



JNP GROUP
CONSULTING ENGINEERS

Phase II Geo-environmental Report

Project: Yew Tree Road,
Birchcliffe,
Huddersfield

Client: Newett Homes

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DOCUMENT CONTROL SHEET

Prepared by.....
Bryony Reynolds
Graduate Geo-Technical Engineer

Approved by.....
Hilary Ilsley BSc (Jnt Hons) MSc CBiol MSB SQP SiLC QP
Associate Geo-environmental Scientist

Approved by.....
Philip Taylor BSc (Hons), MA, CGeol, FGS
Associate

FOR AND ON BEHALF OF JNP GROUP

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EXECUTIVE SUMMARY

Site location	Yew Tree Road, Birchencliffe, Huddersfield, HD3 3QN	
Development scheme	Proposed development with approximately 20 residential properties, with roads and areas of hardstanding for access servicing and parking, and with private gardens.	
NGR	385436, 386871	
Current use	On-site: Pastural fields.	Off-site: Residential, pastural fields, petrol station, church and associated cemetery, woodland and road infrastructure.
Geology	Pennine Lower Coal Measures Formation.	
Coal Mining Risk Assessment	Coal measures strata are present beneath the site.	
Hydrogeology	Secondary-A Aquifer	
Hydrology	The nearest surface water feature is an unnamed stream approximately 40m to the south of the site which flows to the east.	
Geology (from GI)	<p>Topsoil consisting of a gravelly clay, gravel of sandstone, siltstone and mudstone, was encountered across the site to depths between 0.10m and 0.30m bgl.</p> <p>Made ground was encountered in TP205, TP207 and TP208, to depths between 0.30m and 0.70m bgl. Made ground comprised a sandy gravelly clay with occasional cobbles and glass fragments. The gravel fraction comprised brick, clinker, pottery and sandstone.</p> <p>Soils of the Pennine Lower Coal Measures Formation were encountered in all exploratory holes to depths between 0.90m and 2.00m bgl. The cohesive deposits were generally described as firm orangish brown mottled grey slightly sandy gravelly clay.</p> <p>Bedrock inferred to be of the Pennine Lower Coal Measures Formation were encountered in all exploratory holes from depths between 0.90m and 2.70m bgl. Bedrock was generally described as an extremely weak or weak grey mudstone, orangish brown fine-grained sandstone or orangish brown siltstone. Bedrock was typically recovered as gravel or cobbles.</p>	
Groundwater	Groundwater was encountered in one exploratory hole location (TP202) to the west of the site at 3.40m bgl.	

<p>Foundation design</p>	<p>Traditional shallow strip or pad foundations are considered feasible, placed within the cohesive deposits of the Pennine Lower Coal Measures Formation. An allowable bearing pressure of 75 kN/m² would be available at 0.9 m bgl, based upon standard 0.6 m wide foundations;</p> <p>The site contains several mature trees, which would require foundations within influencing distance to be deepened, based upon soils of medium volume change potential. Localised deepening in areas of deeper made ground may also be required.</p> <p>Design sulphate class DS-1 and ACEC class AC-1 is required for buried concrete with the soils encountered on this site.</p>
<p>Road construction</p>	<p>A CBR of 4% is anticipated, subject to outstanding test results. This should be checked upon receipt of an addendum report and on site with plate bearing tests.</p>
<p>Contamination</p>	<p>A risk to future residential end users is present from locally, elevated PAHs in made ground deposits and topsoil in the northwest and eastern field;</p>
<p>Recommendations</p>	<p>A remediation strategy report be produced for the site.</p> <p>A tree survey be undertaken at the site, in order to be able to assess their impact upon foundations types and depths.</p> <p>A copy of this report is submitted to the Regulatory Authorities for their approval before any further work is undertaken at the site.</p>

1 INTRODUCTION

1.1 General

1.1.1 JNP Group was instructed by the Newett Homes to undertake a ground investigation of:

Yew Tree Road,
Birchencliffe,
Huddersfield
HD3 3QN

hereinafter referred to as 'the site'. This report is subject to the limitations presented in **Appendix A**.

1.1.2 It is understood that the site is to be developed with approximately twenty residential properties, with roads and areas of hardstanding for access servicing and parking, and with private gardens. The proposed redevelopment layout is shown on external Drawing Reference 7003-01 dated 28 October 2024 (**Appendix B**).

1.1.3 All comments given are based on the understanding that the proposed redevelopment will be as detailed above.

1.2 Objectives

1.2.1 The purpose of the investigation was to determine the geo-environmental ground conditions at the site and assess the implications of such relative to the proposed residential redevelopment. The scope of work comprised desk-based research, and a site inspection together with intrusive investigation and laboratory testing. This report contains details of the site, the work and laboratory testing undertaken, strata encountered, chemical laboratory test results and provides an interpretative assessment of the ground conditions with regard to contaminated land issues.

1.3 Methodology

1.3.1 This report has been compiled in accordance with the on-line Land contamination: risk management (LCRM) guidance produced by the Environment Agency (June 2019). This can be found on the UK government website: <https://www.gov.uk/guidance/land-contamination-how-to-manage-the-risks>.

1.3.2 The report has also been compiled in accordance with following guidance from the Yorkshire and Lincoln Pollution Advisory Group (YALPAG):

- Verification Requirements for Cover Systems. Technical Guidance for Developers, Landowners, and Consultants. Version 4.1, dated July 2021.
- Verification Requirements for Gas Protection Systems. Technical Guidance for Developers, Landowners, and Consultants Version 1.1, dated December 2016.

1.3.3 This report has been prepared following review of a previous investigation undertaken on the site by Rogers Geotechnical Services (RGS) 'Phase 2 Geo-Environmental Report, Site A - Yew Tree Road/Burn Road, Birchencliffe, Huddersfield, HD2 2EQ' (Referenced C2213/21/E/3266) dated 12 July 2022 and 'Phase 2 Geo-Environmental Report, Site B - Yew Tree Road/Burn Road, Birchencliffe, Huddersfield, HD2 2EQ' (Referenced C2213/21/E/3374)

dated 8 July 2022. The site investigation for both Site A and Site B was undertaken in the spring and summer of 2022.

2 SITE DESCRIPTION

- 2.1.1 The site is located to the south of Yew Tree Road, Birchencliffe, approximately 4.1km to the northwest of Huddersfield town centre (see Figure 1 Key Plan). The centre of the site is located at National Grid Reference SE 119 190. The site covers an area of approximately 1 hectare.
- 2.1.2 An engineer from JNP Group visited the site on 12 March 2025. Photographs of the site are included within **Appendix C**.
- 2.1.3 Regionally, the topography is falling from approximately 182m aOD in the north-west to approximately 174m aOD in the south-west.
- 2.1.4 The site consists of two pastural fields in the east and west, separated by a dry-stone wall. There are few large mature trees sporadically present along the centre of the site and to the northeast.
- 2.1.5 During the site work in March 2025, an area of hardstanding was present to the northwest of the western field of the site consisting of concrete. A stockpile consisting of topsoil and vegetation was noted to be present in the central south of the western field. The footprint of a demolished brick structure was present in the central south of the eastern field and the central south of the western field.
- 2.1.6 The northern and eastern boundaries of the site comprise road infrastructure with residential properties beyond the road infrastructure. There is an overhead telephone wire following the northern boundary of the site. The southern boundary is bounded by large mature trees with pastural fields to the south. There is a church and associated cemetery approximately 130m to the south of the site. There is a petrol station approximately 70m to the south-west of the site. The western boundary of the site is bounded by a wooded area with pastural fields, residential properties and road infrastructure beyond.
- 2.1.7 The surrounding land uses are summarised in Table 2.1 below.

Table 2.1 Surrounding Land Use

Direction	Land Use
North	Road infrastructure and residential properties.
East	Road infrastructure and residential properties.
South	Pastural fields, petrol station, church and associated cemetery.
West	Woodland, pastural field, road infrastructure and residential properties.

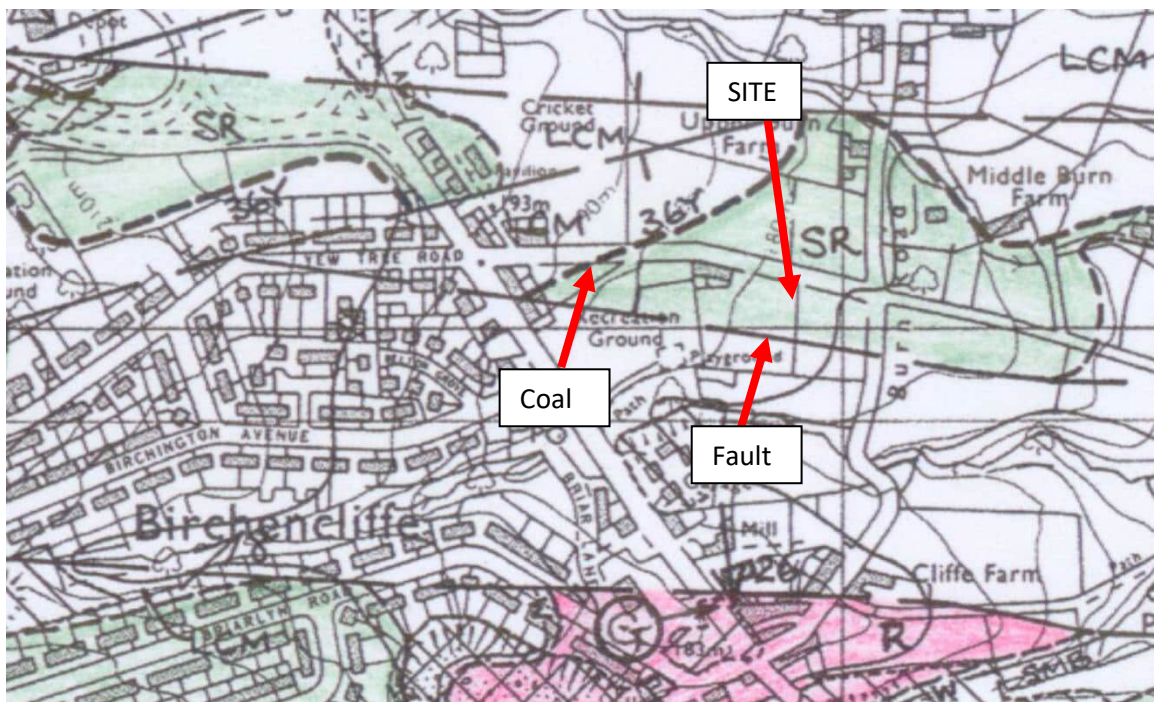
- 2.1.8 Whilst JNP Group are not experts on this, according to online mapping provided by Zetica (<https://zeticauxo.com/downloads-and-resources/risk-maps/>) the site lies with an area of Low risk of unexploded ordnance (UXO).

3 GEOLOGY, HYDROGEOLOGY AND HYDROLOGY

3.1 Geology

- 3.1.1 The geology of the site has been determined by reference to the 1:50,000 scale British Geological Survey (BGS) online GeoIndex Tool as well as to the BGS 1:10,000 Series published geological map, SE11NW, and the BGS 1:50,000 Series published geological map Sheet 77 Huddersfield (Solid and Drift) published 2003.
- 3.1.2 No recorded artificial or made ground is indicated at the site.
- 3.1.3 No superficial geology is indicated to be present on the site.
- 3.1.4 The underlying “bedrock” geology to the north (approximately 75% of the site) is indicated to be strata of the Stanningley Rock (Pennine Lower Coal Measures Formation), which is described by the BGS as “a fine-grained, thinly bedded, commonly ganisteroid sandstone.”
- 3.1.5 The underlying “bedrock” geology to the south (approximately 25% of the site) is indicated to be strata of the Pennine Lower Coal Measures Formation, which is described by the BGS as “Interbedded grey mudstone, siltstone and pale grey sandstone.”
- 3.1.6 The solid geology on the south of the fault is shown to dip approximately 6° to the northwest however, regionally the solid geology dips approximately 4° to the east.
- 3.1.7 A fault is present along the boundary of the Stanningley Rock and strata of the Pennine Lower Coal Measures Formation.
- 3.1.8 The 36 Yars and Hard Bed Band Coal Seams are indicated to outcrop approximately 80m to the northwest of the site.

Figure 3.1 Extract of the BGS 1:10,000 Map SE11NW



3.2 BGS Borehole Records

- 3.2.1 JNP Group has consulted online borehole records held by the BGS. No boreholes are located within 250m of the site.

3.3 Hydrogeology

- 3.3.1 The Aquifer designation determined by reference to defra's Magic Map website (<https://magic.defra.gov.uk/>). The map indicates that the site is underlain by a Secondary-A Aquifer, referring to the Pennine Lower Coal Measures Formation.

- 3.3.2 The Environment Agency define a Secondary-A Aquifer as:

“Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers.”

- 3.3.3 The site's proximity to groundwater Source Protection Zones (SPZs) was determined by reference to defra's Magic Map website (<https://magic.defra.gov.uk/>). These zones show the risk of contamination of major licensed groundwater abstractions from any activities that might cause pollution in the area, with the closer the activity, the greater the associated risk. The maps show four main zones (inner, outer, total catchment and special interest) to a groundwater source.

- 3.3.4 The site does not lie within a groundwater source protection zone (SPZ)

3.4 Hydrology

- 3.4.1 The nearest surface water feature is an unnamed stream approximately 40m to the south of the site which flows to the east.

4 PREVIOUS INVESTIGATION DATA

4.1 Introduction

4.1.1 The site has been subject to previous ground investigation by RGS (reports referenced C2213/21/E/3266 and C2213/21/E/3374), dated July 2022). These reports comprised Phase II Geo-Environmental Reports. The scope of the investigation and the results of the findings are summarised in the following sections.

4.2 Site Work

4.2.1 The site was separated into Site A (in the west) and Site B (in the east) by RGS as shown on Figure 4.1.

Figure 4.1 Satellite image showing the location of Site A and Site B



4.2.2 The intrusive site work for Site A was undertaken by RGS between the spring and summer of 2022 and comprised six windowless sample boreholes (WS01-WS06), three dynamic probes (WS02, WS03 and WS04), four machine excavated trial pits (TP01-TP04), two soakaway pits (TPSA01 and TPSA02) and six water flush rotary open hole boreholes to prove presence of potential coal workings (RO1, RO2, RO4, RO5, RO7 and RO8). Three gas monitoring standpipes were installed (WS01, WS03 and WS05).

The intrusive site work for Site B was undertaken by RGS between the spring and summer of 2022 and comprised four windowless sample boreholes, dynamic probes (WS08, WS09 and DP11), five rotary open hole boreholes RO3, RO5, RO6, RO9 and RO10), seven mechanically excavated trial pits (TP05, TP06, TP06A, TP07, TP08) and two soakaway pits (TPSA03 and TPSA04).

Six gas and groundwater monitoring visits were undertaken over three months from 14 April 2022.

4.3 Ground Conditions

- 4.3.1 Made ground was encountered across the Site A to depths between 0.15m and 0.40m below ground level (bgl) and generally consisted of a 'firm dark brown slightly sandy silty clay with rare gravel of plastic and glass'.
- 4.3.2 Made ground was underlain by cohesive soils to >4m bgl consisting of either a 'firm greyish brown sandy gravelly laminated clay' or 'firm locally stiff gravelly silty clay'. Gravels consisted of sandstone and rare coal. Potentially reworked cohesive soils described as 'firm locally stiff dark brown mottled orangish brown light grey and dark grey sandy gravelly silty clay' was encountered in WS05 and WS06 to the south of the site.
- 4.3.3 The cohesive soils were underlain by interbedded sandstone and mudstone of the Pennine Lower Coal Measures Formation to >30m bgl.
- 4.3.4 Topsoil was encountered in all exploratory hole locations across Site B to depths between 0.15m and 0.30m bgl and was described as 'dark brown organic silty fine sand'.
- 4.3.5 The topsoil was underlain by cohesive soils of either a 'soft to firm silty clay with lithorelics of sandstone' or a 'firm locally stiff brown locally mottled dark brown silty gravelly clay'. Gravels consisted of sandstone and rare coal to depths of >1.20m and >3.00m bgl. Potentially reworked clay was encountered in WS09, WS10 and TPSA03 to depths between 1.40m and 2.30m bgl, comprising 'soft to stiff brown mottled grey and orangish brown slightly sandy slightly gravelly clay with low cobble content'. The gravel and cobbles consisted of sandstone, mudstone and coal.
- 4.3.6 The cohesive soils were underlain by interbedded sandstone and mudstone of the Pennine Lower Coal Measures Formation to >30m bgl.
- 4.3.7 The cohesive soils were recorded to have a medium volume change potential.
- 4.3.8 A design Sulphate Class of DS1, with an ACEC of AC-1s, was recommended for all buried concrete.
- 4.3.9 Copies of the RGS exploratory hole location plans borehole logs are included in **Appendix D**.

4.4 Groundwater

- 4.4.1 Groundwater was encountered by RGS in the rotary boreholes between 3.00m and 9.00m bgl.

4.5 Gas Conditions

- 4.5.1 Gas monitoring was undertaken by RGS after the completion of the site work. Gas monitoring involved the measurement of methane, carbon dioxide and oxygen, along with gas flow rate. Methane was recorded in Site A and Site B between 0.0% and 0.1%, and a maximum concentration of carbon dioxide in Site A (WS01) of 6.9% vol. and 4.2% vol. in Site B (WS08). Flow rates were recorded between 0.0 and 2.1 litres per hour.
- 4.5.2 Gas protections are considered to be necessary for the site.

4.6 Chemical Results Soil Analyses

- 4.6.1 Nine samples of soil were submitted to laboratory analysis for BTEX compounds (benzene, toluene, ethylbenzene and xylene), speciated total petroleum hydrocarbons (TPH), speciated polycyclic aromatic hydrocarbons (PAH), CLEA metals and asbestos.

4.6.2 From the ground investigation and subsequent assessment undertaken at the site in the spring and summer of 2022, contamination was recorded within the near surface soils in the following locations:

- WS07 in the north-west of Site B at 0.10m bgl (benzo[a]anthracene, chrysene, Benzo[b]fluoranthene, Benzo[k]fluoranthene, Benzo[a]pyrene, indeno(1,2,3-c,d)Pyrene, Dibenz(a,h)Anthracene, Benzo[g,h,i]perylene).
- WS08 in the north-east of Site B at 0.20m bgl (benzo[a]anthracene, bhrysene, benzo[b]fluoranthene, benzo[k]fluoranthene, benzo[a]pyrene, indeno(1,2,3-c,d)pyrene, dibenz(a,h)Anthracene, benzo[g,h,i]perylene).

4.6.3 Visual evidence of detrital material consisting of plastic and glass was encountered in the made ground across Site A to depths between 0.15m and 0.40m bgl.

4.7 Conclusions on Land Quality made by RGS

4.7.1 Based on the soil chemical results the following conclusions were made by RGS:

- 'The site is locally contaminated by PAH's'.
- 'This contamination is also noted to be within the topsoil at the site; near surface residual soils appear to be uncontaminated'.

4.8 Land Quality Recommendations made by RGS

4.8.1 Based on their land quality conclusions, RGS made the following recommendations: -

- 'Produce a validation report to demonstrate that the environmental risks discussed in this report have been mitigated'.

4.9 Geotechnical Recommendations made by RGS

4.9.1 Based on their geotechnical test results, RGS made the following foundation recommendation:

- 'In areas of the site where the upper weathered fraction of the Coal Measures will be exposed, which generally consists of firm to stiff clay, it is considered that this material will provide a suitable bearing stratum, provided that the foundations are placed within soil generally described as being present in a firm insitu condition. It is considered that strip or spread foundations constructed within this material at a minimum depth of say 1.2m (or, locally depended in areas of the site in which reworked soils are expected).'
- 'The allowable increase in stress given above assumes a factor of safety of 3 against general shear failure, with cohesion of 50kN/m.'

5 SITE WORK

5.1 Introduction

- 5.1.1 Intrusive site work was undertaken by JNP Group on 12 March 2025 and comprised eleven mechanically excavated trial pits. An additional two mechanically excavated pits were excavated in the stockpile to the central south of the western field to prove natural ground below.
- 5.1.2 All site work was completed under the instruction and supervision of JNP Group with the ground investigation procedures and sample descriptions given in the following publications:
- BS 5930 (2015). Code of Practice for Site Investigations;
 - BS 10175 (2001+A1:2013+A2:2017). Investigation of potentially contaminated sites - code of practice;
 - BS EN ISO 14688-1. "Soil - Identification and Description;
 - BS EN ISO 14688-2. Soil - Classification principles and quantification of descriptive characteristics;
 - BS EN ISO 14689. Rock - Identification and description;
 - BS 18400-104:2018. Soil Quality – Sampling. Part 104: Strategies;
 - BS 18400-202:2018. Soil Quality – Sampling. Part 202: Preliminary Investigations;
 - BS 18400-203: 2018. Soil Quality – Sampling. Part 203: Investigation of potentially contaminated sites;
 - BS 18400-205: 2018. Soil Quality – Sampling. Part 205: Guidance on the procedure for investigation of natural, near natural and cultivated sites;
- 5.1.3 For sites affected by asbestos impacted soils, the guidance given in the following publications has been followed:
- Industry Guidance on Interpretation for Managing & Working with Asbestos in Soil and Construction and Demolition Materials (CL:AIRE 2016);
 - Asbestos in Soil and made ground: a guide to understanding and managing risks (CIRIA C733 2014).
- 5.1.4 The locations of the exploratory holes are shown on JNP Group Drawing No. S12597-JNP-XX-XX-DR-Z-1001. The exploratory hole records including strata and groundwater encountered, in-situ testing and samples taken are presented in **Appendix E**. The full details of the site work undertaken are summarised in the following sections.
- 5.1.5 The site investigation strategy comprised a systemic distribution across the site to suit the proposed redevelopment and address relevant spatial locations considered most likely to be sensitive. The following table shows the rationale for the location of each exploratory hole.

Table 55.1 Exploratory Hole Location Rationale

Exploratory Hole Reference	Rationale
TP201-TP208 and TP210-TP211	General site coverage. To obtain geoenvironmental samples and obtain information to support foundation design.
TP209	To prove the absence of mine shaft on site.
SP1 and SP2	To prove natural ground below the stockpile.

5.1.6 The general sampling strategy was to take representative soil samples from the ground to characterise the strata encountered and to provide suitable horizontal distribution, however, where visible contamination was present or suspected, targeted spot samples were taken.

5.1.7 Sampling from stockpiles was undertaken using a composite approach, two small samples were taken from around each stockpile.

5.2 Trial Pits

5.2.1 Eleven trial pits, designated TP201 to TP211 were excavated on the 12 March 2025, to depths of between 1.90m and 3.70m bgl. The pits were excavated using a JCB 3CX excavator and logged by a ground engineering specialist by examining soil samples brought to the surface.

6 LABORATORY TESTING

6.1 Environmental

6.1.1 A programme of chemical laboratory testing was scheduled by JNP Group on selected soil samples taken from various depths in the made ground, topsoil and natural ground recovered from the exploratory holes. Samples of any soils displaying visual or olfactory evidence of contamination were also collected and submitted for laboratory analyses. The samples were placed into suitable containers for the required chemical analyses.

6.1.2 All samples were transported to i2 Analytical Testing Services in Doncaster which is accredited under UKAS and MCerts. The following table summarises the contaminants scheduled:

Table 6.1 Scheduled Soil Chemical Analyses

Determinant	No
Polycyclic Aromatic Hydrocarbons (PAH) 16 USEPA Speciated	20
TPH Criteria Working Group (TPH CWG)	4
Benzene, toluene, ethylbenzene, xylene (BTEX)	4
pH	4
Soil Organic Matter (SOM)	4

6.1.3 The results of the laboratory chemical testing are interpreted in Section 0 and are presented in full in **Appendix F**.

7 GROUND AND GROUNDWATER CONDITIONS

7.1 Strata Encountered

- 7.1.1 The ground conditions encountered during the intrusive investigation were generally consistent with the published geological map. A variable thickness of made ground was found to be underlain by cohesive weathered deposits of the Stanningley Rock and Pennine Lower Coal Measures Formation. Bedrock of mudstone, siltstone and sandstone was encountered below the cohesive deposits.
- 7.1.2 Made ground was noted during the sitework to be present to the northwest of the western field comprising of hardstanding.
- 7.1.3 A summary of the stratigraphy encountered during the investigation is presented in the following table and described in the following sections, but for full details and descriptions, reference should be made to the exploratory hole records presented in **Appendix E**.

Table 7.1 Stratigraphy Encountered

Stratum	Depth to Top (m bgl)	Depth to Base (m bgl)	Thickness (m)
TOPSOIL All exploratory holes excluding TP205, TP207 and TP208	Ground level	0.10 - 0.30	0.10 - 0.30
MADE GROUND TP205, TP207 and TP208	Ground level	0.30 – 0.70	0.30-0.70
PENNINE LOWER COAL MEASURES FORMATION – Cohesive Deposits All exploratory holes	0.10 - 0.70	0.90 - 2.00	
PENNINE LOWER COAL MEASURES – Bedrock All exploratory holes	0.90-2.70	Not proven	Not proven

7.2 Topsoil

- 7.2.1 Topsoil was encountered in all exploratory hole locations, except TP205, TP207 and TP208, to depths between 0.10m and 0.30m bgl.
- 7.2.2 Topsoil was generally described as a dark brown gravelly clay with frequent rootlets. The proportion of clay and gravel varied between exploratory holes. The gravel fraction comprised sandstone, siltstone and mudstone.

7.3 Made Ground

- 7.3.1 Made ground was encountered in TP205, TP207 and TP208, to depths between 0.30m and 0.70m bgl.
- 7.3.2 Made ground was typically described as a dark brown sandy gravelly clay with occasional cobbles and glass fragments. The proportion of clay, sand and gravel varied between exploratory holes. The gravel fraction comprised brick, clinker, pottery and sandstone.

7.4 Pennine Lower Coal Measures Formation – Cohesive Deposits

7.4.1 Soils inferred to be of the Pennine Lower Coal Measures Formation were encountered in all exploratory holes to depths between 0.90m and 2.00m bgl. The cohesive deposits were generally described as firm orangish brown mottled grey slightly sandy gravelly clay. The proportion of clay, sand and gravel varied between exploratory holes. The gravel fraction comprised fine grained sandstone and siltstone.

Table 7.2 Claygate Member – Geotechnical Laboratory Test Results Summary

Property	Number of Tests	Range	Mean	Assessment
Hand Shear Vane (kN/m ²)	13	47-94	60	Firm CLAY.

7.4.2 The undrained shear strength / depth profile as Figure 3.

7.5 Pennine Lower Coal Measures Formation – Bedrock

7.5.1 Bedrock inferred to be of the Pennine Lower Coal Measures Formation were encountered in all exploratory holes from depths between 0.90m and 2.70m bgl. Bedrock was generally described as an extremely weak or weak grey mudstone, orangish brown fine-grained sandstone or orangish brown siltstone. Bedrock was typically recovered as gravel or cobbles.

7.6 Groundwater

7.6.1 A slow groundwater ingress was encountered in TP202 at 3.40m bgl.

7.7 Ground Contamination and Deleterious Material

7.7.1 Fragments of broken glass, clinker and plastic detritus were observed in the made ground associated with TP205, TP206 and TP207.

7.8 Trees and Tree Roots

7.8.1 A number of mature trees within the margins of the site are located in close proximity to the footprints of the proposed plots. Dense vegetation was present along the southern boundary with sporadically distributed trees along the eastern and western boundaries.

8 HUMAN HEALTH DETAILED QUANTITATIVE RISK ASSESSMENT

8.1 Introduction

8.1.1 Qualitative assessment of risks may be sufficient in many cases to eliminate the possibility of significant pollutant linkages. However, quantitative risk assessment is formally required to determine whether there is a 'significant possibility of significant harm being caused'. Part IIA of the Environmental Protection Act 1990 recommends that 'authoritative and scientifically based guideline values for concentrations of the potential pollutants in or under the land' be used to quantify the risk posed by contamination.

8.1.2 Under the Planning Regime, a quantitative risk assessment can be used to decide whether the site is suitable for the proposed use. In addition, the National Planning Policy Framework (March 2012) also indicates that after remediation, as a minimum land should not be capable of being determined as contaminated land under Part IIA.

8.2 Current UK Screening Values

8.2.1 The UK technical guidance for assessing risks to human health is issued from various UK bodies, including the Environment Agency (EA), DEFRA, Contaminated Land: Applications in Real Environment (CL:AIRE), Chartered Institute of Environmental Health (CIEH), and Land Quality Management (LQM) Ltd (part of the University of Nottingham).

8.2.2 New and updated screening values in the form of provisional Category 4 Screening Levels (C4SL) (published in 2014), and Suitable for Use Levels (S4UL), (published 2015), have been produced by DEFRA and CIEH / LQM respectively using modified versions of the EA's Contaminated Land Exposure Assessment (CLEA) software.

C4SL

8.2.3 Provisional C4SL have been derived by CL:AIRE (project team for DEFRA's SP1010 project) following revised statutory guidance, and as a tool to assist in applying the Part IIA Category 1- 4 classifications to a site. The purpose of the C4SL is to provide a simple test for deciding that land is suitable for use, and definitely not contaminated land under Part IIA. They describe a level of risk that is above minimal, but is still low.

8.2.4 In calculating provisional C4SL some of the exposure modelling scenarios and exposure parameters used in the CLEA software have been modified. These modifications are not discussed further, but reference should be made to the original CL:AIRE / DEFRA publications should further information or clarification be required. A list of the new publications is included in the references section at the end of this report.

8.2.5 To date, fourteen contaminants have been assigned provisional C4SL including arsenic, benzene, benzo[a]pyrene, cadmium, chromium VI, lead, mercury, naphthalene, and some chlorinated solvents for the standard land uses (residential with, and without plant uptake, allotments, commercial, and public open space (parks and residential)).

8.2.6 The C4SL are also considered suitable to be used under the planning regime, and DEFRA have confirmed this to all local authorities.

S4UL

8.2.7 The LQM / CIEH S4UL represent generic assessment criteria based on minimal or tolerable risk that are intended to be protective of human health. They have been derived in

accordance with current UK legislation using a modified version of the CLEA software, and are still based on many conservative assumptions. They represent values above which further assessment of the risks or remedial actions may be needed.

- 8.2.8 S4UL have been derived for a comprehensive list of metals, non–metals, petroleum hydrocarbons, polycyclic aromatic hydrocarbons, chlorinated hydrocarbons, phenolic compounds, explosives, and pesticides, for the standard land uses (residential with, and without plant uptake, allotments, commercial, and public open space (residential and park)).
- 8.2.9 For details of the exposure parameters and scenarios used to derive the S4UL the reader is reference to the original LQM / CIEH document “The LQM/CIEH S4UL for Human Health Risk Assessment” (2015).
- 8.2.10 Both sets of screening values can be used to undertake a generic risk assessment by comparing the data directly to the screening value which is considered a conservative approach or statistically to the screening value. Alternatively and if a sufficient dataset is available, a statistical assessment can be undertaken following the guidance given in the joint Chartered Institute of Environmental Health (CIEH) and the Contaminated Land: Applications in Real Environment (CL:AIRE) organisation publication “Guidance On Comparing Soil Contamination Data with a Critical Concentration” (CIEH / CL:AIRE May 2008).

8.3 Petroleum Hydrocarbons

- 8.3.1 JNP Group have followed the guidance given in the Environment Agency publication ‘The UK Approach for Evaluating Human Health Risks from Petroleum Hydrocarbons in Soils’ (Environment Agency, 2005). LQM S4UL values have been published based on carbon banded hydrocarbons with aliphatic and aromatic split, corresponding to the TPH CWG bands.
- 8.3.2 The Society of Brownfield Risk Assessment (SoBRA) have produced some Generic Assessment Criteria for assessing chronic risks from the inhalation of vapours arising from groundwater (GAC_{gwwap}) for a short list of 66 organic contaminants (SoBRA February 2017). These are designed to a defensible screening criteria to assist in evaluating this exposure pathway. They represent concentrations below which the chronic risks from vapour migration and inhalation can be considered low / tolerable. GAC_{gwwap} have been developed in line with current UK risk assessment guidance, and CLEA v1.07 software was used for residential and commercial land use scenarios.
- 8.3.3 Further details of the input parameters selected for use to generate the GAC_{gwwap} can be found in the SoBRA report, and have not been reproduced here. However, it should be noted that they have been derived using some conservative assumptions:
- Impacted ground / perched water is beneath the buildings;
 - An infinite source term is present;
 - There is no biodegradation;
 - Groundwater depth is 0.65m below ground;
 - Use of a sandy soil type (in line with SR3).

8.4 Statistical Assessment

8.4.1 In line with the guidance given in the joint CIEH / CL:AIRE publication, a statistical assessment of the soil contaminant data has been undertaken as follows:

- The soil contaminant data is collated into appropriate datasets. Datasets not suitable for statistical assessment (such as targeted sample data, or datasets containing 6 results or less) are assessed on an individual basis by direct comparison to the generic screening value;
- Those datasets suitable for statistical assessment are checked for outliers. Any apparent anomalies within the dataset are investigated in order to attempt to explain the possible causes for the anomalies;
- The datasets are checked for normality using graphical and statistical assessment;
- An upper confidence limit (95% UCL) is calculated for comparison to the selected screening value. This is a value where there is a 95% degree of confidence that the true mean of the population will fall below.

9 SOIL AND GROUNDWATER ASSESSMENT RESULTS

9.1 Soil Results

9.1.1 The results of chemical testing of three samples of made ground and five samples of topsoil, ten samples of natural ground and two samples from the stockpiles to the south of the western field have been compared with the C4SL and the LQM S4UL values for a 'residential with gardens end use'. These comparisons are summarised in the following tables.

9.1.2 Four SOM tests were undertaken on the made ground and natural ground identified at the site. These were the made ground and natural ground. A SOM of 2.5% is applicable to the soils.

Table 9.1 Comparison of Soil Chemical Test Results with Residential with plant uptake Guideline Values

Determinant	Maximum Measured Concentration			LQM/CIEH S4UL: Residential with plant uptake (mg/kg)			Number of tests	Number of exceedances
	Made Ground	Topsoil	Natural Ground	1%	2.5%	6%		
Naphthalene	2.4	0.69	0.23	2.3	5.6	13	20	0
Acenaphthylene	0.89	0.87	<0.05	170	420	920	20	0
Acenaphthene	2.4	0.82	0.06	210	510	1100	20	0
Fluorene	2.3	1	<0.05	170	400	860	20	0
Phenanthrene	26	10	0.37	95	220	440	20	0
Anthracene	4.2	5.6	<0.05	2400	5400	11000	20	0
Fluoranthene	36	9.2	0.2	280	560	890	20	0
Pyrene	32	16	0.58	620	1200	2000	20	0
Benzo(a)anthracene	13	7.6	<0.05	7.2	11	13	20	TP205 @ 0.30m bgl
Chrysene	14	7.4	0.31	15	22	27	20	0
Benzo(b)fluoranthene	15	9	0.4	2.6	3.3	3.7	20	TP205 @ 0.30m bgl TP207 @ 0.20m bgl TP210 @ 0.20m bgl
Benzo(k)fluoranthene	6.6	3	0.08	77	93	100	20	0
Benzo(a)pyrene	13	7.8	<0.05	2.2	2.7	3.0	20	TP205 @ 0.30m bgl TP206 @ 0.20m bgl TP207 @ 0.20m bgl TP210 @ 0.20m bgl
Indeno(1,2,3-c,d)pyrene	5.9	4.2	0.16	27	36	41	20	0
Dibenzo(a,h)anthracene	1.2	1	<0.16	0.24	0.28	0.3	20	TP205 @ 0.30m bgl TP206 @ 0.20m bgl TP207 @ 0.20m bgl TP208 @ 0.10m bgl TP210 @ 0.20m bgl
Benzo(g,h,i)perylene	6.3	4.5	0.15	320	340	350	20	0
TPH Aromatic C ₂₁ – C ₃₅		15		1100	1500	1700	4	0

*assumes all chromium on site is in trivalent form

** provisional C4SL

***most sensitive fraction within wider TPH band (specified)

9.2 Interpretation

- 9.2.1 The analyses recorded marginally elevated concentrations of some PAHs (benzo(a)anthracene, benzo(b)fluoranthene, benzo(a)pyrene and dibenzo(a,h)anthracene) within the topsoil and made ground respect to the selected screening values.
- 9.2.2 Elevated concentrations of PAHs were encountered in the eastern field around TP205, TP206, TP207, TP208 and TP210.
- 9.2.3 Made ground was encountered around TP205, TP207, TP208 and was observed in the northwest of the site during the site works.
- 9.2.4 The areas of localised made ground required remediation.
- 9.2.5 A statistical assessment has been undertaken on the topsoil PAH results, this is summarised in the table that follows. For the topsoil the average SOM was 6.7% and therefor JNP Group have selected screening values for a 6% for use in this additional assessment.

Table 9.2 Statistical assessment

Determinant	Number of Tests	95% UCL	Screening Value	Comment
Benzo(a)anthracene	9	8.22	13	Concentrations acceptable
Benzo(b)fluoranthene	9	8.91	3.70	Whilst no statistical outliers were identified, from a review of the dataset, JNP Group considered that there are four locations (TP206, TP210, WS07 and WS08) where these PAH concentrations are higher than the main data set and therefore represent local hot spots and require remediation. Once these are removed from the data set the updated 95% UCL are acceptable to the screening values.
Benzo(a)pyrene	9	9.55	3.00	
Dibenz(a,H)anthracene	9	1.57	0.3	

- 9.2.6 Based on the statistical assessment above, TP206 and TP210, WS07 and WS08 are considered to be localised hotspots of PAH contamination within the topsoil and are not suitable for re-use. The remaining areas of topsoil are suitable for re-use.

Risks to Controlled Waters

9.2.7 Mobile species of hydrocarbons have not been recorded at the site. Concentration of metals recorded in the original investigation were similar to background concentrations.

Table 9.3 Concentration of metals from the ground investigation in 2022

Determinant	Maximum Measured Concentration		Background Concentration	LQM/CI EH S4UL: Residential with plant uptake (mg/kg)	Number of tests	Number of exceedances
	Topsoil	Natural Ground				
Arsenic	17	6.0	14.42	37	5	0
Cadmium	0.39	0.13	0.38	11	5	0
Chromium (trivalent or total)*	<0.50	<0.50	140.89	910	5	0
Copper	45	31	50.58	2400	5	0
Lead	180	26	114.83	200**	5	0
Mercury (elemental)	0.14	<0.05		1.2	5	0
Nickel	32	39	33.69	180	5	0
Selenium	1.6	2.1	1.40	250	5	0
Vanadium	31	35	112.88	410	5	0
Zinc	180	86	117.21	3700	5	0

9.3 Summary

9.3.1 On the basis of the chemical testing undertaken, JNP Group considers that a viable risk to human health exists from localised elevated concentrations of some PAHs in near-surface soils within the made ground and topsoil to the northwest of the site and to the east of the site around TP206, TP207, TP208 and TP210. Hence, remedial actions at the site is considered necessary in these areas for the proposed development.

9.3.2 There is no risk identified to controlled waters.

10 REVISED CONCEPTUAL SITE MODEL AND OVERALL ENVIRONMENTAL RISK

10.1 Summary

10.1.1 Following the ground investigation and subsequent assessment undertaken, the conceptual site model and overall environmental risk assessment have been updated as detailed in the following table.

Table 10.1 Updated Conceptual Model and Risk Assessment

Issue	Risk	Justification
HUMAN HEALTH	MEDIUM	Localised PAH contamination with the topsoil and made ground to the northwest of the site and the east of the site. Remediation is required at the site to reduce the risks to acceptable levels. Elevated concentration of carbon dioxide have been recorded and gas protection measures to CS2 are required.
GROUNDWATER	LOW	Mobile hydrocarbons have not been recorded at the site however, the presence of cohesive strata restricts vertical migration to permeable water table.
SURFACE WATER	LOW	Mobile hydrocarbons have not been however the presence of cohesive strata restricts lateral migration to permeable water table.
PROPERTY & INFRASTRUCTURE	MEDIUM	Elevated concentration of carbon dioxide have been recorded and gas protection measures to CS2 are required. in localised areas to a CS2 classification and hence gas protection measures are required at the site to ensure risks are acceptable to the end users.
ECOLOGY	NONE	Based on the assumption that there are no sensitive/ protected species on site (subject to any ecological survey undertaken)

11 GEOTECHNICAL ENGINEERING ASSESSMENT

11.1 Proposed Development / Redevelopment

11.1.1 It is proposed to develop the site with approximately 20 residential properties, with roads and areas of hardstanding for access servicing and parking, and with private gardens.

11.2 Summary of Ground and Groundwater Conditions

11.2.1 The ground conditions encountered during the intrusive investigations were generally consistent with the published geological records. In general, a variable thickness of made ground was encountered predominantly to the east of the site. The made ground was found to overlie generally firm cohesive weathered strata of the Pennine Lower Coal Measures Formation. Bedrock of the Pennine Lower Coal Measures Formation consisting of mudstone, siltstone and sandstone was encountered across the site from depths between 0.90m and 2.70m bgl. The base of the bedrock was not proven.

11.3 Shallow Foundations

11.3.1 The made ground deposits are considered unsuitable to support foundation loads due to their poor engineering characteristics, and inherent variability.

11.3.2 Traditional shallow strip or trench foundations are considered feasible, placed within the cohesive deposits of the Pennine Lower Coal Measures Formation.

11.3.3 Foundation excavations should be taken through all topsoil and made ground deposits, and foundations placed within the firm to stiff cohesive deposits of the Pennine Lower Coal Measures Formation at a minimum founding depth of 0.90 m bgl, based upon soils of medium volume change potential. An allowable bearing pressure of 75 kN/m² would be available at 0.90 m bgl, based upon standard 0.60 m wide foundations. The allowable bearing capacity includes an overall factor of safety of 3 against bearing capacity failure, whilst ensuring total settlements are maintained at less than 25mm. However, there are several trees, bushes and hedges in and around the site, and the influence of these may be the controlling criteria for determining foundation type and depth.

11.3.4 In addition as part of the 2022 investigation areas of deeper made ground was recorded by RGS and as such some localised deepening may be required. However JNP did not encounter any deep made ground during the recent investigation works.

11.3.5 Where foundations are to be constructed within the influence of existing, felled or proposed trees, they are likely to need deepening, and heave precautions adopted in accordance with National House Building Council (NHBC) Chapter 4.2 'Building Near Trees', based upon soils of medium volume change potential. It is recommended that collapsible materials are used between foundations and cohesive soils to reduce heave pressures. JNP Group recommends that a tree species survey is undertaken, and the results are used to calculate their zones of influence, in order to define areas where foundations would require deepening.

11.3.6 Due to the presence of a fault across the site, it is recommended that reinforcement is included within the foundations to accommodate for potential differential settlement.

11.4 Ground Floor Slabs

11.4.1 The underlying soils are considered to have medium volume change potential and consequently may heave. Therefore, suspended ground floor slabs should be used

incorporating suitable underfloor voids, based on the recommendations in NHBC Chapter 4.2, with reference to soils of medium volume change potential.

11.5 Groundwater and Excavations

- 11.5.1 All trial pits remained stable during excavation and therefore foundation / service trenches should not undergo collapse or spalling. Groundwater was encountered in TP202 at 3.40m bgl therefore, JNP Group does not consider that groundwater inflow or excavation collapse will present practical difficulties during foundation excavation.
- 11.5.2 Trial pits carried out as part of this or previous investigations may represent soft spots and conduits/sumps for groundwater or surface water. In excavations, such materials may also be loose and unstable. Unless specifically stated, exploratory hole locations should be regarded as approximate. Consideration should be given to accurate location of such features where it is considered they may impact on the proposed development.
- 11.5.3 Conventional mechanical backhoe excavators should prove to be suitable for excavation through the ground conditions encountered at the site. However, should occasional large obstructions be encountered in excavations, larger capacity excavators and pneumatic/hydraulic breakout equipment may be necessary.
- 11.5.4 The made ground deposits are in a loose state of compaction and will be subject to spalling and partial collapse within excavations. Deeper excavations are likely to be prone to rapid, unpredictable, large-scale collapse, particularly in the presence of groundwater inflows. Consequently, temporary support should be considered for all excavations where collapse is to be avoided. Heavier duty closed shoring should be provided for any excavation where human entry is necessary, in compliance with statutory requirements to ensure safe working conditions. Low levels of carbon dioxide have been recorded from the made ground, hence care should be taken when personnel enter excavations or other confined spaces, to ensure full ventilation is available and appropriate safety precautions taken.

11.6 Pavement Design

California Bearing Ratio

- 11.6.1 It is assumed that the pavement subgrade/formation would be in near surface soils at an approximate depth of 0.60 m below existing ground levels. If ground levels are to be reduced, the formation level would need to be adjusted accordingly, and the specifying geotechnical engineer informed, so that an assessment of the appropriate soil layer can be made.
- 11.6.2 A mean Plasticity Index value of 20 % was recorded in the near surface soils, which indicates an equilibrium subgrade CBR value of 4% (based upon Table 3.1 in Interim Advice Note 73/06 Rev 1 2009), assuming average construction conditions, and high water table.
- 11.6.3 It is recommended that the subgrade CBR value is verified immediately before placement of the pavement capping/subbase to confirm the minimum design CBR value. The design CBR value should not be increased on the basis of these tests. Should testing indicate a subgrade CBR less than the design value, then measures should be taken to improve the subgrade before proceeding with pavement construction.

Frost Susceptibility

- 11.6.4 Soils with a Plasticity Index of greater than 15% would not generally be frost-susceptible (i.e. susceptible to ice lenses formation in frosty conditions) (Croney and Jacobs, 1967).
- 11.6.5 Cohesive soils were locally encountered in the vicinity of WS11 by RGS. A Plasticity Index of 11% was recorded for this sample, which indicates that the soils are frost-susceptible.

12 CONCLUSIONS AND RECOMMENDATIONS

12.1 Conclusions

12.1.1 JNP Group has determined through desk-based research, intrusive investigation, laboratory testing, monitoring, and assessment that:

- The ground conditions encountered during the intrusive investigations were generally consistent with the published geological records. In general, a variable thickness of made ground was encountered predominantly to the east of the site. The made ground was found to overlie generally firm cohesive weathered strata of the Pennine Lower Coal Measures Formation. Bedrock of the Pennine Lower Coal Measures Formation consisting of mudstone, siltstone and sandstone was encountered across the site from depths between 0.90m and 2.70m bgl. The base of the bedrock was not proven.
- A risk to future residential end users is present from locally, elevated PAHs in made ground deposits and topsoil in the northwest of the site and the eastern field;
- Based on a statistical assessment, TP206, TP210, WS07 and WS08 are considered to be localised hotspots of PAH contamination that require remediation. The remaining areas of topsoil are suitable for re-use.
- Traditional shallow strip or pad foundations are considered feasible, placed within the firm to stiff cohesive deposits of the Pennine Lower Coal Measures Formation. An allowable bearing pressure of 75 kN/m² would be available at 0.9 m bgl, based upon standard 0.6 m wide foundations;
- The site contains several mature trees, which would require foundations within influencing distance to be deepened, based upon soils of medium volume change potential;
- Due to ground gas protection requirements, suspended ground floor slabs are required for all new structures;
- The pavement subgrade at an approximate depth of 0.6 m below existing ground level has an equilibrium subgrade CBR value of 4.0 %.

12.2 Recommendations

12.2.1 In line with the guidelines given LCRM and consequent to the ground investigation conclusions; JNP Group recommends that:

- A remediation strategy report be produced for the site. This would include undertaking an options appraisal of potential remediation options and assess the feasibility of short-listed remedial options, undertaking a hazardous waste assessment, designing a sustainable remediation strategy for the site, and an outline validation plan.
- A tree survey be undertaken at the site, in order to be able to assess their impact upon foundations types and depths.

- A copy of this report is submitted to the Regulatory Authorities for their approval before any further work is undertaken at the site.

12.2.2 In addition, JNP Group recommends that the proposed development works are undertaken in accordance with the definition of Waste Code of Practice (DoWCoP); in following this guidance and to ensure materials are managed correctly, a Materials Management Plan will need to be prepared and declared in advance by a Qualified Person, then implemented and documented in a Verification Report. If this process is not undertaken, then following recent changes in Landfill Tax Regulations by HMRC. There is a risk of penalties equating to twice the Landfill Tax being applied to the re-use of material on site. If the proposed works are to be undertaken outside the DoWCoP, there would need to be some of Environmental Permitting or suitable equivalent. The requirements of such are likely to be more onerous and may take longer to be granted.

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FIGURES / DRAWINGS

Figure 1

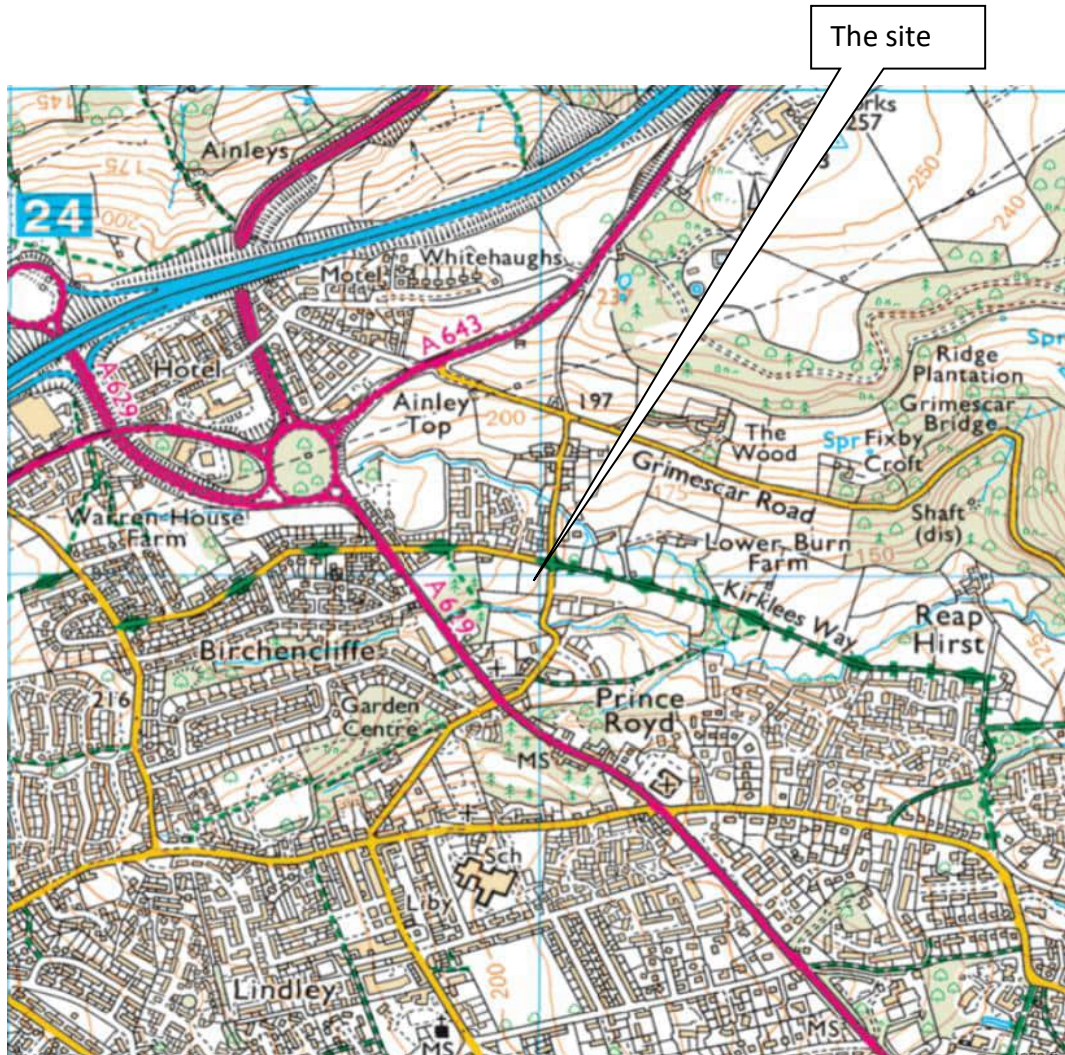
Site Location Plan

Project:

Yew Tree Road, Birchencliffe, Huddersfield

Project No:

S12597



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Figure 2

SPT / Depth Relationship

Project:

Yew Tree Road, Birchencliffe, Huddersfield



Project No:

S12597

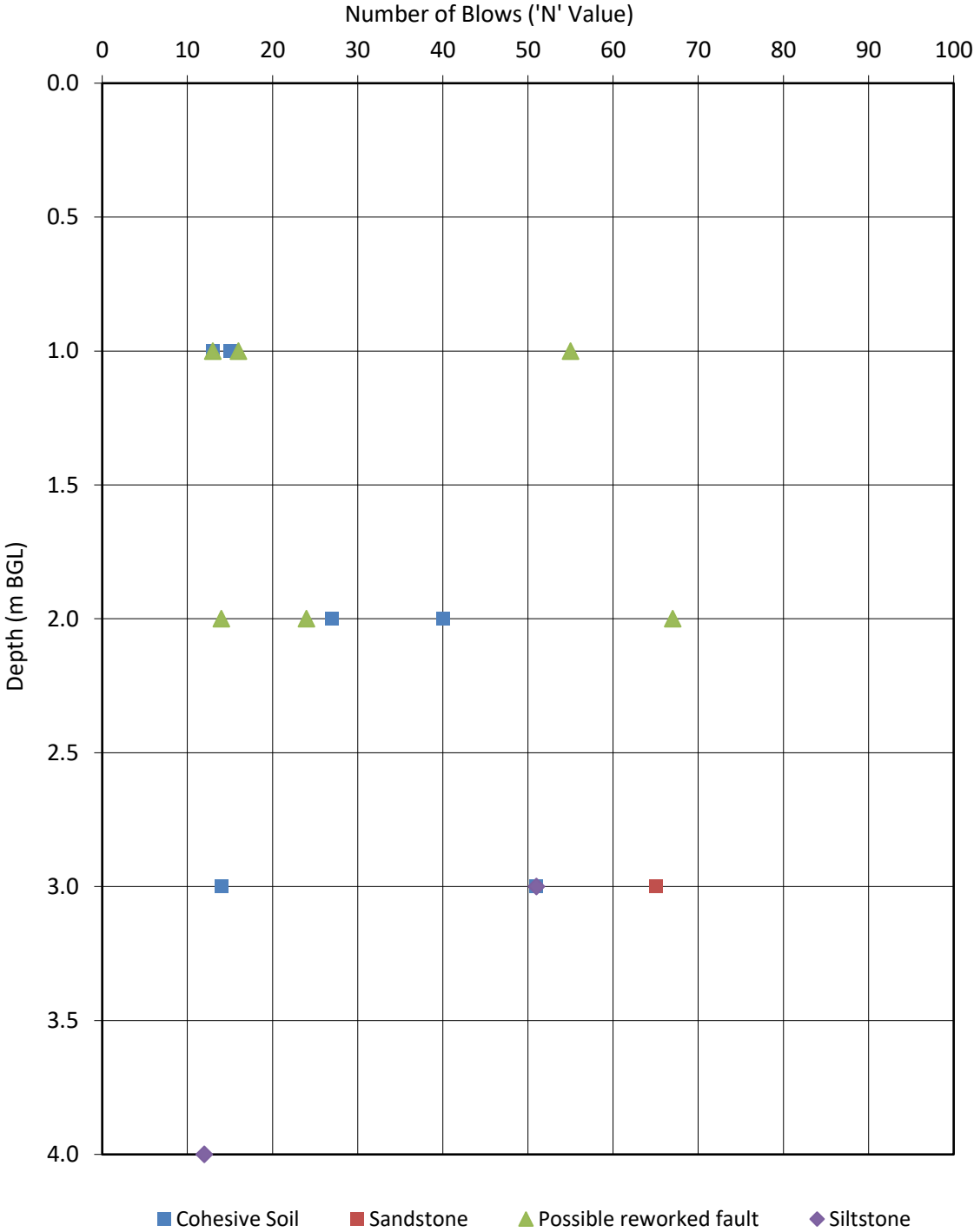


Figure 3

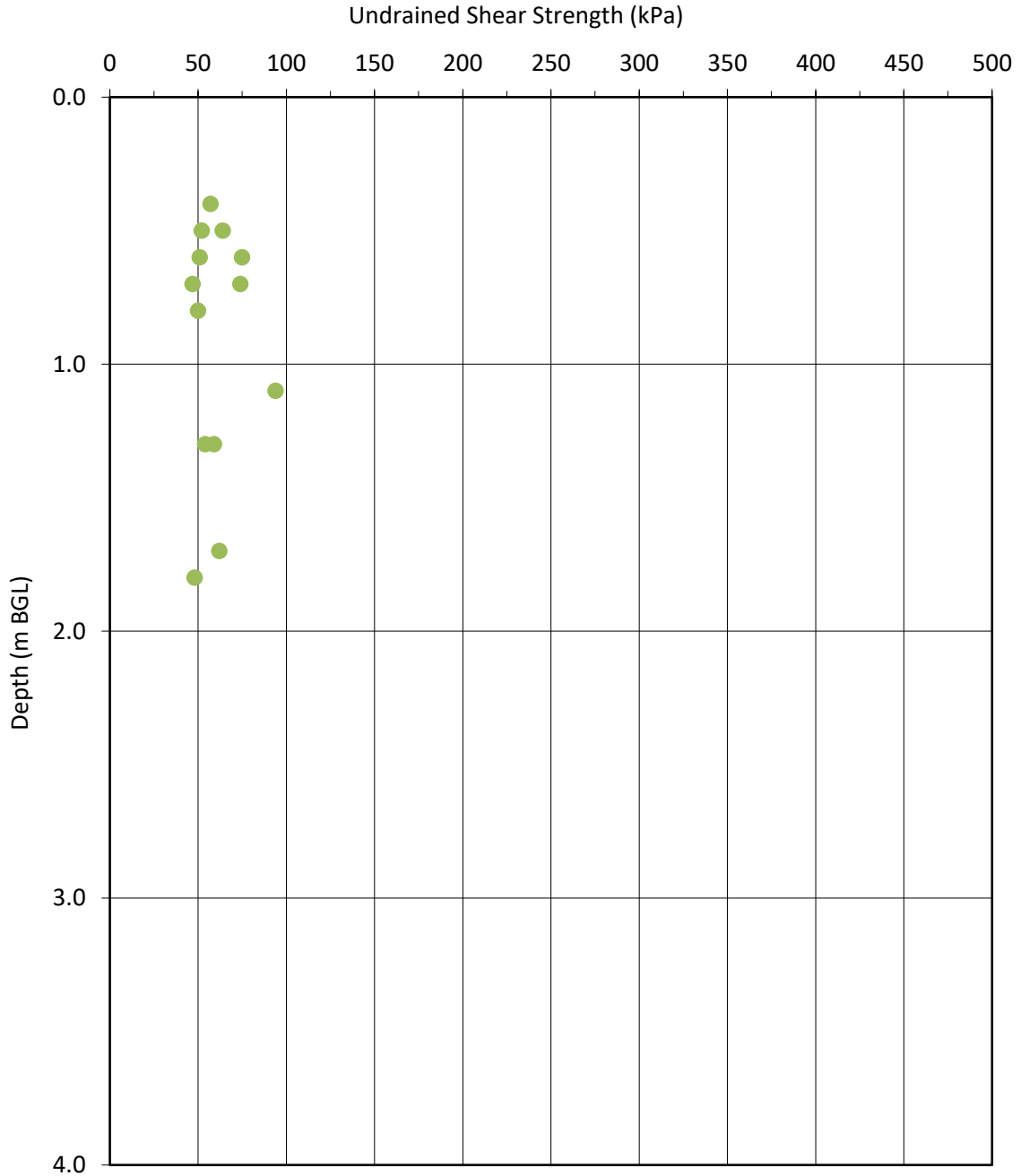
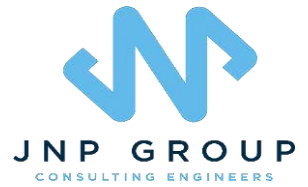
Undrained Shear Strength / Depth Relationship

Project:

Yew Tree Road, Birchencliffe, Huddersfield

Project No:

S12597



- Cohesive Soil
- strata1 (4.5 x SPT N Value)
- strata1 (Triaxial Test)
- strata2 (Hand Shear Vane)
- strata2 (4.5 x SPT N Value)
- strata2 (Triaxial Test)
- Trial Pit (Hand Shear Vane)
- strata3 (4.5 x SPT N Value)
- strata3 (Triaxial Test)
- strata4 (Hand Shear Vane)
- strata4 (4.5 x SPT N Value)
- strata4 (Triaxial Test)

APPENDIX A: LIMITATIONS

INTRODUCTION

This report is confidential and has been prepared solely for the benefit of the client and those parties with whom a warranty agreement has been executed, or with whom an assignment has been agreed. Should any third party wish to use or rely upon the contents of the report, written approval must be sought from JNP Group; a charge may be levied against such approval. JNP Group accepts no responsibility or liability for the consequences of this document being used for any purpose or project other than for which it was commissioned, and: this document to any third party with whom and agreement has not been executed.

Any comments given within this report are based on the understanding that the proposed works to be undertaken will be as described in the introduction and the information referred to and provided by others and will be assumed to be correct and will not have been checked by JNP Group and JNP Group will not accept any liability or responsibility for any inaccuracy in such information.

Any deviation from the recommendations or conclusions contained in this report should be referred to JNP Group in writing for comment and JNP Group reserve the right to reconsider their recommendations and conclusions contained within. JNP Group will not accept any liability or responsibility for any changes or deviations from the recommendations noted in this report without prior consultation and our full approval.

The details contained within this report reflect the site conditions prevailing at the time of investigation. JNP Group warrants the accuracy of this report up to and including that date. Additional information, improved practice or changes in legislation may necessitate this report having to be reviewed in whole or in part after that date. If necessary, this report should be referred back to JNP Group for re-assessment and, if necessary, re-appraisal.

This report is only valid when used in its entirety. Any information or advice included in the report should not be relied upon until considered in the context of the whole report. Whilst this report and the opinion made herein are correct to the best of JNP Group' belief, JNP Group cannot guarantee the accuracy or completeness of any information provided by third parties.

The report represents the finding and opinions of experience geotechnical and geo-environmental engineers. JNP Group does not provide legal advice and the advice of lawyers may also be required.

It should be noted that the following were not included as part of the agreed scope of works with the client: detailed ecological surveys and assessment; groundwater monitoring and sampling; geotechnical requirements etc.

JNP Group has provided advice and made recommendations based on the findings of the work undertaken, however this is subject to the approval / acceptance by the relevant Regulatory Authorities.

Objectives

The work undertaken to provide the basis of this report comprised a study of available documented information from a variety of sources (including the Client), together with (where appropriate) a brief walk over inspection of the site. The opinions given in this report have been dictated by the finite data on which they are based and are relevant only to the purpose for which the report was commissioned. The information reviewed should not be considered exhaustive and has been accepted in good faith as providing true and representative data pertaining to site conditions. Should additional information become available which may affect the opinions expressed in this report, JNP Group reserves the right to review such information and, if warranted, to modify the opinions accordingly. It should be noted

that any risks identified in this report are perceived risks based on the information reviewed; actual risks can only be assessed following a physical investigation of the site.

Phase II Intrusive Investigations

The investigation of the site has been carried out to provide sufficient information concerning the type and degree of contamination, and ground and groundwater conditions to allow a reasonable risk assessment to be made.

Where intrusive investigations have been undertaken, they have been designed to provide a reasonable level of assurance on the conditions. Given the discrete nature sampling, no investigation technique is capable of identifying all conditions present in all areas. The number of sampling points and the methods of sampling and testing do not preclude the existence of localised “hotspots” of contamination where concentrations may be significantly higher than those actually encountered. The risk assessment and opinions provided, inter alia, take into consideration currently available guidance relating to acceptable contamination concentrations; no liability can be accepted for the retrospective effects of any future changes or amendments to these values.

The objectives of the investigation have been linked to establishing the risks associated with potential human targets, building materials, the environment (including adjacent land), and to surface and ground water. The amount of exploratory work and chemical testing undertaken has necessarily been restricted by the short timescale available, and the locations of exploratory holes have been restricted to areas unoccupied by the building(s) on the site and by buried services.

Gas and groundwater levels may vary from those reported due to seasonal, or other effects.

Although preliminary comment has have been provided by JNP Group regarding UXO and Invasive Species, JNP Group not experts in these and as such specialist advice should be sought regarding the presence of UXO and invasive species at the site.

Gas Membranes

Where JNP Group are commissioned to undertake the inspection and validation of a gas membrane, we, at the time of inspection, will ensure that the membrane is laid in accordance with the relevant arrangements and sections. At that time we will ensure that the venting media is laid correctly in preparation of the membrane and we will ensure that any tears in the membrane or bad workmanship is reported and instructions given to be rectified. Thereafter it is the duty of the Principal Contractor to ensure that tears and defects are rectified.

Remediation and Verification Reports Limitations

The risk assessment and opinions provided, inter alia, take into consideration currently available guidance relating to acceptable contamination concentrations; no liability can be accepted for the retrospective effects of any future changes or amendments to these values.

Where intrusive investigations have been undertaken, they have been designed to provide a reasonable level of assurance on the conditions. Given the discrete nature sampling, no investigation technique is capable of identifying all conditions present in all areas. The number of sampling points and the methods of sampling and testing do not preclude the existence of localised “hotspots” of contamination where concentrations may be significantly higher than those actually encountered.

If costs have been included in relation to the site remediation these must be confirmed by a qualified quantity surveyor. The opinions given in this report have been dictated by the finite data on which they are based and are relevant only to the purpose for which the report was commissioned. The

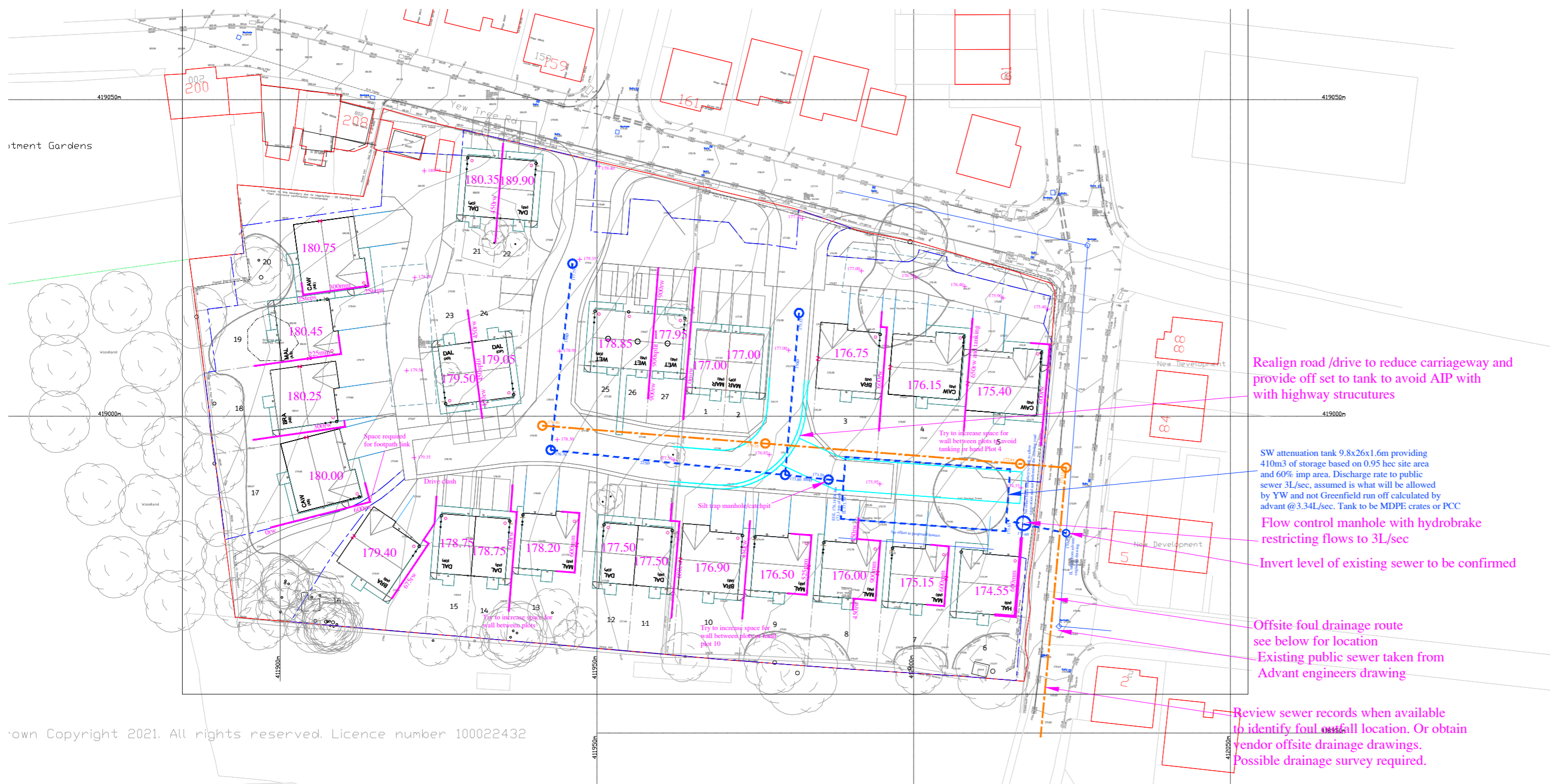
information reviewed from Third Party should not be considered exhaustive and has been accepted in good faith as providing true and representative data pertaining to site conditions. Should additional information become available which may affect the opinions expressed in this report, JNP Group reserves the right to review such information and, if warranted, to modify the opinions accordingly.

Whilst this report and the opinion made herein are correct to the best of JNP Group's belief, JNP Group cannot guarantee the accuracy or completeness of any information provided by third parties.

Gas and groundwater levels may vary from those reported due to seasonal, or other effects.

APPENDIX B: THIRD PARTY DRAWINGS

Ref.	Description	Rev.	Date
------	-------------	------	------



Drainage and levels appraisal



Foundation appraisal

Rev	Details	Date	Drwn.
Newitt Homes			
Yew Tree Road - Birchencliffe			
Engineering appraisal Drawing			
Dwg No. : 7003-01			
Date : 28-10-24			
Scale : 1:500 @A2			
Drawn : PSGBS			

APPENDIX C: PHOTO DOCUMENT



View of the entrance in the north of the western side of the site off Yew Tree Road, facing south



View of the western side of the site from the north, facing south



View of the western side of the site from the south, facing north



View of the western side of the site from the west, facing east



View of the western side of the site from the east, facing west



View of the eastern side of the site from the north, facing south



View of the eastern side of the site from the west, facing east



View of the eastern side of the site from the east, facing west



View of the demolished structure to the central south of the western side of the site, facing east.



View of the stockpile to the central south of the western side of the site, facing south



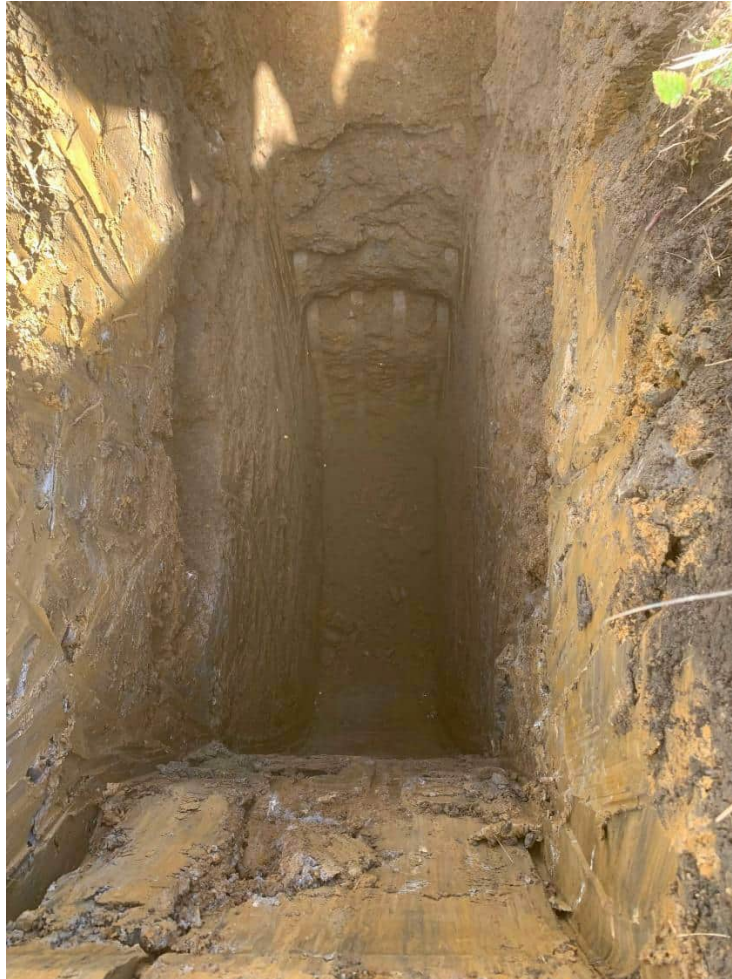
View of the demolished structure to the central south of the eastern side of the site, facing west.



TP201



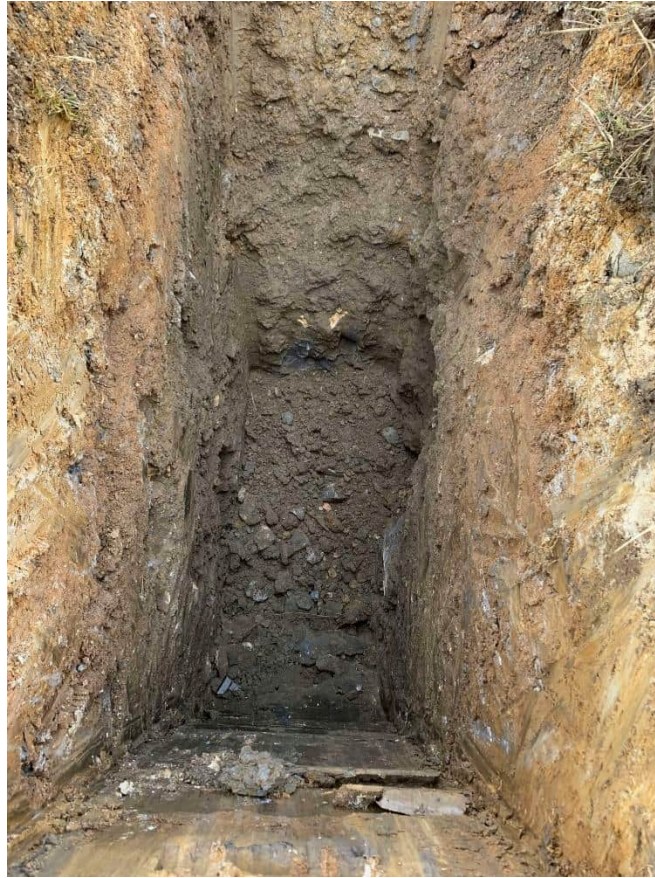
TP201 Arisings



TP202



TP202 Arisings



TP203



TP203 Arisings



TP204



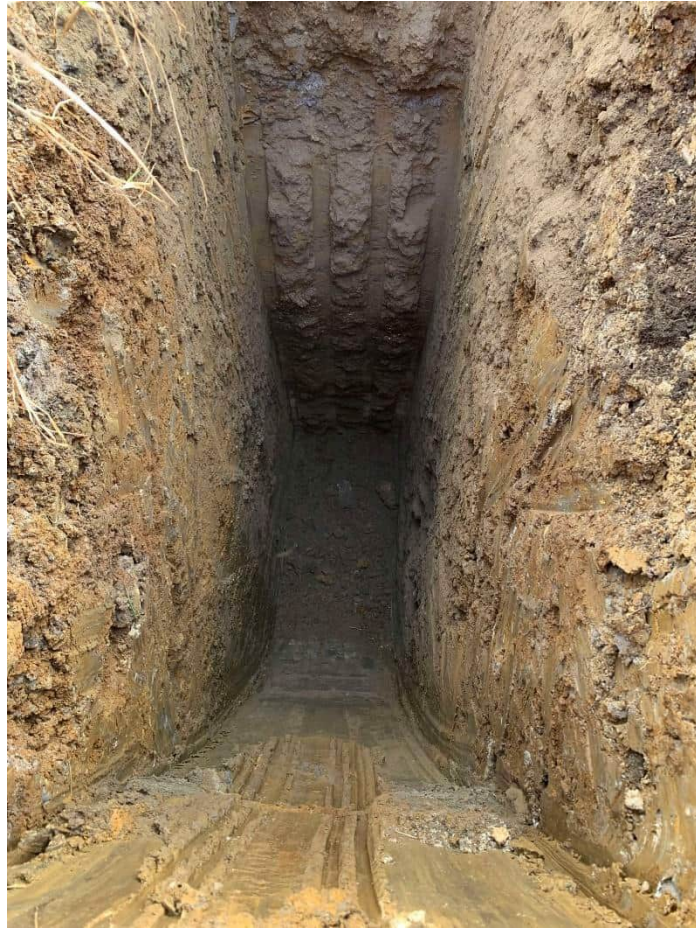
TP204 Arisings



TP205



TP205 Arisings



TP206



TP206 Arisings



TP207



TP207 Arisings



TP208



TP208 Arisings



TP209



TP209 Arisings



TP210



TP210 Arisings



TP211



TP211 Arisings



Stockpile in the central south of the eastern field and arisings

APPENDIX D: PREVIOUS REPORTS

**Environmental
Geotechnical
Specialists**



PHASE 2 GEO-ENVIRONMENTAL REPORT

GEO-TECHNICAL
ENVIRONMENTAL

job number	date
site address	
written by	
checked by	
issued by	

Rogers Geotechnical Services Ltd
Telephone 0843 50 666 87 **Fax** 0843 51 599 30
Email enquiries@rogersgeotech.co.uk
www.rogersgeotech.co.uk
Offices 1 & 2, Barncliffe Business Park, Near Bank, Shelley,
Huddersfield, West Yorkshire HD8 8LU.





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9.	Soil Screening Values



Report on a Phase 2 Geo-environmental Investigation

Location: Site A, Yew Tree Road & Burn Road
Birchencliffe, Huddersfield, HD2 2EQ

For: North Park (Shelley) Ltd.

Report No. C2213/21/E/3266

Report date: July 2022

Planning Application No: 2021/61/94363/W

For and on behalf of **Rogers Geotechnical Services Ltd**

Charlotte Mason BSc FGS
Geo-environmental Engineer

Rob Palmer MSc FGS ACIEH
Senior Geo-environmental Engineer

Report Summary¹

Item	Comments	Section
Development	North Park (Shelley) Ltd, propose to develop the land adjacent to Yew Tree Road/Burn Road, Birchencliffe, Huddersfield, HD2 2EQ by the construction of a series of residential dwellings.	1.0
Geology	Superficial geology – None. Solid geology – Pennine Lower Coal Measures Formation.. The site is split by an east-west trending fault	5.0
Strata Conditions	that localised deposits of made ground was identified in some areas of the site This material shows considerable variability These deposits do not appear to be laterally continuous across the site This investigation has concluded that the natural strata conditions across the site show some variability, which is largely attributed to the change in geology across the site, and also may be intrinsically linked to the faulting within the area.	6.0
Groundwater	Encountered at depths ranging between 3m and 9m bgl.	6.0
Coal Mining Legacy.	No evidence of coal seams, or coal workings have been identified. A Low risk rating has been assigned.	10.0
Foundation Design	Due to variability of ground conditions encountered on site, it is recommended that a pragmatic approach be taken to the foundations for the houses, and are considered on a plot by plot basis. In view of the above, in broad terms, it is considered that the foundation solutions could include shallow footings in areas where natural clays are present in at least a firm in-situ condition. Alternatively, consideration could also be directed towards placing plots on piles.	11.
Effect of Sulphates	DC-1 concrete.	11.5
Contamination	Localised PAH contamination identified within the topsoil. Some remediation will be required	12.1
Gas	Gas monitoring is ongoing. Initial readings would suggest that CS2 conditions will be met, such that gas protection measures will be required.	12.1.2

¹ This summary should not be relied upon to provide a comprehensive review. All of the information contained in this document should be considered.



1. Introduction

It is understood that the land at 'Site A' Yew Tree Road & Burn Road, Birchencliffe, Huddersfield, HD2 2EQ to be developed by the construction of a series of residential houses with front and rear gardens and access roads. Site A forms the western section of a large field, with a dry stone wall present on all four boundary lines. Access to the site is gained via an entrance point in the north-western corner, adjacent to 208 Yew Tree Road; the eastern field, referred to as 'Site B', is being assessed under a separate planning application.

Consequently, a site investigation has been undertaken in accordance with the instruction from the client. This work was required in order to determine the nature of the underlying soils, to assess their engineering properties and to assist in the design of safe and economical foundations for the proposed development. This investigation also takes into consideration the risk of any contamination present, the viability of soakaways and the risks posed by historic coal mining activity.

This report describes the work undertaken, presents the data obtained and discusses the ground conditions in relation to the proposed works.

2. Limitations

The recommendations made and opinions expressed in this report are based on the ground conditions revealed by the site works, together with an assessment of the site and of the laboratory test results. Whilst opinions may be expressed relating to sub-soil conditions in parts of the site not investigated, for example between borehole positions, these are for guidance only and no liability can be accepted for their accuracy.

This report has been prepared in accordance with our understanding of current best practice. However, new information or legislation, or changes to best practice may necessitate revision of the report after the date of issue.

3. Desk Study

3.1 Previous Ground Investigation

For the proposed development area, the following reports have been reviewed:

- Lithos, Preliminary Environmental Investigation, Land at Burn Road, Birchencliffe, Report No. 2550/1, November 2016.

The main issues considered in this report, and in particular in Sections 3 and 4 are based on a review of historical maps and available geological/environmental data, including data obtained by Lithos during investigation of adjacent land. This report provides an assessment of geoenvironmental issues and implications associated with the proposed residential redevelopment



of the site, together with any implications for current use of the site. The report makes the following concluding remarks:

- The published geological data suggests that the site is underlain by Stanningley Rock Sandstone in the north, with undifferentiated Lower Coal Measures in the south. There are no drift deposits shown on the geological map. Moreover, given the findings of Lithos' investigation on adjacent land, natural soils are likely to comprise firm/stiff clays or medium dense gravels, with bedrock likely present within 2m to 3m of current ground levels
- This site is located within a Coal Mining Development High Risk Area (an area with specific mining legacy risks to the surface, including mine entries; shallow coal workings etc). If old mine workings are present in the Hard Bed coal seam, and are considered to pose a significant risk to surface stability, mitigation of the risks posed will be required.
- It is considered possible that the site could be affected by sources of hazardous gas, and therefore a monitoring programme (likely 9 visits over a 6 month period) will be required, with the issue of a Gas Risk Assessment upon completion of the monitoring.
- Given anticipated ground conditions, soakaways may provide a viable solution for the disposal of surface water, subject to in-situ testing.
- The site's environmental setting is considered to be of moderate sensitivity. With respect to human health, the proposed end use (residential) is also considered sensitive.
- It should be noted that the report makes reference to fly tipped waste, but such materials have been stockpiled to the rear (south) of the site.

3.2 Mine Entry Risk Assessment

A mine Entry Risk Assessment was undertaken by RGS in February 2022, the results of which were presented as report number C3113/21/E/3266. That assessment was mainly related to 'site B'. However, there remains some risk, albeit likely low, of unrecorded mine entries of exploratory shafts. In order to mitigate this risk any anomalously deep made ground encountered during future ground investigations would be suspect and should be investigated further. All excavations to natural ground completed during the development of the site should be inspected for anomalous made ground that could represent unrecorded mine entries and if encountered should be investigated accordingly under CA licence.



4. Fieldworks

The fieldworks was undertaken in the spring and early summer of 2022², over numerous visits and included the following:

- Six windowless sample boreholes (WS01 – WS06).
- Standard penetration tests within three boreholes (WS01, WS05, WS06).
- Dynamic probes from surface within three boreholes (WS02, WS03, WS04).
- Three gas monitoring standpipes (WS01, WS03, and WS05).
- Six water flush rotary open hole boreholes to prove presence of potential coal workings (R01, R02, R04, R05, R07, R08).
- Four machine excavated trial pits.
- Two machine excavated trial pits for soakaway tests.

It should be appreciated that whilst Site A and Site B are being assessed under separate planning applications, both sites were investigated simultaneously. As such, the borehole nomenclature is systematic and covers all works over both sites, albeit the investigation locations that were sunk within Site A are summarised above. The investigatory locations are shown on the site plan which is presented in Appendix 1 to this report.

4.1 Acquisition of Coal Authority Permit

In order to undertake this investigation, it was necessary to obtain permission to enter or disturb Coal Authority interests. This permission was granted in November 2021 as permit reference number 24130, which is presented in Appendix 2 to this report. In accordance with the joint Coal Authority and Health and Safety Executive positioning statement, and under the requirements of the permit, the works were undertaken employing water flush drilling techniques with gas monitoring of the boreholes during the fieldworks.

4.2 Windowless Sample Boreholes

These boreholes were sunk using a drive-in windowless sampler. The cores were undertaken in 1m lengths and reduced in diameter from 90mm for the first 1m through 80mm, 70mm and 60mm for subsequent 1m increments. The recovered cores were sealed and returned to the laboratory for logging and subsequent testing. The soils were described in general accordance with BS5930: 2015 +A1: 2020 and full descriptions are given on the windowless sample records which are presented in Appendix 3. Also included on these records are the core diameters and percentages of core recovered.

² The site was observed to be very wet and boggy during the Spring, which inhibited completing the program of site investigation.



4.3 Standard Penetration Tests

Standard penetration tests (SPT) were undertaken at regular depth increments within windowless sample borehole WS01, WS05 and WS06. The SPT was conducted in accordance with the procedures given in BS EN ISO 22476: Part 3: 2005 +A1: 2011, and the results are summarised on the borehole record. During this work an automatic trip hammer of 63.5kg falling through 750mm was employed to drive either a cone or split barrel sampler assembly into the ground and the recovered barrel samples were retained in air tight plastic containers.

4.4 Dynamic Probes

Dynamic penetration tests were undertaken adjacent to the windowless sample boreholes WS02, WS03 and WS04, in accordance with the procedure given in BS EN ISO 22476: Part 2: 2005 +A1: 2011, using the super heavy penetrometer (DPSH). This probe consists of a 63.5kg mass falling through 750mm onto an anvil, which drives a 50mm diameter cone into the ground. The number of blows required to drive the cone through successive 100mm increments are recorded as the N_{100} values. The results of the dynamic penetration tests are tabulated and presented as bar charts of N_{100} values versus depth in Appendix 4.

4.5 Gas Monitoring Standpipes

Gas monitoring standpipes were installed between 2.1m and 3.1m depth in WS01, WS03 and WS05, and the installation details are shown on the appropriate borehole records. In all cases, the monitoring standpipe consisted of a perforated pipe from the base of the borehole to 1.0m below surface, with a non-perforated pipe to ground level. The response zone was filled with pea gravel, with a bentonite seal at the base and above, and the installation was capped with a stop box cover in a concrete surround.

4.6 Rotary Open-hole Boreholes

6 boreholes were sunk using a Comacchio 205 rotary drilling rig using rotary open-hole drilling techniques and employing 130mm diameter drag and tricone roller bits. Where necessary, 140mm diameter casing was temporarily installed through the overburden to support the bore. The investigation was undertaken using water flush drilling techniques in accordance with the Coal Authority and Health and Safety Executive positioning statement. Drill chippings brought to surface in the flush returns were inspected by the driller on a screen, which forms part of the re-circulation tanks. The borehole positions are shown on the site plan, which is presented in Appendix 1 and the strata conditions are presented on the borehole records in Appendix 5.

4.7 Trial Pits

A total of 6 trial pits were excavated in order to reveal the nature of the near surface soils. The soils were logged on site in general accordance with BS5930: 2015+A1: 2020, and full descriptions are given on the trialpit records which are presented in Appendix 6. At regular intervals throughout the excavation of the pits, samples were taken for geotechnical testing. The test specimens were



retained in the appropriate air tight containers within cool boxes for onward transition to the laboratory.

Once excavations were completed, the trial pits were carefully re-instated with the arisings. Whilst every care was taken during the infilling process, including compacting of the infill at regular intervals with the back acting arm of the excavator, it should be appreciated that some mounding of the surface may have resulted. Moreover, the infilled soils may be subjected to settlement over time, such that a depression in the surface may also occur. Therefore, the locations of any pits undertaken in this investigation should be conveyed to the current site user, as the mounds or depressions associated with the pits may present a risk to current site operations. Furthermore, it must be realised that the infilled pits represent an area of disturbance within the site soils, thus the soils at the pit locations may vary characteristically compared to the undisturbed ground. As such, foundations placed in this disturbed material may not perform as anticipated.

4.8 Soakaway Tests

Soakaway tests were conducted at locations TPSA01 and TPSA02. At the elected test depths, the pit was trimmed and squared as much as practicable. Water was then pumped into the pit and the level monitored at timed intervals relative to a reference bar at ground level. These tests were conducted and calculated in general accordance with the method given by BRE Digest 365 and the results are presented in Appendix 7.

5. Geology

The available published geological data for the site has been examined and the following table presents the anticipated geology.

Table 1: Geological Data for the Site

Strata Type	Strata Name ³	Previous Name ⁴	Description ³
Superficial Geology	No superficial deposits recorded.		
Solid Geology	Stanningley Rock (Northern majority of site)		Fine-grained, thinly bedded, commonly ganisteroid sandstone
	Pennine Lower Coal Measures Formation (Southern extent of site)		Interbedded grey mudstone, siltstone and pale grey sandstone, commonly with mudstones containing marine fossils in the lower part, and more numerous and thicker coal seams in the upper part.

The geological appraisal, as outlined within the Lithos report, states the following:

Geological maps suggest that the Hard Bed Coal seam (up to 0.6m thick) could underlie the site at shallow depth, especially in the south of the site, which is underlain by undifferentiated Lower Coal Measure strata. This coal seam should be deeper in the north (around 25m to 30m depth), where

³ Sources: British Geological Survey (NERC) Map Sheet 77; Huddersfield; Solid and Drift Edition, and Geology of Britain Viewer [online resource from www.bgs.ac.uk]

⁴ Sources: British Geological Survey (NERC) Lexicon of Named Rock Units [online resource from www.bgs.ac.uk]



the site is underlain by Stanningley Rock Sandstone. It should be noted that the local area is heavily faulted, which somewhat complicates local geology.

Approximately 10m below the Hard Bed Coal Seam, lies the Middle Band Coal, which is mapped as a discontinuous 'thin' seam, and thus is unlikely to have been worked. The Soft Bed Coal is present approximately 20m below the Hard Bed, but at a maximum thickness of 0.6m is unlikely to be of any significance with respect to subsidence, even if worked.

The Coal Authority have also provided an abandonment plan for the Soft Bed Coal which shows workings approximately 100m north of this site and north of the fault shown on the geological maps. These recorded workings are likely to lie at depths in excess of 30m, and therefore be overlain by a sufficient thick of competent cover (i.e. >10x seam thickness). It should be noted that the data on this abandonment plan does not extend beneath this site, thus it is unlikely that any abandonment plans are available for this site.

6. Strata Conditions

In accordance with the geology of the area, the succession has been shown to include the following:

Table 2: Generalised Strata Profile

Depth m below ground level to underside of layer	Strata Type	Positions Encountered	Groundwater Strikes m below ground level
0.15 – 0.4	TOPSOIL (Firm dark brown slightly sandy silty CLAY with rare gravel of plastic and glass).	WS02, WS03, WS04 TP02, TP03, TP04 TPSA 01, TPSA 02	None
+4.0	Residual Cohesive soils Firm greyish brown sandy gravelly laminated CLAY. Gravel is angular to sub rounded fine to coarse of relict sandstone. [Residual Stanningley Rock] Or Residual Cohesive soils (Typically Firm locally stiff gravelly silty CLAY. Gravel is sub angular to rounded medium to coarse of sandstone and rare coal) [Pennine Lower Coal Measures Formation]	WS02, WS03, WS04 TP01, TP02, TP04 WS07, WS08, TP03, TPSA 04	None
+4.0	Locally: Potentially reworked Cohesive soils Firm locally stiff dark brown mottled orangish brown brown light grey and dark grey sandy gravelly silty CLAY. Sand is fine to coarse. Gravel is sub rounded to angular fine to medium of mixed lithologies including sandstone siltstone rare coal rare carbonaceous mudstone.	WS05, WS06	None
+15 - +30	Interbedded horizons of Sandstone and Mudstone [Pennine Lower Coal Measures Formation]	RO1, RO2, RO4, RO5, RO7, RO8	3.0 (RO3, RO8) 4.0 (RO7) 8.0 (RO5) 9.0 (RO2)

'+' denotes that the strata extended below the termination depth of the investigated positions, thus the extent of the deposit is only proven to the depths indicated



6.1 General Strata

Firstly, it should be appreciated that localised deposits of made ground was identified in some areas of the site (WS01 – 1.0m bgl, WS02 – 2.85m bgl, WS03 – 1.05m bgl, TP01 – 0.45m bgl, TPSA01, 0.4m bgl, TPSA 02 – 1.1m bgl). This material shows considerable variability in composition between investigation locations, albeit is largely present as a soft to stiff gravelly cohesive soil. In some locations, anthropogenic inclusions of ceramic brick and concrete were observed. These deposits do not appear to be laterally continuous across the site, and therefore are likely to represent localised lenses of material, possibly attributed to previous structures or anthropogenic activity on the site previously.

This investigation has concluded that the natural strata conditions across the site show some variability, which is largely attributed to the change in geology across the site, and also may be intrinsically linked to the faulting within the area. A site plan showing the 1:50,000 solid geology, in relation to the borehole locations is presented within Appendix 1.

With this regard, under a capping of topsoil, residual cohesive soils that predominantly comprised lithorelicts of sandstone were typically found at shallow depth in the north of the site (WS02, WS03, WS04, TP01, TP02, TP04). These soils largely consisted of soft to firm (locally stiff) silty clays. It is suggested that these soils can be attributed to the upper weathered fraction of the Stanningley Rock.

Typically, in the central and southern quadrants of the site, cohesive soils were noted to contain gravels lithorelicts of other materials, such as siltstone, mudstone, carbonaceous mudstone and rare coal. Furthermore, some evidence of significant mottling of colour was recorded locally. Given the geology of the site, there is some ambiguity as to whether these soils represent the residual soils of the Pennine Lower Coal Measures Formation, or soils that could represent 'fault gauge' (naturally reworked soils) associated with the fault. However, there is no obvious linear trend that links mottled/disturbed looking soils to the fault bisecting the site. Furthermore, all cohesive soils were recorded to be predominantly in a 'firm' in-situ condition, with no obvious evidence of anthropogenic material, or voidage. With that regard, it should be appreciated that some natural variability in the composition of residual soils should be expected.

Below this stratum, competent layers of the Pennine Lower Coal Measures Formation were revealed to a depth of 30m, comprising interbedded layers of mudstones and sandstone. No coal seams or evidence of coal workings (loss of flush or drilling resistance, obvious voidance or worked ground) were identified in any borehole, regardless of which side of the fault plane the borehole was sunk.

Groundwater strikes were recorded between 3m and 9m during drilling. However, it is possible that the use of water flushing techniques may have masked the presence of any water strikes within the other borehole locations. In any event, it should be appreciated that groundwater levels are subject to seasonal variation or changes in local drainage conditions.



7. Insitu Testing

7.1 Standard Penetration Tests

The standard penetration tests carried out are summarised in the following table:

Table 3: Summary of Standard Penetration Tests				
Strata	Depth Range (m)	SPT 'N' (Blows/300mm)		Comments
		Granular soils	Cohesive soils	
MADE GROUND (Cohesive)	1 – 1.45		13 - 25	Soils in a firm in-situ condition. Locally, stiff conditions have also been identified.
Residual cohesive soils (Pennine Lower Coal Measures Formation)	2 – 2.45		40	Soils in a stiff in-situ condition.
Extremely weak SANDSTONE/ SILTSTONE	3 – 3.45		+50	SPT 'N' value of + 50 blows indicates refusal.

7.2 Dynamic Penetration Tests

Dynamic penetration tests were undertaken adjacent to the corresponding windowless sample borehole positions. A summary of the results is presented below:

Table 4: Summary of Dynamic Penetration Tests					
Position	Blows/100mm			Refusal type (Effective/ Abrupt) ⁵	Comments
	0 - 2	3 - 10	10+		
	Depth to which blow count range was observed (m)				
DP02	1.4	4.1	4.4	Abrupt.	Typically low blow counts recorded to around 1.4m bgl. followed by a variable becoming higher blow counts recorded until abrupt refusal is met.
DP03	1.8	2.1	2.6	Abrupt	Typically low low counts recorded to depths of around 1.8m, at which point a significant increase in blow count is met before refusal is encountered.
DP04	1.0	3.1	3.5	Abrupt.	Typically low blow counts recorded to around 1.0m bgl. followed by a variable becoming higher blow counts recorded until abrupt refusal is met.

⁵ Abrupt refusal: obstruction or bedrock encountered. Effective refusal: +25 blows/100mm.



7.3 Gas and Water Level Monitoring

The monitoring of standpipes commenced on the 14th April 2022 and is currently ongoing (regime of 6 readings over 3 months is proposed). The results of the gas monitoring undertaken to date are tabulated below.

Table 5: Gas Monitoring								
Location	Date	CH ₄ (%)	CO ₂ (%)	O ₂ (%)	Flow (l/h)	Barometric Pressure (mb)	Water Level (m)	Standpipe Depth (m)
WS01	14.04.22	0.1	1.3	20.4	0.2	1001↑	0.97	3.1
	22.04.22	0.1	1.4	20.5	0.4	992↓	0.95	
	29.04.22	0.1	1.4	20.7	0.0	1012↓	1.13	
	06.05.22	0.1	1.7	20.1	0.1	1002↓	1.26	
	21.06.22	0.1	6.9	15.3	0.0	994↔	1.98	
WS03	14.04.22	0.1	0.9	19.3	2.1	1001↑	0.95	2.1
	22.04.22	0.1	0.6	21.2	1.2	993↓	0.20	
	29.04.22	0.1	4.0	21.2	0.0	1013↓	0.31	
	06.05.22	0.1	0.9	20.5	0.0	1003↓	0.49	
	21.06.22	0.0	1.2	19.8	0.4	994↔	1.00	
WS05	14.04.22	0.1	0.4	20.8	0.2	1001↑	0.65	3.0
	22.04.22	0.1	0.2	20.8	0.2	993↓	0.63	
	29.04.22	0.1	0.6	20.9	0.1	1013↓	0.77	
	06.05.22	0.1	0.6	20.5	0.2	1003↓	1.11	
	21.06.22	0.0	2.8	17.3	0.0	995↔	1.68	

↑ - rising pressure ↓ - falling pressure ↔ -steady pressure

This work was undertaken using a Geotechnical Instruments (UK) Ltd. GA5000 (serial No G503524) which was last calibrated on the 5th May 2021.

7.4 Soakaway Test

On reaching the elected soakaway test depth, the pit was trimmed and squared as much as practicable. Water was then introduced into the pit at a controlled rate to prevent collapse of the sides and the level monitored at time intervals relative to a reference bar at ground level. The results obtained from the soakaway tests are presented at Appendix 7 and are summarised below:

Table 6: Soakaway Test Results					
Location	Soakage Area Dimensions (average) (m)	Depths of soaked strata (m)	Soil Description (of soaked strata)	Infiltration Rate (m/sec)	*Drainage Characteristics
TAPSA01	1.7 x 2.2	1.9 – 2.5	Stiff brown mottled grey slightly sandy slightly gravelly CLAY	*	Practically Impermeable
TAPSA02	2.5 x 1.6	2.04 – 2.5	Stiff brown mottled grey slightly sandy slightly gravelly CLAY	*	Practically Impermeable

*Based on the most onerous results for each test.



During the soakaway tests the water level did not achieve a fall from 75% to 25% of the effective depth of the storage volume. On this basis, the tests could not be completed within the scope of the method provided in BRE Digest 365 due to the poor soakage rate of the exposed soils. Due to the negligible water movement it was not possible to extrapolate the results obtained in order to obtain a soil infiltration rate.

8. Laboratory Testing - Geotechnical

The following programme of laboratory testing has been undertaken on samples obtained during this investigation:

- Determination of water content BS EN ISO 17892-1:2014
- Determination of liquid and plastic limits BS EN ISO 17892-12:2018
- Soluble sulphate content BS 1377-3:2018+A1:2021: Pt3: 7.3
- pH value BS 1377-3:2018+A1:2021: Pt3: 12

The test results are presented in Appendix 8 and are summarised below:

Table 7: Summary of Geotechnical Test Results

Test type	Number of tests	Range of results		Comments
Water content determinations	4	13% - 20%		Modified water contents fall within the same value range.
Index properties (1 Point)	4	LL	40% - 49%	Clay of low to intermediate plasticity. Consistency index 1.0 – 1.2 NHBC Class – Medium.
		PL	18% - 24%	
		PI	22% - 25%	
Soluble sulphate & pH	6	SO ₄	0.019 – 0.14g/l	AC-1s Concrete classification
		pH	5.2 – 8.9	

In cohesive soil the approximate cohesion, c_u , and coefficient of consolidation, m_v , may be obtained from the equivalent SPT 'N' value using the following expressions (Stroud 1975).

$$c_u = f_1 N$$

$$m_v = \frac{1}{f_2 N}$$

where:

- c = cohesion (kN/m²).
- m_v = Coefficient of consolidation (m²/MN).
- f_1 & f_2 = factors based on plasticity index.
- N = SPT 'N₃₀₀' value.

For the cohesive soils revealed at this site the highest (worst case) plasticity index⁶ of 25% could be employed, which suggests an f_1 value of 4.5 and an f_2 value of 0.45.

⁶ See paragraph 6.2 'Index Property Tests'



8.1 Geotechnical Properties

The idealised geotechnical properties employed in design are summarised below.

Table 8: Summary of Geotechnical Properties

Property	Range of values		Comments
Volume change potential (NHBC)	Medium		Residual cohesive soils
Shear strength parameters (at proposed foundation level – in residual cohesive soils)	c_u	50kN/m ²	Based on SPT 'N' values, and observations made during logging.
	γ	20kN/m ³	
Concrete classification	DC1		Natural ground locations (Static water)

9. Laboratory Testing - Environmental

A suite of testing was conducted on samples from across the site and the following regime was undertaken.

- Metals – Cd, Cr^{VI}, Cu, Hg, Ni, Pb, V and Zn.
- Semi and Non-Metals - As, Se, Free CN⁻ and Phenols.
- Polycyclic aromatic hydrocarbons (PAHs).
- Petroleum hydrocarbons (TPHs).
- Others – pH, organic content and total/soluble SO₄²⁻.
- Asbestos.

This testing was undertaken by Eurofins Chemtest Ltd and the results of all of the chemical testing are presented in Appendix 8 of this report.

10. Risk Assessment – Mining Instability

In light of the findings of this investigation, the risk to the proposed development is considered with reference to the following ratings and definitions:

- Low - The possibility of instability is unlikely therefore no further action is necessary.
- Moderate - The possibility of instability is likely and further investigation or remedial action may be required.
- High - The possibility of instability is highly likely and further investigation or remedial action will be necessary.

**Table 9: Development Specific Risk Assessment**

Item	Risk of Instability	Location	Risk Rating
10.1	Shallow coal seams (recorded and unrecorded)	Within Northern Fault Block	Low
		Within Southern Fault Block	Low
10.2	Coal workings at depth	The site is not within a surface area that could be affected by past underground mining.	Low
10.3	Mine shafts	Mine Shaft 412418-002	Low
10.4	Mine Gas	Associated with Shallow Workings	Low to Moderate

10.1 Risks Posed by Shallow Mining (recorded and unrecorded Mining).

The results of rotary probing confirm that there is no evidence of coal seams, brecciated or broken ground beneath the site, on either side of the fault plane, to a depth of 30m bgl.

Consequently, it is considered that it is highly unlikely that shallow coal workings are present beneath or in close proximity to the area of the proposed development.

As such, a low risk rating has been assigned and no further action is required.

10.2 Coal Workings at Depth

In regard to deeper mining which could affect the site, no further coal seams, or voids were encountered within the strata or to a depth of 30m bgl. Furthermore, the Coal Authority report as presented within the Lithos report states, 'The site is not within a surface area that could be affected by past underground mining'. As such, a low risk rating has been assigned and no further action is required.

10.3 Mine Shafts

There remains some risk of unrecorded mine entries of exploratory shafts, albeit the risk is deemed to be low. In order to mitigate this risk any anomalously deep made ground encountered during future ground investigations would be suspect and should be investigated further. All excavations to natural ground completed during the development of the site should be inspected for anomalous made ground that could represent unrecorded mine entries and if encountered should be investigated accordingly under CA licence.

10.4 Risks Posed by Migration of Hazardous Ground Gas

In this case, it is evidence that shallow mining are not present beneath the proposed development. It should be appreciated that a regime of gas monitoring is ongoing as part of the Geo-environmental Assessment. Initial findings would suggest that CS2 conditions have been identified. As such, a low to moderate risk rating has been assigned; see section 12.1.2 for further details.



11. Discussion of Ground Conditions - Geotechnical

North Park (Shelley) Ltd, propose to develop the land adjacent to Yew Tree Road/Burn Road, Birchencliffe, Huddersfield, HD2 2EQ by the construction of a series of residential dwellings. At the time of writing this report the precise layout and method of construction is not known, thus the discussion below is of a generalised nature.

11.1 Geotechnical Discussion

This investigation indicates that the ground conditions across the site exhibit some variability both laterally and vertically. Particularly, there is some ambiguity as to whether cohesive soils have been reworked by historic fault movement (which could cause a melange of soils close to the fault plane). Indeed, some cohesive soils are recorded to be mottled and comprise gravels of a mix of coal measures lithorelicts (coal, carbonaceous mudstone, sandstone and siltstone) with little obvious structure.

Due to variability of ground conditions encountered on site, it is recommended that a pragmatic approach be taken to the foundations for the houses, and are considered on a plot by plot basis. It cannot be recommended that footings for a singular plot be placed in made ground, or span both cohesive soil and rock due to the potential for differential settlements. It is therefore recommended that careful inspection takes place during the excavation of footings to ensure that foundations are placed wholly within materials of similar competency.

In view of the above, in broad terms, it is considered that the foundation solutions could include the traditional footings in areas where natural clays are present in at least a firm insitu condition. Alternatively, consideration could also be directed towards placing all plots on a mini piled foundation solution, which could have the advantage of limiting differential settlement across the plots, as well as prevention of positioning footings in localised deposits of made ground.

11.2 Shallow Foundations

In areas of the site where the upper weathered fraction of the Coal Measures will be exposed, which generally consists of firm to stiff clay, it is considered that this material will provide a suitable bearing stratum, provided that the foundations are placed within soil generally described as being present in a firm insitu condition. It is considered that strip or spread foundations constructed within this material at a minimum depth of say 1.2m (or, locally depended in areas of the site in which reworked soils are expected) could be designed assuming an allowable increase in load given in the following table.

Table 10: Allowable increase in stress

Foundation type		Strip Footings			Spread Footings		
Foundation Breadth	B (m)	0.6	0.9	1.2	1.0	2.0	3.0
Foundation Depth	D (m)		1.2			1.2	
Allowable Increase in Stress	(kN/m ²)	90	85	85	100	95	90



The allowable increase in stress given above assumes a factor of safety of 3 against general shear failure, with cohesion of 50kN/m^2 at the foundation depths. Settlements at the above loading intensities should remain within tolerable limits for the type of structure proposed provided that the underlying soils are carefully inspected immediately final trimming has taken place.

Given the volume change potential of the soils, it is not recommended that ground bearing ground floor slabs be employed. In this instance it would be necessary to suspend floors between foundation positions, such that the floor loads are transmitted via the foundations to competent soils at depth.

Should any soft or weak material be encountered they should be locally removed and replaced with lean-mix concrete or compacted granular soil. In addition, if the excavations are required to stand open for any period of time then a blinding layer of lean-mix concrete should be placed in the excavation bases. This expedient will reduce softening or loosening of the sub-grade due to the ingress of surface water.

Should seepages of groundwater be encountered it is considered that they could be dealt with using a simple form of de-watering. Such a system could include the excavation of sumps from which the water could be pumped.

The stability of the excavation faces cannot be guaranteed thus temporary support to the excavation faces may become necessary unless the foundations are constructed using trench-fill techniques. In this method the foundation trenches should be excavated, inspected and backfilled with concrete as a continuous operation. Under no circumstances should operatives be allowed to enter unsupported excavations.

11.3 Mini Piles

Given the geology of the site, there is some ambiguity as to whether the ground conditions within the vicinity of the fault zone represent the residual soils of the Pennine Lower Coal Measures Formation, or soils that could represent 'fault gauge' (naturally reworked soils) associated with the fault may be present locally. Whilst the soils within this zone are typically 'firm', it should be appreciated that disturbed soils may not perform as anticipated should traditional footings be placed within them. As such, it is considered that it could be pragmatic to utilise a mini pile solution for plots within ~10m of the fault zone, in order to avoid the potential for differential settlement to occur. It is considered that precast concrete driven piles are likely to represent the most economical solution. In view of the relatively weak near surface soils it may be necessary to construct a working platform for the piling rig and any other plant required during the works.



11.4 Volume Change

It should be appreciated that in this instance, the cohesive made ground beneath the site has been found to possess volume change potential under the guidance of the NHBC standards. Therefore, it will be necessary to ensure that foundations placed within this cohesive soil, which was found to have a medium volume change potential, are designed in accordance with the Chapter 4.2 of the NHBC standards⁷. The methodology provided in the guidance will require the identification of any trees, still present at or recently removed from, the site and the distance from the proposed foundations. This may result in shallow foundation depths greater than those given above and the requirement for heave protection to be employed against foundations. Piles should be able to cater to for shrinkage or swelling of cohesive ground should they be installed within the zone of influence of any existing or proposed trees and shrubs. For design purposes, in particular the derivation of heave forces on the piles, the zone of desiccation may be considered as equivalent to the minimum foundation depth recommended for a shallow footing in the NHBC Standards.

11.5 Access Roads, Drive-ways and Hard-standing

It is considered that any roads or hard-standing at the site could be constructed employing traditional pavement design.

Once topsoil is stripped from the site, the majority of residual soils will act as a sub-grade. In parts of the site in which residual soils comprise clay, CBR values of 2% would be appropriate. However, it is recommended that proof rolling of the sub-grade be undertaken to establish the suitability of the soils, to expose any soft or weak ground and to ensure the sub-grade is well compacted prior to construction. Any areas of soft or weak ground should be remediated by increasing the sub-base thickness. Alternatively, weak material could be locally removed and replaced with a compacted granular capping layer. If construction were to be undertaken during the winter or after periods of prolonged rainfall, it may be prudent to employ a geotextile and/or a geogrid between the sub-base and sub-grade.

In situ CBR testing could be employed following sub-grade preparation to confirm the provisional design values presented above.

11.6 Effect of Sulphates

In view of the nature of the underlying soils it is considered that the design sulphate class be assessed with reference to Table C2⁸, which is provided in BRE Special Digest 1, *Concrete in aggressive ground*: Part C. On the basis of this table and considering the soluble sulphate contents recorded, it can be shown that well compacted buried concrete should be designed in accordance with Class DS-2 requirements. Assuming static groundwater, the table also indicates that the aggressive chemical environment for concrete (ACEC) classification is AC-1s.

⁷ NHBC Standards, Chapter 4.2, *Building near trees*

⁸ Table C2, *Aggressive Chemical Environment for Concrete (ACEC) classification for brownfield locations*



In order to evaluate the design chemical (DC) class for the buried concrete at this site reference should be made to Table D1⁹, which can be found in Part D, *Specifying concrete for general cast-in-situ use*, of BRE Special Digest 1. From this table it may be shown that for an intended working life of at least 50 years the concrete design class DC-1 is required.

11.7 Soakaway Construction

In areas of the site where residual cohesive soils were encountered at depths rational for soakaway construction practically impermeable drainage characteristics were recorded, such that soakaways cannot be recommended for site A. As such, an alternative drainage system will need to be designed for the discharge of surface water.

12. Discussion of Ground Conditions - Environmental

12.1 Discussion of Test Results

'Site A' Yew Tree Road, is proposed to be developed by the construction of a new residential estate. Consequently, the site may be classified as residential with plant uptake.

12.1.1 Soil Samples

The results of the chemical testing undertaken on soil samples obtained during this investigation have been compared to the ATRISK soil screening values (SSVs) as compiled by WS Atkins plc. With respect to the results it should be appreciated that the soil organic matter (SOM) content for the samples tested was found to range between 0.81% and 13%. On this basis, it is considered that the screening values associated with 1% SOM should be adopted (as these values are considered the most conservative). These values have been derived in such a way as to adhere to the principles within the revised CLEA model and include the most current release of the SGVs. A list of subscribers is provided within the website¹⁰ and these include many local authorities.

A comparison of the results of the testing, together with the data given above, can be found within Appendix 8. These results indicate the following:

Table 11: Summary of Contaminated Areas

Location	Depth (m)	Contaminants found to be exceeding SSVs (Residential with plant uptake)
WS01	0.2	Aliphatic TPH >C12-C16
WS02	2.5	
WS03	0.2	
WS06	0.5	Naphthalene, Benzo[a]anthracene, Chrysene, Benzo[b]fluoranthene, Benzo[k]fluoranthene, Benzo[a]pyrene, Indeno(1,2,3-c,d)Pyrene, Dibenz(a,h)Anthracene, Benzo[g,h,i]perylene

⁹ Table D1, *Selection of the DC Class and the number of APMs for concrete elements where the hydraulic gradient due to groundwater is 5 or less: for general in-situ use of concrete.*

¹⁰ <http://www.atrisksoil.co.uk/pages/general/subscribers.asp>



TP03	0.6	Benzo[a]anthracene, Chrysene, Benzo[k]fluoranthene, Indeno(1,2,3-c,d)Pyrene, Dibenz(a,h)Anthracene, Benzo[g,h,i]perylene
TP04	0.3	Chrysene, Indeno(1,2,3-c,d)Pyrene, Dibenz(a,h)Anthracene, Benzo[g,h,i]perylene

Concentrations of chromium^{VI}, total phenols, free cyanide and total petroleum hydrocarbons (aliphatic C5 to C10; aromatic C5 to C21) were below the detection limits for the tests. Detectable levels of all other contaminants were recorded, but these fell below the associated Atrisk Soil Screening Values. In addition, no asbestos was detected within the soil samples tested.

It should be appreciated that the soil screening values for PAHs and TPHs (where appropriate) represents vapour saturation limits. The inhalation of vapour pathway contributes less than 10% of total exposure, which is unlikely to significantly affect the combined assessment criterion¹¹. In view of this, the ATRISK soil SSVs notes that the users may wish to consider using a combined assessment criterion if free product is not observed, the values for which are also provided on the summary of contamination analysis. It is therefore considered that the criteria for no free product should be adopted for the PAHs and TPHs at this site. The results of the contaminants found to exceed these screening values are tabulated below:

Table 12: Summary of Contaminated Areas

Location	Depth (m)	Contaminants found to be exceeding SSVs (Residential with plant uptake)
WS01	0.2	
WS02	2.5	
WS03	0.2	
WS06	0.5	Naphthalene, Benzo[a]anthracene, Benzo[b]fluoranthene, Benzo[a]pyrene, Indeno(1,2,3-c,d)Pyrene, Benzo[g,h,i]perylene
TP03	0.6	Dibenz(a,h)Anthracene
TP04	0.3	Dibenz(a,h)Anthracene

On the basis of the above information, it can be concluded that the site is locally contaminated by PAH's. A Double PAH ratio analysis suggests that the source of contaminated is largely related to combustion products. This contamination is also noted to be within the topsoil at the site; near surface residual soils appear to be generally uncontaminated.

12.1.2 Gas Concentrations

With respect to ground gas, the results of the monitoring visits indicated a maximum concentration of 0.1% methane, with concentrations of carbon dioxide ranging between 0.2% and 6.9%, in association with oxygen levels of between 15.3% and 21.2%. It should be appreciated that on uncontaminated sites there is generally about 20% by volume of oxygen, associated with low levels of carbon dioxide. In addition, a maximum flow rate of 2.1 litres per hour was recorded and will be employed in the following calculations.

¹¹ Ref: ATRISK soil, SSVs derived using CLEA v1.071 for 6% SOM, Residential with home grown produce land use, 23.06.17



The principal driving force for initiating the movement of gas in the ground is a change in barometric pressure. The most onerous gas condition on a site is usually observed on days of low or falling barometric pressure, preferably below 1000mb. It has been noted that measurements undertaken solely during high pressure conditions may be of lesser value. At this site the readings undertaken to date were at atmospheric pressures of between 992mb and 1013mb.

In order to establish the gas screening value (GSV) for carbon dioxide or methane, the maximum gas concentration (expressed as a decimal) is multiplied by the borehole flow rate (l/hr). In this case 0.1% (0.001) methane was recorded along with 6.9% (0.069) carbon dioxide, in association with a maximum flow rate of 2.1 l/hr. This results in a GSV of 0.0021 l/hr for methane and a GSV of 0.15 l/hr for carbon dioxide.

In accordance with Table 8.5, Modified Wilson and Card classification of the CIRIA report C665, Assessing risks posed by ground gasses to building, the site may be characterised, with respect to the GSV, as Situation Level 2.

With regard to the number of monitoring visits required reference is made to Tables 5.5a and 5.5b of CIRIA report C665 (2007)¹². Accepting that the proposed development is of high sensitivity and that the generation potential is low to very low, these tables suggest that 6 readings could be undertaken over a period of 3 months. However, C665 notes that *not all sites will require gas monitoring for the period and frequency indicated in Tables 5.5a and 5.5b*.

In this case, a total of 5 monitoring visits were undertaken over a 2 month time period and for the purpose of this assessment, it is considered that the site can be provisionally classified as Characteristic Situation Level 2. One further monitoring visits should be undertaken as per the guidance, in order to fully classify the site.

12.2 Site Specific Risk Assessment

12.2.1 Approach

The presence of contamination hazards and the risks associated with them should be assessed in accordance with industry practice and the 'suitable for use' approach. This has been conducted with reference to The Department for Environment, Food and Rural Affairs (DEFRA) and The Environment Agency¹³ advice on the assessment of risks arising from the presence of contamination in soils and using the source-pathway-receptor approach.¹⁴ This method dictates that there must be a risk of contaminant produced at a 'source' in sufficient concentration to cause harm and there must be a 'pathway' for the contaminant to reach an identifiable 'receptor' for the linkage to be proved and a contamination hazard to be considered present. Not all substances are contaminants and not all contaminants are considered to be a risk. Indeed DEFRA and The Environment Agency state that 'a contaminant is a substance which has the potential to cause harm, while a risk itself is considered to exist if such a substance is present in sufficient concentration to cause harm and a pathway exists for a receptor to be exposed to the substance.'¹⁵

¹² Adapted from tables 5.5a and 5.5b of CIRIA C665, 2007, *Assessing risks posed by hazardous ground gas to buildings*, p60.

¹³ R&D Publication CLR 8, 'Assessment of Risks to Human Health from Land Contamination: An overview of the Development of Soil Guideline Values and Related Research'.

¹⁴ The pollution linkage approach was developed by 'Circular 2/2000 Contaminated Land: Implementation of Part II of The Environmental Protection Act 1990' which provides meanings for the terms contained in The Environmental Protection Act 1990 Part IIA, the primary legislation for addressing the issues of contaminated land.

¹⁵ See 'Circular 2/2000 Contaminated Land: Implementation of Part II of The Environmental Protection Act 1990', appendix A.



12.3.2 Conceptual Ground Model and Risk Assessment

In view of the results of the chemical testing undertaken the conceptual site model is presented accordingly as Table 13. The preliminary risk assessment has been evaluated with reference to the following ratings and definitions:

- N/A -** A source-pathway-receptor linkage is not considered to exist and therefore a risk assessment is not required.
- Low -** A pollution linkage is unlikely and/or the likelihood of harm occurring is low and of minor consequence.
- Moderate -** The linkage exists but the likelihood of harm occurring is not considered to be significant although remedial action may be necessary
- High -** The linkage exists and the available data indicates that significant harm may be caused and remedial action could be necessary.

The results of the risk assessment are presented in Table 13.



Table 13: Conceptual Site Model and Site Specific Risk Assessment [Contamination: PAHs]

Conceptual Site Model			Site Specific Risk Assessment	
Pathways	Receptor	Linkage Present?	Risk Rating	Notes
Direct contact/dermal absorption/soil ingestion	Operative	Yes – contamination found to be present at the site and contact with soil likely during works.	High	Some contamination is present in the soils underlying the site. Precautionary measures will be required during the construction phase. Remediation will be required to either remove the contamination or break pathways. However, as the site is anticipated to be secured during the development phase, contamination is not anticipated to affect neighbours.
	End User	Yes – contamination found to be present at the site and site to be developed into a residential estate with landscaped areas.	High	
	Neighbours	Yes – contamination found to be present at the site and a populated residential and commercial area surrounds the site.	Low	
Inhalation of Dust/Vapours	Operative	Yes – dust may be derived from contaminated soils. In addition some PAH contamination found is likely to represent a vapour risk.	High	Some contamination is present underlying the site. Precautionary measures will be required during the construction phase. Remediation will be required to either remove the contamination or break pathways.
	End User	Yes – dust may be derived from contaminated soils.	High	
	Neighbours	Yes – contamination found to be present at the site and residential properties located within 250m radius of the site and possible inhalation of dust during the works.	High	
Ingestion of fruit/vegetables and/or waters	Operative	No – no edible plants or contained water sources in the area of the proposed new works.	N/A	Some contamination is present underlying the site. Precautionary measures will be required during the construction phase. Remediation will be required to either remove the contamination or break pathways. However, the contamination at the site is considered to be of limited mobility, therefore the likelihood of contamination affecting neighbouring gardens is considered low risk.
	End User	Yes – contamination found to be present at the site and site to be developed into a residential estate with garden areas.	Moderate	
	Neighbours	Yes – contamination found to be present at the site and residential area adjoins the site.	Low	
Migration of hazardous gases via permeable strata or shallow mining activity	Operative	Yes – low concentrations of methane and carbon dioxide have been found to be present at the site (assuming <i>Characteristic Situation Level 2</i>). Gas monitoring is ongoing.	Moderate	Concentrations of harmful gases (methane and carbon dioxide) were detected at the site. Gas precautionary measures are deemed to be required.
	End User		Moderate	Gas monitoring is currently ongoing.
	Neighbours		N/A	



Spillage/loss/run off direct to receiving water	Controlled Waters	Yes – known controlled waters within 250m. However, the site is underlain by cohesive soils of low permeability. Contamination by PAH is not anticipated to be significantly mobile.	Low	
Migration via permeable unsaturated strata	Controlled Waters	Yes – a secondary A aquifers is present beneath the site. However, the site is underlain by cohesive soils of low permeability. Contamination by PAH is not anticipated to be significantly mobile.	Low	Old services to be removed or capped.
Run off via drainage/sewers etc	Controlled Waters	Yes – old services may be present on site. However, the site is underlain by cohesive soils of low permeability. Contamination by lead is not anticipated to be significantly mobile..	Low	
Direct contact with contaminated soils	Plants	Yes – significant contamination present at the site which may affect plants.	Moderate	Some contamination is present underlying the site. Remediation will be required to either remove the contamination or break pathways.
Uptake via root system			Moderate	
Direct contact with contaminated soils	Building Materials	Yes –minor PAH contamination revealed at the site may represent a significant risk to building materials or plastic water pipes. Moreover, testing indicates that the aggressive chemical environment for concrete classification is AC-1s.	Moderate (plastic services)	Please see section 12.3.3 for information on good building practice.
Direct contact with contaminated groundwater			Low (buried concrete)	
Exposure to Radon	Operative End User	No – Not in a radon affected area.	N/A	Less than 1% of properties are above the action level. No radon protection measures required.



12.3 Indicative Remediation Strategy

In view of the site specific risk assessment it is considered that remediation will be required at this site. Such a strategy should include the following main elements.

12.3.1 Remediation Objectives

Based on the site specific risk assessment the object of the remediation is likely to be as follows.

- To protect the site operatives during the construction process from the ingestion of soil or dust, dermal contact with the soil and inhalation of dust and vapours.
- To protect the end user from the ingestion of soil or dust, dermal contact with the soil and inhalation of dust and vapours.
- To protect neighbours from the inhalation and ingestion of dust during the construction process.
- To protect operatives and end users from elevated levels of ground gas, specifically carbon dioxide.
- To protect end users and neighbours from the ingestion of contaminated fruit and vegetables.
- To protect plants from direct contact with contamination and prevent uptake via root system.
- To ensure that contamination cannot enter the former services occupying the site which may return to controlled waters.
- To protect plastic services from being penetrated by, or degrading due to the presence of, contamination in the soil or groundwater.

12.3.2 Development Requirements

It is understood that the land at 'Site A' Yew Tree Road & Burn Road, Birchencliffe, Huddersfield, HD2 2EQ to be developed by the construction of a series of residential houses with front and rear gardens and access roads. In view of the above a site specific remediation strategy should be undertaken after the proposed development has been finalised. However, for preliminary design and costing the following remediation proposals are offered.

12.3.3 Outline Strategy

In order to fulfil the objectives defined above it is likely that the following remedial strategy could be utilised. It is recommended that a pragmatic approach be undertaken, with observational techniques being employed at each stage of the work.



Ground-works

During the ground-works phase of the development, protection to the site operatives is required. The risk to site operatives is considered under the Health and Safety at Work Act 1974, together with regulations made under the act, which includes the Control of Substances Hazardous to Health (COSHH) regulations. Therefore the risks to site personnel must be considered under the Construction Design and Management (CDM) regulations at the planning stage and be included in the contractor's Health and Safety Plan and site specific Method Statements. These documents should include the following main elements.

- Site operatives at all levels should be made aware of the hazards of working with contaminated.
- Personal hygiene facilities, including washing and messing, must be provided and site operatives be encouraged to use them.
- Where work is undertaken in dry weather the site should be dampened down to avoid dust. In addition, dust masks must be provided to all site operatives for use in dry weather.
- In order for contaminated soils to be disposed of to an appropriate landfill, it may be necessary to carry out Waste Acceptance Criteria (WAC) testing in accordance with BS EN 12457.
- Any stockpiles of contaminated soil on site should be sheeted over to prevent excessive amounts of airborne dust and cross contamination of imported fill.
- Where vehicles are transferring soil to the landfill site they should be covered to prevent contamination of the surrounding area by dust.
- Where work is undertaken in wet weather, vehicle and wheel washing facilities are required to ensure that the vehicles leaving the site do not transfer contamination to surrounding areas.

On completion of the ground-works a careful site inspection of the sub-grade would be required. Should visual or olfactory evidence of contamination be revealed then further testing may become necessary.

Construction

During the construction phase of the contract the following items are required to protect the end user from the potential contaminants revealed at this site.

- Beneath buildings, pavements and hard-standings clean inert granular sub-base should be employed.
- Any redundant services revealed at this site should be de-commissioned and piped services sealed. Any existing services that are to be employed in the new development should be carefully inspected to ensure that they are serviceable.
- New plastic services should be constructed in a surround of clean inert material and selected in accordance with the recommendation given in the United Kingdom Water Industry Research (UKWIR) website under Report Ref. No. 10/WM/03/21 - 'Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites'. The statutory water authority for the area in which site is located may have a risk assessment form to complete which allows these recommendations to be met. However, further determinand specification contamination testing may be necessary.
- For buried concrete the results of the sulphate and pH testing indicate that the design sulphate class for the site should be DS-1.



Garden and Landscaped Areas

It is proposed that the development will include garden areas. In view of this and the potential contamination on site, it is considered that landscaped areas will require some remediation. This could include the provision of a clean cover system including a capping layer of say 500mm of inert material, which will put the contaminated ground out of the end users' dig range. At the base of this layer, a granular capillary break of say 100mm of free draining granular soil should be placed in order to prevent mobile contamination rising upward. This expedient should also provide a suitable root barrier to isolate the plants from the underlying contaminated ground.

Gas Protection Measures

Gas monitoring is currently ongoing. The final risk assessment should take into consideration the current site conditions, and should be subject to reassessment after the formulation and/ or completion of any remedial measures, and proposed foundation solution. These documents should be prepared by a suitably experienced and qualified specialist.

In order to assess the protection measures required BS8485: 2015+A1:2019: *Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings* has been employed. In accordance with Table 3, *Building types*, of the code, the development may be considered to conform to Type A. Therefore, on the basis of Table 4 *Gas protection score by CS and type of building*, the minimum gas protection score (points) is 3.5 The gas protection system should consist of at least two different elements. The elements work independently and collaboratively, and a single element should not be used because there would be no redundancy to allow for defects in the component.

In order to achieve this score the following shall be undertaken.

Table 14: Combination of protection elements (BS8485: 2015) for CS2		
Reference	Protection Element	Score
Table 5	Precast suspended segmental subfloor (i.e. beam and block)	0
Table 6 <i>Either option is appropriate</i>	Passive sub-floor dispersal layer: good performance (Note 1) (see Annex B of the Code for detail)	1.5
Table 7	Gas resistant membrane complying with the requirements given in Table 7 (Note 2)	2
Total Score		Max: 3.5

Note 1:

As beam and block floors are likely to be adopted at this site it is considered that a clear void with air bricks in the external walls be utilised. The details of the system to be implemented shall be included on the technical drawings provided by the engineer/architect.

**Note 2:**

The gas resistant membrane shall meet the following criteria:

- Sufficiently impervious (methane gas transmission rate $<40.0\text{ml/day/m}^2/\text{atm}$ (average) BS ISO 15105-1 manometric method).
- Sufficiently durable and strong to remain serviceable for the anticipated life of the building, to withstand in-service stresses and installation process.
- Capable, after installation, of providing a complete barrier to the entry of the relevant gas.
- Verified in accordance with CIRIA C735: 2014: *Good practice on the testing and verification of protection systems of buildings against hazardous ground gasses.*

In addition to the above, the following points shall be considered.

- Technical drawings of the incorporation of the gas protection measures into the sub-structure will be provided by a suitably qualified engineer/architect and produced in accordance with the guidance given in BRE 414.
- The sequence of construction indicating when the gas protection system will be installed will be included with the remediation statement. Where possible the installation of membranes will take place as a unique activity on site and shall not take place until sub-structure construction is complete.
- During and following the installation of the membrane, all parties in attendance at the site shall be made aware that a gas protection system is to be employed within the construction. Such communications should include, but not be limited to, the CDM documentation for the site and site inductions.
- The installation of the membrane shall be carried out only by suitable personnel and the qualifications or experience/training will be included as part of the remediation statement. The suitability of personnel will be assessed in accordance with Annex 1 of CIRIA C735.
- The installation shall be in strict accordance with manufacturer specifications and recommendations, which shall also be included as part of the remediation statement.
- The membrane system employed will not be an ensemble (i.e. a system comprising a mixture of products from different manufacturers will not be employed).
- Membranes shall be supplied to site on a single wound roll, creased product will not be accepted or employed.
- Whilst membranes are exposed, signage will be provided to indicate the access to the installation area is prohibited unless authorised. Footwear will be checked prior to accessing the membrane surface to ensure no sharp objects are apparent, such as stones caught in treads. The use of sharp objects or hot-works around the exposed membrane will be strictly prohibited unless the risk of damaging the membrane has been fully assessed and mitigated.
- Non-conformance of manufacturer recommendations shall be discussed and agreed as acceptable, in writing, with a suitably qualified person from the manufacturer.

Verification of the installation of the gas protection system will be carried out on each plot, unless agreed with any statutory authorities prior to construction.

12.4 Fill Materials

It should also be appreciated that any fill material, either site-won (which could be classified as virgin quarried materials) or imported, to be employed at the site should be subjected to the following assessment to determine its suitability.



Fill materials should be initially screened, by a suitably qualified engineer to establish that:

- It is a suitable growing media if it is to be employed as such, including compliance with BS3882 (2015)
- It is free from obvious contamination i.e. visual or olfactory evidence
- It has not come from areas where Japanese Knotweed or other invasive or injurious plants are suspected to be growing
- It is not a statutory nuisance, such as being odorous
- It is free from unsuitable material i.e. whole bricks, brick ties, timber or glass.

It should also be appreciated that any fill should be subjected to validation testing to assess its suitability. The following table has been taken from YALPAG¹⁶ documentation and may be used as a guide. Depending on the origin and nature of the material, not all fill will require the sampling frequency and testing indicated, although this should be in agreement with any regulatory bodies (such as the Local Authority).

Fill Type	Frequency	Minimum Determinands
Virgin Quarried Material	1 or 2 depending on the type of stone utilised, to confirm the inert nature of the material.	Standard metals/metalloids (should include as a minimum As, Cd, Cr, CrVI, Cu, Hg, Ni, Pb, Se, Zn)
Crushed Hardcore, Stone, Brick	Minimum 1 per 500m ³	Standard metals/metalloids (as above), PAH (16 USEPA speciation), asbestos, total TPH. Any additional analysis dependant on the history of the donor site (e.g. phenol, total cyanide, BTEX, MTBE).
Greenfield/ Manufactured Soils	Minimum 3 Dependent on source and receptor, between 1 per 50m ³ and 1 per 250m ³	Standard metals/metalloids (as above), PAH (16 USEPA speciation), asbestos, pH and soil organic matter (SOM) (or calculated from total organic carbon (TOC)).
Brownfield/ Screened Soils	Minimum 6 Dependent on source and receptor, between 1 per 50m ³ and 1 per 100m ³	Standard metals/ metalloids (as above), PAH (16 USEPA speciation), TPH (CWG banded), asbestos, pH and SOM (or calculated from TOC). Any additional analysis dependant on the history of the donor site (e.g. phenol, total cyanide, BTEX, MTBE)..

¹⁶ YALPAG *Technical Guidance for Developers, Landowners and Consultants – Verification Requirements for Cover Systems V4 .1* Appendix 1a, June 2021



The screening values for the above regime should also be agreed with any regulatory bodies; however, the following is recommended in the first instance.

Table 16: Fill Screening Values

Contaminant	Screening Value (Residential with Plant Uptake) (mg/kg)		Reference
	1% SOM	6% SOM	
As	37	37	Atrisk ^{SOIL} SSVs
Cd	22.1	22.1	Atrisk ^{SOIL} SSVs
Cr(VI)	3.62	3.63	Atrisk ^{SOIL} SSVs
Cu	4730	4790	Atrisk ^{SOIL} SSVs
Hg	8.81	15.8	Atrisk ^{SOIL} SSVs
Ni	136	136	Atrisk ^{SOIL} SSVs
Pb	200	200	Atrisk ^{SOIL} SSVs
V	136	138	Atrisk ^{SOIL} SSVs
Zn	20000	20300	Atrisk ^{SOIL} SSVs

Please see summary sheet within Appendix 9 for full screening values including PAHs & TPHs.

The above screening values should be considered with respect to the Soil Organic Matter (SOM) of the subject material i.e. 1% SOM would be typical for granular fill and 6% SOM for topsoil. Testing should comply with UKAS and MCERTS, where applicable, and undertaken by an accredited laboratory.

Where the material has been derived from a commercial company, certificates or other industry quality protocol compliance i.e. WRAP should be obtained. However, it will be necessary to ensure that this documentation specifically related to the material being imported, it is no more than two months old and complies with the screening and frequency requirements given above.

Suitable fill materials should be either placed immediately or sufficiently quarantined to prevent cross-contamination. If it is necessary, the quarantined material should be placed on appropriate sheeting and covered to prevent it becoming mixed with contaminated soils or dust, or penetrated by mobile contaminants.

12.5 Verification Report

In order to demonstrate that the remedial works and provision of clean cover has been sufficiently carried out where applicable, it will be necessary to produce a verification report for submission to any statutory authorities.

It will be necessary for this report to include the following:

- Characterisation of the suitability of the clean material including the derivation of the material, comments from a visual screen, the tests results of chemical screening, delivery tickets where appropriate and the conditions by which the clean material has been stored and handled on site.
- Photographic and logged evidence the clean material has been handled on site and placed in a sufficient thickness. This may be either at the time of placement or after placement by means of hand excavated trialpits. Photographs should include visual site references or



reference boards to prove the location and date taken. A measurement reference should be visible in the photographs to substantiate the thickness of material placed. Please note that it may also be necessary to undertake a topographical survey and the requirement for which should be checked with any statutory authorities.

- Evidence that suitable gas protection measures have been implemented and installed in accordance with manufacturer's instructions. The evidence should also demonstrate that all joints and penetrations have been adequately sealed.

The report detailed above should be produced by a suitably qualified engineer. The number of verification areas for the development should be confirmed with any statutory authorities for the site.

13. Recommendations for Further Work

- This report should be forwarded to the relevant authorities as soon as practicable to ensure they have sufficient time to review and discuss any issues.
- Completion and reporting of recommended additional gas monitoring.
- Discussions with contractors in relation to the suitability of materials and installation methods for gas barriers, if required.
- Produce a validation report to demonstrate that the environmental risks discussed in this report have been mitigated.
- Hold discussions with piling contractors, if necessary.
- Detailed design of the sub-structure.

Clearly Rogers Geotechnical Services Ltd would be happy to offer advice with respect to the above and assist where necessary.



14. References

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- British Standards Institution (1990) BS1377: *British standard methods of test for soils for civil engineering purposes*, B.S.I., London.
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- British Standards Institution (2015 +A1: 2020) BS 5930: *Code of practice for ground investigations*, B.S.I., London.
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 - Part C: *Assessing the aggressive chemical environment*.
 - Part D: *Specifying concrete for general cast-in-situ use*.
- Department for Environment, Food and Rural Affairs and the Environment Agency (2009) DEFRA Science Report – Final SC050021/SR2, *Human Health toxicological assessment of contaminants in soil*. Environment Agency, Bristol.
- Department for Environment, Food and Rural Affairs and the Environment Agency (2009) DEFRA Science Report – SC050021/SR3, *Updated technical background to the CLEA model*. Environment Agency, Bristol.
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- Wilson S, Oliver S, Mallet H, Hutchings H, Card G, *Assessing risks posed by ground gasses to buildings*, CIRIA Report C665.



Appendix 1

Site Plan



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LEGEND

- SITE A
- Trial Pit (SITE A)
- Windowless Sample (SITE A)
- Rotary Open Hole (SITE A)

FOR INFORMATION

Yew Tree Road/Burn Road - SITE B
 Birchcliffe, Huddersfield, HD2 2EQ

BOREHOLE LOCATION PLAN



JOB NUMBER: C2113/21/E/3266

DATE: 07.07.2022 DRAWING NUMBER: 01





R01 - Residential Issue 11/03/21
 New Issue 11/03/21
 Residential Development
 at Yew Tree Road
 Burn Road
 Huddersfield
INC 412418-002
 Huddersfield
 100% Geotechnical Development, Huddersfield, Huddersfield, HD2 2EQ
 Forster Partners Associates Ltd
 51, Tenby Street, Huddersfield, HD1 4DN
 Tel: (01484) 412400 Fax: (01484) 512005
 E-mail: info@forsterpartners.co.uk
 Website: www.forsterpartners.co.uk
 Sketch Layout A
 Project: C2113/21/E/3266
 21P23 - FPA - ZZ - XX - DR - A - 001 -
 Date: 07/07/2022 11/03/21 11/03/21
 DR: Mar 21 51 Preliminary 1:1500



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LEGEND

-  SITE A
-  Trial Pit (SITE A)
-  Windowless Sample (SITE A)
-  Rotary Open Hole (SITE A)

FOR INFORMATION

Yew Tree Road/Burn Road - SITE B
Birchenccliffe, Huddersfield, HD2 2EQ

BOREHOLE LOCATION PLAN



JOB NUMBER: C2113/21/E/3266





DATE: 07.07.2022	DRAWING NUMBER: 01
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LEGEND

-  SITE A
-  Trial Pit (SITE A)
-  Windowless Sample (SITE A)
-  Rotary Open Hole (SITE A)

FOR INFORMATION

Yew Tree Road/Burn Road - SITE B
Birchenclyffe, Huddersfield, HD2 2EQ

BOREHOLE LOCATION PLAN



JOB NUMBER: C2113/21/E/3266

DATE: 07.07.2022

DRAWING NUMBER:
01



Appendix 2

Coal Authority Permit



The Coal
Authority

Permit to Enter or Disturb Coal Authority Interests

Permit 24130

Name and Address of Permit Holder:

North Park (Shelley) Ltd
West House
Kings Cross Road
Halifax
HX1 1EB

Site Location:

Land off
Yew Tree Road - Burn Road
Birchencliffe
Huddersfield
HD2 2EQ

This certificate hereby grants the above named Permit Holder a Permit to carry out:-

Ground investigation by ten boreholes to 30m or as required to assess shallow mining risk to development and locate one recorded mine entry (shaft, Coal Authority Reference 412418-002) by excavation all within the Authority's interests at the identified site location above as shown on the Grant Permit Boundary (overleaf) for the period of 12 months from the granted date shown below. *The granting of this Permit does not constitute advice given by the Authority in relation to the proposed operations. It is the Permit Holder's responsibility to obtain appropriate health, safety, environmental, technical and legal advice.*

Conditions:

- Manned entry (i.e.) into mine entries/workings) is strictly prohibited.
- Water flush drilling only
- Gas Monitoring for CO, CH₄, CO₂, O₂, H₂S at the borehole and rig
- Operators undertaking the work must be in possession of this certificate and the Permit boundary plan at the time of works
- Appropriate borehole reinstatement and sealing without delay and to withstand site level changes

Signed: Leigh Sharpe Granted Date: 19/11/2021

For and on behalf of The Coal Authority

Nominated Representative: Leigh Sharpe, Permitting Manager;

The Coal Authority, Permitting Office, 200 Lichfield Lane, Mansfield, Notts, NG18 4RG

Tel: 01623 637450; E-Mail: permissions@coal.gov.uk



The Coal
Authority

Granted Permit Boundary

Permit Ref: 24130

Permit Boundary:



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Appendix 3

Windowless Sample Borehole Records



Borehole Log

Borehole No.

WS01

Sheet 1 of 1

Project Name: Yew Tree Rd/Burn Rd

Project No.
C2113/21/E/3266

Co-ords:

Hole Type
WLS

Location: Birchencliffe, Huddersfield, , HD2 2EQ

Level:

Scale
1:50

Client: North Park Shelley Ltd

Dates: 08/04/2022

Logged By
SA

Well	Water Strikes	Samples and In Situ Testing				Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Dia. (mm)	TCR (%)				
		0.20 - 0.40	ES						
		0.60	D	85	100	0.45			MADE GROUND. (Stiff brown mottled dark and light brown sandy gravelly CLAY. Gravel is angular to sub rounded fine to coarse of sandstone, mudstone and coal. Band of coarse angular sandstone gravel from 0.42-0.45m).
		1.00	SPT			0.90			MADE GROUND. (Firm light yellowish brown mottled grey slightly sandy gravelly CLAY. gravel is angular to sub rounded fine to coarse of sandstone and coal.) [Reworked cohesive material]
		1.20	D	75	100	1.00			
		2.00	SPT			1.30			MADE GROUND. (Dark grey slightly sandy slightly gravelly silty CLAY. Occasional plant matter. Organic and decomposition odour.) [Possible relict topsoil]
				65	100	1.50			
		3.00	SPT			2.30			Firm brown mottled grey slightly sandy gravelly CLAY. Gravel is angular to sub rounded fine to coarse of sandstone, mudstone and coal. Firm brown mottled grey sandy slightly gravelly CLAY. Gravel is angular to sub rounded fine to coarse of sandstone, mudstone and coal.
				55	100	2.30			
						3.44			Firm light brown mottled light grey very sandy slightly gravelly laminated CLAY. Gravel is angular to sub rounded fine to coarse of relict sandstone. [relict sandstone]
									Extremely weak greyish brown completely weathered thickly laminated to very thinly bedded SANDSTONE recovered as slightly gravelly fine to coarse sand. Gravel is angular to sub angular of relict sandstone. STANNINGLEY ROCK]
									End of Borehole at 3.44m

Remarks

1) CAT scan prior to breaking ground - no services identified.





Borehole Log

Borehole No.

WS02

Sheet 1 of 1

Project Name: Yew Tree Rd/Burn Rd

Project No.
C2113/21/E/3266

Co-ords:

Hole Type
WLS

Location: Birchencliffe, Huddersfield, , HD2 2EQ

Level:

Scale
1:50

Client: North Park Shelley Ltd

Dates: 08/04/2022

Logged By
SA

Well	Water Strikes	Samples and In Situ Testing				Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Dia. (mm)	TCR (%)				
		2.50	ES	85	100	0.40		TOPSOIL. (Dark grey slightly sandy gravelly CLAY. Occasional plant matter.)	
				75	100	1.00		MADE GROUND (Firm light yellowish brown mottled grey slightly sandy gravelly CLAY. gravel is angular to sub rounded fine to coarse of sandstone and coal.) [Reworked cohesive material]	
				65	100	2.85		Firm to stiff mixed dark brown and grey sandy gravelly CLAY. Gravel is angular to sub rounded fine to coarse of sandstone and coal. Hydrocarbon odour from 2.00m, visible sheen on gravel from 2.50m).	
				55	100	3.30		Firm greyish brown sandy gravelly laminated CLAY. Gravel is angular to sub rounded fine to coarse of relict sandstone. [Residual Stanningly Rock]	
						3.35		Yellow gravelly fine to coarse SAND. Gravel is fine to medium of relict sandstone. [Residual Stanningly Rock]	
						4.00		Stiff grey and brown thinly laminated to very thinly bedded sandy slightly gravelly friable CLAY. Gravel is angular to sub rounded fine to coarse of relict sandstone. [Residual Stanningly Rock] End of Borehole at 4.00m	

Remarks

1) CAT scan prior to breaking ground - no services identified.





Borehole Log

Borehole No.

WS03

Sheet 1 of 1

Project Name: Yew Tree Rd/Burn Rd

Project No.
C2113/21/E/3266

Co-ords:

Hole Type
WLS

Location: Birchencliffe, Huddersfield, , HD2 2EQ

Level:

Scale
1:50

Client: North Park Shelley Ltd

Dates: 08/04/2022

Logged By
SA

Well	Water Strikes	Samples and In Situ Testing				Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Dia. (mm)	TCR (%)					
		0.20 - 0.40	ES	85	100	0.15		<p>TOPSOIL. (Dark grey slightly sandy gravelly CLAY. Occasional plant matter.)</p> <p>MADE GROUND. (Firm light yellowish brown mottled grey slightly sandy gravelly CLAY. Gravel is angular to sub rounded fine to coarse of sandstone and coal. Rare plant rootlets.)</p> <p>MADE GROUND. (Stiff mixed brown and grey slightly sandy gravelly CLAY. Gravel is angular to sub rounded fine to coarse of sandstone and coal.)</p> <p>Soft to firm grey and brown thinly laminated to very thinly bedded sandy slightly gravelly friable CLAY. Gravel is angular to sub rounded fine to coarse of relict sandstone. [Residual Stanningly Rock]</p> <p>End of Borehole at 2.00m</p>		
		1.20	D	75	100	0.50			1	
						1.05				
						2.00			2	
									3	
									4	
									5	
									6	
									7	
									8	
									9	
									10	

Remarks

1) CAT scan prior to breaking ground - no services identified.





Borehole Log

Borehole No.

WS04

Sheet 1 of 1

Project Name: Yew Tree Rd/Burn Rd

Project No.
C2113/21/E/3266

Co-ords:

Hole Type
WLS

Location: Birchencliffe, Huddersfield, , HD2 2EQ

Level:

Scale
1:50

Client: North Park Shelley Ltd

Dates: 08/04/2022

Logged By
CM

Well	Water Strikes	Samples and In Situ Testing				Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Dia. (mm)	TCR (%)					
		1.00	D	85	100	0.25		TOPSOIL (Brown slightly organic silty fine SAND)		
				75	100	1.70		Firm dark brown mottled grey silty CLAY with rare rootlets and rare angular tabular gravels of sandstone. [Residual Stanningly Rock]	1	
				65	100	2.40		Firm dark brown locally dark grey gravelly silty CLAY. Gravel is angular tabular fine of siltstone and rare coal. [Residual Pennine Lower Coal Measures Formation]	2	
						3.00		Stiff/hard friable thinly laminated dark grey silty CLAY with rare angular tabular fine to medium siltstone lithorelicts. [Residual PLCM]	3	
								End of Borehole at 3.00m	4	
									5	
									6	
									7	
									8	
									9	
									10	

Remarks

1) CAT scan prior to breaking ground - no services identified.





Borehole Log

Borehole No.

WS05

Sheet 1 of 1

Project Name: Yew Tree Rd/Burn Rd

Project No.
C2113/21/E/3266

Co-ords:

Hole Type
WLS

Location: Birchencliffe, Huddersfield, , HD2 2EQ

Level:

Scale
1:50

Client: North Park Shelley Ltd

Dates: 12/04/2022

Logged By
CM

Well	Water Strikes	Samples and In Situ Testing				Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Dia. (mm)	TCR (%)					
		0.50	D	85	100				Firm orangish brown mottled light grey silty CLAY [Residual Pennine Lower Coal Measures Formation]	
		1.00	SPT	75	100				Stiff dark grey locally mottled dark brown slightly gravelly silty CLAY. Gravel is sub angular tabular fine to medium of mixed sandstone and rare coal/ carbonaceous mudstone flecks [Residual Pennine Lower Coal Measures Formation] [Possibly reworked - fault zone 'gauge']	1
		1.00								
		1.50								
		2.00	SPT	65	100				Firm locally stiff thinly laminated dark blush grey silty CLAY with rare angular tabular fine siltstone lithorelicts [[Residual Pennine Lower Coal Measures Formation] [Possibly reworked - fault zone 'gauge']	2
2.00										
3.00	SPT						Extremely weak thinly to thickly laminated dark grey micaceous SILTSTONE	3		
		3.45						End of Borehole at 3.45m	4	
									5	
									6	
									7	
									8	
									9	
									10	

Remarks

1) CAT scan prior to breaking ground - no services identified.





Borehole Log

Borehole No.

WS06

Sheet 1 of 1

Project Name: Yew Tree Rd/Burn Rd

Project No.
C2113/21/E/3266

Co-ords:

Hole Type
WLS

Location: Birchencliffe, Huddersfield, , HD2 2EQ

Level:

Scale
1:50

Client: North Park Shelley Ltd

Dates: 12/04/2022

Logged By
CM

Well	Water Strikes	Samples and In Situ Testing				Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Dia. (mm)	TCR (%)					
		0.00								
		1.00	SPT	85	100	N=16 (2,3/3,5,4,4)		Firm locally stiff dark brown mottled orangish brown brown light grey and ark grey sandy gravelly silty CLAY. Sand is fine to coarse. Gravel is sub rounded to angular fine to medium of mixed lithologies including sandstone siltstone rare coal rare carbonaceous mudstone. Rare angular tabular cobbles of sandstone at 0.65m and 1.45m. Rare rounded quartzite gravel at 2.35m [Residual Pennine Lower Coal Measures Formation] [Possibly reworked - fault zone 'gauge']	1	
		2.00	SPT	75	100					
				65	100	N=24 (3,4/8,6,4,6)			3	
						3.00		End of Borehole at 3.00m	4	
									5	
									6	
									7	
									8	
									9	
									10	

Remarks

1) CAT scan prior to breaking ground - no services identified.





Appendix 4

Dynamic Probes



Probe Log

Probe No.

DP02

Sheet 1 of 1

Project Name: Yew Tree Rd/Burn Rd

Project No.
C2113/21/E/3266

Co-ords:

Hole Type
DCP

Location: Birchencliffe, Huddersfield, , HD2 2EQ

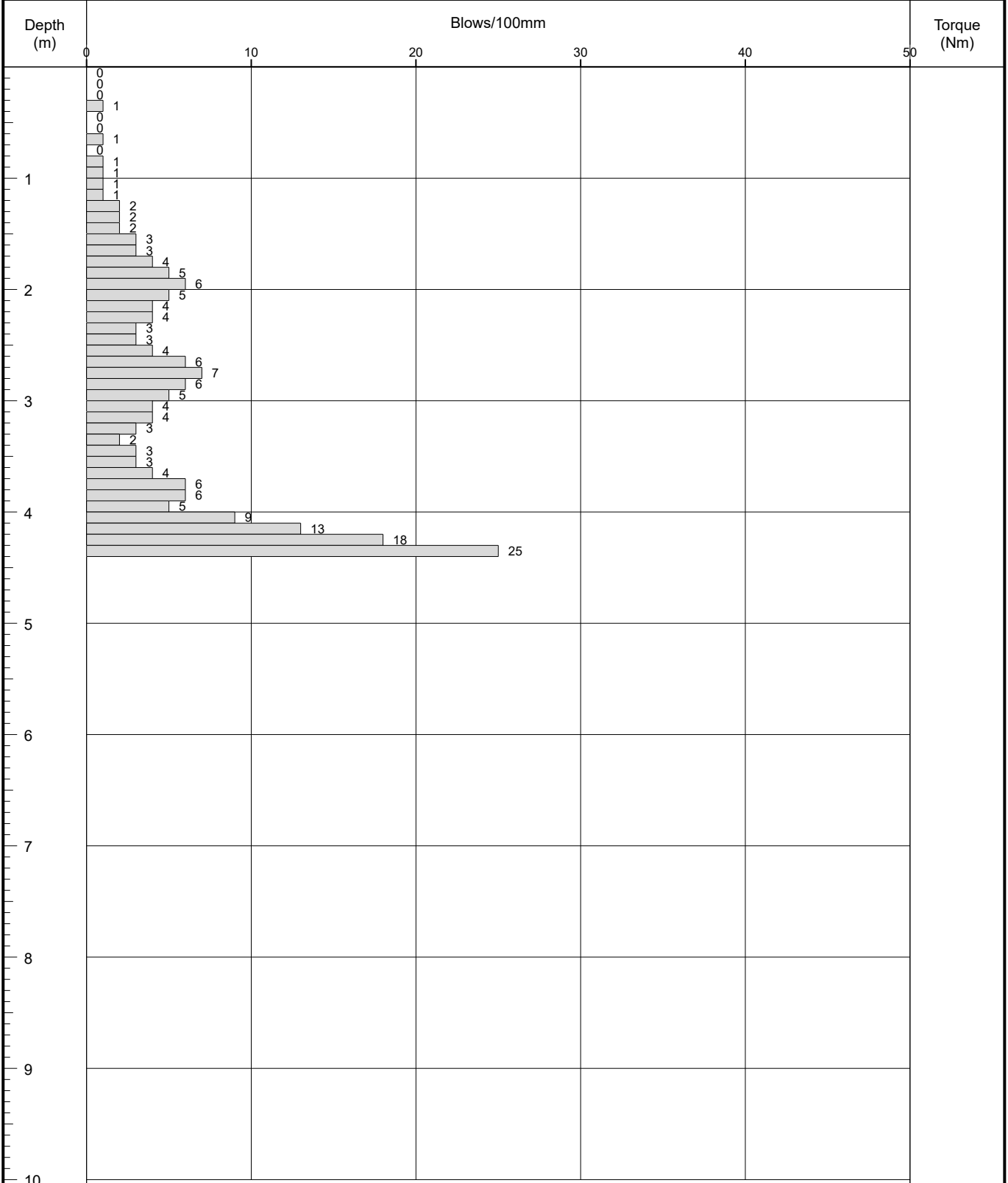
Level:

Scale
1:50

Client: North Park Shelley Ltd

Dates: 08/04/2022

Logged By
AB



Remarks:

Fall Height 750mm

Cone Base Diameter 50.5mm

Hammer Wt 63.5kg

Final Depth 4.25m

Probe Type DPSH-B





Probe Log

Probe No.

DP03

Sheet 1 of 1

Project Name: Yew Tree Rd/Burn Rd

Project No.
C2113/21/E/3266

Co-ords:

Hole Type
DCP

Location: Birchencliffe, Huddersfield, , HD2 2EQ

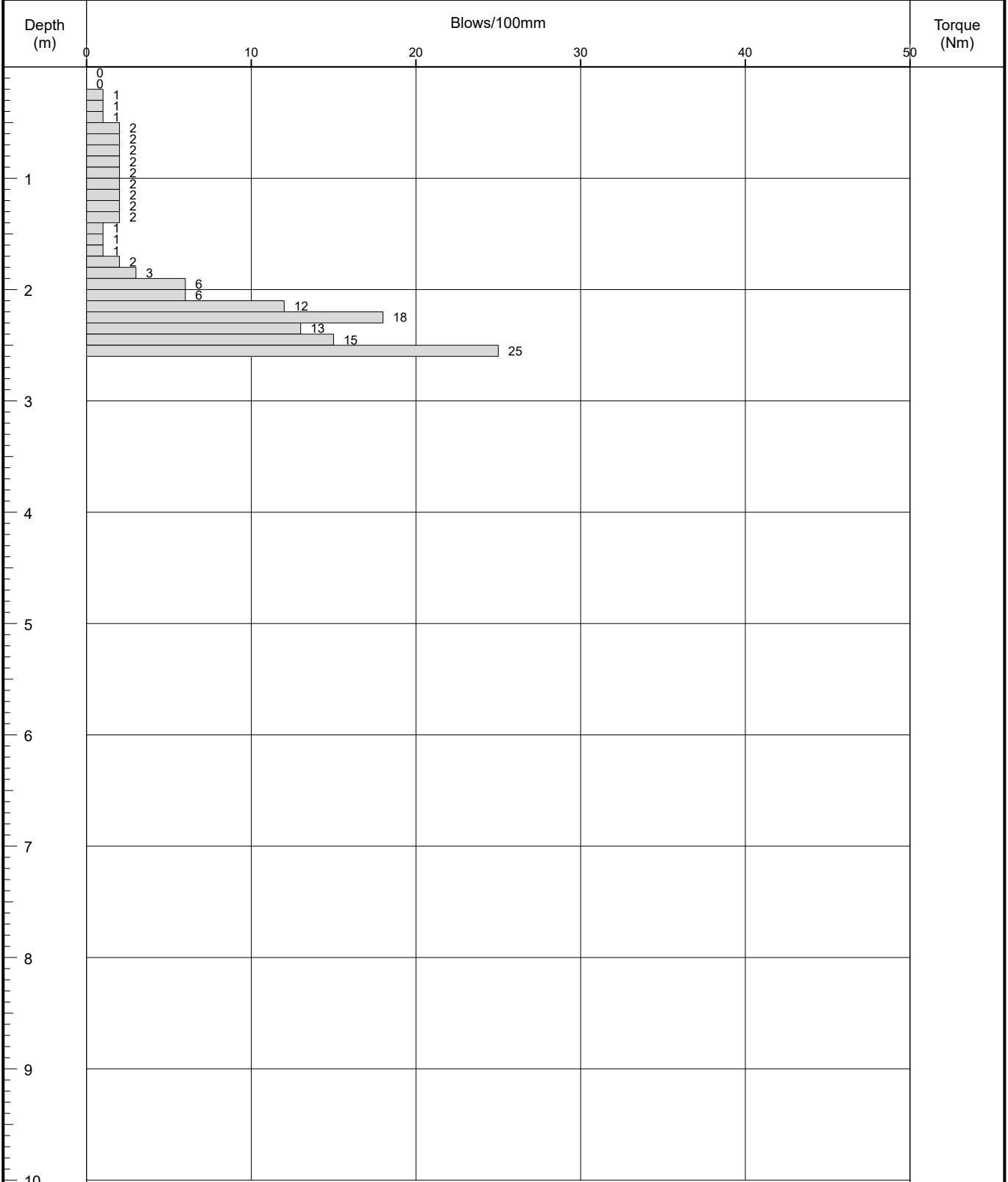
Level:

Scale
1:50

Client: North Park Shelley Ltd

Dates: 08/04/2022

Logged By
AB



Remarks:

Fall Height	750mm	Cone Base Diameter	50.5mm
Hammer Wt	63.5kg	Final Depth	2.6m
Probe Type	DPSH-B		





Probe Log

Probe No.

DP04

Sheet 1 of 1

Project Name: Yew Tree Rd/Burn Rd

Project No.
C2113/21/E/3266

Co-ords:

Hole Type
DCP

Location: Birchencliffe, Huddersfield, , HD2 2EQ

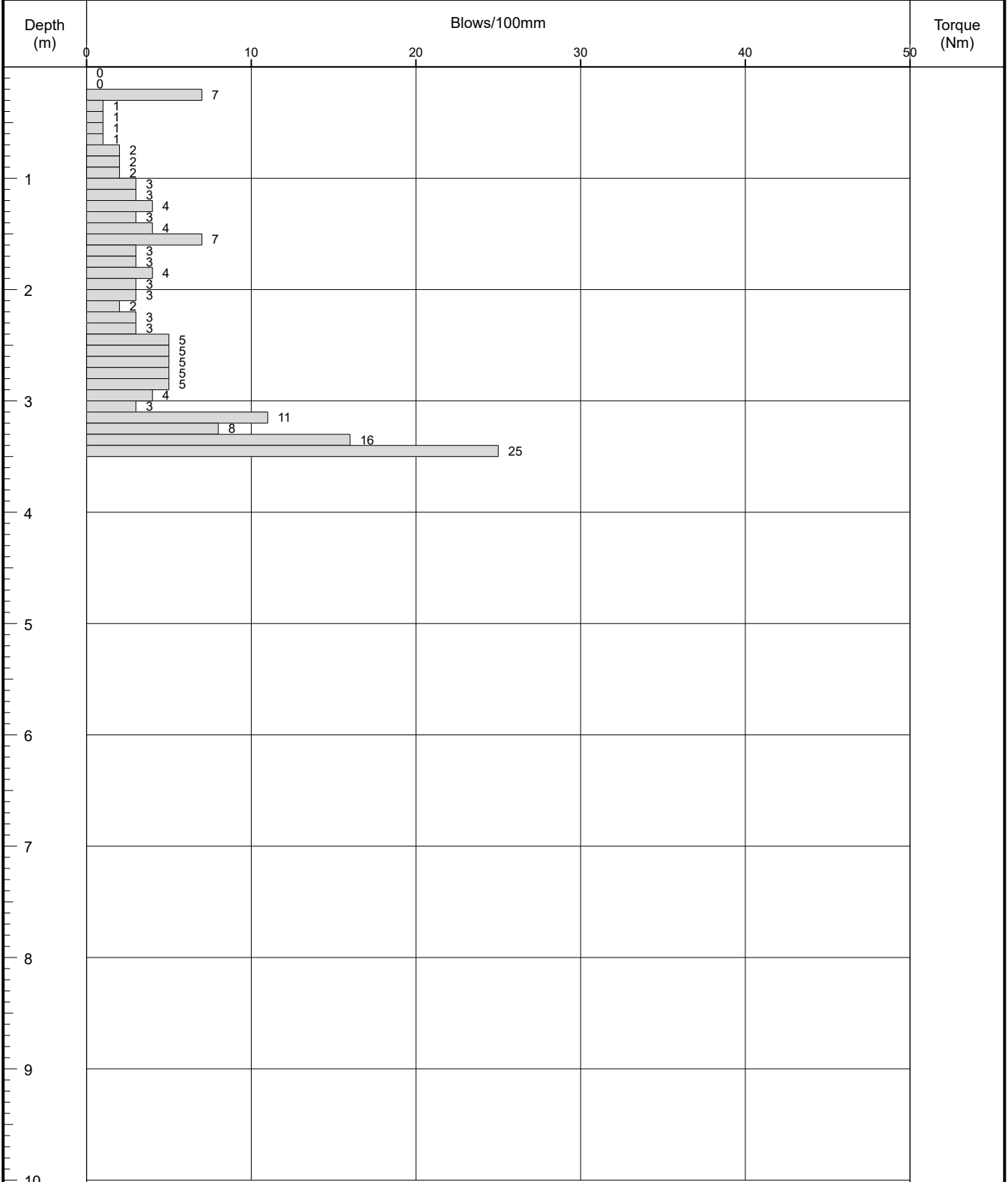
Level:

Scale
1:50

Client: North Park Shelley Ltd

Dates: 20/12/2021

Logged By
AB



Remarks:

Fall Height	750mm	Cone Base Diameter	50.5mm
Hammer Wt	63.5kg	Final Depth	3.5m
Probe Type	DPSH-B		





Appendix 5

Rotary Borehole Records



Borehole Log

Borehole No.

R01

Sheet 1 of 2

Project Name: Yew Tree Rd/Burn Rd

Project No.
C2113/21/E/3266

Co-ords:

Hole Type
RO

Location: Birchencliffe, Huddersfield, , HD2 2EQ

Level:

Scale
1:50

Client: North Park Shelley Ltd

Dates: 14/06/2022

Logged By
ABK

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.30		Dark Brown CLAY (Drillers notes) [Residual Pennine Lower Coal Measures Formation]		1
							Light Brown SANDSTONE (Drillers Notes) [Stanningly Rock]		2
									3
									4
									5
									6
									7
									8
					8.00		Light brown grading into light cream SANDSTONE (Drillers Notes) (Hard Drilling) [Stanningly Rock]		9
									10
Continued on Next Sheet									

Remarks

- 1) Cat scanned prior to breaking ground - no services identified.
- 2) Casing installed to 3m.
- 3) DAYWORKS: Borehole set-up 1hrs, Fetching water 0.5 hrs,



- 5) Borehole backed filled with Gravel.



Borehole Log

Borehole No.

R01

Sheet 2 of 2

Project Name: Yew Tree Rd/Burn Rd

Project No.
C2113/21/E/3266

Co-ords:

Hole Type
RO

Location: Birchencliffe, Huddersfield, , HD2 2EQ

Level:

Scale
1:50

Client: North Park Shelley Ltd

Dates: 14/06/2022

Logged By
ABK

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					12.00		Light grey becoming dark grey MUDSTONE (Drillers Notes)		11 12 13 14
					15.00		End of Borehole at 15.00m		15 16 17 18 19 20

Remarks

- 1) Cat scanned prior to breaking ground - no services identified.
- 2) Casing installed to 3m.
- 3) DAYWORKS: Borehole set-up 1hrs, Fetching water 0.5 hrs,

- 5) Borehole backed filled with Gravel.





Borehole Log

Borehole No.

R02

Sheet 1 of 3

Project Name: Yew Tree Rd/Burn Rd

Project No.
C2113/21/E/3266

Co-ords:

Hole Type
RO

Location: Birchencliffe, Huddersfield, , HD2 2EQ

Level:

Scale
1:50

Client: North Park Shelley Ltd

Dates: 09/06/2022

Logged By
ABK

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
Well casing	▼	9.00			0.50		TOPSOIL (Drillers Notes)	1 2 3 4 5 6 7 8 9 10
							Dark brown CLAY (Drillers Notes)	
					2.00		Obstruction (Possible concrete pad) (Drillers Notes)	
					2.10		Dark brown CLAY (Drillers Notes)	
					3.00		Light brown SANDSTONE (Drillers Notes) [Stanningly Rock]	
							Continued on Next Sheet	

Remarks

- 1) Cat scanned prior to breaking ground - no services identified.
- 2) Casing installed to 3m.
- 3) Borehole backed filled with Gravel





Borehole Log

Borehole No.

R02

Sheet 2 of 3

Project Name: Yew Tree Rd/Burn Rd

Project No.
C2113/21/E/3266

Co-ords:

Hole Type
RO

Location: Birchencliffe, Huddersfield, , HD2 2EQ

Level:

Scale
1:50

Client: North Park Shelley Ltd

Dates: 09/06/2022

Logged By
ABK

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
									11
					12.00		Water Strike. Material recovered of coarse gravel of SANDSTONE (Hard Drilling noted within this horizon. No loss of flush or drilling resistance)		12
					13.00		Very dark grey MUDSTONE (Drillers Notes)		13
					15.00		Dark grey MUDSTONE (Drillers Notes)		15
									16
									17
									18
									19
									20

Continued on Next Sheet

Remarks

- 1) Cat scanned prior to breaking ground - no services identified.
- 2) Casing installed to 3m.
- 3) Borehole backed filled with Gravel





Borehole Log

Borehole No.

R02

Sheet 3 of 3

Project Name: Yew Tree Rd/Burn Rd

Project No.
C2113/21/E/3266

Co-ords:

Hole Type
RO

Location: Birchencliffe, Huddersfield, , HD2 2EQ

Level:

Scale
1:50

Client: North Park Shelley Ltd

Dates: 09/06/2022

Logged By
ABK

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
									21
									22
									23
									24
									25
									26
									27
									28
									29
					30.00			End of Borehole at 30.00m	30

Remarks

- 1) Cat scanned prior to breaking ground - no services identified.
- 2) Casing installed to 3m.
- 3) Borehole backed filled with Gravel





Borehole Log

Borehole No.

R04

Sheet 1 of 3

Project Name: Yew Tree Rd/Burn Rd

Project No.
C2113/21/E/3266

Co-ords:

Hole Type
RO

Location: Birchencliffe, Huddersfield, , HD2 2EQ

Level:

Scale
1:50

Client: North Park Shelley Ltd

Dates: 10/06/2022

Logged By
ABK

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
▼		3.00			3.00		Dark brown CLAY (Drillers Notes)	1	
							Dark brown grading to light brown SANDSTONE (Drillers Notes)	2	
							Light brown SANDSTONE (Drillers Notes)	3	
							Light grey MUDSTONE (Drillers Notes)	4	
					6.00			5	
								6	
								7	
								8	
								9	
								10	

Continued on Next Sheet

Remarks

- 1) Cat scanned prior to breaking ground - no services identified.
- 2) Casing installed to 3m.
- 4) DAYWORKS: Borehole set-up 1hrs, Fetching water 1hrs,



- 5) Borehole backed filled with Gravel/Arisings/Installation and re-instated like-for-like/With flush cover.



Borehole Log

Borehole No.

R04

Sheet 2 of 3

Project Name: Yew Tree Rd/Burn Rd

Project No.
C2113/21/E/3266

Co-ords:

Hole Type
RO

Location: Birchencliffe, Huddersfield, , HD2 2EQ

Level:

Scale
1:50

Client: North Park Shelley Ltd

Dates: 10/06/2022

Logged By
ABK

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					14.00		Very white very hard SANDSTONE. (Drillers Notes)	
					16.00		Very dark grey grading to black carbonaceous MUDSTONE (Drillers Notes)	
					20.00		Continued on Next Sheet	

Remarks

- 1) Cat scanned prior to breaking ground - no services identified.
- 2) Casing installed to 3m.
- 4) DAYWORKS: Borehole set-up 1hrs, Fetching water 1hrs,
- 5) Borehole backed filled with Gravel/Arisings/Installation and re-instated like-for-like/With flush cover.





Borehole Log

Borehole No.

R04

Sheet 3 of 3

Project Name: Yew Tree Rd/Burn Rd

Project No.
C2113/21/E/3266

Co-ords:

Hole Type
RO

Location: Birchencliffe, Huddersfield, , HD2 2EQ

Level:

Scale
1:50

Client: North Park Shelley Ltd

Dates: 10/06/2022

Logged By
ABK

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
							Light grey MUDSTONE (Drillers Notes)		
								21	
								22	
								23	
								24	
								25	
								26	
								27	
								28	
								29	
					30.00		End of Borehole at 30.00m	30	

Remarks

- 1) Cat scanned prior to breaking ground - no services identified.
- 2) Casing installed to 3m.
- 4) DAYWORKS: Borehole set-up 1hrs, Fetching water 1hrs,



- 5) Borehole backed filled with Gravel/Arisings/Installation and re-instated like-for-like/With flush cover.



Borehole Log

Borehole No.

R05

Sheet 1 of 2

Project Name: Yew Tree Rd/Burn Rd

Project No.
C2113/21/E/3266

Co-ords:

Hole Type
RO

Location: Birchencliffe, Huddersfield, , HD2 2EQ

Level:

Scale
1:50

Client: North Park Shelley Ltd

Dates: 07/06/2022

Logged By
ABK

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
							Dark brown CLAY (Drillers Notes)		
					3.00		Dark brown SANDSTONE (Drillers Notes)		
					4.00		Dark grey MUDSTONE (Drillers Notes)		
					5.00		Light grey MUDSTONE (Drillers Notes)		
					8.00		Interbedded light brown and white SANDSTONE (Very hard Drilling) (Drillers Notes)		
					10.00		Continued on Next Sheet		

Remarks

- 1) Cat scanned prior to breaking ground - no services identified.
- 2) Casing installed to 3m.
- 3) DAYWORKS: Borehole set-up 1hrs, fetching water 0.5hrs.
- 4) Borehole backed filled with Gravel.





Borehole Log

Borehole No.

R05

Sheet 2 of 2

Project Name: Yew Tree Rd/Burn Rd

Project No.
C2113/21/E/3266

Co-ords:

Hole Type
RO

Location: Birchencliffe, Huddersfield, , HD2 2EQ

Level:

Scale
1:50

Client: North Park Shelley Ltd

Dates: 07/06/2022

Logged By
ABK

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
							White SANDSTONE (Drillers Notes)		
					14.00		Dark grey MUDSTONE (Drillers Notes)		
					15.00		End of Borehole at 15.00m		

Remarks

- 1) Cat scanned prior to breaking ground - no services identified.
- 2) Casing installed to 3m.
- 3) DAYWORKS: Borehole set-up 1hrs, fetching water 0.5hrs.
- 4) Borehole backed filled with Gravel.





Borehole Log

Borehole No.

R07

Sheet 1 of 3

Project Name: Yew Tree Rd/Burn Rd

Project No.
C2113/21/E/3266

Co-ords:

Hole Type
RO

Location: Birchencliffe, Huddersfield, , HD2 2EQ

Level:

Scale
1:50

Client: North Park Shelley Ltd

Dates: 30/05/2022

Logged By
ABK

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
							TOPSOIL (Drillers notes)		
					0.50		Light brown CLAY (Drillers notes)		
					1.00		Dark brown CLAY (Drillers notes)	1	
					2.50		Light grey MUDSTONE (Drillers notes)	2	
	▼	4.00						3	
								4	
								5	
								6	
								7	
								8	
								9	
								10	

Continued on Next Sheet

Remarks

- 1) Cat scanned prior to breaking ground - no services identified.
- 2) Casing installed to 3m.
- 3) DAYWORKS: Borehole set-up 1hrs, fetching water 0.5hrs.
- 4) Borehole backed filled with Gravel.





Borehole Log

Borehole No.

R07

Sheet 2 of 3

Project Name: Yew Tree Rd/Burn Rd

Project No.
C2113/21/E/3266

Co-ords:

Hole Type
RO

Location: Birchencliffe, Huddersfield, , HD2 2EQ

Level:

Scale
1:50

Client: North Park Shelley Ltd

Dates: 30/05/2022

Logged By
ABK

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
	▼	15.00			15.00		Light grey MUDSTONE (Drillers notes)		
								11	
								12	
								13	
								14	
								15	
								16	
								17	
								18	
								19	
								20	

Continued on Next Sheet

Remarks

- 1) Cat scanned prior to breaking ground - no services identified.
- 2) Casing installed to 3m.
- 3) DAYWORKS: Borehole set-up 1hrs, fetching water 0.5hrs.
- 4) Borehole backed filled with Gravel.





Borehole Log

Borehole No.

R07

Sheet 3 of 3

Project Name: Yew Tree Rd/Burn Rd

Project No.
C2113/21/E/3266

Co-ords:

Hole Type
RO

Location: Birchencliffe, Huddersfield, , HD2 2EQ

Level:

Scale
1:50

Client: North Park Shelley Ltd

Dates: 30/05/2022

Logged By
ABK

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
									21
									22
									23
									24
									25
									26
									27
									28
									29
					30.00			End of Borehole at 30.00m	30

Remarks

- 1) Cat scanned prior to breaking ground - no services identified.
- 2) Casing installed to 3m.
- 3) DAYWORKS: Borehole set-up 1hrs, fetching water 0.5hrs.
- 4) Borehole backed filled with Gravel.





Borehole Log

Borehole No.

R08

Sheet 1 of 3

Project Name: Yew Tree Rd/Burn Rd

Project No.
C2113/21/E/3266

Co-ords:

Hole Type
RO

Location: Birchencliffe, Huddersfield, , HD2 2EQ

Level:

Scale
1:50

Client: North Park Shelley Ltd

Dates: 06/06/2022

Logged By
ABK

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
							Dark brown CLAY (Drillers notes)		
								1	
								2	
	▼	3.00			3.00		Dark brown SANDSTONE (Drillers notes)	3	
					4.00		Light brown SANDSTONE (Drillers notes)	4	
					4.40		GRAVEL of sandstone (slow drilling) (Drillers notes)	5	
					5.80		Medium strong to strong light yellowish brown locally white coarse-grained quartz rich SANDSTONE (Possible ganiseroid) (Hard drilling, poor core recovery)	6	
					7.50		Dark grey / black MUDSTONE (Drillers Notes)	7	
								8	
								9	
								10	
Continued on Next Sheet									

Remarks

- 1) Cat scanned prior to breaking ground - no services identified.
- 2) Casing installed to 3m.
- 3) DAYWORKS: Borehole set-up 1hrs, fetching water 0.5hrs.
- 4) Borehole backed filled with Gravel.





Borehole Log

Borehole No.

R08

Sheet 2 of 3

Project Name: Yew Tree Rd/Burn Rd

Project No.
C2113/21/E/3266

Co-ords:

Hole Type
RO

Location: Birchencliffe, Huddersfield, , HD2 2EQ

Level:

Scale
1:50

Client: North Park Shelley Ltd

Dates: 06/06/2022

Logged By
ABK

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					15.00		Dark grey becoming light grey MUDSTONE (Drillers notes)		11 12 13 14 15 16 17 18 19 20
Continued on Next Sheet									

Remarks

- 1) Cat scanned prior to breaking ground - no services identified.
- 2) Casing installed to 3m.
- 3) DAYWORKS: Borehole set-up 1hrs, fetching water 0.5hrs.
- 4) Borehole backed filled with Gravel.





Borehole Log

Borehole No.

R08

Sheet 3 of 3

Project Name: Yew Tree Rd/Burn Rd

Project No.
C2113/21/E/3266

Co-ords:

Hole Type
RO

Location: Birchencliffe, Huddersfield, , HD2 2EQ

Level:

Scale
1:50

Client: North Park Shelley Ltd

Dates: 06/06/2022

Logged By
ABK

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
								21
								22
								23
								24
								25
								26
								27
								28
								29
					30.00			30
								End of Borehole at 30.00m

Remarks

- 1) Cat scanned prior to breaking ground - no services identified.
- 2) Casing installed to 3m.
- 3) DAYWORKS: Borehole set-up 1hrs, fetching water 0.5hrs.
- 4) Borehole backed filled with Gravel.





Appendix 6

Trial Pit Records



Trial Pit Log

Trialpit No
TPSA 01
Sheet 1 of 1

Project Name: Yew Tree Rd/Burn Rd Project No. C2113/21/E/3266 Co-ords: - Date 07/06/2022
Level:

Location: Birchencliffe, Huddersfield, , HD2 2EQ Dimensions (m): 2.2
Depth 2.50 1.7

Client: North Park Shelley Ltd Scale 1:50
Logged SA

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.15			TOPSOIL (Dark grey slightly clayey slightly gravelly fine to coarse SAND with plant matter. Gravel is angular to sub rounded fine to coarse of sandstone, mudstone, coal, brick and concrete. Common plant and tree roots. Occasional plastic, ceramic, wire and paper).
				0.40			MADE GROUND (Yellowish brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of sandstone, mudstone, coal, brick, and concrete. Common plant matter, rootlets, and tree bark. Rare ceramic.) [Fill. Noted to become deeper towards the east, to approximately 0.80m].
				2.50			Stiff brown mottled grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular and fine to coarse of siltstone and mudstone. [Completely weathered mudstone and siltstone].
							End of pit at 2.50 m

Remarks: 1) CAT scan prior to breaking ground - no services identified.

Stability: sTABLE





Trial Pit Log

Trialpit No
TPSA 02
Sheet 1 of 1

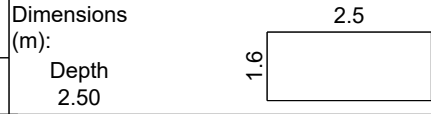
Project Name: Yew Tree Rd/Burn Rd

Project No.
C2113/21/E/3266

Co-ords: -
Level:

Date
07/06/2022

Location: Birchencliffe, Huddersfield, , HD2 2EQ



Scale
1:50
Logged
SA

Client: North Park Shelley Ltd

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.15			TOPSOIL (Grey slightly clayey slightly gravelly fine to coarse SAND with plant matter. Gravel is angular to sub rounded fine to coarse of sandstone, mudstone, coal, brick and concrete. Common plant and tree roots. Occasional plastic, ceramic, wire and paper).
				1.10			MADE GROUND (Soft to stiff, orangish brow and brownish grey slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of sandstone, mudstone, coal, brick, and concrete. Cobbles are rounded sandstone. Common plant matter, rootlets, and tree bark. Rare ceramic).
				2.50			Stiff brown mottled grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular and fine to coarse of siltstone and mudstone. [Completely weathered mudstone and siltstone].
							End of pit at 2.50 m

Remarks: 1) CAT scan prior to breaking ground - no services identified.

Stability: Stable





Trial Pit Log

Trialpit No

TP01

Sheet 1 of 1

Project Name: Yew Tree Rd/Burn Rd

Project No.
C2113/21/E/3266Co-ords: -
Level:Date
08/06/2022

Location: Birchencliffe, Huddersfield, , HD2 2EQ

Dimensions (m): 1.8



Scale
1:50

Client: North Park Shelley Ltd

Depth
0.30

0.0

Logged
RAP

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.45 0.60		 	<p>MADE GROUND (Firm dark brown slightly sandy slightly gravelly silty CLAY. Gravel is sub-rounded to angular fine to coarse of mudstone siltstone sandstone coal glass and pottery).</p> <p>Soft to firm brownish grey mottled brown slightly gravelly silty CLAY. Gravel is sub-angular fine to coarse of sandstone. [Residual Stanningly Rock]</p> <p>End of pit at 0.30 m</p>
							1
							2
							3
							4
							5
							6
							7
							8
							9
							10

Remarks:

Stability:





Trial Pit Log

Trialpit No

TP02

Sheet 1 of 1

Project Name: Yew Tree Rd/Burn Rd

Project No.
C2113/21/E/3266Co-ords: -
Level:Date
08/06/2022

Location: Birchencliffe, Huddersfield, , HD2 2EQ

Dimensions (m): 1.8


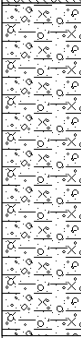
Scale
1:50

Client: North Park Shelley Ltd

Depth
2.60

0.9

Logged
RAP

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.40			TOPSOIL (Firm dark brown slightly sandy silty CLAY with rare gravel of plastic and glass).
				2.60			Firm brownish grey mottled brown slightly gravelly silty CLAY. Gravel is sub-angular fine to coarse of sandstone. Low cobble content of sub-angular and tabular sandstone. [Residual Stanningly Rock]
							End of pit at 2.60 m

1
2
3
4
5
6
7
8
9
10

Remarks:

Stability:





Trial Pit Log

Trialpit No

TP03

Sheet 1 of 1

Project Name: Yew Tree Rd/Burn Rd

Project No.
C2113/21/E/3266Co-ords: -
Level:Date
08/06/2022

Location: Birchenclyffe, Huddersfield, , HD2 2EQ

Dimensions
(m):

1



Scale
1:50

Client: North Park Shelley Ltd

Depth
0.70

0.9

Logged
RAP

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.10			TOPSOIL (Firm dark brown organic silty CLAY). Firm grey mottled brown slightly gravelly silty CLAY. Gravel is sub-angular fine and medium of sandstone and mudstone. [Residual Pennine Lower Coal Measures Formation]
				0.70			
							End of pit at 0.70 m
							1
							2
							3
							4
							5
							6
							7
							8
							9
							10

Remarks:

Stability:





Trial Pit Log

Trialpit No

TP04

Sheet 1 of 1

Project Name: Yew Tree Rd/Burn Rd

Project No.
C2113/21/E/3266Co-ords: -
Level:Date
08/06/2022

Location: Birchencliffe, Huddersfield, , HD2 2EQ

Dimensions
(m):

1

Depth
0.70

0.0

Scale
1:50
Logged
RAP

Client: North Park Shelley Ltd

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.35			TOPSOIL (Soft to firm dark brown organic silty CLAY with rare pottery brick and glass).
				0.70			Firm brownish grey mottled brown slightly gravelly silty CLAY. Gravel is sub-angular fine to coarse of sandstone. Low cobble content of sub-angular and tabular sandstone. [Residual Pennine Lower Coal Measures Formation]
							End of pit at 0.70 m



Remarks:

Stability:





Appendix 7

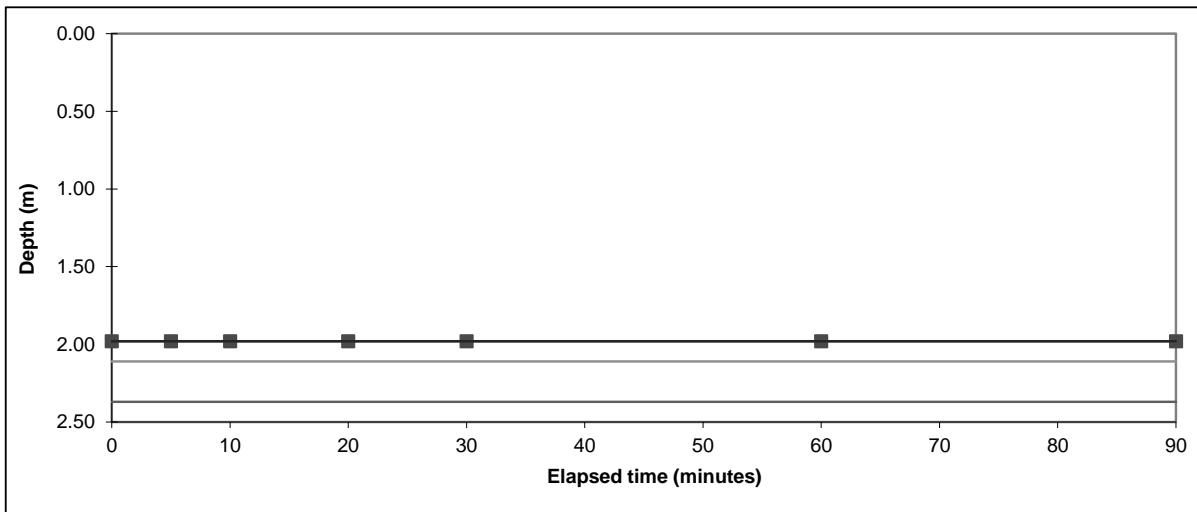
Soakaway Test Results

Rogers Geotechnical Services Ltd

Soakaway Test

Trial Pit No:	TPSA01	Test No:	1	Date:	07/06/2022
Length (m):	2.200	Datum Height:		0.00 m agl	
Width (m):	1.70	Granular infill:	None		
Depth (m):	2.50	Porosity of infill:	1	(assumed)	

Elapsed time (minutes)	Water Depth (m below datum)	Elapsed time (minutes)	Water Depth (m below datum)
0	1.980		
5	1.980		
10	1.980		
20	1.980		
30	1.980		
60	1.980		
90	1.980		



Start water depth for analysis (mbgl):	1.98	Elapsed time (mins):	#N/A
75% effective depth (mbgl):	2.11	Elapsed time (mins):	#N/A
50% effective depth (mbgl):	2.24		
25% effective depth (mbgl):	2.37	Elapsed time (mins):	#N/A
Base of soakage zone (mbgl):	2.50		
Volume outflow between 75% and 25% effective depth (m ³):			
Mean surface area of outflow (m ²):			5.77
(side area at 50% effective depth + base area)			
Time for outflow between 75% and 25% effective depth (mins):			

Soil infiltration rate (m/s):	Test incomplete as 25% effective depth not achieved. Unable to reliably determine soil infiltration rate.
--------------------------------------	--

Remarks	Results processed following BRE 365 (2007).
----------------	---

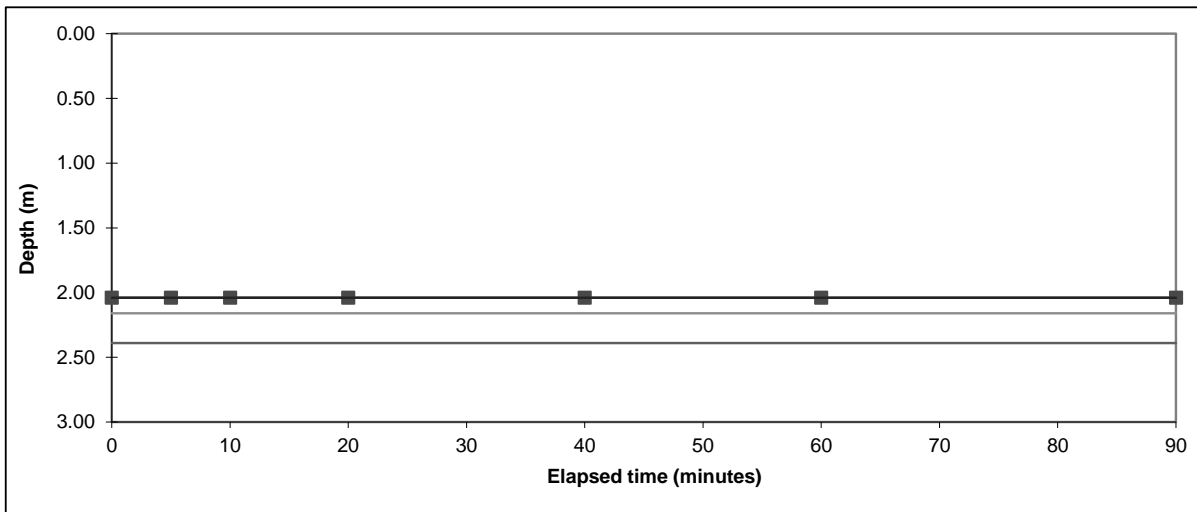
Client:	Weetwood Services Ltd	Job No:	
Site:	Yew Tree Road / Burn Road, Birchencliffe		C2113/21/E/3266

Rogers Geotechnical Services Ltd

Soakaway Test

Trial Pit No:	TPSA02	Test No:	1	Date:	07/06/2022
Length (m):	2.500	Datum Height:		0.00 m agl	
Width (m):	1.60	Granular infill:	None		
Depth (m):	2.50	Porosity of infill:	1	(assumed)	

Elapsed time (minutes)	Water Depth (m below datum)	Elapsed time (minutes)	Water Depth (m below datum)
0	2.040		
5	2.040		
10	2.040		
20	2.040		
40	2.040		
60	2.040		
90	2.040		



Start water depth for analysis (mbgl):	2.04	Elapsed time (mins):	#N/A
75% effective depth (mbgl):	2.16	Elapsed time (mins):	#N/A
50% effective depth (mbgl):	2.27	Elapsed time (mins):	#N/A
25% effective depth (mbgl):	2.39	Elapsed time (mins):	#N/A
Base of soakage zone (mbgl):	2.50		
Volume outflow between 75% and 25% effective depth (m ³):			
Mean surface area of outflow (m ²):			5.89
(side area at 50% effective depth + base area)			
Time for outflow between 75% and 25% effective depth (mins):			

Soil infiltration rate (m/s):	Test incomplete as 25% effective depth not achieved. Unable to reliably determine soil infiltration rate.
--------------------------------------	--

Remarks	Results processed following BRE 365 (2007).
----------------	---

Client:	Weetwood Services Ltd	Job No:	
Site:	Yew Tree Road / Burn Road, Birchencliffe		C2113/21/E/3266



Appendix 8

Laboratory Testing

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Specialists**



LABORATORY REPORT

GEOTECHNICAL
ENVIRONMENTAL

job number	client ref
site address	client address
consultant	
date scheduled	date issued
issued by	job title
checked by	

Rogers Geotechnical Services Ltd Telephone 01484 607 977
Email enquiries@rogersgeotech.co.uk www.rogersgeotech.co.uk
 Unit 4, Barncliffe Business Park, Near Bank, Shelley, Huddersfield, West Yorkshire HD8 8LU.





8948

Environmental
Geotechnical
Specialists



Schedule of UKAS Accredited Laboratory Tests

1. CLASSIFICATION OF SOIL	BS 1377-2:1990	BS EN ISO 17892	Accredited (A)	Unaccredited (U)
1.1 Moisture / Water content determination				
i. Oven drying	Pt 2 : 3.2	Pt 1 : 2014	A	
ii. Saturation m/c of chalk	Pt 2 : 3.3			U
1.2 Index Properties				
i. Liquid limit – cone penetrometer	Pt 2 : 4.3	Pt 12 : 2018 : 5.3 / 5.5	A	
ii. Plastic limit	Pt 2 : 5.3		A	
iii. Shrinkage limit	Pt 2 : 6.3			U
iv. Linear shrinkage	Pt 2 : 6.5		A	
1.3 Particle Density				
i. Gas jar	Pt 2 : 8.2			U
ii. Large pycnometer	Pt 2 : 8.3			U
iii. Small pycnometer	Pt 2 : 8.4	Pt 3 : 2015 : 5.1		U
1.4 Density Tests				
i. Linear measurement	Pt 2 : 7.2	Pt 2 : 2014 : 5.1	A	
ii. Immersion in water	Pt 2 : 7.3	Pt 2 : 2014 : 5.2		U
iii. Fluid / Water displacement	Pt 2 : 7.4	Pt 2 : 2014 : 5.3		U
iv. Sand replacement	Pt 9 : 2.1, 2.2			U
v. Core cutter	Pt 9 : 2.4			U
1.5 Particle Size Distribution				
i. Dry Sieve	Pt 2 : 9.2	Pt 4 : 2016 : 5.2	A	
ii. Wet Sieve	Pt 2 : 9.3	Pt 4 : 2016 : 5.2	A	
iii. Sedimentation by pipette	Pt 2 : 9.4	Pt 4 : 2016 : 5.3 / 5.4	A	
iv. Sedimentation by hydrometer	Pt 2 : 9.5			U
2. CHEMICAL TESTS				
ii. Mass loss on ignition	Pt 3 : 4			U
3. COMPACTION RELATED TESTS				
3.1 Dry density/moisture relationship				
i. 2.5kg rammer – 1 litre mould	Pt 4 : 3			U
- CBR mould	Pt 4 : 3			U
ii. 4.5kg rammer – 1 litre mould	Pt 4 : 3			U
- CBR mould	Pt 4 : 3			U
3.2 Moisture Condition Value				
i. Single point test	Pt 4 : 5.4			U
ii. MCV/moisture content relationship	Pt 4 : 5.5			U
3.3 California Bearing Ratio				
i. Undisturbed sample	Pt 5 : 7			U
ii. Recompacted sample	Pt 5 : 7			U
iii. Soaked, inc measurement of swell	Pt 5 : 7			U
4. COMPRESSIBILITY OF SOIL				
i. One dimensional consolidation	Pt 5 : 3			U
ii. Swelling pressure test	Pt 5 : 3			U
5. SHEAR STRENGTH OF SOIL				
i. Hand shear vane	Makers instructions			U
ii. Shear box (100mm square sample)	BS 1377 : Pt 7 : 4			U
iii. Triaxial – quick undrained	BS 1377 : Pt 7 : 8, 9			U
6. PERMEABILITY				
i. Falling head	K. H. Head Vol 2			U
ii. Constant head	BS 1377 : Pt 6 : 6			U
iii Triaxial cell	BS 1377 : Pt 6 : 6			U
7. ROCK TESTS				
7.1 Classification Tests				
i. Natural moisture content	-			U
ii. Saturated moisture content	-			U
iii. Natural density	-			U
iv. Porosity	-			U
7.2 Strength Tests				
i. Point load index	ISRM '85			U
ii. Uniaxial compression test	ISRM '81			U

GEOTECHNICAL
ENVIRONMENTAL



Rogers Geotechnical Services Ltd
Office 1 & 2 Barncliffe Business Park,
Near Bank, Shelley, Huddersfield, HD8 8LU

Telephone 0843 50 666 87
Fax 0843 51 599 30
Company No: 5130864



GEOTECHNICAL LAB RESULTS

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Disclaimer

The results reported herein relate only to the material supplied to the laboratory.

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Rogers Geotechnical Services Ltd
Office 1 & 2 Barncliffe Business Park,
Near Bank, Shelley, Huddersfield, HD8 8LU

Telephone 01484 607977
Company No: 5130864



Rogers Geotechnical Services Ltd.
 Offices 1&2,
 Barncliffe Business Park,
 Near Bank, Shelley,
 Huddersfield,
 HD8 8LU

Classification of Index Properties

C2113/21/E/3266

Project Name: Yew Tree Rd/Burn Rd

BS EN ISO: 17892: Parts 1, 12

Fig. 2
 Sheet. 1

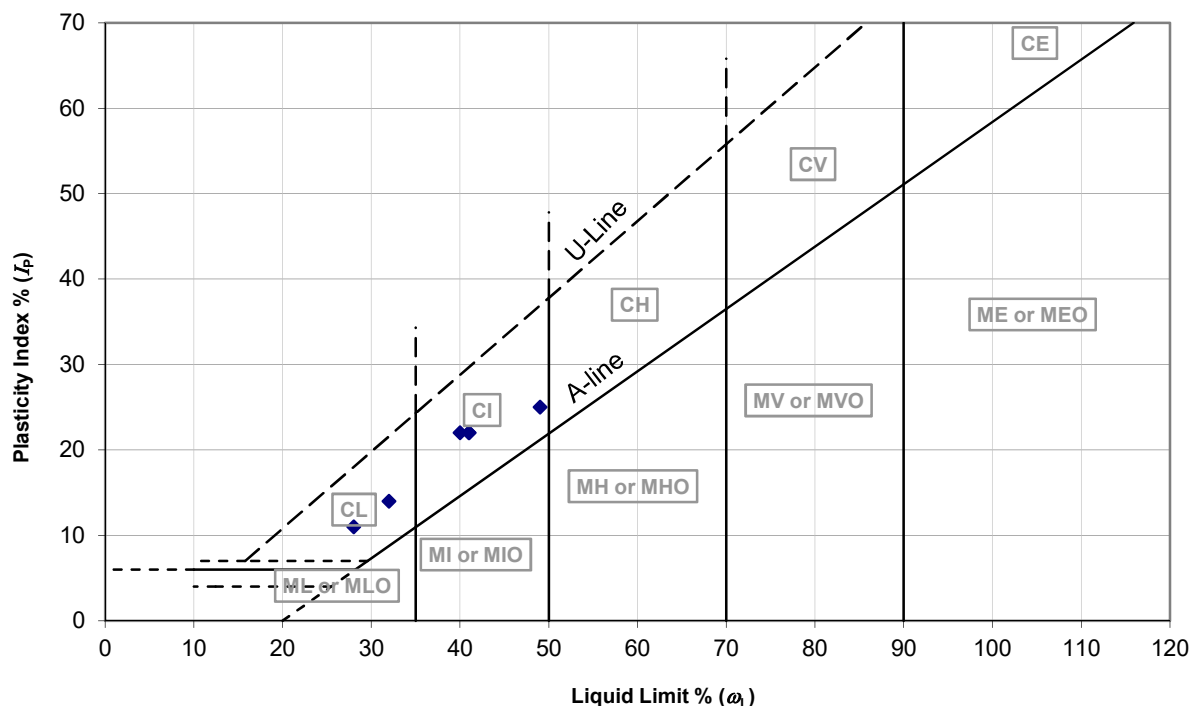
Location:

Input By: Harry

Client: North Park Shelley Ltd

Check By: Harry

Location	Depth (m)	Moisture Content (w) (%)	Liquid Limit (wL) (%)	Plastic Limit (wP) (%)	Plasticity Index (IP) (%)	Retained by 0.425mm (%)	Modified (w) (w') (%)	Modified (IP) (IP') (%)	Liquidity/Consistency		Casagrande Class	N.H.B.C Class (%)
									(IL) (%)	(IC) (%)		
WS01	1.20	16	41	19	22	2	16	22	-0.1	1.1	C I	MEDIUM
WS03	1.20	19.8	41	19	22	2	20	22	0.0	1.0	C I	MEDIUM
WS04	1.00	12.7	40	18	22	0	13	22	-0.2	1.2	C I	MEDIUM
WS05	0.50	19	49	24	25	1	19	25	-0.2	1.2	C I	MEDIUM
WS07	2.20	26.5	32	18	14	0	27	14	0.6	0.4	C L	LOW
WS10	2.50	10.8	28	17	11	32	16	7	-0.6	1.6	C L	*





ENVIRONMENTAL LAB RESULTS

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Environmental
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GEOTECHNICAL
ENVIRONMENTAL



Rogers Geotechnical Services Ltd
Office 1 & 2 Barncliffe Business Park,
Near Bank, Shelley, Huddersfield, HD8 8LU

Telephone 01484 607977
Company No: 5130864



Final Report

Report No.: 22-16031-1

Initial Date of Issue: 06-May-2022

Client: Rogers Geotechnical Services Ltd

Client Address:
Offices 1&2, Barncliffe Business Park
Near Bank
Shelley
Huddersfield
West Yorkshire
HD8 8LU

Contact(s): Harry Letch

Project: Yew Tree

Quotation No.: **Date Received:** 29-Apr-2022

Order No.: C2113/21/E/3266 **Date Instructed:** 29-Apr-2022

No. of Samples: 9

Turnaround (Wkdays): 5 **Results Due:** 06-May-2022

Date Approved: 06-May-2022

Approved By:

Details: Stuart Henderson, Technical Manager

Results - Soil

Project: Yew Tree

Client: Rogers Geotechnical Services Ltd	Chemtest Job No.:				22-16031	22-16031	22-16031	22-16031	22-16031	22-16031	22-16031	22-16031
Quotation No.:	Chemtest Sample ID.:				1420350	1420351	1420352	1420353	1420354	1420355	1420356	1420357
	Sample Location:				WS01	WS02	WS03	WS07	WS06	WS08	WS08	WS01
	Sample Type:				SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
	Top Depth (m):				0.2	2.5	0.2	0.1	0.5	0.2	1.0	0.6
	Bottom Depth (m):				0.4		0.4	0.2	0.6			
	Date Sampled:				26-Apr-2022	26-Apr-2022	26-Apr-2022	26-Apr-2022	26-Apr-2022	26-Apr-2022	26-Apr-2022	26-Apr-2022
	Asbestos Lab:				DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM		
Determinand	Accred.	SOP	Units	LOD								
Cadmium	M	2455	mg/kg	0.10	0.14	0.18	< 0.10	0.39	0.13	0.26		
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50		
Copper	M	2455	mg/kg	0.50	20	25	16	45	31	29		
Mercury	M	2455	mg/kg	0.05	0.10	0.08	0.05	0.14	< 0.05	0.14		
Nickel	M	2455	mg/kg	0.50	20	32	19	15	39	13		
Lead	M	2455	mg/kg	0.50	27	43	24	180	26	82		
Zinc	M	2455	mg/kg	0.50	55	120	55	180	86	120		
Vanadium	U	2455	mg/kg	0.5	18	24	31	24	35	28		
Arsenic	M	2455	mg/kg	0.5	3.7	4.6	4.9	12	6.0	17		
Selenium	M	2455	mg/kg	0.25	1.6	1.4	1.2	0.90	2.1	0.86		
Cyanide (Free)	M	2300	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50		
Total Phenols	M	2920	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10		
Naphthalene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	1.0	< 0.10	0.19		
Acenaphthylene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	0.56	< 0.10	0.15		
Acenaphthene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	1.3	< 0.10	0.20		
Fluorene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	1.1	< 0.10	0.28		
Phenanthrene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	11	< 0.10	1.3		
Anthracene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	2.8	< 0.10	0.24		
Fluoranthene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	22	< 0.10	3.1		
Pyrene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	22	< 0.10	3.3		
Benzo[a]anthracene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	10	< 0.10	2.0		
Chrysene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	10	< 0.10	3.0		
Benzo[b]fluoranthene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	9.2	< 0.10	2.5		
Benzo[k]fluoranthene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	6.1	< 0.10	1.9		
Benzo[a]pyrene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	12	< 0.10	2.0		
Indeno(1,2,3-c,d)Pyrene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	7.2	< 0.10	1.1		
Dibenz(a,h)Anthracene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	2.2	< 0.10	0.59		
Benzo[g,h,i]perylene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	7.1	< 0.10	1.2		
Total Of 16 PAH's	M	2700	mg/kg	2.0	< 2.0	< 2.0	< 2.0	130	< 2.0	23		
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0		
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0		
Aliphatic TPH >C8-C10	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0		
Aliphatic TPH >C10-C12	M	2680	mg/kg	1.0	7.5	< 1.0	< 1.0	7.5	6.4	< 1.0		
Aliphatic TPH >C12-C16	M	2680	mg/kg	1.0	28	5.8	< 1.0	8.1	5.8	7.8		
Aliphatic TPH >C16-C21	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0		
Aliphatic TPH >C21-C35	M	2680	mg/kg	1.0	27	< 1.0	< 1.0	70	20	< 1.0		
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0		

Results - Soil

Project: Yew Tree

Client: Rogers Geotechnical Services Ltd	Chemtest Job No.:		22-16031	22-16031	22-16031	22-16031	22-16031	22-16031	22-16031	22-16031	22-16031	22-16031
Quotation No.:	Chemtest Sample ID.:		1420350	1420351	1420352	1420353	1420354	1420355	1420356	1420357		
	Sample Location:		WS01	WS02	WS03	WS07	WS06	WS08	WS08	WS01		
	Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL		
	Top Depth (m):		0.2	2.5	0.2	0.1	0.5	0.2	1.0	0.6		
	Bottom Depth (m):		0.4		0.4	0.2	0.6					
	Date Sampled:		26-Apr-2022	26-Apr-2022	26-Apr-2022	26-Apr-2022	26-Apr-2022	26-Apr-2022	26-Apr-2022	26-Apr-2022		
	Asbestos Lab:		DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM				
Determinand	Accred.	SOP	Units	LOD								
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	62	5.8	< 5.0	86	32	7.8		
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0		
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0		
Aromatic TPH >C8-C10	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0		
Aromatic TPH >C10-C12	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0		
Aromatic TPH >C12-C16	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0		
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	38	< 1.0	< 1.0		
Aromatic TPH >C21-C35	M	2680	mg/kg	1.0	< 1.0	13	< 1.0	280	< 1.0	33		
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0		
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	13	< 5.0	310	< 5.0	33		
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0	62	19	< 10	400	32	41		
pH	M	2010		4.0	6.4	7.8	8.9	7.4	6.6	6.9	7.8	6.0
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010	0.088	0.14	0.019	0.029	0.032	0.063	0.041	0.024
ACM Type	U	2192		N/A	-	-	-	-	-	-		
Asbestos Identification	U	2192		N/A	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected		
Moisture	N	2030	%	0.020	12	10	21	27	15	29	14	30
Soil Colour	N	2040		N/A	Brown	Brown	Brown	Black	Brown	Brown	Brown	Brown
Other Material	N	2040		N/A	None	Stones	None	Stones	None	Roots	None	None
Soil Texture	N	2040		N/A	Clay	Loam	Clay	Clay	Clay	Loam	Clay	Clay
Sulphate (Total)	U	2430	%	0.010	0.012	0.011	0.014	0.068	0.011	0.043		
Organic Matter	M	2625	%	0.40	1.1	< 0.40	0.81	13	2.2	12		
Demeton-O	N	2820	mg/kg	0.20				< 0.20		< 0.20		
Phorate	N	2820	mg/kg	0.20				< 0.20		< 0.20		
Demeton-S	N	2820	mg/kg	0.20				< 0.20		< 0.20		
Disulfoton	N	2820	mg/kg	0.20				< 0.20		< 0.20		
Fenthion	N	2820	mg/kg	0.20				< 0.20		< 0.20		
Trichloronate	N	2820	mg/kg	0.20				< 0.20		< 0.20		
Prothiofos	N	2820	mg/kg	0.20				< 0.20		< 0.20		
Fensulphothion	N	2820	mg/kg	0.20				< 0.20		< 0.20		
Sulprofos	N	2820	mg/kg	0.20				< 0.20		< 0.20		
Azinphos-Methyl	N	2820	mg/kg	0.20				< 0.20		< 0.20		
Coumaphos	N	2820	mg/kg	0.20				< 0.20		< 0.20		
Atraton	N	2830	mg/kg	0.20				< 0.20		< 0.20		
Prometon	N	2830	mg/kg	0.20				< 0.20		< 0.20		
Simazine	N	2830	mg/kg	0.20				< 0.20		< 0.20		
Atrazine	N	2830	mg/kg	0.20				< 0.20		< 0.20		

Results - Soil

Project: Yew Tree

Client: Rogers Geotechnical Services Ltd	Chemtest Job No.:				22-16031	22-16031	22-16031	22-16031	22-16031	22-16031	22-16031	22-16031	22-16031
Quotation No.:	Chemtest Sample ID.:				1420350	1420351	1420352	1420353	1420354	1420355	1420356	1420357	
	Sample Location:				WS01	WS02	WS03	WS07	WS06	WS08	WS08	WS01	
	Sample Type:				SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	
	Top Depth (m):				0.2	2.5	0.2	0.1	0.5	0.2	1.0	0.6	
	Bottom Depth (m):				0.4		0.4	0.2	0.6				
	Date Sampled:				26-Apr-2022	26-Apr-2022	26-Apr-2022	26-Apr-2022	26-Apr-2022	26-Apr-2022	26-Apr-2022	26-Apr-2022	
	Asbestos Lab:				DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM			
Determinand	Accred.	SOP	Units	LOD									
Propazine	N	2830	mg/kg	0.20				< 0.20		< 0.20			
Terbutylazine	N	2830	mg/kg	0.20				< 0.20		< 0.20			
Secbumeton	N	2830	mg/kg	0.20				< 0.20		< 0.20			
Simetryn	N	2830	mg/kg	0.20				< 0.20		< 0.20			
Ametryn	N	2830	mg/kg	0.20				< 0.20		< 0.20			
Prometryn	N	2830	mg/kg	0.20				< 0.20		< 0.20			
Terbutryn	N	2830	mg/kg	0.20				< 0.20		< 0.20			
Alpha-HCH	N	2840	mg/kg	0.20				< 0.20		< 0.20			
Gamma-HCH (Lindane)	N	2840	mg/kg	0.20				< 0.20		< 0.20			
Beta-HCH	N	2840	mg/kg	0.20				< 0.20		< 0.20			
Delta-HCH	N	2840	mg/kg	0.20				< 0.20		< 0.20			
Heptachlor	N	2840	mg/kg	0.20				< 0.20		< 0.20			
Aldrin	N	2840	mg/kg	0.20				< 0.20		< 0.20			
Heptachlor Epoxide	N	2840	mg/kg	0.20				< 0.20		< 0.20			
Gamma-Chlordane	N	2840	mg/kg	0.20				< 0.20		< 0.20			
Alpha-Chlordane	N	2840	mg/kg	0.20				< 0.20		< 0.20			
Endosulfan I	N	2840	mg/kg	0.20				< 0.20		< 0.20			
4,4-DDE	N	2840	mg/kg	0.20				< 0.20		< 0.20			
Dieldrin	N	2840	mg/kg	0.20				< 0.20		< 0.20			
Endrin	N	2840	mg/kg	0.20				< 0.20		< 0.20			
4,4-DDD	N	2840	mg/kg	0.20				< 0.20		< 0.20			
Endosulfan II	N	2840	mg/kg	0.20				< 0.20		< 0.20			
Endrin Aldehyde	N	2840	mg/kg	0.20				< 0.20		< 0.20			
4,4-DDT	N	2840	mg/kg	0.20				< 0.20		< 0.20			
Endosulfan Sulphate	N	2840	mg/kg	0.20				< 0.20		< 0.20			
Methoxychlor	N	2840	mg/kg	0.20				< 0.20		< 0.20			
Endrin Ketone	N	2840	mg/kg	0.20				< 0.20		< 0.20			

Results - Soil

Project: Yew Tree

Client: Rogers Geotechnical Services Ltd	Chemtest Job No.: 22-16031			
Quotation No.:	Chemtest Sample ID.: 1420358			
	Sample Location: WS03			
	Sample Type: SOIL			
	Top Depth (m): 1.2			
	Bottom Depth (m):			
	Date Sampled: 26-Apr-2022			
	Asbestos Lab:			
Determinand	Accred.	SOP	Units	LOD
Cadmium	M	2455	mg/kg	0.10
Chromium (Hexavalent)	N	2490	mg/kg	0.50
Copper	M	2455	mg/kg	0.50
Mercury	M	2455	mg/kg	0.05
Nickel	M	2455	mg/kg	0.50
Lead	M	2455	mg/kg	0.50
Zinc	M	2455	mg/kg	0.50
Vanadium	U	2455	mg/kg	0.5
Arsenic	M	2455	mg/kg	0.5
Selenium	M	2455	mg/kg	0.25
Cyanide (Free)	M	2300	mg/kg	0.50
Total Phenols	M	2920	mg/kg	0.10
Naphthalene	M	2700	mg/kg	0.10
Acenaphthylene	M	2700	mg/kg	0.10
Acenaphthene	M	2700	mg/kg	0.10
Fluorene	M	2700	mg/kg	0.10
Phenanthrene	M	2700	mg/kg	0.10
Anthracene	M	2700	mg/kg	0.10
Fluoranthene	M	2700	mg/kg	0.10
Pyrene	M	2700	mg/kg	0.10
Benzo[a]anthracene	M	2700	mg/kg	0.10
Chrysene	M	2700	mg/kg	0.10
Benzo[b]fluoranthene	M	2700	mg/kg	0.10
Benzo[k]fluoranthene	M	2700	mg/kg	0.10
Benzo[a]pyrene	M	2700	mg/kg	0.10
Indeno(1,2,3-c,d)Pyrene	M	2700	mg/kg	0.10
Dibenz(a,h)Anthracene	M	2700	mg/kg	0.10
Benzo[g,h,i]perylene	M	2700	mg/kg	0.10
Total Of 16 PAH's	M	2700	mg/kg	2.0
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0
Aliphatic TPH >C8-C10	M	2680	mg/kg	1.0
Aliphatic TPH >C10-C12	M	2680	mg/kg	1.0
Aliphatic TPH >C12-C16	M	2680	mg/kg	1.0
Aliphatic TPH >C16-C21	M	2680	mg/kg	1.0
Aliphatic TPH >C21-C35	M	2680	mg/kg	1.0
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0

Results - Soil

Project: Yew Tree

Client: Rogers Geotechnical Services Ltd	Chemtest Job No.:		22-16031		
Quotation No.:	Chemtest Sample ID.:		1420358		
	Sample Location:		WS03		
	Sample Type:		SOIL		
	Top Depth (m):		1.2		
	Bottom Depth (m):				
	Date Sampled:		26-Apr-2022		
	Asbestos Lab:				
Determinand	Accred.	SOP	Units	LOD	
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	
Aromatic TPH >C8-C10	M	2680	mg/kg	1.0	
Aromatic TPH >C10-C12	M	2680	mg/kg	1.0	
Aromatic TPH >C12-C16	M	2680	mg/kg	1.0	
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	
Aromatic TPH >C21-C35	M	2680	mg/kg	1.0	
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0	
pH	M	2010		4.0	6.6
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010	0.020
ACM Type	U	2192		N/A	
Asbestos Identification	U	2192		N/A	
Moisture	N	2030	%	0.020	18
Soil Colour	N	2040		N/A	Brown
Other Material	N	2040		N/A	None
Soil Texture	N	2040		N/A	Clay
Sulphate (Total)	U	2430	%	0.010	
Organic Matter	M	2625	%	0.40	
Demeton-O	N	2820	mg/kg	0.20	
Phorate	N	2820	mg/kg	0.20	
Demeton-S	N	2820	mg/kg	0.20	
Disulfoton	N	2820	mg/kg	0.20	
Fenthion	N	2820	mg/kg	0.20	
Trichloronate	N	2820	mg/kg	0.20	
Prothiofos	N	2820	mg/kg	0.20	
Fensulphothion	N	2820	mg/kg	0.20	
Sulprofos	N	2820	mg/kg	0.20	
Azinphos-Methyl	N	2820	mg/kg	0.20	
Coumaphos	N	2820	mg/kg	0.20	
Atraton	N	2830	mg/kg	0.20	
Prometon	N	2830	mg/kg	0.20	
Simazine	N	2830	mg/kg	0.20	
Atrazine	N	2830	mg/kg	0.20	

Results - Soil

Project: Yew Tree

Client: Rogers Geotechnical Services Ltd	Chemtest Job No.: 22-16031			
Quotation No.:	Chemtest Sample ID.: 1420358			
	Sample Location: WS03			
	Sample Type: SOIL			
	Top Depth (m): 1.2			
	Bottom Depth (m):			
	Date Sampled: 26-Apr-2022			
	Asbestos Lab:			
Determinand	Accred.	SOP	Units	LOD
Propazine	N	2830	mg/kg	0.20
Terbutylazine	N	2830	mg/kg	0.20
Secbumeton	N	2830	mg/kg	0.20
Simetryn	N	2830	mg/kg	0.20
Ametryn	N	2830	mg/kg	0.20
Prometryn	N	2830	mg/kg	0.20
Terbutryn	N	2830	mg/kg	0.20
Alpha-HCH	N	2840	mg/kg	0.20
Gamma-HCH (Lindane)	N	2840	mg/kg	0.20
Beta-HCH	N	2840	mg/kg	0.20
Delta-HCH	N	2840	mg/kg	0.20
Heptachlor	N	2840	mg/kg	0.20
Aldrin	N	2840	mg/kg	0.20
Heptachlor Epoxide	N	2840	mg/kg	0.20
Gamma-Chlordane	N	2840	mg/kg	0.20
Alpha-Chlordane	N	2840	mg/kg	0.20
Endosulfan I	N	2840	mg/kg	0.20
4,4-DDE	N	2840	mg/kg	0.20
Dieldrin	N	2840	mg/kg	0.20
Endrin	N	2840	mg/kg	0.20
4,4-DDD	N	2840	mg/kg	0.20
Endosulfan II	N	2840	mg/kg	0.20
Endrin Aldehyde	N	2840	mg/kg	0.20
4,4-DDT	N	2840	mg/kg	0.20
Endosulfan Sulphate	N	2840	mg/kg	0.20
Methoxychlor	N	2840	mg/kg	0.20
Endrin Ketone	N	2840	mg/kg	0.20

Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Alkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'AquaKem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2680	TPH A/A Split	Aliphatics: >C5-C6, >C6-C8,>C8-C10, >C10-C12, >C12-C16, >C16-C21, >C21-C35, >C35- C44Aromatics: >C5-C7, >C7-C8, >C8- C10, >C10-C12, >C12-C16, >C16- C21, >C21- C35, >C35- C44	Dichloromethane extraction / GCxGC FID detection
2700	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-FID	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenz[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Dichloromethane extraction / GC-FID (GC-FID detection is non-selective and can be subject to interference from co-eluting compounds)
2820	Organophosphorus (O-P) Pesticides in Soils by GC-MS	Organophosphorus pesticide representative suite including Parathion, Malathion etc, plus client specific determinands	Dichloromethane extraction / GC-MS
2830	Organonitrogen (O-N) Pesticides in Soils by GC-MS	Organonitrogen pesticide representative suite including Triazines etc, plus client specific determinands	Dichloromethane extraction / GC-MS
2840	Organochlorine (O-Cl) Pesticides in Soils by GC-MS	Organochlorine pesticide representative suite including DDT and its metabolites, 'drins' and HCH etc, plus client specific determinands	Dichloromethane extraction / GC-MS
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.

Report Information

Key

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

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

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

For all other tests the samples were dried at < 37°C prior to analysis

All Asbestos testing is performed at the indicated laboratory

Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied

B - Sample age exceeds stability time (sampling to extraction)

C - Sample not received in appropriate containers

D - Broken Container

E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 30 days from the date of receipt

All water samples will be retained for 14 days from the date of receipt

Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:

customerservices@chemtest.com

Rogers Geotechnical Services: Soil Screening Values Comparison Sheet

Rogers Geotechnical Services Ltd				Soil Screening Value (SSV) Comparison Sheet							
Job Number	C2113/21/E			A = WS Atkins PLC, Atrisk Soil Screening Values. A+ = Values updated June 2017. A* = Atrisk's SSV is lower than Chemtest's detectable limit for this compound. B = health criterion values, which are available from toxicological reviews published in the C4SL project methodology report. C = Category 4 Screening Levels (C4SLs) based on 6% soil organic matter. D = Value provided is based on Methyl Mercury. Should elemental mercury be observed or a source be known then a							
Job Name	Yew Tree Lane - Site A			KEY Exceeds SSV Exceeds 2017, Below 2015 Below limit of detection (LOD)							
Date	08.06.22			Sample Location	WS01	WS02	WS03	WS06	TP03	TP04	
Client	Ben Marsden			Depth Top	0.2	2.5	0.2	0.5	0.6	0.3	
				Depth Base							
Determinand	Units	Ref	LOD	Residential With Plant Uptake 1%							
				Atrisk 2015 (No Free Product)	Atrisk 2017						
Cadmium	mg/kg	C	0.10		22.1	0.14	0.18	< 0.10	0.39	0.20	0.14
Chromium (Hexavalent)	mg/kg	B/C	0.5	20.5	3.62	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Copper	mg/kg	A+	0.50		4730	20	25	16	45	16	25
Mercury	mg/kg	A/D	0.10		8.81	0.10	0.08	0.05	0.14	< 0.05	< 0.05
Nickel	mg/kg	A+	0.50		136	20	32	19	15	8.7	10
Lead	mg/kg	C	0.50		200	27	43	24	180	55	18
Zinc	mg/kg	A+	0.50		20000	55	120	55	180	62	48
Vanadium	mg/kg	A+	5.0		136	18	24	31	24	8.5	10
Arsenic	mg/kg	C	1.0		37	3.7	4.6	4.9	12	5.1	6.9
Selenium	mg/kg	A	0.20		375	1.6	1.4	1.2	0.90	< 0.20	0.63
Cyanide (Free)	mg/kg	A	0.50		34	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Total Phenols	mg/kg	A	0.1		267	< 0.10	< 0.10	< 0.10	< 0.10		
Naphthalene	mg/kg	A+	0.10		0.829	< 0.10	< 0.10	< 0.10	1.0	0.51	0.39
Acenaphthylene	mg/kg		0.10			< 0.10	< 0.10	< 0.10	0.56	1.0	0.36
Acenaphthene	mg/kg	A+	0.10	608	157	< 0.10	< 0.10	< 0.10	1.3	0.60	0.70
Fluorene	mg/kg	A+	0.10		735	< 0.10	< 0.10	< 0.10	1.1	0.42	0.71
Phenanthrene	mg/kg		0.10			< 0.10	< 0.10	< 0.10	11	1.3	1.3
Anthracene	mg/kg	A+	0.10		10200	< 0.10	< 0.10	< 0.10	2.8	0.31	0.17
Fluoranthene	mg/kg	A+	0.10		983	< 0.10	< 0.10	< 0.10	22	1.6	1.9
Pyrene	mg/kg	A+	0.10		668	< 0.10	< 0.10	< 0.10	22	1.7	1.9
Benzo[a]anthracene	mg/kg	A	0.10	4.52	1.71	< 0.10	< 0.10	< 0.10	10	3.3	1.5
Chrysene	mg/kg	A	0.10	585	0.44	< 0.10	< 0.10	< 0.10	10	2.2	1.4
Benzo[b]fluoranthene	mg/kg	A	0.10	7.72	1.22	< 0.10	< 0.10	< 0.10	9.2	1.0	1.6
Benzo[k]fluoranthene	mg/kg	A	0.10	84.4	0.686	< 0.10	< 0.10	< 0.10	6.1	2.9	0.56
Benzo[a]pyrene	mg/kg	B/C	0.10	4.95	1.51	< 0.10	< 0.10	< 0.10	12	0.86	1.1
Indeno(1,2,3-c,d)Pyrene	mg/kg	A*	0.10	7.31	0.0614	< 0.10	< 0.10	< 0.10	7.2	3.4	2.3
Dibenz(a,h)Anthracene	mg/kg	A	0.10	0.838	0.00393	< 0.10	< 0.10	< 0.10	2.2	2.2	2.0
Benzo(g,h,i)perylene	mg/kg	A	0.10	96.2	0.0187	< 0.10	< 0.10	< 0.10	7.1	3.8	3.2
Total Of 16 PAH's	mg/kg		2.0			< 2.0	< 2.0	< 2.0	130	27	21
Aliphatic TPH >C5-C6	mg/kg	A+	1.0		42.7	< 1.0	< 1.0	< 1.0	< 1.0		
Aliphatic TPH >C6-C8	mg/kg	A+	1.0		99.3	< 1.0	< 1.0	< 1.0	< 1.0		
Aliphatic TPH >C8-C10	mg/kg	A+	1.0		13.9	< 1.0	< 1.0	< 1.0	< 1.0		
Aliphatic TPH >C10-C12	mg/kg	A+	1.0	81.7	49.9	7.5	< 1.0	< 1.0	7.5		
Aliphatic TPH >C12-C16	mg/kg	A+	1.0	385	20.9	28	5.8	< 1.0	8.1		
Aliphatic TPH >C16-C21	mg/kg	A+	1.0		210000	< 1.0	< 1.0	< 1.0	< 1.0		
Aliphatic TPH >C21-C35	mg/kg	A+	1.0		210000	27	< 1.0	< 1.0	70		
Aliphatic TPH >C35-C44	mg/kg		1.0			< 1.0	< 1.0	< 1.0	< 1.0		
Total Aliphatic Hydrocarbons	mg/kg		5.0			62	5.8	< 5.0	86		
Aromatic TPH >C5-C7	mg/kg	A+	1.0		0.137	< 1.0	< 1.0	< 1.0	< 1.0		
Aromatic TPH >C7-C8	mg/kg	A+	1.0		113	< 1.0	< 1.0	< 1.0	< 1.0		
Aromatic TPH >C8-C10	mg/kg	A+	1.0		20.5	< 1.0	< 1.0	< 1.0	< 1.0		
Aromatic TPH >C10-C12	mg/kg	A+	1.0		70	< 1.0	< 1.0	< 1.0	< 1.0		
Aromatic TPH >C12-C16	mg/kg	A+	1.0	165	155	< 1.0	< 1.0	< 1.0	< 1.0		
Aromatic TPH >C16-C21	mg/kg	A+	1.0		319	< 1.0	< 1.0	< 1.0	38		
Aromatic TPH >C21-C35	mg/kg	A+	1.0		1120	< 1.0	13	< 1.0	280		
Aromatic TPH >C35-C44	mg/kg		1.0			< 1.0	< 1.0	< 1.0	< 1.0		
Total Aromatic Hydrocarbons	mg/kg		5.0			< 5.0	13	< 5.0	310		
Total Petroleum Hydrocarbons	mg/kg		10.0			62	19	< 10	400		
pH			N/A			6.4	7.8	8.9	7.4	5.2	6.3
Sulphate (2:1 Water Soluble) as SO4	g/l		0.010			0.088	0.14	0.019	0.029		
ACM Type			N/A			-	-	-	-	-	-
Asbestos Identification	%		0.001			No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
Moisture	%		0.020			12	10	21	27	30	22
Soil Colour			N/A			Brown	Brown	Brown	Black	Brown	Brown
Other Material			N/A			None	Stones	None	Stones	Roots	Stones and
Soil Texture			N/A			Clay	Loam	Clay	Clay	Sand	Sand
Sulphate (Total)	%		0.010			0.012	0.011	0.014	0.068		
Organic Matter	%		0.40			1.1	< 0.40	0.81	13	10	14

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End of Report

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Rogers Geotechnical Services Ltd
Office 1 & 2 Barncliffe Business Park,
Near Bank, Shelley, Huddersfield, HD8 8LU

Telephone 01484 607977
Company No: 5130864



Appendix 9

Soil Screening Values

Rogers Geotechnical Services Ltd.

Atkins ATRISK Soil Screening Values (SSVs) - Residential With Plant Uptake Landuse

Tox Data Report No.	Compound	Residential with Homegrown Produce Landuse (mg/kg)				Reference
		SOM: 1%		SOM: 6%		
<i>Metals</i>						
3	Cadmium	22.1		22.1		C
4	Chromium VI	3.62	20.5	3.62	20.5	B/C
	Copper	4730		4790		A+
7	Mercury	8.81		15.80		A/D
8	Nickel	136		136		A+
	Lead	200		200		C
	Zinc	20000		20300		A+
	Vanadium	136		138		A+
<i>Semi and Non Metals</i>						
1	Arsenic	37		37		C
10	Selenium	375		375		A
	Free Cyanide	34		34		A
9	Phenols (total)	267		1200		A
<i>Poly Aromatic Hydrocarbons</i>						
		Free product	No free product	Free product	No free product	
20	Napthalene	0.829		12.2		A+
	Acenaphthene	157	608	2760		A+
	Fluorene	735		2610		A+
	Anthracene	10200		26200		A+
	Fluoranthene	983		2980		A+
	Pyrene	668		2120		A+
	Benzo(a)anthracene	1.71	4.52	8.54		A
2	Chrysene	0.44	585	2.64	927	A
2	Benzo(b)fluoranthene	1.22	7.72	7.29	9.86	A
2	Benzo(k)fluoranthene	0.686	84.4	4.12	100	A
2	Benzo(a)pyrene	1.51	4.95	0.998	5	B/C
2	Dibenzo(a,h)anthracene	0.00393	0.838	2.05	4.95	A*
2	Indeno(1,2,3-cd)pyrene	0.0614	7.31	0.368	9.75	A
2	Benzo(g,h,i)perylene	0.0187	96.2	0.112	103	A
<i>Petroleum Hydrocarbons</i>						
	Aliphatic C5-C6	42.7		369		A+
	Aliphatic C6-C8	99.3		768	1240	A+
	Aliphatic C8-C10	13.9		204		A+
	Aliphatic C10-C12	49.9	81.7	297	1180	A+
	Aliphatic C12-C16	20.9	385	125	4130	A+
	Aliphatic C16-C21	210000		210100		A+
	Aliphatic C21-C35	210000		210100		A+
	Aromatic C5-C7 (Benzene)	0.137		0.871		A+
	Aromatic C7-C8 (Toluene)	113		780		A+
	Aromatic C8-C10	20.5		232		A+
	Aromatic C10-C12	70		468		A+
	Aromatic C12-C16	155	165	830		A+
	Aromatic C16-C21	319		1040		A+
	Aromatic C21-C35	1120		1710		A+
A+ = Values update June 2017.						
A* Atrisk's SSV is lower than Chemtest's detectable limit for this compound.						
B = Health Criterion Values (available from toxicological reviews published in the C4SL project methodology report).						
C = Category 4 Screening Levels (C4SLs).						
D = SSV provided is for Methyl Mercury.						

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PHASE 2 GEO-ENVIRONMENTAL REPORT

GEO-TECHNICAL
ENVIRONMENTAL

job number	date
site address	
written by	
checked by	
issued by	

Rogers Geotechnical Services Ltd
Telephone 0843 50 666 87 **Fax** 0843 51 599 30
Email enquiries@rogersgeotech.co.uk
www.rogersgeotech.co.uk
Offices 1 & 2, Barncliffe Business Park, Near Bank, Shelley,
Huddersfield, West Yorkshire HD8 8LU.





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Report on a Phase 2 Geo-environmental Investigation

Location: Site B - Yew Tree Road/Burn Road
Birchencliffe, Huddersfield, HD2 2EQ

For: North Park (Shelley) Ltd

Report No. C2213/21/E/3374

Date: July 2022

Planning Application No: 2021/61/91933/W

For and on behalf of **Rogers Geotechnical Services Ltd**

Charlotte Mason BSc FGS
Geo-environmental Engineer

Rob Palmer MSc FGS ACIEH
Senior Geo-environmental Engineer

Report Summary¹

Item	Comments	Section
Development	North Park (Shelley) Ltd, propose to develop the land adjacent to Yew Tree Road/Burn Road, Birchencliffe, Huddersfield, HD2 2EQ by the construction of a series of residential dwellings.	1.0
Geology	Superficial geology – None. Solid geology – Pennine Lower Coal Measures Formation. The site is split by an east-west trending fault.	5.0
Strata Conditions	This investigation indicates that the ground conditions across the site exhibit some variability both laterally and vertically. Particularly, there is some ambiguity as to whether cohesive soils have been reworked. Under the residual soils competent layers of the Pennine Lower Coal Measures Formation were revealed to a depth of 30m, comprising interbedded layers light grey sandstone and siltstone/mudstone.	6.0
Groundwater	Encountered at depths ranging between 6m and 8m bgl.	6.0
Coal Mining Legacy.	No evidence of coal seams, or coal workings have been identified. A Low risk rating has been assigned.	10.0
Foundation Design	Due to variability of ground conditions encountered on site, it is recommended that a pragmatic approach be taken to the foundations for the houses, and are considered on a plot by plot basis. In view of the above, in broad terms, it is considered that the foundation solutions could include shallow footings in areas where natural clays are present in at least a firm in-situ condition. Alternatively, consideration could also be directed towards placing plots on mini piles.	12.1
Effect of Sulphates	DC-1 concrete.	12.5
Contamination	Localised PAH contamination identified within the topsoil. Some remediation will be required.	13.5
Gas	Gas monitoring is ongoing. Initial readings would suggest that CS1 conditions will be met, such that gas protection measures will not be required.	13.1.2

¹ This summary should not be relied upon to provide a comprehensive review. All of the information contained in this document should be considered.



1. Introduction

It is understood that the land at 'Site B' Yew Tree Road & Burn Road, Birchencliffe, Huddersfield, HD2 2EQ is to be developed by the construction of a series of residential houses with front and rear gardens and access roads. Site B forms the eastern section of a large field, with a dry stone wall present on all four boundary lines. Access to the site is gained via an entrance point in the field to the west; the western field, referred to as 'Site A', is being assessed under a separate planning application.

Consequently, a site investigation has been undertaken in accordance with the instruction from the client. This work was required in order to determine the nature of the underlying soils, to assess their engineering properties and to assist in the design of safe and economical foundations for the proposed development. This investigation also takes into consideration the risk of any contamination present, the viability of soakaways, and the risks posed by historic coal mining activity.

This report describes the work undertaken, presents the data obtained and discusses the ground conditions in relation to the proposed works.

2. Limitations

The recommendations made and opinions expressed in this report are based on the ground conditions revealed by the site works, together with an assessment of the site and of the laboratory test results. Whilst opinions may be expressed relating to sub-soil conditions in parts of the site not investigated, for example between borehole positions, these are for guidance only and no liability can be accepted for their accuracy.

This report has been prepared in accordance with our understanding of current best practice. However, new information or legislation, or changes to best practice may necessitate revision of the report after the date of issue.

3. Previous Works

3.1 Previous Ground Investigation

For the proposed development area, the following reports have been reviewed:

- Lithos, Preliminary Environmental Investigation, Land at Burn Road, Birchencliffe, Report No. 2898/1, January 2018. This report investigated the eastern portion of the site as a whole (now referred to as site B).

The main issues considered in this report, and in particular in Sections 3 and 4, are based on a review of historical maps and available geological/environmental data, including data obtained by Lithos during investigation of adjacent land. This report provides an assessment of Geoenvironmental issues and implications associated with the proposed residential redevelopment



of the site, together with any implications for current use of the site. The report makes the following concluding remarks:

- The published geological data suggests that the site is underlain by Stanningley Rock Sandstone in the north, with undifferentiated Lower Coal Measures in the south. There are no drift deposits shown on the geological map. Moreover, given the findings of Lithos' investigation on adjacent land, natural soils are likely to comprise firm/stiff clays or medium dense gravels, with bedrock likely present within 2m to 3m of current ground levels
- The north-west area of the site is located within a Coal Mining Development High Risk Area (an area with specific mining legacy risks to the surface, including mine entries; shallow coal workings etc). The remainder of the site is located within a Low Risk Area. If old mine workings are present in the Hard Bed coal seam, and are considered to pose a significant risk to surface stability, mitigation of the risks posed will be required
- It is considered possible that the site could be affected by sources of hazardous gas, and therefore a monitoring programme (likely 9 visits over a 6-month period) will be required, with the issue of a Gas Risk Assessment upon completion of the monitoring.
- Given anticipated ground conditions, soakaways may provide a viable solution for the disposal of surface water, subject to in-situ testing.
- The site's environmental setting is considered to be of moderate sensitivity. With respect to human health, the proposed end use (residential) is also considered sensitive. Localised made ground may be present associated with quarrying to the north and (limited) numbers of former structures. Any associated contamination is unlikely to be of great significance, nonetheless, this should be proved by a ground investigation (trial pitting) and sampling where appropriate.

3.2 Mine Entry Data Sheets

A Mine Entry Data Sheet for the shaft 412418-002 was obtained. From this data, the following assumptions have been made about the shaft in order to aid future investigation.

- The given grid reference highlights that the shaft is on the very edge of the eastern site boundary (E 412022, N 418983).
- Based on the source information, the shaft may lie within an 8m departure zone.
- The shaft has an assumed diameter of ~2m.
- In accordance with the information within section 3.1, the Coal Authority confirm that 'This mine entry was searched for but not found by Lithos Consulting in 2015'.

3.3 Mine Entry Risk Assessment

A mine Entry Risk Assessment was undertaken by RGS in February 2022, the results of which were presented as report number C3113/21/E/3266. The works comprised an investigation to determine the risk posed to the future development from the mine entry, as well as to determine the nature of the soils the site. The report drew the following conclusions:



- From the investigation carried out, no evidence of mine entries or ground workings have been proven within the area investigated.
- In addition to the above, the Coal Authority confirm that 'This mine entry was searched for but not found by Lithos Consulting in 2015'.

Regardless of the above, there remains some risk of unrecorded mine entries of exploratory shafts. In order to mitigate this risk any anomalously deep made ground encountered during future ground investigations would be suspect and should be investigated further. All excavations to natural ground completed during the development of the site should be inspected for anomalous made ground that could represent unrecorded mine entries and if encountered should be investigated accordingly under CA licence.

4. Fieldworks

The fieldworks were undertaken predominantly in the spring through to early summer of 2022 and included the following:

- 4 windowless sample boreholes.
- Standard Penetration Tests (SPTs) at regular intervals within WS08 and WS10
- Dynamic probes adjacent to WS08 and WS09. A stand-alone probe was sunk at location DP11.
- Installation of 2 gas monitoring standpipes within WS08 and WS10.
- 5 rotary open hole boreholes (RO3, RO5, RO5, RO6, RO9, RO10).
- 7 mechanically excavated trial pits (TP05, TP06, TP06A, TP07, TP08, TPSA03, TPSA04).
- Soakaway tests within 1 location (TPSA03).

It should be appreciated that whilst Site A and Site B are being assessed under separate planning applications, both sites were investigated simultaneously. As such, the borehole nomenclature is systematic and covers all works over both sites, albeit the investigation locations that were sunk within Site B are summarised above. The investigatory locations are shown on the site plan which is presented in Appendix 1 to this report.

4.1 Acquisition of Coal Authority Permit

In order to undertake this investigation, it was necessary to obtain permission to enter or disturb Coal Authority interests. This permission was granted in November 2021 as permit reference number 24130, which is presented in Appendix 2 to this report. In accordance with the joint Coal Authority and Health and Safety Executive positioning statement, and under the requirements of the permit, the works were undertaken employing water flush drilling techniques with gas monitoring of the boreholes during the fieldworks.



4.2 Windowless Sample Boreholes

These boreholes were sunk using a drive-in windowless sampler. The cores were undertaken in 1m lengths and reduced in diameter from 90mm for the first 1m through 80mm, 70mm and 60mm for subsequent 1m increments. The recovered cores were sealed and returned to the laboratory for logging and subsequent testing. The soils were described in general accordance with BS5930: 2015 +A1: 2020 and full descriptions are given on the windowless sample records which are presented in Appendix 3. Also included on these records are the core diameters and percentages of core recovered.

4.3 Standard Penetration Tests

Standard penetration tests (SPT) were undertaken at regular depth increments within windowless sample borehole WS08 and WS10. The SPT was conducted in accordance with the procedures given in BS EN ISO 22476: Part 3: 2005 +A1: 2011, and the results are summarised on the borehole record. During this work an automatic trip hammer of 63.5kg falling through 750mm was employed to drive either a cone or split barrel sampler assembly into the ground and the recovered barrel samples were retained in air tight plastic containers.

4.4 Dynamic Probes

Dynamic penetration tests were undertaken adjacent to the windowless sample boreholes WS08 and WS09, as well as at the stand-alone position DP11, in accordance with the procedure given in BS EN ISO 22476: Part 2: 2005 +A1: 2011, using the super heavy penetrometer (DPSH). This probe consists of a 63.5kg mass falling through 750mm onto an anvil, which drives a 50mm diameter cone into the ground. The number of blows required to drive the cone through successive 100mm increments are recorded as the N_{100} values. The results of the dynamic penetration tests are tabulated and presented as bar charts of N_{100} values versus depth in Appendix 4.

4.5 Gas Monitoring Standpipes

Gas monitoring standpipes were installed between 1.5m and 3.9m depth in all of the boreholes and the installation details are shown on the appropriate borehole records. In all cases, the monitoring standpipe consisted of a perforated pipe from the base of the borehole to 1.0m below surface, with a non-perforated pipe to ground level. The response zone was filled with pea gravel, with a bentonite seal at the base and above, and the installation was capped with a stop box cover in a concrete surround.

4.6 Rotary Open-hole Boreholes

5 boreholes were sunk using a Comacchio 205 rotary drilling rig using rotary open-hole drilling techniques and employing 130mm diameter drag and tricone roller bits. Where necessary, 140mm diameter casing was temporarily installed through the overburden to support the bore. The investigation was undertaken using water flush drilling techniques in accordance with the Coal Authority and Health and Safety Executive positioning statement. Drill chippings brought to surface



in the flush returns were inspected by the driller on a screen, which forms part of the re-circulation tanks. The borehole positions are shown on the site plan, which is presented in Appendix 1 and the strata conditions are presented on the borehole records in Appendix 5.

4.7 Trial Pits

A total of 7 trial pits were excavated in order to reveal the nature of the near surface soils. The soils were logged on site in general accordance with BS5930: 2015+A1: 2020, and full descriptions are given on the trialpit records which are presented in Appendix 6. At regular intervals throughout the excavation of the pits, samples were taken for geotechnical testing. The test specimens were retained in the appropriate air tight containers within cool boxes for onward transition to the laboratory.

Once excavations were completed, the trial pits were carefully re-instated with the arisings. Whilst every care was taken during the infilling process, including compacting of the infill at regular intervals with the back-acting arm of the excavator, it should be appreciated that some mounding of the surface may have resulted. Moreover, the infilled soils may be subjected to settlement over time, such that a depression in the surface may also occur. Therefore, the locations of any pits undertaken in this investigation should be conveyed to the current site user, as the mounds or depressions associated with the pits may present a risk to current site operations. Furthermore, it must be realised that the infilled pits represent an area of disturbance within the site soils, thus the soils at the pit locations may vary characteristically compared to the undisturbed ground. As such, foundations placed in this disturbed material may not perform as anticipated.

4.8 Soakaway Tests

Soakaway tests were conducted within the location of TPSA03. At the elected test depths, the pit was trimmed and squared as much as practicable. Water was then pumped into the pit and the level monitored at timed intervals relative to a reference bar at ground level. These tests were conducted and calculated in general accordance with the method given by BRE Digest 365 and the results are presented in Appendix 7.



5. Geology

The appropriate 1: 50,000 map sheet for the site and the geology viewer has been examined and the following table presents the indicated geology:

Table 1: Geological Data for the Site			
Strata Type	Strata Name ²	Previous Name ³	Description ³
Made Ground/Fill	N/A	N/A	Not indicated on site.
Superficial Geology	N/A	N/A	Not indicated to underlie the site.
	Within the northern fault block		
	Stanningley Rock	36 Yard Coal	The Stanningley Rock, or 36 Yard Rock, is a fine-grained, thinly bedded, commonly ganisteroid sandstone.
Solid Geology	Within the southern fault block		
	Pennine Lower Coal Measures Formation	-	Interbedded grey mudstone, siltstone and pale grey sandstone, commonly with mudstones containing marine fossils in the lower part, and more numerous and thicker coal seams in the upper part.

The geological appraisal, as outlined within the Lithos report, states the following:

Geological maps suggest that the Hard Bed Coal seam (up to 0.6m thick) could underlie the site at shallow depth, especially in the south of the site, which is underlain by undifferentiated Lower Coal Measure strata. This coal seam should be deeper in the north (around 25m to 30m depth), where the site is underlain by Stanningley Rock Sandstone. It should be noted that the local area is heavily faulted, which somewhat complicates the local geology.

Approximately 10m below the Hard Bed Coal Seam lies the Middle Band Coal, which is mapped as a discontinuous 'thin' seam, and thus is unlikely to have been worked. The Soft Bed Coal is present approximately 20m below the Hard Bed, but generally present at a maximum thickness of 0.6m is deemed unlikely to be of any significance with respect to site surface subsidence, even if worked.

The Coal Authority have also provided an abandonment plan for the Soft Bed Coal which shows workings approximately 100m north of this site and north of the fault shown on the geological maps. These recorded workings are likely to lie at depths in excess of 30m, and therefore be overlain by a sufficient thick of competent cover (i.e. >10x seam thickness). It should be noted that the data on this abandonment plan does not extend beneath this site, thus it is unlikely that any abandonment plans are available for this site.

² Sources: British Geological Survey (NERC) Map Sheets 77; Huddersfield; Solid and Drift Edition, and Geology of Britain Viewer [online resource from www.bgs.ac.uk]

³ Sources: British Geological Survey (NERC) Lexicon of Named Rock Units [online resource from www.bgs.ac.uk]



In summary, the presence of mine workings associated with the 36 Yard Seam in the northern fault block is highly unlikely, and any workings within the underlying Hard Bed seam should be at sufficient depth to not pose a significant risk of subsidence. However, the possibility of unrecorded shallow mine workings in the Hard Bed Coal within the southern fault block cannot be entirely discounted.

6. Strata Conditions

In accordance with the geology of the area, the succession has been shown to include the following:

Table 2: Generalised Strata Profile

Depth m below ground level to underside of layer	Strata Type	Positions Encountered	Groundwater Strikes m below ground level
0.15 – 0.3	TOPSOIL (Dark brown organic silty fine SAND).	All	None
+1.2 - +3.0	Residual Cohesive soils (Typically soft to firm silty CLAY with lithorelicts of sandstone)	TP05, TP07, TP08	None
	Or Residual Cohesive soils (Typically Firm locally stiff brown locally mottled dark brown silty gravelly CLAY. Gravel is sub angular to rounded medium to coarse of sandstone and rare coal) Locally: Potentially reworked Cohesive soils	WS07, WS08, TPSA 04	
1.4 – 2.3	Soft to stiff brown mottled grey and orangish brown slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is angular to sub rounded fine to coarse of sandstone, mudstone and coal.	WS09, WS10, TPSA 03	None
+15 - +30	Interbedded horizons of Sandstone and Mudstone [Pennine Lower Coal Measures Formation]	RO3, RO5, RO6, RO9, RO10	6.0 (RO6) 8.0 (RO5)

'+' denotes that the strata extended below the termination depth of the investigated positions, thus the extent of the deposit is only proven to the depths indicated

6.1 General Strata

Firstly, it should be appreciated that within the location of TP06 and TP06a, evidence of previous structures was observed, and comprised 'bound macadam', anticipated to have a tar binder, as well as a series of brick sets. Furthermore, evidence of a sump was observed at the location of TPSA 04 (Brick wall in west of the pit running with clean water, trial pit expanded to observe deposits and thought to be infilled waste sump. Odour of decomposition from the sump. Concrete block up to 0.30m depth in NW corner of trial pit).

This investigation has concluded that the strata conditions across the site show some variability, which is largely attributed to the change in geology across the site, and also intrinsically linked to the faulting within the area. A site plan showing the 1:50,000 solid geology, in relation to the borehole locations is presented within Appendix 1.



Taking this into consideration, below a capping of topsoil, residual cohesive soils that predominantly comprised lithorelicts of sandstone were typically found at shallow depth in the north of the site (TP05, TP07, TP08). These soils largely consisted of soft to firm (locally stiff) gravelly silty clays. It is suggested that these soils can be attributed to the upper weathered fraction of the Stanningley Rock.

In the central and southern quadrants of the site, cohesive soils were noted to contain lithorelicts of other materials, such as siltstone, mudstone, carbonaceous mudstone and rare coal. Furthermore, some evidence of significant mottling of colour was recorded locally. Given the geology of the site, there is some ambiguity as to whether these soils represent the residual soils of the Pennine Lower Coal Measures Formation, or soils that could represent 'fault gauge' (naturally reworked soils) associated with the fault. However, there is no obvious linear trend that links mottled/disturbed looking soils to the fault bisecting the site. Furthermore, all cohesive soils were recorded to be predominantly in a 'firm' in-situ condition, with no obvious evidence of anthropogenic material, or voidage. With that regard, it should be appreciated that some natural variability in the composition of residual soils should be expected.

Below this stratum, competent layers of the Pennine Lower Coal Measures Formation were revealed to a depth of 30m, comprising interbedded layers of mudstones and sandstone. No coal seams or evidence of coal workings (loss of flush or drilling resistance, obvious voidance or worked ground) were identified in any borehole, regardless of which side of the fault plane the borehole was sunk.

However, momentarily flush was lost within borehole RO9 at a depth of 5m in material described as 'light grey mudstone'. It should be noted, however, that no loss of drilling resistance was recorded, suggesting that this feature does not represent voided ground. Furthermore, no loss of flush or drilling resistance was noted within the other boreholes at similar depths and within the corresponding strata. Therefore, considering the depth of this feature, and the fact that the surrounding strata appears to be intact and comprises mudstone only, it is anticipated that this feature may represent a localised zone of naturally fractured rock, and not a zone of illicit mining activity.

Groundwater strikes were recorded between 6m and 8m during drilling. However, it is possible that the use of water flushing techniques may have masked the presence of any water strikes within the other borehole locations. In any event, it should be appreciated that groundwater levels are subject to seasonal variation or changes in local drainage conditions.



7. Insitu Testing

7.1 Standard Penetration Tests

The standard penetration tests carried out are summarised in the following table:

Strata	Depth Range (m)	SPT 'N' (Blows/300mm)		Comments
		Granular soils	Cohesive soils	
MADE GROUND (Cohesive)	1 – 1.45	-	13 - 15	Soils in a firm in-situ condition.
bluish grey mottled light brown gravelly silty CLAY	3 – 4.45	-	12 – 14	Soils in a firm becoming stiff in-situ condition.

7.2 Dynamic Penetration Tests

Dynamic penetration tests were undertaken adjacent to the corresponding windowless sample borehole positions. A summary of the results is presented below:

Position	Blows/100mm			Refusal type (Effective/ Abrupt) ⁴	Comments
	0 - 2	3 - 10	10+		
Depth to which blow count range was observed (m)					
DP08	1.1	2.5	2.6	Abrupt	Low blow counts recorded until abrupt refusal encountered.
DP09	0.7	0.8	1.0	Abrupt	Low blow counts recorded until abrupt refusal encountered.
DP11	1.3	3.4	3.5	Abrupt	Low blow counts recorded until abrupt refusal encountered.

⁴ Abrupt refusal: obstruction or bedrock encountered. Effective refusal: +25 blows/100mm.



7.3 Gas and Water Level Monitoring

The monitoring of standpipes commenced on the 14th April 2022 and is currently ongoing (regime of 6 readings over 3 months is proposed). The results of the gas monitoring undertaken to date are tabulated below.

Location	Date	CH ₄ (%)	CO ₂ (%)	O ₂ (%)	Flow (l/h)	Barometric Pressure (mb)	Water Level (m)	Standpipe Depth (m)
WS08	14.04.22	0.1	1.2	19.1	0.0	1002↑	—	1.5
	22.04.22	0.1	3.1	18.8	0.0	993↓	1.38	
	29.04.22	0.1	4.0	18.3	0.0	1013↓	—	
	06.05.22	0.1	4.2	17.9	0.1	1004↓	—	
	21.06.22	0.0	3.4	18.0	0.0	995↔	—	
	*							
WS10	14.04.22	0.1	0.9	19.2	0.0	1002↑	3.38	3.9
	22.04.22	0.1	1.2	18.8	0.0	993↓	3.30	
	29.04.22	0.1	1.6	18.3	0.0	1013↓	3.46	
	06.05.22	0.1	2.2	16.5	0.1	1003↓	3.46	
	21.06.22	0.0	2.1	7.3	0.0	995↔	—	
	*							

↑ - rising pressure ↓ - falling pressure ↔ -steady pressure * - 6th reading to be completed in July 2022

This work was undertaken using a Geotechnical Instruments (UK) Ltd. GA5000 (serial No G503524) which was last calibrated on the 5th May 2021.

7.4 Soakaway Test

On reaching the elected soakaway test depth, the pit was trimmed and squared as much as practicable. Water was then introduced into the pit at a controlled rate to prevent collapse of the sides and the level monitored at time intervals relative to a reference bar at ground level. The results obtained from the soakaway tests are presented at Appendix 7 and are summarised below:

Location	Soakage Area Dimensions (average) (m)	Depths of soaked strata (m)	Soil Description (of soaked strata)	Infiltration Rate (m/sec)	*Drainage Characteristics
TAPSA03	1.8 x 1.5	1.67 – 2.1	Stiff brown mottled grey slightly sandy slightly gravelly CLAY	*	Practically Impermeable

*Based on the most onerous results for each test.

During the soakaway tests the water level did not achieve a fall from 75% to 25% of the effective depth of the storage volume. On this basis, the tests could not be completed within the scope of the method provided in BRE Digest 365 due to the poor soakage rate of the exposed soils. Due to the negligible water movement it was not possible to extrapolate the results obtained in order to obtain a soil infiltration rate.



8. Laboratory Testing - Geotechnical

The following programme of laboratory testing has been undertaken on samples obtained during this investigation:

- Determination of water content BS EN ISO 17892-1:2014
- Determination of liquid and plastic limits BS EN ISO 17892-12:2018
- Soluble sulphate content BS 1377-3:2018+A1:2021: Pt3: 7.3
- pH value BS 1377-3:2018+A1:2021: Pt3: 12

The test results are presented in Appendix 8 and are summarised below:

Table 7: Summary of Geotechnical Test Results

Test type	Number of tests	Range of results		Comments
Water content determinations	2	11% - 27%		-
Index properties (1 Point)	2	LL	28% - 32%	Clay of low to intermediate plasticity. Consistency index 0.4 – 1.2 NHBC Class – Medium.
		PL	17% - 18%	
		PI	11% - 14%	
Soluble sulphate & pH	5	SO ₄	0.025 – 0.52g/l	AC-1s Concrete classification
		pH	6.5 – 6.9	

In cohesive soil the approximate cohesion, c_u , and coefficient of consolidation, m_v , may be obtained from the equivalent SPT 'N' value using the following expressions (Stroud 1975).

$$c_u = f_1 N \quad \text{where:} \quad c = \text{cohesion (kN/m}^2\text{).}$$

$$m_v = \frac{1}{f_2 N} \quad m_v = \text{Coefficient of consolidation (m}^2\text{/MN).}$$

f_1 & f_2 = factors based on plasticity index.
 N = SPT 'N₃₀₀' value.

For the cohesive soils revealed at this site the highest (worst case) plasticity index⁵ of 14% could be employed, which suggests an f_1 value of 6.5 and an f_2 value of 0.65.

8.1 Geotechnical Properties

The idealised geotechnical properties employed in design are summarised below.

Table 8: Summary of Geotechnical Properties

Property	Range of values		Comments
Volume change potential (NHBC)	Medium		Residual cohesive soils
Shear strength parameters (at proposed foundation level – in residual cohesive soils)	c_u	50kN/m ²	Based on SPT 'N' values, and observations made during logging.
	γ	20kN/m ³	
Concrete classification	DC1		Natural ground locations (Static water)

⁵ See paragraph 6.2 'Index Property Tests'



9. Laboratory Testing - Environmental

A suite of testing was conducted on samples from across the site and the following regime was undertaken.

- Metals – Cd, Cr^{VI}, Cu, Hg, Ni, Pb, V and Zn.
- Semi and Non-Metals - As, Se, Free CN⁻ and Phenols.
- Polycyclic aromatic hydrocarbons (PAHs).
- Petroleum hydrocarbons (TPHs).
- Others – pH, organic content and total/soluble SO₄²⁻.
- Asbestos.

This testing was undertaken by Eurofins Chemtest Ltd and the results of all of the chemical testing are presented in Appendix 8 of this report.

10. Risk Assessment – Mining Instability

In light of the findings of this investigation, the risk to the proposed development is considered with reference to the following ratings and definitions:

- Low - The possibility of instability is unlikely therefore no further action is necessary.
- Moderate - The possibility of instability is likely and further investigation or remedial action may be required.
- High - The possibility of instability is highly likely and further investigation or remedial action will be necessary.

Table 9: Development Specific Risk Assessment

Item	Risk of Instability	Location	Risk Rating
10.1	Shallow coal seams (recorded and unrecorded)	Within Northern Fault Block	Low
		Within Southern Fault Block	Low
10.2	Coal workings at depth	The site is not within a surface area that could be affected by past underground mining.	Low
10.3	Mine shafts	Mine Shaft 412418-002	Low
10.4	Mine Gas	Associated with Shallow Workings	Low



10.1 Risks Posed by Shallow Mining (recorded and unrecorded Mining).

The results of rotary probing confirm that there is no evidence of coal seams, brecciated or broken ground beneath the site, on either side of the fault plane, to a depth of 30m bgl. Consequently, it is considered that it is highly unlikely that shallow coal workings are present beneath or in close proximity to the area of the proposed development. As such, a low risk rating has been assigned and no further action is required.

10.2 Coal Workings at Depth

In regard to deeper mining which could affect the site, no further coal seams, or voids were encountered within the strata or to a depth of 30m bgl. Furthermore, the Coal Authority report as presented within the Lithos report states, 'The site is not within a surface area that could be affected by past underground mining. As such, a low risk rating has been assigned and no further action is required.

10.3 Mine Shafts

A mine Entry Risk Assessment was undertaken by RGS in February 2022, the results of which were presented as report number C2113/21/E/3266. The works comprised an investigation to determine the risk posed to the future development from the mine entry, as well as to determine the nature of the soils beneath the site. The report drew the following conclusions:

- From the investigation carried out, no evidence of mine entries or ground workings have been proven within the area investigated.
- In addition to the above, the Coal Authority confirm that 'This mine entry was searched for but not found by Lithos Consulting in 2015.

Regardless of the above, there remains some risk of unrecorded mine entries or exploratory shafts.

In order to mitigate this risk, any anomalously deep made ground encountered during future ground investigations or groundworks would be suspect and should be investigated further. All excavations to natural ground completed during the development of the site should be inspected for anomalous made ground that could represent unrecorded mine entries and if encountered should be investigated accordingly under a Coal Authority licence.

10.4 Risks Posed by Migration of Hazardous Ground Gas

In this case, it is evidence that shallow mining is not present beneath the proposed development. It should be appreciated that a regime of gas monitoring is ongoing as part of the Geo-environmental Assessment. Initial findings would suggest that CS1 conditions have been identified. As such, a low risk rating has been assigned and no further action is required; see section 12.1.2 for further details.



11. Discussion of Ground Conditions - Geotechnical

North Park (Shelley) Ltd, propose to develop the land adjacent to Yew Tree Road/Burn Road, Birchencliffe, Huddersfield, HD2 2EQ by the construction of a series of residential dwellings. At the time of writing this report the precise layout and method of construction is not known, thus the discussion below is of a generalised nature.

11.1 Geotechnical Discussion

This investigation indicates that the ground conditions across the site exhibit some variability both laterally and vertically. Particularly, there is some ambiguity as to whether cohesive soils have been reworked by historic fault movement (which could cause a melange of soils close to the fault plane). Indeed, some cohesive soils are recorded to be mottled and comprise gravels of a mix of coal measures lithorelcits (coal, carbonaceous mudstone, sandstone and siltstone) with little obvious structure. Furthermore, it should be appreciated that as the site is in an area of historical mining (pre-1876) and particularly as there are potentially shallow unrecorded workings indicated in the Coal Authority report, there will be a potential risk of unrecorded mine entries of exploratory shafts. In order to mitigate this risk, any anomalously deep made ground encountered during future groundworks would be suspect and should be investigated further.

Due to variability of ground conditions encountered on site, it is recommended that a pragmatic approach be taken to the foundations for the houses, and are considered on a plot by plot basis. It cannot be recommended that footings for a singular plot be placed in reworked soils, or span both cohesive soil and rock due to the potential for differential settlements. It is therefore recommended that careful inspection takes place during the excavation of footings to ensure that foundations are placed wholly within materials of similar competency.

In view of the above, in broad terms, it is considered that the foundation solutions could include the traditional footings in areas where natural clays are present in at least a firm Insitu condition. Alternatively, consideration could also be directed towards placing all plots on a mini piled foundation solution, which could have the advantage of limiting differential settlement across the plots.

11.2 Shallow Foundations

In areas of the site where the upper weathered fraction of the Coal Measures will be exposed, which generally consists of firm to stiff clay, it is considered that this material will provide a suitable bearing stratum, provided that the foundations are placed within soil generally described as being present in a firm insitu condition. It is considered that strip or spread foundations constructed within this material at a minimum depth of say 1.2m (or, locally depended in areas of the site in which reworked soils are expected) could be designed assuming an allowable increase in load given in the following table.

**Table 10: Allowable Increase in Stress**

Foundation type		Strip Footings			Spread Footings		
Foundation Breadth	B (m)	0.6	0.9	1.2	1.0	2.0	3.0
Foundation Depth	D (m)		1.2			1.2	
Allowable Increase in Stress	(kN/m ²)	90	85	85	100	95	90

The allowable increase in stress given above assumes a factor of safety of 3 against general shear failure, with cohesion of 50kN/m² at the foundation depths. Settlements at the above loading intensities should remain within tolerable limits for the type of structure proposed provided that the underlying soils are carefully inspected immediately final trimming has taken place.

Given the volume change potential of the soils, it is not recommended that ground bearing ground floor slabs be employed. In this instance it would be necessary to suspend floors between foundation positions, such that the floor loads are transmitted via the foundations to competent soils at depth.

Should any soft or weak material be encountered they should be locally removed and replaced with lean-mix concrete or compacted granular soil. In addition, if the excavations are required to stand open for any period of time then a blinding layer of lean-mix concrete should be placed in the excavation bases. This expedient will reduce softening or loosening of the sub-grade due to the ingress of surface water.

Should seepages of groundwater be encountered it is considered that they could be dealt with using a simple form of de-watering. Such a system could include the excavation of sumps from which the water could be pumped.

The stability of the excavation faces cannot be guaranteed thus temporary support to the excavation faces may become necessary unless the foundations are constructed using trench-fill techniques. In this method the foundation trenches should be excavated, inspected and backfilled with concrete as a continuous operation. Under no circumstances should operatives be allowed to enter unsupported excavations.

11.3 Mini Piles

Given the geology of the site, there is some ambiguity as to whether the ground conditions within the vicinity of the fault zone represent the residual soils of the Pennine Lower Coal Measures Formation, or soils that could represent 'fault gauge' (naturally reworked soils) associated with the fault may be present locally. Whilst the soils within this zone are typically 'firm', it should be appreciated that disturbed soils may not perform as anticipated should traditional footings be placed within them. As such, it is considered that it could be pragmatic to utilise a mini pile solution for plots within ~10m of the fault zone, in order to avoid the potential for differential settlement to occur. It is considered that precast concrete driven piles are likely to represent the most economical solution. In view of the relatively weak near surface soils it may be necessary to construct a working platform for the piling rig and any other plant required during the works.



11.4 Volume Change

It should be appreciated that in this instance, the cohesive soils beneath the site have been found to possess volume change potential under the guidance of the NHBC standards. Therefore, it will be necessary to ensure that foundations placed within this cohesive soil, which was found to have a medium volume change potential, are designed in accordance with Chapter 4.2 of the NHBC standards⁶. The methodology provided in the guidance will require the identification of any trees, still present at or recently removed from, the site and the distance from the proposed foundations. This may result in shallow foundation depths greater than those given above and the requirement for heave protection to be employed against foundations. Piles should be able to cater to for shrinkage or swelling of cohesive ground should they be installed within the zone of influence of any existing or proposed trees and shrubs. For design purposes, in particular the derivation of heave forces on the piles, the zone of desiccation may be considered as equivalent to the minimum foundation depth recommended for a shallow footing in the NHBC Standards.

11.5 Access Roads, Drive-ways and Hard-standing

It is considered that any roads or hard-standing at the site could be constructed employing traditional pavement design. Once topsoil is stripped from the site, the majority of residual soils will act as a sub-grade. In parts of the site in which residual soils comprise clay, CBR values of 2% would be appropriate. However, it is recommended that proof rolling of the sub-grade be undertaken to establish the suitability of the soils, to expose any soft or weak ground and to ensure the sub-grade is well compacted prior to construction. Any areas of soft or weak ground should be remediated by increasing the sub-base thickness. Alternatively, weak material could be locally removed and replaced with a compacted granular capping layer. If construction were to be undertaken during the winter or after periods of prolonged rainfall, it may be prudent to employ a geotextile and/or a geogrid between the sub-base and sub-grade. In situ CBR testing could be employed following sub-grade preparation to confirm the provisional design values presented above.

11.6 Effect of Sulphates

In view of the nature of the underlying soils it is considered that the design sulphate class be assessed with reference to Table C2⁷, which is provided in BRE Special Digest 1, *Concrete in aggressive ground*: Part C. On the basis of this table and considering the soluble sulphate contents recorded, it can be shown that well compacted buried concrete should be designed in accordance with Class DS-2 requirements. Assuming static groundwater, the table also indicates that the aggressive chemical environment for concrete (ACEC) classification is AC-1s.

In order to evaluate the design chemical (DC) class for the buried concrete at this site reference should be made to Table D1⁸, which can be found in Part D, *Specifying concrete for general cast-in-situ use*, of BRE Special Digest 1. From this table it may be shown that for an intended working life of at least 50 years the concrete design class DC-1 is required.

⁶ NHBC Standards, Chapter 4.2, *Building near trees*

⁷ Table C2, *Aggressive Chemical Environment for Concrete (ACEC) classification for brownfield locations*

⁸ Table D1, *Selection of the DC Class and the number of APMs for concrete elements where the hydraulic gradient due to groundwater is 5 or less: for general in-situ use of concrete.*



11.7 Soakaway Construction

In areas of the site where residual cohesive soils were encountered at depths rational for soakaway construction, practically impermeable drainage characteristics were recorded, such that soakaways cannot be recommended for these areas. As such, an alternative drainage system will need to be designed for the discharge of surface water.

12. Discussion of Ground Conditions - Environmental

12.1 Discussion of Test Results

'Site B' Yew Tree Road, is proposed to be developed by the construction of a new residential estate. Consequently, the site may be classified as residential with plant uptake.

12.1.1 Soil Samples

The results of the chemical testing undertaken on soil samples obtained during this investigation have been compared to the ATRISK soil screening values (SSVs) as compiled by WS Atkins plc. With respect to the results it should be appreciated that the soil organic matter (SOM) content for the samples tested was found to range between 1.6% and 15%. On this basis, it is considered that the screening values associated with 6% SOM should be adopted. These values have been derived in such a way as to adhere to the principles within the revised CLEA model and include the most current release of the SGVs. A list of subscribers is provided within the website⁹ and these include many local authorities.

A comparison of the results of the testing, together with the data given above, can be found within Appendix 8. These results indicate the following:

Table 11: Summary of Contaminated Areas

Location	Depth (m)	Contaminants found to be exceeding SSVs (Residential with plant uptake)
TP06A	0.7	Benzo[a]anthracene, Chrysene
TP07	0.1	Naphthalene, Benzo[a]anthracene, Chrysene, Benzo[b]fluoranthene, Benzo[k]fluoranthene, Benzo[a]pyrene, Indeno(1,2,3-c,d)Pyrene, Dibenz(a,h)Anthracene, Benzo[g,h,i]perylene
TP08	0.3	Benzo[a]anthracene, Chrysene, Benzo[b]fluoranthene, Benzo[k]fluoranthene, Benzo[a]pyrene, Indeno(1,2,3-c,d)Pyrene, Dibenz(a,h)Anthracene, Benzo[g,h,i]perylene
WS07	0.1	Benzo[a]anthracene, Chrysene, Benzo[b]fluoranthene, Benzo[k]fluoranthene, Benzo[a]pyrene, Indeno(1,2,3-c,d)Pyrene, Dibenz(a,h)Anthracene, Benzo[g,h,i]perylene
WS08	0.2	Benzo[a]anthracene, Chrysene, Benzo[b]fluoranthene, Benzo[k]fluoranthene, Benzo[a]pyrene, Indeno(1,2,3-c,d)Pyrene, Dibenz(a,h)Anthracene, Benzo[g,h,i]perylene

Concentrations of chromium^{VI}, free cyanide and total petroleum hydrocarbons (aliphatic C5 to C10; aromatic C5 to C16) were below the detection limits for the tests. Detectable levels of all other

⁹ <http://www.atrisksoil.co.uk/pages/general/subscribers.asp>



contaminants were recorded, but these fell below the associated Atrisk Soil Screening Values. In addition, no asbestos was detected within the soil samples tested.

It should be appreciated that the soil screening values for PAHs and TPHs (where appropriate) represents vapour saturation limits. The inhalation of vapour pathway contributes less than 10% of total exposure, which is unlikely to significantly affect the combined assessment criterion¹⁰. In view of this, the ATRISK soil SSVs notes that the users may wish to consider using a combined assessment criterion if free product is not observed, the values for which are also provided on the summary of contamination analysis. It is therefore considered that the criteria for no free product should be adopted for the PAHs and TPHs at this site. The results of the contaminants found to exceed these screening values are tabulated below:

Table 12: Summary of Contaminated Areas

Location	Depth (m)	Contaminants found to be exceeding SSVs (Residential with plant uptake)
TP06A	0.7	None
TP07	0.1	Naphthalene, Benzo[b]fluoranthene, Dibenz(a,h)Anthracene.
TP08	0.3	None
WS07	0.1	None
WS08	0.2	None

On the basis of the above information, it can be concluded that the site is locally contaminated by PAH's. A Double PAH ratio analysis suggests that the source of contaminated is largely related to combustion and coal derived products. This contamination is also noted to be within the topsoil at the site; near surface residual soils appear to be generally uncontaminated.

12.1.2 Gas Concentrations

With respect to ground gas, the results of the monitoring visits indicated a maximum concentration of 0.1% methane, with concentrations of carbon dioxide ranging between 0.9% and 4.2%, in association with oxygen levels of between 17.30% and 19.2%. It should be appreciated that on uncontaminated sites there is generally about 20% by volume of oxygen, associated with low levels of carbon dioxide. In addition, a maximum flow rate of 0.1 litres per hour was recorded and will be employed in the following calculations.

The principal driving force for initiating the movement of gas in the ground is a change in barometric pressure. The most onerous gas condition on a site is usually observed on days of low or falling barometric pressure, preferably below 1000mb. It has been noted that measurements undertaken solely during high pressure conditions may be of lesser value. At this site the readings undertaken to date were at atmospheric pressures of between 993mb and 1013mb.

In order to establish the gas screening value (GSV) for carbon dioxide or methane, the maximum gas concentration (expressed as a decimal) is multiplied by the borehole flow rate (l/hr). In this case 0.1% (0.001) methane was recorded along with 4.2% (0.042) carbon dioxide, in association with a

¹⁰ Ref: ATRISK soil, SSVs derived using CLEA v1.071 for 6% SOM, Residential with home grown produce land use, 23.06.17



maximum flow rate of 0.1 l/hr. This results in a GSV of 0.0001 l/hr for methane and a GSV of 0.0042 l/hr for carbon dioxide.

In accordance with Table 8.5, Modified Wilson and Card classification of the CIRIA report C665, Assessing risks posed by ground gasses to building, the site may be characterised, with respect to the GSV, as Situation Level 1.

With regard to the number of monitoring visits required reference is made to Tables 5.5a and 5.5b of CIRIA report C665 (2007)¹¹. Accepting that the proposed development is of high sensitivity and that the generation potential is low to very low, these tables suggest that 6 readings could be undertaken over a period of 3 months. However, C665 notes that *not all sites will require gas monitoring for the period and frequency indicated in Tables 5.5a and 5.5b*.

In this case, a total of 5 monitoring visits were undertaken over a 2 month time period and for the purpose of this assessment, it is considered that the site can be provisionally classified as Characteristic Situation Level 1. One further monitoring visit should be undertaken as per the guidance, in order to fully classify the site.

12.2 Site Specific Risk Assessment

12.2.1 Approach

The presence of contamination hazards and the risks associated with them should be assessed in accordance with industry practice and the 'suitable for use' approach. This has been conducted with reference to The Department for Environment, Food and Rural Affairs (DEFRA) and The Environment Agency¹² advice on the assessment of risks arising from the presence of contamination in soils and using the source-pathway-receptor approach.¹³ This method dictates that there must be a risk of contaminant produced at a 'source' in sufficient concentration to cause harm and there must be a 'pathway' for the contaminant to reach an identifiable 'receptor' for the linkage to be proved and a contamination hazard to be considered present. Not all substances are contaminants and not all contaminants are considered to be a risk. Indeed, DEFRA and The Environment Agency state that 'a contaminant is a substance which has the potential to cause harm, while a risk itself is considered to exist if such a substance is present in sufficient concentration to cause harm and a pathway exists for a receptor to be exposed to the substance.'¹⁴

¹¹ Adapted from tables 5.5a and 5.5b of CIRIA C665, 2007, *Assessing risks posed by hazardous ground gas to buildings*, p60.

¹² R&D Publication CLR 8, 'Assessment of Risks to Human Health from Land Contamination: An overview of the Development of Soil Guideline Values and Related Research'.

¹³ The pollution linkage approach was developed by 'Circular 2/2000 Contaminated Land: Implementation of Part II of The Environmental Protection Act 1990' which provides meanings for the terms contained in The Environmental Protection Act 1990 Part IIA, the primary legislation for addressing the issues of contaminated land.

¹⁴ See 'Circular 2/2000 Contaminated Land: Implementation of Part II of The Environmental Protection Act 1990', appendix A.



12.3.2 Conceptual Ground Model and Risk Assessment

In view of the results of the chemical testing undertaken the conceptual site model is presented accordingly as Table 13. The preliminary risk assessment has been evaluated with reference to the following ratings and definitions:

- N/A -** A source-pathway-receptor linkage is not considered to exist and therefore a risk assessment is not required.
- Low -** A pollution linkage is unlikely and/or the likelihood of harm occurring is low and of minor consequence.
- Moderate -** The linkage exists but the likelihood of harm occurring is not considered to be significant although remedial action may be necessary
- High -** The linkage exists and the available data indicates that significant harm may be caused and remedial action could be necessary.



Table 13: Conceptual Site Model and Site-Specific Risk Assessment [Contamination: PAHs]

Conceptual Site Model			Site Specific Risk Assessment	
Pathways	Receptor	Linkage Present?	Risk Rating	Notes
Direct contact/dermal absorption/soil ingestion	Operative	Yes – contamination found to be present at the site and contact with soil likely during works.	High	Some contamination is present in the soils underlying the site. Precautionary measures will be required during the construction phase. Remediation will be required to either remove the contamination or break pathways. However, as the site is anticipated to be secured during the development phase, contamination is not anticipated to affect neighbours.
	End User	Yes – contamination found to be present at the site and site to be developed into residential estate with garden and landscaped areas.	High	
	Neighbours	Yes – contamination found to be present at the site and a populated residential and commercial area surrounds the site.	Low	
Inhalation of Dust/Vapours	Operative	Yes – dust may be derived from contaminated soils. In addition, some PAH contamination found is likely to represent a vapour risk.	High	Some contamination is present underlying the site. Precautionary measures will be required during the construction phase. Remediation will be required to either remove the contamination or break pathways.
	End User	Yes – dust may be derived from contaminated soils.	High	
	Neighbours	Yes – contamination found to be present at the site and residential properties located within 250m radius of the site and possible inhalation of dust during the works.	High	
Ingestion of fruit/vegetables and/or waters	Operative	No – no edible plants or contained water sources in the area of the proposed new works.	N/A	Some contamination is present underlying the site. Precautionary measures will be required during the construction phase. Remediation will be required to either remove the contamination or break pathways. However, the contamination at the site is considered to be of limited mobility, therefore the likelihood of contamination affecting neighbouring gardens is considered low risk.
	End User	Yes – contamination found to be present at the site and site to be developed into a residential estate with garden areas.	Moderate	
	Neighbours	Yes – contamination found to be present at the site and residential area adjoins the site.	Low	
Migration of hazardous gases via permeable strata or shallow mining activity	Operative	Yes – low concentrations of methane and carbon dioxide have been found to be present at the site (assuming <i>Characteristic Situation Level 1</i>). Gas monitoring is ongoing.	Low	Low concentrations of harmful gases (methane and carbon dioxide) were detected at the site. If ground gas conditions remain the same, no special precautionary measures are deemed to be required.
	End User		Low	
	Neighbours		N/A	



Spillage/loss/run off direct to receiving water	Controlled Waters	Yes – known controlled waters within 250m. However, the site is underlain by cohesive soils of low permeability. Contamination by PAH is not anticipated to be significantly mobile.	Low	
Migration via permeable unsaturated strata	Controlled Waters	Yes – a secondary A aquifers is present beneath the site. However, the site is underlain by cohesive soils of low permeability. Contamination by PAH is not anticipated to be significantly mobile.	Low	Old services to be removed or capped.
Run off via drainage/sewers etc	Controlled Waters	Yes – old services may be present on site. However, the site is underlain by cohesive soils of low permeability. Contamination by lead is not anticipated to be significantly mobile.	Low	
Direct contact with contaminated soils	Plants	Yes – significant contamination present at the site which may affect plants.	Moderate	Some contamination is present underlying the site. Remediation will be required to either remove the contamination or break pathways.
Uptake via root system			Moderate	
Direct contact with contaminated soils	Building Materials	Yes – minor PAH contamination revealed at the site may represent a significant risk to building materials or plastic water pipes. Moreover, testing indicates that the aggressive chemical environment for concrete classification is AC-1s.	Moderate (plastic services)	Please see section 12.3.3 for information on good building practice.
Direct contact with contaminated groundwater			Low (buried concrete)	
Exposure to Radon	Operative End User	No – Not in a radon affected area.	N/A	Less than 1% of properties are above the action level. No radon protection measures required.



12.3 Indicative Remediation Strategy

In view of the site-specific risk assessment it is considered that remediation will be required at this site. Such a strategy should include the following main elements.

12.3.1 Remediation Objectives

Based on the site-specific risk assessment the object of the remediation is likely to be as follows.

- To protect the site operatives during the construction process from the ingestion of soil or dust, dermal contact with the soil and inhalation of dust and vapours.
- To protect the end user from the ingestion of soil or dust, dermal contact with the soil and inhalation of dust and vapours.
- To protect neighbours from the inhalation and ingestion of dust during the construction process.
- To protect end users and neighbours from the ingestion of contaminated fruit and vegetables.
- To protect plants from direct contact with contamination and prevent uptake via root system.
- To ensure that contamination cannot enter the former services occupying the site which may return to controlled waters.
- To protect plastic services from being penetrated by, or degrading due to the presence of, contamination in the soil or groundwater.

12.3.2 Development Requirements

It is understood that the land at 'Site B' Yew Tree Road & Burn Road, Birchenclyffe, Huddersfield, HD2 2EQ to be developed by the construction of a series of residential houses with front and rear gardens and access roads. In view of the above a site-specific remediation strategy should be undertaken after the proposed development has been finalised. However, for preliminary design and costing the following remediation proposals are offered.

12.3.3 Outline Strategy

In order to fulfil the objectives defined above it is likely that the following remedial strategy could be utilised. It is recommended that a pragmatic approach be undertaken, with observational techniques being employed at each stage of the work.



Ground-works

During the ground-works phase of the development, protection to the site operatives is required. The risk to site operatives is considered under the Health and Safety at Work Act 1974, together with regulations made under the act, which includes the Control of Substances Hazardous to Health (COSHH) regulations. Therefore, the risks to site personnel must be considered under the Construction Design and Management (CDM) regulations at the planning stage and be included in the contractor's Health and Safety Plan and site-specific Method Statements. These documents should include the following main elements.

- Site operatives at all levels should be made aware of the hazards of working with contaminated.
- Personal hygiene facilities, including washing and messing, must be provided and site operatives be encouraged to use them.
- Where work is undertaken in dry weather the site should be dampened down to avoid dust. In addition, dust masks must be provided to all site operatives for use in dry weather.
- In order for contaminated soils to be disposed of to an appropriate landfill, it may be necessary to carry out Waste Acceptance Criteria (WAC) testing in accordance with BS EN 12457.
- Any stockpiles of contaminated soil on site should be sheeted over to prevent excessive amounts of airborne dust and cross contamination of imported fill.
- Where vehicles are transferring soil to the landfill site they should be covered to prevent contamination of the surrounding area by dust.
- Where work is undertaken in wet weather, vehicle and wheel washing facilities are required to ensure that the vehicles leaving the site do not transfer contamination to surrounding areas.

On completion of the ground-works a careful site inspection of the sub-grade would be required. Should visual or olfactory evidence of contamination be revealed then further testing may become necessary.

Construction

During the construction phase of the contract the following items are required to protect the end user from the potential contaminants revealed at this site.

- Beneath buildings, pavements and hard-standings clean inert granular sub-base should be employed.
- Any redundant services revealed at this site should be de-commissioned and piped services sealed. Any existing services that are to be employed in the new development should be carefully inspected to ensure that they are serviceable.
- New plastic services should be constructed in a surround of clean inert material and selected in accordance with the recommendation given in the United Kingdom Water Industry Research (UKWIR) website under Report Ref. No. 10/WM/03/21 - 'Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites'. The statutory water authority for the area in which site is located may have a risk assessment form to complete which allows these recommendations to be met. However, further determinant specification contamination testing may be necessary.
- For buried concrete the results of the sulphate and pH testing indicate that the design sulphate class for the site should be DS-2.



Garden and Landscaped Areas

It is proposed that the development will include garden areas. In view of this and the potential contamination on site, it is considered that landscaped areas will require some remediation. This could include the provision of a clean cover system including a capping layer of say 500mm of inert material, which will put the contaminated ground out of the end users' dig range. At the base of this layer, a granular capillary break of say 100mm of free draining granular soil should be placed in order to prevent mobile contamination rising upward. This expedient should also provide a suitable root barrier to isolate the plants from the underlying contaminated ground.

Gas Protection Measures

Gas monitoring is currently ongoing. The final risk assessment should take into consideration the current site conditions, and should be subject to reassessment after the formulation and/ or completion of any remedial measures, and proposed foundation solution. These documents should be prepared by a suitably experienced and qualified specialist.

12.4 Fill Materials

It should also be appreciated that any fill material, either site-won (which could be classified as virgin quarried materials) or imported, to be employed at the site should be subjected to the following assessment to determine its suitability.

Fill materials should be initially screened, by a suitably qualified engineer to establish that:

- It is a suitable growing media if it is to be employed as such, including compliance with BS3882 (2015)
- It is free from obvious contamination i.e. visual or olfactory evidence
- It has not come from areas where Japanese Knotweed or other invasive or injurious plants are suspected to be growing
- It is not a statutory nuisance, such as being odorous
- It is free from unsuitable material i.e. whole bricks, brick ties, timber or glass.

It should also be appreciated that any fill should be subjected to validation testing to assess its suitability. The following table has been taken from YALPAG¹⁵ documentation and may be used as a guide. Depending on the origin and nature of the material, not all fill will require the sampling frequency and testing indicated, although this should agree with any regulatory bodies (such as the Local Authority).

¹⁵ YALPAG *Technical Guidance for Developers, Landowners and Consultants – Verification Requirements for Cover Systems V4 .1* Appendix 1a, June 2021

**Table 14: Validation Sampling and Testing**

Fill Type	Frequency	Minimum Determinants
Virgin Quarried Material	1 or 2 depending on the type of stone utilised, to confirm the inert nature of the material.	Standard metals/metalloids (should include as a minimum As, Cd, Cr, CrVI, Cu, Hg, Ni, Pb, Se, Zn)
Crushed Hardcore, Stone, Brick	Minimum 1 per 500m ³	Standard metals/metalloids (as above), PAH (16 USEPA speciation), asbestos, total TPH. Any additional analysis dependant on the history of the donor site (e.g. phenol, total cyanide, BTEX, MTBE).
Greenfield/ Manufactured Soils	Minimum 3 Dependent on source and receptor, between 1 per 50m ³ and 1 per 250m ³	Standard metals/metalloids (as above), PAH (16 USEPA speciation), asbestos, pH and soil organic matter (SOM) (or calculated from total organic carbon (TOC)).
Brownfield/ Screened Soils	Minimum 6 Dependent on source and receptor, between 1 per 50m ³ and 1 per 100m ³	Standard metals/ metalloids (as above), PAH (16 USEPA speciation), TPH (CWG banded), asbestos, pH and SOM (or calculated from TOC). Any additional analysis dependant on the history of the donor site (e.g. phenol, total cyanide, BTEX, MTBE)..

The screening values for the above regime should also be agreed with any regulatory bodies; however, the following is recommended in the first instance.

Table 15: Fill Screening Values

Contaminant	Screening Value (Residential with Plant Uptake) (mg/kg)		Reference
	1% SOM	6% SOM	
As	37	37	Atrisk ^{SOIL} SSVs
Cd	22.1	22.1	Atrisk ^{SOIL} SSVs
Cr(VI)	3.62	3.63	Atrisk ^{SOIL} SSVs
Cu	4730	4790	Atrisk ^{SOIL} SSVs
Hg	8.81	15.8	Atrisk ^{SOIL} SSVs
Ni	136	136	Atrisk ^{SOIL} SSVs
Pb	200	200	Atrisk ^{SOIL} SSVs
V	136	138	Atrisk ^{SOIL} SSVs
Zn	20000	20300	Atrisk ^{SOIL} SSVs

Please see summary sheet within Appendix 9 for full screening values including PAHs & TPHs.

The above screening values should be considered with respect to the Soil Organic Matter (SOM) of the subject material i.e. 1% SOM would be typical for granular fill and 6% SOM for topsoil. Testing should comply with UKAS and MCERTS, where applicable, and undertaken by an accredited laboratory.

Where the material has been derived from a commercial company, certificates or other industry quality protocol compliance i.e. WRAP should be obtained. However, it will be necessary to ensure that this documentation specifically related to the material being imported, it is no more than two months old and complies with the screening and frequency requirements given above.



Suitable fill materials should be either placed immediately or sufficiently quarantined to prevent cross-contamination. If it is necessary, the quarantined material should be placed on appropriate sheeting and covered to prevent it becoming mixed with contaminated soils or dust, or penetrated by mobile contaminants.

12.5 Verification Report

In order to demonstrate that the remedial works and provision of clean cover has been sufficiently carried out where applicable, it will be necessary to produce a verification report for submission to any statutory authorities.

It will be necessary for this report to include the following:

- Characterisation of the suitability of the clean material including the derivation of the material, comments from a visual screen, the tests results of chemical screening, delivery tickets where appropriate and the conditions by which the clean material has been stored and handled on site.
- Photographic and logged evidence the clean material has been handled on site and placed in a sufficient thickness. This may be either at the time of placement or after placement by means of hand excavated trialpits. Photographs should include visual site references or reference boards to prove the location and date taken. A measurement reference should be visible in the photographs to substantiate the thickness of material placed. Please note that it may also be necessary to undertake a topographical survey and the requirement for which should be checked with any statutory authorities.

The report detailed above should be produced by a suitably qualified engineer. The number of verification areas for the development should be confirmed with any statutory authorities for the site.



13. Recommendations for Further Work

- This report should be forwarded to the relevant authorities as soon as practicable to ensure they have sufficient time to review and discuss any issues.
- Completion and reporting of recommended additional gas monitoring.
- Produce a validation report to demonstrate that the environmental risks discussed in this report have been mitigated.
- Hold discussions with piling contractors, if necessary.
- Detailed design of the sub-structure.

Clearly Rogers Geotechnical Services Ltd would be happy to offer advice with respect to the above and assist where necessary.



14. References

- British Geological Survey (NERC) (2022), BGS, Keyworth.
 - Geology of Britain Viewer: (http://maps.bgs.ac.uk/geologyviewer_google/googleviewer.html)
 - Lexicon of Named Rock Units:
 - (<http://www.bgs.ac.uk/lexicon/>)
- British Standards Institution (1990) BS1377: *British standard methods of test for soils for civil engineering purposes*, B.S.I., London.
- British Standard Institution (2005 +A1: 2011) BS EN ISO 22476-2: *Geotechnical investigation and testing – Field testing, Part 2: Dynamic Probing*, B.S.I., London.
- British Standard Institution (2005 +A1: 2011) BS EN ISO 22476-3: *Geotechnical investigation and testing – Field testing, Part 3: Standard penetration test*, B.S.I., London.
- British Standards Institution (2015 +A1: 2020) BS 5930: *Code of practice for ground investigations*, B.S.I., London.
- British Standards Institution (2011), BS 10175: *Investigation of potentially contaminated sites – Code of Practice*, British Standards Institute.
- British Standards Institution (2015 +A1:2019) BS8485: *Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings*, B.S.I., London.
- British Standards Institution (2013), BS 8576 *Guidance on Investigations for Ground Gas – Permanent Gases and Volatile Organic Compounds*.
- British Standards Institution (2017) BS EN ISO 14688: *Geotechnical investigation and testing – Identification and classification of soil*, B.S.I., London.
- Building Research Establishment (BRE) Special Digest 1 (2005), Third Edition: *Concrete in aggressive ground*, BRE Press, Garston.
 - Part C: *Assessing the aggressive chemical environment*.
 - Part D: *Specifying concrete for general cast-in-situ use*.
- Department for Environment, Food and Rural Affairs and the Environment Agency (2009) DEFRA Science Report – Final SC050021/SR2, *Human Health toxicological assessment of contaminants in soil*. Environment Agency, Bristol.
- Department for Environment, Food and Rural Affairs and the Environment Agency (2009) DEFRA Science Report – SC050021/SR3, *Updated technical background to the CLEA model*. Environment Agency, Bristol.
- Department for Environment, Food and Rural Affairs (2014) SP1010: *Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination – Policy Companion Document*.
- Wilson S, Oliver S, Mallet H, Hutchings H, Card G, *Assessing risks posed by ground gasses to buildings*, CIRIA Report C665.



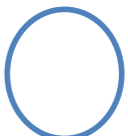


Appendix 1

Site Plan



Google Earth

Notes:
Investigation positions approximated from site operative's notes.

-  Departure Zone
-  Mine Entry Search Excavation
-  Inferred Fault - BGS



Rogers Geotechnical Services Ltd
Offices 1 & 2, Barncliffe Business Park,
Near Bank, Shelley, Huddersfield, HD8 8LU

Telephone: 0843 50 66 87
www.rogersgeotech.co.uk

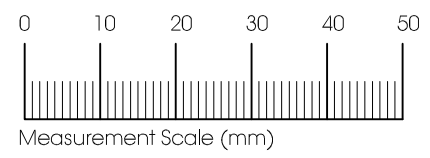
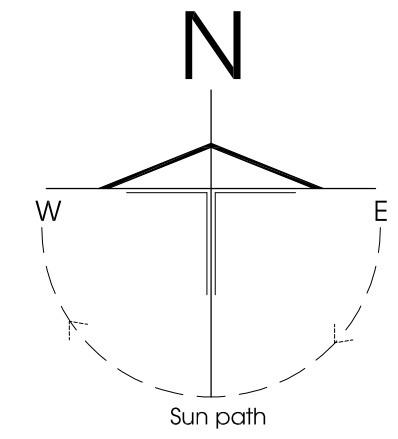
Client:
North Park (Shelley) Ltd

Job Number:
C2113/21/E

Project Details:
SITE B, Yew Tree Rd

Scale: Not to scale - reference only

... delivered using our own drilling rigs / crews / soils lab / engineers



P01	Preliminary Issue	25.10.21	MC	-
Rev	Description	Date	By	R/w

Residential Development
at Yew Tree Road
Birchencliffe
Huddersfield

for NORTH PARK

Farrar Bamforth Associates Ltd.
Architectural Consultants
51 Trinity Street, Huddersfield, HD1 4DN
Tel. (01484) 424008 Fax: (01484) 512305
E-mail: design@farrarbamforth.co.uk
Website: www.farrarbamforth.co.uk

Master Site Layout

Project	Originator	Zone	Level	Type	Role	Number	Revision
21D44	FBA	ZZ	XX	DR	A	9903	P01
Drawn	Date	Suitability	Revision Status	Scale of AS			
MC	Oct 21	S2	Preliminary	1:500			

This document is © Farrar Bamforth Associates Ltd. Drawing measurements shall not be obtained by scaling. Setting out dimensions are to face of structure. Verify all dimensions prior to construction or product manufacture. Immediately report any discrepancies on this document to Farrar Bamforth Associates Ltd. This document shall be read in conjunction with associated models, specifications and related consultants documents.

WORK IN PROGRESS



Appendix 2

Coal Authority Permit



The Coal
Authority

Granted Permit Boundary

Permit Ref: 24130

Permit Boundary:



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The Coal
Authority

Issued by:

The Coal Authority, Property Search Services, 200 Lichfield Lane, Berry Hill, Mansfield, Nottinghamshire, NG18 4RG
Website: www.groundstability.com Phone: 0345 762 6848

**ROGERS GEOTECHNICAL SERVICES
LTD
BARNCLIFFE MILLS
NEAR BANK
SHELLEY
HUDDERSFIELD
KIRKLEES
HD8 8LU**

Our reference: **51002945752001**
Your reference: **C/2113/21/E/3266**
Date of your enquiry: **09 February 2022**
Date we received your enquiry: **09 February 2022**
Date of issue: **09 February 2022**

This report is for the property described in the address below and the attached plan.

Shaft Plan and Data Sheets

YEW TREE ROAD/BURN ROAD, BIRCHENCLIFFE, HUDDERSFIELD, KIRKLEES, HD2 2EQ

I refer to the enquiry dated 09 February 2022, received 09 February 2022, in connection with the above.

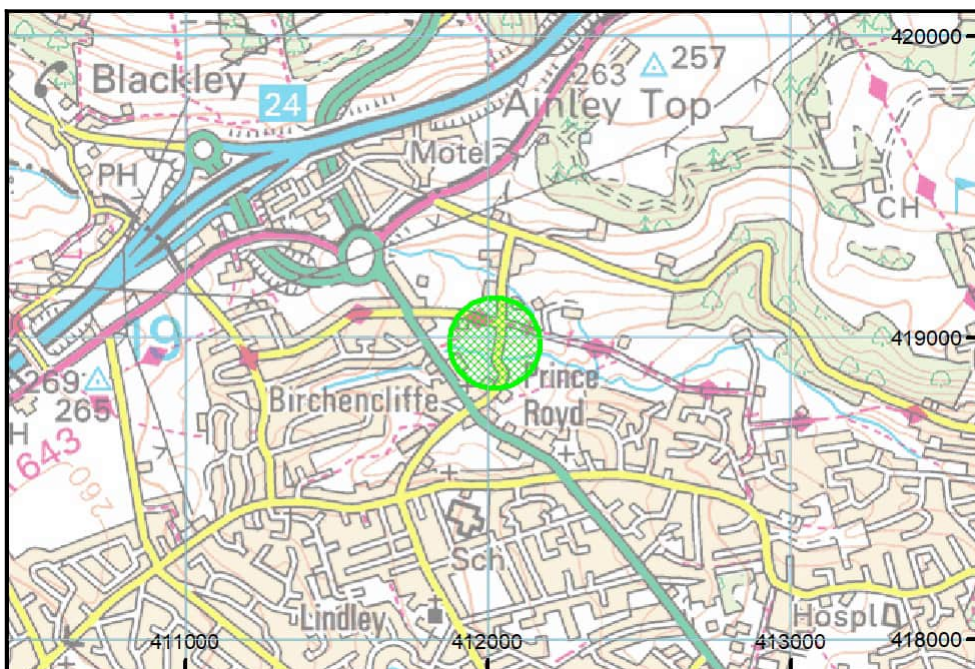
As requested I enclose the mine entry data sheet(s) held for the mine entry/entries referred to.

Mine Entry Data

Shaft/adit:	Shaft
Reference:	412418-002
Source:	Former British Coal Records (R.C. Plan that was held at North Yorkshire Area HQ)
Colliery name:	Unknown
Entry name:	Unknown
Date abandoned:	Unknown
Depth of superficial deposits (m):	Unknown
Depth of shaft (m):	Unknown
Diameter of shaft (m):	Unknown
Probable adit azimuth:	Not Applicable
Treatment details:	This mine entry was searched for but not found by Lithos Consulting in 2015
Conveyance:	Not Applicable
Easting:	412022
Northing:	418983
Other information:	None

Location map

Approximate position of enquiry



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This plan shows the approximate location of the disused mine entry / entries referred to in the attached mining report. For reasons of clarity, mine entry symbols may not be drawn to the same scale as the plan.

Property owners have the benefit of statutory protection (under the Coal Mining Subsidence Act 1991). This contains provision for the making good, to the reasonable satisfaction of the owner, of physical damage from disused coal mine workings including disused coal mine entries. A leaflet setting out the rights and obligations of either the Coal Authority or other responsible persons under the 1991 Act can be obtained by visiting www.groundstability.com.

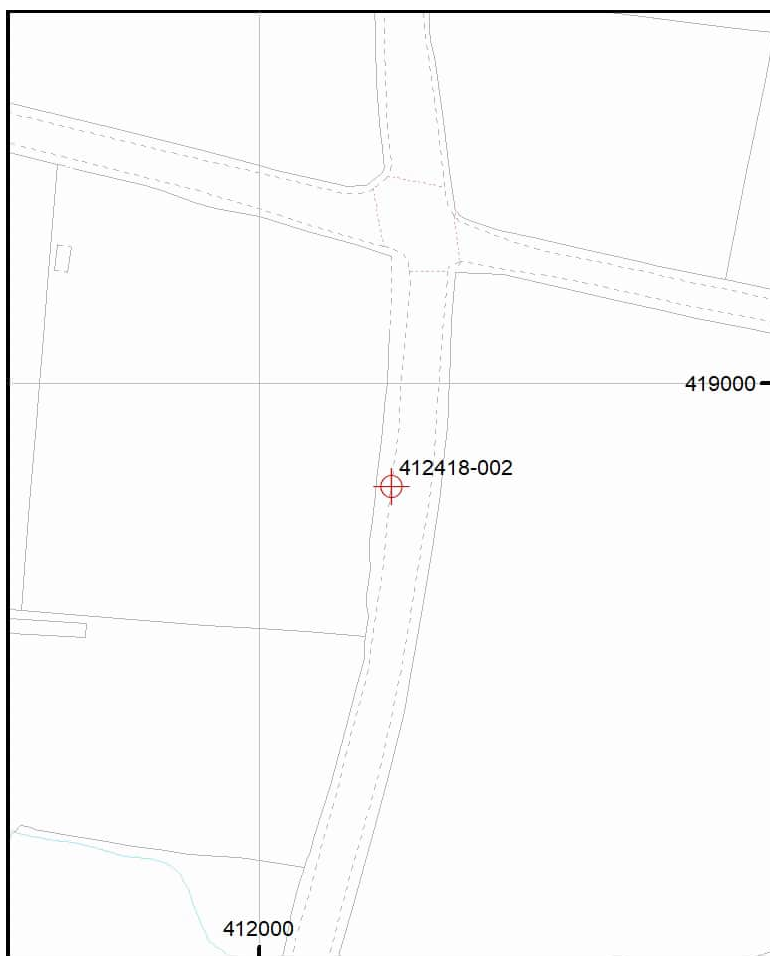
If you wish to discuss the relevance of any of the information contained in this report, you should seek the advice of a qualified mining engineer or surveyor. If you or your advisor wish to examine the source plans from which the information has been taken, these are available to view, free of charge, at our Head Office in Mansfield. To book an appointment please ring 01623 637225. Should you or your advisor wish to carry out a physical investigation that may enter, disturb or interfere with any disused mine entry, prior permission of the owner must be sought. For coal mine entries, the owner will normally be the Coal Authority.

The Coal Authority, regardless of responsibility and in conjunction with other public bodies, provide an emergency call out facility in coalfield areas to assess the public safety implications of mining features (including disused mine entries).

Our emergency telephone number is 01623 646333.

Key

Disused Adit or Mineshaft





Appendix 3

Windowless Sample Borehole Records



Borehole Log

Borehole No.

WS07

Sheet 1 of 1

Project Name: Yew Tree Rd/Burn Rd

Project No.
C2113/21/E/3266

Co-ords:

Hole Type
WLS

Location: Birchencliffe, Huddersfield, , HD2 2EQ

Level:

Scale
1:50

Client: North Park Shelley Ltd

Dates: 12/04/2022

Logged By
SA

Well	Water Strikes	Samples and In Situ Testing					Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Dia. (mm)	TCR (%)	Results					
		0.10 - 0.20	ES				0.40		TOPSOIL. (Dark grey slightly sandy gravelly CLAY. Common plant matter.)		
		1.00	SPT	85	100	N=15 (1,3/3,4,4,4)	0.90		Firm light yellowish brown mottled grey slightly sandy gravelly CLAY. Gravel is angular to sub rounded fine to coarse of sandstone and coal. [Residual Pennine Lower Coal Measures Formation] [Possibly reworked - fault zone 'gauge']	1	
		2.00	SPT	75	100		1.90		Stiff mixed brown and grey slightly sandy gravelly CLAY. Gravel is angular to sub rounded fine to coarse of sandstone and coal. Occasional plant matter. [Residual Stanningly Rock]	2	
		2.20	D	65	100	N=27 (3,3/3,4,5,15)			Soft to firm grey and brown thinly laminated to very thinly bedded sandy slightly gravelly friable CLAY. Gravel is angular to sub rounded fine to coarse of relict sandstone. [Residual Stanningly Rock]		
		3.00	SPT			51 (7,11/13,18,20,)	3.38		End of Borehole at 3.38m	3	

Remarks

1) CAT scan prior to breaking ground - no services identified.





Borehole Log

Borehole No.

WS08

Sheet 1 of 1

Project Name: Yew Tree Rd/Burn Rd

Project No.
C2113/21/E/3266

Co-ords:

Hole Type
WLS

Location: Birchencliffe, Huddersfield, , HD2 2EQ

Level:

Scale
1:50

Client: North Park Shelley Ltd

Dates: 12/04/2022

Logged By
CM

Well	Water Strikes	Samples and In Situ Testing				Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Dia. (mm)	TCR (%)					
		0.20	ES						TOPSOIL (Dark brown organic silty CLAY. Strong organic odour)	
		0.50		85	100	HVP=55	0.35		Firm locally stiff brown locally mottled dark brown silty gravelly CLAY. Gravel is sub angular to rounded medium to coarse of sandstone and rare coal. [Residual Stanningly Rock	1
		1.00	D							
		1.50		75	100		1.50		End of Borehole at 1.50m	2
										3
										4
										5
										6
										7
										8
										9
										10

Remarks

1) CAT scan prior to breaking ground - no services identified.





Borehole Log

Borehole No.

WS10

Sheet 1 of 1

Project Name: Yew Tree Rd/Burn Rd

Project No.
C2113/21/E/3266

Co-ords:

Hole Type
WLS

Location: Birchencliffe, Huddersfield, , HD2 2EQ

Level:

Scale
1:50

Client: North Park Shelley Ltd

Dates: 12/04/2022

Logged By
CM

Well	Water Strikes	Samples and In Situ Testing				Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Dia. (mm)	TCR (%)				
								TOPSOIL (Dark brown organic silty fine SAND).	
		1.00	SPT	85	100	N=13 (2,2/3,3,3,4)		Firm locally stiff dark brown mottled orangish brown brown light grey and dark grey sandy gravelly silty CLAY. Sand is fine to coarse. Gravel is sub rounded to angular fine to medium of mixed lithologies including sandstone siltstone rare coal rare carbonaceous mudstone. Large white sandstone cobble at 1.9m. [Residual Pennine Lower Coal Measures Formation] [Possibly reworked - fault zone 'gauge']	
		2.00	SPT	75	100	14 (3,2/14 for 228mm)			
		2.50	D	65	100			Stiff friable bluish grey mottled light brown gravelly silty CLAY. Gravel is angular tabular fine to medium of micaceous siltstone. [Residual Pennine Lower Coal Measures Formation]	
		3.00	SPT			N=14 (2,3/3,3,4,4)			
		4.00	SPT	55	100	N=12 (2,2/2,2,4,4)		Extremely weak thinly laminated brown locally iron stained micaceous SILTSTONE.	
						3.95 4.00		End of Borehole at 4.07m	

Remarks

1) CAT scan prior to breaking ground - no services identified.





Appendix 4

Dynamic Probes



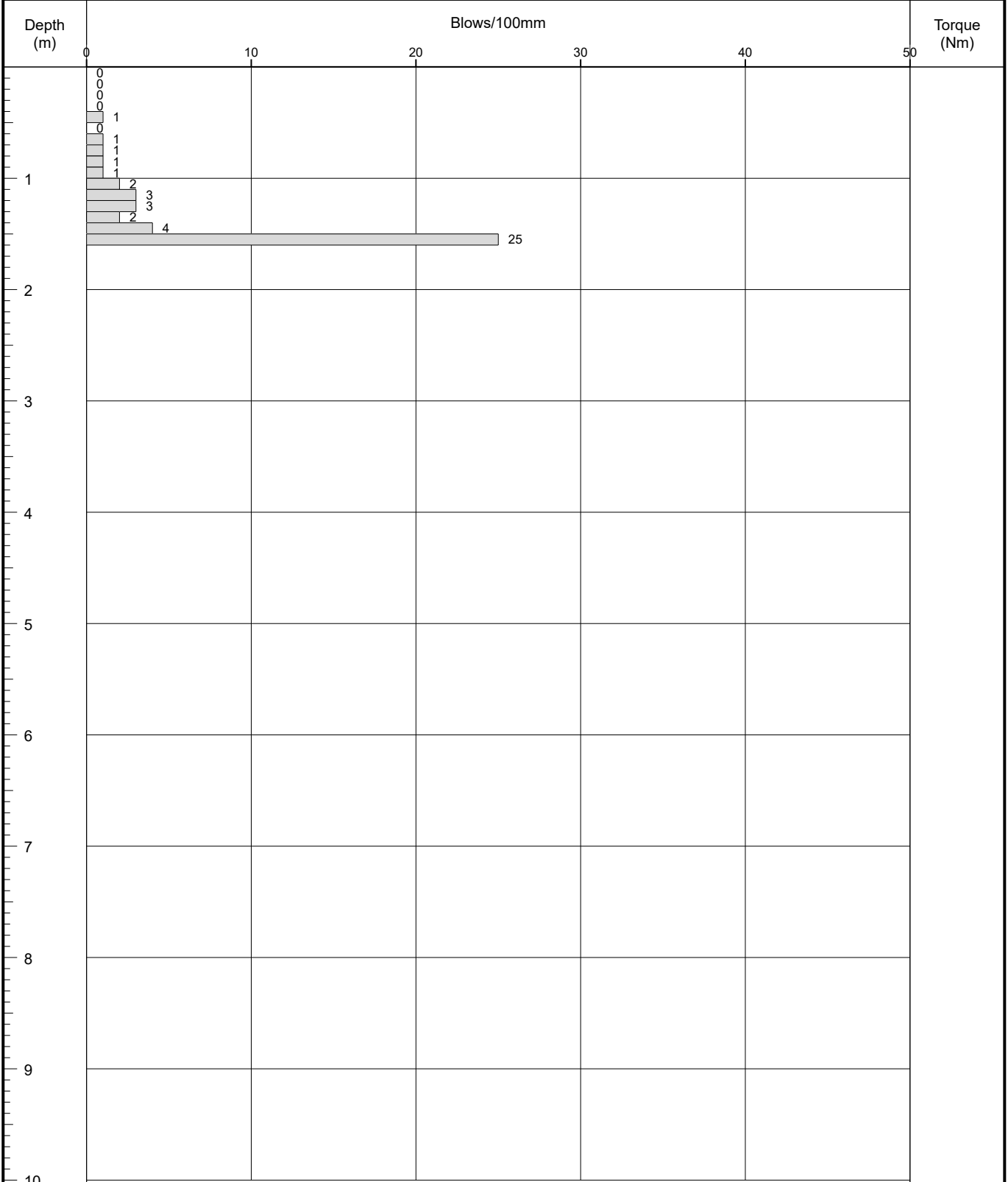
Probe Log

Probe No.

DP08

Sheet 1 of 1

Project Name: Yew Tree Rd/Burn Rd	Project No. C2113/21/E/3266	Co-ords:	Hole Type DCP
Location: Birchencliffe, Huddersfield, , HD2 2EQ		Level:	Scale 1:50
Client: North Park Shelley Ltd		Dates: 08/04/2022	Logged By AB



Remarks:	Fall Height	750mm	Cone Base Diameter	50.5mm
	Hammer Wt	63.5kg	Final Depth	1.6m
	Probe Type	DPSH-B		





Probe Log

Probe No.

DP09

Sheet 1 of 1

Project Name: Yew Tree Rd/Burn Rd

Project No.
C2113/21/E/3266

Co-ords:

Hole Type
DCP

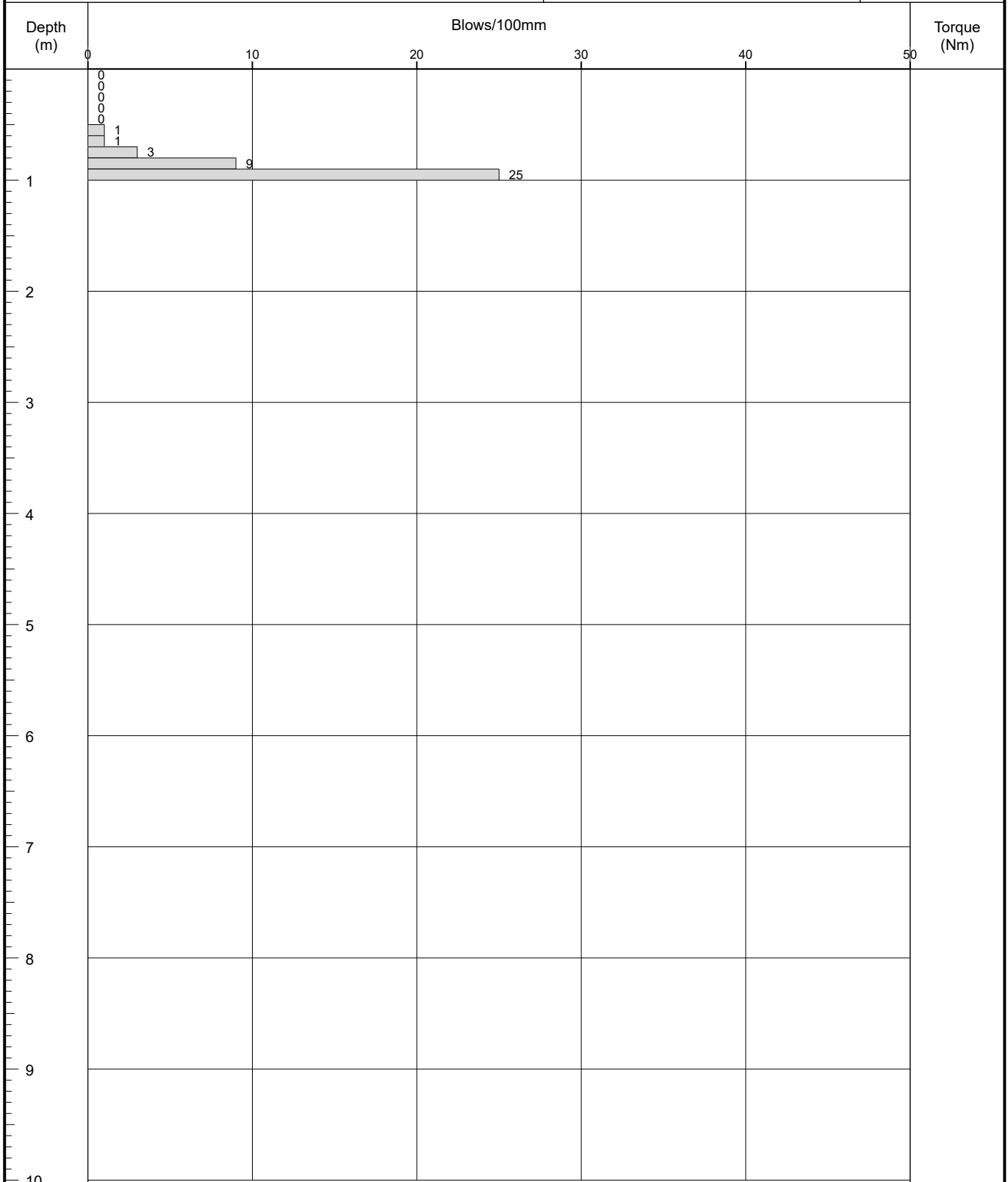
Location: Birchencliffe, Huddersfield, , HD2 2EQ

Level:

Scale
1:50

Client: North Park Shelley Ltd

Dates: 08/04/2022

Logged By
AB

Remarks:

Fall Height 750mm

Cone Base Diameter 50.5mm

Hammer Wt 63.5kg

Final Depth 0.9m

Probe Type DPSH-B





Probe Log

Probe No.

DP11

Sheet 1 of 1

Project Name: Yew Tree Rd/Burn Rd

Project No.
C2113/21/E/3266

Co-ords:

Hole Type

DP

Location: Birchencliffe, Huddersfield, , HD2 2EQ

Level:

Scale

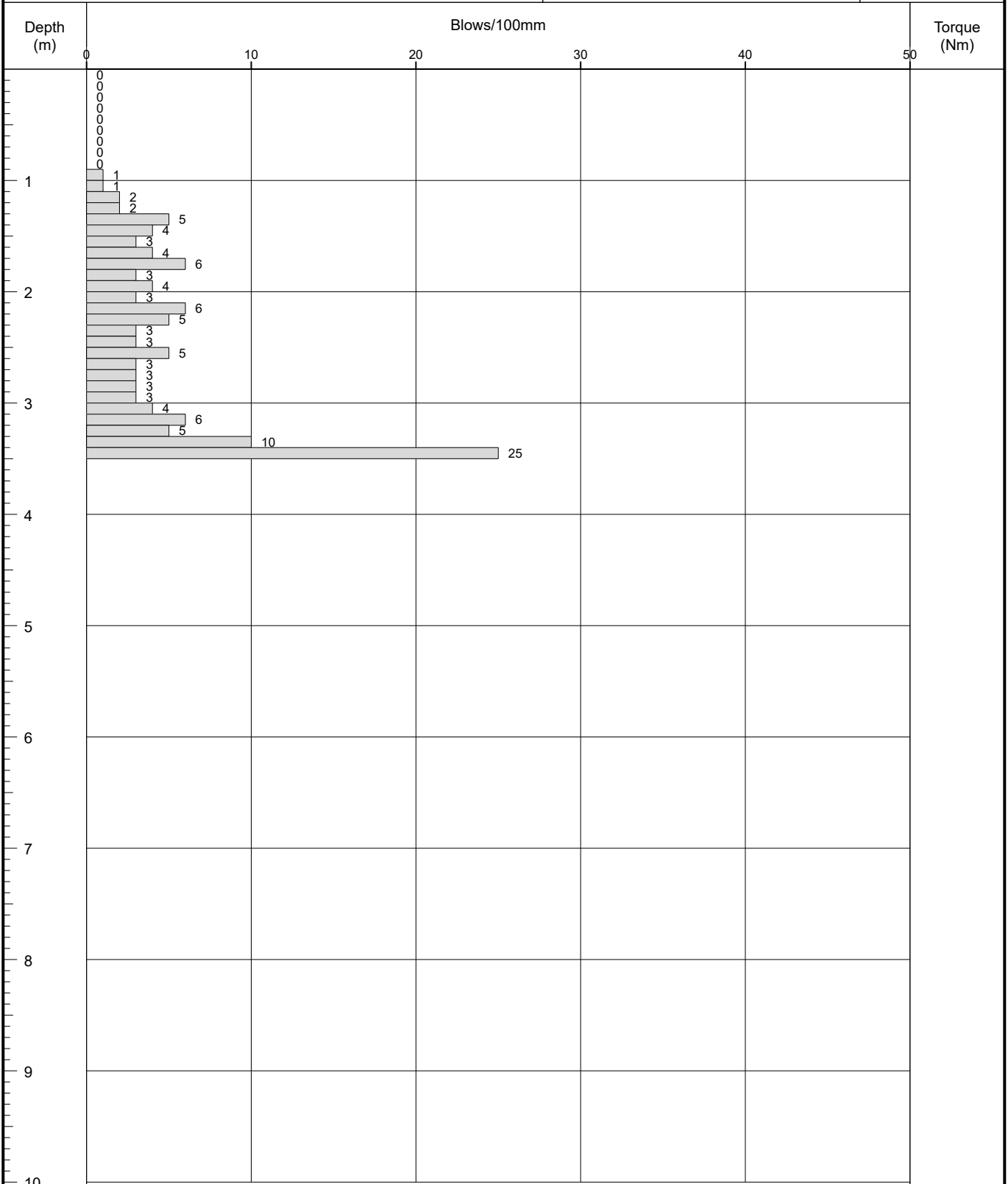
1:50

Client: North Park Shelley Ltd

Dates: 12/04/2022

Logged By

AB



Remarks:

1) CAT scan prior to breaking ground - no services identified.

Fall Height 750mm

Cone Base Diameter 50.5mm

Hammer Wt 63.5kg

Final Depth 3.33m

Probe Type DPSH-B





Appendix 5

Rotary Borehole Records



Borehole Log

Borehole No.

R03

Sheet 1 of 2

Project Name: Yew Tree Rd/Burn Rd

Project No.
C2113/21/E/3266

Co-ords:

Hole Type
RO

Location: Birchencliffe, Huddersfield, , HD2 2EQ

Level:

Scale
1:50

Client: North Park Shelley Ltd

Dates: 10/06/2022

Logged By
ABK

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
							TOPSOIL		
					0.50		Light brown CLAY (Drillers Notes)	1	
					3.00		Light brown SANDSTONE (Drillers Notes) [Stanningly Rock]	2 3	
	▼	6.00			6.00		Light grey/white SANDSTONE. Very hard drilling (Drillers Notes)	4 5 6	
					9.00		Light grey MUDSTONE	7 8	
					9.20		Light brown SANDSTONE	9	
							Continued on Next Sheet	10	

Remarks

- 1) Cat scanned prior to breaking ground - no services identified.
- 2) Casing installed to 3m.
- 3) DAYWORKS: Borehole set-up 1hrs, Fetching water 0.5hrs,
- 4) Borehole backed filled with Gravel/Arisings/Installation and re-instated like-for-like/With flush cover.





Borehole Log

Borehole No.

R03

Sheet 2 of 2

Project Name: Yew Tree Rd/Burn Rd

Project No.
C2113/21/E/3266

Co-ords:

Hole Type
RO

Location: Birchencliffe, Huddersfield, , HD2 2EQ

Level:

Scale
1:50

Client: North Park Shelley Ltd

Dates: 10/06/2022

Logged By
ABK

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					11.00		Very dark grey MUDSTONE	
					15.00		End of Borehole at 15.00m	

Remarks

- 1) Cat scanned prior to breaking ground - no services identified.
- 2) Casing installed to 3m.
- 3) DAYWORKS: Borehole set-up 1hrs, Fetching water 0.5hrs,
- 4) Borehole backed filled with Gravel/Arisings/Installation and re-instated like-for-like/With flush cover.





Borehole Log

Borehole No.

R05

Sheet 1 of 2

Project Name: Yew Tree Rd/Burn Rd

Project No.
C2113/21/E/3266

Co-ords:

Hole Type
RO

Location: Birchencliffe, Huddersfield, , HD2 2EQ

Level:

Scale
1:50

Client: North Park Shelley Ltd

Dates: 07/06/2022

Logged By
ABK

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
							Dark brown CLAY (Drillers Notes)		
					3.00		Dark brown SANDSTONE (Drillers Notes)		
					4.00		Dark grey MUDSTONE (Drillers Notes)		
					5.00		Light grey MUDSTONE (Drillers Notes)		
					8.00		Interbedded light brown and white SANDSTONE (Very hard Drilling) (Drillers Notes)		
					10.00		Continued on Next Sheet		

Remarks

- 1) Cat scanned prior to breaking ground - no services identified.
- 2) Casing installed to 3m.
- 3) DAYWORKS: Borehole set-up 1hrs, fetching water 0.5hrs.
- 4) Borehole backed filled with Gravel.





Borehole Log

Borehole No.

R05

Sheet 2 of 2

Project Name: Yew Tree Rd/Burn Rd

Project No.
C2113/21/E/3266

Co-ords:

Hole Type
RO

Location: Birchencliffe, Huddersfield, , HD2 2EQ

Level:

Scale
1:50

Client: North Park Shelley Ltd

Dates: 07/06/2022

Logged By
ABK

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
							White SANDSTONE (Drillers Notes)		
					14.00		Dark grey MUDSTONE (Drillers Notes)		
					15.00		End of Borehole at 15.00m		

Remarks

- 1) Cat scanned prior to breaking ground - no services identified.
- 2) Casing installed to 3m.
- 3) DAYWORKS: Borehole set-up 1hrs, fetching water 0.5hrs.
- 4) Borehole backed filled with Gravel.





Borehole Log

Borehole No.

R06

Sheet 1 of 3

Project Name: Yew Tree Rd/Burn Rd

Project No.
C2113/21/E/3266

Co-ords:

Hole Type
RO

Location: Birchencliffe, Huddersfield, , HD2 2EQ

Level:

Scale
1:50

Client: North Park Shelley Ltd

Dates: 10/06/2022

Logged By
ABK

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
							MADE GROUND (Drillers notes)		
					0.50		Dark brown CLAY (Drillers Notes)	1	
					2.50		Light brown SANDSTONE (Drillers Notes)	2	
								3	
								4	
								5	
	▼	6.00						6	
								7	
								8	
					8.50		Dark grey MUDSTONE (Drillers notes)	9	
								10	
								Continued on Next Sheet	

Remarks

- 1) Cat scanned prior to breaking ground - no services identified.
- 2) Casing installed to 3m.
- 3) DAYWORKS: Borehole set-up 1hrs, fetching water 0.5hrs.
- 4) Borehole backed filled with Gravel.





Borehole Log

Borehole No.

R06

Sheet 2 of 3

Project Name: Yew Tree Rd/Burn Rd

Project No.
C2113/21/E/3266

Co-ords:

Hole Type
RO

Location: Birchencliffe, Huddersfield, , HD2 2EQ

Level:

Scale
1:50

Client: North Park Shelley Ltd

Dates: 10/06/2022

Logged By
ABK

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
									11
									12
									13
									14
									15
									16
									17
									18
									19
									20

Continued on Next Sheet

Remarks

- 1) Cat scanned prior to breaking ground - no services identified.
- 2) Casing installed to 3m.
- 3) DAYWORKS: Borehole set-up 1hrs, fetching water 0.5hrs.
- 4) Borehole backed filled with Gravel.





Borehole Log

Borehole No.

R06

Sheet 3 of 3

Project Name: Yew Tree Rd/Burn Rd

Project No.
C2113/21/E/3266

Co-ords:

Hole Type
RO

Location: Birchencliffe, Huddersfield, , HD2 2EQ

Level:

Scale
1:50

Client: North Park Shelley Ltd

Dates: 10/06/2022

Logged By
ABK

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
									21
									22
									23
									24
									25
									26
									27
									28
									29
					30.00			End of Borehole at 30.00m	30

Remarks

- 1) Cat scanned prior to breaking ground - no services identified.
- 2) Casing installed to 3m.
- 3) DAYWORKS: Borehole set-up 1hrs, fetching water 0.5hrs.
- 4) Borehole backed filled with Gravel.





Borehole Log

Borehole No.

R09

Sheet 1 of 2

Project Name: Yew Tree Rd/Burn Rd

Project No.
C2113/21/E/3266

Co-ords:

Hole Type
RO

Location: Birchencliffe, Huddersfield, , HD2 2EQ

Level:

Scale
1:50

Client: North Park Shelley Ltd

Dates: 14/06/2022

Logged By
ABK

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
							Brown CLAY (Drillers notes)		
					3.00		Dark brown SANDSTONE (Drillers notes)		
					4.00		Light grey MUDSTONE (Drillers notes)		
					5.00		Possible fracture within MUDSTONE (rods dropped, momentarily lost flush) (Drillers notes)		
					6.00		Light grey MUDSTONE		
							Continued on Next Sheet		

Remarks

- 1) Cat scanned prior to breaking ground - no services identified.
- 2) Casing installed to 3m.
- 3) DAYWORKS: Borehole set-up 1hrs, fetching water 0.5hrs.
- 4) Borehole backed filled with Gravel.





Borehole Log

Borehole No.

R09

Sheet 2 of 2

Project Name: Yew Tree Rd/Burn Rd

Project No.
C2113/21/E/3266

Co-ords:

Hole Type
RO

Location: Birchencliffe, Huddersfield, , HD2 2EQ

Level:

Scale
1:50

Client: North Park Shelley Ltd

Dates: 14/06/2022

Logged By
ABK

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					15.00			End of Borehole at 15.00m	11 12 13 14 15 16 17 18 19 20

Remarks

- 1) Cat scanned prior to breaking ground - no services identified.
- 2) Casing installed to 3m.
- 3) DAYWORKS: Borehole set-up 1hrs, fetching water 0.5hrs.
- 4) Borehole backed filled with Gravel.





Borehole Log

Borehole No.

RO10

Sheet 1 of 3

Project Name: Yew Tree Rd/Burn Rd

Project No.
C2113/21/E/3266

Co-ords:

Hole Type
RO

Location: Birchencliffe, Huddersfield, , HD2 2EQ

Level:

Scale
1:50

Client: North Park Shelley Ltd

Dates: 13/06/2022

Logged By
ABK

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
							MADE GROUND (Brown CLAY) (Drillers notes)	1	
					3.00		Dark brown SANDSTONE (Drillers notes)	3	
					4.50		Light grey MUDSTONE (Drillers notes)	5	
					8.00		Dark grey MUDSTONE (Drillers notes)	8	
							Continued on Next Sheet	10	

Remarks

- 1) Cat scanned prior to breaking ground - no services identified.
- 2) Casing installed to 3m.
- 3) DAYWORKS: Borehole set-up 1hrs, fetching water 0.5hrs.
- 4) Borehole backed filled with Gravel.





Borehole Log

Borehole No.

RO10

Sheet 2 of 3

Project Name: Yew Tree Rd/Burn Rd

Project No.
C2113/21/E/3266

Co-ords:

Hole Type
RO

Location: Birchencliffe, Huddersfield, , HD2 2EQ

Level:

Scale
1:50

Client: North Park Shelley Ltd

Dates: 13/06/2022

Logged By
ABK

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
									11
									12
									13
									14
									15
									16
									17
									18
									19
									20

Continued on Next Sheet

Remarks

- 1) Cat scanned prior to breaking ground - no services identified.
- 2) Casing installed to 3m.
- 3) DAYWORKS: Borehole set-up 1hrs, fetching water 0.5hrs.
- 4) Borehole backed filled with Gravel.





Borehole Log

Borehole No.

RO10

Sheet 3 of 3

Project Name: Yew Tree Rd/Burn Rd

Project No.
C2113/21/E/3266

Co-ords:

Hole Type
RO

Location: Birchencliffe, Huddersfield, , HD2 2EQ

Level:

Scale
1:50

Client: North Park Shelley Ltd

Dates: 13/06/2022

Logged By
ABK

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
								21
								22
								23
								24
								25
								26
								27
								28
								29
					30.00		End of Borehole at 30.00m	30

Remarks

- 1) Cat scanned prior to breaking ground - no services identified.
- 2) Casing installed to 3m.
- 3) DAYWORKS: Borehole set-up 1hrs, fetching water 0.5hrs.
- 4) Borehole backed filled with Gravel.





Appendix 6

Trial Pit Records



Trial Pit Log

Trialpit No

TP05

Sheet 1 of 1

Project Name: Yew Tree Rd/Burn Rd

Project No.
C2113/21/E/3266Co-ords: -
Level:Date
08/06/2022

Location: Birchencliffe, Huddersfield, , HD2 2EQ

Dimensions (m): 1.2

Scale
1:50

Client: North Park Shelley Ltd

Depth
1.20Logged
RAP

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.30			TOPSOIL (Soft to firm dark brown organic slightly gravelly silty CLAY. Gravel is sub-angular fine to coarse of brick mortar and pottery. Loose plastic sheeting also present).
				1.20			Firm brownish grey mottled brown slightly gravelly silty CLAY. Gravel is sub-angular fine to coarse of sandstone. Low cobble content of sub-angular and tabular sandstone. [Residual Stanningly Rock] End of pit at 1.20 m



Remarks:

Stability:





Trial Pit Log

Trialpit No
TP06A
Sheet 1 of 1

Project Name: Yew Tree Rd/Burn Rd

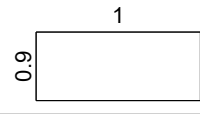
Project No.
C2113/21/E/3266

Co-ords: -
Level:

Date
08/06/2022

Location: Birchencliffe, Huddersfield, , HD2 2EQ

Dimensions (m):
Depth 0.60



Scale
1:50
Logged
RAP

Client: North Park Shelley Ltd

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.15			MADE GROUND (Black-top material. Distinct tar odour).
				0.40			MADE GROUND (Bricks).
				0.60			Firm brownish grey mottled brown slightly gravelly silty CLAY. Gravel is sub-angular fine to coarse of sandstone. [Residual Stanningly Rock]
							End of pit at 0.60 m



Remarks: See associated photos within report appendices.

Stability:





Appendix 7

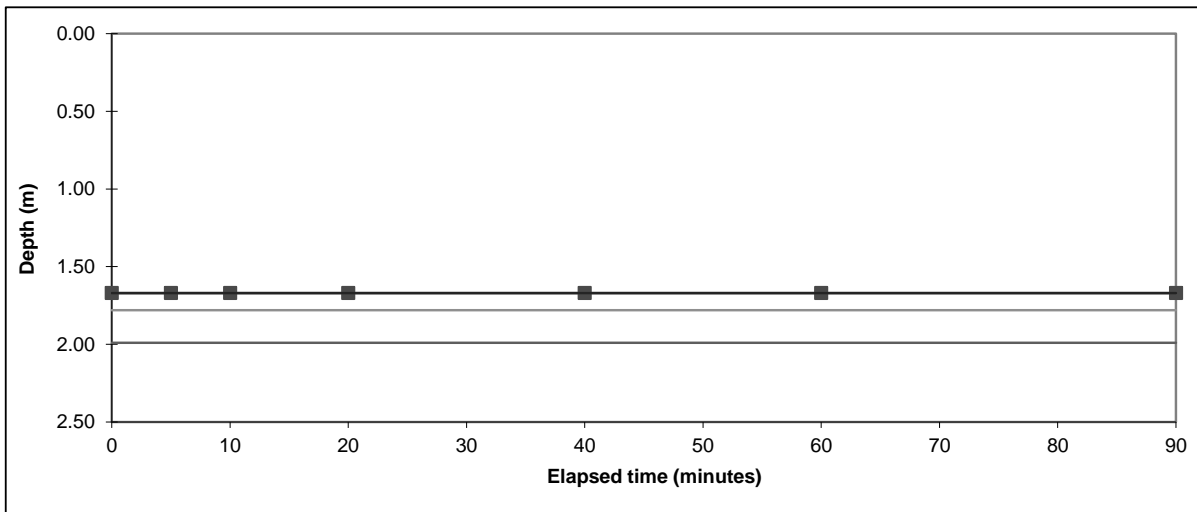
Soakaway Test Results

Rogers Geotechnical Services Ltd

Soakaway Test

Trial Pit No:	TPSA03	Test No:	1	Date:	07/06/2022
Length (m):	1.800	Datum Height:		0.00 m agl	
Width (m):	1.50	Granular infill:	None		
Depth (m):	2.10	Porosity of infill:	1	(assumed)	

Elapsed time (minutes)	Water Depth (m below datum)	Elapsed time (minutes)	Water Depth (m below datum)
0	1.670		
5	1.670		
10	1.670		
20	1.670		
40	1.670		
60	1.670		
90	1.670		



Start water depth for analysis (mbgl):	1.67	Elapsed time (mins):	#N/A
75% effective depth (mbgl):	1.78	Elapsed time (mins):	#N/A
50% effective depth (mbgl):	1.89		
25% effective depth (mbgl):	1.99	Elapsed time (mins):	#N/A
Base of soakage zone (mbgl):	2.10		
Volume outflow between 75% and 25% effective depth (m ³):			
Mean surface area of outflow (m ²):			4.09
(side area at 50% effective depth + base area)			
Time for outflow between 75% and 25% effective depth (mins):			

Soil infiltration rate (m/s):	Test incomplete as 25% effective depth not achieved. Unable to reliably determine soil infiltration rate.
--------------------------------------	--

Remarks	Results processed following BRE 365 (2007).
----------------	---

Client:	Weetwood Services Ltd	Job No:	
Site:	Yew Tree Road / Burn Road, Birchencliffe		C2113/21/E/3266



Appendix 8

Laboratory Testing

**Environmental
Geotechnical
Specialists**



LABORATORY REPORT

GEOTECHNICAL
ENVIRONMENTAL

job number	client ref
site address	client address
consultant	
date scheduled	date issued
issued by	job title
checked by	

Rogers Geotechnical Services Ltd Telephone 01484 607 977
Email enquiries@rogersgeotech.co.uk www.rogersgeotech.co.uk
 Unit 4, Barncliffe Business Park, Near Bank, Shelley, Huddersfield, West Yorkshire HD8 8LU.





8948

Environmental
Geotechnical
Specialists



Schedule of UKAS Accredited Laboratory Tests

1. CLASSIFICATION OF SOIL	BS 1377-2:1990	BS EN ISO 17892	Accredited (A)	Unaccredited (U)
1.1 Moisture / Water content determination				
i. Oven drying	Pt 2 : 3.2	Pt 1 : 2014	A	
ii. Saturation m/c of chalk	Pt 2 : 3.3			U
1.2 Index Properties				
i. Liquid limit – cone penetrometer	Pt 2 : 4.3	Pt 12 : 2018 : 5.3 / 5.5	A	
ii. Plastic limit	Pt 2 : 5.3		A	
iii. Shrinkage limit	Pt 2 : 6.3			U
iv. Linear shrinkage	Pt 2 : 6.5		A	
1.3 Particle Density				
i. Gas jar	Pt 2 : 8.2			U
ii. Large pycnometer	Pt 2 : 8.3			U
iii. Small pycnometer	Pt 2 : 8.4	Pt 3 : 2015 : 5.1		U
1.4 Density Tests				
i. Linear measurement	Pt 2 : 7.2	Pt 2 : 2014 : 5.1	A	
ii. Immersion in water	Pt 2 : 7.3	Pt 2 : 2014 : 5.2		U
iii. Fluid / Water displacement	Pt 2 : 7.4	Pt 2 : 2014 : 5.3		U
iv. Sand replacement	Pt 9 : 2.1, 2.2			U
v. Core cutter	Pt 9 : 2.4			U
1.5 Particle Size Distribution				
i. Dry Sieve	Pt 2 : 9.2	Pt 4 : 2016 : 5.2	A	
ii. Wet Sieve	Pt 2 : 9.3	Pt 4 : 2016 : 5.2	A	
iii. Sedimentation by pipette	Pt 2 : 9.4	Pt 4 : 2016 : 5.3 / 5.4	A	
iv. Sedimentation by hydrometer	Pt 2 : 9.5			U
2. CHEMICAL TESTS				
ii. Mass loss on ignition	Pt 3 : 4			U
3. COMPACTION RELATED TESTS				
3.1 Dry density/moisture relationship				
i. 2.5kg rammer – 1 litre mould	Pt 4 : 3			U
- CBR mould	Pt 4 : 3			U
ii. 4.5kg rammer – 1 litre mould	Pt 4 : 3			U
- CBR mould	Pt 4 : 3			U
3.2 Moisture Condition Value				
i. Single point test	Pt 4 : 5.4			U
ii. MCV/moisture content relationship	Pt 4 : 5.5			U
3.3 California Bearing Ratio				
i. Undisturbed sample	Pt 5 : 7			U
ii. Recompacted sample	Pt 5 : 7			U
iii. Soaked, inc measurement of swell	Pt 5 : 7			U
4. COMPRESSIBILITY OF SOIL				
i. One dimensional consolidation	Pt 5 : 3			U
ii. Swelling pressure test	Pt 5 : 3			U
5. SHEAR STRENGTH OF SOIL				
i. Hand shear vane	Makers instructions			U
ii. Shear box (100mm square sample)	BS 1377 : Pt 7 : 4			U
iii. Triaxial – quick undrained	BS 1377 : Pt 7 : 8, 9			U
6. PERMEABILITY				
i. Falling head	K. H. Head Vol 2			U
ii. Constant head	BS 1377 : Pt 6 : 6			U
iii Triaxial cell	BS 1377 : Pt 6 : 6			U
7. ROCK TESTS				
7.1 Classification Tests				
i. Natural moisture content	-			U
ii. Saturated moisture content	-			U
iii. Natural density	-			U
iv. Porosity	-			U
7.2 Strength Tests				
i. Point load index	ISRM '85			U
ii. Uniaxial compression test	ISRM '81			U

GEOTECHNICAL
ENVIRONMENTAL



Rogers Geotechnical Services Ltd
Office 1 & 2 Barncliffe Business Park,
Near Bank, Shelley, Huddersfield, HD8 8LU

Telephone 0843 50 666 87
Fax 0843 51 599 30
Company No: 5130864



GEOTECHNICAL LAB RESULTS

GEOTECHNICAL
ENVIRONMENTAL



Disclaimer

The results reported herein relate only to the material supplied to the laboratory.

GEOTECHNICAL
ENVIRONMENTAL



Rogers Geotechnical Services Ltd
Office 1 & 2 Barncliffe Business Park,
Near Bank, Shelley, Huddersfield, HD8 8LU

Telephone 01484 607977
Company No: 5130864



Rogers Geotechnical Services Ltd.
 Offices 1&2,
 Barncliffe Business Park,
 Near Bank, Shelley,
 Huddersfield,
 HD8 8LU

Classification of Index Properties

C2113/21/E/3266

Project Name: Yew Tree Rd/Burn Rd

BS EN ISO: 17892: Parts 1, 12

Fig. 2
 Sheet. 1

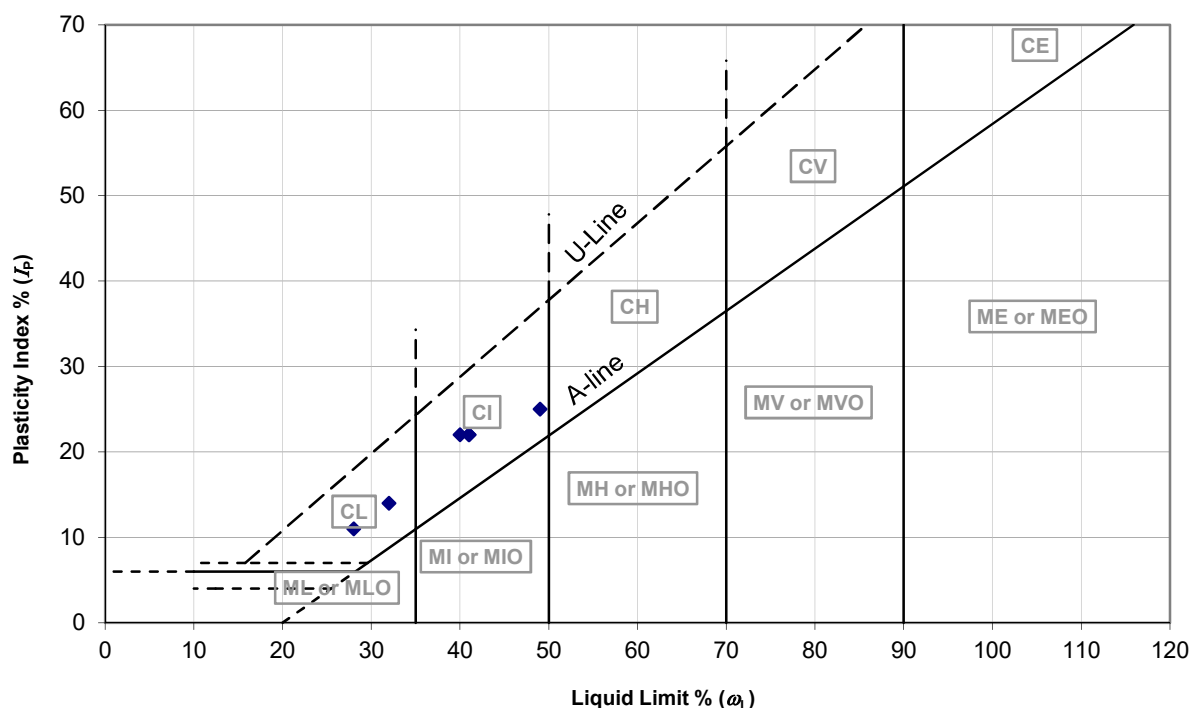
Location:

Input By: Harry

Client: North Park Shelley Ltd

Check By: Harry

Location	Depth (m)	Moisture Content (w) (%)	Liquid Limit (wL) (%)	Plastic Limit (wP) (%)	Plasticity Index (IP) (%)	Retained by 0.425mm (%)	Modified (w) (w') (%)	Modified (IP) (IP') (%)	Liquidity/Consistency		Casagrande Class	N.H.B.C Class (%)
									(IL) (%)	(IC) (%)		
WS01	1.20	16	41	19	22	2	16	22	-0.1	1.1	C I	MEDIUM
WS03	1.20	19.8	41	19	22	2	20	22	0.0	1.0	C I	MEDIUM
WS04	1.00	12.7	40	18	22	0	13	22	-0.2	1.2	C I	MEDIUM
WS05	0.50	19	49	24	25	1	19	25	-0.2	1.2	C I	MEDIUM
WS07	2.20	26.5	32	18	14	0	27	14	0.6	0.4	C L	LOW
WS10	2.50	10.8	28	17	11	32	16	7	-0.6	1.6	C L	*





ENVIRONMENTAL LAB RESULTS

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GEOTECHNICAL
ENVIRONMENTAL



Rogers Geotechnical Services Ltd
Office 1 & 2 Barncliffe Business Park,
Near Bank, Shelley, Huddersfield, HD8 8LU

Telephone 01484 607977
Company No: 5130864



Final Report

Report No.: 22-16031-1

Initial Date of Issue: 06-May-2022

Client: Rogers Geotechnical Services Ltd

Client Address:
Offices 1&2, Barncliffe Business Park
Near Bank
Shelley
Huddersfield
West Yorkshire
HD8 8LU

Contact(s): Harry Letch

Project: Yew Tree

Quotation No.: **Date Received:** 29-Apr-2022

Order No.: C2113/21/E/3266 **Date Instructed:** 29-Apr-2022

No. of Samples: 9

Turnaround (Wkdays): 5 **Results Due:** 06-May-2022

Date Approved: 06-May-2022

Approved By:

Details: Stuart Henderson, Technical Manager

Results - Soil

Project: Yew Tree

Client: Rogers Geotechnical Services Ltd	Chemtest Job No.:				22-16031	22-16031	22-16031	22-16031	22-16031	22-16031	22-16031	22-16031
Quotation No.:	Chemtest Sample ID.:				1420350	1420351	1420352	1420353	1420354	1420355	1420356	1420357
	Sample Location:				WS01	WS02	WS03	WS07	WS06	WS08	WS08	WS01
	Sample Type:				SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
	Top Depth (m):				0.2	2.5	0.2	0.1	0.5	0.2	1.0	0.6
	Bottom Depth (m):				0.4		0.4	0.2	0.6			
	Date Sampled:				26-Apr-2022	26-Apr-2022	26-Apr-2022	26-Apr-2022	26-Apr-2022	26-Apr-2022	26-Apr-2022	26-Apr-2022
	Asbestos Lab:				DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM		
Determinand	Accred.	SOP	Units	LOD								
Cadmium	M	2455	mg/kg	0.10	0.14	0.18	< 0.10	0.39	0.13	0.26		
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50		
Copper	M	2455	mg/kg	0.50	20	25	16	45	31	29		
Mercury	M	2455	mg/kg	0.05	0.10	0.08	0.05	0.14	< 0.05	0.14		
Nickel	M	2455	mg/kg	0.50	20	32	19	15	39	13		
Lead	M	2455	mg/kg	0.50	27	43	24	180	26	82		
Zinc	M	2455	mg/kg	0.50	55	120	55	180	86	120		
Vanadium	U	2455	mg/kg	0.5	18	24	31	24	35	28		
Arsenic	M	2455	mg/kg	0.5	3.7	4.6	4.9	12	6.0	17		
Selenium	M	2455	mg/kg	0.25	1.6	1.4	1.2	0.90	2.1	0.86		
Cyanide (Free)	M	2300	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50		
Total Phenols	M	2920	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10		
Naphthalene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	1.0	< 0.10	0.19		
Acenaphthylene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	0.56	< 0.10	0.15		
Acenaphthene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	1.3	< 0.10	0.20		
Fluorene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	1.1	< 0.10	0.28		
Phenanthrene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	11	< 0.10	1.3		
Anthracene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	2.8	< 0.10	0.24		
Fluoranthene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	22	< 0.10	3.1		
Pyrene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	22	< 0.10	3.3		
Benzo[a]anthracene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	10	< 0.10	2.0		
Chrysene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	10	< 0.10	3.0		
Benzo[b]fluoranthene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	9.2	< 0.10	2.5		
Benzo[k]fluoranthene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	6.1	< 0.10	1.9		
Benzo[a]pyrene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	12	< 0.10	2.0		
Indeno(1,2,3-c,d)Pyrene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	7.2	< 0.10	1.1		
Dibenz(a,h)Anthracene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	2.2	< 0.10	0.59		
Benzo[g,h,i]perylene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	7.1	< 0.10	1.2		
Total Of 16 PAH's	M	2700	mg/kg	2.0	< 2.0	< 2.0	< 2.0	130	< 2.0	23		
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0		
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0		
Aliphatic TPH >C8-C10	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0		
Aliphatic TPH >C10-C12	M	2680	mg/kg	1.0	7.5	< 1.0	< 1.0	7.5	6.4	< 1.0		
Aliphatic TPH >C12-C16	M	2680	mg/kg	1.0	28	5.8	< 1.0	8.1	5.8	7.8		
Aliphatic TPH >C16-C21	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0		
Aliphatic TPH >C21-C35	M	2680	mg/kg	1.0	27	< 1.0	< 1.0	70	20	< 1.0		
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0		

Results - Soil

Project: Yew Tree

Client: Rogers Geotechnical Services Ltd	Chemtest Job No.:		22-16031	22-16031	22-16031	22-16031	22-16031	22-16031	22-16031	22-16031	22-16031	22-16031
Quotation No.:	Chemtest Sample ID.:		1420350	1420351	1420352	1420353	1420354	1420355	1420356	1420357		
	Sample Location:		WS01	WS02	WS03	WS07	WS06	WS08	WS08	WS01		
	Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL		
	Top Depth (m):		0.2	2.5	0.2	0.1	0.5	0.2	1.0	0.6		
	Bottom Depth (m):		0.4		0.4	0.2	0.6					
	Date Sampled:		26-Apr-2022	26-Apr-2022	26-Apr-2022	26-Apr-2022	26-Apr-2022	26-Apr-2022	26-Apr-2022	26-Apr-2022	26-Apr-2022	26-Apr-2022
	Asbestos Lab:		DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM				
Determinand	Accred.	SOP	Units	LOD								
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	62	5.8	< 5.0	86	32	7.8		
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0		
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0		
Aromatic TPH >C8-C10	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0		
Aromatic TPH >C10-C12	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0		
Aromatic TPH >C12-C16	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0		
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	38	< 1.0	< 1.0		
Aromatic TPH >C21-C35	M	2680	mg/kg	1.0	< 1.0	13	< 1.0	280	< 1.0	33		
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0		
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	13	< 5.0	310	< 5.0	33		
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0	62	19	< 10	400	32	41		
pH	M	2010		4.0	6.4	7.8	8.9	7.4	6.6	6.9	7.8	6.0
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010	0.088	0.14	0.019	0.029	0.032	0.063	0.041	0.024
ACM Type	U	2192		N/A	-	-	-	-	-	-		
Asbestos Identification	U	2192		N/A	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected		
Moisture	N	2030	%	0.020	12	10	21	27	15	29	14	30
Soil Colour	N	2040		N/A	Brown	Brown	Brown	Black	Brown	Brown	Brown	Brown
Other Material	N	2040		N/A	None	Stones	None	Stones	None	Roots	None	None
Soil Texture	N	2040		N/A	Clay	Loam	Clay	Clay	Clay	Loam	Clay	Clay
Sulphate (Total)	U	2430	%	0.010	0.012	0.011	0.014	0.068	0.011	0.043		
Organic Matter	M	2625	%	0.40	1.1	< 0.40	0.81	13	2.2	12		
Demeton-O	N	2820	mg/kg	0.20				< 0.20		< 0.20		
Phorate	N	2820	mg/kg	0.20				< 0.20		< 0.20		
Demeton-S	N	2820	mg/kg	0.20				< 0.20		< 0.20		
Disulfoton	N	2820	mg/kg	0.20				< 0.20		< 0.20		
Fenthion	N	2820	mg/kg	0.20				< 0.20		< 0.20		
Trichloronate	N	2820	mg/kg	0.20				< 0.20		< 0.20		
Prothiofos	N	2820	mg/kg	0.20				< 0.20		< 0.20		
Fensulphothion	N	2820	mg/kg	0.20				< 0.20		< 0.20		
Sulprofos	N	2820	mg/kg	0.20				< 0.20		< 0.20		
Azinphos-Methyl	N	2820	mg/kg	0.20				< 0.20		< 0.20		
Coumaphos	N	2820	mg/kg	0.20				< 0.20		< 0.20		
Atraton	N	2830	mg/kg	0.20				< 0.20		< 0.20		
Prometon	N	2830	mg/kg	0.20				< 0.20		< 0.20		
Simazine	N	2830	mg/kg	0.20				< 0.20		< 0.20		
Atrazine	N	2830	mg/kg	0.20				< 0.20		< 0.20		

Results - Soil

Project: Yew Tree

Client: Rogers Geotechnical Services Ltd	Chemtest Job No.:				22-16031	22-16031	22-16031	22-16031	22-16031	22-16031	22-16031	22-16031	22-16031
Quotation No.:	Chemtest Sample ID.:				1420350	1420351	1420352	1420353	1420354	1420355	1420356	1420357	
	Sample Location:				WS01	WS02	WS03	WS07	WS06	WS08	WS08	WS01	
	Sample Type:				SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	
	Top Depth (m):				0.2	2.5	0.2	0.1	0.5	0.2	1.0	0.6	
	Bottom Depth (m):				0.4		0.4	0.2	0.6				
	Date Sampled:				26-Apr-2022	26-Apr-2022	26-Apr-2022	26-Apr-2022	26-Apr-2022	26-Apr-2022	26-Apr-2022	26-Apr-2022	
	Asbestos Lab:				DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM			
Determinand	Accred.	SOP	Units	LOD									
Propazine	N	2830	mg/kg	0.20				< 0.20		< 0.20			
Terbutylazine	N	2830	mg/kg	0.20				< 0.20		< 0.20			
Secbumeton	N	2830	mg/kg	0.20				< 0.20		< 0.20			
Simetryn	N	2830	mg/kg	0.20				< 0.20		< 0.20			
Ametryn	N	2830	mg/kg	0.20				< 0.20		< 0.20			
Prometryn	N	2830	mg/kg	0.20				< 0.20		< 0.20			
Terbutryn	N	2830	mg/kg	0.20				< 0.20		< 0.20			
Alpha-HCH	N	2840	mg/kg	0.20				< 0.20		< 0.20			
Gamma-HCH (Lindane)	N	2840	mg/kg	0.20				< 0.20		< 0.20			
Beta-HCH	N	2840	mg/kg	0.20				< 0.20		< 0.20			
Delta-HCH	N	2840	mg/kg	0.20				< 0.20		< 0.20			
Heptachlor	N	2840	mg/kg	0.20				< 0.20		< 0.20			
Aldrin	N	2840	mg/kg	0.20				< 0.20		< 0.20			
Heptachlor Epoxide	N	2840	mg/kg	0.20				< 0.20		< 0.20			
Gamma-Chlordane	N	2840	mg/kg	0.20				< 0.20		< 0.20			
Alpha-Chlordane	N	2840	mg/kg	0.20				< 0.20		< 0.20			
Endosulfan I	N	2840	mg/kg	0.20				< 0.20		< 0.20			
4,4-DDE	N	2840	mg/kg	0.20				< 0.20		< 0.20			
Dieldrin	N	2840	mg/kg	0.20				< 0.20		< 0.20			
Endrin	N	2840	mg/kg	0.20				< 0.20		< 0.20			
4,4-DDD	N	2840	mg/kg	0.20				< 0.20		< 0.20			
Endosulfan II	N	2840	mg/kg	0.20				< 0.20		< 0.20			
Endrin Aldehyde	N	2840	mg/kg	0.20				< 0.20		< 0.20			
4,4-DDT	N	2840	mg/kg	0.20				< 0.20		< 0.20			
Endosulfan Sulphate	N	2840	mg/kg	0.20				< 0.20		< 0.20			
Methoxychlor	N	2840	mg/kg	0.20				< 0.20		< 0.20			
Endrin Ketone	N	2840	mg/kg	0.20				< 0.20		< 0.20			

Results - Soil

Project: Yew Tree

Client: Rogers Geotechnical Services Ltd	Chemtest Job No.: 22-16031			
Quotation No.:	Chemtest Sample ID.: 1420358			
	Sample Location: WS03			
	Sample Type: SOIL			
	Top Depth (m): 1.2			
	Bottom Depth (m):			
	Date Sampled: 26-Apr-2022			
	Asbestos Lab:			
Determinand	Accred.	SOP	Units	LOD
Cadmium	M	2455	mg/kg	0.10
Chromium (Hexavalent)	N	2490	mg/kg	0.50
Copper	M	2455	mg/kg	0.50
Mercury	M	2455	mg/kg	0.05
Nickel	M	2455	mg/kg	0.50
Lead	M	2455	mg/kg	0.50
Zinc	M	2455	mg/kg	0.50
Vanadium	U	2455	mg/kg	0.5
Arsenic	M	2455	mg/kg	0.5
Selenium	M	2455	mg/kg	0.25
Cyanide (Free)	M	2300	mg/kg	0.50
Total Phenols	M	2920	mg/kg	0.10
Naphthalene	M	2700	mg/kg	0.10
Acenaphthylene	M	2700	mg/kg	0.10
Acenaphthene	M	2700	mg/kg	0.10
Fluorene	M	2700	mg/kg	0.10
Phenanthrene	M	2700	mg/kg	0.10
Anthracene	M	2700	mg/kg	0.10
Fluoranthene	M	2700	mg/kg	0.10
Pyrene	M	2700	mg/kg	0.10
Benzo[a]anthracene	M	2700	mg/kg	0.10
Chrysene	M	2700	mg/kg	0.10
Benzo[b]fluoranthene	M	2700	mg/kg	0.10
Benzo[k]fluoranthene	M	2700	mg/kg	0.10
Benzo[a]pyrene	M	2700	mg/kg	0.10
Indeno(1,2,3-c,d)Pyrene	M	2700	mg/kg	0.10
Dibenz(a,h)Anthracene	M	2700	mg/kg	0.10
Benzo[g,h,i]perylene	M	2700	mg/kg	0.10
Total Of 16 PAH's	M	2700	mg/kg	2.0
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0
Aliphatic TPH >C8-C10	M	2680	mg/kg	1.0
Aliphatic TPH >C10-C12	M	2680	mg/kg	1.0
Aliphatic TPH >C12-C16	M	2680	mg/kg	1.0
Aliphatic TPH >C16-C21	M	2680	mg/kg	1.0
Aliphatic TPH >C21-C35	M	2680	mg/kg	1.0
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0

Results - Soil

Project: Yew Tree

Client: Rogers Geotechnical Services Ltd	Chemtest Job No.:		22-16031		
Quotation No.:	Chemtest Sample ID.:		1420358		
	Sample Location:		WS03		
	Sample Type:		SOIL		
	Top Depth (m):		1.2		
	Bottom Depth (m):				
	Date Sampled:		26-Apr-2022		
	Asbestos Lab:				
Determinand	Accred.	SOP	Units	LOD	
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	
Aromatic TPH >C8-C10	M	2680	mg/kg	1.0	
Aromatic TPH >C10-C12	M	2680	mg/kg	1.0	
Aromatic TPH >C12-C16	M	2680	mg/kg	1.0	
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	
Aromatic TPH >C21-C35	M	2680	mg/kg	1.0	
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0	
pH	M	2010		4.0	6.6
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010	0.020
ACM Type	U	2192		N/A	
Asbestos Identification	U	2192		N/A	
Moisture	N	2030	%	0.020	18
Soil Colour	N	2040		N/A	Brown
Other Material	N	2040		N/A	None
Soil Texture	N	2040		N/A	Clay
Sulphate (Total)	U	2430	%	0.010	
Organic Matter	M	2625	%	0.40	
Demeton-O	N	2820	mg/kg	0.20	
Phorate	N	2820	mg/kg	0.20	
Demeton-S	N	2820	mg/kg	0.20	
Disulfoton	N	2820	mg/kg	0.20	
Fenthion	N	2820	mg/kg	0.20	
Trichloronate	N	2820	mg/kg	0.20	
Prothiofos	N	2820	mg/kg	0.20	
Fensulphothion	N	2820	mg/kg	0.20	
Sulprofos	N	2820	mg/kg	0.20	
Azinphos-Methyl	N	2820	mg/kg	0.20	
Coumaphos	N	2820	mg/kg	0.20	
Atraton	N	2830	mg/kg	0.20	
Prometon	N	2830	mg/kg	0.20	
Simazine	N	2830	mg/kg	0.20	
Atrazine	N	2830	mg/kg	0.20	

Results - Soil

Project: Yew Tree

Client: Rogers Geotechnical Services Ltd	Chemtest Job No.:		22-16031	
Quotation No.:	Chemtest Sample ID.:		1420358	
	Sample Location:		WS03	
	Sample Type:		SOIL	
	Top Depth (m):		1.2	
	Bottom Depth (m):			
	Date Sampled:		26-Apr-2022	
	Asbestos Lab:			
Determinand	Accred.	SOP	Units	LOD
Propazine	N	2830	mg/kg	0.20
Terbutylazine	N	2830	mg/kg	0.20
Secbumeton	N	2830	mg/kg	0.20
Simetryn	N	2830	mg/kg	0.20
Ametryn	N	2830	mg/kg	0.20
Prometryn	N	2830	mg/kg	0.20
Terbutryn	N	2830	mg/kg	0.20
Alpha-HCH	N	2840	mg/kg	0.20
Gamma-HCH (Lindane)	N	2840	mg/kg	0.20
Beta-HCH	N	2840	mg/kg	0.20
Delta-HCH	N	2840	mg/kg	0.20
Heptachlor	N	2840	mg/kg	0.20
Aldrin	N	2840	mg/kg	0.20
Heptachlor Epoxide	N	2840	mg/kg	0.20
Gamma-Chlordane	N	2840	mg/kg	0.20
Alpha-Chlordane	N	2840	mg/kg	0.20
Endosulfan I	N	2840	mg/kg	0.20
4,4-DDE	N	2840	mg/kg	0.20
Dieldrin	N	2840	mg/kg	0.20
Endrin	N	2840	mg/kg	0.20
4,4-DDD	N	2840	mg/kg	0.20
Endosulfan II	N	2840	mg/kg	0.20
Endrin Aldehyde	N	2840	mg/kg	0.20
4,4-DDT	N	2840	mg/kg	0.20
Endosulfan Sulphate	N	2840	mg/kg	0.20
Methoxychlor	N	2840	mg/kg	0.20
Endrin Ketone	N	2840	mg/kg	0.20

Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Alkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2680	TPH A/A Split	Aliphatics: >C5-C6, >C6-C8,>C8-C10, >C10-C12, >C12-C16, >C16-C21, >C21-C35, >C35- C44Aromatics: >C5-C7, >C7-C8, >C8- C10, >C10-C12, >C12-C16, >C16- C21, >C21- C35, >C35- C44	Dichloromethane extraction / GCxGC FID detection
2700	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-FID	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenz[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Dichloromethane extraction / GC-FID (GC-FID detection is non-selective and can be subject to interference from co-eluting compounds)
2820	Organophosphorus (O-P) Pesticides in Soils by GC-MS	Organophosphorus pesticide representative suite including Parathion, Malathion etc, plus client specific determinands	Dichloromethane extraction / GC-MS
2830	Organonitrogen (O-N) Pesticides in Soils by GC-MS	Organonitrogen pesticide representative suite including Triazines etc, plus client specific determinands	Dichloromethane extraction / GC-MS
2840	Organochlorine (O-Cl) Pesticides in Soils by GC-MS	Organochlorine pesticide representative suite including DDT and its metabolites, 'drins' and HCH etc, plus client specific determinands	Dichloromethane extraction / GC-MS
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.

Report Information

Key

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

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

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

For all other tests the samples were dried at < 37°C prior to analysis

All Asbestos testing is performed at the indicated laboratory

Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied

B - Sample age exceeds stability time (sampling to extraction)

C - Sample not received in appropriate containers

D - Broken Container

E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 30 days from the date of receipt

All water samples will be retained for 14 days from the date of receipt

Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:

customerservices@chemtest.com

Environmental
Geotechnical
Specialists



End of Report

GEOTECHNICAL
ENVIRONMENTAL



Rogers Geotechnical Services Ltd
Office 1 & 2 Barncliffe Business Park,
Near Bank, Shelley, Huddersfield, HD8 8LU

Telephone 01484 607977
Company No: 5130864



Appendix 9

Soil Screening Values

Rogers Geotechnical Services Ltd.

Atkins ATRISK Soil Screening Values (SSVs) - Residential With Plant Uptake Landuse

Tox Data Report No.	Compound	Residential with Homegrown Produce Landuse (mg/kg)				Reference
		SOM: 1%		SOM: 6%		
<i>Metals</i>						
3	Cadmium	22.1		22.1		C
4	Chromium VI	3.62	20.5	3.62	20.5	B/C
	Copper	4730		4790		A+
7	Mercury	8.81		15.80		A/D
8	Nickel	136		136		A+
	Lead	200		200		C
	Zinc	20000		20300		A+
	Vanadium	136		138		A+
<i>Semi and Non Metals</i>						
1	Arsenic	37		37		C
10	Selenium	375		375		A
	Free Cyanide	34		34		A
9	Phenols (total)	267		1200		A
<i>Poly Aromatic Hydrocarbons</i>						
		Free product	No free product	Free product	No free product	
20	Napthalene	0.829		12.2		A+
	Acenaphthene	157	608	2760		A+
	Fluorene	735		2610		A+
	Anthracene	10200		26200		A+
	Fluoranthene	983		2980		A+
	Pyrene	668		2120		A+
	Benzo(a)anthracene	1.71	4.52	8.54		A
2	Chrysene	0.44	585	2.64	927	A
2	Benzo(b)fluoranthene	1.22	7.72	7.29	9.86	A
2	Benzo(k)fluoranthene	0.686	84.4	4.12	100	A
2	Benzo(a)pyrene	1.51	4.95	0.998	5	B/C
2	Dibenzo(a,h)anthracene	0.00393	0.838	2.05	4.95	A*
2	Indeno(1,2,3-cd)pyrene	0.0614	7.31	0.368	9.75	A
2	Benzo(g,h,i)perylene	0.0187	96.2	0.112	103	A
<i>Petroleum Hydrocarbons</i>						
	Aliphatic C5-C6	42.7		369		A+
	Aliphatic C6-C8	99.3		768	1240	A+
	Aliphatic C8-C10	13.9		204		A+
	Aliphatic C10-C12	49.9	81.7	297	1180	A+
	Aliphatic C12-C16	20.9	385	125	4130	A+
	Aliphatic C16-C21	210000		210100		A+
	Aliphatic C21-C35	210000		210100		A+
	Aromatic C5-C7 (Benzene)	0.137		0.871		A+
	Aromatic C7-C8 (Toluene)	113		780		A+
	Aromatic C8-C10	20.5		232		A+
	Aromatic C10-C12	70		468		A+
	Aromatic C12-C16	155	165	830		A+
	Aromatic C16-C21	319		1040		A+
	Aromatic C21-C35	1120		1710		A+
A+ = Values update June 2017.						
A* Atrisk's SSV is lower than Chemtest's detectable limit for this compound.						
B = Health Criterion Values (available from toxicological reviews published in the C4SL project methodology report).						
C = Category 4 Screening Levels (C4SLs).						
D = SSV provided is for Methyl Mercury.						



Appendix 10

Site Photographs



Photo 1: TP06A



Photo 2: Bound macadam material recovered in TP06A.



Photo 3: Brick lined feature.



Photo 4: Feature had no distinct foundation and the inside was filled with soil.



Rogers Geotechnical Services Ltd

Offices 1 & 2, Barncliffe Business Park,
Near Bank, Shelley,
Huddersfield,

Job No:

C2113/22/E

Site:

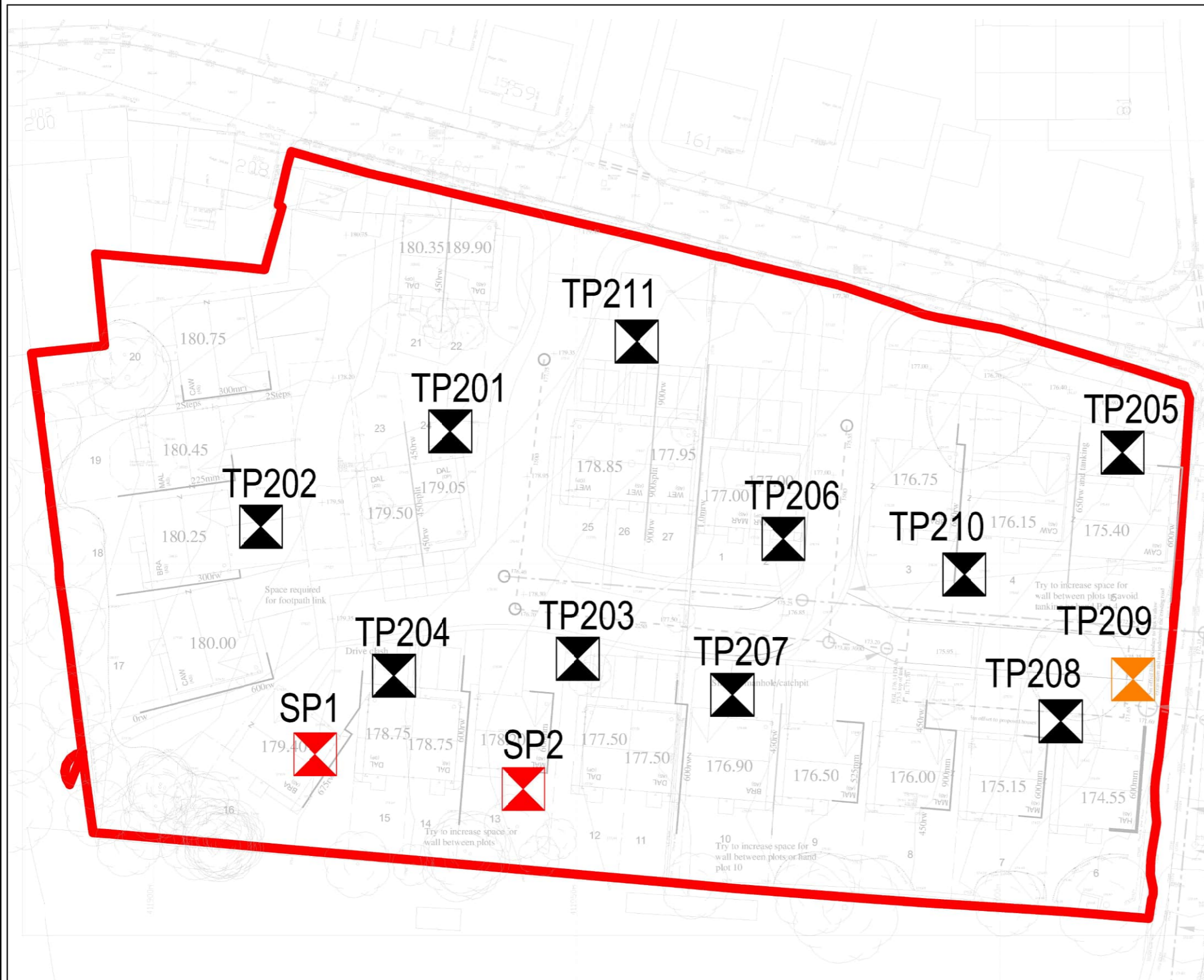
Site B—Yew Tree Road,
Birchencliffe

Client:

North Park Shelley Ltd



APPENDIX E: EXPLORATORY HOLE RECORDS



- Trial Pit Location
- Trial Pit in Spoil Heaps
- Trial Pit for Mine Shaft

HAZARD IDENTIFICATION BOX

This table is provided to assist the Principal Contractor to fulfil their obligations under the CDM Regulations 2015

Hazard Ref	Hazard Type (Construction/Maintenance/ Cleaning/Demolition/Adaptation)	Hazard Description	Mitigation Measures/ Residual Risk
1			



Health & Safety Note

The details on this drawing have been prepared on the assumption that a competent contractor will be carrying out the works. If the contractor(s) considers that there is insufficient Health and Safety information on this drawing, this should immediately be brought to the attention of the designer.

Rev.	Date	Description	Dm / Chk'd / App'd
P02	14/03/2025	Exploratory Hole Location Plan	BR/PT
P01	10/03/2025	Proposed Exploratory Hole Location Plan	BR/PT/PT

Suitability: **S0 - Work In Progress**



Amersham • Belfast • Brighouse • Bristol
Hartlepool • Sheffield • Warwick

www.jnpgroup.co.uk

Client: **Newett Homes**

Job: **Yew Tree Road, Birchencliffe, Huddersfield**

Title: **Proposed Exploratory Hole Location Plan**

Classification: **FI_60_20**

Scale @ A3: **As Shown**

Project - Originator - Volume/System - Level/Location - Type - Discipline - Number
S12597 - JNP-XX-ZZ-DR-Z-1001

Revision: **P01**

Document/Drawing Number

APPENDIX F: CHEMICAL TEST RESULTS



JNP Midlands LLP
3rd Floor
Marlborough House
48 Holly Walk
Leamington Spa
CV32 4XP

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

e: bryony.reynolds@JNPGroup.co.uk

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

Analytical Report Number : 25-012739

Project / Site name:	Yew Tree Road, Huddersfield	Samples received on:	13/03/2025
Your job number:	S12597	Samples instructed on/ Analysis started on:	14/03/2025
Your order number:	GO3587	Analysis completed by:	22/03/2025
Report Issue Number:	1	Report issued on:	24/03/2025
Samples Analysed:	20 soil samples		

Signed: 

Claire Bancroft
Customer Service Advisor
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
air	- once the analysis is complete

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

Retention period for records and reports is minimum 6 years from the date of issue of the final report.
Some records may be kept for longer according to other legal/best practice requirements.

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: 25-012739
 Project / Site name: Yew Tree Road, Huddersfield
 Your Order No: GO3587

Lab Sample Number				481396	481397	481398	481399	481400
Sample Reference				TP206	TP206	TP205	TP205	TP208
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Water Matrix				N/A	N/A	N/A	N/A	N/A
Depth (m)				0.20	0.40	0.30	0.90	0.10
Date Sampled				12/03/2025	12/03/2025	12/03/2025	12/03/2025	12/03/2025
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Test Limit of detection	Test Accreditation Status					

Stone Content	%	0.1	NONE	< 0.1	< 0.1	18.8	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	27	15	19	20	28
Total mass of sample received	kg	0.1	NONE	0.2	0.2	0.2	0.2	0.2

General Inorganics

pH (L099)	pH Units	N/A	MCERTS	-	-	6.4	-	-
Organic Matter (automated)	%	0.1	MCERTS	-	-	6.1	-	-

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	0.47	0.19	2.4	0.23	0.48
Acenaphthylene	mg/kg	0.05	MCERTS	0.08	< 0.05	0.89	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	0.55	< 0.05	2.5	< 0.05	0.42
Fluorene	mg/kg	0.05	MCERTS	0.79	< 0.05	2.3	< 0.05	0.45
Phenanthrene	mg/kg	0.05	MCERTS	5.1	< 0.05	26	0.11	2.8
Anthracene	mg/kg	0.05	MCERTS	5.6	< 0.05	4.2	< 0.05	0.7
Fluoranthene	mg/kg	0.05	MCERTS	9.2	< 0.05	36	0.11	6.3
Pyrene	mg/kg	0.05	MCERTS	8.3	< 0.05	32	0.1	5.4
Benzo(a)anthracene	mg/kg	0.05	MCERTS	4.4	< 0.05	13	< 0.05	2.8
Chrysene	mg/kg	0.05	MCERTS	4.4	< 0.05	14	< 0.05	2.8
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	6.6	< 0.05	15	< 0.05	3.3
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	2.3	< 0.05	6.6	< 0.05	1.1
Benzo(a)pyrene	mg/kg	0.05	MCERTS	6	< 0.05	13	< 0.05	2.7
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	3.1	< 0.05	5.9	< 0.05	1.5
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	0.67	< 0.05	1.2	< 0.05	0.4
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	2.9	< 0.05	6.3	< 0.05	1.6

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	60.4	< 0.80	181	< 0.80	32.7
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Petroleum Hydrocarbons

TPHCWG - Aliphatic >EC5 - EC6 _{HS_1D_AL}	mg/kg	0.01	MCERTS	-	-	-	-	-
TPHCWG - Aliphatic >EC6 - EC8 _{HS_1D_AL}	mg/kg	0.01	MCERTS	-	-	-	-	-
TPHCWG - Aliphatic >EC8 - EC10 _{HS_1D_AL}	mg/kg	0.01	MCERTS	-	-	-	-	-
TPHCWG - Aliphatic >EC10 - EC12 _{EH_CU_1D_AL}	mg/kg	1	MCERTS	-	-	-	-	-
TPHCWG - Aliphatic >EC12 - EC16 _{EH_CU_1D_AL}	mg/kg	2	MCERTS	-	-	-	-	-
TPHCWG - Aliphatic >EC16 - EC21 _{EH_CU_1D_AL}	mg/kg	8	MCERTS	-	-	-	-	-
TPHCWG - Aliphatic >EC21 - EC35 _{EH_CU_1D_AL}	mg/kg	8	MCERTS	-	-	-	-	-
TPHCWG - Aliphatic >EC5 - EC35 _{EH_CU+HS_1D_AL}	mg/kg	10	NONE	-	-	-	-	-

TPHCWG - Aromatic >EC5 - EC7 _{HS_1D_AR}	mg/kg	0.01	MCERTS	-	-	-	-	-
TPHCWG - Aromatic >EC7 - EC8 _{HS_1D_AR}	mg/kg	0.01	MCERTS	-	-	-	-	-
TPHCWG - Aromatic >EC8 - EC10 _{HS_1D_AR}	mg/kg	0.02	MCERTS	-	-	-	-	-
TPHCWG - Aromatic >EC10 - EC12 _{EH_CU_1D_AR}	mg/kg	1	MCERTS	-	-	-	-	-
TPHCWG - Aromatic >EC12 - EC16 _{EH_CU_1D_AR}	mg/kg	2	MCERTS	-	-	-	-	-
TPHCWG - Aromatic >EC16 - EC21 _{EH_CU_1D_AR}	mg/kg	10	MCERTS	-	-	-	-	-
TPHCWG - Aromatic >EC21 - EC35 _{EH_CU_1D_AR}	mg/kg	10	MCERTS	-	-	-	-	-
TPHCWG - Aromatic >EC5 - EC35 _{EH_CU+HS_1D_AR}	mg/kg	10	NONE	-	-	-	-	-

Analytical Report Number: 25-012739

Project / Site name: Yew Tree Road, Huddersfield

Your Order No: GO3587

Lab Sample Number	481396	481397	481398	481399	481400
Sample Reference	TP206	TP206	TP205	TP205	TP208
Sample Number	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Water Matrix	N/A	N/A	N/A	N/A	N/A
Depth (m)	0.20	0.40	0.30	0.90	0.10
Date Sampled	12/03/2025	12/03/2025	12/03/2025	12/03/2025	12/03/2025
Time Taken	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Test Limit of detection	Test Accreditation Status		

VOCs

Compound	Units	Test Limit of detection	Test Accreditation Status	481396	481397	481398	481399	481400
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	5	MCERTS	-	-	-	-	-
Benzene	µg/kg	5	MCERTS	-	-	-	-	-
Toluene	µg/kg	5	MCERTS	-	-	-	-	-
Ethylbenzene	µg/kg	5	MCERTS	-	-	-	-	-
p & m-Xylene	µg/kg	8	MCERTS	-	-	-	-	-
o-Xylene	µg/kg	5	MCERTS	-	-	-	-	-

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

Analytical Report Number: 25-012739
 Project / Site name: Yew Tree Road, Huddersfield
 Your Order No: GO3587

Lab Sample Number				481401	481402	481403	481404	481405
Sample Reference				TP208	TP207	TP207	TP203	TP204
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Water Matrix				N/A	N/A	N/A	N/A	N/A
Depth (m)				0.40	0.20	0.50	0.40	0.20
Date Sampled				12/03/2025	12/03/2025	12/03/2025	12/03/2025	12/03/2025
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Test Limit of detection	Test Accreditation Status					

Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	20	30	20	20	32
Total mass of sample received	kg	0.1	NONE	0.2	0.2	0.2	0.1	0.2

General Inorganics

pH (L099)	pH Units	N/A	MCERTS	-	6.6	-	6.9	-
Organic Matter (automated)	%	0.1	MCERTS	-	5.5	-	0.7	-

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	0.2	0.44	0.17	0.14	0.21
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	0.72	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	0.33	< 0.05	< 0.05	0.12
Fluorene	mg/kg	0.05	MCERTS	< 0.05	0.5	< 0.05	< 0.05	0.17
Phenanthrene	mg/kg	0.05	MCERTS	0.15	4.9	0.37	0.09	0.64
Anthracene	mg/kg	0.05	MCERTS	< 0.05	0.79	< 0.05	< 0.05	0.13
Fluoranthene	mg/kg	0.05	MCERTS	< 0.05	9	0.67	0.1	1.2
Pyrene	mg/kg	0.05	MCERTS	< 0.05	7.7	0.58	< 0.05	1
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05	3.2	< 0.05	< 0.05	< 0.05
Chrysene	mg/kg	0.05	MCERTS	< 0.05	3.8	0.31	< 0.05	0.59
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	< 0.05	3.7	0.4	< 0.05	0.6
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	< 0.05	2.2	0.08	< 0.05	0.3
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	3.4	< 0.05	< 0.05	0.51
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	2	0.16	< 0.05	0.3
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	0.48	< 0.05	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	2.2	0.15	< 0.05	0.37

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	< 0.80	45.4	2.88	< 0.80	6.15
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Petroleum Hydrocarbons

TPHCWG - Aliphatic >EC5 - EC6 _{HS_1D_AL}	mg/kg	0.01	MCERTS	-	-	-	-	-
TPHCWG - Aliphatic >EC6 - EC8 _{HS_1D_AL}	mg/kg	0.01	MCERTS	-	-	-	-	-
TPHCWG - Aliphatic >EC8 - EC10 _{HS_1D_AL}	mg/kg	0.01	MCERTS	-	-	-	-	-
TPHCWG - Aliphatic >EC10 - EC12 _{EH_CU_1D_AL}	mg/kg	1	MCERTS	-	-	-	-	-
TPHCWG - Aliphatic >EC12 - EC16 _{EH_CU_1D_AL}	mg/kg	2	MCERTS	-	-	-	-	-
TPHCWG - Aliphatic >EC16 - EC21 _{EH_CU_1D_AL}	mg/kg	8	MCERTS	-	-	-	-	-
TPHCWG - Aliphatic >EC21 - EC35 _{EH_CU_1D_AL}	mg/kg	8	MCERTS	-	-	-	-	-
TPHCWG - Aliphatic >EC5 - EC35 _{EH_CU+HS_1D_AL}	mg/kg	10	NONE	-	-	-	-	-

TPHCWG - Aromatic >EC5 - EC7 _{HS_1D_AR}	mg/kg	0.01	MCERTS	-	-	-	-	-
TPHCWG - Aromatic >EC7 - EC8 _{HS_1D_AR}	mg/kg	0.01	MCERTS	-	-	-	-	-
TPHCWG - Aromatic >EC8 - EC10 _{HS_1D_AR}	mg/kg	0.02	MCERTS	-	-	-	-	-
TPHCWG - Aromatic >EC10 - EC12 _{EH_CU_1D_AR}	mg/kg	1	MCERTS	-	-	-	-	-
TPHCWG - Aromatic >EC12 - EC16 _{EH_CU_1D_AR}	mg/kg	2	MCERTS	-	-	-	-	-
TPHCWG - Aromatic >EC16 - EC21 _{EH_CU_1D_AR}	mg/kg	10	MCERTS	-	-	-	-	-
TPHCWG - Aromatic >EC21 - EC35 _{EH_CU_1D_AR}	mg/kg	10	MCERTS	-	-	-	-	-
TPHCWG - Aromatic >EC5 - EC35 _{EH_CU+HS_1D_AR}	mg/kg	10	NONE	-	-	-	-	-

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Lab Sample Number	481401			481402			481403			481404			481405		
Sample Reference	TP208			TP207			TP207			TP203			TP204		
Sample Number	None Supplied			None Supplied			None Supplied			None Supplied			None Supplied		
Water Matrix	N/A			N/A			N/A			N/A			N/A		
Depth (m)	0.40			0.20			0.50			0.40			0.20		
Date Sampled	12/03/2025			12/03/2025			12/03/2025			12/03/2025			12/03/2025		
Time Taken	None Supplied			None Supplied			None Supplied			None Supplied			None Supplied		
Analytical Parameter (Soil Analysis)	Units	Test Limit of detection	Test Accreditation Status												

VOCs

Compound	Units	Test Limit of detection	Test Accreditation Status	481401	481402	481403	481404	481405
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	5	MCERTS	-	-	-	-	-
Benzene	µg/kg	5	MCERTS	-	-	-	-	-
Toluene	µg/kg	5	MCERTS	-	-	-	-	-
Ethylbenzene	µg/kg	5	MCERTS	-	-	-	-	-
p & m-Xylene	µg/kg	8	MCERTS	-	-	-	-	-
o-Xylene	µg/kg	5	MCERTS	-	-	-	-	-

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

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Lab Sample Number	481406				481407				481408				481409				481410			
Sample Reference	TP204																			
Sample Number	None Supplied				None Supplied				None Supplied				None Supplied				None Supplied			
Water Matrix	N/A																			
Depth (m)	0.60				0.30				0.10				0.50				0.20			
Date Sampled	12/03/2025				12/03/2025				12/03/2025				12/03/2025				12/03/2025			
Time Taken	None Supplied																			
Analytical Parameter (Soil Analysis)	Units	Test Limit of detection	Test Accreditation Status																	

Parameter	Units	Test Limit of detection	Test Accreditation Status	481406	481407	481408	481409	481410
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	23	23	28	18	25
Total mass of sample received	kg	0.1	NONE	0.2	0.1	0.1	0.1	0.2

General Inorganics

Parameter	Units	Test Limit of detection	Test Accreditation Status	481406	481407	481408	481409	481410
pH (L099)	pH Units	N/A	MCERTS	-	6.9	-	-	-
Organic Matter (automated)	%	0.1	MCERTS	-	1	-	-	-

Speciated PAHs

Parameter	Units	Test Limit of detection	Test Accreditation Status	481406	481407	481408	481409	481410
Naphthalene	mg/kg	0.05	MCERTS	0.17	< 0.05	0.37	0.16	0.69
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	0.87
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.15	0.06	0.82
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.14	< 0.05	1
Phenanthrene	mg/kg	0.05	MCERTS	0.08	0.1	0.58	0.11	10
Anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.16	< 0.05	2.4
Fluoranthene	mg/kg	0.05	MCERTS	0.09	< 0.05	0.99	< 0.05	19
Pyrene	mg/kg	0.05	MCERTS	0.07	< 0.05	0.85	< 0.05	16
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	7.6
Chrysene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.47	< 0.05	7.4
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	< 0.05	< 0.05	0.59	< 0.05	9
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	< 0.05	< 0.05	< 0.05	< 0.05	3
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.46	< 0.05	7.8
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.22	< 0.05	4.2
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	1
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	4.5

Total PAH

Parameter	Units	Test Limit of detection	Test Accreditation Status	481406	481407	481408	481409	481410
Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	< 0.80	< 0.80	4.97	< 0.80	94.6

Petroleum Hydrocarbons

Parameter	Units	Test Limit of detection	Test Accreditation Status	481406	481407	481408	481409	481410
TPHCWG - Aliphatic >EC5 - EC6 _{HS_1D_AL}	mg/kg	0.01	MCERTS	-	< 0.010	< 0.010	< 0.010	-
TPHCWG - Aliphatic >EC6 - EC8 _{HS_1D_AL}	mg/kg	0.01	MCERTS	-	< 0.010	< 0.010	< 0.010	-
TPHCWG - Aliphatic >EC8 - EC10 _{HS_1D_AL}	mg/kg	0.01	MCERTS	-	< 0.010	< 0.010	< 0.010	-
TPHCWG - Aliphatic >EC10 - EC12 _{EH_CU_1D_AL}	mg/kg	1	MCERTS	-	< 1.0	< 1.0	< 1.0	-
TPHCWG - Aliphatic >EC12 - EC16 _{EH_CU_1D_AL}	mg/kg	2	MCERTS	-	< 2.0	< 2.0	< 2.0	-
TPHCWG - Aliphatic >EC16 - EC21 _{EH_CU_1D_AL}	mg/kg	8	MCERTS	-	< 8.0	< 8.0	< 8.0	-
TPHCWG - Aliphatic >EC21 - EC35 _{EH_CU_1D_AL}	mg/kg	8	MCERTS	-	< 8.0	< 8.0	< 8.0	-
TPHCWG - Aliphatic >EC5 - EC35 _{EH_CU+HS_1D_AL}	mg/kg	10	NONE	-	< 10	< 10	< 10	-

Parameter	Units	Test Limit of detection	Test Accreditation Status	481406	481407	481408	481409	481410
TPHCWG - Aromatic >EC5 - EC7 _{HS_1D_AR}	mg/kg	0.01	MCERTS	-	< 0.010	< 0.010	< 0.010	-
TPHCWG - Aromatic >EC7 - EC8 _{HS_1D_AR}	mg/kg	0.01	MCERTS	-	< 0.010	< 0.010	< 0.010	-
TPHCWG - Aromatic >EC8 - EC10 _{HS_1D_AR}	mg/kg	0.02	MCERTS	-	< 0.020	< 0.020	< 0.020	-
TPHCWG - Aromatic >EC10 - EC12 _{EH_CU_1D_AR}	mg/kg	1	MCERTS	-	< 1.0	< 1.0	< 1.0	-
TPHCWG - Aromatic >EC12 - EC16 _{EH_CU_1D_AR}	mg/kg	2	MCERTS	-	< 2.0	< 2.0	< 2.0	-
TPHCWG - Aromatic >EC16 - EC21 _{EH_CU_1D_AR}	mg/kg	10	MCERTS	-	< 10	< 10	< 10	-
TPHCWG - Aromatic >EC21 - EC35 _{EH_CU_1D_AR}	mg/kg	10	MCERTS	-	< 10	< 10	< 10	-
TPHCWG - Aromatic >EC5 - EC35 _{EH_CU+HS_1D_AR}	mg/kg	10	NONE	-	< 10	< 10	< 10	-

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Lab Sample Number				481406	481407	481408	481409	481410
Sample Reference				TP204	TP202	TP201	TP201	TP210
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Water Matrix				N/A	N/A	N/A	N/A	N/A
Depth (m)				0.60	0.30	0.10	0.50	0.20
Date Sampled				12/03/2025	12/03/2025	12/03/2025	12/03/2025	12/03/2025
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Test Limit of detection	Test Accreditation Status					
VOCs								
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	5	MCERTS	-	< 5.0	< 5.0	< 5.0	-
Benzene	µg/kg	5	MCERTS	-	< 5.0	< 5.0	< 5.0	-
Toluene	µg/kg	5	MCERTS	-	< 5.0	< 5.0	< 5.0	-
Ethylbenzene	µg/kg	5	MCERTS	-	< 5.0	< 5.0	< 5.0	-
p & m-Xylene	µg/kg	8	MCERTS	-	< 8.0	< 8.0	< 8.0	-
o-Xylene	µg/kg	5	MCERTS	-	< 5.0	< 5.0	< 5.0	-

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

Analytical Report Number: 25-012739
 Project / Site name: Yew Tree Road, Huddersfield
 Your Order No: GO3587

Lab Sample Number				481411	481412	481413	481414	481415
Sample Reference				TP210	TP211	TP211	Stockpile ES1	Stockpile ES2
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Water Matrix				N/A	N/A	N/A	N/A	N/A
Depth (m)				0.50	0.20	0.60	None Supplied	None Supplied
Date Sampled				12/03/2025	12/03/2025	12/03/2025	12/03/2025	12/03/2025
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Test Limit of detection	Test Accreditation Status					

Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	20	35	26	37	38
Total mass of sample received	kg	0.1	NONE	0.2	0.1	0.2	0.6	0.2

General Inorganics

pH (L099)	pH Units	N/A	MCERTS	-	-	-	-	-
Organic Matter (automated)	%	0.1	MCERTS	-	-	-	-	-

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	0.15	0.19	0.11	0.63	0.12
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	0.1	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	0.06	< 0.05	0.52	0.06
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	0.42	0.06
Phenanthrene	mg/kg	0.05	MCERTS	0.13	0.4	< 0.05	4	0.47
Anthracene	mg/kg	0.05	MCERTS	< 0.05	0.08	< 0.05	0.73	0.1
Fluoranthene	mg/kg	0.05	MCERTS	0.2	0.81	< 0.05	5.8	0.86
Pyrene	mg/kg	0.05	MCERTS	< 0.05	0.73	< 0.05	5.1	0.75
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05	0.35	< 0.05	2.5	0.36
Chrysene	mg/kg	0.05	MCERTS	< 0.05	0.5	< 0.05	2.7	0.4
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	< 0.05	0.56	< 0.05	3.1	0.49
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	< 0.05	0.25	< 0.05	1.1	0.19
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	0.45	< 0.05	2.8	0.41
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	0.26	< 0.05	1.3	0.22
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	0.32	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	1.3	0.2

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	< 0.80	4.63	< 0.80	32.5	4.7
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Petroleum Hydrocarbons

TPHCWG - Aliphatic >EC5 - EC6 _{HS_1D_AL}	mg/kg	0.01	MCERTS	-	< 0.010	-	-	-
TPHCWG - Aliphatic >EC6 - EC8 _{HS_1D_AL}	mg/kg	0.01	MCERTS	-	< 0.010	-	-	-
TPHCWG - Aliphatic >EC8 - EC10 _{HS_1D_AL}	mg/kg	0.01	MCERTS	-	< 0.010	-	-	-
TPHCWG - Aliphatic >EC10 - EC12 _{EH_CU_1D_AL}	mg/kg	1	MCERTS	-	< 1.0	-	-	-
TPHCWG - Aliphatic >EC12 - EC16 _{EH_CU_1D_AL}	mg/kg	2	MCERTS	-	< 2.0	-	-	-
TPHCWG - Aliphatic >EC16 - EC21 _{EH_CU_1D_AL}	mg/kg	8	MCERTS	-	< 8.0	-	-	-
TPHCWG - Aliphatic >EC21 - EC35 _{EH_CU_1D_AL}	mg/kg	8	MCERTS	-	15	-	-	-
TPHCWG - Aliphatic >EC5 - EC35 _{EH_CU+HS_1D_AL}	mg/kg	10	NONE	-	15	-	-	-

TPHCWG - Aromatic >EC5 - EC7 _{HS_1D_AR}	mg/kg	0.01	MCERTS	-	< 0.010	-	-	-
TPHCWG - Aromatic >EC7 - EC8 _{HS_1D_AR}	mg/kg	0.01	MCERTS	-	< 0.010	-	-	-
TPHCWG - Aromatic >EC8 - EC10 _{HS_1D_AR}	mg/kg	0.02	MCERTS	-	< 0.020	-	-	-
TPHCWG - Aromatic >EC10 - EC12 _{EH_CU_1D_AR}	mg/kg	1	MCERTS	-	< 1.0	-	-	-
TPHCWG - Aromatic >EC12 - EC16 _{EH_CU_1D_AR}	mg/kg	2	MCERTS	-	< 2.0	-	-	-
TPHCWG - Aromatic >EC16 - EC21 _{EH_CU_1D_AR}	mg/kg	10	MCERTS	-	< 10	-	-	-
TPHCWG - Aromatic >EC21 - EC35 _{EH_CU_1D_AR}	mg/kg	10	MCERTS	-	< 10	-	-	-
TPHCWG - Aromatic >EC5 - EC35 _{EH_CU+HS_1D_AR}	mg/kg	10	NONE	-	< 10	-	-	-

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Lab Sample Number				481411	481412	481413	481414	481415
Sample Reference				TP210	TP211	TP211	Stockpile ES1	Stockpile ES2
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Water Matrix				N/A	N/A	N/A	N/A	N/A
Depth (m)				0.50	0.20	0.60	None Supplied	None Supplied
Date Sampled				12/03/2025	12/03/2025	12/03/2025	12/03/2025	12/03/2025
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Test Limit of detection	Test Accreditation Status					

VOCs

MTBE (Methyl Tertiary Butyl Ether)	µg/kg	5	MCERTS	-	< 5.0	-	-	-
Benzene	µg/kg	5	MCERTS	-	< 5.0	-	-	-
Toluene	µg/kg	5	MCERTS	-	< 5.0	-	-	-
Ethylbenzene	µg/kg	5	MCERTS	-	< 5.0	-	-	-
p & m-Xylene	µg/kg	8	MCERTS	-	< 8.0	-	-	-
o-Xylene	µg/kg	5	MCERTS	-	< 5.0	-	-	-

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

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* 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 *
481396	TP206	None Supplied	0.2	Brown loam and clay with gravel and vegetation
481397	TP206	None Supplied	0.4	Brown clay and sand with gravel and vegetation
481398	TP205	None Supplied	0.3	Brown loam and sand with clinker and vegetation
481399	TP205	None Supplied	0.9	Brown clay and sand with gravel and vegetation
481400	TP208	None Supplied	0.1	Brown loam and clay with gravel and vegetation
481401	TP208	None Supplied	0.4	Brown clay and sand with gravel and vegetation
481402	TP207	None Supplied	0.2	Brown loam and clay with gravel and vegetation
481403	TP207	None Supplied	0.5	Brown clay and sand
481404	TP203	None Supplied	0.4	Brown clay and sand with vegetation
481405	TP204	None Supplied	0.2	Brown clay and loam with gravel and vegetation
481406	TP204	None Supplied	0.6	Brown clay
481407	TP202	None Supplied	0.3	Brown clay
481408	TP201	None Supplied	0.1	Brown loam and clay with gravel and vegetation
481409	TP201	None Supplied	0.5	Brown clay and sand with gravel and vegetation
481410	TP210	None Supplied	0.2	Brown loam and clay with gravel and vegetation
481411	TP210	None Supplied	0.5	Brown clay and sand with gravel and vegetation
481412	TP211	None Supplied	0.2	Brown loam and clay with gravel and vegetation
481413	TP211	None Supplied	0.6	Brown clay and sand with gravel and vegetation
481414	Stockpile ES1	None Supplied	None Supplied	Brown loam and clay with gravel and vegetation
481415	Stockpile ES2	None Supplied	None Supplied	Brown loam and clay with gravel and vegetation

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Water matrix abbreviations:

Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters Heating/Cooling (PrW) DI Process Water (DI PrW)

Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Organic matter (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate (Walkley Black Method)	In-house method	L009B	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically (up to 30°C)	In-house method	L019B	W	NONE
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.	L019B	D	NONE
Speciated PAHs and/or Semi-volatile organic compounds in soil	Determination of semi-volatile organic compounds (including PAH) in soil by extraction in dichloromethane and hexane followed by GC-MS	In-house method based on USEPA 8270	L064B	D	MCERTS
BTEX and/or Volatile organic compounds in soil	Determination of volatile organic compounds in soil by headspace GC-MS	In-house method based on USEPA 8260	L073B	W	MCERTS
Total petroleum hydrocarbons with carbon banding by GC-FID/GC-MS HS in soil	Determination of total petroleum hydrocarbons in soil by GC-FID/GC-MS HS with carbon banding aliphatic and aromatic	In-house method	L076B/L088-PL	D/W	MCERTS
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

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).

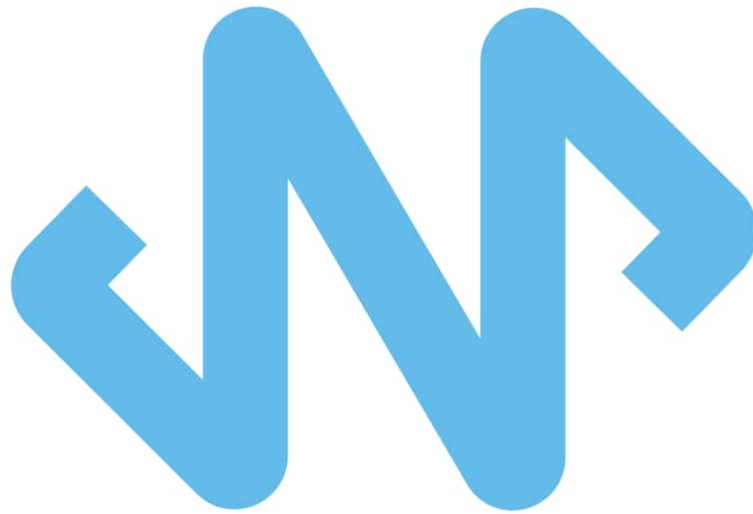
For method numbers ending in 'PL' or 'B' analysis have been carried out in our laboratory in Poland.

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.

Quality control parameter failure associated with individual result applies to calculated sum of individuals.

The result for sum should be interpreted with caution



JNP GROUP

CONSULTING ENGINEERS

Amersham

Sycamore House
1 Woodside Road
Amersham
Buckinghamshire
HP6 6AA

telephone

01494 771221

more info

www.jnpgroup.co.uk/contact

Hartlepool

The Innovation Centre
Venture Court (Hub2)
Queens Meadow Business Park
Hartlepool
TS25 5TG

telephone

01429 800711

more info

www.jnpgroup.co.uk/contact

Belfast

Arthur House
41 Arthur Street
Belfast

BT1 4GB

telephone

02890 027270

more info

www.jnpgroup.co.uk/contact

Sheffield

MBP2 Meadowhall Business Park
Carbrook Hall Road
Sheffield
South Yorkshire

S9 2EQ

telephone

0114 244 3500

more info

www.jnpgroup.co.uk/contact

Brighouse

Woodvale House
Woodvale Road
Brighouse
West Yorkshire

HD6 4AB

telephone

01484 400691

more info

www.jnpgroup.co.uk/contact

Warwick

Portobello House
Portobello Way
Warwick
Warwickshire

CV34 5GJ

telephone

01926 889955

more info

www.jnpgroup.co.uk/contact

Bristol

Whitefriars,
Lewins Mead,
Bristol

BS1 2NT

telephone

01174 721705

more info

www.jnpgroup.co.uk/contact