BARNSLEY
Metropolitan Borough Council

GROUND INVESTIGATION REPORT

FOR

PENNY PIE PARK / POGMOOR RECREATION GROUND FOOTBRIDGE

Location: **Barnsley**

OS Grid Ref : **SE 328 064**

HBPW
CONSULTING ENGINEERS

Document Control Sheet

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GROUND INVESTIGATION REPORT

1.0 INTRODUCTION AND SCOPE OF WORKS

1.1 Report Purpose and Objectives

HBPW LLP (HBPW) was instructed by Barnsley Metropolitan Borough Council (BMBC) to undertake a ground investigation and prepare a Ground Investigation Report (GIR) for the proposed construction of a footbridge over the railway connecting Penny Pie Park and Pogmoor Recreation Ground in Dodworth, Barnsley.

1.2 Scope of Works

The scope of works undertaken in preparing this report includes:

- A brief further review of published and freely available geological and historical information of the site;
- Interpretation of existing ground investigations in the local area;
- Identification of geotechnical risks and other pertinent issues associated with the design, construction and maintenance of the proposed structure, and;
- Discussion of ground conditions with regards to options for the proposed footbridge.

1.3 Limitations

This report has been produced for the sole internal use and reliance of BMBC. It shall not be relied upon by other parties without the express written authority of HBPW. If an unauthorised third party comes into possession of this report, they rely on it at their own risk and the authors owe them no duty of care or skill.

This report considers the proposals for the subject site at the time of issue of the report. Should the scheme change significantly then the implications of recommendations made in this report will need consideration relative to the new proposals.

HBPW have based parts of this report on information sources as detailed within the report text and believes them to be reliable, but cannot and does not guarantee the authenticity or reliability of any third-party information

2.0 EXISTING INFORMATION

This section provides a summary of the findings of publicly available desk study information.

2.1 General Information

Penny Pie Park / Pogmoor Recreation Ground Footbridge is a proposed steel, single span overbridge that will provide pedestrian access between Penny Pie Park and Pogmoor Recreation Ground over the Penistone railway line (Barnsley to Huddersfield).

Figure 2.1.1: Site Location

The site is located west of Barnsley City Centre at approximate grid reference SE 328 064. The Penistone Line is located in a cutting on an approximate east - west axis. Penny Pie Park is located south of the railway and currently consists of an open green area bordered by Pogmoor Road to the west, Dodworth Road/A628 to the south, the Penistone rail line to the north and residential properties to the east. Pogmoor Recreation Ground is located north of the railway and consists of grass football pitches.

Figure 2.1.2 - Proposed location of footbridge

2.2 Existing Geological Data

2.2.1 Geology

The expected geology for the site is described on BGS Sheet 87 “Barnsley” (1:50,000 scale) and the British Geological Survey (BGS) Geology of Britain Viewer at 1:50,000 scale mapping and can be summarised as follows:

- Made Ground
  The BGS Sheet 87 “Barnsley” shows made ground present to the south of the railway underlying Penny Pie Park and described these deposits as “mainly colliery spoil and landfill”.

- Superficial Geology
  No superficial deposits are indicated on the site on either the BGS viewer at 1:50,000 scale mapping or Sheet 87 “Barnsley”.

- Bedrock
  The Carboniferous Pennine Middle Coal Measures Formation (hereby referred to as PMCM) forms the bedrock which is typically described as interbedded mudstone, siltstone, sandstone and coal seams.

The BGS Engineering Geology Viewer further describes the PMCM bedrock as consisting of ‘*medium strong to extremely strong medium to widely jointed thinly to thickly bedded fine to coarse-grained SANDSTONE and very weak to medium strong usually fissured MUDSTONE weathering to a firm to stiff silty clay generally within 2-*

6m of ground surface. These provide generally good foundation conditions depending on the nature and thickness of the weathered zone.'

No dip arrows are present on or near the vicinity of the site however BGS Sheet 87 "Barnsley" shows the PMCM bedrock generally dipping at approximately 3° to 7° north east across the surrounding area.

Two faults are shown in the vicinity of the site. The St Helens Fault undercuts the site running north east to south west with a south eastern downthrow (magnitude not recorded). To the immediate north of the site the Barebones Fault is shown running north west to south east with a north eastern downthrow (magnitude not recorded).

2.2.2 Coal Seams and Mining

BGS Sheet 87 1:50,000 shows several coal seams outcropping in the vicinity of the site. The Dunsil (Harley) coal seam outcrops on the site of Penny Pie Park, approximately 100m west of the proposed bridge structure dipping north east. The Barnsley and Barnsley Rider coal seams outcrop north east of the structure at a distance of approximately 100m – 200m. These seam dips away from the site and do not undercut the proposed structure.

The Gawber Coal, Swallow Wood Coal, Top Haigh Moor Coal and Low Haigh Moor Coal and Lidget seams outcrop to the south west of the site at distances of approximately 200m to 1500m. Using an average dip of 5° (taken from BGS Sheet 87) and a site elevation of 138mAOD (taken from topographical survey) the depth to the seams below the site level is shown in the table below.

Table 2.1: Coal Seams

Seam	Seam thickness (m)	Distance to outcrop (m)	Elevation at outcrop (mAOD)	Depth of seam at Site (m)
Dunsil (Harley)	0 – 1.7	100	138	8.7
Gawber	0 – 0.7	250	139	20.9
Swallow Wood	0.2 – 3.7	760	142	62.5
Top haigh moor	0 – 4.3	900	142	74.7
Bottom Haigh Moor	0 – 2.6	1080	140	92.5
Lidget	0.3 – 1.5	1380	130	112.7

Ciria C758 "Abandoned Mine Workings" advises that worked coal seams can propagate upwards to a total of 10 times their seam thickness. In the case of the Gawber Coal, Swallow Wood Coal, Top Haigh Moor Coal and Low Haigh Moor Coal

and Lidget seams the depth beneath the site is over 10 times the seam thickness and therefore any historical workings within these seams are unlikely to pose a risk to the structure by propagating to the surface. However, it must be noted that further coal seams may exist between named seams given above and that this does not constitute a full mining risk assessment.

The Coal Authority Viewer indicates that the site is located in a “development high risk area”. No past surface or shallow mining has been recorded on the site however there are probable shallow workings to the immediate north of the site likely associated with the Barnsley and Barnsley Rider seams. Several mine entries are surrounding the site are shown however the proposed bridge location is over 50m outside their zone of influence.

It should be noted that there is a risk of unrecorded mine workings and mine entries at the site or within the immediate surrounding area.

2.2.3 Hydrogeology and Hydrology

The BGS Hydrogeology viewer classifies the underlying PMCM formation as a moderately productive aquifer with moderate yields from sandstones and springs.

The DEFRA Magic Map indicates that the PMCM formation is considered to be a Secondary A Aquifer, described 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. The underlying aquifer carries a medium vulnerability rating described as “have some natural protection resulting in a moderate overall groundwater risk. Activities in these areas should as a minimum follow good practice to ensure they do not cause groundwater pollution”.

The Defra “Magic Map” and data.gov website indicates that the site is not located in a groundwater Source Protection Zone (SPZ). Construction work at the site is therefore not likely to affect any abstractions.

The site is located in a “Nitrate Vulnerable Zone”.

The Groundsure Viewer shows that the railway has a medium flood risk rating indicating between 1% and 10% chance of flooding annually. The rest of the site is not considered to be at risk from flooding.

2.3 Site Development History

2.3.1 Historical Site Mapping

The earliest map found for the site dates to **1855** at 1:10,560 scale. On this map the Penistone railway line is present in its current cutting and alignment. The site is surrounded by agricultural land to both the north and south of the railway and Dodworth Road to the south of Penny Pie Park is present.

On the **1893** OS map at 1:2,500 the railway is shown as having two tracks. The area to the south of the site (Penny Pie Park) has been developed into a brick works with a railway siding and buildings to the west of the site and a clay pit approximately 50m south of the proposed structure. The area to the immediate north of the railway has remained agricultural. Several “Old Shafts” and “Old Clay Pits” have been marked on the map however they are all over 100m from the proposed footbridge location, it is understood anecdotally that the White Hill or Penny Pie Colliery was located between these shafts between 1861 and 1872. Barnsley town shows significant domestic and industrial growth.

The **1906** OS map at 1:2,500 shows that the clay pit for the Penny Pie Park brickworks has expanded to the area immediately south of the site with an additional tramway added. The area to the immediate north of the railway has remained agricultural. To the north east of the site a brickworks is shown.

On the **1931** OS map at 1:2,500 the clay pit to the south of the site is shown in the same location and extents as previous. The fields to the north of the railway appear to have been raised and developed into a “Miners Welfare Recreation Ground” on the location of the current Pogmoor Recreation Grounds. The surrounding area shows additional development with additional housing and infrastructure.

The **1938** and **1956** OS maps at 1:10,560 show little additional development in the immediate vicinity of the site. The brickworks to the south of the railway appear to have been removed with the buildings and tramway removed and clay pits left remaining.

The **1960, 1961** and **1969** OS map at 1:250, 1:2,500 and 1:1,250 respectively show the area south of the railway as relatively flat with no clay pit present implying that it has been filled during this time. It is understood from anecdotes that the pit was filled primarily with domestic waste. The Recreation Ground to the north has been extended west and the surrounding area has seen continued residential development.

The most recent historical maps are the OS maps from **1983**, **1988** and **1993** at 1:10,000, 1:1,250 and 1:10,000 respectively. These maps show no changes on the site. The area to the south of the railway has been marked as a recreational area with a model railway built to the south west of the site. The Penistone line has been reduced from 2 tracks to 1.

In the **present (2019)** the site area has remained unchanged. To the immediate east of the site a residential street has been developed.

2.3.2 Summary

Based on the observed history, ground obstructions from previous land uses may be expected. The land to the south of the railway (Penny Pie Park) has been the location of a historic clay pit that has been backfilled around 1960. The area to the north of the railway has been raised to accommodate a recreation ground and as a result deep made ground should be expected.

Potential pollutants on the site may be associated with the railways or sites use as a clay pit and landfill site.

The BGS Sheet 87 “Barnsley” shows made ground present to the south of the railway underlying Penny Pie Park and described these deposits as “mainly colliery spoil and landfill”.

The Groundsure Viewer shows the land to the north and south of the railway as historic landfill sites. No authorised landfill sites exist within 100m of the site.

2.4 Existing Ground Investigations

2.4.1 BGS Historical Borehole Records

No borehole records are shown exist on the site or within the larger site area of Penny Pie Park or Pogmoor Recreation Ground. Several borehole records are available within a 500m radius of the site.

3 No. shallow boreholes (SE30NW630, 631 and 632) dated January 1989 are present 300-400m north of the site on “Intake Lane”. These boreholes all record 0.4m to 0.8m of made ground (not described) overlying light brown clay (likely weathered bedrock) to a depth of 1.2m bgl. Solid bedrock was encountered below 1.2m bgl and is typically described as grey weathered mudstone with occasional laminations, iron nodules and iron staining. All three boreholes terminate under 5m bgl. No water strikes are recorded in any of the boreholes.

2 No. boreholes (SE30NW555 and 20) dated to 1938 are present 400m east of the site recording yellow clay (likely weathered bedrock) to depths of 1.8m and 1.2m respectively overlying solid bedrock. Bedrock is typically described as sandstone and shale with occasional bands of ironstone and thin bands (under 0.5m thick) of coal. The boreholes terminate at 59.4m and 85.4m bgl. Water was struck at 45.7m bgl. A workable coal seam (2.7m thick) was encountered in borehole 555 at 48.5m bgl and a 2.3m band of possible workings (recorded on logs as debris) were recorded in borehole 20 at a depth of 38.6m bgl.

1 No. borehole (SE30NW340) dated to September 1962 is present 500m west of the site located on the Penistone Line. The borehole records firm, grey mottled brown silty clay (likely weathered bedrock) to a depth of 0.9m bgl. Solid bedrock was encountered below 0.9m bgl and is typically described soft friable mudstone and shale. The borehole was terminated at 4.6m bgl. No water strikes were recorded. A 0.4m thick seam of “broken coal” was encountered at 4m.

Table 2.4: BGS Historical Borehole Summary				
Borehole	**Made Ground Depth (m bgl)**	**Weathered Bedrock Depth (m bgl)**	**Bedrock Depth (m bgl)**	**Notes**
SE30NW630	0.0 – 0.4	0.4 – 1.2	1.2 – depth not proven	No water encountered.
SE30NW631	0.0 – 0.6	0.6 – 1.2	1.2 – depth not proven	No water encountered.
SE30NW632	0.0 – 0.8	0.8 – 1.2	1.2 – depth not proven	No water encountered.
SE30NW555	0.0 – 0.3	0.3 – 1.8	1.8 – depth not proven	Water strike at 45.7m bgl. 2.7m coal seam at 48.5m bgl.
SE30NW20	Not Recorded	0.0 – 1.2	1.2 – depth not proven	Water strike not recorded. 2.2m potential workings at 38.6m bgl.
SE30NW340	0.0 – 0.3	0.3 – 2.1	2.1 – depth not proven	0.3m of “fragmented coal” at 2.1m bgl

2.4.2 Abbeydale Site Investigation (November - December 2018)

Penny Pie Park is the location of a proposed gyratory and an intrusive ground investigation was undertaken in December 2018 by Abbeydale to inform design.

Fieldwork was undertaken in from November to December 2018. The investigation comprised:

- 13 No. dynamic sample boreholes (WS1 to WS13) to depths of 3.00m – 5.45m.
- 15 No. dynamic probe boreholes (DP1 to DP15) to depths of 4.90m – 10.60m.
- 4 No. trial trenches (TP1 to TP4) to depths of 3.30m – 4.00m.
- 3 No. cable percussive boreholes (BH1 to BH3) to depths of 6.20m – 11.90m.
- 7 No. Gas monitoring standpipe installs (WS1, Ws6, WS7, WS8, BH1, BH2 and BH3).
- CBR testing on made ground deposits.
- Standard penetration tests (SPT) within the boreholes.
- Geotechnical and Geo-environmental laboratory testing.

The investigation generally found a veneer of topsoil overlying made ground consisting of coal, shale, mudstone, glass, fabric, pottery and general and household waste to a maximum depth of 11.40m. Made ground had highly variable composition with areas of granular and cohesive material throughout. This is consistent with the site history discussed in section 2.3.

SPT data within the made ground classified the strata as loose to very loose. There were occasional high SPT values, possibly caused by cobbles and therefore not representative of the ground as a whole. CBR testing on made ground yielded maximum values of 3%.

Bedrock comprised of weak to extremely weak mudstone typically recovered as gravel.

Groundwater was only encountered in two exploratory holes (BH2 and BH3) at depths of 7.5m and 9.0m respectively.

3.0 PRELIMINARY CONCEPTUAL SITE MODEL

3.1 Introduction

This section presents an appraisal of the desk study findings based upon current legislation in order to identify potential risks and contamination issues associated with the site and therefore develop a preliminary conceptual site model (PCSM).

Current best practice recommends that the determination of hazards due to contaminated land is based on the principle of risk assessment, as outlined in Part IIA of the Environmental Protection Act 1990 and detailed within the DEFRA document CLR11, which outlines the framework for the management of contamination. For a risk to be present, there must be a viable pollutant linkage i.e. a mechanism whereby a source impacts upon a receptor via a pathway. A source, pathway and receptor are defined as:

- Source: A substance that is in, on or under the land and has the potential to cause harm or cause pollution to the surrounding environment.
- Pathway: A route or means by which a receptor can or could potentially be exposed to, or affected by, a contaminant.
- Receptor: A living organism, a group of living organisms, controlled waters, an ecological system or piece of property, which is being, or could be, harmed by a contaminant.

Each of these elements can exist independently of one another, but they create a potential risk only where they are linked together, so that a particular contaminant affects a particular receptor through a particular pathway. If all three are identified in this manner, then a 'pollutant linkage' potentially exists.

Using criteria broadly based on those presented in CIRIA Report "Contaminated Land Risk Assessment: A Guide to Good Practice" (CIRIA Report C552), the magnitude of the risk associated with potential pollutant linkages has then been assessed.

3.2 Potential Sources

Based upon the available information, the following are considered potential sources of contamination:

- Made ground associated with historic domestic landfill on the site.
- Potential chemicals associated with the Penistone Line railway.
- Ground gas generation associated with deep made ground, coal seams and backfilled pit.

3.3 Potential Pathways

Based upon the available information, the following are considered potential pathways:

- Inhalation of dust/vapours.
- Ingestion.
- Dermal contact.
- Vertical migration through unsaturated zone (including leaching of contaminants);
- Lateral migration through unsaturated zone.
- Uptake by vegetation.
- Gas/vapour migration through unsaturated zone.

3.4 Potential Receptors

Based upon the available information, the following are considered potential receptors:

- Future site users.
- Offsite neighbouring residents and houses.
- Building materials.
- Construction workers during development.
- Nearby land drains and wells.

3.5 Preliminary CSM and Risk Assessment

Potential Source	Potential Pathway	Potential Receptor	Probability	Severity	Risk Rating	Comments
Made ground and Landfill.	Inhalation, ingestion, dermal contact	Future site users	Likely	Moderate	Moderate / Low	Presence of significant contamination deemed unlikely, though low level of contamination may be present as a result of landfill.
	Migration and inhalation of vapours	Offsite neighbouring residents and houses	Unlikely	Moderate	Low	Gas/vapour generation potential of made ground likely to be moderate and contain volatile contamination sources on site based on historical landfill use
	Inhalation, ingestion, dermal contact	Construction workers	Likely	Minor	Low	Appropriate usage of PPE and work practices can mitigate potential risks during construction phase. Chemical testing of made ground recommended to determine risks posed.
	Vertical migration through unsaturated zone (including leaching of contaminants)	Groundwater	Unlikely	Moderate	Low	Migration through bedrock to water table considered unlikely.
	Aggressive attack	Building materials	Unlikely	Moderate	Low	Testing required to determine required concrete grade.
Penistone Line Railway.	Migration and inhalation of vapours	Future site users	Unlikely	Moderate	Low	The railway is and will remained fenced to deter access.
	Inhalation	Construction workers	Unlikely	Moderate	Low	Appropriate usage of PPE and work practices can mitigate potential risks during construction phase. Proposed

						work will not require significant earthworks on railway land.
Ground gas from made ground / coal seams or backfilled brick pit.	Vertical migration through unsaturated zone with subsequent inhalation/explosion	Future site users	Likely	Severe	Moderate	Made ground associated with historical site development likely to contain organic content and methane gas generation potential.
	Lateral and vertical migration through unsaturated zone with subsequent inhalation/explosion	Offsite neighbouring residents and houses	Likely	Severe	Low / Moderate	
	Vertical migration through unsaturated zone with subsequent inhalation/explosion	Construction workers	Likely	Severe	Low / Moderate	
	Vertical migration through unsaturated zone with subsequent inhalation/explosion	Building materials	Likely	Severe	Low / Moderate	

4.0 HBPW GROUND INVESTIGATION

4.1 Objectives

The objectives of the investigation were to address the following:

- Assess the ground conditions (and geotechnical properties) underlying the site to inform the design of the proposed footbridge;
- Assess the potential presence and significance of any contamination that may be present, and;
- Assess the potential risks to human health and controlled water receptors.

4.2 Site Works

An intrusive ground investigation was undertaken by Central Alliance starting on the 3rd December 2019.

The investigation comprised:

- 4 No. dynamic sample boreholes (WS01, WS03, WS05 and WS06A) to depths of 3.45m – 7.45m. 2 No. north of the railway (Pogmoor Recreation Ground) and 2 No. south of the railway (Penny Pie Park). Note; WS06 was aborted due to an obstruction and replaced with WS06A;
- 4 No. rotary boreholes (BH01, BH02, BH03 and BH04) to depths of 10.00m – 41.10m. 1 No. 1 No. north of the railway (Pogmoor Recreation Ground) and 3 No. South of the railway (Penny Pie Park);
- 4 No. trial trenches (TT01, TT02, TT03 and TT04) to depths of 3.40m – 3.60m to the South of the railway (Penny Pie Park);
- Standard penetration tests (SPT) within the boreholes, and;
- Geotechnical and Geo-environmental laboratory testing.

The exploratory hole logs and laboratory testing are contained in the Central Alliance Ground Investigation Factual Report contained in Appendix I. The locations of the exploratory holes are summarised in the figures below and shown on the Exploratory Hole Location Plan (2370414_P – Rev A) appended to this report.

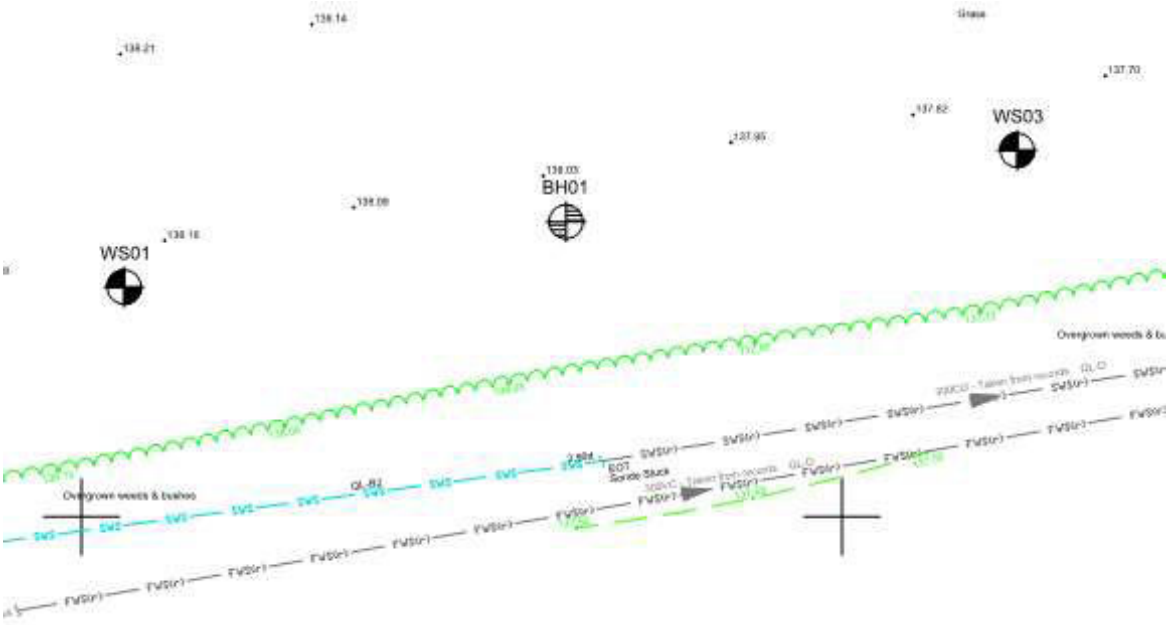


Figure 2.4.1: Site Investigation Layout, North (Pogmoor Recreation Ground)

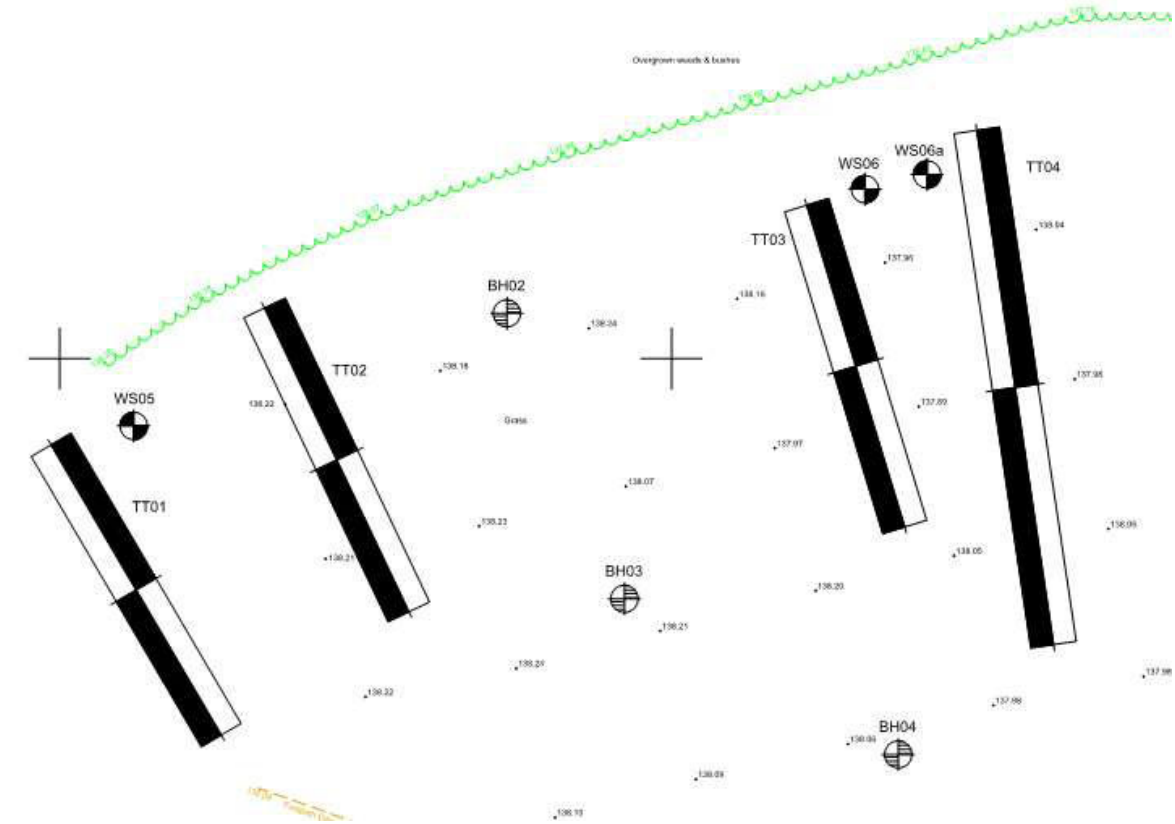


Figure 2.4.2: Site Investigation Layout, South (Penny Pie Park)

5.0 GROUND SUMMARY

The ground model has been developed using all available ground investigation information.

The ground conditions encountered across the site generally concur with those expected from published geology and the development history.

Generally, the ground conditions comprise a variable thickness and composition of MADE GROUND and landfill overlying reworked/weathered bedrock overlying solid bedrock.

5.1 Ground Model

The ground model to the north and south of the railway is summarised in Table 3.1:A and 3.1:B.

Table 3.1:A - North, Pogmoor Recreation Ground Ground Model

Strata	Typical description	Typical depths	Comments
TOPSOIL	Dark brown slightly gravelly sandy organic silt.	0.00 m – 0.10 / 0.15m bgl.	Strip prior to construction.
MADE GROUND ① (GRANULAR)	Black / brown gravelly clayey SAND. Gravel is of siltstone, mudstone, sandstone, clinker, slag, brick and pottery.	0.10 / 0.15m – 2.00 / 4.60m bgl.	Fill likely used during the construction of the recreation grounds.
BEDROCK ⑤ (SILTSTONE)	PMCM. Very weak to moderately weak interbedded siltstone and mudstone.	2.00 / 4.60 m bgl – depth not proven.	Solid bedrock geology.

Table 3.1:B – South, Penny Pie Park Ground Model

Strata	Typical description	Typical depths	Comments
TOPSOIL	Dark brown slightly gravelly sandy organic silt.	0.00 m – 0.10 / 0.20m bgl.	Strip prior to construction.

MADE GROUND ② (GRANULAR)	Dark brown slightly clayey gravelly SAND. Gravel is of glass, plastic, clinker, shale, metal, brick and general household waste.	0.10 / 0.20m – 3.90 / 7.10m bgl.	Domestic Landfill. Some larger obstructions such as tyres, numerous glass bottles and concrete were encountered.
MADE GROUND ③ (COHESIVE)	Dark brown mottled red slightly gravelly sandy CLAY. Gravel is brick, siltstone, paper and concrete.	7.10m – 8.60m bgl.	Only Encountered in BH02
WEATHERED / REWORKED BEDROCK ④ (COHESIVE)	Soft light brown grey mottled orange slightly gravelly sandy CLAY. Gravel is sandstone.	8.60- 10.30m bgl.	Only Encountered in BH02
BEDROCK ⑤ (ROCK)	PMCM. Very weak to moderately strong interbedded Siltstone and Mudstone	3.90 /10.30m bgl – depth not proven.	Solid bedrock geology.

5.2 Groundwater Conditions

During the investigation no water was encountered in any exploratory holes.

5.3 Laboratory Testing

Laboratory testing was conducted on arising's from intrusive investigations (see **Appendix I**). Testing comprised:

- 10 No. PSD tests in granular deposits.
- 4 No. UCS tests on bedrock samples.
- 58 No. Point Load tests bedrock samples.
- 5 No. spectrum analysis tests and Asbestos screens in MADE GROUND deposits to establish the degree of contamination.
- 13 No. BRE SD1 test suites to establish concrete design classes for buried concrete.
- 1 No. WAC test in MADE GROUND.

Particle Size Distribution

Location	Depth (m begl)	Sample Number	Cobbles (%)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
WS01	0.50	5B	0	52	22	26	
WS01	3.00	15B	0	32	33	35	

WS03	0.20	2D	0	21	22	57
WS03	1.20	6D	0	56	32	12
WS05	0.50	5B	0	47	35	18
WS05	3.00	11D	0	49	35	16
WS05	6.00	19D	0	70	16	14
WS06A	1.20	5D	0	38	40	22
WS06A	3.00	10D	0	49	33	18
WS06A	4.00	14D	0	51	30	19

Uniaxial Compressive Strength Test

Location	Depth (m begl)	Sample Number	UCS (MPa)	Failure Type
BH01	9.00	1C	0.8	Plastic
BH02	10.40	1C	1.1	Plastic
BH02	14.60	2C	23.0	Axial Cleavage
BH04	6.60	1C	9.7	Axial Cleavage

Point Load Testing

Location	Depth (m begl)	Sample Number	Test 1		Test 2	
			Point Load Index (MPa)	Test Type	Point Load Index (MPa)	Test Type
BH01	5.10	2C	0.16	A+P	0.04	I+L
BH01	5.45	3C	0.14	A+P	0.08	I+L
BH01	5.70	4C	0.08	A+P	0.01	D+L
BH01	6.30	5C	0.12	A+P	0.01	D+L
BH01	6.80	6C	0.10	A+P	0.01	I+L
BH01	7.40	7C	0.01	A+P	0.01	D+L
BH01	7.80	8C	0.38	A+P	0.21	D+L
BH01	8.50	9C	0.03	A+P	0.00	D+L
BH01	9.45	11C	0.12	A+P	0.02	D+L
BH02	10.40	3C	0.45	A+P	0.31	I+L
BH02	11.00	4C	2.15	A+P	1.29	D+L
BH02	11.30	5C	1.87	A+P	0.68	I+L
BH02	11.90	6C	0.42	A+P	0.15	D+L
BH02	12.40	7C	1.86	A+P	0.65	I+P
BH02	12.90	8C	1.19	A+P	0.22	D+L
BH02	14.50	10C	1.09	A+P	0.54	D+L
BH03	6.10	1C	0.98	A+P	0.23	D+L
BH03	7.40	4C	0.47	I	0.35	I+P
BH03	7.60	5C	0.11	A+P	0.05	D+L
BH03	8.60	6C	0.03	A	0.04	D
BH03	9.40	7C	0.03	A	0.02	D
BH03	10.50	9C	0.02	A	0.01	D
BH04	5.70	3C	0.51	A+P	0.28	I+L

BH04	6.10	4C	0.03	A+P	0.00	D+L
BH04	6.80	5C	0.74	A+P	0.15	I+L
BH04	7.25	6C	0.28	A+P	0.68	I+P
BH04	7.40	7C	0.41	A+P	0.22	D+L
BH04	8.00	8C	0.08	A+P	0.01	D+L
BH04	9.35	10C	0.26	A+P	0.15	D+L

Note: A=Axial, D=Diametral, I=Irregular, L=Parallel, P=Perpendicular.

BRE SD1 Analysis (Soil)

Location	Depth (m begl)	Sample Number	pH	WS SO_4 (mg/l)	WS Mg (mg/l)	Total SO_4 (%)
TT01	1.00	2	7.74	45	5	0.25
TT01	3.00	4	7.32	295	26	0.28
TT02	2.00	3	7.38	107	11	0.35
TT03	2.00	3	7.17	1120	50	0.69
TT04	1.00	2	7.12	395	15	0.35
TT04	3.60	4	3.89	539	84	NA*
WS01	1.00	6	6.78	26	8	0.12
WS01	2.50	11	7.34	101	13	NA
WS03	0.90	5	7.58	45	10	NA
WS05	4.50	14	7.43	1540	76	NA
WS05	5.50	17	7.17	1160	106	NA
WS06A	2.40	8	7.59	115	12	NA
WS06A	3.50	11	7.11	1540	40	NA

Note: *Soil was too acidic to measure total SO_4.

5.4 Coal and Mining

1 No. intact coal seam believed to be the Dunsil or Gawber coal seam was encountered in BH02 at a depth of 22.1m with a thickness of 0.4m. No evidence of previous shallow mining activity was encountered in any of the boreholes including no loss of flush or soft spots.

6.0 MATERIAL PROPERTIES

The ground conditions as encountered in the investigations have been interpreted in order to derive geotechnical material parameters.

Material properties are derived from laboratory testing, in-situ testing and soils descriptions.

6.1 ① Pogmoor Recreation MADE GROUND (Granular)

This strata was encountered as black and brown gravelly clayey SAND. Gravel is of siltstone, mudstone, sandstone, clinker, slag, brick and pottery. The strata was highly variable and as a result classifying accurate and reliable material parameters for design is difficult.

4 No. PSD tests were completed on samples of made ground taken from WS01 and WS03. Based on these tests the average make up of ground is 40% gravel, 27% sand and 33% fines (clay and silt). Based on the soil description, PSD results and BS8004:2015 [2] the angle of shearing resistance is estimated to be between 25° and 30° with a unit weight of 18kN/m^3.

3 No. SPTs were carried out in WS01 and WS03 recording SPT N values of 6 (1.2m), 8 (2.0m) and 7 (1.2m). Applying overburden correction factors (after Seed et. al) [3] SPT's are 10, 11 and 11 yielding an average N value of 10.6.

Using Terzaghi's correlation [6] based on the recorded N values, the angle of shearing resistance is calculated as 30° classifying the relative density of this strata as loose to medium dense. It is recommended that a characteristic angle of shearing resistance 28° and unit weight of 18kN/m^3 are selected for design.

6.2 ② Penny Pie Park MADE GROUND (Granular)

This strata was encountered as dark brown slightly clayey gravelly SAND. Gravel is of glass, plastic, clinker, shale, metal, brick and general household waste. The strata was highly variable and as a result classifying accurate and reliable material parameters for design is difficult.

6 No. PSD tests were completed on samples of made ground taken from WS05 and WS06A. Based on these tests the average make up of ground is 51% gravel, 31% sand and 18% fines (clay and silt). Based on the soil description, PSD results and BS8004:2015 [2] the angle of shearing resistance is estimated to be between 25° and 30° with a unit weight of 18kN/m^3.

11 No. SPTs were carried out in BH02, WS05 and WS06A recording SPT N values of 14 (7.1m), 5 (1.2m), 0 (2.0m), 5 (3.0m), 5 (4.0m), 9 (5.0m), 12 (6.0m), 12 (7.0m), 1 (1.2m), 0 (2.0m) and 3 (3.0m). Applying overburden correction factors (after Seed et. al) [3] SPT's are 12, 8, 0, 7, 6, 9, 11, 10, 2, 0 and 4 yielding an average N value of 6.2.

Using Terzaghi's correlation [6] based on the recorded N values, the angle of shearing resistance is calculated as 28.5° classifying the relative density of this strata as loose. It is recommended that a characteristic angle of shearing resistance 27° and unit weight of 18kN/m^3 are selected for design.

6.3 ③ Penny Pie Park MADE GROUND (Cohesive)

This strata was encountered in BH02 as dark brown mottled red slightly gravelly sandy CLAY. Gravel is brick, siltstone, paper and concrete.

1 No. SPT was carried out yielding an N value of 14. Adopting Stroud and Butler's relationship [5] the undrained shear strength of these strata is estimated to be 60kPa and the modulus of volume compressibility is estimated to be 0.16m^2/MN.

It is recommended that a characteristic design shear strength and modulus of volume compressibility are taken as 50kPa and 0.20m^2/MN respectively.

6.4 ④ Weathered / Reworked Bedrock (Cohesive)

This strata was encountered as soft light brown grey mottled orange slightly gravelly sandy CLAY. Gravel is sandstone.

1 No. SPT was carried out yielding an N value of 22. Adopting Stroud and Butler's relationship [5] the undrained shear strength of these strata is estimated to be 100kPa and the modulus of volume compressibility is estimated to be 0.10m^2/MN.

It is recommended that a characteristic design shear strength and modulus of volume compressibility are taken as 100kPa and 0.10m^2/MN respectively.

6.5 ⑤ Pennine Middle Coal Measures (Rock)

This strata was typically encountered as very weak to moderately weak interbedded siltstone and mudstone. Bedding was typically horizontal.

Boreholes BH01, BH02, BH03 and BH04 recorded RQD values of 12, 13, 9, 0, 0, 0, 0, 11, 78, 0, 13, 22, 26, 28, 30, 24, 27 and 11 with an average value of 16.9. This carries a quality classification of "very poor" and a mass factor (j) of 0.2.

4 No. axially oriented Uniaxial Compressive Strength tests were performed on samples of strata recovered from BH01, BH02 and BH04 yielding strengths (q_{uc}) of 0.8, 1.1, 23.0 and 9.7 MPa.

58 No. Point Load Tests were performed on samples of strata taken from BH01, BH02, BH03 and BH04. 28.No tests were axial and yielded an average point load index ($I_{s(50)}$) of 0.488MPa. Tomlinson [3], table 1.4 and table 2.2 estimate the average q_{uc} of mudstone and siltstone coal measures as 8MPa and a ratio between $I_{s(50)}$ and q_{uc} of 13. Using this relationship, the average axially aligned uniaxial compressive strength (q_{uc}) derived from the point load tests is 6.34MPa.

It is recommended that a characteristic unconfined compressive strength of 6MPa and unit weight of 19kN/m^3 are selected for design.

6.6 Material Properties Summary

Table 4.7: Proposed Material Properties

Strata	SPT (N)	Unit Weight (kN/m^3)	Cu (kPa)	ϕ' (º)	Mv (m^2/MN)	q_{uc} (MN/m^2)
① Pogmoor Recreation MADE GROUND (Granular)	10.6	18.0	NA	28.0	NA	NA
② Penny Pie Park MADE GROUND (Granular)	6.2	18.0	NA	27.0	NA	NA
③ Penny Pie Park MADE GROUND (Cohesive)	14.0	18.0	50	NA	0.20	NA
④ Weathered / Reworked Bedrock (Cohesive)	22.0	18.5	100	NA	0.10	NA
⑤ Pennine Middle Coal Measures (Rock)	NA	19.0	NA	NA	NA	6

7.0 GEOTECHNICAL RISK

Geotechnical risk will be considered for the structure. A geotechnical risk register is included as **Appendix II**.

Where a geotechnical risk also represents an unusual health and safety risk that the Contractor may not normally consider these are communicated via inclusion on the drawings and within the Designer's Risk Assessment.

8.0 DESIGN RECCOMENDATIONS

Design options for the proposed structure have been included in options report SL06524-HBPW-xxx-DOC-C-CV-FEA Rev P02 - Feasibility Study.

8.1 Foundation Design

All current proposed designs for the footbridge involve a lightweight steel deck supported on 2 No. concrete foundations.

The ground model directly beneath the structure comprises a highly variable thickness (2.00m to 8.60m) and composition of uncompacted made ground and landfill. As a result, the use of spread footings is not recommended due to the high risk of both total and differential settlement which could lead to serviceability issues and reduced clearance over the railway. It is recommended that the structure be supported on piles that can be socketed into the PMCM bedrock as this solution will minimise the potential settlement and provide a more consistent foundation on both sides of the footbridge.

Driven or displacement piles could encounter difficulties with drivability as the made ground is highly variable and obstructions such as tyres and concrete are present. Difficulties may also arise from the interbedded siltstone and mudstone. This may be too hard to drive the piles to achieve an adequate socket and as a result these types of piles are not recommended.

Bored piles would require extensive casing throughout the made ground deposits which will increase the price and timeframe of installation.

Continuous Flight Auger (CFA) piles are considered to be an appropriate solution as they will be able to achieve an adequate socket into bedrock and negate the need to case through deep made ground deposits.

It is advised that in designing the piles any potential benefit for the made ground or landfill is discounted as the material is both highly inconsistent and likely to continue settling to some degree potentially causing negative skin friction. For initial designs 300mm Ø piles are advised and are expected to require a 2-3m socket into mudstone bedrock to provide adequate support.

CFA piles and the formation of a pile cap will require excavation and removal of potentially hazardous landfill material. Any arisings from the site will have to be correctly categorised and disposed of in a licenced waste facility. WAC testing was performed on a sample of arisings from Penny Pie Park and is included in the Central Alliance factual report (see **Appendix I**).

8.2 Earthworks Design

The bridge may require earth approach ramps in some configurations which will add significant overburden to the highly compressible made ground / landfill deposits. As a result, high amounts of total settlement and differential settlement between the bridge deck and ramps are expected which could lead to additional maintenance and serviceability issues.

If approach ramps are required it is advised that expected potential settlement is assessed and some means of spreading and evenly distributing the additional overburden are utilised such as a relief slab, geogrids and/or a basal mattress.

8.3 Potential Contamination

The made ground beneath the structure is comprised of landfill believed to have been deposited between 1930 and 1960. The ground contains glass, sharps and several potentially harmful products. Additionally, evidence of medical waste was encountered in trial trenches. A more complete assessment has been undertaken in Section 9.

These deposits have been tested for Waste Acceptance Criteria and for several harmful chemicals including Asbestos (see **Appendix I**). It is advised that where possible the amount of landfill material extracted and removed from site is minimised as much as is practically possible.

9.0 ENVIRONMENTAL ASSESMENT

9.1 Chemical Testing Results

The site should be classified as brownfield due to the site development history. The potential sources of contamination onsite are considered to be associated with the former uses.

The site is proposed to be developed with a public pedestrian footbridge, considering this, values for a "Public Open Space (park)" scenario have been adopted at this stage. GAC trigger values have been taken from LQM/CIEH S4UL's (2015).

For the purposes of risk assessment, the following significant strata types were identified:

- ②/③ Penny Pie Park Made Ground (Landfill)

The full results of the chemical testing are enclosed as **Appendix I**; however, the results are discussed below:

9.1.1 ②/③ Penny Pie Park Made Ground (Landfill)

5 No. soil samples from this strata have been tested for a general suite, including heavy metals, Total Petroleum Hydrocarbons (TPHs) and polycyclic aromatic hydrocarbons (PAHs). Comparing values against GAC's for public open space only one exceedance was noted.

Sample no 3 from TT01 tested for 2020mg/kg of Lead, exceeding the allowable value of 1300mg/kg. the 4 No. other samples all recorded lead content below the trigger value.

5 No. samples from this horizon have been tested for the presence of asbestos. During the screening no asbestos was identified in any samples.

1 No. samples from this horizon were subjected to Waste Acceptance Criteria (WAC) testing. The results are enclosed within **Appendix I**.

9.1.2 Buried Concrete Design

As a part of the geochemical analysis, soil samples for each strata were analysed for pH and water soluble sulphate.

The results were assessed with BRE Special Digest 1. The site is categorised as a Brownfield location. The groundwater is considered to be mobile.

pH values ranged between 3.89 to 7.74, total sulphate levels between 0.12% and 0.69% and water-soluble sulphate levels ranged between 26 and 1540 mg/l.

In accordance with guidance in BRE Special Digest 1 (2005), the Design Sulphate Class for the soils was indicated to be DS-3. The ACEC Class for foundations within both the made ground and natural soils would be AC-5 in mobile groundwater.

9.2 Risk Assessment

Considering the exceedance of the Lead GAC within the Penny Pie Park made ground (Landfill) and its description, it is considered that the made ground material on site presents a medium risk to the construction workers and end users. Additionally, the presence of glass and potential medical waste poses a potential hazard.

9.3 Revised Conceptual Site Model

The Penny Pie Park made ground (Landfill) has been proven to contain lead concentrations above the GAC values and high concentrations of glass and other sharps. Therefore, this made ground material is not considered suitable for reuse onsite.

A review of the proposed development shows that the majority of the site is to be left unaffected by the footbridge. As a result, the contaminants in the made ground are not considered to pose an increased risk to end users.

9.4 Recommended Remedial Strategy

Based on the results of the investigation, the Revised Conceptual Site Model and the Risk Assessments, it is considered that the made ground (Landfill and General Fill) is not suitable for re-use on site in their current state.

It is recommended that the made ground material currently on site should be either placed below hard standing or if present in landscaped areas be capped with 300mm of clean capping material with a minimum of 150mm of topsoil. Should all made ground be removed from landscaped areas then the requirement for a capping layer will be removed. It is recommended that a Remediation Method Statement (RMS) is completed for the site.

Excavations into made ground should be minimised where practicable and arisings must be disposed of appropriately.

9.5 Health & Safety

During the reclamation and construction phases of the site development it will be necessary to protect the health and safety of site personnel. General guidance on these matters is given in the Health and Safety Executive (HSE) document “Protection of Workers and the General Public during the Redevelopment of Contaminated Land”. The guidance is useful whether contamination is present or not.

In summary, the following measures are suggested to provide a minimum level of protection:

- All ground workers should be issued with the relevant protective clothing, footwear and gloves. These protective items should not be removed from the site and personnel should be instructed as to why and how they are to be used;
- Hand-washing and boot-washing facilities should be provided;
- Good practices relating to personal hygiene should be adopted on the site, and;
- The contractor shall satisfy the Health and Safety Executive with regard to any other matters concerning the health, safety and welfare of persons on the site.

9.6 Waste Disposal

Due to the implementation of the Landfill Directive the details of any soils which may require removal from the site should be supplied to the proposed disposal point for clarification on whether a suitable license is held to receive materials with the contamination levels recorded.

9.7 Service Pipes

No special precautions to protect water supply mains from soil contaminants are considered necessary.

10.0 REFERENCES

1. Design Manual for Roads and Bridges, Volume 4 Section 1, HD22/08 Managing Geotechnical Risk.

2. BS8002:2015; Code of practice for foundations.

3. Tomlinson, M. J (2001) Foundation Design and Construction 7th edition, Pearson Education Limited, Essex.

4. NR/L3/CIV/071 Level 3 Geotechnical Design. 3rd September 2011.

5. Stroud MA, and Butler, F, G, 1975, The standard penetration test and The Engineering Properties of Glacial Materials. Proceedings of the European Symposium on Penetration testing,2.

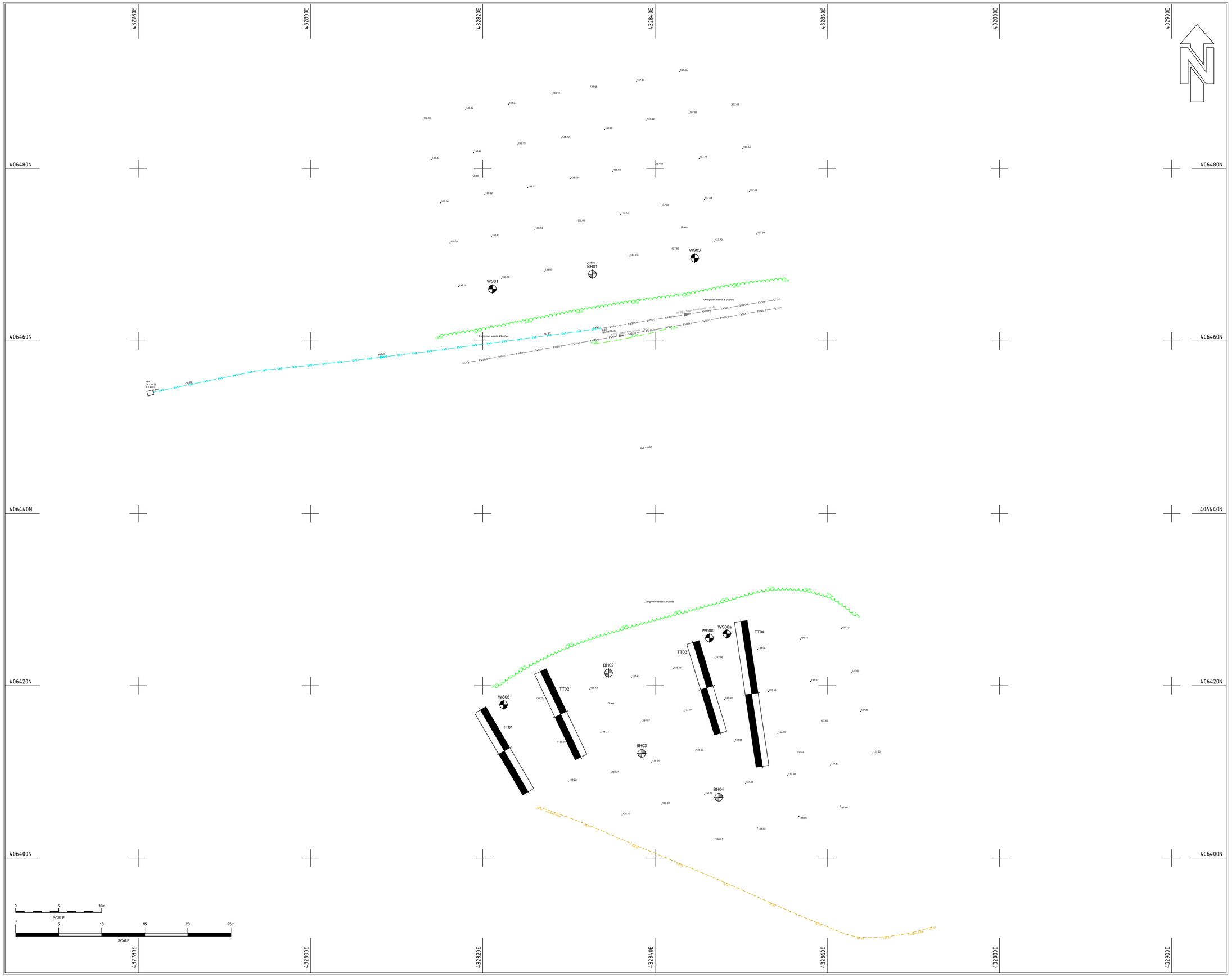
6. Terzaghi, K & Peck, R. B (1967) Soil Mechanics in Engineering Practice 2nd Edition.

7. Bowles, J. E (1977) Foundation Analysis & Design 2nd Edition.

8. BS5930:1999 British Standard, Code of Practice for Site Investigations.

9. BRE Special Digest 1, Concrete in Aggressive Ground, September 2001.

DRAWINGS



LEGEND

- Surface Drainage
- Surface Edge
- Banking
- Vegetation Extents
- Borehole (BH)
- Window Sample (WS)
- Trial Trench (TT)

MANUFACTURERS STATED DEPTHS

- Service found by Electro Magnetic / Radio Frequency Location eg. Any metalic pipe or power carrying cable
- Service found by Electro Magnetic Location using a Sonde eg. Drainage / empty duct
- Service found by Ground Probing Radar eg. Any pipe or any service that could not be located by other means

ABBREVIATIONS

AC	Asbestos Cement	FH	Fire Hydrant	RW	Retaining Wall
ACU	Air Conditioning Unit	FS	Flag Staff	S	Stump
AR	Assumed Route	G	Gully	SA	Soakaway
AV	Air Valve	GPRI	GPR Inconclusive	SC	Speed Camera
BB	Belisha Beacon	GV	Gas Valve	SF	Safety Fence
BD	Back Drop	H/R	Hand Rail	SI	Spun Iron
BdL	Bed Level	IC	Inspection Cover	SL	Soffit Level
BH	Borehole	IL	Invert Level	SP	Sign Post
Bk	Brick	I/R	Iron Rail Fence	S/R	Steel Railings
BL	Basement Light	K/O	Kerb Outlet	SS	Structure Support
BO	Bollard	LB	Letter Box	ST	Stop Tap
BW	Brick	LC	Lighting Column	Stn	Survey Station
BS	Bus Stop	LH	Lamp Hole	SV	Stop Valve
BT	British Telecom Cover	LOR	Loss Of Reflection	SVP	Soil Vent Pipe
B/W	Barbed Wire Fence	LOS	Loss Of Signal	SW	Stone Wall
Cam	Camera	M/C	Multiple Cables	Tac	Tactile Paving
CAT	Catenary Level	MH	Manhole Cover	TCB	Telephone Call Box
C/B	Close Boarded Fence	Mkr	Marker Post	TFR	Taken From Records
CC	Control Cabinet	MP	Mile Post/Stone	TH	Trial Hole / Pit
CI	Cast Iron	N/FI	No Further Information	TOW	Top Of Wall
CL	Corrugated Iron Fence	NP	Name Plate	TP	Telegraph Pole
CoL	Coping Level	N/V	Not Fully Visible	TS	Traffic Signals
C/L	Chain Link Fence	OSA	Off Survey Area	UTCA	Unable to Gain Access
Co	Concrete	P	Post	UTL	Unable to Locate
CP	Catch Pit	PE	Polyethylene	UTR	Unable to Raise
CpL	Coping Level	PL	Plastic	UTS	Unable to Survey
CTV	Cable TV	P/L	Palisade Fence	UTT	Unable to Trace
CW	Concrete Wall	PM	Parking Meter	VC	Vitrified Clay
DI	Ductile Iron	P/R	Post and Rail Fence	VDP	Vehicle Detector Pads
dil	Dilapidated	PVC	Polyvinylchloride	VP	Vent Pipe
D/W	Dry Stone Wall	R/W	Retaining Wall Fence	WC	Water Course
EB	Electricity Box	RP	Rodding Eye	WL	Water Level
E/F	Electric Fence	RS	Road Sign	WM	Water Meter
EOT	End of Trace	RL	Rail Level	W/M	Wire Mesh Fence
EP	Electricity Pole	RP	Reflector Post	WO	Water Wash Out
ER	Earth Rod	RS	Road Sign	WS	Window Sample
FFL	Finished Floor Level	RWP	Rain Water Pipe	WV	Wheel Valve

DISCLAIMER

Unless otherwise stated, all services shown on this plan have been surveyed using approved detectors and the connections between manholes, if not traced, are assumed to be direct.
Locational accuracy is determined by referring to manufacturers guidelines for the detectors used, however in ideal conditions this can generally be considered to be +/-5% for Electromagnetic Tracing methods and +/-10% for Ground Penetrating Radar methods.
Should the background information for the survey area be based on 3rd party topographical survey data, or an Ordnance Survey tile, we are not liable for any loss which may arise due to a lack of accuracy in that digital data.
Some above ground features may have been obscured at the time of survey, therefore no guarantee can be given that all services have been shown.
Reference should be made to the methodology used on site as detailed within the latest version of Central Alliance's Site Procedures for Utility Location Surveys and RICS guidelines for Surveys of Land, Buildings and Utility surveys at scales of 1:500 and Larger.
Excavations in the vicinity of services shown are to be carried out with due diligence (Ref: HS(G)47.)
We are not permitted to lift any BT inspection covers, therefore, where not located by other means, their information will be shown from any available guided information.
We will always consult the Utility providers details, if supplied prior to survey commencement, as guide for location purposes.
Should we be unable to locate any guided services, the information will be shown as "Taken From Records" on the drawing, however we cannot be held liable for any loss that may arise due to a lack of accuracy in that guided information.
"Electromagnetic tracing is a reliable method of locating buried services. On heavy, built up sites 85% completeness is common, all that can be expected.
"Plan accuracies of the order of + or - 150mm may be achieved but this figure will depend on the depth of the service below ground level. Where similar services run in close proximity, separation may be impossible. Successful tracing of non-metalic pipes may be limited.

Penny Pie Park Footbridge GI Locations

TT01	432822.499	406412.435	138.178
WS05	432822.418	406417.800	138.208
TT02	432829.053	406416.680	138.151
BH02	432834.616	406421.478	138.041
BH03	432838.458	406412.143	138.136
BH04	432847.407	406407.055	138.045
TT03	432846.016	406419.755	137.955
WS06	432846.322	406425.539	137.953
WS06a	432848.353	406426.021	137.951
TT04	432851.229	406419.056	137.784
BH01	432832.745	406467.759	138.052
WS03	432844.609	406469.641	137.782
WS01	432821.124	406466.042	138.152

REV.	DETAILS	BY	DATE
A	GI locations added to the drawing	TR	Jan 20

GRID: ORDNANCE SURVEY Related to OS Network Reference Stations by VRS (RTK) observations.
DATUM: ORDNANCE SURVEY Related to OS Network Reference Stations by VRS (RTK) observations.

CENTRAL ALLIANCE GEO
RSK
Tel: (0)1924 229889
Email: info@central-alliance.co.uk
Web: www.central-alliance.co.uk
Alliance House, South Park Way,
Wakefield 41 Business Park,
Wakefield, WF2 0XJ

CLIENT:
HBPW Consulting
43 Bridgegate
Retford
Nottinghamshire

SITE LOCATION:
Dodworth
Site off A628 Dodworth Road, Barnsley

SURVEY TITLE:
Exploratory Hole Location Plan

SURVEYED BY:	DATE:	DRAWING NUMBER:
DB	Dec 2019	2370414_P - Rev.A
DRAWN BY:	DATE:	SCALE:
TR	Dec 2019	1:200 @ A0
APPROVED BY:	DATE:	SHEET NUMBER: / REV:
TR / RH	Dec 2019	1 of 1 A0 / A

APPENDIX I

Central Alliance Ground Investigation Factual Report

CENTRAL ALLIANCE
GEO

Ground Investigation Factual Report

Penny Pie Park/ Pogmoor Recreation Ground Footbridge

HBPW

February 2020

EXPLORE > IDENTIFY > DELIVER

Ground Investigation Factual Report

Penny Pie Park/ Pogmoor Recreation Ground Footbridge

HBPW

February 2020

REPORT QUALITY ASSURANCE SHEET			
2370414 -FAC-02		Prepared by	Approved by
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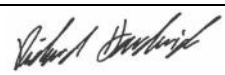
		Graduate Geo-Environmental Engineer	Associate Geo-Environmental Engineer
02	***FINAL***		
		Thomas Goldsby-West	**Richard Hardwick**
		Innovation & Research Engineer	Associate Geo-Environmental Engineer
Distribution: HBPW, Barnsley MBC			

Penny Pie Park / Pogmoor Recreation Ground Footbridge

GROUND INVESTIGATION FACTUAL REPORT

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FIGURES

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APPENDICES

1.0 INTRODUCTION

1.1 Instruction

Central Alliance Pre-Construction Services Limited (Central Alliance) was instructed by HBPW (on behalf of Barnsley Metropolitan Borough Council) to undertake intrusive ground investigation at their site in Barnsley at Penny Pie Park adjacent to Dodworth Road and at Pogmoor Recreational Ground adjacent to Pogmoor Road.

The scope of the investigation was designed by HBPW with final exploratory hole locations agreed between HBPW and Central Alliance, following consideration of the existing site conditions and site access restrictions.

1.2 Objectives

The objective was to obtain geological data across the site, to establish geotechnical properties and investigate presence of below ground contamination for a new proposed pedestrian footbridge over the railway.

The aim of this report is to present the findings and information obtained during the ground investigation and includes the following;

- A factual description of the work undertaken.
- Maps and plans.
- Exploratory hole logs and Photographs.
- Laboratory testing results.

1.3 Limitations

This report presents a description of the site at the time of the fieldwork, results of the fieldwork and in-situ testing undertaken, strata encountered and geotechnical and geo-environmental laboratory test results.

Any of the comments and opinions contained within this report, are based on the information obtained by Central Alliance during the investigation.

There may be other conditions prevailing at the site which have not been disclosed by this investigation and which have not been considered by this report. Responsibility cannot be accepted for conditions at the site not revealed by the investigation and confirmation of intermediate ground conditions between exploratory holes should be considered if deemed necessary.

Unless instructed by the client Central Alliance is not obliged to and disclaims any obligation to update the report for events taking place after the date on which this investigation was undertaken.

This report has been produced for the use by HBPW and Barnsley Metropolitan Borough Council. No other third parties may rely upon or reproduce the contents of this report without the written permission of Central Alliance. If any unauthorised third party comes into possession of this report, they rely on it at their own risk and the authors do not owe them any Duty of Care or Skill.

2.0 SITE DETAILS

2.1 Site Location

The site is in the Pogmoor area of Barnsley and is bisected by a railway line. The southern side of the railway line incorporates Penny Pie Park and is located off Dodworth Road, S75 2EN at GR SE328064. The area of the site on the northern side of the railway line, incorporates Pogmoor Recreational Ground, and is located off Pogmoor Road. Access is from Glendale Close.

A Site Location Plan showing the site extents is provided as Figure No. 1.

Figure 2370414.-FIG-01 – Site Location Plan

2.2 Site Description

Penny Pie Park and Pogmoor Recreation Ground are located on the southern and northern side of the railway line which runs in a north east, south west orientation. Pogmoor Recreation Ground is relatively flat lying and includes a number of grassed sports pitches. The site on the southern side of the railway line known as Penny Pie Park has undulating ground in places, protected trees along the edge of the park and in the centre of the park and pedestrian pathways throughout. In the north east corner of Penny Pie Park there was Japanese Knotweed which was fenced off prior to the works beginning.

2.3 **Published Geology**

2.3.1 Made Ground

From the published geology, the site is not indicated to be underlain with deposits of Made Ground, however, historic clay pits and landfill activity are known in this area and therefore made ground is anticipated.

2.3.2 Superficial Deposits

The published geology of the area indicates that there are no superficial deposits at the site however residual soils are anticipated.

2.3.3 Solid Geology

The solid geology comprises of the Carboniferous Pennine Middle Coal Measures Formation described as Sandstone, Siltstone and Mudstone with coal seams formed approximately 310 – 318 million years ago.

3.0 FIELDWORK

3.1 Scope of Fieldwork

The ground investigation works were completed by Central Alliance between 4/12/2019 and the 17/12/2019 with works completed during normal weekday shifts.

The investigation was specified by HBPW and included the following works:

- 4 No. Rotary Boreholes (BH01, BH02, BH03, BH04).
- 4 No. Trial Trenches (TT01, TT02, TT03, TT04).
- 5 No. Window Sample Holes (WS01, WS03, WS05, WS06, WS06A).
- Laboratory Testing.

The fieldworks were supervised by a suitably qualified Geo-Environmental Engineer provided by Central Alliance. All fieldwork was carried out in general accordance with Eurocode 7, BS5930 'Code of Practice for Site Investigations' – (2015); BS10175 'Investigation of potentially contaminated sites – Code of Practice (2001), Association of Geotechnical and Geo-environmental Specialist Guidelines for Good Practice in Site Investigations (August 1998) and logged in accordance with BS EN ISO 14688-1:2004 and BS EN ISO 14688-2 (2004).

The final locations of exploratory holes were determined by the presence of underground services, practicalities and any site access restrictions. The locations of exploratory holes are indicated on drawing CA-2370414-GI with coordinates and levels recorded on the individual exploratory hole logs presented in Appendix A.

3.2 Hand Excavated Inspection Pits

Prior to the drilling of boreholes and where considered necessary, hand excavated inspection pits were completed to a depth of 1.20m bgl, to confirm the absence of buried services. Inspection pits were excavated with caution with CAT (Cable Avoidance Tool) scanning, by a competent person, completed at surface and then at 0.30m intervals throughout. WS06 refused at 0.6m bgl when digging the inspection pit, so was relocated and renamed WS06A.

3.3 Dynamic Sampling

4 No. locations (WS01, WS03, WS05 and WS06A) were completed to depths between 3.45m bgl and 7.45m bgl, using a tracked window sample rig. The Dynamic Sampling rig used to complete the works was a Boart Longyear DB501.

The holes were formed using conventional equipment comprising 1 metre long steel cylinders with an internal plastic liner. The steel tubes were repeatedly driven into the ground at progressive depths using rods connected to a percussive hammer on the rig.

Standard Penetration Tests (SPTs) were undertaken in accordance with BS EN ISO 22476-3:2005 using a split spoon sampler at 1 metre intervals. The results of these tests are presented as a Standard Penetration 'N' value or as a blow count for a given penetration at the appropriate position on the borehole log.

The SPT calibration details are presented within the individual exploratory hole records.

Representative disturbed (D), bulk disturbed (B), undisturbed (U) and environmental samples (ES) were taken and placed in sealed containers for transportation to the

laboratory. Depths of samples recovered are shown on the exploratory hole logs presented in Appendix A.

3.4 Rotary Boreholes

Boreholes BH01, BH02, BH03, BH04 were undertaken to depths of between 9.90m bgl and 41.10m bgl.

BH01, BH02, BH03, BH04 were formed using a combination of open hole and rotary coring methods utilising PWF casings and a PWF 1.5 long core barrel with a Polycrystalline Diamond (PCD) core bit and water flush to produce cores of a nominal 92mm diameter.

For full details of the strata encountered, samples taken, in-situ testing and calibration certificates please refer to the individual exploratory hole records presented in Appendix A.

Core photographs are presented in Appendix B of this report.

Boreholes BH02 and BH04 were extended by rotary open hole techniques to depths of 41.10m bgl and 14.50m bgl respectively. All rotary boreholes were completed using a tracked Fraste PLG Rotary Rig.

The open hole sections of boreholes were completed using a roller cone bit and water flush techniques. 1.5m steel casings were used to maintain flush returns and prevent the hole from collapsing in non-cohesive materials.

3.5 Machine Excavated Trial Trenches

4 No. machine excavated trial trenches, were excavated to depths between 3.40m bgl and 3.60m bgl. The trial holes were undertaken using a tracked 360 excavator and terminated due to the machine achieving maximum excavation depth.

Representative disturbed (D), bulk disturbed (B) and environmental samples (ES) were taken and placed in sealed containers or bulk bags for transportation to the laboratory.

Trial trench photographs are presented in Appendix B of this report.

4.0 LABORATORY TESTING

4.1 Geotechnical Testing

Laboratory testing was scheduled by HBPW on selected soil and rock samples recovered during the investigation. The samples were sent to Structural Soils Laboratory, at their testing facility in Castleford.

The programme of laboratory testing was carried out in accordance with the laboratory's UKAS accreditation and the guidance given in the British Standard BS1377 (1990): "Methods of Test for Soils for Civil Engineering Purposes" unless stated otherwise.

The following tests have been scheduled on selected samples to date.

Soil:

- Particle Size Distribution (Sieve).

Rock:

- Point Load.
- Unconfined Compressive Strength.

Completed geotechnical laboratory test results are to be presented in Appendix C.

4.2 Chemical Testing

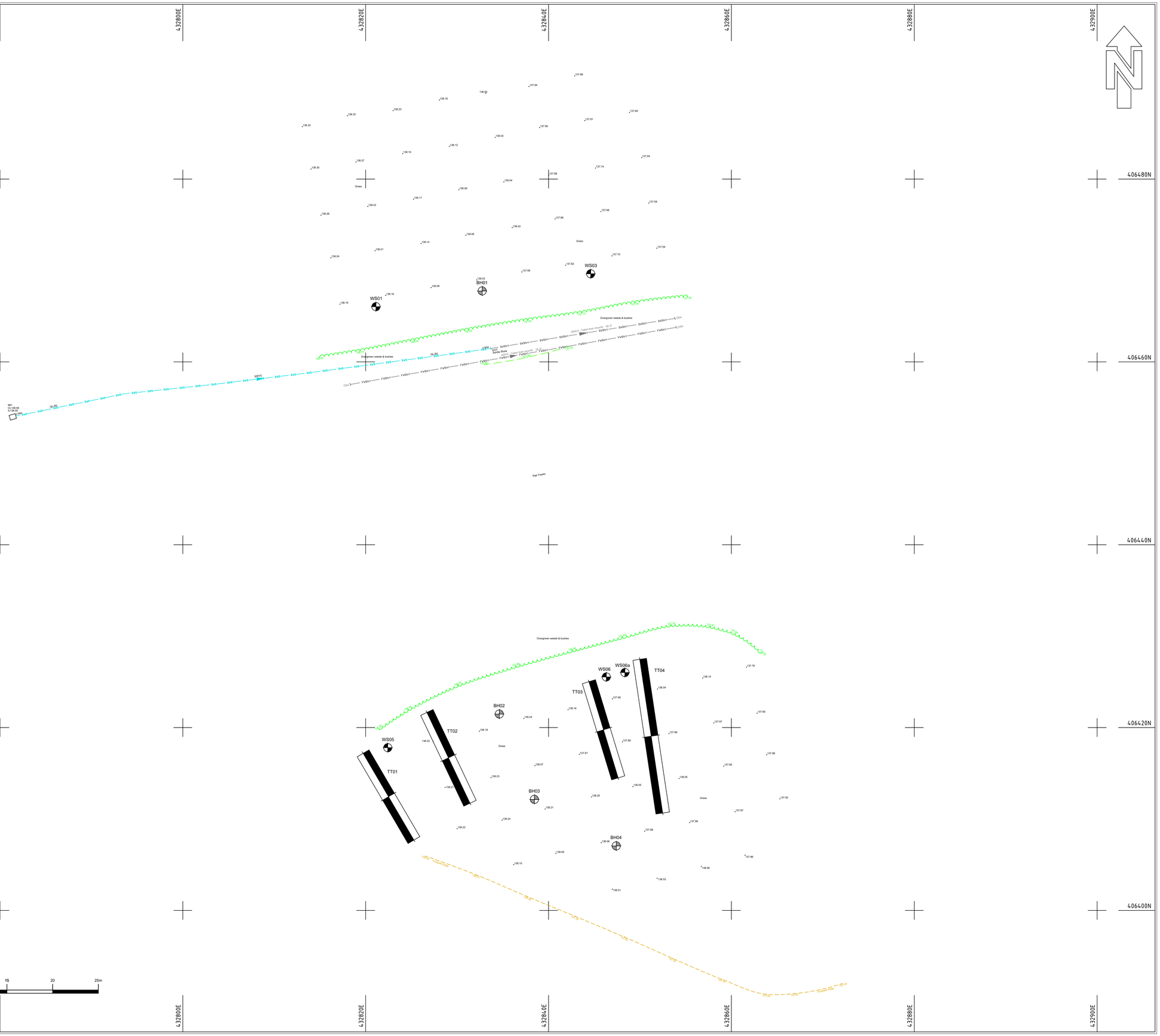
Chemical testing was scheduled by HBPW on selected samples recovered during the ground investigation. The samples were sent to Envirolab Laboratory at their laboratory in Hyde.

All testing was carried out in accordance with the laboratory's UKAS accreditation with the following tests scheduled:

- Asbestos.
- WAC Testing.
- BRE SD1 Full Suite.
- Suite C.

Full details of the chemical analyses are presented in Appendix D.

DRAWINGS



LEGEND

- Surface Drainage
- Surface Edge
- Banking
- Vegetation Extents
- Rotary Borehole (BH)
- Window Sample (WS)
- Trial Trench (TT)

MANUFACTURERS STATED DEPTHS

- Service found by Electro Magnetic / Radio Frequency Location eg. Any metalic pipe or power carrying cable
- Service found by Electro Magnetic Location using a Sonde eg. Drainage / empty duct
- Service found by Ground Probing Radar eg. Any pipe or any service that could not be located by other means

ABBREVIATIONS

AC	Asbestos Cement	FH	Fire Hydrant	RW	Retaining Wall
ACU	Air Conditioning Unit	FS	Flag Staff	S	Stump
AR	Assumed Route	G	Gully	SA	Soakaway
AV	Air Valve	GPRI	GPR Inconclusive	SC	Speed Camera
BB	Belisha Beacon	GV	Gas Valve	SF	Safety Fence
BD	Back Drop	H/R	Hand Rail	SI	Spun Iron
BdL	Bed Level	IC	Inspection Cover	SL	Soffit Level
BH	Borehole	IL	Invert Level	SP	Sign Post
Bk	Brick	I/R	Iron Rail Fence	S/R	Steel Railings
BL	Basement Light	KO	Kerb Outlet	SS	Structure Support
BO	Bollard	LB	Letter Box	ST	Stop Tap
BW	Brick	LC	Lighting Column	Stn	Spot Station
BS	Bus Stop	LH	Lamp Hole	SV	Stop Valve
BT	British Telecom Cover	LOR	Loss Of Reflection	SVP	Soil Vent Pipe
B/W	Barbed Wire Fence	LOS	Loss Of Signal	SW	Stone Wall
Cam	Camera	M/C	Multiple Cables	Tac	Tactile Paving
CAT	Catenary Level	MH	Manhole Cover	TCB	Telephone Call Box
C/B	Close Boarded Fence	Mkr	Marker Post	TFR	Taken From Records
CC	Control Cabinet	MP	Mile Post/Stone	TH	Trial Hole / Pit
CI	Cast Iron	N/FI	No Further Information	TOW	Top Of Wall
CL	Corrugated Iron Fence	NP	Name Plate	TP	Telegraph Pole
C/L	Centre Line	N/PV	No Paint Visible	TS	Traffic Signals
C/L	Chain Link Fence	OSA	Off Survey Area	UTGA	Unable to Gain Access
Co	Concrete	P	Post	UTL	Unable to Locate
CP	Catch Pit	PE	Polyethylene	UTR	Unable to Raise
Cpl.	Coping Level	PL	Plastic	UTS	Unable to Survey
CTV	Cable TV	P/L	Palisade Fence	UTT	Unable to Trace
CW	Concrete Wall	PM	Parking Meter	VC	Vitrified Clay
DI	Ductile Iron	P/R	Post and Rail Fence	VDP	Vehicle Detector Pads
dil	Dilapidated	PVC	Polyvinylchloride	VP	Vent Pipe
D/W	Dry Stone Wall	P/W	Post and Wire Fence	WC	Water Course
EB	Electricity Box	RP	Rodding Eye	WL	Water Level
E/F	Electric Fence	RS	Road Sign	WM	Water Meter
EOT	End of Trace	RL	Rail Level	W/M	Wire Mesh Fence
EP	Electricity Pole	RP	Reflector Post	WO	Water Wash Out
ER	Earth Rod	RS	Road Sign	WS	Window Sample
FFL	Finished Floor Level	RWP	Rain Water Pipe	WV	Wheel Valve

DISCLAIMER

Unless otherwise stated, all services shown on this plan have been surveyed using approved detectors and the connections between manholes, if not traced, are assumed to be direct.
Locational accuracy is determined by referring to manufacturers guidelines for the detectors used, however in ideal conditions this can generally be considered to be +/-5% for Electromagnetic Tracing methods and +/-10% for Ground Penetrating Radar methods.
Should the background information for the survey area be based on 3rd party topographical survey data, or an Ordnance Survey tile, we are not liable for any loss which may arise due to a lack of accuracy in that digital data.
Some above ground features may have been obscured at the time of survey, therefore no guarantee can be given that all services have been shown.
Reference should be made to the methodology used on site as detailed within the latest version of Central Alliance's Site Procedures for Utility Location Surveys and RICS guidelines for Surveys of Land, Buildings and Utility surveys at scales of 1:500 and Larger.
Excavations in the vicinity of services shown are to be carried out with due diligence (Ref: HS(G)47.)
We are not permitted to lift any BT inspection covers, therefore, where not located by other means, their information will be shown from any available guided information.
We will always consult the Utility providers details, if supplied prior to survey commencement, as guide for location purposes.
Should we be unable to locate any guided services, the information will be shown as "Taken From Records" on the drawing, however we cannot be held liable for any loss that may arise due to a lack of accuracy in that guided information.
"Electromagnetic tracing is a reliable method of locating buried services. On heavy, built up sites 85% completeness is achieved, all that can be expected.
"Plan accuracies of the order of + or - 150mm may be achieved but this figure will depend on the depth of the service below ground level. Where similar services run in close proximity, separation may be impossible. Successful tracing of non-metalic pipes may be limited.

GI Locations

TT01	432822.499	406417.435	138.178
WS05	432822.418	406417.800	138.208
TT02	432829.053	406416.680	138.151
BH02	432834.616	406421.478	138.041
BH03	432838.458	406412.143	138.136
BH04	432847.407	406407.055	138.045
TT03	432846.016	406419.755	137.955
WS06	432846.322	406425.539	137.953
WS06a	432848.353	406426.021	137.951
TT04	432851.229	406419.056	137.784
BH01	432832.745	406467.759	138.052
WS03	432844.609	406469.641	137.782
WS01	432821.124	406466.042	138.152

REV.	DETAILS	BY	DATE
A	GI locations added to the drawing	TR	Jan 20

GRID: ORDNANCE SURVEY Related to OS Network Reference Stations by VRS (RTK) observations.
DATUM: ORDNANCE SURVEY Related to OS Network Reference Stations by VRS (RTK) observations.

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Web: www.central-alliance.co.uk
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Wakefield 41 Business Park,
Wakefield, WF2 0XJ

CLIENT:
HBPW Consulting
43 Bridgegate
Retford
Nottinghamshire

SITE LOCATION:
Penny Pie Park / Pogmoor Recreation Ground
Off A628 Dodworth Road, Barnsley

SURVEY TITLE:
Exploratory Hole Location Plan

SURVEYED BY:	DATE:	DRAWING NUMBER:	
DB	Dec 2019	2370414_P - Rev.A	
DRAWN BY:	DATE:	SCALE:	
TR	Dec 2019	1:200 @ A0	
APPROVED BY:	DATE:	SHEET NUMBER:	REV:
TR / RH	Dec 2019	1 of 1 A0	A

APPENDIX A
EXPLORATORY HOLE LOGS

Central Alliance Pre Construction Services
Unit 3A, South Park Way, Wakefield 41 Business Park
Wakefield, WF2 0XJ.
Telephone: 01924 229 889
Internet www.central-alliance.co.uk

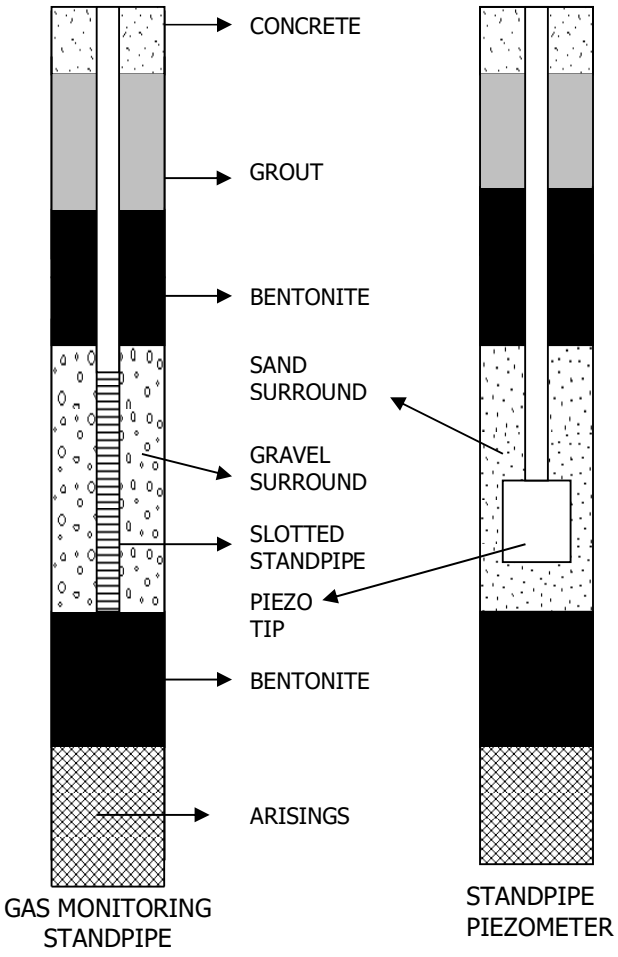
CENTRAL ALLIANCE GEO

EXPLORATORY HOLE LEGEND SHEET

STRATA LEGENDS

- TOPSOIL
- MADE GROUND
- CLAY
- SANDY GRAVELLY CLAY
- ORGANIC CLAY
- SILT
- SAND
- GRAVEL
- SAND & GRAVEL
- PEAT
- COBBLES
- BOULDERS
- MUDSTONE
- SILTSTONE
- SANDSTONE
- LIMESTONE
- CHALK

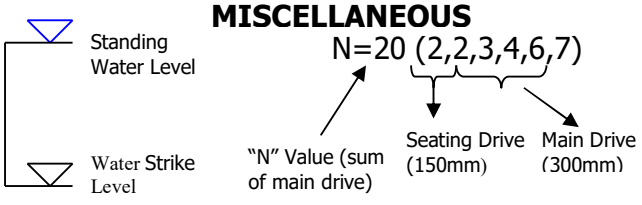
INSTALLATIONS / BACKFILL



SAMPLE / INSITU TEST TYPES

B	Bulk Disturbed Sample
D	Disturbed Sample
W	Water Sample
ES	Environmental Soil Sample
EW	Environmental Water Sample
U	Undisturbed Sample
P	Piston Sample
S	SPT (Split Spoon)
C	CPT / Core Sample
HV	Hand Vane
PID	Photo Ionisation Detector
PP	Pocket Penetrometer

MISCELLANEOUS



CENTRAL ALLIANCE
EXPLORE > IDENTIFY > DELIVER

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Wakefield 41 Business Park
Wakefield WF2 0XJ
Tel: +44 (0)1924 229889
Web: www.central-alliance.co.uk

Log Type	Exploratory Hole Number
Header Sheet	**BH01** FINAL

CENTRAL ALLIANCE GEO

		Location Details				Methodology & Plant				
Project No:	**2370414**	Easting:	**432832.74**	Northing:	**406467.76**	From (m)	Method	Plant Used	Scale:	1:50
Name:	**Penny Pie Park / Pogmoor Recreation Ground Footbridge**	Elevation:	**138.05mAOD**	Final Depth:	**10.00m**	0.00 - 1.20	Inspection Pit	Hand Tools	Checked:	RH
Location:	**Barnsley**	Logger:	**EC**	Grid System:	**OSGB**	1.20 - 4.60	Rotary Open Holing	Fraste PLG	Approved:	RH
Client:	**HBPW**	Orientation:	**N/A**	Inclination:	**90°**	4.60 - 10.00	Rotary Coring	Fraste PLG	Start Date:	16/12/2019
									End Date:	16/12/2019

Hole Diameter

Depth (m)	Diam (mm)
10.00	121

Casing Diameter

Depth (m)	Diam (mm)
4.60	121

Groundwater Strikes

Strike (m)	Casing (m)	Sealed (m)	Time (min)	Rose To (m)	Remarks

No Groundwater Encountered

Installation / Instrument Details

Date	Instrument Details	To (m)	Resp. Zone (m)	Diam (mm)

No Monitoring Point/s Installed

If Methodology includes Dynamic Sampling refer to Runs table for info.

Backfill

Depth (m)	Legend Code
0.00 - 10.00	Bentonite

In-Situ Tests

PID	0
Hand Vane*	0
Standard Penetration Tests	0

* One count indicates an average reported result of 3 tests carried out at one depth where available.

Sample Summary

Environmental Samples			
Soil	0	Water	0
Geotechnical Samples			
Bulk	0	Large Bulk	0
Disturbed	0	Disturbed (NR)	0
Piston	0	Piston (NR)	0
Undisturbed	0	Undisturbed (NR)	0
Undisturbed Thin Wall			0
Undisturbed Thin Wall (NR)			0
Core Sample			11

(NR) Indicates sample undertaken but with 0% Recovery

Standard Penetration Test Summary

Test Type	Depth (m)	Casing (m)	Water (m)	Seating Blows	Main Blows	Penetration Total (mm)	N	Reported Result	Hammer Ref

SPT Hammer Ref.	Energy Ratio (%)

No Standard Penetration Tests Undertaken

Applicable to Cable Percussion Only

Chiselling

Depth (m)	Duration (mins)

Water Added

Depth (m)	Litres

Applicable to Rotary Only

Drilling Flush

Depth (m)	Flush Type	Flush Colour	Return %
0.00 - 10.00	Water	Grey	100

Applicable to Dynamic Sampling Only

Dynamic Sampling Runs

Depth (m)	Diam (mm)	Recovery %	Remarks

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Log Type: **Combined Borehole**

Sheet 1 of 1

Exploratory Hole Number: **BH01**

FINAL

CENTRAL ALLIANCE GEO

Project No:	**2370414**	Location Details		Methodology & Plant	
Name:	**Penny Pie Park / Pogmoor Recreation Ground Footbridge**	Easting: **432832.74**	Northing: **406467.76**	From (m) / Method / Plant Used	0.00 - 1.20 Inspection Pit Hand Tools; 1.20 - 4.60 Rotary Open Holing Fraste PLG; 4.60 - 10.00 Rotary Coring Fraste PLG
Location:	**Barnsley**	Elevation: **138.05mAOD**	Final Depth: **10.00m**	Scale:	1:50
Client:	**HBPW**	Logged By: **EC**	Grid System: **OSGB**	Checked By:	RH
		Orientation: **N/A**	Inclination: **90°**	Approved By:	RH
				Start Date:	16/12/2019
				Finish Date:	16/12/2019

Strata Description	Legend	Depth (m) (Stratum Thickness)	Reduced Level (mAOD)	Hole Ø (mm) Depth (m)	Casing Ø (mm) Depth (m)	Water Level (m)	Installation / Backfill	Samples & Testing: Depth (m) / Ref / Test Results	Method	Coring: Core Run / TCR / SCR / RQD / If
MADE GROUND: Firm brown sandy CLAY TOPSOIL with rootlets. Sand is fine to coarse.		(0.15) 0.15 (0.25) 0.40	137.90 / 137.65						IP	
MADE GROUND: Firm light brown mottled grey sandy CLAY. Sand is fine.										
MADE GROUND: Black gravelly fine to coarse SAND. Gravel is angular fine to coarse brick, slag, clinker and pottery.		(0.80)								
MADE GROUND: Landfill (Driller's Description)		1.20	136.85						RO	
		(3.40)								
Soft reddish grey mottled brown CLAY.		4.60 (0.08)	133.45 / 133.37		121 / 4.60					NI
Moderately weak greyish brown thinly laminated SILTSTONE. Discontinuities are closely spaced to tight to open clean, clay and gravel infilled planar rough. *From 4.80m to 5.00m and 5.90m to 6.20m recovered as gravel.*		4.68 (1.72)						5.10 - 5.17 2 C; 5.45 - 5.50 3 C; 5.70 - 5.80 4 C		17 NI 14 NI; 4.60 / 6.10 / 100 / 73 / 12
Weak grey mottled orangish brown MUDSTONE. Discontinuities are closely spaced horizontal open clean, clay and gravel infilled undulating smooth. *From 6.90m to 7.00m recovered as clayey gravel.*		6.40 (0.90)	131.65					6.30 - 6.40 5 C; 6.80 - 6.85 6 C	RC	10 17 NI; 6.10 / 7.60 / 100 / 80 / 13
Very weak grey MUDSTONE. Discontinuities are closely spaced horizontal open clean and clay infilled planar smooth. *From 8.50m to 9.10m recovered as gravelly clay.*		7.30 (2.70)	130.75					7.40 - 7.50 7 C; 7.80 - 7.95 8 C; 8.50 - 8.60 9 C; 8.70 - 8.80 10 C; 9.00 - 9.20 1 C; 9.45 - 9.50 11 C		11 NI 12 NI; 7.60 / 8.90 / 100 / 80 / 9; 8.90 / 10.00 / 100 / 64 / 0
From 9.55m to 9.65m recovered as clayey gravel.										
EOH at 10.00m - Scheduled Depth		10.00	128.05	121 / 10.00						

Observations / Remarks

Misc.: *No Groundwater Encountered; Casing Used; No Monitoring Point Installed*

Shift Information

Date	Time	Depth (m)	Casing (m)	Water (m)

Backfill

From (m)	To (m)	Material
0.00	10.00	Bentonite

Installations

Instrument Details	Resp. Zone	Depth (m)	Diam

Water Strikes

Strike (m)	Rises To (m)	Time (min)	Remarks

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Log Type	Exploratory Hole Number
Header Sheet	**BH02** FINAL

CENTRAL ALLIANCE GEO

Project No:	**2370414**	Location Details				Scale:	1:50
Name:	**Penny Pie Park / Pogmoor Recreation Ground Footbridge**	Easting:	**432834.62**	Northing:	**406421.48**	Checked:	RH
Location:	**Barnsley**	Elevation:	**138.04mAOD**	Final Depth:	**41.10m**	Approved:	RH
Client:	**HBPW**	Logger:	**EC**	Grid System:	**OSGB**	Start Date:	06/12/2019
		Orientation:	**N/A**	Inclination:	**90°**	End Date:	10/12/2019

Methodology & Plant

From (m)	Method	Plant Used
0.00 - 10.10	Rotary Open Holing	Fraste PLG
10.10 - 15.10	Rotary Coring	Fraste PLG
15.10 - 41.10	Rotary Open Holing	Fraste PLG

Hole Diameter

Depth (m)	Diam (mm)

Casing Diameter

Depth (m)	Diam (mm)
10.10	120

Groundwater Strikes

Strike (m)	Casing (m)	Sealed (m)	Time (min)	Rose To (m)	Remarks

No Groundwater Encountered

Installation / Instrument Details

Date	Instrument Details	To (m)	Resp. Zone (m)	Diam (mm)

No Monitoring Point/s Installed

If Methodology includes Dynamic Sampling refer to Runs table for info.

Backfill

Depth (m)	Legend Code
0.00 - 41.10	Bentonite

In-Situ Tests

PID	**0**
Hand Vane*	**0**
Standard Penetration Tests	**3**

* One count indicates an average reported result of 3 tests carried out at one depth where available.

Sample Summary

Environmental Samples			
Soil	**0**	Water	**0**
Geotechnical Samples			
Bulk	**0**	Large Bulk	**0**
Disturbed	**0**	Disturbed (NR)	**0**
Piston	**0**	Piston (NR)	**0**
Undisturbed	**0**	Undisturbed (NR)	**0**
Undisturbed Thin Wall			**0**
Undisturbed Thin Wall (NR)			**0**
Core Sample			**11**

(NR) Indicates sample undertaken but with 0% Recovery

Standard Penetration Test Summary

Test Type	Depth (m)	Casing (m)	Water (m)	Seating Blows	Main Blows	Penetration Total (mm)	N	Reported Result	Hammer Ref
Split Spoon	7.10	-	-	6	14	450	14	N=14 (3,3/3,4,4,3)	D34
Split Spoon	8.60	-	-	4	22	450	22	N=22 (2,2/5,7,5,5)	D34
Split Spoon	10.10	-	-	7	50	340		50 (3,4/50 for 190mm)	D34

SPT Hammer Ref.	Energy Ratio (%)
D34	69

Applicable to Cable Percussion Only

Chiselling

Depth (m)	Duration (mins)

Water Added

Depth (m)	Litres

Applicable to Rotary Only

Drilling Flush

Depth (m)	Flush Type	Flush Colour	Return %
0.00 - 41.10	Water	Grey	100

Applicable to Dynamic Sampling Only

Dynamic Sampling Runs

Depth (m)	Diam (mm)	Recovery %	Remarks

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Log Type: **Combined Borehole**

Sheet 1 of 5

Exploratory Hole Number: **BH02**

FINAL

CENTRAL ALLIANCE GEO

Project No:	**2370414**	Location Details				Scale:	1:50
Name:	**Penny Pie Park / Pogmoor Recreation Ground Footbridge**	Easting:	**432834.62**	Northing:	**406421.48**	Checked By:	RH
Location:	**Barnsley**	Elevation:	**138.04mAOD**	Final Depth:	**41.10m**	Approved By:	RH
Client:	**HBPW**	Logged By:	**EC**	Grid System:	**OSGB**	Start Date:	06/12/2019
		Orientation:	**N/A**	Inclination:	**90°**	Finish Date:	10/12/2019

Methodology & Plant

From (m)	Method	Plant Used
0.00 - 10.10	Rotary Open Holing	Fraste PLG
10.10 - 15.10	Rotary Coring	Fraste PLG
15.10 - 41.10	Rotary Open Holing	Fraste PLG

Strata Description	Legend	Depth (m) (Stratum Thickness)	Reduced Level (mAOD)	Hole Ø (mm) Depth (m)	Casing Ø (mm) Depth (m)	Water Level (m)	Installation / Backfill	Samples & Testing: Depth (m)	Ref	Test Results	Method	Coring: Core Run	TCR	SCR	RQD	If
MADE GROUND: Brown slightly gravelly sandy CLAY TOPSOIL. Gravel is angular fine to medium sandstone and mudstone. Sand is fine to coarse.		(0.10) 0.10	137.94													
MADE GROUND: Dark brown to black sandy angular fine to coarse clinker, slag and glass GRAVEL. Sand is fine to coarse of ash.		(7.00)									RO					
MADE GROUND: Firm dark brown mottled red slightly gravelly sandy CLAY. Gravel is angular to subangular fine to medium brick, siltstone, paper and concrete. Sand is fine to coarse.		7.10 (1.50)	130.94							SPT(S) 7.10m, N=14 (3,3/3,4,4,3)						
Firm light brownish grey mottled orange slightly gravelly sandy CLAY. Gravel is angular to subangular fine to coarse sandstone. Sand is fine to coarse.		8.60 (1.50)	129.44							SPT(S) 8.60m, N=22 (2,2/5,7,5,5)						
Continued on Next Page																

Observations / Remarks

Misc.

No Groundwater Encountered
Casing Used
No Monitoring Point Installed

Shift Information

Date	Time	Depth (m)	Casing (m)	Water (m)

Backfill

From (m)	To (m)	Material
0.00	41.10	Bentonite

Installations

Instrument Details	Resp. Zone	Depth (m)	Diam

Water Strikes

Strike (m)	Rises To (m)	Time (min)	Remarks

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Log Type: **Combined Borehole**

Sheet 2 of 5

Exploratory Hole Number: **BH02**

FINAL

CENTRAL ALLIANCE GEO

Project No:	**2370414**	Location Details				Methodology & Plant			Scale:	1:50
Name:	**Penny Pie Park / Pogmoor Recreation Ground Footbridge**	Easting:	**432834.62**	Northing:	**406421.48**	From (m)	Method	Plant Used	Checked By:	RH
Location:	**Barnsley**	Elevation:	**138.04mAOD**	Final Depth:	**41.10m**				Approved By:	RH
Client:	**HBPW**	Logged By:	**EC**	Grid System:	**OSGB**				Start Date:	06/12/2019
		Orientation:	**N/A**	Inclination:	**90°**				Finish Date:	10/12/2019

Strata Description	Legend	Depth (m) (Stratum Thickness)	Reduced Level (mAOD)	Hole Ø (mm) Depth (m)	Casing Ø (mm) Depth (m)	Water Level (m)	Installation / Backfill	Samples & Testing: Depth (m)	Ref	Test Results	Method	Coring: Core Run	TCR	SCR	RQD	If
Firm light brownish grey mottled orange slightly gravelly sandy CLAY. Gravel is angular to subangular fine to coarse sandstone. Sand is fine to coarse.		10.10	127.94		120 10.10					SPT(S) 10.10m, 50 (3,4/50 for 190mm)						NI
		(0.20)														
Very dense brown subangular to subrounded medium to coarse sandstone GRAVEL.		10.30	127.74					10.40 - 10.45	3 C							
		(0.45)						10.40 - 10.57	1 C							
Extremely weak grey MUDSTONE. DIscontinuities are closely spaced horizontal undulating rough tight clean to clay infilled.		10.75	127.29									10.10 11.60	93	63	0	9
Moderately weak light grey thinly laminated SILTSTONE. Discontinuities are closely spaced horizontal planar rough tight to open clean.								11.00 - 11.10	4 C							
		(1.25)						11.30 - 11.40	5 C							
From 11.80m to 12.00m recovered as angular fine to coarse gravel.								11.90 - 12.00	6 C			11.60 12.20	100	36	0	NI
Moderately strong grey thinly laminated SILTSTONE. Discontinuities are closely spaced horizontal undulating rough open clean to gravel infilled.		12.00	126.04													
								12.40 - 12.45	7 C			12.20 13.10	100	78	0	11
		(2.18)						12.90 - 13.00	8 C		RC					
From 13.78m to 13.86m recovered as subangular fine to coarse gravel.								13.90 - 14.00	9 C			13.10 14.60	95	71	11	NI
Weak grey MUDSTONE. Discontinuities are closely spaced horizontal planar rough open clean to clay infilled.		14.18	123.86													11
		(0.42)						14.50 - 14.60	10 C							
Moderately strong thinly laminated SILTSTONE. Discontinuities are closely spaced horizontal planar rough open clean.		14.60	123.44					14.60 - 14.85	2 C			14.60 15.10	98	96	78	6
		(0.50)						15.00 - 15.10	11 C							
SILTSTONE and MUDSTONE (Driller's Description).		15.10	122.94													
		(7.00)														
Continued on Next Page																

Observations / Remarks	Misc.	Shift Information: Date	Time	Depth (m)	Casing (m)	Water (m)	Backfill: From (m)	To (m)	Material	Installations: Instrument Details	Resp. Zone	Depth (m)	Diam
	No Groundwater Encountered *Casing Used* *No Monitoring Point Installed*						0.00	41.10	Bentonite				

Water Strikes

Strike (m)	Rises To (m)	Time (min)	Remarks

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Log Type: **Combined Borehole**

Sheet 3 of 5

Exploratory Hole Number: **BH02**

FINAL

CENTRAL ALLIANCE GEO

Project No:	**2370414**	Scale:	1:50
Name:	**Penny Pie Park / Pogmoor Recreation Ground Footbridge**	Checked By:	RH
Location:	**Barnsley**	Approved By:	RH
Client:	**HBPW**	Start Date:	06/12/2019
		Finish Date:	10/12/2019

Location Details

Easting:	**432834.62**	Northing:	**406421.48**
Elevation:	**138.04mAOD**	Final Depth:	**41.10m**
Logged By:	**EC**	Grid System:	**OSGB**
Orientation:	**N/A**	Inclination:	**90°**

Methodology & Plant

From (m)	Method	Plant Used

Strata Description	Legend	Depth (m) (Stratum Thickness)	Reduced Level (mAOD)	Hole Ø (mm) Depth (m)	Casing Ø (mm) Depth (m)	Water Level (m)	Installation / Backfill	Samples & Testing: Depth (m)	Ref	Test Results	Method	Coring: Core Run	TCR	SCR	RQD	If
SILTSTONE and MUDSTONE (Driller's Description).											RO					
COAL (Driller's Description).		22.10 (0.40)	115.94													
SILTSTONE and MUDSTONE (Driller's Description).		22.50	115.54													
Continued on Next Page																

Observations / Remarks

Misc.: *No Groundwater Encountered*, *Casing Used*, *No Monitoring Point Installed*

Shift Information

Date	Time	Depth (m)	Casing (m)	Water (m)

Backfill

From (m)	To (m)	Material
0.00	41.10	Bentonite

Installations

Instrument Details	Resp. Zone	Depth (m)	Diam

Water Strikes

Strike (m)	Rises To (m)	Time (min)	Remarks

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Log Type: **Combined Borehole**

Sheet 4 of 5

Exploratory Hole Number: **BH02**

FINAL

CENTRAL ALLIANCE GEO

Project No:	**2370414**	Scale:	1:50
Name:	**Penny Pie Park / Pogmoor Recreation Ground Footbridge**	Checked By:	RH
Location:	**Barnsley**	Approved By:	RH
Client:	**HBPW**	Start Date:	06/12/2019
		Finish Date:	10/12/2019

Location Details

Easting:	**432834.62**	Northing:	**406421.48**
Elevation:	**138.04mAOD**	Final Depth:	**41.10m**
Logged By:	**EC**	Grid System:	**OSGB**
Orientation:	**N/A**	Inclination:	**90°**

Methodology & Plant

From (m)	Method	Plant Used

Strata Description	Legend	Depth (m) (Stratum Thickness)	Reduced Level (mAOD)	Hole Ø (mm) Depth (m)	Casing Ø (mm) Depth (m)	Water Level (m)	Installation / Backfill	Samples & Testing: Depth (m)	Ref	Test Results	Method	Coring: Core Run	TCR	SCR	RQD	If
SILTSTONE and MUDSTONE (Driller's Description).		(18.60)														
Continued on Next Page																

Observations / Remarks

Misc.

No Groundwater Encountered
Casing Used
No Monitoring Point Installed

Shift Information

Date	Time	Depth (m)	Casing (m)	Water (m)

Backfill

From (m)	To (m)	Material
0.00	41.10	Bentonite

Installations

Instrument Details	Resp. Zone	Depth (m)	Diam

Water Strikes

Strike (m)	Rises To (m)	Time (min)	Remarks

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Log Type: **Combined Borehole**

Sheet 5 of 5

Exploratory Hole Number: **BH02**

FINAL

CENTRAL ALLIANCE GEO

Project No:	**2370414**	Location Details		Methodology & Plant	
Name:	**Penny Pie Park / Pogmoor Recreation Ground Footbridge**	Easting: **432834.62**	Northing: **406421.48**	From (m) / Method / Plant Used	
Location:	**Barnsley**	Elevation: **138.04mAOD**	Final Depth: **41.10m**		
Client:	**HBPW**	Logged By: **EC**	Grid System: **OSGB**		
		Orientation: **N/A**	Inclination: **90°**		

Scale: 1:50
Checked By: RH
Approved By: RH
Start Date: 06/12/2019
Finish Date: 10/12/2019

Strata Description	Legend	Depth (m) (Stratum Thickness)	Reduced Level (mAOD)	Hole Ø (mm) Depth (m)	Casing Ø (mm) Depth (m)	Water Level (m)	Installation / Backfill	Samples & Testing: Depth (m)	Ref	Test Results	Method	Coring: Core Run	TCR	SCR	RQD	If
SILTSTONE and MUDSTONE (Driller's Description).		41.10	96.94													
EOH at 41.10m - Scheduled Depth																

41 42 43 44 45 46 47 48 49 50

Observations / Remarks

Misc.

No Groundwater Encountered
Casing Used
No Monitoring Point Installed

Shift Information

Date	Time	Depth (m)	Casing (m)	Water (m)

Backfill

From (m)	To (m)	Material
0.00	41.10	Bentonite

Installations

Instrument Details	Resp. Zone	Depth (m)	Diam

Water Strikes

Strike (m)	Rises To (m)	Time (min)	Remarks

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Log Type	Exploratory Hole Number
Header Sheet	**BH03** FINAL

CENTRAL ALLIANCE GEO

		Location Details				Methodology & Plant				
Project No:	**2370414**	Easting:	**432835.76**	Northing:	**406416.35**	From (m)	Method	Plant Used	Scale:	1:50
Name:	**Penny Pie Park / Pogmoor Recreation Ground Footbridge**	Elevation:	**138.14mAOD**	Final Depth:	**10.90m**	0.00 - 5.65 5.65 - 10.90	Rotary Open Holing Rotary Coring	Fraste PLG Fraste PLG	Checked:	RH
Location:	**Barnsley**	Logger:	**EC**	Grid System:	**OSGB**				Approved:	RH
Client:	**HBPW**	Orientation:	**N/A**	Inclination:	**90°**				Start Date:	10/12/2019
									End Date:	12/12/2019

Hole Diameter

Depth (m)	Diam (mm)
10.90	121

Casing Diameter

Depth (m)	Diam (mm)
10.90	121

Groundwater Strikes

Strike (m)	Casing (m)	Sealed (m)	Time (min)	Rose To (m)	Remarks

Installation / Instrument Details

Date	Instrument Details	To (m)	Resp. Zone (m)	Diam (mm)

If Methodology includes Dynamic Sampling refer to Runs table for info.

No Groundwater Encountered

No Monitoring Point/s Installed

Backfill

Depth (m)	Legend Code
0.00 - 10.90	Bentonite

In-Situ Tests

PID	0
Hand Vane*	0
Standard Penetration Tests	1

* One count indicates an average reported result of 3 tests carried out at one depth where available.

Sample Summary

Environmental Samples			
Soil	0	Water	0
Geotechnical Samples			
Bulk	0	Large Bulk	0
Disturbed	1	Disturbed (NR)	0
Piston	0	Piston (NR)	0
Undisturbed	0	Undisturbed (NR)	0
Undisturbed Thin Wall			0
Undisturbed Thin Wall (NR)			0
Core Sample			10

(NR) Indicates sample undertaken but with 0% Recovery

Standard Penetration Test Summary

Test Type	Depth (m)	Casing (m)	Water (m)	Seating Blows	Main Blows	Penetration Total (mm)	N	Reported Result	Hammer Ref
Split Spoon	5.65	-	-	25	50	180		50 (25 for 75mm/50 for 105mm)	D34

SPT Hammer Ref.	Energy Ratio (%)
D34	69

Applicable to Cable Percussion Only

Chiselling

Depth (m)	Duration (mins)

Water Added

Depth (m)	Litres

Applicable to Rotary Only

Drilling Flush

Depth (m)	Flush Type	Flush Colour	Return %
0.00 - 10.90	Water	Grey	100

Applicable to Dynamic Sampling Only

Dynamic Sampling Runs

Depth (m)	Diam (mm)	Recovery %	Remarks

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Log Type: **Combined Borehole**

Sheet 1 of 2

Exploratory Hole Number: **BH03**

FINAL

CENTRAL ALLIANCE GEO

Project No:	**2370414**	Location Details		Methodology & Plant	
Name:	**Penny Pie Park / Pogmoor Recreation Ground Footbridge**	Easting: **432835.76**	Northing: **406416.35**	From (m): 0.00 - 5.65, 5.65 - 10.90	Method: Rotary Open Holing, Rotary Coring; Plant Used: Fraste PLG, Fraste PLG
Location:	**Barnsley**	Elevation: **138.14mAOD**	Final Depth: **10.90m**	Scale: 1:50	
Client:	**HBPW**	Logged By: **EC**	Grid System: **OSGB**	Checked By: RH	
		Orientation: **N/A**	Inclination: **90°**	Approved By: RH	
				Start Date: 10/12/2019	
				Finish Date: 12/12/2019	

Strata Description	Legend	Depth (m) (Stratum Thickness)	Reduced Level (mAOD)	Hole Ø (mm) Depth (m)	Casing Ø (mm) Depth (m)	Water Level (m)	Installation / Backfill	Samples & Testing: Depth (m)	Ref	Test Results	Method	Coring: Core Run	TCR	SCR	RQD	If
MADE GROUND: Landfill. (Drillers Description).		(5.65)									RD					
Weak to moderately strong laminated grey mottled burnt orange SILTSTONE recovered as silt.		5.65 (0.11) 5.76	132.49 132.38					5.65 - 5.83	1 D	SPT(S) 5.65m, 50 (25 for 75mm/50 for 105mm)	RC					9
Moderately strong thinly laminated light to dark grey SILTSTONE. Discontinuities are closely spaced horizontal undulating rough gravel infill.		(0.52)						6.10 - 6.20	1 C							23
From 5.90m to 6.28m discontinuities widely spaced horizontal undulating rough clean.		6.28	131.86					6.40 - 6.50	2 C			5.65 7.00	80	6	0	6
Moderately strong structureless grey MUDSTONE. Discontinuities are widely spaced horizontal undulating smooth with clay/gravel infill.		(0.94)						7.00 - 7.10	3 C							NI
From 6.48m to 6.95m recovered as a very gravelly clay.																10
From 6.78m to 6.95m non intact.		7.22	130.92													NI
From 6.95m to 7.22m locally recovered as a firm gravelly clay.								7.40 - 7.45	4 C							20
Weak to moderately weak some very thinly laminated light grey grey MUDSTONE. Discontinuities are widely spaced horizontal smooth clean.		(0.60)						7.60 - 7.70	5 C							NI
From 7.53m to 7.82m recovered as a clay.		7.82	130.32									7.00 8.50	47	13	13	
No recovery, assumed zone of core loss.		(0.68)														NR
Weak to moderately weak some very thinly laminated light grey grey MUDSTONE recovered as clay. Discontinuities are widely spaced horizontal smooth clean.		8.50 (0.53)	129.64					8.60 - 8.65	6 C							12
Moderately strong thinly laminated grey SILTSTONE.		9.03 (0.20)	129.11									8.50 9.60	64	0	22	NR
From 9.03m to 9.23 non intact.		9.23	128.91													
No recovery, assumed zone of core loss.		(0.37)						9.40 - 9.50	7 C							NR
Moderately strong structureless dark and light grey MUDSTONE. Discontinuities are closely spaced rough with clay infill.		9.60	128.54					9.70 - 9.80	8 C							NI
																20

Continued on Next Page

Observations / Remarks

Misc.

No Groundwater Encountered
Casing Used
No Monitoring Point Installed

Shift Information

Date	Time	Depth (m)	Casing (m)	Water (m)

Backfill

From (m)	To (m)	Material
0.00	10.90	Bentonite

Installations

Instrument Details	Resp. Zone	Depth (m)	Diam

Water Strikes

Strike (m)	Rises To (m)	Time (min)	Remarks

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Log Type: **Combined Borehole**

Sheet 2 of 2

Exploratory Hole Number: **BH03**

FINAL

CENTRAL ALLIANCE GEO

Project No:	**2370414**	Location Details		Methodology & Plant	
Name:	**Penny Pie Park / Pogmoor Recreation Ground Footbridge**	Easting: **432835.76**	Northing: **406416.35**	From (m) / Method / Plant Used	
Location:	**Barnsley**	Elevation: **138.14mAOD**	Final Depth: **10.90m**		
Client:	**HBPW**	Logged By: **EC**	Grid System: **OSGB**		
		Orientation: **N/A**	Inclination: **90°**		

Scale: 1:50
Checked By: RH
Approved By: RH
Start Date: 10/12/2019
Finish Date: 12/12/2019

Strata Description	Legend	Depth (m) (Stratum Thickness)	Reduced Level (mAOD)	Hole Ø (mm) Depth (m)	Casing Ø (mm) Depth (m)	Water Level (m)	Installation / Backfill	Samples & Testing: Depth (m)	Ref	Test Results	Method	Coring: Core Run	TCR	SCR	RQD	If
From 9.70m to 10.90m locally recovered as gravelly clay.		(1.30)						10.15 - 10.25	9 C			9.60 10.90	99	26	26	13
								10.50 - 10.60	10 C							28
EOH at 10.90m - Scheduled Depth		10.90	127.24	121 10.90	121 10.90											

Observations / Remarks	Misc.
	No Groundwater Encountered Casing Used No Monitoring Point Installed

Shift Information

Date	Time	Depth (m)	Casing (m)	Water (m)

Backfill

From (m)	To (m)	Material
0.00	10.90	Bentonite

Installations

Instrument Details	Resp. Zone	Depth (m)	Diam

Water Strikes

Strike (m)	Rises To (m)	Time (min)	Remarks

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Log Type	Exploratory Hole Number
Header Sheet	**BH04** FINAL

CENTRAL ALLIANCE GEO

Project No:	**2370414**	Location Details				Scale:	1:50
Name:	**Penny Pie Park / Pogmoor Recreation Ground Footbridge**	Easting:	**N/A**	Northing:	**N/A**	Checked:	RH
Location:	**Barnsley**	Elevation:	**N/A**	Final Depth:	**14.50m**	Approved:	RH
Client:	**HBPW**	Logger:	**EC**	Grid System:	**OSGB**	Start Date:	12/12/2019
		Orientation:	**N/A**	Inclination:	**90°**	End Date:	12/12/2019

Methodology & Plant

From (m)	Method	Plant Used
0.00 - 4.70	Rotary Open Holing	Fraste PLG
4.70 - 9.90	Rotary Coring	Fraste PLG
9.90 - 14.50	Rotary Open Holing	Fraste PLG

Hole Diameter

Depth (m)	Diam (mm)
14.50	121

Casing Diameter

Depth (m)	Diam (mm)
5.80	121

Groundwater Strikes

Strike (m)	Casing (m)	Sealed (m)	Time (min)	Rose To (m)	Remarks

No Groundwater Encountered

Installation / Instrument Details

Date	Instrument Details	To (m)	Resp. Zone (m)	Diam (mm)

No Monitoring Point/s Installed

If Methodology includes Dynamic Sampling refer to Runs table for info.

Backfill

Depth (m)	Legend Code
0.00 - 14.50	Bentonite

In-Situ Tests

PID	0
Hand Vane*	0
Standard Penetration Tests	1

* One count indicates an average reported result of 3 tests carried out at one depth where available.

Sample Summary

Environmental Samples			
Soil	0	Water	0
Geotechnical Samples			
Bulk	0	Large Bulk	0
Disturbed	1	Disturbed (NR)	0
Piston	0	Piston (NR)	0
Undisturbed	0	Undisturbed (NR)	0
Undisturbed Thin Wall			0
Undisturbed Thin Wall (NR)			0
Core Sample			11

(NR) Indicates sample undertaken but with 0% Recovery

Standard Penetration Test Summary

Test Type	Depth (m)	Casing (m)	Water (m)	Seating Blows	Main Blows	Penetration Total (mm)	N	Reported Result	Hammer Ref
Split Spoon	3.60	-	-	25	50	260		50 (7,18/50 for 110mm)	D34

SPT Hammer Ref.	Energy Ratio (%)
D34	69

Applicable to Cable Percussion Only

Chiselling

Depth (m)	Duration (mins)

Water Added

Depth (m)	Litres

Applicable to Rotary Only

Drilling Flush

Depth (m)	Flush Type	Flush Colour	Return %
0.00 - 14.50	Water	Grey	100

Applicable to Dynamic Sampling Only

Dynamic Sampling Runs

Depth (m)	Diam (mm)	Recovery %	Remarks

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Log Type: **Combined Borehole**

Sheet 1 of 2

Exploratory Hole Number: **BH04**

FINAL

CENTRAL ALLIANCE GEO

Project No:	**2370414**	Location Details		Methodology & Plant	
Name:	**Penny Pie Park / Pogmoor Recreation Ground Footbridge**	Easting: **N/A**	Northing: **N/A**	From (m) / Method / Plant Used	0.00 - 4.70 Rotary Open Holing Fraste PLG 4.70 - 9.90 Rotary Coring Fraste PLG 9.90 - 14.50 Rotary Open Holing Fraste PLG
Location:	**Barnsley**	Elevation: **N/A**	Final Depth: **14.50m**	Scale:	1:50
Client:	**HBPW**	Logged By: **EC**	Grid System: **OSGB**	Checked By:	RH
		Orientation: **N/A**	Inclination: **90°**	Approved By:	RH
				Start Date:	12/12/2019
				Finish Date:	12/12/2019

Strata Description	Depth (m) (Stratum Thickness)	Reduced Level (mAOD)	Hole Ø (mm) Depth (m)	Casing Ø (mm) Depth (m)	Water Level (m)	Installation / Backfill	Samples & Testing: Depth (m)	Ref	Test Results	Method	Coring: Core Run	TCR	SCR	RQD	If
MADE GROUND: Landfill. (Driller's Description)	(3.60)									RO					
Very dense light grey mottled brown slightly silty clayey angular to subrounded fine to coarse sandstone, siltstone and mudstone GRAVEL.	3.60 (0.26)						3.60 - 3.86	1 D	SPT(S) 3.60m, 50 (7,18/50 for 110mm)						
BOULDERS (Driller's Description)	3.86 (0.84)														
Moderately strong light grey mottled burnt orange thinly laminated SILTSTONE. *From 4.70m to 4.75m recovered as silty subangular fine to coarse sandstone gravel.*	4.70 (0.10) 4.80						4.80 - 4.85	2 C			4.70 5.20	86	38	28	NI 10
Moderately strong to strong light grey with dark grey bands thinly laminated SILTSTONE. Discontinuities are horizontal, clean, undulating rough with orange oxidization.	(1.15)			121 5.80			5.70 - 5.75	3 C			5.20 5.80	98	64	30	>25 7
Moderately weak to moderately strong light grey mottled orange occasionally laminated interbedded MUDSTONE and SILTSTONE. Discontinuities are horizontal and diagonal undulating rough with clay and gravel infill.	5.95 (0.60)						6.10 - 6.23	4 C			5.80 7.30	93	56	24	>25
Moderately weak to moderately strong light grey occasionally laminated MUDSTONE. Discontinuities are horizontal undulating smooth clean.	6.55 (0.52)						6.60 - 6.83 6.80 - 6.85	1 C 5 C							3
Moderately strong laminated grey and orange SILTSTONE.	7.07 (0.55)						7.25 - 7.30 7.40 - 7.50	6 C 7 C		RC					8 NI
Moderately weak light grey MUDSTONE. Discontinuities are closely spaced horizontal rough with clay and gravel infill. *From 7.62m to 7.70m with occasional laminations.* *From 7.70m to 7.86m infilled with black gravel.* *From 7.86m to 8.52m recovered locally as gravelly clay.*	7.62 (0.90)						8.00 - 8.10	8 C			7.30 8.80	99	28	27	9 17 NI
Weak grey structureless MUDSTONE recovered as clay.	8.52 (0.28)						8.70 - 8.80	9 C							7
Moderately weak light grey with dark grey bands MUDSTONE. Discontinuities are horizontal rough with clay and gravel infill. *From 9.00m to 9.50m recovered as gravelly clay. Gravel is angular to subangular coarse.*	8.80 (1.10)						9.35 - 9.40	10 C			8.80 9.90	51	11	11	6
	9.90						9.85 - 9.90	11 C							NI

Continued on Next Page

Observations / Remarks

Misc.

No Groundwater Encountered
Casing Used
No Monitoring Point Installed

Shift Information

Date	Time	Depth (m)	Casing (m)	Water (m)

Backfill

From (m)	To (m)	Material
0.00	14.50	Bentonite

Installations

Instrument Details	Resp. Zone	Depth (m)	Diam

Water Strikes

Strike (m)	Rises To (m)	Time (min)	Remarks

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Log Type: **Combined Borehole**

Sheet 2 of 2

Exploratory Hole Number: **BH04**

FINAL

CENTRAL ALLIANCE GEO

Project No:	**2370414**	Location Details		Methodology & Plant	
Name:	**Penny Pie Park / Pogmoor Recreation Ground Footbridge**	Easting: **N/A**	Northing: **N/A**	From (m) / Method / Plant Used	
Location:	**Barnsley**	Elevation: **N/A**	Final Depth: **14.50m**		
Client:	**HBPW**	Logged By: **EC**	Grid System: **OSGB**		
		Orientation: **N/A**	Inclination: **90°**		

Scale: 1:50
Checked By: RH
Approved By: RH
Start Date: 12/12/2019
Finish Date: 12/12/2019

Strata Description	Legend	Depth (m) (Stratum Thickness)	Reduced Level (mAOD)	Hole Ø (mm) Depth (m)	Casing Ø (mm) Depth (m)	Water Level (m)	Installation / Backfill	Samples & Testing: Depth (m) / Ref / Test Results	Method	Coring: Core Run / TCR / SCR / RQD / If
SILTSTONE and MUDSTONE (Drillers description).		(4.60)							RO	
EOH at 14.50m - Scheduled Depth		14.50		121 14.50						

Observations / Remarks

Misc.

No Groundwater Encountered
Casing Used
No Monitoring Point Installed

Shift Information

Date	Time	Depth (m)	Casing (m)	Water (m)

Backfill

From (m)	To (m)	Material
0.00	14.50	Bentonite

Installations

Instrument Details	Resp. Zone	Depth (m)	Diam

Water Strikes

Strike (m)	Rises To (m)	Time (min)	Remarks

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Log Type: **Trial Pit**

Sheet 1 of 1

Exploratory Hole Number: **TT01**

FINAL

CENTRAL ALLIANCE GEO

Project No:	**2370414**	Scale:	1:30
Name:	**Penny Pie Park / Pogmoor Recreation Ground Footbridge**	Checked By:	RH
Location:	**Barnsley**	Approved By:	RH
Client:	**HBPW**	Start Date:	04/12/2019
		Finish Date:	04/12/2019

Location Details

Easting:	**432822.06**	Northing:	**406413.18**
Elevation:	**138.18mAOD**	Final Depth:	**3.50m**
Logger:	**EC**	Grid System:	**OSGB**
Orientation:	**150°**	Inclination:	**90°**

Methodology & Plant

Machine Excavated Trench

Wheeled Backhoe Excavator

Strata Description	Legend	Depth (m) (Stratum Thickness)	Reduced Level (mAOD)	Water Level (m)	Installation / Backfill	Samples & Testing: Depth (m)	Ref	Test Results
MADE GROUND: Dark brown slightly gravelly fine to coarse SAND TOPSOIL. Gravel is angular fine to coarse plastic and metal.		(0.15) 0.15	138.03					
MADE GROUND: Dark brownish grey mottled light brown gravelly fine to coarse SAND. Gravel is angular fine to coarse glass, plastic, pottery, wire, rubble and brick.						0.50	1 ES	
At 1.00m thick roots.						1.00	2 ES	
At 1.50m with shell fragments.		(2.75)						
At 2.20m with subangular to subrounded coarse slag gravel.						2.00	3 ES	
MADE GROUND: Brown mottled light and dark brown slightly gravelly slightly clayey fine to coarse SAND. Gravel is angular fine to medium glass, brick, pottery, wire and plastic.		2.90 (0.60)	135.28			3.00	4 ES	
EOH at 3.50m - Limit of machine		3.50	134.68					

Observations / Remarks

Breaking Out / Hard Strata

From (m)	Remarks

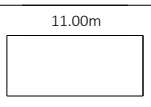
Stability & Backfill

Shoring: None

Stability: Unstable

Backfill: Arisings

Pit Dimensions



Orientation: 150°

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Log Type: **Trial Pit**

Sheet 1 of 1

Exploratory Hole Number: **TT02**

FINAL

CENTRAL ALLIANCE GEO

Project No:	**2370414**	Scale:	1:30
Name:	**Penny Pie Park / Pogmoor Recreation Ground Footbridge**	Checked By:	RH
Location:	**Barnsley**	Approved By:	RH
Client:	**HBPW**	Start Date:	04/12/2019
		Finish Date:	04/12/2019

Location Details

Easting:	**432829.18**	Northing:	**406414.06**
Elevation:	**138.15mAOD**	Final Depth:	**3.40m**
Logger:	**EC**	Grid System:	**OSGB**
Orientation:	**150°**	Inclination:	**90°**

Methodology & Plant

Machine Excavated Trench

Wheeled Backhoe Excavator

Strata Description	Legend	Depth (m) (Stratum Thickness)	Reduced Level (mAOD)	Water Level (m)	Installation / Backfill	Samples & Testing: Depth (m)	Ref	Test Results
MADE GROUND: Dark brown and grey slightly gravelly fine to coarse SAND TOPSOIL. Gravel is angular to subangular fine to medium brick and glass.		(0.20)						
From 0.10m with rootlets.		0.20	137.95					
MADE GROUND: Dark brown mottled red slightly clayey gravelly fine to coarse SAND. Gravel is angular fine to coarse plastic, clinker, glass, shale and metal.						0.50	1 ES	
From 0.90m becomes very gravelly with pottery, rope, rubber and wire fragments.						1.00	2 ES	
		(2.80)						
From 2.00m to 2.70 with frequent shell fragments.						2.00	3 ES	
At 2.70m frequent subrounded coarse coal gravel.								
MADE GROUND: Dark brown and grey slightly gravelly clayey fine to coarse SAND. Gravel is angular to subrounded fine to coarse glass, plastic, coal, wire, shale and pottery.		3.00	135.15			3.00	4 ES	
		(0.40)						
EOH at 3.40m - Limit of machine		3.40	134.75					

Observations / Remarks

Breaking Out / Hard Strata

From (m)	Remarks

Stability & Backfill

Shoring: None

Stability: Unstable

Backfill: Arisings

Pit Dimensions

11.00m

0.60m

Orientation: 150°

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Log Type: **Trial Pit**

Sheet 1 of 1

Exploratory Hole Number: **TT03**

FINAL

CENTRAL ALLIANCE GEO

Project No:	**2370414**	Scale:	1:30
Name:	**Penny Pie Park / Pogmoor Recreation Ground Footbridge**	Checked By:	RH
Location:	**Barnsley**	Approved By:	RH
Client:	**HBPW**	Start Date:	04/12/2019
		Finish Date:	04/12/2019

Location Details

Easting:	**432846.18**	Northing:	**406418.71**
Elevation:	**137.96mAOD**	Final Depth:	**3.40m**
Logger:	**EC**	Grid System:	**OSGB**
Orientation:	**150°**	Inclination:	**90°**

Methodology & Plant

Machine Excavated Trench

Wheeled Backhoe Excavator

Strata Description	Legend	Depth (m) (Stratum Thickness)	Reduced Level (mAOD)	Water Level (m)	Installation / Backfill	Samples & Testing: Depth (m)	Ref	Test Results
MADE GROUND: Dark brown slightly clayey gravelly fine to coarse SAND TOPSOIL. Gravel is angular fine to coarse brick and clinker.		(0.10) 0.10	137.85					
MADE GROUND: Dark brown mottled light brown slightly clayey very gravelly fine to coarse SAND. Gravel is angular medium to coarse glass, brick, clinker, plastic, mudstone, pottery, cloth, metal and wire.						0.50	1 ES	
At 0.70m many glass jars.								
At 1.00m occasional slag, clinker and shells.						1.00	2 ES	
		(2.90)						
From 2.50m becomes very sandy gravel.						2.00	3 ES	
MADE GROUND: Dark brown to black sandy angular fine to coarse ash, clinker, shale and glass GRAVEL. Sand is fine to coarse.		3.00 (0.40)	134.96			3.00	4 ES	
EOH at 3.40m - Limit of machine		3.40	134.56					

Observations / Remarks	Breaking Out / Hard Strata		Stability & Backfill	Pit Dimensions
	From (m)	Remarks	Shoring: None Stability: Unstable Backfill: Arisings	11.00m 0.60m Orientation: 150°

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Log Type: **Trial Pit**

Sheet 1 of 1

Exploratory Hole Number: **TT04**

FINAL

CENTRAL ALLIANCE GEO

Project No:	**2370414**	Scale:	1:30
Name:	**Penny Pie Park / Pogmoor Recreation Ground Footbridge**	Checked By:	RH
Location:	**Barnsley**	Approved By:	RH
Client:	**HBPW**	Start Date:	04/12/2019
		Finish Date:	04/12/2019

Location Details

Easting:	**432851.10**	Northing:	**406419.91**
Elevation:	**137.78mAOD**	Final Depth:	**3.60m**
Logger:	**RH**	Grid System:	**OSGB**
Orientation:	**150°**	Inclination:	**90°**

Methodology & Plant

Machine Excavated Trench

Wheeled Backhoe Excavator

Strata Description	Legend	Depth (m) (Stratum Thickness)	Reduced Level (mAOD)	Water Level (m)	Installation / Backfill	Samples & Testing: Depth (m)	Ref	Test Results
MADE GROUND: Soft brown sandy CLAY TOPSOIL. Sand is fine to medium.		(0.10)						
MADE GROUND: Dark grey and reddish brown gravelly fine to coarse SAND. Gravel is angular fine to coarse clinker and brick.		0.10 (0.35)	137.68					
At 0.40m in extended trench, 1 no. concrete boulder 2.20x0.80x0.60.		0.45	137.33					
MADE GROUND: Dark grey and black sandy angular fine to coarse clinker, slag, brick, glass, pottery, wire, metal, plastic and wood GRAVEL. Sand is fine to coarse.						0.50	1 ES	
From 0.90m with frequent intact and non-intact glass bottles.						1.00	2 ES	
At 1.50m 1 no. leather shoe.		(2.55)						
At 2.00m 1 no. lightbulb.						2.00	3 ES	
MADE GROUND: Black angular fine to coarse vitreous and dull coal GRAVEL.		3.00 (0.30)	134.78					
MADE GROUND: Orangish red slightly clayey sandy angular fine to coarse shale, mudstone and coal GRAVEL. Sand is fine to coarse.		3.30 (0.30)	134.48			3.40	4 ES	
From 3.50m patches of gravelly clay.								
EOH at 3.60m - Limit of machine		3.60	134.18					

Observations / Remarks

Breaking Out / Hard Strata

From (m)	Remarks

Stability & Backfill

Shoring: None

Stability: Unstable

Backfill: Arisings

Pit Dimensions

17.00m

0.60m

Orientation: 150°

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Log Type	Exploratory Hole Number
Header Sheet	**WS01** FINAL

CENTRAL ALLIANCE GEO

		Location Details				Methodology & Plant				
Project No:	**2370414**	Easting:	**432821.12**	Northing:	**406466.04**	From (m)	Method	Plant Used	Scale:	1:50
Name:	**Penny Pie Park / Pogmoor Recreation Ground Footbridge**	Elevation:	**138.15mAOD**	Final Depth:	**4.45m**	0.00 - 1.20 1.20 - 4.45	Inspection Pit Dynamic Sampling	Hand Tools Boart Longyea	Checked:	RH
Location:	**Barnsley**	Logger:	**EC**	Grid System:	**OSGB**				Approved:	RH
Client:	**HBPW**	Orientation:	**N/A**	Inclination:	**90°**				Start Date:	03/12/2019
									End Date:	03/12/2019

Hole Diameter

Depth (m)	Diam (mm)

Casing Diameter

Depth (m)	Diam (mm)
3.00	116

Groundwater Strikes

Strike (m)	Casing (m)	Sealed (m)	Time (min)	Rose To (m)	Remarks

Installation / Instrument Details

Date	Instrument Details	To (m)	Resp. Zone (m)	Diam (mm)

If Methodology includes Dynamic Sampling refer to Runs table for info.

No Groundwater Encountered

No Monitoring Point/s Installed

Backfill

Depth (m)	Legend Code
0.00 - 4.45	Bentonite

In-Situ Tests

PID	0
Hand Vane*	0
Standard Penetration Tests	4

* One count indicates an average reported result of 3 tests carried out at one depth where available.

Sample Summary

Environmental Samples			
Soil	5	Water	0
Geotechnical Samples			
Bulk	3	Large Bulk	0
Disturbed	11	Disturbed (NR)	0
Piston	0	Piston (NR)	0
Undisturbed	0	Undisturbed (NR)	0
Undisturbed Thin Wall			0
Undisturbed Thin Wall (NR)			0
Core Sample			0

(NR) Indicates sample undertaken but with 0% Recovery

Standard Penetration Test Summary

Test Type	Depth (m)	Casing (m)	Water (m)	Seating Blows	Main Blows	Penetration Total (mm)	N	Reported Result	Hammer Ref
Split Spoon	1.20	-	-	2	6	450	6	N=6 (1,1/1,1,1,3)	O5BL005
Split Spoon	2.00	-	-	4	8	450	8	N=8 (2,2/2,2,2,2)	O5BL005
Split Spoon	3.00	-	-	7	13	450	13	N=13 (4,3/3,3,3,4)	O5BL005
Split Spoon	4.00	-	-	8	46	450	46	N=46 (4,4/5,8,12,21)	O5BL005

SPT Hammer Ref.	Energy Ratio (%)
O5BL005	64

Applicable to Cable Percussion Only

Chiselling

Depth (m)	Duration (mins)

Water Added

Depth (m)	Litres

Applicable to Rotary Only

Drilling Flush

Depth (m)	Flush Type	Flush Colour	Return %

Applicable to Dynamic Sampling Only

Dynamic Sampling Runs

Depth (m)	Diam (mm)	Recovery %	Remarks
1.20 - 2.00	101	100	
2.00 - 3.00	101	100	
3.00 - 4.00	86	100	

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Log Type: **Dynamic Sampling**

Sheet 1 of 1

Exploratory Hole Number: **WS01**

FINAL

CENTRAL ALLIANCE GEO

Project No:	**2370414**	Location Details				Methodology & Plant			Scale:	1:50
Name:	**Penny Pie Park / Pogmoor Recreation Ground Footbridge**	Easting:	**432821.12**	Northing:	**406466.04**	Depth (m)	Method	Plant Used	Checked By:	RH
Location:	**Barnsley**	Elevation:	**138.15mAOD**	Final Depth:	**4.45m**	0.00 - 1.20 1.20 - 4.45	Inspection Pit Dynamic Sampling	Hand Tools Boart Longyea	Approved By:	RH
Client:	**HBPW**	Logged By:	**EC**	Grid System:	**OSGB**				Start Date:	03/12/2019
		Orientation:	**N/A**	Inclination:	**90°**				Finish Date:	03/12/2019

Strata Description	Legend	Depth (m) (Stratum Thickness)	Reduced Level (mAOD)	Casing Ø (mm) Depth (m)	Water Level (m)	Installation / Backfill	Samples & Testing: Depth (m)	Ref	Test Results
MADE GROUND: Soft brown and light brown slightly sandy gravelly CLAY with rootlets. Sand is fine to coarse. Gravel is subangular to rounded sandstone, limestone and mudstone.		(0.40)					0.20	1 ES	
From 0.10m with brick fragments.							0.30 - 0.40	2 B	
From 0.30m becomes sandy very clayey gravel.		0.40	137.75				0.40	3 D	
							0.50	4 ES	
							0.50 - 0.60	5 B	
MADE GROUND: Loose black very clayey very sandy subangular to rounded fine to coarse siltstone, mudstone, clinker, slag and brick GRAVEL. Sand is fine to coarse.							1.00	6 ES	
At 1.20m glass fragment cobbles.							1.20 - 1.65	7 D	SPT(S) 1.20m, N=6 (1,1/1,1,1,3)
		(2.20)					1.50	8 ES	
							1.90	9 D	
							2.00 - 2.45	10 D	SPT(S) 2.00m, N=8 (2,2/2,2,2,2)
							2.50	11 ES	
MADE GROUND: Firm dark brown and black slightly gravelly slightly silty CLAY. Gravel is angular to subrounded fine to coarse clinker, sandstone, glass and pottery.		2.60 (0.20)	135.55				2.60	12 D	
		2.80	135.35				2.80	13 D	
Firm dark and light brown slightly gravelly slightly silty CLAY. Gravel is subangular to subrounded fine siltstone.		(0.20) 3.00	135.15	116 3.00			3.00 - 3.45	14 D	SPT(S) 3.00m, N=13 (4,3/3,3,3,4)
							3.00 - 3.50	15 B	
Firm grey mottled orange and brown sandy gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse sandstone.		(0.60)							
Very weak brownish orange laminated SILTSTONE.		3.60	134.55				3.60	16 D	
							3.70	17 D	
							3.80	18 D	
		(0.85)					4.00 - 4.45	19 D	SPT(S) 4.00m, N=46 (4,4/5,8,12,21)
EOH at 4.45m - Scheduled Depth		4.45	133.70						

Observations / Remarks

Misc.: *No Groundwater Encountered*; *Casing Used*; *No Monitoring Point/s Installed*

Backfill

Depth (m)	Material
0.00 - 4.45	Bentonite

Hammer Ref & Energy Ratio (%): **O5BL005 (64%)**

Dynamic Sampling Runs

From (m)	To (m)	Diam (mm)	Recovery (%)	Remarks
1.20	2.00	101	100	
2.00	3.00	101	100	
3.00	4.00	86	100	

Installations

Instrument Details	Resp. Zone	Depth (m)	Diam

Groundwater Strikes

Strike (m)	Casing (m)	Sealed (m)	Rises To (m)	Time (min)	Remarks

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Log Type	Exploratory Hole Number
Header Sheet	**WS03** FINAL

CENTRAL ALLIANCE GEO

		Location Details				Methodology & Plant				
Project No:	**2370414**	Easting:	**432844.61**	Northing:	**406469.64**	From (m)	Method	Plant Used	Scale:	1:50
Name:	**Penny Pie Park / Pogmoor Recreation Ground Footbridge**	Elevation:	**137.78mAOD**	Final Depth:	**3.45m**	0.00 - 1.20 1.20 - 3.45	Inspection Pit Dynamic Sampling	Hand Tools Boart Longyear	Checked:	RH
Location:	**Barnsley**	Logger:	**EC**	Grid System:	**OSGB**				Approved:	RH
Client:	**HBPW**	Orientation:	**N/A**	Inclination:	**90°**				Start Date:	03/12/2019
									End Date:	03/12/2019

Hole Diameter

Depth (m)	Diam (mm)

Casing Diameter

Depth (m)	Diam (mm)
3.00	116

Groundwater Strikes

Strike (m)	Casing (m)	Sealed (m)	Time (min)	Rose To (m)	Remarks

Installation / Instrument Details

Date	Instrument Details	To (m)	Resp. Zone (m)	Diam (mm)

If Methodology includes Dynamic Sampling refer to Runs table for info.

No Groundwater Encountered

No Monitoring Point/s Installed

Backfill

Depth (m)	Legend Code
0.00 - 3.45	Bentonite

In-Situ Tests

PID	0
Hand Vane*	0
Standard Penetration Tests	3

* One count indicates an average reported result of 3 tests carried out at one depth where available.

Sample Summary

Environmental Samples			
Soil	4	Water	0
Geotechnical Samples			
Bulk	1	Large Bulk	0
Disturbed	6	Disturbed (NR)	0
Piston	0	Piston (NR)	0
Undisturbed	0	Undisturbed (NR)	0
Undisturbed Thin Wall			0
Undisturbed Thin Wall (NR)			0
Core Sample			0

(NR) Indicates sample undertaken but with 0% Recovery

Standard Penetration Test Summary

Test Type	Depth (m)	Casing (m)	Water (m)	Seating Blows	Main Blows	Penetration Total (mm)	N	Reported Result	Hammer Ref
Split Spoon	1.20	-	-	2	7	450	7	N=7 (1,1/1,2,2,2)	O5BL005
Split Spoon	2.00	-	-	1	1	450	1	N=1 (1,0/1,0,0,0)	O5BL005
Split Spoon	3.00	-	-	1	2	450	2	N=2 (1,0/1,0,1,0)	O5BL005

SPT Hammer Ref.	Energy Ratio (%)
O5BL005	64

Applicable to Cable Percussion Only

Chiselling

Depth (m)	Duration (mins)

Water Added

Depth (m)	Litres

Applicable to Rotary Only

Drilling Flush

Depth (m)	Flush Type	Flush Colour	Return %

Applicable to Dynamic Sampling Only

Dynamic Sampling Runs

Depth (m)	Diam (mm)	Recovery %	Remarks
1.20 - 2.00	101	100	
2.00 - 3.00	101	0	

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Log Type: **Dynamic Sampling**

Sheet 1 of 1

Exploratory Hole Number: **WS03**

FINAL

CENTRAL ALLIANCE GEO

		Location Details				Methodology & Plant			
Project No:	**2370414**	Easting:	**432844.61**	Northing:	**406469.64**	Depth (m)	Method	Plant Used	Scale: 1:50
Name:	**Penny Pie Park / Pogmoor Recreation Ground Footbridge**	Elevation:	**137.78mAOD**	Final Depth:	**3.45m**	0.00 - 1.20 1.20 - 3.45	Inspection Pit Dynamic Sampling	Hand Tools Boart Longyear	Checked By: RH
Location:	**Barnsley**	Logged By:	**EC**	Grid System:	**OSGB**				Approved By: RH
Client:	**HBPW**	Orientation:	**N/A**	Inclination:	**90°**				Start Date: 03/12/2019 Finish Date: 03/12/2019

Strata Description	Legend	Depth (m) (Stratum Thickness)	Reduced Level (mAOD)	Casing Ø (mm) Depth (m)	Water Level (m)	Installation / Backfill	Samples & Testing: Depth (m)	Ref	Test Results
MADE GROUND: Dark brown sandy very clayey subangular to subrounded fine to coarse sandstone, siltstone and brick GRAVEL. Sand is fine to coarse. *At 0.20m, pocket of brownish black slightly gravelly slightly sandy CLAY.*		(1.00)					0.20 0.20 - 0.50 0.50 0.60 0.90	1 ES 2 B 3 ES 4 D 5 ES	
MADE GROUND: Dark brown gravelly very clayey fine to coarse SAND. Gravel is angular to subangular fine to coarse siltstone, pottery, glass, brick, sandstone, clinker and plastic.		1.00 (0.20) 1.20	136.78 136.58				1.20 1.20 - 1.65	6 D 7 D	SPT(S) 1.20m, N=7 (1,1/1,2,2,2)
MADE GROUND: Loose black clayey very sandy angular to subangular fine to coarse siltstone, mudstone, clinker, slag, brick and coal GRAVEL. Sand is fine to coarse.		(0.80)					1.90	8 D	
Extremely weak black laminated friable SANDSTONE.		2.00 (0.45)	135.78				2.00 2.00 - 2.45	9 ES 10 D	SPT(S) 2.00m, N=1 (1,0/1,0,0,0)
No Recovery.		2.45 (1.00)	135.33	116 3.00			3.00 - 3.45	11 D	SPT(S) 3.00m, N=2 (1,0/1,0,1,0)
EOH at 3.45m - Scheduled Depth		3.45	134.33						

Observations / Remarks	Misc.	Backfill		Dynamic Sampling Runs					Installations			
	No Groundwater Encountered Casing Used No Monitoring Point/s Installed	Depth (m)	Material	From (m)	To (m)	Diam (mm)	Recovery (%)	Remarks	Instrument Details	Resp. Zone	Depth (m)	Diam
		0.00 - 3.45	Bentonite	1.20 2.00	2.00 3.00	101 101	100 0					
		Hammer Ref & Energy Ratio (%)							Groundwater Strikes			
		O5BL005 (64%)							Strike (m)	Casing (m)	Sealed (m)	Rises To (m)	Time (min)	Remarks

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Log Type	Exploratory Hole Number
Header Sheet	**WS05** FINAL

CENTRAL ALLIANCE GEO

		Location Details				Methodology & Plant				
Project No:	**2370414**	Easting:	**432822.42**	Northing:	**406417.80**	From (m)	Method	Plant Used	Scale:	1:50
Name:	**Penny Pie Park / Pogmoor Recreation Ground Footbridge**	Elevation:	**138.21mAOD**	Final Depth:	**7.45m**	0.00 - 1.20 1.20 - 7.45	Inspection Pit Dynamic Sampling	Hand Tools Boart Longyear	Checked:	RH
Location:	**Barnsley**	Logger:	**EC**	Grid System:	**OSGB**				Approved:	RH
Client:	**HBPW**	Orientation:	**N/A**	Inclination:	**90°**				Start Date:	05/12/2019
									End Date:	05/12/2019

Hole Diameter

Depth (m)	Diam (mm)

Casing Diameter

Depth (m)	Diam (mm)
4.00	116

Groundwater Strikes

Strike (m)	Casing (m)	Sealed (m)	Time (min)	Rose To (m)	Remarks

No Groundwater Encountered

Installation / Instrument Details

Date	Instrument Details	To (m)	Resp. Zone (m)	Diam (mm)

No Monitoring Point/s Installed

If Methodology includes Dynamic Sampling refer to Runs table for info.

Backfill

Depth (m)	Legend Code

In-Situ Tests

PID	0
Hand Vane*	0
Standard Penetration Tests	7

* One count indicates an average reported result of 3 tests carried out at one depth where available.

Sample Summary

Environmental Samples			
Soil	8	Water	0
Geotechnical Samples			
Bulk	1	Large Bulk	0
Disturbed	12	Disturbed (NR)	0
Piston	0	Piston (NR)	0
Undisturbed	0	Undisturbed (NR)	0
Undisturbed Thin Wall			0
Undisturbed Thin Wall (NR)			0
Core Sample			0

(NR) Indicates sample undertaken but with 0% Recovery

Standard Penetration Test Summary

Test Type	Depth (m)	Casing (m)	Water (m)	Seating Blows	Main Blows	Penetration Total (mm)	N	Reported Result	Hammer Ref
Split Spoon	1.20	-	-	4	5	450	5	N=5 (2,2/1,1,1,2)	O5BL005
Split Spoon	2.00	-	-	0	0	450	0	N=0 (0,0/0,0,0,0)	O5BL005
Split Spoon	3.00	-	-	2	5	450	5	N=5 (1,1/1,2,1,1)	O5BL005
Split Spoon	4.00	-	-	3	5	450	5	N=5 (2,1/1,1,1,2)	O5BL005
Split Spoon	5.00	-	-	3	9	450	9	N=9 (1,2/2,2,2,3)	O5BL005
Split Spoon	6.00	-	-	4	12	450	12	N=12 (2,2/3,2,3,4)	O5BL005
Split Spoon	7.00	-	-	4	12	450	12	N=12 (2,2/3,2,3,4)	O5BL005

SPT Hammer Ref.	Energy Ratio (%)
O5BL005	64

Applicable to Cable Percussion Only

Chiselling

Depth (m)	Duration (mins)

Water Added

Depth (m)	Litres

Applicable to Rotary Only

Drilling Flush

Depth (m)	Flush Type	Flush Colour	Return %

Applicable to Dynamic Sampling Only

Dynamic Sampling Runs

Depth (m)	Diam (mm)	Recovery %	Remarks
1.20 - 2.00	101	100	32 Blows
2.00 - 3.00	101	80	28 Blows
3.00 - 4.00	101	40	40 Blows
4.00 - 5.00	86	90	26 Blows
5.00 - 6.00	86	100	43 Blows
6.00 - 7.00	76	80	32 Blows

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Log Type: **Dynamic Sampling**

Sheet 1 of 1

Exploratory Hole Number: **WS05**

FINAL

CENTRAL ALLIANCE GEO

Project No:	**2370414**	Location Details				Methodology & Plant			Scale:	1:50
Name:	**Penny Pie Park / Pogmoor Recreation Ground Footbridge**	Easting:	**432822.42**	Northing:	**406417.80**	Depth (m)	Method	Plant Used	Checked By:	RH
Location:	**Barnsley**	Elevation:	**138.21mAOD**	Final Depth:	**7.45m**	0.00 - 1.20 1.20 - 7.45	Inspection Pit Dynamic Sampling	Hand Tools Boart Longyear	Approved By:	RH
Client:	**HBPW**	Logged By:	**EC**	Grid System:	**OSGB**				Start Date:	05/12/2019
		Orientation:	**N/A**	Inclination:	**90°**				Finish Date:	05/12/2019

Strata Description	Legend	Depth (m) (Stratum Thickness)	Reduced Level (mAOD)	Casing Ø (mm) Depth (m)	Water Level (m)	Installation / Backfill	Samples & Testing: Depth (m)	Ref	Test Results
MADE GROUND: Dark brown slightly gravelly slightly clayey fine to coarse SAND. Gravel is angular fine to coarse brick, metal, glass and clinker.		(0.30)					0.20	1 ES	
MADE GROUND: Loose dark brownish grey mottled light brown clayey very sandy angular to subangular fine to coarse glass, pottery, plastic, wire, rope, shale and sandstone GRAVEL. Sand is fine.		0.30	137.91				0.50 0.50 - 0.70	3 ES 2 B	
At 0.90m becomes very gravelly with more glass.							1.00	4 ES	
From 1.20m with cloth and large glass fragments.							1.20 - 1.65	5 D	SPT(S) 1.20m, N=5 (2,2/1,1,1,2)
		(2.20)					1.50	6 ES	
							1.80	7 D	
Below 2.00m, very loose.							2.00 - 2.45	8 D	SPT(S) 2.00m, N=0 (0,0/0,0,0,0)
MADE GROUND: Light brown and reddish orange slightly clayey very sandy angular to subrounded fine to coarse glass, plastic, metal, wire, shale, sandstone and shell GRAVEL. Sand is fine to coarse.		2.50	135.71				2.50	9 ES	
		(0.50)					2.80	10 D	
From 2.80m becomes very clayey and mottled white		3.00	135.21				3.00 - 3.45	11 D	SPT(S) 3.00m, N=5 (1,1/1,2,1,1)
MADE GROUND: Loose dark brown mottled black clayey very sandy angular to subangular fine to coarse glass, clinker and slag GRAVEL. Sand is fine to coarse.							3.50	12 ES	
		(2.00)		116 / 4.00			4.00 - 4.45	13 D	SPT(S) 4.00m, N=5 (2,1/1,1,1,2)
From 4.20m with brick fragments.									
From 4.60m becomes very clayey.							4.50	14 ES	
From 4.90m with occasional siltstone gravel.							4.80	15 D	
MADE GROUND: Loose light brownish grey mottled black clayey very sandy angular to subangular fine to coarse glass, metal, clinker, plastic and brick GRAVEL. Sand is fine to coarse.		5.00	133.21				5.00 - 5.45	16 D	SPT(S) 5.00m, N=9 (1,2/2,2,2,3)
							5.50	17 ES	
							5.80	18 D	
Below 6.00m, medium dense.							6.00 - 6.45	19 D	SPT(S) 6.00m, N=12 (2,2/3,2,3,4)
		(2.45)					6.50	20 D	
							7.00 - 7.45	21 D	SPT(S) 7.00m, N=12 (2,2/3,2,3,4)
EOH at 7.45m - Scheduled Depth		7.45	130.76						

Observations / Remarks

Misc.: *No Groundwater Encountered*, *Casing Used*, *No Monitoring Point/s Installed*

Backfill

Depth (m)	Material

Hammer Ref & Energy Ratio (%): **O5BL005 (64%)**

Dynamic Sampling Runs

From (m)	To (m)	Diam (mm)	Recovery (%)	Remarks
1.20	2.00	101	100	32 Blows
2.00	3.00	101	80	28 Blows
3.00	4.00	101	40	40 Blows
4.00	5.00	86	90	26 Blows
5.00	6.00	86	100	43 Blows
6.00	7.00	76	80	32 Blows

Installations

Instrument Details	Resp. Zone	Depth (m)	Diam

Groundwater Strikes

Strike (m)	Casing (m)	Sealed (m)	Rises To (m)	Time (min)	Remarks

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Log Type	Exploratory Hole Number
Header Sheet	**WS06** FINAL

CENTRAL ALLIANCE GEO

		Location Details				Methodology & Plant				
Project No:	**2370414**	Easting:	**432846.00**	Northing:	**406425.00**	From (m)	Method	Plant Used	Scale:	1:50
Name:	**Penny Pie Park / Pogmoor Recreation Ground Footbridge**	Elevation:	**137.95mAOD**	Final Depth:	**0.60m**	0.00 - 0.60	Inspection Pit	Hand Tools	Checked:	RH
Location:	**Barnsley**	Logger:	**EC**	Grid System:	**OSGB**				Approved:	RH
Client:	**HBPW**	Orientation:	**N/A**	Inclination:	**90°**				Start Date:	05/12/2019
									End Date:	05/12/2019

Hole Diameter

Depth (m)	Diam (mm)

Casing Diameter

Depth (m)	Diam (mm)

Hole Not Cased

Groundwater Strikes

Strike (m)	Casing (m)	Sealed (m)	Time (min)	Rose To (m)	Remarks

No Groundwater Encountered

Installation / Instrument Details

Date	Instrument Details	To (m)	Resp. Zone (m)	Diam (mm)

No Monitoring Point/s Installed

If Methodology includes Dynamic Sampling refer to Runs table for info.

Backfill

Depth (m)	Legend Code
0.00 - 0.60	Arisings

In-Situ Tests

PID	0
Hand Vane*	0
Standard Penetration Tests	0

* One count indicates an average reported result of 3 tests carried out at one depth where available.

Sample Summary

Environmental Samples			
Soil	0	Water	0
Geotechnical Samples			
Bulk	0	Large Bulk	0
Disturbed	0	Disturbed (NR)	0
Piston	0	Piston (NR)	0
Undisturbed	0	Undisturbed (NR)	0
Undisturbed Thin Wall			0
Undisturbed Thin Wall (NR)			0
Core Sample			0

(NR) Indicates sample undertaken but with 0% Recovery

No Samples Taken

Standard Penetration Test Summary

Test Type	Depth (m)	Casing (m)	Water (m)	Seating Blows	Main Blows	Penetration Total (mm)	N	Reported Result	Hammer Ref

SPT Hammer Ref.	Energy Ratio (%)

No Standard Penetration Tests Undertaken

Applicable to Cable Percussion Only

Chiselling

Depth (m)	Duration (mins)

Water Added

Depth (m)	Litres

Applicable to Rotary Only

Drilling Flush

Depth (m)	Flush Type	Flush Colour	Return %

Applicable to Dynamic Sampling Only

Dynamic Sampling Runs

Depth (m)	Diam (mm)	Recovery %	Remarks

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Log Type: **Dynamic Sampling**

Sheet 1 of 1

Exploratory Hole Number: **WS06**

FINAL

CENTRAL ALLIANCE GEO

Project No:	**2370414**	Location Details				Methodology & Plant			Scale:	1:50
Name:	**Penny Pie Park / Pogmoor Recreation Ground Footbridge**	Easting:	**432846.00**	Northing:	**406425.00**	Depth (m)	Method	Plant Used	Checked By:	RH
Location:	**Barnsley**	Elevation:	**137.95mAOD**	Final Depth:	**0.60m**	0.00 - 0.60	Inspection Pit	Hand Tools	Approved By:	RH
Client:	**HBPW**	Logged By:	**EC**	Grid System:	**OSGB**				Start Date:	05/12/2019
		Orientation:	**N/A**	Inclination:	**90°**				Finish Date:	05/12/2019

Strata Description	Legend	Depth (m) (Stratum Thickness)	Reduced Level (mAOD)	Casing Ø (mm) Depth (m)	Water Level (m)	Installation / Backfill	Samples & Testing: Depth (m)	Ref	Test Results
MADE GROUND: Dark brown and brown slightly gravelly slightly clayey fine to coarse SAND. Gravel is angular fine to coarse glass, pottery and brick.		(0.30)							
		0.30	137.65						
MADE GROUND: Dark brown mottled black slightly clayey gravelly fine to coarse SAND. Gravel is angular fine to coarse glass, brick, pottery, wire, clinker, rope, rubber and plastic.		(0.30)							
		0.60	137.35						
EOH at 0.60m - Refusal									

1 2 3 4 5 6 7 8 9 10

Observations / Remarks

Misc.: *No Groundwater Encountered; Hole Not Cased; No Monitoring Point/s Installed*

Backfill

Depth (m)	Material
0.00 - 0.60	Arisings

Hammer Ref & Energy Ratio (%)

Dynamic Sampling Runs

From (m)	To (m)	Diam (mm)	Recovery (%)	Remarks

Installations

Instrument Details	Resp. Zone	Depth (m)	Diam

Groundwater Strikes

Strike (m)	Casing (m)	Sealed (m)	Rises To (m)	Time (min)	Remarks

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Log Type	Exploratory Hole Number
Header Sheet	**WS06A** FINAL

CENTRAL ALLIANCE GEO

		Location Details				Methodology & Plant				
Project No:	**2370414**	Easting:	**432847.00**	Northing:	**406425.10**	From (m)	Method	Plant Used	Scale:	1:50
Name:	**Penny Pie Park / Pogmoor Recreation Ground Footbridge**	Elevation:	**137.95mAOD**	Final Depth:	**5.45m**	0.00 - 1.20 1.20 - 5.45	Inspection Pit Dynamic Sampling	Hand Tools Boart Longyear	Checked:	RH
Location:	**Barnsley**	Logger:	**EC**	Grid System:	**OSGB**				Approved:	RH
Client:	**HBPW**	Orientation:	**N/A**	Inclination:	**90°**				Start Date:	05/12/2019
									End Date:	05/12/2019

Hole Diameter

Depth (m)	Diam (mm)

Casing Diameter

Depth (m)	Diam (mm)
4.00	116

Groundwater Strikes

Strike (m)	Casing (m)	Sealed (m)	Time (min)	Rose To (m)	Remarks

Installation / Instrument Details

Date	Instrument Details	To (m)	Resp. Zone (m)	Diam (mm)

If Methodology includes Dynamic Sampling refer to Runs table for info.

No Groundwater Encountered

No Monitoring Point/s Installed

Backfill

Depth (m)	Legend Code
0.00 - 5.45	Bentonite

In-Situ Tests

PID	0
Hand Vane*	0
Standard Penetration Tests	5

* One count indicates an average reported result of 3 tests carried out at one depth where available.

Sample Summary

Environmental Samples			
Soil	6	Water	0
Geotechnical Samples			
Bulk	1	Large Bulk	0
Disturbed	10	Disturbed (NR)	0
Piston	0	Piston (NR)	0
Undisturbed	0	Undisturbed (NR)	0
Undisturbed Thin Wall			0
Undisturbed Thin Wall (NR)			0
Core Sample			0

(NR) Indicates sample undertaken but with 0% Recovery

Standard Penetration Test Summary

Test Type	Depth (m)	Casing (m)	Water (m)	Seating Blows	Main Blows	Penetration Total (mm)	N	Reported Result	Hammer Ref
Split Spoon	1.20	-	-	1	1	450	1	N=1 (1,0/0,0,0,1)	O5BL005
Split Spoon	2.00	-	-	0	0	450	0	N=0 (0,0/0,0,0,0)	O5BL005
Split Spoon	3.00	-	-	2	3	450	3	N=3 (1,1/1,1,1,0)	O5BL005
Split Spoon	4.00	-	-	2	7	450	7	N=7 (1,1/2,2,1,2)	O5BL005
Split Spoon	5.00	-	-	3	10	450	10	N=10 (1,2/2,3,3,2)	O5BL005

SPT Hammer Ref.	Energy Ratio (%)
O5BL005	64

Applicable to Cable Percussion Only

Chiselling

Depth (m)	Duration (mins)

Water Added

Depth (m)	Litres

Applicable to Rotary Only

Drilling Flush

Depth (m)	Flush Type	Flush Colour	Return %

Applicable to Dynamic Sampling Only

Dynamic Sampling Runs

Depth (m)	Diam (mm)	Recovery %	Remarks
1.20 - 2.00	101	75	34 Blows
2.00 - 3.00	101	80	43 Blows
3.00 - 4.00	101	80	34 Blo
4.00 - 5.00	86	80	31 Blows

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Log Type: **Dynamic Sampling**

Sheet 1 of 1

Exploratory Hole Number: **WS06A**

FINAL

CENTRAL ALLIANCE GEO

Project No:	**2370414**	Location Details				Methodology & Plant			Scale:	1:50
Name:	**Penny Pie Park / Pogmoor Recreation Ground Footbridge**	Easting:	**432847.00**	Northing:	**406425.10**	Depth (m)	Method	Plant Used	Checked By:	RH
Location:	**Barnsley**	Elevation:	**137.95mAOD**	Final Depth:	**5.45m**	0.00 - 1.20 1.20 - 5.45	Inspection Pit Dynamic Sampling	Hand Tools Boart Longyear	Approved By:	RH
Client:	**HBPW**	Logged By:	**EC**	Grid System:	**OSGB**				Start Date:	05/12/2019
		Orientation:	**N/A**	Inclination:	**90°**				Finish Date:	05/12/2019

Strata Description	Legend	Depth (m) (Stratum Thickness)	Reduced Level (mAOD)	Casing Ø (mm) Depth (m)	Water Level (m)	Installation / Backfill	Samples & Testing: Depth (m)	Ref	Test Results
MADE GROUND: Dark brown and brown slightly gravelly slightly clayey fine to coarse SAND. Gravel is angular fine to coarse metal, clinker, glass and brick.		(0.30)					0.20	1 ES	
From 0.10m with rootlets.		0.30	137.65				0.30 - 0.50	2 B	
MADE GROUND: Very loose dark brown and black mottled light brown very clayey very gravelly fine to coarse SAND. Gravel is subangular to subrounded fine to coarse glass, slag, clinker, plastic, pottery and metal.							0.50	3 ES	
At 0.60m with frequent plastic bags									
From 0.70m becomes very gravelly.		(1.40)					1.00	4 ES	
							1.20 - 1.65	5 D	SPT(S) 1.20m, N=1 (1,0/0,0,0,1)
							1.50	6 ES	
From 1.60m becomes slightly gravelly with occasional glass fragments.		1.70	136.25				1.80	7 D	
MADE GROUND: Very loose black and dark brown clayey very sandy angular medium to coarse glass, clinker and slag GRAVEL. Sand is fine to coarse.									SPT(S) 2.00m, N=0 (0,0/0,0,0,0)
From 2.30m becomes very gravelly.									
From 2.40m becomes very clayey		(1.50)					2.40	8 ES	
From 2.50m to 2.70m with shale and coal gravel.							2.50	9 D	
							3.00 - 3.45	10 D	SPT(S) 3.00m, N=3 (1,1/1,1,1,0)
MADE GROUND: Very loose black and dark grey mottled brown slightly gravelly clayey fine to coarse SAND. Gravel is subangular fine to coarse shale, glass, siltstone, clinker and slag.		3.20	134.75						
		(0.60)					3.50	11 ES	
MADE GROUND: Soft light brown mottled dark brown slightly gravelly sandy CLAY. Gravel is angular to subangular fine to coarse siltstone, shale and sandstone. Sand is fine to coarse.		3.80	134.15				3.80	12 D	
		(0.10)	134.05	116			3.90	13 D	
Loose light brown and brownish orange clayey very sandy subangular fine to coarse sandstone and siltstone GRAVEL. Sand is fine to coarse.		3.90		4.00			4.00 - 4.45	14 D	SPT(S) 4.00m, N=7 (1,1/2,2,1,2)
		(0.70)					4.40	15 D	
Light brown grey thinly laminated SANDSTONE.		4.60	133.35						
							4.80	16 D	
		(0.85)					5.00 - 5.45	17 D	SPT(S) 5.00m, N=10 (1,2/2,3,3,2)
EOH at 5.45m - Scheduled Depth		5.45	132.50						

Observations / Remarks

Misc.

No Groundwater Encountered
Casing Used
No Monitoring Point/s Installed

Backfill

Depth (m)	Material
0.00 - 5.45	Bentonite

Hammer Ref & Energy Ratio (%)

O5BL005 (64%)

Dynamic Sampling Runs

From (m)	To (m)	Diam (mm)	Recovery (%)	Remarks
1.20	2.00	101	75	34 Blows
2.00	3.00	101	80	43 Blows
3.00	4.00	101	80	34 Blo
4.00	5.00	86	80	31 Blows

Installations

Instrument Details	Resp. Zone	Depth (m)	Diam

Groundwater Strikes

Strike (m)	Casing (m)	Sealed (m)	Rises To (m)	Time (min)	Remarks

D84

Hammer Energy Test Report

in accordance with BSEN ISO 22476-3:2005

Dynamic sampling uk ltd
5-8 victory parkway
victory road
Derby
DE24 8ZF

Hammer Ref:	06
Test Date:	04/06/2019
Report Date:	06/06/2019
File Name:	06.spt
Test Operator:	TP

Instrumented Rod Data

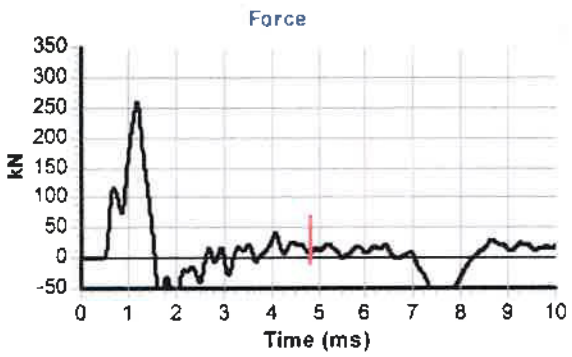
Diameter d_r (mm):	54
Wall Thickness t_r (mm):	6.0
Assumed Modulus E_a (GPa):	208
Accelerometer No.1:	9603
Accelerometer No.2:	6457

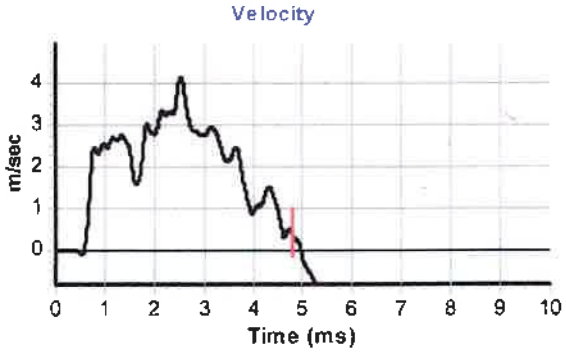
Hammer Information

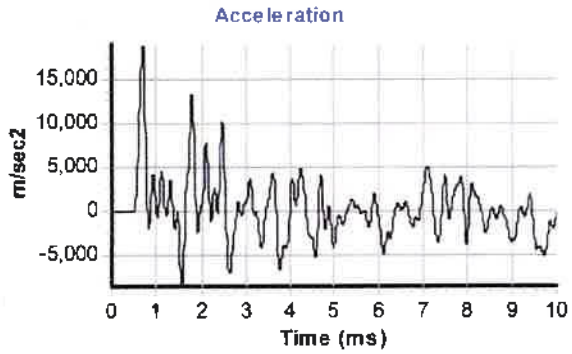
Hammer Mass m (kg):	63.5
Falling Height h (mm):	760
String Length L (m):	15.0

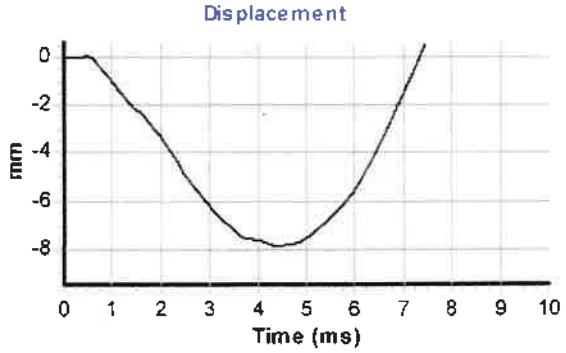
Comments / Location

Central alliance hammer tested at Dynamic samplings yard.





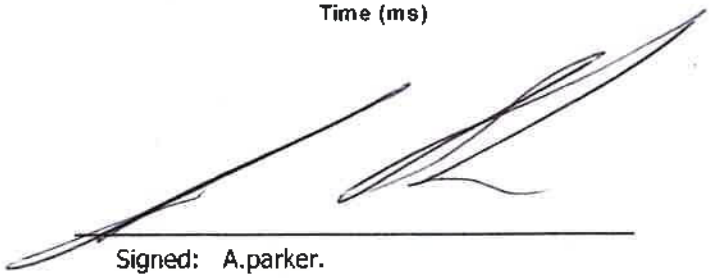




Calculations

Area of Rod A (mm2):	905
Theoretical Energy E_{theor} (J):	473
Measured Energy E_{meas} (J):	327

Energy Ratio E_r (%): **69**



Signed: A.parker.

Title: Associate Director.

The recommended calibration interval is 12 months

Hammer Energy Test Report

in accordance with BSEN ISO 22476-3:2005

Dynamic sampling uk ltd
5-8 victory parkway
victory road
Derby
DE24 8ZF

Hammer Ref:	O5BL005
Test Date:	17/06/2019
Report Date:	18/06/2019
File Name:	O5BL005.spt
Test Operator:	TP

Instrumented Rod Data

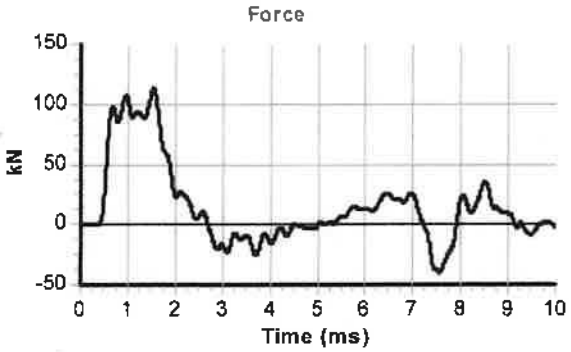
Diameter d_r (mm):	54
Wall Thickness t_r (mm):	6.0
Assumed Modulus E_a (GPa):	208
Accelerometer No.1:	9603
Accelerometer No.2:	6457

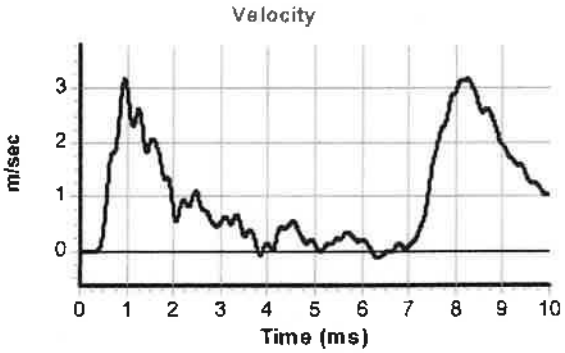
Hammer Information

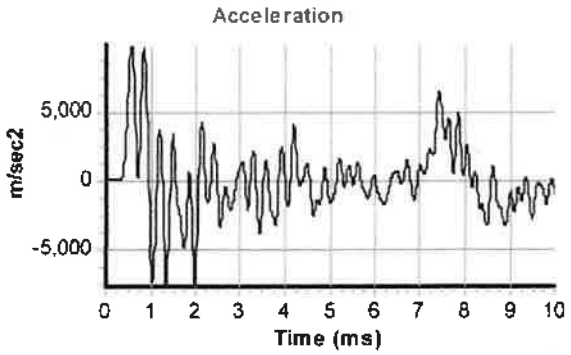
Hammer Mass m (kg):	63.5
Falling Height h (mm):	760
String Length L (m):	15.0

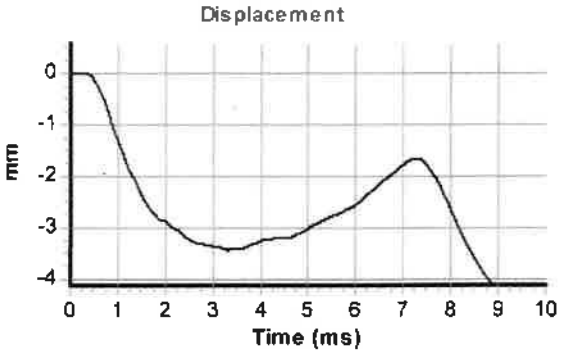
Comments / Location

Central alliance rig tested at Dynamic samlings yard.





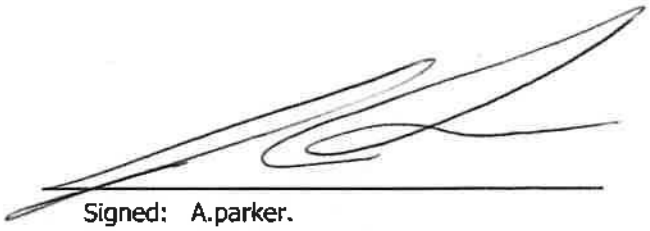




Calculations

Area of Rod A (mm2):	905
Theoretical Energy E_{theor} (J):	473
Measured Energy E_{meas} (J):	303

Energy Ratio E_r (%): **64**



Signed: A.parker.

Title: Associate Director.

The recommended calibration interval is 12 months

APPENDIX B
PHOTOGRAPHS

PHOTOGRAPH 1 – WS01– 1.20m to 2.00m bgl

PHOTOGRAPH 2 – WS01– 2.00m to 3.00m bgl

Client	HBPW
Project	2370414
Title	Penny Pie Park/ Pogmoor Recreation Ground Footbridge.

CENTRAL ALLIANCE GEO

PHOTOGRAPH 3 – WS03– 1.20m to 2.00m bgl

PHOTOGRAPH 4 – WS05– 1.20m- 2.00m bgl

Client	HBPW
Project	2370414
Title	Penny Pie Park/ Pogmoor Recreation Ground Footbridge.

CENTRAL ALLIANCE GEO

PHOTOGRAPH 5 – WS05– 2.00m- 3.00m bgl

PHOTOGRAPH 6 – WS05– 3.00m- 4.00m bgl

Client	HBPW
Project	2370414
Title	Penny Pie Park/ Pogmoor Recreation Ground Footbridge.

CENTRAL ALLIANCE GEO

PHOTOGRAPH 7 – WS05– 4.00m- 5.00m bgl

PHOTOGRAPH 8 – WS05– 5.00m- 6.00m bgl

Client	HBPW
Project	2370414
Title	Penny Pie Park/ Pogmoor Recreation Ground Footbridge.

CENTRAL ALLIANCE GEO

PHOTOGRAPH 9 – WS05– 6.00m- 7.00m bgl

PHOTOGRAPH 10 – WS06A– 1.20m- 2.00m bgl

Client	HBPW
Project	2370414
Title	Penny Pie Park/ Pogmoor Recreation Ground Footbridge.

CENTRAL ALLIANCE GEO

PHOTOGRAPH 11 – WS06A– 2.00m- 3.00m bgl

PHOTOGRAPH 12 – WS06A– 3.00m- 4.00m bgl

Client	HBPW
Project	2370414
Title	Penny Pie Park/ Pogmoor Recreation Ground Footbridge.

CENTRAL ALLIANCE GEO

PHOTOGRAPH 13 – WS06A– 4.00m- 5.00m bgl

PHOTOGRAPH 14 – TT01– Spoil

Client	HBPW
Project	2370414
Title	Penny Pie Park/ Pogmoor Recreation Ground Footbridge.

CENTRAL ALLIANCE GEO

PHOTOGRAPH 15 – TT01 – Spoil

PHOTOGRAPH 16 – TT01– Spoil

Client	HBPW
Project	2370414
Title	Penny Pie Park/ Pogmoor Recreation Ground Footbridge.

CENTRAL ALLIANCE GEO

PHOTOGRAPH 17 – TT01 – Trench 0.00m- 3.50m bgl

PHOTOGRAPH 18 – TT01– Trench 0.00m- 3.50m bgl

Client	HBPW
Project	2370414
Title	Penny Pie Park/ Pogmoor Recreation Ground Footbridge.

CENTRAL ALLIANCE GEO

PHOTOGRAPH 19 – TT02 – Trench 0.00m- 3.40m bgl

PHOTOGRAPH 20 – TT02–Trench 0.00m- 3.50m bgl

Client	HBPW
Project	2370414
Title	Penny Pie Park/ Pogmoor Recreation Ground Footbridge.

CENTRAL ALLIANCE GEO

PHOTOGRAPH 21 – TT02 – Trench 0.00m- 3.40m bgl

PHOTOGRAPH 22 – TT03–Trench Spoil

Client	HBPW
Project	2370414
Title	Penny Pie Park/ Pogmoor Recreation Ground Footbridge.

CENTRAL ALLIANCE GEO

PHOTOGRAPH 23 – TT03 – Trench 0.00m- 3.40m bgl

PHOTOGRAPH 24 – TT03– Spoil

Client	HBPW
Project	2370414
Title	Penny Pie Park/ Pogmoor Recreation Ground Footbridge.

CENTRAL ALLIANCE GEO

PHOTOGRAPH 25 – TT03 – Trench 0.00m- 3.40m bgl

PHOTOGRAPH 26 – TT03– Spoil

Client	HBPW
Project	2370414
Title	Penny Pie Park/ Pogmoor Recreation Ground Footbridge.

CENTRAL ALLIANCE GEO

PHOTOGRAPH 27 – TT04 – Spoil and Trench – 0.00m- 3.60m bgl

PHOTOGRAPH 28 – TT04- Spoil

Client	HBPW
Project	2370414
Title	Penny Pie Park/ Pogmoor Recreation Ground Footbridge.

CENTRAL ALLIANCE GEO

PHOTOGRAPH 29 – TT04 – Trench 0.00m- 3.60m bgl

PHOTOGRAPH 30 – TT04– Trench 0.00m- 3.60m bgl

Client	HBPW
Project	2370414
Title	Penny Pie Park/ Pogmoor Recreation Ground Footbridge.

CENTRAL ALLIANCE GEO

PHOTOGRAPH 31 – TT04 – Trench 0.00m- 3.60m bgl

PHOTOGRAPH 32 – TT04- Spoil

Client	HBPW
Project	2370414
Title	Penny Pie Park/ Pogmoor Recreation Ground Footbridge.

CENTRAL ALLIANCE GEO

PHOTOGRAPH 33 – BH01– 4.60m- 7.60m bgl

PHOTOGRAPH 34 – BH01- 7.60m- 10.00m bgl

Client	HBPW
Project	2370414
Title	Penny Pie Park/ Pogmoor Recreation Ground Footbridge.

CENTRAL ALLIANCE GEO

PHOTOGRAPH 35 – BH02– 10.10m- 13.10m bgl

PHOTOGRAPH 36 – BH02- 13.10m- 15.10m bgl

Client	HBPW
Project	2370414
Title	Penny Pie Park/ Pogmoor Recreation Ground Footbridge.

CENTRAL ALLIANCE GEO

PHOTOGRAPH 37 – BH03– 5.65m- 9.60m bgl

PHOTOGRAPH 38 – BH03- 9.60m- 10.90m bgl

Client	HBPW
Project	2370414
Title	Penny Pie Park/ Pogmoor Recreation Ground Footbridge.

CENTRAL ALLIANCE GEO

PHOTOGRAPH 39 – BH04– 4.70m- 7.30m bgl

PHOTOGRAPH 40 – BH04- 7.30m- 9.90m bgl

Client	HBPW
Project	2370414
Title	Penny Pie Park/ Pogmoor Recreation Ground Footbridge.

CENTRAL ALLIANCE GEO

APPENDIX C
GEOTECHNICAL LABORATORY TESTING

STRUCTURAL SOILS LTD

TEST REPORT

1774

Report No. 784305 - R2

Date	23-January-2020	Contract	Penny Pie Park Footbridge

Client Central Alliance
Address Alliance House
South Park Way
Wakefield 41 Business Park
Wakefield WF2 0XJ

For the Attention of *

Order received	08-January-2020	Client Reference	784305
Testing Started	10-January-2020	Client Order No.	*
Testing Completed	23-January-2020	Instruction Type	Written

Tests marked 'Not UKAS Accredited' in this report are not included in the UKAS Accreditation Schedule for our Laboratory

UKAS Accredited Tests

Particle Size Distribution wet sieve method BS1377:Part 2:1990,clause 9.2

* This clause of BS1377 is no longer the most up to date method due to the publication of ISO17892

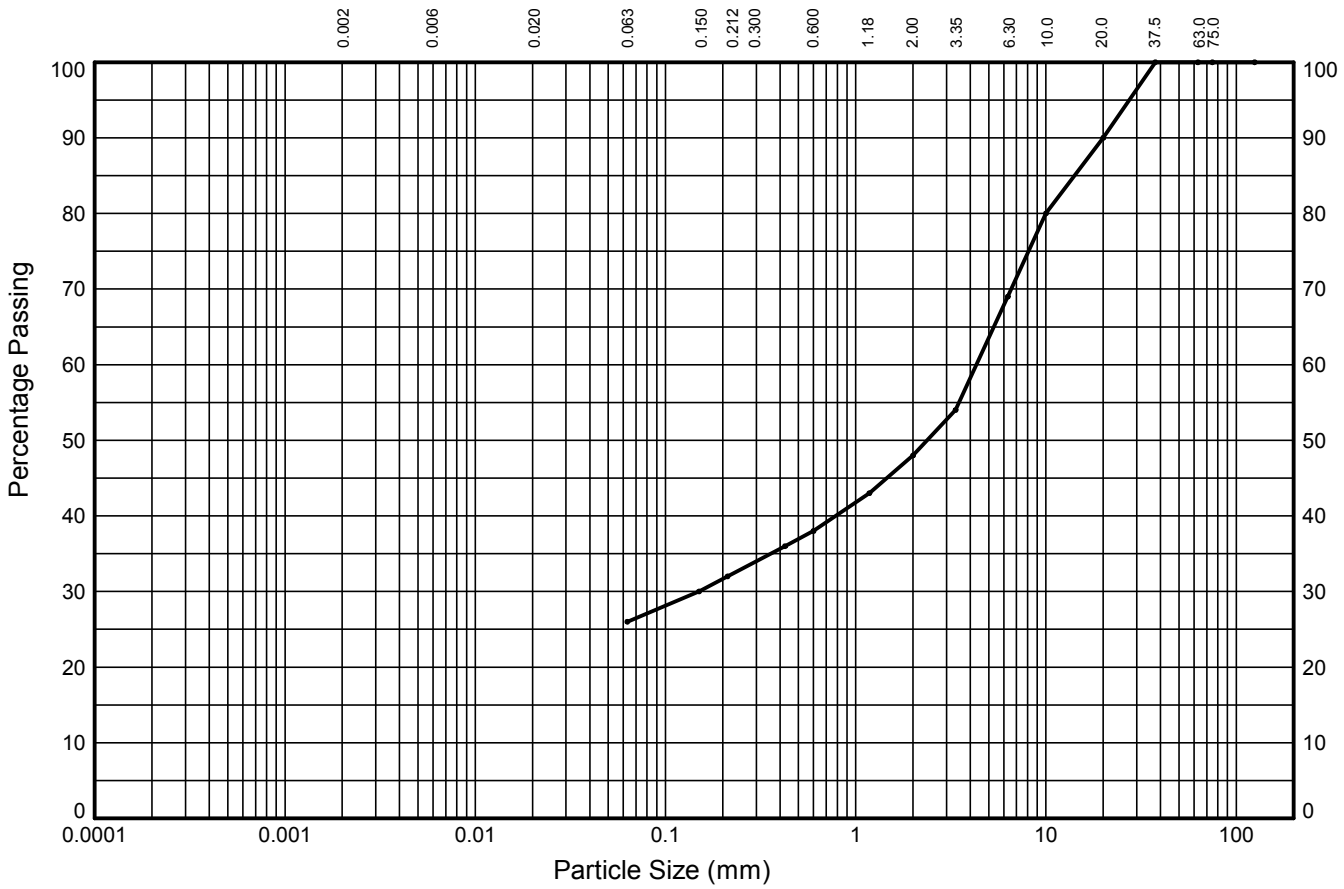
Please Note: Remaining samples will be retained for a period of one month from today and will then be disposed of.
Test were undertaken on samples 'as received' unless otherwise stated.
Opinions and interpretations expressed in this report are outside the scope of accreditation for this laboratory.

Structural Soils Ltd, The Potteries, Pottery Street, Castleford, WF10 1NJ Tel.01977 552255. E-mail mark.athorne@soils.co.uk

PARTICLE SIZE DISTRIBUTION TEST

In accordance with clauses 9.2 of BS1377:Part 2:1990
NON-STANDARD TEST

Window Sample: **WS01** Sample Ref: **5** Sample Type: **B** Depth (m): **0.50**



CLAY	fine	medium	coarse	fine	medium	coarse	fine	medium	coarse	COBBLES
	-	-	-	6%	7%	10%	21%	21%	10%	
	SILT			SAND			GRAVEL			
26%				22%			52%			0%

Test Sieve (mm)	Percent Passing (%)
125.0	**100**
75.0	**100**
63.0	**100**
37.5	**100**
20.0	**90**
10.0	**80**
6.30	**69**
3.35	**54**
2.00	**48**
1.18	**43**
0.600	**38**
0.425	**36**
0.212	**32**
0.150	**30**
0.063	**26**

Particle Diameter (mm)	Percent Passing (%)

Sedimentation sample was not pre-treated

Coefficients	
D_{10} (mm)	**NA**
D_{15} (mm)	**NA**
D_{30} (mm)	**0.150**
D_{50} (mm)	**2.375**
D_{60} (mm)	**4.313**
D_{85} (mm)	**14.142**
D_{90} (mm)	**20.000**
C_U	**NA**
C_C	**NA**

Soil Description:

Black very sandy very clayey GRAVEL

Key: C_U = Uniformity coefficient. C_C = Coefficient of curvature as defined in BS EN ISO 14688-2

STRUCTURAL SOILS
The Potteries
Pottery Street
Castleford
W. Yorkshire WF10 1NJ

Compiled By	Date
LORNA WHITWORTH	**23/01/20**

Contract	Contract Ref:
Penny Pie Park Footbridge	**784305**

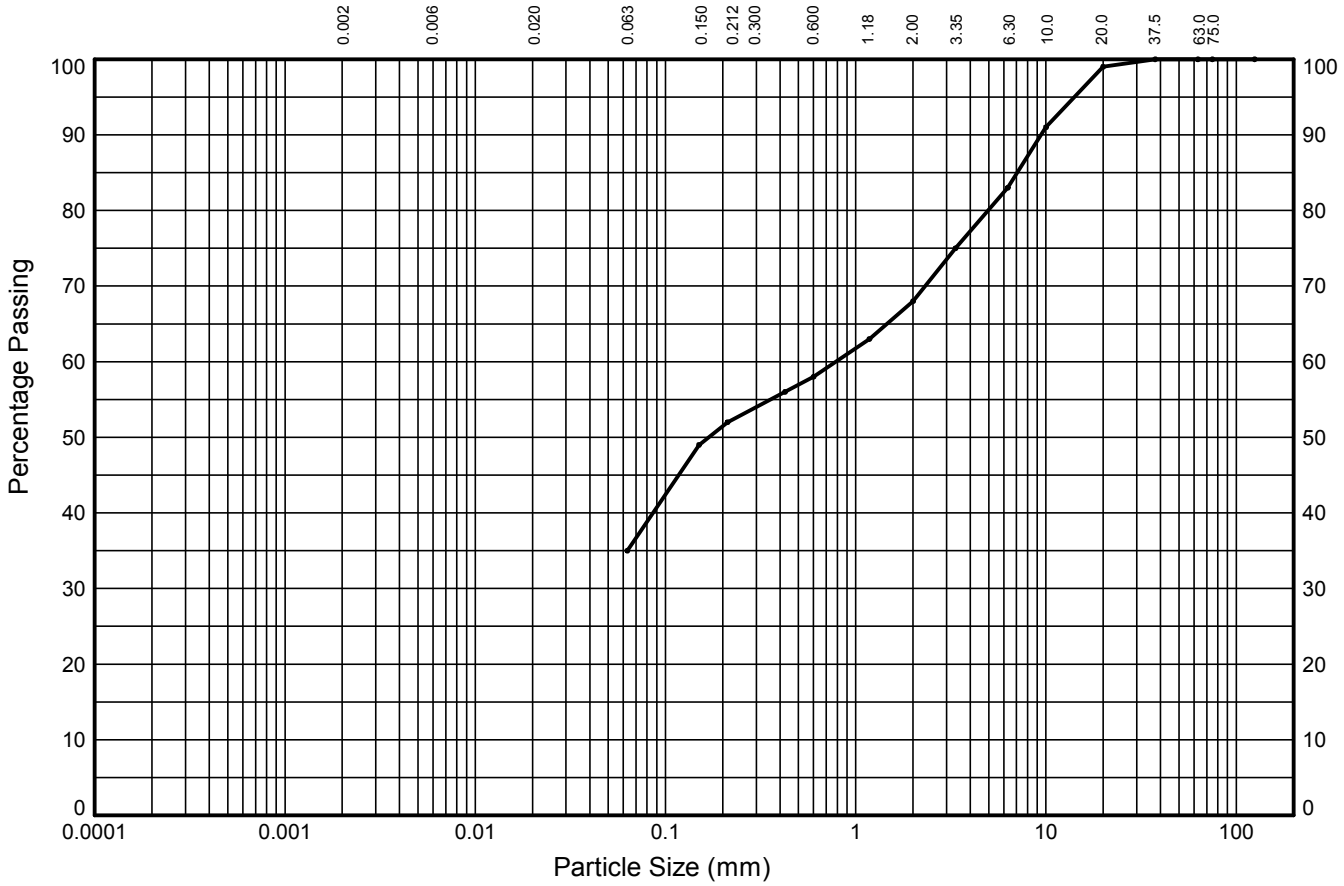
AGS

PARTICLE SIZE DISTRIBUTION TEST

In accordance with clauses 9.2 of BS1377:Part 2:1990

NON-STANDARD TEST

Window Sample: **WS01** Sample Ref: **15** Sample Type: **B** Depth (m): **3.00**



CLAY	fine	medium	coarse	fine	medium	coarse	fine	medium	coarse	COBBLES
	-	-	-	16%	7%	10%	15%	16%	1%	
	SILT			SAND			GRAVEL			
35%				33%			32%			0%

Test Sieve (mm)	Percent Passing (%)
125.0	**100**
75.0	**100**
63.0	**100**
37.5	**100**
20.0	**99**
10.0	**91**
6.30	**83**
3.35	**75**
2.00	**68**
1.18	**63**
0.600	**58**
0.425	**56**
0.212	**52**
0.150	**49**
0.063	**35**

Particle Diameter (mm)	Percent Passing (%)

Sedimentation sample was not pre-treated

Coefficients	
D_{10} (mm)	**NA**
D_{15} (mm)	**NA**
D_{30} (mm)	**NA**
D_{50} (mm)	**0.168**
D_{60} (mm)	**0.786**
D_{85} (mm)	**7.071**
D_{90} (mm)	**9.439**
C_U	**NA**
C_C	**NA**

Soil Description:

Brown sandy gravelly CLAY

Key: C_U = Uniformity coefficient. C_C = Coefficient of curvature as defined in BS EN ISO 14688-2

STRUCTURAL SOILS
The Potteries
Pottery Street
Castleford
W. Yorkshire WF10 1NJ

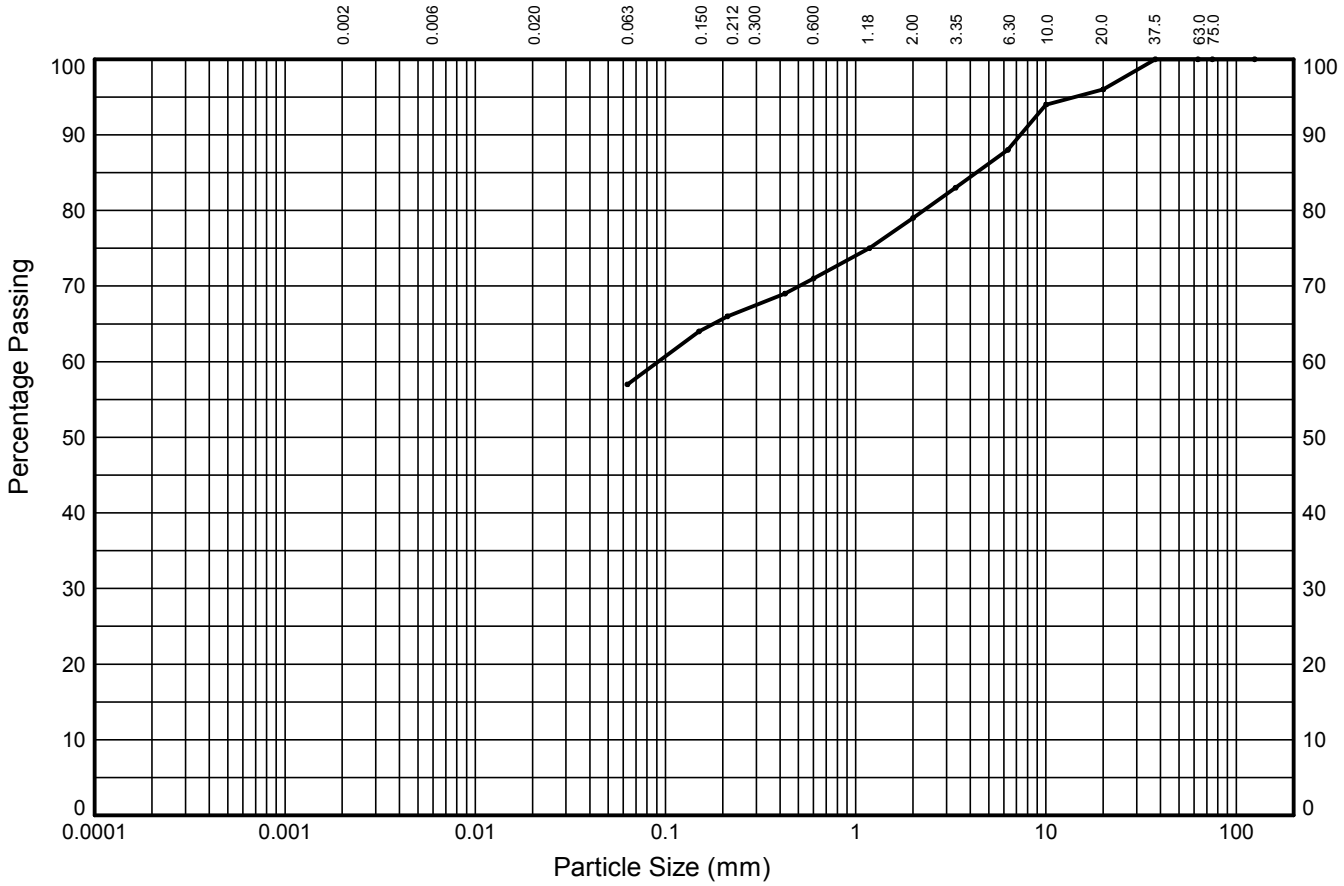
Compiled By	Date
LORNA WHITWORTH	**23/01/20**

Contract	Contract Ref:
Penny Pie Park Footbridge	**784305**

PARTICLE SIZE DISTRIBUTION TEST

In accordance with clauses 9.2 of BS1377:Part 2:1990
NON-STANDARD TEST

Window Sample: **WS03** Sample Ref: **2** Sample Type: **D** Depth (m): **0.20**



CLAY	fine	medium	coarse	fine	medium	coarse	fine	medium	coarse	COBBLES
	-	-	-	9%	6%	8%	9%	8%	4%	
	SILT			SAND			GRAVEL			
57%				22%			21%			0%

Test Sieve (mm)	Percent Passing (%)
125.0	**100**
75.0	**100**
63.0	**100**
37.5	**100**
20.0	**96**
10.0	**94**
6.30	**88**
3.35	**83**
2.00	**79**
1.18	**75**
0.600	**71**
0.425	**69**
0.212	**66**
0.150	**64**
0.063	**57**

Particle Diameter (mm)	Percent Passing (%)

Sedimentation sample was not pre-treated

Coefficients	
D_{10} (mm)	**NA**
D_{15} (mm)	**NA**
D_{30} (mm)	**NA**
D_{50} (mm)	**NA**
D_{60} (mm)	**0.091**
D_{85} (mm)	**4.313**
D_{90} (mm)	**7.349**
C_U	**NA**
C_C	**NA**

Soil Description:

Brown black slightly gravelly slightly sandy CLAY

Key: C_U = Uniformity coefficient. C_C = Coefficient of curvature as defined in BS EN ISO 14688-2

STRUCTURAL SOILS
The Potteries
Pottery Street
Castleford
W. Yorkshire WF10 1NJ

Compiled By	Date
LORNA WHITWORTH	23/01/20

Contract	Contract Ref:
Penny Pie Park Footbridge	**784305**

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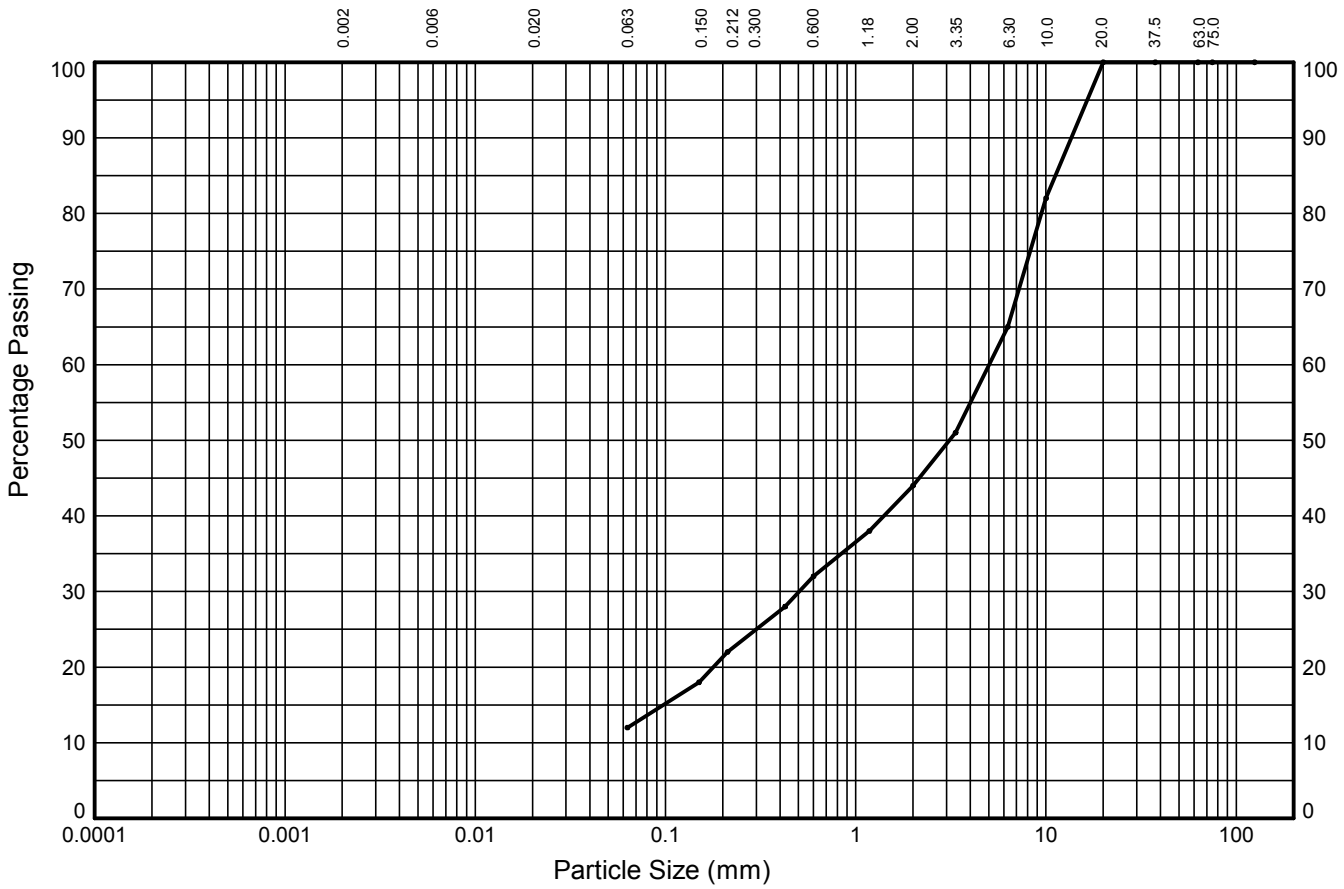
PARTICLE SIZE DISTRIBUTION TEST

In accordance with clauses 9.2 of BS1377:Part 2:1990
NON-STANDARD TEST

Window Sample: **WS03** Sample Ref: **6** Sample Type: **D** Depth (m): **1.20**



CLAY	fine	medium	coarse	fine	medium	coarse	fine	medium	coarse	COBBLES
	-	-	-	9%	11%	12%	21%	35%	0%	
	SILT			SAND			GRAVEL			
12%				32%			56%			0%

Test Sieve (mm)	Percent Passing (%)
125.0	**100**
75.0	**100**
63.0	**100**
37.5	**100**
20.0	**100**
10.0	**82**
6.30	**65**
3.35	**51**
2.00	**44**
1.18	**38**
0.600	**32**
0.425	**28**
0.212	**22**
0.150	**18**
0.063	**12**

Particle Diameter (mm)	Percent Passing (%)

Sedimentation sample was not pre-treated

Coefficients	
D_{10} (mm)	**NA**
D_{15} (mm)	**0.097**
D_{30} (mm)	**0.505**
D_{50} (mm)	**3.112**
D_{60} (mm)	**5.028**
D_{85} (mm)	**11.225**
D_{90} (mm)	**13.608**
C_U	**NA**
C_C	**NA**

Soil Description:

Black clayey very sandy GRAVEL

Key: C_U = Uniformity coefficient. C_C = Coefficient of curvature as defined in BS EN ISO 14688-2

STRUCTURAL SOILS
The Potteries
Pottery Street
Castleford
W. Yorkshire WF10 1NJ

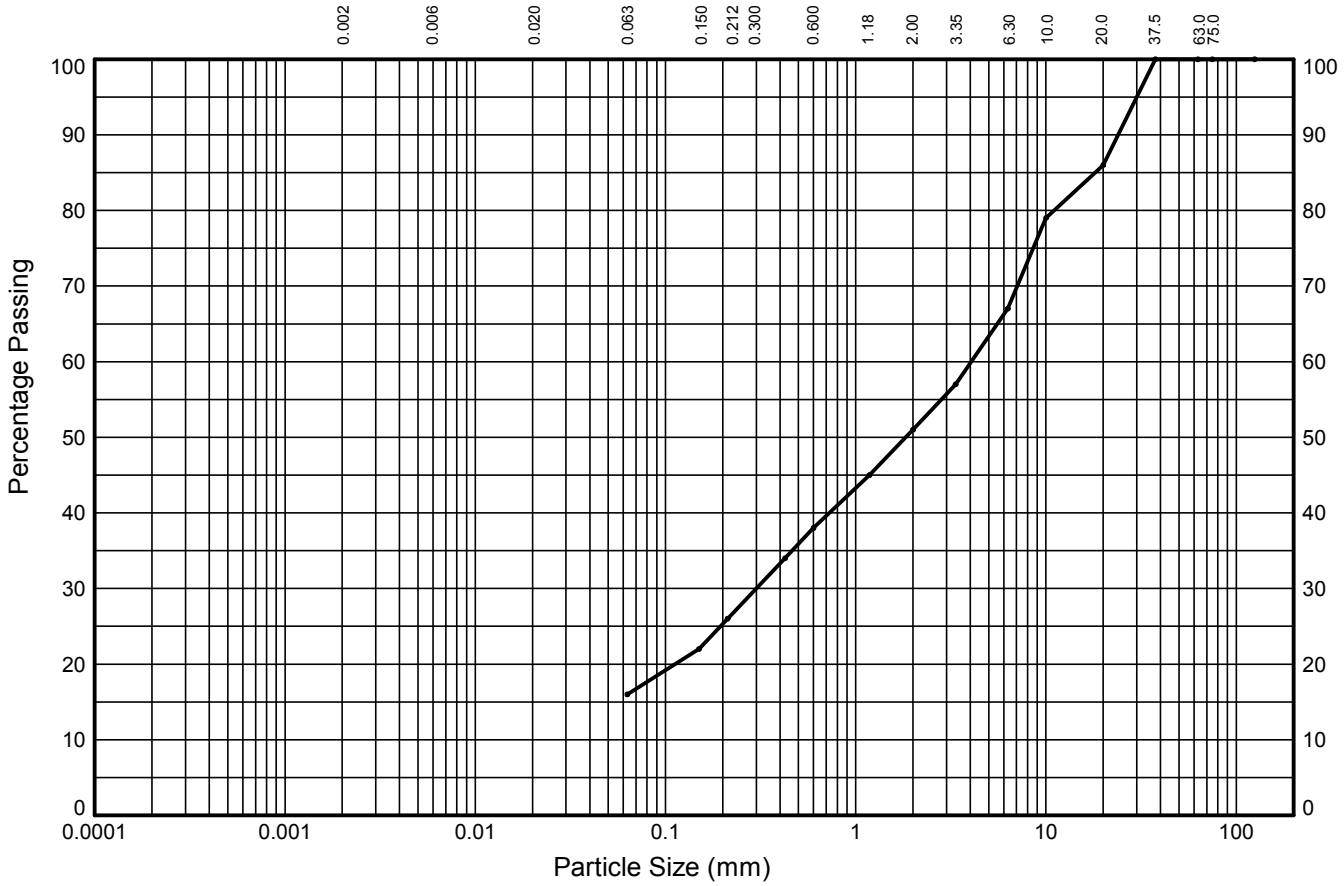
Compiled By	Date
LORNA WHITWORTH	23/01/20

Contract	Contract Ref:
Penny Pie Park Footbridge	**784305**

PARTICLE SIZE DISTRIBUTION TEST

In accordance with clauses 9.2 of BS1377:Part 2:1990
NON-STANDARD TEST

Window Sample: **WS05** Sample Ref: **11** Sample Type: **D** Depth (m): **3.00**



CLAY	fine	medium	coarse	fine	medium	coarse	fine	medium	coarse	COBBLES
	-	-	-	9%	13%	13%	16%	19%	14%	
	SILT			SAND			GRAVEL			
16%				35%			49%			0%

Test Sieve (mm)	Percent Passing (%)
125.0	**100**
75.0	**100**
63.0	**100**
37.5	**100**
20.0	**86**
10.0	**79**
6.30	**67**
3.35	**57**
2.00	**51**
1.18	**45**
0.600	**38**
0.425	**34**
0.212	**26**
0.150	**22**
0.063	**16**

Particle Diameter (mm)	Percent Passing (%)

Sedimentation sample was not pre-treated

Coefficients	
D_{10} (mm)	**NA**
D_{15} (mm)	**NA**
D_{30} (mm)	**0.300**
D_{50} (mm)	**1.832**
D_{60} (mm)	**4.049**
D_{85} (mm)	**18.114**
D_{90} (mm)	**23.935**
C_U	**NA**
C_C	**NA**

Soil Description:

Black clayey very sandy GRAVEL

Key: C_U = Uniformity coefficient. C_C = Coefficient of curvature as defined in BS EN ISO 14688-2

STRUCTURAL SOILS
The Potteries
Pottery Street
Castleford
W. Yorkshire WF10 1NJ

Compiled By	Date
LORNA WHITWORTH	**23/01/20**

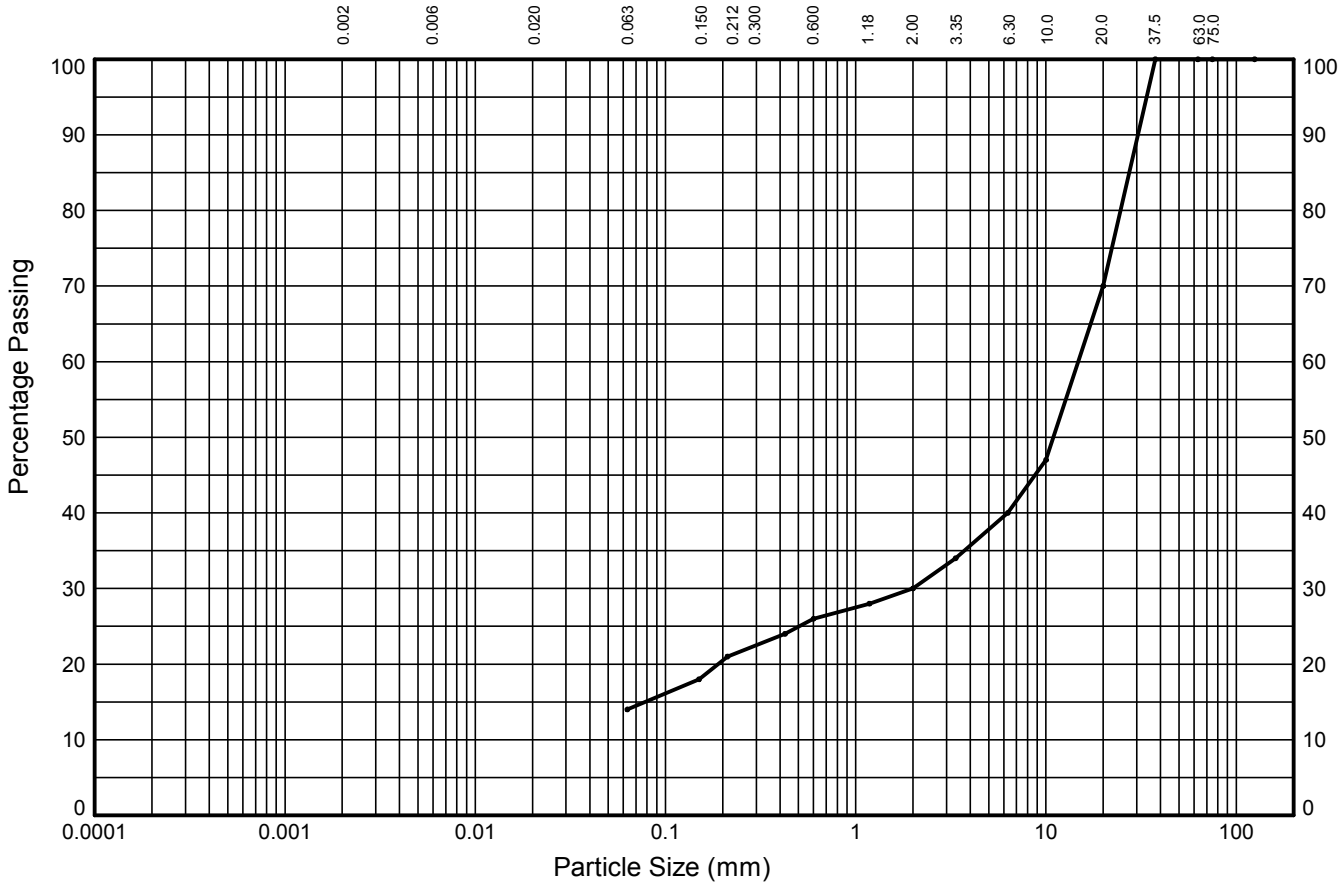
Contract	Contract Ref:
Penny Pie Park Footbridge	**784305**

PARTICLE SIZE DISTRIBUTION TEST

In accordance with clauses 9.2 of BS1377:Part 2:1990

NON-STANDARD TEST

Window Sample: **WS05** Sample Ref: **19** Sample Type: **D** Depth (m): **6.00**



CLAY	fine	medium	coarse	fine	medium	coarse	fine	medium	coarse	COBBLES
	-	-	-	6%	6%	4%	10%	30%	30%	
	SILT			SAND			GRAVEL			
14%				16%			70%			0%

Test Sieve (mm)	Percent Passing (%)
125.0	**100**
75.0	**100**
63.0	**100**
37.5	**100**
20.0	**70**
10.0	**47**
6.30	**40**
3.35	**34**
2.00	**30**
1.18	**28**
0.600	**26**
0.425	**24**
0.212	**21**
0.150	**18**
0.063	**14**

Particle Diameter (mm)	Percent Passing (%)

Sedimentation sample was not pre-treated

Coefficients	
D_{10} (mm)	**NA**
D_{15} (mm)	**0.078**
D_{30} (mm)	**2.000**
D_{50} (mm)	**10.946**
D_{60} (mm)	**14.796**
D_{85} (mm)	**27.386**
D_{90} (mm)	**30.411**
C_U	**NA**
C_C	**NA**

Soil Description:

Brown clayey sandy GRAVEL

Key: C_U = Uniformity coefficient. C_C = Coefficient of curvature as defined in BS EN ISO 14688-2

STRUCTURAL SOILS
The Potteries
Pottery Street
Castleford
W. Yorkshire WF10 1NJ

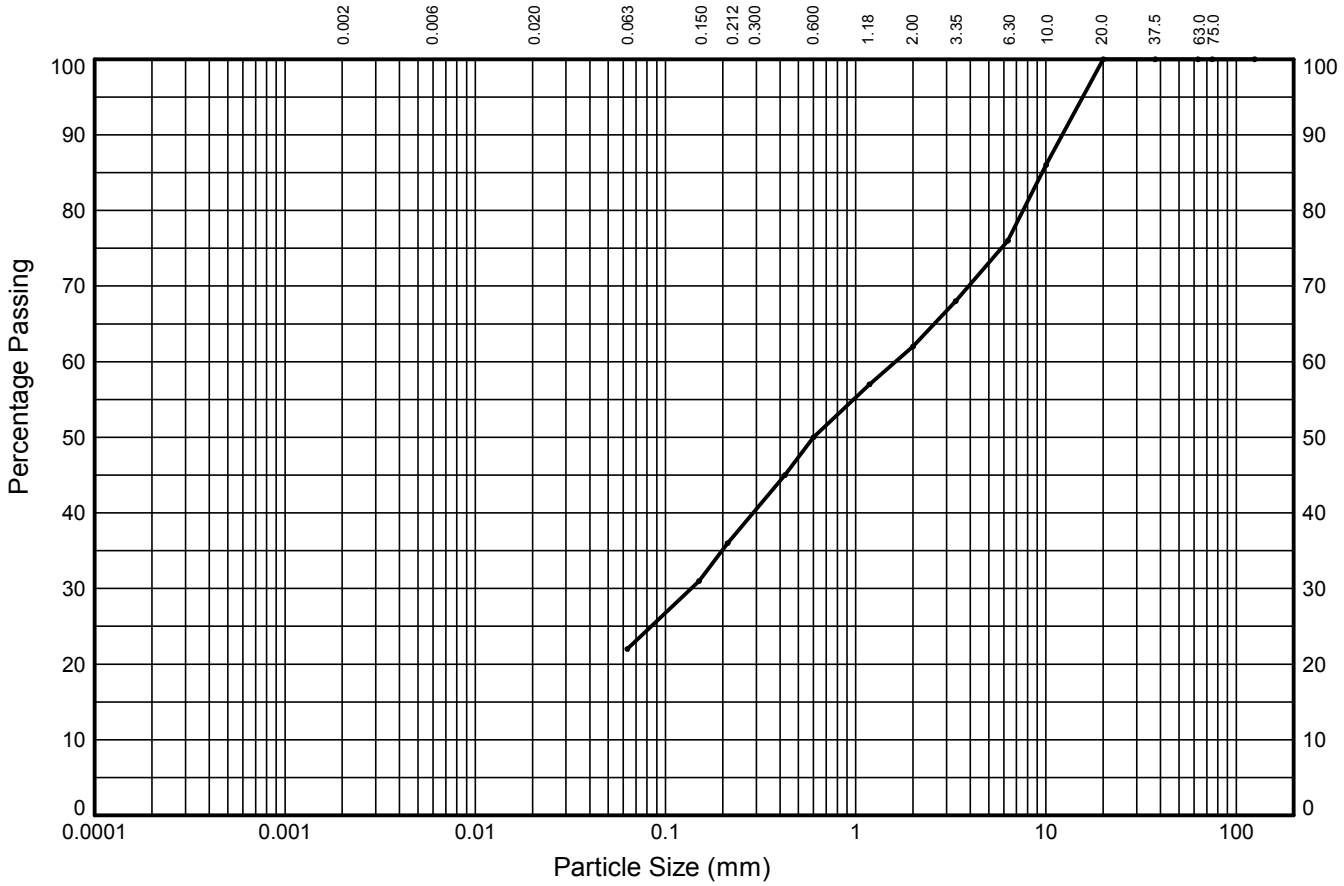
Compiled By	Date
LORNA WHITWORTH	23/01/20

Contract	Contract Ref:
Penny Pie Park Footbridge	**784305**

PARTICLE SIZE DISTRIBUTION TEST

In accordance with clauses 9.2 of BS1377:Part 2:1990
NON-STANDARD TEST

Window Sample: **WS06A** Sample Ref: **5** Sample Type: **D** Depth (m): **1.20**



CLAY	fine	medium	coarse	fine	medium	coarse	fine	medium	coarse	COBBLES
	-	-	-	13%	15%	12%	14%	24%	0%	
	SILT			SAND			GRAVEL			
22%				40%			38%			0%

Test Sieve (mm)	Percent Passing (%)
125.0	**100**
75.0	**100**
63.0	**100**
37.5	**100**
20.0	**100**
10.0	**86**
6.30	**76**
3.35	**68**
2.00	**62**
1.18	**57**
0.600	**50**
0.425	**45**
0.212	**36**
0.150	**31**
0.063	**22**

Particle Diameter (mm)	Percent Passing (%)

Sedimentation sample was not pre-treated

Coefficients	
D_{10} (mm)	**NA**
D_{15} (mm)	**NA**
D_{30} (mm)	**0.136**
D_{50} (mm)	**0.600**
D_{60} (mm)	**1.619**
D_{85} (mm)	**9.548**
D_{90} (mm)	**12.190**
C_U	**NA**
C_C	**NA**

Soil Description:

Black very clayey very gravelly SAND

Key: C_U = Uniformity coefficient. C_C = Coefficient of curvature as defined in BS EN ISO 14688-2

STRUCTURAL SOILS
The Potteries
Pottery Street
Castleford
W. Yorkshire WF10 1NJ

Compiled By	Date
LORNA WHITWORTH	23/01/20

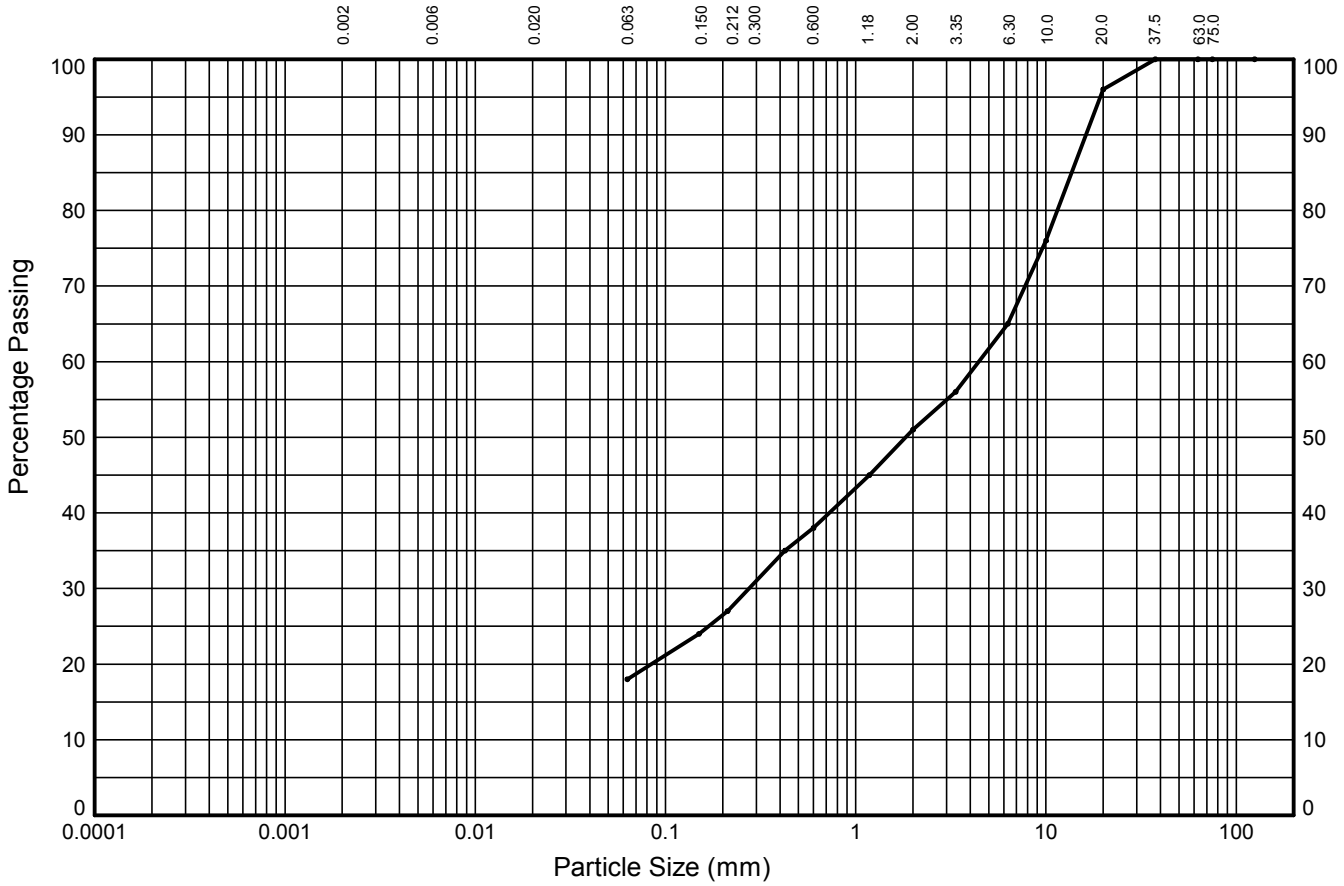
Contract	Contract Ref:
Penny Pie Park Footbridge	**784305**

AGS

PARTICLE SIZE DISTRIBUTION TEST

In accordance with clauses 9.2 of BS1377:Part 2:1990
NON-STANDARD TEST

Window Sample: **WS06A** Sample Ref: **10** Sample Type: **D** Depth (m): **3.00**



CLAY	fine	medium	coarse	fine	medium	coarse	fine	medium	coarse	COBBLES
	-	-	-	8%	12%	13%	14%	31%	4%	
	SILT			SAND			GRAVEL			
18%				33%			49%			0%

Test Sieve (mm)	Percent Passing (%)
125.0	**100**
75.0	**100**
63.0	**100**
37.5	**100**
20.0	**96**
10.0	**76**
6.30	**65**
3.35	**56**
2.00	**51**
1.18	**45**
0.600	**38**
0.425	**35**
0.212	**27**
0.150	**24**
0.063	**18**

Particle Diameter (mm)	Percent Passing (%)

Sedimentation sample was not pre-treated

Coefficients	
D_{10} (mm)	**NA**
D_{15} (mm)	**NA**
D_{30} (mm)	**0.275**
D_{50} (mm)	**1.832**
D_{60} (mm)	**4.436**
D_{85} (mm)	**13.660**
D_{90} (mm)	**16.245**
C_U	**NA**
C_C	**NA**

Soil Description:

Black clayey very sandy GRAVEL

Key: C_U = Uniformity coefficient. C_C = Coefficient of curvature as defined in BS EN ISO 14688-2

STRUCTURAL SOILS
The Potteries
Pottery Street
Castleford
W. Yorkshire WF10 1NJ

Compiled By	Date
LORNA WHITWORTH	23/01/20

Contract	Contract Ref:
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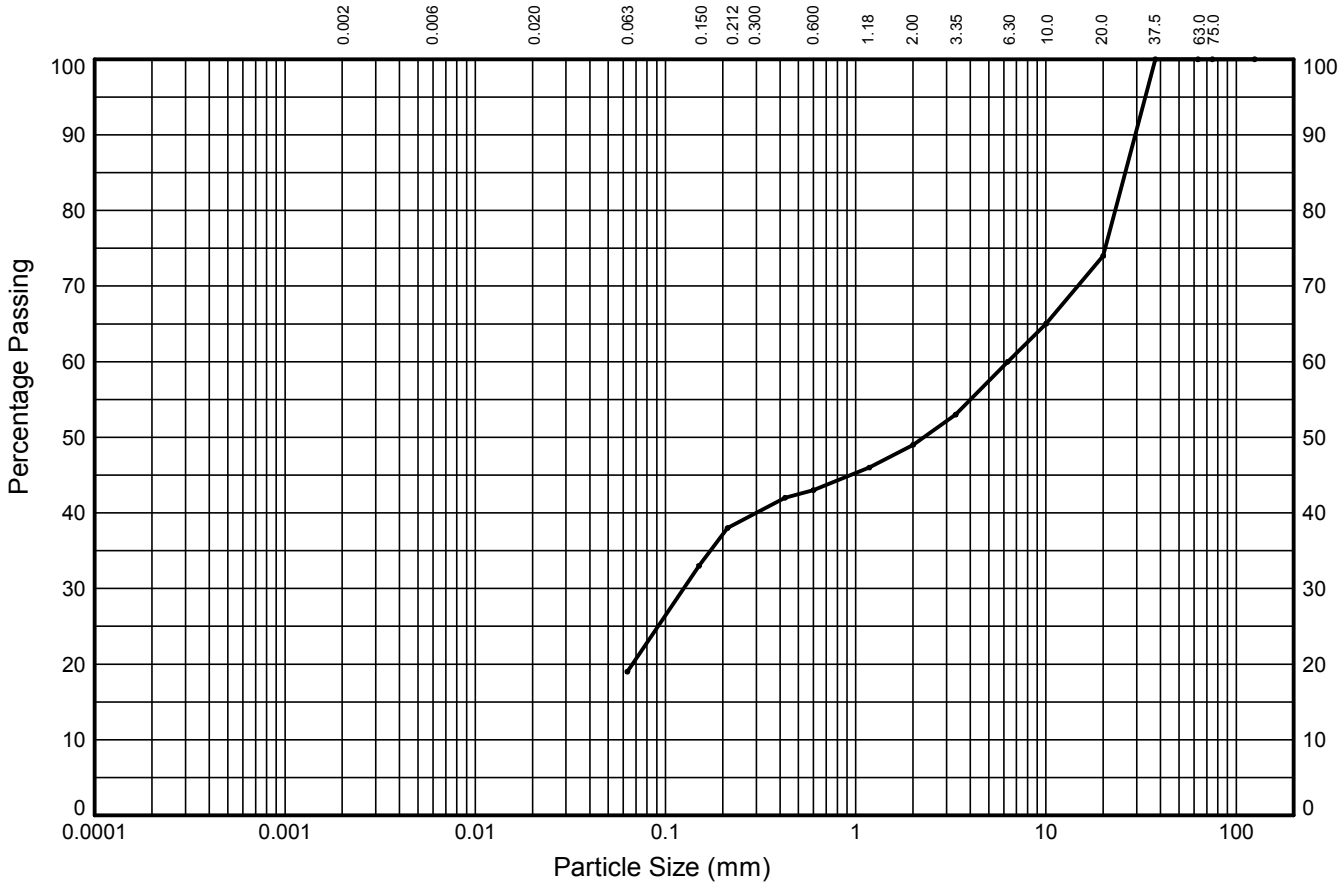
AGS

PARTICLE SIZE DISTRIBUTION TEST

In accordance with clauses 9.2 of BS1377:Part 2:1990
NON-STANDARD TEST

Window Sample: **WS06A** Sample Ref: **14** Sample Type: **D** Depth (m): **4.00**



CLAY	fine	medium	coarse	fine	medium	coarse	fine	medium	coarse	COBBLES
	-	-	-	18%	6%	6%	11%	14%	26%	
	SILT			SAND			GRAVEL			
19%				30%			51%			0%

Test Sieve (mm)	Percent Passing (%)
125.0	**100**
75.0	**100**
63.0	**100**
37.5	**100**
20.0	**74**
10.0	**65**
6.30	**60**
3.35	**53**
2.00	**49**
1.18	**46**
0.600	**43**
0.425	**42**
0.212	**38**
0.150	**33**
0.063	**19**

Particle Diameter (mm)	Percent Passing (%)

Sedimentation sample was not pre-treated

Coefficients	
D_{10} (mm)	**NA**
D_{15} (mm)	**NA**
D_{30} (mm)	**0.125**
D_{50} (mm)	**2.275**
D_{60} (mm)	**6.300**
D_{85} (mm)	**26.093**
D_{90} (mm)	**29.446**
C_U	**NA**
C_C	**NA**

Soil Description:
Brown very sandy clayey GRAVEL

Key: C_U = Uniformity coefficient. C_C = Coefficient of curvature as defined in BS EN ISO 14688-2

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Compiled By	Date
LORNA WHITWORTH	23/01/20

Contract	Contract Ref:
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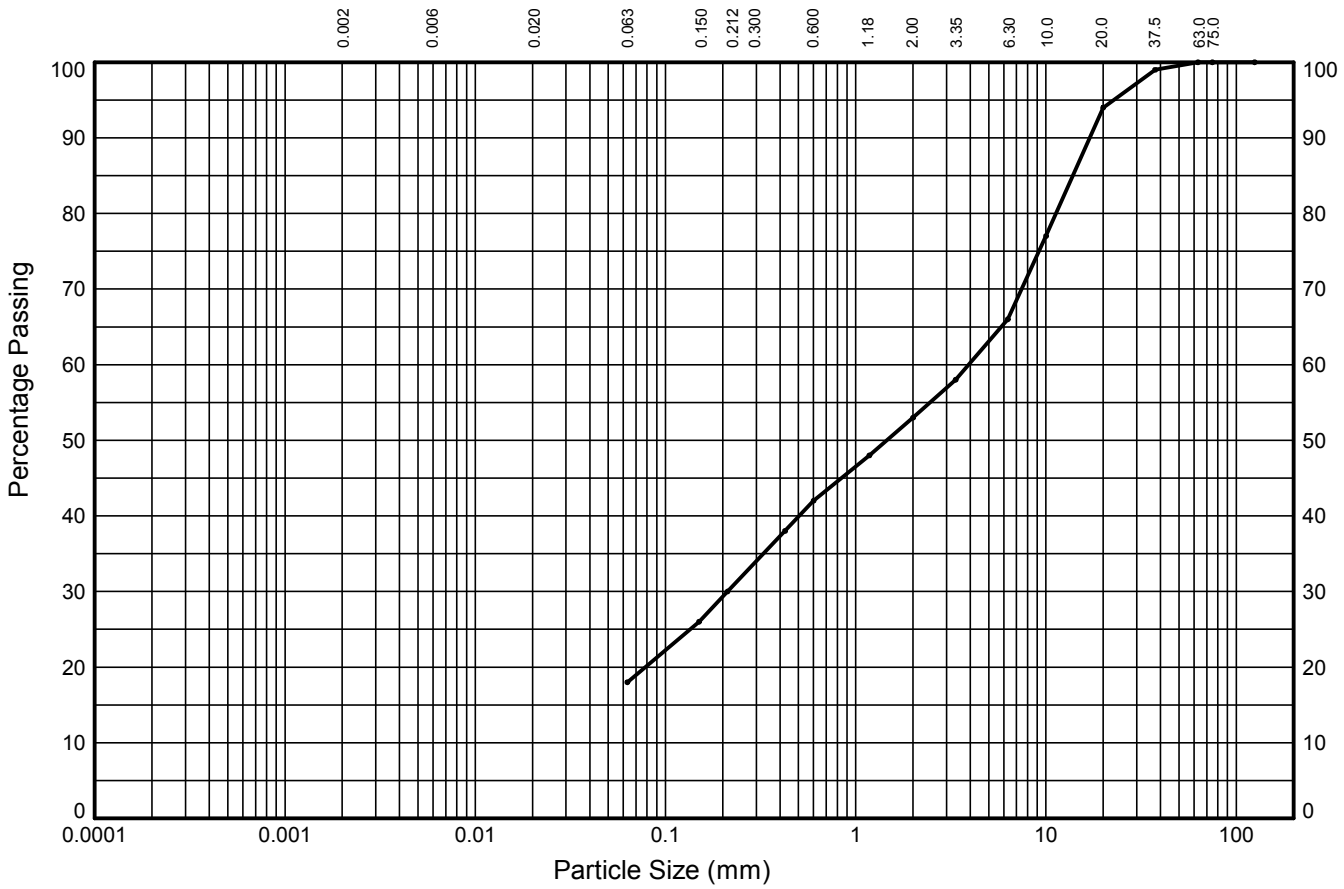
AGS

PARTICLE SIZE DISTRIBUTION TEST

In accordance with clauses 9.2 of BS1377:Part 2:1990

Window Sample: **WS05** Sample Ref: **5** Sample Type: **B** Depth (m): **0.50**



CLAY	fine	medium	coarse	fine	medium	coarse	fine	medium	coarse	COBBLES
	-	-	-	11%	13%	11%	13%	28%	6%	
	SILT			SAND			GRAVEL			
18%				35%			47%			0%

Test Sieve (mm)	Percent Passing (%)
125.0	**100**
75.0	**100**
63.0	**100**
37.5	**99**
20.0	**94**
10.0	**77**
6.30	**66**
3.35	**58**
2.00	**53**
1.18	**48**
0.600	**42**
0.425	**38**
0.212	**30**
0.150	**26**
0.063	**18**

Particle Diameter (mm)	Percent Passing (%)

Sedimentation sample was not pre-treated

Coefficients	
D_{10} (mm)	**NA**
D_{15} (mm)	**NA**
D_{30} (mm)	**0.212**
D_{50} (mm)	**1.457**
D_{60} (mm)	**3.923**
D_{85} (mm)	**13.857**
D_{90} (mm)	**16.990**
C_U	**NA**
C_C	**NA**

Soil Description:

Dark brown clayey very sandy GRAVEL

Key: C_U = Uniformity coefficient. C_C = Coefficient of curvature as defined in BS EN ISO 14688-2

STRUCTURAL SOILS
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Pottery Street
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W. Yorkshire WF10 1NJ

Compiled By	Date
SARAH MUNDY	05/02/20

Contract	Contract Ref:
Penny Pie Park Footbridge	**784305**

TESTING VERIFICATION CERTIFICATE

1774

The test results included in this report are certified as:-

ISSUE STATUS: **FINAL**

In accordance with the Structural Soils Ltd Laboratory Quality Management System, results sheets and summaries of results issued by the laboratory are checked by an approved signatory. The integrity of the test data and results are ensured by control of the computer system employed by the laboratory as part of the Software Verification Program as detailed in the Laboratory Quality Manual.

This testing verification certificate covers all testing compiled on or before the following datetime: **05/02/2020 16:05:38**.

Testing reported after this date is not covered by this Verification Certificate.

Approved Signatory
Daniel Smith (Contract Manager)

(Head Office)
Bristol Laboratory
Unit 1A, Princess Street
Bedminster
Bristol
BS3 4AG

Castleford Laboratory
The Potteries, Pottery Street
Castleford
West Yorkshire
WF10 1NJ

Hemel Laboratory
18 Frogmore Road
Hemel Hempstead
Hertfordshire
HP3 9RT

Tonbridge Laboratory
Anerley Court, Half Moon Lane
Hildenborough
Tonbridge
TN11 9HU

STRUCTURAL SOILS LTD

TEST REPORT

1774

Report No. 784312 R1

Date	29-January-2020	Contract	Penny Pie Park Footbridge

Client Central Alliance
Address Alliance House
South Park Way
Wakefield 41 Business Park
Wakefield WF2 0XJ

For the Attention of Richard Hardwick

Order received	14-January-2020	Client Reference	
Testing Started	23-January-2020	Client Order No.	784312
Testing Completed	29-January-2020	Instruction Type	Written

Tests marked 'Not UKAS Accredited' in this report are not included in the UKAS Accreditation Schedule for our Laboratory

UKAS Accredited Tests

Point load index on a single specimen ISRM SM 1974-2006
Uniaxial compressive strength ISRM SM 1974-2006

* This clause of BS1377 is no longer the most up to date method due to the publication of ISO17892

Please Note: Remaining samples will be retained for a period of one month from today and will then be disposed of.
Test were undertaken on samples 'as received' unless otherwise stated.
Opinions and interpretations expressed in this report are outside the scope of accreditation for this laboratory.

Structural Soils Ltd, The Potteries, Pottery Street, Castleford, WF10 1NJ Tel.01977 552255. E-mail mark.athorne@soils.co.uk

DETERMINATION OF POINT LOAD STRENGTH

In accordance with ISRM 1974-2006

Exploratory Position ID	Sample Ref	Depth (m)	Type of Test	Width or Length (W or L) (mm)	Platen Separation (D) (mm)	Failure Load (P) (kN)	Equivalent Diameter (D_e) (mm)	Point Load (I_s) (MN/m^2)	Size Factor (F)	Point Load Index ($I_{s(50)}$) (MN/m^2)	Water Content (%)	Rock Type	Lab location
BH01	2	5.10	A+P	89	64	0.910	85	0.13	1.27	0.16 (✓)	9.3		**B**
BH01	2	5.10	I+L	42	34	0.070	43	0.04	0.93	0.04	9.3		**B**

Results

$I_s(50)$ Mean Axial tests = **0.16** MN/m^2
Unable to calculate $I_a(50)$ Strength Anisotropy Index from this dataset.
Note:Size Correction Factor (F) calculated using $F = (D_e/50)^{0.45}$ (where D_e is equivalent core diameter).

Key

Type of Test column:, A = Axial, D = Diametral, I = Irregular, B = Block, L = Parallel, P = Perpendicular, [NS] denotes Non-standard Test.
Point Load Index column: (✓) = included in mean calculations, (✗) = excluded from mean calculations
Lab location: B = Bristol (BS3 4AG), C = Castleford (WF10 1NJ), H = Hemel Hempstead (HP3 9RT), T = Tonbridge (TN11 9HU)

STRUCTURAL SOILS
1a Princess Street
Bedminster
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BS3 4AG

Compiled By		Date	Contract Ref:
Francesca Bennett	**FRANCESCA BENNETT**	**28.01.20**	**784312**
Contract: **Penny Pie Park Footbridge**			

DETERMINATION OF POINT LOAD STRENGTH

In accordance with ISRM 1974-2006

Exploratory Position ID	Sample Ref	Depth (m)	Type of Test	Width or Length (W or L) (mm)	Platen Separation (D) (mm)	Failure Load (P) (kN)	Equivalent Diameter (D_e) (mm)	Point Load (I_s) (MN/m^2)	Size Factor (F)	Point Load Index ($I_{s(50)}$) (MN/m^2)	Water Content (%)	Rock Type	Lab location
BH01	3	5.45	A+P	89	55	0.710	79	0.11	1.23	0.14 (✓)	7.9		**B**
BH01	3	5.45	I+L	65	50	0.280	64	0.07	1.12	0.08	7.9		**B**

Results

$I_s(50)$ Mean Axial tests = **0.14** MN/m^2
Unable to calculate $I_a(50)$ Strength Anisotropy Index from this dataset.
Note:Size Correction Factor (F) calculated using $F = (D_e/50)^{0.45}$ (where D_e is equivalent core diameter).

Key

Type of Test column:, A = Axial, D = Diametral, I = Irregular, B = Block, L = Parallel, P = Perpendicular, [NS] denotes Non-standard Test.
Point Load Index column: (✓) = included in mean calculations, (✗) = excluded from mean calculations
Lab location: B = Bristol (BS3 4AG), C = Castleford (WF10 1NJ), H = Hemel Hempstead (HP3 9RT), T = Tonbridge (TN11 9HU)

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DETERMINATION OF POINT LOAD STRENGTH

In accordance with ISRM 1974-2006

Exploratory Position ID	Sample Ref	Depth (m)	Type of Test	Width or Length (W or L) (mm)	Platen Separation (D) (mm)	Failure Load (P) (kN)	Equivalent Diameter (D_e) (mm)	Point Load (I_s) (MN/m^2)	Size Factor (F)	Point Load Index ($I_{s(50)}$) (MN/m^2)	Water Content (%)	Rock Type	Lab location
BH01	4	5.70	D+L	45	86	0.080	86	0.01	1.28	0.01 (✓)	8.2		**B**
BH01	4	5.70	A+P	86	53	0.375	76	0.06	1.21	0.08 (✓)	8.2		**B**

Results

$I_s(50)$ Mean Axial tests = **0.08** MN/m^2
$I_s(50)$ Mean Diametral tests = **0.01** MN/m^2
$I_a(50)$ Strength Anisotropy Index = **5.66** (calculated from highest and lowest diametral and axial $I_s(50)$ ratio)
Note:Size Correction Factor (F) calculated using $F = (D_e/50)^{0.45}$ (where D_e is equivalent core diameter).

Key

Type of Test column:, A = Axial, D = Diametral, I = Irregular, B = Block, L = Parallel, P = Perpendicular, [NS] denotes Non-standard Test.
Point Load Index column: (✓) = included in mean calculations, (✗) = excluded from mean calculations
Lab location: B = Bristol (BS3 4AG), C = Castleford (WF10 1NJ), H = Hemel Hempstead (HP3 9RT), T = Tonbridge (TN11 9HU)

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DETERMINATION OF POINT LOAD STRENGTH

In accordance with ISRM 1974-2006

Exploratory Position ID	Sample Ref	Depth (m)	Type of Test	Width or Length (W or L) (mm)	Platen Separation (D) (mm)	Failure Load (P) (kN)	Equivalent Diameter (D_e) (mm)	Point Load (I_s) (MN/m^2)	Size Factor (F)	Point Load Index ($I_{s(50)}$) (MN/m^2)	Water Content (%)	Rock Type	Lab location
BH01	5	6.30	D+L	48	90	0.075	90	0.01	1.30	0.01 (✓)	7.3		**B**
BH01	5	6.30	A+P	90	37	0.465	65	0.11	1.13	0.12 (✓)	7.3		**B**

Results

$I_s(50)$ Mean Axial tests = **0.12** MN/m^2
$I_s(50)$ Mean Diametral tests = **0.01** MN/m^2
$I_a(50)$ Strength Anisotropy Index = **10.24** (calculated from highest and lowest diametral and axial $I_s(50)$ ratio)
Note:Size Correction Factor (F) calculated using $F = (D_e/50)^{0.45}$ (where D_e is equivalent core diameter).

Key

Type of Test column:, A = Axial, D = Diametral, I = Irregular, B = Block, L = Parallel, P = Perpendicular, [NS] denotes Non-standard Test.
Point Load Index column: (✓) = included in mean calculations, (✗) = excluded from mean calculations
Lab location: B = Bristol (BS3 4AG), C = Castleford (WF10 1NJ), H = Hemel Hempstead (HP3 9RT), T = Tonbridge (TN11 9HU)

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Contract: **Penny Pie Park Footbridge**			

DETERMINATION OF POINT LOAD STRENGTH

In accordance with ISRM 1974-2006

Exploratory Position ID	Sample Ref	Depth (m)	Type of Test	Width or Length (W or L) (mm)	Platen Separation (D) (mm)	Failure Load (P) (kN)	Equivalent Diameter (D_e) (mm)	Point Load (I_s) (MN/m^2)	Size Factor (F)	Point Load Index ($I_{s(50)}$) (MN/m^2)	Water Content (%)	Rock Type	Lab location
BH01	6	6.80	A+P	86	47	0.450	72	0.09	1.18	0.10 (✓)	8.6		**B**
BH01	6	6.80	I+L	60	48	0.040	61	0.01	1.09	0.01	8.6		**B**

Results

$I_s(50)$ Mean Axial tests = **0.1** MN/m^2
Unable to calculate $I_a(50)$ Strength Anisotropy Index from this dataset.
Note:Size Correction Factor (F) calculated using $F = (D_e/50)^{0.45}$ (where D_e is equivalent core diameter).

Key

Type of Test column:, A = Axial, D = Diametral, I = Irregular, B = Block, L = Parallel, P = Perpendicular, [NS] denotes Non-standard Test.
Point Load Index column: (✓) = included in mean calculations, (✗) = excluded from mean calculations
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DETERMINATION OF POINT LOAD STRENGTH

In accordance with ISRM 1974-2006

Exploratory Position ID	Sample Ref	Depth (m)	Type of Test	Width or Length (W or L) (mm)	Platen Separation (D) (mm)	Failure Load (P) (kN)	Equivalent Diameter (D_e) (mm)	Point Load (I_s) (MN/m^2)	Size Factor (F)	Point Load Index ($I_{s(50)}$) (MN/m^2)	Water Content (%)	Rock Type	Lab location
BH01	7	7.40	D+L	44	88	0.040	88	0.01	1.29	0.01 (✓)	14		**B**
BH01	7	7.40	A+P	88	38	0.055	65	0.01	1.13	0.01 (✓)	14		**B**

Results

$I_s(50)$ Mean Axial tests = **0.01** MN/m^2
$I_s(50)$ Mean Diametral tests = **0.01** MN/m^2
$I_a(50)$ Strength Anisotropy Index = **2.19** (calculated from highest and lowest diametral and axial $I_s(50)$ ratio)
Note:Size Correction Factor (F) calculated using $F = (D_e/50)^{0.45}$ (where D_e is equivalent core diameter).

Key

Type of Test column:, A = Axial, D = Diametral, I = Irregular, B = Block, L = Parallel, P = Perpendicular, [NS] denotes Non-standard Test.
Point Load Index column: (✓) = included in mean calculations, (✗) = excluded from mean calculations
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Contract: **Penny Pie Park Footbridge**			

DETERMINATION OF POINT LOAD STRENGTH

In accordance with ISRM 1974-2006

Exploratory Position ID	Sample Ref	Depth (m)	Type of Test	Width or Length (W or L) (mm)	Platen Separation (D) (mm)	Failure Load (P) (kN)	Equivalent Diameter (D_e) (mm)	Point Load (I_s) (MN/m^2)	Size Factor (F)	Point Load Index ($I_{s(50)}$) (MN/m^2)	Water Content (%)	Rock Type	Lab location
BH01	8	7.80	D+L	70	90	1.305	90	0.16	1.30	0.21 (✓)	4.4		**B**
BH01	8	7.80	A+P	90	53	1.800	78	0.30	1.22	0.36 (✓)	4.4		**B**

Results

$I_s(50)$ Mean Axial tests = **0.36** MN/m^2
$I_s(50)$ Mean Diametral tests = **0.21** MN/m^2
$I_a(50)$ Strength Anisotropy Index = **1.72** (calculated from highest and lowest diametral and axial $I_s(50)$ ratio)
Note:Size Correction Factor (F) calculated using $F = (D_e/50)^{0.45}$ (where D_e is equivalent core diameter).

Key

Type of Test column:, A = Axial, D = Diametral, I = Irregular, B = Block, L = Parallel, P = Perpendicular, [NS] denotes Non-standard Test.
Point Load Index column: (✓) = included in mean calculations, (✗) = excluded from mean calculations
Lab location: B = Bristol (BS3 4AG), C = Castleford (WF10 1NJ), H = Hemel Hempstead (HP3 9RT), T = Tonbridge (TN11 9HU)

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DETERMINATION OF POINT LOAD STRENGTH

In accordance with ISRM 1974-2006

Exploratory Position ID	Sample Ref	Depth (m)	Type of Test	Width or Length (W or L) (mm)	Platen Separation (D) (mm)	Failure Load (P) (kN)	Equivalent Diameter (D_e) (mm)	Point Load (I_s) (MN/m^2)	Size Factor (F)	Point Load Index ($I_{s(50)}$) (MN/m^2)	Water Content (%)	Rock Type	Lab location
BH01	9	8.50	D+L	46	94	0.015	94	0.00	1.33	0.00 (✓)	8.6		**B**
BH01	9	8.50	A+P	94	45	0.140	73	0.03	1.19	0.03 (✓)	8.6		**B**

Results

$I_s(50)$ Mean Axial tests = **0.03** MN/m^2
$I_s(50)$ Mean Diametral tests = **0** MN/m^2
$I_a(50)$ Strength Anisotropy Index = **13.7** (calculated from highest and lowest diametral and axial $I_s(50)$ ratio)
Note:Size Correction Factor (F) calculated using $F = (D_e/50)^{0.45}$ (where D_e is equivalent core diameter).

Key

Type of Test column:, A = Axial, D = Diametral, I = Irregular, B = Block, L = Parallel, P = Perpendicular, [NS] denotes Non-standard Test.
Point Load Index column: (✓) = included in mean calculations, (✗) = excluded from mean calculations
Lab location: B = Bristol (BS3 4AG), C = Castleford (WF10 1NJ), H = Hemel Hempstead (HP3 9RT), T = Tonbridge (TN11 9HU)

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Contract: **Penny Pie Park Footbridge**			

DETERMINATION OF POINT LOAD STRENGTH

In accordance with ISRM 1974-2006

Exploratory Position ID	Sample Ref	Depth (m)	Type of Test	Width or Length (W or L) (mm)	Platen Separation (D) (mm)	Failure Load (P) (kN)	Equivalent Diameter (D_e) (mm)	Point Load (I_s) (MN/m^2)	Size Factor (F)	Point Load Index ($I_{s(50)}$) (MN/m^2)	Water Content (%)	Rock Type	Lab location
BH01	11	9.45	D+L	45	88	0.135	88	0.02	1.29	0.02 (✓)	7.7		**B**
BH01	11	9.45	A+P	88	33	0.400	61	0.11	1.09	0.12 (✓)	7.7		**B**

Results

$I_s(50)$ Mean Axial tests = **0.12** MN/m^2
$I_s(50)$ Mean Diametral tests = **0.02** MN/m^2
$I_a(50)$ Strength Anisotropy Index = **5.25** (calculated from highest and lowest diametral and axial $I_s(50)$ ratio)
Note:Size Correction Factor (F) calculated using $F = (D_e/50)^{0.45}$ (where D_e is equivalent core diameter).

Key

Type of Test column:, A = Axial, D = Diametral, I = Irregular, B = Block, L = Parallel, P = Perpendicular, [NS] denotes Non-standard Test.
Point Load Index column: (✓) = included in mean calculations, (✗) = excluded from mean calculations
Lab location: B = Bristol (BS3 4AG), C = Castleford (WF10 1NJ), H = Hemel Hempstead (HP3 9RT), T = Tonbridge (TN11 9HU)

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Compiled By		Date	Contract Ref:
Francesca Bennett	**FRANCESCA BENNETT**	**28.01.20**	**784312**
Contract: **Penny Pie Park Footbridge**			

DETERMINATION OF POINT LOAD STRENGTH

In accordance with ISRM 1974-2006

Exploratory Position ID	Sample Ref	Depth (m)	Type of Test	Width or Length (W or L) (mm)	Platen Separation (D) (mm)	Failure Load (P) (kN)	Equivalent Diameter (D_e) (mm)	Point Load (I_s) (MN/m^2)	Size Factor (F)	Point Load Index ($I_{s(50)}$) (MN/m^2)	Water Content (%)	Rock Type	Lab location
BH02	3	10.40	A+P	88	68	2.660	87	0.35	1.28	0.45 (✓)	2.2		**B**
BH02	3	10.40	I+L	68	50	1.180	66	0.27	1.13	0.31	2.2		**B**

Results

$I_s(50)$ Mean Axial tests = **0.45** MN/m^2
Unable to calculate $I_a(50)$ Strength Anisotropy Index from this dataset.
Note:Size Correction Factor (F) calculated using $F = (D_e/50)^{0.45}$ (where D_e is equivalent core diameter).

Key

Type of Test column:, A = Axial, D = Diametral, I = Irregular, B = Block, L = Parallel, P = Perpendicular, [NS] denotes Non-standard Test.
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Lab location: B = Bristol (BS3 4AG), C = Castleford (WF10 1NJ), H = Hemel Hempstead (HP3 9RT), T = Tonbridge (TN11 9HU)

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Compiled By		Date
Francesca Bennett	**FRANCESCA BENNETT**	**28.01.20**

Contract: **Penny Pie Park Footbridge**

Contract Ref: **784312**

AGS

DETERMINATION OF POINT LOAD STRENGTH

In accordance with ISRM 1974-2006

Exploratory Position ID	Sample Ref	Depth (m)	Type of Test	Width or Length (W or L) (mm)	Platen Separation (D) (mm)	Failure Load (P) (kN)	Equivalent Diameter (D_e) (mm)	Point Load (I_s) (MN/m^2)	Size Factor (F)	Point Load Index ($I_{s(50)}$) (MN/m^2)	Water Content (%)	Rock Type	Lab location
BH02	4	11.00	D+L	47	88	7.750	88	1.00	1.29	1.29 (✓)	2.2		**B**
BH02	4	11.00	A+P	88	50	10.045	75	1.79	1.20	2.15 (✓)	2.2		**B**

Results

$I_s(50)$ Mean Axial tests = **2.15** MN/m^2
$I_s(50)$ Mean Diametral tests = **1.29** MN/m^2
$I_a(50)$ Strength Anisotropy Index = **1.67** (calculated from highest and lowest diametral and axial $I_s(50)$ ratio)
Note:Size Correction Factor (F) calculated using $F = (D_e/50)^{0.45}$ (where D_e is equivalent core diameter).

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Point Load Index column: (✓) = included in mean calculations, (✗) = excluded from mean calculations
Lab location: B = Bristol (BS3 4AG), C = Castleford (WF10 1NJ), H = Hemel Hempstead (HP3 9RT), T = Tonbridge (TN11 9HU)

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Contract: **Penny Pie Park Footbridge**			

DETERMINATION OF POINT LOAD STRENGTH

In accordance with ISRM 1974-2006

Exploratory Position ID	Sample Ref	Depth (m)	Type of Test	Width or Length (W or L) (mm)	Platen Separation (D) (mm)	Failure Load (P) (kN)	Equivalent Diameter (D_e) (mm)	Point Load (I_s) (MN/m^2)	Size Factor (F)	Point Load Index ($I_{s(50)}$) (MN/m^2)	Water Content (%)	Rock Type	Lab location
BH02	5	11.30	A+P	87	67	10.855	86	1.46	1.28	1.87 (✓)	3.0		**B**
BH02	5	11.30	I+L	55	44	1.990	56	0.65	1.05	0.68	3.0		**B**

Results

$I_s(50)$ Mean Axial tests = **1.87** MN/m^2
Unable to calculate $I_a(50)$ Strength Anisotropy Index from this dataset.
Note:Size Correction Factor (F) calculated using $F = (D_e/50)^{0.45}$ (where D_e is equivalent core diameter).

Key

Type of Test column:, A = Axial, D = Diametral, I = Irregular, B = Block, L = Parallel, P = Perpendicular, [NS] denotes Non-standard Test.
Point Load Index column: (✓) = included in mean calculations, (✗) = excluded from mean calculations
Lab location: B = Bristol (BS3 4AG), C = Castleford (WF10 1NJ), H = Hemel Hempstead (HP3 9RT), T = Tonbridge (TN11 9HU)

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Compiled By		Date	Contract Ref:
D. Richards	**DAISY RICHARDS**	**29.01.20**	**784312**
Contract: **Penny Pie Park Footbridge**			

DETERMINATION OF POINT LOAD STRENGTH

In accordance with ISRM 1974-2006

Exploratory Position ID	Sample Ref	Depth (m)	Type of Test	Width or Length (W or L) (mm)	Platen Separation (D) (mm)	Failure Load (P) (kN)	Equivalent Diameter (D_e) (mm)	Point Load (I_s) (MN/m^2)	Size Factor (F)	Point Load Index ($I_{s(50)}$) (MN/m^2)	Water Content (%)	Rock Type	Lab location
BH02	6	11.90	D+L	40	90	0.950	90	0.12	1.30	0.15 (✓)	3.0		**B**
BH02	6	11.90	A+P	90	30	1.350	59	0.39	1.07	0.42 (✓)	3.0		**B**

Results

$I_s(50)$ Mean Axial tests = **0.42** MN/m^2
$I_s(50)$ Mean Diametral tests = **0.15** MN/m^2
$I_a(50)$ Strength Anisotropy Index = **2.76** (calculated from highest and lowest diametral and axial $I_s(50)$ ratio)
Note:Size Correction Factor (F) calculated using $F = (D_e/50)^{0.45}$ (where D_e is equivalent core diameter).

Key

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Point Load Index column: (✓) = included in mean calculations, (✗) = excluded from mean calculations
Lab location: B = Bristol (BS3 4AG), C = Castleford (WF10 1NJ), H = Hemel Hempstead (HP3 9RT), T = Tonbridge (TN11 9HU)

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Francesca Bennett	**FRANCESCA BENNETT**	**28.01.20**	**784312**
Contract: **Penny Pie Park Footbridge**			

DETERMINATION OF POINT LOAD STRENGTH

In accordance with ISRM 1974-2006

Exploratory Position ID	Sample Ref	Depth (m)	Type of Test	Width or Length (W or L) (mm)	Platen Separation (D) (mm)	Failure Load (P) (kN)	Equivalent Diameter (D_e) (mm)	Point Load (I_s) (MN/m^2)	Size Factor (F)	Point Load Index ($I_{s(50)}$) (MN/m^2)	Water Content (%)	Rock Type	Lab location
BH02	7	12.40	A+P	88	56	9.465	79	1.51	1.23	1.86 (✓)	2.5		**B**
BH02	7	12.40	I+P	67	44	2.215	61	0.59	1.10	0.65	2.5		**B**

Results

$I_s(50)$ Mean Axial tests = **1.86** MN/m^2
Unable to calculate $I_a(50)$ Strength Anisotropy Index from this dataset.
Note:Size Correction Factor (F) calculated using $F = (D_e/50)^{0.45}$ (where D_e is equivalent core diameter).

Key

Type of Test column:, A = Axial, D = Diametral, I = Irregular, B = Block, L = Parallel, P = Perpendicular, [NS] denotes Non-standard Test.
Point Load Index column: (✓) = included in mean calculations, (✗) = excluded from mean calculations
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DETERMINATION OF POINT LOAD STRENGTH

In accordance with ISRM 1974-2006

Exploratory Position ID	Sample Ref	Depth (m)	Type of Test	Width or Length (W or L) (mm)	Platen Separation (D) (mm)	Failure Load (P) (kN)	Equivalent Diameter (D_e) (mm)	Point Load (I_s) (MN/m^2)	Size Factor (F)	Point Load Index ($I_{s(50)}$) (MN/m^2)	Water Content (%)	Rock Type	Lab location
BH02	8	12.90	D+L	50	88	1.330	88	0.17	1.29	0.22 (✓)	1.9		**B**
BH02	8	12.90	A+P	88	49	12.380	74	2.25	1.19	2.69 (✓)	1.9		**B**

Results

$I_s(50)$ Mean Axial tests = **2.69** MN/m^2
$I_s(50)$ Mean Diametral tests = **0.22** MN/m^2
$I_a(50)$ Strength Anisotropy Index = **12.15** (calculated from highest and lowest diametral and axial $I_s(50)$ ratio)
Note:Size Correction Factor (F) calculated using $F = (D_e/50)^{0.45}$ (where D_e is equivalent core diameter).

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Point Load Index column: (✓) = included in mean calculations, (✗) = excluded from mean calculations
Lab location: B = Bristol (BS3 4AG), C = Castleford (WF10 1NJ), H = Hemel Hempstead (HP3 9RT), T = Tonbridge (TN11 9HU)

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DETERMINATION OF POINT LOAD STRENGTH

In accordance with ISRM 1974-2006

Exploratory Position ID	Sample Ref	Depth (m)	Type of Test	Width or Length (W or L) (mm)	Platen Separation (D) (mm)	Failure Load (P) (kN)	Equivalent Diameter (D_e) (mm)	Point Load (I_s) (MN/m^2)	Size Factor (F)	Point Load Index ($I_{s(50)}$) (MN/m^2)	Water Content (%)	Rock Type	Lab location
BH02	10	14.50	D+L	45	89	3.315	89	0.42	1.30	0.54 (✓)	2.8		**B**
BH02	10	14.50	A+P	89	54	5.465	78	0.89	1.22	1.09 (✓)	2.8		**B**

Results

$I_s(50)$ Mean Axial tests = **1.09** MN/m^2
$I_s(50)$ Mean Diametral tests = **0.54** MN/m^2
$I_a(50)$ Strength Anisotropy Index = **2.01** (calculated from highest and lowest diametral and axial $I_s(50)$ ratio)
Note:Size Correction Factor (F) calculated using $F = (D_e/50)^{0.45}$ (where D_e is equivalent core diameter).

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DETERMINATION OF POINT LOAD STRENGTH

In accordance with ISRM 1974-2006

Exploratory Position ID	Sample Ref	Depth (m)	Type of Test	Width or Length (W or L) (mm)	Platen Separation (D) (mm)	Failure Load (P) (kN)	Equivalent Diameter (D_e) (mm)	Point Load (I_s) (MN/m^2)	Size Factor (F)	Point Load Index ($I_{s(50)}$) (MN/m^2)	Water Content (%)	Rock Type	Lab location
BH03	1	6.10	D+L	45	87	1.350	87	0.18	1.28	0.23 (✓)	3.9		**B**
BH03	1	6.10	A+P	87	53	4.770	77	0.81	1.21	0.98 (✓)	3.9		**B**

Results

$I_s(50)$ Mean Axial tests = **0.98** MN/m^2
$I_s(50)$ Mean Diametral tests = **0.23** MN/m^2
$I_a(50)$ Strength Anisotropy Index = **4.3** (calculated from highest and lowest diametral and axial $I_s(50)$ ratio)
Note:Size Correction Factor (F) calculated using $F = (D_e/50)^{0.45}$ (where D_e is equivalent core diameter).

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DETERMINATION OF POINT LOAD STRENGTH

In accordance with ISRM 1974-2006

Exploratory Position ID	Sample Ref	Depth (m)	Type of Test	Width or Length (W or L) (mm)	Platen Separation (D) (mm)	Failure Load (P) (kN)	Equivalent Diameter (D_e) (mm)	Point Load (I_s) (MN/m^2)	Size Factor (F)	Point Load Index ($I_{s(50)}$) (MN/m^2)	Water Content (%)	Rock Type	Lab location
BH03	4	7.40	I+P	65	53	1.340	66	0.31	1.13	0.35	3.9		**B**
BH03	4	7.40	I	50	34	1.060	47	0.49	0.97	0.47	3.9		**B**

Results

Unable to calculate $I_a(50)$ Strength Anisotropy Index from this dataset.
Note:Size Correction Factor (F) calculated using $F = (D_e/50)^{0.45}$ (where D_e is equivalent core diameter).

Key

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DETERMINATION OF POINT LOAD STRENGTH

In accordance with ISRM 1974-2006

Exploratory Position ID	Sample Ref	Depth (m)	Type of Test	Width or Length (W or L) (mm)	Platen Separation (D) (mm)	Failure Load (P) (kN)	Equivalent Diameter (D_e) (mm)	Point Load (I_s) (MN/m^2)	Size Factor (F)	Point Load Index ($I_{s(50)}$) (MN/m^2)	Water Content (%)	Rock Type	Lab location
BH03	5	7.60	D+L	65	75	0.235	75	0.04	1.20	0.05 (✓)	6.1		**B**
BH03	5	7.60	A+P	75	56	0.480	73	0.09	1.19	0.11 (✓)	6.1		**B**

Results

$I_s(50)$ Mean Axial tests = **0.11** MN/m^2
$I_s(50)$ Mean Diametral tests = **0.05** MN/m^2
$I_a(50)$ Strength Anisotropy Index = **2.12** (calculated from highest and lowest diametral and axial $I_s(50)$ ratio)
Note:Size Correction Factor (F) calculated using $F = (D_e/50)^{0.45}$ (where D_e is equivalent core diameter).

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DETERMINATION OF POINT LOAD STRENGTH

In accordance with ISRM 1974-2006

Exploratory Position ID	Sample Ref	Depth (m)	Type of Test	Width or Length (W or L) (mm)	Platen Separation (D) (mm)	Failure Load (P) (kN)	Equivalent Diameter (D_e) (mm)	Point Load (I_s) (MN/m^2)	Size Factor (F)	Point Load Index ($I_{s(50)}$) (MN/m^2)	Water Content (%)	Rock Type	Lab location
BH03	6	8.60	D	65	88	0.255	88	0.03	1.29	0.04 (✓)	15		**B**
BH03	6	8.60	A	88	48	0.135	73	0.03	1.19	0.03 (✓)	15		**B**

Results

$I_s(50)$ Mean Axial tests = **0.03** MN/m^2
$I_s(50)$ Mean Diametral tests = **0.04** MN/m^2
$I_a(50)$ Strength Anisotropy Index = **1.42** (calculated from highest and lowest diametral and axial $I_s(50)$ ratio)
Note:Size Correction Factor (F) calculated using $F = (D_e/50)^{0.45}$ (where D_e is equivalent core diameter).

Key

Type of Test column:, A = Axial, D = Diametral, I = Irregular, B = Block, L = Parallel, P = Perpendicular, [NS] denotes Non-standard Test.
Point Load Index column: (✓) = included in mean calculations, (✗) = excluded from mean calculations
Lab location: B = Bristol (BS3 4AG), C = Castleford (WF10 1NJ), H = Hemel Hempstead (HP3 9RT), T = Tonbridge (TN11 9HU)

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DETERMINATION OF POINT LOAD STRENGTH

In accordance with ISRM 1974-2006

Exploratory Position ID	Sample Ref	Depth (m)	Type of Test	Width or Length (W or L) (mm)	Platen Separation (D) (mm)	Failure Load (P) (kN)	Equivalent Diameter (D_e) (mm)	Point Load (I_s) (MN/m^2)	Size Factor (F)	Point Load Index ($I_{s(50)}$) (MN/m^2)	Water Content (%)	Rock Type	Lab location
BH03	7	9.40	D	50	86	0.120	86	0.02	1.28	0.02 (✓)	7.7		**B**
BH03	7	9.40	A	86	43	0.125	69	0.03	1.15	0.03 (✓)	7.7		**B**

Results

$I_s(50)$ Mean Axial tests = **0.03** MN/m^2
$I_s(50)$ Mean Diametral tests = **0.02** MN/m^2
$I_a(50)$ Strength Anisotropy Index = **1.48** (calculated from highest and lowest diametral and axial $I_s(50)$ ratio)
Note:Size Correction Factor (F) calculated using $F = (D_e/50)^{0.45}$ (where D_e is equivalent core diameter).

Key

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Point Load Index column: (✓) = included in mean calculations, (✗) = excluded from mean calculations
Lab location: B = Bristol (BS3 4AG), C = Castleford (WF10 1NJ), H = Hemel Hempstead (HP3 9RT), T = Tonbridge (TN11 9HU)

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DETERMINATION OF POINT LOAD STRENGTH

In accordance with ISRM 1974-2006

Exploratory Position ID	Sample Ref	Depth (m)	Type of Test	Width or Length (W or L) (mm)	Platen Separation (D) (mm)	Failure Load (P) (kN)	Equivalent Diameter (D_e) (mm)	Point Load (I_s) (MN/m^2)	Size Factor (F)	Point Load Index ($I_{s(50)}$) (MN/m^2)	Water Content (%)	Rock Type	Lab location
BH03	9	10.15	D	50	84	0.075	84	0.01	1.26	0.01 (✓)	11		**B**
BH03	9	10.15	A	84	50	0.095	73	0.02	1.19	0.02 (✓)	11		**B**

Results

$I_s(50)$ Mean Axial tests = **0.02** MN/m^2
$I_s(50)$ Mean Diametral tests = **0.01** MN/m^2
$I_a(50)$ Strength Anisotropy Index = **1.57** (calculated from highest and lowest diametral and axial $I_s(50)$ ratio)
Note:Size Correction Factor (F) calculated using $F = (D_e/50)^{0.45}$ (where D_e is equivalent core diameter).

Key

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Point Load Index column: (✓) = included in mean calculations, (✗) = excluded from mean calculations
Lab location: B = Bristol (BS3 4AG), C = Castleford (WF10 1NJ), H = Hemel Hempstead (HP3 9RT), T = Tonbridge (TN11 9HU)

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Exploratory Position ID	Sample Ref	Depth (m)	Type of Test	Width or Length (W or L) (mm)	Platen Separation (D) (mm)	Failure Load (P) (kN)	Equivalent Diameter (D_e) (mm)	Point Load (I_s) (MN/m^2)	Size Factor (F)	Point Load Index ($I_{s(50)}$) (MN/m^2)	Water Content (%)	Rock Type	Lab location
BH04	3	5.70	A+P	90	37	1.915	65	0.45	1.13	0.51 (✓)	4.3		**B**
BH04	3	5.70	I+L	60	47	0.925	60	0.26	1.08	0.28	4.3		**B**

Results

$I_s(50)$ Mean Axial tests = **0.51** MN/m^2
Unable to calculate $I_a(50)$ Strength Anisotropy Index from this dataset.
Note:Size Correction Factor (F) calculated using $F = (D_e/50)^{0.45}$ (where D_e is equivalent core diameter).

Key

Type of Test column:, A = Axial, D = Diametral, I = Irregular, B = Block, L = Parallel, P = Perpendicular, [NS] denotes Non-standard Test.
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Exploratory Position ID	Sample Ref	Depth (m)	Type of Test	Width or Length (W or L) (mm)	Platen Separation (D) (mm)	Failure Load (P) (kN)	Equivalent Diameter (D_e) (mm)	Point Load (I_s) (MN/m^2)	Size Factor (F)	Point Load Index ($I_{s(50)}$) (MN/m^2)	Water Content (%)	Rock Type	Lab location
BH04	4	6.10	D+L	60	87	0.015	87	0.00	1.28	0.00 (✓)	8.4		**B**
BH04	4	6.10	A+P	87	39	0.115	66	0.03	1.13	0.03 (✓)	8.4		**B**

Results

$I_s(50)$ Mean Axial tests = **0.03** MN/m^2
$I_s(50)$ Mean Diametral tests = **0** MN/m^2
$I_a(50)$ Strength Anisotropy Index = **11.84** (calculated from highest and lowest diametral and axial $I_s(50)$ ratio)
Note:Size Correction Factor (F) calculated using $F = (D_e/50)^{0.45}$ (where D_e is equivalent core diameter).

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Point Load Index column: (✓) = included in mean calculations, (✗) = excluded from mean calculations
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DETERMINATION OF POINT LOAD STRENGTH

In accordance with ISRM 1974-2006

Exploratory Position ID	Sample Ref	Depth (m)	Type of Test	Width or Length (W or L) (mm)	Platen Separation (D) (mm)	Failure Load (P) (kN)	Equivalent Diameter (D_e) (mm)	Point Load (I_s) (MN/m^2)	Size Factor (F)	Point Load Index ($I_{s(50)}$) (MN/m^2)	Water Content (%)	Rock Type	Lab location
BH04	5	6.80	A+P	87	54	3.635	77	0.61	1.22	0.74 (✓)	3.4		**B**
BH04	5	6.80	I+L	55	40	0.410	53	0.15	1.03	0.15	3.4		**B**

Results

$I_s(50)$ Mean Axial tests = **0.74** MN/m^2
Unable to calculate $I_a(50)$ Strength Anisotropy Index from this dataset.
Note:Size Correction Factor (F) calculated using $F = (D_e/50)^{0.45}$ (where D_e is equivalent core diameter).

Key

Type of Test column:, A = Axial, D = Diametral, I = Irregular, B = Block, L = Parallel, P = Perpendicular, [NS] denotes Non-standard Test.
Point Load Index column: (✓) = included in mean calculations, (✗) = excluded from mean calculations
Lab location: B = Bristol (BS3 4AG), C = Castleford (WF10 1NJ), H = Hemel Hempstead (HP3 9RT), T = Tonbridge (TN11 9HU)

STRUCTURAL SOILS
1a Princess Street
Bedminster
Bristol
BS3 4AG

Compiled By		Date	Contract Ref:
Francesca Bennett	**FRANCESCA BENNETT**	**28.01.20**	**784312**
Contract: **Penny Pie Park Footbridge**			

DETERMINATION OF POINT LOAD STRENGTH

In accordance with ISRM 1974-2006

Exploratory Position ID	Sample Ref	Depth (m)	Type of Test	Width or Length (W or L) (mm)	Platen Separation (D) (mm)	Failure Load (P) (kN)	Equivalent Diameter (D_e) (mm)	Point Load (I_s) (MN/m^2)	Size Factor (F)	Point Load Index ($I_{s(50)}$) (MN/m^2)	Water Content (%)	Rock Type	Lab location
BH04	6	7.25	A+P	86	53	1.340	76	0.23	1.21	0.28 (✓)	4.3		**B**
BH04	6	7.25	I+P	35	26	0.930	34	0.80	0.84	0.68	4.3		**B**

Results

$I_s(50)$ Mean Axial tests = **0.28** MN/m^2
Unable to calculate $I_a(50)$ Strength Anisotropy Index from this dataset.
Note:Size Correction Factor (F) calculated using $F = (D_e/50)^{0.45}$ (where D_e is equivalent core diameter).

Key

Type of Test column:, A = Axial, D = Diametral, I = Irregular, B = Block, L = Parallel, P = Perpendicular, [NS] denotes Non-standard Test.
Point Load Index column: (✓) = included in mean calculations, (✗) = excluded from mean calculations
Lab location: B = Bristol (BS3 4AG), C = Castleford (WF10 1NJ), H = Hemel Hempstead (HP3 9RT), T = Tonbridge (TN11 9HU)

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Compiled By		Date	Contract Ref:
Francesca Bennett	**FRANCESCA BENNETT**	**28.01.20**	**784312**
Contract: **Penny Pie Park Footbridge**			

DETERMINATION OF POINT LOAD STRENGTH

In accordance with ISRM 1974-2006

Exploratory Position ID	Sample Ref	Depth (m)	Type of Test	Width or Length (W or L) (mm)	Platen Separation (D) (mm)	Failure Load (P) (kN)	Equivalent Diameter (D_e) (mm)	Point Load (I_s) (MN/m^2)	Size Factor (F)	Point Load Index ($I_{s(50)}$) (MN/m^2)	Water Content (%)	Rock Type	Lab location
BH04	7	7.40	D+L	42	89	1.355	89	0.17	1.30	0.22 (✓)	3.7		**B**
BH04	7	7.40	A+P	89	59	2.205	82	0.33	1.25	0.41 (✓)	3.7		**B**

Results

$I_s(50)$ Mean Axial tests = **0.41** MN/m^2
$I_s(50)$ Mean Diametral tests = **0.22** MN/m^2
$I_a(50)$ Strength Anisotropy Index = **1.86** (calculated from highest and lowest diametral and axial $I_s(50)$ ratio)
Note:Size Correction Factor (F) calculated using $F = (D_e/50)^{0.45}$ (where D_e is equivalent core diameter).

Key

Type of Test column:, A = Axial, D = Diametral, I = Irregular, B = Block, L = Parallel, P = Perpendicular, [NS] denotes Non-standard Test.
Point Load Index column: (✓) = included in mean calculations, (✗) = excluded from mean calculations
Lab location: B = Bristol (BS3 4AG), C = Castleford (WF10 1NJ), H = Hemel Hempstead (HP3 9RT), T = Tonbridge (TN11 9HU)

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BS3 4AG

Compiled By		Date	Contract Ref:
Francesca Bennett	**FRANCESCA BENNETT**	**28.01.20**	**784312**
Contract: **Penny Pie Park Footbridge**			

DETERMINATION OF POINT LOAD STRENGTH

In accordance with ISRM 1974-2006

Exploratory Position ID	Sample Ref	Depth (m)	Type of Test	Width or Length (W or L) (mm)	Platen Separation (D) (mm)	Failure Load (P) (kN)	Equivalent Diameter (D_e) (mm)	Point Load (I_s) (MN/m^2)	Size Factor (F)	Point Load Index ($I_{s(50)}$) (MN/m^2)	Water Content (%)	Rock Type	Lab location
BH04	8	8.00	D+L	48	88	0.050	88	0.01	1.29	0.01 (✓)	12		**B**
BH04	8	8.00	A+P	88	42	0.325	69	0.07	1.15	0.08 (✓)	12		**B**

Results

$I_s(50)$ Mean Axial tests = **0.08** MN/m^2
$I_s(50)$ Mean Diametral tests = **0.01** MN/m^2
$I_a(50)$ Strength Anisotropy Index = **9.56** (calculated from highest and lowest diametral and axial $I_s(50)$ ratio)
Note:Size Correction Factor (F) calculated using $F = (D_e/50)^{0.45}$ (where D_e is equivalent core diameter).

Key

Type of Test column:, A = Axial, D = Diametral, I = Irregular, B = Block, L = Parallel, P = Perpendicular, [NS] denotes Non-standard Test.
Point Load Index column: (✓) = included in mean calculations, (✗) = excluded from mean calculations
Lab location: B = Bristol (BS3 4AG), C = Castleford (WF10 1NJ), H = Hemel Hempstead (HP3 9RT), T = Tonbridge (TN11 9HU)

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Compiled By		Date	Contract Ref:
Francesca Bennett	**FRANCESCA BENNETT**	**28.01.20**	**784312**
Contract: **Penny Pie Park Footbridge**			

DETERMINATION OF POINT LOAD STRENGTH

In accordance with ISRM 1974-2006

Exploratory Position ID	Sample Ref	Depth (m)	Type of Test	Width or Length (W or L) (mm)	Platen Separation (D) (mm)	Failure Load (P) (kN)	Equivalent Diameter (D_e) (mm)	Point Load (I_s) (MN/m^2)	Size Factor (F)	Point Load Index ($I_{s(50)}$) (MN/m^2)	Water Content (%)	Rock Type	Lab location
BH04	10	9.35	D+L	40	88	0.900	88	0.12	1.29	0.15 (✓)	5.1		**B**
BH04	10	9.35	A+P	88	56	1.310	79	0.21	1.23	0.26 (✓)	5.1		**B**

Results

$I_s(50)$ Mean Axial tests = **0.26** MN/m^2
$I_s(50)$ Mean Diametral tests = **0.15** MN/m^2
$I_a(50)$ Strength Anisotropy Index = **1.71** (calculated from highest and lowest diametral and axial $I_s(50)$ ratio)
Note:Size Correction Factor (F) calculated using $F = (D_e/50)^{0.45}$ (where D_e is equivalent core diameter).

Key

Type of Test column:, A = Axial, D = Diametral, I = Irregular, B = Block, L = Parallel, P = Perpendicular, [NS] denotes Non-standard Test.
Point Load Index column: (✓) = included in mean calculations, (✗) = excluded from mean calculations
Lab location: B = Bristol (BS3 4AG), C = Castleford (WF10 1NJ), H = Hemel Hempstead (HP3 9RT), T = Tonbridge (TN11 9HU)

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Compiled By		Date	Contract Ref:
Francesca Bennett	**FRANCESCA BENNETT**	**28.01.20**	**784312**
Contract: **Penny Pie Park Footbridge**			

DETERMINATION OF POINT LOAD STRENGTH

In accordance with ISRM 1974-2006

Exploratory Position ID	Sample Ref	Depth (m)	Type of Test	Width or Length (W or L) (mm)	Platen Separation (D) (mm)	Failure Load (P) (kN)	Equivalent Diameter (D_e) (mm)	Point Load (I_s) (MN/m^2)	Size Factor (F)	Point Load Index ($I_{s(50)}$) (MN/m^2)	Water Content (%)	Rock Type	Lab location
BH03	4	7.40	I+L	65	53	1.340	66	0.31	1.13	0.35	3.9		**B**
BH03	4	7.40	I	50	34	1.060	47	0.49	0.97	0.47	3.9		**B**

Results

Unable to calculate $I_a(50)$ Strength Anisotropy Index from this dataset.
Note:Size Correction Factor (F) calculated using $F = (D_e/50)^{0.45}$ (where D_e is equivalent core diameter).

Key

Type of Test column:, A = Axial, D = Diametral, I = Irregular, B = Block, L = Parallel, P = Perpendicular, [NS] denotes Non-standard Test.
Point Load Index column: (✓) = included in mean calculations, (✗) = excluded from mean calculations
Lab location: B = Bristol (BS3 4AG), C = Castleford (WF10 1NJ), H = Hemel Hempstead (HP3 9RT), T = Tonbridge (TN11 9HU)

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Compiled By		Date	Contract Ref:
D. Richards	**DAISY RICHARDS**	**29.01.20**	**784312**
Contract: **Penny Pie Park Footbridge**			

UNIAXIAL COMPRESSIVE STRENGTH

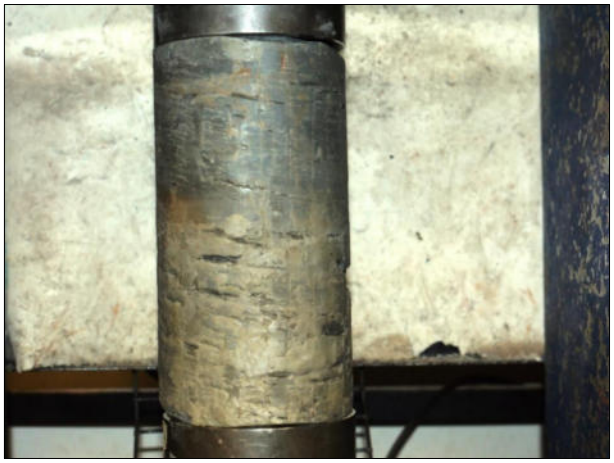
Preparation in accordance with ASTM D4543-08
Testing in accordance with ISRM 1974-2006

Borehole: **BH01** Sample Ref: **1** Sample Type: **C** Depth (m): **9.00**

Bulk Density (Mg/m^3): **2.44** Dry Density (Mg/m^3): **2.28** Moisture Content (%): **6.7**
Length (mm): **169.69** Diameter (mm): **89.96** Length/Diameter Ratio: **1.89**
Test Duration (mins:secs): **6:18** Stress Rate (kN/min): **6.0** Load at Failure (kN): **5.0**
UCS (MPa): **0.8** Failure Type: **Plastic**

Note: **Axis of loading parallel to core axis**
Description: **Grey MUDSTONE**
Specimen Preparation: **Specimen was not recored.**
Sample tolerance checks: Straightness: **PASS**. Flatness: **FAIL**. Perpendicularity: **FAIL**.
Remarks: **Too soft to measure tolerances**

Front view (pre-test)



Rear view (pre-test)

Front view (post-test)

Rear view (post-test)

Samples delivered from site to storage facility. Samples are stored in a frost free environment, at temperatures >4°C
Compression machine: Impact CT340 2000kN Auto Compression Machine Serial No. CT340-22. SSL No. 011076

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Compiled By		Date
Francesca Bennett	**FRANCESCA BENNETT**	**28/01/20**

Contract	Job No
Penny Pie Park Footbridge	**784312**

UNIAXIAL COMPRESSIVE STRENGTH

Preparation in accordance with ASTM D4543-08
Testing in accordance with ISRM 1974-2006

Borehole: **BH02** Sample Ref: **1** Sample Type: **C** Depth (m): **10.40**

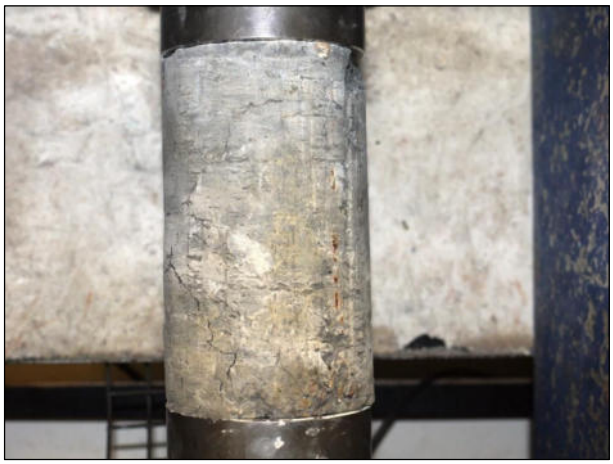
Bulk Density (Mg/m^3): **2.46** Dry Density (Mg/m^3): **2.36** Moisture Content (%): **4.2**
Length (mm): **153.70** Diameter (mm): **89.08** Length/Diameter Ratio: **1.73**
Test Duration (mins:secs): **10:28** Stress Rate (kN/min): **6.0** Load at Failure (kN): **7.1**
UCS (MPa): **1.1** Failure Type: **Plastic**

Note: **Axis of loading parallel to core axis**
Description: **Grey MUDSTONE**
Specimen Preparation: **Specimen was not recored.**
Sample tolerance checks: Straightness: **PASS**. Flatness: **FAIL**. Perpendicularity: **FAIL**.
Remarks: **Too soft to measure tolerances**

Front view (pre-test)

Rear view (pre-test)

Front view (post-test)



Rear view (post-test)

Samples delivered from site to storage facility. Samples are stored in a frost free environment, at temperatures >4°C
Compression machine: Impact CT340 2000kN Auto Compression Machine Serial No. CT340-22. SSL No. 011076

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Bristol
BS3 4AG

Compiled By		Date
Francesca Bennett	**FRANCESCA BENNETT**	**28/01/20**

Contract	Job No
Penny Pie Park Footbridge	**784312**

AGS

UNIAXIAL COMPRESSIVE STRENGTH

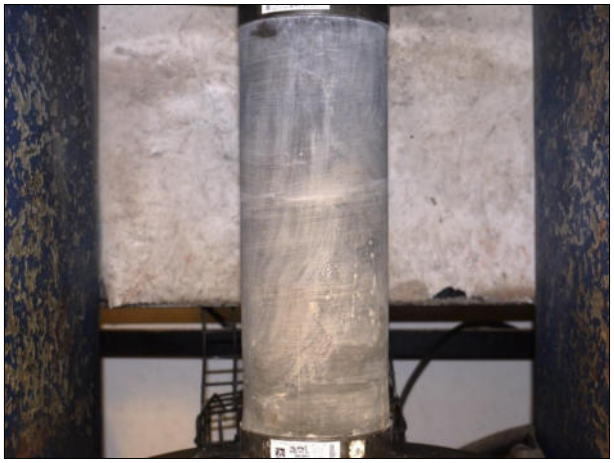
Preparation in accordance with ASTM D4543-08
Testing in accordance with ISRM 1974-2006

Borehole: **BH02** Sample Ref: **2** Sample Type: **C** Depth (m): **14.60**

Bulk Density (Mg/m^3): **2.60** Dry Density (Mg/m^3): **2.53** Moisture Content (%): **3.0**
Length (mm): **231.30** Diameter (mm): **87.14** Length/Diameter Ratio: **2.65**
Test Duration (mins:secs): **13:44** Stress Rate (kN/min): **6.0** Load at Failure (kN): **137.4**
UCS (MPa): **23.0** Failure Type: **Axial cleavage**

Note: **Axis of loading parallel to core axis**
Description: **Grey SILTSTONE**
Specimen Preparation: **Specimen was not recored.**
Sample tolerance checks: Straightness: **PASS**. Flatness: **PASS**. Perpendicularity: **PASS**.

Front view (pre-test)



Rear view (pre-test)

Front view (post-test)

Rear view (post-test)

Samples delivered from site to storage facility. Samples are stored in a frost free environment, at temperatures >4°C
Compression machine: Impact CT340 2000kN Auto Compression Machine Serial No. CT340-22. SSL No. 011076

STRUCTURAL SOILS
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Compiled By		Date
Francesca Bennett	**FRANCESCA BENNETT**	**28/01/20**

Contract	Job No
Penny Pie Park Footbridge	**784312**

UNIAXIAL COMPRESSIVE STRENGTH

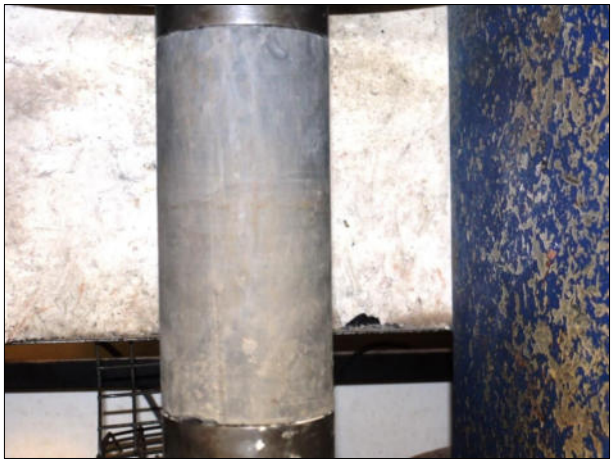
Preparation in accordance with ASTM D4543-08
Testing in accordance with ISRM 1974-2006

Borehole: **BH04** Sample Ref: **1** Sample Type: **C** Depth (m): **6.60**

Bulk Density (Mg/m^3): **2.58** Dry Density (Mg/m^3): **2.49** Moisture Content (%): **3.6**
Length (mm): **188.45** Diameter (mm): **89.52** Length/Diameter Ratio: **2.11**
Test Duration (mins:secs): **11:02** Stress Rate (kN/min): **6.0** Load at Failure (kN): **60.8**
UCS (MPa): **9.7** Failure Type: **Axial cleavage**

Note: **Axis of loading parallel to core axis**
Description: **Grey MUDSTONE/SILTSTONE**
Specimen Preparation: **Specimen was not recored.**
Sample tolerance checks: Straightness: **PASS**. Flatness: **PASS**. Perpendicularity: **PASS**.

Front view (pre-test)



Rear view (pre-test)

Front view (post-test)

Rear view (post-test)

Samples delivered from site to storage facility. Samples are stored in a frost free environment, at temperatures >4°C
Compression machine: Impact CT340 2000kN Auto Compression Machine Serial No. CT340-22. SSL No. 011076

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Compiled By		Date
Francesca Bennett	**FRANCESCA BENNETT**	**28/01/20**

Contract	Job No
Penny Pie Park Footbridge	**784312**

TESTING VERIFICATION CERTIFICATE

1774

The test results included in this report are certified as:-

ISSUE STATUS: **FINAL**

In accordance with the Structural Soils Ltd Laboratory Quality Management System, results sheets and summaries of results issued by the laboratory are checked by an approved signatory. The integrity of the test data and results are ensured by control of the computer system employed by the laboratory as part of the Software Verification Program as detailed in the Laboratory Quality Manual.

This testing verification certificate covers all testing compiled on or before the following datetime: **29/01/2020 11:55:30**.

Testing reported after this date is not covered by this Verification Certificate.

Approved Signatory
Luke Fisher (Materials Laboratory Manager)

(Head Office)
Bristol Laboratory
Unit 1A, Princess Street
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Castleford Laboratory
The Potteries, Pottery Street
Castleford
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Hemel Laboratory
18 Frogmore Road
Hemel Hempstead
Hertfordshire
HP3 9RT

Tonbridge Laboratory
Anerley Court, Half Moon Lane
Hildenborough
Tonbridge
TN11 9HU

STRUCTURAL SOILS LTD	Contract: **Penny Pie Park Footbridge**	Job No: **784312**

APPENDIX D
ENVIRONMENTAL LABORATORY TESTING

Envirolab Job Number: 19/12154
Client: Central Alliance
Client Project Name: Dodworth Road
Client Project Ref: 2370414

Lab Sample ID	Units	Limit of Detection	Method	19/12154/2	19/12154/3	19/12154/4
Client Sample No				2	3	4
Client Sample ID				TT01	TT01	TT01
Depth to Top				1.00	2.00	3.00
Depth to Bottom						
Date Sampled				04-Dec-19	04-Dec-19	04-Dec-19
Sample Type				Soil - ES	Soil - ES	Soil - ES
Sample Matrix Code				4AE	4ABE	4ABE
% Moisture at <40C	% w/w	0.1	A-T-044			
% Stones >10mm	% w/w	0.1	A-T-044	9.1	6.9	29
pH	pH	0.01	A-T-031s		7.65	
pH BRE	pH	0.01	A-T-031s	7.74		7.32
Ammonium NH4 BRE (water sol 2:1)	mg/l	1	A-T-033s	1.26		3.16
Chloride BRE, SO4 equiv. (water sol 2:1)	mg/l	7	A-T-026s	<7		8
Nitrate BRE, SO4 equiv. (water sol 2:1)	mg/l	0.4	A-T-026s	13.6		26.3
Sulphate (water sol 2:1)	g/l	0.01	A-T-026s		0.13	
Sulphate BRE (water sol 2:1)	mg/l	10	A-T-026s	45		295
Sulphate BRE (acid sol)	% w/w	0.02	A-T-028s	0.25		0.28
Sulphur BRE (total)	% w/w	0.01	A-T-024s	0.15		0.16
Magnesium BRE (water sol 2:1)	mg/l	1	A-T-SOLMETS	5		26
Cyanide (free)	mg/kg	1	A-T-042sFCN		<1	
Phenols - Total by HPLC	mg/kg	0.2	A-T-050s		<0.2	
Fraction of organic carbon	N/A	0.0003	A-T-032 FOC		0.1962	
Arsenic	mg/kg	1	A-T-024s		80	
Beryllium	mg/kg	0.5	A-T-024s		4.5	
Boron (water soluble)	mg/kg	1	A-T-027s		2	
Cadmium	mg/kg	0.5	A-T-024s		3.1	
Copper	mg/kg	1	A-T-024s		275	
Chromium	mg/kg	1	A-T-024s		61	
Chromium (hexavalent)	mg/kg	1	A-T-040s		<1	
Chromium (trivalent)	mg/kg	1	Calc		61	
Lead	mg/kg	1	A-T-024s		2020	
Mercury	mg/kg	0.17	A-T-024s		0.82	
Nickel	mg/kg	1	A-T-024s		87	
Selenium	mg/kg	1	A-T-024s		3	
Vanadium	mg/kg	1	A-T-024s		87	
Zinc	mg/kg	5	A-T-024s		1130	
Asbestos in Soil (inc. matrix)						
Asbestos in soil			A-T-045		NAD	
Asbestos ACM - Suitable for Water Absorption Test?			A-T-045		N/A	
PAH-16MS						
Acenaphthene	mg/kg	0.01	A-T-019s		<0.01	
Acenaphthylene	mg/kg	0.01	A-T-019s		0.03	
Anthracene	mg/kg	0.02	A-T-019s		0.1	
Benzo(a)anthracene	mg/kg	0.04	A-T-019s		3.38	
Benzo(a)pyrene	mg/kg	0.04	A-T-019s		3.08	
Benzo(b)fluoranthene	mg/kg	0.05	A-T-019s		3.52	
Benzo(ghi)perylene	mg/kg	0.05	A-T-019s		1.41	
Benzo(k)fluoranthene	mg/kg	0.07	A-T-019s		1.32	
Chrysene	mg/kg	0.06	A-T-019s		3.24	
Dibenzo(ah)anthracene	mg/kg	0.04	A-T-019s		0.33	
Fluoranthene	mg/kg	0.08	A-T-019s		3.45	
Fluorene	mg/kg	0.01	A-T-019s		<0.01	

Envirolab Job Number: 19/12154
Client: Central Alliance
Client Project Name: Dodworth Road
Client Project Ref: 2370414

Lab Sample ID				19/12154/2	19/12154/3	19/12154/4
Client Sample No				2	3	4
Client Sample ID				TT01	TT01	TT01
Depth to Top				1.00	2.00	3.00
Depth to Bottom						
Date Sampled				04-Dec-19	04-Dec-19	04-Dec-19
Sample Type				Soil - ES	Soil - ES	Soil - ES
Sample Matrix Code	Units	Limit of Detection	Method	4AE	4ABE	4ABE
Indeno(123-cd)pyrene	mg/kg	0.03	A-T-019s		1.79	
Naphthalene	mg/kg	0.03	A-T-019s		<0.03	
Phenanthrene	mg/kg	0.03	A-T-019s		0.18	
Pyrene	mg/kg	0.07	A-T-019s		3.52	
Total PAH-16MS	mg/kg	0.01	A-T-019s		25.4	
TPH UKCWG						
Ali >C5-C6	mg/kg	0.01	A-T-022s		<0.01	
Ali >C6-C8	mg/kg	0.01	A-T-022s		<0.01	
Ali >C8-C10	mg/kg	1	A-T-055s		<1	
Ali >C10-C12	mg/kg	1	A-T-055s		<1	
Ali >C12-C16	mg/kg	1	A-T-055s		<1	
Ali >C16-C21	mg/kg	1	A-T-055s		3	
Ali >C21-C35	mg/kg	1	A-T-055s		76	
Ali >C35-C44	mg/kg	1	A-T-055s		16	
Total Aliphatics	mg/kg	1	A-T-055s		95	
Aro >C5-C7	mg/kg	0.01	A-T-022s		<0.01	
Aro >C7-C8	mg/kg	0.01	A-T-022s		<0.01	
Aro >C8-C10	mg/kg	1	A-T-055s		3	
Aro >C10-C12	mg/kg	1	A-T-055s		1	
Aro >C12-C16	mg/kg	1	A-T-055s		3	
Aro >C16-C21	mg/kg	1	A-T-055s		5	
Aro >C21-C35	mg/kg	1	A-T-055s		44	
Aro >C35-C44	mg/kg	1	A-T-055s		21	
Total Aromatics	mg/kg	1	A-T-055s		76	
TPH (Ali & Aro >C5-C44)	mg/kg	1	A-T-055s		169	
BTEX - Benzene	mg/kg	0.01	A-T-022s		<0.01	
BTEX - Toluene	mg/kg	0.01	A-T-022s		<0.01	
BTEX - Ethyl Benzene	mg/kg	0.01	A-T-022s		<0.01	
BTEX - m & p Xylene	mg/kg	0.01	A-T-022s		<0.01	
BTEX - o Xylene	mg/kg	0.01	A-T-022s		<0.01	
MTBE	mg/kg	0.01	A-T-022s		<0.01	

Envirolab Job Number: 19/12154
Client: Central Alliance
Client Project Name: Dodworth Road
Client Project Ref: 2370414

Lab Sample ID	Units	Limit of Detection	19/12154/6	19/12154/7	19/12154/8	19/12154/10
Client Sample No			2	3	4	2
Client Sample ID			TT02	TT02	TT02	TT03
Depth to Top			1.00	2.00	3.00	1.00
Depth to Bottom						
Date Sampled			04-Dec-19	04-Dec-19	04-Dec-19	04-Dec-19
Sample Type			Soil - ES	Soil - ES	Soil - ES	Soil - ES
Sample Matrix Code			4AE	4AE	4AE	4AE
% Moisture at <40C	% w/w	0.1		30.2		
% Stones >10mm	% w/w	0.1	11.2	21.2	12.3	7.6
pH	pH	0.01	7.5		7.36	7.58
pH BRE	pH	0.01		7.38		
Ammonium NH4 BRE (water sol 2:1)	mg/l	1		2.87		
Chloride BRE, SO4 equiv. (water sol 2:1)	mg/l	7		<7		
Nitrate BRE, SO4 equiv. (water sol 2:1)	mg/l	0.4		11.6		
Sulphate (water sol 2:1)	g/l	0.01	0.04		0.14	0.06
Sulphate BRE (water sol 2:1)	mg/l	10		107		
Sulphate BRE (acid sol)	% w/w	0.02		0.35		
Sulphur BRE (total)	% w/w	0.01		0.2		
Magnesium BRE (water sol 2:1)	mg/l	1		11		
Cyanide (free)	mg/kg	1	1		<1	28
Phenols - Total by HPLC	mg/kg	0.2	<0.2		<0.2	<0.2
Fraction of organic carbon	N/A	0.0003	0.2054		0.1749	0.1695
Arsenic	mg/kg	1	77		75	74
Beryllium	mg/kg	0.5	5		4.7	5.1
Boron (water soluble)	mg/kg	1	<1.0		1.4	1.7
Cadmium	mg/kg	0.5	4.4		4.9	3.3
Copper	mg/kg	1	467		401	520
Chromium	mg/kg	1	79		62	46
Chromium (hexavalent)	mg/kg	1	<1		<1	<1
Chromium (trivalent)	mg/kg	1	79		62	46
Lead	mg/kg	1	976		841	531
Mercury	mg/kg	0.17	2.02		2.17	2.01
Nickel	mg/kg	1	83		103	81
Selenium	mg/kg	1	3		3	2
Vanadium	mg/kg	1	93		86	93
Zinc	mg/kg	5	790		1350	933
Asbestos in Soil (inc. matrix)						
Asbestos in soil			NAD		NAD	NAD
Asbestos ACM - Suitable for Water Absorption Test?			N/A		N/A	N/A
PAH-16MS						
Acenaphthene	mg/kg	0.01	<0.01		0.08	<0.01
Acenaphthylene	mg/kg	0.01	<0.01		0.04	0.04
Anthracene	mg/kg	0.02	<0.02		0.13	0.07
Benzo(a)anthracene	mg/kg	0.04	<0.04		0.19	0.49
Benzo(a)pyrene	mg/kg	0.04	<0.04		0.13	0.49
Benzo(b)fluoranthene	mg/kg	0.05	<0.05		0.16	0.57
Benzo(ghi)perylene	mg/kg	0.05	<0.05		<0.05	0.33
Benzo(k)fluoranthene	mg/kg	0.07	<0.07		<0.07	0.21
Chrysene	mg/kg	0.06	<0.06		0.23	0.53
Dibenzo(ah)anthracene	mg/kg	0.04	<0.04		<0.04	0.07
Fluoranthene	mg/kg	0.08	<0.08		0.41	0.66
Fluorene	mg/kg	0.01	<0.01		0.1	<0.01

Envirolab Job Number: 19/12154
Client: Central Alliance
Client Project Name: Dodworth Road
Client Project Ref: 2370414

Lab Sample ID	Units	Limit of Detection	19/12154/6	19/12154/7	19/12154/8	19/12154/10
Client Sample No			2	3	4	2
Client Sample ID			TT02	TT02	TT02	TT03
Depth to Top			1.00	2.00	3.00	1.00
Depth to Bottom						
Date Sampled			04-Dec-19	04-Dec-19	04-Dec-19	04-Dec-19
Sample Type			Soil - ES	Soil - ES	Soil - ES	Soil - ES
Sample Matrix Code			4AE	4AE	4AE	4AE
Indeno(123-cd)pyrene	mg/kg	0.03	<0.03		0.06	0.37
Naphthalene	mg/kg	0.03	<0.03		0.28	<0.03
Phenanthrene	mg/kg	0.03	<0.03		0.55	0.23
Pyrene	mg/kg	0.07	<0.07		0.35	0.64
Total PAH-16MS	mg/kg	0.01	<0.08		2.71	4.7
TPH UKCWG						
Ali >C5-C6	mg/kg	0.01	<0.01		<0.01	<0.01
Ali >C6-C8	mg/kg	0.01	<0.01		<0.01	<0.01
Ali >C8-C10	mg/kg	1	<1		<1	<1
Ali >C10-C12	mg/kg	1	<1		<1	<1
Ali >C12-C16	mg/kg	1	<1		1	1
Ali >C16-C21	mg/kg	1	4		3	7
Ali >C21-C35	mg/kg	1	142		5	174
Ali >C35-C44	mg/kg	1	17		1	15
Total Aliphatics	mg/kg	1	162		11	196
Aro >C5-C7	mg/kg	0.01	<0.01		<0.01	<0.01
Aro >C7-C8	mg/kg	0.01	<0.01		<0.01	<0.01
Aro >C8-C10	mg/kg	1	3		3	3
Aro >C10-C12	mg/kg	1	1		4	1
Aro >C12-C16	mg/kg	1	1		11	3
Aro >C16-C21	mg/kg	1	4		21	17
Aro >C21-C35	mg/kg	1	33		31	163
Aro >C35-C44	mg/kg	1	17		3	9
Total Aromatics	mg/kg	1	61		74	198
TPH (Ali & Aro >C5-C44)	mg/kg	1	223		85	394
BTEX - Benzene	mg/kg	0.01	<0.01		<0.01	<0.01
BTEX - Toluene	mg/kg	0.01	<0.01		<0.01	<0.01
BTEX - Ethyl Benzene	mg/kg	0.01	<0.01		<0.01	<0.01
BTEX - m & p Xylene	mg/kg	0.01	<0.01		<0.01	<0.01
BTEX - o Xylene	mg/kg	0.01	<0.01		<0.01	<0.01
MTBE	mg/kg	0.01	<0.01		<0.01	<0.01

Envirolab Job Number: 19/12154
Client: Central Alliance
Client Project Name: Dodworth Road
Client Project Ref: 2370414

Lab Sample ID	Units	Limit of Detection	19/12154/11	19/12154/14	19/12154/16	19/12154/19
Client Sample No			3	2	4	6
Client Sample ID			TT03	TT04	TT04	WS01
Depth to Top			2.00	1.00	3.60	1.00
Depth to Bottom						
Date Sampled			04-Dec-19	04-Dec-19	04-Dec-19	03-Dec-19
Sample Type			Soil - ES	Soil - ES	Soil - ES	Soil - ES
Sample Matrix Code			4AE	4AE		4AE
% Moisture at <40C	% w/w	0.1				
% Stones >10mm	% w/w	0.1	19.9	19.4		1.1
pH	pH	0.01				
pH BRE	pH	0.01	7.17	7.12	3.89	6.78
Ammonium NH4 BRE (water sol 2:1)	mg/l	1	3.67	4.13		3.54
Chloride BRE, SO4 equiv. (water sol 2:1)	mg/l	7	<7	16	<7	<7
Nitrate BRE, SO4 equiv. (water sol 2:1)	mg/l	0.4	31.8	7.4	29.4	4.9
Sulphate (water sol 2:1)	g/l	0.01				
Sulphate BRE (water sol 2:1)	mg/l	10	1120	395	539	26
Sulphate BRE (acid sol)	% w/w	0.02	0.69	0.35		0.12
Sulphur BRE (total)	% w/w	0.01	0.34	0.22	0.27	0.11
Magnesium BRE (water sol 2:1)	mg/l	1	50	15	84	8
Cyanide (free)	mg/kg	1				
Phenols - Total by HPLC	mg/kg	0.2				
Fraction of organic carbon	N/A	0.0003				
Arsenic	mg/kg	1				
Beryllium	mg/kg	0.5				
Boron (water soluble)	mg/kg	1				
Cadmium	mg/kg	0.5				
Copper	mg/kg	1				
Chromium	mg/kg	1				
Chromium (hexavalent)	mg/kg	1				
Chromium (trivalent)	mg/kg	1				
Lead	mg/kg	1				
Mercury	mg/kg	0.17				
Nickel	mg/kg	1				
Selenium	mg/kg	1				
Vanadium	mg/kg	1				
Zinc	mg/kg	5				
Asbestos in Soil (inc. matrix)						
Asbestos in soil						
Asbestos ACM - Suitable for Water Absorption Test?						
PAH-16MS						
Acenaphthene	mg/kg	0.01				
Acenaphthylene	mg/kg	0.01				
Anthracene	mg/kg	0.02				
Benzo(a)anthracene	mg/kg	0.04				
Benzo(a)pyrene	mg/kg	0.04				
Benzo(b)fluoranthene	mg/kg	0.05				
Benzo(ghi)perylene	mg/kg	0.05				
Benzo(k)fluoranthene	mg/kg	0.07				
Chrysene	mg/kg	0.06				
Dibenzo(ah)anthracene	mg/kg	0.04				
Fluoranthene	mg/kg	0.08				
Fluorene	mg/kg	0.01				

Envirolab Job Number: 19/12154
Client: Central Alliance
Client Project Name: Dodworth Road
Client Project Ref: 2370414

Lab Sample ID			19/12154/11	19/12154/14	19/12154/16	19/12154/19
Client Sample No			3	2	4	6
Client Sample ID			TT03	TT04	TT04	WS01
Depth to Top			2.00	1.00	3.60	1.00
Depth to Bottom						
Date Sampled			04-Dec-19	04-Dec-19	04-Dec-19	03-Dec-19
Sample Type			Soil - ES	Soil - ES	Soil - ES	Soil - ES
Sample Matrix Code	Units	Limit of Detection	4AE	4AE		4AE
Indeno(123-cd)pyrene	mg/kg	0.03				
Naphthalene	mg/kg	0.03				
Phenanthrene	mg/kg	0.03				
Pyrene	mg/kg	0.07				
Total PAH-16MS	mg/kg	0.01				
TPH UKCWG						
Ali >C5-C6	mg/kg	0.01				
Ali >C6-C8	mg/kg	0.01				
Ali >C8-C10	mg/kg	1				
Ali >C10-C12	mg/kg	1				
Ali >C12-C16	mg/kg	1				
Ali >C16-C21	mg/kg	1				
Ali >C21-C35	mg/kg	1				
Ali >C35-C44	mg/kg	1				
Total Aliphatics	mg/kg	1				
Aro >C5-C7	mg/kg	0.01				
Aro >C7-C8	mg/kg	0.01				
Aro >C8-C10	mg/kg	1				
Aro >C10-C12	mg/kg	1				
Aro >C12-C16	mg/kg	1				
Aro >C16-C21	mg/kg	1				
Aro >C21-C35	mg/kg	1				
Aro >C35-C44	mg/kg	1				
Total Aromatics	mg/kg	1				
TPH (Ali & Aro >C5-C44)	mg/kg	1				
BTEX - Benzene	mg/kg	0.01				
BTEX - Toluene	mg/kg	0.01				
BTEX - Ethyl Benzene	mg/kg	0.01				
BTEX - m & p Xylene	mg/kg	0.01				
BTEX - o Xylene	mg/kg	0.01				
MTBE	mg/kg	0.01				

Envirolab Job Number: 19/12154
Client: Central Alliance
Client Project Name: Dodworth Road
Client Project Ref: 2370414

Lab Sample ID			19/12154/21	19/12154/26	19/12154/27	19/12154/30
Client Sample No			11	8	11	5
Client Sample ID			WS01	WS06A	WS06A	WS03
Depth to Top			2.50	2.40	3.50	0.90
Depth to Bottom						
Date Sampled			03-Dec-19	05-Dec-19	05-Dec-19	03-Dec-19
Sample Type			Soil - ES	Soil - ES	Soil - ES	Soil - ES
Sample Matrix Code	Units	Limit of Detection				
% Moisture at <40C	% w/w	0.1				
% Stones >10mm	% w/w	0.1				
pH	pH	0.01				
pH BRE	pH	0.01	7.34	7.59	7.11	7.58
Ammonium NH4 BRE (water sol 2:1)	mg/l	1				
Chloride BRE, SO4 equiv. (water sol 2:1)	mg/l	7	<7	12	17	<7
Nitrate BRE, SO4 equiv. (water sol 2:1)	mg/l	0.4	27.5	11.8	40.8	1.8
Sulphate (water sol 2:1)	g/l	0.01				
Sulphate BRE (water sol 2:1)	mg/l	10	101	115	1540	45
Sulphate BRE (acid sol)	% w/w	0.02				
Sulphur BRE (total)	% w/w	0.01	0.22	0.18		0.16
Magnesium BRE (water sol 2:1)	mg/l	1	13	12	40	10
Cyanide (free)	mg/kg	1				
Phenols - Total by HPLC	mg/kg	0.2				
Fraction of organic carbon	N/A	0.0003				
Arsenic	mg/kg	1				
Beryllium	mg/kg	0.5				
Boron (water soluble)	mg/kg	1				
Cadmium	mg/kg	0.5				
Copper	mg/kg	1				
Chromium	mg/kg	1				
Chromium (hexavalent)	mg/kg	1				
Chromium (trivalent)	mg/kg	1				
Lead	mg/kg	1				
Mercury	mg/kg	0.17				
Nickel	mg/kg	1				
Selenium	mg/kg	1				
Vanadium	mg/kg	1				
Zinc	mg/kg	5				
Asbestos in Soil (inc. matrix)						
Asbestos in soil						
Asbestos ACM - Suitable for Water Absorption Test?						
PAH-16MS						
Acenaphthene	mg/kg	0.01				
Acenaphthylene	mg/kg	0.01				
Anthracene	mg/kg	0.02				
Benzo(a)anthracene	mg/kg	0.04				
Benzo(a)pyrene	mg/kg	0.04				
Benzo(b)fluoranthene	mg/kg	0.05				
Benzo(ghi)perylene	mg/kg	0.05				
Benzo(k)fluoranthene	mg/kg	0.07				
Chrysene	mg/kg	0.06				
Dibenzo(ah)anthracene	mg/kg	0.04				
Fluoranthene	mg/kg	0.08				
Fluorene	mg/kg	0.01				

Envirolab Job Number: 19/12154
Client: Central Alliance
Client Project Name: Dodworth Road
Client Project Ref: 2370414

Lab Sample ID	Units	Limit of Detection	19/12154/21	19/12154/26	19/12154/27	19/12154/30
Client Sample No			11	8	11	5
Client Sample ID			WS01	WS06A	WS06A	WS03
Depth to Top			2.50	2.40	3.50	0.90
Depth to Bottom						
Date Sampled			03-Dec-19	05-Dec-19	05-Dec-19	03-Dec-19
Sample Type			Soil - ES	Soil - ES	Soil - ES	Soil - ES
Sample Matrix Code						
Indeno(123-cd)pyrene	mg/kg	0.03				
Naphthalene	mg/kg	0.03				
Phenanthrene	mg/kg	0.03				
Pyrene	mg/kg	0.07				
Total PAH-16MS	mg/kg	0.01				
TPH UKCWG						
Ali >C5-C6	mg/kg	0.01				
Ali >C6-C8	mg/kg	0.01				
Ali >C8-C10	mg/kg	1				
Ali >C10-C12	mg/kg	1				
Ali >C12-C16	mg/kg	1				
Ali >C16-C21	mg/kg	1				
Ali >C21-C35	mg/kg	1				
Ali >C35-C44	mg/kg	1				
Total Aliphatics	mg/kg	1				
Aro >C5-C7	mg/kg	0.01				
Aro >C7-C8	mg/kg	0.01				
Aro >C8-C10	mg/kg	1				
Aro >C10-C12	mg/kg	1				
Aro >C12-C16	mg/kg	1				
Aro >C16-C21	mg/kg	1				
Aro >C21-C35	mg/kg	1				
Aro >C35-C44	mg/kg	1				
Total Aromatics	mg/kg	1				
TPH (Ali & Aro >C5-C44)	mg/kg	1				
BTEX - Benzene	mg/kg	0.01				
BTEX - Toluene	mg/kg	0.01				
BTEX - Ethyl Benzene	mg/kg	0.01				
BTEX - m & p Xylene	mg/kg	0.01				
BTEX - o Xylene	mg/kg	0.01				
MTBE	mg/kg	0.01				

Envirolab Job Number: 19/12154
Client: Central Alliance
Client Project Name: Dodworth Road
Client Project Ref: 2370414

Lab Sample ID	Units	Limit of Detection	19/12154/34	19/12154/35
Client Sample No			14	17
Client Sample ID			WS05	WS05
Depth to Top			4.50	5.50
Depth to Bottom				
Date Sampled			05-Dec-19	05-Dec-19
Sample Type			Soil - ES	Soil - ES
Sample Matrix Code				
% Moisture at <40C	% w/w	0.1		
% Stones >10mm	% w/w	0.1		
pH	pH	0.01		7.17
pH BRE	pH	0.01	7.43	7.17
Ammonium NH4 BRE (water sol 2:1)	mg/l	1		
Chloride BRE, SO4 equiv. (water sol 2:1)	mg/l	7	13	<7
Nitrate BRE, SO4 equiv. (water sol 2:1)	mg/l	0.4	119	48
Sulphate (water sol 2:1)	g/l	0.01		1.16
Sulphate BRE (water sol 2:1)	mg/l	10	1540	1160
Sulphate BRE (acid sol)	% w/w	0.02		
Sulphur BRE (total)	% w/w	0.01	0.8	0.11
Magnesium BRE (water sol 2:1)	mg/l	1	76	106
Cyanide (free)	mg/kg	1		1
Phenols - Total by HPLC	mg/kg	0.2		<0.2
Fraction of organic carbon	N/A	0.0003		0.0616
Arsenic	mg/kg	1		17
Beryllium	mg/kg	0.5		1.2
Boron (water soluble)	mg/kg	1		3.1
Cadmium	mg/kg	0.5		1.6
Copper	mg/kg	1		116
Chromium	mg/kg	1		22
Chromium (hexavalent)	mg/kg	1		<1
Chromium (trivalent)	mg/kg	1		22
Lead	mg/kg	1		135
Mercury	mg/kg	0.17		<0.17
Nickel	mg/kg	1		31
Selenium	mg/kg	1		1
Vanadium	mg/kg	1		25
Zinc	mg/kg	5		166
Asbestos in Soil (inc. matrix)				
Asbestos in soil				NAD
Asbestos ACM - Suitable for Water Absorption Test?				N/A
PAH-16MS				
Acenaphthene	mg/kg	0.01		0.05
Acenaphthylene	mg/kg	0.01		0.01
Anthracene	mg/kg	0.02		0.1
Benzo(a)anthracene	mg/kg	0.04		0.25
Benzo(a)pyrene	mg/kg	0.04		0.23
Benzo(b)fluoranthene	mg/kg	0.05		0.29
Benzo(ghi)perylene	mg/kg	0.05		0.16
Benzo(k)fluoranthene	mg/kg	0.07		0.1
Chrysene	mg/kg	0.06		0.29
Dibenzo(ah)anthracene	mg/kg	0.04		<0.04
Fluoranthene	mg/kg	0.08		0.46
Fluorene	mg/kg	0.01		0.04

Envirolab Job Number: 19/12154
Client: Central Alliance
Client Project Name: Dodworth Road
Client Project Ref: 2370414

Lab Sample ID	Units	Limit of Detection	19/12154/34	19/12154/35
Client Sample No			14	17
Client Sample ID			WS05	WS05
Depth to Top			4.50	5.50
Depth to Bottom				
Date Sampled			05-Dec-19	05-Dec-19
Sample Type			Soil - ES	Soil - ES
Sample Matrix Code				
Indeno(123-cd)pyrene	mg/kg	0.03		0.18
Naphthalene	mg/kg	0.03		<0.03
Phenanthrene	mg/kg	0.03		0.38
Pyrene	mg/kg	0.07		0.42
Total PAH-16MS	mg/kg	0.01		2.96
TPH UKCWG				
Ali >C5-C6	mg/kg	0.01		<0.01
Ali >C6-C8	mg/kg	0.01		<0.01
Ali >C8-C10	mg/kg	1		<1
Ali >C10-C12	mg/kg	1		<1
Ali >C12-C16	mg/kg	1		<1
Ali >C16-C21	mg/kg	1		<1
Ali >C21-C35	mg/kg	1		9
Ali >C35-C44	mg/kg	1		12
Total Aliphatics	mg/kg	1		21
Aro >C5-C7	mg/kg	0.01		<0.01
Aro >C7-C8	mg/kg	0.01		<0.01
Aro >C8-C10	mg/kg	1		2
Aro >C10-C12	mg/kg	1		<1
Aro >C12-C16	mg/kg	1		2
Aro >C16-C21	mg/kg	1		3
Aro >C21-C35	mg/kg	1		11
Aro >C35-C44	mg/kg	1		8
Total Aromatics	mg/kg	1		25
TPH (Ali & Aro >C5-C44)	mg/kg	1		46
BTEX - Benzene	mg/kg	0.01		<0.01
BTEX - Toluene	mg/kg	0.01		<0.01
BTEX - Ethyl Benzene	mg/kg	0.01		<0.01
BTEX - m & p Xylene	mg/kg	0.01		<0.01
BTEX - o Xylene	mg/kg	0.01		<0.01
MTBE	mg/kg	0.01		<0.01

envirolab
Units 7 & 8, Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

Final Test Report

Envirolab Job Number:	19/12154
Issue Number:	1
Date:	10-Jan-20
Client:	Central Alliance Alliance House South Park Way South Park Way Wakefield 41 Business Park Wakefield, WF2 0XJ
Project Manager:	Alice Wilton / Lab Results
Project Name:	Dodworth Road
Project Ref:	2370414
Order No:	n\a
Date Samples Received:	6-Dec-19
Date Instructions Received:	20-Dec-19
Date Analysis Completed:	10-Jan-20

Notes - Soil analysis

All results are reported as dry weight (<40°C).

For samples with Matrix Codes 1 - 6 natural stones >10mm are removed or excluded from the sample prior to analysis and reported results corrected to a whole sample basis.

For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis.

Notes - General

This report shall not be reproduced, except in full, without written approval from Envirolab.

Subscript "A" indicates analysis performed on the sample as received. "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve, unless asbestos is found to be present in which case all analysis is performed on the sample as received.

All analysis is performed on the dried and crushed sample for samples with Matrix Code 7 and this supercedes any "A" subscripts.

All analysis is performed on the sample as received for soil samples from outside the European Union and this supercedes any "D" subscripts

For complex, multi-compound analysis, quality control results do not always fall within chart limits for every compound and we have criteria for reporting in these situations.

If results are in italic font they are associated with such quality control failures and may be unreliable.

A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid

Predominant Matrix Codes: 1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample

Secondary Matrix Codes: A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal, E = contains roots/twigs.

IS indicates Insufficient sample for analysis, NDP indicates No Determination Possible and NAD indicates No Asbestos Detected.

Analytical results reflect the quality of the sample at the time of analysis only. Opinions and interpretations expressed are outside the scope of our accreditation.

Please contact us if you need any further information.

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Landfill WAC analysis must not be used for hazardous waste classification purposes. This analysis is only applicable for landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Sample Details						Landfill Waste Acceptance Criteria Limits		
Lab Sample ID	Method	ISO17025	MCERTS	19/12154/7				
Client Sample Number				3		Inert Waste Landfill	Stable Non-reactive Hazardous Waste in Non-Hazardous Landfill	Hazardous Waste Landfill
Client Sample ID				TT02				
Depth to Top				2				
Depth to Bottom								
Date Sampled				04/12/2019				
Sample Type				Soil - ES				
Sample Matrix Code				4AE				
Solid Waste Analysis								
pH (pH Units)$_D$	A-T-031	N	N			-	>6	-
ANC to pH 4 (mol/kg)$_D$	A-T-ANC	N	N	**0.13**		-	to be evaluated	to be evaluated
ANC to pH 6 (mol/kg)$_D$	A-T-ANC	N	N	**0.02**		-	to be evaluated	to be evaluated
Loss on Ignition (%)$_D$	A-T-030	N	N	**21**		-	-	10
Total Organic Carbon (%)$_D$	A-T-032	N	N	**17.9**		3	5	6
PAH Sum of 17 (mg/kg) $_A$	A-T-019	N	N			100	-	-
Mineral Oil (mg/kg)$_A$	A-T-007	N	N			500	-	-
Sum of 7 PCBs (mg/kg)$_A$	A-T-004	N	N			1	-	-
Sum of BTEX (mg/kg)$_A$	A-T-022	N	N			6	-	-
Eluate Analysis				**10:1 mg/l**	**10:1 mg/kg**	**Limit values for compliance leaching test using BS EN 12457-2 at L/S 10 l/kg (mg/kg)**		
Arsenic	A-T-025	N	N	0.001	**0.010**	0.5	2	25
Barium	A-T-025	N	N	0.057	**0.570**	20	100	300
Cadmium	A-T-025	N	N	<0.001	**<0.01**	0.04	1	5
Chromium	A-T-025	N	N	0.003	**0.030**	0.5	10	70
Copper	A-T-025	N	N	0.006	**0.060**	2	50	100
Mercury	A-T-025	N	N	<0.0005	**<0.005**	0.01	0.2	2
Molybdenum	A-T-025	N	N	0.012	**0.120**	0.5	10	30
Nickel	A-T-025	N	N	<0.001	**<0.01**	0.4	10	40
Lead	A-T-025	N	N	0.002	**0.020**	0.5	10	50
Antimony	A-T-025	N	N	0.002	**0.020**	0.06	0.7	5
Selenium	A-T-025	N	N	<0.001	**<0.01**	0.1	0.5	7
Zinc	A-T-025	N	N	0.012	**0.120**	4	50	200
Chloride	A-T-026	N	N	<1.00	**<10**	800	15000	25000
Fluoride	A-T-026	N	N	0.2	**2.0**	10	150	500
Sulphate as SO_4	A-T-026	N	N	32	**318**	1000	20000	50000
Total Dissolved Solids	A-T-035	N	N	109	**1090**	4000	60000	100000
Phenol Index	A-T-050	N	N	<0.01	**<0.1**	1	-	-
Dissolved Organic Carbon	A-T-032	N	N	<0.2	**<200**	500	800	1000
Leach Test Information								
pH (pH Units)	A-T-031	N	N	7.6				
Conductivity (µS/cm)	A-T-037	N	N	218				
Mass Sample (kg)				0.253				
Dry Matter (%)	A-T-044	N	N	69.3				

Stated acceptance limits are for guidance only and Envirolab cannot be held responsible for any discrepancies with current legislation

APPENDIX II

Geotechnical Risk Register

HBPW CONSULTING ENGINEERS

	Hazard/Risk	Cause	Initial Risk Rating			Mitigation Measures	Hazard Rating after Mitigation Measures		
			Probability of Hazard	Impact of Hazard	Risk Rating		Probability of Hazard	Impact of Hazard	Risk Rating
1	Made ground (arisings) from the piling works.	Made ground has been proven to contain hazardous materials.	3	4	12	• Refer to Section 9 of the Ground Investigation Report.	1	4	4
2	Differential settlement on the footpath.	Varying thicknesses and compositions of the made ground.	2	3	6	• Resurfacing of the footpath is settlement occurs.	1	3	3
3	Buried services.	Injury or death due to striking or damaging buried cables	3	5	15	• Location of known services reviewed; proposed works positioned to minimise impact. • Area to be CAT scanned and position of any buried services marked out prior to breaking ground	1	5	5

Table 1 – Geotechnical Risk Register

Probability			Impact	
Very Likely	5	-	Very High	5
Likely	4	-	High	4
Probable	3	-	Medium	3
Unlikely	2	-	Low	2
Negligible	1	-	Very Low	1