Leeds CITY COUNCIL

Prince Royd Car Park, A629 Halifax Road, Huddersfield

Ground Investigation Report

Our Scheme Ref: 446368

Date: December 2019

City Development

Geotechnical Section

Table of Contents

1 Introduction

Leeds City Council (LCC) Geotechnical Section (GS) was requested by Kirklees Council to carry out a ground investigation for the proposed Prince Royd car park. The site is approximately 3km north-west from Huddersfield town centre at approximate OS National Grid Reference E: 412020 N: 418650. See Figure 1.

The site is currently occupied by a disused and overgrown parking area on the south side of A629 Halifax Road. Dense mature woodland is present along the western and southern margins of the site. A brick wall is present along the northern and eastern boundary separating the site from the existing highway and an adjacent residential property. There is an overgrown track adjacent to the south-west corner of the site leading to higher ground to the west. There was a significant volume of standing water observed in the south-western corner of the site during the ground investigation. This area appeared to be collecting surface water runoff from adjacent land to the south and from the overgrown track to the west.

A desk study report has been compiled by GS, dated December 2019 (GS ref: 446368). The findings of this report are summarised in Section 2 below.

2 Existing/Desk Study Information

Site History

The earliest available map (1854) shows the site to be open fields. The 1890 map shows the site to be occupied by a Brick & Tile Works with an associated quarry to the south. The 1893 map shows a shaft to the south of the site within the Brick & Tile Works. The 1905 map shows a pond and spoil heap to the west of the site. Between the maps of 1907 and 1918, the Brick & Tile Works are shown to have increased in size along with the quarry however, the shaft is no longer identified. A tramway is shown along Halifax Road and the pond to the west is indicated to have been infilled and the spoil heap extended. Two new ponds are shown to the west of the site and a chimney is indicated in the location of the former shaft. The 1933 map shows a tank on the southern boundary of the site. Between the maps of 1956 and 1960, the Brick & Tile Works are shown to be disused. The 1966 map shows the Brick & Tile Works buildings to have been cleared and a refuse tip is now indicated to the south-west of the site, infilling the former quarry. The site has remained largely unchanged from the late 1960s to present.

Geology

No superficial (drift) deposits are shown within the site area. However, the geological map indicates artificial deposits comprising made ground and infilled ground throughout the site. This is expected to be related to the former spoil heaps and quarry.

The site is underlain by Carboniferous Lower Coal Measures strata, dipping gently to the east and comprising undifferentiated strata below the Soft Bed Flags (sandstone) and above the Sub-crenatum Marine Band. Undifferentiated strata consist of predominantly mudstones and siltstones with thin beds of sandstone. The old geological map (246SW) provides an exposure log for the quarry to the south of the site comprising approximately 3m of 'flaggy' sandstone (Soft Bed Flags) over approximately 18m of 'strong bluish shaly' mudstone. The base of the quarry appears to be at approximately 185m AOD.

Hydrology and Hydrogeology

The underlying geological sequence is classified as a Secondary A aquifer, with the soils classified as having high leaching potential.

The site is recorded as being within a groundwater Source Protection Zone (SPZ) 2 Outer Catchment. No recorded water abstractions are present within 250m of the site.

A watercourse (Grimescar Dike) is located approximately 17m to the north of the site running approximately east to west. The site has a very low probability of flooding according to the Environment Agency.

Mines, Quarries and Mineral Deposits

The Coal Authority (CA) Mining Report states that the site is not within an area of past coal mining activity and there are no probable unrecorded shallow workings. However, the CA record a mine entry to the south of the site (CA ref: 412418-001). The geological map indicates the Halifax Thin or Pot Clay Coal seam outcrops to the north of the site and is present at shallow depth. However, this coal seam is reported in archive boreholes (Phoenix Mills) to be 0.15m thick. GS consider it likely this shaft was a well sunk for the former Brick & Tile Works either to provide a water supply or drainage for the quarry and is not a coal mine shaft.

The site is within a historical surface ground working area, extending approximately 125m from the site to the south-west, associated with the former Brick & Tile Works.

There are no recorded quarries within the site. However, there are old infilled brick pits and quarries shown on the geological and historical maps to the south, west and north-west. The presence of unrecorded quarries within the site cannot be ruled out.

3 Previous Ground Investigations

There are no archive exploratory hole records available from within the site area or its immediate locality. The British Geological Survey (BGS) have a number of confidential borehole records to the north-west of the site off Birchencliffe Road. However, these boreholes are considered too remote from the site to be of use for this assessment.

4 Ground Investigation

An intrusive ground investigation was carried out by GS Contractor Allied Exploration & Geotechnical Ltd (AEG) in July 2019. The exploratory holes records and laboratory test results are included in the AEG Ground Investigation Report extracts (see Appendix 2).

The investigation comprised three machine excavated trial pits (ref: TP010, TP011 and TP012) carried out to depths of between 1.50m and 3.30m below ground level (bgl).

Geotechnical testing was undertaken at the AEG laboratory. Selected samples were sent to Derwentside Environmental Testing Services Ltd for environmental testing. The laboratory test results are included in Appendix 2.

The locations of the exploratory holes are shown on the site layout plan, see Figure 2.

5 Ground Conditions

Introduction

The ground investigation generally confirmed the expected ground conditions comprising made ground over cohesive (clay) and granular (gravel) residual soils over weathered mudstone bedrock.

Made Ground

Made ground was found at the surface throughout the site to depths of between 0.70m and greater than 1.50m bgl. The made ground was reported to comprise sandy gravel with variable cobble content. Gravel and cobbles sized fragments were of mudstone, sandstone, brick, concrete, tiles, macadam, ash, clinker, metal cans and plaster board.

No visual or olfactory evidence of significant contamination was observed within the made ground soils.

No geotechnical testing was undertaken in the made ground soils.

Trial pit TP011 encountered a suspected brick culvert below 0.50m bgl. Further excavation was abandoned to avoid damaging this potentially unstable structure. No drainage features are shown on the Yorkshire Water plans in this area.

Residual Soil

Natural residual soils were found beneath the surface made ground in TP012 only where the thickness of the residual soils was reported to be 2.10m. The residual soils comprise firm slightly sandy gravelly clay over clayey sandy gravel. Gravel sized fragments are reported to be of mudstone and sandstone.

Two particle size distribution tests were carried out on samples of the natural soils. The tests report between 3.7% and 17% fines (clay and silt), between 4.7% and 12% sand, between 13% and 56% gravel and between 15% and 78% cobbles. One plasticity test was carried out on the natural soil and reports a modified plasticity index of 3.6% (low volume change potential). Moisture contents are reported to be between 4.5% and 19.1%.

Bedrock

Weathered mudstone bedrock was encountered below the residual soil in TP012 at 2.80m bgl.

Groundwater

During the intrusive investigation, significant groundwater strikes are reported in TP010 and TP011 at 1.30m bgl from the made ground. However, no groundwater was observed during excavation of trial pit TP012 to 3.30m bgl. The groundwater therefore appears to be perched within the surface granular made ground and appears to be collecting within the deeper made ground present in the western and southern parts of the site.

6 Contamination Assessment

Introduction

The most plausible source of contamination for the site is the made ground. Chemical testing therefore focused on the near surface made ground soils.

Ground contamination is of concern for potential development in terms of:

- Risk to construction workers and adjacent land users during construction;
- Disposal implications for excavated soils generated during construction; and
- The risk to future site users and maintenance workers following development.

The near surface made ground has been determined to be the primary source of potential contamination. Exposure pathways for the made ground comprise inhalation of fibres, dermal

contact, ingestion of soil and dust and leaching of mobile contamination. Potential receptors are construction workers, adjacent land users, future site users and maintenance workers.

Contamination screening tests, including asbestos identification, were carried out throughout the site on the made ground soils.

Contamination

The test results have been compared against the Generic Assessment Criteria (GAC) values. Although the majority of the site is proposed to be covered with hardstanding, soft landscaping areas are present adjacent to existing residential properties therefore GAC values for Public Open Space (POS_{resi}) end use have been used for initial risk assessment purposes. A soil organic matter content of 1% has been employed where appropriate. The GAC values used for assessment along with a summary of the test results are presented in Table 1. The laboratory test certificates are presented in Appendix 2.

The test results show the made ground is not contaminated and can be re-used as landscaping fill without restriction throughout the site area.

A groundwater sample from TP010 was also tested for a range of potential contaminants. The test results appear to show no significant contamination is present within the groundwater.

Ground Gas

Gas monitoring wells were not constructed during the ground investigation and the gas regime is unknown.

Remediation Recommendations

The testing indicates the soil is not contaminated and can be re-used on site as landscaping fill.

Asbestos

No asbestos fibres or asbestos containing material was found in any of the samples tested.

Waste Disposal

Two Waste Acceptance Criteria (WAC) tests were carried out to assess the disposal implications for the made ground. No exceedances of the WAC limit values are reported therefore it is considered likely that made ground soils removed from the site would be classified as Inert Waste.

7 Geotechnical Assessment

Mining and Quarrying

There is no potential for coal mine workings beneath the site according to the Coal Authority. Although the Coal Authority record a shaft to the south of the site, GS consider it likely this shaft was a well sunk for the former Brick & Tile Works for water extraction or drainage purposes. The shaft is located at sufficient distance to not impact on the proposed development.

Although there are no recorded quarries within the site area, the presence of unrecorded quarries and brick pits cannot be entirely ruled out. If any anomalous features are encountered during construction, further advice should be sought.

Excavations and Earthworks

Difficulties in excavation should not be encountered using conventional plant within the surface made ground and underlying natural soils and weathered bedrock. However, obstructions or remnant structures may be encountered within the made ground associated with the former works buildings (see Figure 2).

The ground investigation data indicates that perched groundwater may be encountered in excavations below 1.30m bgl, particularly in the southern and western parts of the site.

Excavations within the surface made ground and natural residual soils are likely to be unstable and may require full support.

Given the restricted working space on site, re-use of the made ground soils as engineered fill is likely to be impractical as screening and crushing of oversize particles would be necessary.

All earthworks shall be carried out in accordance with Specification for Highway Works (SHW) Series 600.

Concrete

A total of six soil samples from depths of between 0.20m and 1.00m bgl were analysed for water soluble sulphate and pH. Concentrations of water soluble sulphate ranged from <10 mg/l to 38 mg/l. pH values are reported to vary between 6.4 and 8.4.

In accordance with BRE SD1, the characteristic value for sulphate is taken to be 100 mg/l and the groundwater is considered to be mobile. Design Sulphate Class DS-1 ACEC Class AC-1 shall be employed for below ground concrete.

Proposed Boundary and Retaining Walls

New 1.80m high stone boundary and 2.00m high stone retaining walls are proposed along the eastern site boundary. Ground conditions comprise a variable thickness of made ground, to depths of between 0.70m and greater than 1.50m bgl, over natural residual soils and weathered mudstone bedrock at approximately 3.00m bgl.

The made ground is unsuitable to support foundations. The natural cohesive residual soils also present problems for foundations related to their expected desiccated condition, associated with the presence of mature trees throughout the site. Although the soils have low volume change potential, if foundations are placed on the cohesive residual soil there is a significant risk of heave post construction as the clay soil takes up moisture and swells after vegetation removal. It should be noted that the residual soils were reported to be present as a clayey sandy gravel below 0.90m bgl. Provided the upper clay is removed the foundation may be placed on the lower granular residual soils. A minimum foundation depth of 1.50m bgl should be assumed for initial design purposes.

The ground investigation suggests that deep made ground and perched groundwater may be encountered in the south-east corner of the site. This may be problematic for the proposed stone retaining wall as a deep trench fill foundation may disrupt existing groundwater flow pathways. Consideration should be given to a more flexible reinforced earth structure (Tensar Greenslope or similar approved) which requires less excavation and may allow re-use of site won fill. If a reinforced earth solution is favoured it is recommended to excavate and replace a minimum of 1m of the existing made ground below the structure with engineered fill and geogrids. This formation improvement should include a minimum 300mm thick starter/drainage layer at the base (Class 6B or similar approved). Alternatively high capacity mini-piles could be considered.

Proposed Car Park

Between 0.70m and greater than 1.50m of made ground was found at the surface. The made ground appears to increase in thickness towards the south and is reported to overlie natural residual soils.

Non-engineered made ground should not be left untreated in-situ beneath the proposed car park construction. Therefore it is recommended that the full thickness of made ground is excavated and replaced with engineered fill.

The residual soils, particularly in the southern part of the site, are likely to be water softened by perched groundwater in the surface made ground and a CBR of <2.5% should be assumed. The highway pavement foundation should therefore comprise a minimum of 475mm sub-base (Type 1 or similar approved) only or 150mm sub-base over 600mm capping fill (Class 6F5 or similar approved). Where full excavation of the made ground is impractical, a minimum of two layers of high strength geogrid (Tensar TriAx or similar approved) shall be employed within the base of the construction with 300mm vertical separation.

As with the proposed retaining wall, this formation improvement should include a minimum 300mm thick starter layer at the base in the southern part of the site area to avoid disrupting groundwater pathways.

Surface Water Drainage

Infiltration drainage is not feasible due to presence of low permeability soils and bedrock and shallow groundwater. On-site attenuation and a restricted off-site discharge to a surface watercourse or sewer is required. There appears to be natural drainage lines and a watercourse in woodland to the north-west of the site and this should be favoured over a discharge to the existing sewers in Halifax Road.

On-site attenuation may be provided by a below ground tank beneath the proposed car park. Alternatively a no infiltration permeable pavement could be considered. For initial design purposes, 450mm of coarse graded aggregate (CGA) should be assumed along with a minimum 145mm porous Dense Bitumen Macadam (DBM) for a permeable pavement construction. Ground improvement (excavate and replace surface made ground) would still be required beneath the permeable pavement as above.

Relict Drainage and Structures

Trial pit TP011 encountered a suspected brick culvert below 0.50m bgl. There are likely to be further obstructions or relict structures encountered during construction. If found, relict drainage features should be protected and existing drainage pathways maintained where possible. Relict structures (cellar walls, floor slabs etc) should be excavated and replaced with granular fill to avoid forming hard spots beneath the proposed car park construction.

Additional Ground Investigation

The ground investigation locations were restricted by the presence of dense vegetation along the southern and western margins of the site. Following vegetation clearance it is recommended that additional trial pits are carried out in the location of the proposed retaining wall and on the western margin of the proposed car park to confirm the ground conditions. A trial pit is also recommended in the location of the former tank (see Figure 2) to establish if there is any associated contamination.

Tables

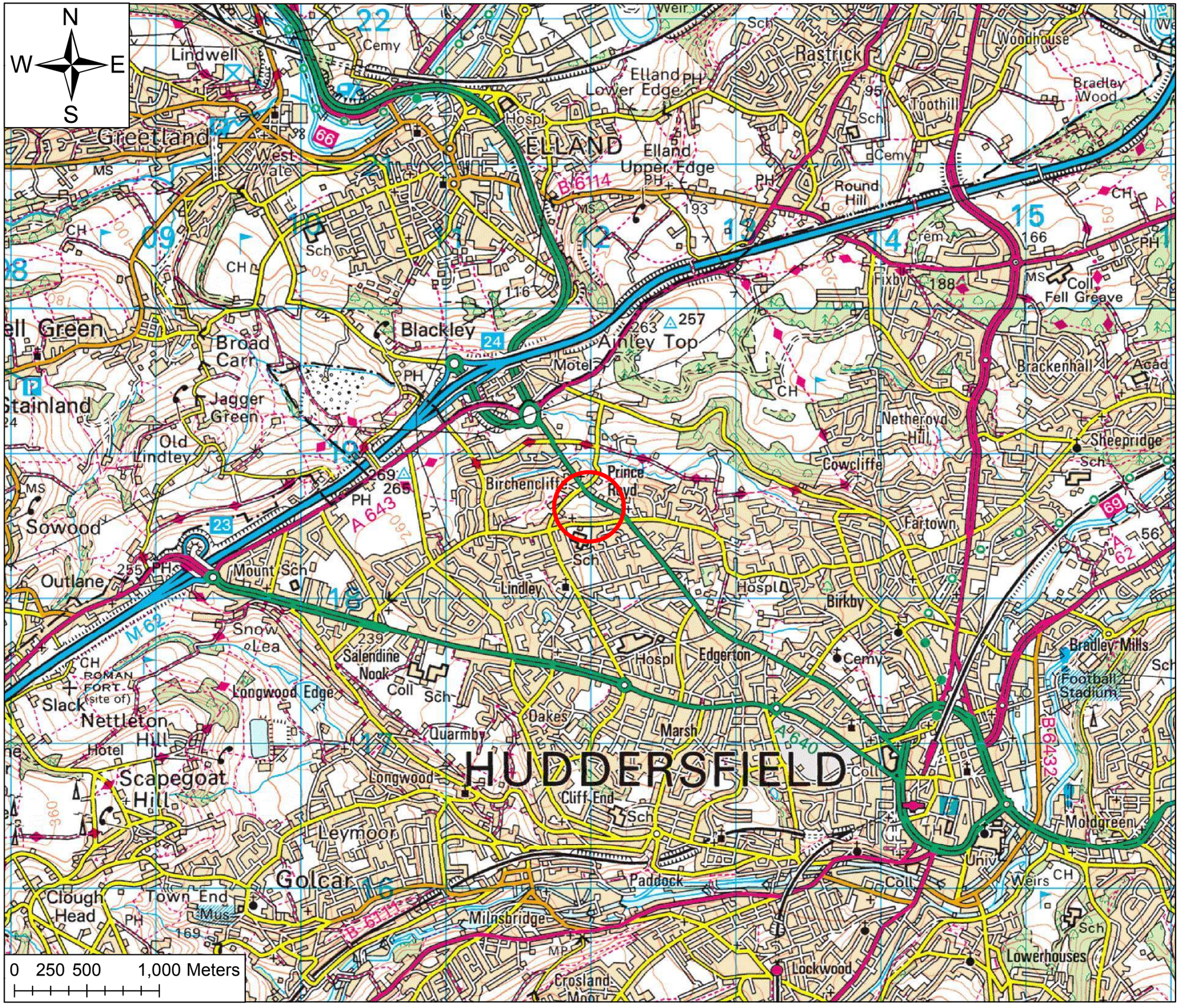
Figures

Appendices

TABLE 1 : CONTAMINATION TESTING SUMMARY

Analyte	No. of Samples	Maximum Concentration (mg/kg)	95th Percentile	No. of samples >GAC	GAC (mg/kg)	GAC Source	
Arsenic	6	16	15.0	0	79	CLEA	Inorganics
Boron	6	0.5	0.5	0	21000	CLEA	
Cadmium	6	0.3	0.3	0	120	CLEA	
Chromium	6	150	122.0	0	1500	LQM	
Chromium VI	6	0.1	0.1	0	7.7	LQM	
Copper	6	920	702.8	0	12000	LQM	
Lead	6	110	94.5	0	630	CLEA	
Mercury	6	0.06	0.1	0	240	CLEA	
Nickel	6	30	29.3	0	230	CLEA	
Selenium	6	0.7	0.7	0	110	CLEA	
Vanadium	6	48	44.0	0	2000	LQM	
Zinc	6	1600	1217.3	0	81000	LQM	
Organic Matter (%)	6	8.4	n/a	n/a	n/a	n/a	Organics
Naphthalene	6	0.2	0.2	0	4900	LQM	
Acenaphthylene	6	0.0	< 0.1	0	15000	LQM	
Acenaphthene	6	0.2	0.2	0	15000	LQM	
Fluorene	6	0.2	0.2	0	9900	LQM	
Phenanthrene	6	1.0	0.9	0	3100	LQM	
Anthracene	6	0.2	0.2	0	74000	LQM	
Fluoranthene	6	1.6	1.5	0	3100	LQM	
Pyrene	6	1.5	1.4	0	7400	LQM	
Benzo(a)anthracene	6	0.8	0.7	0	29	LQM	
Chrysene	6	0.8	0.8	0	57	LQM	
Benzo(b)fluoranthene	6	0.6	0.6	0	7.1	LQM	
Benzo(k)fluoranthene	6	0.4	0.4	0	190	LQM	
Benzo(a)pyrene	6	0.9	0.9	0	5.7	LQM	
Indeno(1,2,3-cd)pyrene	6	0.7	0.7	0	82	LQM	
Dibenzo(a,h)anthracene	6	0.2	0.2	0	0.57	LQM	
Benzo(g,h,i)perylene	6	0.5	0.5	0	640	LQM	

GAC = Generic Assessment Criteria based on Public Open Space (POSresi) End Use. GAC from LQM based on Soil Organic Matter at 1%



Leeds CITY COUNCIL

CITY DEVELOPMENT GEOTECHNICAL SECTION

Prince Royd Car Park, A629 Halifax Road, Huddersfield

Site Location Plan

KEY:

= THE SITE

SCALE @ A3: 1:25,000

DATE: December 2019

SCHEME NO: 446368

FIGURE: 1

N
W E
S

Harry Brook & Son Ltd; plastering contractors

176.2m

100

Existing culvert beneath A629

A629 HALIFAX ROAD

Shire Link van hire

Bella Cars; used car dealership

Dense mature woodland

175.0m

MS

Depot

TP011 terminated in made ground at 1.50m bgl due to encountering suspected culvert

Pond

Former tank

TP012

Former ponds

TP011

TP010

Former buildings

103 101 99a 99 97 95 93

TP010 terminated in made ground at 1.50m bgl due to significant groundwater strike (leaking culvert?)

Former tramway

Former shaft and later chimney (Coal Authority ref: 412418-001)

Former chimney

Dense mature woodland

0 5 10 20 Meters

Leeds CITY COUNCIL

CITY DEVELOPMENT GEOTECHNICAL SECTION

Prince Royd Car Park, A629 Halifax Road, Huddersfield

Site Layout Plan

KEY:

- = Trial pits
- = Proposed car parking area
- = Proposed boundary and retaining walls
- = Former buildings associated with the Brick & Tile Works
- = Former reservoirs/ponds
- = Former watercourses and springs
- = Former tramway
- = Former shaft, later shown to be chimney

SCALE @ A3: 1:500

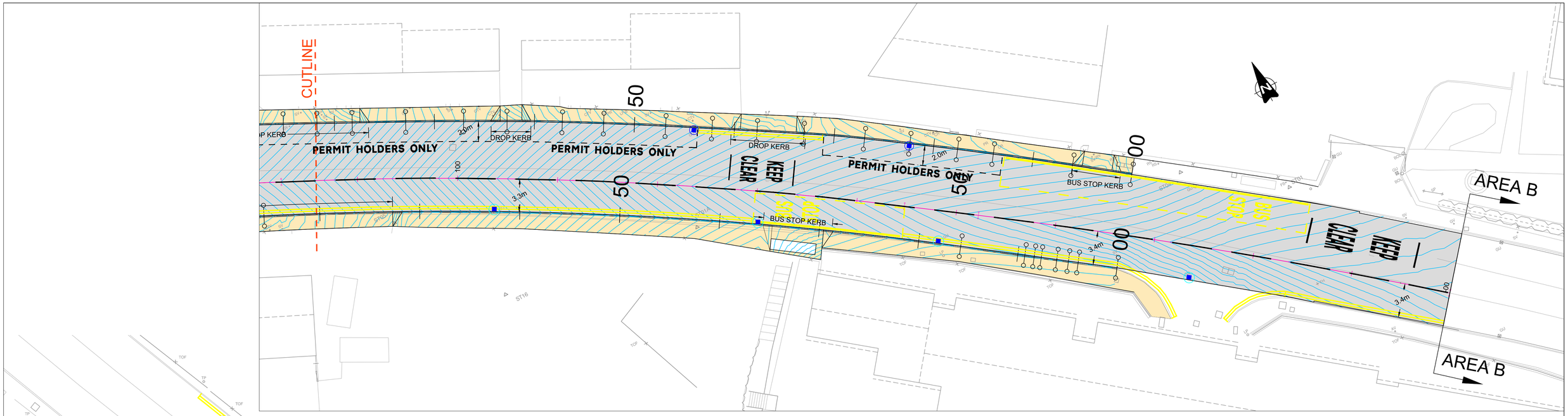
DATE: December 2019

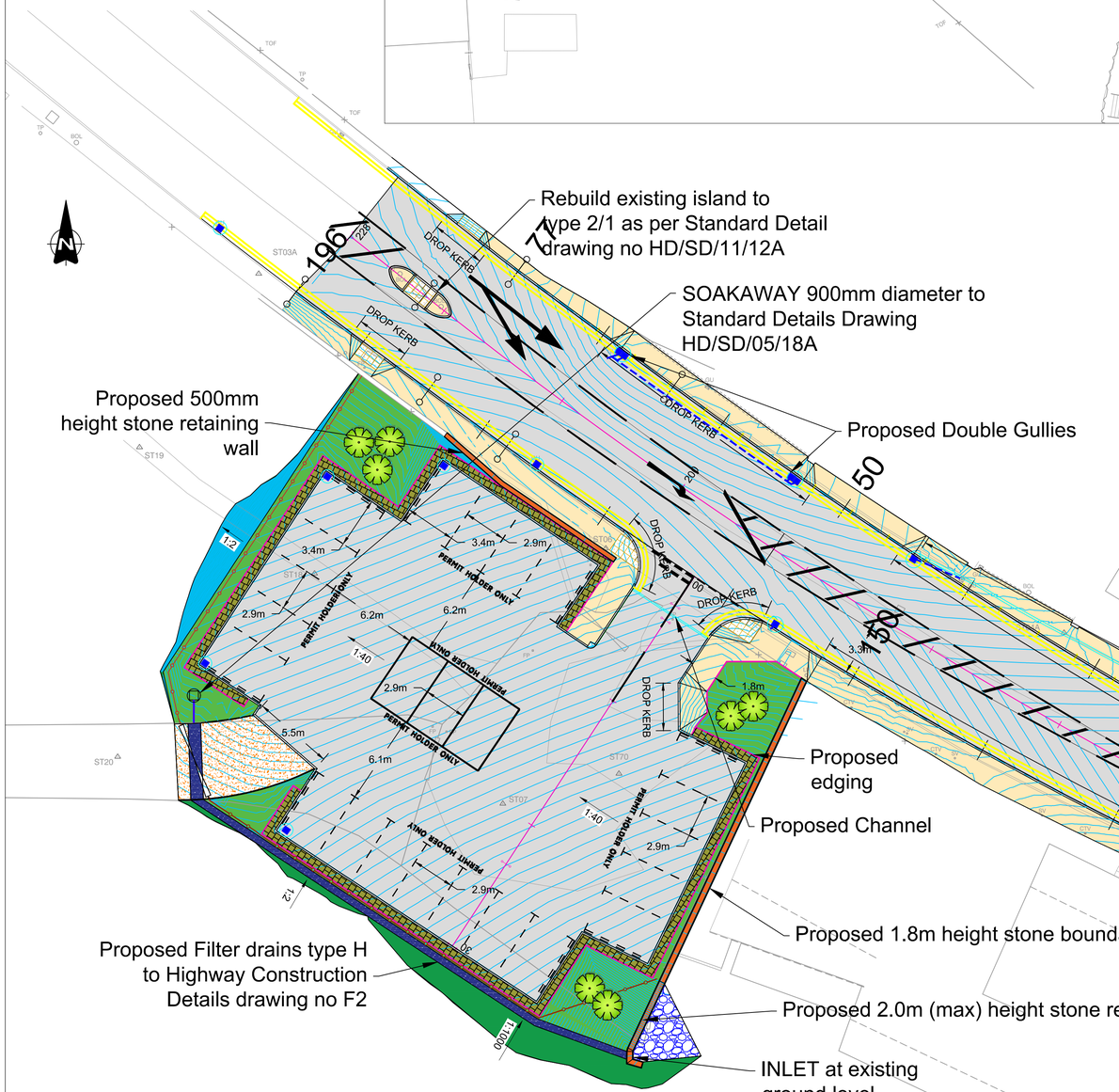
SCHEME NO: 446368

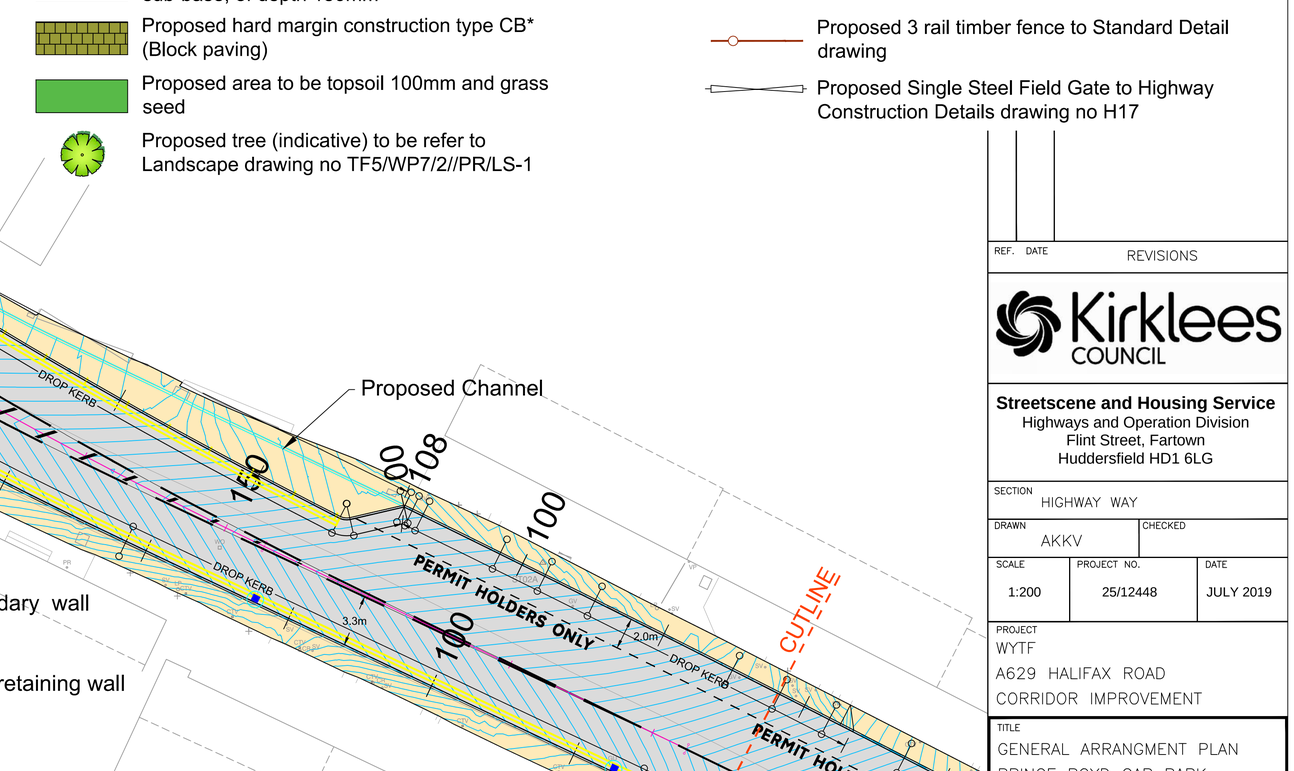
FIGURE: 2

APPENDIX 1

PROPOSED DEVELOPMENT







KEY

- Existing layout
- Proposed layout
- Proposed carriageway construction type CW* (to be refer to pavement drawing no TF5/WP7/2/PR/PV-1)
- Proposed footway construction type FS* (to be refer to pavement drawing no TF5/WP7/2/PR/PV-1)
- Proposed path construction, granular type 1 sub-base, of depth 150mm
- Proposed hard margin construction type CB* (Block paving)
- Proposed area to be topsoil 100mm and grass seed
- Proposed tree (indicative) to be refer to Landscape drawing no TF5/WP7/2//PR/LS-1
- Proposed stone boundary wall to be refer to Structure drawing no TF5/WP7/2/PR/SC-1
- Proposed precast concrete gully permitted design group 1 to Standard Details drawing no HD/SD/05/20A, existing pipe line and connection to be jet washed
- Proposed new gully frame and cover to proposed level
- Proposed 3 rail timber fence to Standard Detail drawing
- Proposed Single Steel Field Gate to Highway Construction Details drawing no H17

REF.	DATE	REVISIONS

Kirklees COUNCIL

Streetscene and Housing Service
Highways and Operation Division
Flint Street, Fartown
Huddersfield HD1 6LG

SECTION: HIGHWAY WAY		
DRAWN: AKKV	CHECKED:	
SCALE: 1:200	PROJECT NO.: 25/12448	DATE: JULY 2019

PROJECT
WYTF
A629 HALIFAX ROAD
CORRIDOR IMPROVEMENT

TITLE
GENERAL ARRANGMENT PLAN
PRINCE ROYD CAR PARK

DRAWING No. TF5/AREA C/ WP7/GA-1

CAD No.

APPENDIX 2

GROUND INVESTIGATION REPORT EXTRACTS

ALLIED EXPLORATION & GEOTECHNICS LIMITED

Head Office: Unit 25 Stella Gill Industrial Estate, Pelton Fell, Chester-le-Street, Co. Durham, DH2 2RG **Tel:** 0191 387 4700 **Fax:** 0191 387 4710
Regional Office: Unit 20 Business Development Centre, Eanam Wharf, Blackburn, BB1 5BL **Tel:** 01772 735 300 **Fax:** 01772 735 999

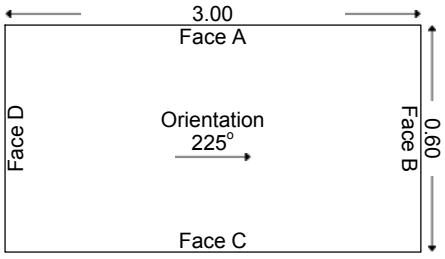
TRIAL PIT RECORD

Status:- **FINAL**

Project: A629 Halifax Road Car Park, Cavalry Arms Jct			**Exploratory Hole No.**
Client: Leeds City Council	**Location:** A629 Halifax Road, Huddersfield E:412016.974 N:418632.449		**TP010**
Method (Equipment): Machine Excavated (JCB 3CX)	**Ground Level (m):** 174.389	**Start Date:** 02/07/2019	**Sheet:** 1 of 3

SAMPLES & TESTS			Water	STRATA			
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thickness)	Description
0.20	ES1			174.09		0.30	MADE GROUND (Grey brown sandy gravel with plaster, tile and cans. Gravel is fine to coarse angular to subangular and includes brick and concrete).
0.20	B2						
0.20	J3						
0.60	ES4						
0.60	B5					(1.20)	MADE GROUND (Yellow brown slightly sandy gravel with high cobble content. Gravel is coarse angular and includes mudstone and sandstone. Cobbles include sandstone).
			▼1				
1.30	EW7			172.89		1.50	
1.50	B6						*Terminated at 1.50m BGL - due to water ingress and instability.*

PLAN



GROUNDWATER
Water strike at 1.30m BGL - sheen noted (no odour).

STABILITY
Pit sides and base very unstable throughout excavation.

ADDITIONAL INFORMATION		
Sketch Diagram:	No Sketch Taken	
Photographs:	Yes	See additional sheets.

GENERAL REMARKS
N/A

All dimensions in metres Scale 1:50	For explanation of symbols and abbreviations see Key Sheets	Checked by: K.W.	Logged by: A. Rees	Contract No. **4208L(c)**

Print Date and Time: 09/10/2019 14:31:35

ALLIED EXPLORATION & GEOTECHNICS LIMITED

Head Office: Unit 25 Stella Gill Industrial Estate, Pelton Fell, Chester-le-Street, Co. Durham, DH2 2RG **Tel:** 0191 387 4700 **Fax:** 0191 387 4710
Regional Office: Unit 20 Business Development Centre, Eanam Wharf, Blackburn, BB1 5BL **Tel:** 01772 735 300 **Fax:** 01772 735 999

TRIAL PIT RECORD

Status:- FINAL

Project: A629 Halifax Road Car Park, Cavalry Arms Jct			**Exploratory Hole No.** TP010
Client: Leeds City Council	**Location:** A629 Halifax Road, Huddersfield E:412016.974 N:418632.449		
Method (Equipment): Machine Excavated (JCB 3CX)	**Ground Level (m):** 174.389	**Start Date:** 02/07/2019	**Sheet:** 2 of 3

Figure TP010.1
TP010

Figure TP010.2
TP010

ALLIED EXPLORATION & GEOTECHNICS LIMITED

Head Office: Unit 25 Stella Gill Industrial Estate, Pelton Fell, Chester-le-Street, Co. Durham, DH2 2RG **Tel:** 0191 387 4700 **Fax:** 0191 387 4710
Regional Office: Unit 20 Business Development Centre, Eanam Wharf, Blackburn, BB1 5BL **Tel:** 01772 735 300 **Fax:** 01772 735 999

TRIAL PIT RECORD

Status:- **FINAL**

Project: A629 Halifax Road Car Park, Cavalry Arms Jct			**Exploratory Hole No.** TP010
Client: Leeds City Council	**Location:** A629 Halifax Road, Huddersfield E:412016.974 N:418632.449		
Method (Equipment): Machine Excavated (JCB 3CX)	**Ground Level (m):** 174.389	**Start Date:** 02/07/2019	**Sheet:** 3 of 3

Figure TP010.3
TP010 Spoil

ALLIED EXPLORATION & GEOTECHNICS LIMITED

Head Office: Unit 25 Stella Gill Industrial Estate, Pelton Fell, Chester-le-Street, Co. Durham, DH2 2RG **Tel:** 0191 387 4700 **Fax:** 0191 387 4710
Regional Office: Unit 20 Business Development Centre, Eanam Wharf, Blackburn, BB1 5BL **Tel:** 01772 735 300 **Fax:** 01772 735 999

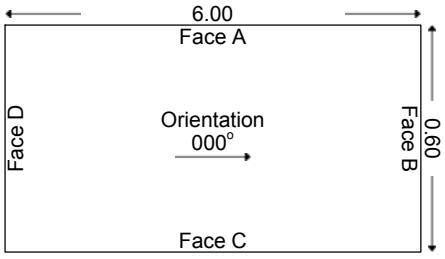
TRIAL PIT RECORD

Status:- **FINAL**

Project: A629 Halifax Road Car Park, Cavalry Arms Jct			**Exploratory Hole No.**
Client: Leeds City Council	**Location:** A629 Halifax Road, Huddersfield E:412011.590 N:418637.548		**TP011**
Method (Equipment): Machine Excavated (JCB 3CX)	**Ground Level (m):** 174.458	**Start Date:** 02/07/2019	**Sheet:** 1 of 3

SAMPLES & TESTS			Water	STRATA			
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thickness)	Description
0.30 0.30 0.30	ES1 B2 J3			173.56		(0.90) 0.90	MADE GROUND (Black brown sandy gravel. Gravel is fine to coarse angular to subangular and includes macadam and brick). at c.0.30m BGL ... terram geotextile. at c.0.50m BGL ... brick culvert (1.00m wide) 21.30m from kerb line.
1.00 1.00 1.00	ES4 B5 J6		▼1	172.96		(0.60) 1.50	MADE GROUND (Black red sandy gravel. Gravel is fine to coarse angular to subangular and includes brick and clinker).
							Terminated at 1.50m BGL - due to encountering brick culvert.

PLAN



GROUNDWATER
Water strike at 1.30m BGL.

STABILITY
Pit sides and base stable throughout excavation.

ADDITIONAL INFORMATION

Sketch Diagram:	Sketch Taken	
Photographs:	Yes	See additional sheets.

GENERAL REMARKS
(1) Refer to following sketch for further details.

All dimensions in metres Scale 1:50	For explanation of symbols and abbreviations see Key Sheets	Checked by: K.W.	Logged by: A. Rees	Contract No. **4208L(c)**

Print Date and Time: 09/10/2019 14:31:43

ALLIED EXPLORATION & GEOTECHNICS LIMITED

Head Office: Unit 25 Stella Gill Industrial Estate, Pelton Fell, Chester-le-Street, Co. Durham, DH2 2RG **Tel:** 0191 387 4700 **Fax:** 0191 387 4710
Regional Office: Unit 20 Business Development Centre, Eanam Wharf, Blackburn, BB1 5BL **Tel:** 01772 735 300 **Fax:** 01772 735 999

TRIAL PIT RECORD

Status:- **FINAL**

Project: A629 Halifax Road Car Park, Cavalry Arms Jct			**Exploratory Hole No.** TP011
Client: Leeds City Council	**Location:** A629 Halifax Road, Huddersfield E:412011.590 N:418637.548		
Method (Equipment): Machine Excavated (JCB 3CX)	**Ground Level (m):** 174.458	**Start Date:** 02/07/2019	**Sheet:** 2 of 3

Figure TP011.1
TP011

Figure TP011.2
TP011

ALLIED EXPLORATION & GEOTECHNICS LIMITED

Head Office: Unit 25 Stella Gill Industrial Estate, Pelton Fell, Chester-le-Street, Co. Durham, DH2 2RG **Tel:** 0191 387 4700 **Fax:** 0191 387 4710
Regional Office: Unit 20 Business Development Centre, Eanam Wharf, Blackburn, BB1 5BL **Tel:** 01772 735 300 **Fax:** 01772 735 999

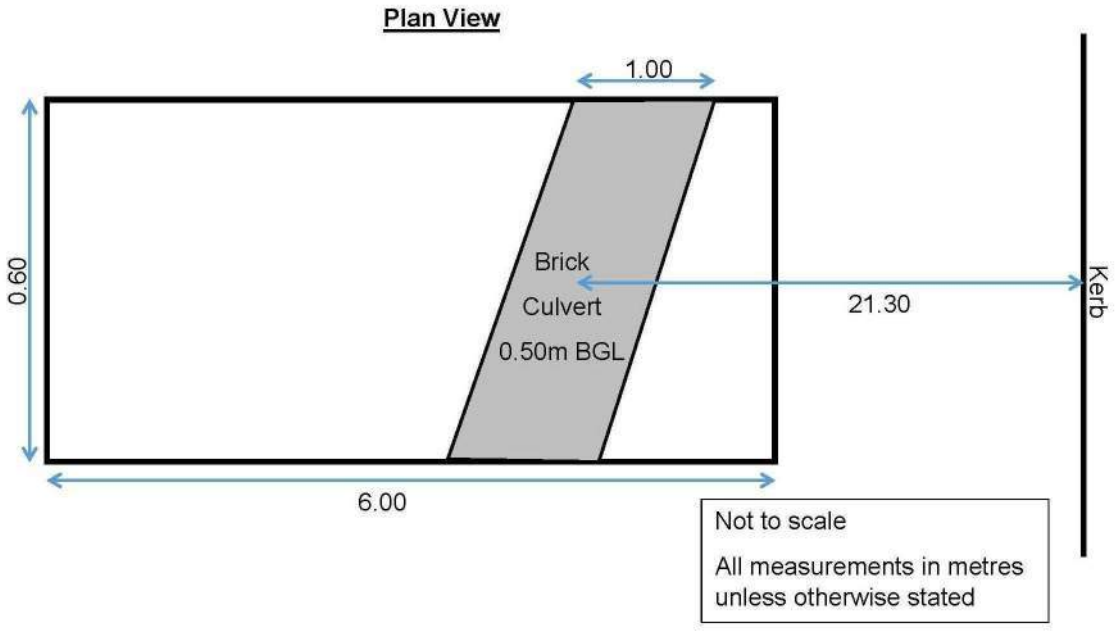
TRIAL PIT RECORD

Status:- FINAL

Project: A629 Halifax Road Car Park, Cavalry Arms Jct			**Exploratory Hole No.** TP011
Client: Leeds City Council	**Location:** A629 Halifax Road, Huddersfield E:412011.590 N:418637.548		
Method (Equipment): Machine Excavated (JCB 3CX)	**Ground Level (m):** 174.458	**Start Date:** 02/07/2019	**Sheet:** 3 of 3

Figure TP011.3
TP011 Spoil

Figure TP011.4
TP011 Sketch



ALLIED EXPLORATION & GEOTECHNICS LIMITED

Head Office: Unit 25 Stella Gill Industrial Estate, Pelton Fell, Chester-le-Street, Co. Durham, DH2 2RG **Tel:** 0191 387 4700 **Fax:** 0191 387 4710
Regional Office: Unit 20 Business Development Centre, Eanam Wharf, Blackburn, BB1 5BL **Tel:** 01772 735 300 **Fax:** 01772 735 999

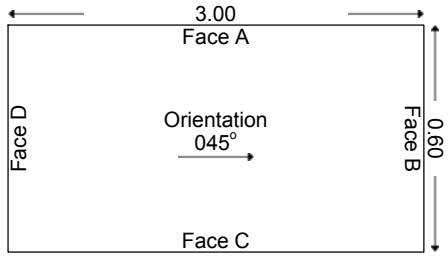
TRIAL PIT RECORD

Status:- **FINAL**

Project: A629 Halifax Road Car Park, Cavalry Arms Jct			**Exploratory Hole No.** TP012
Client: Leeds City Council	**Location:** A629 Halifax Road, Huddersfield E:412023.936 N:418646.805		
Method (Equipment): Machine Excavated (JCB 3CX)	**Ground Level (m):** 174.668	**Start Date:** 02/07/2019	**Sheet:** 1 of 3

SAMPLES & TESTS			Water	STRATA			
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thickness)	Description
0.30 0.30 0.30	ES1 B2 J3			173.97		(0.70) 0.70	MADE GROUND (Grey brown sandy gravel. Gravel is fine to coarse angular to subangular and includes clinker, sandstone and brick).
0.90 0.90 0.90	ES4 B5 J6						Firm yellow brown slightly sandy gravelly CLAY. Gravel is fine to medium angular to subangular tabular and includes mudstone and sandstone. at c.0.90m BGL ... clayey sandy gravel with medium cobble content. Clay fines are of intermediate plasticity.
1.80 1.80	B7 J8			171.87		(2.10) 2.80	
2.80 2.80	B9 J10			171.37		(0.50) 3.30	Grey COBBLES with much clayey sandy gravel. Gravel is fine to coarse tabular and includes mudstone. Cobbles include mudstone. (Probable Bedrock).
							Complete at 3.30m BGL.

PLAN



GROUNDWATER
No groundwater inflow observed.

STABILITY
Pit sides and base stable throughout excavation.

ADDITIONAL INFORMATION

Sketch Diagram:	No Sketch Taken	
Photographs:	Yes	See additional sheets.

GENERAL REMARKS
N/A

All dimensions in metres Scale 1:50	For explanation of symbols and abbreviations see Key Sheets	Checked by: K.W.	Logged by: A. Rees	Contract No. **4208L(c)**

Print Date and Time: 09/10/2019 14:31:54

ALLIED EXPLORATION & GEOTECHNICS LIMITED

Head Office: Unit 25 Stella Gill Industrial Estate, Pelton Fell, Chester-le-Street, Co. Durham, DH2 2RG **Tel:** 0191 387 4700 **Fax:** 0191 387 4710
Regional Office: Unit 20 Business Development Centre, Eanam Wharf, Blackburn, BB1 5BL **Tel:** 01772 735 300 **Fax:** 01772 735 999

TRIAL PIT RECORD

Status:- **FINAL**

Project: A629 Halifax Road Car Park, Cavalry Arms Jct			**Exploratory Hole No.** TP012
Client: Leeds City Council	**Location:** A629 Halifax Road, Huddersfield E:412023.936 N:418646.805		
Method (Equipment): Machine Excavated (JCB 3CX)	**Ground Level (m):** 174.668	**Start Date:** 02/07/2019	**Sheet:** 2 of 3

Figure TP012.1
TP012

Figure TP012.2
TP012

ALLIED EXPLORATION & GEOTECHNICS LIMITED

Head Office: Unit 25 Stella Gill Industrial Estate, Pelton Fell, Chester-le-Street, Co. Durham, DH2 2RG **Tel:** 0191 387 4700 **Fax:** 0191 387 4710
Regional Office: Unit 20 Business Development Centre, Eanam Wharf, Blackburn, BB1 5BL **Tel:** 01772 735 300 **Fax:** 01772 735 999

TRIAL PIT RECORD

Status:- **FINAL**

Project: A629 Halifax Road Car Park, Cavalry Arms Jct			**Exploratory Hole No.** TP012
Client: Leeds City Council	**Location:** A629 Halifax Road, Huddersfield E:412023.936 N:418646.805		
Method (Equipment): Machine Excavated (JCB 3CX)	**Ground Level (m):** 174.668	**Start Date:** 02/07/2019	**Sheet:** 3 of 3

Figure TP012.3
TP012 Spoil

ALLIED EXPLORATION & GEOTECHNICS LIMITED

Head Office: Unit 25 Stella Gill Industrial Estate, Pelton Fell, Chester-le-Street, Co. Durham, DH2 2RG Tel: 0191 387 4700 Fax: 0191 387 4710
Regional Office: Unit 20 Business Development Centre, Eanam Wharf, Blackburn, BB1 5BL Tel: 01772 735 300 Fax: 01772 735 999

GROUNDWATER OBSERVATIONS MADE AT THE TIME OF SITE WORKS (WATER STRIKES)

Exploratory Hole No.	Date	Depth of Water (m)	Depth of Casing (m)	Depth Sealed (m)	Final Depth (m)	Total Time (mins)	Depth After 5 mins	Depth After 10 mins	Depth After 15 mins	Depth After 20 mins	Remarks
TP010	02/07/2019	1.30									
TP011	02/07/2019	1.30									

Contract Title :- A629 Halifax Road Car Park, Cavalry Arms Jct			Client :- Leeds City Council		AEG Contract No :- 4208L(c)
Date of Issue :- 09/10/2019	Page No. :- 1 of 1	Checked By :- LC	Approved By :- AW		Certificate No. :- GWOWS/4208L(c)/1

ALLIED EXPLORATION & GEOTECHNICS LIMITED

Head Office: Unit 25 Stella Gill Industrial Estate, Pelton Fell, Chester-le-Street, Co. Durham, DH2 2RG - Tel: 0191 3874700 Fax: 0191 3874710
Regional Office: Unit 20 Business Development Centre, Eanam Wharf, Blackburn, BB1 5BL – Tel: 01722 735 300 Fax: 01722 735 999

LABORATORY REPORT CERTIFICATE

UKAS TESTING
1367

Contract Title: A629 Halifax Road Car Park, Cavalry Arms Jct **AEG Reference:** 4208L(c)

Client Address: Leeds City Council
Civic Hall
Leeds
LA1 1UR

We certify that Laboratory testing was carried out on samples from the above contract in accordance with techniques outlined in BS 1377: 1990, BS EN ISO 17892:2014 or other appropriate standards as quoted. The samples were received from August 2019 and the following results, given on the attached enclosures, were obtained.

The tests carried out are indicated in the attached table showing the enclosure number and the total number of pages.

For and on behalf of Allied Exploration & Geotechnics Limited

- ☐ Nick Vater (Technical Director)
- ☐ Kevin Warriner (HSE & Quality Director)
- ☑ Michelle Selkirk (Laboratory Manager)

Signed MSelk Date: 13 September 2019

Tests marked not UKAS accredited in this certificate are not included in the UKAS accreditation schedule for our laboratory. Any opinions and interpretations expressed herein are outside the scope of the laboratory's UKAS accreditation.

Please note the material was derived from samples taken outside the control of the laboratory.

LABORATORY REPORT CERTIFICATE

ENCLOSURES

Enclosure Number	Description	UKAS Accredited	Reference	No. of Pages
0	Laboratory Report Certificate	N/A		3
1	Sample Description Sheets	N/A		1
2	Moisture Content	Yes	BS 1377 Part 2 1990 (BS EN ISO 17892-1:2014)	1
2	Plasticity Index and Moisture Content	Yes	BS 1377 Part 2 1990 (BS EN ISO 17892-1:2014)	1
3	Determination of Particle Density	Yes	BS 1377 Part 2 1990	1
4	Particle Size Distribution Sieving	Yes	BS 1377 Part 2 1990	2
4	Particle Size Distribution Sedimentation	No	BS 1377 Part 2 1990	1

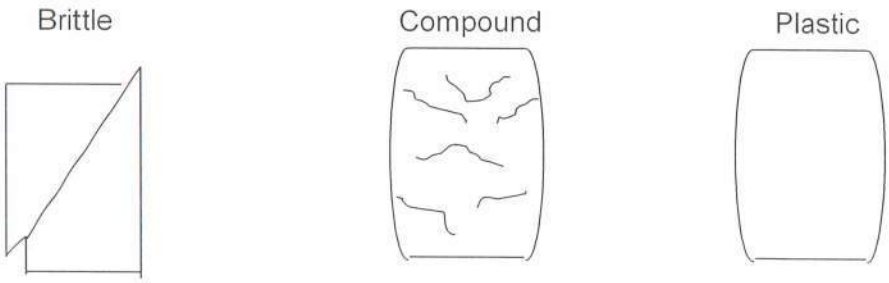
LABORATORY REPORT CERTIFICATE

ABBREVIATIONS

All the abbreviations used on the laboratory certificates are given below:

Br	Brittle	**PSD**	Particle Size Distribution by sieve analysis
C	Compound	**SB**	Shear Box
CBR	California Bearing Ratio	**SED**	Sedimentation Analysis
CDT	Consolidated Drained Triaxial	**SO4**	Sulphate (total, water extract, groundwater)
CL	Chloride content (water or soil)	**CP2**	Dry Density/Moisture Content 2.5kg rammer
US	Unsuitable sample for test	**CP4**	As above using 4.5kg rammer
UUT	Undrained Unconsolidated Triaxial	**CPV**	As above using vibrating hammer
HSV	Vane Test	**CUT**	Consolidated Undrained Triaxial
IS	Insufficient sample for test	**R**	Remoulded
LOI	Loss On Ignition	**U**	Undisturbed
M	Multi-stage testing	**MC**	Moisture Content
MCV	Moisture Content Value	**PL**	Point Load
NAT	Natural preparation method	**NMC**	Natural (or as received) moisture content
P	Plastic	**PFH**	Permeability Falling Head Method
OED	Oedometer	**PTXL**	Permeability in Triaxial Cell
OMC	Optimum Moisture Content	**ORG**	Organic content
B	Large disturbed (bulk) sample	**PD**	Particle Density (SG)
J	Small disturbed (jar) sample	**PI**	Liquid limit, plastic limit and plasticity index

Typical Mode of Failure for Triaxial Testing



ALLIED EXPLORATION & GEOTECHNICS LIMITED

Head Office: Unit 25 Stella Gill Industrial Estate, Pelton Fell, Chester-le-Street, Co. Durham, DH2 2RG - **Tel:** 0191 387 4700 **Fax:** 0191 387 4710
Regional Office: Unit 20, Business Development Centre, Eanam Wharf, Blackburn, BB1 5BL - **Tel:** 01772 735 300 **Fax:** 01772 735 999

LABORATORY SAMPLE DESCRIPTION SHEET

Exploratory Hole No.	Sample Depth (m)	ID	Description	Laboratory Tests/Remarks
TP012	0.90	B5	Brown clayey sandy gravel with a medium cobble content. (Clay of intermediate plasticity).	MC PI PSD SED PD US for CP2 and CBR
TP012	2.80	B9	Dark grey brown COBBLES with much clayey sandy GRAVEL of weathered mudstone.	MC PSD

Contract Title :- A629 Halifax Road Car Park, Cavalry Arms Jct	Client :- Leeds City Council

Signed :- MSelkirk	Name :- M. SELKIRK	Page 1 of 1	UKAS TESTING 1367
Date of issue :- 13/09/2019	Certificate No :- SD/4208L(c)/1	AEG Contract No. :- 4208L(c)	

ALLIED EXPLORATION & GEOTECHNICS LIMITED

Head Office: Unit 25 Stella Gill Industrial Estate, Pelton Fell, Chester-le-Street, Co. Durham, DH2 2RG - **Tel:** 0191 387 4700 **Fax:** 0191 387 4710
Regional Office: Unit 20, Business Development Centre, Eanam Wharf, Blackburn, BB1 5BL - **Tel:** 01772 735 300 **Fax:** 01772 735 999

MOISTURE CONTENT CERTIFICATE

BS 1377 : Part 2 : Clause 3.2

Exploratory Hole No.	Sample Depth (m)	Sample ID	Specific Depth (m)	Moisture Content (%)	Date Tested	Remarks
TP012	2.80	B9	2.80	4.5	03/09/2019	

For description of sample please refer to the Laboratory Sample Description Sheet

Contract Title :-	Client :-
A629 Halifax Road Car Park, Cavalry Arms Jct	Leeds City Council

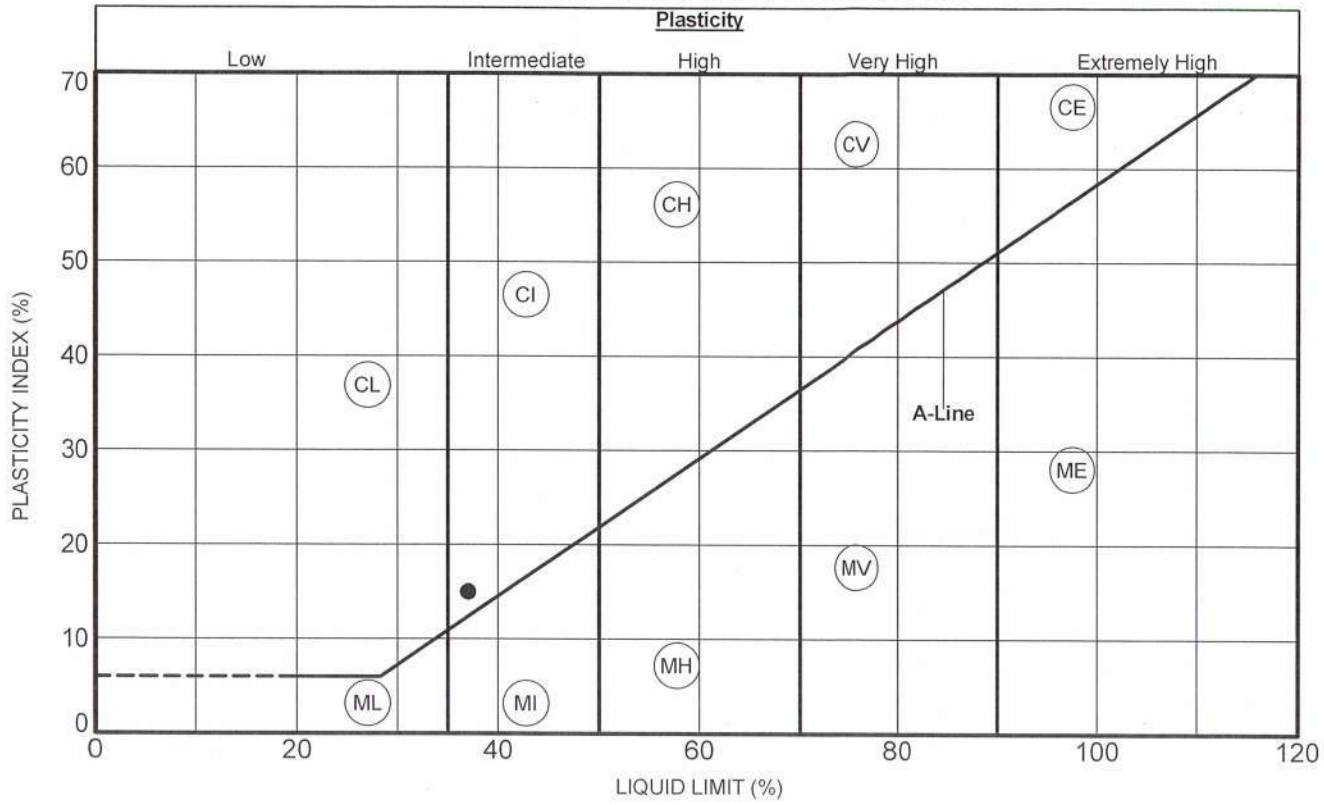
Signed :-	Name :- M. SELKIRK	Page 1 of 1	UKAS TESTING 1367
Date of issue :- 12/09/2019	Certificate No :- MC/4208L(c)/1	AEG Contract No. :- 4208L(c)	

ALLIED EXPLORATION & GEOTECHNICS LIMITED

Head Office: Unit 25 Stella Gill Industrial Estate, Pelton Fell, Chester-le-Street, Co. Durham, DH2 2RG - **Tel:** 0191 387 4700 **Fax:** 0191 387 4710
Regional Office: Unit 20, Business Development Centre, Eanam Wharf, Blackburn, BB1 5BL - **Tel:** 01772 735 300 **Fax:** 01772 735 999

ATTERBERG LIMITS & NATURAL MOISTURE CONTENT

Test Method :- BS 1377 : Part 2 : Clause 3.2, 4.1 to 4.4 & 5 : 1990



Exploratory Hole No.	Depth (m)	Sample Type/Ref.	Specific Depth (m)	LL	PL	PI	I_c	Preparation Method	<0.425mm (%)	m/c (%)	Date Tested	
● TP012	0.90	B5	0.90	37	22	15	-0.19	Air Dried	24.0	19.1	03/09/2019	#

For description of sample please refer to the Laboratory Sample Description Sheet. # = Insufficient for 4 point PI
If sample is prepared in the natural state we are unable to determine % retained on the 0.425mm test sieve.

Contract Title :-	Client :-
A629 Halifax Road Car Park, Cavalry Arms Jct	Leeds City Council

Signed :-	Name :-	Page 1 of 1	
Date of issue :-	Certificate No :-	AEG Contract No. :-	
12/09/2019	PI/4208L(c)/1	4208L(c)	

M. SELKIRK

UKAS TESTING 1367

ALLIED EXPLORATION & GEOTECHNICS LIMITED

Head Office: Unit 25 Stella Gill Industrial Estate, Pelton Fell, Chester-le-Street, Co. Durham, DH2 2RG - **Tel:** 0191 387 4700 **Fax:** 0191 387 4710
Regional Office: Unit 20, Business Development Centre, Eanam Wharf, Blackburn, BB1 5BL - **Tel:** 01772 735 300 **Fax:** 01772 735 999

DETERMINATION OF PARTICLE DENSITY

BS1377 : Part 2 : Clause 8.2 : 1990

Exploratory Hole No.	Depth (m)	Sample Type & No.	Specific Depth (m)	Particle Density (Mg/m^3)	Date Tested
TP012	0.90	B5	0.90	2.63	11/09/2019

For description of sample please refer to the Laboratory Sample Description Sheet

Contract Title :-	Client :-
A629 Halifax Road Car Park, Cavalry Arms Jct	Leeds City Council

Signed :- MSelkirk	Name :- M. SELKIRK		Page 1 of 1
Date of issue :- 12/09/2019	Certificate No :- PD/4208L(c)/1	AEG Contract No. :- 4208L(c)	

UKAS TESTING 1367

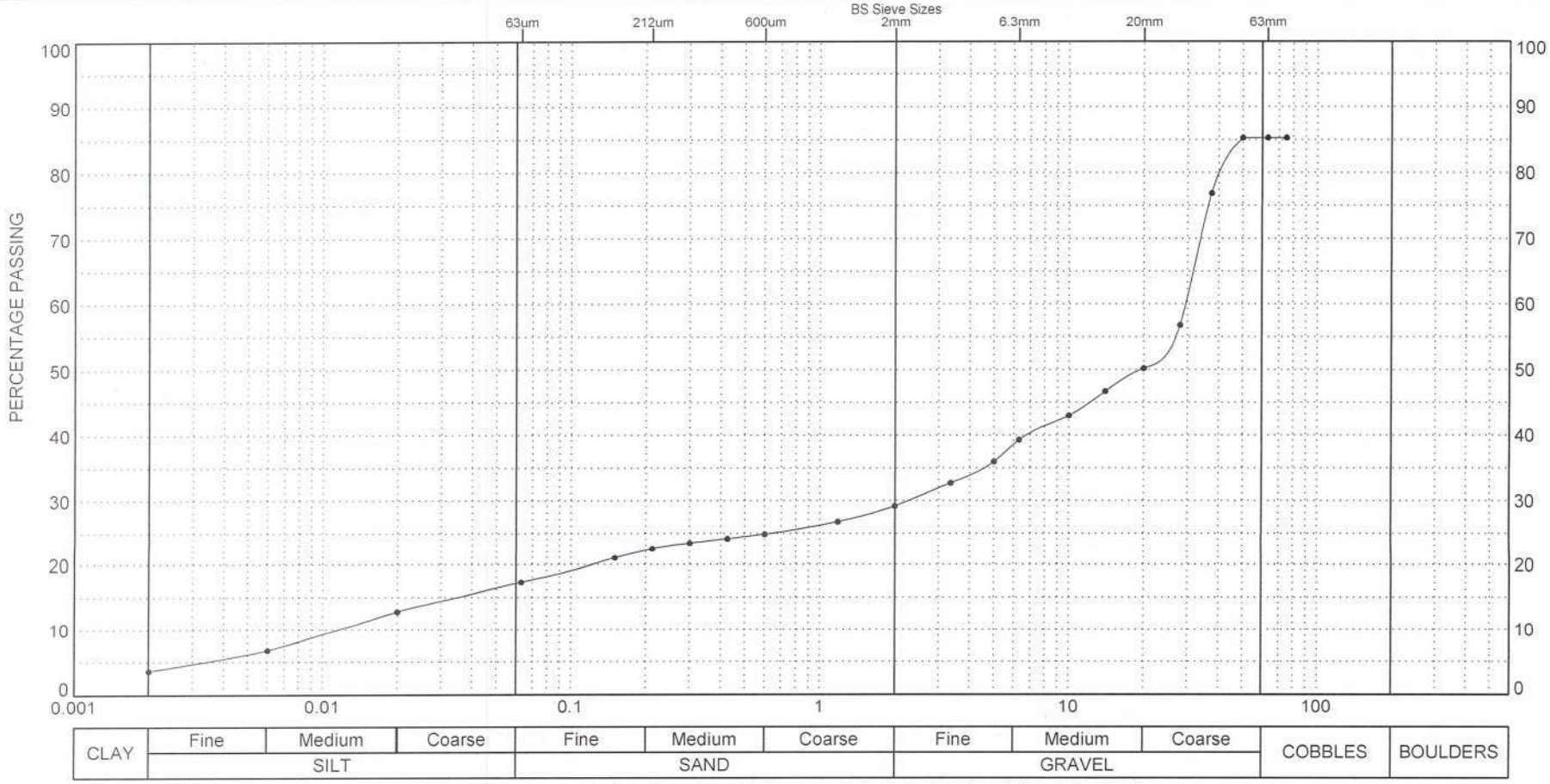
ALLIED EXPLORATION & GEOTECHNICS LIMITED

Head Office: Unit 25 Stella Gill Industrial Estate, Pelton Fell, Chester-le-Street, Co. Durham, DH2 2RG - **Tel:** 0191 387 4700 **Fax:** 0191 387 4710
Regional Office: Unit 20, Business Development Centre, Eanam Wharf, Blackburn, BB1 5BL - **Tel:** 01772 735 300 **Fax:** 01772 735 999

PARTICLE SIZE DISTRIBUTION

BS1377 : Part 2 : Clause 9.2 & 9.4 : 1990

Exploratory Hole No :- **TP012**	Depth (m) :- **0.90**	Sample Type & No :- **B5**	Specific Depth (m) :- **0.90**	Date Tested :- **03/09/2019**



Sieve Size (mm)	Passing (%)
75	85.3
63	85.3
50	85.3
37.5	76.9
28	56.8
20	50.2
14	46.7
10	43.0
6.3	39.3
5	36.0
3.35	32.7
2	29.2
1.18	26.8
0.6	24.9
0.425	24.2
0.3	23.5
0.212	22.6
0.15	21.0
0.063	17.2
0.02	12.7
0.006	6.9
0.002	3.7

For description of sample please refer to the Laboratory Sample Description Sheet

Date of issue :-	Certificate No :-	Signed :-	Name :-	Page 1 of 1
12/09/2019	PSD/4208L(c)/TP012/B5/0.90	MSene	M. SELKIRK	

Client :-	Contract Title :-	AEG Contract No :-
Leeds City Council	A629 Halifax Road Car Park, Cavalry Arms Jct	4208L(c)

UKAS TESTING 1367

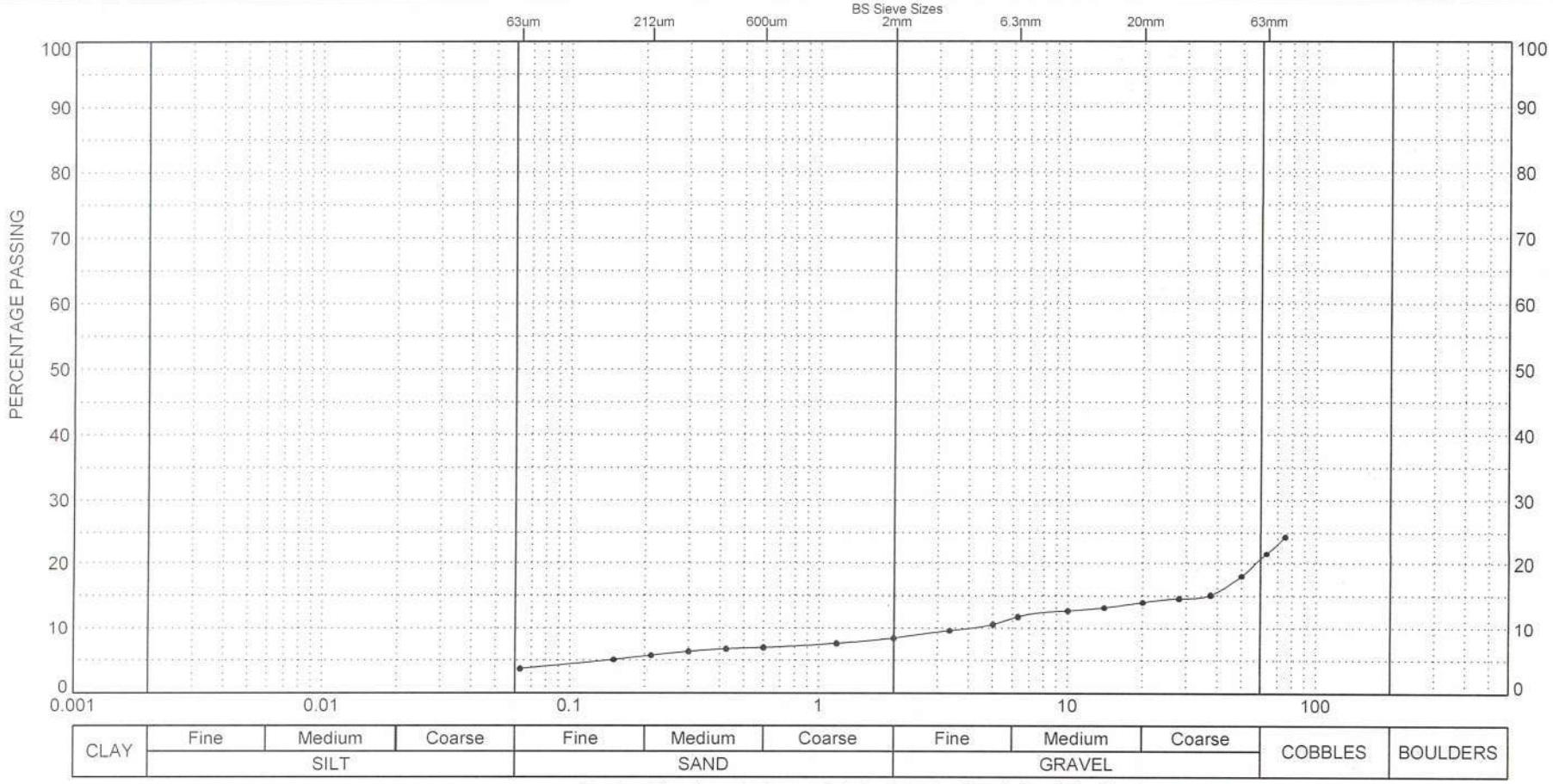
ALLIED EXPLORATION & GEOTECHNICS LIMITED

Head Office: Unit 25 Stella Gill Industrial Estate, Pelton Fell, Chester-le-Street, Co. Durham, DH2 2RG - **Tel:** 0191 387 4700 **Fax:** 0191 387 4710
Regional Office: Unit 20, Business Development Centre, Eanam Wharf, Blackburn, BB1 5BL - **Tel:** 01772 735 300 **Fax:** 01772 735 999

PARTICLE SIZE DISTRIBUTION

BS1377 : Part 2 : Clause 9.2 & 9.4 : 1990
(Test deviated from standard due to insufficient sample mass)

Exploratory Hole No :- **TP012**	Depth (m) :- **2.80**	Sample Type & No :- **B9**	Specific Depth (m) :- **2.80**	Date Tested :- **03/09/2019**



Sieve Size (mm)	Passing (%)
75	24.4
63	21.6
50	18.1
37.5	15.1
28	14.6
20	14.0
14	13.1
10	12.6
6.3	11.7
5	10.6
3.35	9.6
2	8.4
1.18	7.6
0.6	7.0
0.425	6.8
0.3	6.4
0.212	5.8
0.15	5.1
0.063	3.7

For description of sample please refer to the Laboratory Sample Description Sheet

Date of issue :-	Certificate No :-	Signed :-	Name :-	Page 1 of 1
12/09/2019	PSD/4208L(c)/TP012/B9/2.80	MSelk	M. SELKIRK	

Client :-	Contract Title :-	AEG Contract No :-
Leeds City Council	A629 Halifax Road Car Park, Cavalry Arms Jct	4208L(c)

UKAS TESTING 1367

Certificate of Analysis

Certificate Number 19-12867

15-Jul-19

Client Allied Exploration & Geotechnics Limited
Unit 25
Stella Gill Industrial Estate
Pelton Fell
DH2 2RG

Our Reference 19-12867

Client Reference 4208L(c)

Order No CH1527

Contract Title A629 Halifax Road Car Park, Cavalry Arms Jct

Description 6 Soil samples, 4 Leachate samples, 1 Water sample.

Date Received 08-Jul-19

Date Started 08-Jul-19

Date Completed 15-Jul-19

Test Procedures Identified by prefix DETSn (details on request).

Notes Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By

Adam Fenwick
Contracts Manager

UKAS TESTING
2139

Summary of Chemical Analysis

Soil Samples

Our Ref 19-12867
Client Ref 4208L(c)
Contract Title A629 Halifax Road Car Park, Cavalry Arms Jct

			Lab No	1528286	1528287	1528289
			Sample ID	TP010	TP010	TP011
			Depth	0.20	0.60	0.30
			Other ID	1	4	1
			Sample Type	ES	ES	ES
			Sampling Date	02/07/19	02/07/19	02/07/19
			Sampling Time	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**			
Metals						
Arsenic	DETSC 2301#	0.2	mg/kg	4.9	4.6	8.3
Barium	DETSC 2301#	1.5	mg/kg	65	67	84
Boron, Water Soluble	DETSC 2311#	0.2	mg/kg	0.4	< 0.2	0.4
Cadmium	DETSC 2301#	0.1	mg/kg	0.3	0.3	0.3
Chromium	DETSC 2301#	0.15	mg/kg	18	14	150
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	20	920	29
Lead	DETSC 2301#	0.3	mg/kg	29	110	21
Mercury	DETSC 2325#	0.05	mg/kg	< 0.05	< 0.05	< 0.05
Nickel	DETSC 2301#	1	mg/kg	14	21	21
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5	< 0.5
Vanadium	DETSC 2301#	0.8	mg/kg	17	12	32
Zinc	DETSC 2301#	1	mg/kg	60	1600	56
Inorganics						
pH	DETSC 2008#			6.8	8.4	8.1
Cyanide, Total	DETSC 2130#	0.1	mg/kg	0.1	< 0.1	< 0.1
Organic matter	DETSC 2002#	0.1	%	1.6	0.3	1.2
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	20	< 10	38
Sulphide	DETSC 2024*	10	mg/kg	40	44	28
Sulphur (free)	DETSC 3049#	0.75	mg/kg	< 0.75	< 0.75	< 0.75
Petroleum Hydrocarbons						
EPH (C10-C25)	DETSC 3311	10	mg/kg	< 10	< 10	22
EPH (C25-C40)	DETSC 3311	10	mg/kg	< 10	< 10	59

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

Summary of Chemical Analysis

Soil Samples

Our Ref 19-12867
Client Ref 4208L(c)
Contract Title A629 Halifax Road Car Park, Cavalry Arms Jct

			Lab No	1528286	1528287	1528289
			Sample ID	TP010	TP010	TP011
			Depth	0.20	0.60	0.30
			Other ID	1	4	1
			Sample Type	ES	ES	ES
			Sampling Date	02/07/19	02/07/19	02/07/19
			Sampling Time	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**			
PAHs						
Naphthalene	DETSC 3301	0.1	mg/kg	0.1	< 0.1	0.1
Acenaphthylene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Acenaphthene	DETSC 3301	0.1	mg/kg	0.2	< 0.1	0.2
Fluorene	DETSC 3301	0.1	mg/kg	0.2	< 0.1	0.2
Phenanthrene	DETSC 3301	0.1	mg/kg	1.0	0.2	0.5
Anthracene	DETSC 3301	0.1	mg/kg	0.2	< 0.1	0.1
Fluoranthene	DETSC 3301	0.1	mg/kg	1.6	0.3	0.9
Pyrene	DETSC 3301	0.1	mg/kg	1.5	0.3	1.0
Benzo(a)anthracene	DETSC 3301	0.1	mg/kg	0.8	< 0.1	0.4
Chrysene	DETSC 3301	0.1	mg/kg	0.8	0.2	0.6
Benzo(b)fluoranthene	DETSC 3301	0.1	mg/kg	0.6	0.1	0.4
Benzo(k)fluoranthene	DETSC 3301	0.1	mg/kg	0.4	0.2	0.3
Benzo(a)pyrene	DETSC 3301	0.1	mg/kg	0.9	0.2	0.7
Indeno(1,2,3-c,d)pyrene	DETSC 3301	0.1	mg/kg	0.7	< 0.1	0.5
Dibenzo(a,h)anthracene	DETSC 3301	0.1	mg/kg	0.2	< 0.1	0.1
Benzo(g,h,i)perylene	DETSC 3301	0.1	mg/kg	0.5	< 0.1	0.4
Coronene	DETSC 3301*	0.1	mg/kg	< 0.1	< 0.1	< 0.1
PAH Total	DETSC 3301	1.6	mg/kg	9.8	< 1.6	6.4
Phenols						
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	< 0.3	< 0.3

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

Summary of Chemical Analysis

Soil Samples

Our Ref 19-12867
Client Ref 4208L(c)
Contract Title A629 Halifax Road Car Park, Cavalry Arms Jct

			Lab No	1528290	1528291	1528292
			Sample ID	TP011	TP012	TP012
			Depth	1.00	0.30	0.90
			Other ID	4	1	4
			Sample Type	ES	ES	ES
			Sampling Date	02/07/19	02/07/19	02/07/19
			Sampling Time	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**			
Metals						
Arsenic	DETSC 2301#	0.2	mg/kg	12	16	5.9
Barium	DETSC 2301#	1.5	mg/kg	98	120	62
Boron, Water Soluble	DETSC 2311#	0.2	mg/kg	< 0.2	0.3	0.5
Cadmium	DETSC 2301#	0.1	mg/kg	0.1	< 0.1	< 0.1
Chromium	DETSC 2301#	0.15	mg/kg	38	18	32
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	40	51	26
Lead	DETSC 2301#	0.3	mg/kg	19	48	22
Mercury	DETSC 2325#	0.05	mg/kg	< 0.05	0.06	< 0.05
Nickel	DETSC 2301#	1	mg/kg	22	27	30
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	0.7	< 0.5
Vanadium	DETSC 2301#	0.8	mg/kg	29	48	32
Zinc	DETSC 2301#	1	mg/kg	55	40	69
Inorganics						
pH	DETSC 2008#			8.4	8.2	6.4
Cyanide, Total	DETSC 2130#	0.1	mg/kg	< 0.1	< 0.1	0.2
Organic matter	DETSC 2002#	0.1	%	1.9	5.0	1.3
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	27	26	37
Sulphide	DETSC 2024*	10	mg/kg	20	16	24
Sulphur (free)	DETSC 3049#	0.75	mg/kg	< 0.75	< 0.75	< 0.75
Petroleum Hydrocarbons						
EPH (C10-C25)	DETSC 3311	10	mg/kg	< 10	< 10	< 10
EPH (C25-C40)	DETSC 3311	10	mg/kg	< 10	< 10	< 10

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

Summary of Chemical Analysis

Soil Samples

Our Ref 19-12867
Client Ref 4208L(c)
Contract Title A629 Halifax Road Car Park, Cavalry Arms Jct

			Lab No	1528290	1528291	1528292
			Sample ID	TP011	TP012	TP012
			Depth	1.00	0.30	0.90
			Other ID	4	1	4
			Sample Type	ES	ES	ES
			Sampling Date	02/07/19	02/07/19	02/07/19
			Sampling Time	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**			
PAHs						
Naphthalene	DETSC 3301	0.1	mg/kg	0.1	0.2	< 0.1
Acenaphthylene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Acenaphthene	DETSC 3301	0.1	mg/kg	0.1	0.1	< 0.1
Fluorene	DETSC 3301	0.1	mg/kg	< 0.1	0.1	< 0.1
Phenanthrene	DETSC 3301	0.1	mg/kg	0.2	0.3	< 0.1
Anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Fluoranthene	DETSC 3301	0.1	mg/kg	0.4	0.3	< 0.1
Pyrene	DETSC 3301	0.1	mg/kg	0.4	0.4	< 0.1
Benzo(a)anthracene	DETSC 3301	0.1	mg/kg	0.2	0.2	< 0.1
Chrysene	DETSC 3301	0.1	mg/kg	0.3	0.3	< 0.1
Benzo(b)fluoranthene	DETSC 3301	0.1	mg/kg	0.3	0.2	< 0.1
Benzo(k)fluoranthene	DETSC 3301	0.1	mg/kg	0.3	0.1	< 0.1
Benzo(a)pyrene	DETSC 3301	0.1	mg/kg	0.4	0.2	< 0.1
Indeno(1,2,3-c,d)pyrene	DETSC 3301	0.1	mg/kg	< 0.1	0.3	< 0.1
Dibenzo(a,h)anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Benzo(g,h,i)perylene	DETSC 3301	0.1	mg/kg	< 0.1	0.2	< 0.1
Coronene	DETSC 3301*	0.1	mg/kg	< 0.1	< 0.1	< 0.1
PAH Total	DETSC 3301	1.6	mg/kg	2.9	3.1	< 1.6
Phenols						
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	< 0.3	< 0.3

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

Summary of Chemical Analysis

Water Samples

Our Ref 19-12867
Client Ref 4208L(c)
Contract Title A629 Halifax Road Car Park, Cavalry Arms Jct

Lab No	1528288
Sample ID	TP010
Depth	1.30
Other ID	7
Sample Type	EW
Sampling Date	02/07/19
Sampling Time	n/s

Test	Method	LOD	Units	
Metals				
Aluminium, Dissolved	DETSC 2306	10	ug/l	32
Antimony, Dissolved	DETSC 2306	0.17	ug/l	0.94
Arsenic, Dissolved	DETSC 2306	0.16	ug/l	12
Barium, Dissolved	DETSC 2306	0.26	ug/l	40
Boron, Dissolved	DETSC 2306*	12	ug/l	290
Cadmium, Dissolved	DETSC 2306	0.03	ug/l	0.37
Chromium, Dissolved	DETSC 2306	0.25	ug/l	0.78
Copper, Dissolved	DETSC 2306	0.4	ug/l	9.2
Iron, Dissolved	DETSC 2306	5.5	ug/l	67
Lead, Dissolved	DETSC 2306	0.09	ug/l	2.7
Manganese, Dissolved	DETSC 2306	0.22	ug/l	87
Mercury, Dissolved	DETSC 2306	0.01	ug/l	< 0.01
Nickel, Dissolved	DETSC 2306	0.5	ug/l	6.9
Selenium, Dissolved	DETSC 2306	0.25	ug/l	0.63
Silver, Dissolved	DETSC 2306*	0.13	ug/l	< 0.13
Vanadium, Dissolved	DETSC 2306	0.6	ug/l	6.7
Zinc, Dissolved	DETSC 2306	1.3	ug/l	2.8
Inorganics				
pH	DETSC 2008			9.0
Cyanide, Total	DETSC 2130	40	ug/l	41
Ammoniacal Nitrogen as N	DETSC 2207	0.015	mg/l	1.4
Chloride	DETSC 2055	0.1	mg/l	34
Sulphate as SO4	DETSC 2055	0.1	mg/l	24
Sulphide	DETSC 2208	0.01	mg/l	0.03

Key: * -not accredited. n/s -not supplied.

Summary of Chemical Analysis

Water Samples

Our Ref 19-12867
Client Ref 4208L(c)
Contract Title A629 Halifax Road Car Park, Cavalry Arms Jct

Lab No	1528288
Sample ID	TP010
Depth	1.30
Other ID	7
Sample Type	EW
Sampling Date	02/07/19
Sampling Time	n/s

Test	Method	LOD	Units	
Petroleum Hydrocarbons				
EPH (C10-C35)	DETSC 3311	10	ug/l	< 100.0
EPH (C35-C40)	DETSC 3311	10	ug/l	< 100.0
PAHs				
Naphthalene	DETSC 3304	0.05	ug/l	0.12
Acenaphthylene	DETSC 3304	0.01	ug/l	< 0.01
Acenaphthene	DETSC 3304	0.01	ug/l	0.07
Fluorene	DETSC 3304	0.01	ug/l	0.04
Phenanthrene	DETSC 3304	0.01	ug/l	0.05
Anthracene	DETSC 3304	0.01	ug/l	0.02
Fluoranthene	DETSC 3304	0.01	ug/l	0.04
Pyrene	DETSC 3304	0.01	ug/l	0.03
Benzo(a)anthracene	DETSC 3304	0.01	ug/l	0.01
Chrysene	DETSC 3304	0.01	ug/l	0.02
Benzo(b)fluoranthene	DETSC 3304	0.01	ug/l	0.03
Benzo(k)fluoranthene	DETSC 3304	0.01	ug/l	< 0.01
Benzo(a)pyrene	DETSC 3304	0.01	ug/l	0.02
Indeno(1,2,3-c,d)pyrene	DETSC 3304	0.01	ug/l	0.02
Dibenzo(a,h)anthracene	DETSC 3304	0.01	ug/l	< 0.01
Benzo(g,h,i)perylene	DETSC 3304	0.01	ug/l	0.02
Coronene	DETSC 3304*	0.01	ug/l	< 0.01
PAH Total	DETSC 3304	0.2	ug/l	0.50

Key: * -not accredited. n/s -not supplied.

WASTE ACCEPTANCE CRITERIA TESTING
ANALYTICAL REPORT

Our Ref 19-12867
Client Ref 4208L(c)
Contract Title A629 Halifax Road Car Park, Cavalry Arms Jct
Sample Id TP010 4 0.60
Sample Numbers 1528287 1528295 1528296
Date Analysed 15/07/2019

Test Results On Waste

Determinand and Method Reference	Units	Result	WAC Limit Values: Inert Waste	SNRHW	Hazardous Waste
DETSC 2084* Total Organic Carbon	%	0.2	3	5	6
DETSC 2003# Loss On Ignition	%	1.4	n/a	n/a	10
DETSC 3321# BTEX	mg/kg	< 0.04	6	n/a	n/a
DETSC 3401# PCBs (7 congeners)	mg/kg	< 0.01	1	n/a	n/a
DETSC 3311# TPH (C10 - C40)	mg/kg	< 10	500	n/a	n/a
DETSC 3301 PAHs	mg/kg	< 1.6	100	n/a	n/a
DETSC 2008# pH	pH Units	8.4	n/a	>6	n/a
DETSC 2073* Acid Neutralisation Capacity (pH4)	mol/kg	< 1	n/a	TBE	TBE
DETSC 2073* Acid Neutralisation Capacity (pH7)	mol/kg	< 1	n/a	TBE	TBE

Test Results On Leachate

Determinand and Method Reference	Conc in Eluate ug/l		Amount Leached* mg/kg		WAC Limit Values (Limit values for LS10 Leachate): Inert Waste	SNRHW	Hazardous Waste
	2:1	8:1	LS2	LS10			
DETSC 2306 Arsenic as As	1.1	0.89	0.002	< 0.01	0.5	2	25
DETSC 2306 Barium as Ba	11	6.1	0.02	< 0.1	20	100	300
DETSC 2306 Cadmium as Cd	< 0.03	< 0.03	< 0.004	< 0.02	0.04	1	5
DETSC 2306 Chromium as Cr	0.8	< 0.25	< 0.02	< 0.1	0.5	10	70
DETSC 2306 Copper as Cu	15	4.9	0.03	0.066	2	50	100
DETSC 2306 Mercury as Hg	< 0.01	< 0.01	< 0.0004	< 0.002	0.01	0.2	2
DETSC 2306 Molybdenum as Mo	2	< 1.1	< 0.02	< 0.1	0.5	10	30
DETSC 2306 Nickel as Ni	< 0.5	< 0.5	< 0.02	< 0.1	0.4	10	40
DETSC 2306 Lead as Pb	2.1	0.72	< 0.01	< 0.05	0.5	10	50
DETSC 2306 Antimony as Sb	0.29	< 0.17	< 0.01	< 0.05	0.06	0.7	5
DETSC 2306 Selenium as Se	0.33	< 0.25	< 0.006	< 0.03	0.1	0.5	7
DETSC 2306 Zinc as Zn	5.1	2.9	0.01	0.033	4	50	200
DETSC 2055 Chloride as Cl	800	370	< 20	< 100	800	15,000	25,000
DETSC 2055* Fluoride as F	260	120	0.52	1.44	10	150	500
DETSC 2055 Sulphate as SO4	1700	830	< 20	< 100	1000	20,000	50,000
DETSC 2009* Total Dissolved Solids	53000	31000	106	348.1	4000	60,000	100,000
DETSC 2130 Phenol Index	< 100	< 100	< 0.2	< 1	1	n/a	n/a
* Dissolved Organic Carbon	4300	< 2000	< 10	< 50	500	800	1000

TBE - To Be Evaluated
SNRHW - Stable Non-Reactive Hazardous Waste

Additional Information

DETSC 2008 pH	8.4	7.9
DETSC 2009 Conductivity uS/cm	75.7	44.2
* Temperature*	21	21

Mass of Sample Kg*	0.130
Mass of dry Sample Kg*	0.118

Stage 1

Volume of Leachant L2*	0.225
Volume of Eluate VE1*	0.205

Stage 2

Volume of Leachant L8*	0.948
Volume of Eluate VE2*	0.898

Disclaimer: *The WAC limit values are provided for guidance only. DETS does not accept responsibility for errors or omissions. Values are correct at time of issue.*
** DETS are accredited for the testing of leachates and not the leachate preparation stage which is unaccredited.*

WASTE ACCEPTANCE CRITERIA TESTING
ANALYTICAL REPORT

Our Ref 19-12867
Client Ref 4208L(c)
Contract Title A629 Halifax Road Car Park, Cavalry Arms Jct
Sample Id TP012 1 0.30
Sample Numbers 1528291 1528297 1528298
Date Analysed 12/07/2019

Test Results On Waste

Determinand and Method Reference	Units	Result	WAC Limit Values: Inert Waste	SNRHW	Hazardous Waste
DETSC 2084* Total Organic Carbon	%	2.9	3	5	6
DETSC 2003# Loss On Ignition	%	7.6	n/a	n/a	10
DETSC 3321# BTEX	mg/kg	< 0.04	6	n/a	n/a
DETSC 3401# PCBs (7 congeners)	mg/kg	< 0.01	1	n/a	n/a
DETSC 3311# TPH (C10 - C40)	mg/kg	< 10	500	n/a	n/a
DETSC 3301 PAHs	mg/kg	3.1	100	n/a	n/a
DETSC 2008# pH	pH Units	8.2	n/a	>6	n/a
DETSC 2073* Acid Neutralisation Capacity (pH4)	mol/kg	< 1	n/a	TBE	TBE
DETSC 2073* Acid Neutralisation Capacity (pH7)	mol/kg	< 1	n/a	TBE	TBE

Test Results On Leachate

Determinand and Method Reference	Conc in Eluate ug/l		Amount Leached* mg/kg		WAC Limit Values (Limit values for LS10 Leachate): Inert Waste	SNRHW	Hazardous Waste
	2:1	8:1	LS2	LS10			
DETSC 2306 Arsenic as As	3.6	2.8	0.007	0.029	0.5	2	25
DETSC 2306 Barium as Ba	5.9	8.1	< 0.02	< 0.1	20	100	300
DETSC 2306 Cadmium as Cd	< 0.03	< 0.03	< 0.004	< 0.02	0.04	1	5
DETSC 2306 Chromium as Cr	0.67	1.6	< 0.02	< 0.1	0.5	10	70
DETSC 2306 Copper as Cu	1.6	1.5	< 0.004	< 0.02	2	50	100
DETSC 2306 Mercury as Hg	< 0.01	< 0.01	< 0.0004	< 0.002	0.01	0.2	2
DETSC 2306 Molybdenum as Mo	1.1	< 1.1	< 0.02	< 0.1	0.5	10	30
DETSC 2306 Nickel as Ni	< 0.5	0.7	< 0.02	< 0.1	0.4	10	40
DETSC 2306 Lead as Pb	0.26	1.5	< 0.01	< 0.05	0.5	10	50
DETSC 2306 Antimony as Sb	0.25	< 0.17	< 0.01	< 0.05	0.06	0.7	5
DETSC 2306 Selenium as Se	0.7	0.35	< 0.006	< 0.03	0.1	0.5	7
DETSC 2306 Zinc as Zn	2.3	3.8	0.005	0.035	4	50	200
DETSC 2055 Chloride as Cl	1000	510	< 20	< 100	800	15,000	25,000
DETSC 2055* Fluoride as F	660	300	1.32	3.63	10	150	500
DETSC 2055 Sulphate as SO4	4700	1700	< 20	< 100	1000	20,000	50,000
DETSC 2009* Total Dissolved Solids	79000	35000	158	427.3	4000	60,000	100,000
DETSC 2130 Phenol Index	< 100	< 100	< 0.2	< 1	1	n/a	n/a
* Dissolved Organic Carbon	4000	< 2000	< 10	< 50	500	800	1000

TBE - To Be Evaluated
SNRHW - Stable Non-Reactive Hazardous Waste

Additional Information

DETSC 2008 pH	8.2	7.8
DETSC 2009 Conductivity uS/cm	113	50.5
* Temperature*	21	21

Mass of Sample Kg*	0.140
Mass of dry Sample Kg*	0.121

Stage 1

Volume of Leachant L2*	0.224
Volume of Eluate VE1*	0.213

Stage 2

Volume of Leachant L8*	0.97
Volume of Eluate VE2*	0.92

Disclaimer: *The WAC limit values are provided for guidance only. DETS does not accept responsibility for errors or omissions. Values are correct at time of issue.*
** DETS are accredited for the testing of leachates and not the leachate preparation stage which is unaccredited.*

Summary of Asbestos Analysis

Soil Samples

Our Ref 19-12867
Client Ref 4208L(c)
Contract Title A629 Halifax Road Car Park, Cavalry Arms Jct

Lab No	Sample ID	Material Type	Result	Comment*	Analyst
1528286	TP010 1 0.20	SOIL	NAD	none	Colin Patrick
1528287	TP010 4 0.60	SOIL	NAD	none	Colin Patrick
1528289	TP011 1 0.30	SOIL	NAD	none	Colin Patrick
1528290	TP011 4 1.00	SOIL	NAD	none	Colin Patrick
1528291	TP012 1 0.30	SOIL	NAD	none	Colin Patrick
1528292	TP012 4 0.90	SOIL	NAD	none	Colin Patrick

Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETSC 1101 using polarised light microscopy in accordance with HSG248 and documented in-house methods. NAD = No Asbestos Detected. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'. Key: * - not included in laboratory scope of accreditation.

Information in Support of the Analytical Results

Our Ref 19-12867
Client Ref 4208L(c)
Contract A629 Halifax Road Car Park, Cavalry Arms Jct

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
1528286	TP010 0.20 SOIL	02/07/19	GJ 60ml x3, PT 1L x2		
1528287	TP010 0.60 SOIL	02/07/19	GJ 60ml x3, PT 1L x2		
1528288	TP010 1.30 WATER	02/07/19	GV x3	Kone (5 days), Kone (Sulphide) (5 days), pH/Cond/TDS (1 days), PAH MS (4 days), EPH (4 days)	
1528289	TP011 0.30 SOIL	02/07/19	GJ 60ml x3, PT 1L x2		
1528290	TP011 1.00 SOIL	02/07/19	GJ 60ml x3, PT 1L x2		
1528291	TP012 0.30 SOIL	02/07/19	GJ 60ml x3, PT 1L x2		
1528292	TP012 0.90 SOIL	02/07/19	GJ 60ml x3, PT 1L x2		
1528295	TP010 0.60 LEACHATE	02/07/19	GJ 60ml x3, PT 1L x2		
1528296	TP010 0.60 LEACHATE	02/07/19	GJ 60ml x3, PT 1L x2		
1528297	TP012 0.30 LEACHATE	02/07/19	GJ 60ml x3, PT 1L x2		
1528298	TP012 0.30 LEACHATE	02/07/19	GJ 60ml x3, PT 1L x2		

Key: G-Glass P-Plastic J-Jar T-Tub V-Vial

DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.

Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.

The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-

Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months