

GROUND INVESTIGATION REPORT

Proposed Residential Development
Robin Gardens, Waterloooville, Hampshire

Prepared for: Portsmouth City Council

Date: November 2022

Report No: PO-22-040/GIR



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Robin Gardens, Waterlooville, Hampshire

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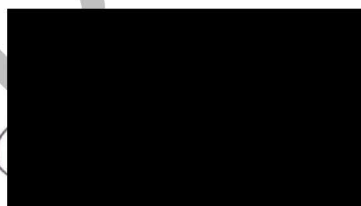
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EXECUTIVE SUMMARY

Proposals		Portsmouth City Council is proposing the construction of a new residential development within land at Robin Gardens, Waterlooville, Hampshire. The proposed development will consist of a 2-storey terraced building of four dwellings, car parking area and associated infrastructure.			
Geology		The Geological Map of the area shows the site to be underlain by the Lambeth Group, which the BGS describes as vertically and laterally variable sequences mainly of clay, some silty or sandy, with some sands and gravels, minor limestones and lignites and occasional sandstone and conglomerate. No Superficial Deposits are shown to overlie the bedrock geology of the area.			
Field Investigation		The site works were during August and September 2022 and comprised 1No. cable percussive boreholes, 6No. mini percussive boreholes, 2No. machine excavated trial pits, 1No. in-situ soakaway test and 2No. in-situ CBR DCP tests. The ground conditions can be summarised as below:			
		Stratum	From	To	Description
		Topsoil	0.00	0.05 / 0.30	Grass over brown silty fine to medium SAND with abundant roots and rootlets.
		Made Ground	0.05 / 0.30	0.50 / 0.80	- Brown to light brown gravelly, SAND with frequent roots. - Brown slightly gravelly, slightly sandy, clayey SILT. - Firm brown slightly gravelly, sandy CLAY.
		Lambeth Group	0.50 / 0.80	>11.35	- Firm to very stiff red/orangish brown mottled grey (slightly sandy, gravelly) CLAY. - Dense slightly clayey SAND
		Post investigation monitoring has confirmed groundwater levels between 5.25m and 5.35m bgl.			
Contamination Risk Assessment		The determinants tested were all present at concentrations below the relevant guidelines and therefore, there are no contaminants of concern. Therefore, it is considered that the human health risks are low and that no mitigation measures will be required for the development.			
Engineering Recommendations	Foundation and Floor Slab Solution	Due to the presence of desiccated soils a minimum foundation depth of >2.50m bgl is recommended by the NHBC. As such a bored piled foundation solution founding at least 3.00m within the Lambeth Group is recommended. Initial pile calculations show a 0.30 m diameter pile 5.00m deep will give an ultimate pile capacity of around 204kN, at 7.50m deep will return 392kN and at 10m deep will return 633kN. The estimated working loads, type and length of piles should be confirmed by the specialist piling contractor. Due to the plastic nature of the underlying deposits, floor slabs should be designed as suspended.			
	Storm Drainage	1No. in-situ soakaway test were undertaken at TP01 in general accordance with the requirements of BRE 365. The test did not sufficiently drain to 75% to give an infiltration rate. Therefore, it is unlikely soakaways will be viable at the site.			
	Highways	Based on a long-term equilibrium assessment, a conservative CBR value of 2% should be adopted for the site.			
	Buried Concrete	Using guidance within BRE Special Digest 1 (2005) it is recommended that any buried concrete within the site conforms to class DS-1 and ACEC Class AC-1s.			

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SECTION 1 Introduction and Proposed Development

Portsmouth City Council is proposing the construction of a new residential development within land at Robin Gardens, Waterlooville, Hampshire. The proposed development will consist of a 2-storey terraced building of four dwellings, car parking area and associated infrastructure.

Terra Firma have been commissioned as Geotechnical and Geo-Environmental Engineers to carry out a Ground Investigation of the site.

The main objectives of the geo-technical ground investigation were to:

- Determine the type, strength and bearing characteristics of the near surface soils and underlying bedrock geology.
- Provide recommendations for a suitable and economic foundation/floor slab solution for the development.
- Provide recommendations with regard to any other geo-technical aspects pertaining to the development such as soakaway design.

The main objectives of the geo-environmental assessment programme were to:

- Identify the potential environmental liabilities at the site associated with any soil and groundwater contamination from past site uses.
- Provide a summary of the environmental conditions at the site, together with any necessary remediation works to render the site fit for its intended use.
- Provide recommendations with regard to any other geo-environmental aspects pertaining to the development.

The Ground Investigation has been undertaken in accordance with the following advisory guidance:

- Code of Practice for Site Investigations - (BS 5930): 2015 + A1:2020
- Investigation of Potentially Contaminated Sites - CoP (BS 10175): 2011 + A2:2017
- Methods of test for soils for civil engineering purposes - In-situ tests (BS 1377-9):1999

In order to achieve the above objectives, Terra Firma carried out an assessment programme including a review of existing data, followed by a field investigation to determine the prevailing ground conditions and also to collect and analyse soil samples from selected locations around the site.

1.1 Limitations and Exceptions of Investigation

Portsmouth City Council has requested that a Ground Investigation Report (GIR) be performed in order to establish the ground conditions at the site and collect representative samples for laboratory analysis.

The Ground Investigation was conducted and this report has been prepared for the sole internal reliance of Portsmouth City Council and their design and construction team. This report shall not be relied upon or transferred to any other parties without the express written authorisation of Terra Firma. If an unauthorised third party comes into possession of this report they rely on it at their peril and the authors owe them no duty of care and skill.

The report represents the findings and opinions of experienced geo-environmental and geo-technical consultants. Terra Firma does not provide legal advice and the advice of lawyers may also be required.

The subsurface geological profiles, any contamination and other plots are generalised by necessity and have been based on the information found at the locations of the exploratory holes and depths sampled and tested.

The ground investigation was limited by the following site constraints:

- The presence of underground services and utilities,
- The presence of existing buildings, structures and/or hard standing,
- The presence of access restrictions to the required locations (Local residents opposed to the project protested on the day of investigation),
- The presence of underground obstructions, structures and/or unexpected ground conditions, and
- The presence of time restraints outside of our reasonable control.

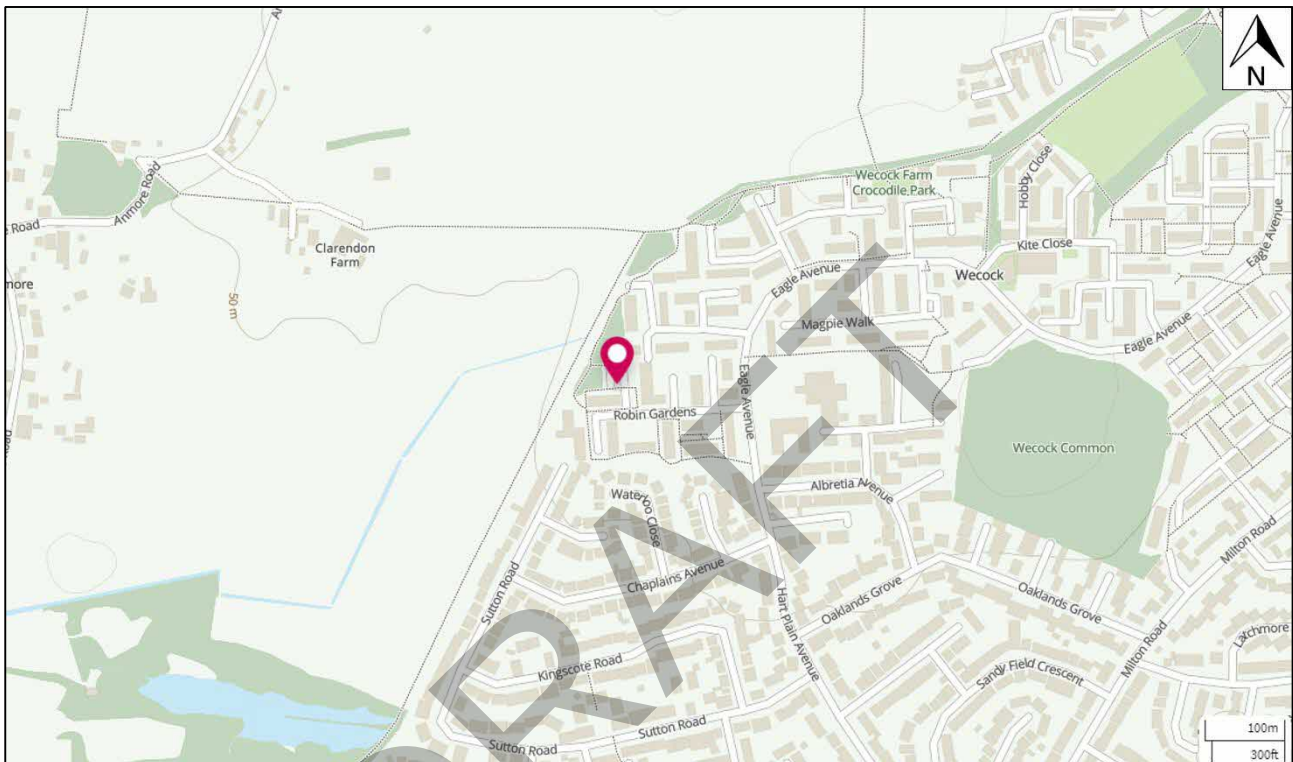
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SECTION 2 Site Setting

2.1 Physical Setting

The proposed development is to be located on land within Robin Gardens, Waterlooville, Hampshire, PO8 9XN.

The site is centred approximately on National Grid Reference (NGR) 467708, 111601. The site location is presented in Drawing 2.1 below.



Drawing 2.1: Site Location Plan

The site is irregular in shape with a plan area of approximately 0.156 hectares and sits at approximately 51m above ordnance datum (aod).

The topography of the site is typically flat. The topography of the surrounding area typically slopes towards the West.

The site boundaries comprise the following:

- North – The northern boundary comprises private gardens and residential buildings, with Puffin Walk beyond.
- East – The eastern boundary comprises access road and residential buildings, with Eagle Avenue about 340m to the east.
- South – The southern boundary comprises private gardens and residential buildings.
- West – The western boundary comprises a strip of woodland with green fields beyond.

2.1.1 Current Use and Site Conditions

A walk-over survey was undertaken on the 15th of August 2022 by a Terra Firma Engineer. The site is accessed via Robin Gardens.

At the time of the walk-over survey the site currently comprises of a car park and soft grassed verges.

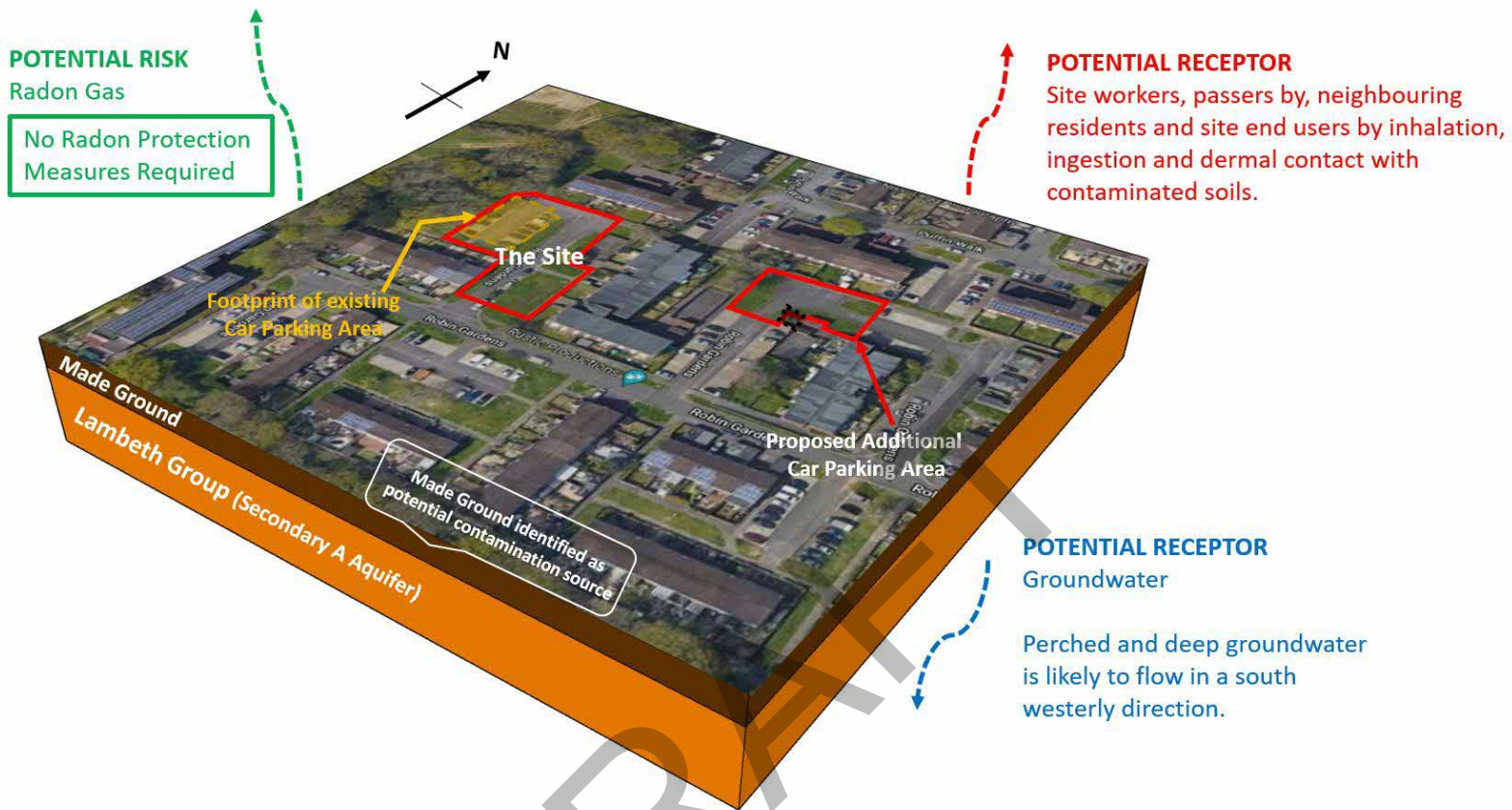
2.2 Phase 1 Risk Assessment

A Phase 1 Contaminated Land Risk Assessment was undertaken by Terra Firma in October 2022 (Report number PO-22-040/P1) and should be read in conjunction with this report. A summary of the report is detailed below:

Geology		The Geological Map of the area shows the site to be underlain by the Lambeth Group, which the BGS describes as vertically and laterally variable sequences mainly of clay, some silty or sandy, with some sands and gravels, minor limestones and lignites and occasional sandstone and conglomerate.
		No Superficial Deposits are shown to overlie the bedrock geology of the area.
Mining		The risk from underground and/or surface mining activity is likely to be Low.
Preliminary Geotechnical Risk Assessment		The preliminary geotechnical risk assessment has revealed that a Low to Moderate risk is present from geotechnical aspects, with particular risk specifically associated with groundwater flooding and also, with the expected shrink-swell nature of the underlying soils.
Recommendations		In order to confirm the above preliminary geotechnical risk assessment, it is recommended that a Phase 2 Intrusive Site Investigation is undertaken in order to determine the ground conditions and confirm relevant geotechnical aspects.
Potential Sources of Contamination	On-site	Currently, the site walkover survey did not identify any sources of contamination. Historically, the site has typically comprised of an open land with a stretch of woodland along its western boundary. No potential sources of contamination were identified from the site history. However, based on the present-day use of site for car parking, the possibility of localised contamination associated with hydrocarbon spillages/leaks from vehicle engines cannot be ruled out in these areas. In addition, any development/redevelopments that have occurred on site, such as when the present car park and surrounding dwellings were constructed, may contribute to made ground being found on the site.
	Off-site	Historically, the surrounding area (<250m) has typically comprised woodland and residential buildings. Except for a number of farms, located beyond 250m of the site, no other sources of contamination were identified from historic maps.
	Gas Migration	Due to the absence of any influencing active or historic landfills, underlying organic material (e.g. peat) and significant Made Ground, the presence of ground gas is considered unlikely.
Preliminary Human Health & Environmental Risk Assessment		The preliminary human health and environmental risk assessment has revealed that due to the sites and surrounding areas current and past land uses that a Low to Moderate risk is present from contamination present beneath the site, with particular risk specifically associated with the on-site parking areas and potential made ground. In addition, a Low risk is present from the migration of radon gas, a Low risk from the migration of landfill gas and a Low risk from the migration of ground gas.
Recommendations		Based on a Low to Moderate overall risk rating, in order to confirm the above preliminary human health and environmental risk assessment it is recommended that a Phase 2 Ground Investigation is undertaken comprising site specific soil chemical testing in order to determine the ground conditions, soil chemistry and any environmental liability associated with the site.

2.2.1 Preliminary Illustrative Site Conceptual Model

The following illustration represents a theorised model through the site. The drawing is generalised and not to scale.



Drawing 2.2: Preliminary Site Conceptual Model

SECTION 3 Field Investigation

3.1 General

The site works were scoped by Terra Firma and comprised the following:

- 1No. cable percussive boreholes (BH01),
- 6No. mini percussive boreholes (WS01-WS06),
- 2No. machine excavated trial pits (TP01 and TP02),
- 1No. in-situ soakaway test conducted in TP01, and
- 2No. in-situ CBR test using TRL Dynamic Cone Penetrometer (DCP01 and DCP02).

The site works were carried out at the site between 15th and 16th of August, and the 16th of September 2022.

Prior to the site works, the following Health and Safety measures were undertaken:

- Risk Assessment & Method Statement (RAMS) was issued and approved beforehand,
- Underground Utility Plans were obtained from the relevant Statutory Undertakers,
- Safety fencing was used to prevent unauthorised access into the site working area,
- Before any excavation, all exploratory hole locations were scanned using a Cable Avoidance Tool (CAT),
- Before any drilling, a 1.20m deep inspection pit was excavated at each borehole location,
- Accessing exploratory hole locations due to residents protesting ground investigation works

The exploratory holes were set out at locations provided by Terra Firma and adjusted where necessary to take account of the site constraints detailed in Section 1.1.

Approximate exploratory hole co-ordinates and levels were picked up post-investigation using a hand-held Global Positioning System (GPS) receiver and presented in the table below:

Table 3.1: Exploratory Hole Co-ordinates		
Exploratory Hole	Easting	Northing
BH01	467713	111606
TP01	467726	111594
TP02	467730	111567
WS01	467691	111586
WS02	467692	111595
WS03	467692	111607
WS04	467692	111614
WS05	467715	111588
WS06	467771	111617
DCP01	467724	111595
DCP02	467727	111568

The site works were supervised by Terra Firma, who also logged the exploratory holes to the requirements of BS5930:2015 + A1:2020.

The exploratory hole logs and in-situ test result are presented in Annex A and Annex B respectively, and their locations shown on Drawing 3.1 below.



Drawing 3.1: Exploratory Hole Location Plan

3.2 Exploratory Holes

3.2.1 Cable Percussive Boreholes

The cable percussive borehole (150mm diameter) was sunk using a Dando 2000 drilling rig as described in EN ISO 22475-1:2006.

Standard Penetration Tests using either a split spoon or solid cone (SPT(S/C)) were undertaken at regular depths during the drilling in accordance with BS EN ISO 22476-3. Typically, tests were undertaken at the base of an inspection pit and every metre for the first 5m, and then every 1.5m thereafter, a final test was undertaken at the base of each borehole.

Undisturbed (U100) and disturbed bulk/small soil samples were taken at regular depths during the drilling. Water samples were taken at each water strike.

Borehole (BH01) was installed with a gas and ground water monitoring pipe, the details of which are summarised in the section below.

During drilling, standing time/day works were incurred due to the following reasons:

- Site Inductions / Briefings (0.5 Hours)
- Inspection Pits (1 Hour)
- Installation and Clear-up (1 Hour)

3.2.2 Mini Percussive Boreholes

The windowless sampling boreholes were bored using a Dando Terrier drilling rig.

The windowless boreholes were used to recover soil samples. Standard Penetration Tests using either a split spoon or solid cone (SPT(S/C)) were undertaken at regular depths during the drilling in accordance with BS

EN ISO 22476-3. Typically, tests were undertaken at the base of an inspection pit and every metre, a final test was undertaken at the base of each borehole.

All windowless boreholes (WS01-WS06) were backfilled using arisings and reinstated using arisings.

3.2.3 Borehole Installations

Groundwater monitoring systems was installed in borehole BH01, terminating below both the depth of made ground and groundwater.

The standpipe installation details for the boreholes are as follows:

Table 3.2: Standpipe Installation Details			
Borehole No.	Top of Response Zone (m bgl)	Bottom of Response Zone (m bgl)	Pipe Detail
BH01	1.00	11.00	Lockable Flush cover set in concrete surround Plain (50mm) to top of Response Zone with gas valve Slotted (50mm) Response Zone with geotextile sock and gravel surround Top/Bottom sealed with bentonite

3.2.4 Machine Excavated Trial Pits

The trial pits were excavated using a 5 Tonne JCB Excavator.

Due to the presence of surface hard standing a hydraulic breaker attachment was used where necessary to progress excavation.

Following completion of soil logging, in-situ testing and sampling, the trial pits were backfilled using arisings and re-compacted as best as practicably possible using the excavator backhoe. If necessary, the trial pit was left slightly proud in order to allow for short-term settlement.

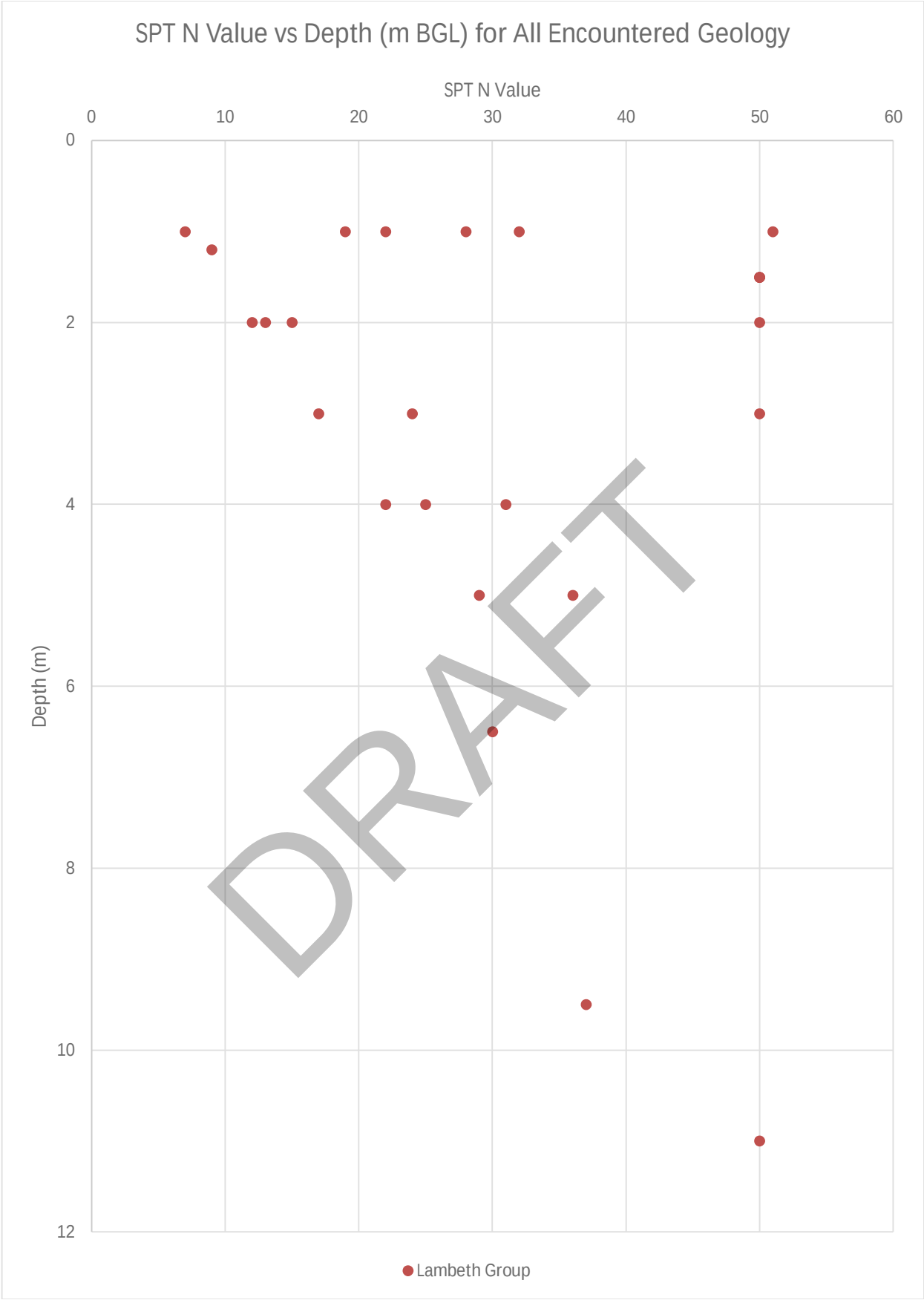
3.3 In-situ Testing

3.3.1 Strength Testing

Standard Penetration Test (SPT)

SPT N Values taken within the Bedrock Lambeth Group revealed an average N value of 27 (Range 7 to 51).

Drawing 3.2 below presents the distribution of SPT N values against depth (mbgl).



Drawing 3.2: SPT vs Depth

The in-situ strength tests were carried out in accordance with ‘Methods of test for soils for civil engineering purposes – Part 9 (BS 1377): 1999’.

3.3.2 Permeability Testing

The in-situ permeability test was undertaken within one of the excavated trial pits in order to provide a soil infiltration rate to be used in soakaway design. A 2,000-gallon tractor-towed bowser was used to rapidly fill the pit with water.

During the site investigation, in-situ permeability test was undertaken within TP01 and where possible was carried out to the requirements of BRE Digest 365.

The appropriate calculation sheets are presented in Annex B and the results given in the table below.

Table 3.3: Infiltration Test Results				
Soak away Test	Depth (m)	Type	Soil Type	Infiltration Rate (m/s)
TP01	3.00	Storm Drainage	Made Ground and Bedrock	*

Notes:

* The test did not drain sufficiently (75% effective depth) to give an infiltration rate

3.3.3 California Bearing Ratio (CBR) Testing

2No. in-situ CBR tests (DCP01 and DCP02) were carried out using a TRL Dynamic Cone Penetrometer (DCP) probe. The probes were typically sunk to a depth of <1.00m below ground level, targeting the proposed formation layer.

The in-situ CBR tests were carried out in accordance with 'Methods of test for soils for civil engineering purposes' – BS1377; Part 9 (1999).

The in-situ CBR test results are presented on the relevant trial pit logs or in Annex B and should be referred to for specific depth related values.

3.4 Sampling

3.4.1 Sampling Quality Assurance

Care was taken to ensure that sampling quality assurance occurred during site works. This included the following measures:

The use of nitrile gloves at each sampling point.

Stainless steel shovels were used to collect soil samples. The tool was cleaned with distilled water between each sample point.

Soil samples were stored at a temperature below 4 degrees.

Soil samples were stored within sample containers according to the chemical testing required.

No head space was left in sample containers.

3.4.2 Soil Chemical Test Sampling Regime

During the intrusive investigation small disturbed soil samples were collected for chemical testing.

The sample locations and depths are illustrated in the table below:

Table 3.4: Chemical Test Sample Descriptions

Sample No.		Sample Type	Description
BH01	0.30	MG	Light brown, gravelly fine to medium SAND
BH01	0.50	MG	Light brown, gravelly fine to medium SAND
BH01	1.00	B	Firm orangish brown mottled grey, slightly sandy, gravelly CLAY
WS01	0.30	MG	Firm brown slightly gravelly, sandy CLAY
WS02	0.50	B	Firm brown mottled grey slightly sandy, gravelly CLAY
WS04	0.30	MG	Firm brown slightly gravelly, sandy CLAY
WS06	0.50	MG	Firm brown slightly gravelly, sandy CLAY
TP01	0.30	MG	Brown to light brown gravelly, fine to coarse SAND
TP01	0.50	MG	Brown to light brown gravelly, fine to coarse SAND
TP02	0.30	MG	Light brown gravelly fine to coarse SAND
TP02	0.50	MG	Light brown gravelly fine to coarse SAND

Notes

Sample Type: MG (Made Ground), B (Bedrock)

3.4.3 Soil Property Test Sampling Regime

During the intrusive investigation bulk soil samples were collected for soil property testing.

The sample locations and depths are illustrated in the following table:

Table 3.5: Soil Property Test Sample Laboratory Descriptions

Sample No.		Sample Type	Description
BH01	0.90-1.20	B	Brown chalky sandy fine to medium gravelly silty CLAY
BH01	2.00-2.45	B	Brown sandy silty CLAY
BH01	3.00-3.45	B	Brown silty CLAY
BH01	3.45	B	Brown silty CLAY
BH01	4.00-4.45	B	Brown silty CLAY
BH01	5.00-5.35	B	Brown silty CLAY
BH01	6.50-6.95	B	Brown sandy silty CLAY
BH01	8.00-8.30	B	Brown sandy silty CLAY
BH01	9.00	B	Brown silty CLAY
BH01	10.60-10.90	B	Brown silty CLAY
BH01	11.00-11.35	B	Brown chalky silty CLAY
WS01	0.80	B	Orangish brown mottled grey gravelly sandy CLAY
WS02	0.80	B	Orangish brown mottled grey gravelly sandy CLAY
WS03	0.80	B	Yellowish brown gravelly sandy CLAY
WS04	0.70	B	Orangish brown mottled grey gravelly sandy CLAY
WS04	1.20	B	Reddish brown mottled light grey CLAY with rare gravel
WS04	1.80-2.00	B	Yellowish brown and reddish brown mottled grey sandy CLAY
WS04	2.80-3.00	B	Yellowish- and reddish-brown mottled grey slightly sandy CLAY
WS05	1.00	B	Orangish brown sandy clayey flint GRAVEL
WS06	1.00	B	Orangish brown silty CLAY
TP01	0.80	B	Brown fine gravelly sandy silty CLAY
TP01	2.00	B	Brown fine to medium gravelly silty CLAY
TP01	3.00	B	Yellowish and reddish brown mottled purple silty CLAY
TP02	0.80	B	Brown sandy silty CLAY
TP02	2.00	B	Brown sandy silty CLAY

Notes

Sample Type: B (Bedrock)

3.5 Groundwater Monitoring

Groundwater monitoring well was installed within BH01. The monitoring pipe was 50mm diameter pipe comprising 1.00m plain pipe and the remainder slotted to between 1.00m and 11.00m depth. A layer of bentonite was placed at the top and bottom of the response zone in order to seal it.

The table below presents the standing groundwater levels recorded during scheduled visits.

Table 3.6: Summary of Groundwater Monitoring			
	GWL (metres BGL)		
Date	16/08/2022	16/09/2022	13/10/2022
Time of Monitoring (GMT)	15:30	16:30	17:30
BH01	5.25	5.35	5.35

Notes:

GWL (BGL) – Groundwater Level (Below Ground Level)

The results of the gas monitoring are presented in Annex E.

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SECTION 4 Ground Conditions

4.1 Summary

The ground conditions encountered by the exploratory holes were variable across the site and but can in general be summarised as shown in the following table:

Table 4.1: Summary of Ground Conditions					
Depth (mbgl)		Thickness (m)		Stratum	
From	To	Min	Max		
0.00	0.05 / 0.30	0.50	0.30	Grass over brown silty fine to medium SAND with abundant roots and rootlets.	Topsoil
0.05 / 0.30	0.50 / 0.80	0.20	0.75	Brown to light brown gravelly, fine to coarse SAND with frequent roots and rootlets. Brown slightly gravelly, slightly sandy, clayey SILT. Firm brown slightly gravelly, sandy CLAY.	Made Ground
0.50 / 0.80	>11.35	Unproven		Firm to very stiff red/orangish brown mottled grey (slightly sandy, gravelly) CLAY. Dense slightly clayey SAND.	Lambeth Group

Within trial pits, the estimated strength of granular deposits was determined from visual assessment only (ease/difficulty of excavation and pit stability).

4.2 Stability

The sides of the excavations were typically found to be stable, except in BH01 where wall collapse was noted between 6.00m BGL and 8.00m BGL associated with a sand layer.

Due to the instability observed between 6.00m BGL and 8.00m in BH01, 150mm casing was needed to advance the borehole to a depth of 11.35m.

4.3 Strata Details

4.3.1 Topsoil

The Topsoil layer was encountered within all exploratory holes. The Topsoil was encountered across the site where there was no Asphalt or Concrete hardstanding.

The Topsoil was described as grass over brown silty fine to medium SAND with abundant roots and rootlets. The thickness of the Topsoil ranges between 0.50m along the grass areas in the centre of the site (as recorded in BH01, TP01 and TP02) and 0.30m to the western boundary along the strip of woodland (as recorded in WS01 and WS02).

4.3.2 Made Ground

The Made Ground was encountered within all exploratory holes.

Made Ground was encountered underlying the Topsoil from a top depth of between 0.05m BGL and 0.30m BGL to a base depth between 0.50m BGL and 0.80m BGL. The Made Ground comprised of either of the following –

1. Brown to light brown gravelly, fine to coarse SAND. Gravel is fine to coarse, angular to subangular flint fragments with frequent roots and rootlets.
2. Brown slightly gravelly, slightly sandy, clayey SILT. Sand is fine to medium. Gravel is fine to coarse of flint, red brick and occasional ceramic fragments.
3. Firm brown slightly gravelly, sandy CLAY. Sand is fine to medium. Gravel is fine to coarse of flint, red brick and occasional ceramic fragments.

Other than anthropogenic inclusions, no other visual or olfactory evidence of contamination was noted within the Made Ground deposits.

4.3.3 Bedrock Geology (Lambeth Group)

The Bedrock Geology identified as the Lambeth Group was encountered within all exploratory holes.

The Lambeth Group was encountered from a top depth of between 0.50m BGL and 0.80m BGL to the maximum depth of investigation, 11.35m BGL in BH01.

The Lambeth Group was described as firm to stiff orangish brown mottled grey (with local colour variation), slightly sandy, gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse flint fragments.

Within WS06 to the northeast of the site the Lambeth Group between 3.20 to 5.00m BGL was recorded as a medium dense yellowish brown mottled greenish grey slightly clayey fine to medium SAND.

The gravel content appears to decrease with depth, with the clay also becoming very stiff, indicating an increase in strength with depth. Between the depths of 11.00m BGL and 11.35m BGL in BH01, the layer was described as very stiff grey sandy CLAY with frequent pockets of calcrete.

4.4 Water Strikes

During site works, groundwater was encountered within BH01 at depths of 6.50m BGL and 9.50m BGL, described as seepage and moist respectively and is presented below.

Table 4.2: Summary of Groundwater

Hole Location	Groundwater Strike Depth (mbgl)	Groundwater Depth (mbgl) after 20 mins	Comments	Water Bearing Strata
BH01	6.50	-	Seepage	B
BH01	9.50	-	Moist	B

Notes

Water Bearing Strata: B (Bedrock)

SECTION 5 Laboratory Chemical Testing

5.1 General

During the recent site works, 11no. soil samples were taken and dispatched to the laboratories of Chemtest for laboratory chemical testing. The following chemical testing was undertaken:

Table 5.1: Summary of Chemical Testing Suites		
Inorganics	Metals	Arsenic (As), Cadmium (Cd), Chromium (Cr), Hexavalent Chromium (CrVI), Copper (Cu), Lead (Pb), Mercury (Hg), Nickel (Ni), Selenium (Se), Zinc (Zn)
	General	pH (acidity), Cyanide (CN ⁻), Sulphate (SO ⁴), Organic Matter (OM)
Organics		Phenol, Poly-Aromatic Hydrocarbons (PAH), Petroleum Hydrocarbons (PH): EPH, Benzene, Toluene, Ethylbenzene, Xylene (BTEX), Methyl tert-butyl ether (MTBE)
Miscellaneous		Asbestos ID
Waste Acceptance Criteria		Single Stage
UKWIR		<u>Inorganics:</u> Conductivity, pH (acidity), Redox Potential <u>Organics:</u> EPH C ₁₀ -C ₂₀ , EPH C ₂₀ -C ₄₀ , Total VOCs, BTEX & MTBE, Total SVOCs, Phenols, Cresols & Chlorinated Phenols, TICs

The results of the above chemical tests are presented in Annex C and evaluated below.

5.2 Risk Assessment

5.2.1 Introduction

The results obtained from the investigation, which are discussed in detail in Section 5.3, were used to conduct an environmental risk assessment for the site. The risk assessment aimed to:

- Identify sensitive receptors
- Determine pathways for contaminant migration to the receptors
- Estimate contaminant impact on receptors
- Establish whether remedial action is required
- Calculate remediation target levels if required

The future use of the site i.e. whether it is to be used for residential or commercial has an impact on any risk assessment. As the site is expected to comprise residential development with private gardens and car parking area, soil guidance values (SGV) for a residential with plant uptake end-use have been adopted.

5.2.2 Methodology

Soils

Environmental risk assessment evaluates the risk to receptors via an analysis of the 'source-pathway-target' linkage. In order for a risk to be present, there must be a contaminant source capable of causing a health risk, a vulnerable receptor, and a pathway linking the two.

This sort of risk assessment is usually conducted using a tiered approach. Tier 1 consists of a comparison of the analytical results obtained from the site investigation with Soil Guideline Values (SGV's) specific to the type of development obtained from The Environment Agency Contaminated Land Exposure Assessment (CLEA) Guidelines.

The CLEA model, technical guidance and Soil Guideline Values are currently under review, as a direct result of the publication published by DEFRA (2006) 'Soil Guideline Values: The Way Forward'. The technical guidance CLR 9 and CLR 10 have been superseded by Science Reports (SR) 2 and SR3.

Whilst the toxicological and risk assessment framework is under review, the laboratory soil chemical test results have been evaluated by comparison with the following published Generic Assessment Criteria (GAC), with preference in most onerous order:

1. Category 4 Screening Levels (C4SLs) - Department for Environment, Food and Rural Affairs (DEFRA, 2014),
2. Suitable for Use Levels (S4ULs) - Land Quality Management & Chartered Institute of Environmental Health (LQM & CIEH, 2015),
3. Soil Guideline Values (SGVs) - EA / DEFRA, 2002-2009,
4. Generic Assessment Criteria (GAC) - Contaminated Land: Applications in Real Environments (CL:AIRE, 2010), and
5. Generic Assessment Criteria (GAC) derived by Terra Firma .

In the absence of a GAC, the laboratory Limit of Detection (LoD) has been used for comparison in order to establish the presence/absence of determinants and for initial screening purposes.

The above sources typically have derived GAC with reference to the EA's Contaminated Land Exposure Assessment (CLEA) model and using the CLEA software.

All receptor profiles, source inputs and toxicological parameters comply with both peer reviewed literature and CLR 7 to CLR 10. As with SGV's the SSV's and CIEH GAC are not yet updated to SR2 and SR3.

Should Tier 1 levels be exceeded, a choice is made either to remediate the site to conservative Tier 1 levels, or proceed to Tier 2.

Tier 2 makes use of site-specific data to evaluate acceptable concentrations of chemicals for the particular conditions present at the site.

At each tier, the amount and detail of investigation work increases as more site-specific data are needed to refine the characterisation of the site. Conversely, as site conditions are better understood, a more site-specific remediation strategy can be determined.

Controlled Waters

In the case of groundwater and/or leachate, the acceptable concentrations are sourced from the Environment Agency Chemical Standards Report for each individual substance. The report presents a variety of target concentrations specific to protection goals and environmental media in which the standard applies. The most applicable protection goal and environmental media for this project is the protection of aquatic life in a freshwater environment.

Where there is no standard for a freshwater environment, the target concentrations are derived from UK standards for drinking water (for human consumption). In the absence of any published guideline, a conservative threshold is suggested.

5.2.3 Sources

The sources of contamination considered in the risk assessment are taken to be concentrations of chemicals beneath the site.

5.2.4 Pathways

The various pathways considered in the risk assessment are summarised in the table below:

Table 5.2: Summary of Potential Contamination Pathways	
Potential Contamination Pathway	
Human Health	Ingestion of soil and soil dust
	Consumption of site grown produce
	Dermal contact (Inc. eye uptake) with soil, soil dust and water
	Inhalation of soil particles, dust, asbestos and vapours, both indoors and outdoors
	Inhalation of landfill / ground gas, accumulation and risk of explosion
	Contaminant permeation of drinking water pipes and ingestion of contaminated water supply
Aquatic Environment	Surface water runoff
	Migration of surface water into underlying soils and groundwater
	Leaching of contaminants via groundwater transport into the wider aquatic environment – surface waters and groundwater

5.2.5 Potential Receptors

A summary of the potential affected receptors at the site are summarised in the table below:

Table 5.3: Summary of Potentially Affected Receptors	
Potentially Affected Receptors	
Construction Workers	
Neighbouring Site Users	
Passers-by	
Future Residents/ Visitors	
Maintenance Contractors	
Residents in the surrounding area	
Persons who may come into contact with water in the vicinity of the site	
Vegetation from phytotoxic contaminants	
Building Materials from aggressive ground conditions	
The underlying secondary aquifer	
Nearby surface waters and the aquatic life within	

5.3 Evaluation of Analytical Results

5.3.1 Soils

A summary of the Inorganic (Metals) soil chemical test results are shown in the table below.

Table 5.4: Soil Chemical Test Results – Inorganics (Metals)					
Substance	Land Use / Guideline Values (mg/kg)	Measured Levels of Substances (mg/kg)		Number of exceedances	95% UCL
	R w HP	Min	Max		
Arsenic	37	3.5	29	0	-
Cadmium	22	<0.1	<0.1	0	-

Chromium	910	7.2	48	0	-
Chromium III	910	7.2	48	0	-
Chromium VI	21	<0.5	<0.5	0	-
Copper	2400	3.4	10	0	-
Lead	200	4.9	29	0	-
Mercury (Total)	40	<0.05	0.07	0	-
Nickel	180	3.2	10	0	-
Selenium	250	<0.25	0.84	0	-
Zinc	3700	11	32	0	-

Notes

C4SL - Provisional Category 4 Screening Levels

S4UL - Suitable for Use Levels

R_wHP (Residential with Home-grown Produce)

A total of 10no. representative soil samples were tested for these substances

A summary of the Inorganic (General) soil chemical test results are shown in the table below.

Table 5.5: Soil Chemical Test Results – Inorganics (General)					
Substance	Land Use / Guideline Values (mg/kg)	Measured Levels of Substances (mg/kg)		Number of exceedances	95% UCL
	R w HP	Min	Max		
pH (pH Units)	Considered in BRE SD1, BS3882, BS8601 and/or UKWIR	6.9	8.7	0	-
Cyanide (Total)	8	<0.5	<0.5	0	-
Organic Matter	Considered in Organic Contaminant Guideline Value Assessment, BS3882 and/or BS8601	0.4	4.1	0	-
Sulphate (2:1) (g/l)	Considered in BRE SD1	<0.01	<0.01	0	-
Sulphate (Total) (%)	Considered in BRE SD1	<0.01	0.068	0	-

Notes

SGV - Soil Guideline Value

BRE SD1: 2005 - Concrete in Aggressive Ground

BS 3882: 2015 - Specification for Topsoil

BS 8601: 2013 - Specification for Subsoil and requirements for use

R_wHP (Residential with Home-grown Produce)

A total of 10 no. representative soil samples were tested for these substances

A summary of the Organic (General) soil chemical test results are shown in the table below.

Table 5.6: Soil Chemical Test Results – Organics (General)					
Substance	SOM	Land Use / Guideline Values (mg/kg)	Measured Levels of Substances (mg/kg)		95% UCL
		R w HP	Min	Max	
Total Phenol	1	120	<0.1	<0.1	0
	2.5	200			
	6	380			
Total PAH*		2 (LoD)	<2	<2	0

Total EPH _(C10-C40) **		1	74+	<10	<10	0	-
		2.5	180+			0	
		6	380+			0	
BTEX	Benzene		0.87	<0.0002	<0.0002	0	-
	Toluene	1	130	0.00054	0.00061	0	-
		2.5	290			0	
		6	660			0	
	Ethylbenzene	1	47	<0.0002	0.00048	0	-
		2.5	110			0	
		6	260			0	
	Xylene***	1	56	0.00087	0.0018	0	-
		2.5	130			0	
		6	310			0	
Methyl tert-butyl ether (MTBE)		1	49	<0.0002	0.0002	0	-
		2.5	84			0	
		6	160			0	

Notes

C4SL - Provisional Category 4 Screening Levels

S4UL - Suitable for Use Levels

CL:AIRE - Generic Assessment Criteria (GAC)

R_wHP (Residential with Home-grown Produce)

LoD - Limit of Detection

SOM - Soil Organic Matter

* Total PAH - Poly-Aromatic Hydrocarbons, EPA 16 (See Speciated PAH Results Table)

** Total EPH – Extractable Petroleum Hydrocarbons, Ali/Aro (See Speciated PH Results Table)

*** - Guideline Value based on worse case of O, M or P - Xylene

A total of 10 no. representative soil samples were tested for these substances

In order to accurately assess the risk from Total PAH, speciation was undertaken, which splits the total PAH concentration into its sixteen components.

A summary of the Organic (Speciated PAH) soil chemical test results are shown in the table below.

Table 5.7: Soil Chemical Test Results – Organics (Speciated PAH)						
Substance	Land Use / Guideline Values (mg/kg)		Measured Levels of Substances (mg/kg)		Number of exceedances	95% UCL
	SOM	R w HP	Min	Max		
Naphthalene	1	2.3	0.1	0.1	0	-
	2.5	5.6			0	
	6	13			0	
Acenaphthylene	1	170	0.1	0.1	0	-
	2.5	420			0	
	6	920			0	
Acenaphthene	1	210	0.1	0.1	0	-
	2.5	510			0	
	6	1100			0	
Fluorene	1	170	0.1	0.1	0	-
	2.5	400			0	
	6	860			0	

Phenanthrene	1	95	0.1	0.1	0	-
	2.5	220			0	
	6	440			0	
Anthracene	1	2400	0.1	0.1	0	-
	2.5	5400			0	
	6	11000			0	
Fluoranthene	1	280	0.1	0.36	0	-
	2.5	560			0	
	6	890			0	
Pyrene	1	620	0.1	0.42	0	-
	2.5	1200			0	
	6	2000			0	
Benzo(a)anthracene	1	7.2	0.1	0.1	0	-
	2.5	11			0	
	6	13			0	
Chrysene	1	15	0.1	0.1	0	-
	2.5	22			0	
	6	27			0	
Benzo(b)fluoranthene	1	2.6	0.1	0.1	0	-
	2.5	3.3			0	
	6	3.7			0	
Benzo(k)fluoranthene	1	77	0.1	0.1	0	-
	2.5	93			0	
	6	100			0	
Benzo(a)pyrene		5	0.1	0.1	0	-
Indeno(1,2,3-cd)pyrene	1	27	0.1	0.1	0	-
	2.5	36			0	
	6	41			0	
Dibenzo(a,h)anthracene	1	0.24	0.1	0.1	0	-
	2.5	0.28			0	
	6	0.3			0	
Benzo(g,h,i)perylene	1	320	0.1	0.1	0	-
	2.5	340			0	
	6	350			0	

Notes

C4SL - Provisional Category 4 Screening Levels

S4UL - Suitable for Use Levels

R_{wp}HP (Residential with Home-grown Produce)

SOM - Soil Organic Matter

A total of 10 no. representative soil samples were tested for these substances

In order to accurately assess the risk from Total PH, speciation was undertaken, which splits the Total PH concentration into carbon bandings in accordance with the Total Petroleum Hydrocarbon Criteria Working Group (CWG).

A summary of the Organic (Speciated PH) soil chemical test results are shown in the table below.

Table 5.8: Soil Chemical Test Results – Organics (Speciated PH)

Substance		SOM	Land Use / Guideline Values (mg/kg)	Measured Levels of Substances (mg/kg)		Number of exceedances	95% UCL
				Min	Max		
Aliphatic	VPH <C5-C6	1	40	0.01	0.01	0	-
		2.5	78			0	
		6	160			0	
	VPH <C6-C8	1	100	0.01	0.01	0	-
		2.5	230			0	
		6	530			0	
	VPH <C8-C10	1	27	0.1	0.1	0	-
		2.5	65			0	
		6	150			0	
	EPH <C10-C12	1	130	0.1	0.1	0	-
		2.5	330			0	
		6	760			0	
	EPH <C12-C16	1	1100	0.1	0.1	0	-
		2.5	2400			0	
		6	4300			0	
	EPH <C16-C21 ⁺	1	65000	0.1	0.1	0	-
		2.5	92000			0	
		6	110000			0	
	EPH <C21-C35 ⁺	1	65000	0.1	0.1	0	-
		2.5	92000			0	
		6	110000			0	
Aromatic	VPH <C5-C7	1	70	0.01	0.01	0	-
		2.5	140			0	
		6	300			0	
	VPH <C7-C8	1	130	0.01	0.01	0	-
		2.5	290			0	
		6	660			0	
	VPH <C8-C10	1	34	0.1	0.1	0	-
		2.5	83			0	
		6	190			0	
	EPH <C10-C12	1	74	0.1	0.1	0	-
		2.5	180			0	
		6	380			0	
	EPH <C12-C16	1	140	0.1	0.1	0	-
		2.5	330			0	
		6	660			0	
	EPH <C16-C21	1	260	0.1	0.1	0	-
		2.5	540			0	
		6	930			0	
	EPH <C21-C35	1	1100	0.1	0.1	0	-
		2.5	1500			0	
		6	1700			0	

Notes

S4UL - Suitable for Use Levels

R_{wp}HP (Residential with Home-grown Produce)

SOM - Soil Organic Matter

VPH – Volatile Petroleum Hydrocarbons

EPH – Extractable Petroleum Hydrocarbons

* Based on worse-case Aliphatic C₁₆-C₃₅ fraction

A total of 10 no. representative soil samples were tested for these substances

A summary of the Miscellaneous (Asbestos) soil chemical test results are shown in the table below.

Table 5.9: Soil Chemical Test Results – Miscellaneous (Asbestos)		
Location	Depths (m)	ID Result
BH01	1.00	No Asbestos Detected
BH01	0.30	No Asbestos Detected
BH01	0.50	No Asbestos Detected
TP01	0.30	No Asbestos Detected
TP02	0.30	No Asbestos Detected
TP02	0.50	No Asbestos Detected
WS01	0.30	No Asbestos Detected
WS02	0.50	No Asbestos Detected
WS04	0.30	No Asbestos Detected
WS06	0.50	No Asbestos Detected

5.4 Contaminants of Concern in Soils

5.4.1 Soils

Contaminants of concern are those where the measured concentrations and 95% Upper Confidence Limit exceeds the relevant Tier 1 CLEA Soil Guideline Value or CIEH Generic Assessment Criteria.

It can be seen from Tables 5.4 to 5.9 that none of the contaminants tested were above the SGV for their respective zone screening criteria, and therefore no contaminants of concern have been identified.

5.5 Waste Acceptance Procedure

Any materials to be removed from site should be subject to the Waste Acceptance Procedure (WAP) in order to appropriately classify the waste for the correct type of landfill.

3No. samples were analysed for Waste Acceptance Criteria. The results of the WAC testing have been included in Annex C. The results of the testing are summarized in the table below.

Table 5.10: Waste Acceptance Criteria Testing			
Sample Location	Sample Depth (m)	Comments	Landfill Waste Acceptance
BH01	0.50	No elevated result	Inert Waste Landfill
TP01	0.50	No elevated result	Inert Waste Landfill
TP02	0.50	No elevated result	Inert Waste Landfill

Based on the results of the WAC testing, the shallow deposits (Made Ground) have been classed as inert waste.

We recommend that the attached results be made available to the relevant parties to determine its classification and acceptance before haulage.

5.6 UKWIR Chemical Testing

In order to accurately assess the risk to various water pipe materials, chemical testing comprising the UKWIR Suite was undertaken on 2No. samples across the site.

A summary of the UKWIR soil chemical test results are shown in the table below.

Table 5.11: Soil Chemical Test Results – UKWIR									
Substance	Measured Concentrations of Tested Substances (mg/kg)			Pipe Selection Criteria					
	Location	BH01	WS02	PE	PVC	BP	WS	WDI	C
	Depth	1.00	0.50						
Inorganics	Conductivity (uS/cm)	2700	400	Π	Π	Π	Corrosive if pH > 7 & conductivity > 400 uS/cm	Corrosive if pH < 5, Eh not neutral & conductivity > 400 uS/cm	Corrosive if pH > 7 & conductivity > 400 uS/cm
	pH (pH Units)	8.7	8.2	Π	Π	Π			
	Redox Potential (mV)	69	72	Π	Π	Π			
Organics	EPH C ₁₁ -C ₂₀	ND	ND	10	Π	Π	Π	Π	Π
	EPH C ₂₀ -C ₄₀	ND	ND	500	Π	Π	Π	Π	Π
	Total VOCs	0.012	0.047	0.5	0.125	Π	Π	Π	Π
	BTEX & MTBE	0.036	0.019	0.1	0.03	Π	Π	Π	Π
	Total SVOCs	ND	ND	2	1.4	Π	Π	Π	Π
	Phenols	ND	ND	2	0.4	Π	Π	Π	Π
	Cresols and Chlorinated Phenols	ND	ND	2	0.04	Π	Π	Π	Π
	TICs*	ND	ND	0.5	1.0	Π	Π	Π	Π
Pipes That Pass Chemical Thresholds				Π	Π	Π	Π	Π	Π

Notes:

* - TICs to include Ethers, Ketones, Aldehydes and Amines

ND – Non-Detected / Below Detection Limits

PE – Polyethylene

PVC – Polyvinyl Chloride

BP – Barrier Pipe

WS – Wrapped Steel

WDI – Wrapped Ductile Iron

C - Copper

5.6.1 Pipe Selection

Based on the above and using the table above from 'UKWIR Guidance for the Selection of Water Supply Pipes to be Used in Brownfield Sites' it is recommended that there are restrictions to pipe selection and that the following pipe materials can be used on site:

Polyethylene (PE)

Barrier Pipe (BP)

SECTION 6 Qualitative Risk Assessment/Mitigation Measures

The following is a representation of environmental processes on the site and its immediate vicinity. Its purpose is to identify potential contaminants, pathways and receptors with a view to identifying potential and significant pollution linkages.

6.1 Site Summary

Historically, the site has typically comprised of an open land with a stretch of woodland along its western boundary. Present-day use of site includes car parking for the adjacent residential development. Historically, the surrounding area (<250m) has typically comprised woodland and residential buildings.

A summary of the ground conditions encountered during the Ground Investigation is given in the table below:

Table 6.1 Summary of Ground Conditions			
Stratum	Depth From (m)	Depth to (m)	Description
Topsoil	0.00	0.05 / 0.30	Grass over brown silty fine to medium SAND with abundant roots and rootlets.
Made Ground	0.05 / 0.30	0.50 / 0.80	- Brown to light brown gravelly, SAND with frequent roots. - Brown slightly gravelly, slightly sandy, clayey SILT. - Firm brown slightly gravelly, sandy CLAY.
Lambeth Group	0.50 / 0.80	>11.35	- Firm to very stiff red/orangish brown mottled grey (slightly sandy, gravelly) CLAY. - Dense slightly clayey SAND

The Aquifer Designation Map for the area shows the site to be underlain by a 'Secondary A' Aquifer.

Surface and perched groundwater flows from the site are likely to be in a Southwest following the natural topography of the wider area. These waters will probably be collected by the Potwell Trib located 1171m to the south.

6.2 Potential Contaminants

6.2.1 Soils

It can be seen from Tables 5.4 to 5.9 that none of the contaminants tested were above the SGV for their respective zone screening criteria, and therefore no contaminants of concern have been identified.

6.3 Potential Receptors

The potential receptors at the site potentially affected during construction of the development are summarised in the table below:

Table 6.2: Summary of Potentially Affected Receptors (During Construction)
Potentially Affected Receptors
Construction Workers
Neighbouring Site Users, Passers-by, and Residents in the surrounding area
The underlying secondary aquifer
Nearby surface waters and the aquatic life within

The potential receptors at the site potentially affected following construction of the development are summarised in the table below:

Table 6.3: Summary of Potentially Affected Receptors Following Construction
Potentially Affected Receptors
Future Residents/ Visitors
Maintenance Contractors
Vegetation from phytotoxic contaminants
Building Materials from aggressive ground conditions
The underlying secondary aquifer
Nearby surface waters and the aquatic life within

6.4 Potential Pathways

The site is planned to be occupied by a 2-storey terraced building of four dwellings, car parking area and associated infrastructure.

How the proposed development finish affects the various possible contamination pathways is considered below, and summarised in Table 6.1.

Potential risks are present during and following construction of the development to potential receptors from ingestion, inhalation, dermal contact, surface water run-off, leaching and groundwater transport. By adhering to the following protection measures any risks can be considered very low.

Ingestion of soil/soil dust, dermal contact and ingestion of site grown vegetables

Any combustible materials found during excavations should be removed and replaced with suitable materials. The combustible materials should be suitably disposed of.

If materials are imported, which are not a natural quarry product with British Standard Certification, or are not sourced from a builders merchant, DIY store or retail outlet in bagged bulk form, analytical validation testing will be required, to ensure that imported materials is suitable and will not cause pollution to the site, and pose a risk to human health.

Any materials to be removed from site should be subject to the Waste Acceptance Procedure (WAP) in order to appropriately classify the waste for the correct type of landfill.

All service runs should be backfilled with inert materials to ensure that future maintenance workers / contractual workers do not come into contact with contaminated soils.

If during the development materials or abnormal ground conditions are encountered that are significantly different to those encountered in the investigation, the occurrence should be reported to the Engineer and appropriate action taken prior to continuing with the works.

The appointed contractor(s) should as a minimum;

1. Comply with all current Health and Safety regulations
2. Provide Method Statements and Risk Assessments in place to deal with measures set out in this section
3. Comply with Control of Substances Hazardous to Health (COSHH) Assessment
4. Maintain a good level of Personal Protection Equipment (PPE)
5. Maintain a good level of hygiene by site workers
6. Put in place dust suppression measures when necessary

The contractor(s) must also strictly adhere to the relevant Pollution Prevention Guidelines which aim to minimise detrimental harm to the environment and health.

Within the documentation prepared by the contractor(s), the following information should be provided, but not limited to:

1. Project Description
2. Key participants/contractor(s)
3. Technical procedures
4. Phasing of works and approximate timescales
5. Site plans to scale
6. Details of consents or license needed
7. Health and Safety, COSHH Assessment, Method Statements and Risk Assessments
8. Emergency contingencies

In addition, the following precautions should also be taken.

1. All potential chemicals and associated risks and emergency procedures for spills/leaks should be considered in a site risk assessment and the details provided to all site employees
2. Any potential pollutant materials or chemicals/detergents used on site should be adequately stored in suitable containers, with clear labelling.
3. Any oil or hazardous substance containers and associated pipe works should be enclosed within a bund.
4. Care taken during delivery of materials, with correct supervision and labelling detailing the substance and its quantities.
5. All delivery drivers should be informed of procedures and restrictions
6. Any materials on delivery should be covered to ensure no spillage from the vehicle.
7. Any detergents, paints, chemicals etc. should not be allowed to be discharged into surface drains or water courses
8. Washing out and cleaning of concrete/cement plant should be carried out in a contained area with adequate measures to collect all run-off water.
9. Security and prevention of vandalism, especially of oil drums/containers.

It is considered that the site will be sufficiently fenced off during development and that dust suppression measures will be made if required, meaning there will be no risk to neighbouring site occupants and passers-by.

The determinants tested were all present at concentrations below the relevant guidelines and therefore, there are no contaminants of concern. Therefore, it is considered that the human health risks are low and that no mitigation measures will be required for the development.

Inhalation of soil dust /ground gas/radon

Protection of site workers from soil dust inhalation can be minimised by simple health and safety measures and dust suppression. Neighbouring site occupants and passers-by will similarly not be at risk with dust suppression.

It is considered that site workers, passers-by and neighbouring site occupants are not at risk from ground gas or vapours.

All risks to site users from dust inhalation will be eliminated by appropriate dust suppression measures.

Site end users, upon completion, will similarly not be at risk from soil dust/vapours once the above mentioned remedial measures have been carried out.

There is also a low risk from landfill gasses, a low risk from ground gasses and a low risk from radon gas where no radon protection measures are likely to be required.

Surface water run-off/leaching into the groundwater/groundwater transport

1. Short-term

In respect of physical effects of the site works during the construction period, there is a very low risk to the environment/adjacent land and water bodies from digging foundations, moving contaminated soil, runoff from construction materials and/or exposed ground, wheel washings and oil or chemical spills.

All adverse effects should however be preventable by due diligence to good construction practice and housekeeping in preventing surface runoff and the spillage of materials. The basic measures that should be taken are as follows:

Prepare a drainage plan

Carry out any activities that could cause pollution in a designated, bunded area, away from rivers or boreholes

Use settlement ponds to remove silty water;

Store all oils and chemicals in a fully bunded area to prevent leaks or spills

It should be noted that the appointed contractor should provide Method Statements and Risk Assessments to deal with these matters.

2. Long-term

The chemical analysis of soil beneath the site constitutes a Level 2 assessment in terms of Remedial Targets Methodology, where the primary receptor/compliance point is the groundwater.

No leachate or groundwater chemical testing has been undertaken; however it is considered that the low levels of total contaminants will have correspondingly low levels of leachate and will, therefore, not pose a risk to the aquatic environment.

In addition, it is considered that the risk to the aquatic environment is low due to environmental setting as detailed below:

1. Contaminant concentrations within the site's near surface soils were low and leachates derived from these soils are likely to contain even lower contaminant concentrations. Therefore, if leachates did migrate to a controlled water the effect is likely to be negligible.
2. The presence of an underlying Secondary Aquifer.
3. There are no groundwater abstraction licenses within the area.
4. Distance to the nearest surface water body (Potwell Trib, located approximately 1171m to the south of the site).
5. The effect of natural attenuation, dilution and absorption will reduce contaminant concentrations with groundwater.

It is therefore considered that there is likely to be a low risk to the aquatic environment and that the next level of assessment (Level 3) is not required, given the environmental setting detailed above.

Permeation of Water Pipes

If water pipes are to be laid beneath the site an assessment should be made, by the water provider, of soils along the route of the pipe with reference to the material selection criteria using the UKWIR methodology.

6.5 Human Health Risks

A Qualitative Risk Assessment on the potential human health effects is detailed in Table 6.4 below:

Table 6.4: Human Health Risk Assessment				
Source	Pathway	Target	Risk Assessment	Mitigation Measures
Made Ground	Dermal contact with soil/dust. Inhalation and ingestion of soil/soil dust	Construction workers	Low Risk with protection measures	COSHH assessment and good level of PPE/ hygiene by site workers/ staff; dust suppression measures if required
Made Ground	Dermal contact with soil/dust. Inhalation and ingestion of soil/soil dust	Neighbouring site occupants, Passers-by	Low Risk during excavation phase of development and on completion	Site screening and dust suppression measures if required
Made Ground	Dermal contact with soil/dust. Inhalation and ingestion of soil/soil dust, ingestion of site grown vegetables	Site end users	Low Risk	Contamination testing revealed no contaminants tested were above the regulatory guidelines for their respective zones
Landfill and Ground Gas	Inhalation	Site end users	Low Risk	No historic or active landfills within 250m of the site.
Radon Gas	Inhalation	Site end users	Low Risk	No Radon protective measures are required.
Made Ground	Permeation of water pipes	Site end users	Low Risk	All chemical lab results to be forwarded to the water provider to assess pipe specification. Made Ground within service trenches should be removed and replaced with clean fill.

6.6 Risks to the Aquatic Environment

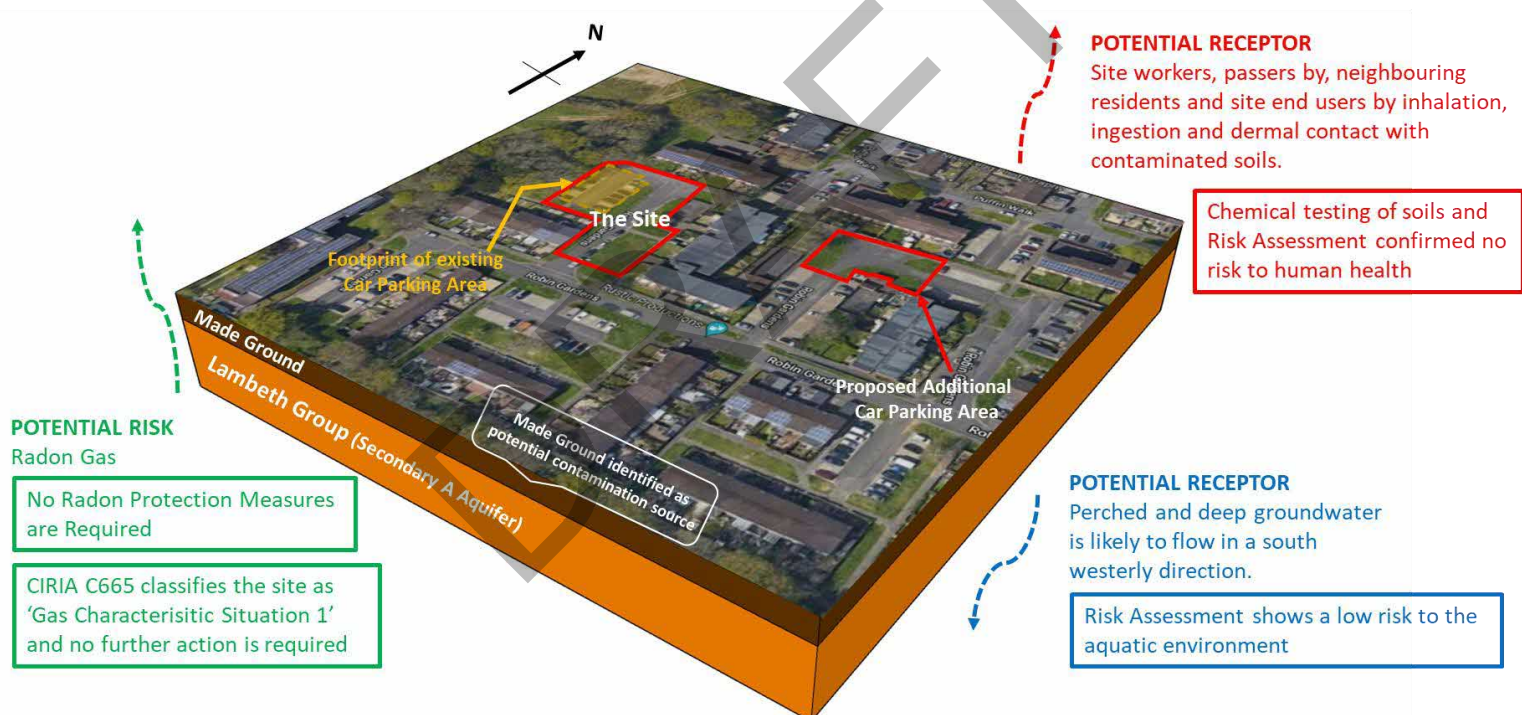
A Qualitative Risk Assessment on the potential effects to the aquatic environment is detailed in Table 6.5 below:

Table 6.5: Risks to the Aquatic Environment				
Source	Pathway	Target	Risk Assessment	Mitigation Measures
Made Ground	Surface water run-off	Surface Water	Low Risk due to the environmental setting and low concentrations identified.	Not Applicable
	Leaching into Groundwater	Groundwater		

			Reduced risk of contaminant migration and deep transmission is due to the installation of drainage systems and the effect of natural dilution and attenuation.	
Made Ground	Leaching into Groundwater	Groundwater	Low Risk during construction and excavation phase of development	Measures to avoid accidental spillage of materials during earthmoving activities, and to control surface run off

6.7 Site Conceptual Model

A schematic cross-section of the site is presented below. The cross section is based on the information available from the recent desk study and site investigation. The model is schematic and not to scale.



Drawing 6.1: Revised Site Conceptual Model

6.8 Limitations of the Site Conceptual Model

The areas of uncertainty within the conceptual site model are:

Presence of and composition of the groundwater within the bedrock
Direction of groundwater flow

SECTION 7 Geotechnical Laboratory Testing Results

7.1 General

A number of bulk and undisturbed samples were collected, and dispatched to the UKAS accredited laboratories of Geolabs and GSTL for soil property testing, in accordance with the following:

Methods of test for soils for civil engineering purposes – Parts 1 to 8 (BS 1377): 1999.

The results of the below property tests are presented in Annex D and discussed below.

7.1.1 Classification Testing

In order to assess the classification characteristics underlying the site, bulk samples were collected, and dispatched to the laboratory for the following soil property tests:

- 18No. Moisture Content (MC)
- 18No. Plasticity Index (P.I)
- 6No. Particle Size Distribution (PSD)

In addition, in order to assess the aggressiveness of the underlying the site, bulk samples were collected and dispatched to the laboratory for the following soil chemical tests:

- 14No. BRE SD1 Suite B

A summary of the soil classification test results are shown in the tables below.

Table 7.1: Summary of Soil Classification Test Results (Geotechnical)

Test	Location		BH01	BH01	BH01	BH01	BH01	WS01	WS02	WS03	WS04	WS04	WS04	WS04	WS05	WS06	TP01	TP01	TP02	TP02
	Depth (m)		0.90	2.00	4.00	9.00	11.00	0.80	0.80	0.80	0.70	1.20	1.80	2.80	1.00	1.00	0.80	2.00	0.80	2.00
	Unit		B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
Moisture Content		%	9.4	12	15	22	12	18.8	18.5	19.7	20.7	12.5	11.6	10.2	12.2	17.6	16	29	28	25
Plasticity	Liquid Limit	%	51	63	43	61	52	54	55	62	54	56	51	49	45	53	62	72	85	77
	Plastic Limit	%	15	16	14	15	18	22	19	24	25	19	17	14	20	24	19	19	17	15
	Plasticity Index	%	36	47	29	46	34	32	36	38	29	37	34	35	25	29	42	52	68	62
	% <425µm	%	77	99	100	100	100	90	86	97	88	99	100	100	35	99	97	98	100	100
	Modified PI	%	27.7	46.5	29	46	34	28.8	31	36.9	25.5	36.6	34	35	8.8	28.7	40.7	51	68	62
PSD	Cobbles	%	0	0	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0
	Gravels	%	18	0	-	-	-	-	-	-	-	-	-	-	-	-	1	2	0	0
	Sands	%	11	3	-	-	-	-	-	-	-	-	-	-	-	-	11	3	1	3
	Silt & Clay	%	71	97	-	-	-	-	-	-	-	-	-	-	-	-	88	95	99	97

Notes Unit: B (Bedrock)

Table 7.2: Summary of Soil Classification Test Results (Chemical)

Test	Location		BH01	BH01	BH01	BH01	BH01	BH01	WS01	WS01	WS02	WS03	WS04	WS05	WS06	TP01
	Depth (m)		0.90	2.00	3.45	6.50	9.00	11.00	0.80	1.20	1.20	1.20	1.80	3.00	1.00	3.00
	Unit		B	B	B	B	B	B	B	B	B	B	B	B	B	B
BRE	Total Sulphate	%	< 0.01	< 0.01	< 0.01	< 0.01	0.01	0.08	0.022	0.021	0.041	0.079	0.030	0.033	0.062	0.01
	2:1 Sulphate	g/l	< 0.010	< 0.010	0.019	0.021	0.02	0.058	< 0.010	0.013	0.018	0.013	< 0.010	< 0.010	< 0.010	0.064
	pH	-	8.1	6.6	6.9	6.8	8.1	8.4	8.4	8.5	6.5	5.0	5.4	6.8	5.8	7.9
	Chloride	Cl/l	-	-	-	-	-	-	0.055	0.054	0.066	0.066	0.041	0.083	0.061	-
	Total Sulphur	%	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.03	0.022	0.021	0.041	0.079	0.030	0.033	0.062	< 0.01

Notes Unit: B (Bedrock)

7.1.2 Compaction Testing

In order to assess the compaction characteristics underlying the site, bulk samples were collected and dispatched to the laboratory for the following soil property tests:

- 1No. Compaction Test (2.5kg Rammer)
- 3No. California Bearing Ratio (CBR)

A summary of the soil compaction test results are shown in the table below.

Table 7.3: Summary of Soil Compaction Test Results						
Test	Location		BH01	BH01	BH01	TP01
	Depth (m)		3.00 - 3.45	8.00 - 8.30	10.60 - 10.90	2.00
	Unit		B	B	B	B
2.5kg	Max Dry Density	Mg/m ³	1.74	-	-	-
	Optimum MC	%	13	-	-	-
California Bearing Ratio		%	-	1.1	1.2	0.91

Notes

Unit: B (Bedrock)

7.1.3 Consolidation Testing

In order to assess the consolidation characteristics underlying the site, undisturbed samples were collected and dispatched to the laboratory for the following soil property tests:

- 1No. One-dimensional Consolidation (OED)

The pressure increments used in the consolidation tests were chosen to mirror overburden pressures and the likely surcharge loads from the proposed building.

A summary of the soil consolidation test results are shown in the table below.

Table 7.4: Summary of Soil Consolidation Test Results						
One-Dimensional Consolidation Test	Location	BH01				
	Depth (m)	5.00 - 5.35				
	Unit	B				
Applied Pressure (kPa)		0 - 50	50 - 100	100 - 200	200 - 400	400 - 200
Mv	m ² /MN	0.58	0.25	0.19	0.11	0.032
Cv	m ² /yr	36	7.8	13	23	73

Notes

Unit: B (Bedrock)

7.1.4 Shear Strength Testing

In order to assess the shear strength characteristics underlying the site, undisturbed samples were collected and dispatched to the laboratory for the following soil property tests:

- 2No. Unconsolidated Undrained Tri-axial (UU)

A summary of the Unconsolidated Undrained Triaxial test results are shown in the table below.

Table 7.5: Summary of Undrained Unconsolidated Triaxial Test Results

Unconsolidated Undrained (UU)	Location	BH01	BH01
	Depth (m)	3.00 - 3.45	5.00 - 5.45
	Unit	B	B
Cell Pressure (kPa)		60	100
Undrained Shear Strength (kPa)		174	253

Notes

Unit: B (Bedrock)

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SECTION 8 Engineering Recommendations

8.1 Preparation of Site

Prior to the main site works, any buildings to be demolished should be subject to a full asbestos survey.

A structural survey should be undertaken of the adjacent buildings and structures (road and pavement structures) including pictorial records. This should be updated throughout the site development phases.

Any existing buildings, foundations, floor slabs, concrete/tarmac hard standings beneath the proposed buildings should be broken up and removed from site and disposed of at a suitable landfill facility.

Alternatively, the crushed site won materials may be re-used as structural fill, subject to laboratory chemical testing and compliance with site soil guidance values.

Significant allowances should be made for dealing with the historic foundations, floor slabs, basement structures and other buried obstructions.

The existing grass and scrub vegetation, including all roots and any trees to be removed (and not subject to preservation orders) should be grubbed up and removed from beneath the proposed buildings and roadways.

The reduced levels should be brought up to the required levels with well, compacted imported granular materials. Department of Transport (DoT) Type 2 sub-base or similar may be used and should be compacted in layers, in accordance with the Specification for Highway Works. Alternatively, appropriate selected inert imported fill could be used.

Allowances should be made for removing any 'soft spots/area' and their replacement with well compacted granular materials as previously described. The excavated materials will be unacceptable as structural fill and should be removed from site and taken to an appropriately licensed tip.

All materials to be removed from site should be subject to the appropriate Waste Acceptance Protocol (WAP) and taken to an appropriately licensed tip.

Contingencies should be made for the protection/diversion of any underground services present beneath the site, brought about as a result of the proposed works.

Contingencies should also be made for the protection and any necessary temporary/permanent support of nearby walls.

8.2 Desiccation Assessment

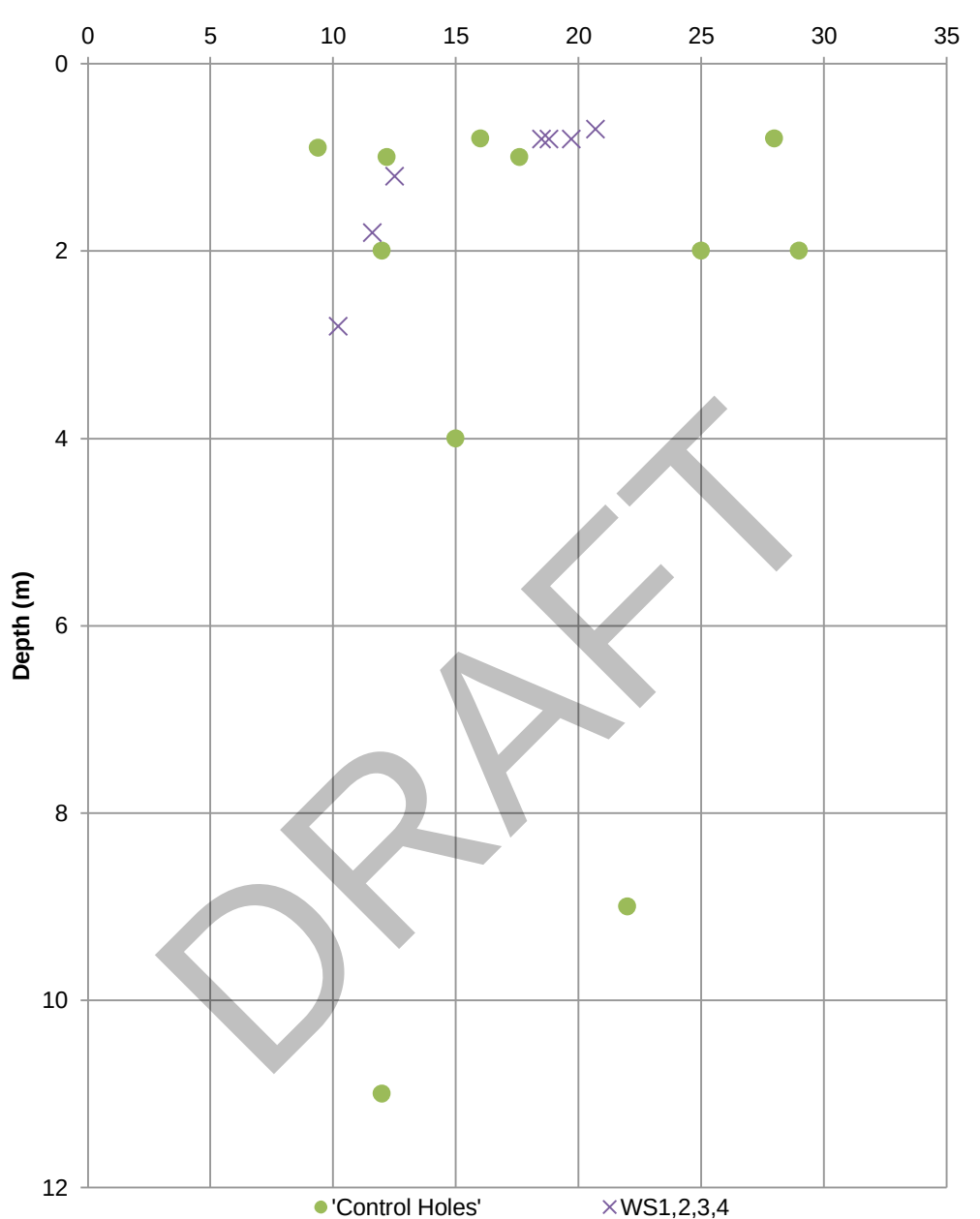
Due to the proximity of mature oak trees in the west of the site, the NHBC guidance recommends a minimum foundation depth of >2.50 m bgl. Further assessment of the extent of soil desiccation at the site has been discussed below.

8.2.1 Soil Water Content

For soils of similar composition, a soil that is desiccated will have a lower moisture content than one that is not. Therefore, moisture contents of a soil suspected to be desiccated can be compared against those of a soil that is not and if there is a notable difference between the two figures at a given depth then this can indicate that the soil is desiccated at this depth.

Exploratory holes WS01, WS02, WS03 and WS04 are located along the western boundary in close proximity to the existing mature trees. The remaining exploratory hole locations are considered 'control' holes to allow an assessment of moisture to be undertaken.

A summary of the moisture contents vs depth for WS01 to WS4 and the 'control holes' is presented below.



The moisture content of the WS01 to WS04 boreholes at 0.70 to 0.80 m bgl was measured to be between 18.5 to 20.7 % with an average of 19.4 %. For the control holes, the moisture content between 0.80 and 1.00 m bgl was measured to be between 9.4 and 28 % with an average of 16 %.

Within WS01 to WS04 the measured moisture content between 1.20 and 2.80 m bgl was between 10.2 and 12.5 % with an average of 11.4%. Within the control holes at 2.00 m bgl the moisture content was measured to be between 12 to 29 % with an average of 22 %.

The results of the moisture content testing show that there is a reduction in moisture content from 1.00 to 2.00 m bgl in the location of the mature trees in the east of the site which corresponds to the root zone of the trees along this boundary.

8.2.2 Summary

Two methodologies have been reviewed to assess if the soils at the site can be considered desiccated. The first of these assessments is a review of the NHBC guidance for constructing foundations near trees which recommended a minimum foundation depth of >2.50 m bgl. The second assessment reviewed the moisture content vs depth of the four exploratory holes located closest to the existing mature trees showed a reduction in moisture contents >3.00 m bgl when compared to the control holes.

8.3 Foundation Solution

The ground conditions from the site investigation can be summarised as follows:

Table 8.1 Summary of Ground Conditions			
Stratum	Depth From (m)	Depth to (m)	Description
Topsoil	0.00	0.05 / 0.30	Grass over brown silty fine to medium SAND with abundant roots and rootlets.
Made Ground	0.05 / 0.30	0.50 / 0.80	- Brown to light brown gravelly, SAND with frequent roots. - Brown slightly gravelly, slightly sandy, clayey SILT. - Firm brown slightly gravelly, sandy CLAY.
Lambeth Group	0.50 / 0.80	>11.35	- Firm to very stiff red/orangish brown mottled grey (slightly sandy, gravelly) CLAY. - Dense slightly clayey SAND

During drilling perched groundwater was encountered between 6.50m and 9.50m bgl. Post investigation monitoring has confirmed groundwater levels between 5.25m and 5.35m bgl.

Due to the presence of mature trees along the western boundary and the presence of desiccated soils associated with these trees, the use of normal mass concrete shallow foundations founded at shallow depth will prove impractical and would lead to structural damage and are, therefore, not recommended.

Therefore, based on the encountered ground conditions, NHBC guidance and BRE 412 regarding desiccation, a piled solution is recommended.

We recommend that a piled foundation solution be founded within the Lambeth Group. Piles should penetrate at least 3.00 metres into the Lambeth Group.

Due to the nature of the ground, the piles are likely to be a combination of skin friction (friction piles) and end-bearing piles.

Based on the nature of the underlying deposits a Continuous Flight Auger (CFA) pile would be most appropriate. However, this technique should be confirmed by specialist piling contractor.

Pile depths will be a function of the required loads and pile diameters. At the time of writing the report, the anticipated loads for the proposed development had not been provided so no pile depths could be given.

The following table gives initial calculations for a 0.15m, 0.30m and 0.45m diameter circular bored piles into the Lambeth Group to be used for preliminary estimation only.

Table 8.2 Preliminary Pile Capacity Values

Depth, m	Ultimate Pile Capacity, kN		
	0.15 m diameter pile	0.30 m diameter pile	0.45 m diameter pile
5.00	85	204	358
7.50	172	392	661
10.00	285	633	1044

Table 8.2 Notes:

1. The Topsoil and Made Ground were ignored when calculating the pile capacity.
2. The following design values were used for the Lambeth Group. 20 kN/m² unit weight, α of 0.50, Nc of 9.00 and F1 of 4.5

Allowances should also be made for negative skin friction that could develop in the cohesive deposits.

It should be noted that while disturbance will be reduced using bored piles the load carrying capacity will also be reduced due to the effect of a loosening annulus around the pile. Casting concrete in situ will produce rough surfaces but this effect is diminished by the loosening of the surrounding material.

To counteract the reduction in load carrying capacity the diameter of the bored pile can be increased.

For the size and type of pile recommended founded within the competent Lambeth Group bedrock, the total settlements should not exceed 10mm, with differential movements between adjacent piles being less than half this value.

The above estimated working loads, type and length of piles should be confirmed by the specialist piling contractor. It may also be prudent to drive a number of test piles at selected locations to confirm their drivability, anticipated lengths and safe working loads.

Allowances should be made for an element of pre-excavation and/or re drilling of piles where obstructions are encountered in the made ground.

All foundation formations should be inspected by a suitably qualified Engineer before being concreted.

8.3.1 Infrastructure

As mentioned in Section 8.3 it is considered that foundations are piled due to the underlying shallow ground conditions.

Therefore, appropriate measures should be taken in order to prevent misalignment issues due to disproportionate settlement between the proposed development and associated infrastructure, which will not be piled.

In addition, it is recommended that for any hard standing or service entry points adjacent the proposed development that the prepared surface should be covered by a geo-grid and 'terram' prior to further infilling, in accordance with Section 8.4, in order to reinforce the formation.

8.3.2 Floor Slabs

Based on Plasticity testing outlined in Section 7.1.1, the underlying shallow deposits exhibit a Modified Plasticity Index of >10%. Therefore, in accordance with NHBC guidelines, floor slabs should be designed as suspended.

Void former may be required beneath suspended concrete floors due to the plastic nature of the surface cohesive soils.

Allowances should be made for the removal of any 'soft spots' and their replacement with a suitable concrete mix or well-compacted granular material in layers to the specification for Highway Works.

All foundation formations should be inspected by a suitably qualified Engineer before being concreted.

8.4 Excavations and Formations

Most shallow excavations should be possible with normal soil excavating machinery, although significant allowances should be made for a hydraulic breaker when excavating out any historic foundations, concrete floor slabs and other buried obstructions.

Post investigation groundwater was encountered between 5.25 and 5.35m bgl.

Therefore, it is unlikely that groundwater may be encountered during foundation excavations. Any inflows should be dealt with using conventional pumping techniques.

It should also be noted that during times of high rainfall a higher groundwater table may be encountered.

The sides of any excavations deeper than 1.00m, especially within the granular deposits, should be supported by planking and strutting or other proprietary means.

The sub-formations/formations will be susceptible to loosening, softening and deterioration by exposure to weather (rain, frost and drying conditions), the action of water (flood water or removal of groundwater) and site traffic.

Formations should never be left unprotected and continuously exposed to rain causing degradation, or left exposed/uncovered overnight, unless permitted by a qualified engineer.

Construction plant and other vehicular traffic should not be operated on unprotected formations. As a minimum the formation/excavation surfaces must be protected by a minimum thickness of 200mm of hard cover immediately after exposure.

Allowances should be made for trimming, re-trimming and re-compaction if necessary and for the removal of soft spots and their replacement with well compacted granular materials.

It is also recommended that if concerns still remain then a number of plate loading tests are carried out at formation level to confirm the suitability of the formations.

Allowances should be made for special precautions to prevent formation deterioration in addition to the above.

It is recommended that approval be gained from a qualified engineer of the formation condition before covering them with any subsequent construction.

8.5 New Access Road and Car Parking Areas

Based on a long-term equilibrium assessment, a conservative CBR value of 2% should be adopted for the site.

Allowances should be made for the removal of any soft spots and their replacement with well-compacted imported granular materials as previously described.

8.6 Storm Drainage

1No. in-situ permeability/soakaway test were undertaken at TP01 in general accordance with the requirements of BRE 365.

The test did not sufficiently drain to 75% to give an infiltration rate. Therefore, it is unlikely soakaways will be viable at the site.

The appropriate calculation sheets are presented in Annex B.

8.7 Protection of Buried Concrete

The results of the BRE testing are given in Table 7.1 and the concrete design is class is summarised in the table below:

Table 8.3: Summary of Concrete Design Class					
	Stratum	MG		B	
	Unit	Min	Max	Min	Max
Total Sulphate	%	0.010	0.055	0.010	0.064
2:1 Sulphate	g/l	0.010	0.013	0.010	0.058
pH	-	8.1	8.4	5.0	8.4
Total Potential Sulphate	%	0.01		0.01	0.03
Oxidisable Sulphates >0.3%?		No		No	
Design Sulphate Class		DS-1		DS-1	
ACEC Class		AC-1s		AC-1s	

Notes

Sample Type: MG (Made Ground), B (Bedrock)

Infiltration tests carried out on the site indicate that the site's near surface soils are of low permeability. As such groundwater is considered to be static.

Based on the above and using guidance within BRE Special Digest 1 (2005) it is recommended that any buried concrete within the site conforms to class DS-1 and ACEC Class AC-1s.

Annex A: Exploratory Hole Logs

Samples and Results					Depth, (Thickness)	Level	Stratum Description	Legend
Results	Type	Depth	Casing	Water				
N=9 (6,5/3,3,1,2)			1.20	Dry	(0.05)	1	Grass over brown silty fine to medium SAND with abundant roots and rootlets. (Topsoil) Light brown, gravelly fine to medium SAND. Gravel is angular to subangular, fine to coarse flint fragments. (Made Ground) <i>0.30 to 0.30m - with occasional pockets of red mottled grey clay and rootlets</i> <i>0.40 to 0.40m - becoming very gravelly. Gravel is fine to coarse, angular to rounded flint and igneous rock aggregate</i> <i>0.50 to 0.50m - with occasional pockets of orangish brown mottled grey clay</i> Firm orangish brown mottled grey, slightly sandy, gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse flint fragments. (Lambeth Group)	
	D	0.30			0.05			
	ES	0.30			(0.75)			
	B	0.50						
	ES	0.50 - 0.70			0.80			
	B	0.90 - 1.20						
	ES	1.00						
D	1.20 - 1.65	2	(2.00)					
SPT(S)	1.20							
N=15 (3,3/3,3,4,5)	D	2.00 - 2.45	2.00	Dry	2			
	SPT(S)	2.00						
blows=60 recovery=100%	U	3.00 - 3.45			3	2.80	Stiff red mottled orangish brown mottled grey CLAY with frequent black specks. (Lambeth Group)	
	D	3.45						
N=25 (3,4/5,6,7,7)	D	4.00 - 4.45	2.20	Dry	4			
	SPT(S)	4.00						
blows=75 recovery=100%	U	5.00 - 5.35			5	(4.60)		
	D	5.35						
	D	6.00			6			
N=30 (2,4/6,6,9,9)	D	6.50 - 6.95	2.20	Seepage	7		6.30 to 7.30m - with occasional to frequent pockets of yellowish brown fine sands	▼
	SPT(S)	6.50						
	D	7.50			8	7.40	Very stiff grey mottled yellowish brown mottled purple CLAY. (Lambeth Group)	
blows=75 recovery=0%	B	8.00 - 8.30			8			
	U	8.00 - 8.30						
	D	9.00			9	(2.10)		
N=37 (3,4/8,8,9,12)	D	9.50 - 9.95	2.20	Dry	9.50		Very stiff greenish grey mottled yellowish brown, slightly gravelly CLAY. Gravel is fine to medium flint fragments. (Lambeth Group)	▼
SPT(S)	9.50							

Samples and Results					Depth, (Thickness)	Level	Stratum Description	Legend
Results	Type	Depth	Casing	Water				
50 (4,10/50 for 195mm)	D	10.50	2.20	Dry	(1.50)		Very stiff greenish grey mottled yellowish brown, slightly gravelly CLAY. Gravel is fine to medium flint fragments. (Lambeth Group) <i>10.00 to 11.00m - becoming slightly sandy with no gravels. Sand is fine to coarse</i>	
	B	10.60 - 10.90						
	D	11.00 - 11.35			11	11.00	Very stiff grey sandy CLAY. Sand is fine to coarse with frequent pockets of calcrete. (Lambeth Group)	
	SPT(S)	11.00				(0.35)		
						11.35	End of Borehole at 11.35m	
						12		
						13		
						14		
						15		
						16		
						17		
						18		
						19		

Samples and Results			Depth, (Thickness)	Level	Stratum Description	Legend
Results	Type	Depth				
			(0.05) 0.05		Grass over dark brown silty fine to medium SAND with abundant roots and rootlets. (Topsoil)	
	ES	0.30			Brown to light brown gravelly, fine to coarse SAND. Gravel is fine to coarse, angular to subangular flint fragments with frequent roots and rootlets. (Made Ground)	
	ES	0.50	(0.75)		0.40 to 0.40m - becoming very gravelly with occasional to frequent cobble size flints 0.50 to 0.50m - with frequent pockets of orangish brown mottled grey clay	
	B D ES	0.80 0.80 1.00	0.80	1	Firm orangish brown mottled grey, slightly sandy, gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse flint fragments. (Lambeth Group)	
	B D	1.20 1.20	(1.20)		1.50 to 1.50m - becoming red mottled grey with no gravels	
	B D	2.00 2.00	2	2.00	Stiff grey mottled red mottled orangish brown slightly silty CLAY. (Lambeth Group)	
			(1.00)		2.80 to 2.80m - becoming grey mottled purple mottled yellowish brown	
	B D	3.00 3.00	3	3.00	End of Trial Pit at 3.00m	
			4			

Samples and Results			Depth, (Thickness)	Level	Stratum Description	Legend
Results	Type	Depth				
			(0.05) 0.05		Grass over dark brown silty fine to medium SAND with abundant roots and rootlets. (Topsoil) Light brown gravelly fine to coarse SAND. Gravel is fine to coarse, angular to subangular flint fragments with frequent roots and rootlets. (Made Ground)	
	ES	0.30				
	ES	0.50	(0.75)		0.40 to 0.40m - becoming very gravelly with frequent cobble size flints 0.50 to 0.50m - with frequent pockets of brown mottled grey clay	
	B D ES	0.80 0.80 1.00	0.80 1		Firm to Stiff grey mottled reddish brown slightly silty CLAY. (Lambeth Group)	
	B D	1.20 1.20	(1.20)		1.20 to 1.20m - becoming grey mottled red	
	B D	2.00 2.00	2 2.00		Stiff grey mottled purple mottled yellowish brown CLAY. (Lambeth Group)	
			(1.00)			
	B D	3.00 3.00	3 3.00		2.80 to 2.80m - becoming dark grey mottled purple End of Trial Pit at 3.00m	
			4			

Samples and Results			Depth, (Thickness)	Level	Stratum Description	Legend
Results	Type	Depth				
N=22 (3,4/3,4,7,8) 50 (25 for 115mm/50 for 190mm)			(0.30)		Grass over dark brown silty fine to medium SAND with abundant roots and rootlets. (Topsoil)	
	ES	0.30	0.30		Firm brown slightly gravelly, sandy CLAY. Sand is fine to medium. Gravel is fine to coarse of flint, red brick and occasional ceramic fragments. (Made Ground)	
	ES	0.50	(0.50)			
	B D	0.80	0.80		Firm brown mottled grey slightly sandy, gravelly CLAY. Sand is fine to medium. Gravel is fine to coarse, angular to subangular of flint. (Lambeth Group)	
	SPT(S)	1.00	1			
	B	1.20 - 1.50	(0.70)		1.10 to 1.50m - becoming sandy and very gravelly. Sand is fine to coarse. Gravel is fine to coarse, angular to subangular of flint.	
	SPT(C)	1.50	1.50		End of Borehole at 1.50m	
			2			
			3			
			4			
			5			
			6			

Samples and Results			Depth, (Thickness)	Level	Stratum Description	Legend
Results	Type	Depth				
N=32 (2,3/4,6,8,14)			(0.30)		Grass over dark brown silty fine to medium SAND with abundant roots and rootlets. (Topsoil)	
	ES	0.30	0.30		Firm brown slightly gravelly, sandy CLAY. Sand is fine to medium. Gravel is fine to coarse of flint, red brick and occasional ceramic fragments. (Made Ground)	
	ES	0.50	(0.50)			
	B	0.80	0.80		Firm brown mottled grey slightly sandy, gravelly CLAY. Sand is fine to medium. Gravel is fine to coarse, angular to subangular of flint. (Lambeth Group)	
	D	0.80 - 1.00	1			
	ES	1.00	(0.70)		1.10 to 1.50m - becoming sandy and very gravelly. Sand is fine to coarse. Gravel is fine to coarse, angular to subangular of flint.	
50 (25 for 85mm/50 for 115mm)	SPT(C)	1.00				
	B	1.20 - 1.50				
	SPT(C)	1.50	1.50		End of Borehole at 1.50m	
			2			
			3			
			4			
			5			
			6			

Samples and Results			Depth, (Thickness)	Level	Stratum Description	Legend
Results	Type	Depth				
N=51 (4,8/8,12,14,17)			(0.20)		Grass over dark brown silty fine to medium SAND with abundant roots and rootlets. (Topsoil)	
	ES	0.30	0.20		Brown slightly gravelly, slightly sandy, clayey SILT. Sand is fine to medium. Gravel is fine to coarse of flint, red brick and occasional ceramic fragments. (Made Ground)	
	ES	0.50	(0.50)		0.50 to 7.00m - with occasional pockets of firm brown clay.	
	B	0.80	0.70		Firm brown mottled grey slightly sandy, gravelly CLAY. Sand is fine to medium. Gravel is fine to coarse, angular to subangular of flint. (Lambeth Group)	
	D	0.80 - 1.00				
	ES	1.00	1		1.00 to 1.50m - becoming sandy and very gravelly. Sand is fine to coarse. Gravel is fine to coarse, angular to subangular of flint.	
	SPT(C)	1.00	(0.80)			
	B	1.20 - 1.50				
50 (25 for 130mm/50 for 190mm)	SPT(C)	1.50	1.50		End of Borehole at 1.50m	
			2			
			3			
			4			
			5			
			6			

Samples and Results			Depth, (Thickness)	Level	Stratum Description	Legend
Results	Type	Depth				
N=28 (6,9/8,6,7,7)			(0.20)		Grass over dark brown silty fine to medium SAND with abundant roots and rootlets. (Topsoil)	
			0.20			
	ES	0.30			Firm brown slightly gravelly, sandy CLAY. Sand is fine to medium. Gravel is fine to coarse of flint, red brick and occasional ceramic fragments. (Made Ground)	
	ES	0.50	(0.50)			
	D	0.70		0.70		
	B	0.80 - 1.00			Firm brown mottled grey slightly sandy, gravelly CLAY. Sand is fine to medium. Gravel is fine to coarse, angular to subangular of flint. (Lambeth Group)	
N=50 (5,8/50 for 295mm)	ES	1.00	1	(0.50)		
	SPT(C)	1.00			1.00 to 1.20m - becoming very gravelly. Gravel is fine to coarse, angular to subangular of flint.	
	D	1.20		1.20		
					Firm red mottled grey mottled orangish brown sandy CLAY. (Lambeth Group)	
	B	1.80 - 2.00				
N=50 (6,9/50 for 265mm)	SPT(C)	2.00	2			
				(2.10)		
	B	2.80 - 3.00				
	SPT(C)	3.00	3		3.00 to 3.30m - becoming very sandy	
				3.30 (0.20)	Grey mottled red, slightly clayey fine to medium SAND (Lambeth Group)	
	D	3.50		3.50		
					End of Borehole at 3.50m	
				4		
				5		
				6		

Samples and Results			Depth, (Thickness)	Level	Stratum Description	Legend		
Results	Type	Depth						
N=7 (3,4/3,1,2,1)	ES	0.30	(0.30)		Grass over dark brown silty fine to medium SAND with abundant roots and rootlets. (Topsoil)			
			0.30					
	ES	0.50	(0.20)		Firm brown slightly gravelly, sandy CLAY. Sand is fine to medium. Gravel is fine to coarse of flint, red brick and occasional ceramic fragments. (Made Ground)			
			0.50		Firm brown mottled grey mottled red slightly sandy, gravelly CLAY. Sand is fine to medium. Gravel is fine to coarse, angular to subangular of flint. (Lambeth Group)			
			(0.70)					
			1					
	D ES SPT(C)	1.00						
		1.00	1.20		1.00 to 1.20m - becoming very gravelly. Gravel is fine to coarse, angular to subangular of flint.			
		1.00			Firm red mottled grey mottled orangish brown sandy CLAY. (Lambeth Group)			
	N=12 (1,2/2,3,3,4)	D SPT(S)	2.00		2			
2.00								
N=17 (2,3/3,4,4,6)	D SPT(S)	3.00	3	(3.80)				
		3.00						
N=22 (3,3/4,5,5,8)	D SPT(S)	4.00	4					
		4.00						
N=29 (4,5/6,7,8,8)	D SPT(S)	5.00	5	5.00	End of Borehole at 5.00m			
		5.00						

Samples and Results			Depth, (Thickness)	Level	Stratum Description	Legend
Results	Type	Depth				
N=19 (2,2/4,6,4,5)	ES	0.30	(0.20)		Grass over dark brown silty fine to medium SAND with abundant roots and rootlets. (Topsoil)	
			0.20		Firm brown slightly gravelly, sandy CLAY. Sand is fine to medium. Gravel is fine to coarse of flint, red brick and occasional ceramic fragments. (Made Ground)	
	ES	0.50	(0.60)			
	D ES SPT(S)	1.00 1.00 1.00	0.80		Firm red mottled yellow, mottled grey slightly sandy CLAY. Sand is fine to medium with occasional angular to subangular fine to medium flint gravels. (Lambeth Group)	
			1		1.00 to 3.20m - with no gravels	
N=13 (3,2/3,3,3,4)	D SPT(S)	2.00 2.00	2	(2.40)		
N=24 (4,4/4,6,7,7)	D SPT(S)	3.00 3.00	3			
N=31 (7,8/8,8,7,8)	D SPT(S)	4.00 4.00	3.20		Yellowish brown mottled greenish grey slightly clayey, fine to medium SAND. (Lambeth Group)	
			4			
			(1.80)			
N=36 (7,7/8,9,9,10)	D SPT(S)	5.00 5.00	5	5.00	4.80 to 5.00m - becoming very clayey	
					End of Borehole at 5.00m	
			6			

Annex B: In-situ Test Results

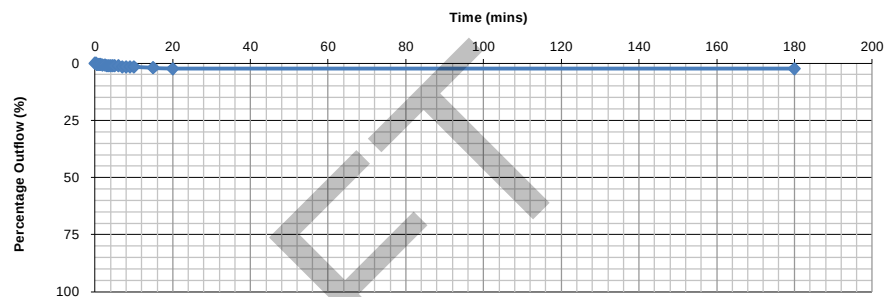
Site Name: Robin Gardens
Trial Pit No.: TP01

Job No.: PO-22-040
Engineer: JI

Date Undertaken: 16/08/2022

TEST NUMBER: T1
VP25 (mBGL): 1.1175
VP75 (mBGL): 2.3725
VP25 (Mins): #NUM!
VP27 (Mins): #DIV/0!

INFILTRATION RATE (m/s): N/A



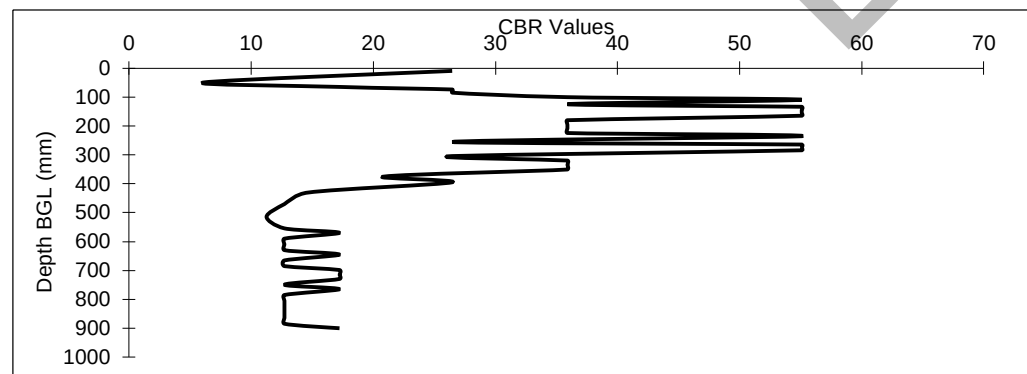
REMARKS: Test carried out in accordance with BRE Digest 365 (2016)

In-situ CBR by TRL DCP

TRRL Road Transport, Note 8

Project Name	Robin Gardens Waterlooilles	Date	16/08/2022	Soil	Brown to light brown gravelly, fine to
Project No.	PO-22-040	Location/ Test No.	DCP01	Description	coarse SAND.

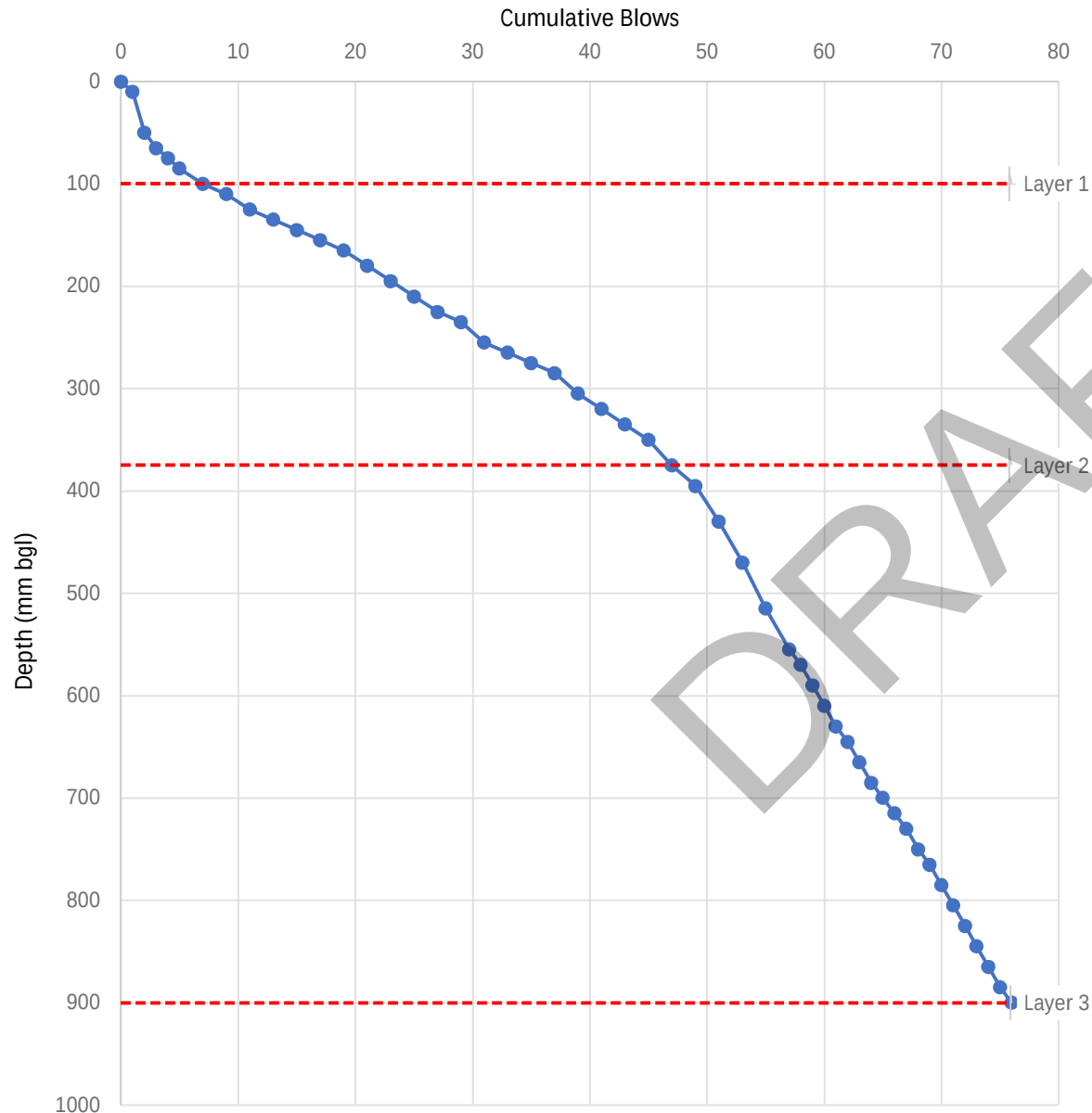
Depth of Test below ground level (mm): 0														
CBR Value %	Depth Below Ground Level (mm)	mm per blow	Blows	Reading on Scale (mm)	CBR Value %	Depth Below Ground Level (mm)	mm per blow	Blows	Reading on Scale (mm)	CBR Value %	Depth Below Ground Level (mm)	mm per blow	Blows	Reading on Scale (mm)
26.5	0	10.0	0	55	26.5	255	10.0	2	310	17.3	645	15.0	1	700
6.1	10	40.0	1	65	55.1	265	5.0	2	320	12.7	665	20.0	1	720
17.3	50	15.0	1	105	55.1	275	5.0	2	330	12.7	685	20.0	1	740
26.5	65	10.0	1	120	55.1	285	5.0	2	340	17.3	700	15.0	1	755
26.5	75	10.0	1	130	26.5	305	10.0	2	360	17.3	715	15.0	1	770
35.9	85	7.5	2	140	35.9	320	7.5	2	375	17.3	730	15.0	1	785
55.1	100	5.0	2	155	35.9	335	7.5	2	390	12.7	750	20.0	1	805
35.9	110	5.0	2	165	35.9	350	7.5	2	405	17.3	765	15.0	1	820
55.1	125	7.5	2	180	20.9	375	12.5	2	430	12.7	785	20.0	1	840
55.1	135	5.0	2	190	26.5	395	10.0	2	450	12.7	805	20.0	1	860
55.1	145	5.0	2	200	14.7	430	17.5	2	485	12.7	825	20.0	1	880
55.1	155	5.0	2	210	12.7	470	20.0	2	525	12.7	845	20.0	1	900
55.1	165	5.0	2	220	11.2	515	22.5	2	570	12.7	865	20.0	1	920
35.9	180	7.5	2	235	12.7	555	20.0	2	610	12.7	885	20.0	1	940
35.9	195	7.5	2	250	17.3	570	15.0	1	625	17.3	900	15.0	1	955
35.9	210	7.5	2	265	12.7	590	20.0	1	645					
35.9	225	7.5	2	280	12.7	610	20.0	1	665					
55.1	235	5.0	2	290	12.7	630	20.0	1	685					



In-situ CBR by TRL DCP

TRRL Road Transport, Note 8

Blows vs Depth



Layer Depth (mm bgl)	CBR Value
Layer 1 Base: 100	18.17
Layer 2 Base: 375	39.36
Layer 3 Base: 900	14.14

CBR value calculated from layers identified in cumulative blows per depth graph in accordance with CS229

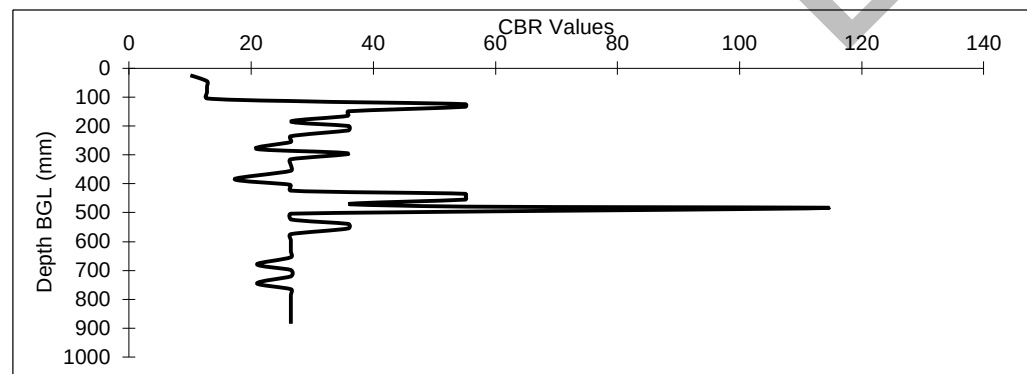


In-situ CBR by TRL DCP

TRRL Road Transport, Note 8

Project Name	Robin Gardens Waterlooilles	Date	16/08/2022	Soil Description	Light brown gravelly fine to coarse SAND.
Project No.	PO-22-040	Location/ Test No.	DCP02		

Depth of Test below ground level (mm): 0														
CBR Value %	Depth Below Ground Level (mm)	mm per blow	Blows	Reading on Scale (mm)	CBR Value %	Depth Below Ground Level (mm)	mm per blow	Blows	Reading on Scale (mm)	CBR Value %	Depth Below Ground Level (mm)	mm per blow	Blows	Reading on Scale (mm)
10.1	0	25.0	0	55	26.5	315	10.0	2	370	26.5	615	10.0	2	670
12.7	25	20.0	1	80	26.5	335	10.0	2	390	26.5	635	10.0	2	690
12.7	45	20.0	1	100	26.5	355	10.0	2	410	26.5	655	10.0	2	710
12.7	65	20.0	1	120	17.3	385	15.0	2	440	20.9	680	12.5	2	735
12.7	85	20.0	1	140	26.5	405	10.0	2	460	26.5	700	10.0	2	755
12.7	105	20.0	1	160	26.5	425	10.0	2	480	26.5	720	10.0	2	775
26.5	115	10.0	1	170	55.1	435	5.0	2	490	20.9	745	12.5	2	800
55.1	125	5.0	2	180	55.1	445	5.0	2	500	26.5	765	10.0	2	820
55.1	135	5.0	2	190	55.1	455	5.0	2	510	26.5	785	10.0	2	840
35.9	150	7.5	2	205	35.9	470	7.5	2	525	26.5	805	10.0	2	860
35.9	165	7.5	2	220	55.1	480	5.0	2	535	26.5	825	10.0	2	880
26.5	185	10.0	2	240	114.7	485	2.5	2	540	26.5	845	10.0	2	900
35.9	200	7.5	2	255	26.5	505	10.0	2	560	26.5	865	10.0	2	920
35.9	215	7.5	2	270	26.5	525	10.0	2	580	26.5	885	10.0	2	940
26.5	235	10.0	2	290	35.9	540	7.5	2	595					
26.5	255	10.0	2	310	35.9	555	7.5	2	610					
20.9	280	12.5	2	335	26.5	575	10.0	2	630					
35.9	295	7.5	2	350	26.5	595	10.0	2	650					

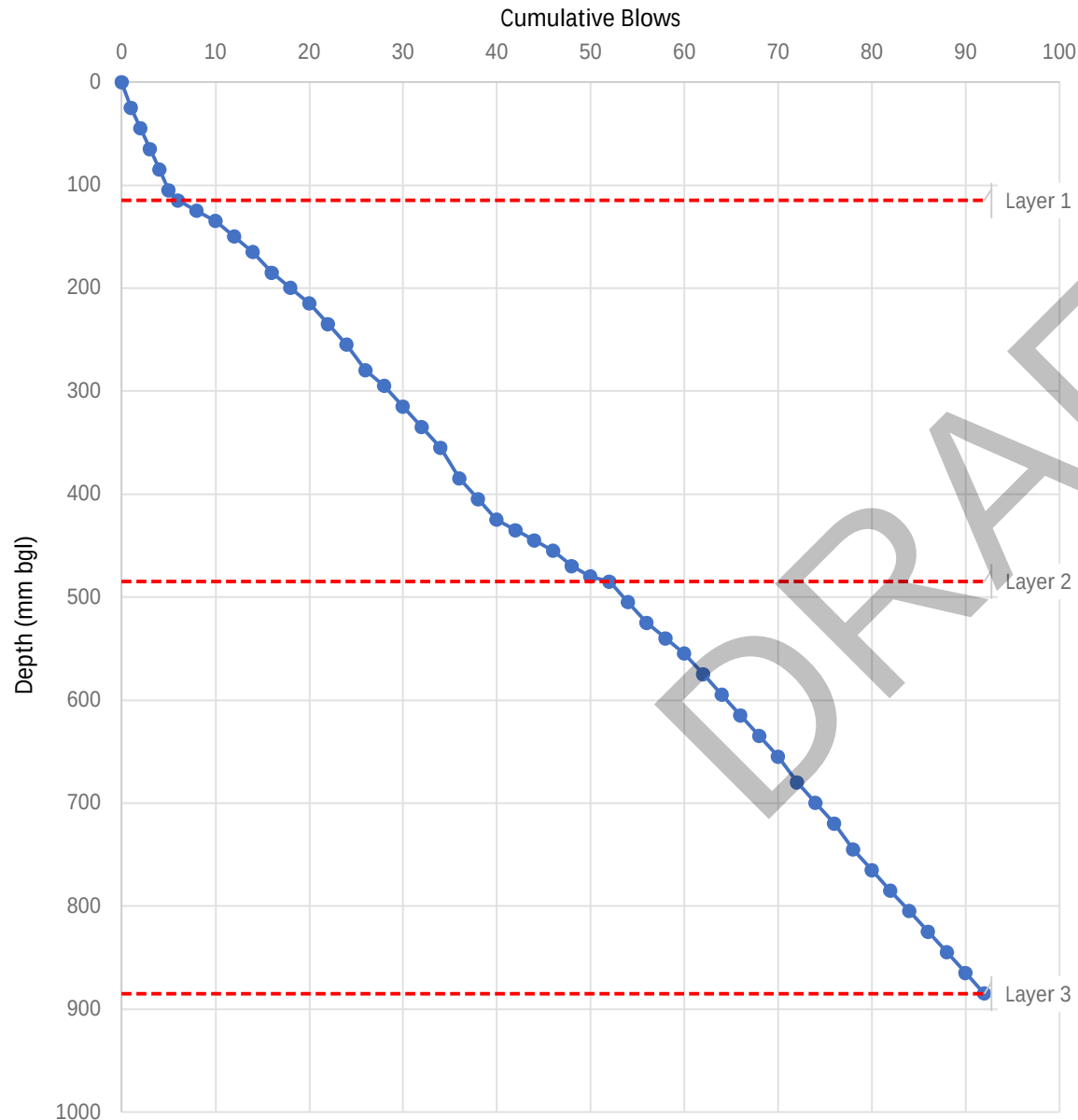



terrafirma(south)

In-situ CBR by TRL DCP

TRRL Road Transport, Note 8

Blows vs Depth



Layer Depth (mm bgl)	CBR Value
Layer 1 Base: 115	13.32
Layer 2 Base: 485	33.34
Layer 3 Base: 885	26.49

CBR value calculated from layers identified in cumulative blows per depth graph in accordance with CS229



Annex C: Chemical Test Results



Amended Report

Report No.: 22-32884-2

Initial Date of Issue: 05-Sep-2022 **Date of Re-Issue:** 15-Sep-2022

Client: Terra Firma

Client Address: t/a Terra Firma
The Slate Barn
Lower Lowley
Dunsford
Devon
EX6 7BP

Contact(s): Info

Project: PO-22-040 Robin Gardens,
Waterlooville

Quotation No.: **Date Received:** 30-Aug-2022

Order No.: PO-22-040 **Date Instructed:** 30-Aug-2022

No. of Samples: 7

Turnaround (Wkdays): 11 **Results Due:** 13-Sep-2022

Date Approved: 15-Sep-2022

Approved By: [Redacted Signature]

Details: Stuart Henderson, Technical Manager

Results - Soil

Project: PO-22-040 Robin Gardens, Waterloooville

Client: Terra Firma	Chemtest Job No.:				22-32884	22-32884	22-32884	22-32884	22-32884	22-32884	22-32884
Quotation No.:	Chemtest Sample ID.:				1495901	1495902	1495903	1495905	1495906	1495908	1495909
Order No.: PO-22-040	Client Sample Ref.:				3	2	1	2	1	1	2
	Sample Location:				BH01	BH01	BH01	TP01	TP01	TP02	TP02
	Sample Type:				SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
	Top Depth (m):				1.0	0.5	0.3	0.5	0.3	0.3	0.5
	Asbestos Lab:				DURHAM	DURHAM	DURHAM		DURHAM	DURHAM	DURHAM
Determinand	Accred.	SOP	Units	LOD							
ACM Type	U	2192		N/A	-	-	-		-	-	-
Asbestos Identification	U	2192		N/A	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected		No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
Moisture	N	2030	%	0.020	7.1	11	8.0	11	6.8	7.5	13
pH	M	2010		4.0	[A] 8.7	[A] 8.4	[A] 8.2		[A] 8.4	[A] 8.4	[A] 6.9
pH (2.5:1)	N	2010		4.0		[A] 8.7					
Electrical Conductivity (2:1)	N	2020	µS/cm	1.0	[A] 2700						
Magnesium (Water Soluble)	N	2120	g/l	0.010		[A] < 0.010					
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010		[A] < 0.010					
Redox Potential	N	2150	mV	N/A	69						
Chloride (Water Soluble)	M	2220	g/l	0.010		[A] < 0.010					
Nitrate (Water Soluble)	N	2220	g/l	0.010		< 0.010					
Cyanide (Total)	M	2300	mg/kg	0.50	[A] < 0.50	[A] < 0.50	[A] < 0.50		[A] < 0.50	[A] < 0.50	[A] < 0.50
Sulphate (Total)	U	2430	%	0.010	[A] 0.010	[A] 0.016	[A] 0.021		[A] 0.023	[A] 0.031	[A] 0.043
Arsenic	M	2455	mg/kg	0.5	5.4	14	10		29	14	8.9
Cadmium	M	2455	mg/kg	0.10	< 0.10	< 0.10	< 0.10		< 0.10	< 0.10	< 0.10
Chromium	M	2455	mg/kg	0.5	13	36	24		48	38	36
Copper	M	2455	mg/kg	0.50	5.4	6.8	4.8		8.2	5.6	10
Mercury	M	2455	mg/kg	0.05	< 0.05	< 0.05	< 0.05		< 0.05	< 0.05	< 0.05
Nickel	M	2455	mg/kg	0.50	5.1	6.1	4.8		10	7.7	10
Lead	M	2455	mg/kg	0.50	4.9	9.8	15		29	13	8.1
Selenium	M	2455	mg/kg	0.25	0.25	0.25	< 0.25		0.78	0.52	0.48
Zinc	M	2455	mg/kg	0.50	11	18	17		32	32	31
Chromium (Trivalent)	N	2490	mg/kg	1.0	13	36	24		48	38	36
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50		< 0.50	< 0.50	< 0.50
Organic Matter	M	2625	%	0.40	[A] < 0.40	[A] 1.1	[A] 1.6		[A] 1.8	[A] 1.3	[A] 0.53
Total TPH >C6-C40	M	2670	mg/kg	10	[A] < 10	[A] < 10	[A] < 10		[A] < 10	[A] < 10	[A] < 10
Aliphatic TPH >C5-C6	N	2680	mg/kg	0.010	[A] < 0.010						
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Aliphatic TPH >C6-C8	N	2680	mg/kg	0.010	[A] < 0.010						
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Aliphatic TPH >C8-C10	N	2680	mg/kg	0.10	[A] < 0.10						
Aliphatic TPH >C8-C10	M	2680	mg/kg	1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Aliphatic TPH >C10-C12	N	2680	mg/kg	0.10	[A] < 0.10						
Aliphatic TPH >C10-C12	M	2680	mg/kg	1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Aliphatic TPH >C12-C16	N	2680	mg/kg	0.10	[A] < 0.10						
Aliphatic TPH >C12-C16	M	2680	mg/kg	1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Aliphatic TPH >C16-C21	N	2680	mg/kg	0.10	[A] < 0.10						
Aliphatic TPH >C16-C21	M	2680	mg/kg	1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0

Results - Soil

Project: PO-22-040 Robin Gardens, Waterloo

Client: Terra Firma	Chemtest Job No.:				22-32884	22-32884	22-32884	22-32884	22-32884	22-32884	22-32884
Quotation No.:	Chemtest Sample ID.:				1495901	1495902	1495903	1495905	1495906	1495908	1495909
Order No.: PO-22-040	Client Sample Ref.:				3	2	1	2	1	1	2
	Sample Location:				BH01	BH01	BH01	TP01	TP01	TP02	TP02
	Sample Type:				SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
	Top Depth (m):				1.0	0.5	0.3	0.5	0.3	0.3	0.5
	Asbestos Lab:				DURHAM	DURHAM	DURHAM		DURHAM	DURHAM	DURHAM
Determinand	Accred.	SOP	Units	LOD							
Aliphatic TPH >C21-C35	N	2680	mg/kg	0.10	[A] < 0.10						
Aliphatic TPH >C21-C35	M	2680	mg/kg	1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Aliphatic TPH >C35-C44	N	2680	mg/kg	0.10	[A] < 0.10						
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Total Aliphatic Hydrocarbons	N	2680	mg/kg	1.0	[A] < 1.0						
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0		[A] < 5.0	[A] < 5.0	[A] < 5.0	[A] < 5.0	[A] < 5.0	[A] < 5.0
Aromatic TPH >C5-C7	N	2680	mg/kg	0.010	[A] < 0.010						
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Aromatic TPH >C7-C8	N	2680	mg/kg	0.010	[A] < 0.010						
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Aromatic TPH >C8-C10	N	2680	mg/kg	0.10	[A] < 0.10						
Aromatic TPH >C8-C10	M	2680	mg/kg	1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Aromatic TPH >C10-C12	N	2680	mg/kg	0.10	[A] < 0.10						
Aromatic TPH >C10-C12	M	2680	mg/kg	1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Aromatic TPH >C12-C16	N	2680	mg/kg	0.10	[A] < 0.10						
Aromatic TPH >C12-C16	M	2680	mg/kg	1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Aromatic TPH >C16-C21	N	2680	mg/kg	0.10	[A] < 0.10						
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Aromatic TPH >C21-C35	N	2680	mg/kg	0.10	[A] < 0.10						
Aromatic TPH >C21-C35	M	2680	mg/kg	1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Aromatic TPH >C35-C44	N	2680	mg/kg	0.10	[A] < 0.10						
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Total Aromatic Hydrocarbons	N	2680	mg/kg	1.0	[A] < 1.0						
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0		[A] < 5.0	[A] < 5.0	[A] < 5.0	[A] < 5.0	[A] < 5.0	[A] < 5.0
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0		[A] < 10	[A] < 10	[A] < 10	[A] < 10	[A] < 10	[A] < 10
Total Petroleum Hydrocarbons	N	2680	mg/kg	2.0	[A] < 2.0						
Naphthalene	M	2700	mg/kg	0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10		[A] < 0.10	[A] < 0.10	[A] < 0.10
Acenaphthylene	M	2700	mg/kg	0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10		[A] < 0.10	[A] < 0.10	[A] < 0.10
Acenaphthene	M	2700	mg/kg	0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10		[A] < 0.10	[A] < 0.10	[A] < 0.10
Fluorene	M	2700	mg/kg	0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10		[A] < 0.10	[A] < 0.10	[A] < 0.10
Phenanthrene	M	2700	mg/kg	0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10		[A] < 0.10	[A] < 0.10	[A] < 0.10
Anthracene	M	2700	mg/kg	0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10		[A] < 0.10	[A] < 0.10	[A] < 0.10
Fluoranthene	M	2700	mg/kg	0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10		[A] < 0.10	[A] < 0.10	[A] < 0.10
Pyrene	M	2700	mg/kg	0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10		[A] < 0.10	[A] < 0.10	[A] < 0.10
Benzo[a]anthracene	M	2700	mg/kg	0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10		[A] < 0.10	[A] < 0.10	[A] < 0.10
Chrysene	M	2700	mg/kg	0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10		[A] < 0.10	[A] < 0.10	[A] < 0.10
Benzo[b]fluoranthene	M	2700	mg/kg	0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10		[A] < 0.10	[A] < 0.10	[A] < 0.10
Benzo[k]fluoranthene	M	2700	mg/kg	0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10		[A] < 0.10	[A] < 0.10	[A] < 0.10
Benzo[a]pyrene	M	2700	mg/kg	0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10		[A] < 0.10	[A] < 0.10	[A] < 0.10

Results - Soil

Project: PO-22-040 Robin Gardens, Waterloooville

Client: Terra Firma	Chemtest Job No.:				22-32884	22-32884	22-32884	22-32884	22-32884	22-32884	22-32884
Quotation No.:	Chemtest Sample ID.:				1495901	1495902	1495903	1495905	1495906	1495908	1495909
Order No.: PO-22-040	Client Sample Ref.:				3	2	1	2	1	1	2
	Sample Location:				BH01	BH01	BH01	TP01	TP01	TP02	TP02
	Sample Type:				SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
	Top Depth (m):				1.0	0.5	0.3	0.5	0.3	0.3	0.5
	Asbestos Lab:				DURHAM	DURHAM	DURHAM		DURHAM	DURHAM	DURHAM
Determinand	Accred.	SOP	Units	LOD							
Indeno(1,2,3-c,d)Pyrene	M	2700	mg/kg	0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10		[A] < 0.10	[A] < 0.10	[A] < 0.10
Dibenz(a,h)Anthracene	M	2700	mg/kg	0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10		[A] < 0.10	[A] < 0.10	[A] < 0.10
Benzo[g,h,i]perylene	M	2700	mg/kg	0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10		[A] < 0.10	[A] < 0.10	[A] < 0.10
Total Of 16 PAH's	M	2700	mg/kg	2.0	[A] < 2.0	[A] < 2.0	[A] < 2.0		[A] < 2.0	[A] < 2.0	[A] < 2.0
Dichlorodifluoromethane	N	2760	µg/kg	0.20	[A] < 0.20						
Chloromethane	N	2760	µg/kg	0.20	[A] 0.24						
Vinyl Chloride	N	2760	µg/kg	0.20	[A] < 0.20						
Bromomethane	N	2760	µg/kg	0.20	[A] < 0.20						
Chloroethane	N	2760	µg/kg	0.20	[A] < 0.20						
Trichlorofluoromethane	N	2760	µg/kg	0.20	[A] < 0.20						
1,1-Dichloroethene	N	2760	µg/kg	0.20	[A] < 0.20						
Trans 1,2-Dichloroethene	N	2760	µg/kg	0.20	[A] < 0.20						
1,1-Dichloroethane	N	2760	µg/kg	0.20	[A] < 0.20						
cis 1,2-Dichloroethene	N	2760	µg/kg	0.20	[A] < 0.20						
Bromochloromethane	N	2760	µg/kg	0.50	[A] < 0.50						
Trichloromethane	N	2760	µg/kg	0.20	[A] < 0.20						
1,1,1-Trichloroethane	N	2760	µg/kg	0.20	[A] < 0.20						
Tetrachloromethane	N	2760	µg/kg	0.20	[A] < 0.20						
1,1-Dichloropropene	N	2760	µg/kg	0.20	[A] < 0.20						
Benzene	N	2760	µg/kg	0.20	[A] < 0.20						
Benzene	M	2760	µg/kg	1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
1,2-Dichloroethane	N	2760	µg/kg	0.20	[A] < 0.20						
Trichloroethene	N	2760	µg/kg	0.20	[A] < 0.20						
1,2-Dichloropropane	N	2760	µg/kg	0.20	[A] < 0.20						
Dibromomethane	N	2760	µg/kg	0.20	[A] < 0.20						
Bromodichloromethane	N	2760	µg/kg	0.20	[A] < 0.20						
cis-1,3-Dichloropropene	N	2760	µg/kg	0.20	[A] < 0.20						
Toluene	N	2760	µg/kg	0.20	[A] 0.54						
Toluene	M	2760	µg/kg	1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Trans-1,3-Dichloropropene	N	2760	µg/kg	0.20	[A] < 0.20						
1,1,2-Trichloroethane	N	2760	µg/kg	0.20	[A] < 0.20						
Tetrachloroethene	N	2760	µg/kg	0.20	[A] < 0.20						
1,3-Dichloropropane	N	2760	µg/kg	0.20	[A] < 0.20						
Dibromochloromethane	N	2760	µg/kg	0.20	[A] < 0.20						
1,2-Dibromoethane	N	2760	µg/kg	0.20	[A] < 0.20						
Chlorobenzene	N	2760	µg/kg	0.20	[A] < 0.20						
1,1,1,2-Tetrachloroethane	N	2760	µg/kg	0.20	[A] < 0.20						
Ethylbenzene	N	2760	µg/kg	0.20	[A] 0.48						
Ethylbenzene	M	2760	µg/kg	1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0

Results - Soil

Project: PO-22-040 Robin Gardens, Waterloooville

Client: Terra Firma	Chemtest Job No.:				22-32884	22-32884	22-32884	22-32884	22-32884	22-32884	22-32884
Quotation No.:	Chemtest Sample ID.:				1495901	1495902	1495903	1495905	1495906	1495908	1495909
Order No.: PO-22-040	Client Sample Ref.:				3	2	1	2	1	1	2
	Sample Location:				BH01	BH01	BH01	TP01	TP01	TP02	TP02
	Sample Type:				SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
	Top Depth (m):				1.0	0.5	0.3	0.5	0.3	0.3	0.5
	Asbestos Lab:				DURHAM	DURHAM	DURHAM		DURHAM	DURHAM	DURHAM
Determinand	Accred.	SOP	Units	LOD							
m & p-Xylene	N	2760	µg/kg	0.20	[A] 1.8						
m & p-Xylene	M	2760	µg/kg	1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
o-Xylene	N	2760	µg/kg	0.20	[A] 0.79						
o-Xylene	M	2760	µg/kg	1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Styrene	N	2760	µg/kg	0.20	[A] < 0.20						
Tribromomethane	N	2760	µg/kg	0.20	[A] < 0.20						
Isopropylbenzene	N	2760	µg/kg	0.20	[A] < 0.20						
Bromobenzene	N	2760	µg/kg	0.20	[A] < 0.20						
1,2,3-Trichloropropane	N	2760	µg/kg	0.20	[A] < 0.20						
2-Chlorotoluene	N	2760	µg/kg	0.20	[A] < 0.20						
1,3,5-Trimethylbenzene	N	2760	µg/kg	0.20	[A] < 0.20						
4-Chlorotoluene	N	2760	µg/kg	0.20	[A] < 0.20						
Tert-Butylbenzene	N	2760	µg/kg	0.20	[A] < 0.20						
1,2,4-Trimethylbenzene	N	2760	µg/kg	0.20	[A] 0.60						
Sec-Butylbenzene	N	2760	µg/kg	0.20	[A] 0.32						
1,3-Dichlorobenzene	N	2760	µg/kg	0.20	[A] < 0.20						
4-Isopropyltoluene	N	2760	µg/kg	0.20	[A] < 0.20						
1,4-Dichlorobenzene	N	2760	µg/kg	0.20	[A] < 0.20						
N-Butylbenzene	N	2760	µg/kg	0.20	[A] < 0.20						
1,2-Dichlorobenzene	N	2760	µg/kg	0.20	[A] < 0.20						
1,2-Dibromo-3-Chloropropane	N	2760	µg/kg	0.20	[A] < 0.20						
1,2,4-Trichlorobenzene	N	2760	µg/kg	0.20	[A] < 0.20						
Hexachlorobutadiene	N	2760	µg/kg	0.20	[A] < 0.20						
1,2,3-Trichlorobenzene	N	2760	µg/kg	0.20	[A] < 0.20						
Carbon Disulphide	N	2760	µg/kg	0.20	[A] < 0.20						
Methyl Tert-Butyl Ether	N	2760	µg/kg	0.20	[A] < 0.20						
Methyl Tert-Butyl Ether	M	2760	µg/kg	1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Aldehydes	N	2780	mg/kg	0.10	< 0.10						
Amines	N	2780	mg/kg	10.00	< 10						
Ethers	N	2780	mg/kg	0.010	< 0.010						
Ketones	N	2780	mg/kg	0.10	< 0.10						
N-Nitrosodimethylamine	N	2790	mg/kg	0.050	[A] < 0.050						
Phenol	N	2790	mg/kg	0.050	[A] < 0.050						
2-Chlorophenol	N	2790	mg/kg	0.050	[A] < 0.050						
Bis-(2-Chloroethyl)Ether	N	2790	mg/kg	0.050	[A] < 0.050						
1,3-Dichlorobenzene	N	2790	mg/kg	0.050	[A] < 0.050						
1,4-Dichlorobenzene	N	2790	mg/kg	0.050	[A] < 0.050						
1,2-Dichlorobenzene	N	2790	mg/kg	0.050	[A] < 0.050						
2-Methylphenol	N	2790	mg/kg	0.050	[A] < 0.050						

Results - Soil

Project: PO-22-040 Robin Gardens, Waterloo

Client: Terra Firma	Chemtest Job No.:				22-32884	22-32884	22-32884	22-32884	22-32884	22-32884	22-32884
Quotation No.:	Chemtest Sample ID.:				1495901	1495902	1495903	1495905	1495906	1495908	1495909
Order No.: PO-22-040	Client Sample Ref.:				3	2	1	2	1	1	2
	Sample Location:				BH01	BH01	BH01	TP01	TP01	TP02	TP02
	Sample Type:				SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
	Top Depth (m):				1.0	0.5	0.3	0.5	0.3	0.3	0.5
	Asbestos Lab:				DURHAM	DURHAM	DURHAM		DURHAM	DURHAM	DURHAM
Determinand	Accred.	SOP	Units	LOD							
Bis(2-Chloroisopropyl)Ether	N	2790	mg/kg	0.050	[A] < 0.050						
Hexachloroethane	N	2790	mg/kg	0.050	[A] < 0.050						
N-Nitrosodi-n-propylamine	N	2790	mg/kg	0.050	[A] < 0.050						
4-Methylphenol	N	2790	mg/kg	0.050	[A] < 0.050						
Nitrobenzene	N	2790	mg/kg	0.050	[A] < 0.050						
Isophorone	N	2790	mg/kg	0.050	[A] < 0.050						
2-Nitrophenol	N	2790	mg/kg	0.050	[A] < 0.050						
2,4-Dimethylphenol	N	2790	mg/kg	0.050	[A] < 0.050						
Bis(2-Chloroethoxy)Methane	N	2790	mg/kg	0.050	[A] < 0.050						
2,4-Dichlorophenol	N	2790	mg/kg	0.050	[A] < 0.050						
1,2,4-Trichlorobenzene	N	2790	mg/kg	0.050	[A] < 0.050						
Naphthalene	N	2790	mg/kg	0.050	[A] < 0.050						
4-Chloroaniline	N	2790	mg/kg	0.050	[A] < 0.050						
Hexachlorobutadiene	N	2790	mg/kg	0.050	[A] < 0.050						
4-Chloro-3-Methylphenol	N	2790	mg/kg	0.050	[A] < 0.050						
2-Methylnaphthalene	N	2790	mg/kg	0.050	[A] < 0.050						
Hexachlorocyclopentadiene	N	2790	mg/kg	0.050	[A] < 0.050						
2,4,6-Trichlorophenol	N	2790	mg/kg	0.050	[A] < 0.050						
2,4,5-Trichlorophenol	N	2790	mg/kg	0.050	[A] < 0.050						
2-Chloronaphthalene	N	2790	mg/kg	0.050	[A] < 0.050						
2-Nitroaniline	N	2790	mg/kg	0.050	[A] < 0.050						
Acenaphthylene	N	2790	mg/kg	0.050	[A] < 0.050						
Dimethylphthalate	N	2790	mg/kg	0.050	[A] < 0.050						
2,6-Dinitrotoluene	N	2790	mg/kg	0.050	[A] < 0.050						
Acenaphthene	N	2790	mg/kg	0.050	[A] < 0.050						
Dibenzofuran	N	2790	mg/kg	0.050	[A] < 0.050						
4-Chlorophenylphenylether	N	2790	mg/kg	0.050	[A] < 0.050						
2,4-Dinitrotoluene	N	2790	mg/kg	0.050	[A] < 0.050						
Fluorene	N	2790	mg/kg	0.050	[A] < 0.050						
Diethyl Phthalate	N	2790	mg/kg	0.050	[A] < 0.050						
4-Nitroaniline	N	2790	mg/kg	0.050	[A] < 0.050						
2-Methyl-4,6-Dinitrophenol	N	2790	mg/kg	0.050	[A] < 0.050						
Azobenzene	N	2790	mg/kg	0.050	[A] < 0.050						
4-Bromophenylphenyl Ether	N	2790	mg/kg	0.050	[A] < 0.050						
Hexachlorobenzene	N	2790	mg/kg	0.050	[A] < 0.050						
Pentachlorophenol	N	2790	mg/kg	0.050	[A] < 0.050						
Phenanthrene	N	2790	mg/kg	0.050	[A] < 0.050						
Anthracene	N	2790	mg/kg	0.050	[A] < 0.050						
Carbazole	N	2790	mg/kg	0.050	[A] < 0.050						

Results - Soil

Project: PO-22-040 Robin Gardens, Waterloo

Client: Terra Firma	Chemtest Job No.:				22-32884	22-32884	22-32884	22-32884	22-32884	22-32884	22-32884
Quotation No.:	Chemtest Sample ID.:				1495901	1495902	1495903	1495905	1495906	1495908	1495909
Order No.: PO-22-040	Client Sample Ref.:				3	2	1	2	1	1	2
	Sample Location:				BH01	BH01	BH01	TP01	TP01	TP02	TP02
	Sample Type:				SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
	Top Depth (m):				1.0	0.5	0.3	0.5	0.3	0.3	0.5
	Asbestos Lab:				DURHAM	DURHAM	DURHAM		DURHAM	DURHAM	DURHAM
Determinand	Accred.	SOP	Units	LOD							
Di-N-Butyl Phthalate	N	2790	mg/kg	0.050	[A] < 0.050						
Fluoranthene	N	2790	mg/kg	0.050	[A] < 0.050						
Pyrene	N	2790	mg/kg	0.050	[A] < 0.050						
Butylbenzyl Phthalate	N	2790	mg/kg	0.050	[A] < 0.050						
Benzo[a]anthracene	N	2790	mg/kg	0.050	[A] < 0.050						
Chrysene	N	2790	mg/kg	0.050	[A] < 0.050						
Bis(2-Ethylhexyl)Phthalate	N	2790	mg/kg	0.050	[A] < 0.050						
Di-N-Octyl Phthalate	N	2790	mg/kg	0.050	[A] < 0.050						
Benzo[b]fluoranthene	N	2790	mg/kg	0.050	[A] < 0.050						
Benzo[k]fluoranthene	N	2790	mg/kg	0.050	[A] < 0.050						
Benzo[a]pyrene	N	2790	mg/kg	0.050	[A] < 0.050						
Indeno(1,2,3-c,d)Pyrene	N	2790	mg/kg	0.050	[A] < 0.050						
Dibenz(a,h)Anthracene	N	2790	mg/kg	0.050	[A] < 0.050						
Benzo[g,h,i]perylene	N	2790	mg/kg	0.050	[A] < 0.050						
Resorcinol	M	2920	mg/kg	0.020	< 0.020						
Phenol	M	2920	mg/kg	0.020	< 0.020						
Cresols	M	2920	mg/kg	0.020	< 0.020						
Xylenols	M	2920	mg/kg	0.020	< 0.020						
1-Naphthol	N	2920	mg/kg	0.020	< 0.020						
Trimethylphenols	M	2920	mg/kg	0.020	< 0.020						
Total Phenols	M	2920	mg/kg	0.10	< 0.10	< 0.10	< 0.10		< 0.10	< 0.10	< 0.10
SVOC TIC	N	2790	mg/kg	N/A	[A] None Detected						
VOC TIC	N	2760	µg/kg	N/A	[A] None Detected						

Results - Single Stage WAC

Project: PO-22-040 Robin Gardens, Waterloooville

Chemtest Job No: 22-32884					Landfill Waste Acceptance Criteria		
Chemtest Sample ID: 1495902					Limits		
Sample Ref: 2					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID:							
Sample Location: BH01							
Top Depth(m): 0.5							
Bottom Depth(m):							
Sampling Date:							
Determinand	SOP	Accred.	Units				
Total Organic Carbon	2625	M	%	[A] 0.63	3	5	6
Loss On Ignition	2610	M	%	3.3	--	--	10
Total BTEX	2760	M	mg/kg	[A] < 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg	< 0.10	1	--	--
TPH Total WAC	2670	M	mg/kg	[A] < 10	500	--	--
Total (Of 17) PAH's	2700	N	mg/kg	< 2.0	100	--	--
pH	2010	M		8.4	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	< 0.0020	--	To evaluate	To evaluate
Eluate Analysis			10:1 Eluate mg/l	10:1 Eluate mg/kg	Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg		
Arsenic	1455	U	0.0016	0.016	0.5	2	25
Barium	1455	U	< 0.005	< 0.050	20	100	300
Cadmium	1455	U	< 0.00011	< 0.0011	0.04	1	5
Chromium	1455	U	0.0043	0.043	0.5	10	70
Copper	1455	U	0.0029	0.029	2	50	100
Mercury	1455	U	< 0.00005	< 0.00050	0.01	0.2	2
Molybdenum	1455	U	0.0011	0.011	0.5	10	30
Nickel	1455	U	0.0020	0.020	0.4	10	40
Lead	1455	U	0.0011	0.011	0.5	10	50
Antimony	1455	U	< 0.0005	< 0.0050	0.06	0.7	5
Selenium	1455	U	< 0.0005	< 0.0050	0.1	0.5	7
Zinc	1455	U	< 0.003	< 0.025	4	50	200
Chloride	1220	U	< 1.0	< 10	800	15000	25000
Fluoride	1220	U	0.13	1.3	10	150	500
Sulphate	1220	U	5.8	58	1000	20000	50000
Total Dissolved Solids	1020	N	48	470	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	11	110	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	11

Waste Acceptance Criteria

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

Results - Single Stage WAC

Project: PO-22-040 Robin Gardens, Waterloooville

Chemtest Job No: 22-32884					Landfill Waste Acceptance Criteria		
Chemtest Sample ID: 1495905					Limits		
Sample Ref: 2					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID:							
Sample Location: TP01							
Top Depth(m): 0.5							
Bottom Depth(m):							
Sampling Date:							
Determinand	SOP	Accred.	Units				
Total Organic Carbon	2625	M	%	[A] 1.3	3	5	6
Loss On Ignition	2610	M	%	4.2	--	--	10
Total BTEX	2760	M	mg/kg	[A] < 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg	< 0.10	1	--	--
TPH Total WAC	2670	M	mg/kg	[A] < 10	500	--	--
Total (Of 17) PAH's	2700	N	mg/kg	< 2.0	100	--	--
pH	2010	M		8.4	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.0030	--	To evaluate	To evaluate
Eluate Analysis			10:1 Eluate mg/l	10:1 Eluate mg/kg	Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg		
Arsenic	1455	U	0.0022	0.022	0.5	2	25
Barium	1455	U	< 0.005	< 0.050	20	100	300
Cadmium	1455	U	< 0.00011	< 0.0011	0.04	1	5
Chromium	1455	U	0.0054	0.054	0.5	10	70
Copper	1455	U	0.0036	0.036	2	50	100
Mercury	1455	U	< 0.00005	< 0.00050	0.01	0.2	2
Molybdenum	1455	U	0.0008	0.0082	0.5	10	30
Nickel	1455	U	0.0022	0.022	0.4	10	40
Lead	1455	U	0.0014	0.014	0.5	10	50
Antimony	1455	U	< 0.0005	< 0.0050	0.06	0.7	5
Selenium	1455	U	0.0009	0.0092	0.1	0.5	7
Zinc	1455	U	0.004	0.045	4	50	200
Chloride	1220	U	< 1.0	< 10	800	15000	25000
Fluoride	1220	U	0.11	1.1	10	150	500
Sulphate	1220	U	1.4	14	1000	20000	50000
Total Dissolved Solids	1020	N	31	310	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	13	130	500	800	1000

Solid Information

Dry mass of test portion/kg	0.090
Moisture (%)	11

Waste Acceptance Criteria

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

Results - Single Stage WAC

Project: PO-22-040 Robin Gardens, Waterloooville

Chemtest Job No: 22-32884					Landfill Waste Acceptance Criteria		
Chemtest Sample ID: 1495909					Limits		
Sample Ref: 2					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID:							
Sample Location: TP02							
Top Depth(m): 0.5							
Bottom Depth(m):							
Sampling Date:							
Determinand	SOP	Accred.	Units				
Total Organic Carbon	2625	M	%	[A] 0.31	3	5	6
Loss On Ignition	2610	M	%	4.0	--	--	10
Total BTEX	2760	M	mg/kg	[A] < 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg	< 0.10	1	--	--
TPH Total WAC	2670	M	mg/kg	[A] < 10	500	--	--
Total (Of 17) PAH's	2700	N	mg/kg	< 2.0	100	--	--
pH	2010	M		6.9	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	< 0.0020	--	To evaluate	To evaluate
Eluate Analysis			10:1 Eluate mg/l	10:1 Eluate mg/kg	Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg		
Arsenic	1455	U	0.0005	0.0049	0.5	2	25
Barium	1455	U	< 0.005	< 0.050	20	100	300
Cadmium	1455	U	< 0.00011	< 0.0011	0.04	1	5
Chromium	1455	U	0.0033	0.033	0.5	10	70
Copper	1455	U	0.0020	0.020	2	50	100
Mercury	1455	U	< 0.00005	< 0.00050	0.01	0.2	2
Molybdenum	1455	U	0.0004	0.0041	0.5	10	30
Nickel	1455	U	0.0020	0.020	0.4	10	40
Lead	1455	U	< 0.0005	< 0.0050	0.5	10	50
Antimony	1455	U	< 0.0005	< 0.0050	0.06	0.7	5
Selenium	1455	U	< 0.0005	< 0.0050	0.1	0.5	7
Zinc	1455	U	0.004	0.037	4	50	200
Chloride	1220	U	2.8	28	800	15000	25000
Fluoride	1220	U	0.070	< 1.0	10	150	500
Sulphate	1220	U	18	180	1000	20000	50000
Total Dissolved Solids	1020	N	36	360	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	3.1	< 50	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	13

Waste Acceptance Criteria

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

Deviations

In accordance with UKAS Policy on Deviating Samples TPS 63. Chemtest have a procedure to ensure 'upon receipt of each sample a competent laboratory shall assess whether the sample is suitable with regard to the requested test(s)'. This policy and the respective holding times applied, can be supplied upon request. The reason a sample is declared as deviating is detailed below. Where applicable the analysis remains UKAS/MCERTs accredited but the results may be compromised.

Sample:	Sample Ref:	Sample ID:	Sample Location:	Sampled Date:	Deviation Code(s):	Containers Received:
1495901	3		BH01		A	Amber Glass 250ml
1495901	3		BH01		A	Amber Glass 60ml
1495901	3		BH01		A	Plastic Tub 1000g
1495902	2		BH01		A	Amber Glass 250ml
1495902	2		BH01		A	Amber Glass 60ml
1495902	2		BH01		A	Plastic Tub 1000g
1495903	1		BH01		A	Amber Glass 250ml
1495903	1		BH01		A	Amber Glass 60ml
1495903	1		BH01		A	Plastic Tub 1000g
1495905	2		TP01		A	Amber Glass 250ml
1495905	2		TP01		A	Amber Glass 60ml
1495905	2		TP01		A	Plastic Tub 1000g
1495906	1		TP01		A	Amber Glass 250ml
1495906	1		TP01		A	Amber Glass 60ml
1495906	1		TP01		A	Plastic Tub 1000g
1495908	1		TP02		A	Amber Glass 250ml
1495908	1		TP02		A	Amber Glass 60ml
1495908	1		TP02		A	Plastic Tub 1000g
1495909	2		TP02		A	Amber Glass 250ml
1495909	2		TP02		A	Amber Glass 60ml
1495909	2		TP02		A	Plastic Tub 1000g

Test Methods

SOP	Title	Parameters included	Method summary
1020	Electrical Conductivity and Total Dissolved Solids (TDS) in Waters	Electrical Conductivity and Total Dissolved Solids (TDS) in Waters	Conductivity Meter
1220	Anions, Alkalinity & Ammonium in Waters	Fluoride; Chloride; Nitrite; Nitrate; Total; Oxidisable Nitrogen (TON); Sulfate; Phosphate; Alkalinity; Ammonium	Automated colorimetric analysis using 'Aquakem 600' Discrete Analyser.
1455	Metals in Waters by ICP-MS	Metals, including: Antimony; Arsenic; Barium; Beryllium; Boron; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Tin; Vanadium; Zinc	Filtration of samples followed by direct determination by inductively coupled plasma mass spectrometry (ICP-MS).
1610	Total/Dissolved Organic Carbon in Waters	Organic Carbon	TOC Analyser using Catalytic Oxidation
1920	Phenols in Waters by HPLC	Phenolic compounds including: Phenol, Cresols, Xylenols, Trimethylphenols Note: Chlorophenols are excluded.	Determination by High Performance Liquid Chromatography (HPLC) using electrochemical detection.
2010	pH Value of Soils	pH	pH Meter
2015	Acid Neutralisation Capacity	Acid Reserve	Titration
2020	Electrical Conductivity	Electrical conductivity (EC) of aqueous extract or calcium sulphate solution for topsoil	Measurement of the electrical resistance of a 2:1 water/soil extract.
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2150	Redox Potential	Redox Potential	Meter
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2220	Water soluble Chloride in Soils	Chloride	Aqueous extraction and measurement by 'Aquakem 600' Discrete Analyser using ferric nitrate / mercuric thiocyanate.
2300	Cyanides & Thiocyanate in Soils	Free (or easily liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Alkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2610	Loss on Ignition	loss on ignition (LOI)	Determination of the proportion by mass that is lost from a soil by ignition at 550°C.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2670	Total Petroleum Hydrocarbons (TPH) in Soils by GC-FID	TPH (C6–C40); optional carbon banding, e.g. 3-band – GRO, DRO & LRO*TPH C8–C40	Dichloromethane extraction / GC-FID
2680	TPH A/A Split	Aliphatics: >C5–C6, >C6–C8,>C8–C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C44	Dichloromethane extraction / GCxGC FID detection

Test Methods

SOP	Title	Parameters included	Method summary
2700	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-FID	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenz[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Dichloromethane extraction / GC-FID (GC-FID detection is non-selective and can be subject to interference from co-eluting compounds)
2760	Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule	Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds.
2780	Glycols, Aldehydes, Amines, Ethers and Ketones	Glycols, Aldehydes, Amines, Ethers and Ketones	GCMS detection
2790	Semi-Volatile Organic Compounds (SVOCs) in Soils by GC-MS	Semi-volatile organic compounds(cf. USEPA Method 8270)	Acetone/Hexane extraction / GC-MS
2815	Polychlorinated Biphenyls (PCB) ICES7Congeners in Soils by GC-MS	ICES7 PCB congeners	Acetone/Hexane extraction / GC-MS
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.
640	Characterisation of Waste (Leaching C10)	Waste material including soil, sludges and granular waste	ComplianceTest for Leaching of Granular Waste Material and Sludge

Report Information

Key

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

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

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

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

All Asbestos testing is performed at the indicated laboratory

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

Sample Deviation Codes

- A - Date of sampling not supplied
- B - Sample age exceeds stability time (sampling to extraction)
- C - Sample not received in appropriate containers
- D - Broken Container
- E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

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

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

Charges may apply to extended sample storage

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

customerservices@chemtest.com



2183

Final Report

Report No.: 22-36290-1

Initial Date of Issue: 03-Oct-2022

Client Terra Firma

Client Address: t/a Terra Firma
The Slate Barn
Lower Lowley
Dunsford
Devon
EX6 7BP

Contact(s): Info

Project PO-22-040 Robin Gardens,
Waterlooville

Quotation No.:

Date Received: 23-Sep-2022

Order No.: PO-22-040

Date Instructed: 23-Sep-2022

No. of Samples: 4

Turnaround (Wkdays): 5

Results Due: 29-Sep-2022

Date Approved: 03-Oct-2022

Approved By:

Details: Stuart Henderson, Technical
Manager

Results - Soil

Project: PO-22-040 Robin Gardens, Waterloooville

Client: Terra Firma	Chemtest Job No.:				22-36290	22-36290	22-36290	22-36290
Quotation No.:	Chemtest Sample ID.:				1511263	1511264	1511266	1511268
Order No.: PO-22-040	Client Sample Ref.:				1	2	1	2
	Sample Location:				WS01	WS02	WS04	WS06
	Sample Type:				SOIL	SOIL	SOIL	SOIL
	Top Depth (m):				0.3	0.5	0.3	0.5
	Asbestos Lab:				DURHAM	DURHAM	DURHAM	DURHAM
Determinand	Accred.	SOP	Units	LOD				
ACM Type	U	2192		N/A	-	-	-	-
Asbestos Identification	U	2192		N/A	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
Moisture	N	2030	%	0.020	14	13	9.5	9.6
pH	U	2010		4.0	[A] 8.4	[A] 8.2	[A] 7.8	[A] 7.7
Electrical Conductivity (2:1)	N	2020	µS/cm	1.0		[A] 400		
Redox Potential	N	2150	mV	N/A		72		
Cyanide (Total)	U	2300	mg/kg	0.50	[A] < 0.50	[A] < 0.50	[A] < 0.50	[A] < 0.50
Sulphate (Total)	U	2430	%	0.010	[A] 0.067	[A] 0.044	[A] 0.062	[A] 0.068
Arsenic	U	2455	mg/kg	0.5	3.5	3.5	6.3	6.0
Cadmium	U	2455	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Chromium	U	2455	mg/kg	0.5	7.2	7.4	14	12
Copper	U	2455	mg/kg	0.50	8.3	3.4	9.1	8.8
Mercury	U	2455	mg/kg	0.05	< 0.05	< 0.05	0.06	0.07
Nickel	U	2455	mg/kg	0.50	4.0	3.2	6.4	6.5
Lead	U	2455	mg/kg	0.50	26	12	21	24
Selenium	U	2455	mg/kg	0.25	< 0.25	0.59	0.74	0.84
Zinc	U	2455	mg/kg	0.50	25	12	23	24
Chromium (Trivalent)	N	2490	mg/kg	1.0	7.2	7.4	14	12
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50
Organic Matter	U	2625	%	0.40	[A] 4.1	[A] 2.3	[A] 1.9	[A] 2.0
Florisil Cleanup	N		-	N/A				Done
Total TPH >C6-C40	U	2670	mg/kg	10	[A] < 10	[A] < 10	[A] < 10	[A] < 10
Aliphatic TPH >C5-C6	N	2680	mg/kg	0.010		[A] < 0.010		
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0				[A] < 1.0
Aliphatic TPH >C6-C8	N	2680	mg/kg	0.010		[A] < 0.010		
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0				[A] < 1.0
Aliphatic TPH >C8-C10	N	2680	mg/kg	0.10		[A] < 0.10		
Aliphatic TPH >C8-C10	U	2680	mg/kg	1.0				[A] < 1.0
Aliphatic TPH >C10-C12	N	2680	mg/kg	0.10		[A] < 0.10		
Aliphatic TPH >C10-C12	U	2680	mg/kg	1.0				[A] < 1.0
Aliphatic TPH >C12-C16	N	2680	mg/kg	0.10		[A] < 0.10		
Aliphatic TPH >C12-C16	U	2680	mg/kg	1.0				[A] < 1.0
Aliphatic TPH >C16-C21	N	2680	mg/kg	0.10		[A] < 0.10		
Aliphatic TPH >C16-C21	U	2680	mg/kg	1.0				[A] < 1.0
Aliphatic TPH >C21-C35	N	2680	mg/kg	0.10		[A] < 0.10		
Aliphatic TPH >C21-C35	U	2680	mg/kg	1.0				[A] < 1.0
Aliphatic TPH >C35-C44	N	2680	mg/kg	0.10		[A] < 0.10		
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0				[A] < 1.0

Results - Soil

Project: PO-22-040 Robin Gardens, Waterloooville

Client: Terra Firma	Chemtest Job No.:				22-36290	22-36290	22-36290	22-36290
Quotation No.:	Chemtest Sample ID.:				1511263	1511264	1511266	1511268
Order No.: PO-22-040	Client Sample Ref.:				1	2	1	2
	Sample Location:				WS01	WS02	WS04	WS06
	Sample Type:				SOIL	SOIL	SOIL	SOIL
	Top Depth (m):				0.3	0.5	0.3	0.5
	Asbestos Lab:				DURHAM	DURHAM	DURHAM	DURHAM
Determinand	Accred.	SOP	Units	LOD				
Total Aliphatic Hydrocarbons	N	2680	mg/kg	1.0		[A] < 1.0		
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0				[A] < 5.0
Aromatic TPH >C5-C7	N	2680	mg/kg	0.010		[A] < 0.010		
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0				[A] < 1.0
Aromatic TPH >C7-C8	N	2680	mg/kg	0.010		[A] < 0.010		
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0				[A] < 1.0
Aromatic TPH >C8-C10	N	2680	mg/kg	0.10		[A] < 0.10		
Aromatic TPH >C8-C10	U	2680	mg/kg	1.0				[A] < 1.0
Aromatic TPH >C10-C12	N	2680	mg/kg	0.10		[A] < 0.10		
Aromatic TPH >C10-C12	U	2680	mg/kg	1.0				[A] < 1.0
Aromatic TPH >C12-C16	N	2680	mg/kg	0.10		[A] < 0.10		
Aromatic TPH >C12-C16	U	2680	mg/kg	1.0				[A] < 1.0
Aromatic TPH >C16-C21	N	2680	mg/kg	0.10		[A] < 0.10		
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0				[A] < 1.0
Aromatic TPH >C21-C35	N	2680	mg/kg	0.10		[A] < 0.10		
Aromatic TPH >C21-C35	U	2680	mg/kg	1.0				[A] < 1.0
Aromatic TPH >C35-C44	N	2680	mg/kg	0.10		[A] < 0.10		
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0				[A] < 1.0
Total Aromatic Hydrocarbons	N	2680	mg/kg	1.0		[A] < 1.0		
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0				[A] < 5.0
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0				[A] < 10
Total Petroleum Hydrocarbons	N	2680	mg/kg	2.0		[A] < 2.0		
Naphthalene	U	2700	mg/kg	0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10
Acenaphthylene	U	2700	mg/kg	0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10
Acenaphthene	U	2700	mg/kg	0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10
Fluorene	U	2700	mg/kg	0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10
Phenanthrene	U	2700	mg/kg	0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10
Anthracene	U	2700	mg/kg	0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10
Fluoranthene	U	2700	mg/kg	0.10	[A] 0.36	[A] < 0.10	[A] < 0.10	[A] < 0.10
Pyrene	U	2700	mg/kg	0.10	[A] 0.42	[A] < 0.10	[A] < 0.10	[A] < 0.10
Benzo[a]anthracene	U	2700	mg/kg	0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10
Chrysene	U	2700	mg/kg	0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10
Benzo[b]fluoranthene	U	2700	mg/kg	0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10
Benzo[k]fluoranthene	U	2700	mg/kg	0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10
Benzo[a]pyrene	U	2700	mg/kg	0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10
Indeno(1,2,3-c,d)Pyrene	U	2700	mg/kg	0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10
Dibenz(a,h)Anthracene	U	2700	mg/kg	0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10
Benzo[g,h,i]perylene	U	2700	mg/kg	0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10
Total Of 16 PAH's	U	2700	mg/kg	2.0	[A] < 2.0	[A] < 2.0	[A] < 2.0	[A] < 2.0

Results - Soil

Project: PO-22-040 Robin Gardens, Waterloo

Client: Terra Firma	Chemtest Job No.:				22-36290	22-36290	22-36290	22-36290
Quotation No.:	Chemtest Sample ID.:				1511263	1511264	1511266	1511268
Order No.: PO-22-040	Client Sample Ref.:				1	2	1	2
	Sample Location:				WS01	WS02	WS04	WS06
	Sample Type:				SOIL	SOIL	SOIL	SOIL
	Top Depth (m):				0.3	0.5	0.3	0.5
	Asbestos Lab:				DURHAM	DURHAM	DURHAM	DURHAM
Determinand	Accred.	SOP	Units	LOD				
Dichlorodifluoromethane	N	2760	µg/kg	0.20		[A] < 0.20		
Chloromethane	N	2760	µg/kg	0.20		[A] 0.48		
Vinyl Chloride	N	2760	µg/kg	0.20		[A] < 0.20		
Bromomethane	N	2760	µg/kg	0.20		[A] < 0.20		
Chloroethane	N	2760	µg/kg	0.20		[A] 2.8		
Trichlorofluoromethane	N	2760	µg/kg	0.20		[A] < 0.20		
1,1-Dichloroethene	N	2760	µg/kg	0.20		[A] < 0.20		
Trans 1,2-Dichloroethene	N	2760	µg/kg	0.20		[A] < 0.20		
1,1-Dichloroethane	N	2760	µg/kg	0.20		[A] < 0.20		
cis 1,2-Dichloroethene	N	2760	µg/kg	0.20		[A] < 0.20		
Bromochloromethane	N	2760	µg/kg	0.50		[A] < 0.50		
Trichloromethane	N	2760	µg/kg	0.20		[A] < 0.20		
1,1,1-Trichloroethane	N	2760	µg/kg	0.20		[A] < 0.20		
Tetrachloromethane	N	2760	µg/kg	0.20		[A] < 0.20		
1,1-Dichloropropene	N	2760	µg/kg	0.20		[A] < 0.20		
Benzene	N	2760	µg/kg	0.20		[A] < 0.20		
Benzene	U	2760	µg/kg	1.0				[A] < 1.0
1,2-Dichloroethane	N	2760	µg/kg	0.20		[A] < 0.20		
Trichloroethene	N	2760	µg/kg	0.20		[A] < 0.20		
1,2-Dichloropropane	N	2760	µg/kg	0.20		[A] < 0.20		
Dibromomethane	N	2760	µg/kg	0.20		[A] < 0.20		
Bromodichloromethane	N	2760	µg/kg	0.20		[A] < 0.20		
cis-1,3-Dichloropropene	N	2760	µg/kg	0.20		[A] < 0.20		
Toluene	N	2760	µg/kg	0.20		[A] 0.61		
Toluene	U	2760	µg/kg	1.0				[A] < 1.0
Trans-1,3-Dichloropropene	N	2760	µg/kg	0.20		[A] < 0.20		
1,1,2-Trichloroethane	N	2760	µg/kg	0.20		[A] < 0.20		
Tetrachloroethene	N	2760	µg/kg	0.20		[A] < 0.20		
1,3-Dichloropropane	N	2760	µg/kg	0.20		[A] < 0.20		
Dibromochloromethane	N	2760	µg/kg	0.20		[A] < 0.20		
1,2-Dibromoethane	N	2760	µg/kg	0.20		[A] < 0.20		
Chlorobenzene	N	2760	µg/kg	0.20		[A] < 0.20		
1,1,1,2-Tetrachloroethane	N	2760	µg/kg	0.20		[A] < 0.20		
Ethylbenzene	N	2760	µg/kg	0.20		[A] < 0.20		
Ethylbenzene	U	2760	µg/kg	1.0				[A] < 1.0
m & p-Xylene	N	2760	µg/kg	0.20		[A] 0.87		
m & p-Xylene	U	2760	µg/kg	1.0				[A] < 1.0
o-Xylene	N	2760	µg/kg	0.20		[A] 0.41		
o-Xylene	U	2760	µg/kg	1.0				[A] < 1.0

Results - Soil

Project: PO-22-040 Robin Gardens, Waterloooville

Client: Terra Firma	Chemtest Job No.:				22-36290	22-36290	22-36290	22-36290
Quotation No.:	Chemtest Sample ID.:				1511263	1511264	1511266	1511268
Order No.: PO-22-040	Client Sample Ref.:				1	2	1	2
	Sample Location:				WS01	WS02	WS04	WS06
	Sample Type:				SOIL	SOIL	SOIL	SOIL
	Top Depth (m):				0.3	0.5	0.3	0.5
	Asbestos Lab:				DURHAM	DURHAM	DURHAM	DURHAM
Determinand	Accred.	SOP	Units	LOD				
Styrene	N	2760	µg/kg	0.20		[A] < 0.20		
Tribromomethane	N	2760	µg/kg	0.20		[A] < 0.20		
Isopropylbenzene	N	2760	µg/kg	0.20		[A] < 0.20		
Bromobenzene	N	2760	µg/kg	0.20		[A] < 0.20		
1,2,3-Trichloropropane	N	2760	µg/kg	0.20		[A] < 0.20		
2-Chlorotoluene	N	2760	µg/kg	0.20		[A] 0.26		
1,3,5-Trimethylbenzene	N	2760	µg/kg	0.20		[A] 0.42		
4-Chlorotoluene	N	2760	µg/kg	0.20		[A] 0.24		
Tert-Butylbenzene	N	2760	µg/kg	0.20		[A] < 0.20		
1,2,4-Trimethylbenzene	N	2760	µg/kg	0.20		[A] 0.48		
Sec-Butylbenzene	N	2760	µg/kg	0.20		[A] < 0.20		
1,3-Dichlorobenzene	N	2760	µg/kg	0.20		[A] < 0.20		
4-Isopropyltoluene	N	2760	µg/kg	0.20		[A] < 0.20		
1,4-Dichlorobenzene	N	2760	µg/kg	0.20		[A] < 0.20		
N-Butylbenzene	N	2760	µg/kg	0.20		[A] < 0.20		
1,2-Dichlorobenzene	N	2760	µg/kg	0.20		[A] < 0.20		
1,2-Dibromo-3-Chloropropane	N	2760	µg/kg	0.20		[A] < 0.20		
1,2,4-Trichlorobenzene	N	2760	µg/kg	0.20		[A] < 0.20		
Hexachlorobutadiene	N	2760	µg/kg	0.20		[A] < 0.20		
1,2,3-Trichlorobenzene	N	2760	µg/kg	0.20		[A] < 0.20		
Carbon Disulphide	N	2760	µg/kg	0.20		[A] < 0.20		
Methyl Tert-Butyl Ether	N	2760	µg/kg	0.20		[A] < 0.20		
Methyl Tert-Butyl Ether	U	2760	µg/kg	1.0				[A] < 1.0
N-Nitrosodimethylamine	N	2790	mg/kg	0.050		[A] < 0.050		
Phenol	N	2790	mg/kg	0.050		[A] < 0.050		
2-Chlorophenol	N	2790	mg/kg	0.050		[A] < 0.050		
Bis-(2-Chloroethyl)Ether	N	2790	mg/kg	0.050		[A] < 0.050		
1,3-Dichlorobenzene	N	2790	mg/kg	0.050		[A] < 0.050		
1,4-Dichlorobenzene	N	2790	mg/kg	0.050		[A] < 0.050		
1,2-Dichlorobenzene	N	2790	mg/kg	0.050		[A] < 0.050		
2-Methylphenol	N	2790	mg/kg	0.050		[A] < 0.050		
Bis(2-Chloroisopropyl)Ether	N	2790	mg/kg	0.050		[A] < 0.050		
Hexachloroethane	N	2790	mg/kg	0.050		[A] < 0.050		
N-Nitrosodi-n-propylamine	N	2790	mg/kg	0.050		[A] < 0.050		
4-Methylphenol	N	2790	mg/kg	0.050		[A] < 0.050		
Nitrobenzene	N	2790	mg/kg	0.050		[A] < 0.050		
Isophorone	N	2790	mg/kg	0.050		[A] < 0.050		
2-Nitrophenol	N	2790	mg/kg	0.050		[A] < 0.050		
2,4-Dimethylphenol	N	2790	mg/kg	0.050		[A] < 0.050		

Results - Soil

Project: PO-22-040 Robin Gardens, Waterloooville

Client: Terra Firma	Chemtest Job No.:				22-36290	22-36290	22-36290	22-36290
Quotation No.:	Chemtest Sample ID.:				1511263	1511264	1511266	1511268
Order No.: PO-22-040	Client Sample Ref.:				1	2	1	2
	Sample Location:				WS01	WS02	WS04	WS06
	Sample Type:				SOIL	SOIL	SOIL	SOIL
	Top Depth (m):				0.3	0.5	0.3	0.5
	Asbestos Lab:				DURHAM	DURHAM	DURHAM	DURHAM
Determinand	Accred.	SOP	Units	LOD				
Bis(2-Chloroethoxy)Methane	N	2790	mg/kg	0.050		[A] < 0.050		
2,4-Dichlorophenol	N	2790	mg/kg	0.050		[A] < 0.050		
1,2,4-Trichlorobenzene	N	2790	mg/kg	0.050		[A] < 0.050		
Naphthalene	N	2790	mg/kg	0.050		[A] < 0.050		
4-Chloroaniline	N	2790	mg/kg	0.050		[A] < 0.050		
Hexachlorobutadiene	N	2790	mg/kg	0.050		[A] < 0.050		
4-Chloro-3-Methylphenol	N	2790	mg/kg	0.050		[A] < 0.050		
2-Methylnaphthalene	N	2790	mg/kg	0.050		[A] < 0.050		
Hexachlorocyclopentadiene	N	2790	mg/kg	0.050		[A] < 0.050		
2,4,6-Trichlorophenol	N	2790	mg/kg	0.050		[A] < 0.050		
2,4,5-Trichlorophenol	N	2790	mg/kg	0.050		[A] < 0.050		
2-Chloronaphthalene	N	2790	mg/kg	0.050		[A] < 0.050		
2-Nitroaniline	N	2790	mg/kg	0.050		[A] < 0.050		
Acenaphthylene	N	2790	mg/kg	0.050		[A] < 0.050		
Dimethylphthalate	N	2790	mg/kg	0.050		[A] < 0.050		
2,6-Dinitrotoluene	N	2790	mg/kg	0.050		[A] < 0.050		
Acenaphthene	N	2790	mg/kg	0.050		[A] < 0.050		
Dibenzofuran	N	2790	mg/kg	0.050		[A] < 0.050		
4-Chlorophenylphenylether	N	2790	mg/kg	0.050		[A] < 0.050		
2,4-Dinitrotoluene	N	2790	mg/kg	0.050		[A] < 0.050		
Fluorene	N	2790	mg/kg	0.050		[A] < 0.050		
Diethyl Phthalate	N	2790	mg/kg	0.050		[A] < 0.050		
4-Nitroaniline	N	2790	mg/kg	0.050		[A] < 0.050		
2-Methyl-4,6-Dinitrophenol	N	2790	mg/kg	0.050		[A] < 0.050		
Azobenzene	N	2790	mg/kg	0.050		[A] < 0.050		
4-Bromophenylphenyl Ether	N	2790	mg/kg	0.050		[A] < 0.050		
Hexachlorobenzene	N	2790	mg/kg	0.050		[A] < 0.050		
Pentachlorophenol	N	2790	mg/kg	0.050		[A] < 0.050		
Phenanthrene	N	2790	mg/kg	0.050		[A] < 0.050		
Anthracene	N	2790	mg/kg	0.050		[A] < 0.050		
Carbazole	N	2790	mg/kg	0.050		[A] < 0.050		
Di-N-Butyl Phthalate	N	2790	mg/kg	0.050		[A] < 0.050		
Fluoranthene	N	2790	mg/kg	0.050		[A] < 0.050		
Pyrene	N	2790	mg/kg	0.050		[A] < 0.050		
Butylbenzyl Phthalate	N	2790	mg/kg	0.050		[A] < 0.050		
Benzo[a]anthracene	N	2790	mg/kg	0.050		[A] < 0.050		
Chrysene	N	2790	mg/kg	0.050		[A] < 0.050		
Bis(2-Ethylhexyl)Phthalate	N	2790	mg/kg	0.050		[A] < 0.050		
Di-N-Octyl Phthalate	N	2790	mg/kg	0.050		[A] < 0.050		

Results - Soil

Project: PO-22-040 Robin Gardens, Waterloo

Client: Terra Firma	Chemtest Job No.:				22-36290	22-36290	22-36290	22-36290
Quotation No.:	Chemtest Sample ID.:				1511263	1511264	1511266	1511268
Order No.: PO-22-040	Client Sample Ref.:				1	2	1	2
	Sample Location:				WS01	WS02	WS04	WS06
	Sample Type:				SOIL	SOIL	SOIL	SOIL
	Top Depth (m):				0.3	0.5	0.3	0.5
	Asbestos Lab:				DURHAM	DURHAM	DURHAM	DURHAM
Determinand	Accred.	SOP	Units	LOD				
Benzo[b]fluoranthene	N	2790	mg/kg	0.050		[A] < 0.050		
Benzo[k]fluoranthene	N	2790	mg/kg	0.050		[A] < 0.050		
Benzo[a]pyrene	N	2790	mg/kg	0.050		[A] < 0.050		
Indeno(1,2,3-c,d)Pyrene	N	2790	mg/kg	0.050		[A] < 0.050		
Dibenz(a,h)Anthracene	N	2790	mg/kg	0.050		[A] < 0.050		
Benzo[g,h,i]perylene	N	2790	mg/kg	0.050		[A] < 0.050		
Resorcinol	U	2920	mg/kg	0.020		< 0.020		
Phenol	U	2920	mg/kg	0.020		< 0.020		
Cresols	U	2920	mg/kg	0.020		< 0.020		
Xylenols	U	2920	mg/kg	0.020		< 0.020		
1-Naphthol	N	2920	mg/kg	0.020		< 0.020		
Trimethylphenols	U	2920	mg/kg	0.020		< 0.020		
Total Phenols	U	2920	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10
SVOC TIC	N	2790	mg/kg	N/A		[A] None Detected		
VOC TIC	N	2760	µg/kg	N/A		[A] None Detected		

Deviations

In accordance with UKAS Policy on Deviating Samples TPS 63. Chemtest have a procedure to ensure 'upon receipt of each sample a competent laboratory shall assess whether the sample is suitable with regard to the requested test(s)'. This policy and the respective holding times applied, can be supplied upon request. The reason a sample is declared as deviating is detailed below. Where applicable the analysis remains UKAS/MCERTs accredited but the results may be compromised.

Sample:	Sample Ref:	Sample ID:	Sample Location:	Sampled Date:	Deviation Code(s):	Containers Received:
1511263	1		WS01		A	Amber Glass 250ml
1511263	1		WS01		A	Amber Glass 60ml
1511263	1		WS01		A	Plastic Tub 500g
1511264	2		WS02		A	Amber Glass 250ml
1511264	2		WS02		A	Amber Glass 60ml
1511264	2		WS02		A	Plastic Tub 500g
1511266	1		WS04		A	Amber Glass 250ml
1511266	1		WS04		A	Amber Glass 60ml
1511266	1		WS04		A	Plastic Tub 500g
1511268	2		WS06		A	Amber Glass 250ml
1511268	2		WS06		A	Amber Glass 60ml
1511268	2		WS06		A	Plastic Tub 500g

Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2020	Electrical Conductivity	Electrical conductivity (EC) of aqueous extract or calcium sulphate solution for topsoil	Measurement of the electrical resistance of a 2:1 water/soil extract.
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2150	Redox Potential	Redox Potential	Meter
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Alkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2670	Total Petroleum Hydrocarbons (TPH) in Soils by GC-FID	TPH (C6–C40); optional carbon banding, e.g. 3-band – GRO, DRO & LRO*TPH C8–C40	Dichloromethane extraction / GC-FID
2680	TPH A/A Split	Aliphatics: >C5–C6, >C6–C8, >C8–C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C44	Dichloromethane extraction / GCxGC FID detection
2700	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-FID	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Diben[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Dichloromethane extraction / GC-FID (GC-FID detection is non-selective and can be subject to interference from co-eluting compounds)
2760	Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule	Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds.
2780	Glycols, Aldehydes, Amines, Ethers and Ketones	Glycols, Aldehydes, Amines, Ethers and Ketones	GCMS detection
2790	Semi-Volatile Organic Compounds (SVOCs) in Soils by GC-MS	Semi-volatile organic compounds(cf. USEPA Method 8270)	Acetone/Hexane extraction / GC-MS
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.

Report Information

Key

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

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

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

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

All Asbestos testing is performed at the indicated laboratory

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

Sample Deviation Codes

- A - Date of sampling not supplied
- B - Sample age exceeds stability time (sampling to extraction)
- C - Sample not received in appropriate containers
- D - Broken Container
- E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

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

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

Charges may apply to extended sample storage

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

customerservices@chemtest.com

Annex D: Soil Property Test Results



Laboratory Report



Contract Number: 62170

Client Ref: **PO-22-040**

Client PO: **PO-22-040**

Date Received: **24-10-2022**

Date Completed: **07-11-2022**

Report Date: **07-11-2022**

Client: **Terrafirma South**
The Slate Barn
Lower Lowley
Dunsford
Exeter
EX6 7BP

This report has been checked and approved by:



Shaun Thomas
Site Manager

Contract Title: **Robin Gardens, Waterloooville**

For the attention of: **Paul Standish**

Test Description	Qty
Moisture Content BS 1377:1990 - Part 2 : 3.2 - * UKAS	9
4 Point Liquid & Plastic Limit BS 1377:1990 - Part 2 : 4.3 & 5.3 - * UKAS	9
PSD Wet Sieve method BS 1377:1990 - Part 2 : 9.2 - * UKAS	6
BRE Suite B Greenfield Site (pyrite present) includes pH, water & acid soluble sulphate and total sulphur Sub-contracted Test	7
Dry Den/MC (2.5kg Rammer Method 1 litre mould/CBR Mould) BS 1377:1990 - Part 4 : 3.4 - * UKAS	1
One-dimensional Consolidation 75mm or 50mm diameter specimens (5 stages) BS 1377:1990 - Part 5 : 3 - * UKAS	1
Quick Undrained Triaxial Compression test - single specimen at one confining pressure (100mm or 38mm diameter) BS 1377:1990 - Part 7 : 8 - * UKAS	2

Notes: Observations and Interpretations are outside the UKAS Accreditation

* - denotes test included in laboratory scope of accreditation

- denotes test carried out by approved contractor

@ - denotes non accredited tests

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 test report/certificate shall not be reproduced except in full, without the approval of GEO Site & Testing Services Ltd. Any opinions or interpretations stated - within this report/certificate are excluded from the laboratories UKAS accreditation.

Approved Signatories:

Brendan Evans (Office Administrator) - Darren Bourne (Quality Senior Technician) - Paul Evans (Director)
Richard John (Quality/Technical Manager) - Shaun Jones (Laboratory manager) - Shaun Thomas (Site Manager)
Wayne Honey (Human Resources/ Health and Safety Coordinator)



Laboratory Report



Contract Number: 62170

Test Description	Qty
CBR: Remoulded Specimen and tested at top only BS 1377:1990 - Part 4 : 7 - * UKAS	3
Disposal of samples for job	1

DRAFT

Notes: Observations and Interpretations are outside the UKAS Accreditation

* - denotes test included in laboratory scope of accreditation

- denotes test carried out by approved contractor

@ - denotes non accredited tests

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Approved Signatories:

Brendan Evans (Office Administrator) - Darren Bourne (Quality Senior Technician) - Paul Evans (Director)
Richard John (Quality/Technical Manager) - Shaun Jones (Laboratory manager) - Shaun Thomas (Site Manager)
Wayne Honey (Human Resources/ Health and Safety Coordinator)

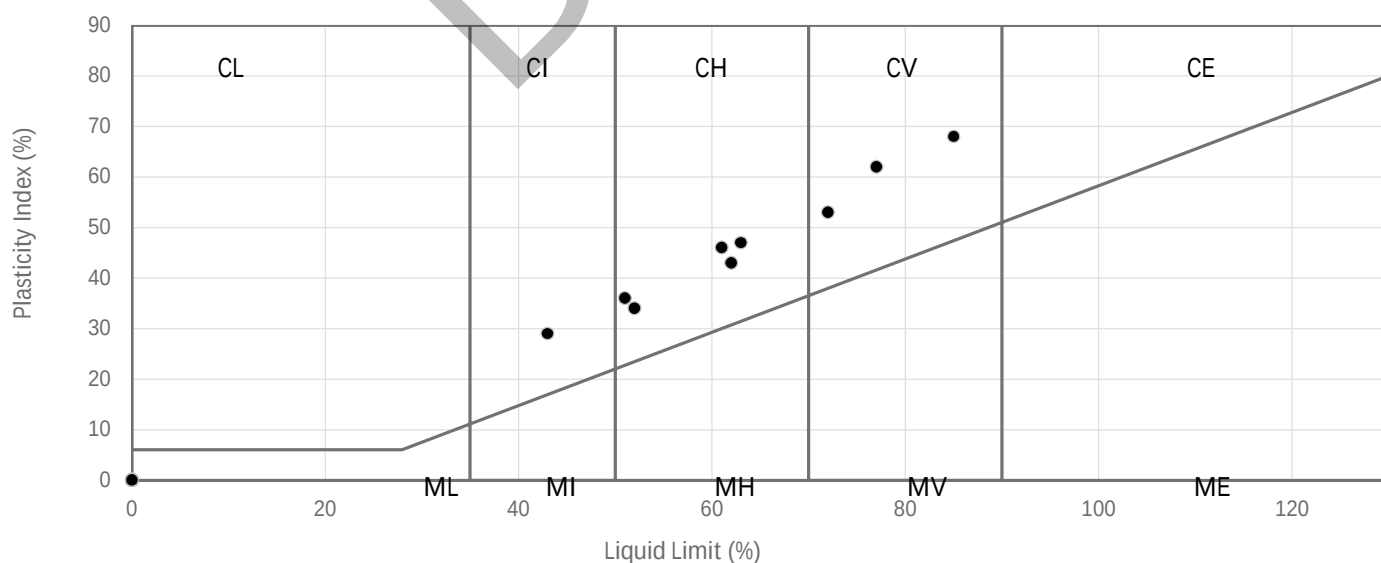
[illegible]

Contract Number	62170	
Project Name	Robin Gardens, Waterloooville	
Date Tested	04/11/2022	

[illegible]

Symbols: NP : Non Plastic # : Liquid Limit and Plastic Limit Wet Sieved

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION



Operator
Ethan Harper

PARTICLE SIZE DISTRIBUTION
BS 1377 Part 2:1990
Wet Sieve, Clause 9.2

Contract Number 62170

Borehole/Pit No. BH01

Project Name Robin Gardens, Waterloooville

Sample No. 3

Soil Description *See sample description sheet

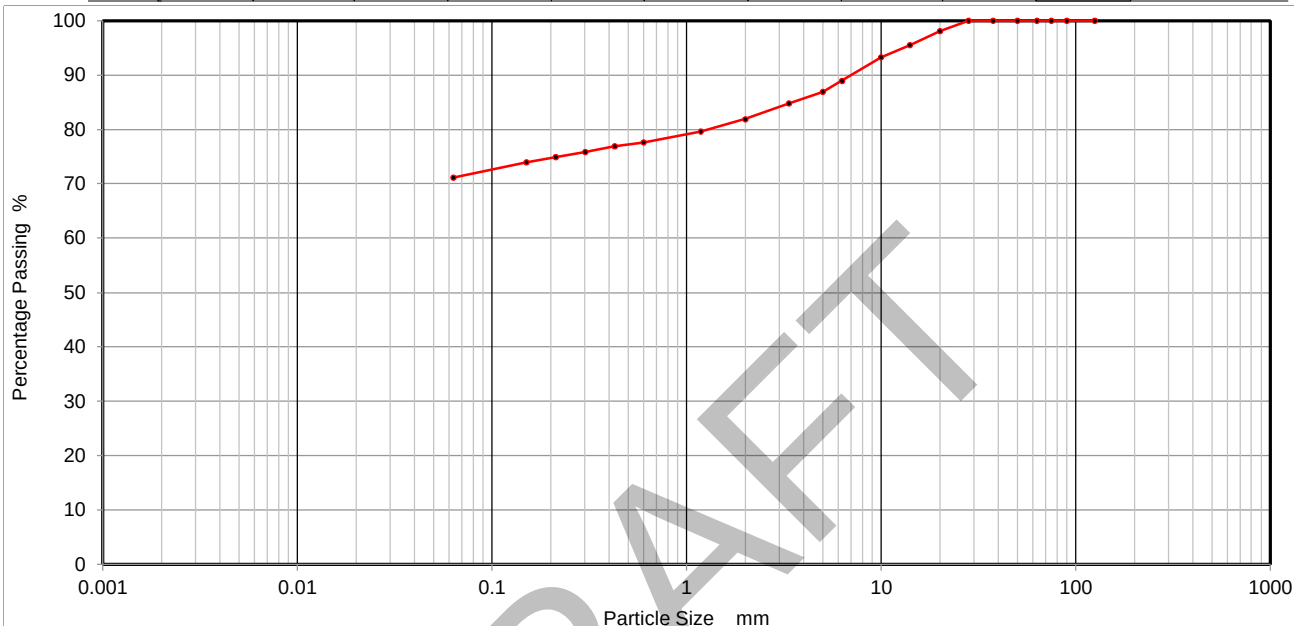
Depth Top 0.90

Depth Base 1.20

Date Tested 04/11/2022

Sample Type B

CLAY	SILT			SAND			GRAVEL			COBBLES	BOULDERS
	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	98		
14	95		
10	93		
6.3	89		
5	87		
3.35	85		
2	82		
1.18	80		
0.6	78		
0.425	77		
0.3	76		
0.212	75		
0.15	74		
0.063	71		

Sample Proportions	% dry mass
Cobbles	0
Gravel	18
Sand	11
Silt and Clay	71

Remarks
Preparation and testing in accordance with BS1377 unless noted below

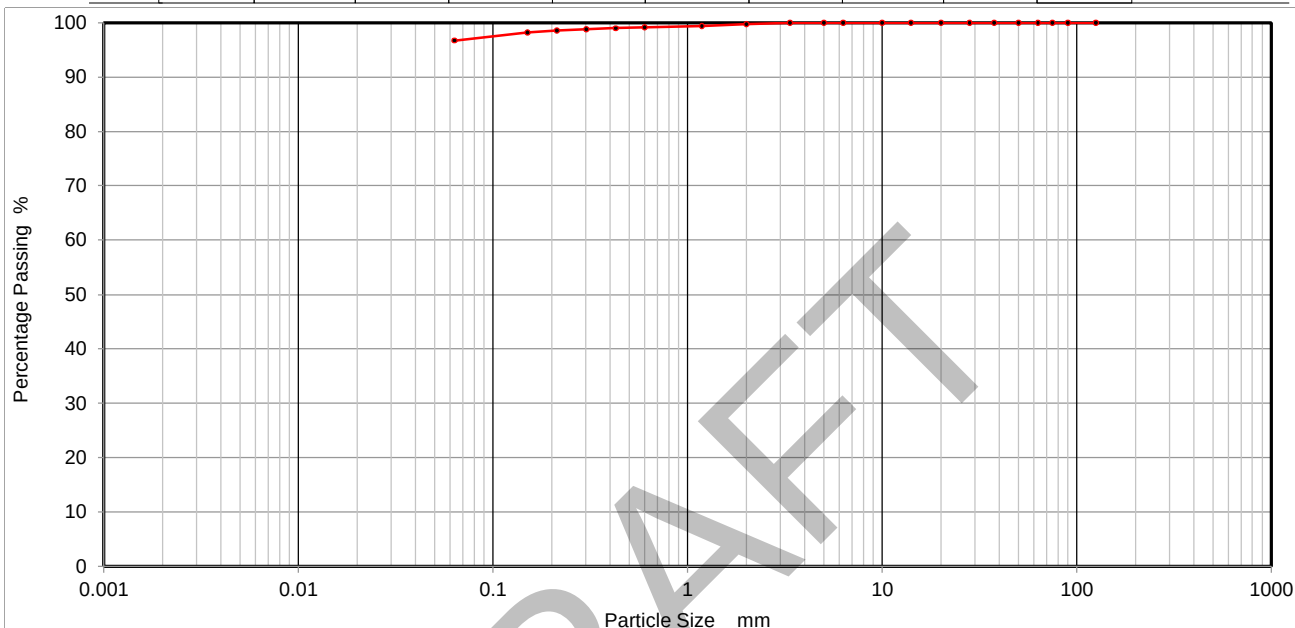
Operator

David Edwards

**PARTICLE SIZE DISTRIBUTION
BS 1377 Part 2:1990
Wet Sieve, Clause 9.2**

Contract Number	62170	
	Borehole/Pit No.	
BH01		
Project Name	Robin Gardens, Waterloooville	
Sample No.	5	
	Depth Top	
2.00		
Soil Description	*See sample description sheet	
	Depth Base	
2.45		
Date Tested	04/11/2022	
Sample Type	D	

CLAY	SILT			SAND			GRAVEL			COBBLES	BOULDERS
	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	99		
0.6	99		
0.425	99		
0.3	99		
0.212	99		
0.15	98		
0.063	97		

Sample Proportions	% dry mass
Cobbles	0
Gravel	0
Sand	3
Silt and Clay	97

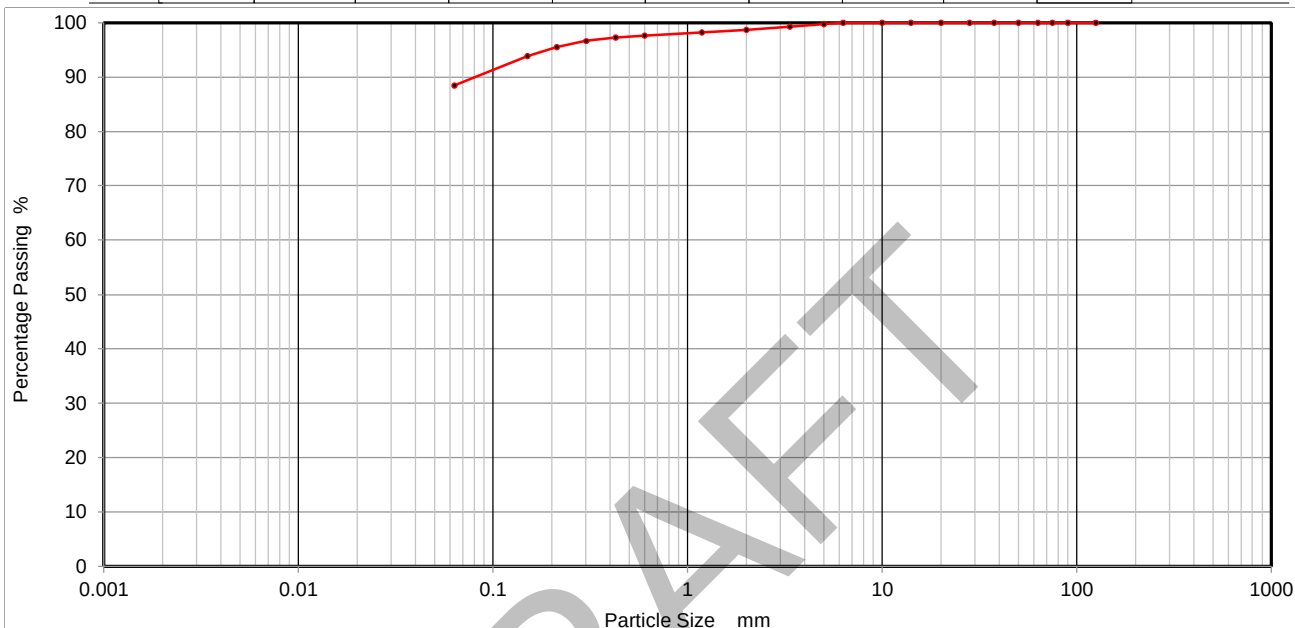
Remarks
Preparation and testing in accordance with BS1377 unless noted below

Operator
David Edwards

**PARTICLE SIZE DISTRIBUTION
BS 1377 Part 2:1990
Wet Sieve, Clause 9.2**

 PARTICLE SIZE DISTRIBUTION BS 1377 Part 2:1990 Wet Sieve, Clause 9.2	Contract Number	62170	
	Borehole/Pit No.	TP01	
Project Name	Robin Gardens, Waterloooville	Sample No.	1
Soil Description	*See sample description sheet	Depth Top	0.80
		Depth Base	
Date Tested	04/11/2022	Sample Type	B

CLAY	SILT			SAND			GRAVEL			COBBLES	BOULDERS
	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	99		
2	99		
1.18	98		
0.6	98		
0.425	97		
0.3	97		
0.212	96		
0.15	94		
0.063	88		

Sample Proportions	% dry mass
Cobbles	0
Gravel	1
Sand	11
Silt and Clay	88

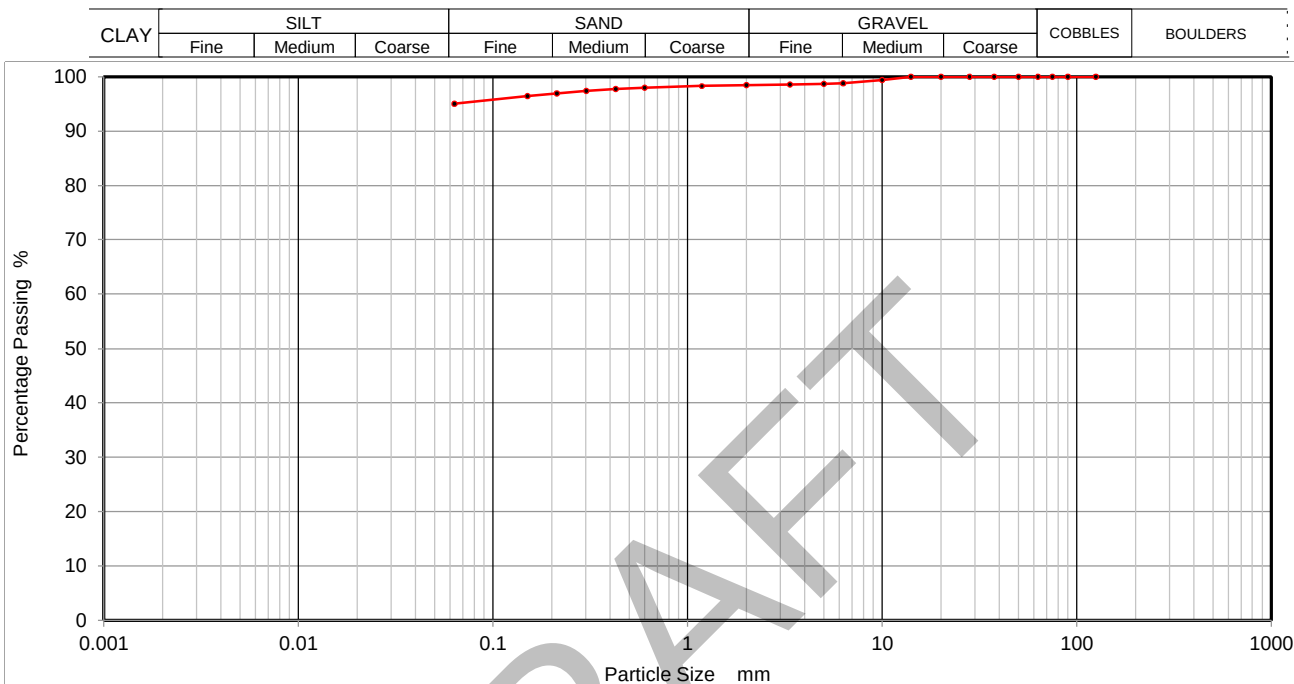
Remarks

Preparation and testing in accordance with BS1377 unless noted below

Operator
David Edwards

**PARTICLE SIZE DISTRIBUTION
BS 1377 Part 2:1990
Wet Sieve, Clause 9.2**

Contract Number	62170	
	Borehole/Pit No.	
TP01		
Project Name	Robin Gardens, Waterloooville	
Sample No.	3	
	Depth Top	
2.00		
Soil Description	*See sample description sheet	
	Depth Base	
Date Tested	04/11/2022	
Sample Type	B	



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	99		
6.3	99		
5	99		
3.35	99		
2	98		
1.18	98		
0.6	98		
0.425	98		
0.3	97		
0.212	97		
0.15	96		
0.063	95		

Sample Proportions	% dry mass
Cobbles	0
Gravel	2
Sand	3
Silt and Clay	95

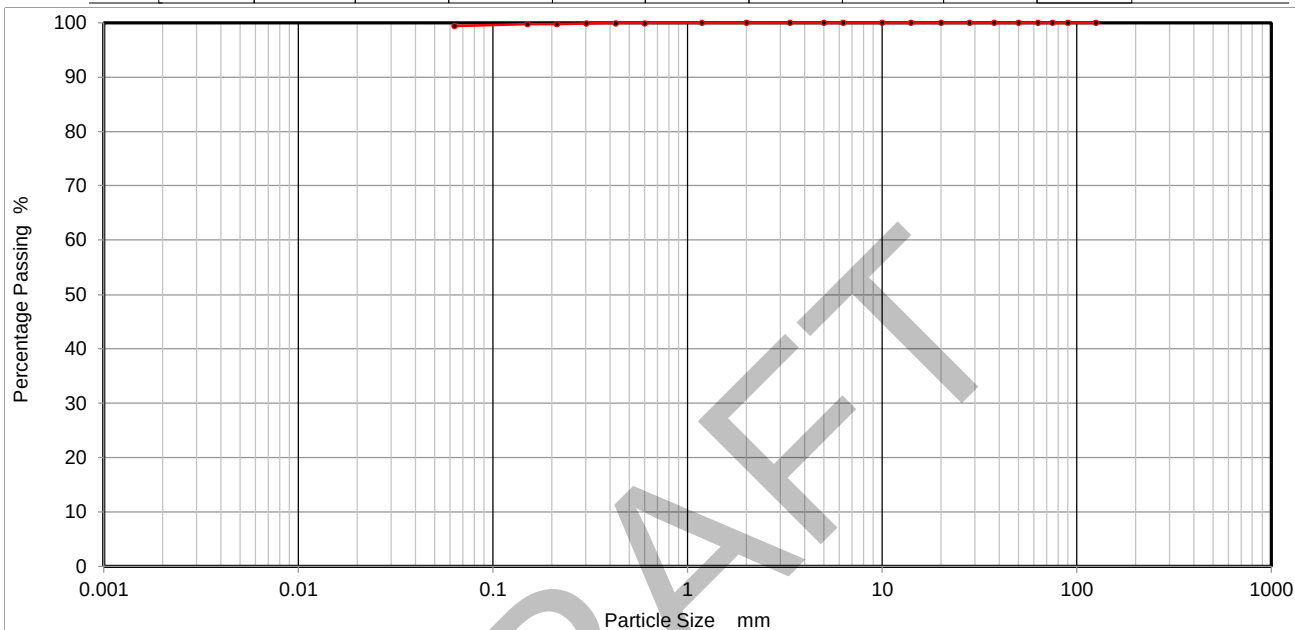
Remarks
Preparation and testing in accordance with BS1377 unless noted below

Operator
David Edwards

PARTICLE SIZE DISTRIBUTION
BS 1377 Part 2:1990
Wet Sieve, Clause 9.2

 GSTL GEOTECHNICAL SITE & TESTING LABORATORIES	PARTICLE SIZE DISTRIBUTION BS 1377 Part 2:1990 Wet Sieve, Clause 9.2	Contract Number	62170
		Borehole/Pit No.	TP02
Project Name	Robin Gardens, Waterloooville	Sample No.	1
Soil Description	*See sample description sheet	Depth Top	0.80
		Depth Base	
Date Tested	04/11/2022	Sample Type	B

CLAY	SILT			SAND			GRAVEL			COBBLES	BOULDERS
	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.6	100		
0.425	100		
0.3	100		
0.212	100		
0.15	100		
0.063	99		

Sample Proportions	% dry mass
Cobbles	0
Gravel	0
Sand	1
Silt and Clay	99

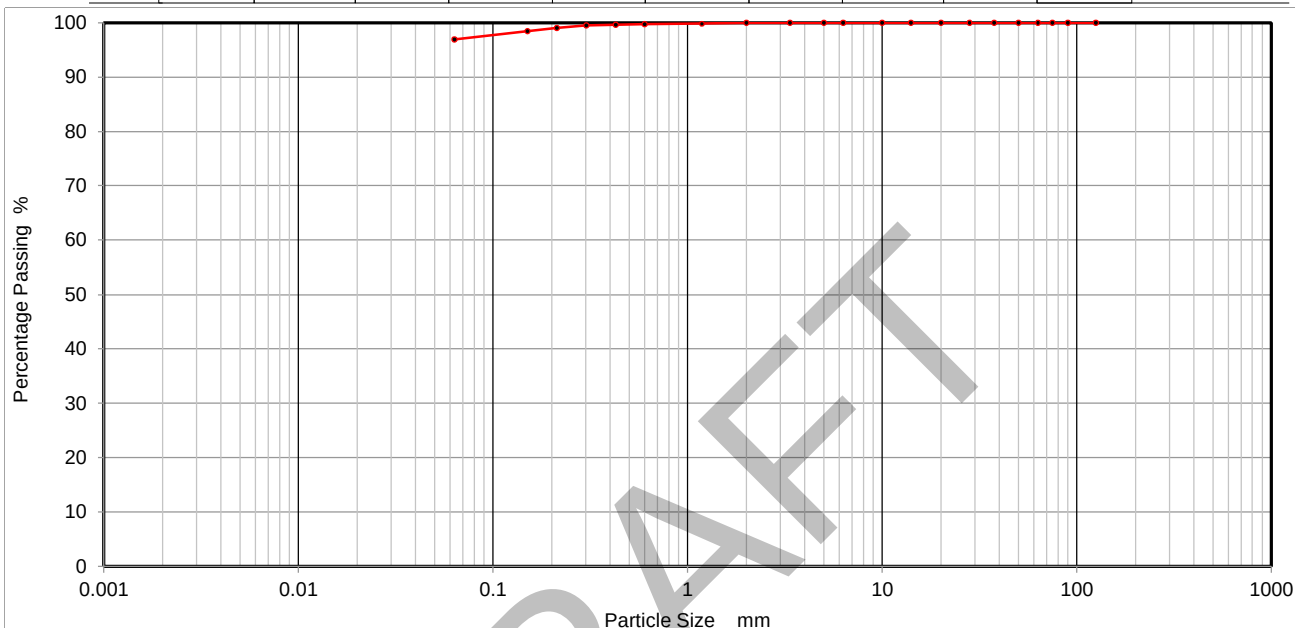
Remarks
Preparation and testing in accordance with BS1377 unless noted below

Operator
David Edwards

PARTICLE SIZE DISTRIBUTION
BS 1377 Part 2:1990
Wet Sieve, Clause 9.2

 GSTL GEOTECHNICAL SITE & TESTING LABORATORIES	PARTICLE SIZE DISTRIBUTION BS 1377 Part 2:1990 Wet Sieve, Clause 9.2	Contract Number	62170
		Borehole/Pit No.	TP02
Project Name	Robin Gardens, Waterloooville	Sample No.	3
Soil Description	*See sample description sheet	Depth Top	2.00
		Depth Base	
Date Tested	04/11/2022	Sample Type	B

CLAY	SILT			SAND			GRAVEL			COBBLES	BOULDERS
	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.6	100		
0.425	100		
0.3	99		
0.212	99		
0.15	98		
0.063	97		

Sample Proportions	% dry mass
Cobbles	0
Gravel	0
Sand	3
Silt and Clay	97

Remarks
Preparation and testing in accordance with BS1377 unless noted below

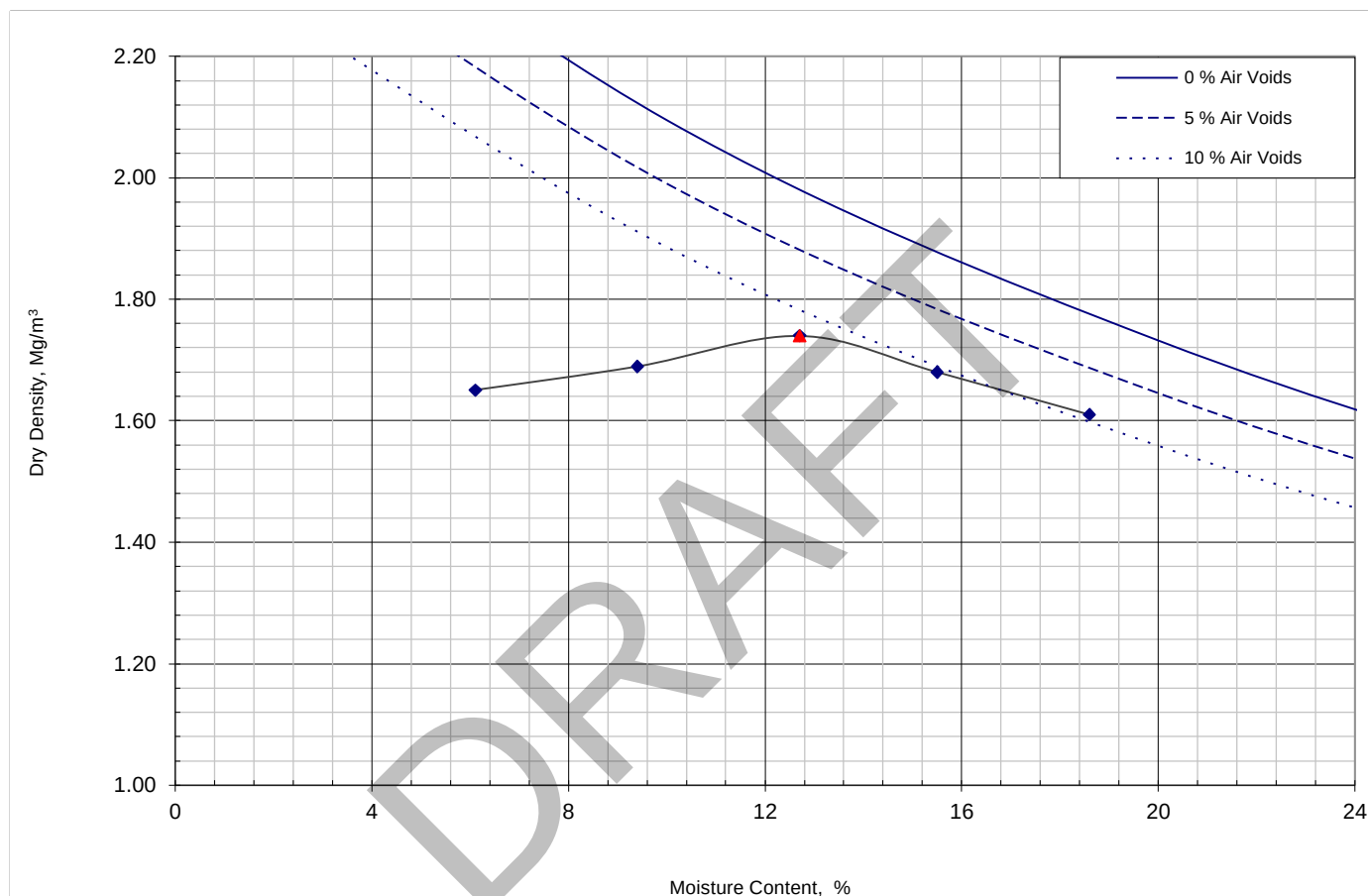
Operator
David Edwards

**Dry Density / Moisture Content Relationship
BS 1377:Part 4:1990**

Contract Number 62170

Borehole / Pit No BH01

Project Name	Robin Gardens, Waterloooville	Sample No	6
Date Tested	04/11/2022	Depth Top	3.00
Compaction Method	2.5 Kg Rammer	Depth Base	3.45
Compaction Clause	BS1377:Part 4:1990, Clause 3.3	Sample Type	U
Sample Description	*See Sample Description Sheet	Single or Separate Sample Used	Single



Compaction Point	1	2	3	4	5						
Moisture Content	6.1	9.4	13	16	19						
Bulk Density	1.75	1.85	1.96	1.94	1.91						
Dry Density	1.65	1.69	1.74	1.68	1.61						

Initial Moisture Content	13	%
Maximum Dry Density	1.74	Mg/m3
Optimum Moisture Content	13	%
Particle Density	2.65 Assumed	Mg/m3
Material Retained 37.5mm	0	%
Material Retained 20mm	0	%

Operator

Conor

**ONE DIMENSIONAL CONSOLIDATION TEST
BS1377:Part 5:1990, clause 3**

Contract Number 62170

Borehole/Trialpit No. BH01

Project Name Robin Gardens, Waterloooville

Sample No. 9

Soil Description *See Sample Description Sheet

Depth Top (m) 5.00

Depth Base (m) 5.35

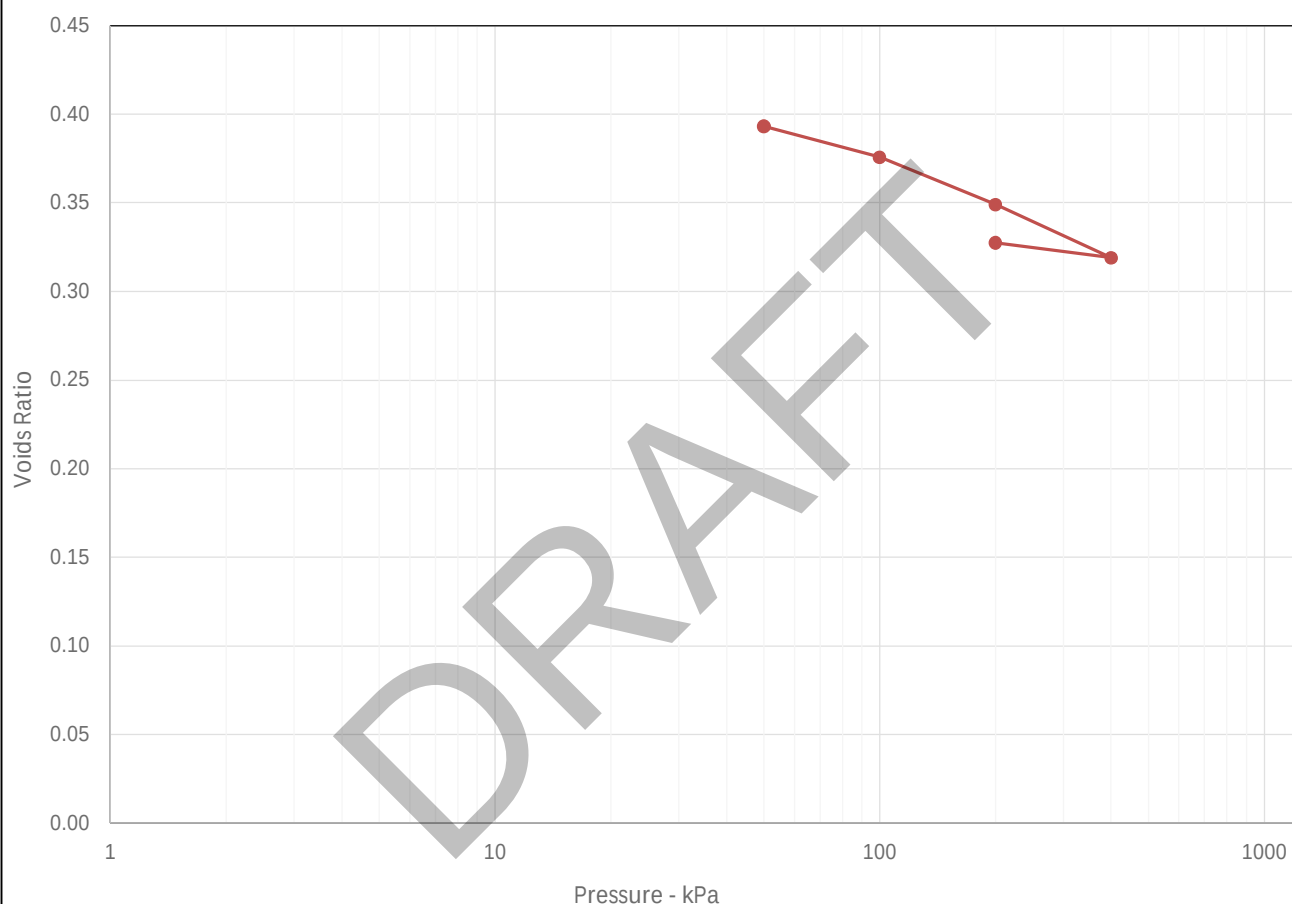
Lab Temperature 20°C

Sample Location Top

Remarks Cv Calculated Using T90
Particle Density Assumed Unless Stated Otherwise

Sample Type U

Date Tested 31/10/2022



Initial Sample Conditions		Pressure Range			Mv m2/MN	Cv m2/yr	Pressure Range			Mv m2/MN	Cv m2/yr
Moisture Content (%)	23	0	-	50	0.58	36		-			
Bulk Density (Mg/m3)	2.27	50	-	100	0.25	7.8		-			
Dry Density (Mg/m3)	1.85	100	-	200	0.19	13		-			
Voids Ratio	0.4350	200	-	400	0.11	23		-			
Degree of saturation	139.1	400	-	200	0.032	73		-			
Height (mm)	19.71		-					-			
Diameter (mm)	75.25		-					-			
Particle Density (Mg/m3)	2.65		-					-			

Operator

Wayne W

Single Stage Unconsolidated-Undrained Triaxial Test
BS 1377 : 1990 Part 7 : 8

Contract Number 62170

Borehole/Pit No. BH01

Project Name Robin Gardens, Waterloooville

Sample No. 6

Soil Description *See Sample Description Sheet

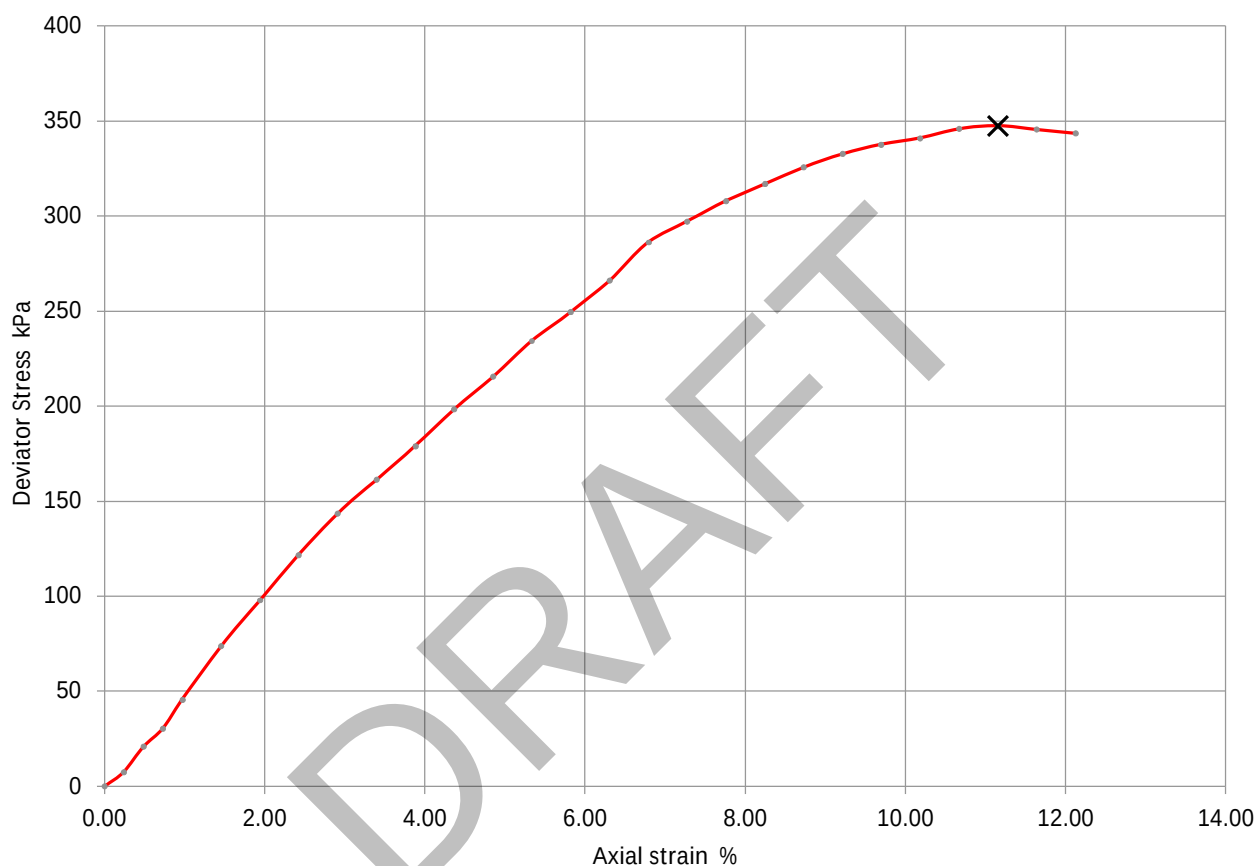
Depth Top (m) 3.00

Depth Base (m) 3.45

Date Tested 25/10/2022

Sample Type U

Operator Jordan



Moisture Content (%)	13
Bulk Density (Mg/m ³)	2.23
Dry Density (Mg/m ³)	1.97
Specimen Length (mm)	206.2
Specimen Diameter (mm)	103.4
Cell Pressure (kPa)	60
Deviator Stress (kPa)	348
Undrained Shear Strength (kPa)	174
Failure Strain (%)	11
Mode Of Failure	Plastic
Membrane Used/Thickness	Rubber/0.3mm
Rate of Strain (%/min)	1.45

**Single Stage Unconsolidated-Undrained Triaxial
Test
BS 1377 : 1990 Part 7 : 8**

Contract Number 62170

Borehole/Pit No. BH01

Project Name Robin Gardens, Waterloooville

Sample No. 9

Soil Description *See Sample Description Sheet

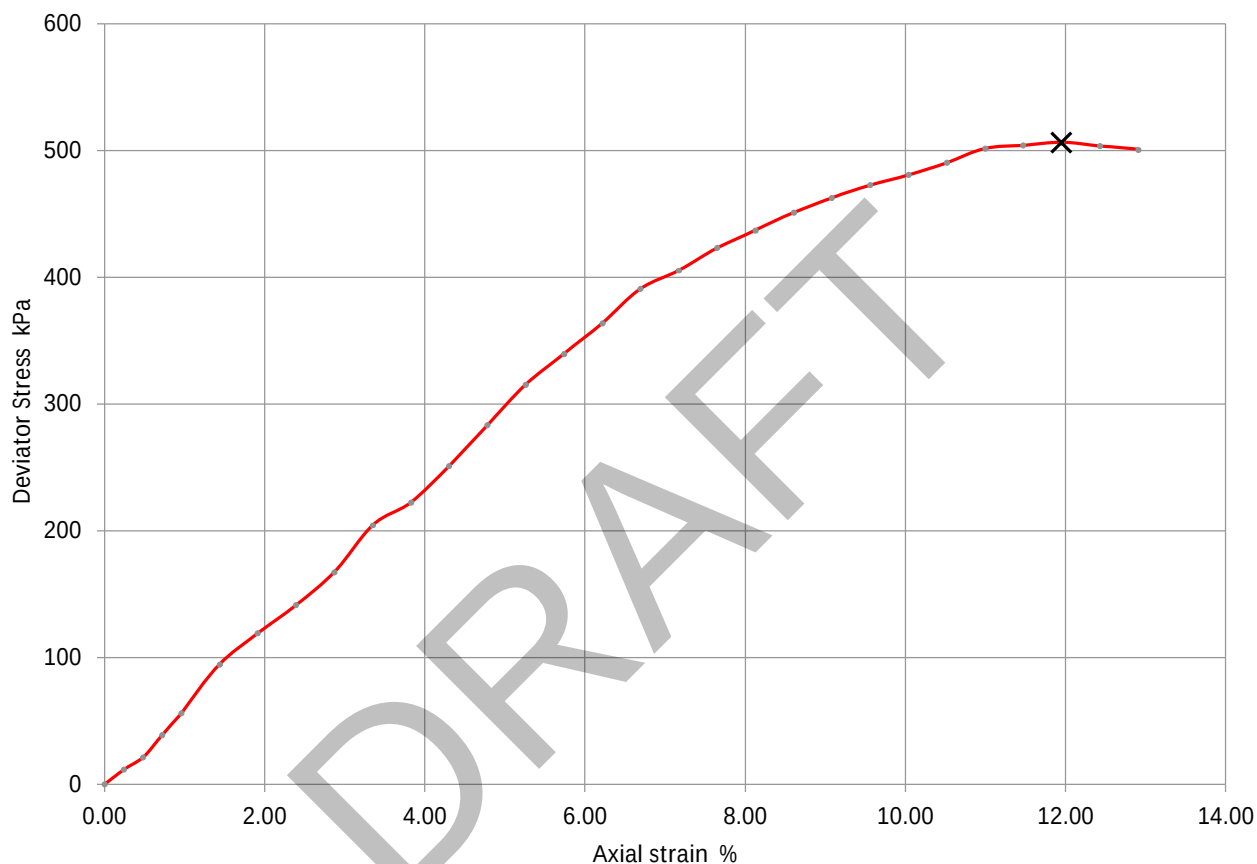
Depth Top (m) 5.00

Depth Base (m) 5.45

Date Tested 25/10/2022

Sample Type U

Operator Jordan



Moisture Content (%)	17
Bulk Density (Mg/m ³)	2.21
Dry Density (Mg/m ³)	1.89
Specimen Length (mm)	209.2
Specimen Diameter (mm)	102.4
Cell Pressure (kPa)	100
Deviator Stress (kPa)	507
Undrained Shear Strength (kPa)	253
Failure Strain (%)	12
Mode Of Failure	Plastic
Membrane Used/Thickness	Rubber/0.3mm
Rate of Strain (%/min)	1.43

**California Bearing Ratio
BS 1377: Part 4: 1990 Clause 7**

Contract Number 62170

Borehole/Pit No. BH01

Project Name Robin Gardens, Waterloooville

Sample No. 14

Soil Description *See Sample Description Sheet

Depth Top 8.00

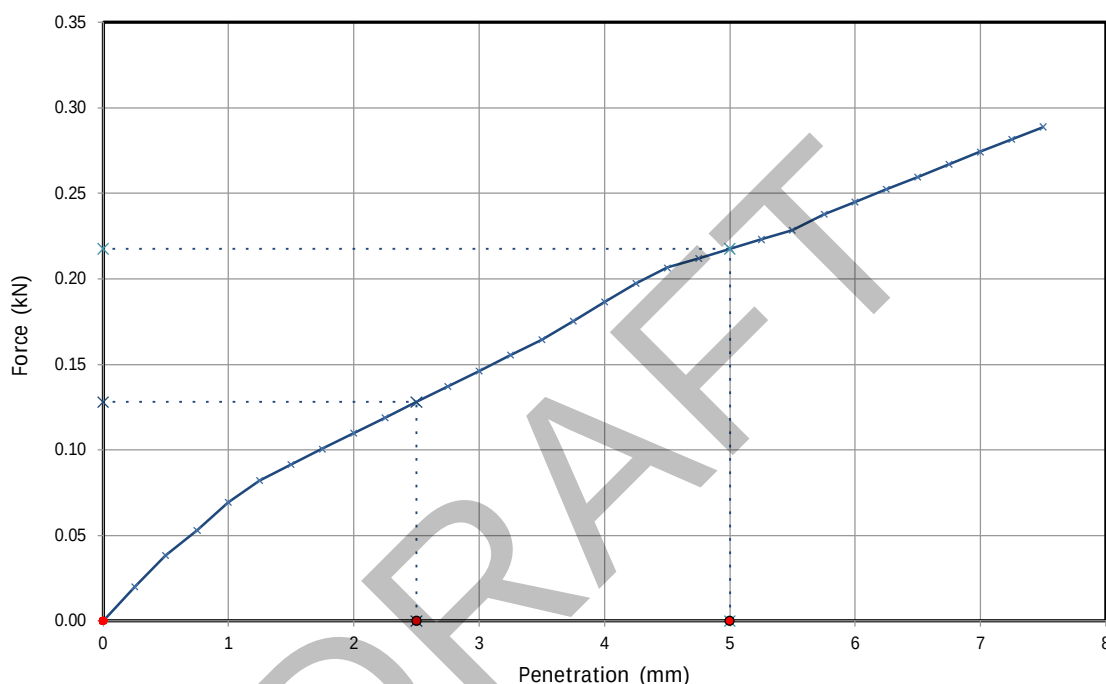
Compaction Method 2.5 Kg Rammer

Depth Base 8.30

Retained 20mm (%) 0

Sample Type BH01

Date Tested 04/11/2022



Initial Sample Conditions	
Moisture Content (%)	26
Moisture Top (%)	26
Moisture Bottom (%)	25
Bulk Density (Mg/m ³)	1.96
Dry Density (Mg/m ³)	1.56

Specified Testing Parameters	
Surcharge (Kg)	2
Soaking Time (hours)	N/A
Swelling (mm)	N/A
Remarks	

CBR Test Values			
2.5mm Top	0.970	2.5mm Bottom	
5mm Top	1.1	5mm Bottom	
CBR Value %	1.1	CBR Value %	

Operator
Conor

**California Bearing Ratio
BS 1377: Part 4: 1990 Clause 7**

Contract Number 62170

Borehole/Pit No. BH01

Project Name Robin Gardens, Waterloooville

Sample No. 18

Soil Description *See Sample Description Sheet

Depth Top 10.60

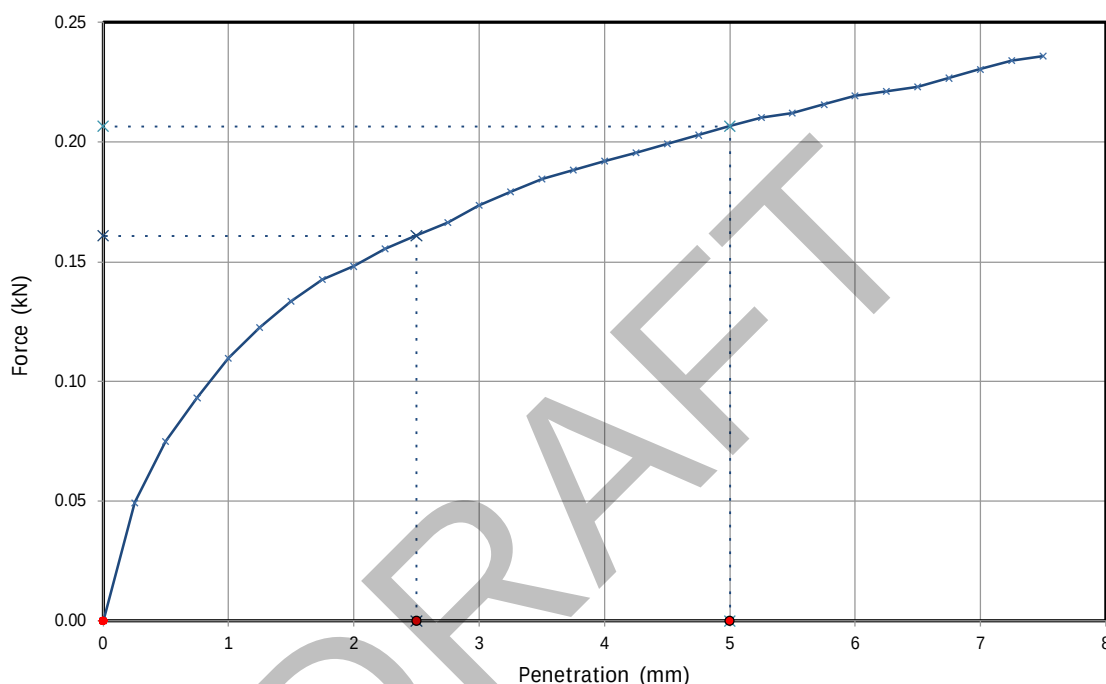
Compaction Method 2.5 Kg Rammer

Depth Base 10.90

Retained 20mm (%) 0

Sample Type BH01

Date Tested 04/11/2022



Initial Sample Conditions	
Moisture Content (%)	24
Moisture Top (%)	24
Moisture Bottom (%)	25
Bulk Density (Mg/m3)	1.95
Dry Density (Mg/m3)	1.58

Specified Testing Parameters	
Surcharge (Kg)	2
Soaking Time (hours)	N/A
Swelling (mm)	N/A
Remarks	

CBR Test Values			
2.5mm Top	1.200	2.5mm Bottom	
5mm Top	1	5mm Bottom	
CBR Value %	1.2	CBR Value %	

Operator
Conor

**California Bearing Ratio
BS 1377: Part 4: 1990 Clause 7**

Contract Number 62170

Borehole/Pit No. TP01

Project Name Robin Gardens, Waterloooville

Sample No. 3

Soil Description *See Sample Description Sheet

Depth Top 2.00

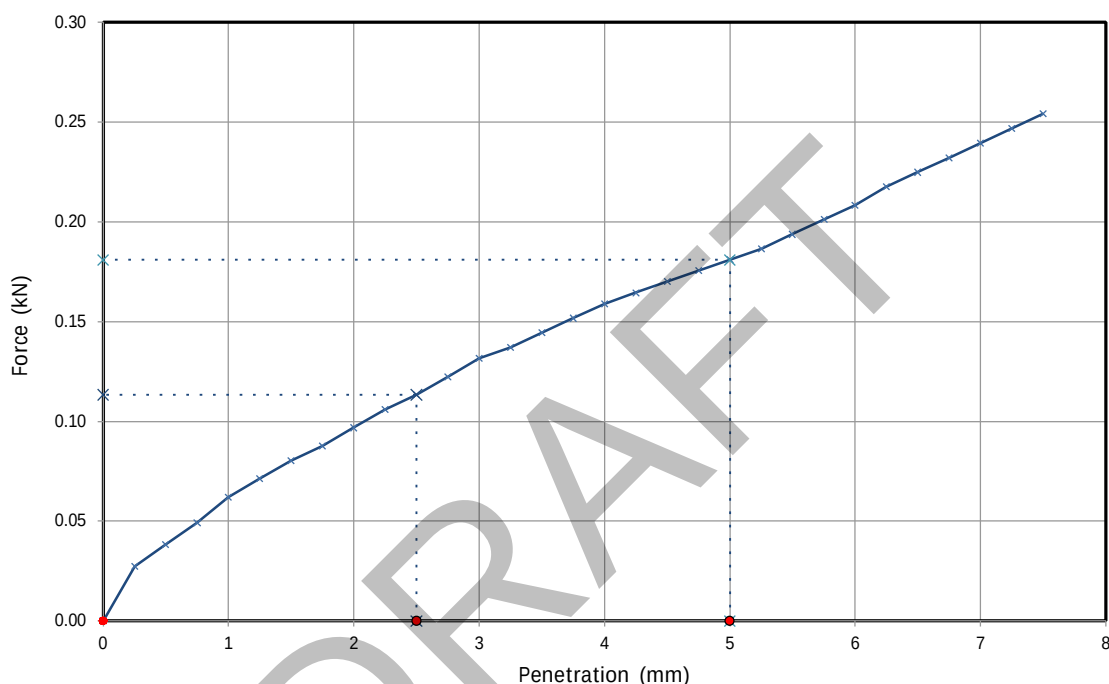
Compaction Method 2.5 Kg Rammer

Depth Base

Retained 20mm (%) 0

Sample Type B

Date Tested 04/11/2022



Initial Sample Conditions	
Moisture Content (%)	27
Moisture Top (%)	27
Moisture Bottom (%)	27
Bulk Density (Mg/m ³)	1.95
Dry Density (Mg/m ³)	1.53

Specified Testing Parameters	
Surcharge (Kg)	2
Soaking Time (hours)	N/A
Swelling (mm)	N/A
Remarks	

CBR Test Values			
2.5mm Top	0.860	2.5mm Bottom	
5mm Top	0.91	5mm Bottom	
CBR Value %	0.91	CBR Value %	

Operator
Conor



ANALYTICAL TEST REPORT

Contract no: 115087

Contract name: Robin Gardens, Waterloooville

Client reference: PO-22-040

Clients name: Geo Site and Testing Services

Clients address: Unit 3 and 4 Heol Aur
Dafen Industrial Estate, Dafen
Llanelli, Carmarthenshire
SA14 8QN

Samples received: 26 October 2022

Analysis started: 26 October 2022

Analysis completed: 02 November 2022

Report issued: 02 November 2022

Key

U	UKAS accredited test
M	MCERTS & UKAS accredited test
\$	Test carried out by an approved subcontractor
I/S	Insufficient sample to carry out test
N/S	Sample not suitable for testing

Approved by:



Abbie Neasham-Bourn
Senior Reporting Administrator

Chemtech Environmental Limited

SOILS

Lab number			115087-1	115087-2	115087-3	115087-4	115087-5	115087-6
Sample id			BH01	BH01	BH01	BH01	BH01	BH01
Depth (m)			0.90-1.20	2.00-2.45	3.45	6.50-6.95	9.00	11.00-11.35
Sample Type			B3	D5	D7	D12	D15	D19
Date sampled			-	-	-	-	-	-
Test	Method	Units						
pH	CE004 ^U	units	8.1	6.6	6.9	6.8	8.1	8.4
Sulphate (2:1 water soluble)	CE061 ^U	mg/l SO ₄	<10	<10	19	21	20	58
Sulphate (acid extractable)	CE062 ^U	mg/kg SO ₄	<100	<100	<100	<100	147	791
Sulphate (acid extractable)	CE062 ^U	% w/w SO ₄	<0.01	<0.01	<0.01	<0.01	0.01	0.08
Sulphur (total)	CE119	mg/kg S	<100	<100	<100	<100	<100	260
Sulphur (total)	CE119	% w/w S	<0.01	<0.01	<0.01	<0.01	<0.01	0.03

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SOILS

Lab number			115087-7
Sample id			TP01
Depth (m)			3.00
Sample Type			D4
Date sampled			-
Test	Method	Units	
pH	CE004 ^U	units	7.9
Sulphate (2:1 water soluble)	CE061 ^U	mg/l SO ₄	64
Sulphate (acid extractable)	CE062 ^U	mg/kg SO ₄	121
Sulphate (acid extractable)	CE062 ^U	% w/w SO ₄	0.01
Sulphur (total)	CE119	mg/kg S	<100
Sulphur (total)	CE119	% w/w S	<0.01

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METHOD DETAILS

METHOD	SOILS	METHOD SUMMARY	SAMPLE	STATUS	LOD	UNITS
CE004	pH	Based on BS 1377, pH Meter	As received	U	-	units
CE061	Sulphate (2:1 water soluble)	Aqueous extraction, ICP-OES	Dry	U	10	mg/l SO ₄
CE062	Sulphate (acid extractable)	HCl extract, analysed by ICP-OES	Dry	U	100	mg/kg SO ₄
CE062	Sulphate (acid extractable)	HCl extract, analysed by ICP-OES	Dry	U	0.01	% w/w SO ₄
CE119	Sulphur (total)	Aqua regia digest, analysed by ICP-OES	Dry		100	mg/kg S
CE119	Sulphur (total)	Aqua regia digest, analysed by ICP-OES	Dry		0.01	% w/w S

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DEVIATING SAMPLE INFORMATION

Comments

Sample deviation is determined in accordance with the UKAS note "Guidance on Deviating Samples" and based on reference standards and laboratory trials.

For samples identified as deviating, test result(s) may be compromised and may not be representative of the sample at the time of sampling.

Chemtech Environmental Ltd cannot be held responsible for the integrity of sample(s) received if Chemtech Environmental Ltd did not undertake the sampling. Such samples may be deviating.

Key

N	No (not deviating sample)
Y	Yes (deviating sample)
NSD	Sampling date not provided
NST	Sampling time not provided (waters only)
EHT	Sample exceeded holding time(s)
IC	Sample not received in appropriate containers
HP	Headspace present in sample container
NCF	Sample not chemically fixed (where appropriate)
OR	Other (specify)

Lab ref	Sample id	Depth (m)	Deviating	Tests (Reason for deviation)
115087-1	BH01	0.90-1.20	Y	All (NSD)
115087-2	BH01	2.00-2.45	Y	All (NSD)
115087-3	BH01	3.45	Y	All (NSD)
115087-4	BH01	6.50-6.95	Y	All (NSD)
115087-5	BH01	9.00	Y	All (NSD)
115087-6	BH01	11.00-11.35	Y	All (NSD)
115087-7	TP01	3.00	Y	All (NSD)

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ADDITIONAL INFORMATION

Notes

Opinions and interpretations expressed herein are outside the UKAS accreditation scope.

Unless otherwise stated, Chemtech Environmental Ltd was not responsible for sampling.

All testing carried out at Unit 6 Parkhead, Stanley, DH9 7YB, except for subcontracted testing.

Methods, procedures and performance data are available on request.

Results reported herein relate only to the material supplied to the laboratory.

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

Samples will be disposed of 4 weeks from initial receipt unless otherwise instructed.

For soils and solids, all results are reported on a dry basis. Samples dried at no more than 30°C in a drying cabinet.

Analytical results are inclusive of stones, where applicable.

DRAFT

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17 October 2022

Report No : GEO/36414/01

Page 1 of 1

For the attention of Mr P Standish

Our ref	GEO / 36414	Date samples received	23/09/2022
Your Ref	PO-22-040	Date written instructions received	23/09/2022
		Date testing commenced	24/09/2022
		Date of sample disposal	14/11/2022

Project **ROBIN GARDENS, WATERLOOVILLE**

Further to your instructions we have pleasure in enclosing the results of the tests you requested in the attached figures.

LABORATORY TEST REPORT

Item No	Test Quantity	Description
1	~	Liquid & Plastic Limits Summary
	9	Water Content
	9	Liquid & Plastic Limits
2	7	BRE SD1 Suite B - Natural ground + pyrite

Any opinions or interpretations expressed herein are outside the scope of UKAS accreditation. All results contained in this report are provisional unless signed by an approved signatory. The results contained in this report relate only to samples received in the laboratory and are tested 'as received' unless otherwise stated. This report should not be reproduced, except in full, without the written approval of the laboratory. The results reported are applicable only to the test items received by the laboratory.

All the necessary data required by the documented test procedures has been recorded and will be stored for a period of not less than 6 years. This data will be issued to yourselves at your request. All samples will be disposed of after the date shown above. Written confirmation will be required to retain the samples beyond this period and a storage charge may be applied.

We trust that the above meets your requirements and should you require any further information or assistance, please do not hesitate to contact us.

Yours faithfully
 on behalf of **GEOLABS Limited**

J Sturges
Operations Manager

eurolab**BGA****AGS**

SUMMARY OF LIQUID AND PLASTIC LIMIT TESTS

Location	Depth m	Sample Ref	Sample Type	Description	Water Content BS EN ISO 17892-1 : 2014 %	Liquid Limit %	Plastic Limit %	Plasticity Index %	Percentage Passing 425µm %	Atterberg Classification	Test Type	Sample Condition
WS01	0.80	1	D	Orangish brown mottled grey gravelly sandy CLAY. Sand is fine. Gravel is fine to medium flint.	18.8	54	22	32	90	CH	2	3
WS02	0.80	1	D	Orangish brown mottled grey gravelly sandy CLAY. Sand is fine. Gravel is fine to medium flint.	18.5	55	19	36	86	CH	2	3
WS03	0.80-1.00	1	B	Yellowish brown gravelly sandy CLAY. Sand is fine. Gravel is flint.	19.7	62	24	38	97	CH	2	1
WS04	0.70	1	D	Orangish brown mottled grey gravelly sandy CLAY. Sand is fine. Gravel is fine to medium flint.	20.7	54	25	29	88	CH	2	3
WS04	1.20	3	D	Reddish brown mottled light grey CLAY with rare fine to medium flint gravel.	12.5	56	19	37	99	CH	2	1
WS04	1.80-2.00	4	B	Yellowish brown and reddish brown mottled grey sandy CLAY. Sand is fine.	11.6	51	17	34	100	CH	2	1
WS04	2.80-3.00	5	B	Yellowish and reddish brown mottled grey slightly sandy CLAY. Sand is fine.	10.2	49	14	35	100	CI	2	1
WS05	1.00	1	D	Orangish brown sandy clayey flint GRAVEL.	12.2	45	20	25	35	CI	2	3
WS06	1.00	1	D	Orangish brown silty CLAY.	17.6	53	24	29	99	CH	2	3

Test Type:

- 1 - 1 point 80g / 30° fall cone method.
 2 - 4 point 80g / 30° fall cone method.
 3 - Non plastic determination.

Sample condition:

- 1 - As Received
 2 - Air Dried
 3 - Washed & Air Dried

Checked and Approved by:



J Sturges - Operations Manager
 17/10/2022

Project Number:

GEO / 36414

Project Name:

ROBIN GARDENS, WATERLOOVILLE
 PO-22-040



SUMMARY OF CHEMICAL TESTS ON SOIL

Location	Depth m	Sample Ref	Sample Type	pH Value	Total Acid Soluble Sulphate as SO ₄ %	Water Soluble Sulphate as SO ₄ 2:1 Water:Soil Extract g/l	Total Sulphur %	Water Soluble Chloride g/l	Water Soluble Nitrate g/l	Magnesium g/l	Organic Content %	Mass Loss on Ignition %	Carbonate Content %
WS01	0.80	1	D	8.4	0.022	< 0.010	0.055	-	-	-	-	-	-
WS01	1.20-1.50	3	B	8.5	0.021	0.013	0.054	-	-	-	-	-	-
WS02	1.20-1.50	3	B	6.5	0.041	0.018	0.066	-	-	-	-	-	-
WS03	1.20-1.50	3	B	5.0	0.079	0.013	0.066	-	-	-	-	-	-
WS04	1.80-2.00	4	B	5.4	0.030	< 0.010	0.041	-	-	-	-	-	-
WS05	3.00	3	D	6.8	0.033	< 0.010	0.083	-	-	-	-	-	-
WS06	1.00	1	D	5.8	0.062	< 0.010	0.061	-	-	-	-	-	-

Tested by Chemtest Ltd : MCERTS / UKAS No 2183

Checked and Approved by:



J Sturges - Operations Manager
17/10/2022

Project Number:

GEO / 36414

Project Name:

**ROBIN GARDENS, WATERLOOVILLE
PO-22-040**

