GEOTECHNICAL REPORT ON
GROUND INVESTIGATION

18 PARK SQUARE EAST, LONDON

FOR

THE DIORAMA ESTATE LTD

Giving our all

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APPROVAL & DISTRIBUTION SHEET

PROJECT DETAILS	
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CLIENT	18 Park Square East Ltd
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FOREWORD

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1. INTRODUCTION

This interpretative report has been prepared upon the written instruction of Quartz Project Services Ltd. acting on behalf of The Diorama Estate Ltd, on 3rd of October 2019.

The subject site is located at 18 Park Square East, London and comprises a five-storey former office building and associated four storey atrium section. It is proposed to redevelop the site by extending the existing basement beneath the existing building footprint, the construction of a rear basement section and the lowering of the 'vault' areas. Information provided by the Structural Engineer indicates that the 'hit and miss' underpinned and contiguous bored pile foundations are to have line loads of between 88.8kN/m run and 28kN/m run, with internal pads to have point loads of between 745kN and 152kN.

A ground investigation was requested by the client, to provide information on the ground conditions underlying the site to inform the design of the structure.

The fieldwork was undertaken in October 2019 and comprised one 20.45m deep cable percussion borehole and two modular windowless sampler boreholes to 18m and 20m below ground level. This report is based upon the above fieldwork and subsequent geotechnical laboratory testing programme.

A Preliminary Risk Assessment and waste classification has also been carried out by CET and will be reported separately. A separately report Basement Impact Assessment (BIA) has been produced and should be read in conjunction with this report.

Attention is drawn to the fact that whilst every effort has been made to ensure the accuracy of the data supplied and any analysis derived from it, there is a potential for variations in ground and groundwater conditions between and beyond the specific locations investigated. No liability can be accepted for any such variations. Furthermore, any recommendations are specific to the client's requirements as detailed herein and no liability will be accepted should these be used by third parties without prior consultation with Construction Testing Solutions Limited.

A geotechnical desk study as recommended in BS5930 "Code of practice for site investigations" was not requested and has therefore not been carried out.

2. SITE SETTINGS

The subject site is located at approximate Ordnance Survey grid reference TQ 287822 (see Figure 1) and comprises a five-storey disused office building located roughly in the centre of Park Square East, NW1.

The terraced building occupies the majority of the site footprint, with the remaining part of the site being occupied by soft landscaped courtyard areas. The property is bordered to the north and south by No. 17 and No. 19 Park Square East respectively and to the east and west by the public carriageways of Park Square East and Albany Terrace respectively. There are no trees within the site boundary or the neighbouring properties.

The subject site is essentially level at around 30mAOD, which is generally in keeping with the surrounding area.

Reference to the publications of the British Geological Survey indicates that the site is underlain by the deposits of the London Clay Formation, which is mantled by superficial deposits of Lynch Hill Gravel Member. Typically, these deposits may be described as follows: -

Stratum	Description
Lynch Hill Gravel Member	Sand and gravel, locally with lenses of silt, clay or peat. Rests on bedrock geology of London Clay, or Woolwich and Reading Beds. Average thickness 6m, but much thicker where infilling deep hollows.
London Clay Formation	Grey overconsolidated clay that weathers to a characteristic brown colour where it outcrops. Layers of claystone (septarian) nodules are common place within the London Clay Formation, as is the presence of selenite.

The ground investigation ascertained that the site was underlain by deposits of London Clay Formation, mantled by superficial deposits of Langley Silt Member over Lynch Hill Gravel Member. These deposits were mantled by Made Ground to a maximum depth of 1.9m m below ground level in BH03.

3. GROUND INVESTIGATION

The fieldwork was undertaken in October 2019 and comprised one 20.45m deep cable percussion borehole and two modular windowless sampler boreholes to 18m and 20m below ground level. The approximate locations of the exploratory holes are shown on Figure 2.

Prior to commencing each exploratory hole, the locations were scanned for services with a Cable Avoidance Tool (CAT) by the CET engineer. The locations with hard surfaced material were then cored out using a concrete coring rig.

Details of the ground conditions encountered in the exploratory holes are presented on the engineer's logs in Appendix A. Reference should be made to these logs for detailed descriptions of the strata penetrated and the results of any in situ tests carried out. A summary only of the ground conditions encountered in the exploratory holes is presented below:-

Strata name	Approximate level to top of strata (mAOD)	Thickness (m)	Description
Made Ground	30	0.25 to 1.9	Very clayey, slightly sandy GRAVEL of angular to rounded, fine to coarse flint and brick. Low cobble content of angular brick.
Langley Silt Member	28.2 to 28.25	1.2 to 1.75m	Firm and firm becoming stiff with depth, brown, slightly gravelly CLAY. Gravel is angular to rounded, fine and medium flint. Or Soft, brown, slightly fine sandy, silty CLAY.
Lynch Hill Gravel Member	27 to 25.78	5.18 to 5.9m	Loose to very dense, brown, very fine to coarse sandy, locally sandy and slightly sandy GRAVEL of sub-angular to rounded, fine to coarse flint.
Weathered and Relatively	21.3 to 20.6	Not proved.	Stiff, brown mottled grey, becoming brown and grey mottled CLAY with occasional sand size selenite and silt

Unweathered London Clay Formation.			partings. Or Stiff, grey, very closely to closely fissured CLAY with rare fine and medium sand size selenite.

From ground level, Made Ground was encountered locally to a maximum depth of 1.9m below ground level in BH03. Typically, this material was encountered as Very clayey, slightly sandy GRAVEL. This material was only present within the courtyard area. As this material will be removed during the basement excavation it will likely not have any impact on the basement design.

Deposits of the Langley Silt Member were found locally in BH01 and BH03 beneath a mantle of concrete or Made Ground respectively to a maximum depth of 3.1m below ground level. Typically, this material was encountered as brown, slightly gravelly CLAY or brown, slightly fine sandy, silty CLAY.

Beneath the Langley Silt Member and locally beneath a mantle of concrete deposits the Kempton Park Gravel Member were encountered to a maximum depth of 9m depth as Loose to very dense, brown, very fine to coarse sandy, locally sandy and slightly sandy GRAVEL.

The deposits of the weathered and relatively unweathered London Clay Formation were penetrated below the Lynch Hill Gravel Member deposits. These deposits were proved to a maximum depth of 20.45m below ground level.

Roots and rootlets were not observed in any of the exploratory holes.

Groundwater was encountered in BH01 at a depth of 9.5m, rising to 8m below ground level after 20 minutes of monitoring. Subsequent readings of the piezometers installed in the boreholes made during two post site work monitoring visits can be found summarised in the below table:-

Standpipe ID	BH01		BH02		BH03	
Date of Monitoring Visit.	05/12/2019	12/12/2019	05/12/2019	12/12/2019	05/12/2019	12/12/2019
Level (mAOD)	Dry	21.65	21.72	21.74	22.42	23.0

LABORATORY TESTING

The following geotechnical laboratory testing programme was carried out to provide further information on the engineering properties of the subsoil. Unless stated otherwise, these tests were carried out in accordance with BS 1377 “Methods of Test for Soils for Civil Engineering Purposes”.

No.	Test	UKAS Accreditation
6	Moisture content determination	CET Supplier
8	Atterberg limits	CET Supplier
9	PSD Wet Sieving	CET Supplier
4	Water soluble sulphate	CET Supplier
4	pH	CET Supplier
4	BRE SD1 Suite	CET Supplier

4. DISCUSSION AND RECOMMENDATIONS

GENERAL

The subject site is located at 18 Park Square East, London and comprises a five-storey former office building and associated four storey atrium section. It is proposed to redevelop the site by extending the existing basement beneath the existing building footprint, the construction of a rear basement section and the lowering of the 'vault' areas. Information provided by the Structural Engineer indicates that the 'hit and miss' underpinned and contiguous bored pile foundations are to have line loads of between 88.8kN/m run and 28kN/m run, with internal pads to have point loads of between 745kN and 152kN.

The fieldwork was undertaken in January 2019 and comprised one 20.45m deep cable percussion borehole and two modular windowless sampler boreholes to 18m and 20m below ground level.

The works established that the site is locally underlain by Made Ground to a maximum depth of 1.9m below ground level. Underlying this are superficial deposits of the Langley Silt Member over deposits of Lynch Hill Gravel Member. Superficial deposits were encountered to a maximum depth of 9.2m below ground level. Underlying superficial deposits, the weathered and relatively unweathered deposits of the London Clay Formation were penetrated to a maximum depth of 20.45m below ground level.

Groundwater was encountered in BH01 at a depth of 9.5m below ground level rising to 8m after 20 minutes during the course of the fieldwork. However, post site work monitoring of the well recorded a water level at a depth of between 23mAOD and 21.65mAOD.

Roots and rootlets were not encountered in any of the exploratory holes.

FOUNDATION RECCOMENDATIONS

In light of foundation design documents provided by the structural engineer a series of 'hit and miss underpinning blocks, contiguous bored pile walls and internal pads. The underpinned and contiguous bored pile walls will form the permanent retaining structure and therefore no temporary works are likely to be required, provided continuous support can be maintained.

Underpinning

In choosing an appropriate underpinning method the contractor must take into account the ability of the relevant company and the available equipment in being able to provide the required working loads within the settlement tolerances allowed by Camden Borough Council.

The recommendations made herein are based on underpinning blocks with a width of 1m and founded in Lynch Hill Gravel Member at a level of no lower than 23.5mAOD. The maximum line loadings on the walls provided by the structural engineer indicate loadings of 320kN/m spread over a 1m wide footing. Based on an average SPT 'N' value of 20 for the Lynch Hill Gravel Member 320kN/m^2 could be accommodated by strip or pad foundations bearing at least 1m below proposed slab level.

Contiguous bored piles

In choosing an appropriate piling contractor the client must take into account the ability of the relevant company and the available equipment in being able to provide the required working loads within the stated settlement tolerances.

The design and selection of appropriate piles is the responsibility of the appointed piling contractor who must give consideration inter alia to the following:

- The ability of the chosen method to penetrate the very dense gravels and cobbles of the Lynch Hill Gravel Member;
- The effects of noise and vibration on public highways, below ground services and nearby buildings, especially if driven piles are adopted; and
- Groundwater was recorded during post site work monitoring recorded water levels as high as 23mAOD below ground level. The chosen piling system must be capable of dealing with potential water ingresses during the installation process within the Lynch Hill Gravel Member.

The design and selection of piles is the responsibility of the appointed piling contractor with the comments contained herein being for guidance purposes only.

Calculations suggest that a 350mm diameter isolated pile founding at a maximum depth of 22.1mAOD with an effective length of circa 6m would have a factored working load of about 140kN.

Internal Pads

The recommendations made herein are based on pads with a surface area of 2.5m and a founding depth of 25mAOD. On this basis the maximum pressure being transferred to the pads would be 298kN/m^2. Based on

the average SPT 'N' values from in-situ testing a presumed net allowable bearing pressure of 298kN/m^2 could be accommodated with a factor of safety of 3 applied.

For likely settlements as a result of the basement construction the Ground Movement Assessment section of the BIA should be consulted.

RETAINING WALL DESIGN AND EXCAVATION SUPPORT

Due to the nature of the Lynch Hill Gravel Member deposits encountered on site continuous support of these materials will be required to maintain the stability of excavations through these deposits. Any loss of support will result in catastrophic settlement to the neighbouring structures. As such Lynch Hill Gravel Member deposits should not be left unsupported for any length of time. One prospective method of construction, among other methods, that will preclude loss of support is injection grouting to form the underpinning blocks. Additionally Injection grouting could be utilised to support material between the gaps in the contiguous bored pile wall.

The basement walls will need to be designed as permanent retaining structures. With reference to the laboratory test results and BS8002: 2015, the design parameters in the below table are appropriate for the design of retaining walls.

The design of piles as retaining structures should take account of the bending and shear movements when considering an appropriate pile diameter and reinforcement.

The design of retaining walls should adopt k_0, the lateral earth pressure at rest, to mitigate the risk of lateral movement and damage to adjacent structures.

Made Ground was not encountered within any of the boreholes at the depths of the proposed retaining walls. The chance for the occurrence of Made Ground arising in the public highway of Albany Terrace cannot be ruled out.

Material	$Ø'_{crit}$	c'	ϒ
Langley Silt Member	21.5˚	0	18kN/m^3
Lynch Hill Gravel Member	30˚	0	20kN/m^3

FLOOR SLAB DESIGN

Based on drawings provided by the structural engineer the anticipated formation level of the ground floor slab will be within the Lynch Hill Gravel Member deposits. Based on the SPT results from the formation level of the slab a ground bearing floor slab design may be adopted for this scheme.

CONCRETE BELOW GROUND

Chemical testing was carried out on soil samples recovered from the Langley Silt Member, Lynch Hill Gravel Member and London Clay Formation encountered in the three cable percussion boreholes. However based on the current design of the basement deposits of the London Clay Formation Will not be penetrated and therefore concrete will not come in to contact with soils from this strata.

The underlying groundwater condition within the Lynch Hill Gravel Member is likely to be classified as 'mobile', while the Langley Silt and London Clay Formation are likely to be classified as 'static' as defined in BRE Special Digest 1:2005 Third Edition "Concrete in Aggressive Ground".

In accordance with BRE Special Digest 1:2005 Third Edition "Concrete in Aggressive Ground", Table C2 "Aggressive Chemical Environment for Concrete (ACEC) classification for brownfield locations", the Design Sulphate Class and ACEC Class have been established based upon the available laboratory results.

The results of the water-soluble sulphate, for Langley Silt Member and strata indicate that the concrete could be designed to Design Sulphate Class DS-1 and ACEC Class AC-1s. While deposits of the Lynch Hill Gravel Member could be designed to Class DS-1 and ACEC Class AC-1.

FIGURES

INFRASTRUCTURE
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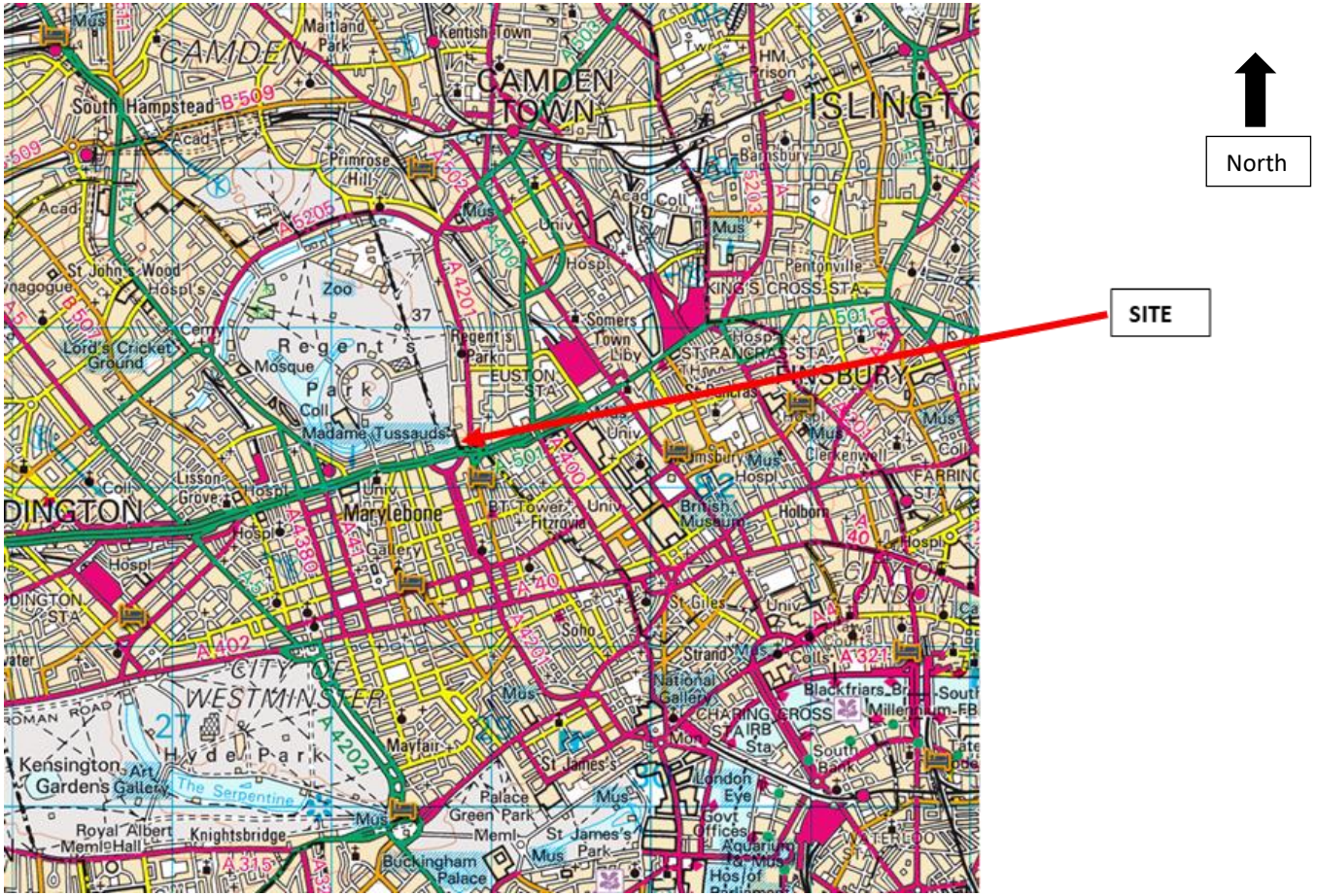
Northdown House, Ashford Road, Harrietsham, Maidstone
Kent, ME17 1QW
Telephone: 01622 858545 Facsimile: 01622 858544

The Diorama

Lead No.: **1038915**

Created By:	Checked:	Approved:	Date:
JM	**PJW**	**PJW**	**November 2019**



Site Location Plan

Scale: Not to Scale

FIGURE 1

INFRASTRUCTURE
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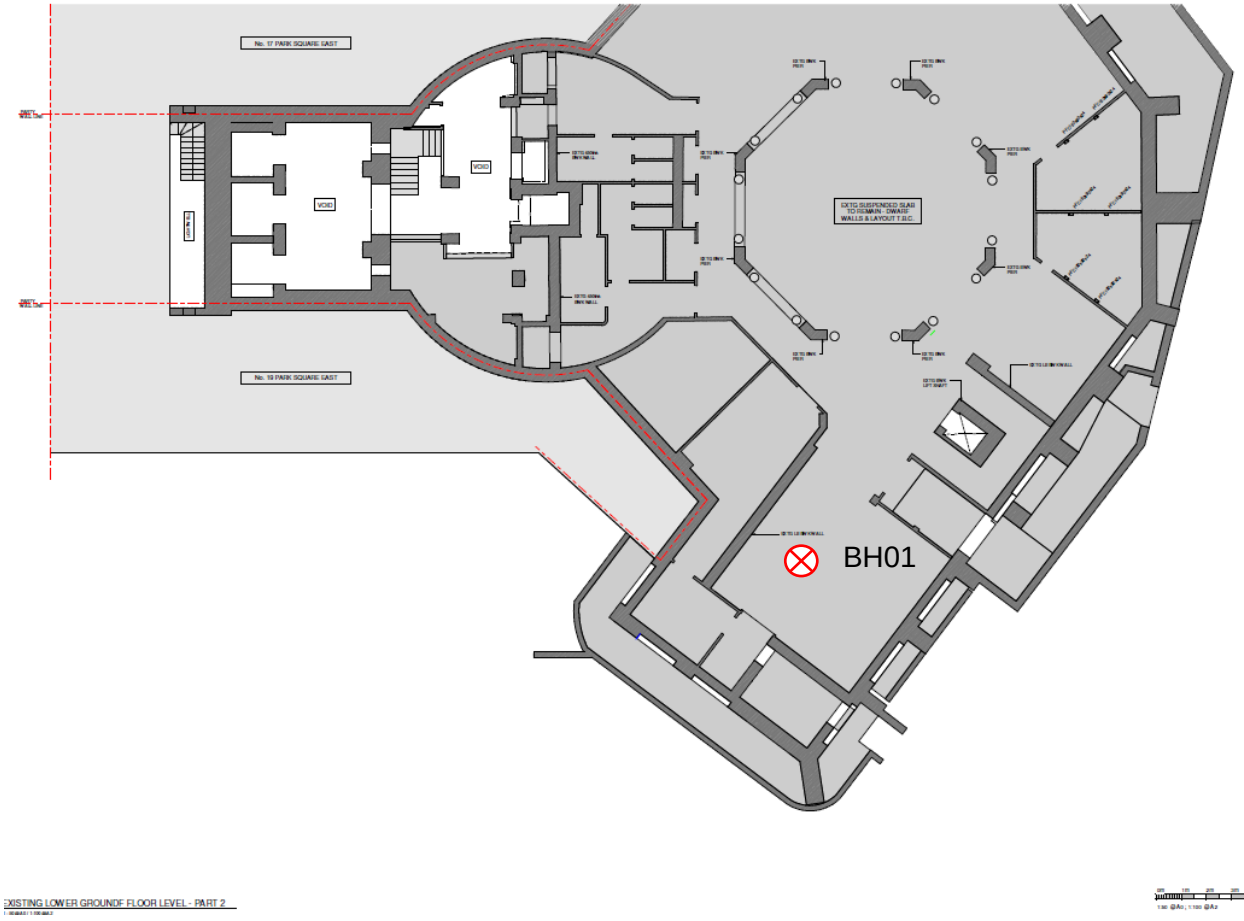
The Diorama

Lead No.	Created By:	Checked:	Approved:	Date:
1038915	**JM**	**PJW**	**PJW**	**November 2019**



Approximate Exploratory Hole Location Plan

Scale: Not to Scale

FIGURE 2 (page 1 of 3)

INFRASTRUCTURE
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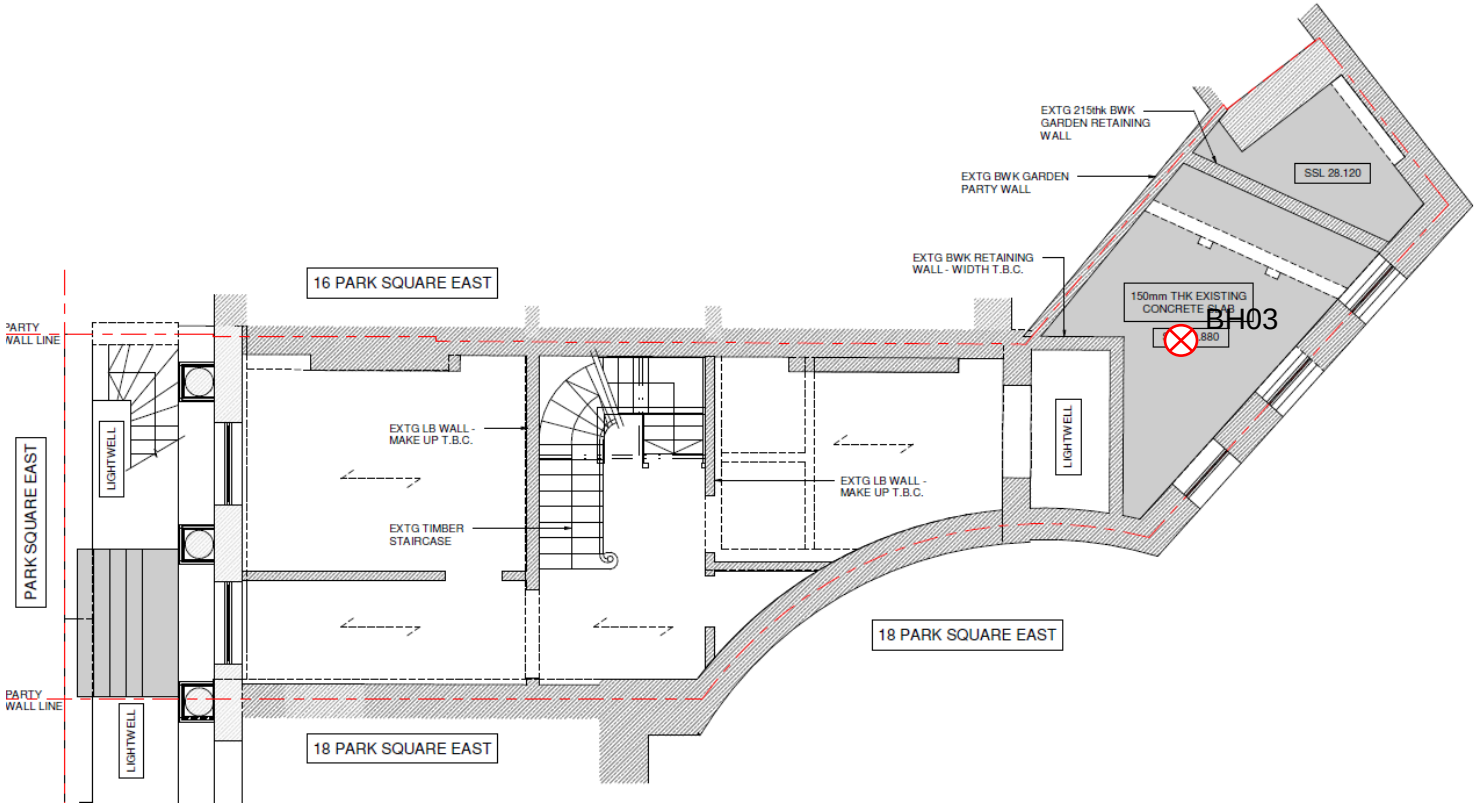
Kent, ME17 1QW
Telephone: 01622 858545 Facsimile: 01622 858544

The Diorama

Lead No.	Created By:	Checked:	Approved:	Date:
1038915	**JM**	**PJW**	**PJW**	**November 2019**



Approximate Exploratory Hole Location Plan

Scale: Not to Scale

FIGURE 2 (page 2 of 3)

INFRASTRUCTURE
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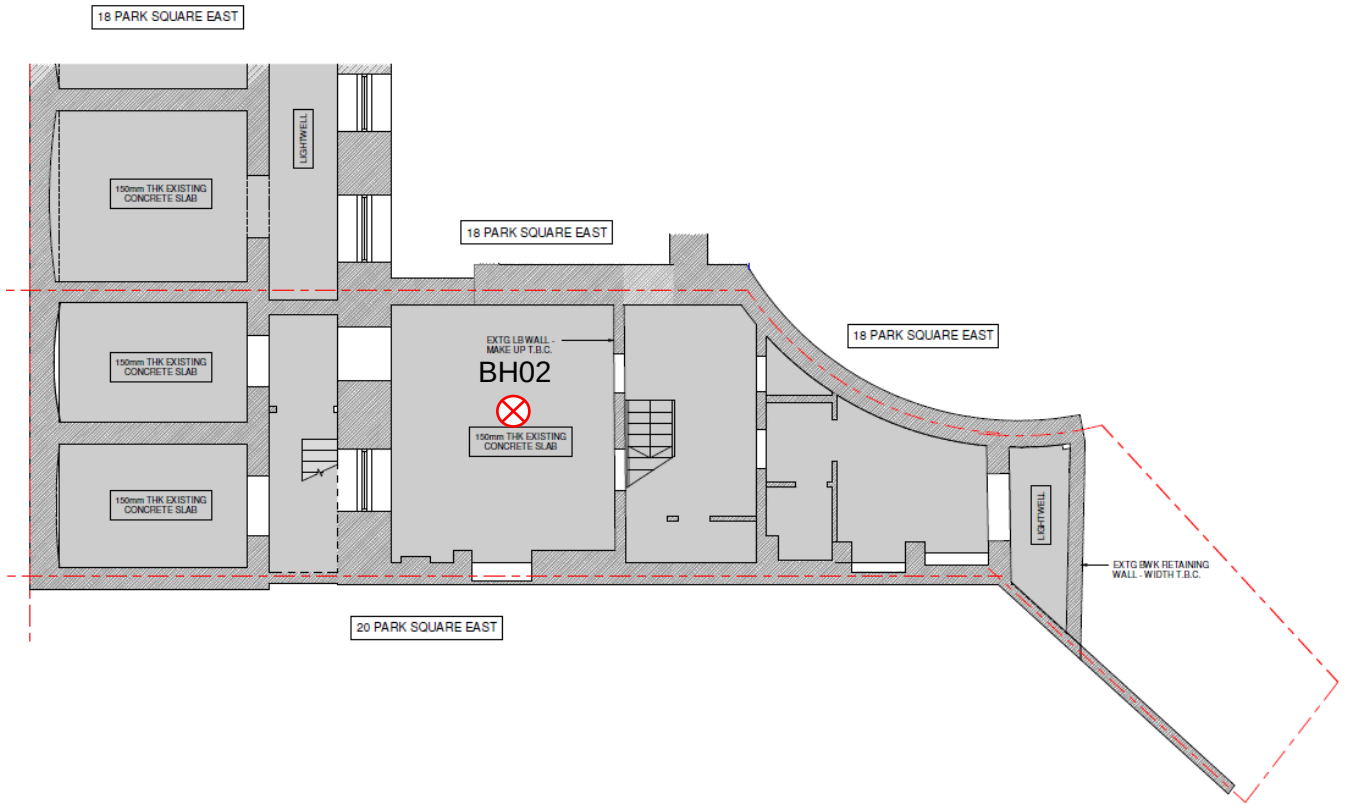
Kent, ME17 1QW
Telephone: 01622 858545 Facsimile: 01622 858544

The Diorama

Lead No.	Created By:	Checked:	Approved:	Date:
1038915	**JM**	**PJW**	**PJW**	**November 2019**



Approximate Exploratory Hole Location Plan

Scale: Not to Scale

FIGURE 2 (page 3 of 3)

APPENDIX A

Fieldwork

Client: **17 Park Square East Ltd, 19 Park Square East Ltd, The Diorama Estate Ltd**	Hole Diameter (mm): 100 to 20.45m	BOREHOLE NUMBER **BH01**
Method: Cable Percussion	Casing Dia. (mm): 150 to 7.50m	
Date Started: 14/10/2019 Co-ordinates	Ground Level (m AOD) 28.50 Ref. No: **1038915**	Sheet 1 of 3

Backfill/Well Depth (m)	Backfill/Well Legend	Water Depth (m)	Samples Depth (m)	Samples Type	In Situ Tests Type	In Situ Tests Results	Reduced Level (mAOD)	Depth & (Thickness) (m)	Description of Strata	Legend
			0.00 - 1.00	B			28.50	(0.25)	Concrete.	
0.50			0.50	D			28.25	0.25	Firm, brown, slightly gravelly CLAY. Gravel is angular to rounded, fine and medium flint. (Langley Silt Member)	
			1.20	D	C	N = 4		(1.45)		
			1.70	D			26.80	1.70		
2.00			2.00	D	C	N = 8		(0.30)	Soft, brown slightly fine sandy, silty CLAY. (Langley Silt Member)	
			2.50	D			26.50	2.00	Loose to medium dense, brown, slightly fine sandy, becoming very sandy at 4m below ground level GRAVEL of sub-angular to rounded, fine to course flint. Low cobble content of rounded flint. (Lynch Hill Gravel Member)	
			3.00	D	C	N = 8				
			3.00 - 4.00	B						
			3.50	D						
			4.00	D	C	N = 18				
			4.50	D				(5.20)		
			5.00	D	C	N = 23				
			6.00	D						
			6.00 - 7.00	B						
			6.50	D	C	N = 24				
7.00	W						21.30	7.20	Stiff brown mottled grey, becoming brown and grey mottled at 9m below ground level, CLAY with occasional sand size selenite and silt partings. (Weathered London Clay Formation)	
7.50			7.50	D						
		8.00	8.00	D	C	N = 12		(2.80)		
			9.00	D						
		9.50	9.50	D	C	N = 13				

General Remarks:

1. Water strike at 9.5m rising to 8m below ground level after 20 minutes.

Driller:	LH	**BOREHOLE RECORD** Scale 1:50 See Key Sheet for explanation of symbols, etc.	CET INFRASTRUCTURE Giving our all
Logged:	JM		
Checked:		**The Diorama**	**FIG A1**
Appr'd:			

Client: **17 Park Square East Ltd, 19 Park Square East Ltd, The Diorama Estate Ltd**	Hole Diameter (mm): 100 to 20.45m	BOREHOLE NUMBER **BH01**
Method: Cable Percussion	Casing Dia. (mm): 150 to 7.50m	
Date Started: 14/10/2019 Co-ordinates	Ground Level (m AOD) 28.50 Ref. No: **1038915**	Sheet 2 of 3

Backfill/Well Depth (m)	Backfill/Well Legend	Water Depth (m)	Samples Depth (m)	Samples Type	In Situ Tests Type	In Situ Tests Results	Reduced Level (mAOD)	Depth & (Thickness) (m)	Description of Strata	Legend
			10.50	D			18.50	10.00	Stiff, grey, very closely to closely fissured CLAY with rare fine and medium sand size selenite. (London Clay Formation)	
			11.00	D	C	N = 18				
			11.00 - 12.00	B						
			12.50	D	C	N = 19				
			13.50	D						
					C	N = 19				
								(10.45)		
					C	N = 24				
			16.00 - 17.00	B						
					C	N = 27				
					C	N = 25				

General Remarks:

1. Water strike at 9.5m rising to 8m below ground level after 20 minutes.

Driller:	LH	**BOREHOLE RECORD** Scale 1:50 See Key Sheet for explanation of symbols, etc.	CET INFRASTRUCTURE Giving our all
Logged:	JM		
Checked:		**The Diorama**	**FIG A1**
Appr'd:			

Client: **17 Park Square East Ltd, 19 Park Square East Ltd, The Diorama Estate Ltd**	Hole Diameter (mm): 100 to 20.45m	BOREHOLE NUMBER **BH01**
Method: Cable Percussion	Casing Dia. (mm): 150 to 7.50m	
Date Started: 14/10/2019 Co-ordinates	Ground Level (m AOD) 28.50 Ref. No: **1038915**	Sheet 3 of 3

Backfill/Well		Water	Samples		In Situ Tests		Reduced Level (mAOD)	Depth & (Thickness) (m)	Description of Strata	Legend
Depth (m)	Legend	Depth (m)	Depth (m)	Type	Type	Results				
20.00					C	N = 28	8.05	20.45	End of Borehole at 20.45m	

General Remarks:

1. Water strike at 9.5m rising to 8m below ground level after 20 minutes.

Driller:	LH	**BOREHOLE RECORD** Scale 1:50 See Key Sheet for explanation of symbols, etc.	CET INFRASTRUCTURE Giving our all
Logged:	JM		
Checked:		**The Diorama**	**FIG A1**
Appr'd:			

Client: **17 Park Square East Ltd, 19 Park Square East Ltd, The Diorama Estate Ltd**	Hole Diameter (mm): 75mm tapering with depth to 18.45m	BOREHOLE NUMBER **BH02**
Method: Windowless Sampler		
Date Started: 21/10/2019 Co-ordinates	Ground Level (m AOD) 26.10 Ref. No: **1038915**	Sheet 1 of 3

Backfill/Well Depth (m)	Backfill/Well Legend	Water Depth (m)	Samples Depth (m)	Samples Type	In Situ Tests Type	In Situ Tests Results	Reduced Level (mAOD)	Depth & (Thickness) (m)	Description of Strata	Legend
							26.10	(0.32)	Concrete.	
0.50							25.78	0.32	Dense to very dense, brown, very fine to coarse sandy, locally sandy GRAVEL of sub-rounded to rounded, fine to coarse flint. (Lynch Hill Gravel Member)	
1.00			1.00 - 2.00	B	S	N = 58				
			2.00 - 3.00	B	S	N = 42				
			3.00 - 4.00	B	S	N = 47		(5.18)		
			4.00 - 5.00	B	S	N = 43				
			5.00 - 6.00	B	S	N = 14				
							20.60	5.50	Stiff, brown mottled grey CLAY with rare silty fine sand partings. (Weathered London Clay Formation)	
								(0.40)		
6.00	W		6.00 - 7.00	B	S	N = 25	20.20	5.90	Stiff, grey, very closely to closely fissured CLAY with rare fine and medium sand size selenite. (London Clay Formation)	
6.50										

General Remarks:
1. Gravel transitioning to Clay at 5.0m below ground level, inferred from drop in SPT N value.

Driller:	AR	BOREHOLE RECORD Scale 1:33 See Key Sheet for explanation of symbols, etc.	CET INFRASTRUCTURE Giving our all
Logged:	JM		
Checked:		**The Diorama**	**FIG A2**
Appr'd:			

Client: **17 Park Square East Ltd, 19 Park Square East Ltd, The Diorama Estate Ltd**	Hole Diameter (mm): 75mm tapering with depth to 18.45m	BOREHOLE NUMBER **BH02**
Method: Windowless Sampler		
Date Started: 21/10/2019 Co-ordinates	Ground Level (m AOD) 26.10 Ref. No: **1038915**	Sheet 2 of 3

Backfill/Well		Water	Samples		In Situ Tests		Reduced Level (mAOD)	Depth & (Thickness) (m)	Description of Strata	Legend
Depth (m)	Legend	Depth (m)	Depth (m)	Type	Type	Results				
			7.00 - 8.00	B	S	N = 24				
			8.00 - 9.00	B	S	N = 26				
			9.00 - 10.00	B	S	N = 24				
			10.00 - 11.00	B	S	N = 29				
			11.00 - 12.00	B	S	N = 33				
			12.00 - 13.00	B	C	N = 38		(12.55)		
			13.00 - 14.00	B	S	N = 38				

General Remarks:
1. Gravel transitioning to Clay at 5.0m below ground level, inferred from drop in SPT N value.

Driller:	AR	BOREHOLE RECORD Scale 1:33 See Key Sheet for explanation of symbols, etc.	CET INFRASTRUCTURE Giving our all
Logged:	JM		
Checked:		**The Diorama**	**FIG A2**
Appr'd:			

Client: **17 Park Square East Ltd, 19 Park Square East Ltd, The Diorama Estate Ltd**	Hole Diameter (mm): 75mm tapering with depth to 18.45m	BOREHOLE NUMBER **BH02**
Method: Windowless Sampler		
Date Started: 21/10/2019 Co-ordinates	Ground Level (m AOD) 26.10 Ref. No: **1038915**	Sheet 3 of 3

Backfill/Well		Water	Samples		In Situ Tests		Reduced Level (mAOD)	Depth & (Thickness) (m)	Description of Strata	Legend
Depth (m)	Legend	Depth (m)	Depth (m)	Type	Type	Results				
			14.00 - 15.00	B	S	N = 44				
			15.00 - 16.00	B						
			16.00 - 17.00	B	S	N = 44				
			17.00 - 18.00	B						
					S	N = 52				
							7.65	18.45	End of Borehole at 18.45m	

General Remarks:
1. Gravel transitioning to Clay at 5.0m below ground level, inferred from drop in SPT N value.

Driller:	AR	BOREHOLE RECORD Scale 1:33 See Key Sheet for explanation of symbols, etc.	CET INFRASTRUCTURE Giving our all
Logged:	JM		
Checked:		**The Diorama**	**FIG A2**
Appr'd:			

Client: **17 Park Square East Ltd, 19 Park Square East Ltd, The Diorama Estate Ltd**	Hole Diameter (mm): 75mm tapering with depth to 20m	BOREHOLE NUMBER **BH03**
Method: Windowless Sampler		
Date Started: 25/10/2019 Co-ordinates	Ground Level (m AOD) 30.10 Ref. No: **1038915**	Sheet 1 of 4

Backfill/Well		Water	Samples		In Situ Tests		Reduced Level (mAOD)	Depth & (Thickness) (m)	Description of Strata	Legend
Depth (m)	Legend	Depth (m)	Depth (m)	Type	Type	Results				
			0.00 - 1.00	B			30.10	(0.10)	Decorative gravel.	
0.50							30.00	0.10	Loose, dark brown mottled red, very clayey, slightly fine to coarse sandy GRAVEL of angular to rounded, fine to coarse flint and brick. Low cobble content of angular brick. (Made Ground)	
			1.00 - 2.00	B	S	N = 4		(1.80)		
2.00			2.00 - 3.00	B	S	N = 14	28.20	1.90	Firm becoming stiff with depth, brown, slightly gravelly CLAY. Gravel is angular to rounded, fine and medium flint. (Langley Silt Member)	
			3.00 - 4.00	B	S	N = 51		(1.20)		
			4.00 - 5.00	B	S	N =50/160mm	27.00	3.10	Very dense, brown, very fine to coarse sandy, locally sandy GRAVEL of sub-rounded to rounded, fine to coarse flint. (Lynch Hill Gravel Member)	
			5.00 - 6.00	B	S	N =50/275mm				
			6.00 - 7.00	B	S	N = 50		(5.90)		

General Remarks:

Driller:	MW	BOREHOLE RECORD Scale 1:33 See Key Sheet for explanation of symbols, etc.	CET INFRASTRUCTURE Giving our all
Logged:	JM		
Checked:		**The Diorama**	**FIG A3**
Appr'd:			

Client: **17 Park Square East Ltd, 19 Park Square East Ltd, The Diorama Estate Ltd**	Hole Diameter (mm): 75mm tapering with depth to 20m	BOREHOLE NUMBER **BH03**
Method: Windowless Sampler		
Date Started: 25/10/2019 Co-ordinates	Ground Level (m AOD) 30.10 Ref. No: **1038915**	Sheet 2 of 4

Backfill/Well		Water	Samples		In Situ Tests		Reduced Level (mAOD)	Depth & (Thickness) (m)	Description of Strata	Legend
Depth (m)	Legend	Depth (m)	Depth (m)	Type	Type	Results				
			7.00 - 8.00	B	S	N = 62				
			8.00 - 9.00	B	S	N = 50				
			9.00 - 10.00	B	S	N = 22	21.10	9.00	Stiff, brown mottled grey CLAY with rare silty fine sand partings. (Weathered London Clay Formation)	
								(0.80)		
10.00	W		10.00 - 11.00	B	S	N = 33	20.30	9.80	Stiff, grey, very closely to closely fissured CLAY with rare fine and medium sand size selenite. (London Clay Formation)	
10.50										
			11.00 - 12.00	B	S	N = 25				
			12.00 - 13.00	B	S	N = 28				
			13.00 - 14.00	B	S	N = 35				

General Remarks:

Driller:	MW	BOREHOLE RECORD Scale 1:33 See Key Sheet for explanation of symbols, etc.	CET INFRASTRUCTURE Giving our all
Logged:	JM		
Checked:		**The Diorama**	**FIG A3**
Appr'd:			

Client: **17 Park Square East Ltd, 19 Park Square East Ltd, The Diorama Estate Ltd**			Hole Diameter (mm): 75mm tapering with depth to 20m		BOREHOLE NUMBER **BH03**
Method: Windowless Sampler					Sheet 3 of 4
Date Started: 25/10/2019	Co-ordinates		Ground Level (m AOD) 30.10	Ref. No: **1038915**	

Backfill/Well		Water	Samples		In Situ Tests		Reduced Level (mAOD)	Depth & (Thickness) (m)	Description of Strata	Legend
Depth (m)	Legend	Depth (m)	Depth (m)	Type	Type	Results				
			14.00 - 15.00	B	S	N = 42				
			15.00 - 16.00	B	S	N =50/95mm		(10.20)		
			16.00 - 17.00	B						
			17.00 - 18.00	B	S	N = 21				
			18.00 - 19.00	B						
			19.00 - 20.00	B	S	N = 33				

General Remarks:

Driller:	MW	BOREHOLE RECORD Scale 1:33 See Key Sheet for explanation of symbols, etc.	CET INFRASTRUCTURE Giving our all
Logged:	JM		
Checked:		**The Diorama**	**FIG A3**
Appr'd:			

Client: **17 Park Square East Ltd, 19 Park Square East Ltd, The Diorama Estate Ltd**	Hole Diameter (mm): 75mm tapering with depth to 20m	BOREHOLE NUMBER **BH03**
Method: Windowless Sampler		Sheet 4 of 4
Date Started: 25/10/2019 Co-ordinates	Ground Level (m AOD) 30.10	Ref. No: **1038915**

Backfill/Well		Water	Samples		In Situ Tests		Reduced Level (mAOD)	Depth & (Thickness) (m)	Description of Strata	Legend
Depth (m)	Legend	Depth (m)	Depth (m)	Type	Type	Results				
							10.10	20.00	End of Borehole at 20.00m	

General Remarks:

Driller:	MW	BOREHOLE RECORD Scale 1:33 See Key Sheet for explanation of symbols, etc.	CET INFRASTRUCTURE Giving our all
Logged:	JM		
Checked:		**The Diorama**	**FIG A3**
Appr'd:			

APPENDIX B

Laboratory Testing

SUMMARY OF GEOTECHNICAL TESTING

Sample details							Classification Tests					Density Tests		Undrained Triaxial Compression				Chemical Tests			Other tests and comments
Borehole / Trial Pit	Depth (m)	Sample Ref	Type	Spec. Ref	Spec. Depth (m)	Description	WC (%)	LL (%)	PL (%)	PI (%)	<425 µm (%)	Bulk Mg/m³	Dry Mg/m³	Condition	Cell Pressure kPa	Deviator Stress kPa	Shear Stress kPa	pH	2:1 W/S SO4 (g/L)	W/S Mg (mg/L)	
BH01	0.50		B			Greyish brown slightly sandy gravelly silty CLAY with rare cobbles. Gravel includes brick fragments with traces of bitumen.															Particle Size Distribution
BH01	1.20		D			Brown slightly fine sandy silty CLAY with rare fine chalk gravel.	29.0	62	19	43	99										
BH01	3.00-4.00		B			Orangish brown very sandy GRAVEL.															Particle Size Distribution
BH01	6.00-7.00		B			Yellowish brown very gravelly SAND.															Particle Size Distribution
BH01	8.00		D			Brown and dark brown slightly fine sandy silty CLAY with rare fine gravel.	29.3	80	26	54	99										
BH01	10.50		D			Dark grey and dark brown slightly fine sandy silty CLAY with rare fine gravel.	30.5	74	25	49	99										
BH02	1.00-2.00		WS			Orangish brown SAND and GRAVEL.															Particle Size Distribution
BH02	4.00-5.00		WS			Orangish brown very gravelly SAND.															Particle Size Distribution
BH02	5.00-6.00		WS		5.50	Dark brown and dark greyish brown slightly sandy slightly gravelly silty CLAY.	28.2	72	29	43	92										
BH02	6.00-7.00		WS			Dark brown slightly fine sandy silty CLAY.	26.7	74	25	49	100										

Sample type: B (Bulk disturb.) BLK (Block) C (Core) D (Disturbed) LB (Large Bulk dist.) U (Undisturbed)

Checked and Approved by

S Burke - Senior Technician
18/12/2019

Project Number: **GEO / 30305**

Project Name: **THE DIORAMA 1038915**

GEOLABS®

SUMMARY OF GEOTECHNICAL TESTING

Sample details							Classification Tests					Density Tests		Undrained Triaxial Compression				Chemical Tests			Other tests and comments
Borehole / Trial Pit	Depth (m)	Sample Ref	Type	Spec. Ref	Spec. Depth (m)	Description	WC (%)	LL (%)	PL (%)	PI (%)	<425 µm (%)	Bulk Mg/m³	Dry Mg/m³	Condition	Cell Pressure kPa	Deviator Stress kPa	Shear Stress kPa	pH	2:1 W/S SO4 (g/L)	W/S Mg (mg/L)	
BH03	2.00-3.00		WS			Dark brown and yellowish brown slightly sandy silty CLAY with rare gravel.		71	20	51	97										
BH03	3.00-4.00		WS			Orangish brown very sandy GRAVEL.															Particle Size Distribution
BH03	4.00-5.00		WS			Orangish brown SAND and GRAVEL.															Particle Size Distribution
BH03	5.00-6.00		WS			Yellowish brown very sandy GRAVEL.															Particle Size Distribution
BH03	7.00-8.00		WS			Orangish brown SAND and GRAVEL.															Particle Size Distribution
BH03	9.00-10.00		WS			Dark brown slightly fine sandy silty CLAY.		81	26	55	100										
BH03	11.00-12.00		WS			Dark brown slightly fine sandy silty CLAY.	22.9	71	22	49	100										

Sample type: B (Bulk disturb.) BLK (Block) C (Core) D (Disturbed) LB (Large Bulk dist.) U (Undisturbed)

Checked and Approved by

S Burke - Senior Technician
18/12/2019

Project Number:

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BS EN ISO 17892-4 : 2016

PARTICLE SIZE DISTRIBUTION

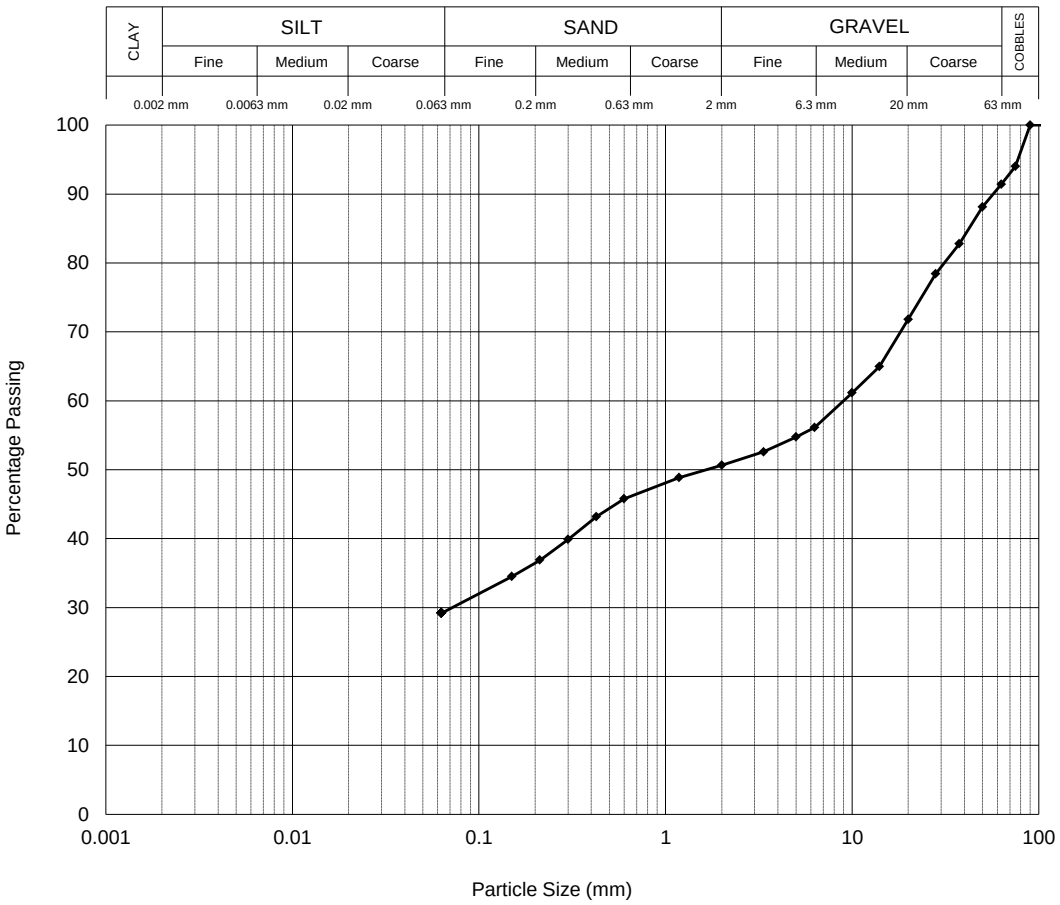
BH / TP No.	BH01
Depth (m)	0.50
Sample Type	B

Description

Greyish brown slightly sandy gravelly silty CLAY with rare cobbles. Gravel includes brick fragments with traces of bitumen.

BS EN ISO 17892-4 : 2016 : Clause 5.2 - Wet Sieve

Sieve	
Size	% Pass
200.0 mm	100
125.0 mm	100
90.0 mm	100
75.0 mm	94
63.0 mm	91
50.0 mm	88
37.5 mm	83
28.0 mm	78
20.0 mm	72
14.0 mm	65
10.0 mm	61
6.30 mm	56
5.00 mm	55
3.35 mm	53
2.00 mm	51
1.18 mm	49
600 µm	46
425 µm	43
300 µm	40
212 µm	37
150 µm	34
63 µm	29



Particle Proportions	
Cobbles	9
Gravel	41
Sand	21
Silt & Clay	29

Checked and Approved by

S Burke

S Burke - Senior Technician
18/12/2019

Project Number:

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Project Name:

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BS EN ISO 17892-4 : 2016

PARTICLE SIZE DISTRIBUTION

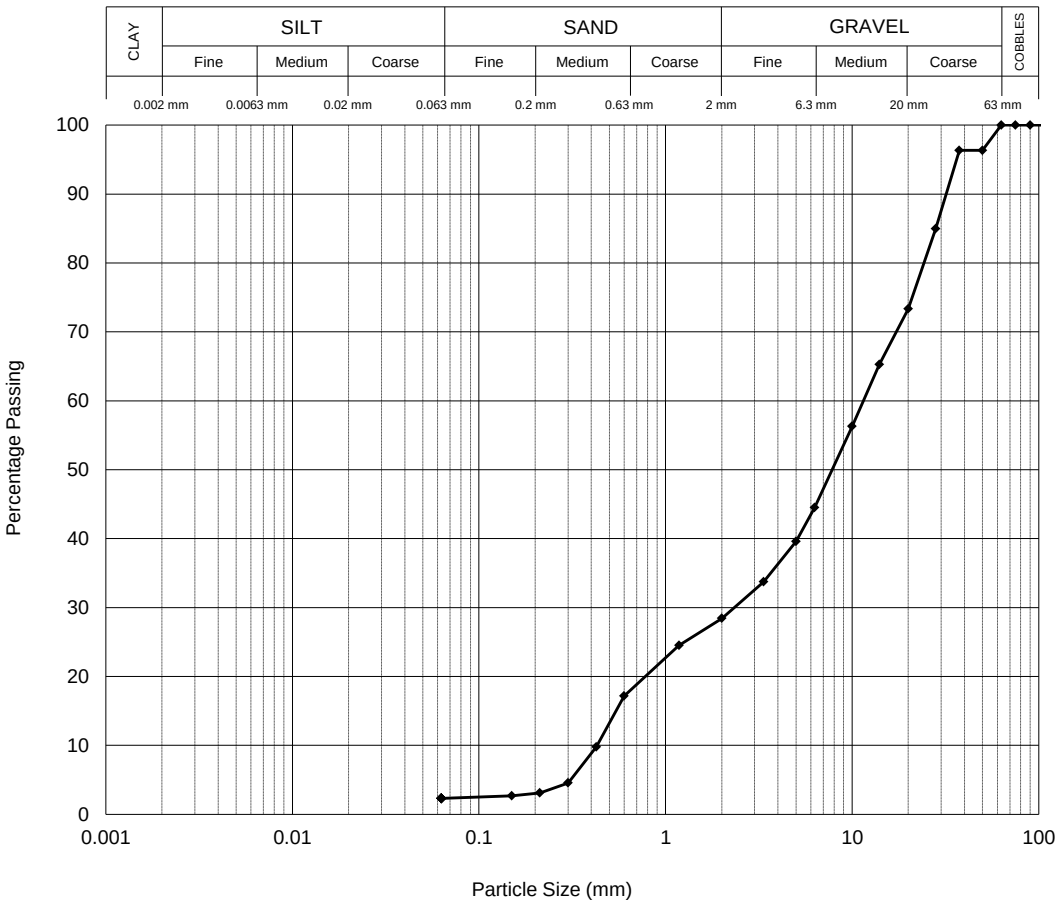
BH / TP No.	BH01
Depth (m)	3.00-4.00
Sample Type	B

Description

Orangish brown very sandy GRAVEL.

BS EN ISO 17892-4 : 2016 : Clause 5.2 - Dry Sieve

Sieve	
Size	% Pass
200.0 mm	100
125.0 mm	100
90.0 mm	100
75.0 mm	100
63.0 mm	100
50.0 mm	96
37.5 mm	96
28.0 mm	85
20.0 mm	73
14.0 mm	65
10.0 mm	56
6.30 mm	45
5.00 mm	40
3.35 mm	34
2.00 mm	28
1.18 mm	25
600 µm	17
425 µm	10
300 µm	5
212 µm	3
150 µm	3
63 µm	2



Particle Proportions	
Cobbles	0
Gravel	72
Sand	26
Silt & Clay	2

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S Burke

S Burke - Senior Technician
18/12/2019

Project Number:

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Project Name:

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BS EN ISO 17892-4 : 2016

PARTICLE SIZE DISTRIBUTION

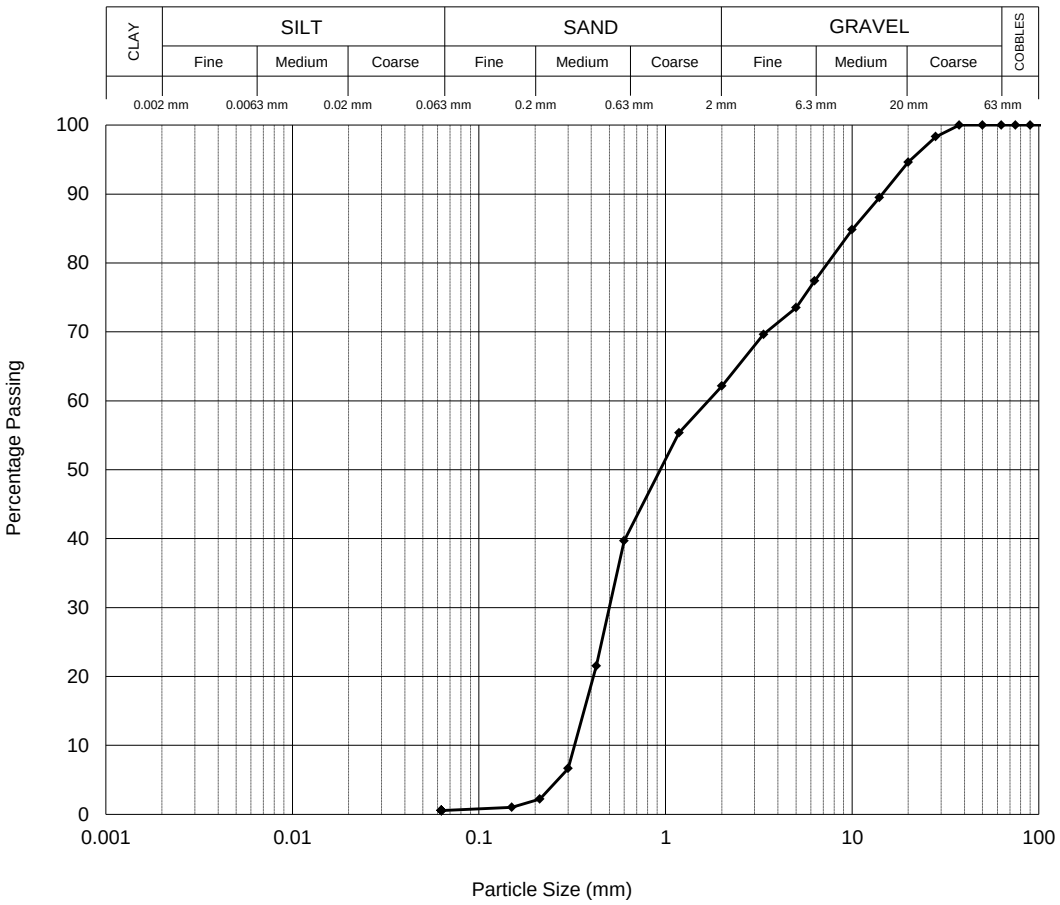
BH / TP No.	BH01
Depth (m)	6.00-7.00
Sample Type	B

Description

Yellowish brown very gravelly SAND.

BS EN ISO 17892-4 : 2016 : Clause 5.2 - Dry Sieve

Sieve	
Size	% Pass
200.0 mm	100
125.0 mm	100
90.0 mm	100
75.0 mm	100
63.0 mm	100
50.0 mm	100
37.5 mm	100
28.0 mm	98
20.0 mm	95
14.0 mm	89
10.0 mm	85
6.30 mm	77
5.00 mm	73
3.35 mm	70
2.00 mm	62
1.18 mm	55
600 µm	40
425 µm	22
300 µm	7
212 µm	2
150 µm	1
63 µm	1



Particle Proportions	
Cobbles	0
Gravel	38
Sand	62
Silt & Clay	0

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BS EN ISO 17892-4 : 2016

PARTICLE SIZE DISTRIBUTION

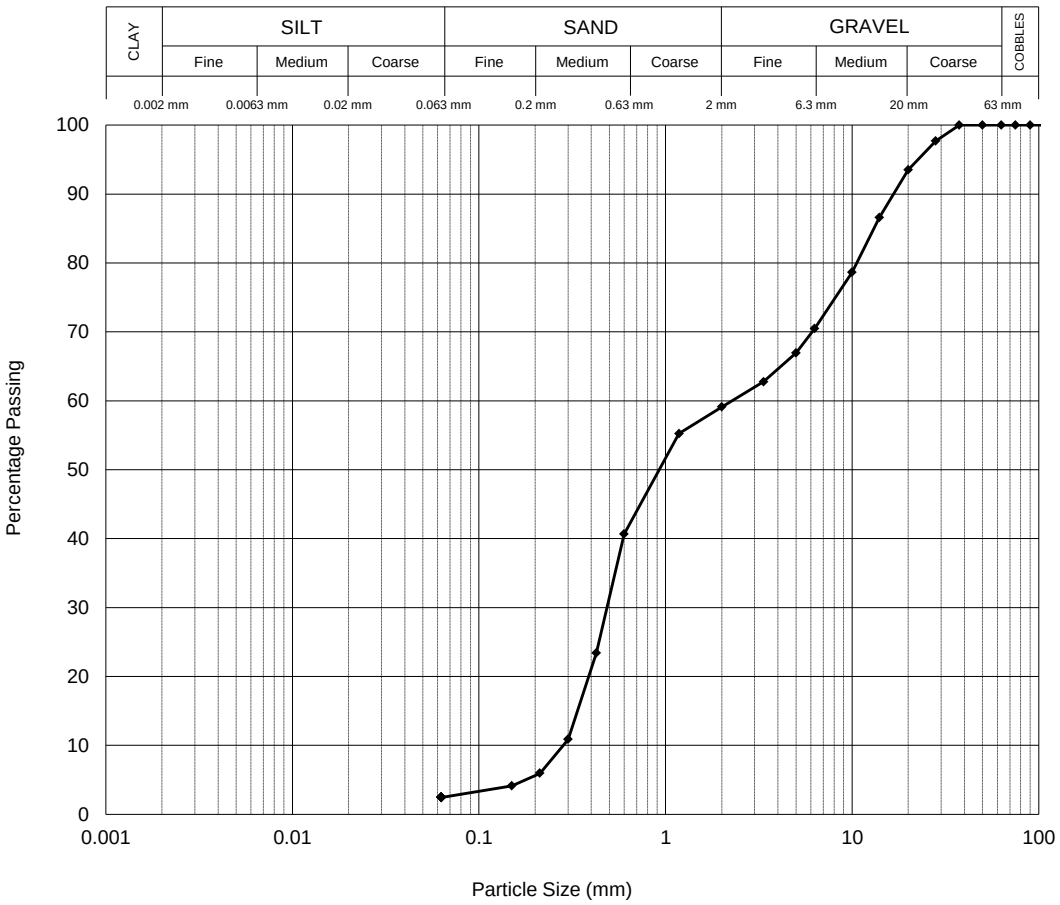
BH / TP No.	BH02
Depth (m)	1.00-2.00
Sample Type	WS

Description

Orangish brown SAND and GRAVEL.

BS EN ISO 17892-4 : 2016 : Clause 5.2 - Dry Sieve

Sieve	
Size	% Pass
200.0 mm	100
125.0 mm	100
90.0 mm	100
75.0 mm	100
63.0 mm	100
50.0 mm	100
37.5 mm	100
28.0 mm	98
20.0 mm	94
14.0 mm	87
10.0 mm	79
6.30 mm	70
5.00 mm	67
3.35 mm	63
2.00 mm	59
1.18 mm	55
600 µm	41
425 µm	23
300 µm	11
212 µm	6
150 µm	4
63 µm	2



Particle Proportions	
Cobbles	0
Gravel	41
Sand	57
Silt & Clay	2

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S Burke

S Burke - Senior Technician
18/12/2019

Project Number:

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Project Name:

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BS EN ISO 17892-4 : 2016

PARTICLE SIZE DISTRIBUTION

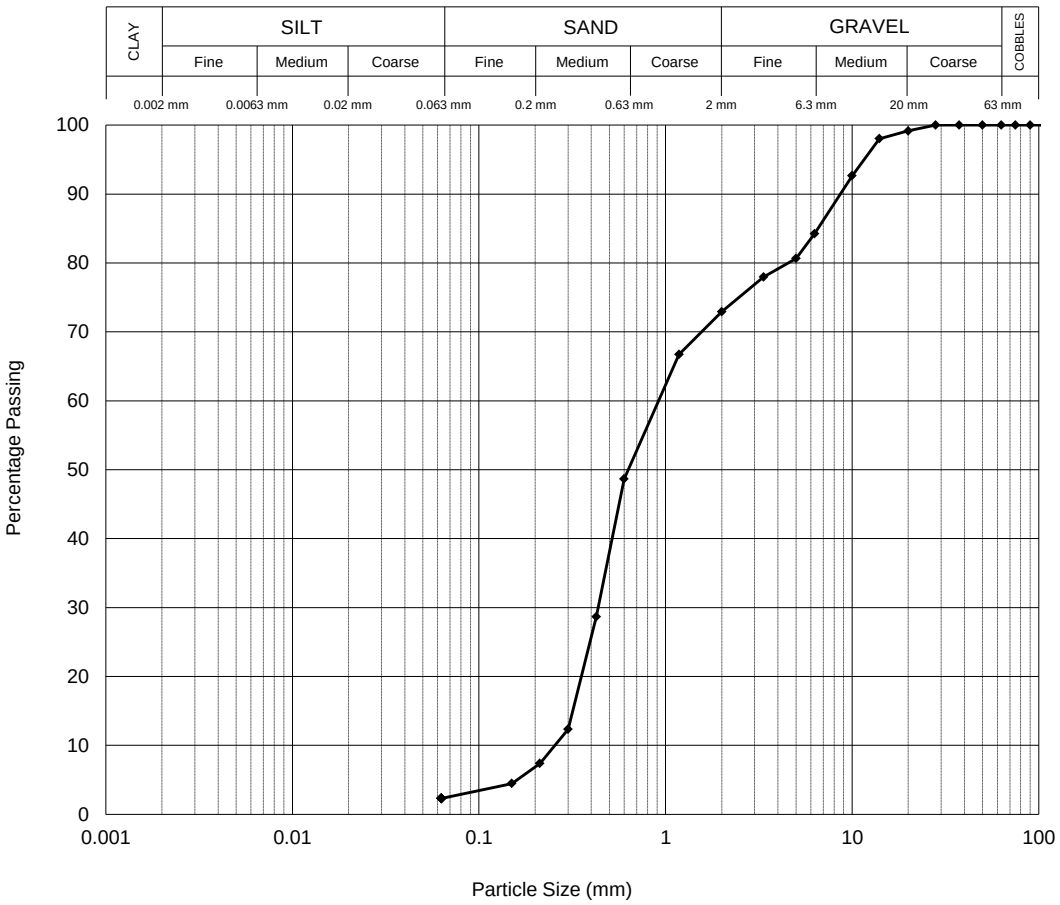
BH / TP No.	BH02
Depth (m)	4.00-5.00
Sample Type	WS

Description

Orangish brown very gravelly SAND.

BS EN ISO 17892-4 : 2016 : Clause 5.2 - Dry Sieve

Sieve	
Size	% Pass
200.0 mm	100
125.0 mm	100
90.0 mm	100
75.0 mm	100
63.0 mm	100
50.0 mm	100
37.5 mm	100
28.0 mm	100
20.0 mm	99
14.0 mm	98
10.0 mm	93
6.30 mm	84
5.00 mm	81
3.35 mm	78
2.00 mm	73
1.18 mm	67
600 µm	49
425 µm	29
300 µm	12
212 µm	7
150 µm	4
63 µm	2



Particle Proportions	
Cobbles	0
Gravel	27
Sand	71
Silt & Clay	2

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S Burke

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18/12/2019

Project Number:

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Project Name:

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BS EN ISO 17892-4 : 2016

PARTICLE SIZE DISTRIBUTION

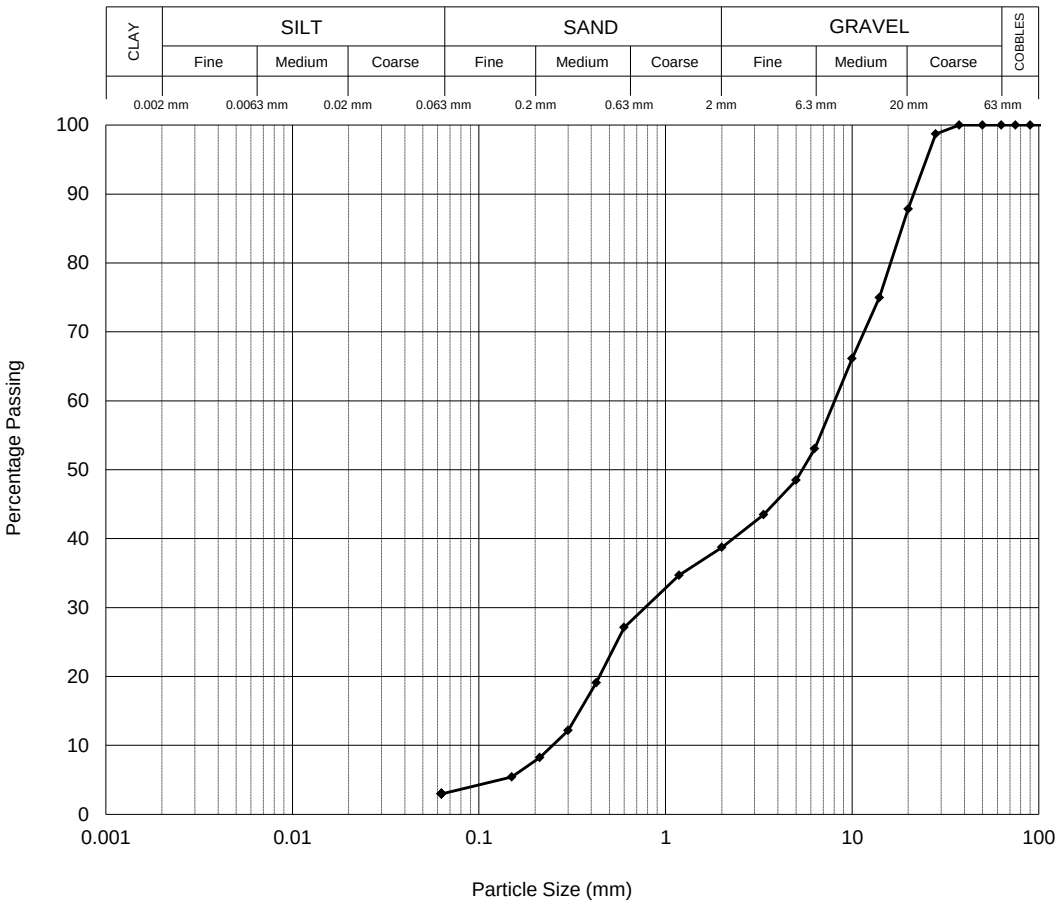
BH / TP No.	BH03
Depth (m)	3.00-4.00
Sample Type	WS

Description

Orangish brown very sandy GRAVEL.

BS EN ISO 17892-4 : 2016 : Clause 5.2 - Dry Sieve

Sieve	
Size	% Pass
200.0 mm	100
125.0 mm	100
90.0 mm	100
75.0 mm	100
63.0 mm	100
50.0 mm	100
37.5 mm	100
28.0 mm	99
20.0 mm	88
14.0 mm	75
10.0 mm	66
6.30 mm	53
5.00 mm	48
3.35 mm	43
2.00 mm	39
1.18 mm	35
600 µm	27
425 µm	19
300 µm	12
212 µm	8
150 µm	5
63 µm	3



Particle Proportions	
Cobbles	0
Gravel	61
Sand	36
Silt & Clay	3

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18/12/2019

Project Number:

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Project Name:

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BS EN ISO 17892-4 : 2016

PARTICLE SIZE DISTRIBUTION

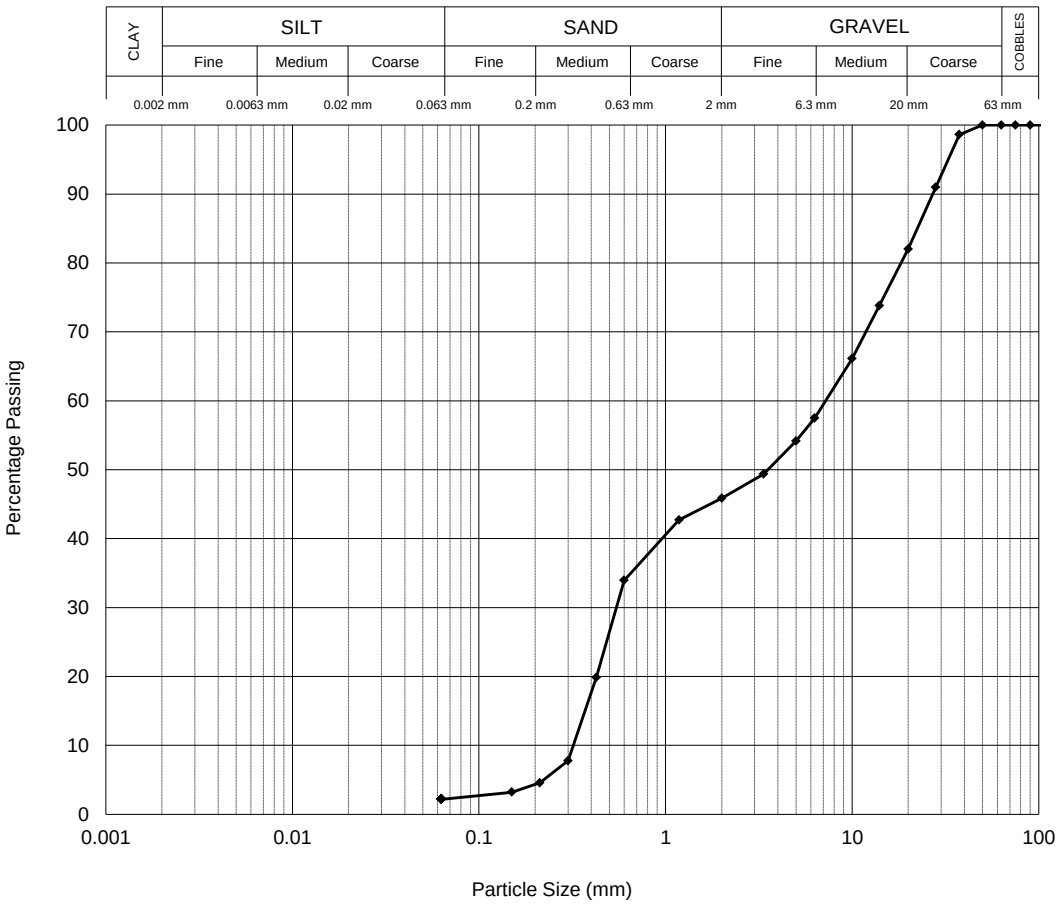
BH / TP No.	BH03
Depth (m)	4.00-5.00
Sample Type	WS

Description

Orangish brown SAND and GRAVEL.

BS EN ISO 17892-4 : 2016 : Clause 5.2 - Dry Sieve

Sieve	
Size	% Pass
200.0 mm	100
125.0 mm	100
90.0 mm	100
75.0 mm	100
63.0 mm	100
50.0 mm	100
37.5 mm	99
28.0 mm	91
20.0 mm	82
14.0 mm	74
10.0 mm	66
6.30 mm	57
5.00 mm	54
3.35 mm	49
2.00 mm	46
1.18 mm	43
600 µm	34
425 µm	20
300 µm	8
212 µm	5
150 µm	3
63 µm	2



Particle Proportions	
Cobbles	0
Gravel	54
Sand	44
Silt & Clay	2

Checked and Approved by

S Burke

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Project Number:

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BS EN ISO 17892-4 : 2016

PARTICLE SIZE DISTRIBUTION

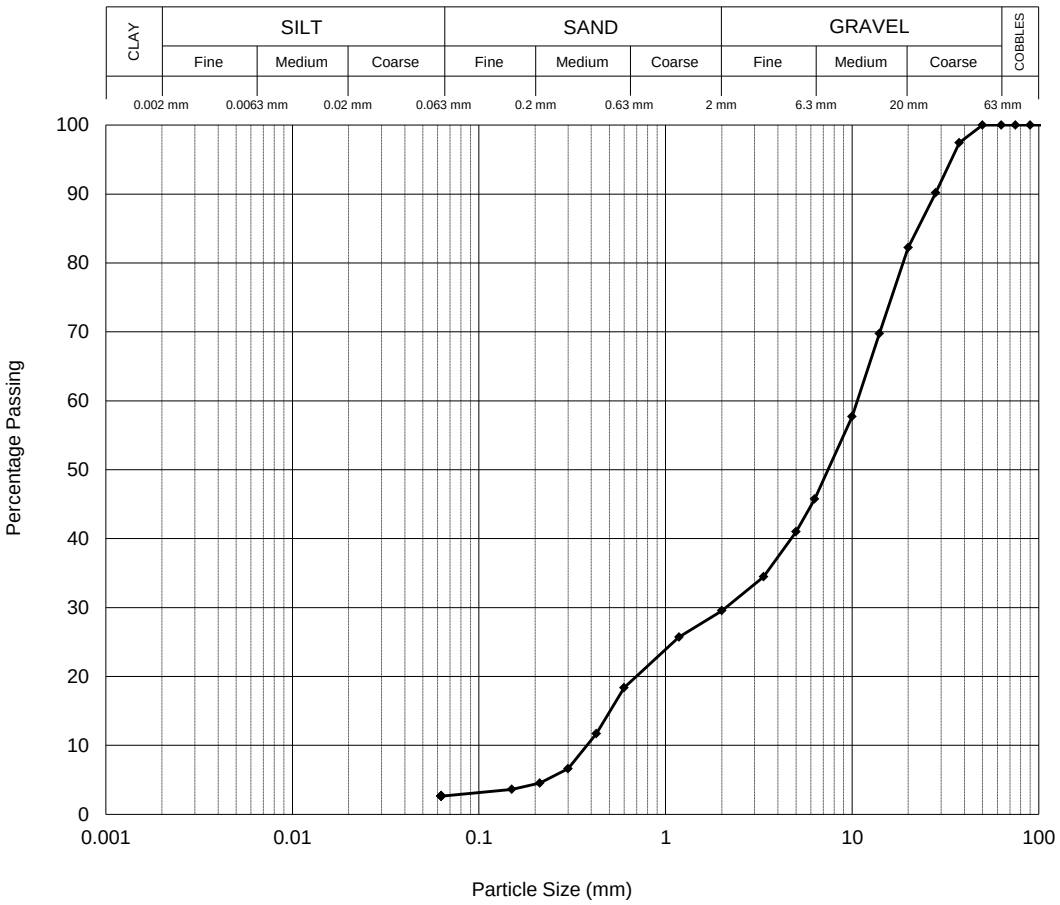
BH / TP No.	BH03
Depth (m)	5.00-6.00
Sample Type	WS

Description

Yellowish brown very sandy GRAVEL.

BS EN ISO 17892-4 : 2016 : Clause 5.2 - Dry Sieve

Sieve	
Size	% Pass
200.0 mm	100
125.0 mm	100
90.0 mm	100
75.0 mm	100
63.0 mm	100
50.0 mm	100
37.5 mm	97
28.0 mm	90
20.0 mm	82
14.0 mm	70
10.0 mm	58
6.30 mm	46
5.00 mm	41
3.35 mm	34
2.00 mm	30
1.18 mm	26
600 µm	18
425 µm	12
300 µm	7
212 µm	5
150 µm	4
63 µm	3



Particle Proportions	
Cobbles	0
Gravel	70
Sand	27
Silt & Clay	3

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S Burke

S Burke - Senior Technician
18/12/2019

Project Number:

GEO / 30305

Project Name:

THE DIORAMA
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BS EN ISO 17892-4 : 2016

PARTICLE SIZE DISTRIBUTION

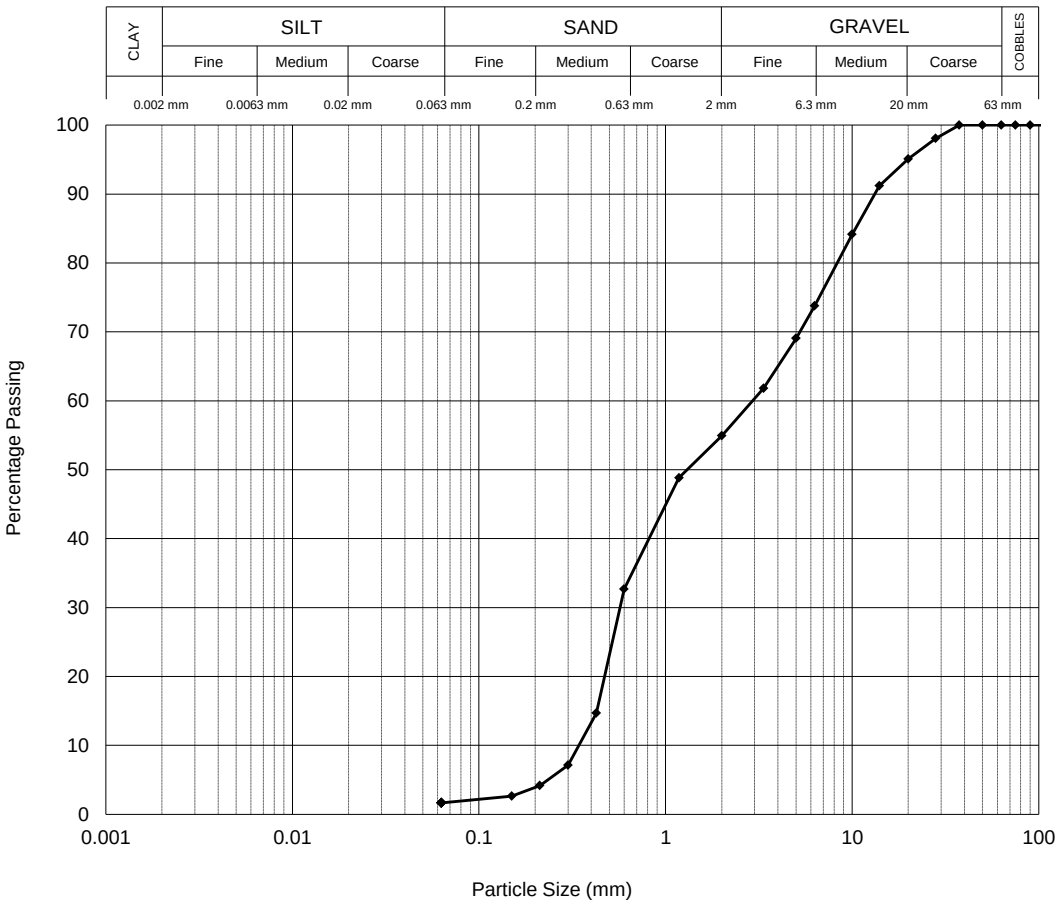
BH / TP No.	BH03
Depth (m)	7.00-8.00
Sample Type	WS

Description

Orangish brown SAND and GRAVEL.

BS EN ISO 17892-4 : 2016 : Clause 5.2 - Dry Sieve

Sieve	
Size	% Pass
200.0 mm	100
125.0 mm	100
90.0 mm	100
75.0 mm	100
63.0 mm	100
50.0 mm	100
37.5 mm	100
28.0 mm	98
20.0 mm	95
14.0 mm	91
10.0 mm	84
6.30 mm	74
5.00 mm	69
3.35 mm	62
2.00 mm	55
1.18 mm	49
600 µm	33
425 µm	15
300 µm	7
212 µm	4
150 µm	3
63 µm	2



Particle Proportions	
Cobbles	0
Gravel	45
Sand	53
Silt & Clay	2

Checked and Approved by

S Burke

S Burke - Senior Technician
18/12/2019

Project Number:

GEO / 30305

Project Name:

THE DIORAMA
1038915

GEOLABS

UKAS TESTING 1982

Chemtest
The right chemistry to deliver results
Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

UKAS TESTING
2183

Final Report

Report No.:	19-41044-1
Initial Date of Issue:	31-Dec-2019
Client	GEOLABS Limited
Client Address:	Bucknalls Lane Garston Watford Hertfordshire WD25 9XX
Contact(s):	ChemResults
Project	GEO/30305 Park Square East

Quotation No.:	Q17-10216	**Date Received:**	06-Dec-2019
Order No.:	GEO/30305	**Date Instructed:**	09-Dec-2019
No. of Samples:	10		
Turnaround (Wkdays):	5	**Results Due:**	13-Dec-2019
Date Approved:	31-Dec-2019		

Approved By:

Details: Glynn Harvey, Laboratory Manager

Chemtest
The right chemistry to deliver results

Results - Soil

Project: GEO/30305 Park Square East

Client: GEOLABS Limited				**Chemtest Job No.:**	19-41044	19-41044	19-41044	19-41044	19-41044	19-41044	19-41044	19-41044	19-41044	19-41044
Quotation No.: Q17-10216				**Chemtest Sample ID.:**	939523	939524	939525	939526	939527	939528	939529	939530	939531	939532
Order No.: GEO/30305				Client Sample Ref.:	D1									B
				Client Sample ID.:	344348	344383	344391	344387	344381	344392	344369	344365	344372	344749
				Sample Location:	BH01	BH02	BH02	BH02	BH02	BH03	BH03	BH03	BH03	BH01
				Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				Top Depth (m):	0.50	1.00	2.00	5.00	12.00	2.00	4.00	9.00	11.00	0.50
				Bottom Depth (m):		2.00	3.00	6.00	13.00	3.00	5.00	10.00	12.00	
				Asbestos Lab:	COVENTRY									COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**										
ACM Type	U	2192		N/A	-									-
Asbestos Identification	U	2192	%	0.001	No Asbestos Detected									No Asbestos Detected
ACM Detection Stage	U	2192		N/A	-									-
Moisture	N	2030	%	0.020	17	1.9	2.5	18	15	13	3.0	17	17	15
Chromatogram (TPH)	N			N/A	See Attached									See Attached
pH	U	2010		4.0	[A] 9.2			[A] 9.2	[A] 9.1			[A] 8.9	[A] 8.8	[A] 9.8
pH (2.5:1)	N	2010		4.0		[A] 9.1	[A] 8.6			[A] 8.4	[A] 9.4			
Boron (Hot Water Soluble)	U	2120	mg/kg	0.40	< 0.40									0.87
Magnesium (Water Soluble)	N	2120	g/l	0.010				0.99	2.3			2.2	6.2	
Sulphate (2:1 Water Soluble) as SO4	U	2120	g/l	0.010	0.16	0.027	0.063	0.017	0.099	< 0.010	< 0.010	0.076	0.39	0.40
Total Sulphur	U	2175	%	0.010				[A] 0.046	[A] 0.41			[A] 0.18	[A] 0.78	
Chloride (Water Soluble)	U	2220	g/l	0.010				[A] < 0.010	[A] 0.016			[A] < 0.010	[A] 0.029	
Nitrate (Water Soluble)	N	2220	g/l	0.010				< 0.010	< 0.010			< 0.010	< 0.010	
Cyanide (Free)	U	2300	mg/kg	0.50	[A] < 0.50									[A] < 0.50
Ammonium (Water Soluble)	U	2120	g/l	0.01				0.90	0.44			0.42	0.62	
Sulphate (Total)	U	2430	%	0.010				[A] 0.038	[A] 0.82			[A] 0.33	[A] 1.1	
Arsenic	U	2450	mg/kg	1.0	8.1									15
Cadmium	U	2450	mg/kg	0.10	0.20									0.26
Chromium	U	2450	mg/kg	1.0	12									23
Copper	U	2450	mg/kg	0.50	8.6									34
Mercury	U	2450	mg/kg	0.10	< 0.10									0.13
Nickel	U	2450	mg/kg	0.50	16									22
Lead	U	2450	mg/kg	0.50	11									560
Selenium	U	2450	mg/kg	0.20	0.20									< 0.20
Zinc	U	2450	mg/kg	0.50	25									90
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50									< 0.50
Total Organic Carbon	U	2625	%	0.20	[A] 0.23									[A] 0.48
Fuel Type	N	2670		N/A	N/A									N/A
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0	[AC] < 1.0									[AC] < 1.0
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0	[AC] < 1.0									[AC] < 1.0
Aliphatic TPH >C8-C10	U	2680	mg/kg	1.0	[AC] < 1.0									[AC] < 1.0
Aliphatic TPH >C10-C12	U	2680	mg/kg	1.0	[AC] < 1.0									[AC] < 1.0
Aliphatic TPH >C12-C16	U	2680	mg/kg	1.0	[AC] < 1.0									[AC] < 1.0
Aliphatic TPH >C16-C21	U	2680	mg/kg	1.0	[AC] < 1.0									[AC] < 1.0
Aliphatic TPH >C21-C35	U	2680	mg/kg	1.0	[AC] < 1.0									[AC] < 1.0
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	[AC] < 1.0									[AC] < 1.0

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Results - Soil

Project: GEO/30305 Park Square East

Client: GEOLABS Limited					**Chemtest Job No.:**	19-41044	19-41044	19-41044	19-41044	19-41044	19-41044	19-41044	19-41044	19-41044	19-41044
Quotation No.: Q17-10216					**Chemtest Sample ID.:**	939523	939524	939525	939526	939527	939528	939529	939530	939531	939532
Order No.: GEO/30305					Client Sample Ref.:	D1									B
					Client Sample ID.:	344348	344383	344391	344387	344381	344392	344369	344365	344372	344749
					Sample Location:	BH01	BH02	BH02	BH02	BH02	BH03	BH03	BH03	BH03	BH01
					Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
					Top Depth (m):	0.50	1.00	2.00	5.00	12.00	2.00	4.00	9.00	11.00	0.50
					Bottom Depth (m):		2.00	3.00	6.00	13.00	3.00	5.00	10.00	12.00	
					Asbestos Lab:	COVENTRY									COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**											
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	[AC] < 5.0									[AC] < 5.0
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	[AC] < 1.0									[AC] < 1.0
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	[AC] < 1.0									[AC] < 1.0
Aromatic TPH >C8-C10	U	2680	mg/kg	1.0	[AC] < 1.0									[AC] < 1.0
Aromatic TPH >C10-C12	U	2680	mg/kg	1.0	[AC] < 1.0									[AC] < 1.0
Aromatic TPH >C12-C16	U	2680	mg/kg	1.0	[AC] < 1.0									[AC] < 1.0
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	[AC] < 1.0									[AC] < 1.0
Aromatic TPH >C21-C35	U	2680	mg/kg	1.0	[AC] < 1.0									[AC] < 1.0
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	[AC] < 1.0									[AC] < 1.0
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	[AC] < 5.0									[AC] < 5.0
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0	[AC] < 10									[AC] < 10
Naphthalene	U	2700	mg/kg	0.10	[A] < 0.10									[A] < 0.10
Acenaphthylene	U	2700	mg/kg	0.10	[A] < 0.10									[A] < 0.10
Acenaphthene	U	2700	mg/kg	0.10	[A] < 0.10									[A] < 0.10
Fluorene	U	2700	mg/kg	0.10	[A] < 0.10									[A] < 0.10
Phenanthrene	U	2700	mg/kg	0.10	[A] < 0.10									[A] < 0.10
Anthracene	U	2700	mg/kg	0.10	[A] < 0.10									[A] < 0.10
Fluoranthene	U	2700	mg/kg	0.10	[A] < 0.10									[A] < 0.10
Pyrene	U	2700	mg/kg	0.10	[A] < 0.10									[A] < 0.10
Benzo[a]anthracene	U	2700	mg/kg	0.10	[A] < 0.10									[A] < 0.10
Chrysene	U	2700	mg/kg	0.10	[A] < 0.10									[A] < 0.10
Benzo[b]fluoranthene	U	2700	mg/kg	0.10	[A] < 0.10									[A] < 0.10
Benzo[k]fluoranthene	U	2700	mg/kg	0.10	[A] < 0.10									[A] < 0.10
Benzo[a]pyrene	U	2700	mg/kg	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
Dibenz(a,h)Anthracene	U	2700	mg/kg	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
Coronene	N	2700	mg/kg	0.10	[A] < 0.10									[A] < 0.10
Total Of 17 PAH's	N	2700	mg/kg	2.0	[A] < 2.0									[A] < 2.0
Benzene	U	2760	µg/kg	1.0	[AC] < 1.0									[AC] < 1.0
Toluene	U	2760	µg/kg	1.0	[AC] < 1.0									[AC] < 1.0
Ethylbenzene	U	2760	µg/kg	1.0	[AC] < 1.0									[AC] < 1.0
m & p-Xylene	U	2760	µg/kg	1.0	[AC] < 1.0									[AC] < 1.0
o-Xylene	U	2760	µg/kg	1.0	[AC] < 1.0									[AC] < 1.0
PCB 28	U	2815	mg/kg	0.010	[AC] < 0.010									[AC] < 0.010
PCB 52	U	2815	mg/kg	0.010	[AC] < 0.010									[AC] < 0.010
PCB 90+101	U	2815	mg/kg	0.010	[AC] < 0.010									[AC] < 0.010

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Results - Soil

Project: GEO/30305 Park Square East

Client: GEOLABS Limited					**Chemtest Job No.:**	19-41044	19-41044	19-41044	19-41044	19-41044	19-41044	19-41044	19-41044	19-41044	19-41044
Quotation No.: Q17-10216					**Chemtest Sample ID.:**	939523	939524	939525	939526	939527	939528	939529	939530	939531	939532
Order No.: GEO/30305					Client Sample Ref.:	D1									B
					Client Sample ID.:	344348	344383	344391	344387	344381	344392	344369	344365	344372	344749
					Sample Location:	BH01	BH02	BH02	BH02	BH02	BH03	BH03	BH03	BH03	BH01
					Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
					Top Depth (m):	0.50	1.00	2.00	5.00	12.00	2.00	4.00	9.00	11.00	0.50
					Bottom Depth (m):		2.00	3.00	6.00	13.00	3.00	5.00	10.00	12.00	
					Asbestos Lab:	COVENTRY									COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**											
PCB 118	U	2815	mg/kg	0.010	[AC] < 0.010										[AC] < 0.010
PCB 153	U	2815	mg/kg	0.010	[AC] < 0.010										[AC] < 0.010
PCB 138	U	2815	mg/kg	0.010	[AC] < 0.010										[AC] < 0.010
PCB 180	U	2815	mg/kg	0.010	[AC] < 0.010										[AC] < 0.010
Total PCBs (7 Congeners)	N	2815	mg/kg	0.10	[AC] < 0.10										[AC] < 0.10
Total Phenols	U	2920	mg/kg	0.30	< 0.30										< 0.30

TPH Chromatogram on Soil Sample: 939523

TPH Chromatogram on Soil Sample: 939532

Results - Single Stage WAC

Project: GEO/30305 Park Square East

					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	19-41044						
Chemtest Sample ID:	939523						
Sample Ref:	D1						
Sample ID:	344348						
Sample Location:	BH01						
Top Depth(m):	0.50						
Bottom Depth(m):							
Sampling Date:							
Determinand	**SOP**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	U	%	[A] 0.23	3	5	6
Loss On Ignition	2610	U	%	2.7	--	--	10
Total BTEX	2760	U	mg/kg	[AC] < 0.010	6	--	--
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	U	mg/kg	[AC] < 10	500	--	--
Total (Of 17) PAH's	2700	N	mg/kg	< 2.0	100	--	--
pH	2010	U		9.2	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.017	--	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	1450	U	< 0.0010	< 0.050	0.5	2	25
Barium	1450	U	0.013	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	0.0014	< 0.050	0.5	10	70
Copper	1450	U	0.0011	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.0042	< 0.050	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	0.0014	0.014	0.1	0.5	7
Zinc	1450	U	0.0034	< 0.50	4	50	200
Chloride	1220	U	9.2	92	800	15000	25000
Fluoride	1220	U	1.6	16	10	150	500
Sulphate	1220	U	68	680	1000	20000	50000
Total Dissolved Solids	1020	N	160	1600	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	7.8	78	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	17

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: GEO/30305 Park Square East

					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	19-41044						
Chemtest Sample ID:	939532						
Sample Ref:	B						
Sample ID:	344749						
Sample Location:	BH01						
Top Depth(m):	0.50						
Bottom Depth(m):							
Sampling Date:							
Determinand	**SOP**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	U	%	[A] 0.48	3	5	6
Loss On Ignition	2610	U	%	1.5	--	--	10
Total BTEX	2760	U	mg/kg	[AC] < 0.010	6	--	--
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	U	mg/kg	[AC] < 10	500	--	--
Total (Of 17) PAH's	2700	N	mg/kg	< 2.0	100	--	--
pH	2010	U		9.8	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.049	--	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	1450	U	0.0062	0.062	0.5	2	25
Barium	1450	U	0.013	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	0.0021	< 0.050	0.5	10	70
Copper	1450	U	0.0013	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.0011	< 0.050	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	0.0027	< 0.50	4	50	200
Chloride	1220	U	2.4	24	800	15000	25000
Fluoride	1220	U	0.067	< 1.0	10	150	500
Sulphate	1220	U	44	440	1000	20000	50000
Total Dissolved Solids	1020	N	120	1200	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	6.1	61	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	15

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:
939523	D1	344348	BH01		AC	Plastic Tub 500g
939524		344383	BH02		A	Plastic Bag
939525		344391	BH02		A	Plastic Bag
939526		344387	BH02		A	Plastic Bag
939527		344381	BH02		A	Plastic Bag
939528		344392	BH03		A	Plastic Bag
939529		344369	BH03		A	Plastic Bag
939530		344365	BH03		A	Plastic Bag
939531		344372	BH03		A	Plastic Bag
939532	B	344749	BH01		AC	Plastic Bag

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.
1450	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
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.
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2175	Total Sulphur in Soils	Total Sulphur	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2220	Water soluble Chloride in Soils	Chloride	Aqueous extraction and measuremernt by 'Aquakem 600' Discrete Analyser using ferric nitrate / mercuric thiocyanate.
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Allkaline 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.
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
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.
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

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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"

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 45 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