

GROUND INVESTIGATION REPORT

**Proposed Educational Development
The King's School, Fair Oak, Hampshire**

Prepared for: Kingswell Buildings Limited

Date: September 2023

Report No: PO-23-060



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Site Location : **The King's School, Fair Oak, Hampshire**

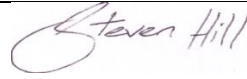
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00	15/09/2023	For Draft Issue	KT	PS	SH
01	27/09/2023	Updated BRE Test Results	KT	PS	SH

EXECUTIVE SUMMARY

Proposals		Kingswell Buildings Limited is proposing a new educational development within land at The King's School, Fair Oak, Hampshire. The proposed development will consist of the construction of a new building and associated infrastructure.				
Geology		The Geological Map of the area shows the site to be underlain by the Wittering Formation, which the BGS describes as greyish brown laminated clay; sand interbedded with clay; and fine- to medium-grained sparsely glauconitic sand.				
Field Investigation		The site works undertaken on the 9 th of August 2023 and comprised 5No. mini percussive boreholes including 3No. in-situ falling head tests. The ground conditions can be summarized as below:				
		<i>Topsoil</i>		0.00	0.40 / 0.50	Soft dark brown sandy CLAY
		<i>Made Ground</i>		0.00	0.05	ASPHALT
				0.05	0.40	Soft dark greyish brown slightly sandy CLAY
		<i>Wittering Formation</i>	<i>Upper</i>	0.40 / 0.50	3.90 / 4.90	Soft becoming firm orangish greyish brown gravelly sandy CLAY
			<i>Lower</i>	3.90 / 4.90	>6.00	Loose to medium dense greyish orangish yellowish brown clayey gravelly SAND
		During drilling groundwater was encountered between 3.00 and 5.00m bgl.				
Waste Classification		The shallow samples underlying the site have been classified as Inert and Non-Hazardous.				
Engineering Recommendations	Foundation and Floor Slab Solution	It is recommended that a foundation solution for the proposed development comprise traditional strip/trench fill foundations within the upper cohesive Wittering Formation comprising soft becoming firm orangish greyish brown gravelly sandy CLAY, with an allowable bearing capacity of 100kN/m ² .				
		Due to nearby trees, foundations should be at a minimum depth of 1.86m. The depth can possibly be reduced away from the influence of trees but a detailed foundation plan is required.				
		Based on plasticity testing, to avoid damage from frost heave and thermal shrinkage, the minimum base of the foundations should lie at least 0.90m below final ground level.				
	Due to the plastic nature of the underlying deposits, floor slabs should be designed as suspended.					
	Concrete Design	It is recommended that any buried concrete within the site conforms to class AC-2s.				
	Storm Drainage	3No. in-situ soakaway tests were undertaken in accordance with the requirements of BS 5930:2015+A1:2020 (Section 7). All three boreholes drained, however this is due to the lower more permeable granular sand layer encountered below typically 4.00m.				
		Shallow soakaways within the upper impermeable cohesive clay layer are very unlikely to provide suitable drainage in accordance with SuDS. This is attested to by the previous investigation at the site for the MUGA pitch to the south where shallow soakaway tests did not sufficiently drain to give an infiltration rate.				

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Annex B: In-situ Test Results
Annex C: Chemical Test Results
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Drawing 2.1: Site Location Plan
Drawing 3.1: Exploratory Hole Location Plan
Drawing 3.2: SPT vs Depth

SECTION 1 Introduction and Proposed Development

Kingswell Buildings Limited is proposing a new educational development within land at The King's School, Fair Oak, Hampshire. The proposed development will consist of the construction of a new building and associated infrastructure.

Braeburn Structures Ltd are the Consulting Civil & Structural Engineer for the proposed development.

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 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 regarding any other geo-technical aspects pertaining to the development.
- Collect representative samples for laboratory testing, and provide an evaluation of the results.

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 to collect and analyse soil samples from selected locations around the site.

A comprehensive desk study, other than an inspection of geological maps, has not been requested or undertaken as part of this investigation. Nor has a preliminary risk assessment been completed.

1.1 Geotechnical Category of Project

In accordance with BS EN 1997-2: 2004, the proposed development comprises the following Geotechnical Category:

1. **Geotechnical Category 2:** Conventional types of structures and foundation with no exceptional risk of difficult soil or loading conditions (e.g., spread, raft & pile foundations; retaining structures; excavations; earthworks and ground anchors).

1.2 Limitations and Exceptions of Investigation

Kingswell Buildings Limited 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 Kingswell Buildings Limited 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:

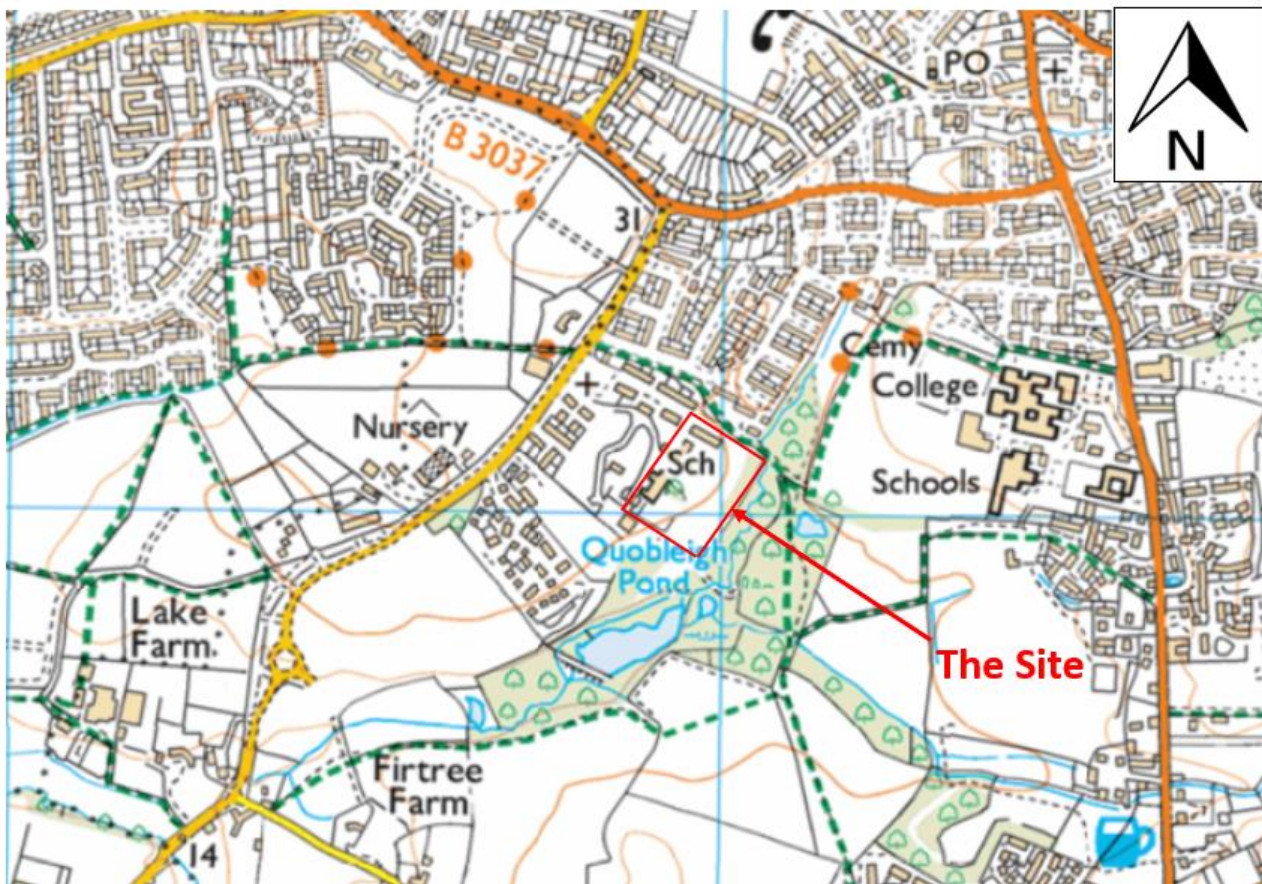
- The presence of existing buildings, structures and/or hard standing, and
- The presence of time restraints outside of our reasonable control.

SECTION 2 Site Setting

2.1 Physical Setting

The proposed development is to be located within property boundaries of The King's School, Allington Lane, Fair Oak, Hampshire, SO50 7DB.

The site is centred approximately on National Grid Reference (NGR) SU 48948, 18055. The site location is presented in **Drawing 2.1** below.



Drawing 2.1: Site Location Plan

The site is rectangular in shape with a plan area of approximately 0.06 hectares and sits at approximately 31 m above ordnance datum (aod).

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

The site is bound by residential housing in the North and West. The East and South the site are bound by Quobleigh Pond and Woodland respectively.

2.1.1 Current Use and Site Conditions

A walk-over survey was undertaken on the 9th of August 2023 by a Terra Firma Engineer. The site is accessed via the main school gates. At the time of the walk-over survey the site currently comprises of a school and associated infrastructures.

Photographs taken during the walk-over survey are shown in Table 4.1 below.

Table 2.1: Walk-over Survey Photographs**Photo 1:** Site locations. East orientated**Photo 2:** Site locations. Northeast orientated**Photo 3:** Site locations. Southeast orientated**Photo 4:** Site locations. West orientated

2.2 Geological Setting

The 1:50,000-scale Geological Map of the area shows the site to be underlain by the Wittering Formation of Lutetian Age. The BGS describes the Wittering Formation as greyish brown laminated clay; wavy- to lenticular-bedded sand interbedded with clay in equal proportions; and fine- to medium-grained sparsely glauconitic sand.

No Superficial Deposits are shown to overlie the bedrock geology of the area.

Due to the nature and history of the site the presence of significant made ground is not expected.

2.3 Historical Setting

The site history was not requested under the scope of this investigation.

2.4 Previous Investigations

There has been one previous investigation at the site by Terra Firma in September 2021 (Report Number EX-23-009). The investigation was to determine infiltration rates of the ground to facilitate drainage design of a new MUGA pitch located to the south of the current development.

The results of the investigation are highlighted below:

Field Investigation	The site works were scoped by Baker and Associates and comprised the following: • 3 machine excavated trial pits SA01-SA03, and • 3 in-situ soakaway tests SA01-SA03. The site works were carried out at the site on the 18th of August 2021. During site works, groundwater was encountered within SA03 at depths of 2.60m, rising to a depth of 2.50m after 20 minutes.
Storm Drainage	Three in-situ soakaway tests were undertaken at SA01, SA02 and SA03 broadly in accordance with the requirements of BRE 365. In all the localities the tests did not sufficiently drain to 75% to give an infiltration rate and shallow soakaways at these localities are unlikely to be feasible. Therefore, based on the above it is considered soakaways will be unviable at the site for discharging surface waters.

SECTION 3 Field Investigation

3.1 General

The scope of the works including the schedule for in-situ and laboratory testing was determined by Braeburn Structures Ltd and Terra Firma and comprised the following:

- 5No. mini percussive boreholes (WS01-WS05), including
 - 3No. in-situ falling head tests (WS01, WS03, WS04).

The site works were carried out at the site on the 9th of August 2023.

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,
- Before any excavation, all exploratory hole locations were scanned using a Cable Avoidance Tool (CAT), and
- Before any drilling, a 1.20m deep inspection pit was excavated at each borehole location.

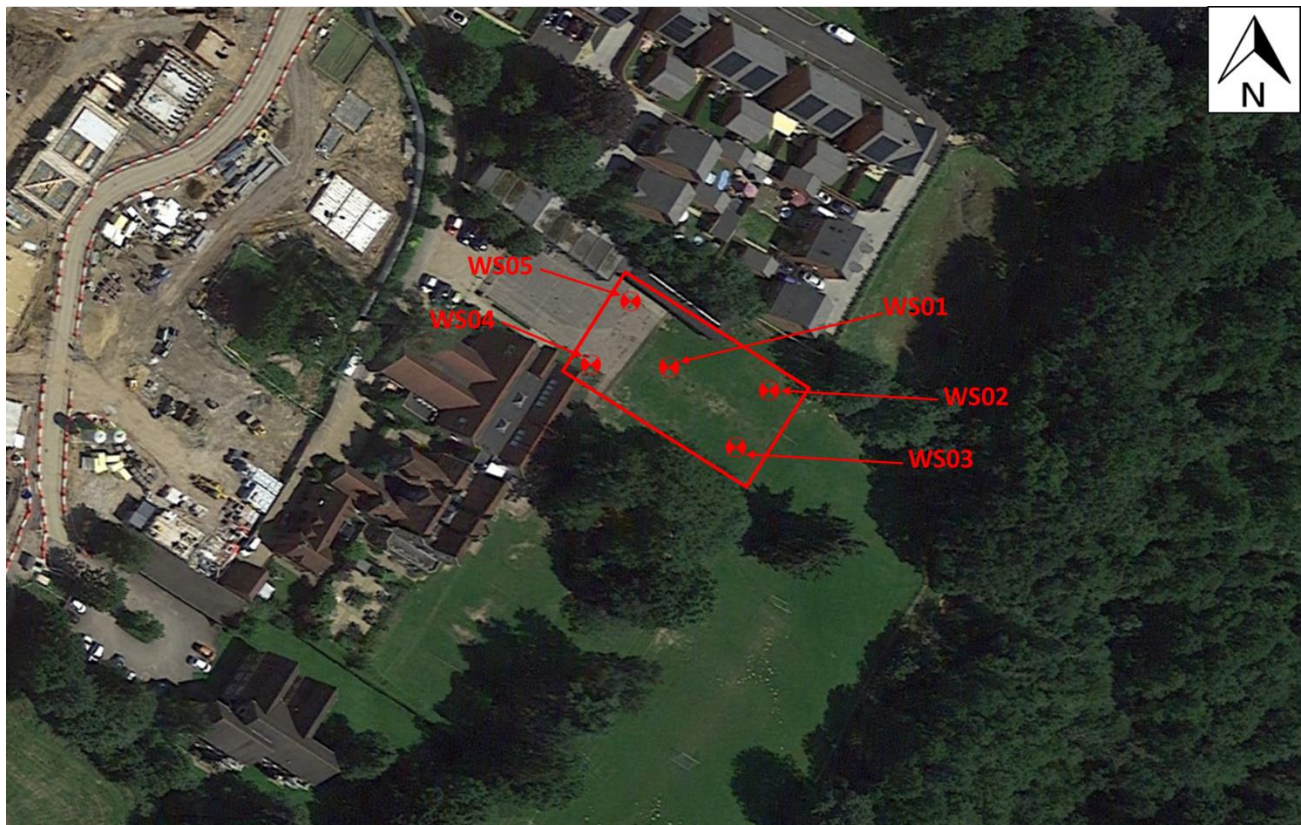
The exploratory holes were set out at locations provided by Terra Firma, and adjusted where necessary to take account of the site constraints detailed in Section 1.1.

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
WS01	448950	118056
WS02	448970	118052
WS03	448962	118042
WS04	448936	118056
WS05	448942	118067

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 results 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 Mini Percussive Boreholes

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

Due to the presence of surface hard standing a concrete corer attachment or hydraulic breaker was used where necessary to progress drilling.

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.

Boreholes were backfilled using arisings and gravel and reinstated using asphalt where needed.

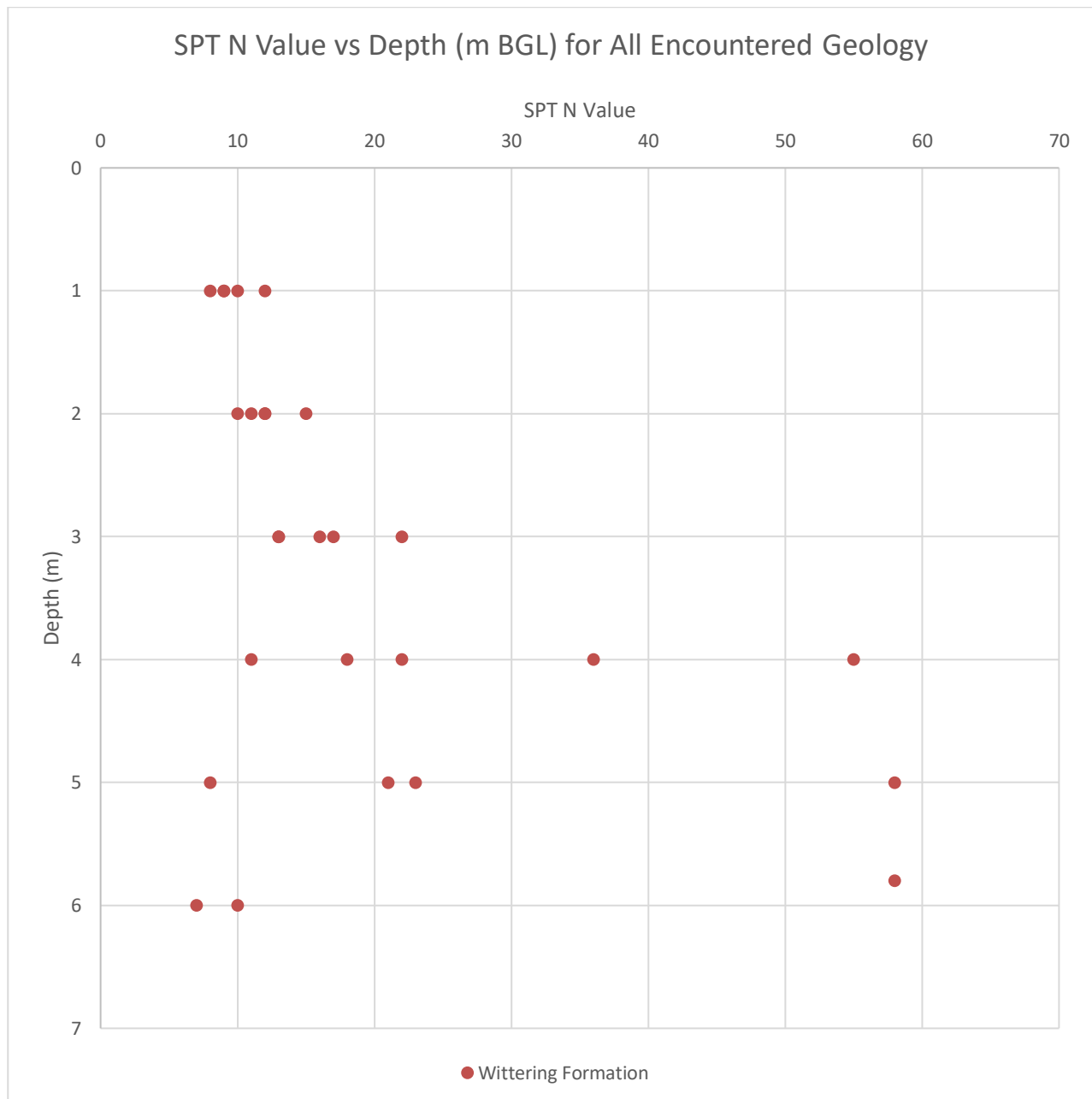
3.3 In-situ Testing

3.3.1 Strength Testing

Standard Penetration Tests (SPT)

SPT N Values taken within the Wittering Formation revealed an average N value of 19 (Range 7 to 58).

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



Drawing 3.2: SPT vs Depth

3.3.2 Permeability Testing

The in-situ permeability tests were undertaken within the boreholes/hand excavated trial pits, using large 25 litre jerry cans to rapidly fill the holes with water.

During the site investigation, in-situ permeability tests were undertaken within WS01, WS02 and WS04 and where possible were carried out to the requirements of BS 5930:2015+A1:2020 (Section 7).

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

Table 3.2: Infiltration Test Results				
Soak away Test	Depth (m)	Type	Soil Type	Infiltration Rate (m/s)
WS01	6.00	Storm Drainage	SAND (>3.90m)	4.00×10^{-04}
WS02	6.00		SAND (>4.40m)	8.22×10^{-04}
WS04	5.00		SAND (>4.20m)	3.12×10^{-04}

It should be noted that the infiltration obtained from the boreholes is due to the deeper more permeable sand horizon encountered at depths of typically >4.00m. The upper 4.00m comprised impermeable clay which is very unlikely to be suitable for SuDS design as found in the previous Ground Investigation for the new MUGA pitch by Terra Firma in September 2021.

Therefore, during drainage design, consideration should be given to the variability encountered across the site.

It should also be noted that soakaways would only be effective above the depth of groundwater, which given seasonal variations is likely to be higher than that recorded during this investigation.

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 3.3: Chemical Test Sample Descriptions			
Sample No.		Sample Type	Description
WS01	0.20	TS	Soft dark brown sandy CLAY
WS02	0.30	TS	Soft dark brown sandy CLAY
WS03	0.40	TS	Soft dark brown sandy CLAY
WS04	0.30	TS	Soft dark brown sandy CLAY
WS05	0.30	MG	Soft dark greyish brown slightly sandy CLAY

Notes

- Sample Type: TS (Topsoil), MG (Made Ground)

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 3.4: Soil Property Test Sample Laboratory Descriptions			
Sample No.		Sample Type	Description
WS01	0.90-1.10	WF	Orangish brown slightly gravelly sandy CLAY. Gravel is fine to medium. Sand is fine.

WS02	0.80	WF	Orangish brown sandy CLAY. Sand is fine.
WS03	2.40	WF	Orangish brown slightly gravelly sandy CLAY. Gravel is fine to medium. Sand is fine.
WS04	1.90-2.10	WF	Orangish brown silty sandy CLAY. Sand is fine.
WS05	3.30-3.50	WF	Orangish brown and brown slightly gravelly sandy CLAY. Gravel is fine to medium. Sand is fine.

Notes

- Sample Type: WF (Wittering Formation)

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	0.40 / 0.50	0.40	0.50	Soft dark brown sandy CLAY	Topsoil	
0.00	0.05	0.05		ASPHALT	Made Ground	
0.05	0.40	0.35		Soft dark greyish brown slightly sandy CLAY		
0.40 / 0.50	3.90 / 4.90	3.50	4.50	Soft becoming firm orangish greyish brown gravelly sandy CLAY	Upper Formation	Wittering Formation
3.90 / 4.90	>6.00	Unproven		Loose to medium dense greyish orangish yellowish brown clayey gravelly SAND	Lower Formation	

4.2 Stability

Due to the hole stability casing was not needed to advance the boreholes.

4.3 Strata Details

4.3.1 Topsoil

The Topsoil layer was encountered within WS01, WS02, WS03 and WS04, although was absent within WS05 and typically comprised of soft dark brown sandy CLAY with abundant roots and rootlets.

4.3.2 Asphalt and Made Ground

The Asphalt and Made Ground was encountered within WS05 only and is associated with the existing playground hard surface. The Made Ground comprised of soft dark greyish brown slightly sandy CLAY with frequent crushed concrete and rare brick fragments.

4.3.3 Wittering Formation

The Bedrock Geology of the Wittering Formation was encountered within all localities and typically comprised of an upper formation of cohesive soft becoming firm orangish greyish brown gravelly sandy CLAY overlying a granular loose to medium dense greyish orangish yellowish brown clayey gravelly SAND. Gravels are fine subrounded to subangular flints.

The Wittering Formation was not fully penetrated and found to extend beyond the maximum depth of investigation of 6.00m.

4.4 Water Strikes

During site works, groundwater was encountered within WS01, WS02, WS04 and WS05 at depths of between 3.00m and 5.00m, with no rise.

Groundwater encountered by the exploratory holes can in general be summarised as shown in the following table:

Table 4.2: Summary of Groundwater				
Hole Location	Groundwater Strike Depth (mbgl)	Groundwater Depth (mbgl) after 20 mins	Comments	Water Bearing Strata
WS01	4.89	-	No Rise	Wittering Formation - SAND
WS02	4.32	-	No Rise	Wittering Formation - SAND
WS04	5.00	-	No Rise	Wittering Formation - SAND
WS05	3.00	-	No Rise	Wittering Formation - SAND

Notes

- Water Bearing Strata: B (Bedrock)

SECTION 5 Laboratory Chemical Testing

5.1 General

During the recent site works, 2No. 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
Miscellaneous		Asbestos ID

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

5.2 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.

The results of the testing are given in the table below.

Table 5.2: Waste Acceptance Criteria Testing			
Sample Location	Sample Depth (m)	Comments	Landfill Waste Acceptance
WS01	0.20	-	INERT
WS03	0.40	-	INERT

Based on the results of the WAC testing, the shallow deposits 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.

The results of the WAC testing have been included in **Annex C**.

5.3 Waste Classification

Based on the soils chemical test results, the soils were classified based on the identified hazard phases as defined in accordance with waste classification algorithms detailed in Environmental Agency publication WM3 (V.1.2, 2021), using the HazWaste Online software.

Using the results from the chemical analysis for the samples analysed, the following waste classification has been identified in the table below.

Table 5.3: Summary of Waste Classification				
Sample Location	Sample Depth (m)	Waste Classification	EWC Code	Additional Comments
WS02	0.30	Non-Hazardous	17 05 04	-
WS05	0.30	Non-Hazardous	17 05 04	-

Conditions may exist between sampling points which are not representative of testing provided at the site. If anomalous materials are encountered at the site during excavation, the classification should be revisited.

It should be noted that the receiving landfill sites and the Environment Agency have ultimate authority in deciding whether a waste may be accepted, regardless of its classification.

HazWaste Online outputs are included in **Annex D**.

SECTION 6 Geotechnical Laboratory Testing Results

6.1 General

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

1. 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 E** and discussed below.

6.1.1 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:

- 5No. Moisture Content (MC)
- 5No. Plasticity Index (P.I)
- 1No. 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:

- 3No. BRE SD1 Suite B

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

Table 6.1: Summary of Soil Classification Test Results							
Test		Location	WS01	WS02	WS03	WS04	WS05
		Depth (m)	0.90-1.10	0.80	2.40	1.90-2.10	3.30-3.50
		Unit	WF	WF	WF	WF	WF
Moisture Content		%	21.8	17.4	18.1	25	18.6
Plasticity	Liquid Limit	%	44	33	46	46	32
	Plastic Limit	%	18	16	18	21	14
	Plasticity Index	%	26	17	28	25	18
	% <425µm	%	98	99	97	100	98
	Modified PI	%	25	17	27	25	17.5
PSD	Cobbles	%	-	0	-	-	-
	Gravels	%	-	0	-	-	-
	Sands	%	-	79.9	-	-	-
	Silt & Clay	%	-	20.1	-	-	-
BRE	Total Sulphate	%	<0.01	-	<0.01	0.35	-
	2:1 Sulphate	g/l	<0.01	-	<0.01	<0.01	-
	pH	-	6.9	-	7.1	5.8	-
	Total Sulphur	%	0.013	-	0.015	0.22	-

Notes

- Unit: WF (Wittering Formation)

SECTION 7 Engineering Recommendations

7.1 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.

7.2 Foundation Solution

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

Table 7.1 Summary of Ground Conditions				
Stratum		Depth From (m)	Depth to (m)	Description
<i>Topsoil</i>		0.00	0.40 / 0.50	Soft dark brown sandy CLAY
<i>Made Ground</i>		0.00	0.05	ASPHALT
		0.05	0.40	Soft dark greyish brown slightly sandy CLAY
<i>Wittering Formation</i>	<i>Upper Formation</i>	0.40 / 0.50	3.90 / 4.90	Soft becoming firm orangish greyish brown gravelly sandy CLAY
	<i>Lower Formation</i>	3.90 / 4.90	>6.00	Loose to medium dense greyish orangish yellowish brown clayey gravelly SAND

During drilling groundwater was encountered between 3.00 and 5.00m bgl.

Based on the encountered ground conditions the following foundation solution is recommended.

Traditional Strip/Trench Fill

The Topsoil/Made Ground deposits are variable in respect to their thickness and geotechnical properties and if foundations were extended to these strata in their current state it would lead to unacceptable levels of differential settlement.

Therefore, in order to avoid unacceptable levels of differential settlement we recommend that mass concrete strip/trench foundations be extended into the underlying upper Wittering Formation comprising Soft becoming firm orangish greyish brown gravelly sandy CLAY.

For the above foundation solution and in-situ materials it is recommended that a presumed bearing resistance of 100kN/m² is used for design purposes. This value is based on the representative N value between 1.00 and 2.00m and an SPT Energy Ratio (Er) of 74%.

For the above given foundation solutions and bearing pressures, maximum total settlements of 25mm should result, with differential movements (δ/l) of the superstructure not exceeding 1:750 where δ is the differential settlement between two points of a foundation and l is the distance between these points.

Due to the depth of shallow groundwater excavations and foundations should be kept as shallow as possible, not ignoring tree and frost protection outlined below.

It is also recommended that the foundations achieve a minimum penetration of 200mm into the foundation bearing stratum.

7.2.1 Foundation Depth

The foundation depth will be determined by the worst case of the depth of foundation stratum, the plasticity of the soil, the effect of nearby trees. The table below summarises these depths:

Table 7.2 Foundation Depths		
	Worse case	Founding Depth (m)
Foundation Stratum	Wittering Formation	0.40 – 0.50
Plasticity of Soil	Moderate	0.90
Tree Effect	Oak (NE – 13m distance)	1.86
	Oak (SW – 16m distance)	1.61
Minimum Founding Depth Required		1.86

Based on the above the minimum foundation depth should be 1.86m bgl due to the presence of Oak trees in the area of the proposed development. The foundation can possibly be reduced away from the influence of trees but a detailed foundation plan is required. Any steps in foundation should be designed in accordance with NHBC guidance.

No roots were encountered during the intrusive investigation. However, if roots are encountered during the construction phase, foundations must not be placed within any live root penetrated or desiccated cohesive soils. Should the foundation excavations reveal such materials, the excavations must be extended to greater depth in order to bypass these unsuitable soils. Excavations must be checked by a suitable person prior to concrete being poured.

Void former may be required along the inside faces of foundations and underground beams due to the plastic nature of the surface cohesive soils.

7.2.2 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.

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

7.3 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.

Groundwater was encountered during the investigation between 3.00 and 5.00m bgl. Therefore, it is unlikely that groundwater may be encountered during foundation excavations. Any inflows should be dealt with using conventional pumping techniques. Heavy pumping should be avoided where possible as this will remove the fines from the soil and possibly cause localised settlement.

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.

7.4 Storm Drainage

3No. in-situ soakaway tests were undertaken in accordance with the requirements of BS 5930:2015+A1:2020 (Section 7).

During drainage design, consideration should be given to the variability encountered across the site. All three boreholes drained, however this is due to the lower more permeable granular sand layer encountered below typically 4.00m.

Shallow soakaways within the upper impermeable cohesive clay layer are very unlikely to provide suitable drainage in accordance with SuDS. This is attested to by the previous investigation at the site for the MUGA pitch to the south where shallow soakaway tests did not sufficiently drain to give an infiltration rate.

Any planned soakaways would only be effective above the level of groundwater, encountered between 3.00m and 5.00m. Given seasonal variations it is likely to be higher than recorded during this investigation.

Planned soakaways should be at least 5m away from building foundations in accordance with recommendations within guidelines.

7.5 Protection of Buried Concrete

The results of the BRE testing are given in Table 6.1 and the concrete design class is summarised in the table below:

Table 7.3: Summary of Concrete Design Class			
	Stratum	Wittering Formation	
	Unit	Min	Max
Total Sulphate	%	<0.01	0.35
2:1 Sulphate	g/l	<0.01	<0.01
pH	-	5.8	7.1
Total Sulphur	%	0.013	0.22
Total Potential Sulphate	%	0.039	0.66
Oxidisable Sulphates >0.3%?		Yes	
Design Sulphate Class		DS-3	
ACEC Class		AC-2s	

Shallow concrete foundations will be within the impermeable clay deposits and therefore groundwater is considered to be static.

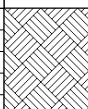
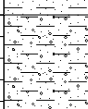
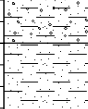
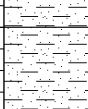
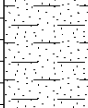
Based on the above and using guidance within BRE Special Digest 1 (2005) it is recommended that any buried concrete within the site conforms to class AC-2s.

Annex A: Exploratory Hole Logs

Project Name The Kings School, Fair Oaks	Project No. PO-23-060	Date 09/08/2023 to 09/08/2023	Hole Type WLS
Client Kingswell Builders Limited	Co-ords E: 448950.00 N: 118056.00 L:	Water Strike Details Depth Strike: 4.89 After 20 mins: 0.00 Remarks:	Logged By KT
Contractor Oaklands Site Investigation	Plant Used Dando Terrier		Approved By TC
			Scale 1:50

Samples and Results			Depth, (Thickness)	Level	Stratum Description	Legend	Well
Results	Type	Depth					
N=12 (1,2/2,3,3,4)	ES	0.20	(0.40)		Soft dark brown sandy CLAY with abundant roots and rootlets. (Topsoil)		
			0.40				
	D	0.70	(0.40)		Soft dark brown slightly sandy CLAY. (Wittering Formation)		
	B	0.90 - 1.10	0.80				
N=15 (1,3/3,3,4,5)	SPT(S)	1.00	(0.40)	1	Soft orangish brown slightly sandy CLAY. (Wittering Formation)		
			1.20				
	B	1.40 - 1.70	(0.50)		Soft orangish brown slightly gravelly sandy CLAY. Gravels are fine to medium subrounded to subangular flints. (Wittering Formation)		
	D	1.50	1.70				
N=16 (2,3/3,4,5,4)	SPT(S)	2.00		2	Firm orangish brown slightly sandy CLAY. (Wittering Formation)		
	D	2.20	(1.10)				
			2.80				
N=18 (4,5/4,5,4,5)	SPT(S)	3.00		3	Firm orangish brown sandy CLAY. (Wittering Formation)		
	B	3.10					
	D	3.10 - 3.40	(1.10)				
			3.90				
N=8 (1,1/2,2,2,2)	SPT(S)	4.00		4	Medium dense orangish brown slightly clayey SAND. (Wittering Formation)		
			(0.80)				
	B	4.90 - 5.10	4.70		Loose orangish yellowish brown slightly clayey SAND. (Wittering Formation)		
	SPT(S)	5.00	(0.70)	5			
N=7 (1,1/2,1,2,2)	B	5.50 - 5.70	5.40		Loose greyish brown slightly clayey SAND. (Wittering Formation)		
			(0.60)				
	SPT(S)	6.00		6			
			6.00		End of Borehole at 6.00m		

Remarks Groundwater encounter at 4.89m bgl.	Borehole Diameter Base Depth: Diameter:

Project Name The Kings School, Fair Oaks				Project No. PO-23-060		Date 09/08/2023 to 09/08/2023			Hole Type WLS		
Client Kingswell Builders Limited				Co-ords E: 448970.00 N: 118052.00 L:		Water Strike Details			Logged By KT		
						Depth Strike	After 20 mins	Remarks			
Contractor Oaklands Site Investigation				Plant Used Dando Terrier		4.32	0.00		Approved By TC		
									Scale 1:50		
Samples and Results			Depth, (Thickness)	Level	Stratum Description				Legend	Well	
Results	Type	Depth									
N=10 (1,2/2,2,3,3)	ES	0.30	(0.50)		Soft dark brown sandy CLAY with abundant roots and rootlets. (Topsoil)						
	B	0.60 - 0.80	0.50		Soft orangish brown slightly sandy CLAY. (Wittering Formation)						
	D	0.80	(0.60)								
	SPT(S)	1.00	1		Soft orangish brown slightly gravelly sandy CLAY. Gravels are fine to medium subrounded to subangular flints. (Wittering Formation)						
N=12 (1,2/2,3,3,4)			1.10								
			(1.20)								
	D	2.00	2		Firm orangish greyish brown slightly sandy CLAY. (Wittering Formation)						
	SPT(S)	2.00	2.30								
N=17 (2,3/3,4,5,5)			(1.00)								
	B	3.00	3		Firm to stiff orangish greyish brown sandy CLAY. (Wittering Formation)						
	D	3.00 - 3.30	3.30								
	SPT(S)	3.00	(1.10)								
N=22 (3,4/4,6,6,6)			3.30								
	B	4.00	4		Medium dense orangish greyish brown slightly clayey SAND. (Wittering Formation)						
	D	4.00 - 4.40	4.40								
	SPT(S)	4.00	(0.90)								
N=21 (3,2/3,4,6,8)			4.40								
	B	5.00 - 5.30	5		Loos greyish brown slightly clayey SAND. (Wittering Formation)						
	D	5.00	5.30								
	SPT(S)		(0.70)								
N=10 (1,1/2,2,3,3)	B	5.70 - 6.00	(0.70)								
	SPT(S)	6.00	6	6.00	End of Borehole at 6.00m						

Remarks

Groundwater encounter at 4.32m bgl.

Borehole Diameter

Base Depth

Diameter

Remarks	Borehole Diameter	
	Base Depth	Diameter
No groundwater encounter. Refusal at 4m bgl.		
Notes: For all symbols and abbreviations please see key sheet. All depths and measurements in metres. Stratum thicknesses given in brackets.		

Project Name The Kings School, Fair Oaks				Project No. PO-23-060	Date 09/08/2023 to 09/08/2023			Hole Type WLS		
Client Kingswell Builders Limited				Co-ords E: 448936.00 N: 118056.00 L:	Water Strike Details			Logged By KT		
					Depth Strike 5.00	After 20 mins 0.00	Remarks			
Contractor Oaklands Site Investigation			Plant Used Dando Terrier					Approved By TC		
								Scale 1:50		
Samples and Results			Depth, (Thickness)	Level	Stratum Description				Legend	Well
Results	Type	Depth								
N=8 (1,1/2,2,2,2)	ES D B D SPT(S)	0.30 0.60 0.80 - 1.00 0.90 1.00			Soft dark brown sandy CLAY with abundant roots and rootlets. (Topsoil)					
					Soft dark brown slightly sandy CLAY. (Wittering Formation)					
					Soft orangish greyish brown slightly sandy CLAY. (Wittering Formation)					
					Soft orangish yellowish greyish brown slightly sandy CLAY. (Wittering Formation)					
N=10 (2,2/2,2,3,3)	D B SPT(S)	1.50 1.90 - 2.10 2.00								
					Soft orangish greyish brown slightly sandy CLAY. (Wittering Formation)					
N=13 (2,2/2,3,4,4)	SPT(S) B	3.00 3.40 - 3.60								
					Soft orangish greyish brown slightly sandy CLAY. (Wittering Formation)					
N=11 (4,3/2,2,3,4)	D SPT(S)	4.00 4.00								
					Soft orangish greyish brown sandy CLAY. (Wittering Formation)					
N=58 (5,7/14,15,15,14)	B SPT(S)	4.40 - 4.60 5.00								
					Loose yellowish greyish brown slightly clayey SAND. (Wittering Formation)					
					Very dense greyish brown gravelly SAND. Gravel is subangular to subrounded fine to coarse of flint. (Wittering Formation)					
					End of Borehole at 5.00m					

Remarks

Groundwater encounter at 5m bgl. Refusal at 5m bgl.

Borehole Diameter

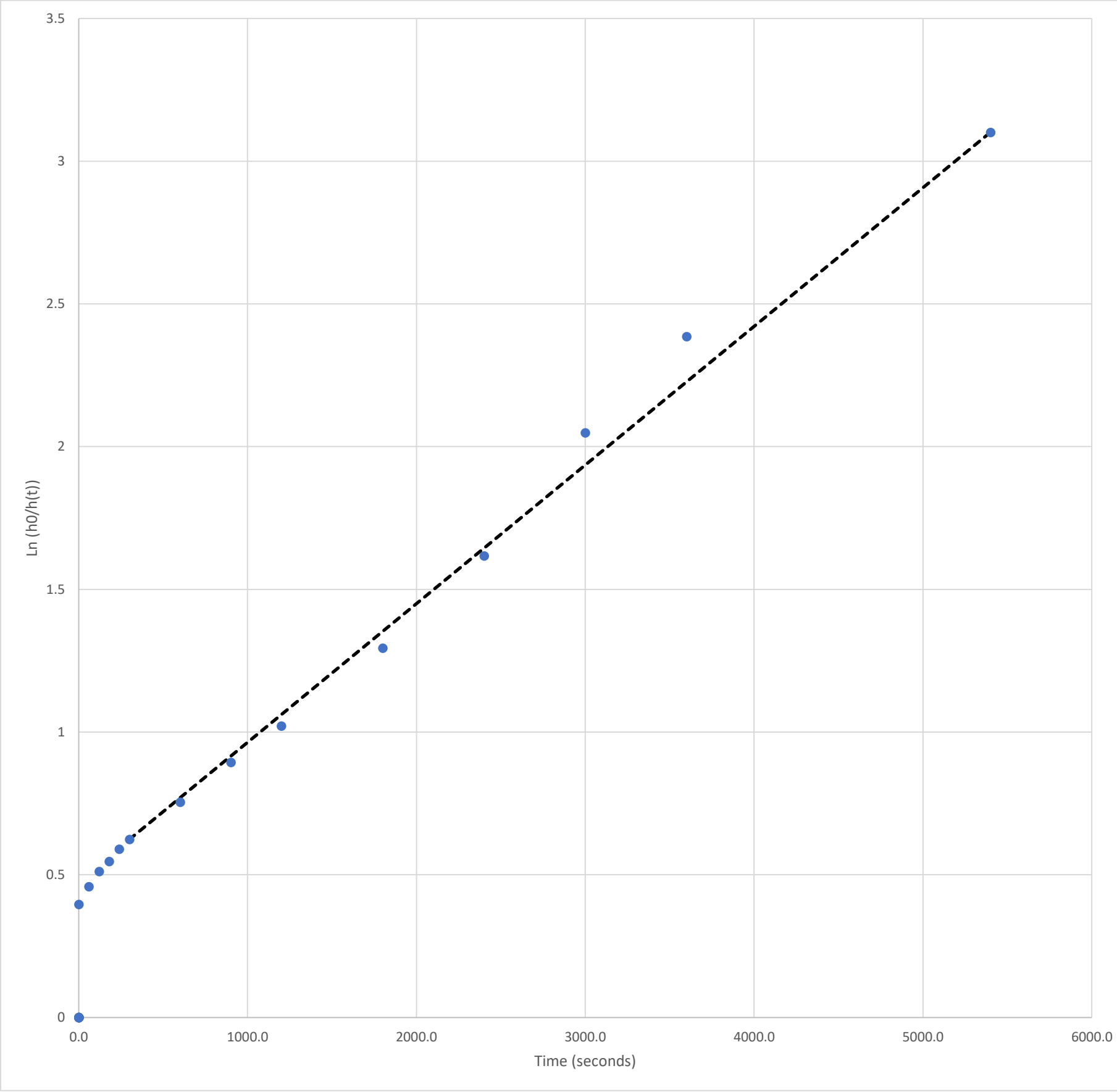
Base Depth

Diameter

Notes: For all symbols and abbreviations please see key sheet. All depths and measurements in metres. Stratum thicknesses given in brackets.

 Consulting Geo-Technical & Geo-Environmental Engineers Site Investigation Contractors				The Slate Barn, Lower Lowley, Dunsford, Exeter, EX6 7BP 01647 252414 www.terrafirmasouth.co.uk				Borehole No. WS05 Sheet 1 of 1						
Project Name The Kings School, Fair Oaks				Project No. PO-23-060	Date 09/08/2023 to 09/08/2023		Hole Type WLS							
Client Kingswell Builders Limited				Co-ords E: 448942.00 N: 118067.00 L:	Water Strike Details <table><tr><td>Depth Strike</td><td>After 20 mins</td><td>Remarks</td></tr><tr><td>3.00</td><td>0.00</td><td></td></tr></table>			Depth Strike	After 20 mins	Remarks	3.00	0.00		Logged By KT
Depth Strike	After 20 mins	Remarks												
3.00	0.00													
Contractor Oaklands Site Investigation		Plant Used Dando Terrier					Approved By TC							
							Scale 1:50							
Samples and Results <table><tr><td>Results</td><td>Type</td><td>Depth</td></tr></table>			Results	Type	Depth	Depth, (Thickness)	Level	Stratum Description		Legend	Well			
Results	Type	Depth												
N=9 (1,1/2,2,2,3)			(0.05)	1	ASPHALT (Made Ground)									
			0.05		Soft dark greyish brown slightly sandy CLAY with frequent crushed concrete and rare brick fragments. (Made Ground)									
N=12 (2,3/2,3,3,4)			(0.35)	2	Soft dark brown slightly sandy CLAY. (Wittering Formation)									
			0.40											
N=22 (2,3/5,5,5,7)			(0.70)	3	Soft greyish brown slightly sandy CLAY. (Wittering Formation)									
			0.80											
N=36 (10,9/9,9,9,9)			0.80 - 1.10	4	Soft orangish greyish brown slightly sandy CLAY. (Wittering Formation)									
			1.00											
N=23 (1,4/4,6,6,7)			1.10	5	Firm yellowish greyish brown sandy CLAY. (Wittering Formation)									
			1.50											
N=58 (10,11/13,15,15,15)			(0.70)	6	Firm orangish greyish brown sandy CLAY. (Wittering Formation)									
			1.50 - 1.80											
			1.80		Medium dense to dense yellowish orangish brown slightly clayey SAND. (Wittering Formation)									
			2.00											
			2.00		Medium dense greyish brown slightly clayey SAND. (Wittering Formation)									
			2.60 - 2.80											
			(1.10)		End of Borehole at 5.80m									
			2.90											
			(0.60)											
			3.00											
			(0.80)											
			3.30 - 3.50											
			(0.90)											
			4.00											
			4.30											
			4.90											
			(0.90)											
			5.00											
			5.10 - 5.40											
			5.80											
			5.80											
														
														
														
														

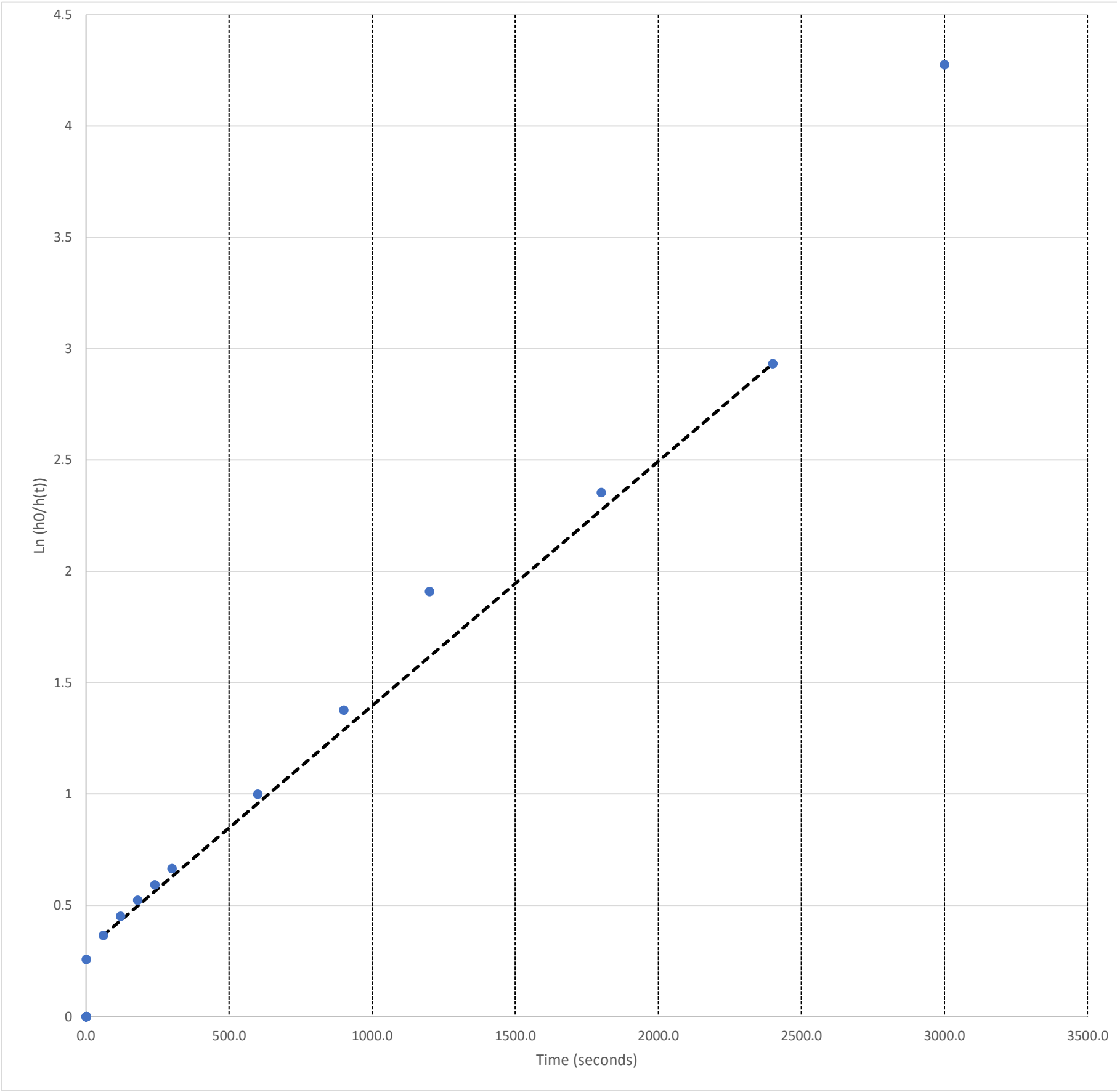
Annex B: In-situ Test Results



Method: BS EN ISO 22282-2:2012 - Velocity graph

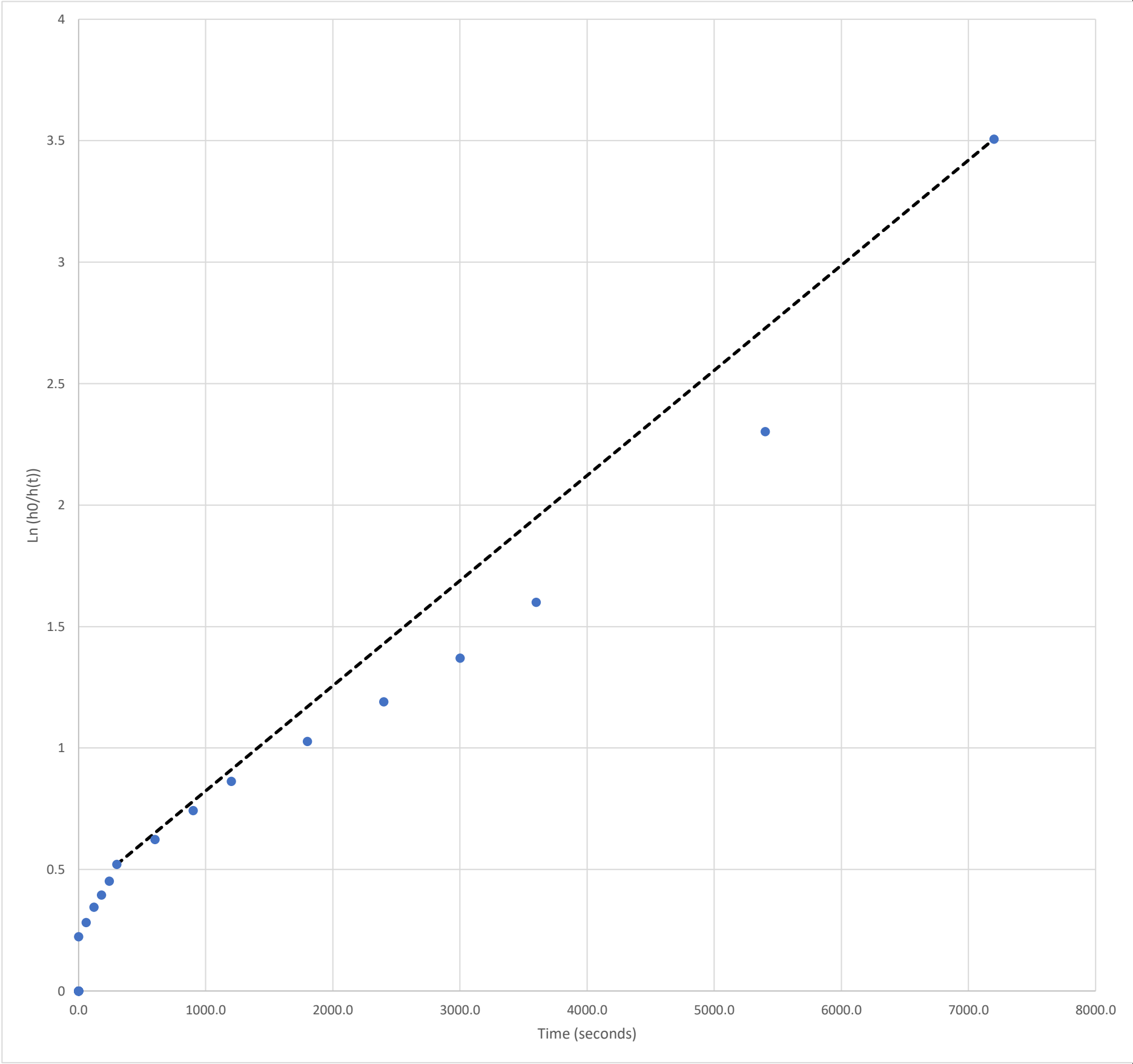
$k = \alpha \cdot (S/F)$
 $\alpha = 0.000486$ $S = 5.823067$ $F = 7.770539$ $F \text{ for cylindrical cavity} = 2 \cdot \pi \cdot L / \ln(2 \cdot (L/D))$
 $k = 0.000364$

Terra firma Terrafirma Lower Lowley Dunsford Devon Ex6 7BP Tel: 01647 252414	Client	Title					
	Kingswell Buildings Ltd	Variable head test in WS01					
	Project	Sheet size	Drawn:	KT	Checked:	TC	Reviewed:
Kings School, FairOak		A4	Date:	31/07/23	Date:	01/08/23	Date:
		Status	Figure Number				Rev
		Final					00



Method: BS EN ISO 22282-2:2012 - Velocity graph
k = α. (S/F)
α= 0.001098 S= 5.823067 F= 7.770539 F for cylindrical cavity = 2*Pi*L / ln(2*(L/D))
k= 0.000822

Terra firma Terrafirma Lower Lowley Dunsford Devon Ex6 7BP Tel: 01647 252414	Client	Title					
	Kingswell Buildings Ltd	Variable head test in WS02					
	Project	Sheet size	Drawn:	Checked:	TC	Reviewed:	
Kings School, Fair oak		A4	Date:	31/07/23	Date:	01/08/23	Date:
		Status	Figure Number				Rev
		Final					00



Method: BS EN ISO 22282-2:2012 - Velocity graph
k = $\alpha \cdot (S/F)$
 $\alpha = 0.000432708$ S= 4.836106 F= 6.714902 F for cylindrical cavity = $2 \cdot \pi \cdot L / \ln(2 \cdot (L/D))$
k= 0.000311638

 Terra Firma Lower Lowley Dunsford Tel: 01647 252414 Devon Ex6 7BP	Client Kingswell Buildings Ltd		Title Variable head test in WS04					
	Project Kings School, Fair oak		Sheet size A4	Drawn: Date:	KT 31/07/23	Checked: Date:	TC 01/08/23	Reviewed: Date:
			Status Final	Figure Number				Rev 00

Annex C: Chemical Test Results



Final Report

Report No.: 23-27565-1

Initial Date of Issue: 24-Aug-2023

Re-Issue Details:

Client Terra Firma

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

Contact(s): Info

Project PO-23-060 THE KINGS SCHOOL FAIR
OAKS

Quotation No.: Q23-31893

Date Received: 17-Aug-2023

Order No.: PO-23-060

Date Instructed: 17-Aug-2023

No. of Samples: 4

Turnaround (Wkdays): 5

Results Due: 23-Aug-2023

Date Approved: 24-Aug-2023

Approved By:

Details: Stuart Henderson, Technical
Manager

Results - Soil

Project: PO-23-060 THE KINGS SCHOOL FAIR OAKS

Client: Terra Firma	Chemtest Job No.:				23-27565	23-27565
Quotation No.: Q23-31893	Chemtest Sample ID.:				1689317	1689320
Order No.: PO-23-060	Client Sample Ref.:				ES1	ES1
	Sample Location:				WS02	WS05
	Sample Type:				SOIL	SOIL
	Top Depth (m):				0.30	0.30
	Date Sampled:				09-Aug-2023	09-Aug-2023
	Asbestos Lab:				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
Moisture	N	2030	%	0.020	13	13
pH	M	2010		4.0	6.4	8.0
Cyanide (Total)	M	2300	mg/kg	0.50	0.50	< 0.50
Sulphate (Total)	U	2430	%	0.010	0.10	0.23
Arsenic	M	2455	mg/kg	0.5	7.5	10
Cadmium	M	2455	mg/kg	0.10	0.49	0.27
Chromium	M	2455	mg/kg	0.5	24	20
Copper	M	2455	mg/kg	0.50	12	22
Mercury	M	2455	mg/kg	0.05	0.16	0.10
Nickel	M	2455	mg/kg	0.50	11	16
Lead	M	2455	mg/kg	0.50	86	27
Selenium	M	2455	mg/kg	0.25	1.4	0.86
Zinc	M	2455	mg/kg	0.50	41	51
Chromium (Trivalent)	N	2490	mg/kg	1.0	24	20
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50
Organic Matter	M	2625	%	0.40	1.7	1.8
Total TPH >C6-C40	M	2670	mg/kg	10	< 10	95
Naphthalene	M	2800	mg/kg	0.10	< 0.10	0.12
Acenaphthylene	N	2800	mg/kg	0.10	< 0.10	< 0.10
Acenaphthene	M	2800	mg/kg	0.10	< 0.10	< 0.10
Fluorene	M	2800	mg/kg	0.10	< 0.10	< 0.10
Phenanthrene	M	2800	mg/kg	0.10	< 0.10	< 0.10
Anthracene	M	2800	mg/kg	0.10	< 0.10	< 0.10
Fluoranthene	M	2800	mg/kg	0.10	< 0.10	< 0.10
Pyrene	M	2800	mg/kg	0.10	< 0.10	< 0.10
Benzo[a]anthracene	M	2800	mg/kg	0.10	< 0.10	< 0.10
Chrysene	M	2800	mg/kg	0.10	< 0.10	< 0.10
Benzo[b]fluoranthene	M	2800	mg/kg	0.10	< 0.10	< 0.10
Benzo[k]fluoranthene	M	2800	mg/kg	0.10	< 0.10	< 0.10
Benzo[a]pyrene	M	2800	mg/kg	0.10	< 0.10	< 0.10
Indeno(1,2,3-c,d)Pyrene	M	2800	mg/kg	0.10	< 0.10	< 0.10
Dibenz(a,h)Anthracene	N	2800	mg/kg	0.10	< 0.10	< 0.10
Benzo[g,h,i]perylene	M	2800	mg/kg	0.10	< 0.10	< 0.10
Total Of 16 PAH's	N	2800	mg/kg	2.0	< 2.0	< 2.0

Results - Soil

Project: PO-23-060 THE KINGS SCHOOL FAIR OAKS

Client: Terra Firma	Chemtest Job No.:		23-27565	23-27565
Quotation No.: Q23-31893	Chemtest Sample ID.:		1689317	1689320
Order No.: PO-23-060	Client Sample Ref.:		ES1	ES1
	Sample Location:		WS02	WS05
	Sample Type:		SOIL	SOIL
	Top Depth (m):		0.30	0.30
	Date Sampled:		09-Aug-2023	09-Aug-2023
	Asbestos Lab:		DURHAM	DURHAM
Determinand	Accred.	SOP	Units	LOD
Total Phenols	M	2920	mg/kg	0.10
				< 0.10
				< 0.10

Results - Single Stage WAC

Project: PO-23-060 THE KINGS SCHOOL FAIR OAKS

Chemtest Job No: 23-27565					Landfill Waste Acceptance Criteria		
Chemtest Sample ID: 1689316					Limits		
Sample Ref: ES1					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID:							
Sample Location: WS01							
Top Depth(m): 0.20							
Bottom Depth(m):							
Sampling Date: 09-Aug-2023							
Determinand	SOP	Accred.	Units				
Total Organic Carbon	2625	M	%	0.25	3	5	6
Loss On Ignition	2610	M	%	3.3	--	--	10
Total BTEX	2760	M	mg/kg	< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg	< 0.10	1	--	--
TPH Total WAC	2670	M	mg/kg	< 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	0.0040	--	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	0.0004	0.0035	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	< 0.0005	< 0.0050	0.5	10	70
Copper	1455	U	< 0.0005	< 0.0050	2	50	100
Mercury	1455	U	< 0.00005	< 0.00050	0.01	0.2	2
Molybdenum	1455	U	< 0.0002	< 0.0020	0.5	10	30
Nickel	1455	U	< 0.0005	< 0.0050	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	0.015	0.15	4	50	200
Chloride	1220	U	< 1.0	< 10	800	15000	25000
Fluoride	1220	U	0.095	< 1.0	10	150	500
Sulphate	1220	U	2.3	23	1000	20000	50000
Total Dissolved Solids	1020	N	9.6	96	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	< 2.5	< 50	500	800	1000

Solid Information

Dry mass of test portion/kg	0.090
Moisture (%)	16

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-23-060 THE KINGS SCHOOL FAIR OAKS

Chemtest Job No: 23-27565					Landfill Waste Acceptance Criteria		
Chemtest Sample ID: 1689318					Limits		
Sample Ref: ES1					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID:							
Sample Location: WS03							
Top Depth(m): 0.40							
Bottom Depth(m):							
Sampling Date: 09-Aug-2023							
Determinand	SOP	Accred.	Units				
Total Organic Carbon	2625	M	%	1.4	3	5	6
Loss On Ignition	2610	M	%	5.2	--	--	10
Total BTEX	2760	M	mg/kg	< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg	< 0.10	1	--	--
TPH Total WAC	2670	M	mg/kg	< 10	500	--	--
Total (Of 17) PAH's	2700	N	mg/kg	< 2.0	100	--	--
pH	2010	M		6.2	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.0050	--	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	< 0.0002	< 0.0020	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	< 0.0005	< 0.0050	0.5	10	70
Copper	1455	U	< 0.0005	< 0.0050	2	50	100
Mercury	1455	U	< 0.00005	< 0.00050	0.01	0.2	2
Molybdenum	1455	U	< 0.0002	< 0.0020	0.5	10	30
Nickel	1455	U	< 0.0005	< 0.0050	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	0.013	0.13	4	50	200
Chloride	1220	U	< 1.0	< 10	800	15000	25000
Fluoride	1220	U	0.093	< 1.0	10	150	500
Sulphate	1220	U	2.5	25	1000	20000	50000
Total Dissolved Solids	1020	N	19	190	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	< 2.5	< 50	500	800	1000

Solid Information

Dry mass of test portion/kg	0.090
Moisture (%)	19

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.

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
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Alkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.
2455	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
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; Dibenzo[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.

Test Methods

SOP	Title	Parameters included	Method summary
2800	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-MS	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-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:

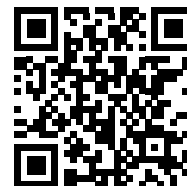
customerservices@chemtest.com

Annex D: HazWaste Classification Report

Waste Classification Report

HazWasteOnline™ classifies waste as either **hazardous** or **non-hazardous** based on its chemical composition, related legislation and the rules and data defined in the current UK or EU technical guidance (Appendix C) (note that HP 9 Infectious is not assessed). It is the responsibility of the classifier named below to:

- understand the origin of the waste
- select the correct List of Waste code(s)
- confirm that the list of determinands, results and sampling plan are fit for purpose
- select and justify the chosen metal species (Appendix B)
- correctly apply moisture correction and other available corrections
- add the meta data for their user-defined substances (Appendix A)
- check that the classification engine is suitable with respect to the national destination of the waste (Appendix C)



M1CGH-GRM4U-ULM34

To aid the reviewer, the laboratory results, assumptions and justifications managed by the classifier are highlighted in pale yellow.

Job name

HWOL_23-27565-20230824 124130

Description/Comments

Project

PO-23-060

Site

The Kings School, Fair Oak

Classified by

Name: **Steven Hill**
 Date: **15 Sep 2023 13:41 GMT**
 Telephone: **01647 252414**
 Company: **TFW Group Ltd t/a Terra Firma (South)**
The Slate Barn
Lower Lowley
Dunsford
EX6 7BP

HazWasteOnline™ provides a two day, hazardous waste classification course that covers the use of the software and both basic and advanced waste classification techniques. Certification has to be renewed every 3 years.

HazWasteOnline™ Certification:

Course	Date
Hazardous Waste Classification	50% complete

Purpose of classification

2 - Material Characterisation

Address of the waste

The Kings School, Fair Oak

Post Code SO50 7DB

SIC for the process giving rise to the waste

41201 Construction of commercial buildings

Description of industry/producer giving rise to the waste

Development of Educational Building

Description of the specific process, sub-process and/or activity that created the waste

Waste generated during groundworks

Description of the waste

Topsoil, MG, Natural Soils

Job summary

#	Sample name	Depth [m]	Classification Result	Hazard properties	Page
1	WS02-ES1-09/08/2023-0.30	0.30	Non Hazardous		3
2	WS05-ES1-09/08/2023-0.30	0.30	Non Hazardous		5

Related documents

#	Name	Description
1	HWOL_23-27565-20230824 124130.hwol	Eurofins Chemtest .hwol file used to populate the Job
2	Example waste stream template for contaminated soils	waste stream template used to create this Job

Report

Created by: Steven Hill

Created date: 15 Sep 2023 13:41 GMT

Appendices	Page
Appendix A: Classifier defined and non GB MCL determinands	7
Appendix B: Rationale for selection of metal species	8
Appendix C: Version	9

Classification of sample: WS02-ES1-09/08/2023-0.30

✔ **Non Hazardous Waste**
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:	LoW Code:
WS02-ES1-09/08/2023-0.30	Chapter:
Sample Depth:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
0.30 m	Entry:
Moisture content:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)
13%	
(wet weight correction)	

Hazard properties

None identified

Determinands

Moisture content: 13% Wet Weight Moisture Correction applied (MC)

#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number							
1	arsenic { arsenic trioxide }				7.5 mg/kg	1.32	8.615 mg/kg	0.000862 %	✓	
	033-003-00-0	215-481-4	1327-53-3							
2	cadmium { cadmium oxide }				0.49 mg/kg	1.142	0.487 mg/kg	0.0000487 %	✓	
	048-002-00-0	215-146-2	1306-19-0							
3	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }				24 mg/kg	1.462	30.517 mg/kg	0.00305 %	✓	
		215-160-9	1308-38-9							
4	chromium in chromium(VI) compounds { chromium (VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex }				<0.5 mg/kg	2.27	<1.135 mg/kg	<0.000113 %		<LOD
	024-017-00-8									
5	copper { dicopper oxide; copper (I) oxide }				12 mg/kg	1.126	11.754 mg/kg	0.00118 %	✓	
	029-002-00-X	215-270-7	1317-39-1							
6	lead { lead chromate }			1	86 mg/kg	1.56	116.705 mg/kg	0.00748 %	✓	
	082-004-00-2	231-846-0	7758-97-6							
7	mercury { mercury dichloride }				0.16 mg/kg	1.353	0.188 mg/kg	0.0000188 %	✓	
	080-010-00-X	231-299-8	7487-94-7							
8	nickel { nickel chromate }				11 mg/kg	2.976	28.483 mg/kg	0.00285 %	✓	
	028-035-00-7	238-766-5	14721-18-7							
9	selenium { nickel selenate }				1.4 mg/kg	2.554	3.111 mg/kg	0.000311 %	✓	
	028-031-00-5	239-125-2	15060-62-5							
10	zinc { zinc chromate }				41 mg/kg	2.774	98.954 mg/kg	0.0099 %	✓	
	024-007-00-3	236-878-9	13530-65-9							
11	TPH (C6 to C40) petroleum group				<10 mg/kg		<10 mg/kg	<0.001 %		<LOD
			TPH							
12	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }				0.5 mg/kg	1.884	0.82 mg/kg	0.000082 %	✓	
	006-007-00-5									
13	pH				6.4 pH		6.4 pH	6.4 pH		
			PH							
14	naphthalene				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
	601-052-00-2	202-049-5	91-20-3							

#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number							
15	● acenaphthylene	205-917-1	208-96-8		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
16	● acenaphthene	201-469-6	83-32-9		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
17	● fluorene	201-695-5	86-73-7		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
18	● phenanthrene	201-581-5	85-01-8		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
19	● anthracene	204-371-1	120-12-7		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
20	● fluoranthene	205-912-4	206-44-0		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
21	● pyrene	204-927-3	129-00-0		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
22	benzo[a]anthracene	601-033-00-9	200-280-6		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
23	chrysene	601-048-00-0	205-923-4		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
24	benzo[b]fluoranthene	601-034-00-4	205-911-9		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
25	benzo[k]fluoranthene	601-036-00-5	205-916-6		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
26	benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
27	● indeno[123-cd]pyrene	205-893-2	193-39-5		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
28	dibenz[a,h]anthracene	601-041-00-2	200-181-8		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
29	● benzo[ghi]perylene	205-883-8	191-24-2		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
30	● monohydric phenols		P1186		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
Total:								0.0271 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
●	Speciated Determinand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: WS05-ES1-09/08/2023-0.30

✔ **Non Hazardous Waste**
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:	LoW Code:
WS05-ES1-09/08/2023-0.30	Chapter:
Sample Depth:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
0.30 m	Entry:
Moisture content:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)
13%	
(wet weight correction)	

Hazard properties

None identified

Determinands

Moisture content: 13% Wet Weight Moisture Correction applied (MC)

#		Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number							
1		arsenic { arsenic trioxide }				10 mg/kg	1.32	11.487 mg/kg	0.00115 %	✓	
		033-003-00-0	215-481-4	1327-53-3							
2		cadmium { cadmium oxide }				0.27 mg/kg	1.142	0.268 mg/kg	0.0000268 %	✓	
		048-002-00-0	215-146-2	1306-19-0							
3		chromium in chromium(III) compounds { chromium(III) oxide (worst case) }				20 mg/kg	1.462	25.431 mg/kg	0.00254 %	✓	
			215-160-9	1308-38-9							
4		chromium in chromium(VI) compounds { chromium (VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex }				<0.5 mg/kg	2.27	<1.135 mg/kg	<0.000113 %		<LOD
		024-017-00-8									
5		copper { dicopper oxide; copper (I) oxide }				22 mg/kg	1.126	21.55 mg/kg	0.00215 %	✓	
		029-002-00-X	215-270-7	1317-39-1							
6		lead { lead chromate }			1	27 mg/kg	1.56	36.64 mg/kg	0.00235 %	✓	
		082-004-00-2	231-846-0	7758-97-6							
7		mercury { mercury dichloride }				0.1 mg/kg	1.353	0.118 mg/kg	0.0000118 %	✓	
		080-010-00-X	231-299-8	7487-94-7							
8		nickel { nickel chromate }				16 mg/kg	2.976	41.43 mg/kg	0.00414 %	✓	
		028-035-00-7	238-766-5	14721-18-7							
9		selenium { nickel selenate }				0.86 mg/kg	2.554	1.911 mg/kg	0.000191 %	✓	
		028-031-00-5	239-125-2	15060-62-5							
10		zinc { zinc chromate }				51 mg/kg	2.774	123.089 mg/kg	0.0123 %	✓	
		024-007-00-3	236-878-9	13530-65-9							
11		TPH (C6 to C40) petroleum group				95 mg/kg		82.65 mg/kg	0.00827 %	✓	
				TPH							
12		cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }				<0.5 mg/kg	1.884	<0.942 mg/kg	<0.0000942 %		<LOD
		006-007-00-5									
13		pH				8 pH		8 pH	8pH		
				PH							
14		naphthalene				0.12 mg/kg		0.104 mg/kg	0.0000104 %	✓	
		601-052-00-2	202-049-5	91-20-3							

#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number							
15	acenaphthylene	205-917-1	208-96-8		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
16	acenaphthene	201-469-6	83-32-9		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
17	fluorene	201-695-5	86-73-7		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
18	phenanthrene	201-581-5	85-01-8		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
19	anthracene	204-371-1	120-12-7		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
20	fluoranthene	205-912-4	206-44-0		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
21	pyrene	204-927-3	129-00-0		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
22	benzo[a]anthracene	601-033-00-9	200-280-6		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
23	chrysene	601-048-00-0	205-923-4		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
24	benzo[b]fluoranthene	601-034-00-4	205-911-9		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
25	benzo[k]fluoranthene	601-036-00-5	205-916-6		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
26	benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
27	indeno[123-cd]pyrene	205-893-2	193-39-5		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
28	dibenz[a,h]anthracene	601-041-00-2	200-181-8		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
29	benzo[ghi]perylene	205-883-8	191-24-2		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
30	monohydric phenols		P1186		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
Total:								0.0335 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Determinand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Supplementary Hazardous Property Information

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and ≤ 75°C"

Force this Hazardous property to non hazardous because Non flammable <12.5%

Hazard Statements hit:

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.00827%)

Appendix A: Classifier defined and non GB MCL determinands

■ **chromium(III) oxide (worst case)** (EC Number: 215-160-9, CAS Number: 1308-38-9)

Description/Comments: Data from C&L Inventory Database

Data source: <https://echa.europa.eu/information-on-chemicals/cl-inventory-database/-/discli/details/33806>

Data source date: 17 Jul 2015

Hazard Statements: Acute Tox. 4; H332 , Acute Tox. 4; H302 , Eye Irrit. 2; H319 , STOT SE 3; H335 , Skin Irrit. 2; H315 , Resp. Sens. 1; H334 , Skin Sens. 1; H317 , Repr. 1B; H360FD , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

■ **TPH (C6 to C40) petroleum group** (CAS Number: TPH)

Description/Comments: Hazard statements taken from WM3 1st Edition 2015; Risk phrases: WM2 3rd Edition 2013

Data source: WM3 1st Edition 2015

Data source date: 25 May 2015

Hazard Statements: Flam. Liq. 3; H226 , Asp. Tox. 1; H304 , STOT RE 2; H373 , Muta. 1B; H340 , Carc. 1B; H350 , Repr. 2; H361d , Aquatic Chronic 2; H411

■ **salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex**

GB MCL index number: 006-007-00-5

Description/Comments: Conversion factor based on a worst case compound: sodium cyanide

Additional Hazard Statement(s): EUH032 >= 0.2 %

Reason for additional Hazards Statement(s):

20 Nov 2021 - EUH032 >= 0.2 % hazard statement sourced from: WM3, Table C12.2

■ **pH** (CAS Number: PH)

Description/Comments: Appendix C4

Data source: WM3 1st Edition 2015

Data source date: 25 May 2015

Hazard Statements: None.

■ **acenaphthylene** (EC Number: 205-917-1, CAS Number: 208-96-8)

Description/Comments: Data from C&L Inventory Database

Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>

Data source date: 17 Jul 2015

Hazard Statements: Acute Tox. 4; H302 , Acute Tox. 1; H330 , Acute Tox. 1; H310 , Eye Irrit. 2; H319 , STOT SE 3; H335 , Skin Irrit. 2; H315

■ **acenaphthene** (EC Number: 201-469-6, CAS Number: 83-32-9)

Description/Comments: Data from C&L Inventory Database

Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>

Data source date: 17 Jul 2015

Hazard Statements: Eye Irrit. 2; H319 , STOT SE 3; H335 , Skin Irrit. 2; H315 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410 , Aquatic Chronic 2; H411

■ **fluorene** (EC Number: 201-695-5, CAS Number: 86-73-7)

Description/Comments: Data from C&L Inventory Database

Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>

Data source date: 06 Aug 2015

Hazard Statements: Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

■ **phenanthrene** (EC Number: 201-581-5, CAS Number: 85-01-8)

Description/Comments: Data from C&L Inventory Database

Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>

Data source date: 06 Aug 2015

Hazard Statements: Acute Tox. 4; H302 , Eye Irrit. 2; H319 , STOT SE 3; H335 , Carc. 2; H351 , Skin Sens. 1; H317 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410 , Skin Irrit. 2; H315

■ **anthracene** (EC Number: 204-371-1, CAS Number: 120-12-7)

Description/Comments: Data from C&L Inventory Database

Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>

Data source date: 17 Jul 2015

Hazard Statements: Eye Irrit. 2; H319 , STOT SE 3; H335 , Skin Irrit. 2; H315 , Skin Sens. 1; H317 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

■ **fluoranthene** (EC Number: 205-912-4, CAS Number: 206-44-0)

Description/Comments: Data from C&L Inventory Database

Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>

Data source date: 21 Aug 2015

Hazard Statements: Acute Tox. 4; H302 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

■ **pyrene** (EC Number: 204-927-3, CAS Number: 129-00-0)

Description/Comments: Data from C&L Inventory Database; SDS Sigma Aldrich 2014

Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>

Data source date: 21 Aug 2015

Hazard Statements: Skin Irrit. 2; H315, Eye Irrit. 2; H319, STOT SE 3; H335, Aquatic Acute 1; H400, Aquatic Chronic 1; H410

■ **indeno[123-cd]pyrene** (EC Number: 205-893-2, CAS Number: 193-39-5)

Description/Comments: Data from C&L Inventory Database

Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>

Data source date: 06 Aug 2015

Hazard Statements: Carc. 2; H351

■ **benzo[ghi]perylene** (EC Number: 205-883-8, CAS Number: 191-24-2)

Description/Comments: Data from C&L Inventory Database; SDS Sigma Aldrich 28/02/2015

Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>

Data source date: 23 Jul 2015

Hazard Statements: Aquatic Acute 1; H400, Aquatic Chronic 1; H410

■ **monohydric phenols** (CAS Number: P1186)

Description/Comments: Combined hazards statements from harmonised entries in CLP for phenol, cresols and xylenols (604-001-00-2, 604-004-00-9, 604-006-00-X)

Data source: CLP combined data

Data source date: 26 Mar 2019

Hazard Statements: Muta. 2; H341, Acute Tox. 3; H331, Acute Tox. 3; H311, Acute Tox. 3; H301, STOT RE 2; H373, Skin Corr. 1B; H314, Skin Corr. 1B; H314 >= 3 %, Skin Irrit. 2; H315 1 % conc. < 3 %, Eye Irrit. 2; H319 1 % conc. < 3 %, Aquatic Chronic 2; H411

Appendix B: Rationale for selection of metal species

arsenic {arsenic trioxide}

Reasonable case CLP species based on hazard statements/molecular weight and most common (stable) oxide of arsenic. Industrial sources include: smelting; main precursor to other arsenic compounds (edit as required)

cadmium {cadmium oxide}

Reasonable case CLP species based on hazard statements/molecular weight, very low solubility in water. Industrial sources include: electroplating baths, electrodes for storage batteries, catalysts, ceramic glazes, phosphors, pigments and nematocides. (edit as required) Worst case compounds in CLP: cadmium sulphate, chloride, fluoride & iodide not expected as either very soluble and/or compound's industrial usage not related to site history (edit as required)

chromium in chromium(III) compounds {chromium(III) oxide (worst case)}

Reasonable case species based on hazard statements/molecular weight. Industrial sources include: tanning, pigment in paint, inks and glass (edit as required)

chromium in chromium(VI) compounds {chromium (VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex}

Worst case species based on hazard statements/molecular weight (edit as required)

copper {dicopper oxide; copper (I) oxide}

Reasonable case CLP species based on hazard statements/molecular weight and insolubility in water. Industrial sources include: oxidised copper metal, brake pads, pigments, antifouling paints, fungicide. (edit as required) Worse case copper sulphate is very soluble and likely to have been leached away if ever present and/or not enough soluble sulphate detected. (edit as required)

lead {lead chromate}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

mercury {mercury dichloride}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

nickel {nickel chromate}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

selenium {nickel selenate}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

zinc {zinc chromate}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

cyanides {salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex}

Harmonised group entry used as most reasonable case as complex cyanides and those specified elsewhere in the annex are not likely to be present in this soil: [Note conversion factor based on a worst case compound: sodium cyanide] (edit as required)

Appendix C: Version

HazWasteOnline Classification Engine: **WM3 1st Edition v1.2.GB - Oct 2021**

HazWasteOnline Classification Engine Version: 2023.237.5731.10565 (25 Aug 2023)

HazWasteOnline Database: 2023.237.5731.10565 (25 Aug 2023)

This classification utilises the following guidance and legislation:

WM3 v1.2.GB - Waste Classification - 1st Edition v1.2.GB - Oct 2021

CLP Regulation - Regulation 1272/2008/EC of 16 December 2008

1st ATP - Regulation 790/2009/EC of 10 August 2009

2nd ATP - Regulation 286/2011/EC of 10 March 2011

3rd ATP - Regulation 618/2012/EU of 10 July 2012

4th ATP - Regulation 487/2013/EU of 8 May 2013

Correction to 1st ATP - Regulation 758/2013/EU of 7 August 2013

5th ATP - Regulation 944/2013/EU of 2 October 2013

6th ATP - Regulation 605/2014/EU of 5 June 2014

WFD Annex III replacement - Regulation 1357/2014/EU of 18 December 2014

Revised List of Waste 2014 - Decision 2014/955/EU of 18 December 2014

7th ATP - Regulation 2015/1221/EU of 24 July 2015

8th ATP - Regulation (EU) 2016/918 of 19 May 2016

9th ATP - Regulation (EU) 2016/1179 of 19 July 2016

10th ATP - Regulation (EU) 2017/776 of 4 May 2017

HP14 amendment - Regulation (EU) 2017/997 of 8 June 2017

13th ATP - Regulation (EU) 2018/1480 of 4 October 2018

14th ATP - Regulation (EU) 2020/217 of 4 October 2019

15th ATP - Regulation (EU) 2020/1182 of 19 May 2020

The Chemicals (Health and Safety) and Genetically Modified Organisms (Contained Use)(Amendment etc.) (EU Exit)

Regulations 2020 - UK: 2020 No. 1567 of 16th December 2020

The Waste and Environmental Permitting etc. (Legislative Functions and Amendment etc.) (EU Exit) Regulations 2020 - UK:

2020 No. 1540 of 16th December 2020

GB MCL List - version 1.1 of 09 June 2021

Annex E: Soil Property Test Results

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08 September 2023

Report No : GEO/38769/01

Page 1 of 1

For the attention of Mr S Hill / Ms K Timkey

Our ref **GEO / 38769**
Your Ref **PO-23-060**

Date samples received 15/08/2023
Date written instructions received 15/09/2023
Date testing commenced 16/09/2023
Date of sample disposal 06/10/2023

Project **THE KINGS SCHOOL, FAIR OAKS**

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
~	5	Water Content
~	5	Liquid & Plastic Limits
2	1	Particle Size Distribution
3	~	Geochemical Test Summary
~	3	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**



S Burke
Senior Technician

SUMMARY OF LIQUID AND PLASTIC LIMIT TESTS

Location	Depth m	Sample Ref	Sample Type	Description	Water Content BS EN ISO 17892-1 : 2014 +A1:2022 %	Liquid Limit %	Plastic Limit %	Plasticity Index %	Percentage Passing 425µm %	Atterberg Classification	Test Type	Sample Condition
WS01	0.90-1.10	B1	B	Orangish brown slightly gravelly sandy CLAY. Gravel is fine to medium. Sand is fine.	21.8	44	18	26	98	CI	2	1
WS02	0.80	D1	D	Orangish brown sandy CLAY. Sand is fine.	17.4	33	16	17	99	CL	2	1
WS03	2.40	D2	D	Orangish brown slightly gravelly sandy CLAY. Gravel is fine to medium. Sand is fine.	18.1	46	18	28	97	CI	2	1
WS04	1.90-2.10	B2	B	Orangish brown silty sandy CLAY. Sand is fine.	25.0	46	21	25	100	CI	2	1
WS05	3.30-3.50	B4	B	Orangish brown and brown slightly gravelly sandy CLAY. Gravel is fine to medium. Sand is fine.	18.6	32	14	18	98	CL	2	1

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:



S Burke - Senior Technician
 08/09/2023

Project Number:

GEO / 38769

Project Name:

THE KINGS SCHOOL, FAIR OAKS
 PO-23-060

GEOLABS®



Tested by Eurofins Chemtest Ltd : MCERTS / UKAS No 2183

GEOLABSPage 1 of 1
(Ref 1695825270)

PARTICLE SIZE DISTRIBUTION

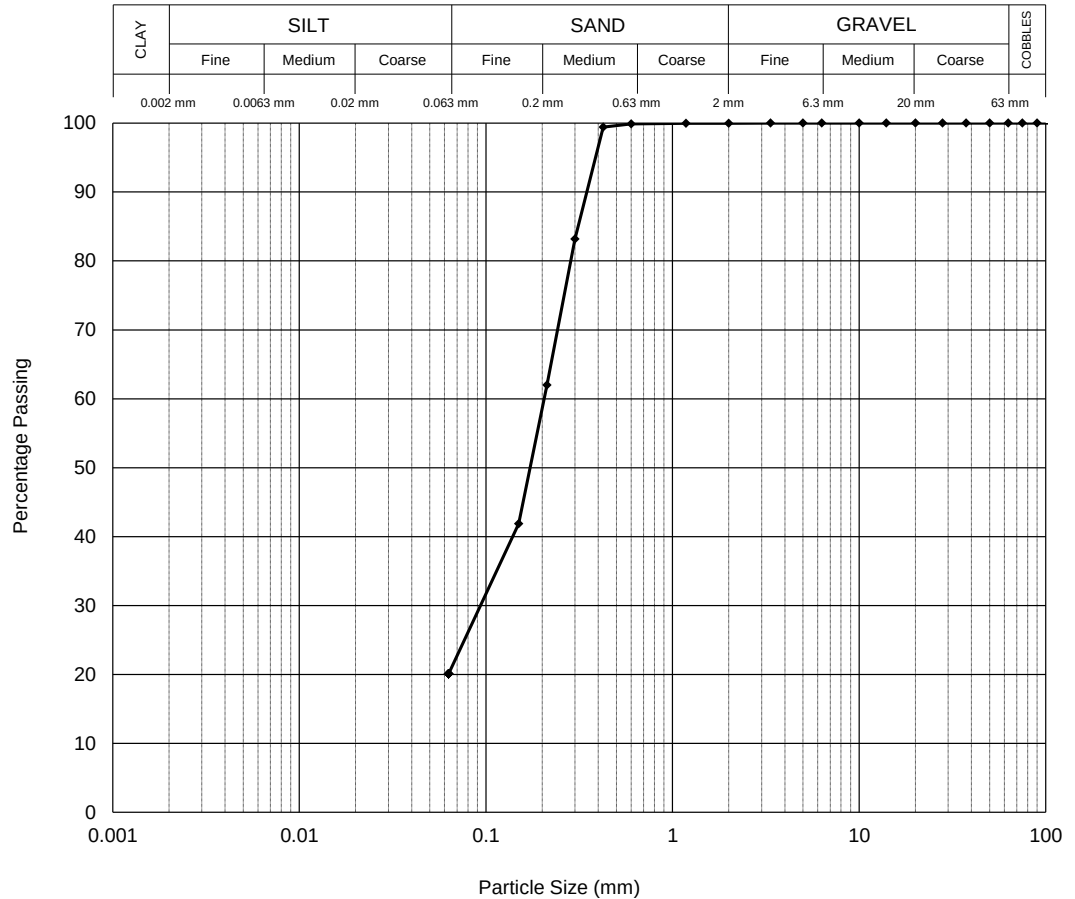
Location WS02
 Sample Ref D1
 Depth (m) 0.80
 Sample Type D

Description

Light grey silty clayey SAND.

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	100
63.0 mm	100
50.0 mm	100
37.5 mm	100
28.0 mm	100
20.0 mm	100
14.0 mm	100
10.0 mm	100
6.30 mm	100
5.00 mm	100
3.35 mm	100
2.00 mm	100
1.18 mm	100
600 µm	100
425 µm	99
300 µm	83
212 µm	62
150 µm	42
63 µm	20



Particle Proportions	
Cobbles	0.0
Gravel	0.0
Sand	79.9
Silt & Clay	20.1

Tested by AJ
 Checked and Approved by

S Burke

S Burke - Senior Technician
 08/09/2023

Project Number:

GEO / 38769

Project Name:

THE KINGS SCHOOL, FAIR OAKS
PO-23-060

