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Geological & Geotechnical Consultants

John Kyrle High School, Ross-on-Wye

Report on Ground Investigation (November 2013)

Prepared for Built Offsite Limited

Geological & Geotechnical Consultants

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Built Offsite Limited

John Kyrle High School, Ross-on-Wye

Report on Ground Investigation (November 2013)

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CONTENTS

		Page Number
1.0	INTRODUCTION	2
2.0	SITE OVERVIEW	3
2.1	Site Location	3
2.2	Geology of the Site	3
3.0	GROUND INVESTIGATION	4
4.0	LABORATORY TESTING	5
5.0	DISCUSSIONS ON GROUND CONDITIONS	6 - 8
5.1	Soil Conditions	6
5.2	Shallow Foundations	7
5.3	Infiltration Test	7
5.4	Chemical Considerations	8
6.0	CONCLUSIONS	9 - 10

References

Figures

Figure 1 Site Location Plan
Figure 2 Trial Pit Location Plan

Appendices

Appendix 1 Trial Pit Logs
Appendix 2 Infiltration Test Results
Appendix 3 Laboratory Results (Alcontrol)

1.0 INTRODUCTION

Key GeoSolutions Ltd (KGS) have been commissioned by Built Offsite Limited to undertake a ground investigation at John Kyrle High School, Ross-on-Wye in order to ascertain the ground conditions for foundation design purposes in relation to the proposed construction of an extension to the main school building. In addition, Waste Acceptance Criteria (WAC) testing of the ground encountered and soakaway infiltration rate testing has been carried out.

A Kubota KX057-4 excavator was used to sink 5 No. trial pits; 3 No. in the vicinity of the proposed footprint of the new building to check the ground conditions and provide samples for geotechnical and chemical testing, and 2 No. in the vicinity of the proposed soakaway.

An initial phase of ground investigation which involved sinking 4 No. trial pits was carried out by KGS in July 2012; the details of which can be found in report reference 12-242-R-001.

The proposed structure is a modular building, which is rectangular, measuring approximately 20.7m by 16.3m and KGS are informed that it will be three storey. The proposed location of the building is to the north of the exiting sports hall. At the time of writing, KGS had not been supplied with proposed loadings for this structure. The proposed location of the soakaway is on an area of ground to the north west of the artificial pitches.

The comments given in this report and any opinions expressed are based on the ground conditions encountered during the site work, the results of tests made in the field and in the laboratory and on information made available by Built Offsite. There may be, however, conditions pertaining to the site which have not been disclosed by the investigation and which therefore could not be taken into account in this report. In particular old foundations or underground services may be present that could affect the proposed development. The term 'topsoil' is used in this report to describe the surface, usually organic, layer including turf and shallow soils, weathered material with roots etc. and should not be taken to imply agricultural soil suitable for sale.

2.0 SITE OVERVIEW

2.1 Site Location

The site, which may be located by approximate National Grid Reference 360373mE 225308mN, is situated within the grounds of John Kyrle High School, off Three Crosses Road in Ross-on-Wye (Figure 1).

The new structure will be located on the northern side of the main school building, adjacent to the current sports hall and a recently build modular building; currently a grassed area. Access to the site is via the main car park at the front of the school (off Three Crosses Road).

2.2 Geology of the Site

The site is covered by BGS 1: 50,000 Geological Sheet No. 215 (Ross-on-Wye). This indicates the site to be underlain by the Brownstones Formation, which is part of the Lower Old Red Sandstone of Early Devonian age (c. 416-397 mya).

No superficial deposits are recorded.

3.0 GROUND INVESTIGATION

The most recent phase of site work was carried out on 25th November 2013 and in accordance with the guidelines laid down in BS EN 1997-2:2007 (1).

Five trial pits (TP1 to TP5) were dug in the vicinity of the proposed footprint of the proposed structure and soakaway to investigate the ground conditions. The trial pits were dug using a Kubota KX057-4 excavator provided by Construction 7 Ltd. The approximate locations of the trial pits are shown on Figure 2. The depths of the trial pits and descriptions of the soils encountered are given in the trial pit records (Appendix 1); disturbed samples were taken at the depths shown on the trial pit records.

KeyGS were made aware of the presence of an existing soakaway in the vicinity of the proposed building location; it is thought to be in an area where a surface depression is present (approximate area shown on Figure 2). This area was avoided during this phase of site work so as not to damage the soakaway.

The details of buried underground services for the site (as in July 2012) were obtained by the Client prior to the ground investigation commencing and additional, known, buried services were pointed out by the school staff; trial pit locations were scanned using a Cable Avoidance Tool prior to excavating.

4.0 LABORATORY TESTING

Asbestos Identification and Waste Acceptance Criteria (WAC) for inert landfill tests were carried out on representative samples of the made ground encountered; the results are given in Appendix 3.

5.0 DISCUSSIONS ON GROUND CONDITIONS

5.1 Soil Conditions

Five trial pits (numbered TP1 to TP5) were dug at the positions shown on Figure 2.

The following strata were encountered during the investigation:-

- Topsoil
- Possible made ground (Sand, gravel and cobbles)
- Sands and Gravels
- Cobbles
- Sandstone (Brownstone Formation)

Beneath the topsoil (0.05m thickness), trial pits TP1 and TP2 encountered dark red brown, very silty, slightly gravelly, fine to medium SAND which becomes increasingly gravelly with depth down to rockhead. Sandstone cobbles were encountered within the sand and gravel in the 0.2-0.7m above rockhead. Bedrock was encountered at 2.20 and 3.20mbgl (below ground level) respectfully, and found to be extremely weak, purple to grey/green, fine to medium grained SANDSTONE which becomes very weak and slightly gravelly with depth; this was thought to represent the Brownstone Formation. At c.1.80mbgl a tree stump was encountered in TP1.

Beneath the topsoil with rootlets (0.05m thickness), trial pits TP3, TP4 and TP5 encountered dark red brown, silty, slightly gravelly, fine to medium SAND (with rare brick cobbles in TP5) down to a depth of 0.50mbgl. Below which, to depths of 0.90, 1.05 and 1.20mbgl respectively, light red or brown, silty, sandy, gravelly, extremely weak to very weak sandstone COBBLES were encountered. Below this ground, red brown, silty to very silty, slightly gravelly, fine to medium SAND was encountered, which contains occasional cobbles and becomes increasingly gravelly with depth. Bedrock was encountered at 3.00, 2.70 and 2.10mbgl respectfully, and found to be extremely weak, pale red brown to grey/green, slightly gravelly, fine to medium, occasionally coarse grained SANDSTONE; this was thought to represent the Brownstone Formation.

The presence of a tree stump in TP1, suggests that the sands and gravels in the upper c.1.80m of TP1 are possibly Made Ground.

The variation in ground conditions, along with the previous July 2012 site investigation encountering large boulders in TP4, suggest that the sands, gravels and cobbles in the upper 0.90 to 1.20m of TP3, TP4 and TP5 are possibly Made Ground.

Made Ground is inherently variable, and the presence of further tree stumps, boulders or other potentially hazardous unknowns cannot be ruled out.

- TP1 was terminated at a depth of 3.30m bgl.
- TP2 was terminated at a depth of 2.80m bgl.
- TP3 was terminated at a depth of 3.00m bgl.
- TP4 was terminated at a depth of 2.70m bgl.
- TP5 was terminated at a depth of 2.10m bgl.

Groundwater was not encountered during the ground investigation.

5.2 Shallow Foundations

For the proposed type of structure it is considered that traditional shallow pad foundations will be suitable. For foundation design purposes it is recommended that an Allowable Bearing Pressure (ABP) of 140kN/m² should be used for the foundation designs. This ABP value is based on a dry dense sand; if ground conditions differ, and groundwater or soft/loose material is encountered, the design would need to be reviewed by a geotechnical engineer. (The ABP is the Maximum Bearing Capacity of the material divided by a suitable Factor of Safety (FoS), usually taken to be between 2.5 - 3.0 (depending on the quantity and quality of data available).)

The made ground is not considered to be a suitable load bearing material; therefore, the foundations should be founded within the underlying sand deposits at a minimum depth of 0.90m.

No loadings have been provided and the provision of a foundation design is beyond the scope of the current report.

The foundation design should consider the proximity of the cutting slope adjacent to the A40.

Prior to casting the foundations, a competent person should inspect the formation level and confirm the suitability or otherwise of the founding strata. Any potential soft areas or other anomalies (including remains of tree stumps) should be excavated further until ground with suitable strength is encountered; the excavation can be brought back up to the required formation level using adequately compacted clean granular material.

5.3 Infiltration Test

An infiltration test was undertaken in trial pit TP02, the pit was extended into the sandstone bedrock in order that testing could be carried out to establish the infiltration rate of the ground for soakaway design purposes.

The test pit measured 2.60m in length by 0.65m in width, and was cut vertical from 1.80mbgl down to 2.8mbgl. The results of the infiltration tests are included in Appendix 2; these results were used to calculate the infiltration rate as detailed in Building Research Establishment (BRE) Digest 365: Soakaway design.

The infiltration rate calculated from the test results was $5.68x10^{-6}$ m/s. This infiltration rate should be used for soakaway design purposes.

5.4 Chemical Considerations

5.4.1 Results of Chemical Analyses

The results of the chemical analyses undertaken on the samples from John Kyrle High School are presented in Appendix 3. The results show that the levels of chemical contamination found within the samples tested were generally below the Waste Acceptance Criteria limits for Inert Waste Landfill.

The levels of Antimony recorded in one sample, taken between 0.1 and 0.5mbgl in TP4, was 0.0952mg/Kg, which is above that of the limit acceptable for Inert Waste Landfill (0.06mg/Kg) and within that which is acceptable for Stable Non-reactive Hazardous Waste in Non-Hazardous Landfill (0.7mg/Kg).

The elevated levels of Antimony found within the ground at John Kyrle High School will potentially result in increased costs, as it will be necessary to take the material off site for disposal to a Special Waste Management Site.

Ultimately, it is envisaged that the ground will largely be covered over either by the structure or landscaped areas. The long-term risk exposure to end-users will therefore be low.

6.0 CONCLUSIONS

A ground investigation has been carried out to determine the ground conditions for a new permanent structure at John Kyrle High School, Ross-on-Wye.

Five trial pits (TP1 to TP5) were dug using a Kubota KX057-4 excavator to allow the ground conditions to be described and tested as required. Beneath 0.05m of topsoil, trial pits TP1 and TP2 generally encountered silty, gravelly, fine to medium SAND which becomes increasingly gravelly with depth, with sandstone cobbles included above rockhead. Bedrock was encountered at 2.20 and 3.20mbgl respectfully, and found to be extremely weak SANDSTONE which becomes very weak and slightly gravelly with depth; this was thought to represent the Brownstone Formation. At c.1.80mbgl a tree stump was encountered in TP1.

Beneath the topsoil (0.05m thickness), trial pits TP3, TP4 and TP5 encountered dark red brown, silty, gravelly, fine to medium SAND (with rare brick cobbles in TP5) down to a depth of 0.50mbgl. Below which, to depths of 0.90, 1.05 and 1.20mbgl respectively, light red or brown, silty, sandy, gravelly, sandstone COBBLES were encountered. Below this ground, red brown, silty to very silty, gravelly, SAND was encountered, which contains occasional cobbles and becomes increasingly gravelly with depth. Sandstone bedrock was encountered at 3.00, 2.70 and 2.10mbgl respectfully.

The presence of a tree stump in TP1, suggests that the sands and gravels in the upper c.1.80m of TP1 are possibly Made Ground. The variation in ground conditions, along with the previous July 2012 site investigation encountering large boulders in TP4, suggest that the sands, gravels and cobbles in the upper 0.90 to 1.20m of TP3, TP4 and TP5 are possibly Made Ground. Made Ground is inherently variable, and the presence of further tree stumps, boulders or other potentially hazardous unknowns cannot be ruled out.

Groundwater was not encountered in any trial pit.

It should also be ensured that the construction workers undergo appropriate health and safety training, wear the required PPE and have access to suitable hygiene facilities.

The made ground is not considered to be a suitable load bearing material; therefore, the foundations should be founded within the underlying sand deposits at a minimum depth of 0.90m.

For the proposed type of structure it is considered that traditional shallow pad foundations will be suitable. For foundation design purposes it is recommended that an Allowable Bearing Pressure (ABP) of 140kN/m^2 should be used for the foundation designs. This ABP value is based on a dry dense sand; if ground conditions differ, and groundwater or soft/loose material is encountered,

the design would need to be reviewed by a geotechnical engineer. (The ABP is the Maximum Bearing Capacity of the material divided by a suitable Factor of Safety (FoS), usually taken to be between 2.5 - 3.0 (depending on the quantity and quality of data available).)

The foundation design should consider the proximity of the cutting slope adjacent to the A40.

Prior to casting the foundations, a competent person should inspect the formation level and confirm the suitability or otherwise of the founding strata. Any potential soft areas or other anomalies (including remains of tree stumps) should be excavated further until ground with suitable strength is encountered.

An infiltration test was undertaken in trial pit TP02; these returned an infiltration rate of 5.68×10^{-6} m/s; this infiltration rate should be used for soakaway design purposes.

The soil samples were sent to a UKAS approved laboratory for chemical analysis. The analytical suites chosen comprised Asbestos Identification, Waste Acceptance Criteria (WAC) for inert landfill and pH. The results show that the levels of chemical contamination found within the samples tested were generally below the Waste Acceptance Criteria limits for Inert Waste Landfill. However, levels of Antimony above that of the limit acceptable for Inert Waste Landfill and within that which is acceptable for Stable Non-reactive Hazardous Waste in Non-Hazardous Landfill were detected.

The elevated levels of Antimony found within the ground at John Kyrle High School will potentially result in increased costs, as it will be necessary to take the material off site for disposal to a Special Waste Management Site.

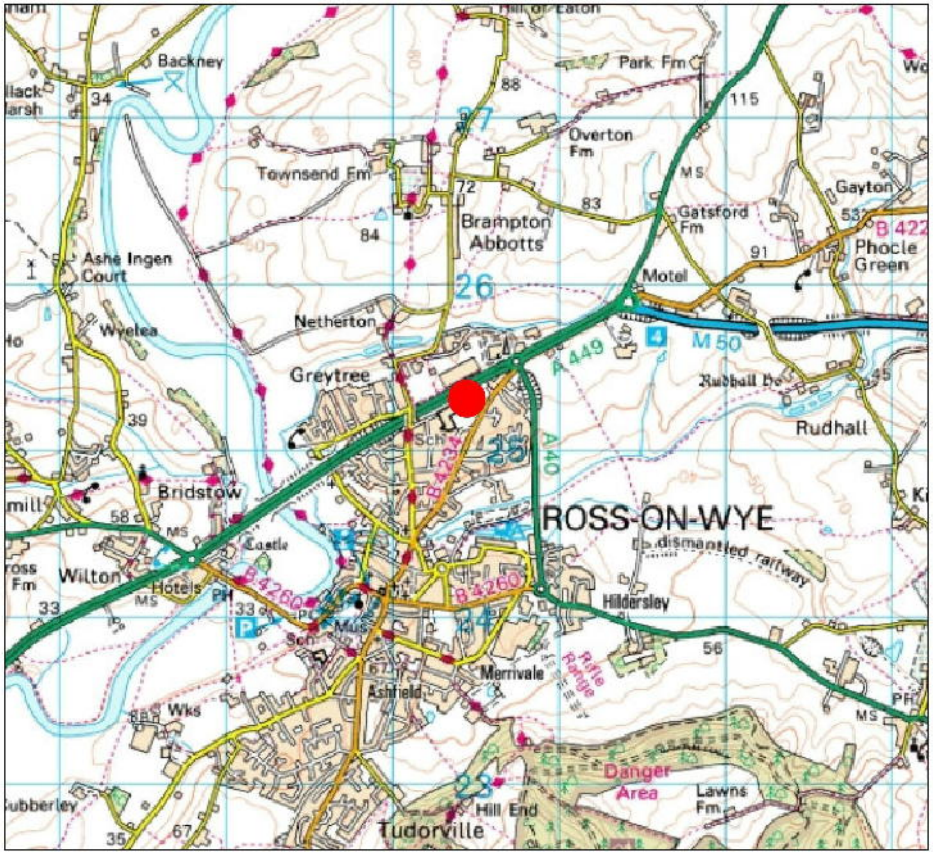
The results of the chemical analyses are presented in Appendix 3; these results should be made available to interested parties (i.e. waste management operators) if it is necessary to take the material off site for disposal.

REFERENCES

References:

1. BS5930: Code of Practice for Site Investigations, British Standards Institution, 1999.
2. Soakaway design: Building Research Establishment (BRE) Digest 365, 1991.

FIGURES



LBS Model used to create plot: **MODEL DETAIL**

Rev	Revision Detail	Drawn	Date

CLIENT:

BuiltOffSite

PROJECT: John Kyrle High School

TITLE: Site Location Plan

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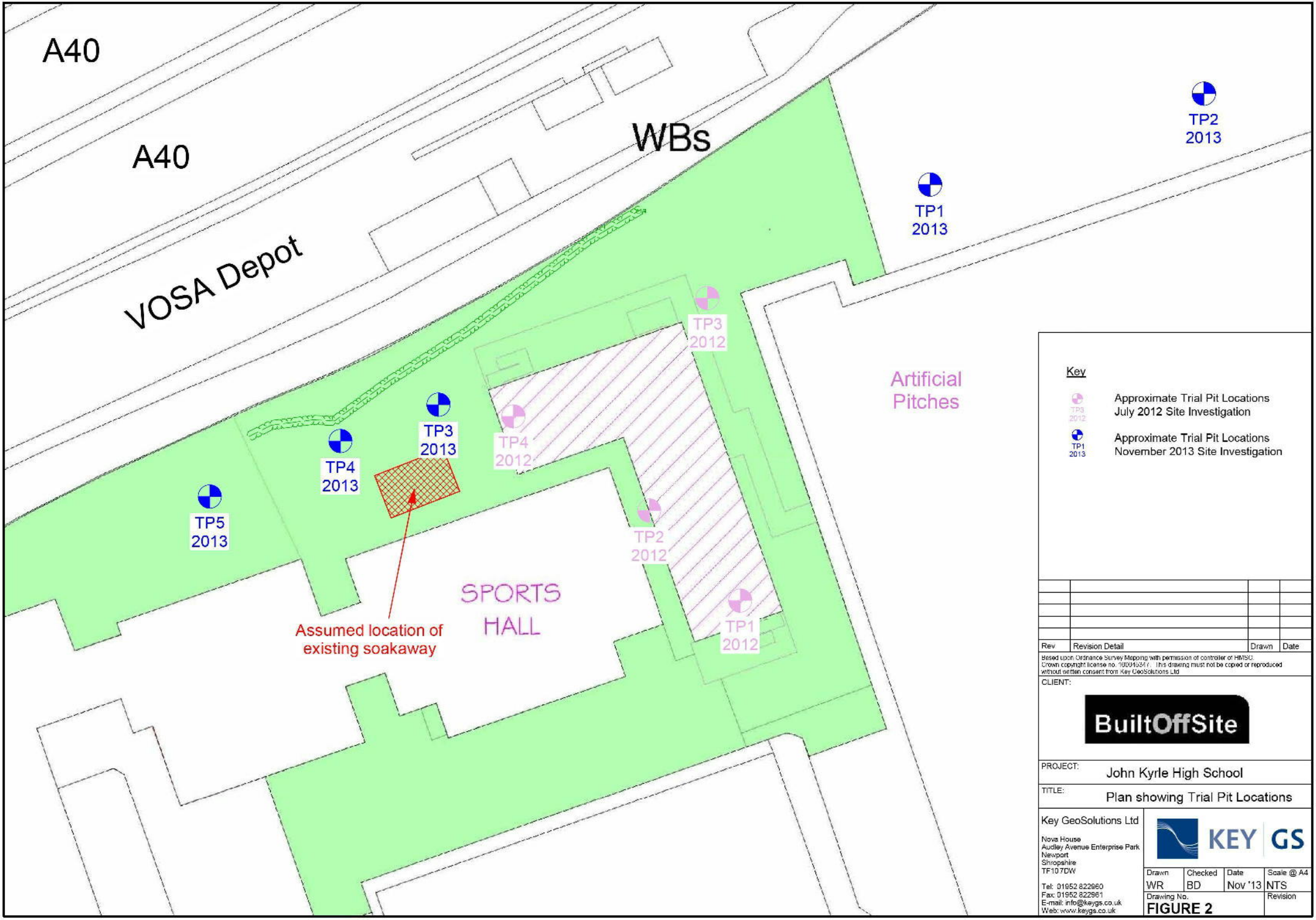
KEY GS

Drawn	Checked	Date	Scale @ A3
WR	BD	Nov '13	NTS

Drawing No.
FIGURE 1
Revision


A40
A40
VOSA Depot
WBs
TP2
2013
TP1
2013
TP3
2012
Artificial
Pitches
TP3
2013
TP4
2012
TP4
2013
TP5
2013
TP2
2012
TP1
2012
SPORTS
HALL
Assumed location of
existing soakaway
Key
Approximate Trial Pit Locations
July 2012 Site Investigation
Approximate Trial Pit Locations
November 2013 Site Investigation
Rev
Revision Detail
Drawn
Date
Based upon Ordnance Survey Mapping with permission of controller of HMSO.
Crown copyright license no. 100019241. This drawing must not be copied or reproduced
without written consent from Key GeoSolutions Ltd
CLIENT:
BuiltOffSite
PROJECT:
John Kyrle High School
TITLE:
Plan showing Trial Pit Locations
Key GeoSolutions Ltd
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KEY GS
Drawn
WR
Checked
BD
Date
Nov '13
Scale @ A4
NTS
Drawing No.
FIGURE 2
Revision

APPENDICES

APPENDIX 1

Trial Pit Logs

Key GeoSolutions Ltd
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TRIAL PIT NUMBER TP1

CLIENT Built Offsite Ltd
PROJECT NAME John Kyrle High School
PROJECT NUMBER 13-312
PROJECT LOCATION Ross-on-Wye
DATE STARTED 25/11/13 **COMPLETED** 25/11/13
CO-ORDINATES 360424 mE, 225328 mN
EXCAVATION CONTRACTOR Construction 7
GROUND ELEVATION _____ **TRIAL PIT SIZE** _____
EXCAVATION METHOD Excavator
LOGGED BY Will Roberts **CHECKED BY** BD

DEPTH (m)	SAMPLE TYPE NUMBER	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION & REMARKS
				0.05 Topsoil with rootlets
				Dark red brown very silty slightly gravelly fine to medium SAND. Gravel is fine to medium sub-rounded quartz and extremely weak sandstone
0.5				
1.0				
1.5				...becoming gravelly
				...tree stump encountered
2.0				...gravel becoming fine to coarse sub-rounded to sub-angular
2.5				...with extremely weak sandstone cobbles
3.0				
				3.20 Extremely weak green grey SANDSTONE
				3.30 Bottom of trial pit at 3.30 metres.

NOTES Hole abandoned due to pit walls collapsing.

SAMPLE TYPE KEY U = Undisturbed D = Disturbed B = Bulk J = Jar VA = Shear Vane SPT = Standard Penetration Test

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TRIAL PIT NUMBER TP2

CLIENT Built Offsite Ltd
PROJECT NAME John Kyrle High School
PROJECT NUMBER 13-312
PROJECT LOCATION Ross-on-Wye
DATE STARTED 25/11/13 **COMPLETED** 25/11/13
CO-ORDINATES 360454 mE, 225338 mN
EXCAVATION CONTRACTOR Construction 7
GROUND ELEVATION _____ **TRIAL PIT SIZE** _____
EXCAVATION METHOD Excavator
LOGGED BY Will Roberts **CHECKED BY** BD

DEPTH (m)	SAMPLE TYPE NUMBER	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION & REMARKS
				0.05 Topsoil with rootlets
				Dark red brown very silty slightly gravelly fine to medium SAND. Gravel is fine to medium sub-rounded quartz and sandstone
0.5				
1.0				1.00
				Dark red brown very silty gravelly fine to medium SAND. Gravel is fine to coarse sub-rounded quartz and sandstone
1.5				
				...with occasional bands of red/grey fine to medium SAND
2.0				...with occasional cobbles
				2.20
				Extremely weak purple to green grey fine to medium grained SANDSTONE
				...becoming extremely weak to very weak
2.5				...becoming very weak slightly gravelly. Gravel is fine to coarse rounded to sub-angular quartz
				2.80

Bottom of trial pit at 2.80 metres.

NOTES Soakaway Infiltration Test carried out.

SAMPLE TYPE KEY U = Undisturbed D = Disturbed B = Bulk J = Jar VA = Shear Vane SPT = Standard Penetration Test

Key GeoSolutions Ltd
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TRIAL PIT NUMBER TP3

CLIENT Built Offsite Ltd
PROJECT NAME John Kyrle High School
PROJECT NUMBER 13-312
PROJECT LOCATION Ross-on-Wye
DATE STARTED 25/11/13 **COMPLETED** 25/11/13
CO-ORDINATES 360370 mE, 225304 mN
EXCAVATION CONTRACTOR Construction 7
GROUND ELEVATION _____ **TRIAL PIT SIZE** _____
EXCAVATION METHOD Excavator
LOGGED BY Will Roberts **CHECKED BY** BD

DEPTH (m)	SAMPLE TYPE NUMBER	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION & REMARKS
				0.05 Topsoil with roots and rootlets
	D	WAC		Dark red brown slightly silty to silty slightly gravelly fine to medium SAND. Gravel is fine to medium sub-rounded quartz and sandstone (possible MADE GROUND?)
0.5				0.50 Light red silty very sandy very gravelly extremely weak to very weak sandstone COBBLES (possible MADE GROUND?)
1.0				1.20 Red brown very silty slightly gravelly fine to medium SAND with occasional sandstone cobbles. Gravel is fine to coarse sub-rounded sandstone and quartz
1.5				1.80 Red brown very silty gravelly fine to medium SAND with occasional cobbles. Gravel is fine to coarse sub-rounded to tabular sandstone
2.0				...thick lamination of light grey slightly silty gravelly fine to medium SAND
2.5				
3.0				3.00 ...at 3.00m assumed rockhead

Bottom of trial pit at 3.00 metres.

NOTES

SAMPLE TYPE KEY U = Undisturbed D = Disturbed B = Bulk J = Jar VA = Shear Vane SPT = Standard Penetration Test

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TRIAL PIT NUMBER TP4

CLIENT Built Offsite Ltd
PROJECT NAME John Kyrle High School
PROJECT NUMBER 13-312
PROJECT LOCATION Ross-on-Wye
DATE STARTED 25/11/13 **COMPLETED** 25/11/13
CO-ORDINATES 360359 mE, 225300 mN
EXCAVATION CONTRACTOR Construction 7
GROUND ELEVATION _____ **TRIAL PIT SIZE** _____
EXCAVATION METHOD Excavator
LOGGED BY Will Roberts **CHECKED BY** BD

DEPTH (m)	SAMPLE TYPE NUMBER	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION & REMARKS
				0.05 Topsoil with roots and rootlets
	D	WAC		Dark red brown slightly silty slightly gravelly fine to medium SAND. Gravel is fine to medium sub-rounded to sub-angular quartz and sandstone (possible MADE GROUND?)
0.5				0.50
				Light red silty slightly clayey very sandy very gravelly extremely weak to very weak sub-rounded to sub-angular sandstone COBBLES with occasional boulders (possible MADE GROUND?)
1.0				1.05
				Dark red brown silty slightly gravelly fine to medium SAND with occasional cobbles. Gravel is fine to coarse sub-rounded to sub-angular sandstone
1.5				
2.0				
				...becoming gravelly
2.5				
				...at 2.70m assumed rockhead
				2.70
				Bottom of trial pit at 2.70 metres.

NOTES

SAMPLE TYPE KEY U = Undisturbed D = Disturbed B = Bulk J = Jar VA = Shear Vane SPT = Standard Penetration Test

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TRIAL PIT NUMBER TP5

CLIENT Built Offsite Ltd
PROJECT NAME John Kyrle High School
PROJECT NUMBER 13-312
PROJECT LOCATION Ross-on-Wye
DATE STARTED 25/11/13 **COMPLETED** 25/11/13
CO-ORDINATES 360345 mE, 225294 mN
EXCAVATION CONTRACTOR Construction 7
GROUND ELEVATION _____ **TRIAL PIT SIZE** _____
EXCAVATION METHOD Excavator
LOGGED BY Will Roberts **CHECKED BY** BD

DEPTH (m)	SAMPLE TYPE NUMBER	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION & REMARKS
				0.05 Topsoil with roots and rootlets
	D	WAC		Dark brown very silty slightly gravelly fine to medium SAND with rare brick cobbles. Gravel is fine to medium sub-rounded to sub-angular of various lithologies including sandstone (possible MADE GROUND?)
0.5				0.50
				Brown very sandy silty gravelly COBBLES with occasional boulders. Gravel and cobbles are fine to coarse sub-rounded to sub-angular extremely weak to very weak dark purple / green grey fine to coarse sandstone (possible MADE GROUND?)
				0.90
1.0				Red brown very silty slightly gravelly fine to medium SAND. Gravel is fine to medium sub-rounded to sub-angular sandstone
1.5				...becoming very gravelly with occasional cobbles
				1.70
				Extremely weak to very weak pale red brown / green grey fine to medium occasionally coarse SANDSTONE with occasional fine to medium quartz and mudstone gravel
2.0				2.10

Bottom of trial pit at 2.10 metres.

NOTES

SAMPLE TYPE KEY U = Undisturbed D = Disturbed B = Bulk J = Jar VA = Shear Vane SPT = Standard Penetration Test

APPENDIX 2

Infiltration Test Results

SOAKAWAY TRIAL PIT PRO-FORMA

Site/Project: John Kyrle High School

Dimensions/Volume of Pit:

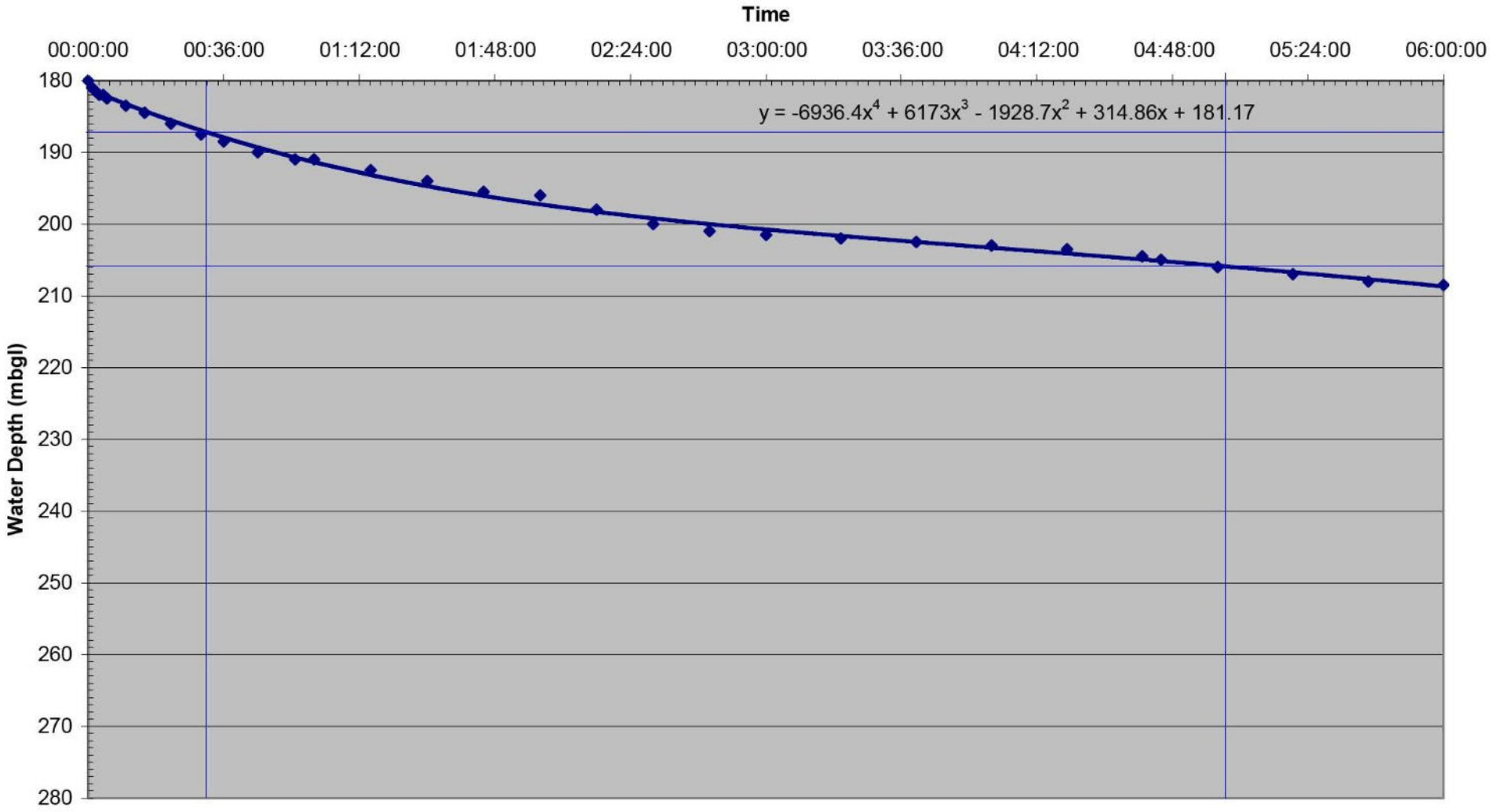
Pit No:	TP2	**Length:**	2.6 m
Date dug:	25/11/2013	**Width:**	0.65 m
Date filled with water/monitored:	25/11/2013	**Depth:**	1 m
		Volume:	1.69 m^3

Pit Location/Description of strata encountered:
0.0-0.05m Topsoil, 0.05-2.2m Dark red brown very silty gravelly fine to medium Sand, 2.2-2.8m Extremely weak to very weak purple/green grey fine to medium grained slightly gravelly Sandstone becoming fine to coarse grained with depth.

NOTES:
Pit filled from 2.80mbgl to 1.80mbgl

Time	Time elapsed from previous reading (mins)	Depth from GL to WL (cm)	WL difference from previous reading (cm)
00:00:00	00:00:00	180	0
00:01:00	00:01:00	181	1
00:02:00	00:01:00	181.5	0.5
00:03:00	00:01:00	182	0.5
00:04:00	00:01:00	182	0
00:05:00	00:01:00	182.5	0.5
00:10:00	00:05:00	183.5	1
00:15:00	00:05:00	184.5	1
00:22:00	00:07:00	186	1.5
00:30:00	00:08:00	187.5	1.5
00:36:00	00:06:00	188.5	1
00:45:00	00:09:00	190	1.5
00:55:00	00:10:00	191	1
01:00:00	00:05:00	191	0
01:15:00	00:15:00	192.5	1.5
01:30:00	00:15:00	194	1.5
01:45:00	00:15:00	195.5	1.5
02:00:00	00:15:00	196	0.5
02:15:00	00:15:00	198	2
02:30:00	00:15:00	200	2
02:45:00	00:15:00	201	1
03:00:00	00:15:00	201.5	0.5
03:20:00	00:20:00	202	0.5
03:40:00	00:20:00	202.5	0.5
04:00:00	00:20:00	203	0.5
04:20:00	00:20:00	203.5	0.5
04:40:00	00:20:00	204.5	1
04:45:00	00:05:00	205	0.5
05:00:00	00:15:00	206	1
05:20:00	00:20:00	207	1
05:40:00	00:20:00	208	1
06:00:00	00:20:00	208.5	0.5

John Kyrle High School - Soakaway Pit Test



Calculation of Soil Infiltration Rate - John Kyrle High School

Width	W =	***0.65***	m	
Length	L =	***2.6***	m	
Total depth (mbgl)	Dt =	2.085	m	*Actual Depth Dug = 2.80m bgl
Water depth (mbgl)	Dw =	1.8	m	
Rock depth (mbgl)	Dc =	2.2	m	
Base area	A_b =	1.69	m^2	
Perimeter	P =	6.5	m	

V p75 - 25 =	0.240825				
a p50 =	2.61625	2.61625	min	sec	
t p75 - 25 =	16200	04:30:00	4.5	270	16200

$$f = \frac{V}{a \times t} = \textbf{5.68208E-06 m/s}$$

0.020455487 m/hr

APPENDIX 3

Results of WAC Testing

(Undertaken by Alcontrol Laboratories)

ALcontrol Laboratories

Unit 7-8 Hawarden Business Park
Manor Road (off Manor Lane)
Hawarden
Deeside
CH5 3US
Tel: (01244) 528700
Fax: (01244) 528701
email: mkt@alcontrol.com
Website: www.alcontrol.com

Key Geosolutions Limited
Nova House
Audley Avenue
Newport
Shropshire
TF10 7DW

Attention: Will Roberts

CERTIFICATE OF ANALYSIS

Date:	09 December 2013
Customer:	H_KEYGEO_NPT
Sample Delivery Group (SDG):	131129-113
Your Reference:	13-312
Location:	John Kyrle School
Report No:	253168

We received 3 samples on Friday November 29, 2013 and 3 of these samples were scheduled for analysis which was completed on Monday December 09, 2013. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data sections alone.

All chemical testing (unless subcontracted) is performed at ALcontrol Hawarden Laboratories.

Approved By:

[redacted]

Sonia McWhan

Operations Manager

CERTIFICATE OF ANALYSIS

SDG:	131129-113	**Location:**	John Kyrle School	**Order Number:**	
Job:	H_KEYGEO_NPT-52	**Customer:**	Key Geosolutions Limited	**Report Number:**	253168
Client Reference:	13-312	**Attention:**	Will Roberts	**Superseded Report:**	

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
8503515	TP3		0.00 - 0.50	25/11/2013
8503514	TP4		0.10 - 0.50	25/11/2013
8503516	TP5		0.00 - 0.50	25/11/2013

Only received samples which have had analysis scheduled will be shown on the following pages.

CERTIFICATE OF ANALYSIS

SDG:	131129-113	**Location:**	John Kyrle School	**Order Number:**	
Job:	H_KEYGEO_NPT-52	**Customer:**	Key Geosolutions Limited	**Report Number:**	253168
Client Reference:	13-312	**Attention:**	Will Roberts	**Superseded Report:**	

SOLID

Results Legend

X Test

N No Determination Possible

			Lab Sample No(s)	8503515	8503514	8503516
			Customer Sample Reference	TP3	TP4	TP5
			AGS Reference			
			Depth (m)	0.00 - 0.50	0.10 - 0.50	0.00 - 0.50
			Container	250g Amber Jar (AL) / 1kg TUB	60g VOC (ALE215) / 1kg TUB	250g Amber Jar (AL) / 1kg TUB	60g VOC (ALE215) / 250g Amber Jar (AL)
ANC at pH4 and ANC at pH 6	All	NDPs: 0 Tests: 2		X		X
Anions by Kone (w)	All	NDPs: 0 Tests: 2			X	X
Asbestos ID in Solid Samples	All	NDPs: 0 Tests: 2		X		X
CEN 2:1 Readings	All	NDPs: 0 Tests: 2			X	X
CEN 8:1 Readings	All	NDPs: 0 Tests: 2			X	X
Dissolved Metals by ICP-MS	All	NDPs: 0 Tests: 2			X	X
Dissolved Organic/Inorganic Carbon	All	NDPs: 0 Tests: 2			X	X
Fluoride	All	NDPs: 0 Tests: 2			X	X
GRO by GC-FID (S)	All	NDPs: 0 Tests: 2			X		X
Loss on Ignition in soils	All	NDPs: 0 Tests: 2		X		X
Mercury Dissolved	All	NDPs: 0 Tests: 2			X	X
Mineral Oil	All	NDPs: 0 Tests: 2		X		X
PAH Value of soil	All	NDPs: 0 Tests: 2		X		X
PCBs by GCMS	All	NDPs: 0 Tests: 2		X		X
pH	All	NDPs: 0 Tests: 2		X		X

CERTIFICATE OF ANALYSIS

SDG:	131129-113	**Location:**	John Kyrle School	**Order Number:**	
Job:	H_KEYGEO_NPT-52	**Customer:**	Key Geosolutions Limited	**Report Number:**	253168
Client Reference:	13-312	**Attention:**	Will Roberts	**Superseded Report:**	

SOLID

Results Legend

X Test

N No Determination Possible

			Lab Sample No(s)	Customer Sample Reference	AGS Reference	Depth (m)	Container
			8503515	TP3		0.00 - 0.50	1kg TUB
			8503515	TP3		0.00 - 0.50	250g Amber Jar (AL
			8503514	TP4		0.10 - 0.50	60g VOC (ALE215)
			8503514	TP4		0.10 - 0.50	1kg TUB
			8503516	TP5		0.00 - 0.50	250g Amber Jar (AL
			8503516	TP5		0.00 - 0.50	60g VOC (ALE215)
Phenols by HPLC (W)	All	NDPs: 0 Tests: 2					
				X			
				X			
Sample description	All	NDPs: 0 Tests: 3					
			X				
					X		
							X
Total Dissolved Solids	All	NDPs: 0 Tests: 2					
				X			
					X		
Total Organic Carbon	All	NDPs: 0 Tests: 2					
			X				
							X

CERTIFICATE OF ANALYSIS

SDG:	131129-113	**Location:**	John Kyrle School	**Order Number:**	
Job:	H_KEYGEO_NPT-52	**Customer:**	Key Geosolutions Limited	**Report Number:**	253168
Client Reference:	13-312	**Attention:**	Will Roberts	**Superseded Report:**	

Sample Descriptions

Grain Sizes

very fine	<0.063mm	fine	0.063mm - 0.1mm	medium	0.1mm - 2mm	coarse	2mm - 10mm	very coarse	>10mm

Lab Sample No(s)	Customer Sample Ref.	Depth (m)	Colour	Description	Grain size	Inclusions	Inclusions 2
8503515	TP3	0.00 - 0.50	Dark Brown	Clay Loam	<0.063 mm	Stones	N/A
8503514	TP4	0.10 - 0.50	Dark Brown	Sandy Silt Loam	0.1 - 2 mm	Stones	None
8503516	TP5	0.00 - 0.50	Dark Brown	Clay Loam	<0.063 mm	Stones	N/A

These descriptions are only intended to act as a cross check if sample identities are questioned, and to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions.

We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally ocurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample.

Other coarse granular materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

CERTIFICATE OF ANALYSIS

SDG:	131129-113	**Location:**	John Kyrle School	**Order Number:**	
Job:	H_KEYGEO_NPT-52	**Customer:**	Key Geosolutions Limited	**Report Number:**	253168
Client Reference:	13-312	**Attention:**	Will Roberts	**Superseded Report:**	

Results Legend

#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
^	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4&+§@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample R	TP3	TP4	TP5			
			Depth (m)	0.00 - 0.50	0.10 - 0.50	0.00 - 0.50			
			Sample Type	Soil/Solid	Soil/Solid	Soil/Solid			
			Date Sampled	25/11/2013	25/11/2013	25/11/2013			
			Sample Time	-	-	-			
			Date Received	29/11/2013	29/11/2013	29/11/2013			
			SDG Ref	131129-113	131129-113	131129-113			
			Lab Sample No.(s)	8503515	8503514	8503516			
			AGS Reference						
Moisture Content Ratio	%	PM024		11	13	14			
Loss on ignition	<0.7 %	TM018		3.38 M		4.38 M			
Mineral oil >C10-C40	<1 mg/kg	TM061		<1 #		<1 #			
Organic Carbon, Total	<0.2 %	TM132		0.88 #		1.27 #			
pH	1 pH Units	TM133		8.15 M		8.29 M			
PCB congener 28	<3 µg/kg	TM168		<3 M		<3 M			
PCB congener 52	<3 µg/kg	TM168		<3 M		<3 M			
PCB congener 101	<3 µg/kg	TM168		<3 M		<3 M			
PCB congener 118	<3 µg/kg	TM168		<3 M		<3 M			
PCB congener 138	<3 µg/kg	TM168		<3 M		<3 M			
PCB congener 153	<3 µg/kg	TM168		<3 M		<3 M			
PCB congener 180	<3 µg/kg	TM168		<3 M		<3 M			
Sum of detected PCB 7 Congeners	<21 µg/kg	TM168		<21		<21			
ANC @ pH 4	<0.03 mol/kg	TM182		0.0684		0.0842			
ANC @ pH 6	<0.03 mol/kg	TM182		<0.03		0.0308			
Polyaromatic hydrocarbons, Total 17	<10 mg/kg	TM213		<10		<10			

CERTIFICATE OF ANALYSIS

SDG:	131129-113	**Location:**	John Kyrle School	**Order Number:**	
Job:	H_KEYGEO_NPT-52	**Customer:**	Key Geosolutions Limited	**Report Number:**	253168
Client Reference:	13-312	**Attention:**	Will Roberts	**Superseded Report:**	

GRO by GC-FID (S)

Results Legend	
#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4&+§@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample R	TP3	TP5
			Depth (m)	0.00 - 0.50	0.00 - 0.50
			Sample Type	Soil/Solid	Soil/Solid
			Date Sampled	25/11/2013	25/11/2013
			Sample Time	-	-
			Date Received	29/11/2013	29/11/2013
			SDG Ref	131129-113	131129-113
			Lab Sample No.(s)	8503515	8503516
			AGS Reference		
GRO Surrogate % recovery**	%	TM089		84	116
Methyl tertiary butyl ether (MTBE)	<5 µg/kg	TM089		<5 M	<5 M
Benzene	<10 µg/kg	TM089		<10 M	<10 M
Toluene	<2 µg/kg	TM089		<2 M	<2 M
Ethylbenzene	<3 µg/kg	TM089		<3 M	<3 M
m,p-Xylene	<6 µg/kg	TM089		<6 M	<6 M
o-Xylene	<3 µg/kg	TM089		<3 M	<3 M
sum of detected mpo xylene by GC	<9 µg/kg	TM089		<9	<9
sum of detected BTEX by GC	<24 µg/kg	TM089		<24	<24

CERTIFICATE OF ANALYSIS

SDG:	131129-113	**Location:**	John Kyrle School	**Order Number:**	
Job:	H_KEYGEO_NPT-52	**Customer:**	Key Geosolutions Limited	**Report Number:**	253168
Client Reference:	13-312	**Attention:**	Will Roberts	**Superseded Report:**	

Asbestos Identification - Solid Samples

		Date of Analysis	Analysed By	Comments	Amosite (Brown) Asbestos	Chrysotile (White) Asbestos	Crocidolite (Blue) Asbestos	Fibrous Actinolite	Fibrous Anthophyllite	Fibrous Tremolite	Non-Asbestos Fibre
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Receieved SDG Original Sample Method Number	TP3 0.00 - 0.50 SOLID 25/11/2013 00:00:00 131129-113 8503515 TM048	05/12/13	Lauren Sargeant	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Receieved SDG Original Sample Method Number	TP5 0.00 - 0.50 SOLID 25/11/2013 00:00:00 131129-113 8503516 TM048	05/12/13	Lauren Sargeant	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected

CERTIFICATE OF ANALYSIS

SDG:	131129-113	**Location:**	John Kyrle School	**Order Number:**	
Job:	H_KEYGEO_NPT-52	**Customer:**	Key Geosolutions Limited	**Report Number:**	253168
Client Reference:	13-312	**Attention:**	Will Roberts	**Superseded Report:**	

CEN 10:1 CUMULATIVE TWO STAGE BATCH TEST

WAC ANALYTICAL RESULTS

REF : BS EN 12457/3

Client Reference		**Site Location**	John Kyrle School
Mass Sample taken (kg)	0.203	**Natural Moisture Content (%)**	16.2
Mass of dry sample (kg)	0.175	**Dry Matter Content (%)**	86
Particle Size <4mm	>95%		

Case	
SDG	131129-113
Lab Sample Number(s)	8503514
Sampled Date	25-Nov-2013
Customer Sample Ref.	TP4
Depth (m)	0.10 - 0.50

Solid Waste Analysis		**Landfill Waste Acceptance Criteria Limits**		
		Inert Waste Landfill	Stable Non-reactive Hazardous Waste in Non-Hazardous Landfill	Hazardous Waste Landfill
Total Organic Carbon (%)	-	-	-	-
Loss on Ignition (%)	-	-	-	-
Sum of BTEX (mg/kg)	-	-	-	-
Sum of 7 PCBs (mg/kg)	-	-	-	-
Mineral Oil (mg/kg)	-	-	-	-
PAH Sum of 17 (mg/kg)	-	-	-	-
pH (pH Units)	-	-	-	-
ANC to pH 6 (mol/kg)	-	-	-	-
ANC to pH 4 (mol/kg)	-	-	-	-

Eluate Analysis	C_2 Concⁿ in 2:1 eluate	C_8 Concⁿ in 8:1 eluate	A_2 2:1 concⁿ leached	$A_{2\text{-}10}$ Cumulative concⁿ leached	Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg		
	mg/l		mg/kg				
Arsenic	0.00191	0.0012	0.00382	0.013	0.5	2	25
Barium	0.0101	0.00385	0.0202	0.0469	20	100	300
Cadmium	<0.0001	<0.0001	<0.0002	<0.001	0.04	1	5
Chromium	0.000963	0.000499	0.00193	0.00561	0.5	10	70
Copper	0.00571	0.00119	0.0114	0.018	2	50	100
Mercury Dissolved (CVAF)	0.0000102	<0.00001	0.0000204	<0.0001	0.01	0.2	2
Molybdenum	0.00266	0.00414	0.00533	0.0394	0.5	10	30
Nickel	0.000697	0.000175	0.0014	0.00245	0.4	10	40
Lead	0.00108	0.000168	0.00215	0.00291	0.5	10	50
Antimony	0.00449	0.0103	0.00898	0.0952	0.06	0.7	5
Selenium	0.000652	0.000737	0.00131	0.00726	0.1	0.5	7
Zinc	0.00133	<0.00041	0.00267	<0.0041	4	50	200
Chloride	<2	<2	<4	<20	800	15000	25000
Fluoride	0.669	<0.5	1.34	<5	10	150	500
Sulphate (soluble)	<2	<2	<4	<20	1000	20000	50000
Total Dissolved Solids	120	46.8	240	566	4000	60000	100000
Total Monohydric Phenols (W)	<0.016	<0.016	<0.032	<0.16	1	-	-
Dissolved Organic Carbon	7.77	<3	15.6	<30	500	800	1000

Leach Test Information	**2:1**	**8:1**
Date Prepared	03-Dec-2013	04-Dec-2013
pH (pH Units)	8.099	7.821
Conductivity (µS/cm)	155.20	55.30
Temperature (ºC)	19.50	19.40
Volume Leachant (Litres)	0.322	1.400
Volume of Eluate VE1 (Litres)	0.235	

Solid Results are expressed on a dry weight basis, after correction for moisture content where applicable
Stated limits are for guidance only and ALcontrol cannot be held responsible for any discrepancies with current legislation
Mcerts Certification does not apply to leachates
09/12/2013 13:37:23

13:37:14 09/12/2013

CERTIFICATE OF ANALYSIS

SDG:	131129-113	**Location:**	John Kyrle School	**Order Number:**	
Job:	H_KEYGEO_NPT-52	**Customer:**	Key Geosolutions Limited	**Report Number:**	253168
Client Reference:	13-312	**Attention:**	Will Roberts	**Superseded Report:**	

CEN 10:1 CUMULATIVE TWO STAGE BATCH TEST

WAC ANALYTICAL RESULTS

REF : BS EN 12457/3

Client Reference		**Site Location**	John Kyrle School
Mass Sample taken (kg)	0.211	**Natural Moisture Content (%)**	20.5
Mass of dry sample (kg)	0.175	**Dry Matter Content (%)**	83
Particle Size <4mm	>95%		

Case	
SDG	131129-113
Lab Sample Number(s)	8503516
Sampled Date	25-Nov-2013
Customer Sample Ref.	TP5
Depth (m)	0.00 - 0.50

Solid Waste Analysis

		Landfill Waste Acceptance Criteria Limits		
		Inert Waste Landfill	Stable Non-reactive Hazardous Waste in Non-Hazardous Landfill	Hazardous Waste Landfill
Total Organic Carbon (%)	1.27	3	5	6
Loss on Ignition (%)	4.38	-	-	10
Sum of BTEX (mg/kg)	<0.024	6	-	-
Sum of 7 PCBs (mg/kg)	<0.021	1	-	-
Mineral Oil (mg/kg)	<1	500	-	-
PAH Sum of 17 (mg/kg)	<10	100	-	-
pH (pH Units)	8.29	-	<6 or >9	-
ANC to pH 6 (mol/kg)	0.0308	-	-	-
ANC to pH 4 (mol/kg)	0.0842	-	-	-

Eluate Analysis

	C_2 Concn in 2:1 eluate	C_8 Concn in 8:1 eluate	A_2 2:1 concn leached	$A_{2\text{-}10}$ Cumulative concn leached	Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg		
	mg/l		mg/kg				
Arsenic	0.000853	0.000912	0.00171	0.00904	0.5	2	25
Barium	0.0138	0.00679	0.0276	0.0771	20	100	300
Cadmium	<0.0001	<0.0001	<0.0002	<0.001	0.04	1	5
Chromium	0.00138	0.000713	0.00275	0.00801	0.5	10	70
Copper	0.0116	0.00179	0.0232	0.0308	2	50	100
Mercury Dissolved (CVAF)	<0.00001	0.0000156	<0.00002	0.000136	0.01	0.2	2
Molybdenum	0.00162	0.00173	0.00323	0.0172	0.5	10	30
Nickel	0.000728	0.000203	0.00146	0.00272	0.4	10	40
Lead	0.000414	0.000341	0.000828	0.00351	0.5	10	50
Antimony	0.00115	0.00373	0.0023	0.0339	0.06	0.7	5
Selenium	<0.00039	<0.00039	<0.00078	<0.0039	0.1	0.5	7
Zinc	0.00182	0.000782	0.00364	0.00918	4	50	200
Chloride	<2	<2	<4	<20	800	15000	25000
Fluoride	<0.5	<0.5	<1	<5	10	150	500
Sulphate (soluble)	<2	<2	<4	<20	1000	20000	50000
Total Dissolved Solids	158	67.3	315	792	4000	60000	100000
Total Monohydric Phenols (W)	<0.016	<0.016	<0.032	<0.16	1	-	-
Dissolved Organic Carbon	7.23	<3	14.4	<30	500	800	1000

Leach Test Information

	2:1	8:1
Date Prepared	03-Dec-2013	04-Dec-2013
pH (pH Units)	8.294	8.391
Conductivity (µS/cm)	196.60	72.40
Temperature (°C)	19.70	19.30
Volume Leachant (Litres)	0.314	1.400
Volume of Eluate VE1 (Litres)	0.230	

Solid Results are expressed on a dry weight basis, after correction for moisture content where applicable
Stated limits are for guidance only and ALcontrol cannot be held responsible for any discrepancies with current legislation
Mcerts Certification does not apply to leachates
09/12/2013 13:37:23

13:37:14 09/12/2013

CERTIFICATE OF ANALYSIS

SDG:	131129-113	**Location:**	John Kyrle School	**Order Number:**	
Job:	H_KEYGEO_NPT-52	**Customer:**	Key Geosolutions Limited	**Report Number:**	253168
Client Reference:	13-312	**Attention:**	Will Roberts	**Superseded Report:**	

Table of Results - Appendix

Method No	Reference	Description	Wet/Dry Sample [1]	Surrogate Corrected
ASB_PREP				
PM024	Modified BS 1377	Soil preparation including homogenisation, moisture screens of soils for Asbestos Containing Material		
PM114		Leaching Procedure for CEN Two Stage BatchTest 2:1/8:1 Cumulative		
TM018	BS 1377: Part 3 1990	Determination of Loss on Ignition		
TM048	HSG 248, Asbestos: The analysts' guide for sampling, analysis and clearance procedures	Identification of Asbestos in Bulk Material		
TM061	Method for the Determination of EPH,Massachusetts Dept.of EP, 1998	Determination of Extractable Petroleum Hydrocarbons by GC-FID (C10-C40)		
TM089	Modified: US EPA Methods 8020 & 602	Determination of Gasoline Range Hydrocarbons (GRO) and BTEX (MTBE) compounds by Headspace GC-FID (C4-C12)		
TM090	Method 5310, AWWA/APHA, 20th Ed., 1999 / Modified: US EPA Method 415.1 & 9060	Determination of Total Organic Carbon/Total Inorganic Carbon in Water and Waste Water		
TM104	Method 4500F, AWWA/APHA, 20th Ed., 1999	Determination of Fluoride using the Kone Analyser		
TM123	BS 2690: Part 121:1981	The Determination of Total Dissolved Solids in Water		
TM132	In - house Method	ELTRA CS800 Operators Guide		
TM133	BS 1377: Part 3 1990;BS 6068-2.5	Determination of pH in Soil and Water using the GLpH pH Meter		
TM152	Method 3125B, AWWA/APHA, 20th Ed., 1999	Analysis of Aqueous Samples by ICP-MS		
TM168	EPA Method 8082, Polychlorinated Biphenyls by Gas Chromatography	Determination of WHO12 and EC7 Polychlorinated Biphenyl Congeners by GC-MS in Soils		
TM182	CEN/TC 292 - WI 292046-chacterization of waste-leaching Behaviour Tests- Acid and Base Neutralization Capacity Test	Determination of Acid Neutralisation Capacity (ANC) Using Autotitration in Soils		
TM183	BS EN 23506:2002, (BS 6068-2.74:2002) ISBN 0 580 38924 3	Determination of Trace Level Mercury in Waters and Leachates by PSA Cold Vapour Atomic Fluorescence Spectrometry		
TM184	EPA Methods 325.1 & 325.2,	The Determination of Anions in Aqueous Matrices using the Kone Spectrophotometric Analysers		
TM213	In-house Method	Rapid Determination of PAHs by GC-FID		
TM259	by HPLC	Determination of Phenols in Waters and Leachates by HPLC		

[1] Applies to Solid samples only. DRY indicates samples have been dried at 35°C. NA = not applicable.

CERTIFICATE OF ANALYSIS

SDG:	131129-113	**Location:**	John Kyrle School	**Order Number:**	
Job:	H_KEYGEO_NPT-52	**Customer:**	Key Geosolutions Limited	**Report Number:**	253168
Client Reference:	13-312	**Attention:**	Will Roberts	**Superseded Report:**	

Test Completion Dates

Lab Sample No(s)	8503515	8503514	8503516
Customer Sample Ref.	TP3	TP4	TP5
AGS Ref.			
Depth	0.00 - 0.50	0.10 - 0.50	0.00 - 0.50
Type	SOLID	SOLID	SOLID
ANC at pH4 and ANC at pH 6	06-Dec-2013		06-Dec-2013
Anions by Kone (w)		06-Dec-2013	06-Dec-2013
Asbestos ID in Solid Samples	05-Dec-2013		05-Dec-2013
CEN 2:1 Leachate (2 Stage)		03-Dec-2013	03-Dec-2013
CEN 2:1 Readings		06-Dec-2013	06-Dec-2013
CEN 8:1 Leachate (2 Stage)		06-Dec-2013	06-Dec-2013
CEN 8:1 Readings		06-Dec-2013	06-Dec-2013
Dissolved Metals by ICP-MS		09-Dec-2013	09-Dec-2013
Dissolved Organic/Inorganic Carbon		06-Dec-2013	06-Dec-2013
Fluoride		09-Dec-2013	09-Dec-2013
GRO by GC-FID (S)	04-Dec-2013		04-Dec-2013
Loss on Ignition in soils	06-Dec-2013		06-Dec-2013
Mercury Dissolved		06-Dec-2013	06-Dec-2013
Mineral Oil	06-Dec-2013		06-Dec-2013
PAH Value of soil	05-Dec-2013		05-Dec-2013
PCBs by GCMS	08-Dec-2013		08-Dec-2013
pH	04-Dec-2013		04-Dec-2013
Phenols by HPLC (W)		09-Dec-2013	09-Dec-2013
Sample description	03-Dec-2013	30-Nov-2013	03-Dec-2013
Total Dissolved Solids		06-Dec-2013	06-Dec-2013
Total Organic Carbon	09-Dec-2013		09-Dec-2013

SDG:	131129-113	**Location:**	John Kyrle School	**Order Number:**	
Job:	H_KEYGEO_NPT-52	**Customer:**	Key Geosolutions Limited	**Report Number:**	253168
Client Reference:	13-312	**Attention:**	Will Roberts	**Superseded Report:**	

Appendix
General

1. Results are expressed on a dry weight basis (dried at 35ºC) for all soil analyses except for the following: NRA and CEN Leach tests, flash point LOI, pH, ammonium as NH4 by the BRE method, VOC TICS and SVOC TICS.

2. Samples will be run in duplicate upon request, but an additional charge may be incurred.

3. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for all sample types unless the sample is destroyed on testing. The prepared soil sub sample that is analysed for asbestos will be retained for a period of 6 months after the analysis date. All bulk samples will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALcontrol Laboratories reserve the right to charge for samples received and stored but not analysed.

4. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.

5. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS/MCERTS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS/MCERTS Accredited Laboratories, in this instance a laboratory with a known track record will be utilised.

6. When requested, the individual sub sample scheduled will be analysed in house for the presence of asbestos fibres and asbestos containing material by our documented in house method TM048 based on HSG 248 (2005), which is accredited to ISO17025. If a specific asbestos fibre type is not found this will be reported as "Not detected". If no asbestos fibre types are found all will be reported as "Not detected" and the sub sample analysed deemed to be clear of asbestos. If an asbestos fibre type is found it will be reported as detected (for each fibre type found). Testing can be carried out on asbestos positive samples, but, due to Health and Safety considerations, may be replaced by alternative tests or reported as No Determination Possible. The quantity of asbestos present is not determined unless specifically requested.

7. If no separate volatile sample is supplied by the client, or if a headspace or sediment is present in the volatile sample, the integrity of the data may be compromised. This will be flagged up as an invalid VOC on the test schedule and the result marked as deviating on the test certificate.

8. If appropriate preserved bottles are not received preservation will take place on receipt. However, the integrity of the data may be compromised.

9. NDP -No determination possible due to insufficient/unsuitable sample.

10. Metals in water are performed on a filtered sample, and therefore represent dissolved metals -total metals must be requested separately.

11. Results relate only to the items tested.

12. LODs for wet tests reported on a dry weight basis are not corrected for moisture content.

13. **Surrogate recoveries** -Most of our organic methods include surrogates, the recovery of which is monitored and reported. For EPH, MO, PAH, GRO and VOCs on soils the result is not surrogate corrected, but a percentage recovery is quoted. Acceptable limits for most organic methods are 70 -130 %.

14. **Product analyses** -Organic analyses on products can only be semi-quantitative due to the matrix effects and high dilution factors
employed.

15. Phenols monohydric by HPLC include phenol, cresols (2-Methylphenol, 3-Methylphenol and 4-Methylphenol) and Xylenols (2,3 Dimethylphenol, 2,4 Dimethylphenol, 2,5 Dimethylphenol, 2,6 Dimethylphenol, 3,4 Dimethyphenol, 3,5 Dimethylphenol).

16. Total of 5 speciated phenols by HPLC includes Phenol, 2,3,5-Trimethyl Phenol, 2-Isopropylphenol, Cresols and Xylenols (as detailed in 15).

17. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.

18. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the method detection limit to be raised.

19. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.

20. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles GCFID/GCMS and all subcontracted analysis.

21. For all leachate preparations (NRA, DIN, TCLP, BSEN 12457-1, 2, 3) volatile loss may occur, as we do not employ zero headspace extraction.

22. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally occurring soil profiles, or from fill /made ground, as long as these materials constitute the major part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

23. Analysis and identification of specific compounds using GCFID is by retention time only, and we routinely calibrate and quantify for benzene, toluene, ethylbenzenes and xylenes (BTEX). For total volatiles in the C5 -C12 range, the total area of the chromatogram is integrated and expressed as ug/kg or ug/l. Although this analysis is commonly used for the quantification of gasoline range organics (GRO), the system will also detect other compounds such as chlorinated solvents, and this may lead to a falsely high result with respect to hydrocarbons only. It is not possible to specifically identify these non-hydrocarbons, as standards are not routinely run for any other compounds, and for more definitive identification, volatiles by GCMS should be utilised.

Sample Deviations

1	**Container with Headspace provided for volatiles analysis**
2	**Incorrect container received**
3	**Deviation from method**
4	**Holding time exceeded before sample received**
§	**Sampled on date not provided**
♦	**Sample holding time exceeded in laboratory**
@	**Sample holding time exceeded due to sampled on date**
&	**Sample Holding Time exceeded - Late arrival of instructions.**

Asbestos

Identification of Asbestos in Bulk Materials & Soils

The results for identification of asbestos in bulk materials are obtained from supplied bulk materials which have been examined to determine the presence of asbestos fibres using Alcontrol Laboratories (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

The results for identification of asbestos in soils are obtained from a homogenised sub sample which has been examined to determine the presence of asbestos fibres using Alcontrol Laboratories (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anthophyllite	-
Fibrous Tremolite	-

Visual Estimation Of Fibre Content

Estimation of fibre content is not permitted as part of our UKAS accredited test other than: -
Trace -Where only one or two asbestos fibres were identified.

Further guidance on typical asbestos fibre content of manufactured products can be found in HSG 264.

The identification of asbestos containing materials and soils falls within our schedule of tests for which we hold UKAS accreditation, however opinions, interpretations and all other information contained in the report are outside the scope of UKAS accreditation.