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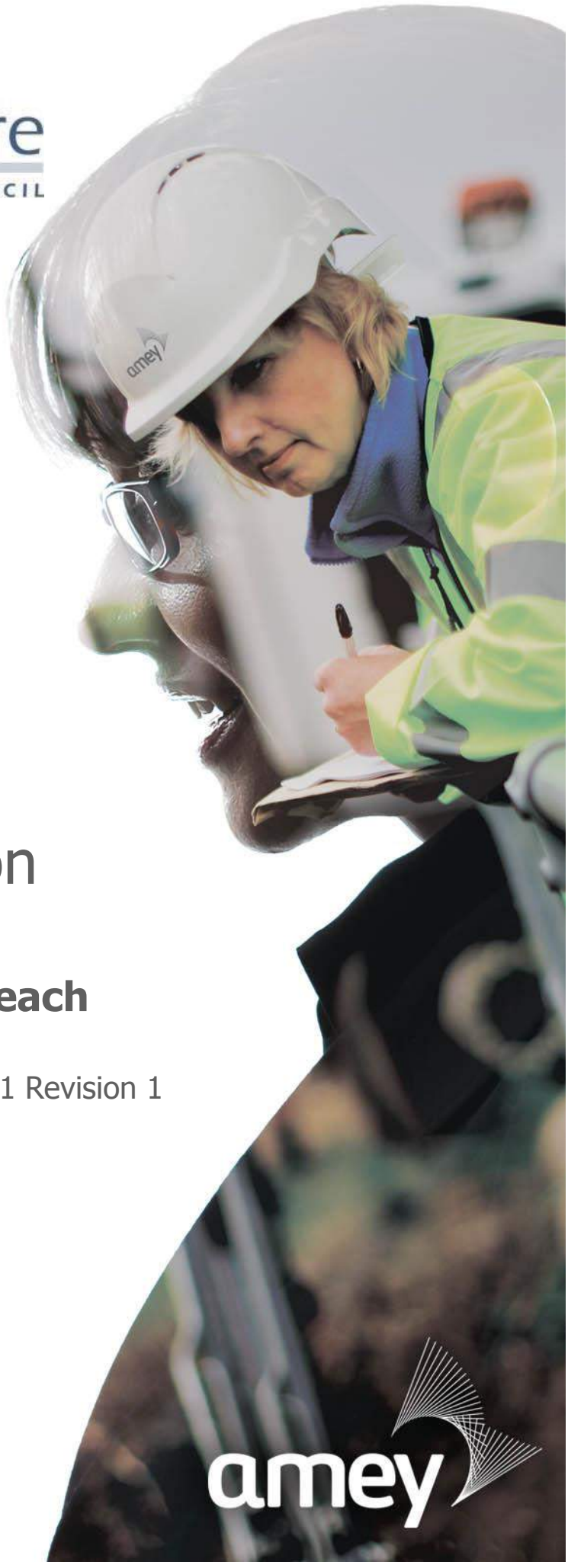

Ground Investigation Report

Prison Copse Wall, Northleach

CON-GE-BHAM-COGL43048589-GIR-001 Revision 1

August 2017

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1 EXECUTIVE SUMMARY

Gloucester County Council has contracted Amey Gloucestershire to undertake investigation and geotechnical design works for the remediation of a retaining wall at Northleach. Deterioration of Cotswold Stone facing (over concrete) and tension cracks and subsidence in the road have required the road to be closed in order to protect the public from possible collapse.

The Prison Copse Wall site lies adjacent to the north of an unnamed road, approximately 200m to the west of its junction with the A429, and 1km west of the village of Northleach. The unnamed road ascends westwards along the southern side of the valley of the River Leach. It is constructed on sidelong ground.

Following desk study to obtain existing information on the site and its environs, a ground investigation was undertaken in February 2017. It comprised three boreholes drilled through the road pavement, two trial pits to expose the form of the wall's foundation and two cores through the wall to reveal its thickness and construction.

The ground investigation revealed the geology beneath the site to comprise Made Ground associated with the road construction over Reworked Material (possible landslipped material) to depths of up to 2.1m below ground level (bgl), in turn over soft becoming firm and then stiff clay. Mudstone was encountered at depths in excess of 7.90m bgl, with Limestone at depths in excess of 10.0m bgl.

This report summarises collected desk study data, site walkover information and ground investigation site and laboratory work, and tabulates material properties and derived geotechnical parameters. A ground model is defined, an engineering assessment made and possible remediation solutions proposed.

Preferred solutions at this stage comprise a king post wall or a sheet pile wall, both of these options would be constructed in front of the existing wall. The king post wall solution is considerably cheaper than the sheet pile wall; however it presents greater design challenges and financial and health and safety risks during construction.

Visual inspections have indicated that the failure mechanism may comprise a shallow slip failure passing below the toe of the retaining wall. However the results of the inclinometer monitoring undertaken to date have been inconclusive and further monitoring will be required to determine the failure mechanism. The piled retaining wall and king post wall solutions would be suitable for remediating a shallow failure. If a deeper seated failure plane is present, further design options will need to be considered.

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2 INTRODUCTION

2.1 Scope and Objectives of Report

This Ground Investigation Report has been prepared in general accordance with Eurocode 7 (EC7) [**Ref 1**] and best practice guidance set out in the Design Manual for Roads and Bridges (DMRB) Volume 4 Section 1 Part 1 HD22/08 [**Ref 2**]. It presents the findings of a ground investigation, undertaken to determine ground and groundwater conditions at Prison Copse Wall, Northleach, and provides geotechnical parameters for the design of suitable remediation.

The ground investigation was undertaken by specialist ground investigation contractor CC Ground Investigations Ltd. between 6th and 10th February 2016.

This report should be read in conjunction with CC Ground Investigations Ltd. Factual Report No. C5530 [**Ref 3**].

2.2 Description of Project

Following a request from Gloucestershire County Council (GCC), members of the Amey Geotechnical Team first undertook a site visit to determine the condition of the Prison Copse Wall, Northleach site on 25 November 2015. The site had previously been inspected by the Amey Structures Team.

The Prison Copse Wall site is located at National Grid Reference 410635 214925, as shown on the Site Location Plan, **Figure 1** and Aerial Photograph, **Figure 2**. It lies adjacent to the north of an unnamed road, approximately 200m to the west of its junction with the A429, and 1km west of the village of Northleach. The unnamed road ascends westwards along the southern side of the valley of the River Leach, which flows towards the east.

The carriageway, which has been constructed on sidelong ground, lies at an approximate elevation of 180m AOD, with the slope above and beneath the road falling towards the river to the north at an angle of approximately 10°. The carriageway is supported on its northern side by a retaining wall, which appears to be constructed from concrete faced with Cotswold stone. The retaining wall is approximately 150m in length, and increases in height from 1m at either end to approximately 3m at its centre.

The retaining wall was noted to be visibly distressed and subject to large distortion apparently related to ground movements. Mapping and aerial photographs indicate the slope to be in an area of historical landslip.

Because of the extremely poor condition of the wall, Amey Gloucestershire (Amey) recommended that the road be closed and a remedial scheme be considered. GCC instructed Amey to undertake necessary ground investigations and design works to enable the road to be re-opened.

Details obtained from site walkover are discussed in **Section 4.1**.

3 EXISTING INFORMATION

3.1 Topographical Maps

A review of available historical Ordnance Survey (OS) maps [**Ref 4**] was undertaken to determine the historical development of the site. A list of the available historical maps is summarised in **Table 3.1** below.

Table 3.1 Summary of Historical Ordnance Survey Maps

Map name	Scale	Date
OS County Series: Gloucestershire	1:2,500	1884
OS County Series: Gloucestershire	1: 10,560	1887 - 1892
OS County Series: Gloucestershire	1:2,500	1902 - 1903
OS County Series: Gloucestershire	1:10,560	1903
OS County Series: Gloucestershire	1:2,500	1922
OS County Series: Gloucestershire	1:10560	1924
OS Plan	1:10,560	1955
OS Plan	1:2,500	1979
OS Plan	1:10,000	1982
OS Plan	1:2,500	1982 - 1993

The earliest available map of 1884 indicates the road in place and the site to be predominantly surrounded by agricultural fields. The site is located northwest of Northleach village, and approximately 200m from the junction with an unnamed carriageway road (now the A429 Fosse Way). A single structure was located approximately 200m to the north-east. No significant changes in proximity to the site have been recorded on subsequent maps.

The current OS maps indicates the site to be located at National Grid Reference 410635 214925, and at an elevation of approximately 180m AOD, on sidelong ground sloping down to the River Leach to the northeast.

3.2 Geological Maps and Memoirs

An extract from the 1:50,000 scale British Geological Survey (BGS) Solid and Drift Map No. 235 obtained from their online map viewer [**Ref 5**] is reproduced in **Figure 3**, Geological Map.

The map indicates that the site is not underlain by Made Ground or Superficial materials. However, as the retaining wall has been constructed to support the road, there is likely to be a wedge of Made Ground behind the wall and beneath the road. There are also likely to be weathered deposits of the parent bedrock.

Alluvium is shown associated with the River Leach in the valley bottom, and Landslide Deposits are shown in the field at the base of the wall and extending along the valley side to the west.

The BGS online map indicates the succession of Solid strata in increasing age in proximity to the site is as shown in **Table 3.2** below.

Table 3.2 Summary of Solid Geology

Strata	Age	Description
White Limestone Formation	Middle Jurassic Period	Pale grey to off-white or yellowish limestone, peloidal wackestone and packstone with subordinate ooidal and shell fragmental grainstones, recrystallised limestone and/or hardgrounds at some levels with rare sandy limestone, argillaceous limestone, marl and mudstone or clay.
Hampen Formation	Middle Jurassic Period	Limestones with subordinate interbedded marls; limestones characteristically grey to brown, thinly bedded, fine- to very fine-grained, well-sorted, ooidal grainstone to packstone, commonly slightly sandy or silty, with small-scale cross-bedding.
Taynton Limestone Formation	Middle Jurassic Period	White to pale brown, typically well-sorted medium- to coarse-grained, moderately to highly shell-detrital ooidal grainstone, locally fine- to very coarse-grained; medium to thickly well-bedded and cross-bedded, with thin shell-detrital marl seams and locally calcareous sandstone beds
Fuller's Earth Formation	Middle Jurassic Period	Silicate-mudstone, grey, bedded, variably calcareous, grading to lime-mudstone, fossiliferous, with units of thinly interbedded, more or less silici-muddy limestone
Salperton Limestone Formation	Middle Jurassic Period	Pale grey to brown rubbly, fine- to coarse-grained ooidal, peloidal and finely shell-detrital packstone to grainstone, generally with very shelly and coarsely shell-detrital ooidal grainstone and packstone at base.

The disposition of Solid strata shown on the map suggests that the site is immediately underlain by the Fuller's Earth Formation and Salperton Limestone Formation

3.3 Hydrogeology

The Environment Agency (EA) website [**Ref 6**] reveals the site to be located on a Principal Aquifer relating to the bedrock. These are described as layers of rock or drift deposits that have high intergranular and/or fracture permeability, meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale. An extract from the Environment Agency Aquifer Map is presented in **Figure 4**, Aquifer Map. The EA website also advises that the aquifer is of high leaching potential.

The EA website indicates that the site lies outside any Groundwater Source Protection Zones but that a Total Catchment (Zone 3) lies close to the southwest, with an Outer Zone (Zone 2) approximately 300m to the southwest and an Inner Zone (Zone 1) approximately 500m to the southwest. An extract from the Groundwater Source Protection Map is shown as **Figure 5**.

3.4 Records of Mines and Mineral Deposits

The Mining Plans Portal database held on the BGS website [**Ref 7**] indicates that there have been no historic or current mining activities on or in proximity to the site.

The Coal Authority Gazetteer indicates that the site is not in an area requiring coal or mining authority reports in relation to property searches.

3.5 Land Use and Soil Survey Information

The EA website [**Ref 6**] indicates that the site is located within a surface water Nitrate Vulnerable Zone (NVZ).

A review has been undertaken of the Multi-Agency Geographic Information for the Countryside (MAGIC) website [**Ref 8**] to check for any statutory designations. This indicates that the site is located within an Area of Outstanding Natural Beauty (AONB).

The Historic England website [**Ref 9**] reveals a number of listed buildings with 1km of the site, the closest being 220m from the site.

3.6 Archaeological and Historical Investigations

The National Mapping Programme undertaken by English Heritage [**Ref 10**] identifies no archaeological sites at or close to the area of interest. An archaeology investigation is unlikely to be required at the site given the past land use identified from historic OS maps for the area. As any remediation scheme will fall within existing highway land, excavation of undisturbed ground is likely to be limited.

3.7 Existing Ground Investigation Data

The BGS website search reveals no records of publically available boreholes on or in proximity to the site.

3.8 Flood Records

The EA website [**Ref 6**] indicates that the site lies outside the area in the bottom of the valley where flood alerts are issued for the River Leach.

3.9 Contaminated Land

No pollution incidents, previous land uses, sources of contamination, landfills or other waste sites are recorded within the study area on the EA website [**Ref 6**].

4 FIELD AND LABORATORY STUDIES

4.1 Walkover Survey

As noted in **Section 2.2** the Amey Geotechnical Team first undertook a site visit to determine the condition of the Prison Copse Wall on 25 November 2015. Subsequent inspections to monitor the condition of the wall were carried out intermittently throughout 2016 and early 2017. A photographic record of the condition of the wall has been obtained; photographs are presented in **Appendix A**. The findings of the site inspections are summarised as follows.

The defective section of carriageway can conveniently be considered in three parts:

Area 1

The central section of the retaining wall has become visibly distressed with 6 No. diagonal tension cracks located along its central third (see **Photographs 1 to 5** in **Appendix A**). The most severe section of defective retaining wall comprises an 8m section that has become detached and leans out towards the field below (see **Photographs 6 & 7**). Exposure of the concrete suggests it is approximately 800mm thick.

A 6" drainage outfall is located 1.5m above ground level approximately 10m to the east of the detached section of retaining wall. There is a drainage gully located in the carriageway above. The pipe is cracked and deformed, potentially leaking water within the retaining wall). The stone work around the outfall is damp, and the ground below shows signs of scour thus indicating a significant flow of water through the outfall.

An approximately 50mm deep depression has formed in the eastbound carriageway above the detached section of retaining wall (**Photograph 8**), and a 2m long, 30mm wide, crack is located in the westbound carriageway (**Photograph 9**). Approximately 4m of cracking, up to 20mm wide, has developed diagonally across the eastbound carriageway (**Photograph 10**); it appears that the diagonal cracking has occurred relatively recently. A void has formed in the grass verge between the cracked carriageway and the defective section of retaining wall.

Area 2

This area is located immediately to the west of Area 1 and is defined by an approximately 10m long, 50mm deep depression within the footway (**Photograph 11**), and extends along the top of the defective section of retaining wall.

Area 3

This area is located immediately to the east of Area 1 and is defined by an approximately 60m long, 20mm wide crack running along the centre of the carriageway (**Photograph 12**). It is probable that this cracking has formed along a construction joint. Several cracks approximately 0.5m long and 5mm wide have formed in the eastbound carriageway within this area (**Photograph 13**).

4.2 Ground Investigations

4.2.1 Fieldwork

A ground investigation, specified by Amey and carried out by CC Ground Investigations Ltd., was undertaken between 6th and 10th February 2016 in general accordance with Eurocode (EC7) Part 2, Ground Investigation and testing (1997) [**Ref 1**], BS5930:2015 [**Ref 11**] and BS10175:2011 [**Ref 12**].

The ground investigation comprised the following:

- Three boreholes (BH01 to BH03) to depths of between 12.50m and 14.50m bgl using a track mounted Comacchio MC300 multi-purpose rig; on completion combined gas and water monitoring standpipes were installed in BH01 and BH03, and an inclinometer in BH02
- Two trial pits (TP01 and TP02) to depths of 0.85m and 1.10m bgl using hand digging tools
- Two masonry cores (CH01 and CH02) using water-flush hydraulic apparatus.

The locations of exploratory holes are shown on **Figure 6**, Exploratory Hole Location Plan.

4.2.2 Ground Investigation Report (Factual)

The locations of all exploratory holes, exploratory hole logs and laboratory test results are presented in the CCGI Factual Report [**Ref 3**], a copy of which is presented in **Appendix B**.

This information was also supplied in digital format as set out in the Association of Geotechnical Specialists publication "Electronic Transfer of Geotechnical Data from Ground Investigations" [**Ref 13**].

4.2.3 Results of in-situ tests

In-situ Standard Penetration Tests (SPTs) utilising split barrel and solid cone techniques were carried out at regular intervals in boreholes in accordance with BS1377 Part 9 [**Ref 14**] and BS EN ISO 22476-3:2005 [**Ref 15**].

BS EN ISO 22476-3:2005 [**Ref 15**] provides the following equation for adjusting Standard Penetration Resistance (N) values to account for the energy delivered to the drive rods (N_{60} = N value adjusted to a reference energy ratio of 60%):

$$N_{60} = \frac{E_r}{60} N$$

Where E_r is the energy ratio of the specific test equipment.

The CCGI Factual Report (**Appendix B**) gives the E_r value for the test equipment as 59.65%, so in effect the field values are also N_{60} values.

Where SPT refusal was encountered the N_{300} value has been obtained by extrapolating to the full SPT test distance of 300mm.

Hand Shear Vane (HSV) testing was conducted where materials were suitable for tests.

The results of in-situ testing are presented in the CCGI Factual Report [**Ref 3**] presented in **Appendix B**.

4.2.4 Laboratory Investigation

The following laboratory tests were undertaken on soil samples recovered from the site by CCGI:

- Natural moisture content (NMC) (7 No.)
- Liquid limit (LL), plastic limit (PL) and plasticity index (PI) (7 No.)
- Consolidated undrained triaxial compression test on 3 No. 38mm dia. specimens with pore water pressure measurement (2 No.)
- BRE SD1 full suite (Building Research Establishment) (4 No.)

Copies of laboratory test results are contained within the CCGI Factual Report [**Ref 3**] presented in **Appendix B**.

4.3 Results of Trial Pits at Toe of Wall

The two trial pits (TP01 and TP02) undertaken at the toe of the wall in order to investigate the masonry wall foundation revealed the foundation to comprise a 350mm or 400mm thick limestone foundation with a 120mm or 300mm step out and founded at a depth of 0.55m or 0.60m below general ground level. The founding material comprised Possible Reworked Material comprising soft slightly gravelly slightly sandy CLAY or slightly sandy sub-angular and sub-rounded fine to coarse GRAVEL of limestone with a high cobble content as discussed later in **Section 6**.

4.4 Results of Coring

The two cores from the wall (CH01 and CH02), one of which was drilled at an angle of 40° from the vertical and the other being horizontal, revealed the wall to comprise composite masonry and concrete construction up to 1.4m thick. Core hole logs are included in the CCGI Factual Report presented in **Appendix B**. In the case of core CH02 two courses of masonry sandwich a thickness of 260mm of concrete, with a further 590mm of concrete behind. It is not clear, therefore, if the wall has been constructed on more than one occasion.

4.5 Inclinometer Monitoring

A base set of inclinometer readings were recorded in borehole BH02 on 21st February with a first set of readings obtained on 23rd March 2017 and the most recent set on 20th July 2017. The inclinometer results summarise ground movements (mm), cumulative ground movements (mm), rate of ground movement (mm/yr) between monitoring events and rate of cumulative ground movement (mm/yr).

The inclinometer data for this installation is shown as **Appendix C** and summarised in **Table 4.1** below.

Table 4.1 Inclinometer Monitoring Data

Borehole BH02						
Date of base Reading	Monitoring Period		Ground Movement over Period (mm) [1]	Cumulative Ground Movement (mm)	Rate of Ground Movement over Period (mm/yr) [2]	Rate of Cumulative Ground Movement (mm/yr)
	Period	No. of Months				
February 2017 (Amey)	Feb to Mar 2017	1	0.6	0.6	7.4	7.4
	Mar to May 2017	2	0.4	1.0	2.5	6.2
	May to July 2017	2	-0.6	0.5	-	-
Nature of ground movement: Generally increasing ground movement from nil at the base to 0.6mm at 1.5m bgl						

The initial inclinometer monitoring by Amey from February 2017 to March 2017 indicated a rate of ground movement in BH02 of 7.4mm/year. Monitoring from March 2017 to May 2017 indicated a rate of cumulative ground movement of 2.5mm/year. Recent monitoring indicated a negative movement and may represent the accuracy of the measuring equipment. Further monitoring will be required in order to determine typical rates of ground movement.

5 GROUND SUMMARY

5.1 Topography

A topographical survey of the site has not been undertaken.

As noted in **Section 2.2**, the road pavement lies at an elevation of approximately 180m AOD, with the slope above and beneath the road falling towards the river to the north at an angle of approximately 10°. The wall has a maximum height of approximately 3m.

5.2 Geology

The following geological units were anticipated at the site following the review of available information discussed previously:

- Made Ground (Fill material behind the wall and beneath the road pavement)
- Weathered Bedrock (Fuller's Earth Formation (mudstone with limestone beds)); anticipated to be weathered mudstone (soft to firm clay).
- Fuller's Earth Formation (mudstone with limestone beds)
- Salperton Limestone Formation

The general sequence of strata encountered in boreholes advanced from road pavement level is presented in **Table 5.1** below. It confirms the anticipated succession of strata.

Table 5.1 Ground Summary

Stratum	**General Description**	Depth to top (m bgl)	Depth to base (m bgl)	Maximum Thickness (m)
Bituminous Surfacing	Made Ground (Tarmacadam)	0.00	0.60	0.60
Made Ground	Made Ground (Slightly sandy gravel of limestone, concrete and clinker)	0.60	0.80 to 1.20	0.20 to 0.60
Made Ground?	Possible Reworked Material (Sandy clayey gravel and cobbles of limestone)	0.80 to 1.20	1.00 to 1.60	0.20 to 0.40
Made Ground?	Possible Reworked Material (Soft and very soft slightly gravelly slightly sandy CLAY with low cobble content; gravel and cobbles are limestone)	1.00 to 1.60	1.70 to 2.10	0.30 to 1.10
Fuller's Earth Formation?	Soft fissured greenish grey becoming yellowish brown slightly gravelly slightly sandy silty CLAY; gravel is limestone	1.70 to 2.10	5.40 to 6.70	3.30 to 5.00
Fuller's Earth Formation	Firm becoming stiff extremely closely and very closely fissured bluish grey slightly sandy silty CLAY	5.40 to 6.70	7.90 to 10.00	2.00 to 3.40

Fuller's Earth Formation	Extremely weak thinly and thickly laminated bluish grey MUDSTONE	7.90 to 10.00	10.00 to 11.90	Nil to 3.10
Salperton Limestone Formation?	Very weak yellowish brown thinly and thickly bedded LIMESTONE	10.00 to 11.90	12.50* to 14.50*	1.60+* to 2.60+*

Note: * indicates base of unit was not penetrated

5.3 Groundwater

Groundwater strikes encountered in exploratory holes as they were advanced are detailed in **Table 5.2** below.

Following the installation of standpipe piezometers in boreholes BH01 and BH03, groundwater was monitored as shown in **Table 5.3** below.

Table 5.2 Groundwater Strikes

Exploratory Hole No.	Depth of strike (m bgl)	Depth after 20 mins (m bgl)
BH01	3.1	3.1
BH02	None encountered prior to use of water flush at 8.00m bgl	
BH03	3.3	3.3
TP01	None encountered	-
TP02	0.85	0.57

Table 5.3 Groundwater Monitoring

Exploratory Hole No.	Date	Date	Date	Date
	21/02/2017	23/03/2017	11/05/2017	20/07/2017
BH01	3.30m bgl	3.90m bgl	4.25m bgl	4.25m bgl
BH03	2.50m bgl	2.50m bgl	3.30m bgl	3.63m bgl

6 GROUND CONDITIONS AND MATERIAL PROPERTIES

6.1 General

The strata encountered during the ground investigation are briefly summarised in **Section 5** and are discussed further below. In-situ and laboratory test results are included in the Factual Report presented in **Appendix B**. A summary of the material properties for each stratum is provided in **Table 6.1**, and a summary of the geotechnical parameters derived for each stratum below, determined from in-situ and laboratory tests and by engineering judgement, is presented in **Table 6.2**.

6.2 Made Ground and Possible Reworked Material

6.2.1 Material Description

Beneath 600mm of bituminous road construction, Made Ground comprises up to 600mm of greyish brown and dark grey slightly sandy occasionally slightly clayey angular to sub-rounded fine to coarse GRAVEL of limestone, slag, concrete, clinker and ash, with occasional cobbles of limestone.

Made Ground is underlain by two layers of Possible Reworked Material. The upper layer comprises up to 400mm of light grey and yellowish brown slightly sandy clayey GRAVEL and COBBLES of limestone. The lower layer comprises up to 1.10m of soft and very soft orangish brown mottled greyish brown slightly gravelly slightly sandy CLAY with a low cobble content; gravel and cobbles are limestone.

The base of the Possible Reworked Material lies at a depth varying from 1.70m to 2.10m bgl.

6.2.2 Material Properties

The following in-situ and laboratory tests were undertaken on Possible Reworked Material:

- 1 No. SPT test
- 2 No. HSV tests
- 1 No. NMC test
- 1 No. Atterberg Limit test
- 2 No. Environmental suite (discussed in **Section 7**)

A single moisture content determination within the lower layer of Possible Reworked Material revealed a moisture content of 66%, with Plastic Limit and Liquid Limit determinations of 48% and 78% respectively, thus indicating a plastic index of 30%. These are plotted against depth in **Figure 7**. When plotted on a Plasticity Chart (**Figure 8**), these results indicate the material to be a silt of very high plasticity as defined in BS5930 (2015) [**Ref 11**].

Using guidance given in BS8002 (2015) [**Ref 16**], a bulk unit weight (γ_b) of 16.5kN/m³ is suggested for the Possible Reworked Material.

A single standard penetration test (SPT) was carried out within the Possible Reworked Material with an 'N_{60}' value of 6 being obtained. SPT 'N_{60}' values are plotted against depth in **Figure 9**. SPT 'N' values can also be used to estimate undrained shear strengths using the correlation Cu = f.N proposed by Stroud [**Ref 17**], where the factor f is dependent on the plasticity index. Based on a plasticity index of 30%, a factor of 4.5 can be assumed. This indicates an equivalent undrained shear strength of 27kN/m^2.

Two hand shear vane tests in the Possible Reworked Material indicate undrained shear strengths of 31kN/m^2 and 42kN/m^2.

A characteristic undrained shear strength value of Cu = 35 kN/m^2 for the Possible Reworked Material is suggested for design.

Guidance provided in BS8002 [**Ref 16**] suggests a value of Φ' = 25.0° for clay with a plasticity index of 30% in the absence of reliable laboratory results, whilst a relationship between SPT N value and angle of shearing resistance (Φ') after Peck, Hanson and Thornburn [**Ref 18**] indicates a value of Φ' = 28.0° for an SPT N_{60} value of 6. It is suggested that the lower value be adopted for design.

6.3 Fuller's Earth Formation (Clay)

6.3.1 Material Description

The Fuller's Earth Formation is conveniently considered as an upper and lower layer, with the upper layer comprising clay and the lower layer comprising mudstone. This Section describes the clay layer, and the mudstone layer is described in **Section 6.4**.

The clay layer of the Fuller's Earth Formation is also conveniently considered as an upper and lower layer in terms of description, but is considered together in terms of its material properties.

The upper layer is typically described as very soft and soft becoming soft extremely closely fissured greenish grey grading to light brownish grey and yellowish brown slightly gravelly slightly sandy silty CLAY, and was encountered to depths of between 5.40m and 6.70m bgl.

The lower layer was typically described as firm and stiff extremely closely fissured bluish grey slightly sandy silty CLAY. It was encountered to depths of 8.80m and 7.90m bgl in boreholes BH01 and BH02, and to a depth of 10.00m bgl in BH03.

6.3.2 Material Properties

The following in-situ and laboratory tests were undertaken on the Fuller's Earth Formation (Clay):

- 14 No. SPT tests
- 10 No. HSV tests
- 6 No. Moisture content tests
- 6 No. Atterberg Limit tests
- 2 No. Effective Shear Strength
- 4 No. BRE SD1 Aggressive Chemical Environment of Concrete test

Six moisture content determinations within the Fuller's Earth Formation (Clay) revealed moisture contents of between 17% and 47%, with Plastic Limit and Liquid Limit determinations of between 20% and 41% and 55% and 77% respectively, thus indicating plastic index values of between 25% and 36%; a characteristic value for plastic index of 33% is suggested. Moisture content, plastic limit and liquid limit are plotted against depth in **Figure 7**. When plotted on a Casagrande Plasticity Chart (**Figure 8**), these results indicate this material to comprise clays and silts of moderately high to very high plasticity as defined in BS5930 (2015) [**Ref 11**].

Six bulk Density (ρ_b) measurements undertaken as part of effective shear strength tests ranged from 1.50 Mg/m^3 to 1.61 Mg/m^3 and indicate a mean value of ρ_b of 1.56 Mg/m^3, and thus a bulk density (γ_b) of 15.6 kPa. However, as these results are from samples with soft and very soft consistency obtained at relatively shallow depth within the clay it is suggested that a value of 15.5 kPa be adopted for the upper layer and 18kPa, as indicated by BS8002 [**Ref 16**] for firm clay, be adopted for design for the lower layer.

Fourteen standard penetration tests (SPT) were carried out within the Fuller's Earth Formation (Clay) with 'N_{60}' values ranging from of 2 to 46 being obtained. SPT 'N_{60}' values are plotted against depth in **Figure 9**. SPT 'N' values can also be used to estimate undrained shear strengths using the correlation Cu = f.N proposed by Stroud [**Ref 17**], where the factor f is dependent on the plasticity index. Based on a mean plasticity index of 33%, a factor of 4.5 can be assumed. This indicates equivalent undrained shear strengths of between 9kN/m^2 and 207kN/m^2.

Ten hand shear vane tests in the Fuller's Earth Formation (Clay) indicate undrained shear strengths of between 28kN/m^2 and 112kN/m^2.

Undrained shear strengths derived from SPT and HSV results are shown in **Figure 10**. Based on these values, a value of 35kN/m^2 is recommended for design to a depth of 5.5m bgl. Undrained shear strength increases beneath a depth of 5.5m bgl and it is suggested that a shear strength profile varying from 35kN/m^2 at a depth of 5.5m bgl to 100kN/m^2 at a depth of 10.0m bgl be employed for design.

Consolidated undrained shear strength tests with the measurement of pore pressure were undertaken on two sets of 3 No. 38mm diameter undisturbed samples of the Fuller's Earth Formation (Clay), with effective strength parameters of c′ = 14kPa, Φ′ = 29.0° and c′ = 8kPa, Φ′ = 24.0° being obtained. This compares with a value of Φ′ = 24.0° given by guidance in BS8002 [**Ref 16**] for clay with a plasticity index of 33% in the absence of reliable laboratory results. It is suggested that sensitivity analysis using a range of results be considered during design, but it is probable that the value provided by BS8002 can be dispensed with.

The coefficient of volume compressibility (m_v) may be estimated after Stroud [**Ref 17**] from the relationship

$$m_v = 1/500N = 1/100Cu$$

and a value of m_v = 0.3mMN/m^2 is indicated for an undrained shear strength of 35kN/m^2 at shallow depth within the Fuller's Earth Formation (Clay) and a value of 0.15MN/m2 for an average undrained shear strength of 65kN/m2 in the lower layer.

Chemical testing was undertaken on four samples of the Fuller's Earth Formation (Clay) in accordance with BRE SD1 (2005) [**Ref 19**] to assess sulphate attack in relation to the design of buried concrete. The results of the chemical testing revealed acid soluble sulphate concentrations of between 0.22% and 0.34% SO4, aqueous extract sulphate concentrations of between 0.02g/l and 0.04g/l SO4, total sulphur concentrations of

between 0.08% and 0.11%, all associated with a pH levels of between 8.06 and 8.23. Magnesium levels of <1g/l and Nitrate levels of 10mg/l or less were obtained. These results indicate a design sulphate class of DS-1 and ACEC class of AC-1s assuming a brownfield site and static groundwater conditions.

6.4 Fuller's Earth Formation (Mudstone)

6.4.1 Material Description

The Fuller's Earth Formation (Mudstone) is typically described as extremely weak thinly and thickly laminated bluish grey MUDSTONE with sub-horizontal extremely closely spaced discontinuities. It is noted that the mudstone layer was absent in borehole BH03, with the Fuller's Earth Formation being weathered to a clay.

6.4.2 Material Properties

The following in-situ and laboratory tests were undertaken on Fuller's Earth Formation (Mudstone):

- 5 No. SPT tests

Five standard penetration tests (SPT) were carried out within the Fuller's Earth Formation (Mudstone) with 'N' and extrapolated 'N' values ranging from of 41 to 83 being obtained. SPT 'N_{60}' values are plotted against depth in **Figure 9**. SPT 'N' values can be used to very loosely estimate uniaxial compressive strength of the rock using the correlation Cu = f.N proposed by Stroud [**Ref 17**] for clays, where a factor f = 5 can be used to estimate undrained shear strength, with uniaxial compressive strength being double the undrained shear strength. This suggests uniaxial compressive strengths of between 0.41MN/m^2 and 0.83MN/m^2; a uniaxial strength compressive strength of 0.5MN/m^2 is suggested for design in this extremely weak rock.

The effective angle of friction for mudstone is given as Φ' = 28.0° in BS8002 [**Ref 16**].

6.5 Salperton Limestone Formation

6.5.1 Material Description

The Salperton Limestone Formation is typically described as very weak yellowish brown thinly and thickly bedded LIMESTONE

6.5.2 Material Properties

The following in-situ and laboratory tests were undertaken on the Salperton Limestone Formation:

- 6 No. SPT tests

Six standard penetration tests (SPT) were carried out within the Salperton Limestone Formation, extrapolated 'N' values ranging from 500 to 750 being obtained. SPT 'N' values can be used to very loosely estimate uniaxial compressive strength of the rock using the correlation Cu = f.N proposed by Stroud [**Ref 17**], where a factor f = 5 can be used to estimate undrained shear strength, with uniaxial compressive strength being double the undrained shear strength. This suggests uniaxial compressive strengths of between 5MN/m^2 and 7.5MN/m^2; a uniaxial strength compressive strength of 5MN/m^2 is suggested for design in this very weak rock.

6.6 Material Properties Summary

A summary of the material properties for each stratum is provided in **Table 6.1**, and a summary of the geotechnical parameters derived for each stratum is presented in **Table 6.2**.

Table 6.1 Summary of Material Properties obtained from In-Situ and Laboratory Tests

Strata	NMC (%) Range (No.) Average	Plastic Limit (%) Range (No.) Average	Liquid Limit (%) Range (No.) Average	Plasticity Index (%) Range (No.) Average	Bulk Density (kN/m^3) Range (No.) Average	Undrained Shear Strength (kN/m^2) Range (No.) Average	Effective Shear Strength (c'-Ø) (kN/m^2-°)	SPT 'N$_{60}$' Value Range (No.) Average	Acid Soluble Sulphate (%) Range (No.)	Water Soluble Sulphate (g/l) Range (No.)	pH Range/No. (Range (No.)
Possible Reworked Material	66 (1) 66	48 (1) 48	78 (1) 78	30 (1) 30	-	31-42[1] (2) 36	-	6 (1) 6	-	-	-
Fuller's Earth (Clay)	17-47 (6) 32	20-41 (6) 31	55-77 (6) 64	25-36 (6) 33	15.0-16.1 (6) 15.6	28-112[1] (10) 50	14 - 29 8 - 24	2-46 (14) 33	0.22-0.34 (4)	0.02-0.04 (4)	8.06-8.23 (4)
Fuller's Earth (Mudstone)	-	-	-	-	-	-	-	41-83[2] (5) 56	-	-	-
Salperton Limestone	-	-	-	-	-	-	-	500-750[2] (6) -	-	-	-

Notes: 1 Hand shear vane
2 Extrapolated 'N' values

Table 6.2 Recommended Geotechnical Design Parameters

Strata	Plasticity Index	γb (kN/m^3)	C_u (kPa)	c'-Ø (kPa-°)	m_v (m2/MN)	UCS (MPa)	DS Class	ACEC Class
Possible Reworked Material	30	16.5	35	0 - 25	-	-	-	-
Fuller's Earth Formation (Clay)	33	15.5 &18[1]	35[2]	14 – 29[3] 8 - 24 0 - 24	0.3 & 0.15[4]	-	DS-1	AC-1s
Fuller's Earth Formation (Mudstone)	-	-	-	0 - 28	-	0.5	-	-
Salperton Limestone	-	-	-	-	-	5	-	-

Notes:
1 γb = 15.5 kN/m^3 in upper layer and 18 kN/m^3 in lower layer
2 Based on SPT and HSV results; Cu = 35kN/m^2 to a depth of 5.5m bgl & Cu = 35kN/m^2 at 5.5m bgl to 80kN/m^2 at 10m bgl
3 It is suggested that a sensitivity analysis be undertaken for effective shear strength parameters during design
4 m_v = 0.3 m^2/MN in upper layer and 0.15 m^2/MN in lower layer

7 Assessment of Potential Contamination

7.1 Introductory information

This section summarises the geo-environmental testing of Made Ground and Possible Reworked Material encountered at the site. Review of the analytical data enables a preliminary assessment of the risks posed to human health, the potential for material re-use on site and the assessment of potential waste disposal routes.

7.2 Contamination testing undertaken

Six soil samples were obtained at depths of between 0.7m and 1.5m bgl from boreholes BH01 to BH03 drilled through the road pavement. They comprised three samples of Made Ground and three of Possible Reworked Material.

A summary of the depths of samples obtained from the boreholes, geological descriptions and chemical testing undertaken on each sample is provided in **Table 7.1** below. The exploratory hole logs are presented in the CC Ground Investigations Factual Report (**Appendix B**).

Table 7.1 Soil Testing undertaken

Borehole ref	Sample depth (mbgl)	Stratum		Analyte tested				
			Metals	BTEX and MTBE	Asbestos screen	TPHCWG	PAH USEPA16	Leachate test (PAHs, metals, TPH)
BH01	0.7	MADE GROUND: Greyish brown and dark grey slightly sandy angular to sub-rounded fine to coarse GRAVEL of limestone, concrete and clinker.	✓	✓	✓	✓	✓	✓
	1.5	POSSIBLE REWORKED MATERIAL: Soft and very soft orangish brown mottled greyish brown slightly gravelly slightly sandy CLAY with a low cobble content. Gravel and cobbles are sub-angular and sub-rounded fine to coarse of limestone. 1.40-1.70m: Rare fossil/shell fragments <10mm.	✓	✓		✓	✓	

Borehole ref	Sample depth (mbgl)	Stratum		Analyte tested					
BH02	1.0	MADE GROUND: Dark grey and greyish brown slightly sandy angular and sub-angular fine to coarse GRAVEL of slag, clinker and ash.	✓	✓	✓	✓	✓	✓
	1.4	POSSIBLE REWORKED MATERIAL: Medium dense yellowish brown slightly sandy GRAVEL & COBBLES of limestone.	✓	✓		✓	✓	
BH03	1.0	MADE GROUND: Dark grey, orangish brown and greyish brown slightly sandy slightly clayey angular and sub-angular fine to coarse GRAVEL of limestone, clinker and ash. 0.90-1.10m: Low cobble content. Cobbles are sub-angular of limestone.	✓	✓	✓	✓	✓	✓
	1.4	POSSIBLE REWORKED MATERIAL: Soft and very soft orangish brown mottled greyish brown slightly gravelly slightly sandy CLAY with a low cobble content. Gravel and cobbles are sub-angular and sub-rounded fine to coarse of limestone.	✓	✓		✓	✓	

7.3 Human health Risk Assessment

Desk study information suggests that the Prison Copse Wall site is highly unlikely to be contaminated. Therefore, a full geo-environmental assessment is not considered necessary. However, a preliminary geo-environmental assessment has been undertaken, using suitable generic assessment criteria (GAC) for the protection of human health.

Whilst it is noted that GAC for short term exposure to construction workers have not been set and, where GAC are set, are used for long term assessment for other situations, they are generally considered suitably conservative for the assessment of shorter term exposure. The preliminary assessment of risks to human health from the materials obtained from site and analysed assumes a Public Open Space (Park) end land use. The GAC chosen were EA/Defra Category 4 Screening Levels (C4SLs) [**Ref 20**] and LQM/CIEH Suitable 4 Use Levels (S4ULs) [**Ref 21**] where C4SLs were unavailable. The soil organic matter (SOM) for the soil samples taken was not measured, and a conservative average SOM of 1% was assumed when selecting the applicable GAC.

Where GACs are not exceeded there is unlikely to be a significant possibility of significant harm to the (human) health of long term users if the assumptions remain unchanged. However should the proposed land use change, the results may need to be re-assessed.

The full analytical results are presented in **Appendix B**.

No individual analyses from any samples exceeded the relevant assessment criteria. Asbestos was not detected.

It is noted that, although a sample from a depth of 1.4m bgl in borehole BH03 recorded an elevated concentration of Total Petroleum Hydrocarbons (TPH) C6-C40 (1100mg/kg compared with the reference level of 1100mg/kg) as discussed later, it falls below the relevant assessment criteria for human health.

Although no long term human health risks were identified from the samples taken and tested, it should be noted that site operatives should be advised that the site has the potential to be contaminated. As such, suitable personal protective equipment (PPE) should be worn to protect workers from site specific hazards as described under CIRIA R132 Guidance, A Guidance for Safe Working on Contaminated Sites [**Ref 22**]. The primary risk for exposure from contamination is via dermal pathways during construction works at the site, and therefore operatives should wear hand protection (nitrile gloves), overalls (covering arms), and eye protection where necessary, in addition to standard PPE. Should olfactory or visual evidence of gross contamination be encountered on site, work should cease and a Geo-Environmental Specialist should be consulted.

7.4 Waste acceptance

To determine the likely waste class of excavated soils, a waste categorisation exercise has been undertaken assuming that offsite disposal will occur. If possible, it is preferable that the proposed construction is designed to minimise volumes of waste, or that material can be re-used in preference to landfill disposal.

Waste classification is a two stage process. The first stage comprises a hazard assessment of soil quality data in line with guidance set out in the Environment Agency WM3 document [**Ref 23**], which provides a likely List of Waste (LoW) code. Once the hazardous nature of the materials is known, the second stage is to assess the potential performance of the materials in hazardous or inert landfills, by considering the results of waste acceptance criteria (WAC) testing. However, WAC testing is beyond the scope of this assessment.

Chemical test results have been analysed using the HazWaste online assessment tool following the WM3 V1 document methodology (**Ref 23**). This allows waste hazard classification and determines whether the waste is likely to be hazardous or non-hazardous. This determination can reduce the need for further Waste Acceptance Criteria (WAC) which is used primarily to confirm disposal routes.

Six soil samples were tested, as summarised in **Table 7.2**. The full waste classification report can be seen in **Appendix D**.

Table 7.2: Summary of HazWaste Classification

Samples (depth m bgl)	Waste hazard classification code	Hazardous Properties
BH01 (0.7m)	**Non Hazardous Waste 17 05 04**	None
BH01 (1.5m)	**Non Hazardous Waste 17 05 04**	None
BH02 (1.0m)	**Non Hazardous Waste 17 05 04**	None
BH02 (1.4m)	**Non Hazardous Waste 17 05 04**	None
BH03 (1.0m)	**Non Hazardous Waste 17 05 04**	None
BH03 (1.4m)	**Hazardous 17 05 03*** (0.11% TPH C6 to C40)	**HP 7: Carcinogenic** "waste which induces cancer or increases its incidence" Risk Phrase: **Carc. 1B; H350** **HP 11: Mutagenic** "waste which may cause a mutation, that is a permanent change in the amount or structure of the genetic material in a cell" Risk Phrase: **Muta. 1B; H340**

Five samples were determined to be non-hazardous, and will likely have a List of Waste (LoW) code for Construction and Demolition Wastes of 17 05 04 (Soil and stones other than those mentioned in 17 05 03). This material is suitable for disposal in a non-hazardous landfill.

The sixth sample, from a depth of 1.4m bgl in borehole BH03, was determined to be hazardous due to concentrations of TPH C6-C40 greater than 1000mg/kg. This sample will have a likely LoW code for Construction and Demolition Waste of 17 05 03* (Soil and stone containing hazardous substances). To clarify the most appropriate waste stream of this material, WAC testing would need to be undertaken.

Waste generated from site will need to be sorted and screened etc. in order to minimise the volume of hazardous waste being disposed. Relevant chemical test data along with material descriptions and LoW codes will need to be provided to the proposed landfill, and confirmation sought as to the final classification and subsequent cost associated with disposal.

8 ENGINEERING ASSESSMENT

8.1 Ground Model

The road at the Prison Copse Wall site has been constructed on sidelong ground in which indications that historic slope instability has previously occurred are apparent.

Inspections indicate that cracking and depressions within the road pavement are due to the deterioration and movement of the supporting retaining wall. It is probable that the retaining wall deterioration has been caused by possible deteriorating ground conditions, ground movements and possible road drainage issues.

The effects of ground movements and road pavement and retaining wall deterioration extend for approximately 80m, with the most severe area of carriageway cracking and depressions and retaining wall defects being in the central area directly above the highest section of the retaining wall. The masonry facing of the concrete retaining wall is now dislocated and leans out towards the field beneath.

Anticipated ground conditions have been confirmed by the ground investigation and can be summarised as in **Table 8.1** below.

Table 8.1 Ground Model

Strata	General description	Depth to top of strata (m bgl)	Depth to base of strata (m bgl)	Thickness (m)
Road Construction	Bituminous surfacing underlain by slightly sandy angular to subrounded fine to coarse gravel of limestone, concrete and clinker	Road pavement level	0.8 to 1.2	0.8 to 1.2
Possible Reworked Material	Slightly sandy clayey Gravel and Cobbles of limestone over soft and very soft slightly gravelly slightly sandy Clay with cobbles	0.8 to 1.2	1.7 to 2.1	0.6 to 1.3
Fuller's Earth Formation (Clay)	Very soft and soft extremely closely fissured grey and brown slightly gravelly slightly sandy silty Clay	1.7 to 2.1	5.4 to 6.7	3.3 to 5.0
Fuller's Earth Formation (Clay)	Firm and stiff extremely closely fissured bluish grey slightly sandy silty Clay	5.4 to 6.7	7.9 to 10.0	2.0 to 3.4
Fuller's Earth Formation (Mudstone)	Extremely weak laminated bluish grey Mudstone	7.9 to 10.0	10.9 to 11.9	Nil to 3.1
Salperton Limestone Formation	Very weak thinly and thickly bedded Limestone	10.9 to 11.9	Base not penetrated	-

A Schematic Geological Cross-Section along the length of the wall from road pavement level is presented in **Figure 11**.

Groundwater was encountered at depths of 3.1m and 3.3m bgl in two boreholes during drilling, and was monitored in standpipe piezometers following site work at depths of 2.5m and 3.3m bgl.

8.2 Options Review

The road is currently closed and in order to return it to service it will be necessary to repair or replace the existing damaged retaining wall.

Cored holes into the retaining wall indicate it to comprise a Cotswold stone faced concrete structure. Visual inspection of the Cotswold stone facing blocks have indicated that they are generally in poor condition, having weathered and split, and are unlikely to be suitable for re-use. The cored holes have also indicated that the Cotswold stone is embedded in the concrete structure and will therefore be difficult to remove. The condition of the concrete element of the wall should be assessed by a Structural Engineer and appropriate options be considered. However, given that cracking and subsidence is apparent in the road pavement, it is probable that the concrete element of the wall is also in poor condition.

In addition to reconstruction of the road pavement as part of the remediation scheme, it will also be necessary to investigate the extent and condition of the existing drainage system and to incorporate adequate drainage into the scheme.

The ground investigation indicated that the toe of the retaining wall is founded within soft cohesive material. Ground water has been monitored at a depth of approximately 1m below the toe of the retaining wall. These observations indicate that the failure is mechanism is likely to be shallow in nature; however this assumption is not supported by the inclinometer monitoring data which has been inconclusive to date. Therefore further monitoring is recommended before the design of a remedial solution is progressed.

The potential remedial solutions outlined in **Table 8.2** below have been recommended on the basis that the carriageway has failed due to a shallow failure.

Table 8.2 Options Review

Option	Advantages	Disadvantages	Recommendation
Gabions	• Relatively low cost in itself • Simple design • Low environmental impact • Medium to long term solution	• Significant height and intrusion into third party land required • Would require demolition of existing structure and reconstruction of road • Durability and settlement; flow of fines over time • Increased construction time and manual handling • Excavation requirements	NOT RECOMMENDED
Gravity retaining wall	• Relatively simple design • Long term solution	• Issues with loading of heavy plant in area of failed mass • Would require demolition of existing structure and reconstruction of road • High short term environmental impact • Significant volume and cost of imported material • Could not be completed within highways boundaries	NOT RECOMMENDED
Anchoring of existing concrete structure	• Anchoring into competent material required due to poor superficial materials • Long-term solution. Robust design with slope drainage provision. • Proven technology. • Reduced temporary works requirement. • Limited land take required.	• Would require significant length of anchor to reach competent materials • Anchors will be required to penetrate through a significant depth of existing retaining wall and fill construction • Would require construction operatives to work from base of retaining structure • Feasibility dependent on current condition of concrete element of the wall, which would need to be determined	NOT RECOMMENDED
King post wall	• Long term solution • Relatively low cost structural option • Proven technology. • Limited land take required.	• Significant temporary works platform required; issues with loading of heavy plant in area of failed mass • May require demolition of existing structure and reconstruction of road • Requirement for site workers to operate at the base of the defective wall • High short term environmental impact • High cost of facing retaining wall with Cotswold stone to blend in with the surrounding	RECOMMENDED FOR CONSIDERATION

		environment	
Piled retaining wall	• Robust and long term solution in combination with slope drainage measures • Would provide a satisfactory factor of safety for shallow and deeper seated failures • Proven technology. • Limited land take required.	• Relatively expensive due to embedded length requirements • Significant temporary works platform required; issues with loading of heavy plant in area of failed mass • High short term environmental impact • High cost of facing retaining wall with Cotswold stone to blend in with the surrounding environment	RECOMMENDED FOR CONSIDERATION

The engineering assessment and provisional options review has highlighted two engineering options that are considered to be worthy of detailed assessment considering a shallow failure mechanism, condition of the concrete structure, the projected comparative costs, in addition to environmental and other factors:

- Sheet Pile Wall: support existing wall with temporary works and drive sheet piles in front of the wall. Grout void in between existing wall and sheet piles. Face sheet piles with Cotswold stone. Undertake carriageway reconstruction and resurfacing. Whilst this would be the most expensive solution to construct it is the option with the least design, construction and financial risk.
- King Post Wall: support existing wall with temporary works and drive king posts. Install whaler beams and face wall with Cotswold stone. Undertake carriageway reconstruction and resurfacing. It should be noted that this solution, whilst considerably cheaper than the sheet pile option is only viable dependent on the findings of further design work to determine the nature of the slip that has caused the carriageway cracking and wall displacement. There would also be an increased requirement for site workers to operate at the base of the defective wall presenting health and safety risks. Further consultation with specialist construction contractors and a detailed design would be required to establish the validity of this solution.

The piled retaining wall and king post wall solutions would be suitable for remediating a shallow failure. If a deeper seated failure plane is determined to be present, further design options will need to be considered.

Amey have generated **Tables 8.3** and **8.4** of projected costs below, based on the Spons 2016 guide [**Ref 24**] and on 2016 Amey Consultancy fee rates for the GCC contract.

Table 8.3 Projected Costs – Driven Sheet Pile Wall	
Cost Item	**Sum**
Construction:	
Preliminaries	£11,000
Temporary works	£22,000
Sheet pile construction	£199,326
Grouting voiding	£27,799
Rebuild stone facing	£146,907
Carriageway construction	£48,090
Contingency	£22,000
Total	**£477,122**
Consultancy and Design:	
Design (20% construction – £30,654 GI and reporting costs)	£64,770
Supervision (10% construction)	£47,712
Total	**£112,482**
Grand Total	**£589,604**

Table 8.4 Projected Costs – King Post Wall	
Cost Item	**Sum**
Construction:	
Preliminaries	£11,000
Temporary works / king post installation	£65,979
Rebuild stone facing	£96,206
Carriageway construction	£48,090
Contingency	£22,000
Total	**£243,306**
Consultancy and Design:	
Design (20% construction – £30,654 GI and reporting costs)	£22,866
Supervision (10% construction)	£26,760
Total	**£49626**
Grand Total	**£292,901**

In preparation of the projected costs, the following is noted:

- Costs are projected from known current information and may be subject to amendment following topographical survey, further ground investigation, preliminary and detailed design.
- Costs are for comparative purposes; estimates have been provided for drainage and road re-construction or re-surfacing which is likely to be required for all options.
- Rates have been taken from the Spons 2016 guide [**Ref 24**] and the 2016 Amey Consultancy fee rates for the GCC contract.
- Assumed length of wall to be constructed is 120m.

In order to allow a more robust estimate of expected construction costs for each solution, it is recommended that preliminary design be undertaken.

9 GEOTECHNICAL RISK REGISTER

9.1 Geotechnical Risk Assessment

A review of the geotechnical and environmental risks associated with the proposed works has been undertaken. The risks have been evaluated using a risk evaluation matrix as presented below in **Table 9.1** below. Although not a GCC standard, reference has been made to Part 3 of HD 41/03 'Maintenance of Highway Geotechnical Assets' [**Ref 25**] as part of the risk assessment process.

Table 9-1: Risk Evaluation Matrix

LIKELIHOOD (L)		X	**SEVERITY (S)**			=	**RISK (R)**					
% Likelihood			TIME, COST, HSEQ, REPUTATION					Severity				
								1	2	3	4	5
Almost Certain	5		Negligible Impact	1	E.g. Programme, budget, commercial sensitivity, SHE risks and reputation	Likelihood	5	5	10	15	20	25
Probable	4		Client and Contract strained	2			4	4	8	12	16	20
Possible	3		Client dissatisfaction and damage to Amey relationships	3			3	3	6	9	12	15
Unlikely	2		Threat to future schemes and Client/business relationships	4			2	2	4	6	8	10
Negligible	1		Threat to contract credibility	5			1	1	2	3	4	5

Risk Ratings

1 to 5 Green Risk is negligible or of otherwise low severity (green) and shall be set aside for further consideration.

6 to 12 Amber Risk is unacceptable and shall be subject to further analysis and evaluation.

13 to 25 Red Risk is unacceptable and shall be subject to immediate analysis and evaluation.

The risk register is detailed in **Table 9.2**. The risk register lists the anticipated geotechnical and environmental hazards associated with the works and the potential consequences of those hazards. The risk before control of the hazard has been assessed quantitatively as has the anticipated risk following the proposed response to each hazard.

Table 9.2: Geotechnical Risk Register

Hazard	Consequence	Risk before control			Response	Risk after control		
		(L)	(S)	(R)		(L)	(S)	(R)
Prison Copse Wall, Northleach								
Ground and groundwater conditions different to those anticipated / unforeseen ground conditions	Inadequate design assumptions caused by missing data. Inadequate design solutions caused by insufficient ground information.	**3**	**3**	**9**	Identify any possible shortage of GI information. Carry out additional GI if necessary. Adequate / conservative design assumptions shall be adopted to ensure that a suitable long term Factor of Safety is maintained including the worst credible ground condition; Additional cost and delays shall be allowed to program for re-design and mobilisation of appropriate plant. Temporary support, or/and appropriate dewatering or control measures may be required during construction	**1**	**3**	**3**
Weak / compressible ground	Unacceptable serviceability settlements of potential retaining wall solution. Localised areas of weak materials causing further instability.	**3**	**3**	**9**	Undertake settlement calculations at design stage and include measures in solution to accommodate where necessary. Excavate soft materials were necessary to prevent further instability.	**1**	**3**	**3**

Hazard	Consequence	Risk before control			Response	Risk after control		
		(L)	(S)	(R)		(L)	(S)	(R)
Extensive temporary works arrangements for construction activities. Provisions for water control etc.	Slope instability, retaining wall instability, difficult working conditions, implications for remedial design. Delay to programme and additional costs. Working on slopes.	3	3	9	Ensure temporary stability has been designed for. Consider groundwater during construction sequence. Assess groundwater conditions based on long-term monitoring. Consider conservative assumptions for groundwater condition in the design. Temporary support, and/or appropriate dewatering or control measures may be required during construction. Access constraints to be assessed by Main Contractor with appropriate working practises employed for slopes.	1	3	3
Aggressive chemicals/ compounds present in site soils/water	Chemical attack on concrete, leading to structural failure over time.	2	3	6	Suitable class of concrete to be used in line with ground conditions.	1	3	3
Encountering localised contaminated materials.	Health and safety implications for site personnel. Additional costs and delays to program whilst contamination is quantified and remedial measures implemented.	2	4	8	Contamination samples tested as part of the ground investigation. No significant levels of contamination encountered. Additional testing would be required to determine WAC Classifications for any materials taken off site. Pass all appropriate ground investigation information to the design team and appointed contractor. Any visual or olfactory evidence of contamination to be recorded and appropriate personnel notified. Appropriate PPE to be worn at all times.	1	4	4

Hazard	Consequence	Risk before control			Response	Risk after control		
		(L)	(S)	(R)		(L)	(S)	(R)
Presence of unidentified utilities (buried or overhead)	Utilities strikes during construction. Health risk to site users from electrocution etc. Delays during construction.	3	4	12	Obtain plans from statutory authorities and carry out CAT scanning and trial holes to confirm locations as necessary. Plan service diversions as required and include diversions in the construction programme.	1	4	4
Disruption to completing works by third party	Equipment and man-power idle leading to standing time costs. Delay in completion	2	3	6	Stakeholder participation in the planning of works to ensure that disruption of highway use is limited. Keep third parties up to date with monitoring and planning to ensure good relationships are maintained.	2	2	4

10 References

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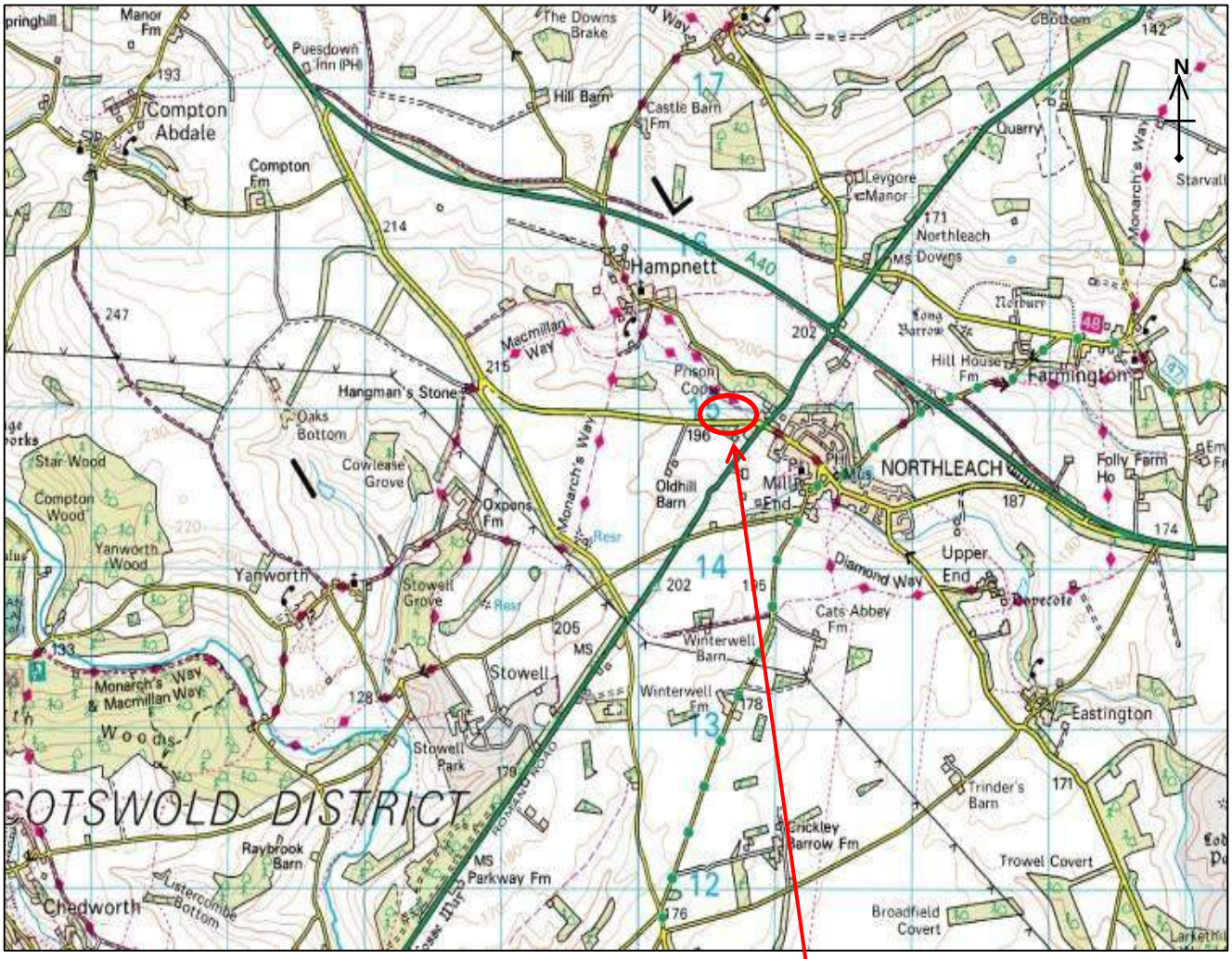
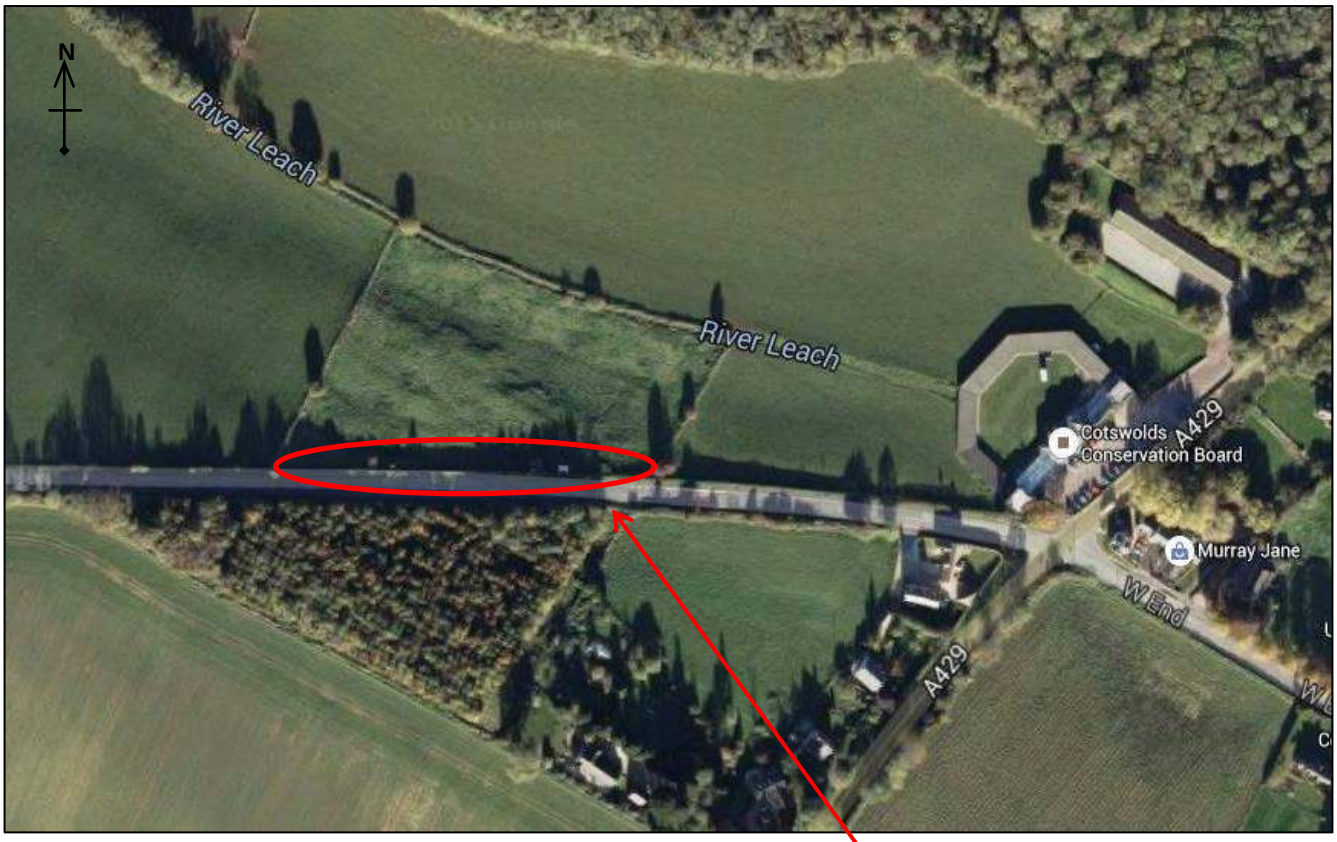
FIGURES



NGR: 410635, 214925
SP108149

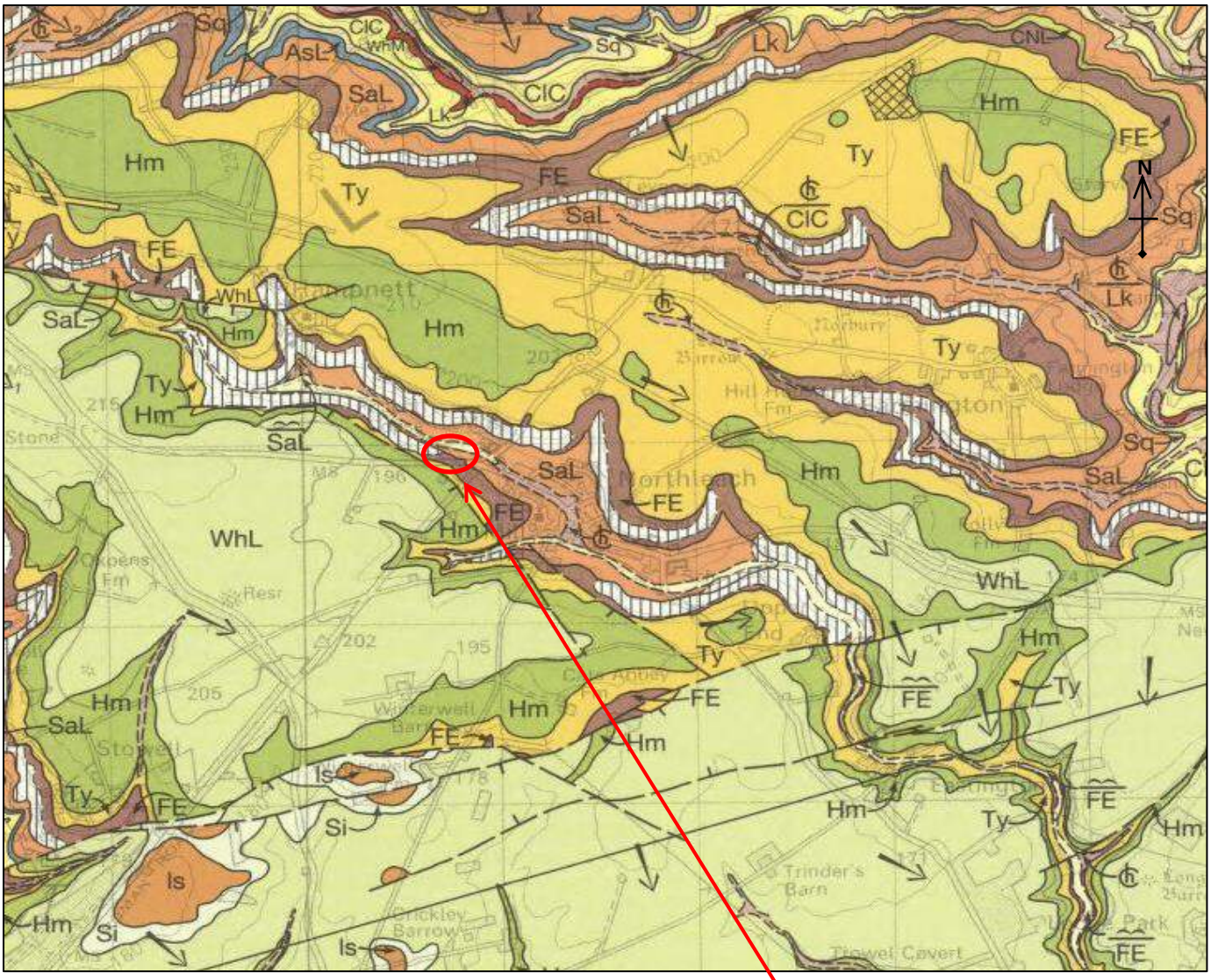
Source: Ordnance Survey

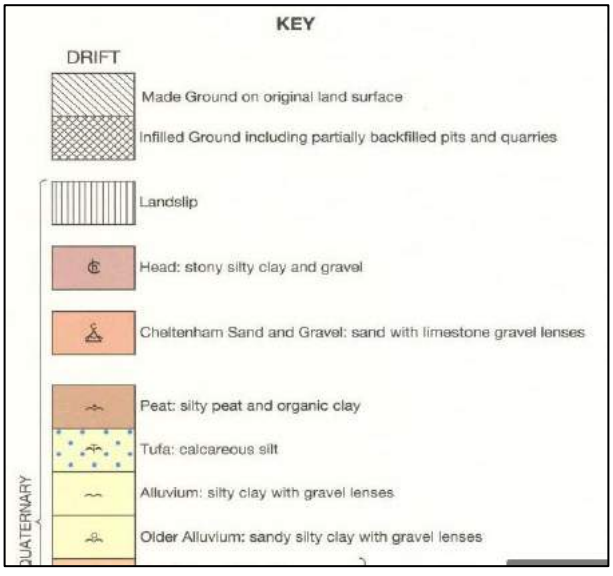
Project:	**Prison Copse Wall, Northleach**		
Report:	**Ground Investigation Report**		
Title:	**Site Location Plan**		
Report Reference:	**CON-GE-BHAM-COGL43048589-GIR-001**	Figure Reference:	**Figure 1**

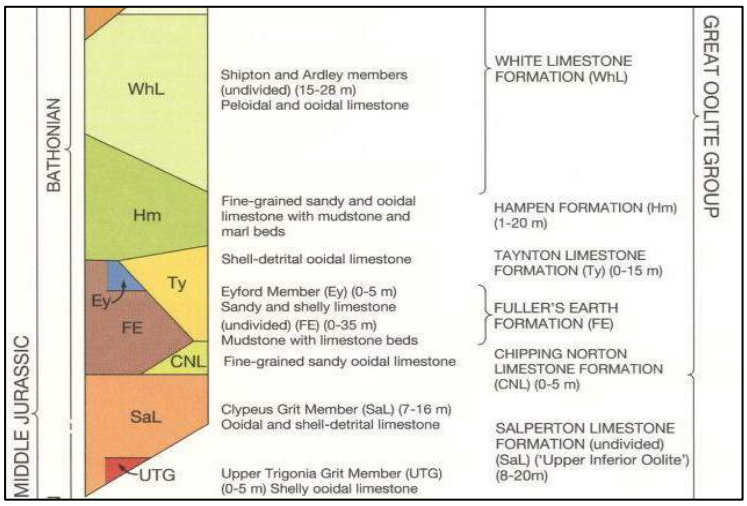


Source: Google Maps

Project:	**Prison Copse Wall, Northleach**		
Report:	**Ground Investigation Report**		
Title:	**Aerial Photograph**		
Report Reference:	**CON-GE-BHAM-COGL43048589-GIR-001**	Figure Reference:	**Figure 2**

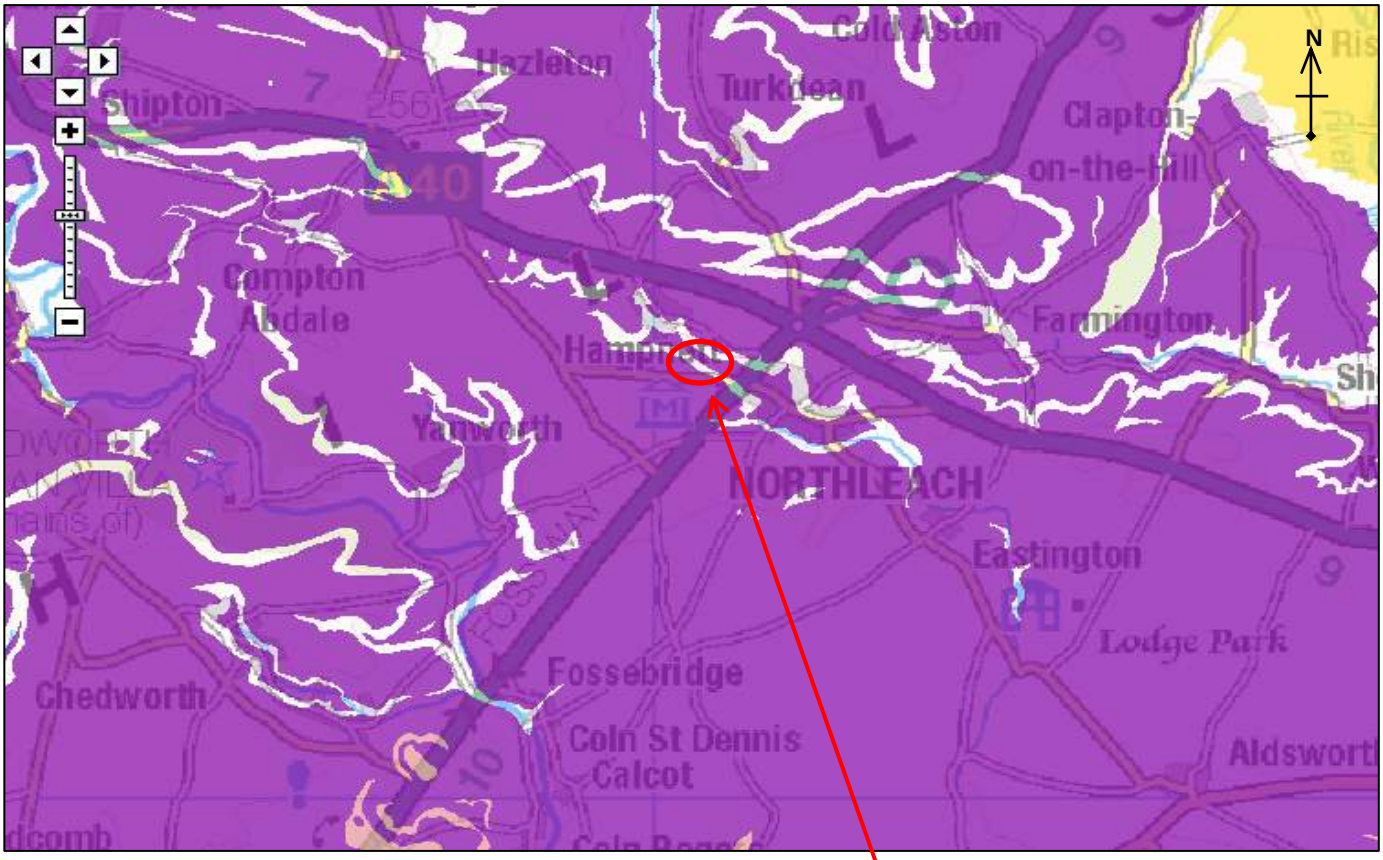






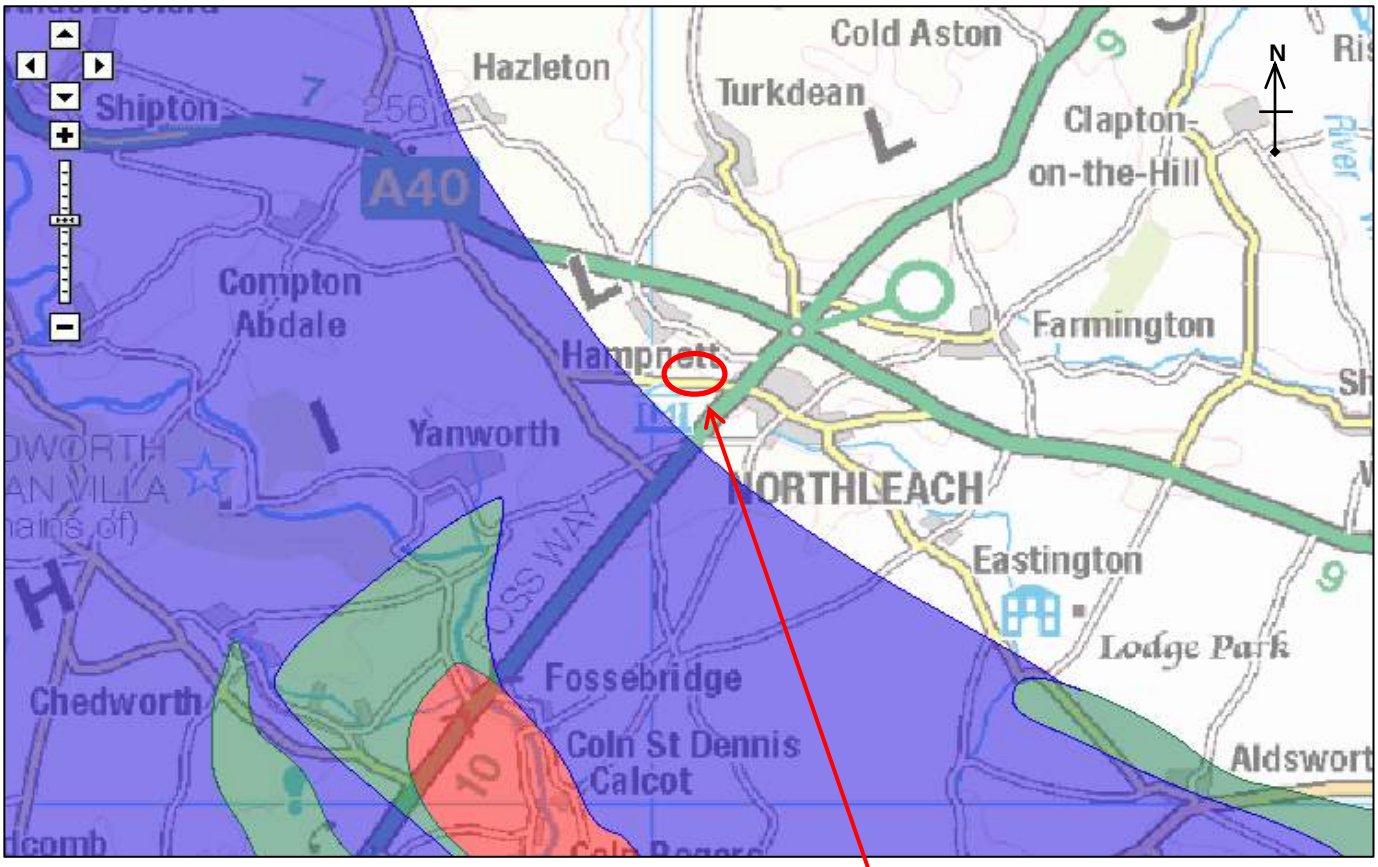
Source: British Geological Survey

Project:	**Prison Copse Wall, Northleach**		
Report:	**Ground Investigation Report**		
Title:	**Geological Map**		
Report Reference:	**CON-GE-BHAM-COGL43048589-GIR-001**	Figure Reference:	**Figure 3**



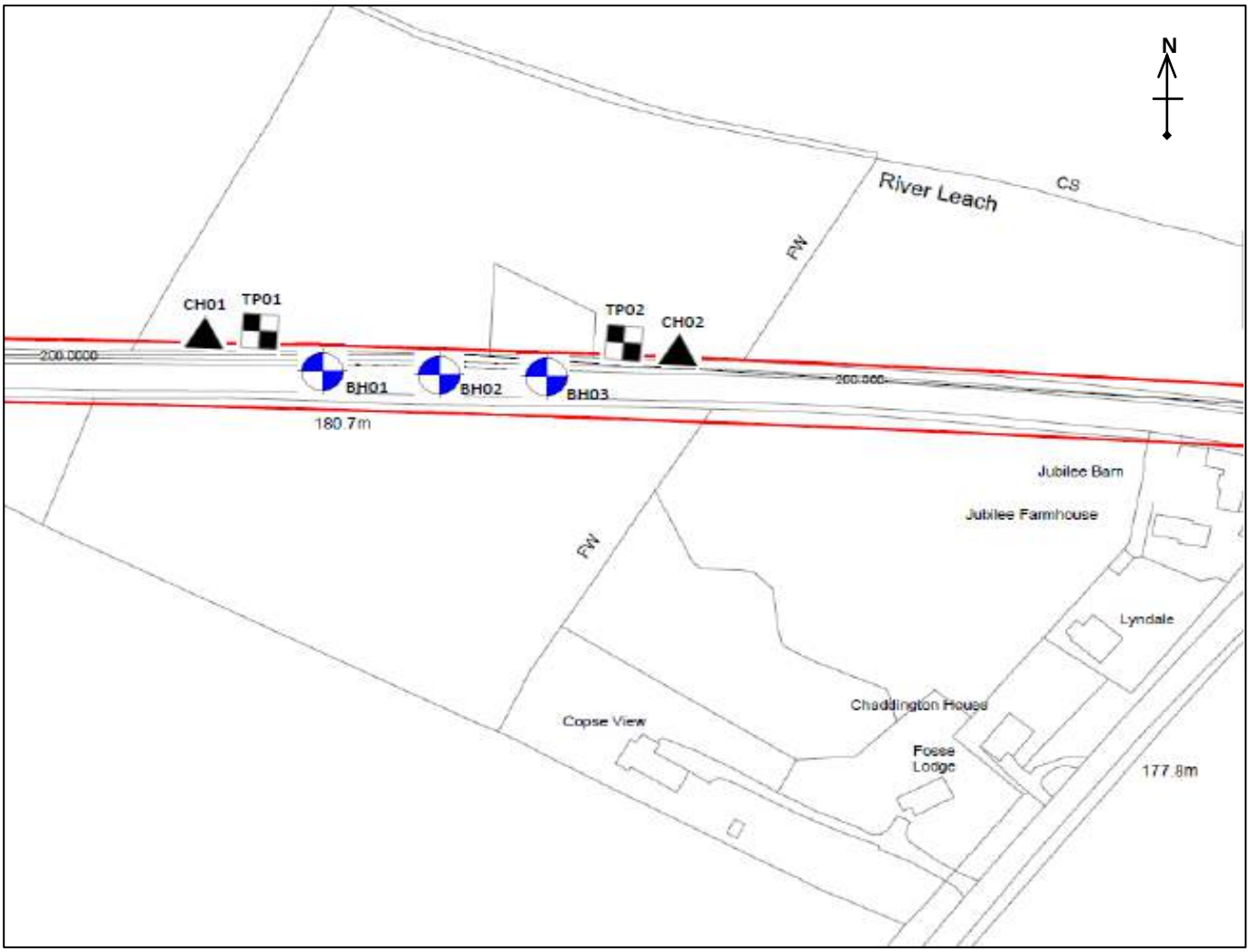
Source: Environment Agency

Project:	**Prison Copse Wall, Northleach**		
Report:	**Ground Investigation Report**		
Title:	**Aquifer Map**		
Report Reference:	**CON-GE-BHAM-COGL43048589-GIR-001**	Figure Reference:	**Figure 4**



Source: Environment Agency

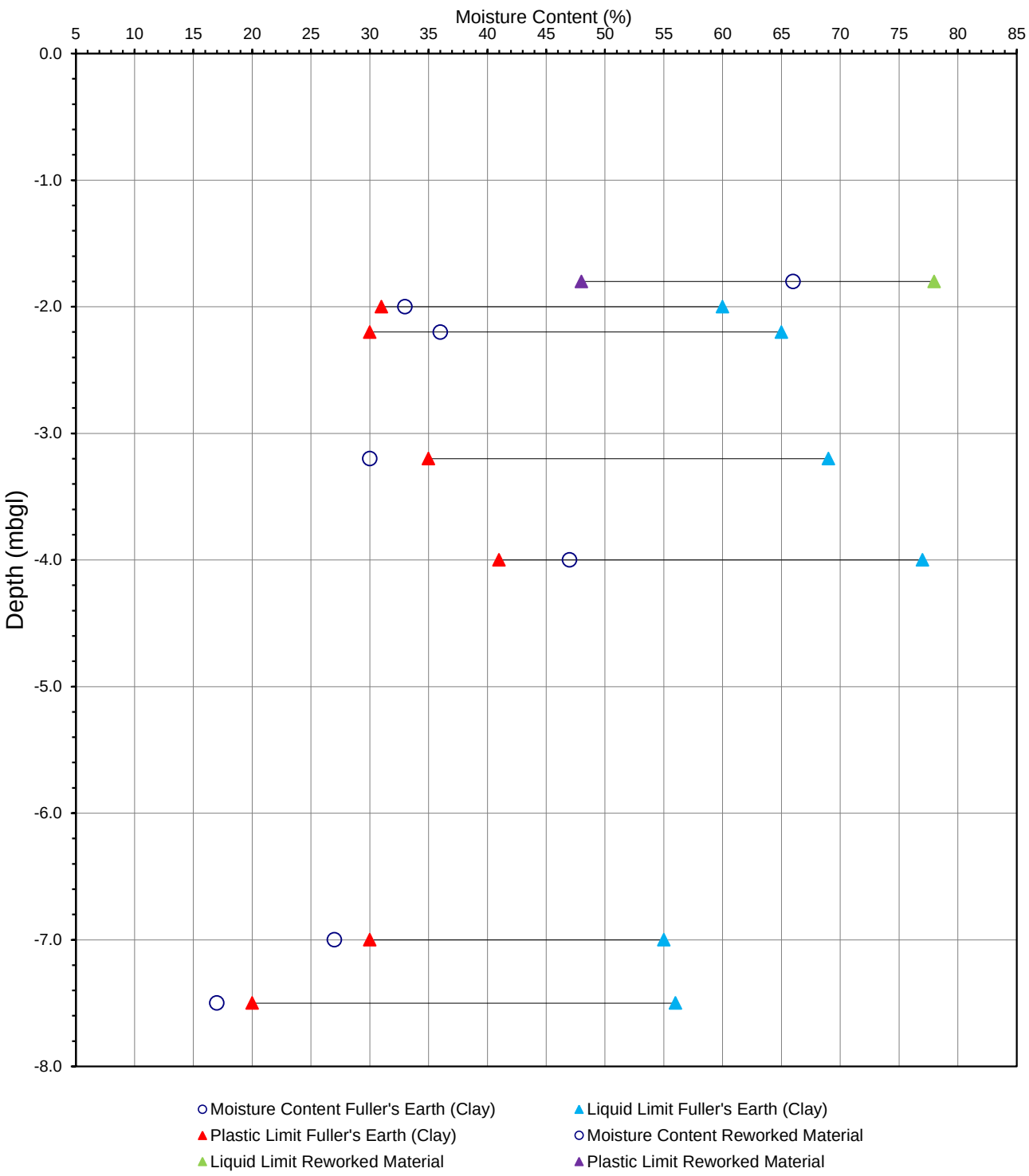
Project:	**Prison Copse Wall, Northleach**		
Report:	**Ground Investigation Report**		
Title:	**Groundwater Source Protection Map**		
Report Reference:	**CON-GE-BHAM-COGL43048589-GIR-001**	Figure Reference:	**Figure 5**



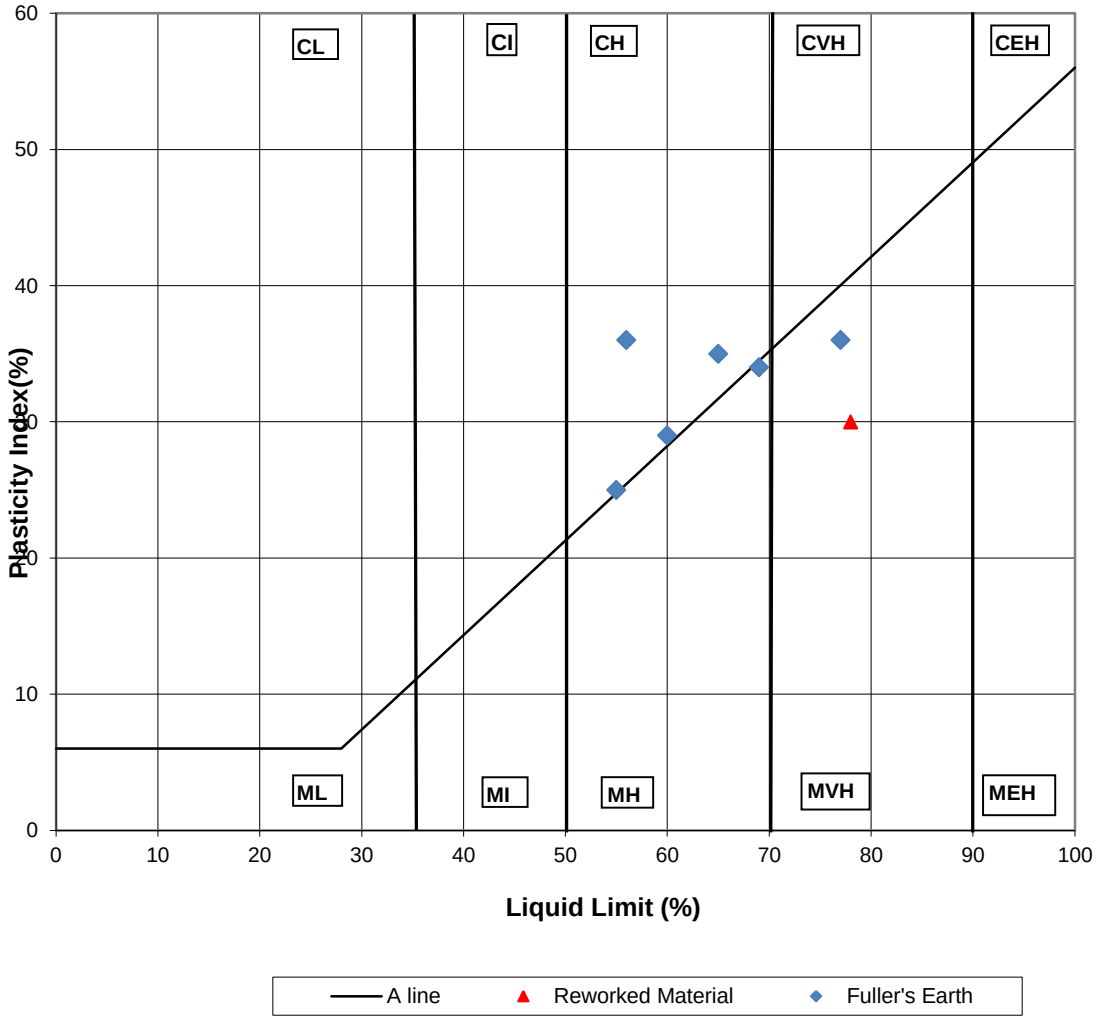
Source: CCGI Factual Report

Project:	**Prison Copse Wall, Northleach**		
Report:	**Ground Investigation Report**		
Title:	**Exploratory Hole Location Plan**		
Report Reference:	**CON-GE-BHAM-COGL43048589-GIR-001**	Figure Reference:	**Figure 6**

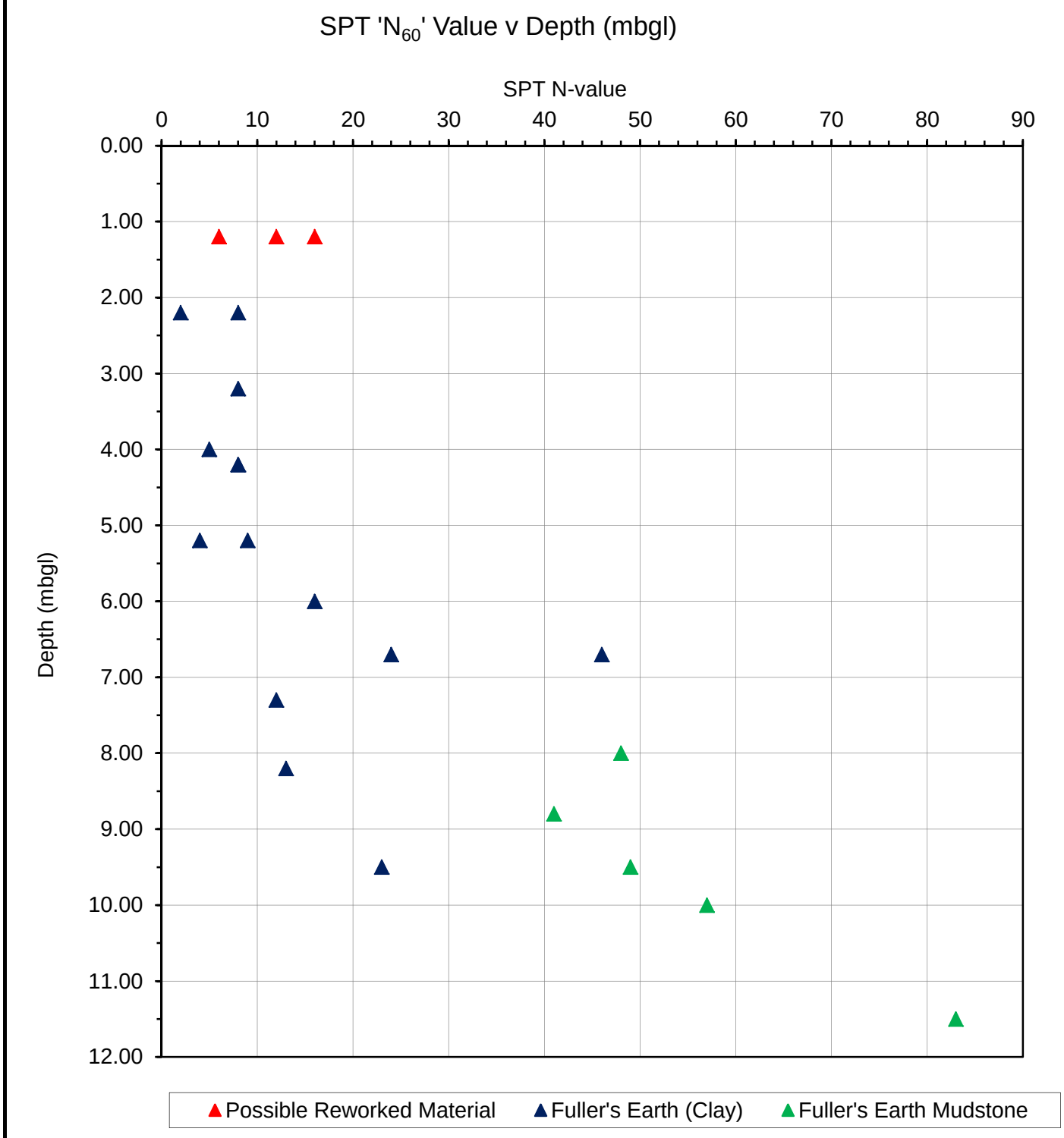
Moisture Content, Liquid Limit and Plastic Limit



Project:	**Prison Copse Wall, Northleach**		
Report:	**Ground Investigation Report**		
Title:	**Moisture Content, Liquid Limit and Plastic Limit v Depth (mbgl)**		
Report Reference:	**CON-GE-BHAM-COGL43048589-GIR-001**	Figure Reference:	**Figure 7**

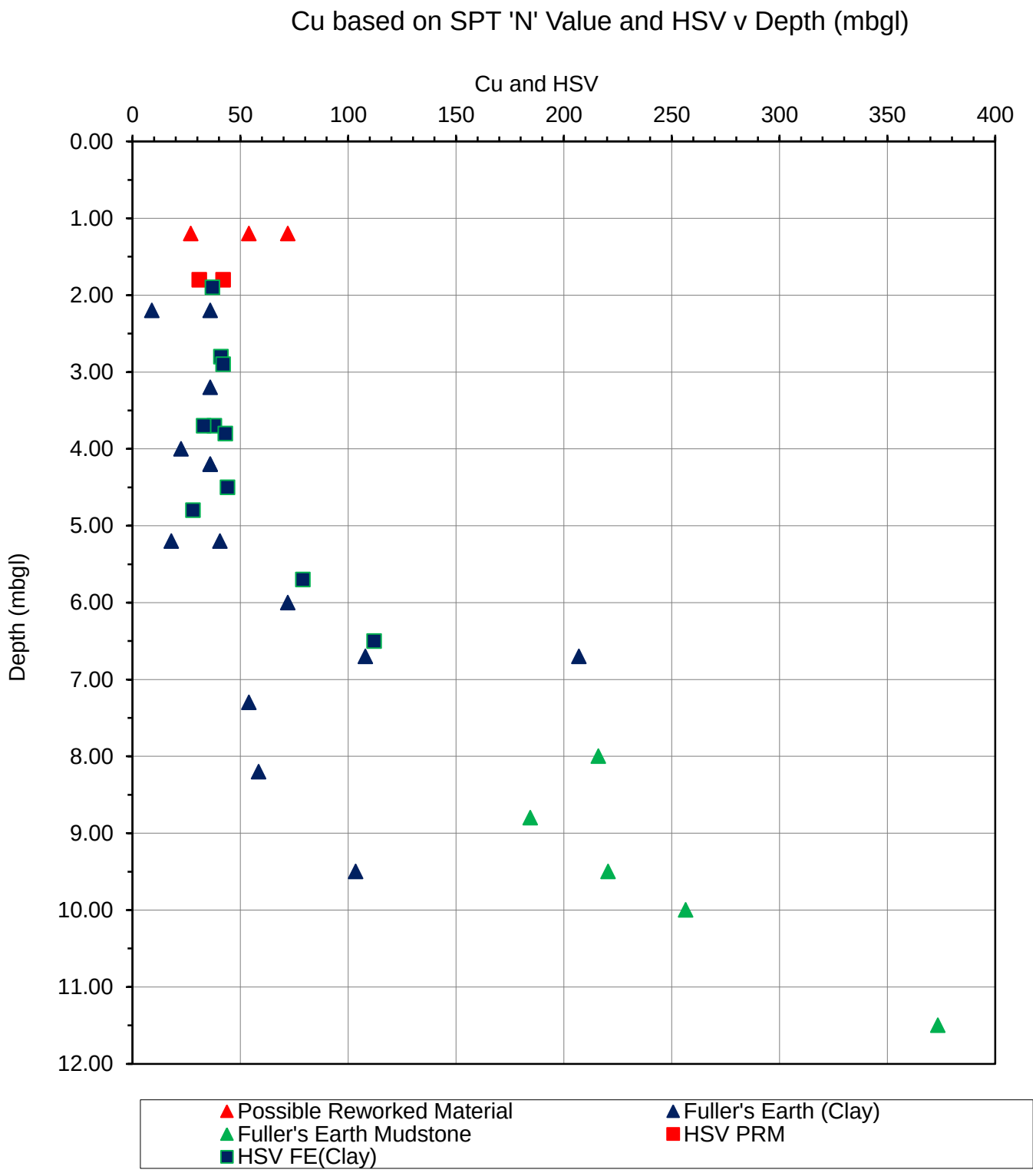


Project:	**Northleach Prison Copse Wall**		
Report:	**Ground Investigation Report**		
Title:	**Plasticity Chart**		
Report Reference:	**CON-GE-BHAM-COGL43048589-GIR-001**	Figure Reference:	**8**

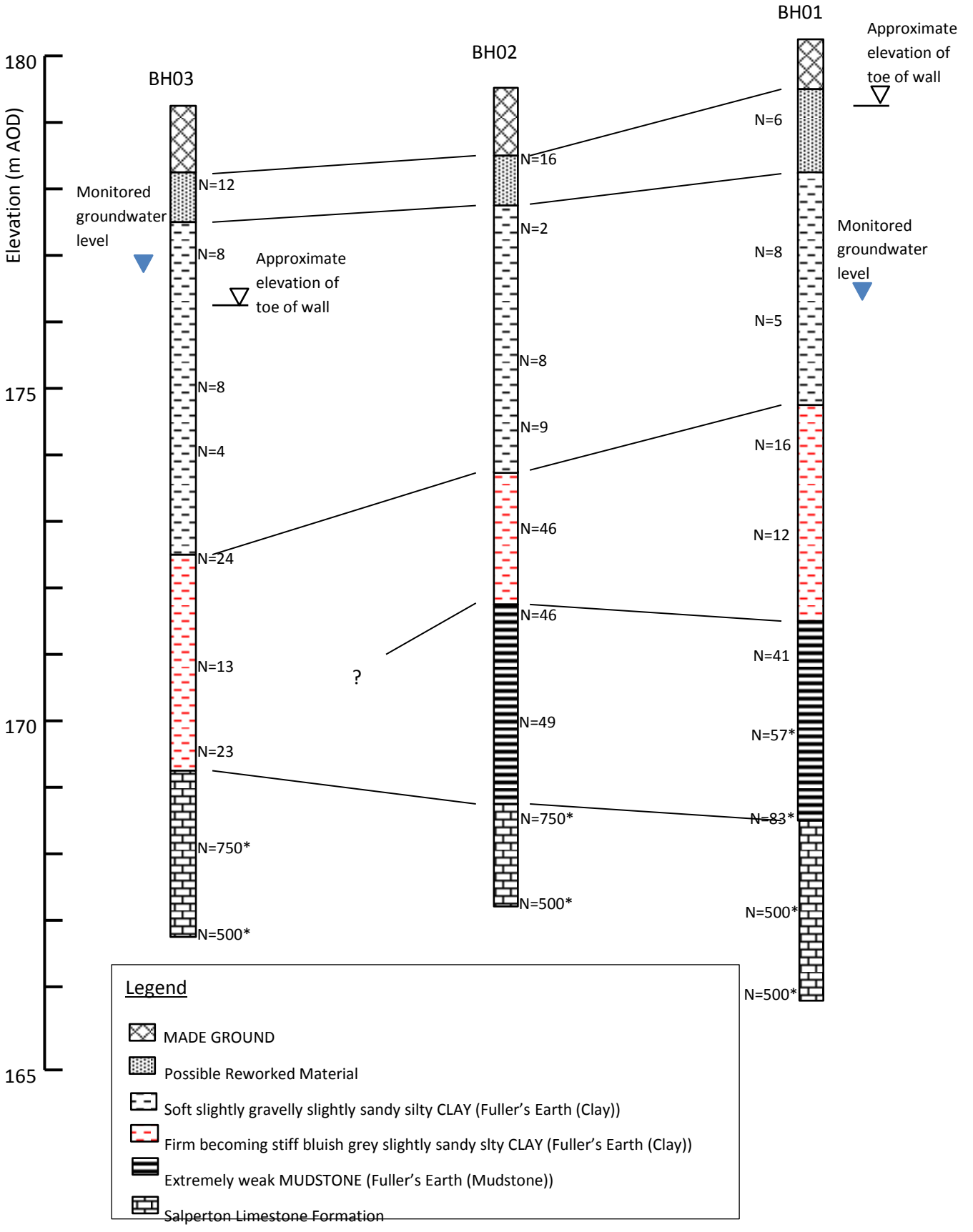


Note: Values of N_{60} greater than 50 are extrapolated values.

Project:	**Northleach Prison Copse Wall**		
Report:	**Ground Investigation Report**		
Title:	**SPT 'N_{60}' v Depth (mbgl)**		
Report Reference:	**CON-GE-BHAM-COGL43048589-GIR-001**	Figure No:	**Figure 9**



Project:	**Northleach Prison Copse Wall**		
Report:	**Ground Investigation Report**		
Title:	**Cu based on SPT and HSV v Depth (mbgl)**		
Report Reference:	**CON-GE-BHAM-COGL43048589-GIR-001**	Figure No:	**Figure 10**



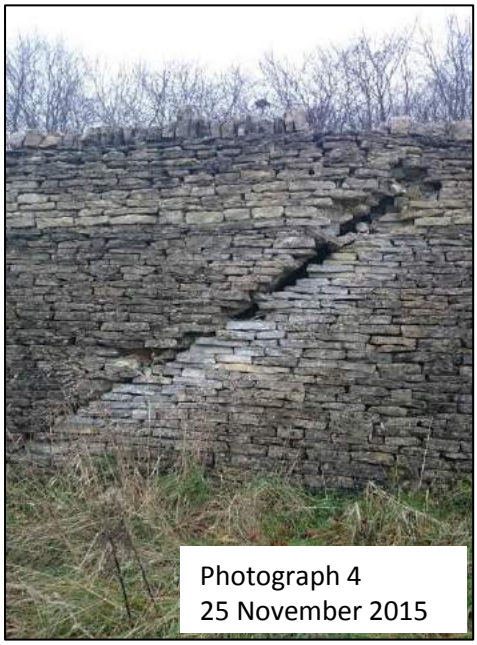
Project:	**Prison Copse Wall, Northleach**		
Report:	**Ground Investigation Report**		
Title:	**Schematic Geological Cross-Section**		
Report Reference:	**CON-GE-BHAM-COGL43048589-GIR-001**	Figure Reference:	**Figure 11**

Appendix A Photographs

Photograph 1
25 November 2015

Photograph 2
25 November 2015

Photograph 3
29 November 2016



Photograph 4
25 November 2015

Photograph 5
29 November 2016

Photograph 6
25 November 2015

Photograph 7
29 November 2016

Photograph 8
25 November 2015

Photograph 9
29 November 2016

Photograph 10
25 November 2015

Photograph 11
25 November 2015

Photograph 12
25 November 2015

Photograph 13
25 November 2015

Appendix B CCGI Factual Ground Investigation Report

CC Ground Investigations Ltd

DRAFT

FACTUAL REPORT

SITE: Prison Copse Wall, Northleach

CLIENT: Amey

ORDER No: **4800051555**

DATE: 12 April 2017

REPORT No: C5530

CC Ground Investigations Ltd • Unit A2 • Innsworth Technology Park • Innsworth Lane • Gloucester • GL3 1DL • UK
T: 01452 739165 • F: 01452 739220 • info@ccground.co.uk • www.ccground.co.uk
Directors: Mark Carden, Rob Clarke • Registered in England and Wales No.4238891

CONTENTS

1. INTRODUCTION

This investigation was carried out by CC Ground Investigations Ltd (CCGI) on the instruction and on behalf of Amey (The Client and the Engineer).

The purpose of the ground investigation was as follows:

- To determine the failure mechanism of the ground underlying the retaining wall.
- To determine the ground conditions and obtain appropriate soil parameters for use in the pioneering of geotechnical solutions to remediate the retaining wall and to obtain groundwater information.
- To identify any contamination of the underlying soils and groundwater, with particular attention to geotechnical engineering constraints and waste disposal.
- To determine the internal construction and dimensions of the dry stone retaining wall.

The scope of the ground investigation was defined in the Engineer's specification, reference: CON-GE-BHAM- COGL43043047-GI-SPEC-001 Revision 0

This report describes the work carried out by CCGI and presents the findings.

All information, comments and opinions given in this report are based on the ground conditions encountered during the site work, and on the results of laboratory and field tests performed during the investigation. There may however be conditions at or adjacent to the site which have not been taken into account,

such as unpredictable soil strata and water conditions between or below exploratory holes. A careful watch should be maintained during any future groundworks and the comments of this report reviewed as necessary.

This report has been prepared for Amey. This report shall not be relied upon or transferred to other parties without the written consent of CCGI. Should any information contained within this report be used by any unauthorised third party it is done so at their own risk and shall not be the responsibility of CCGI.

2. SITE DESCRIPTION AND GEOLOGY

2.1 Site Description

The area of investigation comprises a currently closed road approximately 200m west of its junction with the A429 at, Northleach, Gloucestershire. The site is centred on the approximate National Grid Reference SP 10659 14929.

2.2 Geology

Geological Records (British Geological Survey (BGS), England and Wales sheet 235 1:50,000 scale) indicate the underlying solid geology comprising the White Limestone Formation, Hampden Formation (Limestone), Taynton Limestone Formation, Fuller's Earth Formation (Mudstone) and Salperton Limestone Formation is recorded. No superficial deposits are recorded.

3. GROUND INVESTIGATION

3.1 Fieldwork

Seven exploratory holes were carried out between 6th and 10th February 2016. All exploratory hole locations are shown on the site plan (Appendix A). The exploratory hole locations were set out by CCGI as directed by the Client on site.

The fieldwork was carried out in general accordance with BS5930; 2015.

Three boreholes, referenced BH01 to BH03 (Exploratory Hole Data – Appendix B) were formed using a track mounted Comacchio MC300 multi-purpose rig. Following CAT scanning hand tools were used to excavate an inspection pit to a maximum depth of 1.20m to check for buried services. Bulk, small disturbed and environmental soil samples were taken and retained from the inspection pits. The boreholes were then advanced using percussive sampling techniques to produce continuous disturbed samples of 98mm diameter.

On refusal of percussive sampling the boreholes were continued by rotary core drilling techniques utilising a water flush. A double-tube swivel core barrel with a semi-rigid plastic liner was utilised to recover continuous cores of 91mm diameter.

Undisturbed samples of 100mm nominal diameter were taken in suitable cohesive material using an open drive sampler (U(T)100). The samples were wax sealed on site to prevent moisture loss.

Boreholes were monitored for groundwater ingress as they were advanced. Upon encountering water, sampling was temporarily stopped to allow the level to stabilise. Water levels were also recorded at the start and finish of each shifts work and on completion of the borehole and are presented on the relevant log.

On completion combined gas and water monitoring standpipes were installed in BH01 and BH03. Each installation consisted of a 19mm ID HDPE slotted tube set in a filter response zone of limestone free gravel. The installation was sealed above and below with a bentonite pellet seal and accessed via a valve assembly.

On completion an inclinometer monitoring standpipe was installed in BH02. The installation consisted of a 70mm 0D HDPE tube set in bentonite-cement grout. The installation was sealed above with a bentonite pellet seal.

The installations were protected at the surface by a D400 traffic rated stopcock covers set in concrete. Installation details are given on the relevant borehole log.

Following CAT scanning, two trial pits, referenced TP01 and TP02, (Exploratory Hole Data – Appendix B) were excavated using hand digging tools.

Photographs and representative sketches of the trial pit profile, and photographs of the spoil heap were taken and are presented following the relevant log.

On completion all trial pits were backfilled with arisings. The ground surface was reinstated.

Two masonry cores, referenced CH01 and CH02, were undertaken within an existing retaining wall adjacent to the road, core locations are shown in Appendix A. Coring was undertaken using water-flush hydraulic coring apparatus. Coring was undertaken using 65mm diamond tipped barrels.
On completion of masonry coring the core holes were backfilled with site mixed mortar. Core logs are presented in Appendix B.

Subsequent to fieldwork, all exploratory hole positions were surveyed and National Grid co-ordinates and levels are presented on the relevant log.

On completion of fieldwork all samples were brought to CCGI's office for storage.

3.2 In Situ Testing

Standard penetration tests (SPT's) were carried out in general accordance with BS EN ISO 22476-3:2005. A split barrel or a solid cone was used depending upon the materials encountered and the split barrel samples retained as small disturbed samples. The SPT N value was taken as the number of blows to penetrate the 300mm test drive following a 150mm seating drive. Where low penetration was recorded the seating drive was terminated at 25 blows and the test drive completed after a further 50 blows. SPT results are summarised as uncorrected N values on the borehole logs. SPT hammer calibration data is presented in Appendix D.

Hand shear vane tests were carried out using a direct read Pilcon Simmons Edeco hand vane tester, different vane sizes were used depending on the consistency of

the soil encountered. The results are presented on the relevant exploratory hole log. (Appendix B)

3.3 Logging

Soil and rock samples from the exploratory holes were logged by an Engineering Geologist in general accordance with BS5930; 2015. Bulk, small disturbed, core and environmental soil samples were taken and retained at a range of depths. Soil and rock descriptions are presented in the borehole logs together with details of sampling, in situ testing and relevant comments on drilling techniques.

3.4 Laboratory Testing

The following laboratory tests were carried out by GSTL (UKAS No. 2788) in accordance with BS1377:1990, Parts 1 to 8, unless otherwise stated. The results are presented in Appendix C.

Test Type	No. of Tests	Remarks
Natural Moisture Content	7	The results are shown on the summary of soil classification tests.
Liquid and Plastic Limits	7	The results are shown on the plasticity chart and summary of soil classification tests.
Effective Stress testing	2	Undertaken on a set of 3no 38mm samples – **testing is ongoing at the time of issue of this report**
BRE SD1 chemical testing suite for soil	4	Testing carried out by Chemical Testing Laboratories in accordance with BRE Special Digest 1.

A range of chemical tests were carried out on soil and water samples by i2 Analytical (UKAS No. 4041). Testing was carried out in accordance with ISO 17025. The results are tabulated and presented in Appendix C.

CC GROUND INVESTIGATIONS LIMITED

Declan O'Donnell BSc (Hons) FGS
Engineering Geologist

Rob Clarke. BSc (Hons) MSc
Director

4. REFERENCES

British Geological Society, Solid and Drift Sheet 235, Cirencester, 1:50,000 scale

BRE Special Digest 1:2003: Concrete in aggressive ground. Part 1.

BS 5930; 2015, Code of Practice for Site Investigations

BS 1377: Parts 1 to 9 (1990), Methods of Tests of Soils for Civil Engineering Purposes

BS EN ISO 14688: Part 1: (2002), Identification and description of soil.

BS EN ISO 14688: Part 2: (2004), Principles for a classification of soil.

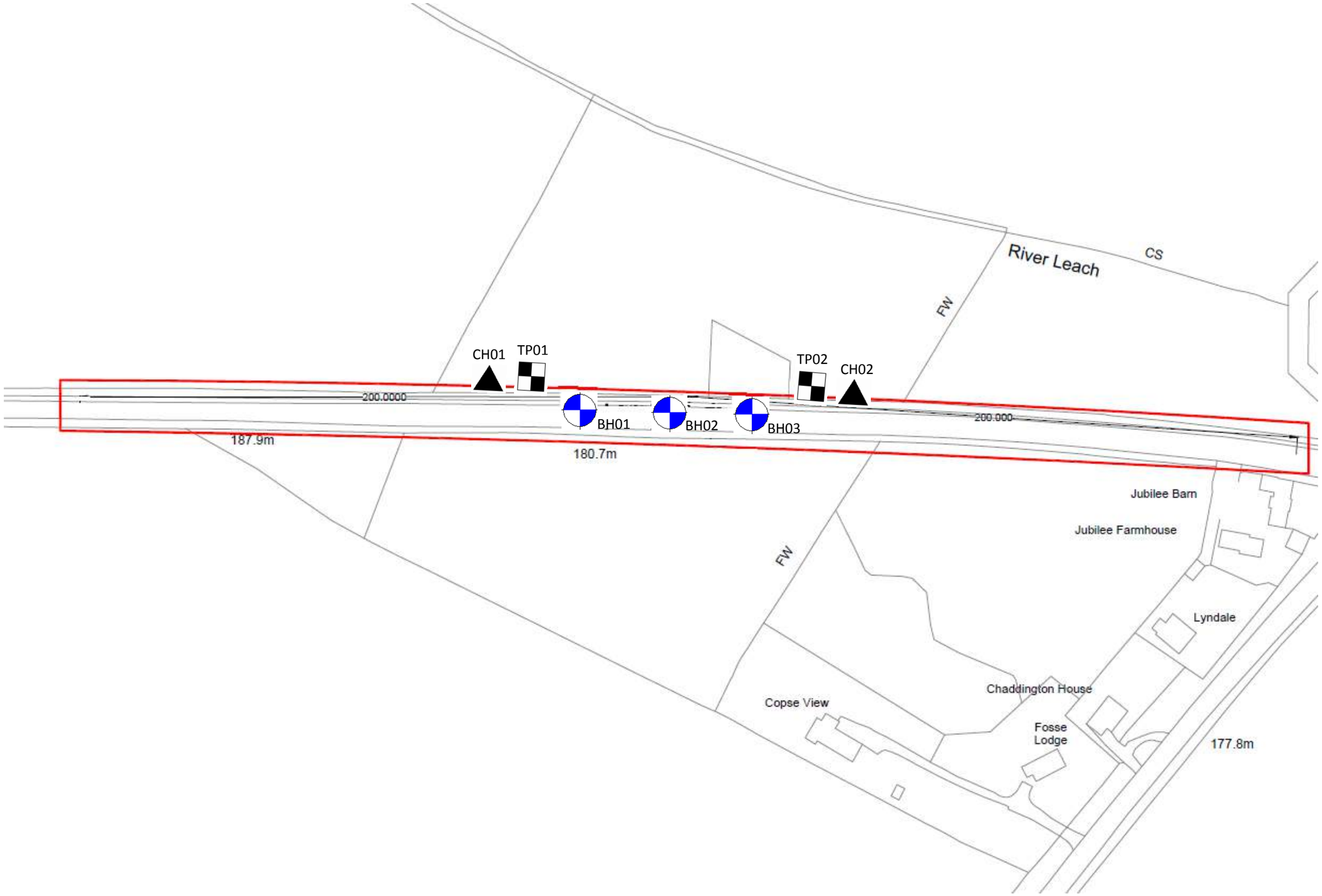
BS EN ISO 14689: Part 1: (2003), Identification and description.

BS EN ISO 22475: Part 1: (2006), Technical principles for execution.

BS EN ISO 22476: Part 3: (2005), Standard penetration test.

APPENDIX A

Appendix A – Site Plan



KEY:

Borehole

Foundation Pits

Corehole

Notes:

Reproduced from base plan provided by Client.

Locations indicative only.

CC Ground Investigations Ltd

Site Layout Plan

Prison Copse Wall

Amey

Appendix A

Contract No: C5530

Drawn by:	Scale:
DO	NTS

APPENDIX B

Appendix B – Exploratory Hole Data

KEY TO EXPLORATORY HOLE LOGS

CC Ground Investigations Ltd

Logging

The logging of soils and rocks has been carried out in general accordance with BS 5930:2015.

Sample type

B	Large disturbed sample
C	Core run
CS	Rotary core sub-sample
D	Small disturbed sample
ES	Environmental sample
SPT	Standard penetration test carried out using split spoon (split spoon sample retained)
SPT C	Standard penetration test carried out using solid cone (no sample retained)
U70 or U100	Undisturbed sample followed by nominal diameter of sample. (Taken using thick-walled open-tube sampler – OS-TK/W)
UT100	Undisturbed sample followed by nominal diameter of sample. (Taken using thin-walled open-tube sampler – OS-T/W)
W	Water sample

Water levels

Initial Water Strike

Level after monitoring

3.00m/Dry
Standing Level/No groundwater encountered

Insitu Testing

S 30	Denotes SPT undertaken using split spoon followed by N Value (EN ISO 22476-3:2005+A1:2011)
C 30	Denotes SPT undertaken using solid cone followed by N Value (EN ISO 22476-3:2005+A1:2011)
*240	Denotes SPT where full test drive has not been completed and linearly extrapolated N value reported
**	Denotes no effective penetration (Linearly extrapolated N value > 1000)
H 30	Hand shear vane. Direct reading in kPa

Sample range

Undisturbed sample

Core run

U(T)100 Undisturbed Samples

Rotary core sub-sample

Installation Details

Porous Tip

Screened Standpipe

Bentonite seal

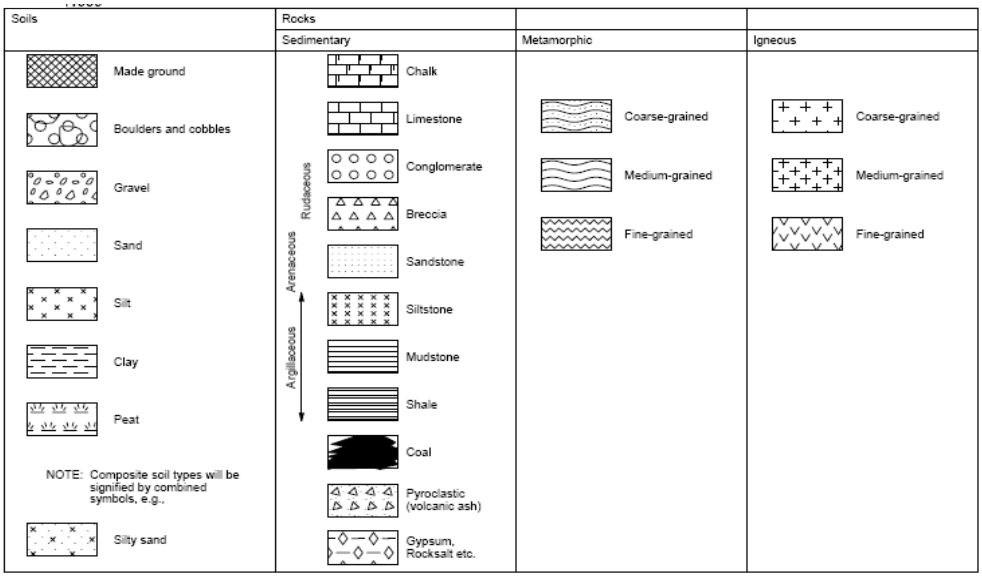
Plain standpipe

Granular response zone

Concrete

Grout

Backfill with arisings



CC Ground Investigations Ltd

ROTARY BOREHOLE LOG

Telephone: 01452739165 , Fax: 01452739220 , Email: Info@CCGround.co.uk

Borehole No. **BH01**

Sheet 1 of 2

Project Name: Prison Copse Wall	Project No: **C5530**	Co-ords: E 410631 N 214930	Hole Type DS+RC
Location: Northleach		Level: 180.24mAOD	Scale 1 : 50.00
Client: Gloucestershire County Council		Dates: Start: 06/02/2017 End: 07/02/2017	Logged By DO

(m)	Water Levels	Core Run, Samples & Testing: No/Type	Depth (m)	Result	Core Run & Sample	TCR SCR RQD	Install	Description	Depth (m)	Level (mAD)	Legend
		B	0.20					MADE GROUND: Tarmacadam. 0.20m: Plastic geotextile. 0.35m: Plastic geotextile.	(0.60)		
		B	0.50						0.60	179.64	
		ES	0.70					MADE GROUND: Greyish brown and dark grey slightly sandy angular to sub-rounded fine to coarse GRAVEL of limestone, concrete and clinker.	0.80	179.44	
1		B	1.00					Light grey and yellowish brown slightly sandy clayey GRAVEL & COBBLES of limestone. [POSSIBLE REWORKED MATERIAL]	1.00	179.24	1
		SPT	1.20 - 1.65	S 6							
		ES	1.50					Soft and very soft orangish brown mottled greyish brown slightly gravelly slightly sandy CLAY with a low cobble content. Gravel and cobbles are sub-angular and sub-rounded fine to coarse of limestone. [POSSIBLE REWORKED MATERIAL] 1.40-1.70m: Rare fossil/shell fragments <10mm.	(1.10)		
		D	1.80	H 42							
2		H							2.10	178.14	2
		D	2.70					Soft extremely closely fissured greenish grey slightly gravelly slightly sandy silty CLAY. Gravel is sub-angular fine to coarse of limestone. 2.70-3.20m: Frequent fossil/shell fragments <15mm.	(1.60)		
3	▽										3
		SPT	3.20 - 3.65	S 8							
		H	3.70	H 38				Soft very closely fissured light brownish grey and yellowish brown slightly sandy CLAY.	3.70	176.54	
		D	3.80								
4		SPT	4.00 - 4.45	S 5							4
		H	4.50	H 44				4.40-4.60m: 1 no. sub-angular limestone cobble.	(1.70)		
		UT100	4.60 - 5.05								
5								5.00-5.40m: Rare dark orangish brown staining (<2 x 10mm) penetrating up to 5mm.			5
								Firm extremely closely and very closely fissured bluish grey slightly sandy silty CLAY.	5.40	174.84	
		D	5.60								
		H	5.70	H 79							
6		SPT	6.00 - 6.45	S 16				5.90-6.20m: Locally light brown. Slightly gravelly. Gravel is sub-angular fine to coarse of limestone.			6
								6.50-7.00m: Occasional partings of slightly sandy silty (<10 x 30mm).			
7		D	7.00						(3.40)		7
		SPT	7.30 - 7.75	S 12				7.30-8.00m: Indistinctly thinly laminated.			
8											8

EQUIPMENT: Hand digging tools. Comacchio MC300 track mounted rig.
METHOD: Waterflush rotary coring using 300mm concrete coring barrel: 0.00-0.60m. Dynamic sampling using 113mm sample barrel: 1.20-8.80m. Waterflush rotary coring using T6-116 coring barrel: 8.80-14.50m.
CASING: PW to 8.80m.
GROUNDWATER: Encountered at 3.10m. No rise recorded after 20 minutes of observation.
INSTALLATION: 50mm ID HDPE slotted pipe with washed gravel response zone: 1.00-5.00m. Plain 50mm ID HDPE pipe with bentonite pellet seal: 0.20-1.00m. Flush 150mm steel cover set in concrete: 0.00-0.20m. Gas valve fitted.

Groundwater:

Date	Strike Depth (m)	Casing Depth (m)	Depth After Observation (m)
06/02/17	3.10		3.10

Hole Progress:

Date	Hole Depth (m)	Casing Depth (m)	Water Depth (m)
06/02/2017 17:00	4.00	4.00	3.10
07/02/2017 08:00	4.00	4.00	3.10

CC Ground Investigations Ltd

ROTARY BOREHOLE LOG

Telephone: 01452739165 , Fax: 01452739220 , Email: Info@CCGround.co.uk

Borehole No. **BH01**

Sheet 2 of 2

Project Name: Prison Copse Wall	Project No: **C5530**	Co-ords: E 410631 N 214930	Hole Type DS+RC
Location: Northleach		Level: 180.24mAOD	Scale 1 : 50.00
Client: Gloucestershire County Council		Dates: Start: 06/02/2017 End: 07/02/2017	Logged By DO

(m)	Water Levels	Core Run, Samples & Testing: No/Type	Depth (m)	Result	Core Run & Sample	TCR SCR RQD	Install	Description	Depth (m)	Level (mAD)	Legend
		D	8.20					Firm extremely closely and very closely fissured bluish grey slightly sandy silty CLAY. *(continued from previous sheet)* 8.00-8.50m: Rare thin laminae of sandy silt. 8.00-8.80m: Becoming stiff.			
9		C SPT	8.80 - 10.00 8.80 - 9.25	S 41	C	100% 100% 0%		Extremely weak thinly and thickly laminated bluish grey MUDSTONE. Discontinuities are sub-horizontal extremely closely spaced planar and stepped smooth.	8.80	171.44	
		D	9.80					9.50-10.00m: Discontinuities locally infilled with slightly sandy silt (<5mm).			
10		C SPT C	10.00 - 11.50 10.00 - 10.42	C*57	C	100% 82% 0%			(3.10)		
		D	10.80					10.50-11.00m: Locally non-intact.			
11		D C SPT C	11.40 11.50 - 13.00 11.50 - 11.83	C*83	C	100% 75% 45%					
12								Non intact very weak LIMESTONE recovered as yellowish brown and brown sub-angular fine to coarse gravel.	11.90 12.20	168.34 168.04	
								Very weak yellowish brown thinly and thickly bedded LIMESTONE. Discontinuities are sub-horizontal very closely spaced and closely spaced undulating rough. 12.50m: Discontinuity infilled with slightly sandy gravel.			
13		CS C SPT C	12.85 - 13.00 13.00 - 14.50 13.00 - 13.13	C*500	C	100% 78% 71%			(2.30)		
14		CS	14.20 - 14.50		C						
		SPT C	14.50 - 14.56	C*500				Borehole completed at 14.50m	14.50	165.74	
15											
16											
17											

Groundwater:

Date	Strike Depth (m)	Casing Depth (m)	Depth After Observation (m)

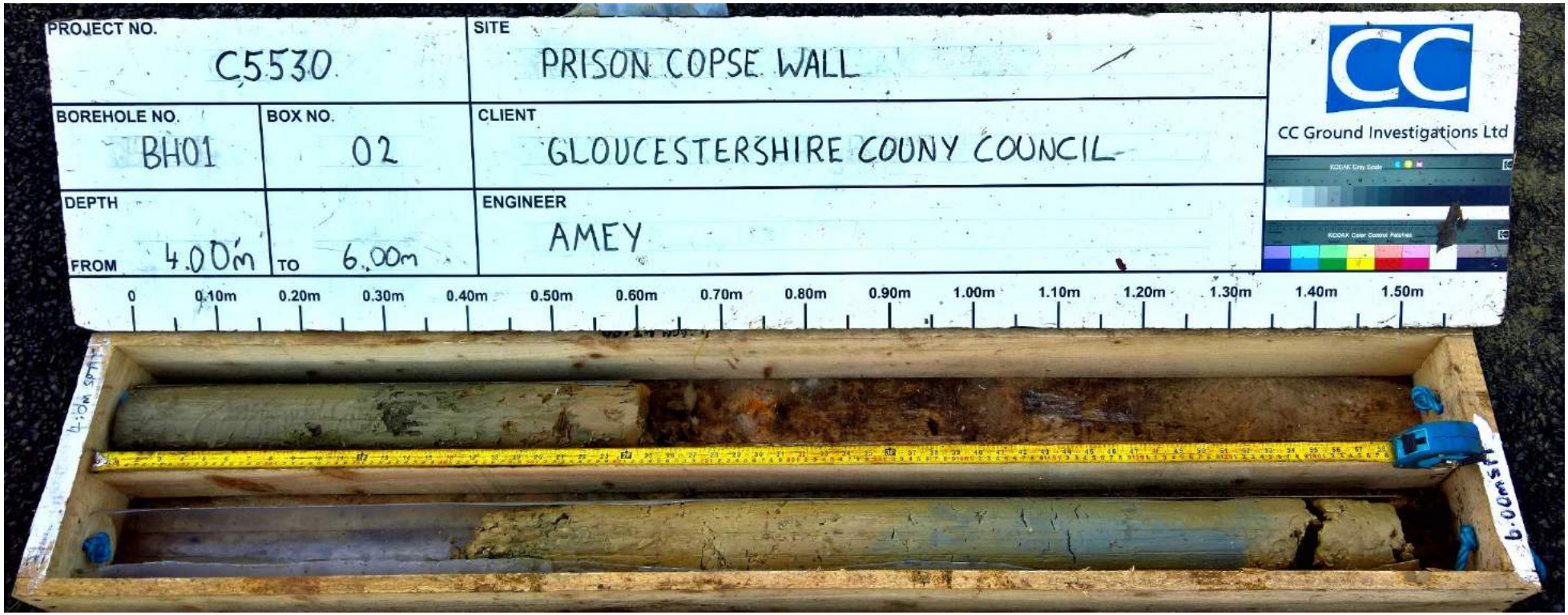
Hole Progress:

Date	Hole Depth (m)	Casing Depth (m)	Water Depth (m)
07/02/2017 17:00	14.50	8.80	0.80

Core Photograph

CC Ground Investigations Ltd			
Contract ID:	C5530	**Borehole ID:**	BH01
Contract Name:	Prison Copse Wall	**Box No:**	01
Client:	Amey	**Depth:**	1.20-4.00m

Core Photograph

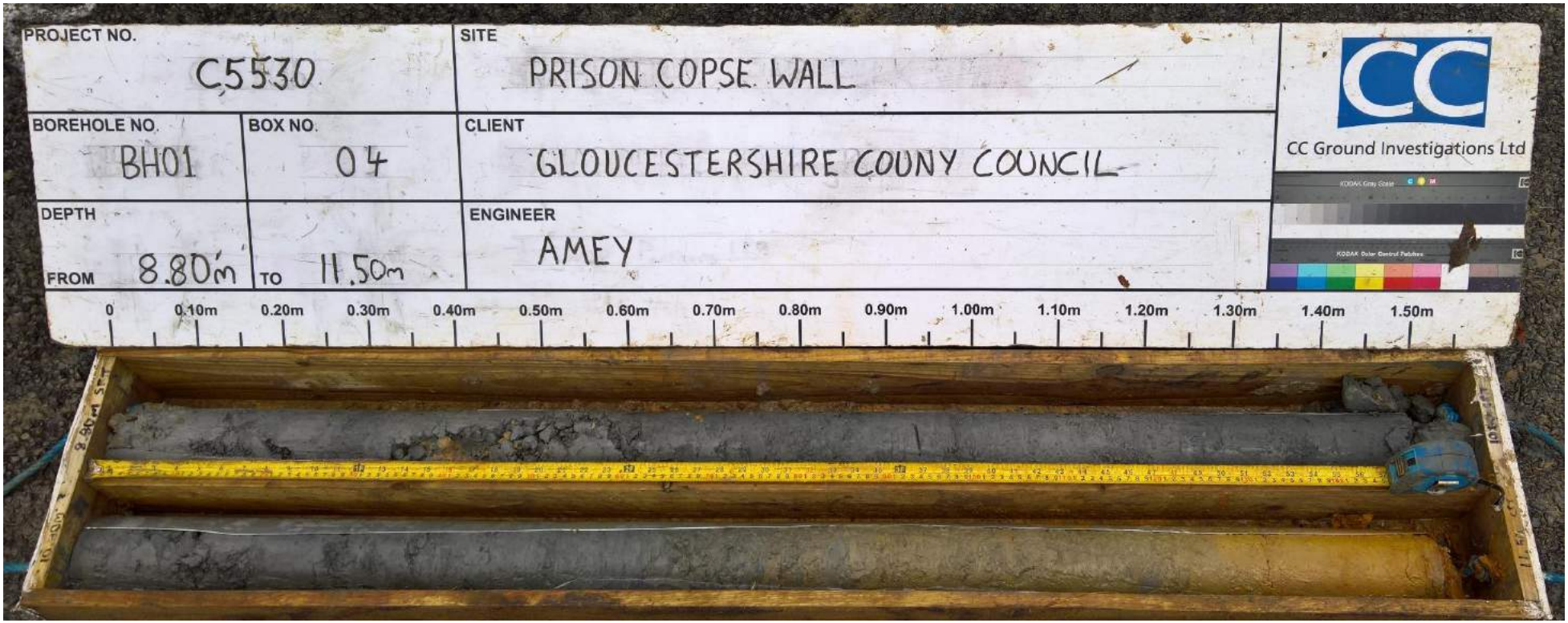


CC Ground Investigations Ltd			
Contract ID:	C5530	**Borehole ID:**	BH01
Contract Name:	Prison Copse Wall	**Box No:**	02
Client:	Amey	**Depth:**	4.00-6.00m

Core Photograph

CC Ground Investigations Ltd	**Contract ID:**	C5530	**Borehole ID:**	BH01
	Contract Name:	Prison Copse Wall	**Box No:**	03
	Client:	Amey	**Depth:**	6.00-8.80m

Core Photograph



CC Ground Investigations Ltd			
Contract ID:	C5530	**Borehole ID:**	BH01
Contract Name:	Prison Copse Wall	**Box No:**	04
Client:	Amey	**Depth:**	8.80-11.50m

Core Photograph

CC Ground Investigations Ltd			
Contract ID:	C5530	**Borehole ID:**	BH01
Contract Name:	Prison Copse Wall	**Box No:**	05
Client:	Amey	**Depth:**	11.50-14.50m

CC Ground Investigations Ltd

ROTARY BOREHOLE LOG

Telephone: 01452739165 , Fax: 01452739220 , Email: Info@CCGround.co.uk

Borehole No. **BH02**

Sheet 1 of 2

Project Name: Prison Copse Wall	Project No: **C5530**	Co-ords: E 410640 N 214929	Hole Type DS+RC
Location: Northleach		Level: 179.63mAOD	Scale 1 : 50.00
Client: Gloucestershire County Council		Dates: Start: 08/02/2017 End: 09/02/2017	Logged By DO

(m)	Water Levels	Core Run, Samples & Testing: No/Type	Depth (m)	Result	Core Run & Sample	TCR SCR RQD	Install	Description	Depth (m)	Level (mAD)	Legend
								MADE GROUND: Tarmacadam.			
								0.20m: Plastic geotextile. 0.35m: Plastic geotextile.	(0.60)		
								MADE GROUND: Dark grey and greyish brown slightly sandy angular and sub-angular fine to coarse GRAVEL of slag, clinker and ash.	0.60	179.03	
1		B	1.00 - 1.10						(0.60)		1
		ES	1.00	S 16				Medium dense yellowish brown slightly sandy GRAVEL & COBBLES of limestone. [POSSIBLE REWORKED MATERIAL]	1.20	178.43	
		SPT	1.20 - 1.65						(0.40)		
		ES	1.40						1.60	178.03	
		D	1.70					Soft extremely closely fissured orangish brown mottled greyish brown slightly gravelly slightly sandy CLAY. Gravel is sub-angular and sub-rounded fine to coarse of limestone. [POSSIBLE REWORKED MATERIAL]	1.90	177.73	
2		H	1.80	H 31							2
		SPT	2.20 - 2.65	S 2				Very soft and soft very closely fissured greenish grey slightly gravelly slightly sandy silty CLAY. Gravel is sub-angular fine to coarse of limestone. 2.30-2.75m: Rare fossil/shell fragments <20mm. 2.60-3.40m: Slight organic odour.	(1.80)		
		H	2.80	H 41							
3		D	3.00								3
		UT100	3.20 - 3.65						3.70	175.93	
		H	3.80	H 43				Soft extremely closely fissured orangish brown and light orangish brown slightly gravelly slightly sandy CLAY. Gravel is sub-rounded fine and medium of limestone. 4.10-4.20m: Rare partly decomposing organic matter <10mm.			
4		D	4.00								4
		SPT	4.20 - 4.65	S 8							
		H	4.80	H 28					(2.20)		
5		D	5.00								5
		SPT	5.20 - 5.65	S 9							
								Stiff extremely closely fissured bluish grey slightly sandy silty CLAY.	5.90	173.73	
6		D	6.20								6
		H	6.50	H 112							
		SPT	6.70 - 7.15	S 46				6.70-7.30m: Indistinctly thinly laminated. Rare silty lenses (<2x10mm).	(2.00)		
7											7
		D	7.50								
8									7.90	171.73	8

EQUIPMENT: Hand digging tools. Comacchio MC300 track mounted rig.
METHOD: Hand breaker: 0.00-0.60m. Hand dug inspection pit: 0.60-1.20m. Dynamic sampling using 113mm sample barrel: 1.20-8.00m. Waterflush rotary coring using T6-116 coring barrel: 8.00-12.50m.
CASING: PW to 8.00m.
GROUNDWATER: None encountered prior to using water flush to advance casing to 8.00m.
INSTALLATION: 70mm ID HDPE Inclinometer installed to 15.00m with 2:1 grout mix. Flush 150mm steel cover set in concrete: 0.00-0.20m. Bottom and top caps fitted.

Groundwater:

Date	Strike Depth (m)	Casing Depth (m)	Depth After Observation (m)

Hole Progress:

Date	Hole Depth (m)	Casing Depth (m)	Water Depth (m)

CC Ground Investigations Ltd

ROTARY BOREHOLE LOG

Telephone: 01452739165 , Fax: 01452739220 , Email: Info@CCGround.co.uk

Borehole No. **BH02**

Project Name: Prison Copse Wall	Project No: **C5530**	Co-ords: E 410640 N 214929	Hole Type DS+RC
Location: Northleach		Level: 179.63mAOD	Scale 1 : 50.00
Client: Gloucestershire County Council		Dates: Start: 08/02/2017 End: 09/02/2017	Logged By DO

(m)	Water Levels	Core Run, Samples & Testing: No/Type	Depth (m)	Result	Core Run & Sample	TCR SCR RQD	Install	Description	Depth (m)	Level (mAD)	Legend
9		C SPT D	8.00 - 9.50 8.00 - 8.45 8.50	S 46		100% 65% 0%		Extremely weak thinly and thickly laminated bluish grey MUDSTONE. Discontinuities are sub-horizontal extremely closely spaced planar and stepped smooth. *(continued from previous sheet)* 8.60-9.50m: Locally very stiff.			
10		C SPT D	9.50 - 11.00 9.50 - 9.45 10.00	S 49		100% 60% 0%			(3.00)		
11		C SPT C	11.00 - 12.50 11.00 - 11.05	S*750		100% 84% 60%		Non intact very weak LIMESTONE recovered as yellowish brown brown sub-angular fine to coarse gravel. Very weak yellowish brown thinly bedded LIMESTONE. Discontinuities are sub-horizontal very closely spaced and closely spaced undulating rough.	10.90 11.00	168.73 168.63	
12		CS	12.00 - 12.20						(1.50)		
13		SPT C	12.50 - 12.56	S*500				Borehole completed at 12.50m	12.50	167.13	
14											
15											
16											
17											

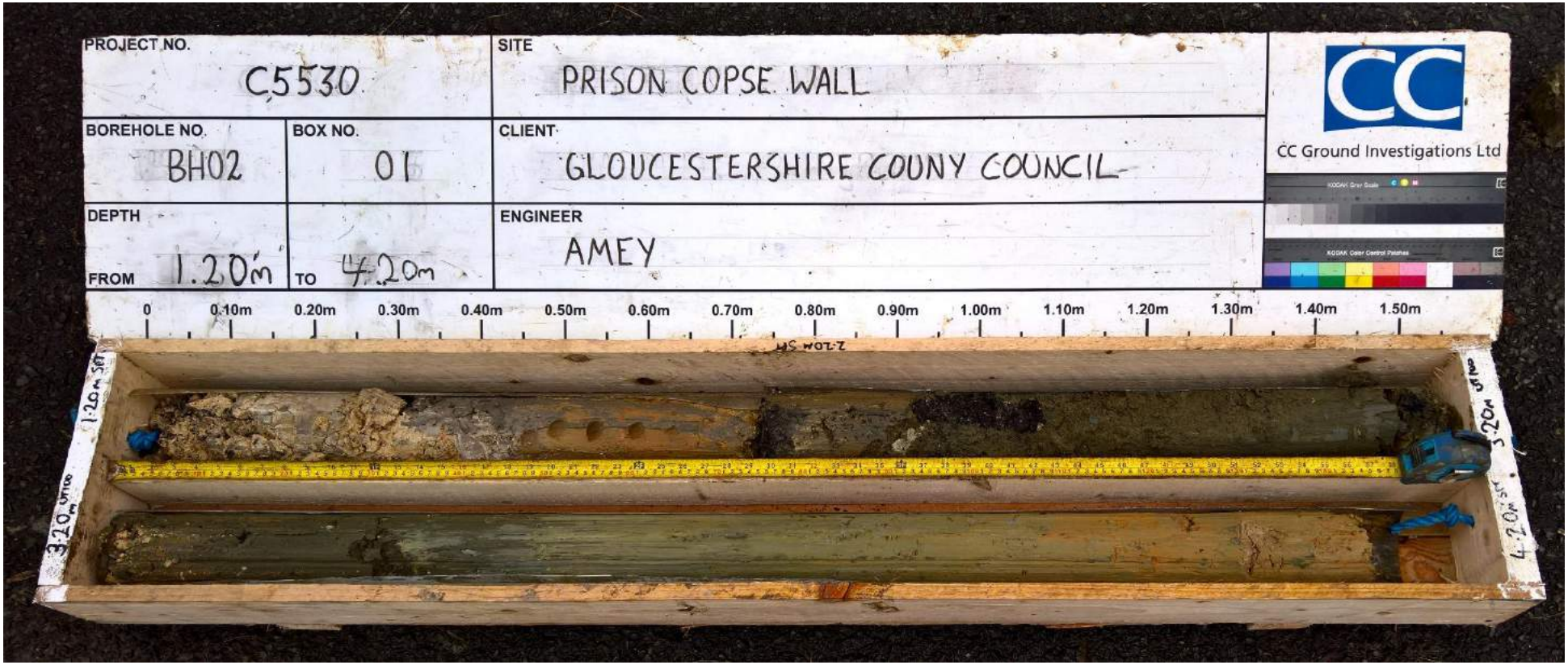
Groundwater:

Date	Strike Depth (m)	Casing Depth (m)	Depth After Observation (m)

Hole Progress:

Date	Hole Depth (m)	Casing Depth (m)	Water Depth (m)
08/02/2017 17:00	11.00	8.00	1.30
09/02/2017 08:00	11.00	8.00	3.30
09/02/2017 17:00	12.50	8.00	3.30

Core Photograph

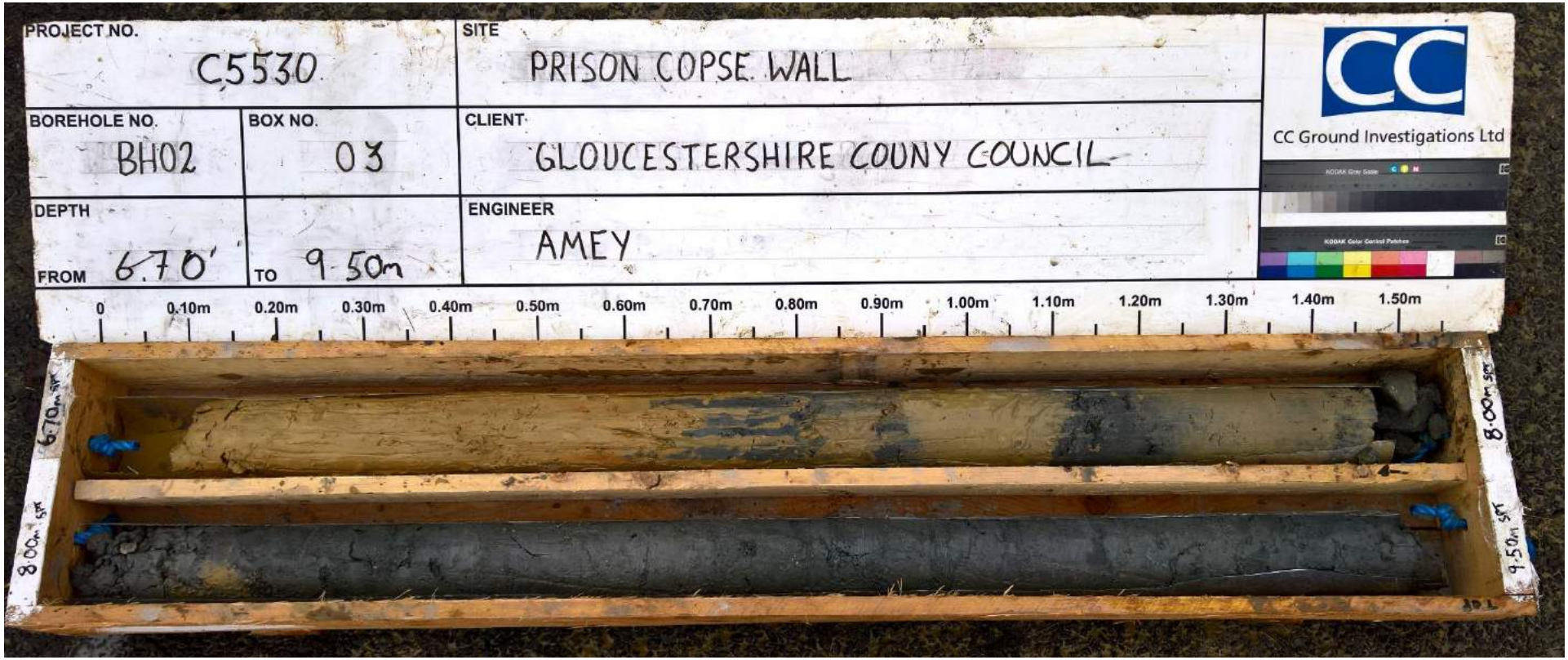


CC Ground Investigations Ltd			
Contract ID:	C5530	**Borehole ID:**	BH02
Contract Name:	Prison Copse Wall	**Box No:**	01
Client:	Amey	**Depth:**	1.20-4.20m

Core Photograph

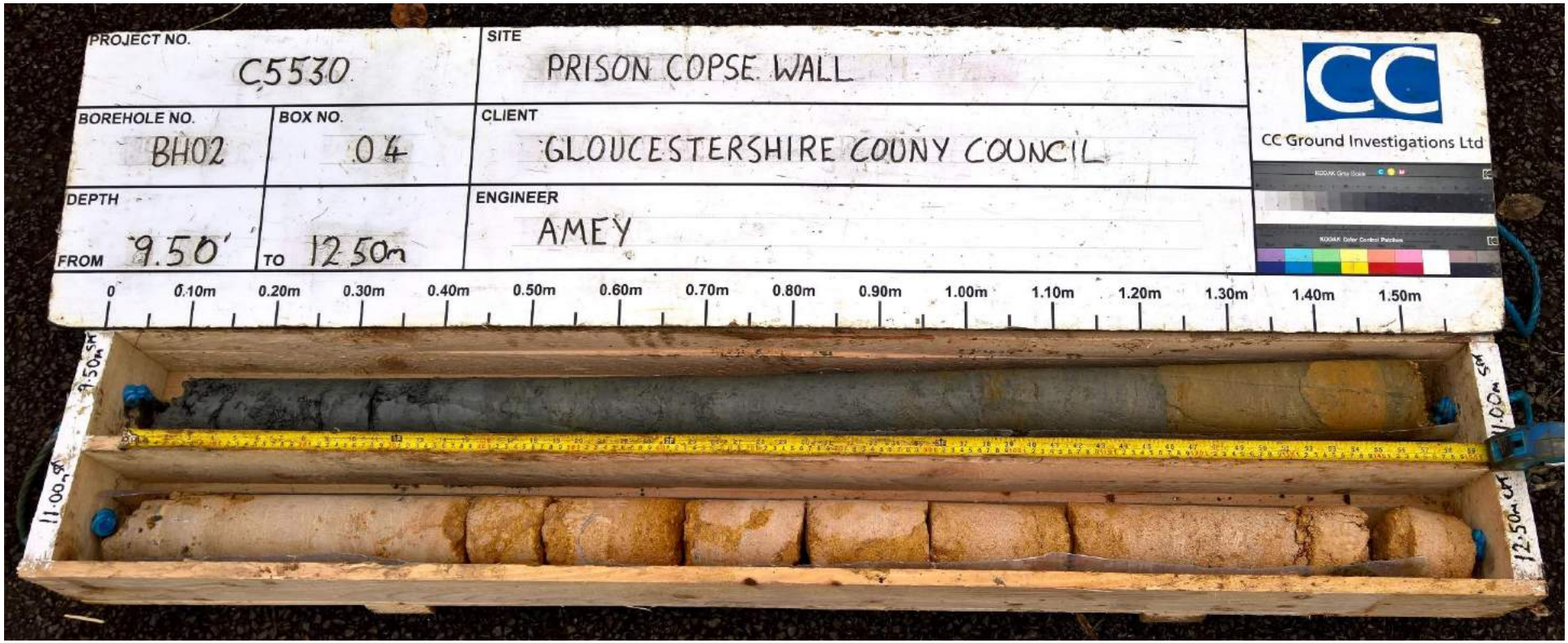
CC Ground Investigations Ltd			
Contract ID:	C5530	**Borehole ID:**	BH02
Contract Name:	Prison Copse Wall	**Box No:**	02
Client:	Amey	**Depth:**	4.20-6.70m

Core Photograph



CC Ground Investigations Ltd			
Contract ID:	C5530	**Borehole ID:**	BH02
Contract Name:	Prison Copse Wall	**Box No:**	03
Client:	Amey	**Depth:**	6.70-9.50m

Core Photograph



CC Ground Investigations Ltd			
Contract ID:	C5530	**Borehole ID:**	BH02
Contract Name:	Prison Copse Wall	**Box No:**	04
Client:	Amey	**Depth:**	9.50-12.50m

CC Ground Investigations Ltd

ROTARY BOREHOLE LOG

Telephone: 01452739165 , Fax: 01452739220 , Email: Info@CCGround.co.uk

Borehole No. **BH03**

Sheet 1 of 2

Project Name: Prison Copse Wall	Project No: **C5530**	Co-ords: E 410648 N 214930	Hole Type DS+RC
Location: Northleach		Level: 179.21mAOD	Scale 1 : 50.00
Client: Gloucestershire County Council		Dates: Start: 09/02/2017 End: 10/02/2017	Logged By DO

(m)	Water Levels	Core Run, Samples & Testing: No/Type	Depth (m)	Result	Core Run & Sample	TCR SCR RQD	Install	Description	Depth (m)	Level (mAD)	Legend
								MADE GROUND: Tarmacadam.	(0.60)		
								MADE GROUND: Dark grey, orangish brown and greyish brown slightly sandy slightly clayey angular and sub-angular fine to coarse GRAVEL of limestone, clinker and ash. 0.90-1.10m: Low cobble content. Cobbles are sub-angular of limestone.	0.60	178.61	
1		B	1.00 - 1.10						(0.50)		1
		ES	1.00	S 12					1.10	178.11	
		SPT	1.20 - 1.65					Yellowish brown slightly sandy slightly clayey angular to rounded fine to coarse GRAVEL of limestone with a low cobble content. Cobbles are sub-angular of limestone. [POSSIBLE REWORKED MATERIAL]	1.40	177.81	
		ES	1.40						1.70	177.51	
		D	1.60					Soft and very soft orangish brown mottled greyish brown slightly gravelly slightly sandy CLAY with a low cobble content. Gravel and cobbles are sub-angular and sub-rounded fine to coarse of limestone. [POSSIBLE REWORKED MATERIAL] 1.60-1.70m: Frequent fossil/shell fragments <10mm.			2
2		H	1.90	H 37							
		D	2.00								
		SPT	2.20 - 2.65	S 8							
		H	2.90	H 42				Soft very closely fissured greenish grey slightly gravelly slightly sandy silty CLAY. Gravel is sub-angular fine to coarse of limestone. 2.50-3.20m: Rare to occasional fossil/shell fragments <10mm. 3.30-4.00m: Frequent dark orangish brown staining (<2x10mm) penetrating up to 2mm.			3
3									(2.95)		
	▽1.1	UT100	3.20 - 3.65								
		D	3.65	H 33							
		H	3.70								
4		SPT	4.20 - 4.65	S 8							4
								Soft very closely fissured light brownish grey and yellowish brown slightly sandy CLAY.	4.65	174.56	
5		D	5.00								5
		SPT	5.20 - 5.65	S 4					(2.05)		
6		D	6.30								6
		SPT	6.70 - 7.15	S 24				Stiff extremely closely and very closely fissured bluish grey slightly sandy silty CLAY.	6.70	172.51	
7		D	7.50								7
8											8

EQUIPMENT: Hand digging tools. Comacchio MC300 track mounted rig.
METHOD: Hand breaker: 0.00-0.60m. Hand dug inspection pit: 0.60-1.20m. Dynamic sampling using 113mm sample barrel: 1.20-8.20m. Waterflush rotary coring using T6-116 coring barrel: 8.20-12.50m.
CASING: PW to 8.20m.
GROUNDWATER: Encountered at 3.30m. No rise recorded after 20 minutes of observation.
INSTALLATION: 50mm ID HDPE slotted pipe with washed gravel response zone: 7.00-10.00m. Plain 50mm ID HDPE pipe with bentonite pellet seal: 0.20-7.00m. Raised 150mm steel cover set in concrete: 0.00-0.20m. Gas valve fitted.

Groundwater:

Date	Strike Depth (m)	Casing Depth (m)	Depth After Observation (m)
09/02/17	3.30		3.30

Hole Progress:

Date	Hole Depth (m)	Casing Depth (m)	Water Depth (m)

CC Ground Investigations Ltd

ROTARY BOREHOLE LOG

Telephone: 01452739165 , Fax: 01452739220 , Email: Info@CCGround.co.uk

Borehole No. **BH03**

Project Name: Prison Copse Wall	Project No: **C5530**	Co-ords: E 410648 N 214930	Hole Type DS+RC
Location: Northleach		Level: 179.21mAOD	Scale 1 : 50.00
Client: Gloucestershire County Council		Dates: Start: 09/02/2017 End: 10/02/2017	Logged By DO

(m)	Water Levels	Core Run, Samples & Testing: No/Type	Depth (m)	Result	Core Run & Sample	TCR SCR RQD	Install	Description	Depth (m)	Level (mAD)	Legend
		SPT	8.20 - 8.65	S 13				Stiff extremely closely and very closely fissured bluish grey slightly sandy silty CLAY. *(continued from previous sheet)*	(3.30)		
								8.20-8.65m: Locally firm.			
		D	8.80					8.60-10.00m: Locally tending to an extremely weak mudstone.			
9		C	9.50 - 11.00	S 23		100% 72% 48%					9
		SPT	9.50 - 9.95		C						
10								Very weak yellowish brown thinly and thickly bedded LIMESTONE. Discontinuities are sub-horizontal very closely spaced and closely spaced undulating rough.	10.00	169.21	10
		CS	10.85 - 11.00								
11		C	11.00 - 12.50	S*750		100% 92% 84%			(2.50)		11
		SPT C	11.00 - 11.11		C						
12								11.80-11.85m: Non intact.			12
		CS	12.20 - 12.50								
		SPT C	12.50 - 12.56	S*500				Borehole completed at 12.50m	12.50	166.71	
13											13
14											14
15											15
16											16
17											17

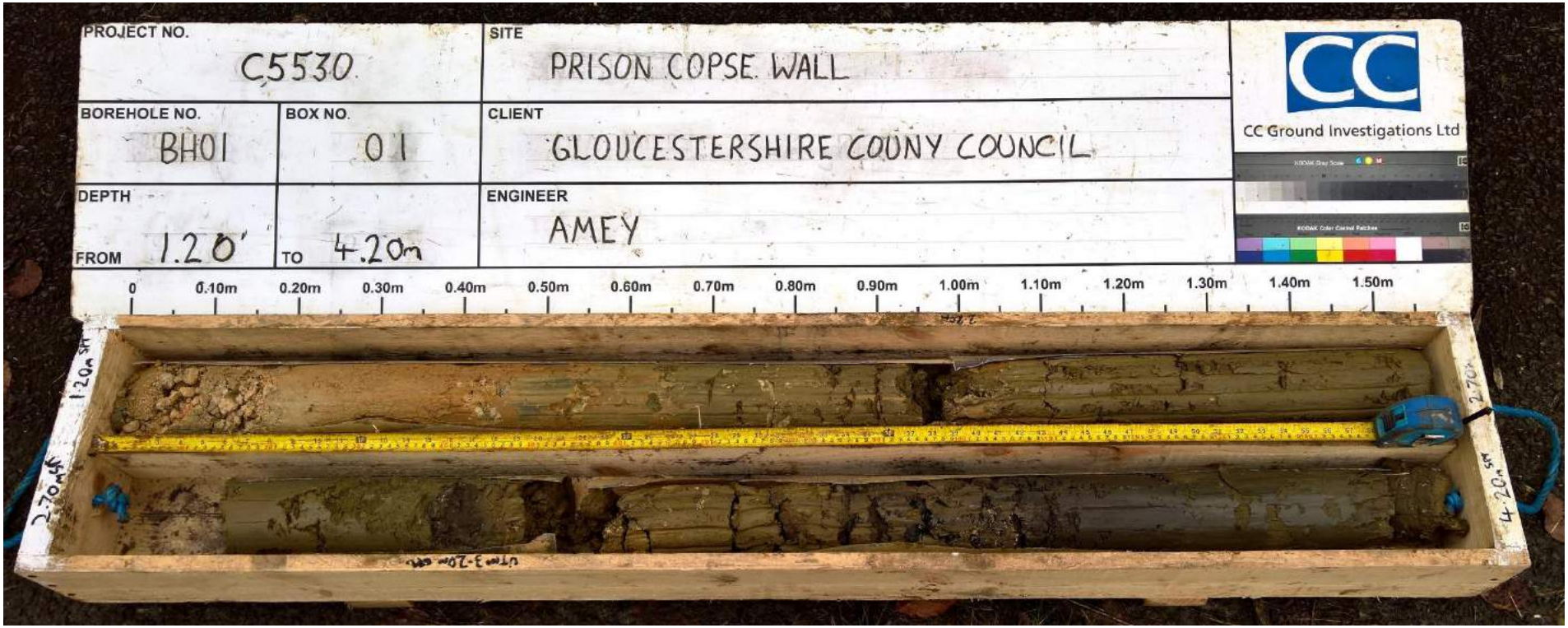
Groundwater:

Date	Strike Depth (m)	Casing Depth (m)	Depth After Observation (m)

Hole Progress:

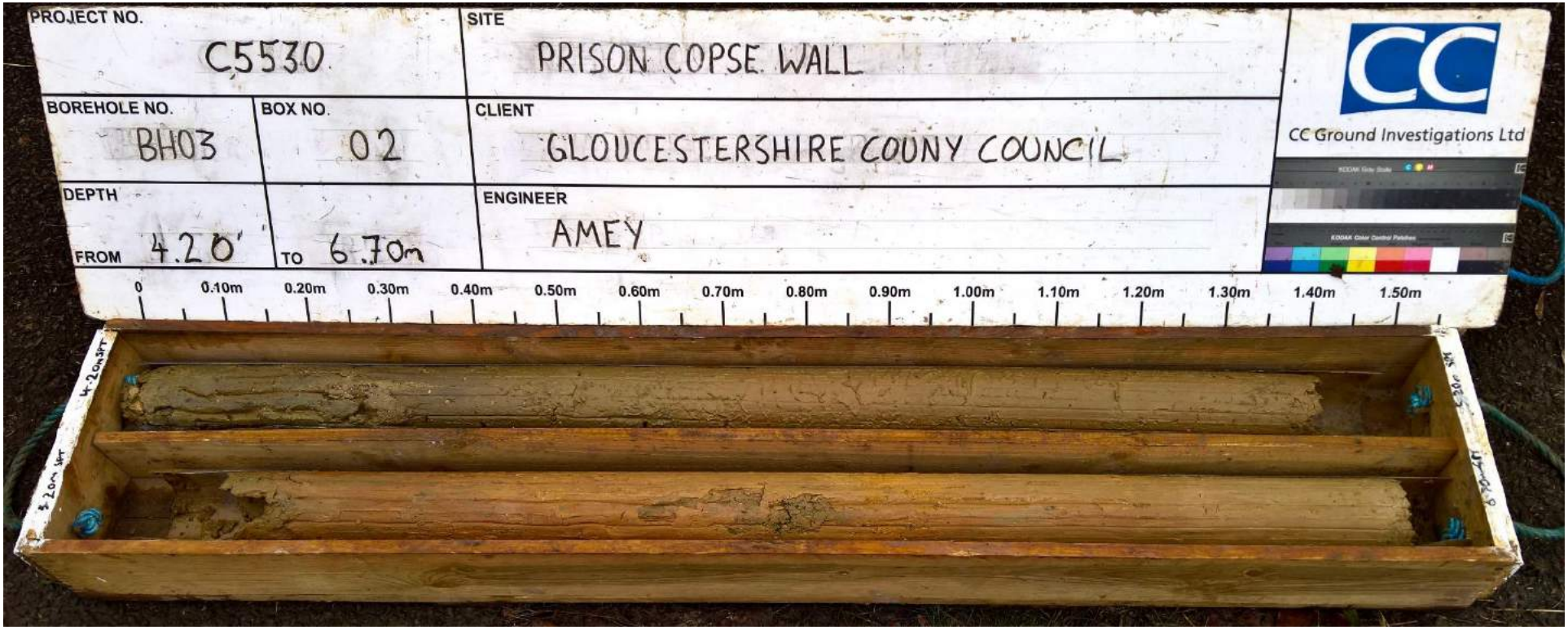
Date	Hole Depth (m)	Casing Depth (m)	Water Depth (m)
09/02/2017 17:00	8.20	6.70	0.80
10/02/2017 08:00	8.20	6.70	2.20
10/02/2017 17:00	12.50	8.20	0.80

Core Photograph



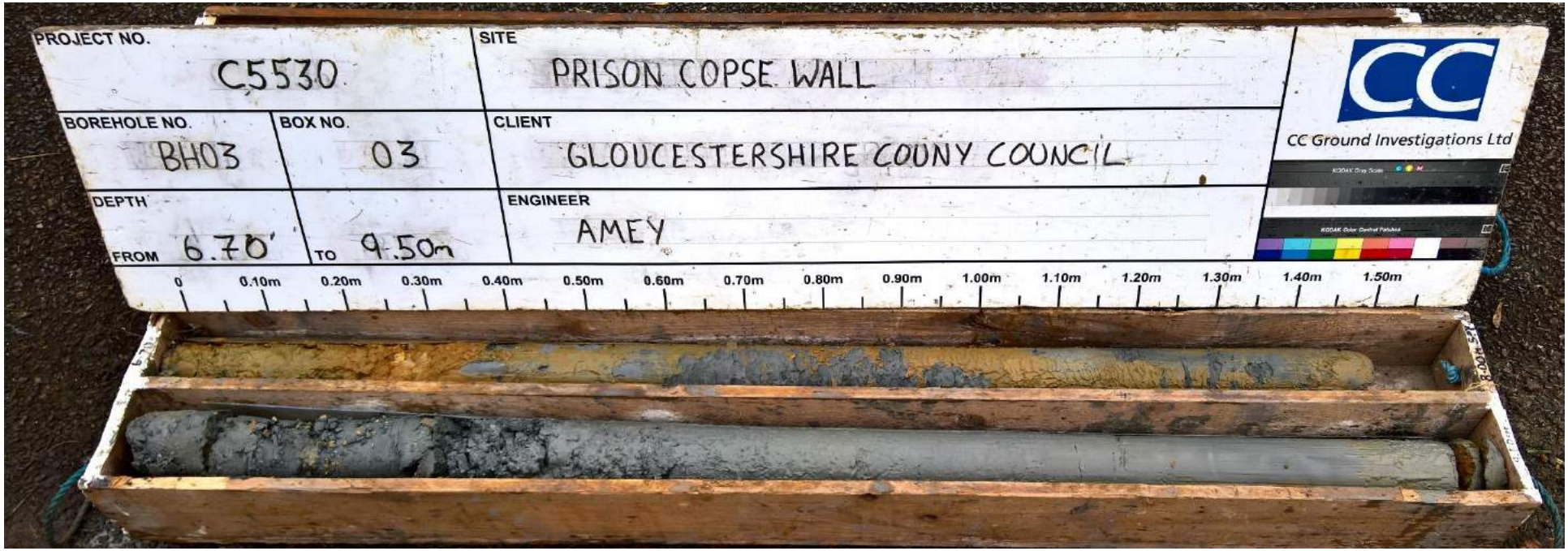
CC Ground Investigations Ltd			
Contract ID:	C5530	**Borehole ID:**	BH03
Contract Name:	Prison Copse Wall	**Box No:**	01
Client:	Amey	**Depth:**	1.20-4.20m

Core Photograph



CC Ground Investigations Ltd			
Contract ID:	C5530	**Borehole ID:**	BH03
Contract Name:	Prison Copse Wall	**Box No:**	02
Client:	Amey	**Depth:**	4.20-6.70m

Core Photograph



CC Ground Investigations Ltd	**Contract ID:**	C5530	**Borehole ID:**	BH03
	Contract Name:	Prison Copse Wall	**Box No:**	03
	Client:	Amey	**Depth:**	6.70-9.50m

Core Photograph

CC Ground Investigations Ltd	**Contract ID:**	C5530	**Borehole ID:**	BH03
	Contract Name:	Prison Copse Wall	**Box No:**	04
	Client:	Amey	**Depth:**	9.50-12.50m

CC Ground Investigations Ltd

TRIAL PIT LOG

Telephone: 01452739165 , Fax: 01452739220 , Email: Info@CCGround.co.uk

Pit No **TP01**

Sheet 1 of 1

Project Name: Prison Copse Wall	Project No: **C5530**	Co-ords: E 410607 N 214936 Level: 179.16mAOD	Date 09/02/2017
Location: Northleach		Dimensions: 0.60m Depth 1.10m, 0.65m	Scale 1 : 12.5
Client: Gloucestershire County Council			Logged By DO

(m)	Water Levels	Samples & In Situ Testing No/Type	Depth (m)	Result	Description	Depth (m)	Level (mAD)	Legend
					MADE GROUND: Grass over soft orangish brown and greyish brown slightly gravelly slightly sandy CLAY. Gravel is sub-angular and sub-rounded fine to coarse of limestone, brick fragments and rare clinker.			
					0.20-0.60m: Limestone footing stepping out 120mm.	(0.40)		
					Soft very closely fissured orangish brown slightly gravelly slightly sandy CLAY. Gravel is sub-angular fine to coarse of limestone. [POSSIBLE REWORKED MATERIAL]	0.40	178.76	
						(0.20)		
					Yellowish brown slightly sandy sub-angular and sub-rounded fine to coarse GRAVEL of limestone with a high cobble content and low boulder content. Cobbles and boulders are sub-angular and sub-rounded of limestone. [POSSIBLE REWORKED MATERIAL]	0.60	178.56	
					0.60m: Road pin inserted under footing.	(0.50)		
1	Dry.				Trial pit completed at 1.10m	1.10	178.06	1
2								2

EQUIPMENT: Hand Digging Tools.

METHOD: Trial pits excavated using hand tools.

GROUNDWATER: Not encountered.

STABILITY: Trial pit remained stable and vertical throughout.

BACKFILL: Trial pit backfilled with arisings and compacted by hand.

Trial Pit Photographs

CC Ground Investigations Ltd

Contract Name:	Prison Copse Wall
Contract ID:	C5530
Client:	Amey
Sample ID:	TP01

Trial Pit Photographs

CC Ground Investigations Ltd	
Contract Name:	Prison Copse Wall
Contract ID:	C5530
Client:	Amey
Sample ID:	TP01

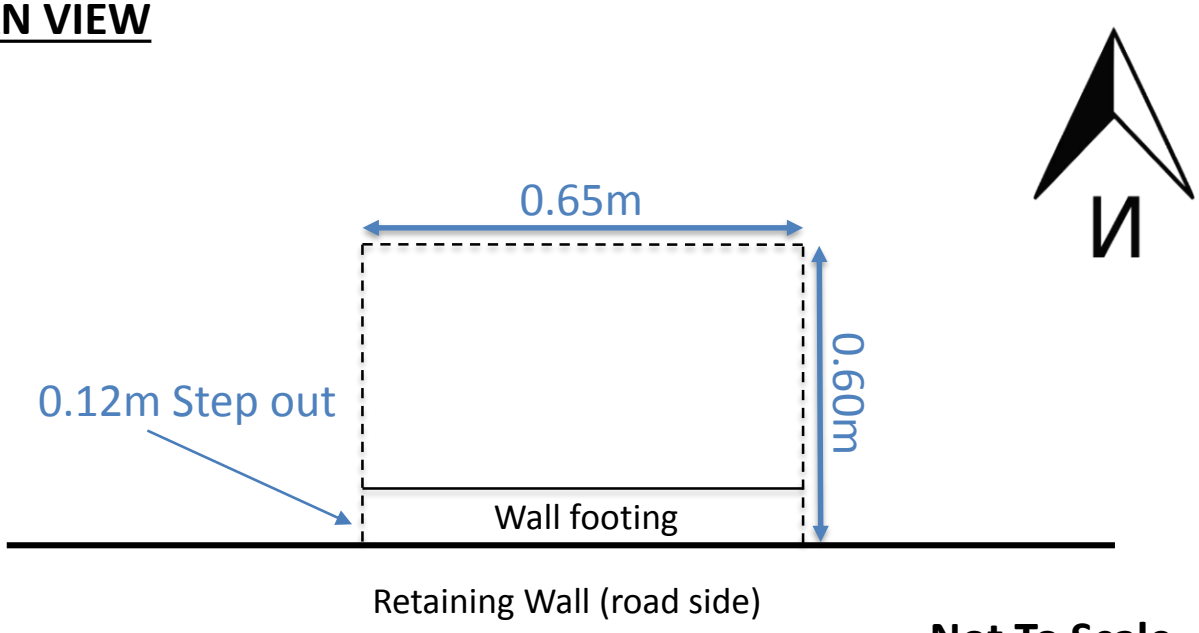
Trial Pit Photographs

CC Ground Investigations Ltd

Contract Name:	Prison Copse Wall
Contract ID:	C5530
Client:	Amey
Sample ID:	TP01

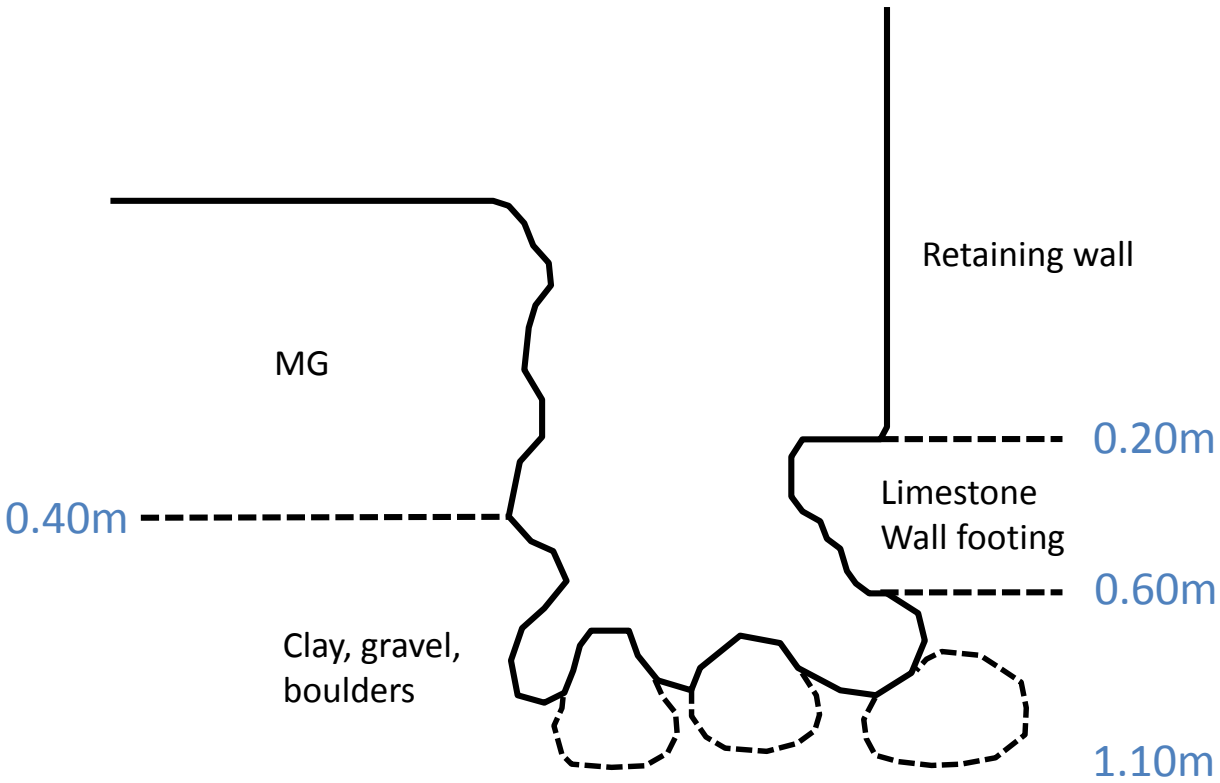
Trial Pit Sketch

PLAN VIEW



Not To Scale
All dimensions in m

CROSS SECTION



CC Ground Investigations Ltd

Contract Name:	Prison Copse Wall
Contract ID:	C5530
Client:	GCC
Hole ID:	TP01

CC Ground Investigations Ltd

TRIAL PIT LOG

Telephone: 01452739165 , Fax: 01452739220 , Email: Info@CCGround.co.uk

Pit No **TP02**

Sheet 1 of 1

Project Name: Prison Copse Wall	Project No: **C5530**	Co-ords: E 410660 N 214935 Level: 176.18mAOD	Date 09/02/2017
Location: Northleach		Dimensions: 0.60m, Depth 0.85m, 0.70m	Scale 1 : 12.5
Client: Gloucestershire County Council			Logged By DO

(m)	Water Levels	Samples & In Situ Testing: No/Type	Depth (m)	Result	Description	Depth (m)	Level (mAD)	Legend
					MADE GROUND: Grass over soft orangish brown and greyish brown slightly gravelly slightly sandy CLAY. Gravel is sub-angular and sub-rounded fine to coarse of limestone and brick fragments.			
					0.20-0.55m: Limestone footing stepping out 300mm.	(0.55)		
	1 Seepage.				Soft orangish brown very closely fissured slightly gravelly slightly sandy CLAY. Gravel is sub-angular fine to coarse of limestone. [POSSIBLE REWORKED MATERIAL]	0.55	175.63	
					0.55m: Road pin inserted under footing.	(0.30)		
	1				Trial pit completed at 0.85m	0.85	175.33	
1								1
2								2

EQUIPMENT: Hand Digging Tools.

METHOD: Trial pits excavated using hand tools.

GROUNDWATER: Seepage at base rising to 0.57m on completion.

STABILITY: Trial pit remained stable and vertical throughout.

BACKFILL: Trial pit backfilled with arisings and compacted by hand.

Trial Pit Photographs

CC Ground Investigations Ltd

Contract Name:	Prison Copse Wall
Contract ID:	C5530
Client:	Amey
Sample ID:	TP02

Trial Pit Photographs

CC Ground Investigations Ltd

Contract Name:	Prison Copse Wall
Contract ID:	C5530
Client:	Amey
Sample ID:	TP02

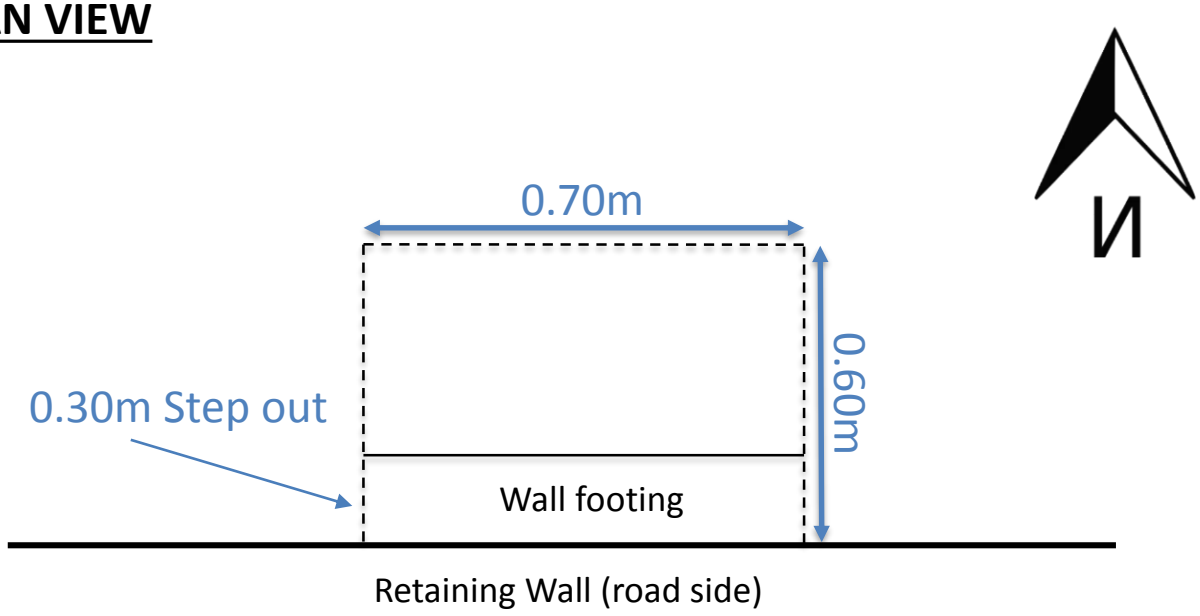
Trial Pit Photographs

Contract Name:	Prison Copse Wall
Contract ID:	C5530
Client:	Amey
Sample ID:	TP02

CC Ground Investigations Ltd

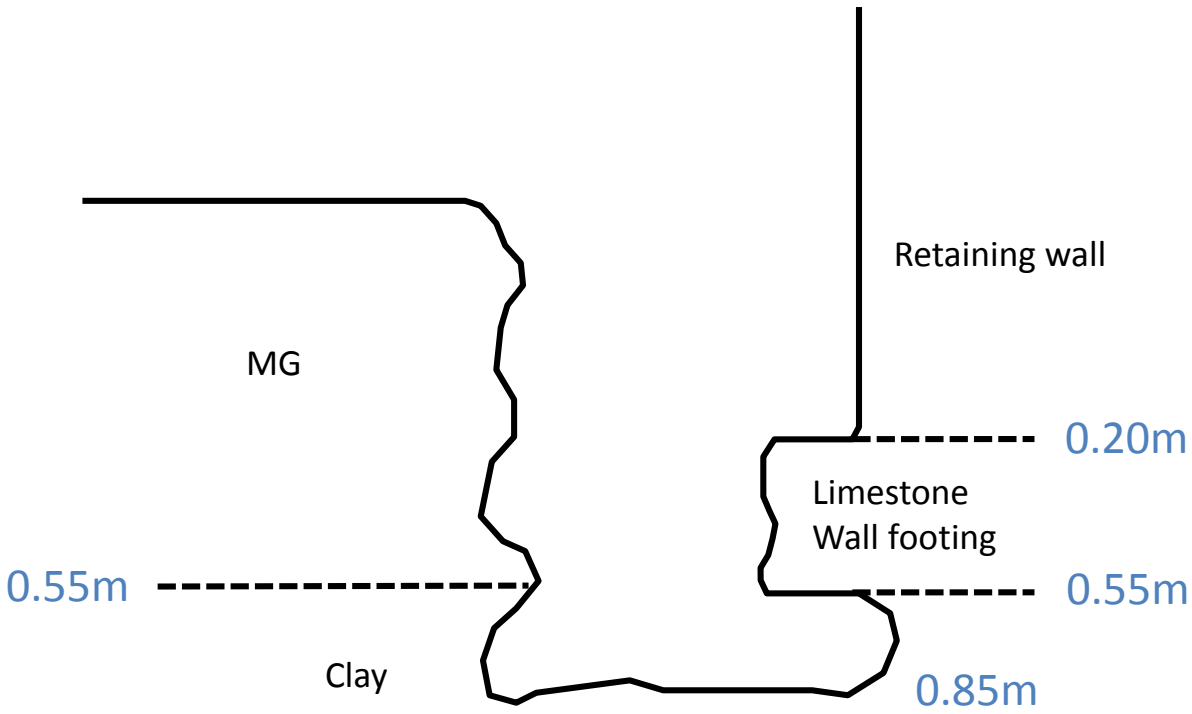
Trial Pit Sketch

PLAN VIEW



Not To Scale
All dimensions in m

CROSS SECTION



CC Ground Investigations Ltd

Contract Name:	Prison Copse Wall
Contract ID:	C5530
Client:	GCC
Hole ID:	TP02

CC Ground Investigations Ltd

CORE HOLE LOG

Telephone: 01452739165 , Fax: 01452739220 , Email: Info@CCGround.co.uk

Corehole No. **CH01**

Sheet 1 of 1

Project Name: Prison Copse Wall	Project No: **C5530**	Co-ords: E 410599 N 214936	Hole Type RC
Location: Northleach		Level: 181.31mAD	Scale 1 : 17.54
Client: Gloucestershire County Council		Dates: Start: 09/02/2017 End: 09/02/2017	Logged By DO

(m)	Water Levels	Install	Description	Depth (m)	Level (mAD)	Legend
			Limestone MASONRY.	(0.18)		
			Weak grey CONCRETE. Clasts <20mm of limestone. <10% voids.	0.18	181.13	
				(0.56)		
			Limestone MASONRY.	0.74	180.57	
1				(0.66)		1
			MADE GROUND: Soft brown clay.	1.40	179.91	
			Corehole completed at 1.47m	1.47	179.84	
2						2

EQUIPMENT: Magnum hydraulic coring apparatus.
METHOD: Water flush rotary coring using diamond tipped barrels (65mm diameter): 0.00-1.49m
REINSTATEMENT: Corehole backfilled with site mixed rapid set concrete and surface reinstated.
ORIENTATION: Corehole undertaken at approximately 40 degrees from vertical. All measurements taken relative to long axis of core.

CC Ground Investigations Ltd

CORE HOLE LOG

Telephone: 01452739165 , Fax: 01452739220 , Email: Info@CCGround.co.uk

Corehole No. **CH02**

Sheet 1 of 1

Project Name: Prison Copse Wall	Project No: **C5530**	Co-ords: E 410663 N 214935	Hole Type RC
Location: Northleach		Level: 177.33mAD	Scale 1 : 17.54
Client: Gloucestershire County Council		Dates: Start: 09/02/2017 End: 09/02/2017	Logged By DO

(m)	Water Levels	Install	Description	Depth (m)	Level (mAD)	Legend
			Limestone MASONRY.	(0.20)		
			Weak grey CONCRETE. Clasts <20mm of limestone. <10% voids.	0.20	177.13	
				(0.26)		
			Limestone MASONRY.	0.46	176.87	
				(0.34)		
			Weak grey CONCRETE. Clasts <20mm of limestone. <5% voids.	0.80	176.53	
1				(0.59)		1
			Corehole completed at 1.39m	1.39	175.94	
2						2

EQUIPMENT: Magnum hydraulic coring apparatus.
METHOD: Water flush rotary coring using diamond tipped barrels (65mm diameter): 0.00-1.39m
REINSTATEMENT: Corehole backfilled with site mixed rapid set concrete and surface reinstated.
ORIENTATION: Corehole undertaken horizontally. All measurements taken relative to long axis of core.

APPENDIX C

Appendix C – Laboratory Test Results

Laboratory Report

2788

GEO Site & Testing Services Ltd

Contract Number: 34689

Client's Reference: **C5530**

Report Date: **21-04-2017**

Client **CC Ground Investigations Gloucester**
Unit 15A
Innsworth Lane
Gloucester
GL3 1DL

Contract Title: **Prison Copse Wall**

For the attention of: **Chris Scrivens**

Date Received: **28-03-2017**

Date Commenced: **28-03-2017**

Date Completed: **21-04-2017**

Test Description	Qty
Moisture Content 1377 : 1990 Part 2 : 3.2 - * UKAS	7
4 Point Liquid & Plastic Limit (LL/PL) 1377 : 1990 Part 2 : 4.3 & 5.3 - * UKAS	7
BRE Suite D Ph Total Sulphate, Aqueous Sulphate, Total Sulphur, Aqueous Nitrate, Aqueous Mag, Chloride, - @ Non Accredited Test	4
CUD 38mm Consolidated undrained triaxial compression test on a set of three x 38 mm diameter specimens with the measurement of pore water pressure including saturation and consolidation, test duration four days. 1377 : 1990 Part 8 : 7 - @ Non Accredited Test	2
Extra over items for test duration in excess of four days.	12
Disposal of Samples on Project	1

Notes: **Observations and Interpretations are outside the UKAS Accreditation**
*** - denotes test included in laboratory scope of accreditation**
 # - denotes test carried out by approved contractor
@ - denotes non accredited tests

Approved Signatories:
Alex Wynn (Associate Director) - Ben Sharp (Contracts Manager) - Emma Sharp (Office Manager)
Paul Evans (Quality/Technical Manager) - Richard John (Advanced Testing Manager) - Sean Penn (Administrative/Quality Assistant)
Vaughan Edwards (Managing Director) - Wayne Honey (Administrative/Quality Assistant)

GEO Site & Testing Services Ltd
Unit 3-4, Heol Aur, Dafen Ind Estate, Dafen, Llanelli, Carmarthenshire SA14 8QN
Tel: 01554 784040 Fax: 01554 784041 info@gstl.co.uk gstl.co.uk

Client ref: C5530

Location: Prison Copse Wall

Contract Number: 34689

Hole Number	Sample Number	Type	Depth (m)	Description of Sample*
BH01		D	1.80	Brown slightly fine to medium gravelly clayey SILT
BH01		D	3.20 - 3.65	Brown fine to medium gravelly clayey SILT
BH01		D	7.00	Grey slightly fine to medium gravelly clayey SILT
BH02		D	2.20 - 2.65	Brown fine to medium gravelly silty CLAY
BH02		D	4.00	Brown slightly fine to medium gravelly slightly sandy clayey SILT
BH02		D	7.50	Grey silty CLAY
BH03		D	2.00	Brown slightly fine to coarse gravelly clayey SILT

Note: Results on this table are in summary format and may not meet the requirements of the relevant standards, additional information is held by the laboratory

GSTL
GEO SITE & TESTING SERVICES LTD

For and behalf of GEO Site & Testing Services Ltd

Authorised By:
Sean Penn (Administrative/Quality Assistant)

Date: 12.4.17

UKAS TESTING 2788

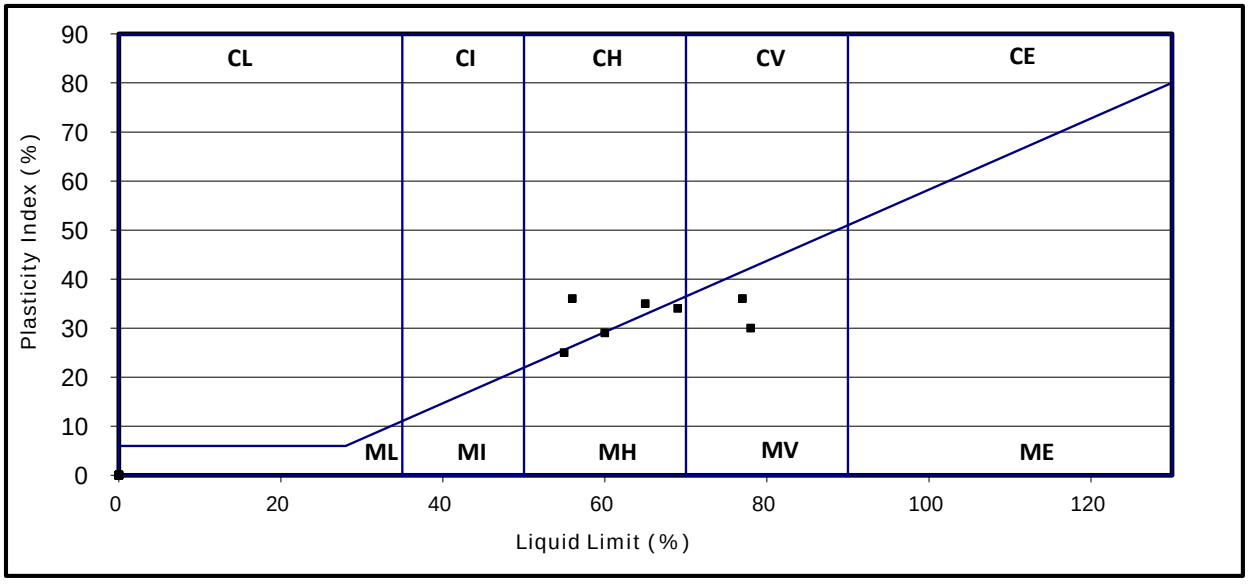
Test Report: Method of the Determination of the plastic limit and plasticity index
BS 1377 : Part 2 : 1990 Method 5

Client ref: C5530
Location: Prison Copse Wall
Contract Number: 34689

Hole/ Sample Number	Sample Type	Depth m	Moisture Content % Cl. 3.2	Liquid Limit % Cl. 4.3/4.4	Plastic Limit % Cl. 5.	Plasticity Index % Cl. 6.	% Passing .425mm	Remarks
BH01	D	1.80	66	78	48	30	93	MV Very High Plasticity
BH01	D	3.20 - 3.65	30	69	35	34	85	MH High Plasticity
BH01	D	7.00	27	55	30	25	92	MH High Plasticity
BH02	D	2.20 - 2.65	36	65	30	35	70	CH High Plasticity
BH02	D	4.00	47	77	41	36	91	MV Very High Plasticity
BH02	D	7.50	17	56	20	36	100	CH High Plasticity
BH03	D	2.00	33	60	31	29	92	MH High Plasticity

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

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.
BS 5930:1999+A2:2010



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For and behalf of GEO Site & Testing Services Ltd

Authorised By:
Sean Penn (Administrative/Quality Assistant)
Date: 12.4.17

UKAS TESTING 2788

Unit 4
Heol Aur
Dafen Ind EstateDafen
Carmarthenshire
SA14 8QN
Tel: 01554 784040
01554 750752
Fax: 01554 770529
01554 784041
Web: www.geo.uk.com

Certificate of Analysis

Date:	08/04/2017
Client:	CC Ground Investigations
Our Reference:	34689
Client Reference:	C5530
Contract Title:	Prison Copse Wall
Description: (Total Samples)	4
Date Received:	28/03/2017
Date Started:	07/04/2017
Date Completed:	08/04/2017
Test Procedures:	(BRE BR 279)

Notes:

Solid samples will be disposed 1 month and liquids 2 weeks after the date of issue of this test certificate

Approved By:

Authorised Signatories:

Emma Sharp	Ben Sharp	Paul Evans
Laboratory Office Manager	Contracts Manager	Quality Manager

Contract No: 34689
Client Ref: C5530
Location: Prison Copse Wall
Date: 08/04/2017

Summary of Chemical Analysis

(BRE BR 279)

Hole Number	Sample Number	Sample Type	Depth m	Sulphate Content as SO_4			Chloride Content		pH Value @ 25°C	Total Sulphur % S	Magnesium g/l	Nitrate NO_3 mg/l
				Acid Soluble Sulphate as % SO_4	Aqueous Extract Sulphate as g/l SO_4	Ground-water g/l	Semi Quantative Test Strip mg Cl/l	Quantative g/l				
				BR 279	BR 279	BR 279	BR 279	BR 279	BR 279		BR 279	BR 279
BH02		D	6.20	0.24	0.03		NCP		8.23	0.08	<1	10
BH03		UT100	3.2-3.65	0.24	0.02		NCP		8.06	0.08	<1	<10
BH01		D	2.70	0.22	0.03		NCP		8.12	0.08	<1	<10
BH01		SPT	6.0-6.45	0.34	0.04		NCP		8.22	0.11	<1	<10

NCP - No Chloride present

Consolidated Undrained Triaxial Compression Test
BS 1377 : Part 8 : 1990 : 38mm Set of Three

Specimen Details

Borehole		BH2
Sample No.		
Depth	from(m)	3.20
Depth	to(m)	3.65
Date		21/04/2017
Disturbed / Undisturbed		Undisturbed

Description of Specimen

Brown sl silty soft CLAY

Initial Specimen Conditions

Height	mm	76.00	76.00	76.00
Diameter	mm	38.00	38.00	38.00
Area	mm^2	1134.11	1134.11	1134.11
Volume	cm^3	86.19	86.19	86.19
Mass	g	136.70	138.40	138.40
Dry Mass	g	89.90	37.00	82.30
Density	Mg/m^3	1.59	1.61	1.61
Dry Density	Mg/m^3	1.04	1.01	0.95
Moisture Content	%	52	59	68
Specific Gravity	kN/m^3	2.65	2.65	2.65
(assumed/measured)		assumed	assumed	assumed

Final Specimen Conditions

Moisture Content	%	53	51	54
Density	Mg/m^3	1.77	193.00	1.93
Dry Density	Mg/m^3	1.16	128.00	1.25

D P Evans

Checked and Approved By

21/04/17
Date

Client Ref
C5530

Prison Copse Wall

Contract No
34689

GSTL
GEO SITE & TESTING SERVICES LTD

Consolidated Undrained Triaxial Compression Test
BS 1377 : Part 8 : 1990 : 38mm Set of Three

Specimen Details

Borehole		BH2
Sample No.		
Depth	from(m)	3.20
Depth	to(m)	3.65

Test Setup

Date started	13/04/2017	00/01/1900	00/01/1900
Date Finished	20/04/2017	00/01/1900	00/01/1900
Top Drain Used	y	y	y
Base Drain Used	y	y	y
Side Drains Used	y	y	y
Pressure System Number	P12	P13	P11
Cell Number	C12	C13	C11

Saturation

Cell Pressure Incr.	kPa	100.00	100.00	100.00
Back Pressure Incr.	kPa	95.00	95.00	95.00
Differential Pressure	kPa	5.00	5.00	5.00
Final Cell Pressure	kPa	200.00	300.00	300.00
Final Pore Pressure	kPa	198.00	247.50	297.00
Final B Value		0.98	0.95	0.98

Consolidation

Effective Pressure	kPa	70.00	120.00	220.00
Cell Pressure	kPa	200.00	300.00	300.00
Back Pressure	kPa	130.00	180.00	80.00
Excess Pore Pressure	kPa	68.00	120.00	219.00
Pore Pressure at End	kPa	130.00	180.00	80.00
Consolidated Volume	cm^3	77.39	72.99	65.69
Consolidated Height	mm	73.41	72.12	69.97
Consolidated Area	mm^2	1056.92	1018.33	954.29
Vol. Compressibility	m^2/MN	0.78536	0.85081	2.97299
Consolidation Coef.	$m^2/yr.$	6.46418	0.02043	0.06779

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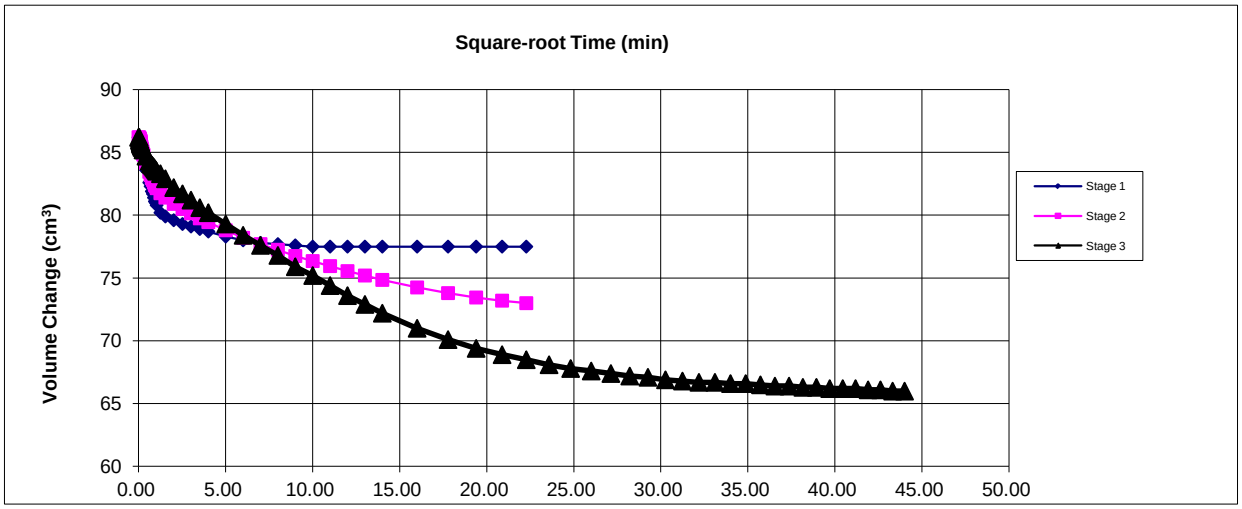
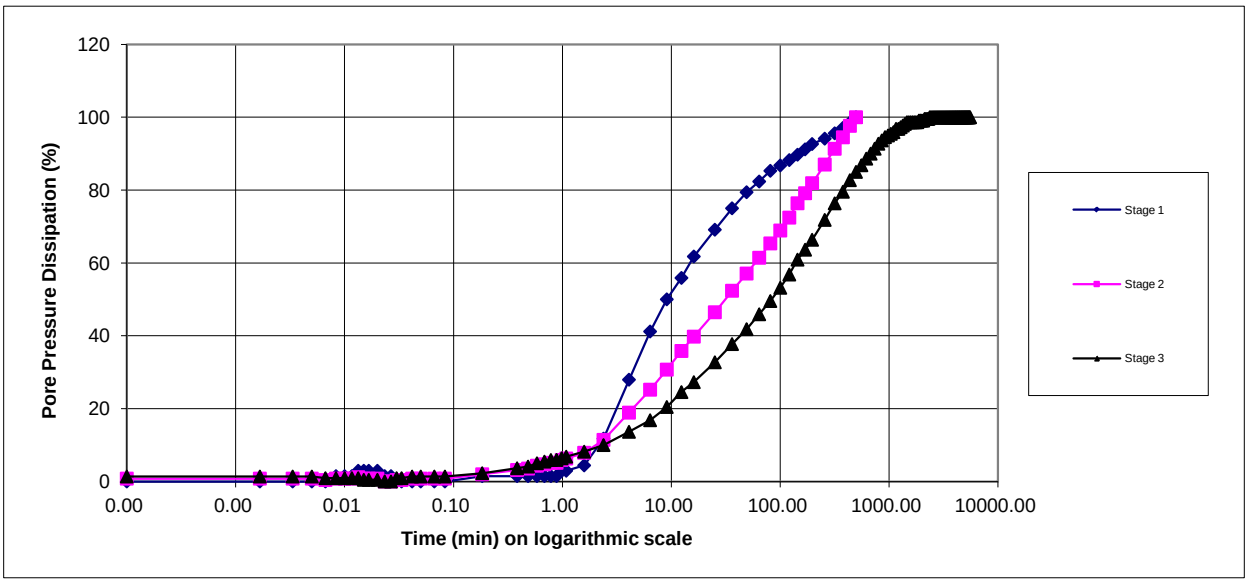
Consolidated Undrained Triaxial Compression Test
BS 1377 : Part 8 : 1990 : 38mm Set of Three

Specimen Details

Borehole		BH2
Sample No.		
Depth	from(m)	3.20
Depth	to(m)	3.65

Consolidation Stage





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Consolidated Undrained Triaxial Compression Test
BS 1377 : Part 8 : 1990 : 38mm Set of Three

Specimen Details

Borehole		BH2
Sample No.		
Depth	from(m)	3.20
Depth	to(m)	3.65

Shearing

Initial Cell Pressure	kPa	200	300	300
Initial Pore Pressure	kPa	130	180	80
Rate of Strain	mm/min	0.3464	0.0011	0.0035
Max Deviator Stress				
Axial Strain		5.653	5.844	6.088
Axial Stress	kPa	92.837	115.92	210.60
Cor. Deviator stress	kPa	82.277	104.32	198.75
Effective Major Stress	kPa	130.277	167.82	330.75
Effective Minor Stress	kPa	49.000	63.50	132.00
Effective Stress Ratio		2.659	2.643	2.51
s'	kPa	89.638	115.66	231.38
t'	kPa	40.638	52.16	99.38
Max Effective Priciple Stress Ratio				
Axial Strain		13.690	9.519	10.489
Axial Stress	kPa	88.195	114.043	205.418
Cor. Deviator stress	kPa	74.989	101.691	192.868
Effective Major Stress	kPa	111.989	158.691	315.868
Effective Minor Stress	kPa	37.000	57.000	123.000
Effective Stress Ratio		3.027	2.784	2.568
s'	kPa	74.495	107.846	219.434
t'	kPa	37.495	50.846	96.434
Shear Resistance Angle	degs			24.0
Cohesion c'	kPa			8

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Prison Copse Wall

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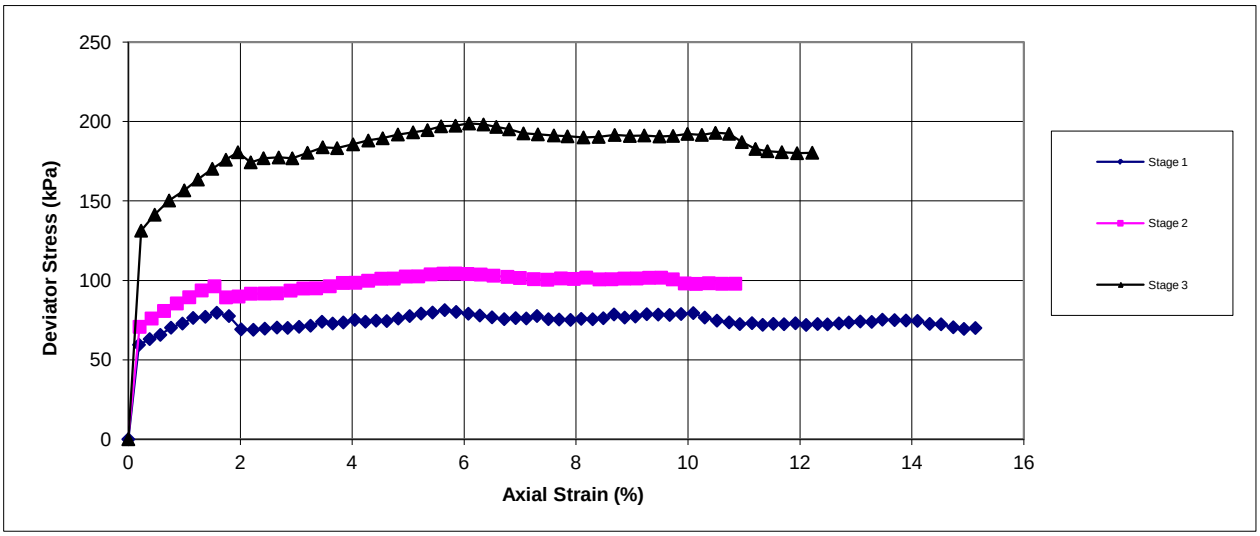
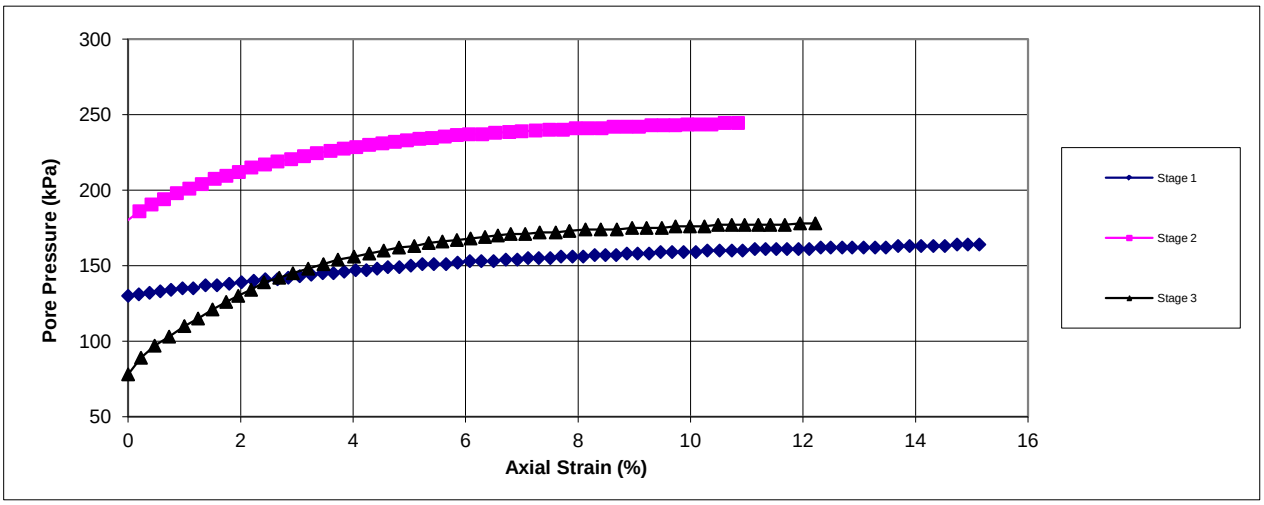
Consolidated Undrained Triaxial Compression Test
BS 1377 : Part 8 : 1990 : 38mm Set of Three

Specimen Details

Borehole		BH2
Sample No.		
Depth	from(m)	3.20
Depth	to(m)	3.65

Shearing Stage





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Prison Copse Wall

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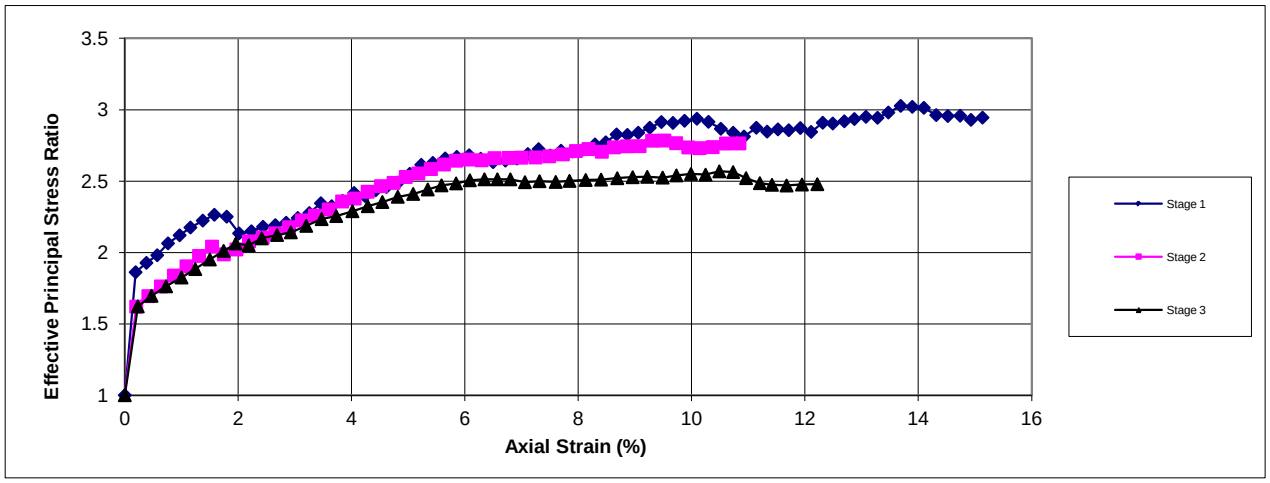
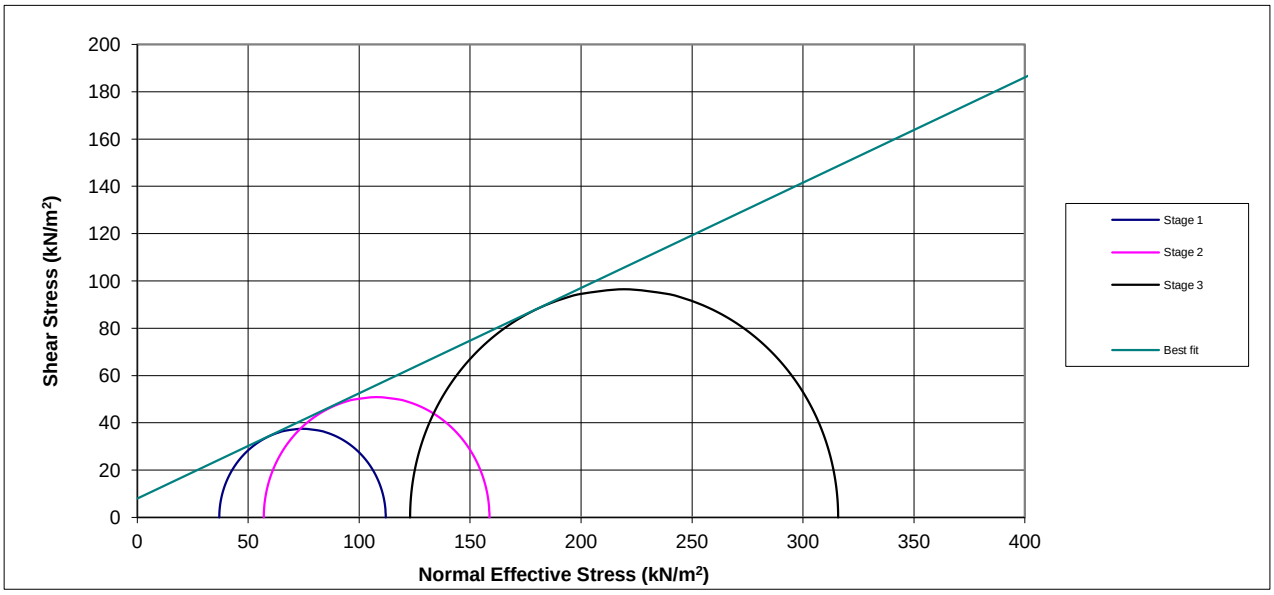
Consolidated Undrained Triaxial Compression Test
BS 1377 : Part 8 : 1990 : 38mm Set of Three

Specimen Details

Borehole		BH2
Sample No.		
Depth	from(m)	3.20
Depth	to(m)	3.65

Shearing Stage





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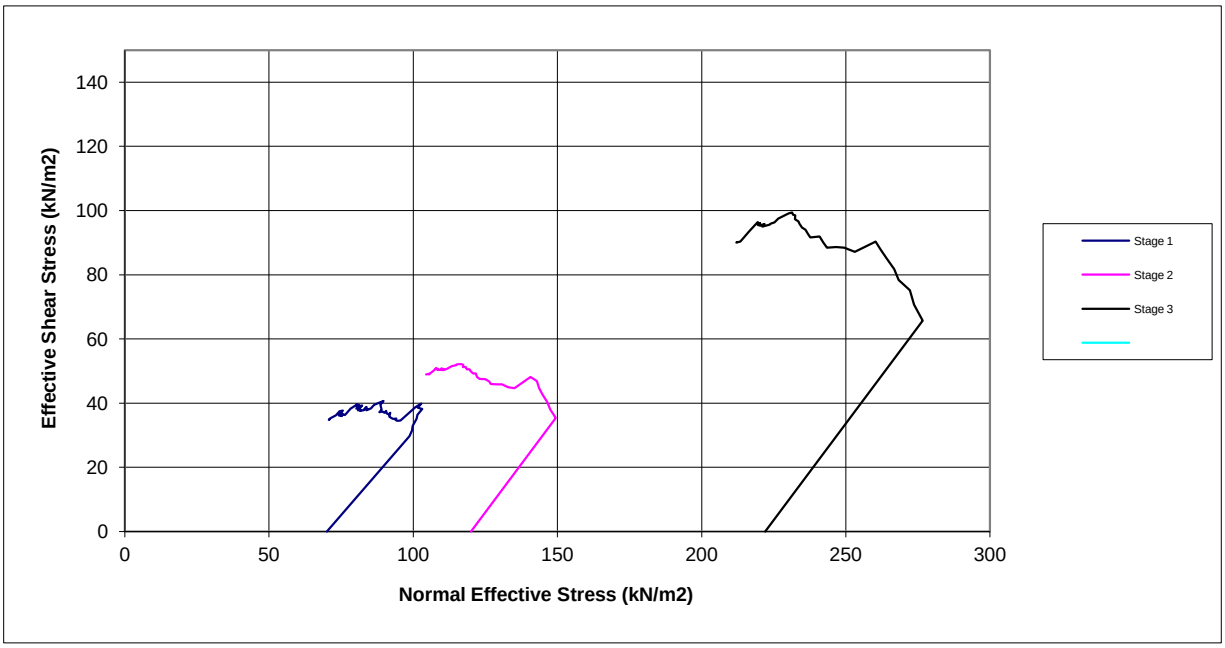
Specimen Details

Borehole		BH2
Sample No.		
Depth	from(m)	3.20
Depth	to(m)	3.65

Shearing Stage



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BS 1377 : Part 8 : 1990 : 38mm Set of Three

Specimen Details

Borehole		BH2
Sample No.		
Depth	from(m)	3.20
Depth	to(m)	3.65

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Client Ref
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Contract No
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Consolidated Undrained Triaxial Compression Test

BS 1377 : Part 8 : 1990 : 38mm Set of Three

Specimen Details

Borehole		BH3
Sample No.		
Depth	from(m)	3.20
Depth	to(m)	3.65
Date		21/04/2017
Disturbed / Undisturbed		Undisturbed

Description of Specimen

Brown sl silty soft CLAY

Initial Specimen Conditions

Height	mm	76.00	76.00	76.00
Diameter	mm	38.00	38.00	38.00
Area	mm^2	1134.11	1134.11	1134.11
Volume	cm^3	86.19	86.19	86.19
Mass	g	129.10	130.90	131.70
Dry Mass	g	79.40	83.50	78.30
Density	Mg/m^3	1.50	1.52	1.53
Dry Density	Mg/m^3	0.92	0.97	0.91
Moisture Content	%	63	57	68
Specific Gravity	kN/m^3	2.65	2.65	2.65
(assumed/measured)		assumed	assumed	assumed

Final Specimen Conditions

Moisture Content	%	64	57	57
Density	Mg/m^3	1.82	1.93	1.94
Dry Density	Mg/m^3	1.10	1.23	1.24

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Checked and Approved By

21/04/17
Date

Client Ref

C5530

Contract No

34689

Prison Copse Wall

GSTL
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Consolidated Undrained Triaxial Compression Test

BS 1377 : Part 8 : 1990 : 38mm Set of Three

Specimen Details

Borehole		BH3
Sample No.		
Depth	from(m)	3.20
Depth	to(m)	3.65

Test Setup

Date started	13/04/2017	00/01/1900	00/01/1900
Date Finished	20/04/2017	00/01/1900	00/01/1900
Top Drain Used	y	y	y
Base Drain Used	y	y	y
Side Drains Used	y	y	y
Pressure System Number	P12	P13	P11
Cell Number	C12	C13	C11

Saturation

Cell Pressure Incr.	kPa	100.00	100.00	100.00
Back Pressure Incr.	kPa	95.00	95.00	95.00
Differential Pressure	kPa	5.00	5.00	5.00
Final Cell Pressure	kPa	300.00	500.00	300.00
Final Pore Pressure	kPa	296.00	296.50	297.00
Final B Value		0.97	0.95	0.97

Consolidation

Effective Pressure	kPa	70.00	120.00	220.00
Cell Pressure	kPa	300.00	300.00	300.00
Back Pressure	kPa	230.00	180.00	80.00
Excess Pore Pressure	kPa	67.00	116.00	217.00
Pore Pressure at End	kPa	230.00	180.00	80.00
Consolidated Volume	cm^3	71.89	67.69	63.39
Consolidated Height	mm	71.80	70.56	69.30
Consolidated Area	mm^2	1008.68	971.83	934.11
Vol. Compressibility	m^2/MN	0.72134	1.19242	3.30654
Consolidation Coef.	$m^2/yr.$	0.39467	0.02043	0.48599

D P Evans

Checked and Approved By

21/04/17
Date

Client Ref

C5530

Contract No

34689

Prison Copse Wall

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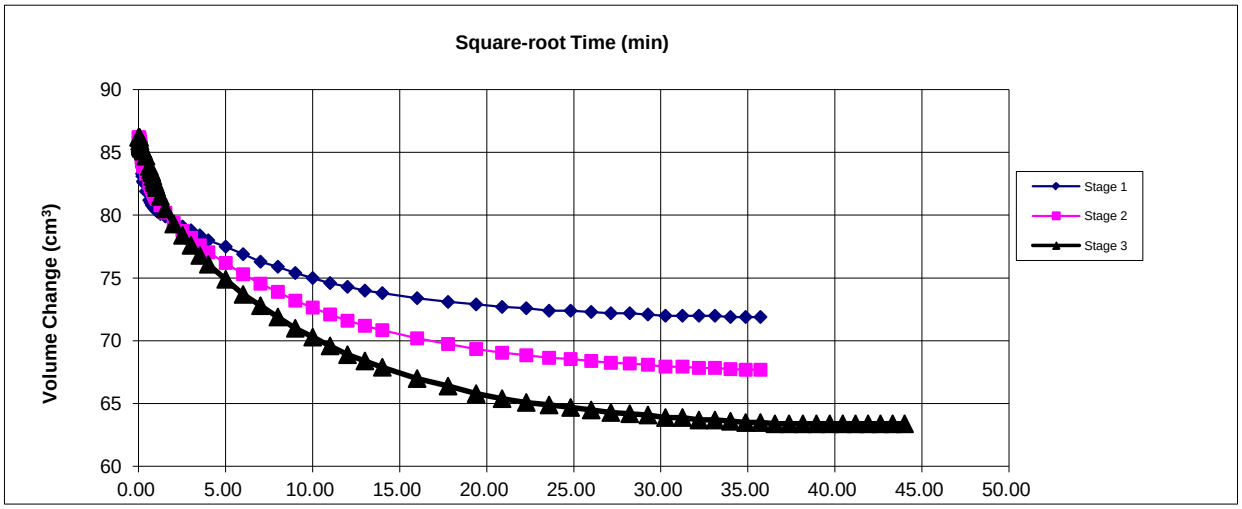
Consolidated Undrained Triaxial Compression Test

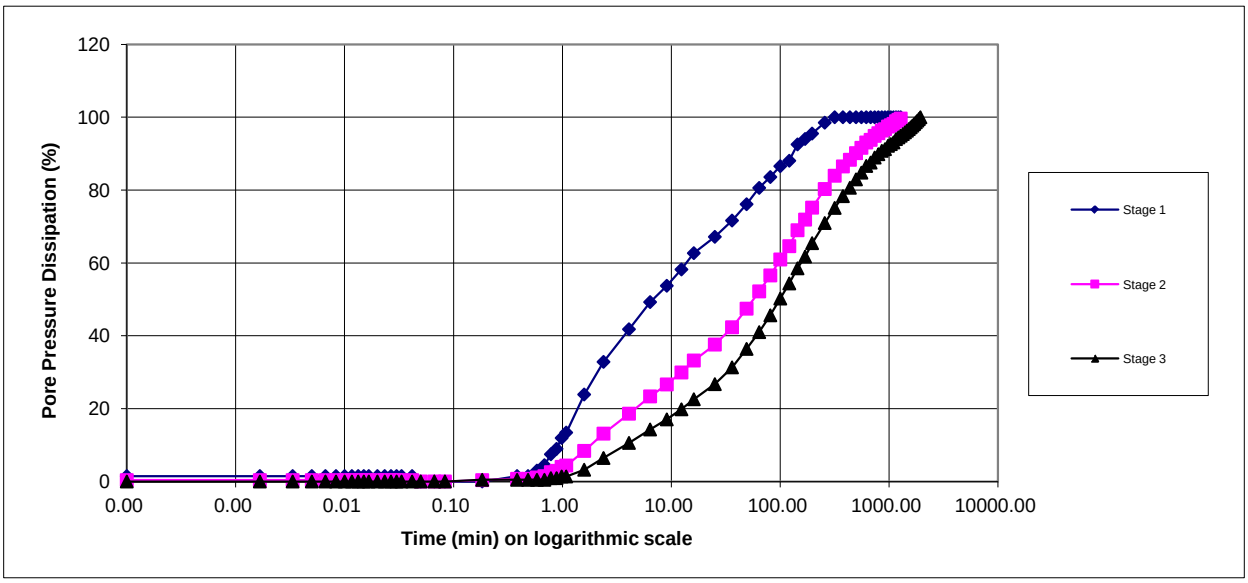
BS 1377 : Part 8 : 1990 : 38mm Set of Three

Specimen Details

Borehole		BH3
Sample No.		
Depth	from(m)	3.20
Depth	to(m)	3.65

Consolidation Stage





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21/04/17
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C5530

Contract No

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Prison Copse Wall

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GEO SITE & TESTING SERVICES LTD

Consolidated Undrained Triaxial Compression Test

BS 1377 : Part 8 : 1990 : 38mm Set of Three

Specimen Details

Borehole		BH3
Sample No.		
Depth	from(m)	3.20
Depth	to(m)	3.65

Shearing

Initial Cell Pressure	kPa	300	300	300
Initial Pore Pressure	kPa	230	180	80
Rate of Strain	mm/min	0.0207	0.0011	0.0246
Max Deviator Stress				
Axial Strain		8.761	8.935	9.351
Axial Stress	kPa	129.350	189.16	326.81
Cor. Deviator stress	kPa	118.154	176.93	314.44
Effective Major Stress	kPa	156.154	245.93	459.44
Effective Minor Stress	kPa	39.000	69.00	145.00
Effective Stress Ratio		4.004	3.564	3.17
s'	kPa	97.577	157.47	302.22
t'	kPa	58.577	88.47	157.22
Max Effective Priciple Stress Ratio				
Axial Strain		8.761	10.225	10.231
Axial Stress	kPa	129.350	186.047	325.925
Cor. Deviator stress	kPa	117.154	173.551	313.417
Effective Major Stress	kPa	156.154	241.051	455.417
Effective Minor Stress	kPa	39.000	67.500	142.000
Effective Stress Ratio		4.004	3.571	3.207
s'	kPa	97.577	154.275	298.708
t'	kPa	58.577	86.775	156.708
Shear Resistance Angle	degs			29.0
Cohesion c'	kPa			14

D P Evans

Checked and Approved By

21/04/17
Date

Client Ref

C5530

Contract No

34689

Prison Copse Wall

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GEO SITE & TESTING SERVICES LTD

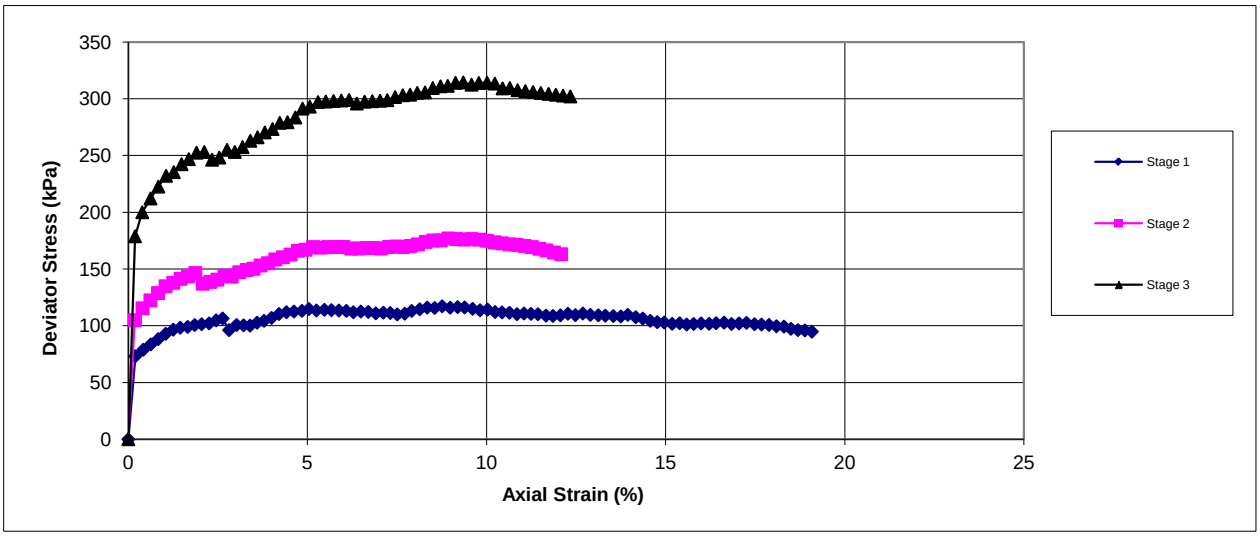
Consolidated Undrained Triaxial Compression Test

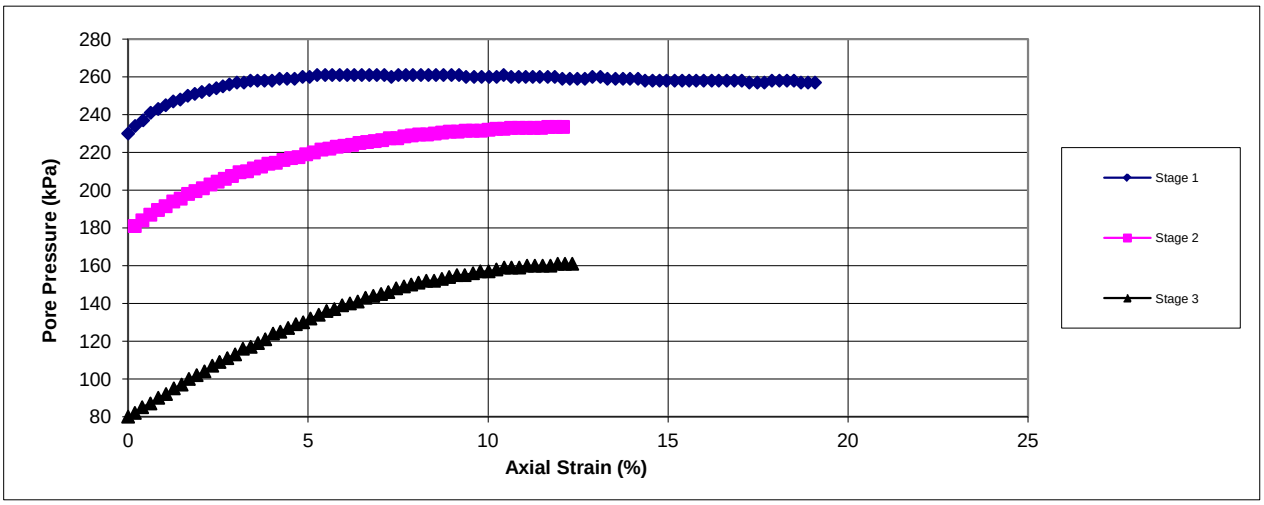
BS 1377 : Part 8 : 1990 : 38mm Set of Three

Specimen Details

Borehole		BH3
Sample No.		
Depth	from(m)	3.20
Depth	to(m)	3.65

Shearing Stage





D P Evans

Checked and Approved By

21/04/17
Date

Client Ref

C5530

Contract No

34689

Prison Copse Wall

GSTL
GEO SITE & TESTING SERVICES LTD

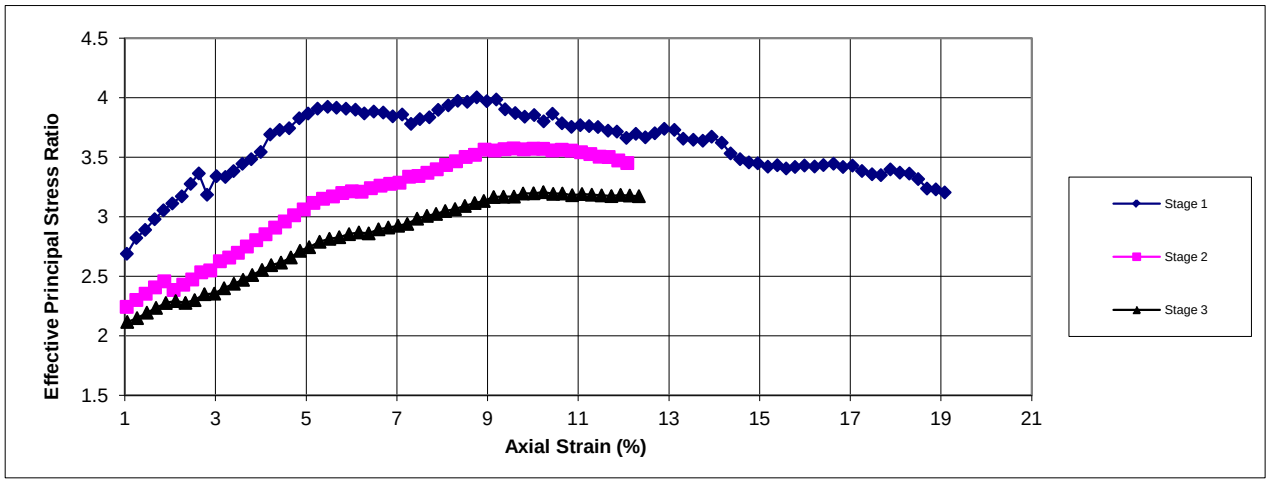
Consolidated Undrained Triaxial Compression Test

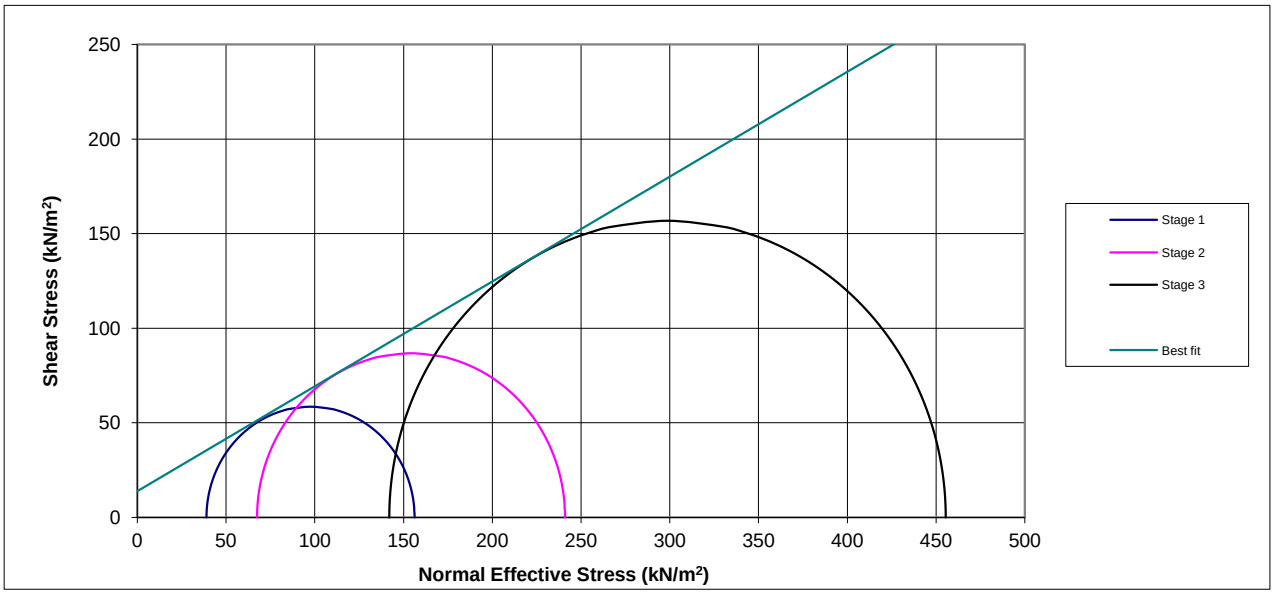
BS 1377 : Part 8 : 1990 : 38mm Set of Three

Specimen Details

Borehole		BH3
Sample No.		
Depth	from(m)	3.20
Depth	to(m)	3.65

Shearing Stage





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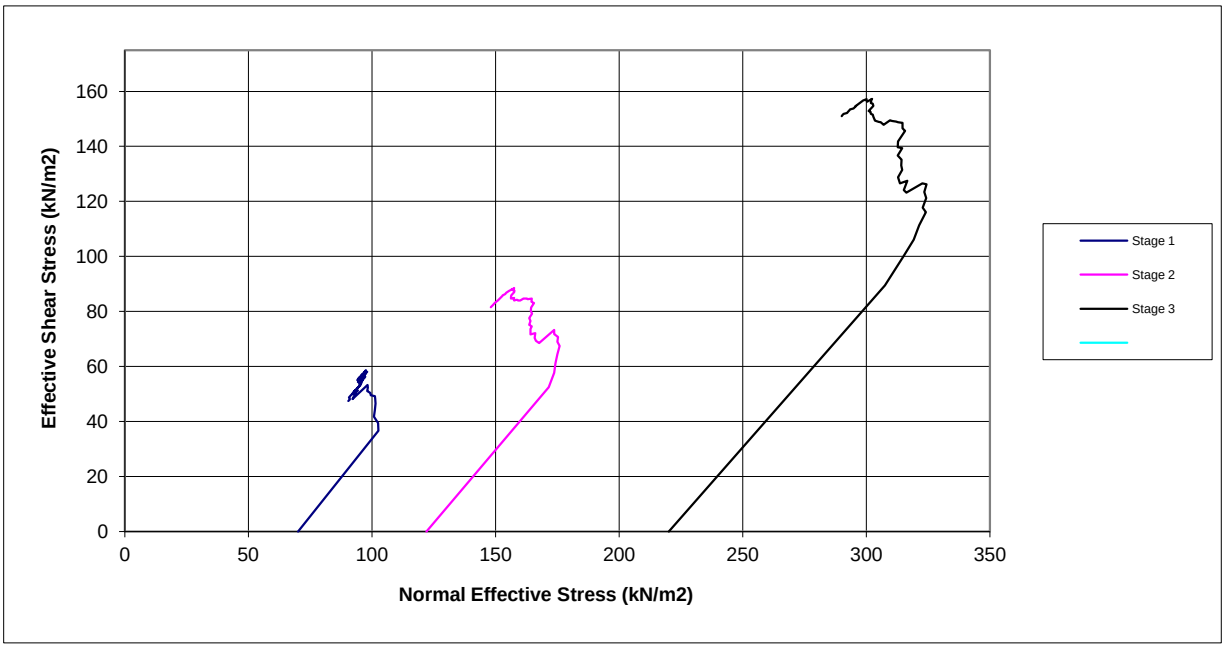
Specimen Details

Borehole		BH3
Sample No.		
Depth	from(m)	3.20
Depth	to(m)	3.65

Shearing Stage



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Consolidated Undrained Triaxial Compression Test

BS 1377 : Part 8 : 1990 : 38mm Set of Three

Specimen Details

Borehole		BH3
Sample No.		
Depth	from(m)	3.20
Depth	to(m)	3.65

D P Grant

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21/04/17
Date

Client Ref
C5530
Contract No
34689

GSTL
GEO SITE & TESTING SERVICES LTD

Prison Copse Wall

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Analytical Report Number : 17-43772

Project / Site name:	Prison Copse Wall	**Samples received on:**	27/03/2017
Your job number:	C5530	**Samples instructed on:**	27/03/2017
Your order number:		**Analysis completed by:**	04/04/2017
Report Issue Number:	1	**Report issued on:**	04/04/2017
Samples Analysed:	3 leachate samples - 6 soil samples		

Signed:

Rexona Rahman
Reporting Manager
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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Analytical Report Number: 17-43772

Project / Site name: Prison Copse Wall

Lab Sample Number				724037	724038	724039	724040	724041
Sample Reference				BH01	BH01	BH02	BH02	BH03
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.70	1.50	1.00	1.40	1.00
Date Sampled				06/02/2017	06/02/2017	08/02/2017	08/02/2017	09/02/2017
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	5.9	20	14	17	18
Total mass of sample received	kg	0.001	NONE	2.0	1.4	1.8	1.6	1.0
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	-	Not-detected	-	Not-detected
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	0.35
Acenaphthylene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluorene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Phenanthrene	mg/kg	0.1	MCERTS	0.17	< 0.10	< 0.10	< 0.10	0.53
Anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluoranthene	mg/kg	0.1	MCERTS	0.30	< 0.10	< 0.10	< 0.10	0.40
Pyrene	mg/kg	0.1	MCERTS	0.33	< 0.10	< 0.10	< 0.10	0.39
Benzo(a)anthracene	mg/kg	0.1	MCERTS	0.20	< 0.10	< 0.10	< 0.10	0.21
Chrysene	mg/kg	0.05	MCERTS	0.23	< 0.05	< 0.05	< 0.05	0.26
Benzo(b)fluoranthene	mg/kg	0.1	MCERTS	0.29	< 0.10	< 0.10	< 0.10	0.31
Benzo(k)fluoranthene	mg/kg	0.1	MCERTS	0.18	< 0.10	< 0.10	< 0.10	0.16
Benzo(a)pyrene	mg/kg	0.1	MCERTS	0.23	< 0.10	< 0.10	< 0.10	0.15
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Dibenz(a,h)anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	0.18	< 0.05	< 0.05	< 0.05	0.34
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	1.6	MCERTS	2.11	< 1.60	< 1.60	< 1.60	3.10
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	17	10	9.2	23	37
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	18	36	31	30	12
Copper (aqua regia extractable)	mg/kg	1	MCERTS	36	28	21	42	46
Lead (aqua regia extractable)	mg/kg	1	MCERTS	57	14	20	50	24
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	19	45	34	28	21
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	51	56	49	110	33

Analytical Report Number: 17-43772

Project / Site name: Prison Copse Wall

Lab Sample Number				724037	724038	724039	724040	724041
Sample Reference				BH01	BH01	BH02	BH02	BH03
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.70	1.50	1.00	1.40	1.00
Date Sampled				06/02/2017	06/02/2017	08/02/2017	08/02/2017	09/02/2017
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Monoaromatics								
Benzene	ug/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
p & m-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Petroleum Hydrocarbons								
TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	1.5
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0	< 2.0	6.7
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	13	< 8.0	< 8.0	< 8.0	< 8.0
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	34	< 8.0	< 8.0	< 8.0	8.8
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	49	< 10	< 10	< 10	19
TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0	< 2.0	2.1
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	< 10	< 10	< 10	< 10	< 10

Analytical Report Number: 17-43772

Project / Site name: Prison Copse Wall

Lab Sample Number				724042				
Sample Reference				BH03				
Sample Number				None Supplied				
Depth (m)				1.40				
Date Sampled				09/02/2017				
Time Taken				None Supplied				
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1				
Moisture Content	%	N/A	NONE	17				
Total mass of sample received	kg	0.001	NONE	1.8				
Asbestos in Soil	Type	N/A	ISO 17025	-				
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	< 0.05				
Acenaphthylene	mg/kg	0.1	MCERTS	< 0.10				
Acenaphthene	mg/kg	0.1	MCERTS	< 0.10				
Fluorene	mg/kg	0.1	MCERTS	< 0.10				
Phenanthrene	mg/kg	0.1	MCERTS	< 0.10				
Anthracene	mg/kg	0.1	MCERTS	< 0.10				
Fluoranthene	mg/kg	0.1	MCERTS	< 0.10				
Pyrene	mg/kg	0.1	MCERTS	< 0.10				
Benzo(a)anthracene	mg/kg	0.1	MCERTS	< 0.10				
Chrysene	mg/kg	0.05	MCERTS	< 0.05				
Benzo(b)fluoranthene	mg/kg	0.1	MCERTS	< 0.10				
Benzo(k)fluoranthene	mg/kg	0.1	MCERTS	< 0.10				
Benzo(a)pyrene	mg/kg	0.1	MCERTS	< 0.10				
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	MCERTS	< 0.10				
Dibenz(a,h)anthracene	mg/kg	0.1	MCERTS	< 0.10				
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05				
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	1.6	MCERTS	< 1.60				
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	22				
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2				
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	28				
Copper (aqua regia extractable)	mg/kg	1	MCERTS	23				
Lead (aqua regia extractable)	mg/kg	1	MCERTS	14				
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3				
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	19				
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0				
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	52				

Analytical Report Number: 17-43772

Project / Site name: Prison Copse Wall

Lab Sample Number				724042				
Sample Reference				BH03				
Sample Number				None Supplied				
Depth (m)				1.40				
Date Sampled				09/02/2017				
Time Taken				None Supplied				
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Monoaromatics								
Benzene	ug/kg	1	MCERTS	< 1.0				
Toluene	µg/kg	1	MCERTS	< 1.0				
Ethylbenzene	µg/kg	1	MCERTS	< 1.0				
p & m-xylene	µg/kg	1	MCERTS	< 1.0				
o-xylene	µg/kg	1	MCERTS	< 1.0				
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0				

Petroleum Hydrocarbons

TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.1	MCERTS	< 0.1				
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.1	MCERTS	0.2				
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.1	MCERTS	14				
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	170				
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	380				
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	82				
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	41				
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	690				

TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.1	MCERTS	< 0.1				
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.1	MCERTS	< 0.1				
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.1	MCERTS	< 0.1				
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	57				
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	240				
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	59				
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	52				
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	410				

Analytical Report Number: 17-43772

Project / Site name: Prison Copse Wall

Lab Sample Number				724043	724044	724045		
Sample Reference				BH01	BH02	BH03		
Sample Number				None Supplied	None Supplied	None Supplied		
Depth (m)				0.70	1.00	1.00		
Date Sampled				06/02/2017	08/02/2017	09/02/2017		
Time Taken				None Supplied	None Supplied	None Supplied		
Analytical Parameter (Leachate Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Speciated PAHs								
Naphthalene	µg/l	0.01	NONE	< 0.01	0.24	< 0.01		
Acenaphthylene	µg/l	0.01	NONE	< 0.01	0.24	< 0.01		
Acenaphthene	µg/l	0.01	NONE	< 0.01	4.1	< 0.01		
Fluorene	µg/l	0.01	NONE	< 0.01	1.9	< 0.01		
Phenanthrene	µg/l	0.01	NONE	< 0.01	1.8	< 0.01		
Anthracene	µg/l	0.01	NONE	< 0.01	0.42	< 0.01		
Fluoranthene	µg/l	0.01	NONE	< 0.01	0.68	< 0.01		
Pyrene	µg/l	0.01	NONE	< 0.01	0.45	< 0.01		
Benzo(a)anthracene	µg/l	0.01	NONE	< 0.01	< 0.01	< 0.01		
Chrysene	µg/l	0.01	NONE	< 0.01	< 0.01	< 0.01		
Benzo(b)fluoranthene	µg/l	0.01	NONE	< 0.01	< 0.01	< 0.01		
Benzo(k)fluoranthene	µg/l	0.01	NONE	< 0.01	< 0.01	< 0.01		
Benzo(a)pyrene	µg/l	0.01	NONE	< 0.01	< 0.01	< 0.01		
Indeno(1,2,3-cd)pyrene	µg/l	0.01	NONE	< 0.01	< 0.01	< 0.01		
Dibenz(a,h)anthracene	µg/l	0.01	NONE	< 0.01	< 0.01	< 0.01		
Benzo(ghi)perylene	µg/l	0.01	NONE	< 0.01	< 0.01	< 0.01		
Total PAH								
Total EPA-16 PAHs	µg/l	0.2	NONE	< 0.2	9.8	< 0.2		
Heavy Metals / Metalloids								
Arsenic (dissolved)	µg/l	1.1	ISO 17025	< 1.1	4.3	< 1.1		
Cadmium (dissolved)	µg/l	0.08	ISO 17025	< 0.08	< 0.08	0.95		
Chromium (dissolved)	µg/l	0.4	ISO 17025	0.4	1.3	3.6		
Copper (dissolved)	µg/l	0.7	ISO 17025	9.6	7.3	68		
Lead (dissolved)	µg/l	1	ISO 17025	2.7	1.7	6.0		
Mercury (dissolved)	µg/l	0.5	ISO 17025	< 0.5	< 0.5	< 0.5		
Nickel (dissolved)	µg/l	0.3	ISO 17025	< 0.3	< 0.3	130		
Selenium (dissolved)	µg/l	4	ISO 17025	< 4.0	< 4.0	< 4.0		
Zinc (dissolved)	µg/l	0.4	ISO 17025	3.2	3.5	110		

Analytical Report Number: 17-43772

Project / Site name: Prison Copse Wall

Lab Sample Number				724043	724044	724045		
Sample Reference				BH01	BH02	BH03		
Sample Number				None Supplied	None Supplied	None Supplied		
Depth (m)				0.70	1.00	1.00		
Date Sampled				06/02/2017	08/02/2017	09/02/2017		
Time Taken				None Supplied	None Supplied	None Supplied		
Analytical Parameter (Leachate Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Monoaromatics								
Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
p & m-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
o-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
MTBE (Methyl Tertiary Butyl Ether)	µg/l	10	NONE	< 10	< 10	< 10		
Petroleum Hydrocarbons								
TPH-CWG - Aliphatic >C5 - C6	µg/l	10	NONE	< 10	< 10	< 10		
TPH-CWG - Aliphatic >C6 - C8	µg/l	10	NONE	< 10	< 10	< 10		
TPH-CWG - Aliphatic >C8 - C10	µg/l	10	NONE	< 10	< 10	< 10		
TPH-CWG - Aliphatic >C10 - C12	µg/l	10	NONE	< 10	< 10	< 10		
TPH-CWG - Aliphatic >C12 - C16	µg/l	10	NONE	< 10	< 10	< 10		
TPH-CWG - Aliphatic >C16 - C21	µg/l	10	NONE	< 10	< 10	< 10		
TPH-CWG - Aliphatic >C21 - C35	µg/l	10	NONE	< 10	< 10	< 10		
TPH-CWG - Aliphatic (C5 - C35)	µg/l	10	NONE	< 10	< 10	< 10		
TPH-CWG - Aromatic >C5 - C7	µg/l	10	NONE	< 10	< 10	< 10		
TPH-CWG - Aromatic >C7 - C8	µg/l	10	NONE	< 10	< 10	< 10		
TPH-CWG - Aromatic >C8 - C10	µg/l	10	NONE	< 10	< 10	< 10		
TPH-CWG - Aromatic >C10 - C12	µg/l	10	NONE	< 10	< 10	< 10		
TPH-CWG - Aromatic >C12 - C16	µg/l	10	NONE	< 10	< 10	< 10		
TPH-CWG - Aromatic >C16 - C21	µg/l	10	NONE	< 10	< 10	< 10		
TPH-CWG - Aromatic >C21 - C35	µg/l	10	NONE	< 10	< 10	< 10		
TPH-CWG - Aromatic (C5 - C35)	µg/l	10	NONE	< 10	< 10	< 10		

Analytical Report Number : 17-43772

Project / Site name: Prison Copse Wall

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
724037	BH01	None Supplied	0.70	Brown loam and sand with gravel.
724038	BH01	None Supplied	1.50	Grey clay.
724039	BH02	None Supplied	1.00	Brown clay and sand with gravel.
724040	BH02	None Supplied	1.40	Brown sandy clay.
724041	BH03	None Supplied	1.00	Black clay and sand.
724042	BH03	None Supplied	1.40	Brown clay.

Analytical Report Number : 17-43772

Project / Site name: Prison Copse Wall

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
BS EN 12457-1 (2:1) Leachate Prep	2:1 (as recieved, moisture adjusted) end over end extraction with water for 24 hours. Eluate filtered prior to analysis.	In-house method based on BSEN12457-1.	L043-PL	W	NONE
BTEX and MTBE in leachates (Monoaromatics)	Determination of BTEX and MTBE in leachates by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS
D.O. for Gravimetric Quant if Screen/ID positive	Dependent option for Gravimetric Quant if Screen/ID positive scheduled.	In house asbestos methods A001 & A006.	A006-PL	D	NONE
Metals by ICP-OES in leachate	Determination of metals in leachate by acidification followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically.	In-house method based on BS1377 Part 2, 1990, Chemical and Electrochemical Tests	L019-UK/PL	W	NONE
Speciated EPA-16 PAHs in leachate	Determination of PAH compounds in leachate by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L102B-PL	W	NONE
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
TPHCWG (Leachates)	Determination of dichloromethane extractable hydrocarbons in leachate by GC-MS.	In-house method	L070-PL	W	NONE
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method	L076-PL	W	MCERTS

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.
For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

Sample ID	Other_ID	Sample Type	Job	Sample Number	Sample Deviation Code	test_name	test_ref	Test Deviation code
BH01		S	17-43772	724037	c	BTEX and MTBE in soil (Monoaromatics)	L073B-PL	c
BH01		S	17-43772	724037	c	Speciated EPA-16 PAHs in soil	L064-PL	c
BH01		S	17-43772	724037	c	TPHCWG (Soil)	L076-PL	c
BH01		S	17-43772	724038	c	BTEX and MTBE in soil (Monoaromatics)	L073B-PL	c
BH01		S	17-43772	724038	c	Speciated EPA-16 PAHs in soil	L064-PL	c
BH01		S	17-43772	724038	c	TPHCWG (Soil)	L076-PL	c
BH02		S	17-43772	724039	c	BTEX and MTBE in soil (Monoaromatics)	L073B-PL	c
BH02		S	17-43772	724039	c	Speciated EPA-16 PAHs in soil	L064-PL	c
BH02		S	17-43772	724039	c	TPHCWG (Soil)	L076-PL	c
BH02		S	17-43772	724040	c	BTEX and MTBE in soil (Monoaromatics)	L073B-PL	c
BH02		S	17-43772	724040	c	Speciated EPA-16 PAHs in soil	L064-PL	c
BH02		S	17-43772	724040	c	TPHCWG (Soil)	L076-PL	c
BH03		S	17-43772	724041	c	BTEX and MTBE in soil (Monoaromatics)	L073B-PL	c
BH03		S	17-43772	724041	c	Speciated EPA-16 PAHs in soil	L064-PL	c
BH03		S	17-43772	724041	c	TPHCWG (Soil)	L076-PL	c
BH03		S	17-43772	724042	c	BTEX and MTBE in soil (Monoaromatics)	L073B-PL	c
BH03		S	17-43772	724042	c	Speciated EPA-16 PAHs in soil	L064-PL	c
BH03		S	17-43772	724042	c	TPHCWG (Soil)	L076-PL	c

Key: a - No sampling date b - Incorrect container
c - Holding time d - Headspace e - Temperature

APPENDIX D

Appendix D – SPT Calibration Data

SPT Calibration Report

EQUIPE GROUP
www.equipegroup.com

Hammer Energy Measurement Report

Type of Hammer	SPT HAMMER
Client	CC GROUND INVESTIGATIONS LTD
Test No	EQU1700
Test Depth (m)	8.50
Date of Test	03 January 2017
Valid until	03 January 2018
Hammer ID	CC05

Mass of the hammer	m = 63.5kg
Falling height	h = 0.76m
E_{theor} =	$m \times g \times h$ = 473J

Characteristics of the instrumented rod

Diameter	d_r = 0.052 m
Length of the instrumented rod	0.558 m
Area	A = 11.61 cm²
Modulus	E_a = 206843 MPa

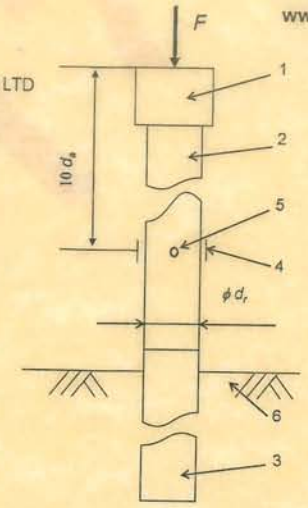
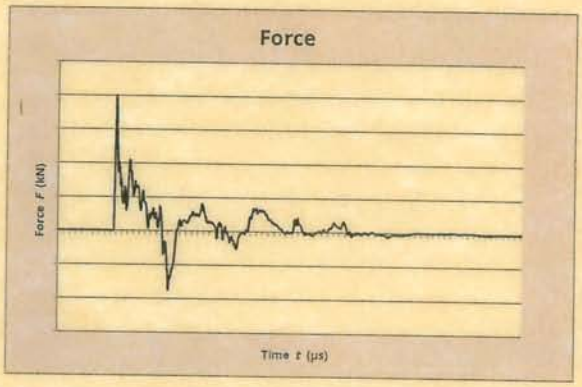
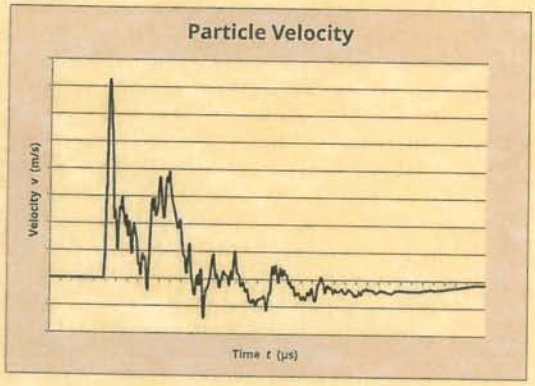
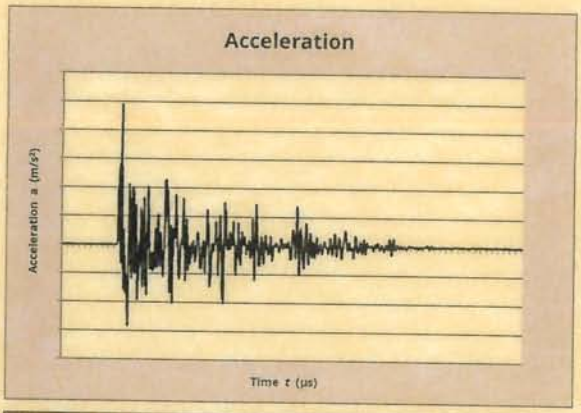
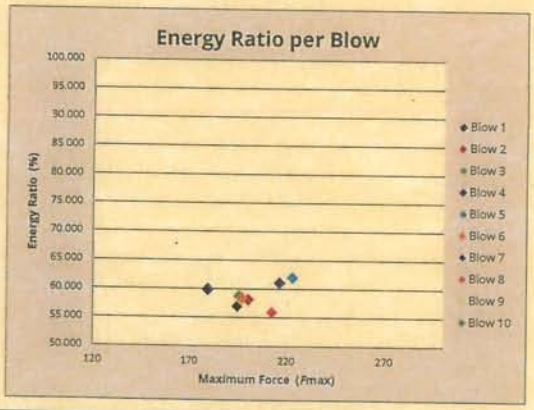


Fig. B.1 and B.2 BS EN ISO 22476-3 : 2005 + A1 : 2011









Observations:
1.

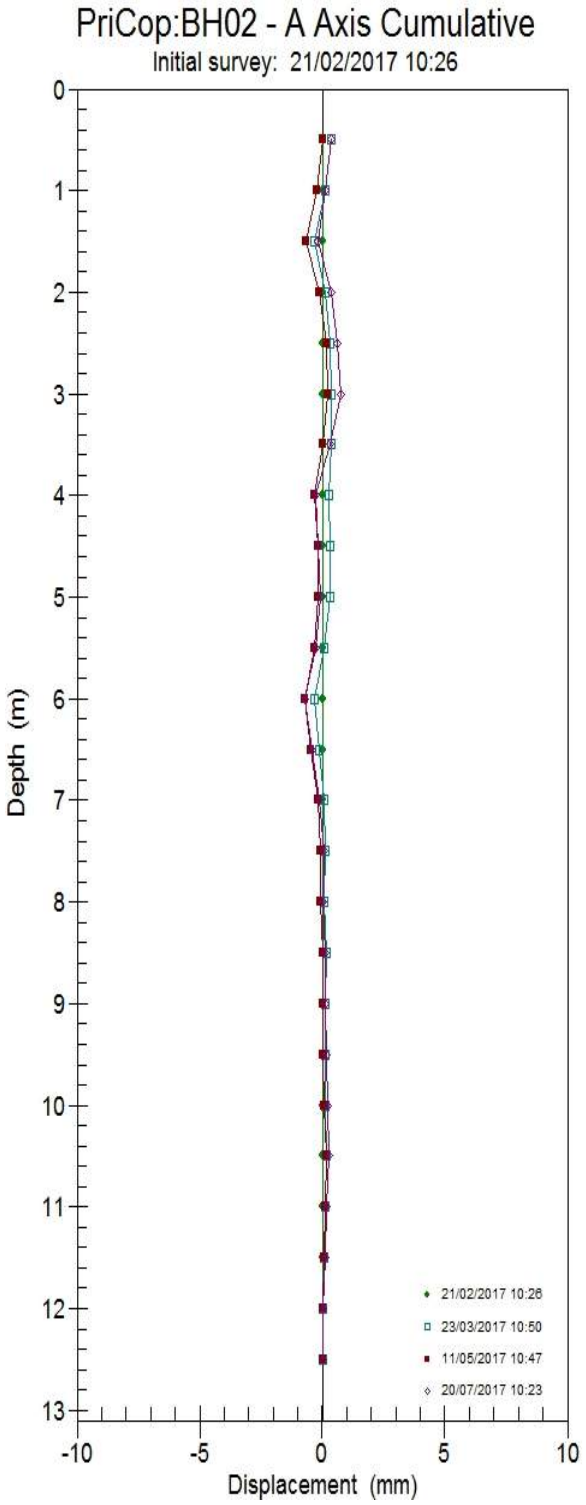
E_{meas} =	0.282 kN-m	
E_{theor} =	0.473 kN-m	
Energy Ratio (E_r) = $\frac{E_{meas}}{E_{theor}}$		59.65%

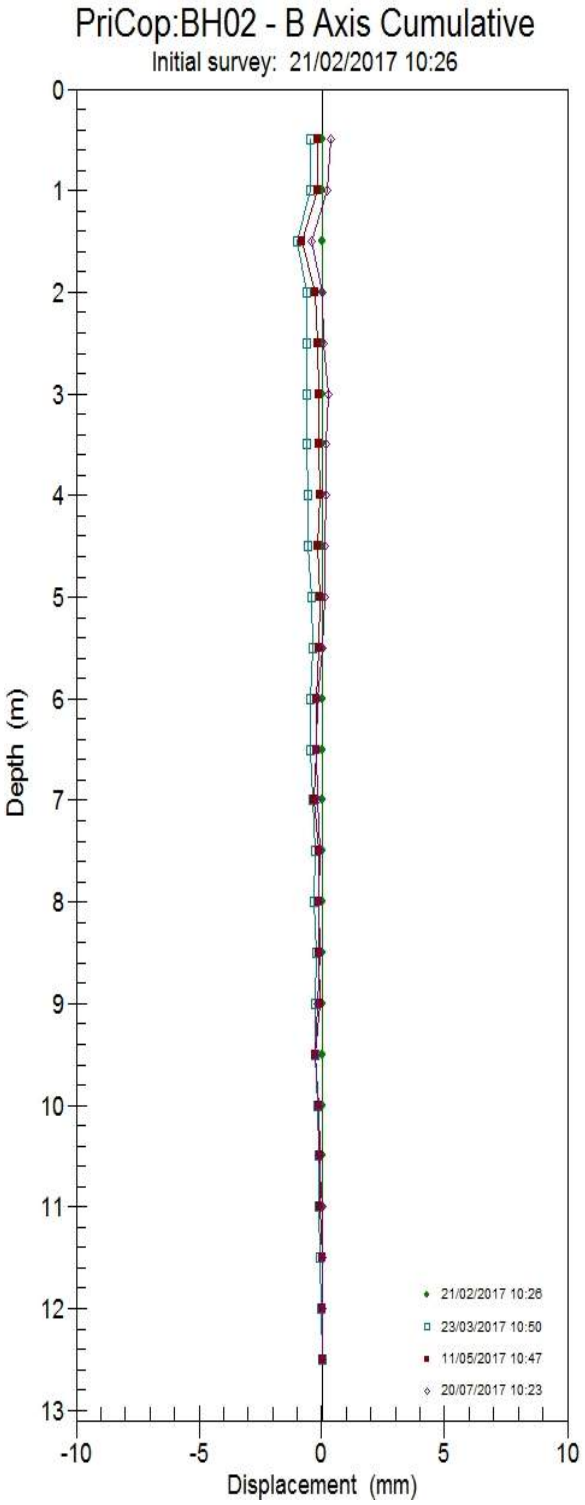
Equipe SPT Analyzer Operators: AF

Prepared by: Checked by: Date 01/02/2017

Equipe Group, The Paddocks, Home Farm Offices, The Upton Estate, Banbury, Oxfordshire, OX15 6HU
Tel: +44 (0)1295 670990 Fax: +44 (0)1295 678232 Email: info@equipegroup.com

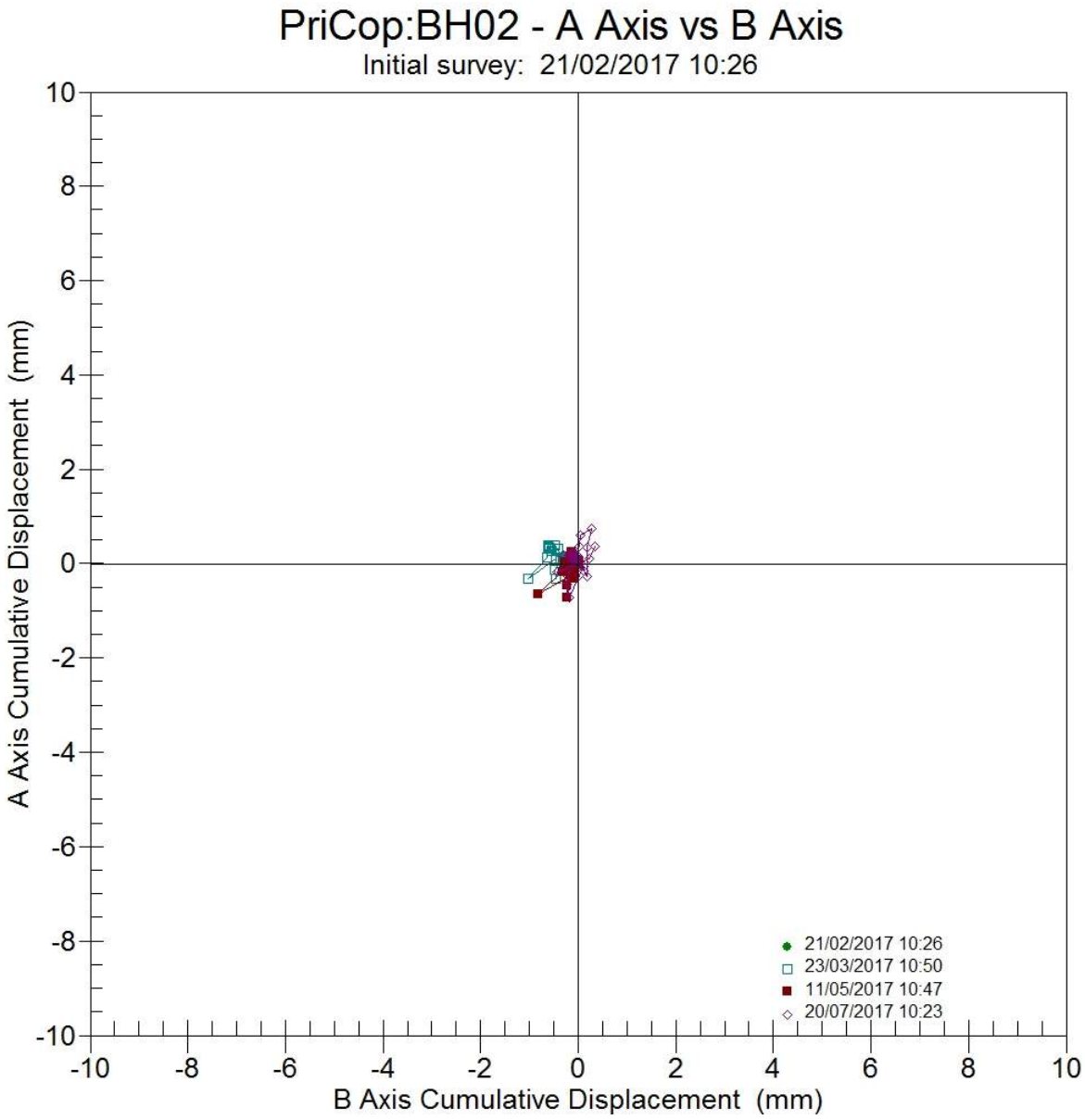
Appendix C Inclinometer Results





PROJECT: Northleach, Prison Copse Wall
SITE: Northleach
INSTALLATION: BH02
COMPANY: Amey
CLIENT: Gloucestershire County Council

NOTE:



PROJECT: Northleach, Prison Copse Wall
SITE: Northleach
INSTALLATION: BH02
COMPANY: Amey
CLIENT: Gloucestershire County Council

NOTE:

PROJECT: Northleach, Prison Copse Wall
SITE: Northleach
INSTALLATION: BH02
COMPANY: Amey
CLIENT: Gloucestershire County Council
NOTE:

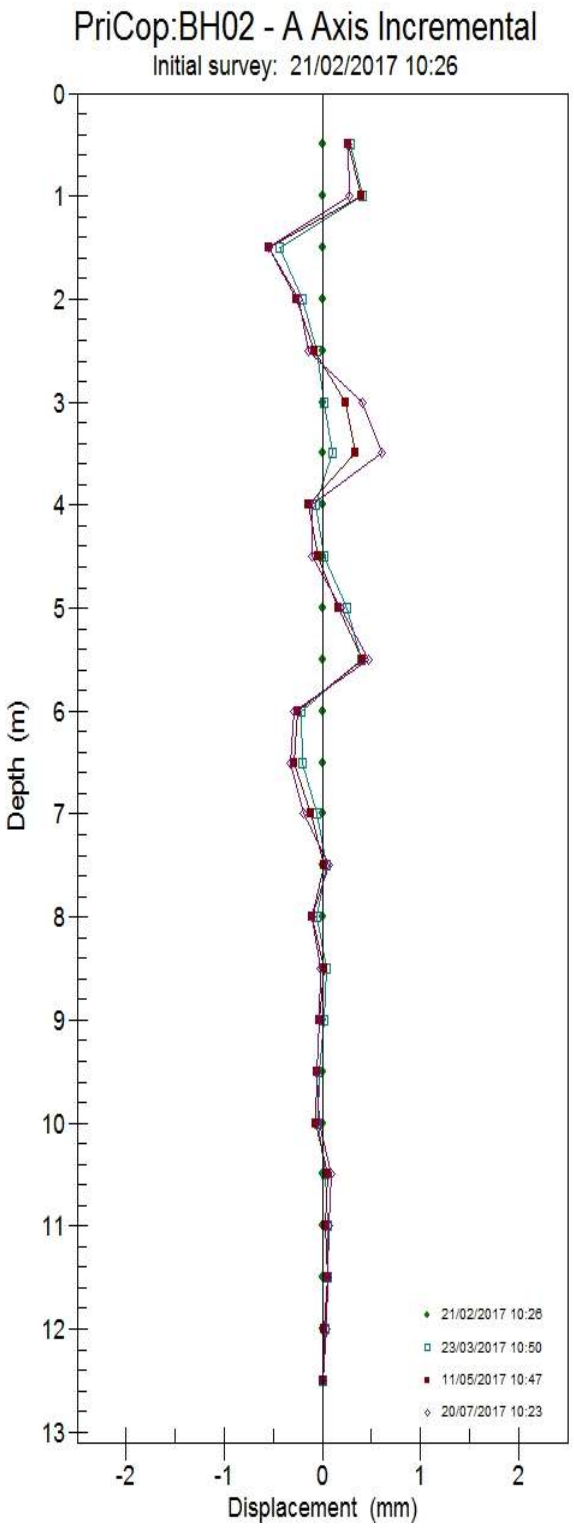
Cumulative Deflection Data in A Axis (mm):

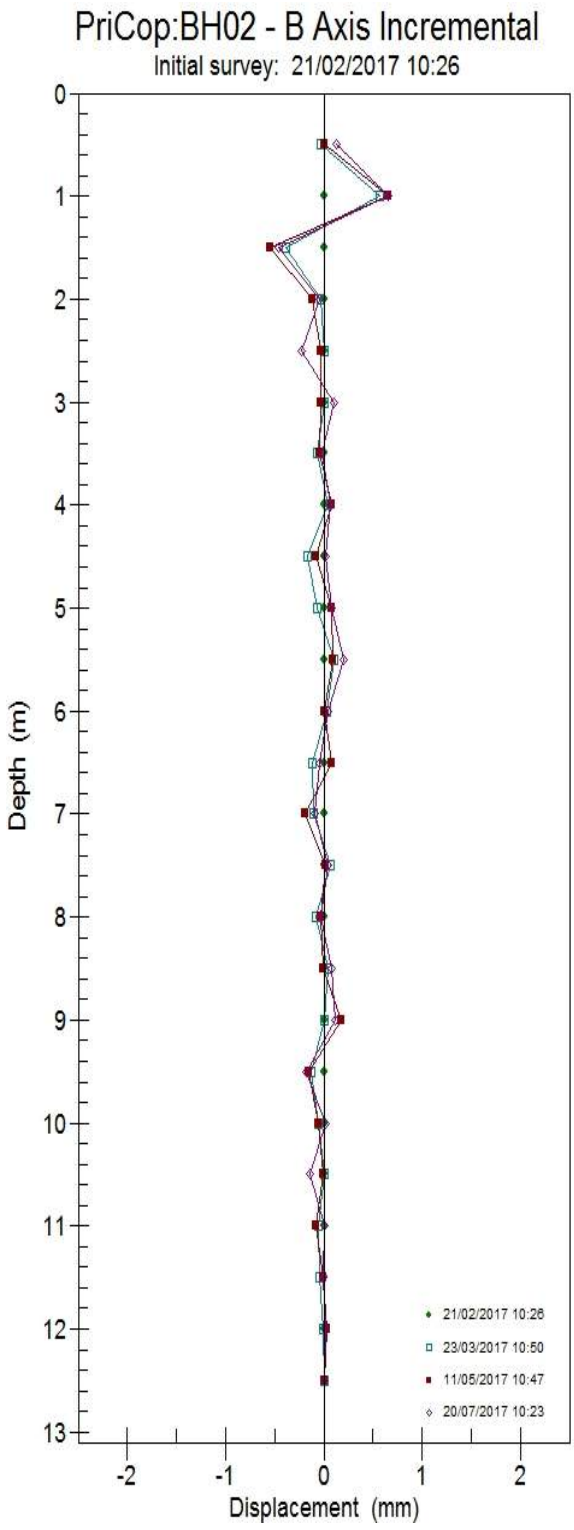
Depth (m)	21/02/2017 10:26:00 (mm)	23/03/2017 10:50:21 (mm)	11/05/2017 10:47:33 (mm)	20/07/2017 10:23:43 (mm)
0.5	0.00	0.39	0.01	0.36
1.0	0.00	0.10	-0.25	0.10
1.5	0.00	-0.31	-0.64	-0.17
2.0	0.00	0.13	-0.10	0.37
2.5	0.00	0.33	0.16	0.61
3.0	0.00	0.39	0.24	0.74
3.5	0.00	0.37	0.01	0.34
4.0	0.00	0.26	-0.33	-0.27
4.5	0.00	0.34	-0.19	-0.16
5.0	0.00	0.32	-0.15	-0.05
5.5	0.00	0.07	-0.31	-0.25
6.0	0.00	-0.33	-0.72	-0.72
6.5	0.00	-0.12	-0.47	-0.44
7.0	0.00	0.08	-0.18	-0.12
7.5	0.00	0.14	-0.06	0.08
8.0	0.00	0.10	-0.08	0.01
8.5	0.00	0.16	0.02	0.12
9.0	0.00	0.12	0.01	0.14
9.5	0.00	0.10	0.04	0.17
10.0	0.00	0.13	0.09	0.22
10.5	0.00	0.17	0.16	0.25
11.0	0.00	0.14	0.10	0.16
11.5	0.00	0.08	0.07	0.10
12.0	0.00	0.03	0.02	0.05
12.5	0.00	0.00	0.00	0.00

PROJECT: Northleach, Prison Copse Wall
SITE: Northleach
INSTALLATION: BH02
COMPANY: Amey
CLIENT: Gloucestershire County Council
NOTE:

Cumulative Deflection Data in B Axis (mm):

Depth (m)	21/02/2017 10:26:00 (mm)	23/03/2017 10:50:21 (mm)	11/05/2017 10:47:33 (mm)	20/07/2017 10:23:43 (mm)
0.5	0.00	-0.48	-0.16	0.35
1.0	0.00	-0.45	-0.16	0.22
1.5	0.00	-1.02	-0.82	-0.44
2.0	0.00	-0.63	-0.27	0.01
2.5	0.00	-0.61	-0.15	0.05
3.0	0.00	-0.61	-0.13	0.28
3.5	0.00	-0.62	-0.10	0.17
4.0	0.00	-0.55	-0.06	0.19
4.5	0.00	-0.59	-0.15	0.12
5.0	0.00	-0.42	-0.07	0.11
5.5	0.00	-0.35	-0.14	0.03
6.0	0.00	-0.45	-0.23	-0.18
6.5	0.00	-0.49	-0.23	-0.22
7.0	0.00	-0.37	-0.31	-0.18
7.5	0.00	-0.26	-0.11	-0.08
8.0	0.00	-0.33	-0.13	-0.12
8.5	0.00	-0.24	-0.10	-0.09
9.0	0.00	-0.28	-0.09	-0.17
9.5	0.00	-0.29	-0.27	-0.29
10.0	0.00	-0.16	-0.11	-0.11
10.5	0.00	-0.11	-0.06	-0.12
11.0	0.00	-0.11	-0.06	0.01
11.5	0.00	-0.05	0.02	0.01
12.0	0.00	-0.01	0.03	0.02
12.5	0.00	0.00	0.00	0.00





PROJECT: Northleach, Prison Copse Wall
SITE: Northleach
INSTALLATION: BH02
COMPANY: Amey
CLIENT: Gloucestershire County Council

NOTE:

PROJECT: Northleach, Prison Copse Wall
SITE: Northleach
INSTALLATION: BH02
COMPANY: Amey
CLIENT: Gloucestershire County Council
NOTE:

Incremental Deflection Data in A Axis (mm):

Depth (m)	21/02/2017 10:26:00 (mm)	23/03/2017 10:50:21 (mm)	11/05/2017 10:47:33 (mm)	20/07/2017 10:23:43 (mm)
0.5	0.00	0.28	0.26	0.26
1.0	0.00	0.42	0.40	0.28
1.5	0.00	-0.44	-0.54	-0.54
2.0	0.00	-0.20	-0.26	-0.24
2.5	0.00	-0.06	-0.08	-0.14
3.0	0.00	0.02	0.24	0.41
3.5	0.00	0.11	0.34	0.61
4.0	0.00	-0.07	-0.14	-0.11
4.5	0.00	0.02	-0.05	-0.11
5.0	0.00	0.26	0.16	0.20
5.5	0.00	0.39	0.42	0.47
6.0	0.00	-0.21	-0.26	-0.28
6.5	0.00	-0.20	-0.29	-0.32
7.0	0.00	-0.06	-0.12	-0.19
7.5	0.00	0.04	0.02	0.06
8.0	0.00	-0.06	-0.10	-0.11
8.5	0.00	0.04	0.02	-0.02
9.0	0.00	0.02	-0.03	-0.03
9.5	0.00	-0.03	-0.06	-0.05
10.0	0.00	-0.04	-0.07	-0.03
10.5	0.00	0.03	0.06	0.09
11.0	0.00	0.06	0.03	0.06
11.5	0.00	0.06	0.05	0.05
12.0	0.00	0.03	0.02	0.05
12.5	0.00	0.00	0.00	0.00

PROJECT: Northleach, Prison Copse Wall
SITE: Northleach
INSTALLATION: BH02
COMPANY: Amey
CLIENT: Gloucestershire County Council
NOTE:

Incremental Deflection Data in B Axis (mm):

Depth (m)	21/02/2017 10:26:00 (mm)	23/03/2017 10:50:21 (mm)	11/05/2017 10:47:33 (mm)	20/07/2017 10:23:43 (mm)
0.5	0.00	-0.02	0.00	0.13
1.0	0.00	0.57	0.66	0.66
1.5	0.00	-0.38	-0.55	-0.45
2.0	0.00	-0.03	-0.12	-0.04
2.5	0.00	0.01	-0.02	-0.23
3.0	0.00	0.01	-0.03	0.11
3.5	0.00	-0.07	-0.04	-0.01
4.0	0.00	0.04	0.09	0.07
4.5	0.00	-0.17	-0.08	0.01
5.0	0.00	-0.07	0.08	0.08
5.5	0.00	0.10	0.09	0.20
6.0	0.00	0.03	0.00	0.05
6.5	0.00	-0.12	0.07	-0.05
7.0	0.00	-0.11	-0.20	-0.10
7.5	0.00	0.07	0.01	0.04
8.0	0.00	-0.09	-0.03	-0.04
8.5	0.00	0.04	-0.01	0.08
9.0	0.00	0.01	0.18	0.12
9.5	0.00	-0.13	-0.16	-0.18
10.0	0.00	-0.05	-0.05	0.01
10.5	0.00	0.00	0.00	-0.13
11.0	0.00	-0.06	-0.08	0.00
11.5	0.00	-0.05	-0.01	-0.01
12.0	0.00	-0.01	0.03	0.02
12.5	0.00	0.00	0.00	0.00

Appendix D Waste Classification Report

Waste Classification Report

256J9-YK597-8QMHG

Job name

Prison Copse

Description/Comments

Six soil samples taken from depths of 0.7-1.5mbgl taken on 6-9th Feb

Project

Prison Copse

Site

Prison Copse

Waste Stream Template

Example waste stream template for contaminated soils

Classified by

Name:
Robert Hughes
Date:
06/04/2017 14:02:25 UTC
Telephone:
0121 2125360

Company:
Amey plc
International Design Hub, Colmore Plaza
20 Colmore Circus, Queensway
Birmingham
B4 6AT

Report

Created by: Robert Hughes
Created date: 06/04/2017 14:02 UTC

Job summary

Classification of sample: BH01

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

Sample details

Sample Name:
BH01
Sample Depth:
0.70 m
Moisture content:
5.9%
(no correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 5.9% No Moisture Correction applied (MC)

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		17 mg/kg	1.32	22.446 mg/kg	0.00224 %		
2	cadmium { cadmium oxide }	048-002-00-0	231-152-8 [1] 215-146-2 [2]	7440-43-9 [1] 1306-19-0 [2]		<0.2 mg/kg	1.14	<0.228 mg/kg	<0.000023 %		<**LOD**
3	chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		18 mg/kg	1.46	26.308 mg/kg	0.00263 %		
4	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		36 mg/kg	1.13	40.532 mg/kg	0.00405 %		
5	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	57 mg/kg	1.56	88.909 mg/kg	0.0057 %		
6	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.3 mg/kg	1.35	<0.406 mg/kg	<0.000041 %		<**LOD**
7	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		19 mg/kg	2.98	56.549 mg/kg	0.00565 %		
8	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				<1 mg/kg	2.55	<2.554 mg/kg	<0.000255 %		<**LOD**
9	zinc { zinc chromate }	024-007-00-3				51 mg/kg	2.77	141.481 mg/kg	0.0141 %		
10	TPH (C6 to C40) petroleum group			TPH		59 mg/kg		59 mg/kg	0.0059 %		
11	tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane	603-181-00-X	216-653-1	1634-04-4		<1 mg/kg		<1 mg/kg	<0.0001 %		<**LOD**
12	benzene	601-020-00-8	200-753-7	71-43-2		<1 mg/kg		<1 mg/kg	<0.0001 %		<**LOD**
13	toluene	601-021-00-3	203-625-9	108-88-3		<1 mg/kg		<1 mg/kg	<0.0001 %		<**LOD**

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
14		ethylbenzene				<1	mg/kg		<1	mg/kg	<0.0001 %		<LOD
		601-023-00-4	202-849-4	100-41-4									
15		xylene				<1	mg/kg		<1	mg/kg	<0.0001 %		<LOD
		601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]									
16		naphthalene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
		601-052-00-2	202-049-5	91-20-3									
17		acenaphthylene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
			205-917-1	208-96-8									
18		acenaphthene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
			201-469-6	83-32-9									
19		fluorene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
			201-695-5	86-73-7									
20		phenanthrene				0.17	mg/kg		0.17	mg/kg	0.000017 %		
			201-581-5	85-01-8									
21		anthracene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
			204-371-1	120-12-7									
22		fluoranthene				0.3	mg/kg		0.3	mg/kg	0.00003 %		
			205-912-4	206-44-0									
23		pyrene				0.33	mg/kg		0.33	mg/kg	0.000033 %		
			204-927-3	129-00-0									
24		benzo[a]anthracene				0.2	mg/kg		0.2	mg/kg	0.00002 %		
		601-033-00-9	200-280-6	56-55-3									
25		chrysene				0.23	mg/kg		0.23	mg/kg	0.000023 %		
		601-048-00-0	205-923-4	218-01-9									
26		benzo[b]fluoranthene				0.29	mg/kg		0.29	mg/kg	0.000029 %		
		601-034-00-4	205-911-9	205-99-2									
27		benzo[k]fluoranthene				0.18	mg/kg		0.18	mg/kg	0.000018 %		
		601-036-00-5	205-916-6	207-08-9									
28		benzo[a]pyrene; benzo[def]chrysene				0.23	mg/kg		0.23	mg/kg	0.000023 %		
		601-032-00-3	200-028-5	50-32-8									
29		indeno[123-cd]pyrene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
			205-893-2	193-39-5									
30		dibenz[a,h]anthracene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
		601-041-00-2	200-181-8	53-70-3									
31		benzo[ghi]perylene				0.18	mg/kg		0.18	mg/kg	0.000018 %		
			205-883-8	191-24-2									
										Total:	0.0414 %		

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 Deteminand - 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) on Flam. Liq. 1; H224, Flam. Liq. 2; H225, Flam. Liq. 3; H226: Force this Hazardous property to non hazardous because The risk phrase HP 3 (i) Flammable is unlikely to apply to this waste stream. This is due to the solid soil and natural moisture content of the sample. The concentration required to provide a flammability risk is likely to be >10,000mg. This risk of flammability from solid state soils <1000mg/kg TPH is negligible and has been deemed non-hazardous if below this concentration.

Classification of sample: BH01[1]

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

Sample details

Sample Name:
BH01[1]
Sample Depth:
1.50 m
Moisture content:
20%
(no correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 20% No Moisture Correction applied (MC)

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		10	mg/kg	1.32	13.203	mg/kg	0.00132 %		
2	cadmium { cadmium oxide }	048-002-00-0	231-152-8 [1] 215-146-2 [2]	7440-43-9 [1] 1306-19-0 [2]		<0.2	mg/kg	1.14	<0.228	mg/kg	<0.000023 %		<**LOD**
3	chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		36	mg/kg	1.46	52.616	mg/kg	0.00526 %		
4	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		28	mg/kg	1.13	31.525	mg/kg	0.00315 %		
5	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	14	mg/kg	1.56	21.837	mg/kg	0.0014 %		
6	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.3	mg/kg	1.35	<0.406	mg/kg	<0.000041 %		<**LOD**
7	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		45	mg/kg	2.98	133.932	mg/kg	0.0134 %		
8	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				<1	mg/kg	2.55	<2.554	mg/kg	<0.000255 %		<**LOD**
9	zinc { zinc chromate }	024-007-00-3				56	mg/kg	2.77	155.352	mg/kg	0.0155 %		
10	TPH (C6 to C40) petroleum group			TPH		20	mg/kg		20	mg/kg	0.002 %		
11	tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane	603-181-00-X	216-653-1	1634-04-4		<1	mg/kg		<1	mg/kg	<0.0001 %		<**LOD**
12	benzene	601-020-00-8	200-753-7	71-43-2		<1	mg/kg		<1	mg/kg	<0.0001 %		<**LOD**
13	toluene	601-021-00-3	203-625-9	108-88-3		<1	mg/kg		<1	mg/kg	<0.0001 %		<**LOD**

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
14		ethylbenzene				<1	mg/kg		<1	mg/kg	<0.0001 %		<LOD
		601-023-00-4	202-849-4	100-41-4									
15		xylene				<1	mg/kg		<1	mg/kg	<0.0001 %		<LOD
		601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]									
16		naphthalene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
		601-052-00-2	202-049-5	91-20-3									
17		acenaphthylene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
			205-917-1	208-96-8									
18		acenaphthene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
			201-469-6	83-32-9									
19		fluorene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
			201-695-5	86-73-7									
20		phenanthrene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
			201-581-5	85-01-8									
21		anthracene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
			204-371-1	120-12-7									
22		fluoranthene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
			205-912-4	206-44-0									
23		pyrene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
			204-927-3	129-00-0									
24		benzo[a]anthracene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
		601-033-00-9	200-280-6	56-55-3									
25		chrysene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
		601-048-00-0	205-923-4	218-01-9									
26		benzo[b]fluoranthene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
		601-034-00-4	205-911-9	205-99-2									
27		benzo[k]fluoranthene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
		601-036-00-5	205-916-6	207-08-9									
28		benzo[a]pyrene; benzo[def]chrysene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
		601-032-00-3	200-028-5	50-32-8									
29		indeno[123-cd]pyrene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
			205-893-2	193-39-5									
30		dibenz[a,h]anthracene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
		601-041-00-2	200-181-8	53-70-3									
31		benzo[ghi]perylene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
			205-883-8	191-24-2									
										Total:	0.043 %		

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 Deteminand - 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) on Flam. Liq. 1; H224, Flam. Liq. 2; H225, Flam. Liq. 3; H226: Force this Hazardous property to non hazardous because The risk phrase HP 3 (i) Flammable is unlikely to apply to this waste stream. This is due to the solid soil and natural moisture content of the sample. The concentration required to provide a flammability risk is likely to be >10,000mg. This risk of flammability from solid state soils <1000mg/kg TPH is negligible and has been deemed non-hazardous if below this concentration.

Classification of sample: BH02

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

Sample details

Sample Name:
BH02
Sample Depth:
1.00 m
Moisture content:
14%
(no correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 14% No Moisture Correction applied (MC)

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		9.2	mg/kg	1.32	12.147	mg/kg	0.00121 %		
2	cadmium { cadmium oxide }	048-002-00-0	231-152-8 [1] 215-146-2 [2]	7440-43-9 [1] 1306-19-0 [2]		<0.2	mg/kg	1.14	<0.228	mg/kg	<0.000023 %		<**LOD**
3	chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		31	mg/kg	1.46	45.308	mg/kg	0.00453 %		
4	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		21	mg/kg	1.13	23.644	mg/kg	0.00236 %		
5	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	20	mg/kg	1.56	31.196	mg/kg	0.002 %		
6	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.3	mg/kg	1.35	<0.406	mg/kg	<0.000041 %		<**LOD**
7	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		34	mg/kg	2.98	101.193	mg/kg	0.0101 %		
8	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				<1	mg/kg	2.55	<2.554	mg/kg	<0.000255 %		<**LOD**
9	zinc { zinc chromate }	024-007-00-3				49	mg/kg	2.77	135.933	mg/kg	0.0136 %		
10	TPH (C6 to C40) petroleum group			TPH		20	mg/kg		20	mg/kg	0.002 %		
11	tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane	603-181-00-X	216-653-1	1634-04-4		<1	mg/kg		<1	mg/kg	<0.0001 %		<**LOD**
12	benzene	601-020-00-8	200-753-7	71-43-2		<1	mg/kg		<1	mg/kg	<0.0001 %		<**LOD**
13	toluene	601-021-00-3	203-625-9	108-88-3		<1	mg/kg		<1	mg/kg	<0.0001 %		<**LOD**

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
14		ethylbenzene				<1	mg/kg		<1	mg/kg	<0.0001 %		<LOD
		601-023-00-4	202-849-4	100-41-4									
15		xylene				<1	mg/kg		<1	mg/kg	<0.0001 %		<LOD
		601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]									
16		naphthalene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
		601-052-00-2	202-049-5	91-20-3									
17		acenaphthylene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
			205-917-1	208-96-8									
18		acenaphthene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
			201-469-6	83-32-9									
19		fluorene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
			201-695-5	86-73-7									
20		phenanthrene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
			201-581-5	85-01-8									
21		anthracene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
			204-371-1	120-12-7									
22		fluoranthene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
			205-912-4	206-44-0									
23		pyrene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
			204-927-3	129-00-0									
24		benzo[a]anthracene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
		601-033-00-9	200-280-6	56-55-3									
25		chrysene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
		601-048-00-0	205-923-4	218-01-9									
26		benzo[b]fluoranthene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
		601-034-00-4	205-911-9	205-99-2									
27		benzo[k]fluoranthene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
		601-036-00-5	205-916-6	207-08-9									
28		benzo[a]pyrene; benzo[def]chrysene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
		601-032-00-3	200-028-5	50-32-8									
29		indeno[123-cd]pyrene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
			205-893-2	193-39-5									
30		dibenz[a,h]anthracene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
		601-041-00-2	200-181-8	53-70-3									
31		benzo[ghi]perylene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
			205-883-8	191-24-2									
										Total:	0.0368 %		

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 Deteminand - 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) on Flam. Liq. 1; H224, Flam. Liq. 2; H225, Flam. Liq. 3; H226: Force this Hazardous property to non hazardous because The risk phrase HP 3 (i) Flammable is unlikely to apply to this waste stream. This is due to the solid soil and natural moisture content of the sample. The concentration required to provide a flammability risk is likely to be >10,000mg. This risk of flammability from solid state soils <1000mg/kg TPH is negligible and has been deemed non-hazardous if below this concentration.

Classification of sample: BH02[1]

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

Sample details

Sample Name:
BH02[1]
Sample Depth:
1.40 m
Moisture content:
17%
(no correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 17% No Moisture Correction applied (MC)

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		23	mg/kg	1.32	30.367	mg/kg	0.00304 %		
2	cadmium { cadmium oxide }	048-002-00-0	231-152-8 [1] 215-146-2 [2]	7440-43-9 [1] 1306-19-0 [2]		<0.2	mg/kg	1.14	<0.228	mg/kg	<0.000023 %		<**LOD**
3	chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		30	mg/kg	1.46	43.847	mg/kg	0.00438 %		
4	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		42	mg/kg	1.13	47.287	mg/kg	0.00473 %		
5	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	50	mg/kg	1.56	77.991	mg/kg	0.005 %		
6	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.3	mg/kg	1.35	<0.406	mg/kg	<0.000041 %		<**LOD**
7	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		28	mg/kg	2.98	83.335	mg/kg	0.00833 %		
8	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				<1	mg/kg	2.55	<2.554	mg/kg	<0.000255 %		<**LOD**
9	zinc { zinc chromate }	024-007-00-3				110	mg/kg	2.77	305.156	mg/kg	0.0305 %		
10	TPH (C6 to C40) petroleum group			TPH		20	mg/kg		20	mg/kg	0.002 %		
11	tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane	603-181-00-X	216-653-1	1634-04-4		<1	mg/kg		<1	mg/kg	<0.0001 %		<**LOD**
12	benzene	601-020-00-8	200-753-7	71-43-2		<1	mg/kg		<1	mg/kg	<0.0001 %		<**LOD**
13	toluene	601-021-00-3	203-625-9	108-88-3		<1	mg/kg		<1	mg/kg	<0.0001 %		<**LOD**

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
14		ethylbenzene				<1	mg/kg		<1	mg/kg	<0.0001 %		<LOD
		601-023-00-4	202-849-4	100-41-4									
15		xylene				<1	mg/kg		<1	mg/kg	<0.0001 %		<LOD
		601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]									
16		naphthalene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
		601-052-00-2	202-049-5	91-20-3									
17		acenaphthylene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
			205-917-1	208-96-8									
18		acenaphthene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
			201-469-6	83-32-9									
19		fluorene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
			201-695-5	86-73-7									
20		phenanthrene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
			201-581-5	85-01-8									
21		anthracene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
			204-371-1	120-12-7									
22		fluoranthene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
			205-912-4	206-44-0									
23		pyrene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
			204-927-3	129-00-0									
24		benzo[a]anthracene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
		601-033-00-9	200-280-6	56-55-3									
25		chrysene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
		601-048-00-0	205-923-4	218-01-9									
26		benzo[b]fluoranthene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
		601-034-00-4	205-911-9	205-99-2									
27		benzo[k]fluoranthene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
		601-036-00-5	205-916-6	207-08-9									
28		benzo[a]pyrene; benzo[def]chrysene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
		601-032-00-3	200-028-5	50-32-8									
29		indeno[123-cd]pyrene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
			205-893-2	193-39-5									
30		dibenz[a,h]anthracene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
		601-041-00-2	200-181-8	53-70-3									
31		benzo[ghi]perylene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
			205-883-8	191-24-2									
										Total:	0.059 %		

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 Deteminand - 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) on Flam. Liq. 1; H224, Flam. Liq. 2; H225, Flam. Liq. 3; H226: Force this Hazardous property to non hazardous because The risk phrase HP 3 (i) Flammable is unlikely to apply to this waste stream. This is due to the solid soil and natural moisture content of the sample. The concentration required to provide a flammability risk is likely to be >10,000mg. This risk of flammability from solid state soils <1000mg/kg TPH is negligible and has been deemed non-hazardous if below this concentration.

Classification of sample: BH03

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

Sample details

Sample Name:
BH03
Sample Depth:
1.00 m
Moisture content:
18%
(no correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 18% No Moisture Correction applied (MC)

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		37	mg/kg	1.32	48.852	mg/kg	0.00489 %		
2	cadmium { cadmium oxide }	048-002-00-0	231-152-8 [1] 215-146-2 [2]	7440-43-9 [1] 1306-19-0 [2]		<0.2	mg/kg	1.14	<0.228	mg/kg	<0.000023 %		<**LOD**
3	chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		12	mg/kg	1.46	17.539	mg/kg	0.00175 %		
4	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		46	mg/kg	1.13	51.791	mg/kg	0.00518 %		
5	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	24	mg/kg	1.56	37.436	mg/kg	0.0024 %		
6	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.3	mg/kg	1.35	<0.406	mg/kg	<0.000041 %		<**LOD**
7	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		21	mg/kg	2.98	62.502	mg/kg	0.00625 %		
8	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				<1	mg/kg	2.55	<2.554	mg/kg	<0.000255 %		<**LOD**
9	zinc { zinc chromate }	024-007-00-3				33	mg/kg	2.77	91.547	mg/kg	0.00915 %		
10	TPH (C6 to C40) petroleum group			TPH		29	mg/kg		29	mg/kg	0.0029 %		
11	tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane	603-181-00-X	216-653-1	1634-04-4		<1	mg/kg		<1	mg/kg	<0.0001 %		<**LOD**
12	benzene	601-020-00-8	200-753-7	71-43-2		<1	mg/kg		<1	mg/kg	<0.0001 %		<**LOD**
13	toluene	601-021-00-3	203-625-9	108-88-3		<1	mg/kg		<1	mg/kg	<0.0001 %		<**LOD**

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
14		ethylbenzene				<1	mg/kg		<1	mg/kg	<0.0001 %		<**LOD**
		601-023-00-4	202-849-4	100-41-4									
15		xylene				<1	mg/kg		<1	mg/kg	<0.0001 %		<**LOD**
		601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]									
16		naphthalene				0.35	mg/kg		0.35	mg/kg	0.000035 %		
		601-052-00-2	202-049-5	91-20-3									
17		acenaphthylene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<**LOD**
			205-917-1	208-96-8									
18		acenaphthene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<**LOD**
			201-469-6	83-32-9									
19		fluorene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<**LOD**
			201-695-5	86-73-7									
20		phenanthrene				0.53	mg/kg		0.53	mg/kg	0.000053 %		
			201-581-5	85-01-8									
21		anthracene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<**LOD**
			204-371-1	120-12-7									
22		fluoranthene				0.4	mg/kg		0.4	mg/kg	0.00004 %		
			205-912-4	206-44-0									
23		pyrene				0.39	mg/kg		0.39	mg/kg	0.000039 %		
			204-927-3	129-00-0									
24		benzo[a]anthracene				0.21	mg/kg		0.21	mg/kg	0.000021 %		
		601-033-00-9	200-280-6	56-55-3									
25		chrysene				0.26	mg/kg		0.26	mg/kg	0.000026 %		
		601-048-00-0	205-923-4	218-01-9									
26		benzo[b]fluoranthene				0.31	mg/kg		0.31	mg/kg	0.000031 %		
		601-034-00-4	205-911-9	205-99-2									
27		benzo[k]fluoranthene				0.16	mg/kg		0.16	mg/kg	0.000016 %		
		601-036-00-5	205-916-6	207-08-9									
28		benzo[a]pyrene; benzo[def]chrysene				0.15	mg/kg		0.15	mg/kg	0.000015 %		
		601-032-00-3	200-028-5	50-32-8									
29		indeno[123-cd]pyrene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<**LOD**
			205-893-2	193-39-5									
30		dibenz[a,h]anthracene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<**LOD**
		601-041-00-2	200-181-8	53-70-3									
31		benzo[ghi]perylene				0.34	mg/kg		0.34	mg/kg	0.000034 %		
			205-883-8	191-24-2									
										Total:	0.0337 %		

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 Deteminand - 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) on Flam. Liq. 1; H224, Flam. Liq. 2; H225, Flam. Liq. 3; H226: Force this Hazardous property to non hazardous because The risk phrase HP 3 (i) Flammable is unlikely to apply to this waste stream. This is due to the solid soil and natural moisture content of the sample. The concentration required to provide a flammability risk is likely to be >10,000mg. This risk of flammability from solid state soils <1000mg/kg TPH is negligible and has been deemed non-hazardous if below this concentration.

Classification of sample: BH03[1]

Hazardous Waste
Classified as **17 05 03 ***
in the List of Waste

Sample details

Sample Name:
BH03[1]
Sample Depth:
1.40 m
Moisture content:
17%
(no correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 03 * (Soil and stones containing hazardous substances)

Hazard properties

HP 7: Carcinogenic "waste which induces cancer or increases its incidence"

Hazard Statements hit:

Carc. 1B; H350 "May cause cancer [state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard]."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.11%)

HP 11: Mutagenic "waste which may cause a mutation, that is a permanent change in the amount or structure of the genetic material in a cell"

Hazard Statements hit:

Muta. 1B; H340 "May cause genetic defects [state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard]."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.11%)

Determinands

Moisture content: 17% No Moisture Correction applied (MC)

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		22 mg/kg	1.32	29.047 mg/kg	0.0029 %		
2	cadmium { cadmium oxide }	048-002-00-0	231-152-8 [1] 215-146-2 [2]	7440-43-9 [1] 1306-19-0 [2]		<0.2 mg/kg	1.14	<0.228 mg/kg	<0.000023 %		<LOD
3	chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		28 mg/kg	1.46	40.924 mg/kg	0.00409 %		
4	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		23 mg/kg	1.13	25.895 mg/kg	0.00259 %		
5	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	14 mg/kg	1.56	21.837 mg/kg	0.0014 %		
6	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.3 mg/kg	1.35	<0.406 mg/kg	<0.000041 %		<LOD

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
7		nickel { nickel chromate }				19	mg/kg	2.98	56.549	mg/kg	0.00565 %		
		028-035-00-7	238-766-5	14721-18-7									
8		selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }				<1	mg/kg	2.55	<2.554	mg/kg	<0.000255 %		<LOD
		034-002-00-8											
9		zinc { zinc chromate }				52	mg/kg	2.77	144.256	mg/kg	0.0144 %		
		024-007-00-3											
10		TPH (C6 to C40) petroleum group				1100	mg/kg		1100	mg/kg	0.11 %		
				TPH									
11		tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane				<1	mg/kg		<1	mg/kg	<0.0001 %		<LOD
		603-181-00-X	216-653-1	1634-04-4									
12		benzene				<1	mg/kg		<1	mg/kg	<0.0001 %		<LOD
		601-020-00-8	200-753-7	71-43-2									
13		toluene				<1	mg/kg		<1	mg/kg	<0.0001 %		<LOD
		601-021-00-3	203-625-9	108-88-3									
14		ethylbenzene				<1	mg/kg		<1	mg/kg	<0.0001 %		<LOD
		601-023-00-4	202-849-4	100-41-4									
15		xylene				<1	mg/kg		<1	mg/kg	<0.0001 %		<LOD
		601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]									
16		naphthalene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
		601-052-00-2	202-049-5	91-20-3									
17		acenaphthylene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
			205-917-1	208-96-8									
18		acenaphthene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
			201-469-6	83-32-9									
19		fluorene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
			201-695-5	86-73-7									
20		phenanthrene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
			201-581-5	85-01-8									
21		anthracene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
			204-371-1	120-12-7									
22		fluoranthene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
			205-912-4	206-44-0									
23		pyrene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
			204-927-3	129-00-0									
24		benzo[a]anthracene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
		601-033-00-9	200-280-6	56-55-3									
25		chrysene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
		601-048-00-0	205-923-4	218-01-9									
26		benzo[b]fluoranthene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
		601-034-00-4	205-911-9	205-99-2									
27		benzo[k]fluoranthene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
		601-036-00-5	205-916-6	207-08-9									
28		benzo[a]pyrene; benzo[def]chrysene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
		601-032-00-3	200-028-5	50-32-8									
29		indeno[123-cd]pyrene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
			205-893-2	193-39-5									
30		dibenz[a,h]anthracene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
		601-041-00-2	200-181-8	53-70-3									
31		benzo[ghi]perylene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
			205-883-8	191-24-2									
										Total:	0.142 %		

Key	
	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Hazardous result
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - 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) on Flam. Liq. 1; H224, Flam. Liq. 2; H225, Flam. Liq. 3; H226: Force this Hazardous property to non hazardous because The risk phrase HP 3 (i) Flammable is unlikely to apply to this waste stream. This is due to the solid soil and natural moisture content of the sample. The concentration required to provide a flammability risk is likely to be >10,000mg. This risk of flammability from solid state soils <1000mg/kg TPH is negligible and has been deemed non-hazardous if below this concentration.

Appendix A: Classifier defined and non CLP determinands

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

Conversion factor: 1.462
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: 17/07/2015
Risk Phrases: R20 , R22 , R36 , R37 , R38 , R42 , R43 , R50/53 , R60 , R61
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

dicopper oxide; copper (I) oxide (EC Number: 215-270-7, CAS Number: 1317-39-1)

CLP index number: 029-002-00-X
Data source: Regulation (EU) 2016/1179 of 19 July 2016 (ATP9)
Additional Risk Phrases: N R50/53 , N R50/53 >= 0.25 %
Additional Hazard Statement(s): None.
Reason for additional Hazards Statement(s)/Risk Phrase(s):
10/10/2016 - N R50/53 risk phrase sourced from: WM3 v1 still uses ecotoxic risk phrases
10/10/2016 - N R50/53 >= 0.25 % risk phrase sourced from: WM3 v1 still uses ecotoxic risk phrases

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: 25/05/2015
Risk Phrases: R10 , R45 , R46 , R51/53 , R63 , R65
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

ethylbenzene (EC Number: 202-849-4, CAS Number: 100-41-4)

CLP index number: 601-023-00-4
Data source: Commission Regulation (EU) No 605/2014 – 6th Adaptation to Technical Progress for Regulation (EC) No 1272/2008. (ATP6)
Additional Risk Phrases: None.
Additional Hazard Statement(s): Carc. 2 H351
Reason for additional Hazards Statement(s)/Risk Phrase(s):
03/06/2015 - Carc. 2 H351 hazard statement sourced from: IARC Group 2B (77) 2000

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: 17/07/2015
Risk Phrases: R22 , R26 , R27 , R36 , R37 , R38
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: 17/07/2015
Risk Phrases: R36 , R37 , R38 , N R50/53 , N R51/53
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: 06/08/2015
Risk Phrases: N R50/53
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: 06/08/2015
Risk Phrases: R22 , R36 , R37 , R38 , R40 , R43 , N R50/53
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: 17/07/2015
Risk Phrases: R36 , R37 , R38 , R43 , N R50/53
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: 21/08/2015
Risk Phrases: Xn R22 , N R50/53
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: 21/08/2015
Risk Phrases: Xi R36/37/38 , N R50/53
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: 06/08/2015
Risk Phrases: R40
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: 23/07/2015
Risk Phrases: N R50/53
Hazard Statements: Aquatic Acute 1 H400 , Aquatic Chronic 1 H410

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}

Reasonable case species based on hazard statements/molecular weight. Industrial sources include: tanning, pigment in paint, inks and glass (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 {selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex}

Harmonised group entry used as most reasonable case. Pigment cadmium sulphoselenide not likely to be present in this soil. No evidence for the other CLP entries: sodium selenite, nickel II selenite and nickel selenide, to be present in this soil. (edit as required)

zinc {zinc chromate}

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

Appendix C: Version

HazWasteOnline Classification Engine: WM3 1st Edition, May 2015
HazWasteOnline Classification Engine Version: 2017.55.3206.6376 (24 Feb 2017)
HazWasteOnline Database: 2017.55.3206.6376 (24 Feb 2017)

This classification utilises the following guidance and legislation:
WM3 - Waste Classification - May 2015
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 Wastes 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
POPs Regulation 2004 - Regulation 850/2004/EC of 29 April 2004
1st ATP to POPs Regulation - Regulation 756/2010/EU of 24 August 2010
2nd ATP to POPs Regulation - Regulation 757/2010/EU of 24 August 2010