Land off High Street, Shafton

Factual & Interpretative Geo-Environment Report

A090070-550

Homes England
March 2019
WYG Environment

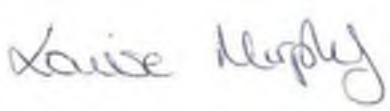
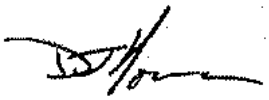


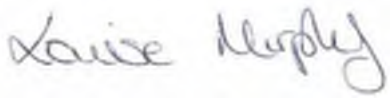
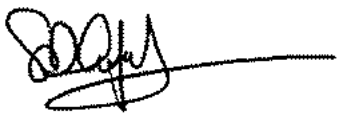
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1.0 Executive Summary

Proposed Development	Residential development is proposed.
Site Conditions	Most of the site comprises gently undulating open grassland with scrub vegetation. Areas of hardstanding from demolished building footprints and several piles of demolition arisings / household waste were encountered in the north-western portion of the site.
Ground Investigation	The ground investigation was undertaken by WYG between 24 and 25 January 2019. The investigation comprised the excavating of 8No. trial pits and drilling of 5No. window sample boreholes. Groundwater and gas monitoring standpipes were installed in the 5No. boreholes.
Ground Conditions	The ground conditions typically comprised topsoil overlying cohesive superficial deposits overlying MUDSTONE or SANDSTONE bedrock of the Pennine Middle Coal Measures Formation. Groundwater monitoring recorded water at depths between 0.32m and 1.14m bgl; water levels are likely affected by surface water infiltration.
Geotechnical Assessment	In general, the CLAY underlying the site was of medium to high strength. The average moisture content of TOPSOIL was 36%, superficial CLAY was 26% and MUDSTONE was 12%. The Atterberg Limits test indicate that superficial CLAY generally has a high to very high plasticity and a medium to high volume change potential. The superficial CLAY deposits fell within the grading envelopes of 2B/2C. 2.5kg compaction testing returned optimum moisture content values of 26-34% and a maximum dry density of 1.37-1.57Mg/m^3. The Design Sulphate Class was assessed as DS-1, ACEC Class AC-1s.
Contamination Assessment	Contaminant concentrations were predominantly below relevant screening criteria. Sporadic elevated concentrations of metals were assessed as not requiring remedial action following supplementary investigation. Ground gas monitoring was constrained by shallow groundwater levels. However, gas protection will be required due to radon risk and no further protection is required to mitigate other gases.
Conclusions and Recommendations	Building foundations and waste materials remain on site and will require removal to facilitate development. Numerous trees are present within the site and around the site boundary; CLAY beneath the site is of medium to high volume change potential. It would be prudent to undertake a tree survey to confirm species and heights to assess their potential effects on the underlying CLAY. If high-water demand species are present in close proximity to proposed building footprints and a significant proportion of the development would require deep trench fill footings, it may be more economical to consider a piled foundation solution. Where applicable, a proprietary compressible material should be incorporated into the foundation design to protect against heave/ shrinkage.

	Suspended ground floors should be used in all situations where heave can occur within the area bounded by the foundations. Water levels were recorded at shallow depths immediately after the site investigation and the boreholes were subsequently purged during the monitoring period. After purging the groundwater levels returned to the initial levels and therefore management of groundwater during site redevelopment will be required and the presence of a shallow groundwater should be considered during the foundation design. Suitable foundations should be designed in accordance with NHBC Guidelines. No requirements for contamination remediation were identified. Buildings will require gas protection due to radon, which will also provide precautionary protection from other gases.
This sheet is intended as a summary of the assessment of the site in relation to ground contamination and geotechnical conditions. It does not provide a definitive engineering analysis.	

2.0 Introduction

2.1 Instruction

WYG Environment (WYG) were commissioned by Homes England to conduct a ground investigation at land off High Street, Shafton ("the site"). The ground investigation has been carried out in line with BS10175 [1] and BS5930 [2].

2.2 Scope of Services

The investigation was undertaken to assess the sub-surface conditions at the site using in-situ and laboratory testing. The scope of the fieldwork programme included:

- Review of existing geotechnical data included in the WYG (2017) High Street, Shafton – Soakaway Testing Letter Report [3].
- 8No. machine excavated trial pits to a maximum depth of 3.0mbgl or refusal.
- 5No. window sample boreholes to 5.0m below ground level (bgl) or refusal with in-situ standard penetration tests (SPTs).
- 5No. standpipe installations for gas and groundwater monitoring.
- Geotechnical and contamination testing of selected soil samples from the trial pit and borehole arisings.
- Four return visits for gas and groundwater monitoring.
- Provision of a factual and interpretative report.

Supplementary soil samples were obtained from hand-excavated pits to investigate an anomaly identified in the initial investigation.

2.3 Terms and Conditions

Attention is drawn to the report conditions, included in Appendix A, and to the terms and conditions of the engagement.

3.0 Site Details

3.1 General

A site location plan is included as Figure 1.

3.2 Site Location

The site is bounded to the southwest by High Street and to the northwest by residential properties off Poplar Avenue. The site occupies an area of approximately 1.26 hectares. Site location details are summarised in Table 1.

Table 1: Site Location

Site Address	Land off High Street Shafton Barnsley S72 8NG
National Grid Reference	439370mE, 410870mN

3.3 Site Description

A site walkover inspection was undertaken by WYG on 7 March 2018.

The site is rectangular in shape and accessed via High Street on the western boundary. Most of the site comprises gently undulating open grassland with scrub vegetation. Mature trees, hedgerows and scrub vegetation were encountered within the centre of the site and along the site boundary. Areas of hardstanding from demolished building footprints and several piles of demolition arisings / household waste were encountered in the north-western portion of the site.

3.4 Surrounding Land Uses

The site is located in the town of Shafton. Uses of the surrounding land are discussed in the Table 2.

Table 2: Surrounding Land Uses

Boundary	Description
North	Residential.
East	Residential and agricultural land beyond.
South	Shafton Primary School and residential beyond.
West	Residential and agricultural land beyond.

3.5 Proposed Development

The Indicative Masterplan suggests that the site will be developed with up to 43 two-storey residential properties with associated driveways and car parks. The Indicative Masterplan also suggests that a pumping station and attenuation pond will be situated on site.

3.6 Previous Reports

A desk study investigation for the site was undertaken by WYG in 2018 [4]. The desk study was undertaken to identify potential environmental implications and development constraints with regards to the proposed development.

The key findings from the investigation are detailed below. The desk study report should be read in its entirety for details on the findings.

- *Historical Ordnance Survey (OS) mapping indicates that the site was undeveloped agricultural land from c.1854 (earliest available OS map) to c.1933 when the northern half was developed as allotment gardens. Several structures associated with the allotment gardens are recorded on the 1962 OS map. The largest structure approached the footprint area of a small house, up to 10m x 4m, which is more substantial than typical allotment holder's sheds. All structures were subsequently removed by the 2010s.*
- *Made ground and superficial deposits are not mapped on site. The bedrock underlying the site is the Pennine Middle Coal Measures Formation.*
- *The Bedrock strata is classified as a Secondary A Aquifer. Groundwater is not abstracted on site or within 250m. The site is not located on a Source Protection Zone.*
- *No surface waterbodies are located on site or in the surrounding area. Surface water is not abstracted on site or within 250m.*
- *A Coal Authority Mining Report indicates that the site is underlain by worked coal strata at a minimum depth of 330m, last worked in 1963. The site is not considered to be within the zone of influence of any ground stability concerns. A shaft was recorded 20m north of the site. No details of treatment of the mine entry are available. It is not considered likely that the presence of the shaft would represent any constraint to development.*
- *There is a low potential for ground contamination from Made Ground, historical building demolition and the storage and usage of pesticide/ herbicide and fertiliser. There is also a potential for migration of ground gas to the site from a neighbouring historical landfill. Subject to the findings of an intrusive site investigation, the risks posed to identified*

*receptors were considered to be **Very Low**, with the potential for higher risk if asbestos is identified in soils.*

- *Residual below-ground structures from the early allotment structures may remain. It is unlikely that these would be substantial, although they should be removed before redevelopment.*
- *Intrusive site investigations including geotechnical and limited contamination testing and gas monitoring are recommended within the development area to investigate ground conditions, determine the extent and properties of Made Ground, to determine gas risk and to inform foundation / structure design.*

A soakaway investigation was undertaken and reported by WYG in 2017 [3]. The purpose of the investigation was to determine site-specific soil infiltration rates. Key findings from the investigation are detailed below:

- *Three trial pits (SO01-SO03) for the purposes of soakaway testing were excavated to a maximum depth of 2.5m bgl. All three trial pits were situated in the eastern half of the site. In general, the ground conditions comprised topsoil to 0.3m bgl, overlying sandy clay to depth between 1.55m and 1.70m bgl, overlying mudstone and sandstone of the Pennine Lower Coal Measures.*
- *Groundwater was not encountered during investigation works.*
- *Infiltration rates were calculated from SO01, SO02 and SO03 as $1.40E^{-07}$ m/s, $9.75E^{-07}$ m/s and $1.77E^{-06}$ m/s, respectively, with an average infiltration rate of $9.61E^{-07}$ m/s.*

4.0 Published Geology

4.1 Information Sources

Details of the geology underlying the site have been obtained from the following sources:

- British Geological Survey (BGS) Sheet 87 Barnsley, 2008 [5].
- BGS GeoIndex Website [6].
- BGS Lexicon of named rock units [7].

4.2 Artificial Ground

Artificial Ground (Made Ground and Infilled Ground) is not mapped on site or in the immediate surrounds.

4.3 Superficial Geology

Superficial deposits are not mapped on site or in the immediate surrounds.

4.4 Solid Geology

The 1:50,000 scale geological plan indicates the bedrock underlying the site is the Pennine Middle Coal Measures Formation.

The Pennine Middle Coal Measures is described as *"interbedded grey mudstone, siltstone, pale grey sandstone and commonly coal seams, with a bed of mudstone containing marine fossils at the base, and several such marine fossil-bearing mudstones in the upper half of the unit"* [7].

4.5 Historical BGS Borehole Information

No BGS recorded boreholes are located on site or within a 250m radius.

5.0 Fieldwork

The ground investigation was undertaken between 24 and 25 January 2019. The locations of exploratory holes are shown on the Exploratory Hole Location Plan, included as Figure 2. The exploratory holes were supervised, logged and sampled by a WYG Engineer. Fieldworks were undertaken in accordance with BS5930 [2].

The exploratory boreholes were situated at approximate distances of 30m across the site to obtain a spread of geotechnical and environmental data. Given that the likelihood of ground contamination was low, sampling at 30m centres was considered sufficient for this investigation.

Detailed trial pit and borehole logs can be seen in the exploratory hole records attached as Appendix B. Photographs of the trial pit and borehole arisings are included in Appendix C.

5.1 Trial Pits

Eight machine-excavated trial pits (TP01-TP08) were advanced to a maximum depth of 2.3m bgl due to difficulties with excavation. The trial pits were advanced using a JCB wheeled hydraulic excavator with a 0.6m bucket.

Sampling of the recovered material was undertaken at discrete intervals and changes of strata. Representative samples of soils were scheduled for geotechnical and contamination testing.

Subsequent to the identification of a localised contamination anomaly for lead, additional hand-excavated trial pits were undertaken to delineate the extent of impact.

5.2 Window Sample Boreholes

Five window sample boreholes were advanced through the sub-surface strata using window sample techniques to a maximum depth of 3.0mbgl or refusal. Standard penetration tests (SPTs) were carried out at 1.0m intervals through the window sample boreholes.

Standpipes were installed in all boreholes to enable ongoing gas and groundwater monitoring. Details of the installations are provided in the borehole records, Appendix B.

Sampling of the recovered core was undertaken at discrete intervals and changes of strata. Representative samples of soils were scheduled for geotechnical and contamination testing.

5.3 Geotechnical Laboratory Testing

Following the completion of fieldwork, selected samples recovered during the investigation were submitted to a UKAS accredited geotechnical laboratory for testing.

The testing suite undertaken comprised:

- 23No. Moisture Content.
- 8No. Atterberg Limits.
- 3No. 2.5kg Compaction.
- 2No. Particle Size Distribution (Wet Sieve).
- 5No. BRE SD1 Concrete Aggressivity Suites.

The results of the geotechnical testing are discussed in Section 7.0 and attached in Appendix D.

5.4 Contamination Laboratory Testing

Selected soil samples from the ground investigations works were scheduled for contamination testing. 15No. Screening contamination suites were undertaken, comprising:

- Metals (As, Cd, Cr, Cr VI, Cu, Hg, Ni, Pb, Se, Zn).
- Boron (hot water soluble).
- pH Value.
- Cyanide (free).
- Water Soluble Sulphate as SO_4.
- Speciated PAHs (US EPA 16 priority pollutants).
- Extractable Petroleum Hydrocarbons.

Additional testing comprised:

- 7No. Soil Organic Matter (SOM).
- 9No. Asbestos Screen.
- 5No. Organochlorine Pesticides & Organophosphorus Pesticides (OCP/OPP)

The results of the chemical analytical testing are discussed in Section 9.0 and attached in Appendix E.

6.0 Encountered Subsurface Conditions

The ground conditions typically comprised topsoil overlying cohesive superficial deposits overlying MUDSTONE or SANDSTONE bedrock.

For further description of the ground conditions refer to the soil logs in Appendix B.

6.1 Hardstanding

Two remnant concrete foundations were observed in the west, adjacent to sample locations TP07 and TP08. No exploratory holes were positioned on the remnant foundations, and therefore, the thickness of the concrete is unknown.

6.2 Topsoil

Topsoil was encountered in all exploratory hole locations to depths between 0.15m and 0.35m bgl and was typically characterised as dark brown slightly gravelly silty SAND with abundant roots.

Rare anthropogenic materials, i.e. glass and brick, were encountered to depths between 0.20m and 0.25m bgl in two exploratory hole locations: TP07 and TP08, noted to be situated in areas of previous building development.

6.3 Superficial Geology

Superficial deposits were encountered in all exploratory borehole locations to depths between 1.10m and 2.10m bgl. Superficial deposits typically comprised firm light brown to orangish brown silty CLAY.

6.4 Solid Geology

The geology of the Pennine Middle Coal Measures Formation, typically recovered as extremely weak to weak MUDSTONE or fine to medium-grained SANDSTONE, was encountered in all exploratory hole locations from depths between 1.10m and 2.10m bgl. The base of the Pennine Middle Coal Measures Formation was not encountered.

6.5 Groundwater

During the site works, groundwater was not encountered in any exploratory hole locations; however, seepage was noted in the base of trial pits TP01, TP03 and TP04. Subsequent monitoring recorded perched water at depths between 0.32m and 1.14m bgl. It is likely that surface water infiltration has

influenced the groundwater monitoring considering the low permeability of the underlying CLAY and MUDSTONE strata. The results may therefore not be representative of the actual groundwater conditions beneath the site.

During the third groundwater monitoring round, the boreholes were purged of perched water. The boreholes will be subsequently re-monitored to better assess actual groundwater conditions at the site.

Monitoring results are presented in Table 3.

Table 3: Recorded water levels (m bgl).

Location ID	31 Jan 2019	18 Feb 2019	27 Feb 2019	15 Mar 2019
BH01	0.71	0.74	0.97	0.48
BH02	0.78	0.83	1.14	0.58
BH03	0.67	0.62	1.01	0.50
BH04	0.39	0.36	0.78	0.26
BH05	0.32	0.38	1.08	0.28

7.0 Geotechnical Assessment

7.1 Standard Penetration Tests

SPTs were carried out at regular intervals of 1.0m throughout the five window sample boreholes. The energy ratio of the SPT hammer used was 71% in comparison to the British Standard of 60%.

The corrected SPT N_{60} results are summarised within Table 4. A plot of corrected SPT N_{60} values versus depth is included as Figure 3 and uncorrected N values are included in logs attached in Appendix B.

Table 4: Summary of SPT N60 results

	Superficial CLAY deposits	MUDSTONE
Number of tests	6	5
Minimum Corrected N Value	8	44
Maximum Corrected N Value	23	44
Average Corrected N Value	17	44

There was a good correlation between increased SPT values and depth.

7.2 Hand Vane Results

In-situ hand vane testing was undertaken in the superficial CLAY strata at approximately 1.0m intervals. The results of the hand vane tests are included on the logs attached in Appendix B. In general, the CLAY underlying the site was generally of medium to high strength.

7.3 Geotechnical Laboratory Analysis Results

7.3.1 Sulphates

The Design Sulphate class for site soils was assessed as DS-1, ACEC Class AC-1s in accordance with the guidance given in BRE Special Digest 1 [8]. Protection of concrete from sulphate attack is unlikely to be required.

7.3.2 Water Content

23No. water content determinations were carried out on samples recovered from the site. A plot of moisture content versus depth is included as Figure 4. The results are summarised in Table 5.

Table 5: Summary of Moisture Content Results

Stratum	No. of Tests	Moisture Content (%)		
		Minimum	Maximum	Average
TOPSOIL	4	26	47	36
Superficial CLAY deposits	18	17	37	26
MUDSTONE	1	12	12	12

7.3.3 Atterberg Limits Tests

Eight Atterberg Limits tests were carried out on deposits from across the site. The results are summarised in Table 6.

Table 6: Summary of Atterberg Limits Test Results

Location ID	Depth (m)	Stratum	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Modified Plasticity Index	Plasticity	Volume Change Potential
BH03	2.0	MUDSTONE	Non-plastic					
TP01	0.2-1.0	CLAY	43	21	22	22	Intermediate	Medium
TP02	0.5-1.0	CLAY	64	27	37	37	High	Medium
TP04	0.5-1.0	CLAY	69	29	40	40	High	High
TP05	1.0-1.5	CLAY	72	30	42	42	Very high	High
TP06	0.5-1.0	CLAY	68	29	39	39	High	Medium
TP07	1.5-2.0	CLAY	83	34	49	49	Very high	High
TP08	0.25-0.6	CLAY	79	32	47	47	Very high	High

The results of the Atterberg Limits test indicate that superficial CLAY deposits generally have a high to very high plasticity and a medium to high volume change potential in accordance with NHBC Chapter 4.2 [9]. A sample of MUDSTONE was non-plastic.

7.3.4 Particle Size Distribution Tests

Two particle size distribution (PSD) tests were carried out on samples taken from this investigation; three PSD tests were carried out on samples taken from the WYG 2017 investigation. The results from the two investigations are summarised in Table 7.

A plot of all the PSDs is included as Figure 5. The superficial CLAY deposits fell within the grading envelopes of 2B/2C.

Table 7: Summary of Particle Size Distribution Results

Location	Depth (m bgl)	Stratum	Silt/Clay (%)	Sand (%)	Gravel (%)	Cobble (%)	Grading Class
SO01	0.3-2.5	CLAY & MUDSTONE	70	4	26	0	2B/2C
SO02	0.3-1.8	CLAY	95	5	0	0	2B/2C
SO03	0.5-1.5	CLAY & MUDSTONE	19	18	63	0	2B/2C
TP03	0.4-0.8	CLAY	87	9	4	0	2B/2C
TP05	1.0-1.5	CLAY	95	5	0	0	2B/2C

7.3.5 2.5kg Compaction Tests

Three 2.5kg dry density/moisture content relationship tests were carried out on samples recovered from the site. The results are summarised in Table 8.

The results indicate that the natural moisture content of superficial CLAY deposits is at or slightly higher than optimum. CLAY may need drying out prior to re-profiling/engineering.

Table 8: Summary of Compaction Test Results

Location ID	Depth (m bgl)	Stratum	Natural Moisture Content (%)	Optimum Moisture Content (%)	Maximum Dry Density (Mg/m^3)
TP02	0.5-1.0	Superficial CLAY deposits	26	26	1.57
TP04	0.5-1.0	Superficial CLAY deposits	31	28	1.49
TP07	1.5-2.0	Superficial CLAY deposits	37	34	1.37

8.0 Contamination Assessment Criteria

8.1 Soils

A Generic Quantitative Risk Assessment, GQRA, has been undertaken by comparing recorded concentrations of chemical constituents in soil with Generic Assessment Criteria, GAC, (provided in Appendix F) to identify whether, at the concentrations recorded, the presence of the constituent has the potential to adversely affect the health of site users.

If the recorded concentrations of a particular constituent are below the GAC then the risk is considered to be acceptable. Where a substance is recorded at concentrations higher than GAC this does not necessarily indicate that a particular risk is present but signifies the requirement to undertake further review/ assessment in line with the UK tiered risk assessment framework.

The Soil Screening Values (SSVs) used to screen analytical results derive from various sources. Preferentially WYG have used Category 4 Screening Levels (C4SL) derived by DEFRA with CL:AIRE (Contaminated Land: Applications in Real Environments) [10]. C4SLs are currently available for arsenic, benzene, benzo(a)pyrene, cadmium, chromium VI and lead.

Where C4SLs are unavailable, 'Suitable for Use Levels' (S4ULs) developed by LQM/CIEH [11] have been applied. The LQM/CIEH S4ULs are based on minimal or tolerable risk intended to be protective of human health.

An SSV for 'Easily Liberatable Cyanide' has also been generated by WYG, based on potential short-term exposure.

SSVs are available for various land uses. Based on current proposals for residential development with private gardens, criteria for 'Residential with Plant Uptake' use have been applied.

For a number of contaminants of concern, where one or more individual results exceeded the GAC by a more significant margin, statistical assessment of the data set has been undertaken. Consideration has been given to the sorting of the data, for example to represent sample depth, material type and/or zones within the site. Data for deeper samples may be excluded as viable pollutant linkages may not be available.

Statistical analysis has been undertaken based on guidance by CL:AIRE/Chartered Institute of Environmental Health [12], determining the 95% upper confidence limit of the true population mean (95% UCL). Where the normality of the dataset cannot be demonstrated the 95% UCL has been derived using the non-parametric Chebychev Theorem method. The 95% UCL value is compared with

the assessment criterion (GAC) for the contaminant to provide preliminary assessment of potential health risk.

Consideration is also given to the significance of any results identified as statistical outliers, and requirements for delineation or localised mitigation.

9.0 Contamination Assessment

9.1 General

Contamination testing was undertaken on 15No. samples (11No. topsoil & 4No. superficial deposits) at depths ranging from 0.0m to 0.3m bgl. Contamination testing was limited to shallow soils because the Phase I Geo-Environment identified that if contamination was present, it would likely be localised to the upper 0.3m of soils. No visual or olfactory indicators of contamination were observed in deeper ground.

Asbestos screening was carried out on 9No. samples of topsoil at depths ranging from 0.0m to 0.2m bgl. Asbestos was not detected in any sample tested.

Soil organic matter (SOM) was scheduled on 7No. sample of topsoil. SOM of topsoil ranged between 7.67% and 10.80%, with an average SOM of 8.96%. Contamination assessment criteria based on 6% SOM have been applied.

In general, most of the samples tested contained contaminant concentrations (i.e. metals, phenol, TPH, PAH) below their relevant screening criteria. No topsoil sample tested contained herbicide or pesticide concentrations above the laboratory detection limit.

Exceedances of the screening criteria were identified as detailed in the sub-sections below. A results table summarising the laboratory data is provided in Appendix G.

9.1.1 Metals

Three out of fifteen samples tested contained at least one metal contaminant exceeding their relevant human health screening criterion, as follows:

- Arsenic concentrations marginally exceeded the screening criterion (37mg/kg) on two occasions: TP07 at 0.0m bgl, 39.1mg/kg and TP08 at 0.0m bgl, 42.7m bgl.
- Lead concentrations marginally exceeded the screening criterion (200mg/kg) on three occasions: TP06 at 0.2m bgl, 484mg/kg; TP07 at 0.0m bgl, 310mg/kg and TP08 at 0.0m bgl, 269m bgl.
- The elevated arsenic and lead concentrations in topsoil were recorded in the former allotment area with associated sheds in the northwest and west. The elevated arsenic and lead are likely due to the storage of herbicides and usage of leaded paints in the allotment shed construction.

The 95% UCL of the topsoil dataset was calculated for arsenic and lead (Table 9). The 95% UCL of arsenic was below the screening criterion, and therefore, arsenic contamination is not considered to pose a human health risk to end users of the site. The 95% Chebyshev UCL for lead was marginally above the screening criterion. However, if the most elevated lead result from TP06 is removed from the calculation (identified as a potential statistical outlier), the 95% Chebyshev UCL of lead was below the screening criterion.

Table 9: 95% UCL of metal contaminants within topsoil.

Contaminant	Distribution	95% UCL (mg/kg)	Criterion (mg/kg)
Arsenic	Normal	25.56	37
Lead	Log-normal	265 193*	200

*95% UCL if the TP06 at 0.2m bgl, 484mg/kg is removed from the calculation (outlier).

Supplementary investigation was undertaken to verify the elevated concentration of lead identified at TP06. Four additional hand-excavated trial pits were undertaken, one immediately adjacent to TP06, three at 5m radially. Results of lead analysis identified concentrations in the range 56.4 – 210mg/kg, the more elevated maximum concentration at TP06, 484mg/kg, not being replicated. Statistical analysis for the full dataset, replacing the anomalous maximum concentration with the supplementary investigation data (18 results in total) indicated a 95% Chebyshev UCL of 180mg/kg, below the 200mg/kg criterion. It is considered that the maximum result was anomalous, possibly relating to a localised fragment of elevated lead material in the sample tested, and no remedial action is proposed.

9.1.2 Phytotoxic Metals

Zinc concentrations in four samples of topsoil exceeded the potential plant toxicity threshold (200mg/kg). However, as on site topsoil currently supports apparently healthy plant growth, re-use of topsoil in garden and landscaped area will likely be suitable.

9.1.3 Summary

- Measured contaminant concentrations (metals, phenol, TPH, PAH, asbestos) were predominantly below relevant human health criteria. Three samples of topsoil contained at least one metal contaminant marginally exceeding their screening criteria.
- The 95% UCL of arsenic was well below the screening criterion and no remedial action is required.

- Supplementary investigation at the location of the maximum recorded lead concentration did not replicate the elevated result. The 95% UCL for lead, excluding the anomaly result, was below the screening criterion and no remedial action is required.
- Zinc concentrations in four samples of topsoil exceeded the potential plant toxicity threshold. However, as on site topsoil currently supports apparently healthy plant growth, re-use of topsoil in gardens and landscaped areas will likely be suitable.
- No topsoil sample tested contained herbicide or pesticide concentrations above the laboratory detection limit.

10.0 Gas Assessment

10.1 Monitoring data

Ground gas monitoring has been undertaken on four occasions between 31 January and 15 March 2019. Results of the gas monitoring are included in Appendix H.

Standing perched water level was generally recorded at less than 1.0m bgl in all boreholes, above the response zone of the installations. Consequently, the high water table would prevent the ingress of soil gas into the monitoring well. Calculation of the characteristic gas situation based on concentration and flow measurements, as per CIRIA C665 Guidelines [13], is consequently not valid.

During monitoring round 3, the boreholes were purged dry after initial monitoring, and re-monitored after 2 successive 1-hour periods. In most cases, the water level had not recovered to 1m bgl after this period, allowing gas exchange into the standpipe for this limited period. Results did not exceed 0.1% methane (corrected for background reading), 0.2% carbon dioxide. There was consequently no indication of any ground gas hazard.

10.2 Conceptual appraisal

Due to the limitations of the ground gas monitoring caused by shallow groundwater recorded in boreholes, supplementary consideration of the conceptual sources of gas has been undertaken.

No borehole identified any materials likely to represent a source of hazardous ground gases, made ground being absent.

The site was recorded as being underlain by worked coal strata at 330 to 560m depth in the WYG Desk Study Report [4]. However, all WYG boreholes recorded the presence of natural silty clay strata of low anticipated gas permeability, between 1.1 and 1.90m thickness, beneath thin topsoils. In most

cases the clay was underlain by low permeability mudstone, though more permeable sandstone potentially able to transmit gases was present at some locations. Potential for migration of mines gas or gas from intact coal strata to the surface is considered low. A former mine shaft was identified 20m outside the site boundary to the north, a possible vertical gas migration pathway, but the low permeability strata are also expected to prevent lateral migration of any mines gas which might be present in the shaft.

A landfill, which appears to relate to a land-raise to create a recreation ground, was located 167m east. Although the landfill might represent a source of gas, lateral migration would be restricted by the clay / mudstone strata. The landfill was licensed by British Gas for inert and commercial waste (excavation waste and non-hazardous demolition waste) and is assessed as a low potential gas risk site. Residential development is located between the landfill location and the site.

The site is located in an area of 'intermediate' radon probability (5-10% of homes being above the radon action level). Basic radon protection measures will be required, also providing protection from other hazardous ground gases.

The site conditions have been reviewed based on guidance published by Wilson and Card [14], which assesses the requirement for ground gas monitoring (and by inference, ground gas risk), based on identified risk factors. In the absence of made ground, but where radon protection is required, the guidance recommends the inclusion of gas protection but does not require gas monitoring.

In summary, although gas monitoring was constrained, risk due to methane and carbon dioxide from identified potential sources is considered low. Gas protection due to radon will be required, which will also provide coincident protection from other gases. Consequently, no additional gas mitigation measures are recommended.

11.0 Preliminary Engineering Assessment

11.1 Foundation Design

Ground conditions beneath the site typically comprise topsoil over medium to high strength CLAY overlying MUDSTONE or SANDSTONE bedrock. Groundwater monitoring recorded water levels at depths between 0.32m and 0.83m bgl; water levels are likely affected by surface water infiltration. The exploratory hole records are attached as Appendix B.

Shallow strip or trench fill footings placed within the medium to high strength superficial CLAY deposits or the shallow MUDSTONE or SANDSTONE bedrock may be a feasible foundation solution for the proposed houses. Numerous trees are present on site and trench fill footings will need to be deepened within the influencing distance of trees to ensure footings are placed within moisture-stable strata. Water levels were recorded at shallow depths, further assessment of groundwater levels following well purging of perched water will be required. If shallow groundwater is present, trench stability may be an issue with deep trench fill foundations and load bearing capacity will be reduced. Alternatively, a piled foundation solution could be considered.

Inclusion of a suspended ground floor slab and heave protection into the foundation design will likely be required due to the presence of high to very high plasticity clays.

11.2 Compaction

The 2.5kg compaction tests showed that the natural and optimum moisture contents were generally the same or very similar indicating the material is suitable for use in reprofiling the site. In some areas, the material may require drying out to achieve the optimum 95% compaction.

11.3 Pavement Design

CBR testing was not carried out as part of the site investigation. During construction, the formation for proposed pavements should be inspected and any areas of soft/loose deleterious strata replaced with an appropriately compacted coarse-grained fill. Proof rolling/compaction of the formation level should be carried out prior to laying new pavement. Similarly, any hard spots should also be removed to guard against reflective cracking in the pavement.

Pavements should be designed in accordance with recognised standards such as IAN 73/06 [15] or HD26/06 [16].

11.4 Protection of Buried Concrete

The sulphate data, refer Section 7.3.1, indicate that protection of concrete from sulphate attack is unlikely to be required. The Design Sulphate class was assessed as DS-1, ACEC Class AC-1s.

11.5 Geotechnical Constraints

Building foundations and waste materials remain on site and will require removal to facilitate development.

Numerous trees are present within the site and around the site boundary. Atterberg Limit testing indicates the CLAY beneath the site is of medium to high volume change potential. Suitable foundations should be designed in accordance with NHBC Guidelines, Chapter 4.2 Building Near Trees [9], to determine foundation depth requirements. It would be prudent to undertake a tree survey to confirm species and heights to assess their potential effects on the underlying CLAY. If a number of high-water demand species are present in close proximity to proposed building footprints and a significant proportion of the development would require deep trench fill footings, it may be more economical to consider a piled foundation solution.

Where applicable, a proprietary compressible material should be incorporated into the foundation design to protect the foundations from heave and shrinkage of the superficial CLAY deposits.

In accordance with the NHBC guidance, suspended ground floors should be used in all situations where heave can occur within the area bounded by the foundations.

Water levels were recorded at shallow depths immediately after the site investigation and the boreholes were subsequently purged during the monitoring period. After purging the groundwater levels returned to the initial levels and therefore management of groundwater during site redevelopment will be required and the presence of a shallow groundwater should be considered during the foundation design.

12.0 Summary and Conclusions

- WYG were commissioned by Homes England to conduct a ground investigation at Land off High Street, Shafton, in support of the proposed residential development of the site.
- The ground investigation comprised the excavating of 8No. trial pits, drilling of 5No. window sample boreholes and the subsequent ground and gas monitoring from 5No. installed standpipes. 4No. supplementary hand - excavated pits were dug to investigate a possible lead contamination hotspot.
- The ground conditions typically comprised topsoil overlying superficial CLAY overlying MUDSTONE or SANDSTONE bedrock of the Pennine Middle Coal Measures Formation.
- Groundwater monitoring recorded water at depths between 0.32m and 0.83m bgl; water levels are likely affected by surface water infiltration.
- In general, the CLAY underlying the site was generally of medium to high strength.
- The average moisture content of TOPSOIL was 36%, superficial CLAY was 26% and MUDSTONE was 12%.
- The Atterberg Limits test indicate that superficial CLAY generally has a high to very high plasticity and a medium to high volume change potential.
- The superficial CLAY deposits fell within the grading envelopes of 2B/2C.
- 2.5kg compaction testing returned optimum moisture content values of 26-34% and a maximum dry density of 1.37-1.57mg/m^3.
- The Design Sulphate Class was assessed as DS-1, ACEC Class AC-1s.
- In general, most of the samples tested contained contaminant concentrations (i.e. metals, phenol, TPH, PAH, asbestos, pesticides and herbicides) below their relevant screening criteria. Excepting a single result for lead in topsoil which was demonstrated to be anomalous, statistical analysis confirmed a small number of exceedances of criteria for arsenic and lead not to be of significance.
- Protection of buildings from radon will be required. Based on the encountered ground conditions, restricted ground gas monitoring and appraisal of conceptual gas risk, no additional ground gas mitigation is required due to other gases.
- Building foundations and waste materials remain on site and will require removal to facilitate development.

- Numerous trees are present within the site and around the site boundary. Atterberg Limit testing indicates the CLAY beneath the site is of medium to high volume change potential. Suitable foundations should be designed in accordance with NHBC Guidelines, Chapter 4.2 Building Near Trees [9], to determine foundation depth requirements.
- It would be prudent to undertake a tree survey to confirm species and heights to assess their potential effects on the underlying CLAY. If a number of high-water demand species are present in close proximity to proposed building footprints and a significant proportion of the development would require deep trench fill footings, it may be more economical to consider a piled foundation solution.
- Where applicable, a proprietary compressible material should be incorporated into the foundation design to protect the foundations from heave and shrinkage of the superficial CLAY deposits.
- In accordance with the NHBC guidance, suspended ground floors should be used in all situations where heave can occur within the area bounded by the foundations.
- Water levels were recorded at shallow depths immediately after the site investigation and the boreholes were subsequently purged during the monitoring period. After purging the groundwater levels returned to the initial levels and therefore management of groundwater during site redevelopment will be required and the presence of a shallow groundwater should be considered during the foundation design.

13.0 References

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14.0 Figures and Appendices

Figure 1 – Site Location Plan

Site Location Plan

Land off High Street, Shafton

Homes England

N

Legend

Site Boundary

Notes:

Drawn by: LM

Drawing No. A090070-550_Fig1

Checked by: AW

Revision No. 1

0 52 104 156 Meters

Scale: 1:3533 @A3

4/2/2019

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Geneva Building,
Lake View Drive,
Sherwood Business Park,
Annesley,
Nottingham, NG15 0ED

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Email: nottingham@wyg.com

Figure 2 – Exploratory Hole Location Plan



Exploratory Hole Location Plan

Land off High Street, Shafton

Homes England

N

Legend

- Trial Pit (2017 WYG)
- Site Boundary

Exploratory Hole (2019 WYG)

- Window Sample
- Trial Pit

Notes:

Drawn by: LM

Drawing No. A090070-550_Fig2

Checked by: AW

Revision No. 1

0 30 60 90 Meters

Scale: 1:1766 @A3

4/2/2019

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Figure 3 – SPT 'N' Value v Depth

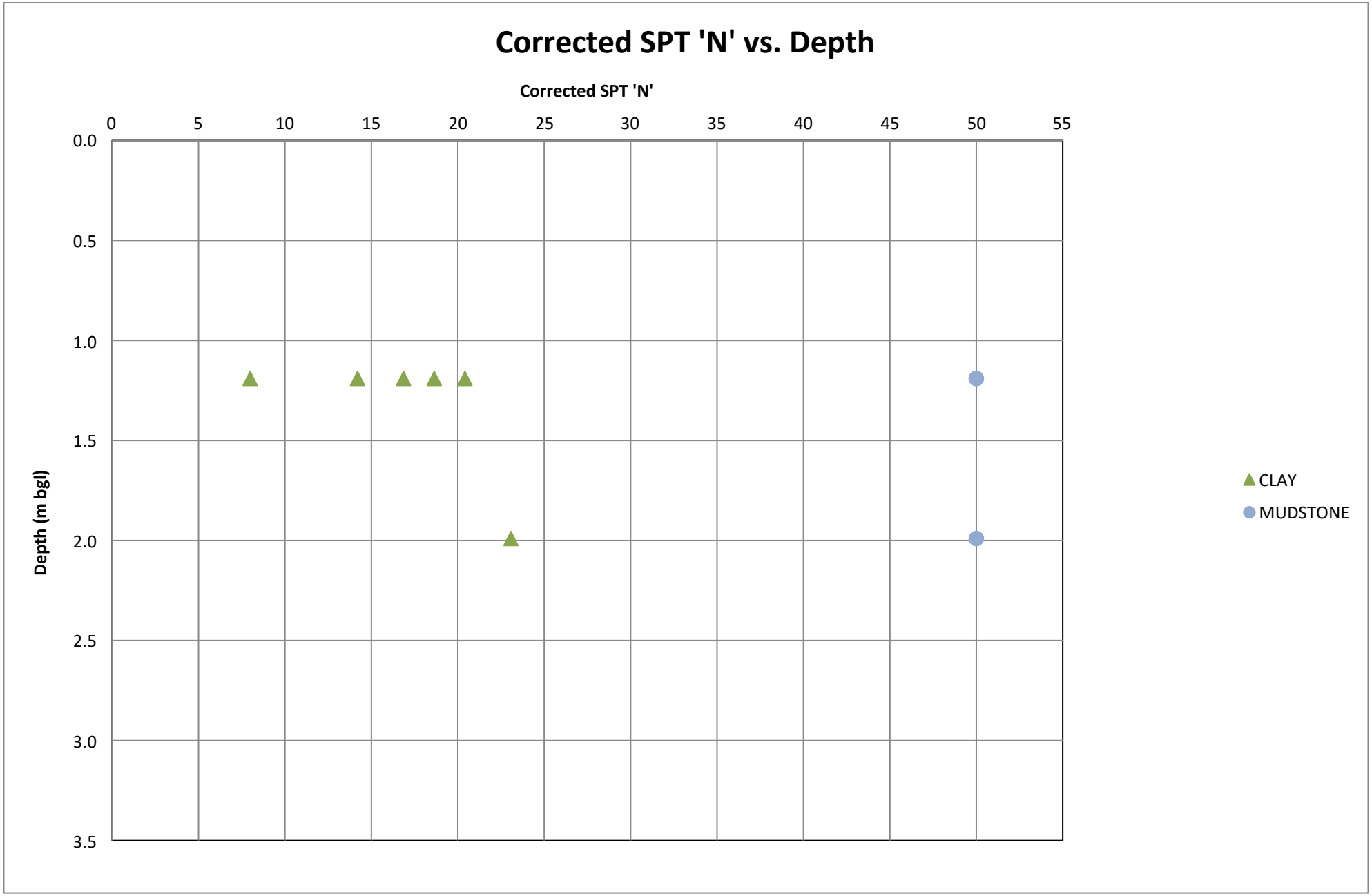

Corrected SPT 'N' vs. Depth
Corrected SPT 'N'
0
5
10
15
20
25
30
35
40
45
50
55
Depth (m bgl)
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
CLAY
MUDSTONE

Figure 4 – Moisture Content v Depth

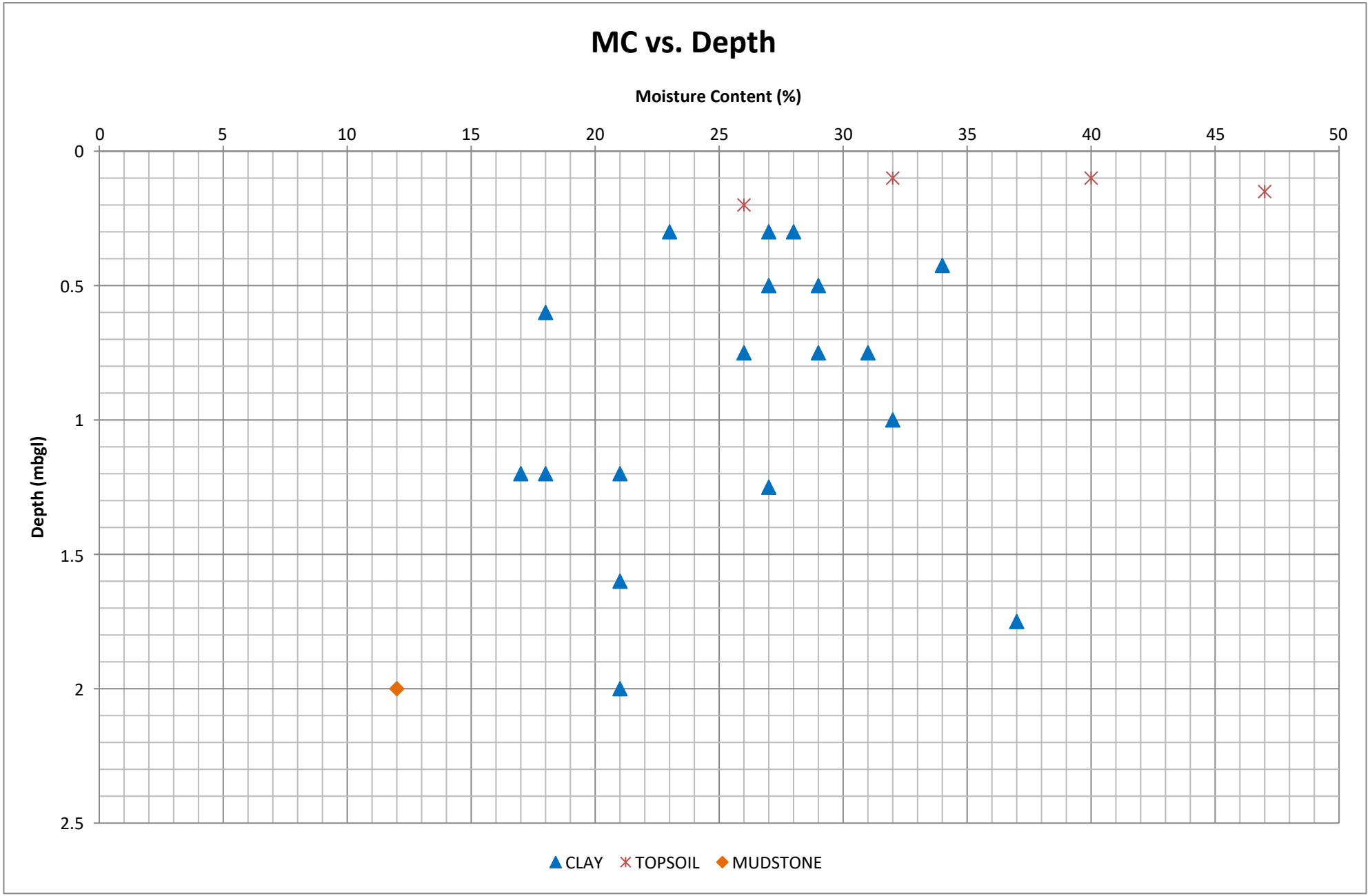
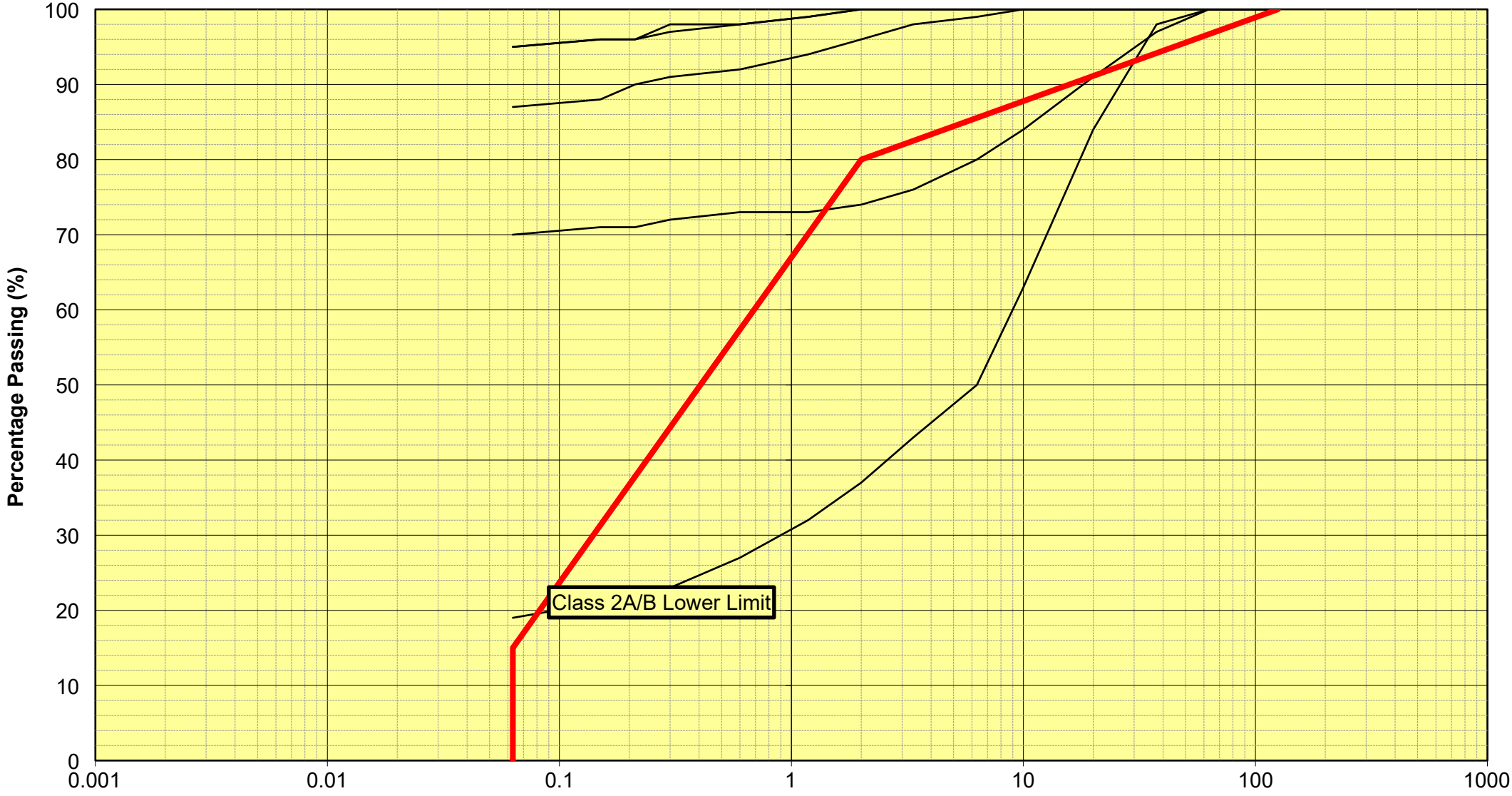

MC vs. Depth
Moisture Content (%)
0
5
10
15
20
25
30
35
40
45
50
Depth (mbgl)
0
0.5
1
1.5
2
2.5
CLAY
TOPSOIL
MUDSTONE

Figure 5 – Particle Size Distribution

-

-



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

Appendix A – Report Conditions

Report Conditions

GROUND INVESTIGATION

This report is produced solely for the benefit of Homes England and no liability is accepted for any reliance placed on it by any other party unless specifically agreed in writing otherwise.

This report refers, within the limitations stated, to the condition of the site at the time of the inspections. No warranty is given as to the possibility of future changes in the condition of the site.

This report is based on a visual site inspection, reference to accessible referenced historical records, information supplied by those parties referenced in the text and preliminary discussions with local and Statutory Authorities. Some of the opinions are based on unconfirmed data and information and are presented as the best that can be obtained without further extensive research. Where ground contamination is suspected but no physical site test results are available to confirm this, the report must be regarded as initial advice only, and further assessment should be undertaken prior to activities related to the site. Where test results undertaken by others have been made available these can only be regarded as a limited sample. The possibility of the presence of contaminants, perhaps in higher concentrations, elsewhere on the site cannot be discounted.

Whilst confident in the findings detailed within this report because there are no exact UK definitions of these matters, being subject to risk analysis, we are unable to give categoric assurances that they will be accepted by Authorities or Funds etc. without question as such bodies often have unpublished, more stringent objectives. This report is prepared for the proposed uses stated in the report and should not be used in a different context without reference to WYGE. In time improved practices or amended legislation may necessitate a re-assessment.

The assessment of ground conditions within this report is based upon the findings of the study undertaken. We have interpreted the ground conditions in between locations on the assumption that conditions do not vary significantly. However, no investigation can inspect each and every part of the site and therefore changes or variances in the physical and chemical site conditions as described in this report cannot be discounted.

The report is limited to those aspects of land contamination specifically reported on and is necessarily restricted and no liability is accepted for any other aspect especially concerning gradual or sudden pollution incidents. The opinions expressed cannot be absolute due to the limitations of time and resources imposed by the agreed brief and the possibility of unrecorded previous use and abuse of the site and adjacent sites. The report concentrates on the site as defined in the report and provides an opinion on surrounding sites. If migrating pollution or contamination (past or present) exits further extensive research will be required before the effects can be better determined.

Appendix B – Exploratory Hole Logs

Project: **High Street, Shafton**

Location: **Shafton**

Client: **Homes England**

Location Details			
Easting:	439344.00	Northing:	410822.00
Level:	81.00mAOD	Depth:	2.00m
Logger:	SC	Type:	WS
		Inclination:	90°

Status: FINAL

Borehole Number: **BH01**

Sheet 1 of 1

Method, Plant and Crew					Diameter		Casing		Groundwater						Scale: 1:50
From (m)	To (m)	Type	Plant Used	Crew	Depth (m)	Diam (mm)	Depth(m)	Diam (mm)	Strike (m)	Casing (m)	Sealed (m)	Rose To (m)	Time (mins)	Remarks	Checked By: LM
0.00	1.20	Inspection Pit	Hand pitting tools	DSUK	1.20	200									Approved By: AW
1.20	2.00	Window Sampler	Premier Tracker 110	DSUK	2.00	87									Start Date: 25/01/2019
															Finish Date: 25/01/2019

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples and Testing: Depth (m)	Ref	Tests / Results
Grass over TOPSOIL comprising dark brown slightly gravelly silty SAND with abundant rootlets. Gravel is angular to sub-rounded fine to coarse quartzite and sandstone.						0.15	D2	
						0.15	ES1	
		0.30	80.70					
Firm orangish brown mottled light grey silty CLAY.						0.50	D3	
						1.00	D4	
Becoming friable from 1.1mbgl. *Stiff from 1.2mbgl.*								SPT(S) 1.20m, N=16 (3,3/4,4,4,4)
						1.60	D5	
Weak dark brown to grey mottled purple MUDSTONE.		1.70	79.30			1.80	D6	
EOH at 2.00m - Refusal		2.00	79.00					SPT(S) 2.00m, 50 (25 for 125mm/50 for 290mm)

Observations / Remarks

1. Groundwater not encountered.
2. Hand dug inspection pit to 1.2mbgl.
3. Borehole terminated at 2.0mbgl due to refusal.

Sampling Runs

From (m)	To (m)	Diam (mm)	Recovery %	Remarks
0.00	1.20	200	100	
1.20	2.00	87	100	

Hammer Information

Serial No.	Energy Ratio %
120.58	71

Project Number: **A090070-550**

Project: **High Street, Shafton**

Location: **Shafton**

Client: **Homes England**

Location Details			
Easting:	439401.00	Northing:	410872.00
Level:	78.00mAOD	Depth:	2.00m
Logger:	SC	Type:	WS
		Inclination:	90°

Status: FINAL

Borehole Number: **BH02**

Sheet 1 of 1

Method, Plant and Crew					Diameter		Casing		Groundwater						
From (m)	To (m)	Type	Plant Used	Crew	Depth (m)	Diam (mm)	Depth(m)	Diam (mm)	Strike (m)	Casing (m)	Sealed (m)	Rose To (m)	Time (mins)	Remarks
0.00	1.20	Inspection Pit	Hand Pitting Tools	DSUK	1.20	200								
1.20	2.00	Window Sampler	Premier Tracker 110	DSUK	2.00	87								

Scale: 1:50
Checked By: LM
Approved By: AW
Start Date: 25/01/2019
Finish Date: 25/01/2019

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples and Testing: Depth (m)	Ref	Tests / Results
Grass over TOPSOIL comprising brown slightly gravelly silty SAND with abundant rootlets. Gravel is angular to sub-rounded fine to coarse quartzite and sandstone.						0.10	D2	
						0.10	ES1	
Firm yellowish brown mottled light grey silty CLAY.		0.25	77.75			0.30	D4	
						0.30	ES3	
Friable from 0.9mbgl.						1.20	D5	SPT(S) 1.20m, N=21 (4,4/5,5,5,6)
Weak brown mottled purple MUDSTONE.		1.80	76.20			1.90	D6	
EOH at 2.00m - Refusal		2.00	76.00					SPT(S) 2.00m, 50 (10,12/50 for 220mm)

Observations / Remarks

1. Groundwater not encountered.
2. Hand dug inspection pit to 1.2mbgl.
3. Borehole terminated at 2.0mbgl due to refusal.

Sampling Runs

From (m)	To (m)	Diam (mm)	Recovery %	Remarks
0.00	1.20	200	100	
1.20	2.00	87	100	

Hammer Information

Serial No.	Energy Ratio %
120.58	71

Project Number: **A090070-550**

Project: **High Street, Shafton**

Location: **Shafton**

Client: **Homes England**

Location Details			
Easting:	439441.00	Northing:	410904.00
Level:	78.00mAOD	Depth:	2.00m
Logger:	SC	Type:	WS
		Inclination:	90°

Status: FINAL

Borehole Number: **BH03**

Sheet 1 of 1

Method, Plant and Crew					Diameter		Casing		Groundwater					
From (m)	To (m)	Type	Plant Used	Crew	Depth (m)	Diam (mm)	Depth(m)	Diam (mm)	Strike (m)	Casing (m)	Sealed (m)	Rose To (m)	Time (mins)	Remarks
0.00	1.20	Inspection Pit	Hand Pitting Tools	DSUK	1.20	200								
1.20	2.00	Window Sampler	Premier Tracker 110	DSUK	2.00	87								

Scale: 1:50
Checked By: LM
Approved By: AW
Start Date: 25/01/2019
Finish Date: 25/01/2019

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples and Testing: Depth (m)	Ref	Tests / Results
Grass over TOPSOIL comprising brown slightly gravelly silty SAND with abundant rootlets. Gravel is angular to sub-rounded fine to coarse quartzite and sandstone.						0.10	D2	
						0.10	ES1	
		0.20	77.80			0.30	D3	
Firm yellowish brown silty CLAY.								
Friable from 1.2mbgl.						1.20	D4	SPT(S) 1.20m, N=23 (5,5/5,6,6,6)
Weak light brown mottled dark brown MUDSTONE.		1.90	76.10					
EOH at 2.00m - Refusal		2.00	76.00			2.00	D5	SPT(S) 2.00m, 50 (25 for 140mm/50 for 210mm)

Observations / Remarks

1. Groundwater not encountered.
2. Hand dug inspection pit to 1.2mbgl.
3. Borehole terminated at 2.0mbgl due to refusal.

Sampling Runs

From (m)	To (m)	Diam (mm)	Recovery %	Remarks
0.00	1.20	200	100	
1.20	2.00	87	100	

Hammer Information

Serial No.	Energy Ratio %
120.58	71

Project Number: **A090070-550**

Project: **High Street, Shafton**

Location: **Shafton**

Client: **Homes England**

Location Details			
Easting:	439412.00	Northing:	410950.00
Level:	78.00mAOD	Depth:	3.00m
Logger:	SC	Type:	WS
		Inclination:	90°

Status: FINAL

Borehole Number: **BH04**

Sheet 1 of 1

Method, Plant and Crew					Diameter		Casing		Groundwater					
From (m)	To (m)	Type	Plant Used	Crew	Depth (m)	Diam (mm)	Depth(m)	Diam (mm)	Strike (m)	Casing (m)	Sealed (m)	Rose To (m)	Time (mins)	Remarks
0.00	1.20	Inspection Pit	Hand Pitting Tools	DSUK	1.20	200								
1.20	3.00	Window Sampler	Premier Tracker 110	DSUK	2.00	87								
					3.00	77								

Scale: 1:50
Checked By: LM
Approved By: AW
Start Date: 25/01/2019
Finish Date: 25/01/2019

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples and Testing: Depth (m)	Ref	Tests / Results
Grass over TOPSOIL comprising brown slightly gravelly silty SAND with abundant rootlets. Gravel is angular to sub-rounded fine to coarse quartzite and sandstone.						0.10	D2	
						0.10	ES1	
Firm light brown to light grey slightly silty CLAY.		0.20	77.80			0.30	D4	
						0.30	ES3	
Grey mottled orange from 1.1mbgl.						1.20	D5	SPT(S) 1.20m, N=9 (2,2/2,2,2,3)
Stiff from 2.0mbgl.						2.00	D6	SPT(S) 2.00m, N=26 (6,6/6,7,6,7)
Very weak dark brown mottled purple MUDSTONE.		2.10	75.90			2.20	D7	
EOH at 3.00m - Refusal		3.00	75.00			3.00	D8	SPT(S) 3.00m, 50 (10,11/50 for 275mm)

Observations / Remarks

1. Groundwater not encountered.
2. Hand dug inspection pit to 1.2mbgl.
3. Borehole terminated at 3.0mbgl due to refusal.

Sampling Runs

From (m)	To (m)	Diam (mm)	Recovery %	Remarks
0.00	1.20	200	100	
1.20	2.00	87	100	
2.00	3.00	77	90	

Hammer Information

Serial No.	Energy Ratio %
120.58	71

Project Number: **A090070-550**

Project: **High Street, Shafton**

Location: **Shafton**

Client: **Homes England**

Location Details			
Easting:	439390.00	Northing:	410900.00
Level:	81.00mAOD	Depth:	2.00m
Logger:	SC	Type:	WS
		Inclination:	90°

Status: FINAL

Borehole Number: **BH05**

Sheet 1 of 1

Method, Plant and Crew					Diameter		Casing		Groundwater					
From (m)	To (m)	Type	Plant Used	Crew	Depth (m)	Diam (mm)	Depth(m)	Diam (mm)	Strike (m)	Casing (m)	Sealed (m)	Rose To (m)	Time (mins)	Remarks
0.00	1.20	Inspection Pit	Hand Pitting Tools	DSUK	1.20	200								
1.20	2.00	Window Sampler	Premier Tracker 110	DSUK	2.00	87								

Scale: 1:50
Checked By: LM
Approved By: AW
Start Date: 25/01/2019
Finish Date: 25/01/2019

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples and Testing: Depth (m)	Ref	Tests / Results
Grass over TOPSOIL comprising brown slightly gravelly silty SAND with abundant rootlets. Gravel is angular to sub-rounded fine to coarse quartzite and sandstone.						0.20	D2	
						0.20	ES1	
		0.35	80.65					
Firm yellowish brown mottled light grey slightly silty CLAY.						0.50	D3	
						1.20	D4	SPT(S) 1.20m, N=19 (3,3/4,5,5,5)
Very weak dark grey mottled light grey and purple MUDSTONE.		1.90	79.10					
EOH at 2.00m - Refusal		2.00	79.00			2.00	D5	SPT(S) 2.00m, 50 (6,15/50 for 205mm)

1 2 3 4 5 6 7 8 9 10

Observations / Remarks

1. Groundwater not encountered.
2. Hand dug inspection pit to 1.2mbgl.
3. Borehole terminated at 2.0mbgl due to refusal.

Sampling Runs

From (m)	To (m)	Diam (mm)	Recovery %	Remarks
0.00	1.20	200	100	
1.20	2.00	87	100	

Hammer Information

Serial No.	Energy Ratio %
120.58	71

Project Number: **A090070-550**

Project: **High Street, Shafton**	Location Details	Status	Pit Number
Location: **Shafton**	Easting: 439329.00 Northing: 410808.00	FINAL	**TP01**
Client: **Homes England**	Level: 81.00mAOD Depth: 1.50m		Sheet 1 of 1
	Logger: SC Type: TP		

Hole Information		Groundwater				Scale: 1:25
Pit Dimensions	Orientation: 110°	Strike (m)	Rose To (m)	After (mins)	Remarks	Checked By: LM
0.60m / 3.30m	Shoring: None					Approved By: AW
	Stability: Stable					Start Date: 24/01/2019
	Plant: JCB 3CX					Finish Date: 24/01/2019

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Backfill	Samples and Testing: Depth (m)	Ref	Tests / Results
Grass over TOPSOIL comprising dark brown slightly gravelly silty SAND with abundant rootlets. Gravel is angular to sub-rounded fine to coarse quartzite and sandstone.						0.15 0.20 - 1.00	ES1 B2	
Firm light brown to orangish brown silty very friable CLAY.		0.20	80.80					HV 0.50m, (p)=39 kPa (r)=18 kPa
Weak light brown to light grey mottled orange fine to medium grained SANDSTONE.		1.30	79.70					
EOH at 1.50m - Refusal		1.50	79.50					

Observations / Remarks

1. Groundwater seeping into base of trial pit.
2. Trial pit terminated at 1.5mbgl due to difficulty excavating.

Project Number

A090070-550

Project: **High Street, Shafton**	Location Details	Status	Pit Number
Location: **Shafton**	Easting: 439393.00 Northing: 410860.00	FINAL	**TP02**
Client: **Homes England**	Level: 81.00mAOD Depth: 2.00m		Sheet 1 of 1
	Logger: SC Type: TP		

Hole Information		Groundwater				Scale: 1:25
Pit Dimensions	Orientation: 120°	Strike (m)	Rose To (m)	After (mins)	Remarks	Checked By: LM
0.60m / 3.30m	Shoring: None					Approved By: AW
	Stability: Stable					Start Date: 24/01/2019
	Plant: JCB 3CX					Finish Date: 24/01/2019

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Backfill	Samples and Testing: Depth (m)	Ref	Tests / Results
Grass over TOPSOIL comprising dark brown slightly gravelly silty SAND with abundant rootlets. Gravel is angular to sub-rounded fine to coarse quartzite and sandstone.		0.15	80.85			0.10	ES1	
Firm light brown mottled orange slightly silty CLAY.								
Friable from 0.5mbgl.						0.50 - 1.00	B2	
Grey mottled orange from 1.1mbgl.								
Very weak purplish grey mottled orange MUDSTONE.		1.80	79.20					
EOH at 2.00m - Refusal		2.00	79.00					

Observations / Remarks

1. Groundwater not encountered.
2. Trial pit terminated at 2.0mbgl due to difficulty excavating.

Project Number

A090070-550

Project: **High Street, Shafton**	Location Details	Status	Pit Number
Location: **Shafton**	Easting: 439449.00 Northing: 410918.00	FINAL	**TP03**
Client: **Homes England**	Level: 78.00mAOD Depth: 1.70m		Sheet 1 of 1
	Logger: SC Type: TP		

Hole Information		Groundwater				Scale: 1:25
Pit Dimensions	Orientation: 90°	Strike (m)	Rose To (m)	After (mins)	Remarks	Checked By: LM
0.60m / 3.40m	Shoring: None					Approved By: AW
	Stability: Stable					Start Date: 24/01/2019
	Plant: JCB 3CX					Finish Date: 24/01/2019

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Backfill	Samples and Testing: Depth (m)	Ref	Tests / Results
Grass over TOPSOIL comprising dark brown slightly gravelly silty SAND with abundant rootlets. Gravel is angular to sub-rounded fine to coarse quartzite and sandstone.						0.10	ES1	
Firm orangish brown silty CLAY. Clay is locally friable.		0.20	77.80			0.40 - 0.80	B2	HV 0.40m, (p)=71 kPa (r)=33 kPa
Weak light grey to brown mottled orange fine to medium grained SANDSTONE.		1.45	76.55					
EOH at 1.70m - Refusal		1.70	76.30					

Observations / Remarks

1. Groundwater seeping into base of trial pit.
2. Trial pit terminated at 1.7mbgl due to difficulty excavating.

Project Number

A090070-550

Project: **High Street, Shafton**	Location Details	Status	Pit Number
Location: **Shafton**	Easting: 439421.00 Northing: 410936.00	FINAL	**TP04**
Client: **Homes England**	Level: 78.00mAOD Depth: 2.20m		Sheet 1 of 1
	Logger: SC Type: TP		

Hole Information		Groundwater				Scale: 1:25
Pit Dimensions	Orientation: 60°	Strike (m)	Rose To (m)	After (mins)	Remarks	Checked By: LM
0.60m / 3.20m	Shoring: None					Approved By: AW
	Stability: Stable					Start Date: 24/01/2019
	Plant: JCB 3CX					Finish Date: 24/01/2019

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Backfill	Samples and Testing: Depth (m)	Ref	Tests / Results
Grass over TOPSOIL comprising dark brown slightly gravelly silty SAND with abundant rootlets. Gravel is angular to sub-rounded fine to coarse quartzite and sandstone.		0.15	77.85			0.10	ES1	
Firm orangish brown slightly silty very friable CLAY.								HV 0.40m, (p)=30 kPa (r)=15 kPa
						0.50 - 1.00	B2	
								HV 1.00m, (p)=75 kPa (r)=30 kPa
Orangish grey from 1.2mbgl.								
Very weak dark brown mottled orange and purple fine to medium grained SANDSTONE.		1.90	76.10			1.90 - 2.20	B3	
EOH at 2.20m - Refusal		2.20	75.80					

Observations / Remarks

1. Groundwater seeping into base of the trial pit.
2. Trial pit terminated at 2.2mbgl due to difficulty excavating.

Project Number

A090070-550

Project: **High Street, Shafton**	Location Details	Status	Pit Number
Location: **Shafton**	Easting: 439386.00 Northing: 410929.00	FINAL	**TP05**
Client: **Homes England**	Level: 78.00mAOD Depth: 1.80m		Sheet 1 of 1
	Logger: SC Type: TP		

Hole Information		Groundwater				Scale: 1:25
Pit Dimensions	Orientation: 110°	Strike (m)	Rose To (m)	After (mins)	Remarks	Checked By: LM
0.60m / 3.30m	Shoring: None					Approved By: AW
	Stability: Stable					Start Date: 24/01/2019
	Plant: JCB 3CX					Finish Date: 24/01/2019

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Backfill	Samples and Testing: Depth (m)	Ref	Tests / Results
Grass over TOPSOIL comprising dark brown slightly gravelly silty SAND with abundant rootlets. Gravel is angular to sub-rounded fine to coarse quartzite and sandstone.						0.10	ES1	
Firm light brown to orangish brown slightly silty friable CLAY.		0.20	77.80					HV 0.50m, (p)=47 kPa (r)=28 kPa
						1.00 - 1.50	B2	HV 1.00m, (p)=89 kPa (r)=34 kPa
Very weak dark grey mottled purple fine grained SANDSTONE.		1.70	76.30					
EOH at 1.80m - Refusal		1.80	76.20					

Observations / Remarks

1. Groundwater not encountered.
2. Trial pit terminated at 1.8mbgl due to difficulty excavating.

Project Number

A090070-550

Project: **High Street, Shafton**	Location Details	Status	Pit Number
Location: **Shafton**	Easting: 439371.00 Northing: 410887.00	FINAL	**TP06**
Client: **Homes England**	Level: 81.00mAOD Depth: 1.80m		Sheet 1 of 1
	Logger: SC Type: TP		

Hole Information		Groundwater				Scale: 1:25
Pit Dimensions	Orientation: 0°	Strike (m)	Rose To (m)	After (mins)	Remarks	Checked By: LM
0.60m / 3.20m	Shoring: None					Approved By: AW
	Stability: Stable					Start Date: 24/01/2019
	Plant: JCB 3CX					Finish Date: 24/01/2019

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Backfill	Samples and Testing: Depth (m)	Ref	Tests / Results
Grass over TOPSOIL comprising dark brown slightly gravelly silty SAND with abundant rootlets. Gravel is angular to sub-rounded fine to coarse quartzite and sandstone.						0.20	ES1	
Soft brown mottled light brown slightly silty very friable CLAY.		0.25	80.75			0.50 - 1.00	B2	HV 0.50m, (p)=86 kPa (r)=39 kPa
Slightly friable and mottled light grey from 0.5mbgl.								
Weak dark grey mottled purple and orange MUDSTONE.		1.70	79.30					
EOH at 1.80m - Refusal		1.80	79.20					

Observations / Remarks

1. Groundwater not encountered.
2. Trial pit terminated at 1.8mbgl due to difficulty excavating.

Project Number

A090070-550

Project: **High Street, Shafton**	Location Details	Status	Pit Number
Location: **Shafton**	Easting: 439355.00 Northing: 410868.00	FINAL	**TP07**
Client: **Homes England**	Level: 81.00mAOD Depth: 2.30m		Sheet 1 of 1
	Logger: SC Type: TP		

Hole Information		Groundwater				Scale: 1:25
Pit Dimensions	Orientation: 10°	Strike (m)	Rose To (m)	After (mins)	Remarks	Checked By: LM
0.65m / 3.20m	Shoring: None					Approved By: AW
	Stability: Stable					Start Date: 24/01/2019
	Plant: JCB 3CX					Finish Date: 24/01/2019

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Backfill	Samples and Testing: Depth (m)	Ref	Tests / Results
Grass over TOPSOIL comprising dark brown slightly gravelly silty SAND with abundant rootlets and very low cobble content. Gravel is angular to sub-rounded fine to coarse quartzite and sandstone with rare brick and glass. Cobbles are angular to sub-angular brick.		0.25	80.75			0.00	ES1	
Firm light brown to orangish brown slightly silty friable CLAY.						0.30	ES2	
Slightly friable from 0.5mbgl.								HV 0.50m, (p)=68 kPa (r)=31 kPa
Grey mottled orange from 1.0mbgl.								HV 1.00m, (p)=56 kPa (r)=29 kPa
						1.50 - 2.00	B3	
Becoming very friable from 2.0mbgl.								
Weak dark grey mottled purple MUDSTONE		2.10	78.90					
EOH at 2.30m - Refusal		2.30	78.70					

Observations / Remarks

1. Groundwater not encountered.
2. Trial pit terminated at 2.3mbgl due to difficulty excavating.

Project Number

A090070-550

Project: **High Street, Shafton**	Location Details	Status	Pit Number
Location: **Shafton**	Easting: 439317.00 Northing: 410865.00	FINAL	**TP08**
Client: **Homes England**	Level: 81.00mAOD Depth: 1.20m		Sheet 1 of 1
	Logger: SC Type: TP		

Hole Information		Groundwater				Scale: 1:25
Pit Dimensions	Orientation: 45°	Strike (m)	Rose To (m)	After (mins)	Remarks	Checked By: LM
0.60m / 3.20m	Shoring: None					Approved By: AW
	Stability: Stable					Start Date: 24/01/2019
	Plant: JCB 3CX					Finish Date: 24/01/2019

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Backfill	Samples and Testing: Depth (m)	Ref	Tests / Results
Grass over TOPSOIL comprising dark brown slightly gravelly silty SAND with abundant rootlets. Gravel is angular to sub-rounded fine to coarse quartzite and sandstone with rare brick and glass.						0.00	ES1	
Firm light brown to orangish brown silty slightly friable CLAY.		0.20	80.80			0.25 0.25 - 0.60	ES2 B3	HV 0.50m, (p)=66 kPa (r)=29 kPa
Dark brown from 0.9mbgl.								
Weak dark grey mottled orange and purple MUDSTONE.		1.10	79.90			1.10 - 1.20	B4	
EOH at 1.20m - Refusal		1.20	79.80					

Observations / Remarks

1. Groundwater not encountered.
2. Trial pit terminated at 1.2mbgl due to difficulty excavating.

Project Number

A090070-550

Appendix C – Photographs



Photograph No 1 BH01 ground level to 1.20mbgl.



Photograph No 2 BH01 1.20mbgl to 2.00mbgl.

WYG EPT
Geneva Building
Lake View Drive
Sherwood Park
Annesley
Nottinghamshire
NG15 0ED

Tel: 01623 684550
E-mail: nottingham@wyg.com

Environmental Consultancy
Ground Technologies & Investigation

Project: Land off High Street, Shafton	
Client: Homes England	
Project No: A090070-550	Date: January 2019



Photograph No 3 BH02 ground level to 1.20mbgl.



Photograph No 4 BH02 1.20mbgl to 2.00mbgl.

WYG EPT
Geneva Building
Lake View Drive
Sherwood Park
Annesley
Nottinghamshire
NG15 0ED

Tel: 01623 684550
E-mail: nottingham@wyg.com

Environmental Consultancy
Ground Technologies & Investigation

Project: Land off High Street, Shafton	
Client: Homes England	
Project No: A090070-550	Date: January 2019



Photograph No 5 BH03 1.20mbgl to 2.00mbgl.



Photograph No 6 BH04 ground level to 1.20mbgl.

WYG EPT
Geneva Building
Lake View Drive
Sherwood Park
Annesley
Nottinghamshire
NG15 0ED

Tel: 01623 684550
E-mail: nottingham@wyg.com

Environmental Consultancy
Ground Technologies & Investigation

Project: Land off High Street, Shafton	
Client: Homes England	
Project No: A090070-550	Date: January 2019



Photograph No 7 BH04 1.20mbgl to 2.00mbgl.



Photograph No 8 BH04 2.00mbgl to 3.00mbgl.

WYG EPT
Geneva Building
Lake View Drive
Sherwood Park
Annesley
Nottinghamshire
NG15 0ED

Tel: 01623 684550
E-mail: nottingham@wyg.com

Environmental Consultancy
Ground Technologies & Investigation

Project: Land off High Street, Shafton	
Client: Homes England	
Project No: A090070-550	Date: January 2019



Photograph No 9 BH05 1.20mbgl to 2.00mbgl.



Photograph No 10 TP01 ground level to 1.50mbgl.

WYG EPT
Geneva Building
Lake View Drive
Sherwood Park
Annesley
Nottinghamshire
NG15 0ED

Tel: 01623 684550
E-mail: nottingham@wyg.com

Environmental Consultancy
Ground Technologies & Investigation

Project: Land off High Street, Shafton	
Client: Homes England	
Project No: A090070-550	Date: January 2019



Photograph No 11 TP02 ground level to 2.00mbgl.



Photograph No 12 TP03 ground level to 1.70mbgl.

WYG EPT
Geneva Building
Lake View Drive
Sherwood Park
Annesley
Nottinghamshire
NG15 0ED

Tel: 01623 684550
E-mail: nottingham@wyg.com

Environmental Consultancy
Ground Technologies & Investigation

Project: Land off High Street, Shafton

Client: Homes England

Project No: A090070-550

Date: January 2019



Photograph No 13 TP04 ground level to 2.20mbgl.



Photograph No 14 TP05 ground level to 1.80mbgl.

WYG EPT
Geneva Building
Lake View Drive
Sherwood Park
Annesley
Nottinghamshire
NG15 0ED

Tel: 01623 684550
E-mail: nottingham@wyg.com

Environmental Consultancy
Ground Technologies & Investigation

Project: Land off High Street, Shafton

Client: Homes England

Project No: A090070-550

Date: January 2019



Photograph No 15 TP06 ground level to 1.80mbgl.



Photograph No 16 TP07 ground level to 2.30mbgl.

WYG EPT
Geneva Building
Lake View Drive
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Annesley
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Environmental Consultancy
Ground Technologies & Investigation

Project: Land off High Street, Shafton

Client: Homes England

Project No: A090070-550

Date: January 2019



Photograph No 17 TP08 ground level to 1.20mbgl.

WYG EPT
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Nottinghamshire
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Environmental Consultancy
Ground Technologies & Investigation

Project: Land off High Street, Shafton	
Client: Homes England	
Project No: A090070-550	Date: January 2019

Appendix D – Geotechnical Laboratory Transcripts

LABORATORY REPORT

4043

Contract Number: PSL19/0796

Report Date: 18 February 2019

Client's Reference: A090070-550

Client Name: WYG Notts
Geneva Buildings
Lake View Drive, Sherwood Business Park
Annesley
Nottingham
NG15 0ED

For the attention of: Simon Collin

Contract Title: Shafton

Date Received: 1/2/2019
Date Commenced: 1/2/2019
Date Completed: 18/2/2019

Notes: Opinions and Interpretations are outside the UKAS Accreditation

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced other than in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:

R Gunson (Director)	A Watkins (Director)	R Berriman (Quality Manager)
L Knight (Senior Technician)	S Eyre (Senior Technician)	S Royle (Laboratory Manager)

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SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Description of Sample
BH01	2	D	0.15		Dark brown TOPSOIL.
BH01	3	D	0.50		Brown mottled grey slightly gravelly slightly sandy CLAY.
BH01	4	D	1.00		Brown mottled grey slightly gravelly slightly sandy CLAY.
BH01	5	D	1.60		Brown mottled grey slightly gravelly sandy CLAY.
BH02	2	D	0.10		Dark brown TOPSOIL.
BH02	4	D	0.30		Brown mottled grey slightly sandy CLAY.
BH02	5	D	1.20		Brown mottled grey slightly gravelly sandy CLAY.
BH03	2	D	0.30		Brown mottled grey slightly gravelly sandy CLAY.
BH03	4	D	2.00		Brown slightly sandy slightly clayey GRAVEL.
BH04	2	D	0.10		Brown TOPSOIL.
BH04	4	D	0.30		Brown mottled grey slightly gravelly slightly sandy CLAY.
BH04	5	D	1.20		Brown mottled grey slightly gravelly sandy CLAY.
BH04	6	D	2.00		Brown mottled grey slightly gravelly sandy CLAY.
BH05	2	D	0.20		Brown slightly gravelly slightly sandy CLAY.
BH05	3	D	0.50		Brown mottled grey slightly gravelly slightly sandy CLAY.
BH05	4	D	1.20		Brown mottled grey slightly gravelly sandy CLAY.
TP01	2	B	0.20	1.00	Brown mottled grey sandy CLAY.
TP02	2	B	0.50	1.00	Brown mottled grey slightly sandy CLAY.
TP03	2	B	0.40	0.80	Brown mottled grey slightly gravelly slightly sandy CLAY.

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Description of Sample
TP04	2	B	0.50	1.00	Brown mottled grey slightly sandy CLAY.
TP05	2	B	1.00	1.50	Brown mottled grey slightly sandy CLAY.
TP06	2	B	0.50	1.00	Brown mottled grey slightly sandy CLAY.
TP07	3	B	1.50	2.00	Brown mottled grey CLAY.
TP08	3	B	0.25	0.60	Brown mottled grey CLAY.

UKAS TESTING
4043

PSL
Professional Soils Laboratory

Shafton

Contract No:
PSL19/0796
Client Ref:
A090070-550

SUMMARY OF SOIL CLASSIFICATION TESTS

(BS1377 : PART 2 : 1990)

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Moisture Content % Clause 3.2	Linear Shrinkage % Clause 6.5	Particle Density Mg/m^3 Clause 8.2	Liquid Limit % Clause 4.3/4	Plastic Limit % Clause 5.3	Plasticity Index % Clause 5.4	Passing .425mm %	Remarks
BH01	2	D	0.15		47							
BH01	3	D	0.50		29							
BH01	4	D	1.00		32							
BH01	5	D	1.60		21							
BH02	2	D	0.10		32							
BH02	4	D	0.30		27							
BH02	5	D	1.20		17							
BH03	2	D	0.30		23							
BH03	4	D	2.00		12				NP			
BH04	2	D	0.10		40							
BH04	4	D	0.30		28							
BH04	5	D	1.20		18							
BH04	6	D	2.00		21							
BH05	2	D	0.20		26							
BH05	3	D	0.50		27							
BH05	4	D	1.20		21							
TP01	2	B	0.20	1.00	18			43	21	22	100	Intermediate plasticity CI.
TP02	2	B	0.50	1.00	26			64	27	37	100	High plasticity CH.
TP04	2	B	0.50	1.00	31			69	29	40	100	High plasticity CH.

SYMBOLS : **NP : Non Plastic** *** : Liquid Limit and Plastic Limit Wet Sieved.**

UKAS TESTING 4043

PSL Professional Soils Laboratory

Shafton

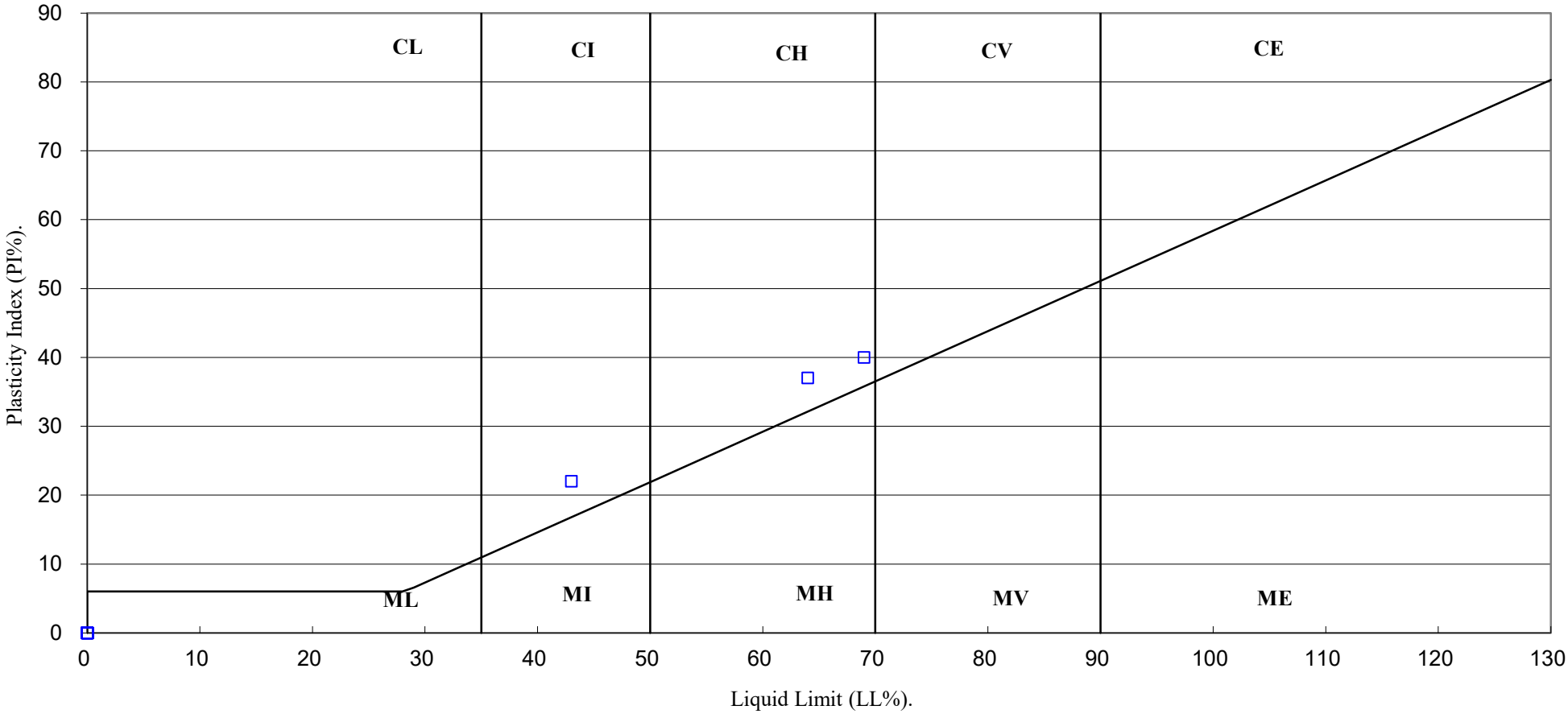
Contract No:

PSL19/0796

Client Ref:

A090070-550

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.



UKAS TESTING 4043	PSL Professional Soils Laboratory	Shafton	Contract No: PSL19/0796
			Client Ref: A090070-550

SUMMARY OF SOIL CLASSIFICATION TESTS

(BS1377 : PART 2 : 1990)

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Moisture Content % Clause 3.2	Linear Shrinkage % Clause 6.5	Particle Density Mg/m^3 Clause 8.2	Liquid Limit % Clause 4.3/4	Plastic Limit % Clause 5.3	Plasticity Index % Clause 5.4	Passing .425mm %	Remarks
TP05	2	B	1.00	1.50	27			72	30	42	100	Very high plasticity CV.
TP06	2	B	0.50	1.00	29			68	29	39	100	High plasticity CH.
TP07	3	B	1.50	2.00	37			83	34	49	100	Very high plasticity CV.
TP08	3	B	0.25	0.60	34			79	32	47	100	Very high plasticity CV.

SYMBOLS : **NP : Non Plastic** *** : Liquid Limit and Plastic Limit Wet Sieved.**

UKAS TESTING 4043

PSL Professional Soils Laboratory

Shafton

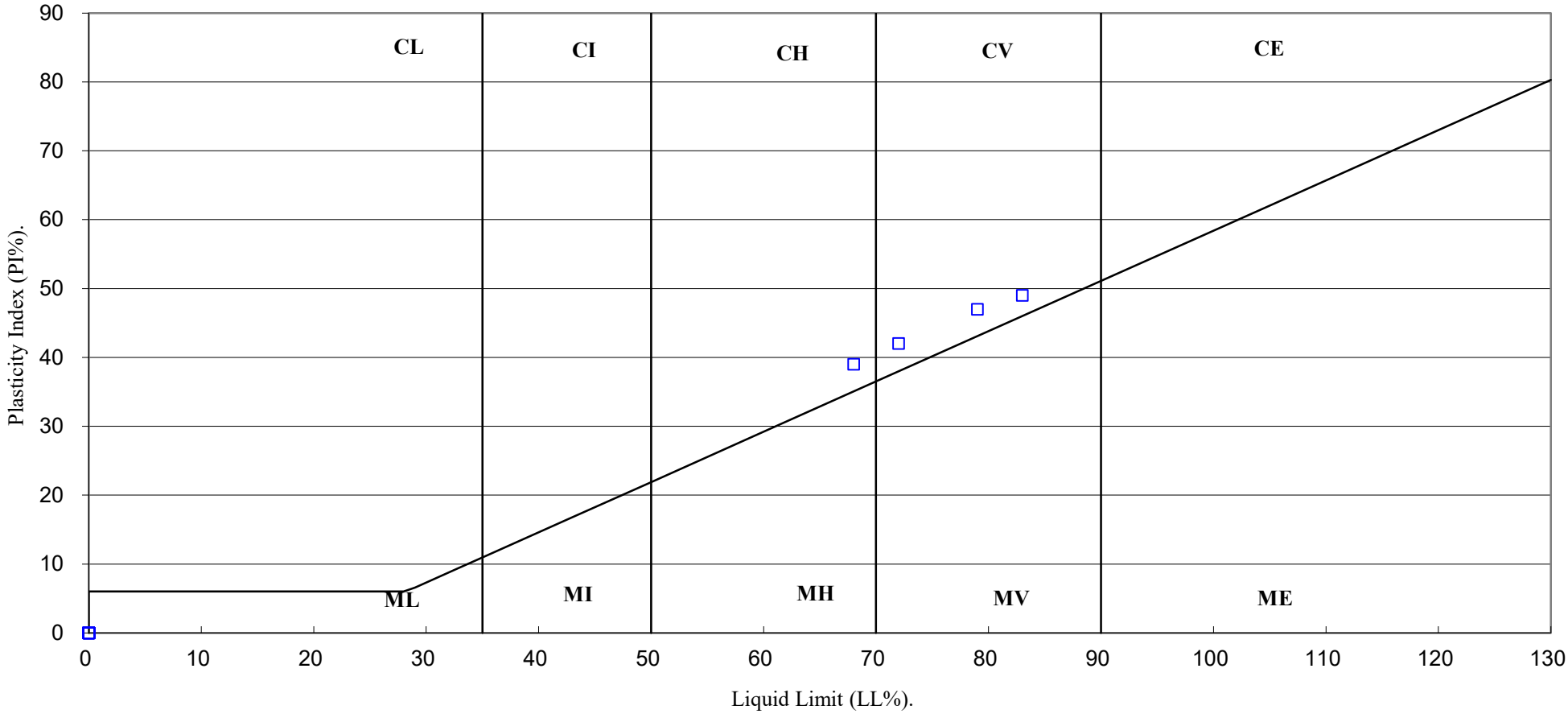
Contract No:

PSL19/0796

Client Ref:

A090070-550

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.



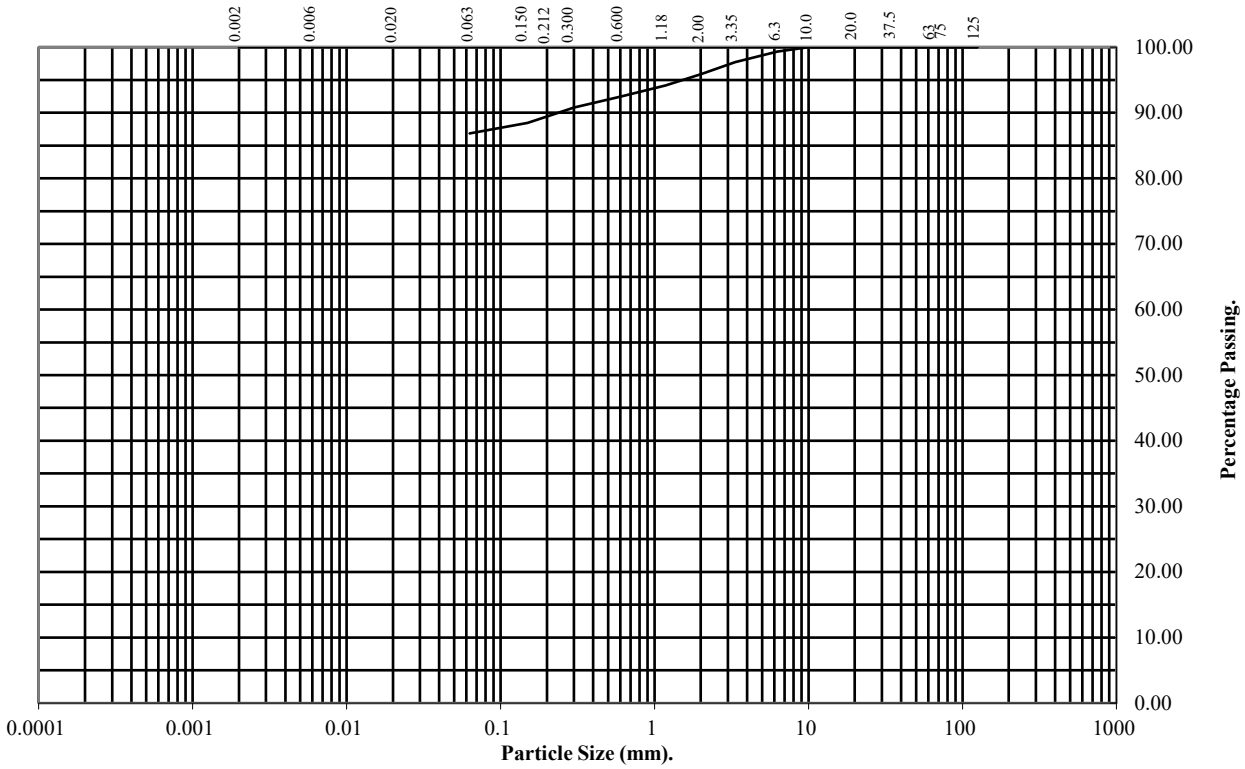
UKAS TESTING 4043	PSL Professional Soils Laboratory	Shafton	Contract No: PSL19/0796 Client Ref: A090070-550

PARTICLE SIZE DISTRIBUTION TEST

BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number:	**TP03**	**Top Depth (m):**	**0.40**
Sample Number:	**2**	**Base Depth(m):**	**0.80**
Sample Type:	**B**		



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	99
3.35	98
2	96
1.18	94
0.6	92
0.3	91
0.212	90
0.15	88
0.063	87

Soil Fraction	Total Percentage
Cobbles	0
Gravel	4
Sand	9
Silt/Clay	87

Remarks:

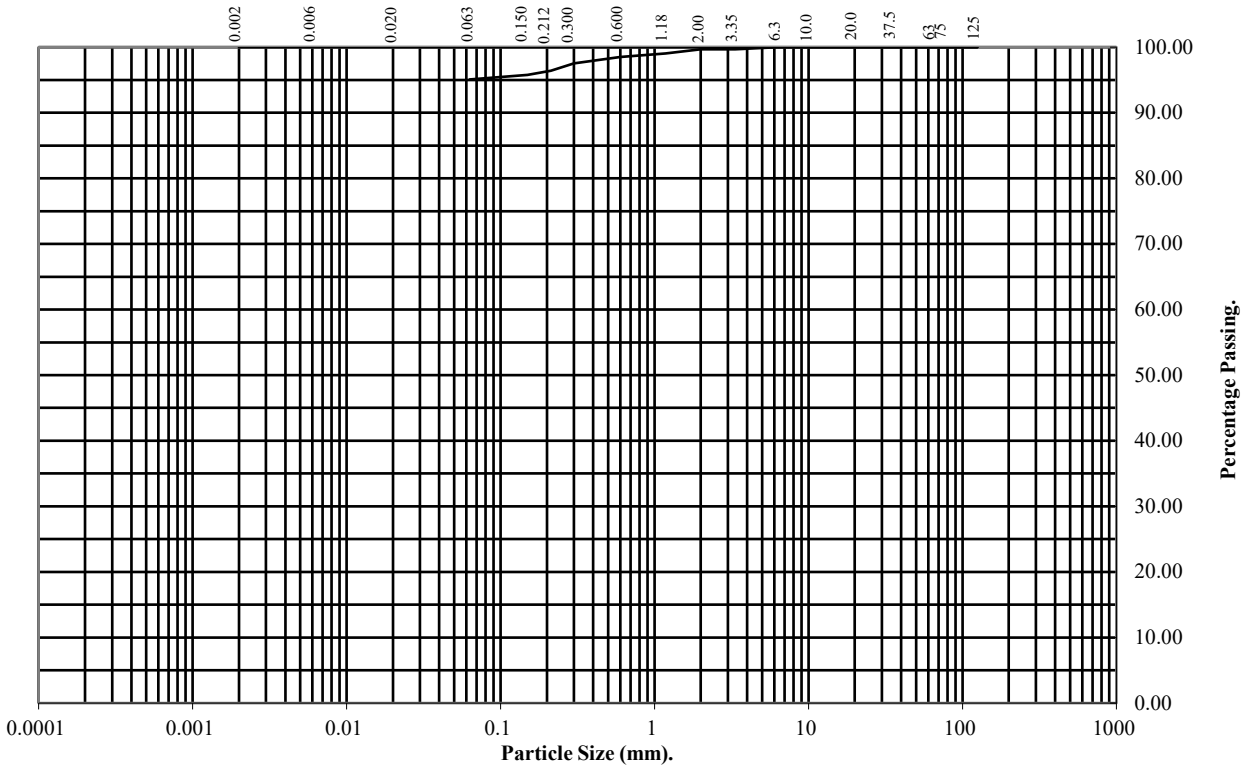
See Summary of Soil Descriptions

PARTICLE SIZE DISTRIBUTION TEST

BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number:	**TP05**	**Top Depth (m):**	**1.00**
Sample Number:	**2**	**Base Depth(m):**	**1.50**
Sample Type:	**B**		



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	100
3.35	100
2	100
1.18	99
0.6	98
0.3	98
0.212	96
0.15	96
0.063	95

Soil Fraction	Total Percentage
Cobbles	0
Gravel	0
Sand	5
Silt/Clay	95

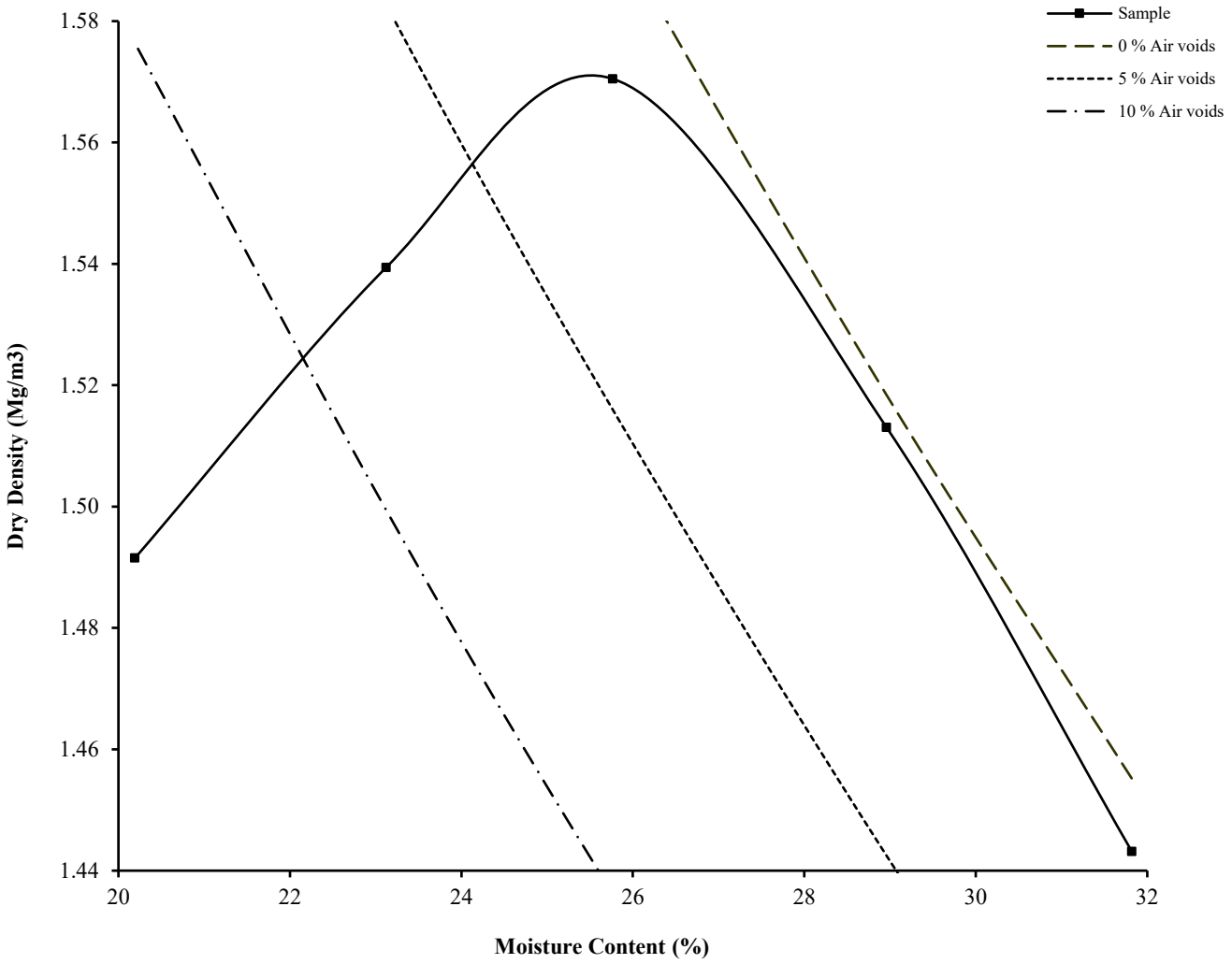
Remarks:

See Summary of Soil Descriptions

DRY DENSITY / MOISTURE CONTENT RELATIONSHIP

BS 1377 : Part 4 : 1990

Hole Number:	**TP02**	**Top Depth (m) :**	**0.50**
Sample Number:	**2**	**Base Depth (m) :**	**1.00**
Sample Type:	**B**		

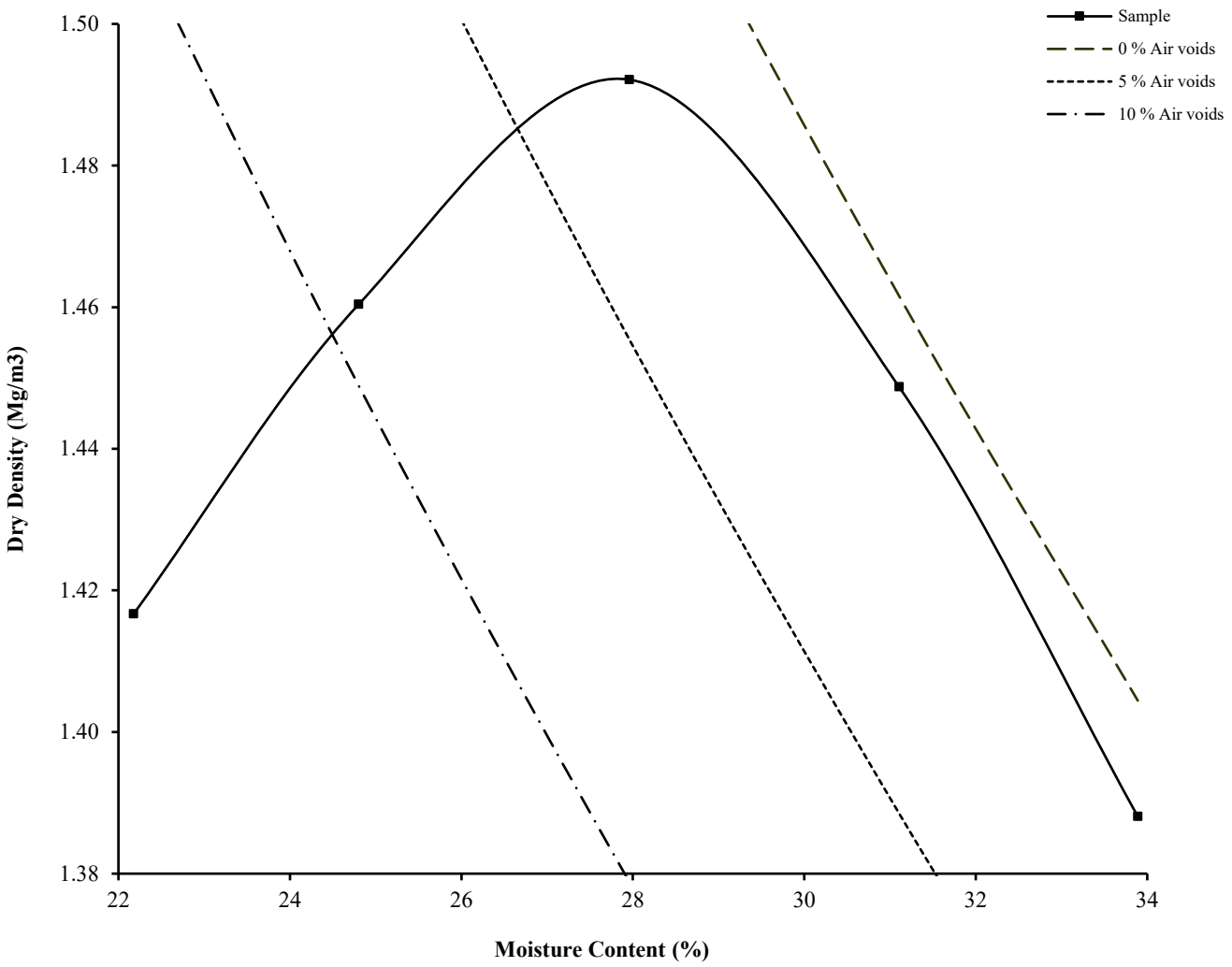


Initial Moisture Content:		26	Method of Compaction:	2.5kg	Separate Samples
Particle Density (Mg/m3):	2.71	Assumed	Material Retained on 37.5 mm Test Sieve (%):		0
Maximum Dry Density (Mg/m3):		1.57	Material Retained on 20.0 mm Test Sieve (%):		0
Optimum Moisture Content (%):		26			
Remarks See summary of soil descriptions.					

DRY DENSITY / MOISTURE CONTENT RELATIONSHIP

BS 1377 : Part 4 : 1990

Hole Number:	**TP04**	**Top Depth (m) :**	**0.50**
Sample Number:	**2**	**Base Depth (m) :**	**1.00**
Sample Type:	**B**		

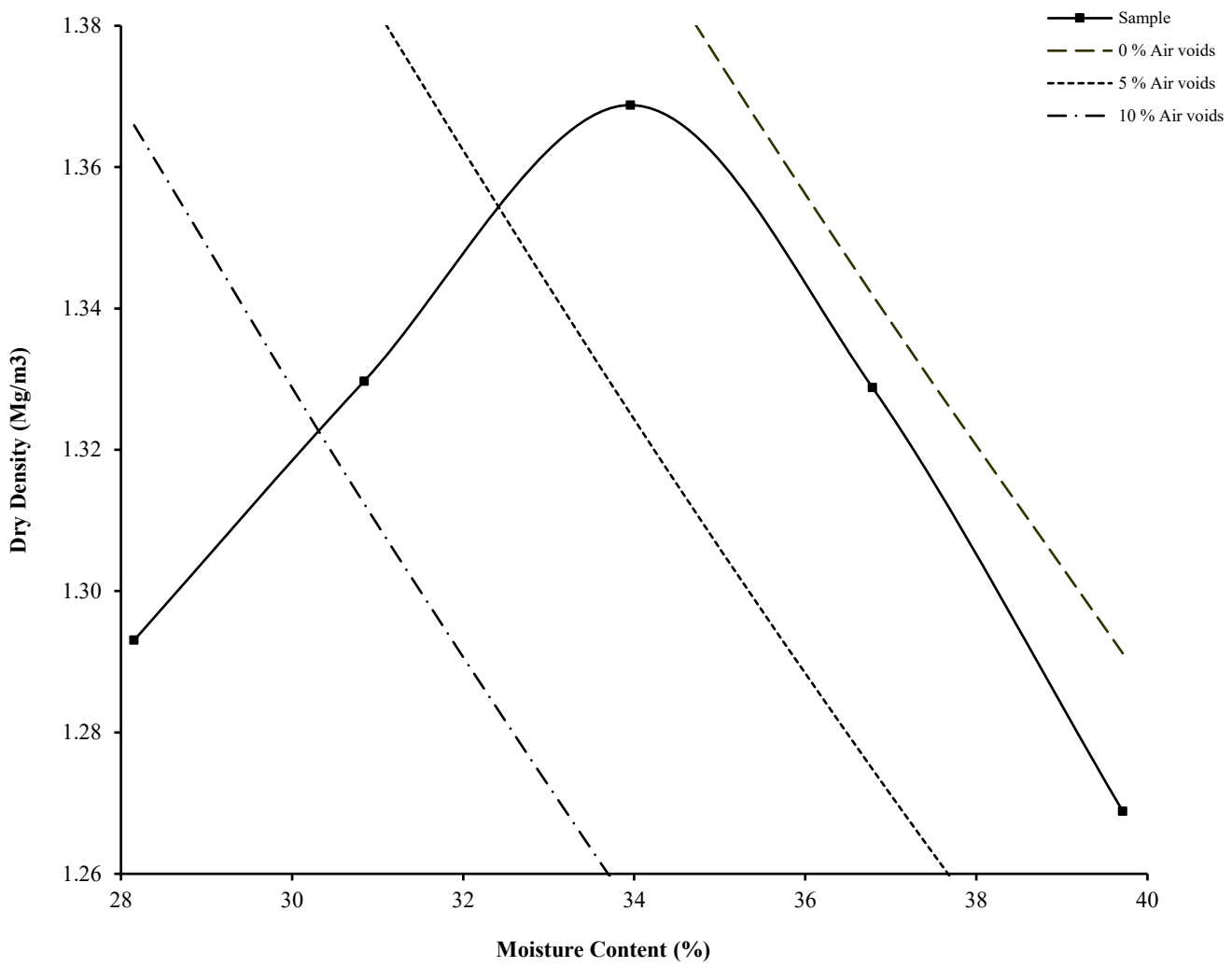


Initial Moisture Content:		31	Method of Compaction:	2.5kg	Separate Samples
Particle Density (Mg/m3):	2.68	Assumed	Material Retained on 37.5 mm Test Sieve (%):		0
Maximum Dry Density (Mg/m3):		1.49	Material Retained on 20.0 mm Test Sieve (%):		0
Optimum Moisture Content (%):		28			
Remarks See summary of soil descriptions.					

DRY DENSITY / MOISTURE CONTENT RELATIONSHIP

BS 1377 : Part 4 : 1990

Hole Number:	**TP07**	**Top Depth (m) :**	**1.50**
Sample Number:	**3**	**Base Depth (m) :**	**2.00**
Sample Type:	**B**		



Initial Moisture Content:		37	Method of Compaction:	2.5kg	Separate Samples
Particle Density (Mg/m3):	2.65	Assumed	Material Retained on 37.5 mm Test Sieve (%):		0
Maximum Dry Density (Mg/m3):		1.37	Material Retained on 20.0 mm Test Sieve (%):		0
Optimum Moisture Content (%):		34			
Remarks See summary of soil descriptions.					

Certificate of Analysis

Certificate Number 19-02109

11-Feb-19

Client Professional Soils Laboratory Ltd
5/7 Hexthorpe Road
Hexthorpe
DN4 0AR

Our Reference 19-02109

Client Reference PSL19/0796

Order No (not supplied)

Contract Title Shafton

Description 5 Soil samples.

Date Received 05-Feb-19

Date Started 05-Feb-19

Date Completed 11-Feb-19

Test Procedures Identified by prefix DETSn (details on request).

Notes Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By

Adam Fenwick
Contracts Manager

UKAS TESTING
2139

Summary of Chemical Analysis
Soil Samples

Our Ref 19-02109
Client Ref PSL19/0796
Contract Title Shafton

	Lab No	1455347	1455348	1455349	1455350	1455351
	Sample ID	BH01	BH02	BH03	BH04	BH05
	Depth	0.15	0.10	0.30	0.10	0.20
	Other ID	2	2	2	2	2
	Sample Type	D	D	D	D	D
	Sampling Date	n/s	n/s	n/s	n/s	n/s
	Sampling Time	n/s	n/s	n/s	n/s	n/s

Test	Method	LOD	Units					
Metals								
Magnesium Aqueous Extract	DETSC 2076*	10	mg/l	< 10	< 10	< 10	< 10	< 10
Inorganics								
pH	DETSC 2008#			6.4	6.3	6.0	6.0	5.6
Chloride Aqueous Extract	DETSC 2055	1	mg/l	18	6.4	5.2	16	10
Nitrate Aqueous Extract as NO3	DETSC 2055	1	mg/l	4.3	1.3	1.8	9.7	2.3
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	36	18	32	35	36
Sulphur as S, Total	DETSC 2320	0.01	%	0.07	0.05	0.02	0.06	0.04
Sulphate as SO4, Total	DETSC 2321#	0.01	%	0.16	0.08	0.04	0.14	0.08

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

Information in Support of the Analytical Results

Our Ref 19-02109
Client Ref PSL19/0796
Contract Shafton

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
1455347	BH01 0.15 SOIL		PT 500ml	Sample date not supplied, Anions 2:1 (365 days), Total Sulphur ICP (365 days), Total Sulphate ICP (730 days), Metals ICP Prep (365 days), pH + Conductivity (7 days)	
1455348	BH02 0.10 SOIL		PT 500ml	Sample date not supplied, Anions 2:1 (365 days), Total Sulphur ICP (365 days), Total Sulphate ICP (730 days), Metals ICP Prep (365 days), pH + Conductivity (7 days)	
1455349	BH03 0.30 SOIL		PT 500ml	Sample date not supplied, Anions 2:1 (365 days), Total Sulphur ICP (365 days), Total Sulphate ICP (730 days), Metals ICP Prep (365 days), pH + Conductivity (7 days)	
1455350	BH04 0.10 SOIL		PT 500ml	Sample date not supplied, Anions 2:1 (365 days), Total Sulphur ICP (365 days), Total Sulphate ICP (730 days), Metals ICP Prep (365 days), pH + Conductivity (7 days)	
1455351	BH05 0.20 SOIL		PT 500ml	Sample date not supplied, Anions 2:1 (365 days), Total Sulphur ICP (365 days), Total Sulphate ICP (730 days), Metals ICP Prep (365 days), pH + Conductivity (7 days)	

Key: P-Plastic T-Tub

DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.

Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.

The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-

Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

Appendix E – Contamination Laboratory Transcripts

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

WYG Geo-Environment
Newstead Court
Little Oak Drive
Nottingham
Nottinghamshire
NG15 0DR

Attention: Simon Collin

CERTIFICATE OF ANALYSIS

Date of report Generation:	14 February 2019
Customer:	H_WYG_ANN
Sample Delivery Group (SDG):	190131-136
Your Reference:	A090070-550
Location:	Shafton
Report No:	492488

We received 17 samples on Thursday January 31, 2019 and 15 of these samples were scheduled for analysis which was completed on Thursday February 14, 2019. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

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

Chemical testing (unless subcontracted) performed at ALS Life Sciences Ltd Hawarden (Method codes TM) or ALS Life Sciences Ltd Aberdeen (Method codes S).

All sample data is provided by the customer. The reported results relate to the sample supplied, and on the basis that this data is correct.
Incorrect sampling dates and/or sample information will affect the validity of results.
The customer is not permitted to reproduce this report except in full without the approval of the laboratory.

Approved By:



Sonia McWhan

Operations Manager

ALS Life Sciences Limited. Registered Office: Units 7 & 8 Hawarden Business Park, Manor Road, Hawarden, Deeside, CH5 3US. Registered in England and Wales No. 4057291.

CERTIFICATE OF ANALYSIS

SDG:	190131-136	**Client Reference:**	A090070-550	**Report Number:**	492488
Location:	Shafton	**Order Number:**	NOT/1616	**Superseded Report:**	

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
19245569	BH01		0.15 - 0.15	25/01/2019
19245572	BH02		0.10 - 0.10	25/01/2019
19245577	BH02		0.30 - 0.30	25/01/2019
19245581	BH03		0.10 - 0.10	25/01/2019
19245587	BH04		0.10 - 0.10	25/01/2019
19245592	BH04		0.30 - 0.30	25/01/2019
19245597	BH05		0.20 - 0.20	25/01/2019
19245559	TP01		0.15 - 0.15	24/01/2019
19245601	TP02		0.10 - 0.10	24/01/2019
19245605	TP03		0.10 - 0.10	24/01/2019
19245609	TP04		0.10 - 0.10	24/01/2019
19245614	TP05		0.10 - 0.10	24/01/2019
19245618	TP06		0.20 - 0.20	24/01/2019
19245623	TP07		0.00 - 0.00	24/01/2019
19245627	TP07		0.30 - 0.30	24/01/2019
19245631	TP08		0.00 - 0.00	24/01/2019
19245564	TP08		0.25 - 0.25	24/01/2019

Maximum Sample/Coolbox Temperature (°C) : **5**

ISO5667-3 Water quality - Sampling - Part3 -
During Transportation samples shall be stored in a cooling device capable of maintaining a temperature of (5±3)°C.

ALS have data which show that a cool box with 4 frozen icepacks is capable of maintaining pre-chilled samples at a temperature of (5±3)°C for a period of up to 24hrs.

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

Validated

CERTIFICATE OF ANALYSIS

SDG:	190131-136	**Client Reference:**	A090070-550	**Report Number:**	492488
Location:	Shafton	**Order Number:**	NOT/1616	**Superseded Report:**	

Results Legend

X Test

N No Determination Possible

Sample Types -
S - Soil/Solid
UNS - Unspecified Solid
GW - Ground Water
SW - Surface Water
LE - Land Leachate
PL - Prepared Leachate
PR - Process Water
SA - Saline Water
TE - Trade Effluent
TS - Treated Sewage
US - Untreated Sewage
RE - Recreational Water
DW - Drinking Water Non-regulatory
UNL - Unspecified Liquid
SL - Sludge
G - Gas
OTH - Other

Lab Sample No(s)	19245569	19245577	19245587	19245592	19245597	19245559	19245601	19245605	19245609	19245614	19245618	19245623								
Customer Sample Reference	BH01	BH02	BH04	BH04	BH05	TP01	TP02	TP03	TP04	TP05	TP06	TP07								
AGS Reference																				
Depth (m)	0.15 - 0.15	0.30 - 0.30	0.10 - 0.10	0.30 - 0.30	0.20 - 0.20	0.15 - 0.15	0.10 - 0.10	0.10 - 0.10	0.10 - 0.10	0.10 - 0.10	0.20 - 0.20	0.00 - 0.00								
Container	1kg TUB	250g Amber Jar (ALE210)	1kg TUB	250g Amber Jar (ALE210)	250g Amber Jar (ALE210)	1kg TUB	250g Amber Jar (ALE210)	1kg TUB	250g Amber Jar (ALE210)	1kg TUB	250g Amber Jar (ALE210)	1kg TUB	250g Amber Jar (ALE210)	1kg TUB	250g Amber Jar (ALE210)	1kg TUB	250g Amber Jar (ALE210)	1kg TUB	250g Amber Jar (ALE210)	1kg TUB
Sample Type	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S

Anions by Kone (soil)	All	NDPs: 0 Tests: 15	X	X		X	X		X		X		X		X	X		X		X	
Asbestos ID in Solid Samples	All	NDPs: 0 Tests: 9			X			X		X		X		X			X		X		X
Boron Water Soluble	All	NDPs: 0 Tests: 15	X	X		X	X		X		X		X		X	X		X		X	
Cyanide Comp/Free/Total/Thiocyanate	All	NDPs: 0 Tests: 15	X	X		X	X		X		X		X		X	X		X		X	
Hexavalent Chromium (s)	All	NDPs: 0 Tests: 15	X	X		X	X		X		X		X		X	X		X		X	
Metals in solid samples by OES	All	NDPs: 0 Tests: 15	X	X		X	X		X		X		X		X	X		X		X	
OC, OP Pesticides and Triazine Herb	All	NDPs: 0 Tests: 5								X			X			X		X		X	
PAH by GCMS	All	NDPs: 0 Tests: 15	X	X		X	X		X		X		X		X	X		X		X	
pH	All	NDPs: 0 Tests: 15	X	X		X	X		X		X		X		X	X		X		X	
Phenols by HPLC (S)	All	NDPs: 0 Tests: 15	X	X		X	X		X		X		X		X	X		X		X	
Sample description	All	NDPs: 0 Tests: 15	X	X		X	X		X		X		X		X	X		X		X	
Total Organic Carbon	All	NDPs: 0 Tests: 7						X		X			X		X	X		X		X	
TPH c6-40 Value of soil	All	NDPs: 0 Tests: 15	X	X		X	X		X		X		X		X	X		X		X	

19245623	19245627	19245631	19245564
TP07	TP07	TP08	TP08
0.00 - 0.00	0.30 - 0.30	0.00 - 0.00	0.25 - 0.25
250g Amber Jar (ALE210)	250g Amber Jar (ALE210)	1kg TUB	250g Amber Jar (ALE210)	250g Amber Jar (ALE210)
S	S	S	S	S
X	X		X	X
		X		
X	X		X	X
X	X		X	X
X	X		X	X
X	X		X	X
			X	
X	X		X	X
X	X		X	X
X	X		X	X
X	X		X	X
			X	
X	X		X	X

CERTIFICATE OF ANALYSIS

SDG:	190131-136	**Client Reference:**	A090070-550	**Report Number:**	492488
Location:	Shafton	**Order Number:**	NOT/1616	**Superseded Report:**	

Sample Descriptions

Grain Sizes

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

Lab Sample No(s)	Customer Sample Ref.	Depth (m)	Colour	Description	Inclusions	Inclusions 2
19245569	BH01	0.15 - 0.15	Dark Brown	Sandy Clay	Vegetation	Stones
19245577	BH02	0.30 - 0.30	Light Brown	Sandy Clay	Vegetation	None
19245587	BH04	0.10 - 0.10	Dark Brown	Loamy Sand	Vegetation	None
19245592	BH04	0.30 - 0.30	Dark Brown	Sandy Clay	Stones	None
19245597	BH05	0.20 - 0.20	Dark Brown	Loamy Sand	Vegetation	None
19245559	TP01	0.15 - 0.15	Dark Brown	Loamy Sand	Vegetation	None
19245601	TP02	0.10 - 0.10	Dark Brown	Sandy Loam	Vegetation	None
19245605	TP03	0.10 - 0.10	Dark Brown	Sandy Loam	Vegetation	None
19245609	TP04	0.10 - 0.10	Dark Brown	Sandy Loam	Vegetation	None
19245614	TP05	0.10 - 0.10	Dark Brown	Loamy Sand	Vegetation	None
19245618	TP06	0.20 - 0.20	Dark Brown	Loamy Sand	Vegetation	None
19245623	TP07	0.00 - 0.00	Dark Brown	Loamy Sand	Vegetation	None
19245627	TP07	0.30 - 0.30	Light Brown	Sandy Loam	Stones	None
19245564	TP08	0.25 - 0.25	Dark Brown	Loamy Sand	Vegetation	None
19245631	TP08	0.00 - 0.00	Dark Brown	Sandy Clay	Vegetation	Stones

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

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

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

Validated

CERTIFICATE OF ANALYSIS

SDG:	190131-136	**Client Reference:**	A090070-550	**Report Number:**	492488
Location:	Shafton	**Order Number:**	NOT/1616	**Superseded Report:**	

Results Legend	
#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-5&+§@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample Ref.	BH01	BH02	BH04	BH04	BH05	TP01
			Depth (m)	0.15 - 0.15	0.30 - 0.30	0.10 - 0.10	0.30 - 0.30	0.20 - 0.20	0.15 - 0.15
			Sample Type	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)
			Date Sampled	25/01/2019	25/01/2019	25/01/2019	25/01/2019	25/01/2019	24/01/2019
			Sample Time	.	.	.	.	.	.
			Date Received	31/01/2019	31/01/2019	31/01/2019	31/01/2019	31/01/2019	31/01/2019
			SDG Ref	190131-136	190131-136	190131-136	190131-136	190131-136	190131-136
			Lab Sample No.(s)	19245569	19245577	19245587	19245592	19245597	19245559
			AGS Reference						
Moisture Content Ratio (% of as received sample)	%	PM024		28	21	25	24	34	25
Phenol	<0.01 mg/kg	TM062 (S)		<0.01 M	<0.01 M	<0.01 M	<0.01 M	<0.01 M	0.0402 @ M
Cresols	<0.01 mg/kg	TM062 (S)		<0.01 M	<0.01 M	<0.01 M	<0.01 M	0.0456 M	0.0134 @ M
Xylenols	<0.015 mg/kg	TM062 (S)		<0.015 M	<0.015 M	<0.015 M	<0.015 M	<0.015 M	<0.015 @ M
Phenols, Total Detected monohydric	<0.035 mg/kg	TM062 (S)		<0.035 M	<0.035 M	<0.035 M	<0.035 M	<0.035 M	0.0536 @ M
Soil Organic Matter (SOM)	<0.35 %	TM132							8.93 #
pH	1 pH Units	TM133		6.78 M	6.25 M	5.57 M	5.78 M	6.1 M	6.16 M
Chromium, Hexavalent	<0.6 mg/kg	TM151		<0.6 #	<0.6 #	<0.6 #	<0.6 #	<0.6 #	<0.6 #
Cyanide, Free	<1 mg/kg	TM153		<1 M	<1 M	<1 M	<1 M	<1 M	<1 M
TPH >C6-C8	<10 mg/kg	TM154		<10	<10	<10	<10	<10	<10
TPH >C8-C10	<10 mg/kg	TM154		<10	<10	<10	<10	<10	<10
TPH >C10-C12	<10 mg/kg	TM154		<10	<10	<10	<10	<10	<10
TPH >C12-C16	<10 mg/kg	TM154		<10	<10	<10	<10	<10	<10
TPH >C16-C21	<10 mg/kg	TM154		16.8	<10	<10	<10	46.5	22.1
TPH >C21-C40	<10 mg/kg	TM154		66.6	<10	85.7	18.4	534	106
TPH >C6-C40	<10 mg/kg	TM154		90.6	12.8	99.1	19.9	585	137
TPH >C8-40	<10 mg/kg	TM154		90.6 #	12.8 #	99.1 #	19.9 #	585 #	137 #
Arsenic	<0.6 mg/kg	TM181		20.6 M	4.96 M	17.6 M	9.18 M	16.5 M	20.3 M
Cadmium	<0.02 mg/kg	TM181		0.0952 M	0.332 M	<0.02 M	<0.02 M	0.246 M	0.173 M
Chromium	<0.9 mg/kg	TM181		16.5 M	29.7 M	12.4 M	28.7 M	16.6 M	16.5 M
Copper	<1.4 mg/kg	TM181		31.9 M	25.7 M	22.8 M	13.4 M	33.9 M	34.8 M
Lead	<0.7 mg/kg	TM181		63.8 M	13.3 M	46.3 M	18.4 M	85.6 M	92.1 M
Mercury	<0.14 mg/kg	TM181		<0.14 M	<0.14 M	<0.14 M	<0.14 M	<0.14 M	<0.14 M
Nickel	<0.2 mg/kg	TM181		24.8 M	26.9 M	15.1 M	18.9 M	18.4 M	21.7 M
Selenium	<1 mg/kg	TM181		<1 #	<1 #	<1 #	<1 #	1.17 #	1.12 #
Zinc	<1.9 mg/kg	TM181		87.6 M	81.2 M	73.3 M	92.5 M	177 M	92.1 M
Boron, water soluble	<1 mg/kg	TM222		<1 M	<1 M	<1 M	<1 M	1.02 M	<1 M
Water Soluble Sulphate as SO4 2:1 Extract	<0.004 g/l	TM243		0.0271 M	0.0377 M	0.0337 M	0.0374 M	0.0353 M	0.038 M

Validated

CERTIFICATE OF ANALYSIS

SDG:	190131-136	**Client Reference:**	A090070-550	**Report Number:**	492488
Location:	Shafton	**Order Number:**	NOT/1616	**Superseded Report:**	

Results Legend	
#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-5&+§@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample Ref.	TP02	TP03	TP04	TP05	TP06	TP07
			Depth (m)	0.10 - 0.10	0.10 - 0.10	0.10 - 0.10	0.10 - 0.10	0.20 - 0.20	0.00 - 0.00
			Sample Type	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)
			Date Sampled	24/01/2019	24/01/2019	24/01/2019	24/01/2019	24/01/2019	24/01/2019
			Sample Time	.	.	.	.	.	.
			Date Received	31/01/2019	31/01/2019	31/01/2019	31/01/2019	31/01/2019	31/01/2019
			SDG Ref	190131-136	190131-136	190131-136	190131-136	190131-136	190131-136
			Lab Sample No.(s)	19245601	19245605	19245609	19245614	19245618	19245623
			AGS Reference						
Moisture Content Ratio (% of as received sample)	%	PM024		27	36	28	37	26	21
Phenol	<0.01 mg/kg	TM062 (S)		<0.01 @ M	<0.01 M	<0.01 @ M	<0.01 @ M	<0.01 @ M	<0.01 @ M
Cresols	<0.01 mg/kg	TM062 (S)		0.0138 @ M	0.0157 M	<0.01 @ M	<0.01 @ M	0.0136 @ M	<0.01 @ M
Xylenols	<0.015 mg/kg	TM062 (S)		<0.015 @ M	<0.015 M	<0.015 @ M	<0.015 @ M	<0.015 @ M	<0.015 @ M
Phenols, Total Detected monohydric	<0.035 mg/kg	TM062 (S)		<0.035 @ M	<0.035 M	<0.035 @ M	<0.035 @ M	<0.035 @ M	<0.035 @ M
Soil Organic Matter (SOM)	<0.35 %	TM132		7.67 #	7.93 #	7.72 #	10.8 #	8.95 #	
pH	1 pH Units	TM133		6.72 M	5.64 M	5.41 M	6.29 M	6.4 M	7.09 M
Chromium, Hexavalent	<0.6 mg/kg	TM151		<0.6 #	<0.6 #	<0.6 #	<0.6 #	<0.6 #	<0.6 #
Cyanide, Free	<1 mg/kg	TM153		<1 M	<1 M	<1 M	<1 M	<1 M	<1 M
TPH >C6-C8	<10 mg/kg	TM154		<10	<10	<10	<10	<10	<10
TPH >C8-C10	<10 mg/kg	TM154		<10	<10	<10	<10	<10	<10
TPH >C10-C12	<10 mg/kg	TM154		<10	<10	<10	<10	<10	<10
TPH >C12-C16	<10 mg/kg	TM154		<10	<10	<10	<10	<10	<10
TPH >C16-C21	<10 mg/kg	TM154		22.3	19.4	20.3	19.8	17.6	38.4
TPH >C21-C40	<10 mg/kg	TM154		130	138	162	138	120	199
TPH >C6-C40	<10 mg/kg	TM154		156	164	189	163	144	253
TPH >C8-40	<10 mg/kg	TM154		156 #	164 #	189 #	163 #	144 #	253 #
Arsenic	<0.6 mg/kg	TM181		21.9 M	20 M	18.6 M	21.8 M	24.9 M	39.1 M
Cadmium	<0.02 mg/kg	TM181		0.257 M	0.165 M	0.298 M	16.5 M	0.238 M	0.577 M
Chromium	<0.9 mg/kg	TM181		20.7 M	25.1 M	21.2 M	17.7 M	11.5 M	9.32 M
Copper	<1.4 mg/kg	TM181		34.4 M	34.9 M	26.4 M	46.3 M	126 M	71 M
Lead	<0.7 mg/kg	TM181		64.3 M	65.4 M	61.4 M	70.5 M	484 M	310 M
Mercury	<0.14 mg/kg	TM181		<0.14 M	<0.14 M	<0.14 M	<0.14 M	<0.14 M	0.443 M
Nickel	<0.2 mg/kg	TM181		20.7 M	22.3 M	16.8 M	21.9 M	24.9 M	29.5 M
Selenium	<1 mg/kg	TM181		<1 #	<1 #	<1 #	5.44 #	<1 #	1.06 #
Zinc	<1.9 mg/kg	TM181		90.5 M	94.3 M	83 M	367 M	231 M	651 M
Boron, water soluble	<1 mg/kg	TM222		<1 M	<1 M	<1 M	1.68 M	<1 M	<1 M
Water Soluble Sulphate as SO4 2:1 Extract	<0.004 g/l	TM243		<0.004 M	0.0244 M	0.0527 M	0.0381 M	0.0394 M	0.0349 M

Validated

CERTIFICATE OF ANALYSIS

SDG:	190131-136	**Client Reference:**	A090070-550	**Report Number:**	492488
Location:	Shafton	**Order Number:**	NOT/1616	**Superseded Report:**	

Results Legend	
#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-5&+§@	Sample deviation (see appendix)

Customer Sample Ref.	TP07	TP08	TP08			
Depth (m)	0.30 - 0.30	0.00 - 0.00	0.25 - 0.25			
Sample Type	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)			
Date Sampled	24/01/2019	24/01/2019	24/01/2019			
Sample Time	.	.	.			
Date Received	31/01/2019	31/01/2019	31/01/2019			
SDG Ref	190131-136	190131-136	190131-136			
Lab Sample No.(s)	19245627	19245631	19245564			
AGS Reference						

Component	LOD/Units	Method						
Moisture Content Ratio (% of as received sample)	%	PM024	17	25	20			
Phenol	<0.01 mg/kg	TM062 (S)	<0.01 @ M	0.0134 @ M	<0.01 @ M			
Cresols	<0.01 mg/kg	TM062 (S)	<0.01 @ M	0.0134 @ M	<0.01 @ M			
Xylenols	<0.015 mg/kg	TM062 (S)	<0.015 @ M	<0.015 @ M	<0.015 @ M			
Phenols, Total Detected monohydric	<0.035 mg/kg	TM062 (S)	<0.035 @ M	<0.035 @ M	<0.035 @ M			
Soil Organic Matter (SOM)	<0.35 %	TM132		10.7 #				
pH	1 pH Units	TM133	6.14 M	6.1 M	6.17 M			
Chromium, Hexavalent	<0.6 mg/kg	TM151	<0.6 #	<0.6 #	<0.6 #			
Cyanide, Free	<1 mg/kg	TM153	<1 M	<1 M	<1 M			
TPH >C6-C8	<10 mg/kg	TM154	<10	<10	<10			
TPH >C8-C10	<10 mg/kg	TM154	<10	<10	<10			
TPH >C10-C12	<10 mg/kg	TM154	<10	<10	<10			
TPH >C12-C16	<10 mg/kg	TM154	<10	<10	<10			
TPH >C16-C21	<10 mg/kg	TM154	<10	74.1	23.7			
TPH >C21-C40	<10 mg/kg	TM154	<10	351	101			
TPH >C6-C40	<10 mg/kg	TM154	10.2	441	134			
TPH >C8-40	<10 mg/kg	TM154	10.2 #	441 #	134 #			
Arsenic	<0.6 mg/kg	TM181	16.1 M	42.7 M	23.8 M			
Cadmium	<0.02 mg/kg	TM181	<0.02 M	0.167 M	0.725 M			
Chromium	<0.9 mg/kg	TM181	16.1 M	19.8 M	16.4 M			
Copper	<1.4 mg/kg	TM181	19.7 M	75 M	21.4 M			
Lead	<0.7 mg/kg	TM181	30.8 M	269 M	75.8 M			
Mercury	<0.14 mg/kg	TM181	<0.14 M	0.17 M	<1.4 M			
Nickel	<0.2 mg/kg	TM181	17.4 M	26.7 M	20.8 M			
Selenium	<1 mg/kg	TM181	<1 #	<1 #	<10 #			
Zinc	<1.9 mg/kg	TM181	94.6 M	>500 M	165 M			
Boron, water soluble	<1 mg/kg	TM222	<1 M	1.1 M	<1 M			
Water Soluble Sulphate as SO4 2:1 Extract	<0.004 g/l	TM243	0.12 M	0.0375 M	0.168 M			

CERTIFICATE OF ANALYSIS

SDG:	190131-136	**Client Reference:**	A090070-550	**Report Number:**	492488
Location:	Shafton	**Order Number:**	NOT/1616	**Superseded Report:**	

OC, OP Pesticides and Triazine Herb

Results Legend	
#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-5&+§@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample Ref.	TP02	TP04	TP05	TP06	TP08	
			Depth (m)	0.10 - 0.10	0.10 - 0.10	0.10 - 0.10	0.20 - 0.20	0.00 - 0.00	
			Sample Type	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	
			Date Sampled	24/01/2019	24/01/2019	24/01/2019	24/01/2019	24/01/2019	
			Sample Time	.	.	.	.	.	
			Date Received	31/01/2019	31/01/2019	31/01/2019	31/01/2019	31/01/2019	
			SDG Ref	190131-136	190131-136	190131-136	190131-136	190131-136	
			Lab Sample No.(s)	19245601	19245609	19245614	19245618	19245631	
			AGS Reference						
Dichlorvos	<0.05 mg/kg	TM073		<0.05	<0.05	<0.05	<0.05	<0.5	
Mevinphos	<0.05 mg/kg	TM073		<0.05	<0.05	<0.05	<0.05	<0.5	
alpha-Hexachlorocyclohexane (HCH)	<0.05 mg/kg	TM073		<0.05	<0.05	<0.05	<0.05	<0.5	
Diazinon	<0.05 mg/kg	TM073		<0.05	<0.05	<0.05	<0.05	<0.5	
gamma-Hexachlorocyclohexane (HCH / Lindane)	<0.05 mg/kg	TM073		<0.05	<0.05	<0.05	<0.05	<0.5	
Heptachlor	<0.05 mg/kg	TM073		<0.05	<0.05	<0.05	<0.05	<0.5	
Aldrin	<0.05 mg/kg	TM073		<0.05	<0.05	<0.05	<0.05	<0.5	
beta-Hexachlorocyclohexane (HCH)	<0.05 mg/kg	TM073		<0.05	<0.05	<0.05	<0.05	<0.5	
Methyl parathion	<0.05 mg/kg	TM073		<0.05	<0.05	<0.05	<0.05	<0.5	
delta-Hexachlorocyclohexane (HCH)	<0.05 mg/kg	TM073		<0.05	<0.05	<0.05	<0.05	<0.5	
Malathion	<0.05 mg/kg	TM073		<0.05	<0.05	<0.05	<0.05	<0.5	
Fenitrothion	<0.05 mg/kg	TM073		<0.05	<0.05	<0.05	<0.05	<0.5	
Heptachlor epoxide	<0.05 mg/kg	TM073		<0.05	<0.05	<0.05	<0.05	<0.5	
Parathion	<0.05 mg/kg	TM073		<0.05	<0.05	<0.05	<0.05	<0.5	
Endosulphan I	<0.05 mg/kg	TM073		<0.05	<0.05	<0.05	<0.05	<0.5	
p,p-DDE	<0.05 mg/kg	TM073		<0.05	<0.05	<0.05	<0.05	<0.5	
Dieldrin	<0.05 mg/kg	TM073		<0.05	<0.05	<0.05	<0.05	<0.5	
o,p'-DDD (TDE)	<0.05 mg/kg	TM073		<0.05	<0.05	<0.05	<0.05	<0.5	
Endrin	<0.05 mg/kg	TM073		<0.05	<0.05	<0.05	<0.05	<0.5	
p,p-TDE (DDD)	<0.05 mg/kg	TM073		<0.05	<0.05	<0.05	<0.05	<0.5	
Ethion	<0.05 mg/kg	TM073		<0.05	<0.05	<0.05	<0.05	<0.5	
Endosulphan II	<0.05 mg/kg	TM073		<0.05	<0.05	<0.05	<0.05	<0.5	
p,p-DDT	<0.05 mg/kg	TM073		<0.05	<0.05	<0.05	<0.05	<0.5	
o,p-Methoxychlor	<0.05 mg/kg	TM073		<0.05	<0.05	<0.05	<0.05	<0.5	
p,p-Methoxychlor	<0.05 mg/kg	TM073		<0.05	<0.05	<0.05	<0.05	<0.5	
Endosulphan sulphate	<0.05 mg/kg	TM073		<0.05	<0.05	<0.05	<0.05	<0.5	
Azinphos-methyl	<0.05 mg/kg	TM073		<0.05	<0.05	<0.05	<0.05	<0.5	

Validated

CERTIFICATE OF ANALYSIS

SDG:	190131-136	**Client Reference:**	A090070-550	**Report Number:**	492488
Location:	Shafton	**Order Number:**	NOT/1616	**Superseded Report:**	

PAH by GCMS

Results Legend	
#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-5&+§@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample Ref.	BH01	BH02	BH04	BH04	BH05	TP01
			Depth (m)	0.15 - 0.15	0.30 - 0.30	0.10 - 0.10	0.30 - 0.30	0.20 - 0.20	0.15 - 0.15
			Sample Type	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)
			Date Sampled	25/01/2019	25/01/2019	25/01/2019	25/01/2019	25/01/2019	24/01/2019
			Sample Time	.	.	.	.	.	.
			Date Received	31/01/2019	31/01/2019	31/01/2019	31/01/2019	31/01/2019	31/01/2019
			SDG Ref	190131-136	190131-136	190131-136	190131-136	190131-136	190131-136
			Lab Sample No.(s)	19245569	19245577	19245587	19245592	19245597	19245559
			AGS Reference						
Naphthalene-d8 % recovery**	%	TM218		117	125	112	114	109	112
Acenaphthene-d10 % recovery**	%	TM218		118	115	113	117	112	109
Phenanthrene-d10 % recovery**	%	TM218		105	112	117	106	119	108
Chrysene-d12 % recovery**	%	TM218		97.8	116	118	101	134	130
Perylene-d12 % recovery**	%	TM218		93.6	123	103	99.9	118	117
Naphthalene	<0.009 mg/kg	TM218		0.0292 M	<0.009 M	0.0171 M	<0.009 M	0.0441 M	0.0571 M
Acenaphthylene	<0.012 mg/kg	TM218		<0.012 M	<0.012 M	<0.012 M	<0.012 M	0.0234 M	0.0324 M
Acenaphthene	<0.008 mg/kg	TM218		<0.008 M	<0.008 M	<0.008 M	<0.008 M	<0.008 M	0.022 M
Fluorene	<0.01 mg/kg	TM218		<0.01 M	<0.01 M	<0.01 M	<0.01 M	<0.01 M	<0.01 M
Phenanthrene	<0.015 mg/kg	TM218		0.13 M	<0.015 M	0.0979 M	<0.015 M	0.315 M	0.379 M
Anthracene	<0.016 mg/kg	TM218		0.0228 M	<0.016 M	0.0217 M	<0.016 M	0.0556 M	0.0822 M
Fluoranthene	<0.017 mg/kg	TM218		0.37 M	<0.017 M	0.204 M	<0.017 M	0.627 M	1.05 M
Pyrene	<0.015 mg/kg	TM218		0.312 M	<0.015 M	0.17 M	<0.015 M	0.507 M	0.875 M
Benz(a)anthracene	<0.014 mg/kg	TM218		0.136 M	<0.014 M	0.0817 M	<0.014 M	0.24 M	0.448 M
Chrysene	<0.01 mg/kg	TM218		0.169 M	<0.01 M	0.0781 M	<0.01 M	0.271 M	0.43 M
Benzo(b)fluoranthene	<0.015 mg/kg	TM218		0.244 M	<0.015 M	0.128 M	<0.015 M	0.393 M	0.764 M
Benzo(k)fluoranthene	<0.014 mg/kg	TM218		0.111 M	<0.014 M	0.0413 M	<0.014 M	0.166 M	0.25 M
Benzo(a)pyrene	<0.015 mg/kg	TM218		0.165 M	<0.015 M	0.0729 M	<0.015 M	0.248 M	0.479 M
Indeno(1,2,3-cd)pyrene	<0.018 mg/kg	TM218		0.0887 M	<0.018 M	0.0408 M	<0.018 M	0.138 M	0.257 M
Dibenzo(a,h)anthracene	<0.023 mg/kg	TM218		<0.023 M	<0.023 M	<0.023 M	<0.023 M	<0.023 M	0.0675 M
Benzo(g,h,i)perylene	<0.024 mg/kg	TM218		0.0986 M	<0.024 M	0.0497 M	<0.024 M	0.163 M	0.311 M
PAH, Total Detected USEPA 16	<0.118 mg/kg	TM218		1.88	<0.118	1	<0.118	3.19	5.51

Validated

CERTIFICATE OF ANALYSIS

SDG:	190131-136	**Client Reference:**	A090070-550	**Report Number:**	492488
Location:	Shafton	**Order Number:**	NOT/1616	**Superseded Report:**	

PAH by GCMS

Results Legend	
#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-5&+§@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample Ref.	TP02	TP03	TP04	TP05	TP06	TP07
			Depth (m)	0.10 - 0.10	0.10 - 0.10	0.10 - 0.10	0.10 - 0.10	0.20 - 0.20	0.00 - 0.00
			Sample Type	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)
			Date Sampled	24/01/2019	24/01/2019	24/01/2019	24/01/2019	24/01/2019	24/01/2019
			Sample Time	.	.	.	.	.	.
			Date Received	31/01/2019	31/01/2019	31/01/2019	31/01/2019	31/01/2019	31/01/2019
			SDG Ref	190131-136	190131-136	190131-136	190131-136	190131-136	190131-136
			Lab Sample No.(s)	19245601	19245605	19245609	19245614	19245618	19245623
			AGS Reference						
Naphthalene-d8 % recovery**	%	TM218		113	114	110	113	112	116
Acenaphthene-d10 % recovery**	%	TM218		117	110	110	112	104	112
Phenanthrene-d10 % recovery**	%	TM218		123	101	108	109	120	108
Chrysene-d12 % recovery**	%	TM218		134	96.7	99.6	97.1	129	111
Perylene-d12 % recovery**	%	TM218		121	92.6	97.3	93.6	114	117
Naphthalene	<0.009 mg/kg	TM218		0.0472 M	0.0514 M	0.0339 M	0.0393 M	0.0521 M	0.128 M
Acenaphthylene	<0.012 mg/kg	TM218		0.0429 M	<0.012 M	<0.012 M	<0.012 M	0.0549 M	0.25 M
Acenaphthene	<0.008 mg/kg	TM218		<0.008 M	<0.008 M	<0.008 M	<0.008 M	<0.008 M	0.0388 M
Fluorene	<0.01 mg/kg	TM218		<0.01 M	<0.01 M	<0.01 M	<0.01 M	<0.01 M	0.0685 M
Phenanthrene	<0.015 mg/kg	TM218		0.359 M	0.173 M	0.159 M	0.128 M	0.282 M	1.22 M
Anthracene	<0.016 mg/kg	TM218		0.0854 M	0.0276 M	0.0287 M	<0.016 M	0.0832 M	0.272 M
Fluoranthene	<0.017 mg/kg	TM218		0.839 M	0.489 M	0.409 M	0.396 M	0.757 M	2.54 M
Pyrene	<0.015 mg/kg	TM218		0.656 M	0.391 M	0.345 M	0.348 M	0.632 M	2.2 M
Benz(a)anthracene	<0.014 mg/kg	TM218		0.365 M	0.168 M	0.149 M	0.159 M	0.32 M	1.22 M
Chrysene	<0.01 mg/kg	TM218		0.347 M	0.21 M	0.192 M	0.204 M	0.343 M	1.09 M
Benzo(b)fluoranthene	<0.015 mg/kg	TM218		0.544 M	0.304 M	0.255 M	0.313 M	0.545 M	2.02 M
Benzo(k)fluoranthene	<0.014 mg/kg	TM218		0.217 M	0.112 M	0.0821 M	0.121 M	0.215 M	0.771 M
Benzo(a)pyrene	<0.015 mg/kg	TM218		0.352 M	0.193 M	0.138 M	0.155 M	0.334 M	1.38 M
Indeno(1,2,3-cd)pyrene	<0.018 mg/kg	TM218		0.187 M	0.11 M	0.0856 M	0.0986 M	0.184 M	0.875 M
Dibenzo(a,h)anthracene	<0.023 mg/kg	TM218		0.0508 M	<0.023 M	<0.023 M	<0.023 M	0.0504 M	0.213 M
Benzo(g,h,i)perylene	<0.024 mg/kg	TM218		0.223 M	0.123 M	0.0912 M	0.108 M	0.219 M	1.03 M
PAH, Total Detected USEPA 16	<0.118 mg/kg	TM218		4.32	2.35	1.97	2.07	4.07	15.3

Validated

CERTIFICATE OF ANALYSIS

SDG:	190131-136	**Client Reference:**	A090070-550	**Report Number:**	492488
Location:	Shafton	**Order Number:**	NOT/1616	**Superseded Report:**	

PAH by GCMS

Results Legend	
#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-5&+§@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample Ref.	TP07	TP08	TP08			
			Depth (m)	0.30 - 0.30	0.00 - 0.00	0.25 - 0.25			
			Sample Type	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)			
			Date Sampled	24/01/2019	24/01/2019	24/01/2019			
			Sample Time	.	.	.			
			Date Received	31/01/2019	31/01/2019	31/01/2019			
			SDG Ref	190131-136	190131-136	190131-136			
			Lab Sample No.(s)	19245627	19245631	19245564			
			AGS Reference						
Naphthalene-d8 % recovery**	%	TM218		117	20.3	110			
Acenaphthene-d10 % recovery**	%	TM218		119	22.3	109			
Phenanthrene-d10 % recovery**	%	TM218		111	18.7	120			
Chrysene-d12 % recovery**	%	TM218		96.8	18.4	132			
Perylene-d12 % recovery**	%	TM218		106	18.6	114			
Naphthalene	<0.009 mg/kg	TM218		<0.009 M	0.341 M	0.0454 M			
Acenaphthylene	<0.012 mg/kg	TM218		<0.012 M	0.174 M	0.0827 M			
Acenaphthene	<0.008 mg/kg	TM218		<0.008 M	0.0889 M	0.039 M			
Fluorene	<0.01 mg/kg	TM218		<0.01 M	0.221 M	0.0431 M			
Phenanthrene	<0.015 mg/kg	TM218		0.0267 M	2.21 M	0.782 M			
Anthracene	<0.016 mg/kg	TM218		<0.016 M	0.12 M	0.178 M			
Fluoranthene	<0.017 mg/kg	TM218		0.0712 M	2.24 M	1.67 M			
Pyrene	<0.015 mg/kg	TM218		0.0638 M	1.85 M	1.39 M			
Benz(a)anthracene	<0.014 mg/kg	TM218		0.0274 M	0.544 M	0.699 M			
Chrysene	<0.01 mg/kg	TM218		0.0309 M	0.854 M	0.716 M			
Benzo(b)fluoranthene	<0.015 mg/kg	TM218		0.0443 M	1.07 M	0.97 M			
Benzo(k)fluoranthene	<0.014 mg/kg	TM218		0.021 M	0.374 M	0.348 M			
Benzo(a)pyrene	<0.015 mg/kg	TM218		0.0314 M	0.656 M	0.671 M			
Indeno(1,2,3-cd)pyrene	<0.018 mg/kg	TM218		<0.018 M	0.381 M	0.353 M			
Dibenzo(a,h)anthracene	<0.023 mg/kg	TM218		<0.023 M	0.0956 M	0.0913 M			
Benzo(g,h,i)perylene	<0.024 mg/kg	TM218		<0.024 M	0.417 M	0.432 M			
PAH, Total Detected USEPA 16	<0.118 mg/kg	TM218		0.317	11.6	8.51			

CERTIFICATE OF ANALYSIS

SDG:	190131-136	**Client Reference:**	A090070-550	**Report Number:**	492488
Location:	Shafton	**Order Number:**	NOT/1616	**Superseded Report:**	

Asbestos Identification - Solid Samples

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
*	Subcontracted test.
(F)	Trigger breach confirmed
1-5&♦§@	Sample deviation (see appendix)

		Date of Analysis	Analysed By	Comments	Amosite (Brown) Asbestos	Chrysotile (White) Asbestos	Crocidolite (Blue) Asbestos	Fibrous Actinolite	Fibrous Anthophyllite	Fibrous Tremolite	Non-Asbestos Fibre
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Receieved SDG Original Sample Method Number	BH04 0.10 - 0.10 SOLID 25/01/2019 00:00:00 31/01/2019 17:34:00 190131-136 19245587 TM048	06/02/2019	James Richards	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Receieved SDG Original Sample Method Number	BH05 0.20 - 0.20 SOLID 25/01/2019 00:00:00 31/01/2019 17:34:00 190131-136 19245597 TM048	06/02/2019	James Richards	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Receieved SDG Original Sample Method Number	TP01 0.15 - 0.15 SOLID 24/01/2019 00:00:00 31/01/2019 17:34:00 190131-136 19245559 TM048	06/02/2019	James Richards	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Receieved SDG Original Sample Method Number	TP02 0.10 - 0.10 SOLID 24/01/2019 00:00:00 31/01/2019 17:34:00 190131-136 19245601 TM048	06/02/2019	James Richards	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Receieved SDG Original Sample Method Number	TP03 0.10 - 0.10 SOLID 24/01/2019 00:00:00 31/01/2019 17:34:00 190131-136 19245605 TM048	06/02/2019	James Richards	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Receieved SDG Original Sample Method Number	TP05 0.10 - 0.10 SOLID 24/01/2019 00:00:00 31/01/2019 17:34:00 190131-136 19245614 TM048	06/02/2019	James Richards	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Receieved SDG Original Sample Method Number	TP06 0.20 - 0.20 SOLID 24/01/2019 00:00:00 31/01/2019 17:34:00 190131-136 19245618 TM048	06/02/2019	James Richards	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Receieved SDG Original Sample Method Number	TP07 0.00 - 0.00 SOLID 24/01/2019 00:00:00 31/01/2019 17:34:00 190131-136 19245623 TM048	6/02/2019	Barbara Urbanek-Walsh	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected

Validated

CERTIFICATE OF ANALYSIS

SDG:	190131-136	**Client Reference:**	A090070-550	**Report Number:**	492488
Location:	Shafton	**Order Number:**	NOT/1616	**Superseded Report:**	

		Date of Analysis	Analysed By	Comments	Amosite (Brown) Asbestos	Chrysotile (White) Asbestos	Crocidolite (Blue) Asbestos	Fibrous Actinolite	Fibrous Anthophyllite	Fibrous Tremolite	Non-Asbestos Fibre
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Receieved SDG Original Sample Method Number	TP08 0.00 - 0.00 SOLID 24/01/2019 00:00:00 31/01/2019 17:34:00 190131-136 19245631 TM048	06/02/2019	James Richards	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected

Table of Results - Appendix

Method No	Reference	Description
PM001		Preparation of Samples for Metals Analysis
PM024	Modified BS 1377	Soil preparation including homogenisation, moisture screens of soils for Asbestos Containing Material
TM048	HSG 248, Asbestos: The analysts' guide for sampling, analysis and clearance procedures	Identification of Asbestos in Bulk Material
TM062 (S)	National Grid Property Holdings Methods for the Collection & Analysis of Samples from National Grid Sites version 1 Sec 3.9	Determination of Phenols in Soils by HPLC
TM073	MEWAM BOOK 60 1980,95 1985, HMSO / Modified: US EPA Method 8081A & 8141A	Determination of organochlorine and organophosphorous pesticides by GCMS
TM132	In - house Method	ELTRA CS800 Operators Guide
TM133	BS 1377: Part 3 1990;BS 6068-2.5	Determination of pH in Soil and Water using the GLpH pH Meter
TM151	Method 3500D, AWWA/APHA, 20th Ed., 1999	Determination of Hexavalent Chromium using Kone analyser
TM153	Method 4500A,B,C, I, M AWWA/APHA, 20th Ed., 1999	Determination of Total Cyanide, Free (Easily Liberatable) Cyanide and Thiocyanate using the Skalar SANS+ System Segmented Flow Analyser
TM154	In - house Method	Determination of Petroleum Hydrocarbons by EZ Flash GC-FID in the Carbon range C6-C40
TM181	US EPA Method 6010B	Determination of Routine Metals in Soil by iCap 6500 Duo ICP-OES
TM218	Shaker extraction - EPA method 3546.	The determination of PAH in soil samples by GC-MS
TM222	In-House Method	Determination of Hot Water Soluble Boron in Soils (10:1 Water:soil) by IRIS Emission Spectrometer
TM243		Mixed Anions In Soils By Kone

NA = not applicable.

Chemical testing (unless subcontracted) performed at ALS Life Sciences Ltd Hawarden (Method codes TM) or ALS Life Sciences Ltd Aberdeen (Method codes S).

CERTIFICATE OF ANALYSIS

SDG:	190131-136	**Client Reference:**	A090070-550	**Report Number:**	492488
Location:	Shafton	**Order Number:**	NOT/1616	**Superseded Report:**	

Test Completion Dates

Lab Sample No(s)	19245569	19245577	19245587	19245592	19245597	19245559	19245601	19245605	19245609	19245614
Customer Sample Ref.	BH01	BH02	BH04	BH04	BH05	TP01	TP02	TP03	TP04	TP05
AGS Ref.										
Depth	0.15 - 0.15	0.30 - 0.30	0.10 - 0.10	0.30 - 0.30	0.20 - 0.20	0.15 - 0.15	0.10 - 0.10	0.10 - 0.10	0.10 - 0.10	0.10 - 0.10
Type	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)
Anions by Kone (soil)	11-Feb-2019	08-Feb-2019	11-Feb-2019	08-Feb-2019	11-Feb-2019	11-Feb-2019	08-Feb-2019	11-Feb-2019	06-Feb-2019	11-Feb-2019
Asbestos ID in Solid Samples			06-Feb-2019		06-Feb-2019	06-Feb-2019	06-Feb-2019	06-Feb-2019		06-Feb-2019
Boron Water Soluble	08-Feb-2019	08-Feb-2019	07-Feb-2019	08-Feb-2019	07-Feb-2019	07-Feb-2019	08-Feb-2019	11-Feb-2019	05-Feb-2019	11-Feb-2019
Cyanide Comp/Free/Total/Thiocyanate	06-Feb-2019	06-Feb-2019	07-Feb-2019	06-Feb-2019	06-Feb-2019	07-Feb-2019	06-Feb-2019	07-Feb-2019	06-Feb-2019	07-Feb-2019
Hexavalent Chromium (s)	08-Feb-2019	07-Feb-2019	07-Feb-2019	08-Feb-2019	07-Feb-2019	07-Feb-2019	08-Feb-2019	08-Feb-2019	08-Feb-2019	07-Feb-2019
Metals in solid samples by OES	11-Feb-2019	08-Feb-2019	08-Feb-2019	09-Feb-2019	08-Feb-2019	08-Feb-2019	09-Feb-2019	12-Feb-2019	11-Feb-2019	13-Feb-2019
OC, OP Pesticides and Triazine Herb							06-Feb-2019		06-Feb-2019	06-Feb-2019
PAH by GCMS	06-Feb-2019	05-Feb-2019	06-Feb-2019	06-Feb-2019	06-Feb-2019	06-Feb-2019	05-Feb-2019	06-Feb-2019	06-Feb-2019	06-Feb-2019
pH	06-Feb-2019	06-Feb-2019	07-Feb-2019	06-Feb-2019	07-Feb-2019	07-Feb-2019	06-Feb-2019	07-Feb-2019	06-Feb-2019	06-Feb-2019
Phenols by HPLC (S)	13-Feb-2019	12-Feb-2019	08-Feb-2019	11-Feb-2019	14-Feb-2019	12-Feb-2019	12-Feb-2019	08-Feb-2019	12-Feb-2019	13-Feb-2019
Sample description	02-Feb-2019	02-Feb-2019	02-Feb-2019	02-Feb-2019	02-Feb-2019	02-Feb-2019	02-Feb-2019	02-Feb-2019	02-Feb-2019	02-Feb-2019
Total Organic Carbon						08-Feb-2019	08-Feb-2019	11-Feb-2019	06-Feb-2019	11-Feb-2019
TPH c6-40 Value of soil	07-Feb-2019	07-Feb-2019	07-Feb-2019	07-Feb-2019	07-Feb-2019	07-Feb-2019	07-Feb-2019	07-Feb-2019	07-Feb-2019	07-Feb-2019

Lab Sample No(s)	19245618	19245623	19245627	19245564	19245631
Customer Sample Ref.	TP06	TP07	TP07	TP08	TP08
AGS Ref.					
Depth	0.20 - 0.20	0.00 - 0.00	0.30 - 0.30	0.25 - 0.25	0.00 - 0.00
Type	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)
Anions by Kone (soil)	11-Feb-2019	11-Feb-2019	06-Feb-2019	11-Feb-2019	08-Feb-2019
Asbestos ID in Solid Samples	06-Feb-2019	06-Feb-2019			06-Feb-2019
Boron Water Soluble	07-Feb-2019	07-Feb-2019	05-Feb-2019	08-Feb-2019	08-Feb-2019
Cyanide Comp/Free/Total/Thiocyanate	06-Feb-2019	07-Feb-2019	07-Feb-2019	06-Feb-2019	06-Feb-2019
Hexavalent Chromium (s)	07-Feb-2019	07-Feb-2019	08-Feb-2019	07-Feb-2019	08-Feb-2019
Metals in solid samples by OES	08-Feb-2019	09-Feb-2019	07-Feb-2019	12-Feb-2019	12-Feb-2019
OC, OP Pesticides and Triazine Herb	06-Feb-2019				06-Feb-2019
PAH by GCMS	06-Feb-2019	06-Feb-2019	06-Feb-2019	05-Feb-2019	06-Feb-2019
pH	07-Feb-2019	07-Feb-2019	06-Feb-2019	06-Feb-2019	07-Feb-2019
Phenols by HPLC (S)	13-Feb-2019	12-Feb-2019	12-Feb-2019	13-Feb-2019	14-Feb-2019
Sample description	02-Feb-2019	02-Feb-2019	02-Feb-2019	02-Feb-2019	02-Feb-2019
Total Organic Carbon	08-Feb-2019				08-Feb-2019
TPH c6-40 Value of soil	07-Feb-2019	07-Feb-2019	07-Feb-2019	07-Feb-2019	07-Feb-2019

ASSOCIATED AQC DATA

Anions by Kone (soil)

Component	Method Code	QC 1978	QC 1959	QC 1963	QC 1969	QC 1973	QC 1974
Chloride (soluble)	TM243	**85.71** 70.00 : 130.00	70.00 : 130.00	70.00 : 130.00	70.00 : 130.00	70.00 : 130.00	70.00 : 130.00
Water Soluble Sulphate as SO4 2:1 Extract	TM243	**112.56** 70.00 : 130.00	70.00 : 130.00	70.00 : 130.00	70.00 : 130.00	70.00 : 130.00	70.00 : 130.00

Component	Method Code	QC 1979
Chloride (soluble)	TM243	70.00 : 130.00
Water Soluble Sulphate as SO4 2:1 Extract	TM243	70.00 : 130.00

Boron Water Soluble

Component	Method Code	QC 1973	QC 1900	QC 1954	QC 1996	QC 1959	QC 1964
Water Soluble Boron	TM222	**97.0** 86.05 : 109.75	**98.0** 86.05 : 109.75	**100.0** 86.05 : 109.75	**95.5** 86.05 : 109.75	**94.0** 86.05 : 109.75	**100.0** 86.05 : 109.75

Cyanide Comp/Free/Total/Thiocyanate

Component	Method Code	QC 1926	QC 1994	QC 1927	QC 1998
Free Cyanide	TM153	**96.6** 87.60 : 108.63	**93.7** 87.60 : 108.63	**95.9** 87.60 : 108.63	**97.0** 87.60 : 108.63
Thiocyanate	TM153	**91.02** 92.90 : 108.39	**89.22** 92.90 : 108.39	**94.01** 92.90 : 108.39	**94.01** 92.90 : 108.39
Total Cyanide	TM153	**103.57** 87.00 : 103.00	**100.0** 87.00 : 103.00	**102.14** 87.00 : 103.00	**97.14** 87.00 : 103.00

Hexavalent Chromium (s)

Component	Method Code	QC 1919	QC 1925	QC 1967
Hexavalent Chromium	TM151	**102.0** 90.20 : 107.00	**102.0** 90.20 : 107.00	**102.0** 90.20 : 107.00

Metals in solid samples by OES

Component	Method Code	QC 1905	QC 1986	QC 1986	QC 1999	QC 1974	QC 1937
Aluminium	TM181	**111.5** 77.46 : 123.98	**92.92** 77.46 : 123.98	**96.46** 77.46 : 123.98	**92.92** 77.84 : 119.01	**107.96** 77.46 : 123.98	**99.12** 77.46 : 123.98
Antimony	TM181	**106.91** 87.04 : 111.16	**91.87** 87.04 : 111.16	**93.09** 87.04 : 111.16	**95.93** 88.24 : 108.30	**97.97** 87.04 : 111.16	**92.28** 87.04 : 111.16
Arsenic	TM181	**111.05** 87.34 : 110.87	**95.06** 87.34 : 110.87	**95.64** 87.34 : 110.87	**98.26** 91.21 : 109.74	**98.84** 87.34 : 110.87	**98.26** 87.34 : 110.87
Barium	TM181	**105.5** 80.73 : 115.16	**89.63** 80.73 : 115.16	**97.25** 80.73 : 115.16	**93.58** 82.49 : 109.34	**95.41** 80.73 : 115.16	**92.66** 80.73 : 115.16

CERTIFICATE OF ANALYSIS

SDG:	190131-136	**Client Reference:**	A090070-550	**Report Number:**	492488
Location:	Shafton	**Order Number:**	NOT/1616	**Superseded Report:**	

Metals in solid samples by OES

		QC 1905	QC 1986	QC 1986	QC 1999	QC 1974	QC 1937
Beryllium	TM181	**111.57** 89.47 : 112.97	**94.78** 89.47 : 112.97	**97.01** 89.47 : 112.97	**99.25** 90.00 : 109.18	**98.51** 89.47 : 112.97	**95.15** 89.47 : 112.97
Boron	TM181	**97.71** 76.57 : 104.15	**83.67** 76.57 : 104.15	**85.96** 76.57 : 104.15	**85.67** 76.57 : 104.15	**93.41** 76.57 : 104.15	**83.09** 76.57 : 104.15
Cadmium	TM181	**111.93** 82.98 : 105.97	**89.3** 82.98 : 105.97	**92.59** 82.98 : 105.97	**91.36** 82.95 : 110.25	**90.53** 82.98 : 105.97	**78.19** 82.98 : 105.97
Chromium	TM181	**100.61** 77.55 : 104.47	**90.26** 77.55 : 104.47	**88.24** 77.55 : 104.47	**91.68** 79.78 : 102.80	**97.36** 77.55 : 104.47	**94.12** 77.55 : 104.47
Cobalt	TM181	**100.0** 83.30 : 102.38	**86.16** 83.30 : 102.38	**88.36** 83.30 : 102.38	**89.31** 83.02 : 100.17	**89.31** 83.30 : 102.38	**86.16** 83.30 : 102.38
Copper	TM181	**102.11** 84.36 : 106.14	**94.72** 88.76 : 109.59	**92.25** 84.36 : 106.14	**96.13** 85.25 : 108.00	**98.06** 84.36 : 106.14	**95.6** 84.36 : 106.14
Iron	TM181	**108.73** 81.43 : 115.79	**93.65** 81.43 : 115.79	**100.79** 81.43 : 115.79	**97.62** 82.95 : 110.58	**100.0** 81.43 : 115.79	**97.62** 81.43 : 115.79
Lead	TM181	**95.72** 81.95 : 107.63	**89.64** 81.95 : 107.63	**92.79** 81.95 : 107.63	**91.22** 81.63 : 104.17	**104.05** 81.95 : 107.63	**88.96** 81.95 : 107.63
Manganese	TM181	**122.5** 97.73 : 122.27	**105.56** 97.73 : 122.27	**111.11** 97.73 : 122.27	**111.67** 99.46 : 120.54	**111.39** 97.73 : 122.27	**106.11** 97.73 : 122.27
Mercury	TM181	**110.39** 82.73 : 106.36	**90.58** 82.73 : 106.36	**91.3** 82.73 : 106.36	**94.2** 86.53 : 105.35	**93.72** 82.73 : 106.36	**96.38** 82.73 : 106.36
Molybdenum	TM181	**108.64** 86.61 : 111.07	**93.0** 86.61 : 111.07	**92.18** 86.61 : 111.07	**95.47** 89.41 : 107.75	**95.47** 86.61 : 111.07	**92.18** 86.61 : 111.07
Nickel	TM181	**99.02** 83.87 : 104.87	**87.29** 83.87 : 104.87	**88.26** 83.87 : 104.87	**89.98** 85.63 : 103.11	**91.69** 83.87 : 104.87	**88.75** 83.87 : 104.87
Phosphorus	TM181	**120.81** 92.65 : 125.47	**108.28** 92.65 : 125.47	**112.93** 92.65 : 125.47	**119.39** 94.56 : 124.28	**112.12** 92.65 : 125.47	**112.73** 92.65 : 125.47
Selenium	TM181	**108.63** 88.36 : 111.25	**95.29** 88.36 : 111.25	**95.29** 88.36 : 111.25	**99.22** 89.98 : 109.62	**97.25** 88.36 : 111.25	**96.47** 88.36 : 111.25
Strontium	TM181	**104.45** 83.94 : 111.48	**86.64** 83.94 : 111.48	**86.41** 83.94 : 111.48	**87.75** 84.00 : 104.25	**94.88** 83.94 : 111.48	**85.52** 83.94 : 111.48
Thallium	TM181	**100.0** 88.60 : 116.73	**54.42** 88.60 : 116.73	**57.96** 88.60 : 116.73	**60.18** 86.84 : 111.14	**56.64** 88.60 : 116.73	**52.65** 88.60 : 116.73
Tin	TM181	**106.46** 89.77 : 112.62	**94.68** 89.77 : 112.62	**96.2** 89.77 : 112.62	**98.48** 90.25 : 108.86	**97.72** 89.77 : 112.62	**96.2** 89.77 : 112.62
Titanium	TM181	**90.08** 66.29 : 105.96	**77.86** 66.29 : 105.96	**76.34** 66.29 : 105.96	**80.15** 66.23 : 102.06	**85.5** 66.29 : 105.96	**85.5** 66.29 : 105.96
Vanadium	TM181	**104.76** 84.11 : 113.29	**91.58** 84.11 : 113.29	**91.58** 84.11 : 113.29	**93.04** 86.37 : 107.94	**98.53** 84.11 : 113.29	**94.51** 84.11 : 113.29
Zinc	TM181	**105.75** 86.34 : 113.56	**94.05** 86.34 : 113.56	**95.89** 86.34 : 113.56	**102.46** 84.68 : 113.99	**100.41** 86.34 : 113.56	**98.36** 86.34 : 113.56

Component	Method Code	QC 1901	QC 1926	QC 1978	QC 1971	QC 1980	QC 1939
Aluminium	TM181	**93.81** 77.46 : 123.98	**102.65** 77.46 : 123.98	**94.69** 77.46 : 123.98	**89.38** 77.84 : 119.01	**82.57** 77.84 : 119.01	**103.54** 77.46 : 123.98
Antimony	TM181	**96.75** 87.04 : 111.16	**97.97** 87.04 : 111.16	**93.09** 87.04 : 111.16	**90.24** 88.24 : 108.30	**88.62** 88.24 : 108.30	**98.37** 87.04 : 111.16
Arsenic	TM181	**98.26** 87.34 : 110.87	**98.26** 87.34 : 110.87	**95.64** 87.34 : 110.87	**93.02** 91.21 : 109.74	**88.95** 91.21 : 109.74	**98.84** 87.34 : 110.87
Barium	TM181	**94.5** 80.73 : 115.16	**99.08** 80.73 : 115.16	**93.58** 80.73 : 115.16	**82.2** 82.49 : 109.34	**77.89** 82.49 : 109.34	**92.66** 80.73 : 115.16
Beryllium	TM181	**97.39** 89.47 : 112.97	**99.25** 89.47 : 112.97	**95.9** 89.47 : 112.97	**93.66** 90.00 : 109.18	**89.55** 90.00 : 109.18	**95.15** 89.47 : 112.97
Boron	TM181	**85.39** 76.57 : 104.15	**96.85** 76.57 : 104.15	**85.96** 76.57 : 104.15	**85.1** 76.57 : 104.15	**79.66** 76.57 : 104.15	**93.12** 76.57 : 104.15

CERTIFICATE OF ANALYSIS

SDG:	190131-136	**Client Reference:**	A090070-550	**Report Number:**	492488
Location:	Shafton	**Order Number:**	NOT/1616	**Superseded Report:**	

Metals in solid samples by OES

		QC 1901	QC 1926	QC 1978	QC 1971	QC 1980	QC 1939
Cadmium	TM181	**92.59** 82.98 : 105.97	**89.71** 82.98 : 105.97	**91.36** 82.98 : 105.97	**88.89** 82.95 : 110.25	**87.65** 82.95 : 110.25	**90.12** 82.98 : 105.97
Chromium	TM181	**92.09** 77.55 : 104.47	**93.31** 77.55 : 104.47	**85.8** 77.55 : 104.47	**91.89** 79.78 : 102.80	**88.44** 79.78 : 102.80	**93.31** 77.55 : 104.47
Cobalt	TM181	**88.68** 83.30 : 102.38	**89.94** 83.30 : 102.38	**87.74** 83.30 : 102.38	**85.22** 83.02 : 100.17	**81.76** 83.02 : 100.17	**87.74** 83.30 : 102.38
Copper	TM181	**94.37** 84.36 : 106.14	**94.01** 84.36 : 106.14	**90.14** 84.36 : 106.14	**95.95** 85.25 : 108.00	**90.85** 85.25 : 108.00	**94.54** 84.36 : 106.14
Iron	TM181	**96.03** 81.43 : 115.79	**98.41** 81.43 : 115.79	**95.24** 81.43 : 115.79	**88.1** 82.95 : 110.58	**83.33** 82.95 : 110.58	**96.83** 81.43 : 115.79
Lead	TM181	**88.29** 81.95 : 107.63	**91.67** 81.95 : 107.63	**86.71** 81.95 : 107.63	**84.68** 81.63 : 104.17	**81.98** 81.63 : 104.17	**88.96** 81.95 : 107.63
Manganese	TM181	**109.44** 97.73 : 122.27	**109.72** 97.73 : 122.27	**102.78** 97.73 : 122.27	**106.67** 99.46 : 120.54	**102.78** 99.46 : 120.54	**106.67** 97.73 : 122.27
Mercury	TM181	**94.2** 82.73 : 106.36	**93.96** 82.73 : 106.36	**92.03** 82.73 : 106.36	**90.82** 86.53 : 105.35	**86.96** 86.53 : 105.35	**94.44** 82.73 : 106.36
Molybdenum	TM181	**96.71** 86.61 : 111.07	**100.82** 86.61 : 111.07	**93.42** 86.61 : 111.07	**92.59** 89.41 : 107.75	**90.12** 89.41 : 107.75	**95.47** 86.61 : 111.07
Nickel	TM181	**90.71** 83.87 : 104.87	**93.15** 83.87 : 104.87	**89.49** 83.87 : 104.87	**90.22** 85.63 : 103.11	**85.57** 85.63 : 103.11	**89.49** 83.87 : 104.87
Phosphorus	TM181	**110.51** 92.65 : 125.47	**113.74** 92.65 : 125.47	**117.17** 92.65 : 125.47	**111.72** 94.56 : 124.28	**107.27** 94.56 : 124.28	**109.9** 92.65 : 125.47
Selenium	TM181	**98.04** 88.36 : 111.25	**100.0** 88.36 : 111.25	**93.33** 88.36 : 111.25	**96.86** 89.98 : 109.62	**91.37** 89.98 : 109.62	**96.86** 88.36 : 111.25
Strontium	TM181	**91.09** 83.94 : 111.48	**96.21** 83.94 : 111.48	**88.64** 83.94 : 111.48	**88.2** 84.00 : 104.25	**84.63** 84.00 : 104.25	**93.32** 83.94 : 111.48
Thallium	TM181	**54.87** 88.60 : 116.73	**55.75** 88.60 : 116.73	**58.41** 88.60 : 116.73	**90.71** 86.84 : 111.14	**87.17** 86.84 : 111.14	**53.98** 88.60 : 116.73
Tin	TM181	**99.62** 89.77 : 112.62	**97.34** 89.77 : 112.62	**96.2** 89.77 : 112.62	**95.82** 90.25 : 108.86	**92.02** 90.25 : 108.86	**98.1** 89.77 : 112.62
Titanium	TM181	**70.46** 66.29 : 105.96	**77.1** 66.29 : 105.96	**76.34** 66.29 : 105.96	**82.44** 66.23 : 102.06	**78.63** 66.23 : 102.06	**88.55** 66.29 : 105.96
Vanadium	TM181	**93.41** 84.11 : 113.29	**98.17** 84.11 : 113.29	**95.24** 84.11 : 113.29	**91.94** 86.37 : 107.94	**89.01** 86.37 : 107.94	**98.53** 84.11 : 113.29
Zinc	TM181	**97.95** 86.34 : 113.56	**102.46** 86.34 : 113.56	**94.66** 86.34 : 113.56	**99.59** 84.68 : 113.99	**93.02** 84.68 : 113.99	**98.56** 86.34 : 113.56

Component	Method Code	QC 1965
Aluminium	TM181	**90.27** 77.46 : 123.98
Antimony	TM181	**97.15** 87.04 : 111.16
Arsenic	TM181	**95.93** 87.34 : 110.87
Barium	TM181	**93.58** 80.73 : 115.16
Beryllium	TM181	**92.91** 89.47 : 112.97
Boron	TM181	**89.11** 76.57 : 104.15
Cadmium	TM181	**90.53** 82.98 : 105.97
Chromium	TM181	**86.61** 77.55 : 104.47

CERTIFICATE OF ANALYSIS

SDG:	190131-136	**Client Reference:**	A090070-550	**Report Number:**	492488
Location:	Shafton	**Order Number:**	NOT/1616	**Superseded Report:**	

Metals in solid samples by OES

		QC 1965
Cobalt	TM181	**88.99** 83.30 : 102.38
Copper	TM181	**96.83** 84.36 : 106.14
Iron	TM181	**90.48** 81.43 : 115.79
Lead	TM181	**89.64** 81.95 : 107.63
Manganese	TM181	**108.61** 97.73 : 122.27
Mercury	TM181	**93.24** 82.73 : 106.36
Molybdenum	TM181	**94.24** 86.61 : 111.07
Nickel	TM181	**91.2** 83.87 : 104.87
Phosphorus	TM181	**104.24** 92.65 : 125.47
Selenium	TM181	**92.55** 88.36 : 111.25
Strontium	TM181	**91.31** 83.94 : 111.48
Thallium	TM181	**56.64** 88.60 : 116.73
Tin	TM181	**97.34** 89.77 : 112.62
Titanium	TM181	**80.15** 66.29 : 105.96
Vanadium	TM181	**93.77** 84.11 : 113.29
Zinc	TM181	**92.81** 86.34 : 113.56

OC, OP Pesticides and Triazine Herb

Component	Method Code	QC 1979
Atrazine (Raw)	TM073	**91.98** 78.55 : 119.92
Azinphos methyl (Raw)	TM073	**115.89** 58.68 : 154.71
cis-Chlordane (Raw)	TM073	**95.38** 71.90 : 129.99
Diazinon (Raw)	TM073	**125.0** 70.00 : 130.00
Dichlorvos (Raw)	TM073	**116.04** 70.00 : 130.00
Dieldrin (Raw)	TM073	**216.13** 70.00 : 130.00
gamma-HCH (Lindane) (Raw)	TM073	**131.15** 71.48 : 129.99
Heptachlor (Raw)	TM073	**114.22** 66.39 : 134.63
Hexachlorobenzene (Raw)	TM073	**94.19** 47.15 : 124.32

CERTIFICATE OF ANALYSIS

SDG:	190131-136	**Client Reference:**	A090070-550	**Report Number:**	492488
Location:	Shafton	**Order Number:**	NOT/1616	**Superseded Report:**	

OC, OP Pesticides and Triazine Herb

		QC 1979
Malathion (Raw)	TM073	**160.57** 70.00 : 130.00
p,p-DDT (Raw)	TM073	**111.8** 70.00 : 130.00
Parathion (Raw)	TM073	**115.52** 64.13 : 127.88

PAH by GCMS

Component	Method Code	QC 1929	QC 1909	QC 1961
Acenaphthene	TM218	**104.5** 76.82 : 113.72	**96.5** 76.79 : 103.90	**105.0** 76.82 : 113.72
Acenaphthylene	TM218	**102.5** 75.95 : 108.85	**93.5** 78.40 : 108.66	**99.0** 75.95 : 108.85
Anthracene	TM218	**102.0** 76.67 : 109.58	**101.0** 76.15 : 110.07	**105.5** 76.67 : 109.58
Benz(a)anthracene	TM218	**98.0** 70.05 : 119.30	**96.5** 73.77 : 119.26	**115.0** 70.05 : 119.30
Benzo(a)pyrene	TM218	**102.5** 68.22 : 116.60	**94.0** 73.20 : 114.18	**105.0** 68.22 : 116.60
Benzo(b)fluoranthene	TM218	**103.0** 75.44 : 113.45	**92.0** 75.36 : 117.58	**104.0** 75.44 : 113.45
Benzo(ghi)perylene	TM218	**105.5** 70.79 : 114.76	**94.5** 70.73 : 116.12	**98.0** 70.79 : 114.76
Benzo(k)fluoranthene	TM218	**90.5** 81.43 : 115.17	**87.0** 75.98 : 116.59	**105.5** 81.43 : 115.17
Chrysene	TM218	**97.0** 75.94 : 114.39	**93.5** 74.82 : 114.18	**106.0** 75.94 : 114.39
Dibenzo(ah)anthracene	TM218	**107.0** 71.87 : 118.97	**92.5** 69.17 : 115.30	**98.0** 71.87 : 118.97
Fluoranthene	TM218	**94.0** 77.92 : 113.69	**102.5** 75.88 : 112.84	**113.0** 77.92 : 113.69
Fluorene	TM218	**99.5** 82.02 : 108.34	**98.5** 78.50 : 114.02	**100.5** 82.02 : 108.34
Indeno(123cd)pyrene	TM218	**102.5** 67.80 : 113.60	**91.0** 80.09 : 117.12	**100.5** 67.80 : 113.60
Naphthalene	TM218	**105.0** 77.17 : 112.55	**90.0** 75.24 : 111.26	**101.5** 77.17 : 112.55
Phenanthrene	TM218	**96.0** 78.26 : 113.22	**98.5** 77.07 : 107.43	**105.5** 78.26 : 113.22
Pyrene	TM218	**91.5** 74.86 : 116.81	**101.0** 78.74 : 112.56	**112.0** 74.86 : 116.81

pH

Component	Method Code	QC 1964	QC 1985	QC 1935	QC 1973	QC 1946	QC 1995
pH	TM133	**100.11** 97.41 : 101.91	**100.23** 97.41 : 101.91	**100.34** 97.41 : 101.91	**100.0** 97.41 : 101.91	**99.43** 97.60 : 101.72	**99.31** 97.41 : 101.91

CERTIFICATE OF ANALYSIS

SDG:	190131-136	**Client Reference:**	A090070-550	**Report Number:**	492488
Location:	Shafton	**Order Number:**	NOT/1616	**Superseded Report:**	

pH

Component	Method Code	QC 1910
pH	TM133	**99.66** 97.41 : 101.91

Phenols by HPLC (S)

Component	Method Code	QC 1959	QC 1975	QC 1938	QC 1966
2.3.5 Trimethyl-Phenol by HPLC (S)	TM062 (S)	**101.3** 66.00 : 84.00	**104.55** 66.00 : 84.00	**97.4** 83.23 : 109.71	**101.95** 83.23 : 109.71
2-Isopropyl Phenol by HPLC (S)	TM062 (S)	**91.81** 69.50 : 87.50	**91.81** 69.50 : 87.50	**81.29** 76.34 : 104.11	**82.46** 76.34 : 104.11
Catechol by HPLC (S)	TM062 (S)	**84.76** 19.39 : 135.70	**37.14** 19.39 : 135.70	**77.14** 22.43 : 157.02	**76.19** 22.43 : 157.02
Cresols by HPLC (S)	TM062 (S)	**103.34** 84.53 : 106.34	**105.01** 84.53 : 106.34	**100.21** 92.94 : 114.26	**104.59** 92.94 : 114.26
Napthol by HPLC (S)	TM062 (S)	**126.43** 57.50 : 102.50	**110.0** 57.50 : 102.50	**123.57** 75.62 : 124.38	**130.0** 75.62 : 124.38
Phenol by HPLC (S)	TM062 (S)	**111.92** 86.51 : 119.43	**111.92** 86.51 : 119.43	**101.99** 79.53 : 120.47	**107.95** 79.53 : 120.47
Resorcinol HPLC (S)	TM062 (S)	**101.89** 69.99 : 127.22	**97.48** 69.99 : 127.22	**91.82** 71.43 : 129.59	**96.86** 71.43 : 129.59
Xylenols by HPLC (S)	TM062 (S)	**98.75** 91.21 : 105.38	**97.08** 91.21 : 105.38	**94.27** 89.90 : 107.23	**98.23** 89.90 : 107.23

Total Organic Carbon

Component	Method Code	QC 1933	QC 1939	QC 1902
Total Organic Carbon	TM132	**95.7** 88.47 : 112.82	**103.13** 88.47 : 112.82	**90.63** 88.47 : 112.82

TPH c6-40 Value of soil

Component	Method Code	QC 1981
Diesel QC	TM154	**102.32** 87.23 : 107.46
Lube Oil QC	TM154	**101.01** 88.86 : 105.23
TPH C6-40 Corrected	TM154	**101.75** 89.77 : 105.84

The above information details the reference name of the analytical quality control sample (AQC) that has been run with the samples contained in this report for the different methods of analysis.
The figure detailed is the percentage recovery result for the AQC.
The subscript numbers below are the percentage recovery lower control limit (LCL) and the upper control limit (UCL). The percentage recovery result for the AQC should be between these limits to be statistically in control.

Appendix General

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

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

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

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

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

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

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

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

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

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

11. Results relate only to the items tested.

12. LoDs (Limit of Detection) for wet tests reported on a dry weight basis are not corrected for moisture content.

13. **Surrogate recoveries** - Surrogates are added to your sample to monitor recovery of the test requested. A % recovery is reported, results are not corrected for the recovery measured. Typical recoveries for organics tests are 70-130%. Recoveries in soils are affected by organic rich or clay rich matrices. Waters can be affected by remediation fluids or high amounts of sediment. Test results are only ever reported if all of the associated quality checks pass; it is assumed that all recoveries outside of the values above are due to matrix affect.

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

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

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

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

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

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

20. For leachate preparations other than Zero Headspace Extraction (ZHE) volatile loss may occur.

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

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

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

24. **Tentatively Identified Compounds (TICs)** are non-target peaks in VOC and SVOC analysis. All non-target peaks detected with a concentration above the LoD are subjected to a mass spectral library search. Non-target peaks with a library search confidence of >75% are reported based on the best mass spectral library match. When a non-target peak with a library search confidence of <75% is detected it is reported as “mixed hydrocarbons”. Non-target compounds identified from the scan data are semi-quantified relative to one of the deuterated internal standards, under the same chromatographic conditions as the target compounds. This result is reported as a semi-quantitative value and reported as Tentatively Identified Compounds (TICs). TICs are outside the scope of UKAS accreditation and are not moisture corrected.

Sample Deviations

If a sample is classed as deviated then the associated results may be compromised.

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

Asbestos

Identification of Asbestos in Bulk Materials & Soils

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

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

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

Visual Estimation Of Fibre Content

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

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

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

Appendix F – Contamination Assessment Criteria

Appendix F – Contamination Assessment Criteria

WYG Tier One Human Health Screening Values, Issue 15.
Residential With Plant Uptake

Determinand	Units	SOIL ORGANIC MATTER			SOURCE
		1%	2.5%	6%	
pH		<5, >9			
Asbestos	%	Presence			
HEAVY METALS/METALLOIDS					
Arsenic	mg/kg	37			C4SL
Cadmium	mg/kg	22			C4SL
Chromium (III)	mg/kg	910			CIEH/LQM S4ULs
Chromium (VI)	mg/kg	21			C4SL
Lead	mg/kg	200			C4SL
Mercury (Elemental)	mg/kg		1.2		CIEH/LQM S4ULs
Mercury (Inorganic)	mg/kg	40			CIEH/LQM S4ULs
Mercury (Methyl)	mg/kg		11		CIEH/LQM S4ULs
Nickel	mg/kg	180			CIEH/LQM S4ULs
Selenium	mg/kg	250			CIEH/LQM S4ULs
Beryllium	mg/kg	1.7			CIEH/LQM S4ULs
Boron	mg/kg	290			CIEH/LQM S4ULs
Vanadium	mg/kg	410			CIEH/LQM S4ULs
Copper	mg/kg	2,400			CIEH/LQM S4ULs
Zinc	mg/kg	3,700			CIEH/LQM S4ULs
GENERAL INORGANICS					
Easily Liberatable Cyanide (free)	mg/kg	24			Acute effects infant 1 dose 3g soil
US EPA PRIORITY PAHs					
Acenaphthene	mg/kg	210	510	1100	CIEH/LQM S4ULs
Acenaphthylene	mg/kg	170	420	920	CIEH/LQM S4ULs
Anthracene	mg/kg	2,400	5,400	11,000	CIEH/LQM S4ULs
Benzo(a)anthracene	mg/kg	7.2	11	13	CIEH/LQM S4ULs
Benzo(b)fluoranthene	mg/kg	2.6	3.3	3.7	CIEH/LQM S4ULs
Benzo(k)fluoranthene	mg/kg	77	93	100	CIEH/LQM S4ULs
Benzo(g,h,i)perylene	mg/kg	320	340	350	CIEH/LQM S4ULs
Benzo(a)pyrene	mg/kg	5	5	5	C4SL, CLEA v1.071
Chrysene	mg/kg	15	22	27	CIEH/LQM S4ULs
Di-benzo(a,h)anthracene	mg/kg	0.24	0.28	0.30	CIEH/LQM S4ULs

Determinand	Units	SOIL ORGANIC MATTER			SOURCE
		1%	2.5%	6%	
Fluoranthene	mg/kg	280	560	890	CIEH/LQM S4ULs
Fluorene	mg/kg	170	400	860	CIEH/LQM S4ULs
Indeno(1,2,3-cd)pyrene	mg/kg	27	36	41	CIEH/LQM S4ULs
Naphthalene	mg/kg	2.3	5.6	13	CIEH/LQM S4ULs
Phenanthrene	mg/kg	95	220	440	CIEH/LQM S4ULs
Pyrene	mg/kg	620	1200	2000	CIEH/LQM S4ULs
Phenolics					
Phenol	mg/kg	120	200	380	CIEH/LQM S4ULs
TPH					
TPH Aliphatic >C5-6	mg/kg	42	78	160	CIEH/LQM S4ULs
TPH Aliphatic >C6-8	mg/kg	100	230	530	CIEH/LQM S4ULs
TPH Aliphatic >C8-10	mg/kg	27	65	150	CIEH/LQM S4ULs
TPH Aliphatic >C10-12	mg/kg	130	330	770	CIEH/LQM S4ULs
TPH Aliphatic >C12-16	mg/kg	1,100	2,400	4,400	CIEH/LQM S4ULs
TPH Aliphatic >C16-35	mg/kg	65,000	92,000	110,000	CIEH/LQM S4ULs
TPH Aliphatic >C35-44	mg/kg	65,000	92,000	110,000	CIEH/LQM S4ULs
TPH Aromatic >EC5-7 (Benzene)	mg/kg	0.2	0.41	0.87	C4SL, CLEA v1.071
TPH Aromatic >EC7-8	mg/kg	130	290	660	CIEH/LQM S4ULs
TPH Aromatic >EC8-10	mg/kg	34	83	190	CIEH/LQM S4ULs
TPH Aromatic >EC10-12	mg/kg	74	180	380	CIEH/LQM S4ULs
TPH Aromatic >EC12-16	mg/kg	140	330	660	CIEH/LQM S4ULs
TPH Aromatic >EC16-21	mg/kg	260	540	930	CIEH/LQM S4ULs
TPH Aromatic >EC21-35	mg/kg	1,100	1,500	1,700	CIEH/LQM S4ULs
TPH Aromatic >EC35-44	mg/kg	1,100	1,500	1,700	CIEH/LQM S4ULs
TPH Aliphatic & Aromatic >EC44-70	mg/kg	1,600	1,800	1,900	CIEH/LQM S4ULs

Appendix G – Results Table

Table 1: Soil results - Land off High Street, Shafton

	BH01	BH02	BH04	BH04	BH05	TP01	TP02	TP03	TP04	TP05	TP06	TP07	TP07	TP08	TP08	Res with plant [1,2,3]
	0.15	0.30	0.10	0.30	0.20	0.15	0.10	0.10	0.10	0.10	0.20	0.00	0.30	0.00	0.25	
Asbestos																
Asbestos Screen	-	-	ND	-	ND	ND	ND	ND	-	ND	ND	ND	-	ND	-	ND
Carbon																
Soil Organic Matter (%)	-	-	-	-	-	8.93	7.67	7.93	7.72	10.8	8.95	-	-	10.7	-	-
Inorganics																
Water Soluble Sulphate	0.0271	0.0377	0.0337	0.0374	0.0353	0.038	<0.004	0.0244	0.0527	0.0381	0.0394	0.0349	0.12	0.0375	0.168	-
pH	6.78	6.25	5.57	5.78	6.1	6.16	6.72	5.64	5.41	6.29	6.4	7.09	6.14	6.1	6.17	5-9
Cyanide, Free	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	24
Metals																
Chromium, Hexavalent	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	21
Boron, water soluble	<1	<1	<1	<1	1.02	<1	<1	<1	<1	1.68	<1	<1	<1	1.1	<1	290
Arsenic	20.6	4.96	17.6	9.18	16.5	20.3	21.9	20	18.6	21.8	24.9	39.1	16.1	42.7	23.8	37
Cadmium	0.0952	0.332	<0.02	<0.02	0.246	0.173	0.257	0.165	0.298	16.5	0.238	0.577	<0.02	0.167	0.725	22
Chromium	16.5	29.7	12.4	28.7	16.6	16.5	20.7	25.1	21.2	17.7	11.5	9.32	16.1	19.8	16.4	910
Copper	31.9	25.7	22.8	13.4	33.9	34.8	34.4	34.9	26.4	46.3	126	71	19.7	75	21.4	2400
Lead	63.8	13.3	46.3	18.4	85.6	92.1	64.3	65.4	61.4	70.5	484	310	30.8	269	75.8	200
Mercury	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	0.443	<0.14	0.17	<1.4	1.2 [4]
Nickel	24.8	26.9	15.1	18.9	18.4	21.7	20.7	22.3	16.8	21.90	24.9	29.5	17.4	26.7	20.8	180
Selenium	<1	<1	<1	<1	1.17	1.12	<1	<1	<1	5.44	<1	1.06	<1	<1	<10	250
Zinc	87.6	81.2	73.3	92.5	177	92.1	90.5	94.3	83	367	231	651	94.6	>500	165	3700
Phenols																
Phenols [5]	<0.035	<0.035	<0.035	<0.035	<0.035	0.0536	<0.035	<0.035	<0.035	<0.035	<0.035	<0.035	<0.035	<0.035	<0.035	380
Total Petroleum Hydrocarbons (TPH) Screen [6]																
TPH >C6-C8	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	530
TPH >C8-C10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	150
TPH >C10-C12	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	380
TPH >C12-C16	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	660
TPH >C16-C21	16.8	<10	<10	<10	46.5	22.1	22.3	19.4	20.3	19.8	17.6	38.4	<10	74.1	23.7	930
TPH >C21-C40	66.6	<10	85.7	18.4	534	106	130	138	162	138	120	199	<10	351	101	1700
TPH >C6-C40	90.6	12.8	99.1	19.9	585	137	156	164	189	163	144	253	10.2	441	134	-
Polyaromatic Hydrocarbons (PAHs)																
Acenaphthene	<0.008	<0.008	<0.008	<0.008	<0.008	0.022	<0.008	<0.008	<0.008	<0.008	<0.008	0.039	<0.008	0.089	0.039	1100
Acenaphthylene	<0.012	<0.012	<0.012	<0.012	0.0234	0.032	0.043	<0.012	<0.012	<0.012	0.055	0.250	<0.012	0.174	0.083	920
Anthracene	0.023	<0.016	0.022	<0.016	0.056	0.082	0.085	0.028	0.029	<0.016	0.083	0.272	<0.016	0.120	0.178	11000
Benzo(a)anthracene	0.136	<0.014	0.082	<0.014	0.240	0.448	0.365	0.168	0.149	0.159	0.320	1.220	0.027	0.544	0.699	13
Benzo(b)fluoranthene	0.244	<0.015	0.128	<0.015	0.393	0.764	0.544	0.304	0.255	0.313	0.545	2.020	0.044	1.070	0.970	3.7
Benzo(k)fluoranthene	0.111	<0.014	0.041	<0.014	0.166	0.250	0.217	0.112	0.082	0.121	0.215	0.771	0.021	0.374	0.348	100
Benzo(g,h,i)perylene	0.099	<0.024	0.050	<0.024	0.163	0.311	0.223	0.123	0.091	0.108	0.219	1.030	<0.024	0.417	0.432	350
Benzo(a)pyrene	0.165	<0.015	0.073	<0.015	0.248	0.479	0.352	0.193	0.138	0.155	0.334	1.380	0.031	0.656	0.671	5
Chrysene	0.169	<0.01	0.078	<0.01	0.271	0.430	0.347	0.210	0.192	0.204	0.343	1.090	0.031	0.854	0.716	27
Dibenzo(a,h)anthracene	<0.023	<0.023	<0.023	<0.023	<0.023	0.068	0.051	<0.023	<0.023	<0.023	0.050	0.213	<0.023	0.096	0.091	0.3
Fluoranthene	0.370	<0.017	0.204	<0.017	0.627	1.050	0.839	0.489	0.409	0.396	0.757	2.540	0.071	2.240	1.670	890
Fluorene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.069	<0.01	0.221	0.043	860
Indeno(1,2,3-cd)pyrene	0.089	<0.018	0.041	<0.018	0.138	0.257	0.187	0.110	0.086	0.099	0.184	0.875	<0.018	0.381	0.353	41
Naphthalene	0.029	<0.009	0.017	<0.009	0.044	0.057	0.047	0.051	0.034	0.039	0.052	0.128	<0.009	0.341	0.045	13
Phenanthrene	0.130	<0.015	0.098	<0.015	0.315	0.379	0.359	0.173	0.159	0.128	0.282	1.220	0.027	2.210	0.782	440
Pyrene	0.312	<0.015	0.170	<0.015	0.507	0.875	0.656	0.391	0.345	0.348	0.632	2.200	0.064	1.850	1.390	2000
Pesticides / Herbicides																
OCP/OPP [7]	-	-	-	-	-	-	ND	-	ND	ND	ND	-	-	ND	-	-

All results are in mg/kg unless otherwise stated.
Where: "-" = not available; "ND" = not detected.
Yellow indicates that the "residential with plant uptake" screening criteria has been exceeded.
Green indicates that the phytotoxicity thresholds set out in BS3882:2015 have been exceeded.

1. DEFRA, 2014. SP1010: Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination – Policy Companion Document.
2. Nathaniel et al., 2015. The LQM/CIEH S4ULs for Human Health Risk Assessment (© Land Quality Management Limited, reproduced with permission; publication no. S4UL3193).
3. Screening criteria corresponding to 6% SOM is only represented in this table.
4. Concentrations were assessed against the screening criteria for mercury (elemental) as a conservative measure.
5. Phenols, Total Detected monohydric.
6. There is no screening criteria for the total (aromatic and aliphatic) petroleum hydrocarbons. Screening criteria has been selected based on the most conservative of the corresponding aromatic or aliphatic carbon band.
7. Samples tested for a suite of OCP/OPP pesticide compounds. No OCP/OPP pesticide compound had concentrations exceeding the analytical dectection limit.

Appendix H – Gas Monitoring Records

WYG ENVIRONMENT

Geneva Building, Lakeview Drive, Sherwood Business Park, Annesley, Nottinghamshire, NG15 0ED
Tel: 01623 684550 Fax: 01623 684551

GROUNDWATER / GAS MONITORING RECORD SHEET

Client:	Homes England	**Job No.:** A090070-550		**Instruments Used:**	Dip Meter & Infra Red Gas Analyser
Project:	High Street, Shafton	**Date:** 31-Jan-19		**Monitored By:**	SC
Weather:	Sunny				

Installation No.	Elevation of cover (m agl)	Peak [1] CH_4 (% vol)	Peak [1] CO_2 (% vol)	Steady [2] CH_4 (% vol)	Steady [2] CO_2 (% vol)	Steady [2] O_2 (% vol)	Steady [2] CO (ppm)	Steady [2] H_2S (ppm)	Total gas flow rate (l/hr)	Peak CH_4 flow rate (l/hr)	Peak CO_2 flow rate (l/hr)	Atmospheric Pressure (mbar)	Water Depth to Cover (m bgl)	Base Depth (m bgl)	Water Level (m bgl)	Remarks
BH01	0.27	0.1	0.1	0.1	0.1	19.9	0.0	0.0	0.0	0.000	0.000	991	0.98	2.27	0.71	
BH02	0.31	0.1	0.3	0.1	0.3	20.9	0.0	0.0	0.1	0.000	0.000	991	1.09	2.22	0.78	
BH03	0.28	0.1	0.3	0.1	0.3	21.0	0.0	0.0	0.0	0.000	0.000	991	0.95	2.21	0.67	
BH04	0.29	0.1	0.3	0.1	0.5	19.6	0.0	0.0	0.0	0.000	0.000	991	0.68	3.20	0.39	
BH05	0.31	0.1	0.2	0.1	0.2	20.1	0.0	0.0	0.1	0.000	0.000	992	0.63	2.23	0.32	

Background Gas Levels:

	CH_4 (%)	CO_2 (%)	O_2 (%)	Atmos. (mbar)
Before Monitoring	0.1	0.1	21.1	991
After Monitoring	0.1	0.1	21.1	992

Characteristic Gas Situation	
1	
2	
3	
4	

[1] The peak reading is the maximum recorded level during a monitoring event.

[2] The steady reading is the level which remained constant after approximately 1 minute.

WYG ENVIRONMENT

Geneva Building, Lakeview Drive, Sherwood Business Park, Annesley, Nottinghamshire, NG15 0ED
Tel: 01623 684550 Fax: 01623 684551

GROUNDWATER / GAS MONITORING RECORD SHEET

Client:	Homes England	**Job No.:**	A090070-550	**Instruments Used:**	Dip Meter & Infra Red Gas Analyser
Project:	High Street, Shafton	**Date:**	18-Feb-19	**Monitored By:**	SC
Weather:	Overcast				

Installation No.	Elevation of cover (m agl)	Peak [1] CH_4 (% vol)	Peak [1] CO_2 (% vol)	Steady [2] CH_4 (% vol)	Steady [2] CO_2 (% vol)	Steady [2] O_2 (% vol)	Steady [2] CO (ppm)	Steady [2] H_2S (ppm)	Total gas flow rate (l/hr)	Peak CH_4 flow rate (l/hr)	Peak CO_2 flow rate (l/hr)	Atmospheric Pressure (mbar)	Water Depth to Cover (m bgl)	Base Depth (m bgl)	Water Level (m bgl)	Remarks
BH01	0.27	0.1	0.4	0.1	0.3	21.0	0.0	0.0	0.1	0.000	0.000	1001	1.01	2.26	0.74	
BH02	0.31	0.1	0.1	0.1	0.1	21.2	0.0	0.0	0.1	0.000	0.000	1002	1.14	2.23	0.83	
BH03	0.27	0.1	1.7	0.1	1.1	20.7	0.0	0.0	0.1	0.000	0.002	1002	0.89	2.20	0.62	
BH04	0.29	0.1	0.2	0.1	0.2	21.2	0.0	0.0	0.2	0.000	0.000	1003	0.65	3.20	0.36	
BH05	0.30	0.1	0.1	0.1	0.1	21.2	0.0	0.0	0.1	0.000	0.000	1003	0.68	2.23	0.38	

Background Gas Levels:

	CH_4 (%)	CO_2 (%)	O_2 (%)	Atmos. (mbar)
Before Monitoring	0.1	0.1	21.2	1001
After Monitoring	0.1	0.1	20.9	1003

Characteristic Gas Situation	
1	
2	
3	
4	

[1] The peak reading is the maximum recorded level during a monitoring event.

[2] The steady reading is the level which remained constant after approximately 1 minute.

WYG ENVIRONMENT

Geneva Building, Lakeview Drive, Sherwood Business Park, Annesley, Nottinghamshire, NG15 0ED
Tel: 01623 684550 Fax: 01623 684551

GROUNDWATER / GAS MONITORING RECORD SHEET

Client:	Homes England	**Job No.:** A090070-550		**Instruments Used:**	Dip Meter & Infra Red Gas Analyser
Project:	High Street, Shafton	**Date:** 27-Feb-19		**Monitored By:**	**SC**
Weather:	Sunny				

Installation No.	Elevation of cover (m agl)	Peak [1] CH_4 (% vol)	Peak [1] CO_2 (% vol)	Steady [2] CH_4 (% vol)	Steady [2] CO_2 (% vol)	Steady [2] O_2 (% vol)	Steady [2] CO (ppm)	Steady [2] H_2S (ppm)	Total gas flow rate (l/hr)	Peak CH_4 flow rate (l/hr)	Peak CO_2 flow rate (l/hr)	Atmospheric Pressure (mbar)	Water Depth to Cover (m bgl)	Base Depth (m bgl)	Water Level (m bgl)	Remarks
BH01	0.27	0.3	0.9	0.3	0.9	19.8	1.0	0.0	-2.7	-0.008	-0.024	1014	0.97	2.26	0.70	Purgered dry after monitoring
BH02	0.31	0.2	1.3	0.2	1.0	19.5	0.0	0.0	-0.1	0.000	-0.001	1016	1.14	2.23	0.83	"
BH03	0.28	0.1	1.6	0.1	0.7	20.1	0.0	0.0	0.1	0.000	0.002	1016	1.01	2.20	0.73	"
BH04	0.29	0.1	0.8	0.1	0.6	20.2	0.0	0.0	0.1	0.000	0.001	1016	0.78	3.22	0.49	"
BH05	0.31	0.1	1.3	0.1	0.8	19.4	0.0	0.0	-0.7	-0.001	-0.009	1016	1.08	2.22	0.77	"
Gas bung replaced and monitored after ~1hour																
BH01	0.27	0.2	0.1	0.2	0.1	20.3	0.0	0.0	0.2	0.000	0.000	1016	1.56	2.26	1.29	"
BH02	0.31	0.2	0.1	0.2	0.1	20.4	0.0	0.0	0.1	0.000	0.000	1016	1.88	2.23	1.57	"
BH03	0.28	0.1	0.2	0.1	0.1	19.9	0.0	0.0	0.1			1016	1.87	2.20	1.59	"
BH04	0.29	0.1	0.1	0.1	0.1	20.4	0.0	0.0	0.0	0.000	0.000	1016	2.21	3.22	1.92	"
BH05	0.31	0.1	0.2	0.1	0.2	20.2	0.0	0.0	-0.4			1016	1.26	2.22	0.95	"
Gas bung replaced and monitored after ~1hour																
BH01	0.27	0.1	0.1	0.1	0.1	19.9	0.0	0.0	0.0	0.000	0.000	1016	1.78	2.26	1.51	"
BH02	0.31	0.1	0.1	0.1	0.1	20.1	0.0	0.0	0.0			1016	1.97	2.23	1.66	"
BH03	0.28	0.1	0.2	0.1	0.1	20.4	0.0	0.0	0.0	0.000	0.000	1016	2.06	2.20	1.78	"
BH04	0.29	0.1	0.1	0.1	0.1	19.7	0.0	0.0	0.1			1016	2.56	3.22	2.27	"
BH05	0.31	0.1	0.1	0.1	0.1	20.1	0.0	0.0	-0.3			1016	1.36	2.22	1.05	"

Background Gas Levels:

	CH_4 (%)	CO_2 (%)	O_2 (%)	Atmos. (mbar)
Before Monitoring	0.1.	0.1	20.1	1014
After Monitoring	0.1	0.1	20.2	1014

Characteristic Gas Situation	
1	
2	
3	
4	

[1] The peak reading is the maximum recorded level during a monitoring event.

[2] The steady reading is the level which remained constant after approximately 1 minute.

WYG ENVIRONMENT

Geneva Building, Lakeview Drive, Sherwood Business Park, Annesley, Nottinghamshire, NG15 0ED
Tel: 01623 684550 Fax: 01623 684551

GROUNDWATER / GAS MONITORING RECORD SHEET

Client:	Homes England	**Job No.:** A090070-550		**Instruments Used:**	Dip Meter & Infra Red Gas Analyser
Project:	High Street, Shafton	**Date:** 15-Mar-19		**Monitored By:**	**SC**
Weather:	Windy, overcast				

Installation No.	Elevation of cover (m agl)	Peak [1] CH_4 (% vol)	Peak [1] CO_2 (% vol)	Steady [2] CH_4 (% vol)	Steady [2] CO_2 (% vol)	Steady [2] O_2 (% vol)	Steady [2] CO (ppm)	Steady [2] H_2S (ppm)	Total gas flow rate (l/hr)	Peak CH_4 flow rate (l/hr)	Peak CO_2 flow rate (l/hr)	Atmospheric Pressure (mbar)	Water Depth to Cover (m bgl)	Base Depth (m bgl)	Water Level (m bgl)	Remarks
BH01	0.27	0.1	1.2	0.0	0.7	20.0	1.0	0.0	7.4	0.007	0.089	989	0.75	2.25	0.48	
BH02	0.31	0.1	0.3	0.1	0.3	20.1	0.0	0.0	-0.1	0.000	0.000	989	0.89	2.23	0.58	
BH03	0.28	0.1	0.2	0.1	0.2	19.9	0.0	0.0	0.1	0.000	0.000	989	0.78	2.20	0.50	
BH04	0.29	0.1	0.1	0.1	0.1	20.4	0.0	0.0	0.3	0.000	0.000	989	0.55	3.22	0.26	
BH05	0.31	0.1	0.2	0.1	0.2	20.8	0.0	0.0	-0.7	-0.001	-0.001	988	0.59	2.22	0.28	

Background Gas Levels:

	CH_4 (%)	CO_2 (%)	O_2 (%)	Atmos. (mbar)
Before Monitoring	0.1.	0.1	21.4	989
After Monitoring	0.1	0.1	20.9	988

Characteristic Gas Situation	
1	
2	
3	
4	

[1] The peak reading is the maximum recorded level during a monitoring event.

[2] The steady reading is the level which remained constant after approximately 1 minute.