

CHORLTON VILLAS CHORLTON

FINAL PHASE 2 GEO-ENVIRONMENTAL INVESTIGATION, RISK ASSESSMENT AND REMEDIATION STRATEGY

Job Number: LKC 20 1012

Date: March 2021

Client: Step Places



INCREASING LAND VALUE

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LK Consult Document Verification			
Site Address	Chorlton Villas, Hardy Lane, Chorlton Cum Hardy, Manchester, M21 8DN		
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EXECUTIVE SUMMARY

Site Details

Site Location:	Western end of Chorlton Villas, Hardy Lane, Chorlton Cum Hardy, Manchester, M21 8DN (adjacent to Plot 20). Centred at approximate National Grid Reference 381518E 392596N.
Site Area:	550m ² .
Current Land Use:	Between 24.90 and 26.69 metres above ordnance datum (AOD). Site is approximately level.
Proposed Development:	The site is split into two areas. An area of open land is present in the north west of site comprising a grass covered mound with a footpath leading to the Metrolink line to the north of site. The area to the south east of site is located within a garden associated with occupied property of Chorlton Villas and is separated by a wooden fence.
Purpose of Report:	Contamination and Geotechnical Assessment.

Preliminary Risk Assessment

PRA Details:	Undertaken by LKC in April 2014. Ref: LKC 14 1022
History:	Orchard 1848-1977, Buildings 1981-2014.
Geology / Hydrogeology:	Flandrian Alluvium (Clay, silt, sand and gravel), Secondary A Aquifer over Anisian-Early Triassic Helsby Sandstone Formation (Sandstone, pebbly), Principal Aquifer.
Mining:	No recorded mining.
Relevant Environmental Setting:	Un-named watercourse on SW boundary of the site. Pollution incident 23m W by domestic/residential property in February 1997. Sewage was released into the River Mersey due to a blocked sewer. This was a Category 3 – Minor Incident. Onsite 'Hardy Farm Tip' Operational landfilling 1967 until 1974. Deposited waste included inert, industrial, commercial, household, special waste and liquid sludge. Not within Source Protection Zone.
Preliminary Conceptual Model: PL=Pollutant Linkage	PL1 Direct Contact (Human Health): Moderate Risk (asbestos, metals, PAHs and Petroleum Hydrocarbons). PL2 Inhalation of Vapours: Low Risk (volatile contaminants). PL3 Gas: High Risk (hazardous and ground gas). PL4 Controlled waters: Low Risk (mobile contaminants). PL5 Sulphate Attack: Moderate Risk (sulphate). PL6 Water Pipelines: Moderate Risk (organic contaminants). PL7 Phytotoxic: Low Risk (metals).
Development Works	Site subject to remediation and enabling works as part of the Chorlton Villas development. Included cut and fill exercise. Development phase remediation included gas protection measures and environmental capping layer in the majority of gardens.
Recommendations:	Site Investigation was recommended to further assess all the above pollutant linkages.

Ground Investigation Work Undertaken

Date of Investigation:	28 th January 2021
Intrusive Investigation Work Undertaken:	5no. window sample boreholes (WS101-WS105). 1no. hand excavated pit (HP101).
Monitoring Wells:	Installed in WS102 and WS103.
Soil Sampling:	4no. samples tested for metals, speciated PAHs, pH, sulphate, asbestos and SOM. 1no. sample tested for cyanide, phenol, TPHCWG, BTEX, 1no. sample tested for Waste Acceptance Criteria (WAC).

Monitoring:	Not undertaken. Referred to 2014 monitoring data.
In situ and Laboratory Geotechnical Testing:	SPTs, shear vanes, pocket penetrometer.

Ground Conditions and Geotechnical Assessment

Proposed Development	- Residential Property
General Ground conditions / Geotechnical Testing	- Based on WS101-WS105 and relevant information from the 2014 survey. - Maximum investigation depth 5.45mbgl. - Made Ground to 2.0-3.7mbgl. SPT N=4-9. - Sandy Clay encountered in WS101 and WS102 to between 4.0-4.4mbgl. SPTs N=11 at 3-4mbgl. - Localised organic clay (WS103 at 2.0-4.9mbgl) SPT N=11-17. - Glacial stiff gravelly Clay in WS101, WS102, WS104 and WS105 >5.45mbgl. SPTs N=9-34. - No bedrock encountered. - Groundwater struck at 4.0mbgl in WS101 and WS102.
Allowable Bearing Pressure	70-75kN/m² at 3.0 to 3.8mbgl in the very sandy clay. >200kN/m² in the unweathered sandstone (from 2014 survey).
Anticipated Foundation Type	- Foundations within the made ground are not recommended due the potential variability and unknown geotechnical properties. - The wider Chorlton Villas development had piled foundations. Initial assessment of underlying clay from in-situ and laboratory testing indicates the clay to be firm to very stiff consistency, high to very high strength with a low to medium risk of time dependent settlement. To mitigate the risk of time dependant and differential settlement piled foundations are recommended mobilising load supporting shear strength into the stiff to very stiff clays at depth for an allowable bearing pressure to be set at 150-250kN/m² to keep settlements within tolerance. - The appointed specialist piling contractor will be able to optimise pile design such as pile grouping per pile cap, pile diameter & pile spacing, installation methodology, pile cap settlement, and socket lengths to suit from the SI data. - Suspended floor slabs would be required in conjunction with the piled foundations.
Concrete Requirements	- Based on the site investigation test results the BRE Digest 2005 ¹ – DS-2 AC1s recommended.
Services	- Services – consideration to the presence of services running through the site. Services may need to re-routed.
Temporary support of excavation	- May be required within the deep made ground encountered on the site.
Plasticity	- Consideration will need to be given to the shrink / swell of the clay strata if it is to be used as founding strata, particularly where trees/hedges are present. Foundations may need to be deepened. A medium volume change potential has been calculated for the site.

Contamination Risk Assessment

The table below shows a summary of the risk assessments undertaken for each pollutant linkage, the revised conceptual model and recommendation for either remediation and / or further investigation.

¹ BRE (2005). "Concrete in Aggressive Ground." Special Digest 1.

Pollutant Linkage		Risk	Recommendations
1	Contaminants posing a risk to future site users via dermal contact, ingestion and inhalation (of soil, dust and vegetables).	Moderate	- Elevated PAHs identified across the site. - Recommendation: Remediation required in garden / soft landscaped areas.
2	Volatile contaminants posing a risk to future site users via the inhalation of vapours.	Low	- No elevated volatile contaminants across remainder of the site. - Recommendation: No remediation required.
3	Gas posing a risk to buildings and future site users via the migration of gas into building causing explosion and asphyxiation.	High	- Elevated methane and carbon dioxide. Organic soils present. - Recommendation: Gas protection measures in line with CS2 recommended.
4	Mobile contamination posing a risk to controlled waters via the migration through permeable strata.	Low	- Although slightly elevated PAHs identified, given the environmental settings and ground conditions encountered not considered to pose a significant risk to groundwater or surface water. - Recommendation: No remediation require
5	Sulphate posing a risk to building via direct contact (sulphate attack).	Moderate	- Elevated sulphate identified across the site (max. 730mg/l); therefore moderate risk considered appropriate. - Recommendation: Sulphate resistant concrete in line with DS-2 AC1s.
6	Organic contaminants posing a risk to water pipes.	Moderate	- No elevated contaminants across the site. - Recommendation: No remediation required. Standard PE pipe considered suitable.
7	Phytotoxic metals posing a risk to flora via root uptake.	Moderate / Low	- No elevated phytotoxic contaminants across the site. - Recommendation: No remediation required.

Waste Disposal

The site soils have been classified as non-hazardous waste.

A WAC test indicated the soil was within inert waste landfill acceptance criteria.

Recommendations and Remedial Strategy

The table below shows the remediation and validation requirements for the site. This information should be documented in a Site Completion Report for submission to the local authority.

PL	Remediation Requirements	Validation Requirements
ALL	<u>Earthworks Inspections / Unexpected Contamination</u> The relevant contractors should be briefed that during development works at the site should any unusual ground conditions and / or visual or olfactory evidence of contamination (including asbestos containing material) be encountered at the site, LKC and the Local Authority should be informed, and further assessment of the material may be required. Should asbestos be identified during groundworks, precautions should be taken to ensure the safety of the construction workers and nearby	Log of work undertaken including photographs. Details of any sampling undertaken and validation of any potential additional remedial work.

PL	Remediation Requirements	Validation Requirements
	land users. It would be advisable to introduce an asbestos management strategy in line with CIRIA C733 ² .	
1	<u>Environmental Cover System</u> As made ground is relatively deep, it is unlikely to be viable to remove the contaminated soils. Therefore, an environmental cover system is recommended. The environmental cover system should be as follows: Private Back Gardens: 600mm thick environmental cover system comprising: <u>Either</u> 100mm physical break layer (MOT type 1 material, 20-30mm, minimal fines) and at least 500mm comprising clean inert fill and sufficient topsoil for a growing medium. <u>Or</u> geotextile membrane and at least 600mm comprising clean inert fill and sufficient topsoil for a growing medium. Private Front Garden / Shared Landscaping: 300mm thick environmental cover system comprising: <u>Either</u> 100mm physical break layer (MOT type 1 material, 20-30mm, minimal fines) and at least 200mm comprising clean inert fill and sufficient topsoil for a growing medium. <u>Or</u> geotextile membrane and at least 300mm comprising clean inert fill and sufficient topsoil for a growing medium. The subsoil layer can be replaced by additional topsoil. A diagram of a typical environmental cover system is shown in Appendix G	Measuring depth of environmental cover system using a staff and providing photographic evidence. Photographic evidence of the granular physical break or geotextile layer will also be collected. Chemical validation of imported soils: See Table 9-2.
3	<u>Gas Protection Measures</u> In line with CS2 as per UK guidance^{3,4}. This is likely to / should include: • Passive subfloor or active subfloor ventilation system. • Methane and carbon dioxide resistant membrane installed as per manufacturer's instructions. • Ventilation of confined spaces within the building. • Well-constructed reinforced suspended, raft or cast in situ ground slab. • Minimum penetration of ground slab by services. • All joints and penetrations to be sealed. Depending on the type of building and foundation design the protection measures can vary. The gas protection measures will be detailed and approved with the Local Authority once the foundation design has been confirmed. LKC advise that final foundation details should be provided to the Local Authority for review.	Supply and review of foundation designs. Photographic evidence of sub-floor void, ventilation and suitably sealed gas membrane. Validation of gas protection measures should be in line with CIRIA 735⁵
5	<u>Sulphate Resistant Concrete</u> Sulphate Resistant Concrete in line with DS-2 AC-1s is recommended.	N/A

² CIRIA (2014). "Asbestos in Soil and Made Ground: A Guide to Understanding and Managing Risks". C733.

³ CIRIA (2007). "Assessing Risks Posed by Hazardous Ground Gases to Buildings." CIRIA C665

⁴ BSI (2015). "Code of Practice for the Design of Protective Measures for Methane and Carbon Dioxide Ground Gases for new buildings." BS8485:2015.

⁵ CIRIA (2014). "Good Practice on the Testing and Verification of Protection Systems for Building Against Hazardous Ground Gas". CIRIA C735.

PL	Remediation Requirements	Validation Requirements
2,4,6,7	No remediation considered necessary for PL2 (vapours), PL4 (Controlled Waters), PL6 (Potable Water Pipes) and PL7 (Phytotoxicity).	N/A
<u>Re-use of site won material</u> To ensure material is compliant with appropriate waste regulations, any site won material re-used onsite should be in recourse to appropriate exemptions. A U1 and T5 exemption should be registered. This will allow the following to be used onsite or brought in for use onsite (refer to guidance for types of waste that can be used ⁶): 5,000 tonnes (c. 2,500m³) <u>treatment</u> of crushed concrete / stone. 1,000 tonnes (c. 500³) <u>use of</u> non-hazardous soil 5,000 tonnes (c. 2,500m³) <u>use of</u> clays, sand, gravel, brick, concrete, stone etc. 50,000 tonnes (c. 25,000m³) <u>use of</u> bituminous material to be used in roadways. A Materials Management Plan (MMP) with recourse to the CL:AIRE Code of Practice may be required if volumes exceed exemption limits. This must be registered before material movement starts onsite. If an MMP is required, this needs to be registered by a Qualified Person (QP) and there must be 'certainty of use' for any material re-used onsite or exported to site to ensure there is no 'sham recovery'. For all the above material will need to be tested at the rate and analytical suites presented in Table 9-2.		
<u>Health and Safety Considerations</u> In working with, removing or treating any contaminating material it is important that any potential risks associated with the actual site works are mitigated by good environmental management of the site during the remedial phases. Standard health and safety precautions (as per HSE guidance⁷) should be adopted by all workers involved with site enabling and construction works.		
<u>Piling in Contaminated Land</u> It is understood that the building will be piled into the bedrock. This may provide a preferential pathway for contaminants to the Principal Aquifer. Once the method of piling has been determined, good practice for the drilling of piles on contaminated sites should be adhered to, such as guidance provided by the Environment Agency⁸.		

The remediation recommended in the table above should be validated to ensure it has been carried out appropriately. This should be documented in a Completion/Validation Report and submitted to the local authority for completion.

⁶ <https://www.gov.uk/guidance/waste-exemptions-using-waste>

⁷ HSE (1991). "Protection of Workers and the General Public During Development of Contaminated Land" London HMSO.

⁸ Environment Agency (2001) Piling and Penetrative Ground Improvement Methods on Land Affected by Contamination: Guidance on Pollution Prevention.

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Figure 1:	Site Location and Boundary Plan
Figure 2:	Proposed Development Plan
Figure 3:	Site Investigation Location Plan

APPENDICES

Appendix A:	Risk Matrix
Appendix B:	Profile Logs
Appendix C:	Certificate of Analysis - Soil
Appendix D:	Generic Assessment Criteria Values
Appendix E:	Gas Monitoring Results (2014)
Appendix F:	Haz Waste Online Output Sheets
Appendix G:	Typical Environmental Cover System

1 Introduction

1.1 Background

LK Consult Ltd (LKC) has been commissioned by Step Places to carry out a Phase 2 Geo-Environmental Investigation, Risk Assessment and Remediation Strategy for Chorlton Villas. The investigation was undertaken in support of a planning application for the construction of a single dwelling adjacent west of the existing Plot 20.

The following work has previously been undertaken on the Chorlton Villas development:

- Preliminary Risk Assessment (PRA) report, undertaken by LKC (Ref: LKC 14 1022, dated 14th April 2014).
- Report on Geo-Environmental Ground Investigation Works, undertaken by The Land Consultancy Limited (Ref: L0659 SFK (TLC676) rep AP First Step 140814 dated August 2014).
- LKC 'Pre-Construction Remediation Strategy' – report ref. LKC 14 1022-03, dated January 2015.
- LKC 'Pre-Construction Remediation Validation report and On-Construction Remediation Strategy' – report ref. LKC 15 1165-01 R1, dated May 2015.
- LKC Plot completion Reports Plots 1 to 28 inclusive and Central Area validation report (large landscaped area in the centre of the site).
- LKC Allotment Validation Report 29th March 2017.

The area investigated as part of this report forms part of the previous investigations listed above.

This investigation has been undertaken to confirm the ground conditions below the site and to allow a contamination and geotechnical assessment to be undertaken.

1.2 Site Details

A summary of the site details is presented in Table 1-1. Figure 1 indicates the site location and boundary. Figure 2 indicates the proposed development.

Location	Western end of Chorlton Villas, Hardy Lane, Chorlton Cum Hardy, Manchester, M21 8DN. Centred at approximate National Grid Reference 381518E 392596N.
Area	Approx. 550m ² .
Topography	Between 24.90 and 26.69 metres above ordnance datum (AOD). Site is approximately level.
Land Use	The site is split into two areas. An area of open land is present in the north west of site comprising a grass covered mound beyond which is a footpath leading to the Metrolink line to the north of site. The south eastern area of the site is currently used as a garden by adjacent occupied Plot 20. The site is split by a wooden fence.
Proposed Development	Single residential dwelling with Gardens.

Table 1-1. Summary of site details.

2 Previous Work

2.1 Summary of Existing Information

A PRA report (Ref: CL-602-CL1502-01, dated 14th April 2014) has previously been undertaken by LKC and is summarised in Sections 2.2 and 2.3.

This also includes a summary of a previous intrusive investigation undertaken by The Land Consultancy Limited (Section 2.4) and the subsequent site remediation and validation works (Section 2.5). A contemporary site reconnaissance is provided in Section 2.6.

The conceptual model (Section 2.7) has been updated to be in line with LKC current risk assessment methodology.

2.2 Site History

The site history is summarised in Table 2-1.

Site Features	Location	Map Dates Present	Comments
Orchard	Centre and East	1848-1977	-No longer identified on 1981 mapping, replaced by buildings.
Cutting/Embankment	South	1894-2014	
Undifferentiated Buildings	Centre and East	1981-2014	Walkover confirms student accommodation buildings.
Watercourse	South west	1989-2014	-Culvert formerly adjacent S appears onsite.
Surrounding Area Features	Distance/ Location	Map Dates Present	Comments
Orchard	Adjacent N	1848-1977	-Associated with Hardy Farm. -No longer identified on 1981 mapping.
Culvert	Adjacent S	1848-2014	-Possibly still present.
Hardy Farm (Buildings)	25m N	1848-1977	-With associated glass houses. -No longer identified on 1981 mapping.
Well	25m N	1848 only	-Associated with Hardy Farm. -No longer identified on 1894 mapping.
Cutting/Embankment	Adjacent S	1894-2014	-Running south then east.
Pond	70m E	1894 only	-No longer identified on 1907 mapping.
Golf Course	Adjacent S	1907-2014	
Builder's Yard	10m N	1955-1966	-No longer identified on 1981 mapping, replaced by housing.
Sports Centre	60m NW	1977-2014	
Pond	130m SW	1992-2014	
Pond	220m SE	1992-2014	

Table 2-1: Summary of significant historical features.

2.3 Environmental Setting

The environmental setting is summarised in Table 2-2.

Categories			Details
Geology	Artificial		- Made Ground on the site due to site levelling.
	Superficial		- Flandrian Alluvium (Clay, silt, sand and gravel).
	Bedrock		- Anisian-Early Triassic Helsby Sandstone Formation (Sandstone, pebbly) - No Faulting within 500m.
Hydro-geology	Aquifer Designation	Superficial	- Secondary A.
		Bedrock	- Principal.
	Source Protection Zone (SPZ)		- Site is not within an SPZ.
	Groundwater Abstractions		- None within 500m.
Hydrology	Nearest Surface Water		- Un-named watercourse onsite (south west).
	Water Quality Data		- No water quality data.
	Flooding		- At risk of flooding from rivers of the sea without defences.
	Surface Water Abstractions		- None within 500m.
	Discharge Consent		- 12 within 1km. - Nearest being 384m W by Allied Domecq Leisure Ltd discharging final/treated effluent into the River Mersey. This consent has been revoked.
	Pollution Incidents		- Two within 250m. -
Minerals / Mining	Coal Mining Development High Risk Area (DHRA)		- Not within DHRA.
	Coal Report		- Not within coal reporting area.
	Surface Extractions		- No mineral extraction within 500m of the site.
	Cheshire Brine Compensation District		- Not within site area.
Ground Stability ¹ (on-site)	Collapsible Ground		- Very Low.
	Compressible Ground		- Moderate (West).
	Ground Dissolution		- No Hazard.
	Landslide Ground		- Very Low.
	Running Sand Ground		- Low (West).
	Shrinking or Swelling Clay		- Very Low.
Landfill sites	Known/Registered		- Within the boundary of ‘Hardy Farm Tip’ Operational 1967 until 1974. Deposited waste included inert, industrial, commercial, household, special waste and liquid sludge.
	Potential		- Well 25m N potentially infilled by 1894 mapping. - Pond 70m E potentially infilled by 1907 mapping.
Radon			- Probability of <1% of homes above Action Level. No further action required.
Designated Sites			- Adopted Green Belt onsite (South).
Contemporary Trade Directory			- One within 250m. - 171m N – SCP Properties (Damp Course Manufacturers).
Fuel Station Entries			- None within 100m.

Table 2-2: Summary of the environmental setting.

2.4 Previous Investigations

An intrusive investigation was carried out in July 2014. The investigation included:

- 4no. cable tool percussion boreholes.
- 11no. trial pits.
- 5no. window sample boreholes.
- 15no. hand dug pits.
- Soil and Groundwater sampling.
- Gas Monitoring (6 visits over 3 months).

Ground conditions comprised within the nearest exploratory holes:

- Made ground to 2.4mbgl (WS3)- 6.6mbgl (BH3) with variable composition which comprised of variable proportions of clay, silt, sand, gravel, cobbles, boulders and occasional pottery, coal and cinders (asbestos identified TP3).
- Alluvium deposits in the west (beneath the study site) comprised of very loose sand and typically very soft clays, and was locally very organic rich. Thin peat bands were described at several locations with occasional thin gravelly sand layers. Depths varied from 4.6-5.45mbgl.
- Slightly sandy gravelly CLAY to 10.9mbgl.
- Weathered reddish brown Sandstone, >11.50mbgl recovered as clayey silty fine to medium grained Sand.

Groundwater was encountered within the made ground between depths of 0.5mbgl to 1.7mbgl.

Soil results were compared to SGVs and ATKINSs (editions applicable in 2014). Elevated lead and benzo(a)pyrene were identified above assessment criteria.

Slightly elevated TPH was identified in the groundwater however were not considered to pose a significant risk.

Gas monitoring recorded maximum concentrations of carbon dioxide and methane as 35.2%v/v and 11.6%v/v respectively. Maximum flow was recorded as 0.1l/hr. A worst-case gas screening value of 0.0352l/hr was calculated, characterising the site as Characteristic Situation 2 / Amber.

Remediation was recommended with respect to the soil contamination. A 600mm environmental cover system was recommended in garden areas.

2.5 Site Remediation

The pre-construction enabling and remediation works for the wider site included *inter alia* the demolition of site buildings, removal of in ground obstructions, a cut and fill exercise and provision of a fully enabled site ready for development.

- Nominal 150mm validated topsoil required in the garden areas to Plots 1-5 and Plots 23-28.
- 600mm clean capping layer with Hi-Viz geotextile membrane required in garden areas in Plots 6-22.
- Testing of imported material for use in the soil capping layers.
- Installation of gas protection measures LKC recommended CS2 / Amber 2 as per UK guidance^{9,10}.
- Installation of standard PE pipe for potable water supplies.

⁹ CIRIA (2007). "Assessing Risks Posed by Hazardous Ground Gases to Buildings." CIRIA C665.

¹⁰ BSI (2007). "Code of Practice for the Characterisation and Remediation from Ground Gas in Affected Developments." BS8485:2007.

The study site is adjacent to Plot 20.

2.6 Site Reconnaissance

From the site investigation carried out on 23rd February 2021.

Relevant photographs are provided in Plate 2-1.

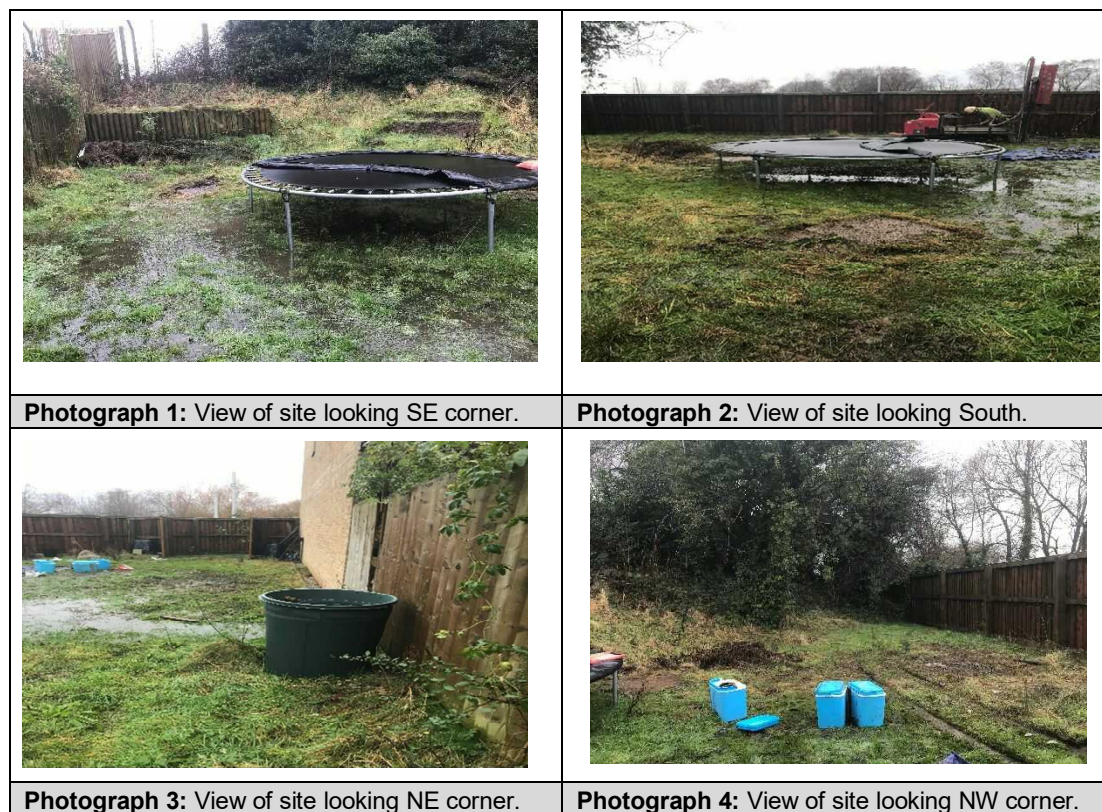


Plate 2-1. Site photographs.

2.7 Contamination Sources / Pathways and Receptors

Following a review of the available information including the available testing results and enabling and remediation works the viable potential contamination sources are detailed in Table 2-3.

Source	Contaminants
On site made ground associated with cut and fill enabling works.	- Asbestos Containing Material (ACM). - lead and PAHs.
Onsite Made Ground / construction layers which may have been imported post development	- Heavy metals, sulphates, TPH and PAHs ¹¹ .
Surrounding Area	- No significant contamination sources within influencing distance of the site.
Made ground, landfill and underlying / adjacent Peat.	- Ground gas: elevated carbon dioxide and methane measured on site.

Table 2-3: Potential contamination sources.

¹¹ Defra (2002). "Potential Contaminants for the Assessment of Land." R&D Publication CLR 8.

Potential receptors are detailed in Table 2-4.

Receptors	
Human Health	- Future site users (including residents, visitors and site workers). - Offsite land users.
Controlled Waters	- Secondary A Aquifer. - Pond 100m southwest, Sutton Brook 50m east and Sutton Brook 250m east are not considered to be significant receptors given the distance from the site.
Buildings and structures.	
Potable water pipes.	
Flora within future gardens/landscaping.	

Table 2-4: Potential receptors.

Potential pathways are detailed in Table 2-5.

Pathways		
Soil	Human Health ¹² (residential land use: house with private garden)	- Ingestion of soil. - Ingestion of soil-derived indoor dust. - Ingestion of contaminated vegetables. - Ingestion of soil attached to vegetables. - Dermal contact with soil. - Dermal contact with soil-derived indoor dust. - Inhalation of soil-derived outdoor dust. - Inhalation of soil-derived indoor dust. - Inhalation of vapours outside. - Inhalation of vapours inside.
		- Windblown dust / fibres to adjacent receptors.
		- Direct contact with receptors (building foundations, services).
		- Root uptake.
Water		- Site is relatively flat and grassed; therefore, surface run-off will be limited.
		- Infiltration into the ground, through potentially contaminated material (contamination possibly going into solution).
		- Migration through potentially permeable strata and preferential pathways.
		- Superficial (Till) likely to be low permeability.
Gas		- Bedrock (sandstone) likely to be relatively permeable.
		- No preferential pathways are anticipated.
		- Migration through potentially permeable strata and preferential pathways.
		- Superficial (Alluvium) with localised peat layers set within cohesive materials likely to be low permeability.
		- Bedrock (sandstone) likely to be relatively permeable.
		- No preferential pathways are anticipated.
		- Migration into buildings (e.g. via services) and accumulation of gases in confined spaces (potentially causing explosion if methane is present).

Table 2-5: Potential pathways.

2.8 LKC Preliminary Contamination Conceptual Model

The preliminary contamination conceptual model in the original report has been updated to be in line with LKC current risk assessment methodology (detailed below). The pollutant linkage numbers remain the same; however, the linkage is assessed based on risk rather than complete / incomplete.

¹² EA (2008). "Updated Technical Background to the CLEA Model." Science Report – SC050021/SR3.

The preliminary contamination conceptual model using contaminant-pathway-receptor linkages based on guidance in LCRM¹³ has been summarised in Table 2-6.

The aim of the conceptual model is to provide a preliminary assessment of the likelihood of a pollutant linkage for each potential combination of contaminant, pathway and receptor. A conceptual model can be used to make an informed decision on the contamination risks associated with the site and determine what site investigation work is required.

The preliminary contamination conceptual model has identified seven generic potential pollutant linkages. Each linkage is described along with an assessment of the risk based upon guidance on probabilities and consequences outlined in CIRIA C552¹⁴.

In order to assess the potential risk for each pollutant linkage, an assessment of the magnitude of the potential consequence (severity) of the risk occurring and the magnitude of the probability (likelihood) of the risk occurring has been considered and classified. This is based on the guidance provided in CIRIA C552 and further details including a risk matrix is provided in Appendix A.

Where LKC identified a low to very low risk, limited intrusive investigation work, a watching brief (during construction work) or no investigation work will be recommended. This will be dependent on the nature of the site and the proposed development.

Where the risk falls into the moderate/low risk, LKC will undertake an assessment to establish what category the pollutant linkage will fall into (i.e. moderate or low risk will be chosen).

Where LKC identifies a moderate or higher risk, intrusive work or precautionary remedial measures will be recommended.

The conceptual model is based on the future use of the site (post development), in line with proposed development scheme.

¹³ Land Contamination Risk Management (LCRM) <https://www.gov.uk/government/publications/land-contamination-risk-management-lcrm>

¹⁴ CIRIA (2001). "Contaminated land risk assessment: A guide to good practice". C552.

Pollutant Linkage	Pathway	Receptor	Contaminant (source)	Probability	Consequence	Risk	Assessment and Recommendations
PL1	-Dermal contact. -Inhalation of soil, fibres and dust. -Ingestion of soils, dust, vegetables, soil attached to vegetables. -Windblown dust.	-Current residents -Future residents -Future site users. -Offsite receptors.	-ACM -Heavy metals -PAHs -Hydrocarbons (made ground / imported ground).	Likely	Medium	Moderate	-Likely probability given history of site, previous soil testing and enabling / remediation works. -Recommendation: Intrusive investigation required. TPHCWG testing required if evidence of hydrocarbons identified in the ground.
PL2	-Inhalation of vapours. -Migration through permeable strata and preferential pathways.	-Current residents -Future site users. -Offsite receptors.	-Volatile Contaminants such as hydrocarbons, (made ground).	Unlikely	Medium	Low	-Unlikely probability as no elevated contamination source is only from a domestic garage therefore significant leakages / noted in previous investigation -Recommendation: No testing required unless evidence of volatile contaminants identified in the ground.
PL3	-Inhalation of gas. -Migration through permeable strata and preferential pathways. -Explosion in confined spaces.	-Current residents -Future site users. -Buildings. -Offsite land users.	-Methane, carbon dioxide. (landfill, underlying Peat)	Likely	Severe	High	-Likely probability due to elevated concentrations of methane and carbon dioxide previously encountered on site. -Recommendation: Gas protection measures required.
PL4	-Surface Run-off. -Migration through permeable strata and preferential pathways -Perched waters migration.	-Groundwater (Principal Aquifer).	-Mobile contaminants such as metals, PAHs, hydrocarbons, volatile compounds (made ground / imported ground),	Unlikely	Medium	Low	-Unlikely probability as no viable mobile contamination source identified on site. -Recommendation: No testing required unless evidence of significant mobile contamination is identified in the soil.
PL5	-Sulphate attack on concrete.	-Building structure.	-Sulphate (made ground / imported ground).	Likely	Mild	Moderate / Low	-Likely probability as made ground on site likely to include demolition materials and ash, which may be in contact with concrete used in future buildings. -Moderate risk assumed at this stage. -Recommendation: Intrusive investigation required as part of PL1.
PL6	-Ingestion of tainted water supply.	-Future site users. -Water pipes.	-Organic Contaminants such as hydrocarbons, (made ground).	Low Likelihood	Medium	Moderate / Low	-Low probability as significant contamination not anticipated at pipeline depth (0.75-1.35m). -Risk is considered moderate at this stage due to unknown depth of made ground. -Recommendation: Sampling required if made ground present at pipeline installation depths.
PL7	-Direct Contact (plant uptake).	-Flora.	-Phytotoxic Contaminants (made ground).	Low Likelihood	Mild	Low	-Low probability as contamination considered possible, which may be taken up by flora in soft landscaping / gardens. -Recommendation: Investigation work as part of PL1.

Table 2-6. Preliminary Contamination Conceptual Model.

3 Ground Investigation

3.1 Site Investigation Design and Methodology

In order to assess the ground conditions at the site and to investigate the potential pollutant linkages identified in the preliminary contamination conceptual model an intrusive investigation was undertaken.

The investigation was carried out on 28th January 2021 and comprised the following:

- 5no. window sample boreholes drilled to 4.1-4.45 metres below ground level (mbgl) (ref. WS101 to WS105).
- 1no. hand pit (using hand auger / spade) excavated to 0.60mbgl (ref. HD101).

All window sample holes encountered natural ground beneath made ground varying between 2.0 to 3.8mbgl.

All site investigation locations are shown in Figure 3.

The number of site investigation points corresponds to approximately one location per 10m square centres. This is considered to be a conservative sampling density and is in line with BS10175¹⁵ for a 'main investigation'.

All profile logs are provided in Appendix B and are in line with BS14688-1¹⁶ and BS5930¹⁷.

3.2 Well Installations

2no. boreholes (WS102 and WS103) were installed with monitoring wells should gas and groundwater monitoring, groundwater sampling and falling head tests be required. Monitoring wells were installed in accordance with BS10175 and CIRIA C665¹⁸ and generally comprised approximately 1m plain pipe over a length of slotted pipe surrounded by pea gravel and sealed at the top with bentonite and concrete.

Well installation details are provided in Profile Logs in Appendix B.

3.3 Sampling Protocol

3.3.1 Soil Sampling (Contamination)

Standard sampling protocol and preservation of samples was undertaken as described in the EA guidance on site investigation¹⁹.

Soil was collected for onsite testing. A plastic zip bag was half filled with soil allowing a suitably sized headspace. The bag was sealed and stored for at least 20 minutes before being tested for total volatile organic compounds (TVOCs) using a PhoCheck photoionisation detector (PID). Results of the PID readings are presented on the profile logs (Appendix B). The on-site monitoring was carried out in line CIRIA C665²⁰ to aid in screening samples for volatile analysis.

¹⁵ British Standard (2017). "Investigation of Potentially Contaminated Sites – Code of Practice." BS10175:2017.

¹⁶ British Standards (2002) Geotechnical investigation and testing – Identification and Classification of Soil. Part 1: Identification and description. BS EN ISO 14688-1:2002.

¹⁷ British Standard (2015). "Code of Practice for Ground Investigations". BS5930:2015.

¹⁸ CIRIA (2007). "Assessing Risks Posed by Hazardous Ground Gases to Buildings." CIRIA C665.

¹⁹ EA (2000). "Technical Aspects of Site Investigation. Volumes 1 & 2 Text Supplements Research and Development Technical Report." P5-065/Tr.

²⁰ CIRIA (2007). "Assessing Risks Posed by Hazardous Ground Gases to Buildings." CIRIA C665.

Soil samples of approximately 500g were recovered in amber jars, amber vials for volatile analysis and plastic tubs. All the samples were labelled and stored in cool boxes prior to being collected by courier at the end of the day for delivery to the Chemtest laboratory in Newmarket for chemical testing. If collection was not possible the same day then samples were stored in the sample storage fridge at the LK Group offices below 4°C. Samples were tracked using appropriate Chain of Custody forms provided by Chemtest.

Many of the contamination tests are UKAS or MCERTS accredited and further details are given in the Certificate of Analysis presented in Appendix C. Table 3-2 shows the soil testing undertaken.

Suites and Contaminants	No. Samples	Location & Depth	Justification
Metals / metalloids, pH, water soluble sulphate, speciated PAHs, SOM and asbestos screen.	3	WS102 0.3-0.8m WS103 0.2-0.6m HD101 0.1-0.5m	A basic suite with a broad selection of contaminants tested on samples across the site where no significant evidence of contamination was identified (with the exception of occasional ash and coal) and no TVOCs identified from the PID tests.
Metals / metalloids, pH, water soluble sulphate, cyanide suite, phenol, TPHCWG, BTEX, MTBE, speciated PAHs, SOM and asbestos screen.	1	WS104 0.1-0.3m	Although no visual/olfactory evidence, organic made ground was identified in WS104 0.1-0.3m therefore detailed suite undertaken to confirm the contamination risk.
Waste Acceptance Criteria (WAC)	1	WS104 0.1-0.3m	To inform the soil disposal off site.

Table 3-2. Summary of soil sample testing undertaken.

Notes:

Metal/metalloids=arsenic, cadmium, chromium, (total and hexavalent), copper, lead, mercury, nickel, selenium, vanadium, zinc and boron; TPHCWG=carbon banded and aromatic/aliphatic split petroleum hydrocarbons; PAH=polycyclic aromatic hydrocarbons, BTEX=benzene, toluene, ethylbenzene and xylenes; MTBE=Methyl tert-butyl ether, VOC=Volatile organic Compounds, SVOC= Semi Volatile Organic Compounds, PCB=polychlorinated biphenyls, SOM=Soil Organic Matter.

3.3.2 Water Sampling / Leaching Testing

Groundwater sampling / leaching testing was not carried out as part of this investigation.

A low risk was identified in the preliminary contamination conceptual model for controlled waters (pollutant linkage 4) and further action was only recommended if significant soil contamination was identified on site. Based on the ground conditions encountered, LKC did not consider testing to be required. This is discussed further in Section 6.4.

3.4 Gas Monitoring

Gas monitoring was not carried out as part of this investigation.

Although a high risk was identified in the preliminary contamination conceptual model for gas (pollutant linkage 3), precautionary gas protection measures are proposed to be installed in the building, based on the reported monitoring results within the 2014

site investigation findings, which used gas-clam automated reading devices and spot check readings.

The findings of the 2014 site investigation may be summarised as:

- Maximum methane and carbon dioxide concentrations of 35.2 and 11.6% v/v respectively have been recorded from the site.
- Elevated methane concentrations were encountered at one location only (WS4).
- Carbon monoxide concentrations of up to 7ppm have been measured. Marked oxygen depletions have been recorded locally across the site.
- Gas flow rates have remained below detection limits (0.1l/hr), for those installations which have not been affected by rising groundwater levels within sealed well casing.
- Ground gas flux recharge values of up to 0.105l/hr have been recorded.

The principal sources of the methane, carbon dioxide and carbon monoxide recorded are likely to be biodegradation of finely disseminated organic matter and wood fragments contained within the Made Ground beneath the site, as well as organic rich soil layers within the Alluvium (e.g. peat). This is discussed further in Section 6.3.

3.5 Geotechnical Testing

3.5.1 *In-situ Onsite Geotechnical Testing*

In-situ geotechnical tests were performed in the boreholes to further characterise the sub-soil conditions. The following tests were undertaken:

- Standard Penetration Tests (SPTs) were performed in the window sample boreholes and cable percussion boreholes at approximately 1m intervals, generally within the natural strata.
- Shear Vane and pocket penetrometer tests (giving undrained shear strength) were performed in the window sample boreholes (to a maximum depth of 3mbgl) and trial pits, within the natural clay strata.

Shear vanes tests were not always possible due to the friable or gravel rich nature of some of the clay deposits.

The SPT and pocket penetrometer readings are provided within the profile logs (Appendix B).

4 Ground Conditions

4.1 Geology – Generalised Sequence

The ground conditions beneath the site comprised made ground underlain by firm to stiff medium high strength natural clay.

Variations from this are soft to firm clay from 3.8mbgl in WS105. The clay in WS103 was described as slightly organic in WS103 from 2.0-4.9mbgl.

4.2 Groundwater

4.2.1 Groundwater Levels

Groundwater strikes were recorded during the investigation.

Results are summarised in Table 4-1.

BH/TP	Water Strike Depths (mbgl)	Well Response Zone (mbgl)	Monitoring Depths (mbgl)			Sample Taken?	Evidence of Contam?
			Min	Max	Base		
WS101	4.0	-					
WS102	4.0	1.0-4.5 (MG/C)				N	N
WS103	Dry	1.0-3.0 (MG/OC)				N	N
WS104	Dry	-					
WS105	Dry	-					
TP3	Dry	-	-	-	-	-	-
BH3	8.3	1.0-7.0 (MG/C)	2.76	3.07	7.0	N	N
WS3	1.7	1.0-5.0 (MGC)	2.30	2.34	5.0	N	N

Table 4-1: Summary of water strike depths within boreholes and trial pits.

Response Zones:

MG=Made Ground; SG=Sands and Gravel; S=Sand; OC=Organic Clay; C=Clay; P=Peat

4.2.2 Standard Penetration Tests

In-situ standard penetration tests (SPTs) were undertaken, predominantly in the natural ground. The results are summarised in Table 4-2 and provided within the profile logs in Appendix B.

Approximate Depth (mbgl)	SPT 'N' Values						
	WS101	WS102	WS103	WS104	WS105	WS3 (2014)	BH3 (2014)
1.2-2	8 (MG)	7 (MG)	9 (MG)	9 (MG)	7 (MG)	3 (MG)	11 (MG)
2-3	4 (MG)	6 (MG)	13 (MG/OC)	9 (MG/C)	7 (MG)	0 (MG)	17 (MG)
3-4	4 (MG/C)	8 (MG)	11 (OC)	11 (C)	8 (MG)	1 (C)	11 (MG)
4-5	23 (C)	26 (C)	17 (OC)	12 (C)	9 (C)	1 (S)	9 (MG)
5-6	33 (C)	33 (C)	25 (C)	14 (C)	9 (C)	34 (S/S)	9 (MG)
6-7	-	-	-	-	-	-	17 (MG/C)
7-8	-	-	-	-	-	-	-
8-9	-	-	-	-	-	-	-
9-10	-	-	-	-	-	-	19 (C)
10-11	-	-	-	-	-	-	50/40mm (S/S)
GW Level	4.0	4.0	4.0	Dry	Dry	1.7	8.3

Table 4-2: Summary of SPT (N) values.

Notes:

S/S = Sandstone; SG=Sands and Gravel; S=Sand; C=Clay; P=Peat; OC=Organic Clay.
Groundwater level based on strikes during investigation and monitoring data.

4.2.3 Shear Vanes/ Pocket Penetrometer

Hand shear vane and Pocket penetrometer readings, recording undrained shear strength (USS), were taken within the clay strata. The results are summarised in Table 4-3 and provided within the profile logs in Appendix B.

Approximate Depth (mbgl)	Average Undrained Shear Strength (kN/m ²)						
	WS101	WS102	WS103	WS104	WS105	WS3 (2014)	BH3 (2014)
1-2	12.26	-	-	-	-	-	-
2-3	24.53	-	36.79	42.91	12.26	-	-
3-4	57.23	36.78	85.84	61.31	36.79	-	-
4-5	73.58	85.84	79.71	85.83	36.79	45 (4.60m)	-
5-6	79.7	98.1	85.84	79.7	30.65	41 (4.80m)	-
6.80	-	-	-	-	-	-	60
8.05	-	-	-	-	-	-	64
8.50	-	-	-	-	-	-	44
GW Level	4.0	4.0	4.0	Dry	Dry	1.7	8.3

Table 4-3: Summary of average hand shear vane readings.

Notes:

Groundwater level based on strikes during investigation and monitoring data.

Unconfined Compressive Strength readings can be influenced by coarse material including coarse silt.

4.3 Geotechnical Laboratory Testing

The following section offers a summary of site representative sampling test results extracted from the 2014 SI report, by TLC.

4.3.1 Atterberg Limits

From the Site Investigation 2014 some 10no. representative samples of natural clay encountered within the Alluvium and Glacial Clays (Till) and were subjected to Atterberg Limits (plasticity) and Moisture Content testing. The results are summarised in Table 4-4.

Table 4-4 also includes the modified plasticity index as detailed in Chapter 4.2-D5 of the NHBC standards (modified plasticity index = plasticity index x % less than 425µm sieve / 100%).

Summarised Material values	Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)	Modified Plasticity Index (%)
Alluvium	22 & 46	34 & 64	18 & 36	16 & 26	90 & 100	14.4 & 26
Glacial Clay (Till)	12 & 25	31 & 50	12 & 25	17 & 29	88 & 97	15 & 28

Table 4-4: Summary of site representative plasticity index testing from 2014.

The modified plasticity index is between 14% and 28%. This characterises the clay as having a low to medium volume change potential.

4.3.2 Sulphate and pH

Water soluble sulphate and pH tests were carried out on the site soils.

pH values ranged between 9.3 and 10.6 and soluble sulphate results ranged between 0.046 and 0.73g/l.

5 Geotechnical Assessment

Final foundation design will need to be confirmed once loadings of proposed buildings are known and details of ground works (i.e. potential cut and fill exercises) are known.

A preliminary foundation assessment is summarised in Table 5-1.

Proposed Development	- Residential Property
General Ground conditions / Geotechnical Testing	- Based on WS101-WS105 and relevant information from the 2014 survey. - Maximum investigation depth 5.45mbgl. - Made Ground to 2.0-3.7mbgl. SPT N=4-9. - Sandy Clay encountered in WS101 and WS102 to between 4.0-4.4mbgl. SPTs N=11 at 3-4mbgl. - Localised organic clay (WS103 at 2.0-4.9mbgl) SPT N=11-17. - Glacial stiff gravelly Clay in WS101, WS102, WS104 and WS105 >5.45mbgl. SPTs N=9-34. - No bedrock encountered. - Groundwater struck at 4.0mbgl in WS101 and WS102.
Allowable Bearing Pressure	70-75kN/m² at 3.0 to 3.8mbgl in the very sandy clay. >200kN/m² in the unweathered sandstone (from 2014 survey).
Anticipated Foundation Type	- Foundations within the made ground are not recommended due the potential variability and unknown geotechnical properties. - The wider Chorlton Villas development had piled foundations. Initial assessment of underlying clay from in-situ and laboratory testing indicates the clay to be firm to very stiff consistency, high to very high strength with a low to medium risk of time dependent settlement. To mitigate the risk of time dependant and differential settlement piled foundations are recommended mobilising load supporting shear strength into the stiff to very stiff clays at depth for an allowable bearing pressure to be set at 150-250kN/m² to keep settlements within tolerance. - The appointed specialist piling contractor will be able to optimise pile design such as pile grouping per pile cap, pile diameter & pile spacing, installation methodology, pile cap settlement, and socket lengths to suit from the SI data. - Suspended floor slabs would be required in conjunction with the piled foundations.
Concrete Requirements	- Based on the site investigation test results the BRE Digest 2005 ²¹ – DS-2 AC1s recommended.
Services	- Services – consideration to the presence of services running through the site. Services may need to re-routed.
Temporary support of excavation	- May be required within the deep made ground encountered on the site.
Plasticity	- Consideration will need to be given to the shrink / swell of the clay strata if it is to be used as founding strata, particularly where trees/hedges are present. Foundations may need to be deepened. A medium volume change potential has been calculated for the site.

Table 5-1: Preliminary Geotechnical assessment summary.

²¹ BRE (2005). "Concrete in Aggressive Ground." Special Digest 1.

6 Generic Risk Assessment

6.1 Introduction

Current good practice requires that the findings from a site investigation should be evaluated on a site-specific basis, using a risk-based approach. Risk assessment involves identification and evaluation of the hazards presented by the concentrations of contaminants measured followed by an evaluation of the risks which are associated with these hazards (LMRM²²). Information gathered from the risk assessment has been collated in the revised contamination conceptual model in Section 6.6.

6.2 Soil Risk Assessment

6.2.1 Methodology

With regards to the soil risk assessment LKC will use the following hierarchy:

- Category 4 Screening Levels (C4SLs).
- LQM Suitable 4 Use Levels (S4ULs).
- ATRISK Soil Screening Values (SSVs) and CL:AIRE Generic Assessment Criteria (GACs).

C4SLs were published in 2013^{23,24}. The recent change to the contaminated land guidance has changed the evaluation of risk from 'minimal' (referred to as Health Criteria values (HCVs))²⁵ used to generate Soil Guideline Values (SGVs) to 'low' (referred to as Lowest Level of Toxicological Concern (LLTCs)). The policy companion document and supporting letter by Defra, dated 3rd September 2014, states that C4SLs *'could be used under the planning regime, as well as within Part 2A'*. Based on these comments LKC considers the justifications and assumptions used to generate 'low' risk are suitable for the planning regime.

Where no C4SLs have been generated LKC will use the LQM S4ULs²⁶. Similar assumptions and land uses to C4SLs have been used. However, toxicological information has been based on 'minimal risk' as per previous guidelines and assumptions^{27,28,29,30}.

If contaminants are not present as C4SLs and S4ULs then LKC will use ATRISK SSVs or CL:AIRE GACs³¹. These follow the 'minimal' risk principle and more stringent exposure parameters and will be conservative.

LKC consider the main risk drivers for PAHs are benzo(a)pyrene (B(a)P) and naphthalene. This is due to B(a)P possibly being a carcinogen and most toxic of the

²² Land Contamination Risk Management (LCRM) <https://www.gov.uk/government/publications/land-contamination-risk-management-lcrm>

²³ Defra (2014). "SP1010: Development of Category 4 Screening Levels and Assessment of Land Affected by Contamination – Policy Companion Document."

²⁴ CL:AIRE (2013). "SP1010: Development of Category 4 Screening Levels and Assessment of Land Affected by Contamination – Final project Report."

²⁵ EA (2008). "Human Health Toxicological Assessment of Contaminants in Soils." Science Report – SC050021/SR2.

²⁶ LQM (2014). "The LQM/CIEH S4ULs for Human Health Risk Assessment."

²⁷ EA (2008). "Updated Technical Background to the CLEA Model." Science Report – SC050021/SR3.

²⁸ EA (2008). "Human Health Toxicological Assessment of Contaminants in Soils." Science Report – SC050021/SR2.

²⁹ EA (2008). "A Review of Body Weight and Height Data used within the Contaminated Land Exposure Assessment Model (CLEA)." Project SC050021/Technical Review 1.

³⁰ EA (2009). "Compilation of Data for Priority Organic Pollutants for Derivation of Soil Guideline Values." Science report SC050021/SR7.

³¹ CL:AIRE (2009). "The Soil Generic Assessment Criteria for Human Health Risk Assessment."

PAHs^{32,33} and naphthalene the most volatile and soluble³⁴. The new C4SLs indicate B(a)P as a surrogate marker for carcinogenic PAHs, if it falls within appropriate limits, since the risk from other non-carcinogenic PAHs are considered negligible³⁵. For B(a)P to be used as a surrogate marker it should follow the profile described by the HPA (2008)³⁶ and CL:AIRE (2013). Naphthalene will be treated separately using the LQM S4ULs.

The proposed development is for residential houses with gardens, therefore the assessment criteria for residential with plant uptake has been used.

All criteria have been generated using the CLEA V1.06 model³⁷ based either on 1%, 2.5% and 6% Soil Organic matter (SOM). Results will be compared to the nearest appropriate SOM.

A summary of the generic assessment criteria is provided in Appendix D. ATRISK SSVs and CL:AIRE GACs were not required for this dataset and have not been included.

B(a)P as Surrogate Marker

Based on the above assumption for PAHs, LKC undertook an assessment of the data for the site with regards to using B(a)P as a surrogate marker for carcinogenic PAHs as per HPA and CL:AIRE guidelines. The primary toxicological study related to Culp *et al.*³⁸, which was based on coal tar mixtures (>80,000mg/kg of total PAHs) fed in food to mice over a two-year carcinogenicity study.

Graph 6-1 summarises the study site data with respect to how the ratios of carcinogenic PAHs relate to B(a)P, within the confidence limits provided in the HPA document.

³² EA (2002). "Contaminants in Soils: Collation of Toxicological Data and Intake Values for Humans. Benzo[a]pyrene." R&D Publication TOX2.

³³ USEPA (1984). "Health Effects Assessment of Polycyclic Aromatic Hydrocarbons (PAHs). EPA 540/1-86-013."

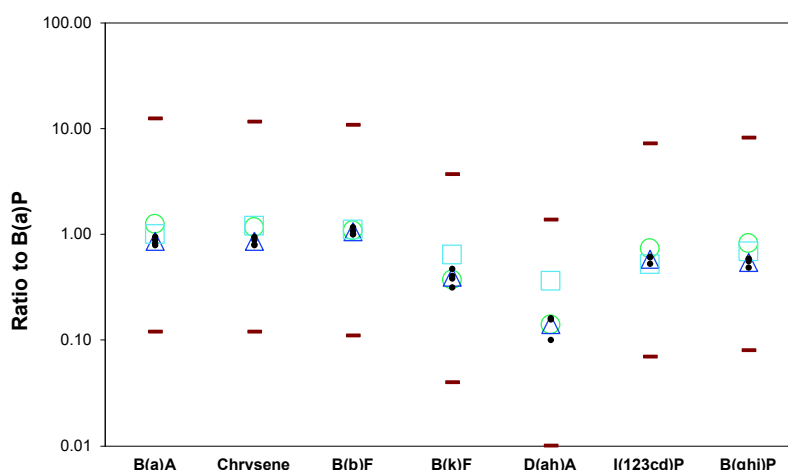
³⁴ EA (2003). "Review of the Fate and Transport of Selected Contaminants in the Soil Environment." Draft technical report P5- 079/TR1.

³⁵ CL:AIRE (2013). "SP1010: Development of Category 4 Screening Levels and Assessment of Land Affected by Contamination – Final project Report."

³⁶ HPA (2010). "HPA Contaminated Land Information Sheet: Risk Assessment Approaches for Polycyclic Aromatic Hydrocarbons (PAHs)." Version 3.

³⁷ EA (2008). "CLEA Software (Version 1.05) Handbook." Science Report – SC050021/SR4.

³⁸ Culp, S; Gaylor, D; Sheldon, W; Goldstein, L and Beland, F (1998). "A Comparison of Tumours Induced by Coal Tar and Benzo-a-pyrene in a 2-Year Bioassay." Carcinogenesis. **Vol 19**, no. 1, pp. 117-124.



Graph 6-1: The ratio of PAH to B(a)P in soil for all available data at the site based on 4 samples (where values were >LOD to allow the calculation of a ratio).

Notes:

B(a)P = Benzo(a)pyrene; D(ah)A = Dibenzo(ah)anthracene; B(a)A = Benzo(a)anthracene; B(b)F = Benzo(b)fluoranthene;

B(k)F = benzo(k)fluoranthene; I(123cd)P = Indeno(123cd)pyrene; B(ghi)P = Benzo(ghi)perylene

● = Ratio to B(a)P for all data ○ = Mean ratio to B(a)P for Culp data ▲ = Mean ratio to B(a)P from all data at the site

□ = Mean ratio to B(a)P for UK data presented by HPA — = Upper and Lower limits (order of magnitude from Culp data)

All the data points that could be used to calculate ratios fall inside the upper or lower limits.

Based on this distribution of data LKC considers B(a)P can be used as a surrogate marker for carcinogenic PAHs and the C4SL criteria is suitable for this dataset.

6.2.2 Soil Results Comparison against Assessment Criteria

All analysis sheets are presented in Appendix C. All the data has been compared to relevant assessment criteria and is presented in Appendix D. Elevated and pertinent results are presented in Table 6-1.

Results have been compared to the relevant assessment criteria and no elevated contaminants were identified.

Contaminant	Units	No. of samples	Elevated Results	Sample Location	Criteria	Source of Criteria
PAHs						
Benzo(a)pyrene	mg/kg	4	19	WS103 (0.2-0.6m)	5	C4SL
GENERAL						
pH	pH	4	Range 9.3 to 10.6			
SOM	%	4	0.74 to 3.1			

Table 6-1: Summary of elevated and pertinent analytical results.

Notes:

Only results that exceeded assessment criteria have been shown and results from **all depths** are noted. Results have been compared to the nearest appropriate SOM.

No asbestos was identified in any soil samples analysed.

Elevated PAHs (B(a)P as a surrogate marker have been identified for made ground in WS103.

6.2.3 *Direct Contact Risk – Pollutant Linkage 1*

Elevated PAHs have been identified on site, with the source of the contamination likely to be from anthropogenic inclusions in the made ground.

At the concentrations identified, the contaminants are considered to pose a potential risk to future site users (residents) in gardens and soft landscaped areas, where made ground may be exposed / in contact with vegetables. The principal pathways are the ingestion pathways (soil, dust and vegetables) and dermal contact.

The probability of PAH contamination affecting site users is likely. With a medium consequence, the risk is considered to be moderate and remediation is recommended.

6.2.4 *Risk from Inhalation of Vapours – Pollutant Linkage 2*

No visual / olfactory evidence of volatile contaminants was identified during the investigation. The PID did not detect any TVOCs. Confirmatory soil analysis did not detect any VOCs / SVOCs above detection limits.

LKC therefore consider the probability of volatile contaminants affecting site users as unlikely. The consequence is expected to be medium, giving a low risk and no remediation is required with respect to pollutant linkage 2.

6.3 **Gas Risk Assessment**

No further gas monitoring visits have been undertaken on the study site. Gas monitoring results from the 2014 Site Investigation in full are presented in Appendix E. Following guidance set out in CIRIA C665³⁹ and BS8485⁴⁰ peak methane (35.2% v/v) and carbon dioxide (11.6% v/v) concentrations have been used in the gas risk assessment. A maximum flow value of 0.105l/hr has been assumed.

This gives a maximum gas screening value (GSV) for methane of 0.03696l/hr which is Characteristic Situation (CS) 2.

it should be noted that this is very much “worst case” and the other 6no. boreholes monitored on site had measured gas fluxes ≤ 0.1 l/hr and methane concentrations of $<1\%$. Organic inclusions were noted in the clay in WS103.

Considering the above “lines of evidence” LKC consider that a CS2 assessment is appropriate. This is commensurate with the measures installed to the wider Chorlton Villas development.

Assuming a severe consequence, there is a moderate risk associated with Pollutant Linkage 3 and remediation is required.

6.4 **Controlled Water Assessment**

The PRA identified a low risk with respect to controlled waters as no significant source of mobile contamination was anticipated. Furthermore, although a Principal Aquifer is present below the site, no abstractions have been identified within influencing distance. The surface water is not considered to be a significant receptor.

³⁹ CIRIA (2007). “Assessing Risks Posed by Hazardous Ground Gases to Buildings.” CIRIA C665.

⁴⁰ BSI (2015). “Code of Practice for the Characterisation and Remediation from Ground Gas in Affected Developments.” BS8485:2015.

No evidence of significant mobile contamination was identified on the site. Although elevated PAHs were identified within the soils, the source is anticipated to be ash, clinker and coal noted within the made ground. Contamination associated with ash and clinker is not anticipated to be mobile due to the residual crystalline nature of the matrix.

The site investigation did not identify any significant sources of likely mobile contamination within the soils. This confirms an unlikely probability of onsite contamination affecting controlled waters. With a medium consequence the risk is anticipated to be low and no remediation is required.

6.5 Additional Risk Assessments

6.5.1 Concrete (Pollutant Linkage 5)

As stated in Section 5, sulphate resistant concrete will be required at the site. The site was classified as DS-2 AC-1s.

Based on the above, the probability of sulphate concentrations affecting buildings is likely. Given the consequence is considered to be mild, the risk (pollutant linkage 5) is anticipated to be moderate and remediation (sulphate resistant concrete) is required. This should be confirmed with the structural engineer.

6.5.2 Potable Water Supply (Pollutant Linkage 6)

Soil results were compared to United Utilities (UU) guidelines for the selection of potable water pipes in land potentially affected by contamination⁴¹. Only contaminants of concern, based on the preliminary conceptual model and ground conditions encountered, were analysed. The following contaminants were not considered to be a risk and therefore not included in the analysis suites: chlorinated compounds, cresols, ethers, nitrobenzene, ketones, aldehydes and amines.

No elevated levels of contaminants were encountered and standard PE pipe is deemed to be applicable.

At this stage, the probability of organic contaminants affecting potable water pipes is unlikely. Given the consequence is considered to be moderate, the risk (pollutant linkage 6) is anticipated to be low and no remediation is required.

6.5.3 Phytotoxicity (Pollutant Linkage 7)

Soil results were compared to phytotoxic guideline values as outlined in BS3882⁴².

No elevated contaminants of heavy metals were identified therefore the probability of phytotoxic contaminants affecting vegetation is considered to be unlikely. With a mild consequence, the risk (pollutant linkage 7) is anticipated to be very low and no remediation is required.

6.6 Revised Contamination Conceptual Model

The preliminary contamination conceptual model (Table 2-6) has been revised following the risk assessments undertaken in Sections 6.1-6.5. The revised contamination conceptual model follows the same methodology and guidance used in

⁴¹ UU(2011). "United Utilities Water Supplementary Guidance for the Selection of Water Pipes in Land Potentially Affected by Contamination."

⁴² BS (2015). "Specifications for Topsoil and Requirements for Use." BS3882:2015.

the preliminary contamination conceptual model. The risk matrix is provided in Appendix A.

The revised contamination conceptual model is presented in Table 6-2.

Where a very low risk is identified no specific remediation is required.

Where a low risk is identified, some form of remediation may be required depending on the pollutant linkage, the type and concentration of contaminants present and the proposed development.

Where there is a moderate/low risk is identified, an assessment will be undertaken to establish what category the pollutant linkage will fall into.

Where LKC identifies a moderate or higher risk, remediation or further investigation work is recommended.

Further details of the remedial proposals are given in Section 9.

Pollutant Linkage	Pathway	Receptor	Contaminant	Probability	Consequence	Risk	Assessment
PL1	- Dermal contact. - Inhalation of soil and dust. - Ingestion of soils, dust, vegetables, soil attached to vegetables. - Windblown dust.	- Current residents - Future residents - Future site users. - Offsite receptors.	- PAHs.	Likely	Medium	Moderate	- Elevated PAHs in shallow soils which could come into contact with site users in gardens / soft landscaping areas. - Recommendation*1 *2: Remediation required. Likely to include an environmental cover system in gardens / soft landscaping areas.
PL2	- Inhalation of vapours. - Migration through permeable strata and preferential pathways.	- Current residents - Future site users. - Offsite receptors.	- Volatile Contaminants.	Unlikely	Medium	Low	- No elevated volatile contaminants across the site. - Recommendation: No remediation required.
PL3	- Inhalation of gas. - Migration through permeable strata and preferential pathways. - Explosion in confined spaces.	- Current residents - Future site users. - Buildings. - Offsite land users.	- Methane, carbon dioxide.	Likely	Severe	High	- Elevated methane and carbon dioxide identified in the previous survey and organic inclusions noted in the natural clay in WS103. - Recommendation: Gas protection measures in line with CS2 recommended.
PL4	- Surface Run-off. - Migration through permeable strata and preferential pathways - Perched waters migration.	- Groundwater (Principal Aquifer).	- PAHs.	Unlikely	Medium	Low	- Although slightly elevated PAHs identified, given the environmental settings and ground conditions encountered not considered to pose a significant risk to groundwater or surface water. - Recommendation: No remediation required.
PL5	- Sulphate attack on concrete.	- Building structure.	- Sulphate.	Likely	Mild	Moderate / Low	- Elevated sulphate identified across the site (max. 730mg/l) therefore moderate risk considered appropriate. - Recommendation: Sulphate resistant concrete in line with DS-2 AC-1s.
PL6	- Ingestion of tainted water supply.	- Future site users. - Water pipes.	- Organic Contaminants such as hydrocarbons, (made ground).	Unlikely	Medium	Low	- No elevated contaminants across the site. - Recommendation: No remediation required. Standard PE pipe considered suitable.
PL7	- Direct Contact (plant uptake).	- Flora.	- Phytotoxic Contaminants (made ground).	Unlikely	Mild	Very Low	- No elevated phytotoxic contaminants across the site. - Recommendation: No remediation required.

Table 6-2: Revised Contamination Conceptual Model.

Notes

*1 Although no ACM identified, contractors should be vigilant during earthworks of any potential ACM.

*2 The conceptual model only takes into consideration the future use of the site and long-term exposure. Consideration should also be given to the short-term exposure of construction workers and nearby land users to ACM containing soils during groundworks.

*3 limited and slightly elevated concentrations of phytotoxic contaminants identified in soils, the characteristics of the made ground should also be taken into account if it is to be used as a topsoil / growing medium for flora. The material should be assessed against the parameters outlined in Table 1 of BS3882 (not included within this assessment).

7 Waste Disposal Assessment

The soil contamination results as presented in Appendix C have been used to help determine the waste classification of material for off-site disposal.

As an initial screen the soil results were inputted into Hazwaste Online™. This is a web-based facility that allows an assessment waste as either hazardous or non-hazardous waste based on relevant guidance and legislation^{43, 44, 45, 46, 47, 48, 49, 50, 51}.

Hazwaste Online™. has been designed to cover, amongst other waste types, the European Waste List of Waste (LoW) code number 17 "Construction and Demolition Waste (Including Excavated Soil from Contaminated Sites)".

Where less than limits of detection (LOD) were recorded, the value of the LOD was inputted.

Where applicable, appropriate metal species based on hazard statements/ molecular weight, site history, ground conditions and likely species present in soils were used (e.g. metal oxides relating to an ash based source).

The results show that all the samples tested are classified as NON-HAZARDOUS WASTE and LoW code "17-05-04 - soil and stones other than those mentioned in 17 05 03" is suitable. The Hazwaste Online™ output sheets are provided in Appendix F and summarised in Table 7-1.

Sampling Location	Hazardous Waste Y/N	LoW Code	Hazard (Risk Phrase)	Contaminants
WS102-ES1-28/01/2021-0.3	N	17 05 04	N/A	N/A
WS103-ES2-28/01/2021-0.2	N	17-05-04	N/A	N/A
WS104-ES1-28/01/2021-0.1	N	17-05-04	N/A	N/A
HD101-ES1-28/01/2021-0.1	N	17-05-04	N/A	N/A

Table 7-1: Summary of Hazwaste Online™ findings.

7.1 Waste Acceptance Criteria (WAC) Testing

Waste Acceptance Criteria (WAC) testing was also undertaken on 1no. sample representative of material likely to be earmarked for off-site disposal. WAC test results are included in Appendix C.

The WAC limits cannot be used to make an assessment of whether a waste is hazardous. Landfills are classified according to whether they can accept hazardous or non-hazardous wastes. Wastes can only be accepted at a landfill if they meet the WAC for that class of landfill.

With regards to non-hazardous waste, material can only be designated to an inert cell of a non-hazardous landfill based on WAC testing. With regards to hazardous waste,

⁴³ EA (2018). "Guidance on the Classification and Assessment of Waste (1st Edition v1.1)". Technical Guidance WM3.

⁴⁴ CLP Regulation - Regulation 1272/2008/EC of 16 December 2008.

⁴⁵ 1st ATP - Regulation 790/2009/EC of 10 August 2009

⁴⁶ Correction to 1st ATP - Regulation 758/2013/EU of 7 August 2013

⁴⁷ WFD Annex III replacement - Regulation 1357/2014/EU of 18 December 2014

⁴⁸ Revised List of Wastes 2014 - Decision 2014/955/EU of 18 December 2014

⁴⁹ 13th ATP - Regulation (EU) 2018/1480 of 4 October 2018

⁵⁰ POPs Regulation 2004 - Regulation 850/2004/EC of 29 April 2004

⁵¹ 2nd ATP to POPs Regulation - Regulation 757/2010/EU of 24 August 2010

material can only be designated as SNRH cell within a non-hazardous landfill or hazardous landfill from WAC testing.

The above potential designation if disposed to a licenced landfill are summarised in Table 7-2. It should be noted that the licenced landfill operator would determine the designation, which may differ to this assessment.

Sampling Location	Soil Designation		Potential Landfill Designation			Designation
	Non-haz.	Haz.	Inert	SNRH	Haz.	
WS104 / ES1 (0.10-0.30mbgl)	x	-	x	-	-	Inert landfill

Table 7-2: Summary of Waste Acceptance Criteria classification.

8 Conclusions

8.1 Geotechnical

The foundations are recommended to make use of piled and suspended floor slabs to allow for the localised softer strata observed and highly variable depths of made ground. Consideration of effects of trees also needs to be considered.

Shallow groundwater may impact upon the methodology of excavation and final design.

Temporary supports of excavations may be required.

Detailed design should be carried out by structural engineer.

Sulphate resistant concrete is recommended (DS-2 AC-1s).

8.2 Contamination Assessment

A revised contamination conceptual model has been produced by LKC which is summarised in Table 8-1 below (more detailed model provided in Section 5).

	Pollutant Linkage	Risk	Recommendations
1	Contaminants posing a risk to future site users via dermal contact, ingestion and inhalation (of soil, dust and vegetables).	Moderate	- Elevated PAHs identified across the site. - Recommendation: Remediation required in garden / soft landscaped areas.
2	Volatile contaminants posing a risk to future site users via the inhalation of vapours.	Low	- No elevated volatile contaminants across remainder of the site. - Recommendation: No remediation required.
3	Gas posing a risk to buildings and future site users via the migration of gas into building causing explosion and asphyxiation.	High	- Elevated methane and carbon dioxide. Organic soils present. - Recommendation: Gas protection measures in line with CS2 recommended.
4	Mobile contamination posing a risk to controlled waters via the migration through permeable strata.	Low	- Although slightly elevated PAHs identified, given the environmental settings and ground conditions encountered not considered to pose a significant risk to groundwater or surface water. - Recommendation: No remediation require
5	Sulphate posing a risk to building via direct contact (sulphate attack).	Moderate	- Elevated sulphate identified across the site (max. 730mg/l); therefore moderate risk considered appropriate. - Recommendation: Sulphate resistant concrete in line with DS-2 AC1s.
6	Organic contaminants posing a risk to water pipes.	Moderate	- No elevated contaminants across the site. - Recommendation: No remediation required. Standard PE pipe considered suitable.
7	Phytotoxic metals posing a risk to flora via root uptake.	Moderate / Low	- No elevated phytotoxic contaminants across the site. - Recommendation: No remediation required.

Table 8-1: Summary Risk Table.

Remedial recommendations are presented in Section 9.

9 Recommendations and Remedial Strategy

The recommendations provided below are considered appropriate for the site based on the site investigation work undertaken. LKC should stress that no remediation, enabling works or designing works should take place until Regulatory approval has been obtained.

9.1 Remediation and Validation Recommendations

PL	Remediation Requirements	Validation Requirements
ALL	<u>Earthworks Inspections / Unexpected Contamination</u> The relevant contractors should be briefed that during development works at the site should any unusual ground conditions and / or visual or olfactory evidence of contamination (including asbestos containing material) be encountered at the site, LKC and the Local Authority should be informed, and further assessment of the material may be required. Should asbestos be identified during groundworks, precautions should be taken to ensure the safety of the construction workers and nearby land users. It would be advisable to introduce an asbestos management strategy in line with CIRIA C733⁵².	Log of work undertaken including photographs. Details of any sampling undertaken and validation of any potential additional remedial work.
1	<u>Environmental Cover System</u> As made ground is relatively deep, it is unlikely to be viable to remove the contaminated soils. Therefore, an environmental cover system is recommended. The environmental cover system should be as follows: Private Back Gardens: 600mm thick environmental cover system comprising: Either 100mm physical break layer (MOT type 1 material, 20-30mm, minimal fines) and at least 500mm comprising clean inert fill and sufficient topsoil for a growing medium. Or geotextile membrane and at least 600mm comprising clean inert fill and sufficient topsoil for a growing medium. Private Front Garden / Shared Landscaping: 300mm thick environmental cover system comprising: Either 100mm physical break layer (MOT type 1 material, 20-30mm, minimal fines) and at least 200mm comprising clean inert fill and sufficient topsoil for a growing medium. Or geotextile membrane and at least 300mm comprising clean inert fill and sufficient topsoil for a growing medium. The subsoil layer can be replaced by additional topsoil. A diagram of a typical environmental cover system is shown in Appendix G	Measuring depth of environmental cover system using a staff and providing photographic evidence. Photographic evidence of the granular physical break or geotextile layer will also be collected. Chemical validation of imported soils: See Table 9-2.

⁵² CIRIA (2014). "Asbestos in Soil and Made Ground: A Guide to Understanding and Managing Risks". C733.

PL	Remediation Requirements	Validation Requirements
3	<u>Gas Protection Measures</u> In line with CS2 as per UK guidance^{53,54}. This is likely to / should include: • Passive subfloor or active subfloor ventilation system. • Methane and carbon dioxide resistant membrane installed as per manufacturer's instructions. • Ventilation of confined spaces within the building. • Well-constructed reinforced suspended, raft or cast in situ ground slab. • Minimum penetration of ground slab by services. • All joints and penetrations to be sealed. Depending on the type of building and foundation design the protection measures can vary. The gas protection measures will be detailed and approved with the Local Authority once the foundation design has been confirmed. LKC advise that final foundation details should be provided to the Local Authority for review.	Supply and review of foundation designs. Photographic evidence of sub-floor void, ventilation and suitably sealed gas membrane. Validation of gas protection measures should be in line with CIRIA 735⁵⁵
5	<u>Sulphate Resistant Concrete</u> Sulphate Resistant Concrete in line with DS-2 AC-1s is recommended.	N/A
2,4,6,7	No remediation considered necessary for PL2 (vapours), PL4 (Controlled Waters), PL6 (Potable Water Pipes) and PL7 (Phytotoxicity).	N/A
<u>Re-use of site won material</u> To ensure material is compliant with appropriate waste regulations, any site won material re-used onsite should be in recourse to appropriate exemptions. A U1 and T5 exemption should be registered. This will allow the following to be used onsite or brought in for use onsite (refer to guidance for types of waste that can be used ⁵⁶): 5,000 tonnes (c. 2,500m³) <u>treatment</u> of crushed concrete / stone. 1,000 tonnes (c. 500³) <u>use of</u> non-hazardous soil 5,000 tonnes (c. 2,500m³) <u>use of</u> clays, sand, gravel, brick, concrete, stone etc. 50,000 tonnes (c. 25,000m³) <u>use of</u> bituminous material to be used in roadways. A Materials Management Plan (MMP) with recourse to the CL:AIRE Code of Practice may be required if volumes exceed exemption limits. This must be registered before material movement starts onsite. If an MMP is required, this needs to be registered by a Qualified Person (QP) and there must be 'certainty of use' for any material re-used onsite or exported to site to ensure there is no 'sham recovery'. For all the above material will need to be tested at the rate and analytical suites presented in Table 9-2.		
<u>Health and Safety Considerations</u> In working with, removing or treating any contaminating material it is important that any potential risks associated with the actual site works are mitigated by good environmental management of the site		

⁵³ CIRIA (2007). "Assessing Risks Posed by Hazardous Ground Gases to Buildings." CIRIA C665

⁵⁴ BSI (2015). "Code of Practice for the Design of Protective Measures for Methane and Carbon Dioxide Ground Gases for new buildings." BS8485:2015.

⁵⁵ CIRIA (2014). "Good Practice on the Testing and Verification of Protection Systems for Building Against Hazardous Ground Gas". CIRIA C735.

⁵⁶ <https://www.gov.uk/guidance/waste-exemptions-using-waste>

PL	Remediation Requirements	Validation Requirements
	during the remedial phases. Standard health and safety precautions (as per HSE guidance ⁵⁷) should be adopted by all workers involved with site enabling and construction works.	
	Piling in Contaminated Land It is understood that the building will be piled into the bedrock. This may provide a preferential pathway for contaminants to the Principal Aquifer. Once the method of piling has been determined, good practice for the drilling of piles on contaminated sites should be adhered to, such as guidance provided by the Environment Agency ⁵⁸ .	

Table 9-1: Further work, remediation and validation requirements

Notes: See Table 6-1 for pollutant linkage (PL) details.

9.2 Validation of Subsoil / Topsoil

Chemical validation of all imported soils to be used on site in gardens and soft landscaping areas should be undertaken. Imported soils should be accompanied by a certificate of analysis and source details.

A summary of the required imported material sampling requirements is presented in Table 9-2. Ideally, the material should be sampled at source to prevent double handling if soil fails, with confirmatory sampling undertaken on importation to site. However, where this is not possible then material imported should be segregated based on source and soil type. Validation samples should be taken prior to placement in gardens to ensure suitability for use.

Material Type	Source	Suite of Analysis	Sampling Rate*
Topsoil	Greenfield	Suite A	1 sample per 50m³
	Brownfield / Unknown	Suite B	
Subsoil	Brownfield / Unknown	Suite B	1 sample per 150m³
	Site won natural material / greenfield	Suite A	
	First Generation i.e. quarried sand (subsoil) or stone (break layer)	No testing is required. Certification of material provenance is required.	
Physical Stone Break Layer	Recycled Stone (6F2 / screened)	Suite B	1 sample per 500m³

Table 9-2: Sampling requirements for imported soils.

Notes:

Suite A - Heavy metals, pH, water soluble sulphate, speciated PAH, soil organic matter and asbestos screen.

Suite B - Heavy metals, pH, water soluble sulphate, speciated PAH, phenol, total and free cyanide, soil organic matter, asbestos screen, banded petroleum hydrocarbons (TPH CWG), BTEX, MTBE.

*Minimum sampling rate of 3 samples per source.

Any soil with visual or olfactory evidence of hydrocarbons should be rejected.

In addition, it should be ensured that the matrix of the topsoil is suitable as a growing medium and no undesirable material is present (in line with BS3882⁵⁹). LKC advise this information is provided by the supplier before material is imported onto site.

⁵⁷ HSE (1991). "Protection of Workers and the General Public During Development of Contaminated Land" London HMSO.

⁵⁸ Environment Agency (2001) Piling and Penetrative Ground Improvement Methods on Land Affected by Contamination: Guidance on Pollution Prevention.

⁵⁹ BS (2015). "Specifications for Topsoil and Requirements for use." BS3882:2015.

Imported material to be used in gardens will be compared against residential with plant uptake criteria (as used in the contamination risk assessment (Section 6-1)). Appropriate remedial target criteria are presented in Appendix D.

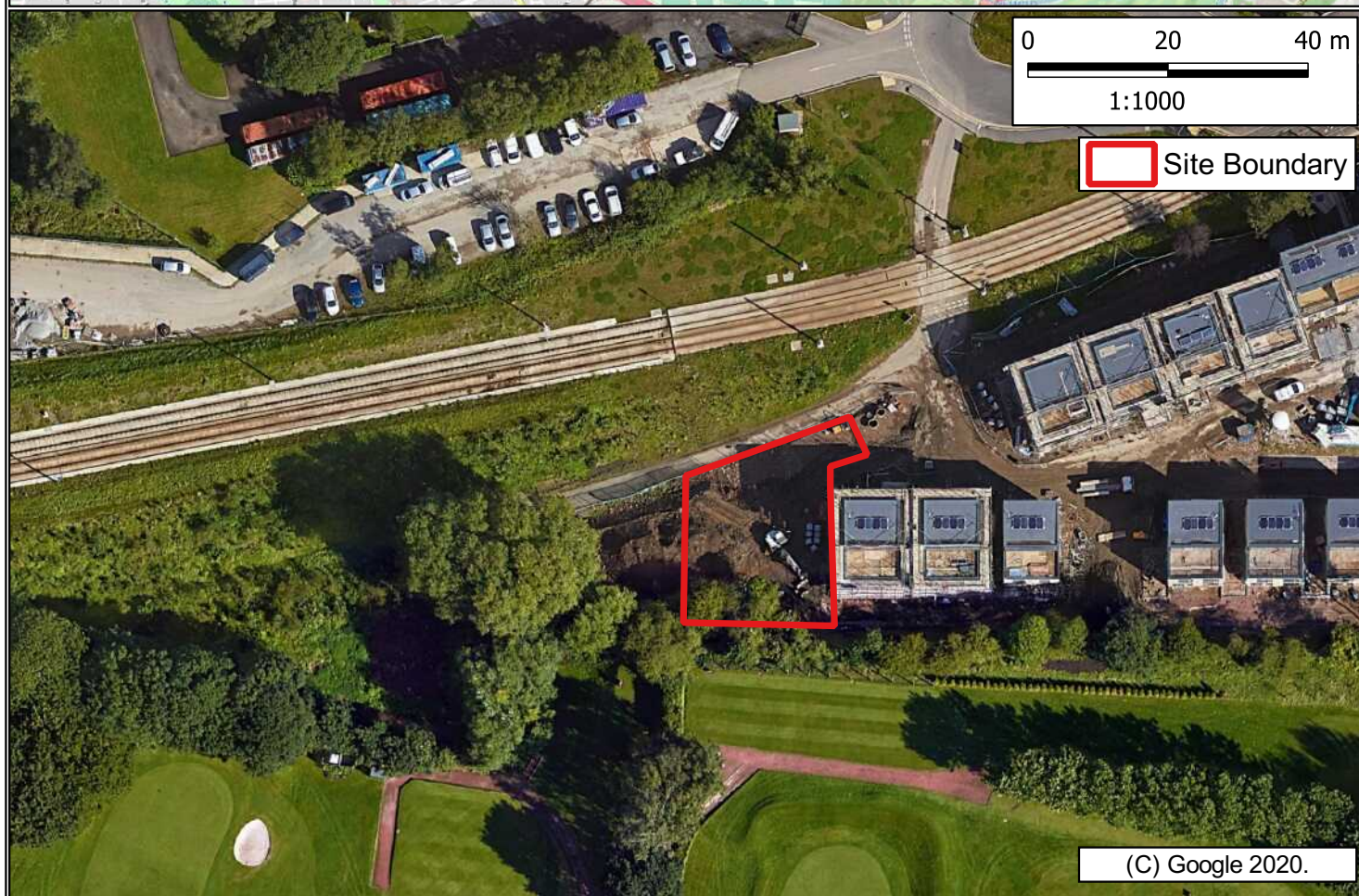
9.3 Site Completion Report

It is recommended that any remediation carried out on the site is validated by a third party and suitable documentary evidence provided in a Site Completion Report, such as photographs, consignment documents and analytical results. This should include as a minimum:

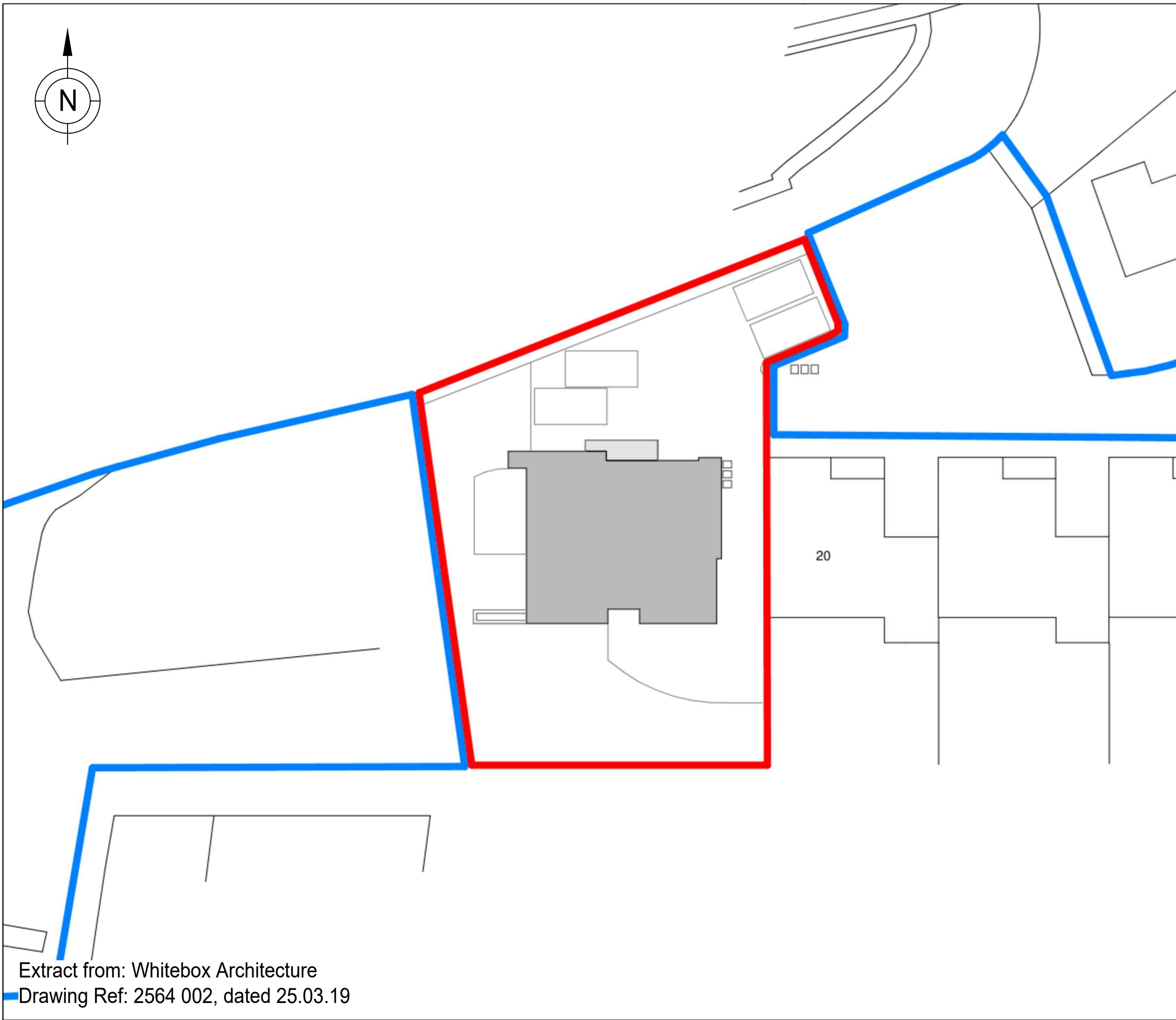
- » Validation of gas protection measures installed.
- » Provision of waste transfer documents.
- » Validation of environmental capping layer.
- » Verification testing of all imported soil for garden and soft landscaping areas.
- » Details of any unexpected contamination identified onsite, suitably risk assessed and / or validated.

The Site Completion Report will assist the Local Authority in the discharge of any future relevant planning condition and will also be of use to solicitors acting on behalf of any prospective conveyancer who may have concerns over the former use of the site.

Figures



Client: Step Places				Title: Site Location & Boundary Plan			
Site: Chorlton Villas, Chorlton				Scale (see scale bar): 1:25,000 & 1:1,000 @ A4			
Job No.: LKC 21 1012	Drawn By: HM	Checked By: CC	Drawn: Jan 2021	Figure: 1		Revision:	

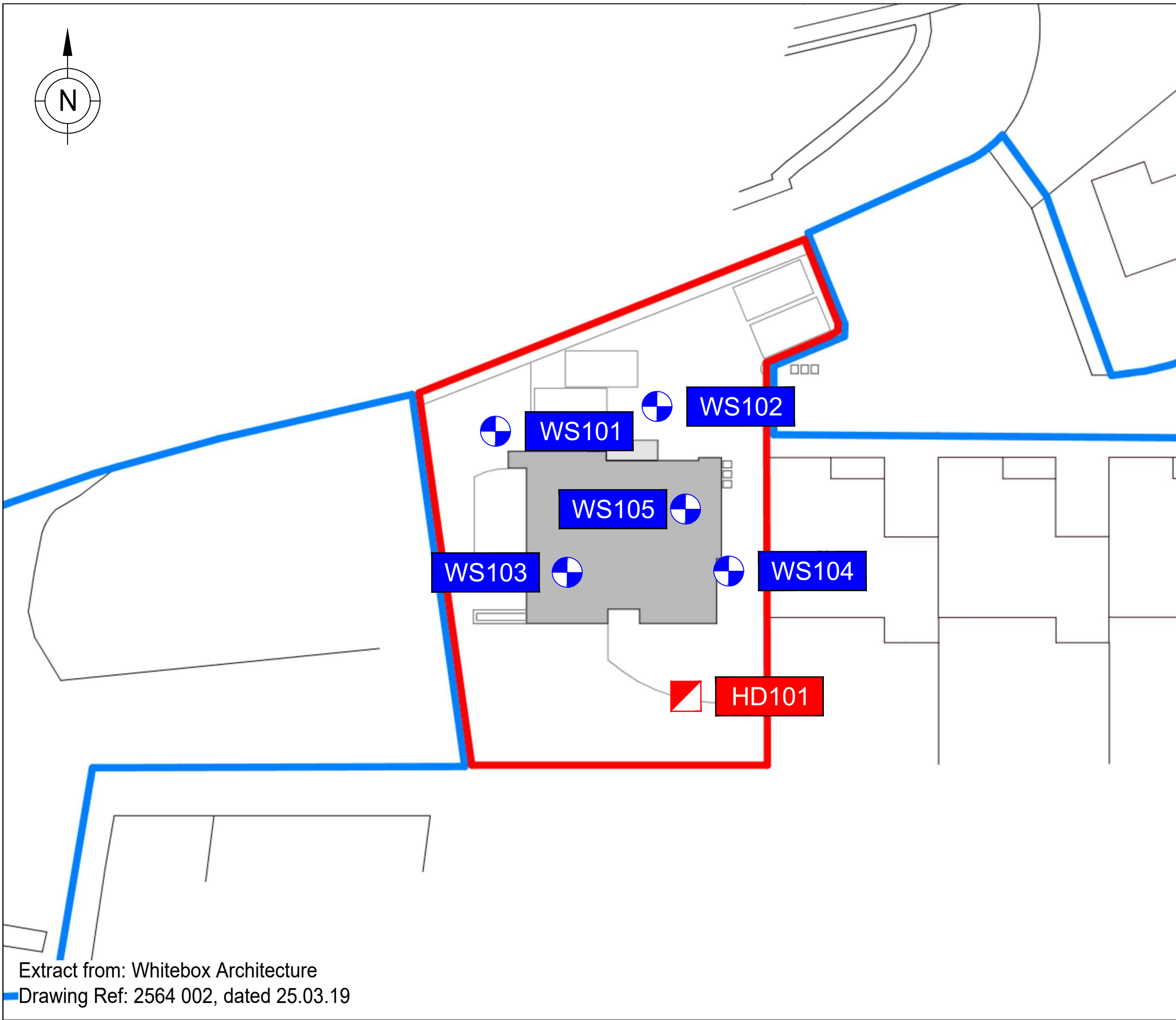


KEY
 Site Boundary

Sampling Locations and features annotated by LK Consult Ltd are approximate and are based upon observed measurements unless otherwise stated. Do not scale from this drawing and work from marked dimensions only. All dimensions and features should be confirmed on site by the Contractor. Where this drawing includes information provided to LK Consult Ltd by others, LK Consult Ltd gives no warranty, representation or assurance as to the accuracy of such information.

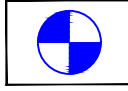


Client: Step Places			
Site: Chorlton Villas			
Title: Proposed Development Plan			
Job No.: LKC 21 1012	Scale (See Scale Bar): 1:250 @ A3	Figure: 2	Revision:
Drawn By: CC	Checked By: HM	Drawn: March 2021	



KEY

 Site Boundary

 Window Sample Borehole (WS)

 Trial Pit (TP)

Sampling Locations and features annotated by LK Consult Ltd are approximate and are based upon observed measurements unless otherwise stated. Do not scale from this drawing and work from marked dimensions only. All dimensions and features should be confirmed on site by the Contractor. Where this drawing includes information provided to LK Consult Ltd by others, LK Consult Ltd gives no warranty, representation or assurance as to the accuracy of such information.



Client:				Step Places	
Site:				Chorlton Villas	
Title:				Sampling Location Plan	
Job No.:		Scale (See Scale Bar):		Figure:	Revision:
LKC 21 1012		1:250 @ A3		3	
Drawn By:	Checked By:	Drawn:			
CC	HM	March 2021			

Appendix A

Risk Matrix

Risk Evaluation

The method for risk evaluation is a qualitative method of interpreting the output from the risk estimation stage of the assessment, based on CIRIA 552⁶⁰. It involves the classification of the:

- Magnitude of the potential consequence (severity) of the risk occurring (Table A).
- Magnitude of the probability (likelihood) of the risk occurring (Table B).

Consequence (Severity)		
Classification	Definition	Example
Severe	- Short term (acute) risk to human health likely to result in 'significant harm' as defined by the Environment Protection Act 1990, Part IIA. - Short term risk of pollution (note: water Resources Act contains no scope for considering significance of pollution) of sensitive water resource. - Catastrophic damage to buildings/properties. - A short-term risk to a particular ecosystem, or organism forming part of such ecosystem (note: the definition of ecological systems within the Draft Circular on Contaminated Land, DETR, 2000).	- High Concentrations of cyanide on the surface of an informal recreation area. - Major spillage of contaminants from site into controlled waters. - Explosion, causing building collapse (can also equate to short term human health risk if buildings are occupied).
Medium	- Chronic damage to Human Health ('significant harm' as defined in DETR, 2000). - Pollution of sensitive water resources (note Water Resources Act contains no scope for considering significance of pollution). - A significant change in a particular ecosystem, or organism forming part of such ecosystem.	- Concentrations of a contaminant from site exceed generic, or site-specific assessment criteria. - Leaching of contaminants from a site to a major or minor aquifer (Principal and Secondary). - Death of a species within a designated nature reserve.
Mild	- Pollution of non-sensitive water resources. - Significant damage to crops, buildings, structures and services ('significant harm' as defined in DETR, 2000). - Damage to sensitive buildings/structures/services or the environment.	- Pollution of non-classified groundwater. - Damage to building rendering it unsafe to occupy (e.g. foundation damage resulting in instability).
Minor	- Harm, although not necessarily significant harm, which may result in a financial loss, or expenditure to resolve. - Non-permanent health effects to human health (easily prevented by means such as personal protective clothing etc). - Easily repairable damage to buildings, structures and services.	- The presence of contaminants at such concentrations that protective equipment is required during site works. - The loss of plants in a landscaping scheme. - Discoloration of concrete.

Table A. Classification of Consequence

Probability (Likelihood)	
Classification	Definition
High Likelihood	- There is a pollutant linkage and an event that either appears very likely in the short term and almost inevitable over the long term, or there is evidence at the receptor of harm or pollution.
Likely	- There is a pollutant linkage and all the elements are present and in the right place, which means that it is probable that an event will occur. - Circumstances are such that an event is not inevitable, but possible in the short term and likely over the long term.
Low Likelihood	- There is a pollutant linkage and circumstances are possible under which an event could occur. - However, it is by no means certain that even over a longer period such event would take place and is less likely in the shorter term.
Unlikely	- There is a pollutant linkage, but circumstances are such that it is improbable that an event would occur in the very long term.

Table B. Classification of Probability.

⁶⁰ CIRIA C552 (2001) Contaminated Land Risk Assessment - A Guide to Good Practice.

These classifications are then compared to indicate the risk presented by each pollutant linkage (Table C). It is important that this classification is only applied where there is a possibility (which can range from high likelihood to unlikely) of a pollutant linkage existing.

		Consequence			
		Severe	Medium	Mild	Minor
Probability	High Likelihood	Very High Risk	High Risk	Moderate Risk	Moderate / Low Risk
	Likely	High Risk	Moderate Risk	Moderate / Low Risk	Low Risk
	Low Likelihood	Moderate Risk	Moderate / Low Risk	Low Risk	Very Low Risk
	Unlikely	Moderate / Low Risk	Low Risk	Very Low Risk	Very Low Risk

Table C. Comparison of Consequence against Probability

Once the risk has been determined the corresponding action can be assessed (Table D).

Risk	Action Required
Very High Risk	- There is a high probability that severe harm could arise to a designated receptor from an identified hazard, OR, there is evidence that severe harm to a designated receptor is currently happening. - This risk, if realised, is likely to result in a substantial liability. - Urgent investigation (if not already undertaken) and remediation are likely to be required.
High Risk	- Harm is likely to arise to a designated receptor from an identified hazard. - Realisation of the risk is likely to present a substantial liability. - Urgent investigation (if not undertaken already) is required and remedial works may be necessary in the short term and are likely over the longer term.
Moderate Risk	- It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that any such harm would be severe, or if any harm were to occur it is more likely that the harm would be relatively mild. - Investigation (if not already undertaken) is normally required to clarify the risk and to determine the potential liability. Some remedial works may be required in the longer term.
Low Risk	- It is possible that harm could arise to a designated receptor from an identified hazard, but it is likely that this harm, if realised, would at worst normally be mild.
Very Low Risk	- There is a low possibility that harm could arise to a receptor. In the event of such harm being realised it is not likely to be severe.

Table D. Description of the Classification and Likely Action Required.

Where a very low risk is identified no specific remediation is required.

Where a low risk is identified, some form of remediation may be required depending on the pollutant linkage, the type and concentration of contaminants present and the proposed development.

Where there is a moderate/low risk identified, an assessment will be undertaken to establish what category the pollutant linkage will fall into.

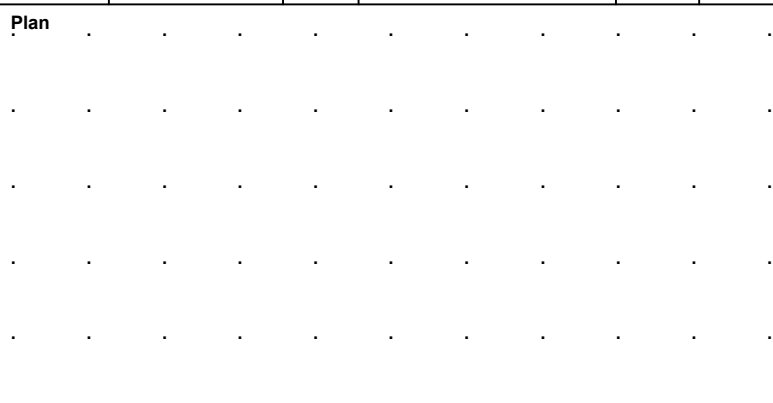
Where LKC identifies a moderate or higher risk, remediation or further investigation work is recommended.

Appendix B

Profile Logs

Excavation Method Hand excavated trial hole to 0.60mbgl.	Dimensions	Ground Level (mOD)	Client Step Places	Job Number LKC 21 1012
	Location 381523 E 392591 N	Dates 28/01/2021	Project Contractor D&I	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10-0.50	ES1 PID=<0.1ppm				(0.10) 0.10 (0.50) 0.60	MADE GROUND: Dark grey very sandy SILT with occasional rootlets. MADE GROUND: Brown gravelly sandy CLAY with rare brick fragments and plastic. Sand is fine to medium. Gravel is fine to coarse and subangular comprising sandstone and limestone. Geotextile membrane at 0.20mbgl. Layer of GRAVEL between 0.50-0.60mbgl. Water pooling in at base. Complete at 0.60m		

Plan 	Remarks		
	Water pooling in at base of pit. Trial pit stable. Location accurate to 5.00-8.00m.		
	Scale (approx)	Logged By	Figure No.
	1:25	HM	LKC 21 1012.HD101

Excavation Method

Drive-in Windowless Sample
driven to 5.45mbgl.

Dimensions
Ground Level (mOD)

30.00

Client

Step Places

Job
Number

LKC 21 1012

Location

381507 E 392599 N

Dates

28/01/2021

Project Contractor

D&I

Sheet

1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.50	ES1				(0.50)	MADE GROUND: Brown gravelly sandy CLAY with occasional brick fragments, rare rubber and wood fragments. Sand is fine to medium. Gravel is fine to medium and angular to rounded comprising sandstone and mudstone.		
0.50-0.80	ES2			29.50	0.50			
1.00					(0.50)	MADE GROUND: Grey brown gravelly SAND with occasional brick fragments, wood fragments, rare ash and rubber. Sand is fine to coarse. Gravel is fine to coarse and subangular to angular comprising sandstone and limestone. Slightly clayey and very gravelly between 0.80-1.00mbgl.		
1.00-1.40	PP 12.26kPa ES3			29.00	1.00			
1.20-1.65	SPT N=8		1,1/2,2,2,2			MADE GROUND: Dark brownish grey slightly gravelly sandy silty CLAY with occasional organic material and rare brick fragments. Sand is fine to medium. Gravel is fine to medium, subrounded to subangular comprising sandstone.		
1.40-2.00	ESB4							
2.00					(2.10)			
2.00-2.45	PP 24.53kPa SPT N=4 X5		1,1/1,1,1,1					
2.00-2.45								
3.00-3.45	SPT N=4 X6		1,1/1,1,1,1	26.90	3.10	Soft to firm consistency medium strength brown very sandy CLAY. Sand is fine to coarse. Very wet strata.		
3.00-3.45	PP 57.23kPa ES7				(0.40)			
3.10				26.50	3.50	Firm to stiff consistency medium strength brown slightly gravelly sandy CLAY. Sand is fine to medium. Gravel is fine to medium and subangular comprising sandstone.		
3.10-3.50								
3.50-4.00	B8							
4.00					(0.90)			
4.00-4.45	PP 73.58kPa X9		Water strike(1) at 4.00m. 4,4/5,6,6,6	25.60	4.40	Stiff consistency high strength brown slightly gravelly CLAY. Gravel is fine to medium and subangular comprising sandstone.		
4.00-4.45	SPT N=23							
5.00					(1.05)			
5.00-5.45	PP 79.7kPa SPT N=33 X10		5,5/7,8,8,10	24.55	5.45	Complete at 5.45m		
5.00-5.45								

Remarks

Groundwater strike at 4.00mbgl.
Borehole stable.
Location accurate to 5.0-8.0m.
Elevation estimated using <https://www.freemaptools.com/elevation-finder.htm>
Scale (approx)

1:40

Logged By

HM

Figure No.

LKC 21 1012.WS101

Excavation Method

Drive-in Windowless Sample
driven to 5.45mbgl.

Dimensions
Location

381516 E 392600 N

Ground Level (mOD)

30.00

Dates

28/01/2021

Client

Step Places

Project Contractor

D&I

Job
Number

LKC 21 1012

Sheet
1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.30-0.80	ES1 PID=<0.1ppm			29.90 29.70	(0.10) (0.20) 0.30	MADE GROUND: Dark brown gravelly sandy CLAY with occasional brick fragments. Sand is fine to medium. Gravel is fine to medium and angular to subangular comprising sandstone.			
1.00-1.50	ES2 PID=<0.1ppm		2,2/2,2,1,2	29.00	1.00	MADE GROUND: Brown very clayey GRAVEL. Gravel is fine to coarse and subangular comprising sandstone and limestone.			
1.20-1.65	SPT N=7								
1.60-2.00	B3					MADE GROUND: Dark grey slightly gravelly sandy silty CLAY with occasional rootlets, rare organic material, brick fragments and metal. Sand is fine to medium. Gravel is fine to medium and subangular comprising sandstone.			
2.00-2.45	SPT N=6		3,2/2,1,1,2						
2.00-2.45	X4				(2.70)				
3.00	PP 36.78kPa								
3.00-3.45	SPT N=8		3,3/2,2,2,2						
3.00-3.45	X5								
3.50-4.00	B6			26.30	3.70	Firm to stiff consistency high strength brownish grey mottled slightly gravelly sandy to very sandy CLAY. Sand is fine to medium. Gravel is fine to medium and subangular comprising sandstone.			
4.00	PP 85.84kPa		Water strike(1) at 4.00m.		(0.70)				
4.00-4.45	X7		5,4/5,7,7,7	25.60	4.40	Stiff consistency high strength red, brown and grey mottled slightly gravelly CLAY. Gravel is fine to medium and subangular comprising sandstone.			
4.00-4.45	SPT N=26								
5.00	PP 98.1kPa		5,5/7,8,8,10		(1.05)				
5.00-5.45	SPT N=33			24.55	5.45	Complete at 5.45m			
5.00-5.45	X8								

Remarks

Water strike at 4.00mbgl.
Borehole stable.
Location accurate to 5.00-8.00m.
Elevation estimated using <https://www.freemaptools.com/elevation-finder.htm>
Scale
(approx)

1:40

Logged
By

HM

Figure No.

LKC 21 1012.WS102

Excavation Method

Drive-in Windowless Sample
driven to 5.45mbgl.

Dimensions
Location

381515 E 392593 N

Ground Level (mOD)

30.00

Dates

28/01/2021

Client

Step Places

Project Contractor

D&I

Job
Number

LKC 21 1012

Sheet
1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.00-0.15	ES1 PID=<0.1ppm			29.85	(0.15)	MADE GROUND: Dark grey very sandy SILT with occasional rootlets.			
0.20-0.60	ES2 PID=<0.1ppm				(0.45)	MADE GROUND: Brown very clayey GRAVEL with occasional brick fragments and rare metal fragments. Sand is fine to medium. Gravel is fine to coarse and subangular to angular comprising sandstone and limestone.			
0.60-1.00	ESB3 PID=<0.1ppm			29.40	0.60	Geotextile membrane at 0.15mbgl.			
1.20-1.65	SPT N=9		2,2/2,3,2,2		(1.40)	MADE GROUND: Greyish brown slightly gravelly sandy silty CLAY with occasional brick fragments and organic material. Sand is fine to medium. Gravel is fine to medium and subrounded.			
1.70-2.00	B4								
2.00	PP 36.79kPa			28.00	2.00	Firm consistency brownish grey sandy silty organic CLAY. Sand is fine to medium. Slight organic odour.			
2.00-2.45	SPT N=13		3,3/3,3,4,3						
2.00-2.20	ES5 PID=<0.1ppm								
2.50-3.00	B6								
3.00	PP 85.84kPa								
3.00-3.45	SPT N=11		2,2/2,3,3,3		(2.90)				
3.00-3.45	X7								
4.00	PP 79.71kPa								
4.00-4.45	SPT N=17		5,3/8,3,3,3						
4.00-4.45	X8								
5.00	PP 85.84kPa			25.10	4.90	Stiff consistency grey CLAY.			
5.00-5.45	SPT N=25		4,4/6,7,6,6		(0.40)				
5.00-5.45	X9			24.70	5.30	Light brownish grey fine to medium SAND.			
				24.55	(0.15)				
					5.45	Complete at 5.45m			

Remarks

Groundwater strike at 4.00mbgl.
Borehole stable.
Location accurate to 5.0-8.0m.
Elevation estimated using <https://www.freemaptools.com/elevation-finder.htm>
Scale (approx)

1:40

Logged By

HM

Figure No.

LKC 21 1012.WS103

Excavation Method

Drive-in Windowless Sample
driven to 5.45mbgl.

Dimensions
Location

381521 E 392593 N

Ground Level (mOD)

30.00

Dates

28/01/2021

Client

Step Places

Project Contractor

D&I

Job
Number
LKC 21 1012

Sheet
1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10-0.30	ES1 PID=<0.1ppm			29.90	(0.10)	MADE GROUND: Dark grey very sandy SILT with occasional rootlets.		
0.50-1.00	ES2 PID=<0.1ppm			29.50	(0.40)	MADE GROUND: Dark brown sandy very gravelly CLAY with occasional brick fragments and rare plastic. Sand is fine to medium. Gravel is fine to coarse and subangular comprising sandstone.		
1.20-1.65	SPT N=9		5,4/2,2,2,3		(1.70)	MADE GROUND: Dark greyish brown slightly gravelly sandy silty CLAY with occasional organic material, ash, rare brick fragments. Sand is fine to medium. Gravel is fine to medium and subangular comprising sandstone.		
1.70-2.00	B3							
2.00-2.45	SPT N=9		3,2/2,2,2,3					
2.00-2.20	ES4 PID=<0.1ppm			27.80	2.20	Firm to stiff consistency medium to high strength grey and brown mottled slightly gravelly sandy CLAY. Sand is fine to medium. Gravel is fine to medium, subangular comprising sandstone.		
2.20	PP 42.91kPa							
2.20-2.40	ES5 PID=<0.1ppm							
2.70-3.00	B6							
3.00	PP 61.31kPa		2,2/2,2,3,4					
3.00-3.45	SPT N=11							
3.00-3.45	X7							
4.00	PP 85.83kPa		2,3/3,3,3,3		(3.25)			
4.00-4.45	SPT N=12							
4.00-4.45	X8							
5.00	PP 79.7kPa		2,2/2,4,4,4					
5.00-5.45	SPT N=14			24.55	5.45	Complete at 5.45m		
5.00-5.45	X9							

Remarks
Scale
(approx)

1:40

Logged
By

HM

Figure No.

LKC 21 1012.WS104

Excavation Method

Drive-in Windowless sample
driven to 5.45mbgl.

Dimensions

Borehole dry and stable. to
Location accurate to 5.00-8.00m. to
Elevation estimated using <https://www.freemaptools.com/elevation-finder.htm> to

Ground Level (mOD)

30.00

Client

Step Places
<https://www.freemaptools.com/elevation-finder.htm> to

Job
Number
LKC 21 1012

Location

381518 E 392596 N

Dates

28/01/2021

Project Contractor

D&I

Sheet
1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10-0.50	ES1 PID=<0.1ppm			29.85	(0.15) 0.15	MADE GROUND: Dark grey very sandy SILT with occasional rootlets.		
0.90-1.20	ES2 PID=<0.1ppm			29.10	(0.75) 0.90	MADE GROUND: Brown sandy very clayey GRAVEL with occasional brick and concrete fragments. Sand is fine to medium. Gravel is fine to coarse and angular to subangular comprising sandstone and limestone. Geotextile membrane at 0.15mbgl.		
1.20-1.65	SPT N=7		1,2/2,2,1,2					
1.70-2.00	B3							
2.00-2.45	PP 12.26kPa SPT N=7 X4		1,1/1,2,2,2		(2.90)			
2.50-3.00	B5							
3.00-3.45	PP 36.79kPa SPT N=8 X6		2,2/2,2,2,2					
4.00-4.45	PP 36.79kPa SPT N=9 X7		1,1/3,2,2,2	26.20	3.80	Soft to firm consistency low strength slightly greyish brown and yellow mottled slightly gravelly sandy CLAY. Sand is fine to medium. Gravel is fine to medium and subangular comprising sandstone and siltstone.		
5.00-5.45	PP 30.65kPa SPT N=9 X8		1,2/2,2,2,3	24.55	5.45	Complete at 5.45m		

Remarks

Borehole dry and stable.
Location accurate to 5.00-8.00m.
Elevation estimated using <https://www.freemaptools.com/elevation-finder.htm>
Scale
(approx)

1:40

Logged
By

HM

Figure No.

LKC 21 1012.WS105

Appendix C

Certificates of Analysis – Soil



Final Report

Report No.:	21-02853-1		
Initial Date of Issue:	09-Feb-2021		
Client	LK Consult		
Client Address:	Unit 29 Eton Business Park Eton Hill Road Radcliffe Manchester Lancashire M26 2ZS		
Contact(s):	Contaminated Land Colin Crompton		
Project	LKC 21 1012 Chorlton Villas		
Quotation No.:		Date Received:	02-Feb-2021
Order No.:	738306	Date Instructed:	03-Feb-2021
No. of Samples:	4		
Turnaround (Wkdays):	5	Results Due:	09-Feb-2021
Date Approved:	09-Feb-2021		
Approved By:			
Details:	Glynn Harvey, Technical Manager		

Results - Soil

Project: LKC 21 1012 Chorlton Villas

Client: LK Consult	Chemtest Job No.:				21-02853	21-02853	21-02853	21-02853
Quotation No.:	Chemtest Sample ID.:				1133910	1133913	1133916	1133922
Order No.: 738306	Client Sample Ref.:				ES1	ES2	ES1	ES1
	Sample Location:				WS102	WS103	WS104	HD101
	Sample Type:				SOIL	SOIL	SOIL	SOIL
	Top Depth (m):				0.3	0.2	0.1	0.1
	Bottom Depth (m):				0.8	0.6	0.3	0.5
	Date Sampled:				28-Jan-2021	28-Jan-2021	28-Jan-2021	28-Jan-2021
	Asbestos Lab:				COVENTRY	COVENTRY	COVENTRY	COVENTRY
Determinand	Accred.	SOP	Units	LOD				
ACM Type	U	2192		N/A	-	-	-	-
Asbestos Identification	U	2192		N/A	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
ACM Detection Stage	U	2192		N/A	-	-	-	-
Moisture	N	2030	%	0.020	8.6	12	15	12
Soil Colour	N	2040		N/A	Brown	Brown	Brown	Brown
Other Material	N	2040		N/A	Stones	Stones	Stones	Stones
Soil Texture	N	2040		N/A	Sand	Sand	Clay	Sand
Chromatogram (TPH)	N			N/A			See Attached	
pH	M	2010		4.0	10.2	10.3	9.3	10.6
Boron (Hot Water Soluble)	M	2120	mg/kg	0.40			0.45	
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010	0.73	0.42	0.046	0.24
Cyanide (Free)	M	2300	mg/kg	0.50			< 0.50	
Cyanide (Total)	M	2300	mg/kg	0.50			< 0.50	
Arsenic	M	2450	mg/kg	1.0	9.2	11	14	12
Cadmium	M	2450	mg/kg	0.10	0.13	0.21	0.25	0.31
Chromium	M	2450	mg/kg	1.0	11	14	15	15
Copper	M	2450	mg/kg	0.50	13	21	29	39
Mercury	M	2450	mg/kg	0.10	< 0.10	0.11	0.15	0.10
Nickel	M	2450	mg/kg	0.50	13	17	19	18
Lead	M	2450	mg/kg	0.50	22	40	59	38
Selenium	M	2450	mg/kg	0.20	< 0.20	< 0.20	0.25	< 0.20
Vanadium	U	2450	mg/kg	5.0	13	19	20	19
Zinc	M	2450	mg/kg	0.50	38	83	77	53
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50
Organic Matter	M	2625	%	0.40	0.74	2.2	3.1	1.6
Diesel Present	N	2670		N/A			False	
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0			< 1.0	
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0			< 1.0	
Aliphatic TPH >C8-C10	M	2680	mg/kg	1.0			< 1.0	
Aliphatic TPH >C10-C12	M	2680	mg/kg	1.0			< 1.0	
Aliphatic TPH >C12-C16	M	2680	mg/kg	1.0			< 1.0	
Aliphatic TPH >C16-C21	M	2680	mg/kg	1.0			< 1.0	
Aliphatic TPH >C21-C35	M	2680	mg/kg	1.0			< 1.0	
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0			< 1.0	
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0			< 5.0	
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0			< 1.0	

Results - Soil

Project: LKC 21 1012 Chorlton Villas

Client: LK Consult	Chemtest Job No.:				21-02853	21-02853	21-02853	21-02853
Quotation No.:	Chemtest Sample ID.:				1133910	1133913	1133916	1133922
Order No.: 738306	Client Sample Ref.:				ES1	ES2	ES1	ES1
	Sample Location:				WS102	WS103	WS104	HD101
	Sample Type:				SOIL	SOIL	SOIL	SOIL
	Top Depth (m):				0.3	0.2	0.1	0.1
	Bottom Depth (m):				0.8	0.6	0.3	0.5
	Date Sampled:				28-Jan-2021	28-Jan-2021	28-Jan-2021	28-Jan-2021
	Asbestos Lab:				COVENTRY	COVENTRY	COVENTRY	COVENTRY
Determinand	Accred.	SOP	Units	LOD				
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0			< 1.0	
Aromatic TPH >C8-C10	M	2680	mg/kg	1.0			< 1.0	
Aromatic TPH >C10-C12	M	2680	mg/kg	1.0			< 1.0	
Aromatic TPH >C12-C16	M	2680	mg/kg	1.0			< 1.0	
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0			< 1.0	
Aromatic TPH >C21-C35	M	2680	mg/kg	1.0			< 1.0	
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0			< 1.0	
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0			< 5.0	
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0			< 10	
Benzene	M	2760	µg/kg	1.0			< 1.0	
Toluene	M	2760	µg/kg	1.0			< 1.0	
Ethylbenzene	M	2760	µg/kg	1.0			< 1.0	
m & p-Xylene	M	2760	µg/kg	1.0			< 1.0	
o-Xylene	M	2760	µg/kg	1.0			< 1.0	
Methyl Tert-Butyl Ether	M	2760	µg/kg	1.0			< 1.0	
Naphthalene	M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthylene	N	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthene	M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluorene	M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Phenanthrene	M	2800	mg/kg	0.10	0.31	38	0.65	1.2
Anthracene	M	2800	mg/kg	0.10	< 0.10	8.6	0.19	0.30
Fluoranthene	M	2800	mg/kg	0.10	0.61	45	1.2	2.2
Pyrene	M	2800	mg/kg	0.10	0.57	36	1.0	2.0
Benzo[a]anthracene	M	2800	mg/kg	0.10	0.28	18	0.56	1.1
Chrysene	M	2800	mg/kg	0.10	0.28	18	0.54	1.1
Benzo[b]fluoranthene	M	2800	mg/kg	0.10	0.32	22	0.68	1.5
Benzo[k]fluoranthene	M	2800	mg/kg	0.10	0.15	7.7	0.26	0.44
Benzo[a]pyrene	M	2800	mg/kg	0.10	0.32	19	0.68	1.4
Indeno(1,2,3-c,d)Pyrene	M	2800	mg/kg	0.10	< 0.10	10	0.41	0.86
Dibenz(a,h)Anthracene	N	2800	mg/kg	0.10	< 0.10	1.9	0.11	0.22
Benzo[g,h,i]perylene	M	2800	mg/kg	0.10	< 0.10	9.2	0.38	0.82
Total Of 16 PAH's	N	2800	mg/kg	2.0	2.8	230	6.7	13
Total Phenols	M	2920	mg/kg	0.30			< 0.30	

TPH Chromatogram on Soil Sample: 1133916

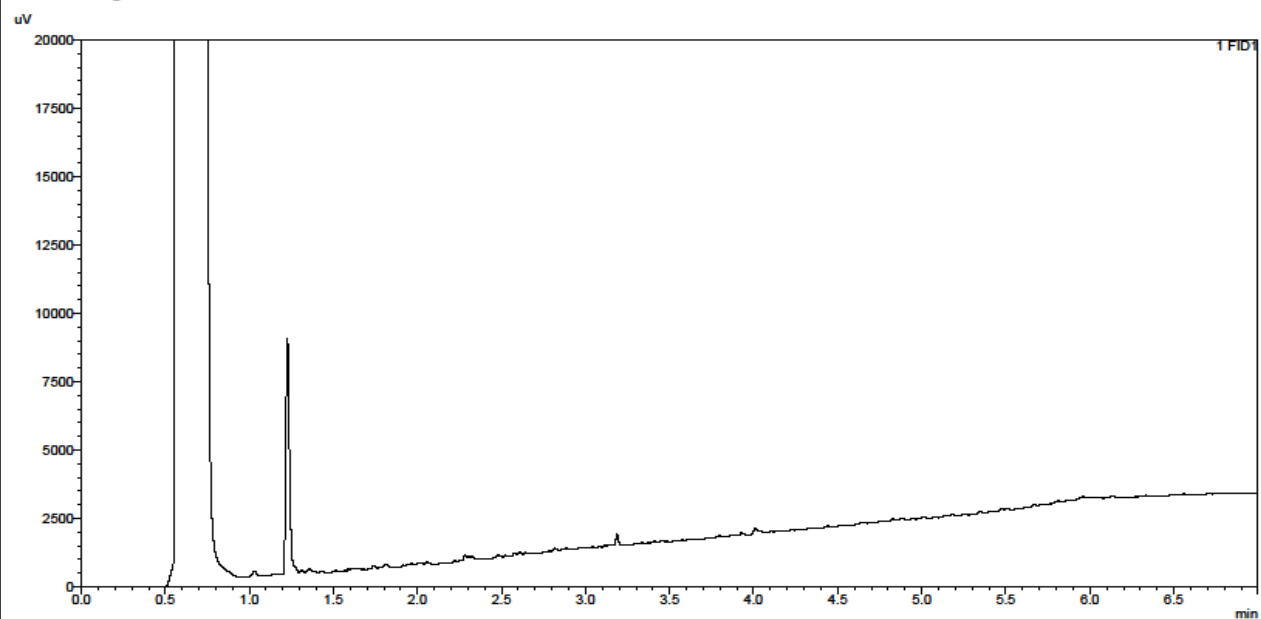
<Sample Information>

Sample Name : 1133916 21-02853
Data Filename : 04 February 2021_04022021_1133916 21-02853_057.gcd
Method Filename : TPH 12m Fast OSv2.gcm
Sample # : 29
Date Acquired : 04/02/2021 18:30:29
Date Processed : 04/02/2021



Chemtest

<Chromatogram>



TPH Interpretation

Job	Sample	Matrix	Location	Sample Ref	Sample ID	Sample Depth (m)	Gasoline / Diesel Present	TPH Interpretation
21-02853	1133916	S	WS104	ES1		0.1	No	N/A

Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Alkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2670	Total Petroleum Hydrocarbons (TPH) in Soils by GC-FID	TPH (C6–C40); optional carbon banding, e.g. 3-band – GRO, DRO & LRO*TPH C8–C40	Dichloromethane extraction / GC-FID
2680	TPH A/A Split	Aliphatics: >C5–C6, >C6–C8,>C8–C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C44	Dichloromethane extraction / GCxGC FID detection
2760	Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule	Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds.
2800	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-MS	Acenaphthene*; Acenaphthylene; Anthracene*; Benzo[a]Anthracene*; Benzo[a]Pyrene*; Benzo[b]Fluoranthene*; Benzo[ghi]Perylene*; Benzo[k]Fluoranthene; Chrysene*; Dibenz[ah]Anthracene; Fluoranthene*; Fluorene*; Indeno[123cd]Pyrene*; Naphthalene*; Phenanthrene*; Pyrene*	Dichloromethane extraction / GC-MS
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.

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I/S	Insufficient Sample
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N/E	not evaluated
<	"less than"
>	"greater than"
SOP	Standard operation procedure
LOD	Limit of detection

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The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

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- D - Broken Container
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All water samples will be retained for 14 days from the date of receipt

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If you require extended retention of samples, please email your requirements to:

customerservices@chemtest.com



Final Report

Report No.: 21-03106-1
Initial Date of Issue: 12-Feb-2021
Client LK Consult
Client Address: Unit 29 Eton Business Park
Eton Hill Road
Radcliffe
Manchester
Lancashire
M26 2ZS
Contact(s): Colin Crompton
Contaminated Land
Project LKC 21 1012 Chorlton Villas

Quotation No.:		Date Received:	03-Feb-2021
Order No.:	738306	Date Instructed:	03-Feb-2021
No. of Samples:	1		
Turnaround (Wkdays):	7	Results Due:	11-Feb-2021
Date Approved:	12-Feb-2021		

Approved By:

Details: Glynn Harvey, Technical Manager

Results - 2 Stage WAC

Project: LKC 21 1012 Chorlton Villas

Chemtest Job No: 21-03106							Landfill Waste Acceptance Criteria			
Chemtest Sample ID: 1135253							Limits			
Sample Ref: ES1							Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill	
Sample ID:										
Sample Location: WS104										
Top Depth(m): 0.10										
Bottom Depth(m): 0.30										
Sampling Date: 28-Jan-2021										
Determinand	SOP	Accred.	Units							
Total Organic Carbon	2625	M	%				1.3	3	5	6
Loss On Ignition	2610	M	%				7.2	--	--	10
Total BTEX	2760	M	mg/kg				< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg				< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	M	mg/kg				< 10	500	--	--
Total (Of 17) PAH's	2700	N	mg/kg				3.9	100	--	--
pH	2010	M					9.2	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg				0.032	--	To evaluate	To evaluate
Eluate Analysis			2:1 mg/l	8:1 mg/l	2:1 mg/kg	Cumulative mg/kg 10:1	Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg			
Arsenic	1450	U	0.0036	0.0049	< 0.050	< 0.050	0.5	2	25	
Barium	1450	U	0.034	0.023	< 0.50	< 0.50	20	100	300	
Cadmium	1450	U	< 0.00010	< 0.00010	< 0.010	< 0.010	0.04	1	5	
Chromium	1450	U	0.0033	0.0028	< 0.050	< 0.050	0.5	10	70	
Copper	1450	U	0.0037	0.0047	< 0.050	< 0.050	2	50	100	
Mercury	1450	U	< 0.00050	< 0.00050	< 0.0010	< 0.0050	0.01	0.2	2	
Molybdenum	1450	U	0.010	0.0027	< 0.050	< 0.050	0.5	10	30	
Nickel	1450	U	0.0012	0.0015	< 0.050	< 0.050	0.4	10	40	
Lead	1450	U	< 0.0010	0.0044	< 0.010	0.039	0.5	10	50	
Antimony	1450	U	0.0023	0.0012	< 0.010	0.013	0.06	0.7	5	
Selenium	1450	U	0.0022	0.0017	< 0.010	0.017	0.1	0.5	7	
Zinc	1450	U	0.016	0.0062	< 0.50	< 0.50	4	50	200	
Chloride	1220	U	< 1.0	2.5	< 10	22	800	15000	25000	
Fluoride	1220	U	0.68	0.40	1.3	4.3	10	150	500	
Sulphate	1220	U	18	7.2	35	84	1000	20000	50000	
Total Dissolved Solids	1020	N	170	85	330	930	4000	60000	100000	
Phenol Index	1920	U	< 0.030	< 0.030	< 0.30	< 0.50	1	-	-	
Dissolved Organic Carbon	1610	U	9.1	11	< 50	110	500	800	1000	

Solid Information	
Dry mass of test portion/kg	0.175
Moisture (%)	16

Leachate Test Information	
Leachant volume 1st extract/l	0.317
Leachant volume 2nd extract/l	1.400
Eluant recovered from 1st extract/l	0.190

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Test Methods

SOP	Title	Parameters included	Method summary
1020	Electrical Conductivity and Total Dissolved Solids (TDS) in Waters	Electrical Conductivity and Total Dissolved Solids (TDS) in Waters	Conductivity Meter
1220	Anions, Alkalinity & Ammonium in Waters	Fluoride; Chloride; Nitrite; Nitrate; Total; Oxidisable Nitrogen (TON); Sulfate; Phosphate; Alkalinity; Ammonium	Automated colorimetric analysis using 'Aquakem 600' Discrete Analyser.
1450	Metals in Waters by ICP-MS	Metals, including: Antimony; Arsenic; Barium; Beryllium; Boron; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Tin; Vanadium; Zinc	Filtration of samples followed by direct determination by inductively coupled plasma mass spectrometry (ICP-MS).
1610	Total/Dissolved Organic Carbon in Waters	Organic Carbon	TOC Analyser using Catalytic Oxidation
1920	Phenols in Waters by HPLC	Phenolic compounds including: Phenol, Cresols, Xylenols, Trimethylphenols Note: Chlorophenols are excluded.	Determination by High Performance Liquid Chromatography (HPLC) using electrochemical detection.
2010	pH Value of Soils	pH	pH Meter
2015	Acid Neutralisation Capacity	Acid Reserve	Titration
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2610	Loss on Ignition	loss on ignition (LOI)	Determination of the proportion by mass that is lost from a soil by ignition at 550°C.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2670	Total Petroleum Hydrocarbons (TPH) in Soils by GC-FID	TPH (C6–C40); optional carbon banding, e.g. 3-band – GRO, DRO & LRO*TPH C8–C40	Dichloromethane extraction / GC-FID
2700	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-FID	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenzo[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Dichloromethane extraction / GC-FID (GC-FID detection is non-selective and can be subject to interference from co-eluting compounds)
2760	Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule	Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds.
2815	Polychlorinated Biphenyls (PCB) ICES7Congeners in Soils by GC-MS	ICES7 PCB congeners	Acetone/Hexane extraction / GC-MS
640	Characterisation of Waste (Leaching C10)	Waste material including soil, sludges and granular waste	ComplianceTest for Leaching of Granular Waste Material and Sludge
650	Characterisation of Waste (Leaching WAC)	Waste material including soil, sludges and granular waste	ComplianceTest for Leaching of Granular Waste Material and Sludge

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Appendix D

Generic Assessment Criteria Values

Summary of Category 4 Screening Levels: 2015

Substance	Residential (with home- grown produce)	Residential (without home- grown produce)	Allotments	Commercial	Public Open Space 1	Public Open Space 2
Arsenic	37 mg/kg	40 mg/kg	49 mg/kg	640 mg/kg	79 mg/kg	170 mg/kg
Benzene	0.87 mg/kg	3.3 mg/kg	0.18 mg/kg	98 mg/kg	140 mg/kg	230 mg/kg
Benzo(a)pyrene	5.0 mg/kg	5.3 mg/kg	5.7 mg/kg	77 mg/kg	10 mg/kg	21 mg/kg
Cadmium	22 mg/kg	150 mg/kg	3.9 mg/kg	410 mg/kg	220 mg/kg	880 mg/kg
Chromium VI	21 mg/kg	21 mg/kg	170 mg/kg	49 mg/kg	21 mg/kg	250 mg/kg
Lead	200 mg/kg	310 mg/kg	80 mg/kg	2300 mg/kg	630 mg/kg	1300 mg/kg

Summary Table for the Generic Assessment Criteria for Human Health Risk Assessment Land Quality Management (LQM) S4ULs.

All GAC are based on sandy loam soils with a pH 7.

		LQM Generic Assessment Criteria (mg/kg) Dry weight soil						
Contaminant		SOM	Res +	Res -	Allot.	Comm.	POS _{resi}	POS _{park}
Metals	Inorganic Arsenic	6%	37	40	43	640	79	170
	Beryllium	6%	1.7	1.7	35	12	2.2	63
	Boron	6%	290	11,000	45	240,000	21,000	46,000
	Cadmium	6%	11	85	1.9	190	120	532
	Chromium (III)	6%	910	910	18,000	8,600	1,500	33,000
	Chromium (VI)	6%	6.0	6.0	1.8	33	7.7	220
	Copper	6%	2,400	7,100	520	68,000	12,000	44,000
	Elemental Mercury	6%	1.2	1.2	21	58 (25.8) ^{vap}	16	30 (25.8) ^{vap}
	Inorganic Mercury	6%	40	56	19	1,100	120	240
	Methylmercury	6%	11	15	6.0	320	40	68
	Nickel	6%	180	180	230	980	230	3,400
	Selenium	6%	250	430	88	12,000	1,100	1,800
	Vanadium	6%	410	1,200	91	9,000	2,000	5,000
	Zinc	6%	3,700	40,000	620	730,000	81,000	170,000
BTEX Compounds	Benzene	1%	0.087	0.38	0.017	27	72	90
		2.5%	0.17	0.70	0.034	47	72	100
		6%	0.37	1.4	0.075	90	73	110
	Toluene	1%	130	880 (869) ^{vap}	22	56,000 (869) ^{vap}	56,000	87,000 (869) ^{vap}
		2.5%	290	1,900	51	110,000 (1,920) ^{vap}	56,000	95,000 (1,920) ^{vap}
		6%	660	3,900	120	180,000 (4,360) ^{vap}	56,000	100,000 (4,360) ^{vap}
	Ethylbenzene	1%	47	83	16	5,700 (518) ^{vap}	24,000	17,000 (518) ^{vap}
		2.5%	110	190	39	13,000 (1,220) ^{vap}	24,000	22,000 (1,220) ^{vap}
		6%	260	440	91	27,000 (2,840) ^{vap}	25,000	27,000 (2,840) ^{vap}
	o-xylene	1%	60	88	28	6,600 (478) ^{sol}	41,000	17,000 (478) ^{sol}
		2.5%	140	210	67	15,000 (1,120) ^{sol}	42,000	24,000 (1,120) ^{sol}
		6%	330	480	160	33,000 (2,620) ^{sol}	43,000	33,000 (2,620) ^{sol}
	m-xylene	1%	59	82	31	6,200 (625) ^{vap}	41,000	17,000 (625) ^{vap}
		2.5%	140	190	74	14,000 (1,470) ^{vap}	42,000	24,000 (1,470) ^{vap}
		6%	320	450	170	31,000 (3,460) ^{vap}	43,000	32,000 (3,460) ^{vap}
	p-xylene	1%	56	79	29	5,900 (576) ^{sol}	41,000	17,000 (576) ^{sol}
		2.5%	130	180	69	14,000 (1,350) ^{sol}	42,000	23,000 (1,350) ^{sol}
		6%	310	430	160	30,000 (3,170) ^{sol}	43,000	31,000 (3,170) ^{sol}

NOTES

^{sol/vap} = solubility / vapour limit (potentially use if free product identified, although highly conservative).

f = oral, dermal and inhalation exposures compared to oral HCV.

All GAC are based on sandy loam soils with a pH 7.

All GAC are based on sandy loam soils with a pH 7.			LQM Generic Assessment Criteria (mg/kg) Dry weight soil					
Contaminant		SOM	Res +	Res -	Allot.	Comm.	POS _{resi}	POS _{park}
Polycyclic Aromatic Hydrocarbons (PAHs)	Acenaphthene	1%	210	3,000 (57.1) ^{sol}	34	84,000 (57.0) ^{sol}	15,000	29,000
		2.5%	510	4,700 (141) ^{sol}	85	97,000 (141) ^{sol}	15,000	30,000
		6%	1,100	6,000 (336) ^{sol}	200	100,000	15,000	30,000
	Acenaphthylene	1%	170	2,900 (86.1) ^{sol}	28	83,000 (86.1) ^{sol}	15,000	29,000
		2.5%	420	4,600 (212) ^{sol}	69	97,000 (212) ^{sol}	15,000	30,000
		6%	920	6,000 (506) ^{sol}	160	100,000	15,000	30,000
	Anthracene	1%	2,400	31,000 (1.17) ^{vap}	380	520,000	74,000	150,000
		2.5%	5,400	35,000	950	540,000	74,000	150,000
		6%	11,000	37,000	2,200	540,000	74,000	150,000
	Benz(a)anthracene	1%	7.2	11	2.9	170	29	49
		2.5%	11	14	6.5	170	29	56
		6%	13	15	13	180	29	62
	Benzo(a)pyrene (only)	1%	2.2	3.2	0.97	35	5.7	11
		2.5%	2.7	3.2	2.0	35	5.7	12
		6%	3.0	3.2	3.5	36	5.7	13
	Benzo(b)fluoranthene	1%	2.6	3.9	0.99	44	7.1	13
		2.5%	3.3	4.0	2.1	44	7.2	15
		6%	3.7	4.0	3.9	45	7.2	16
	Benzo(ghi)perylene	1%	320	360	290	3,900	640	1,400
		2.5%	340	360	470	4,000	640	1,500
		6%	350	360	640	4,000	640	1,600
	Benzo(k)fluoranthene	1%	77	110	37	1,200	190	370
		2.5%	93	110	75	1,200	190	410
		6%	100	110	130	1,200	190	440
	Chrysene	1%	15	30	4.1	350	57	93
		2.5%	22	31	9.4	350	57	110
		6%	27	32	19	350	57	120
	Dibenzo(ah)anthracene	1%	0.24	0.31	0.14	3.5	0.57	1.1
		2.5%	0.28	0.32	0.27	3.6	0.58	1.3
		6%	0.3	0.32	0.43	3.6	0.58	1.4
	Fluoranthene	1%	280	1,500	52	23,000	3,100	6,300
		2.5%	560	1,600	130	23,000	3,100	6,300
		6%	890	1,600	290	23,000	3,100	6,400
	Fluorene	1%	170	2,800 (36.0) ^{sol}	27	63,000 (30.9) ^{sol}	9,900	20,000
		2.5%	400	3,800 (76.5) ^{sol}	67	68,000	9,900	20,000
		6%	860	4,500 (183) ^{sol}	160	71,000	9,900	20,000
	Indeno(123-cd)pyrene	1%	27	45	9.5	500	82	150
		2.5%	36	46	21	510	82	170
		6%	41	46	39	510	82	180
	Naphthalene	1%	2.3 ^f	2.3 ^f	4.1 ^f	190 ^f (76.4) ^{sol}	4,900 ^f	1,200 ^f (76.4) ^{sol}
		2.5%	5.6 ^f	5.6 ^f	10 ^f	460 ^f (183) ^{sol}	4,900 ^f	1,900 ^f (183) ^{sol}
		6%	13 ^f	13 ^f	24 ^f	1,100 ^f (432) ^{sol}	4,900 ^f	3,000
	Phenanthrene	1%	95	1,300 (36.0) ^{sol}	15	22,000	3,100	6,200
		2.5%	220	1,500	38	22,000	3,100	6,200
		6%	440	1,500	90	22,000	3,100	6,300
	Pyrene	1%	620	3,700	110	54,000	7,400	15,000
		2.5%	1,200	3,800	270	54,000	7,400	15,000
		6%	2,000	3,800	620	54,000	7,400	15,000
Coal Tar (B(a)P as surrogate marker)	1%	0.79	1.2	0.32	15	2.2	4.4	
	2.5%	0.98	1.2	0.67	15	2.2	4.7	
	6%	1.1	1.2	1.2	15	2.2	4.8	

NOTES

^{sol} / ^{vap} = solubility / vapour limit (potentially use if free product identified, although highly conservative).

^f = naphthalene is based on comparison of inhalation exposure with TDI_{Inhal} for localised effect.

All GAC are based on sandy loam soils with a pH 7.

LQM Generic Assessment Criteria (mg/kg) Dry weight soil

Contaminant	SOM	Res +	Res -	Allot.	Comm.	POS _{resi}	POS _{park}
Aliphatic							
EC 5-6	1%	42	42	730	3,200 (304) ^{sol}	570,000(304) ^{sol}	95,000 (304) ^{sol}
EC>6-8	1%	100	100	2,300	7,800 (144) ^{sol}	600,000	150,000 (144) ^{sol}
EC>8-10	1%	27	27	320	2,000 (78) ^{sol}	13,000	14,000 (78) ^{vap}
EC>10-12	1%	130 (48) ^{vap}	130 (48) ^{vap}	2,200	9,700 (48) ^{sol}	13,000	21,000 (48) ^{vap}
EC>12-16	1%	1,100 (24) ^{sol}	1,100 (24) ^{sol}	11,000	59,000 (24) ^{sol}	13,000	25,000 (24) ^{sol}
EC>16-35	1%	65,000 (8.48) ^{f, sol}	65,000 (8.48) ^{f, sol}	260,000 ^f	160,000 ^f	250,000 ^f	450,000 ^f
EC>35-44	1%	65,000 (8.48) ^{f, sol}	65,000 (8.48) ^{f, sol}	260,000 ^f	160,000 ^f	250,000 ^f	450,000 ^f
Aliphatic							
EC 5-6	2.5%	78	78	1,700	5,900 (558) ^{sol}	590,000	130,000 (558) ^{sol}
EC>6-8	2.5%	230	230	5,600	17,000 (322) ^{sol}	610,000	220,000 (322) ^{sol}
EC>8-10	2.5%	65	65	770	4,800 (190) ^{vap}	13,000	18,000 (190) ^{vap}
EC>10-12	2.5%	330 (118) ^{vap}	330 (118) ^{vap}	4,400	23,000 (118) ^{vap}	13,000	23,000 (118) ^{vap}
EC>12-16	2.5%	2,400 (59) ^{sol}	2,400 (59) ^{sol}	13,000	82,000 (59) ^{sol}	13,000	25,000 (59) ^{sol}
EC>16-35	2.5%	92,000 (21) ^{f, sol}	92,000 (21) ^{f, sol}	270,000 ^f	1,700,000 ^f	250,000 ^f	480,000 ^f
EC>35-44	2.5%	92,000 (21) ^{f, sol}	92,000 (21) ^{f, sol}	270,000 ^f	1,700,000 ^f	250,000 ^f	480,000 ^f
Aliphatic							
EC 5-6	6%	160	160	3,900	12,000 (1,150) ^{sol}	600,000	180,000 (1,150) ^{sol}
EC>6-8	6%	530	530	13,000	40,000 (736) ^{sol}	620,000	320,000 (736) ^{sol}
EC>8-10	6%	150	150	1,700	11,000 (451) ^{vap}	13,000	21,000 (451) ^{vap}
EC>10-12	6%	760 (283) ^{vap}	760 (283) ^{vap}	7,300	47,000 (283) ^{vap}	13,000	24,000 (283) ^{vap}
EC>12-16	6%	4,300 (142) ^{sol}	4,400 (142) ^{sol}	13,000	90,000 (142) ^{sol}	13,000	26,000 (142) ^{sol}
EC>16-35	6%	110,000 ^f	110,000 ^f	270,000 ^f	1,800,000 ^f	250,000 ^f	490,000 ^f
EC>35-44	6%	110,000 ^f	110,000 ^f	270,000 ^f	1,800,000 ^f	250,000 ^f	490,000 ^f
Aromatic							
EC5-7(benzene as non-threshold)	1%	70	370	13	26,000 (1,220) ^{sol}	56,000	76,000 (1,220) ^{sol}
EC>7-8(toluene)	1%	130	860	22	56,000 (869) ^{vap}	56,000	87,000 (869) ^{vap}
EC>8-10	1%	34	47	8.6	3,500 (613) ^{vap}	5,000	7,200 (613) ^{vap}
EC>10-12	1%	74	250	13	16,000 (364) ^{sol}	5,000	9,200 (364) ^{sol}
EC>12-16	1%	140	1,800	23	36,000 (169) ^{sol}	5,100	10,000
EC>16-21	1%	260 ^f	1,900 ^f	46 ^f	28,000 ^f	3,800 ^f	7,600 ^f
EC>21-35	1%	1,100 ^f	1,900 ^f	370 ^f	28,000 ^f	3,800 ^f	7,800 ^f
EC>35-44	1%	1,100 ^f	1,900 ^f	370 ^f	28,000 ^f	3,800 ^f	7,800 ^f
Aromatic							
EC5-7(benzene as non-threshold)	2.5%	140	690	27	46,000 (2,260) ^{sol}	56,000	84,000 (2,260) ^{sol}
EC>7-8(toluene)	2.5%	290	1,800	51	110,000 (1,920) ^{sol}	56,000	95,000 (1,920) ^{sol}
EC>8-10	2.5%	83	110	21	8,100 (1,500) ^{vap}	5,000	8,500 (1,500) ^{vap}
EC>10-12	2.5%	180	590	31	28,000 (899) ^{sol}	5,000	9,700 (899) ^{sol}
EC>12-16	2.5%	330	2,300 (419) ^{sol}	57	37,000	5,100	10,000
EC>16-21	2.5%	540 ^f	1,900 ^f	110 ^f	28,000 ^f	3,800 ^f	7,700 ^f
EC>21-35	2.5%	1,500 ^f	1,900 ^f	820 ^f	28,000 ^f	3,800 ^f	7,800 ^f
EC>35-44	2.5%	1,500 ^f	1,900 ^f	820 ^f	28,000 ^f	3,800 ^f	7,800 ^f
Aromatic							
EC5-7(benzene as non-threshold)	6%	300	1,400	57	86,000 (4,710) ^{sol}	56,000	92,000 (4,710) ^{sol}
EC>7-8(toluene)	6%	660	3,900	120	180,000 (4,360) ^{vap}	56,000	100,000 (4,360) ^{vap}
EC>8-10	6%	190	270	51	17,000 (3,580) ^{vap}	5,000	9,300 (3,580) ^{vap}
EC>10-12	6%	380	1,200	4	34,000 (2,150) ^{sol}	5,000	10,000
EC>12-16	6%	660	2,500	130	38,000	5,100	10,000
EC>16-21	6%	930 ^f	1,900 ^f	260 ^f	28,000 ^f	3,800 ^f	7,800 ^f
EC>21-35	6%	1,700 ^f	1,900 ^f	1,600 ^f	28,000 ^f	3,800 ^f	7,900 ^f
EC>35-44	6%	1,700 ^f	1,900 ^f	1,600 ^f	28,000 ^f	3,800 ^f	7,900 ^f
Aliphatic	1%	1,600 ^f	1,900 ^f	1,200 ^f	28,000 ^f	3,800 ^f	7,800 ^f
+Aromatic	2.5%	1,800 ^f	1,900 ^f	2,100 ^f	28,000 ^f	3,800 ^f	7,800 ^f
>EC44	6%	1,900 ^f	1,900 ^f	3,000 ^f	28,000 ^f	3,800 ^f	7,900 ^f

NOTES

^{sol}/^{vap} = solubility / vapour limit (potentially use if free product identified, although highly conservative).

^f = oral, dermal and inhalation exposures compared to oral HCV.

All GAC are based on sandy loam soils with a pH 7.

		LQM Generic Assessment Criteria (mg/kg) Dry weight soil						
Contaminant		SOM	Res +	Res -	Allot.	Comm.	POS _{resi}	POS _{park}
Chloalkanes and Alkenes & Explosives	1,2 Dichloroethane (DCA)	1%	7.1E-03	9.2E-03	4.6E-03	0.67	29	21
		2.5%	1.1E-02	1.3E-02	8.3E-03	0.97	29	24
		6%	1.9E-02	2.3E-02	1.6E-02	1.7	29	28
	1,1,1 Trichloroethane (TCA)	1%	8.8	9.0	48	660	140,000	57,000 (1,425) ^{vap}
		2.5%	18	18	110	1,300	140,000	76,000 (2,915) ^{vap}
		6%	39	40	240	3,000	140,000	100,000 (6,392) ^{vap}
	1,1,2,2-Tetrachloroethanes (PCA)	1%	1.6	3.9	0.41	270	1,400	1,800
		2.5%	3.4	8.0	0.89	550	1,400	2,100
		6%	7.5	17	2.0	1,100	1,400	2,300
	1,1,1,2-Tetrachloroethanes (PCA)	1%	1.2	1.5	0.79	110	1,400	1,500
		2.5%	2.8	3.5	1.9	250	1,400	1,800
		6%	6.4	8.2	4.4	560	1,400	2,100
	Tetrachloroethene (PCE)	1%	0.18	0.18	0.65	19	1,400	810 (424) ^{sol}
		2.5%	0.39	0.40	1.5	42	1,400	1,100 (951) ^{sol}
		6%	0.90	0.92	3.6	95	1,400	1,500
	Tetrachloromethane (carbon tetrachloride)	1%	2.6E-02	2.6E-02	0.45	2.9	890	190
		2.5%	5.6E-02	5.6E-02	1.0	6.3	920	270
		6%	0.13	0.13	2.4	14	950	400
	Trichloroethene (TCE)	1%	1.6E-02	1.7E-02	4.1E-02	1.2	120	70
		2.5%	3.4E-02	3.6E-02	9.1E-02	2.6	120	91
		6%	7.5E-02	8.0E-02	0.21	5.7	120	120
	Trichloromethane (chloroform)	1%	0.91	1.2	0.42	99	2,500	2,600
		2.5%	1.7	2.1	0.83	170	2,500	2,800
		6%	3.4	4.2	1.7	350	2,500	3,100
	Chloroethene (vinyl chloride)	1%	6.4E-04	7.7E-04	5.5E-04	5.9E-02	3.5	4.8
		2.5%	8.7E-04	1.0E-03	1.0E-03	7.7E-02	3.5	5.0
		6%	1.4E-03	1.5E-03	1.8E-03	0.12	3.5	5.4
	2,4,6-Trinitrotoluene (TNT)	1%	1.6	65	0.24	1,000	130	260
		2.5%	3.7	66	0.58	1,000	130	270
		6%	8.1	66	1.4	1,000	130	270
	RDX	1%	120	13,000	17	210,000	26,000	49,000 (18.7) ^{sol}
		2.5%	250	13,000	38	210,000	26,000	51,000
		6%	540	13,000	85	210,000	27,000	53,000
	HMX	1%	5.7	6,700	0.86	110,000	13,000	23,000 (0.35) ^{vap}
		2.5%	13	6,700	1.9	110,000	13,000	23,000 (0.39) ^{vap}
		6%	26	6,700	3.9	110,000	13,000	24,000 (0.48) ^{vap}
Pesticides	Aldrin	1%	5.7	7.3	3.2	170	18	30
		2.5%	6.6	7.4	6.1	170	18	31
		6%	7.1	7.5	9.8	170	18	31
	Dieldrin	1%	0.97	7.0	0.17	170	18	30
		2.5%	2.0	7.3	0.41	170	18	30
		6%	3.5	7.4	0.96	170	18	31
	Atrazine	1%	3.3	610	0.5	9,300	1,200	2,300
		2.5%	7.8	620	1.2	9,400	1,200	2,400
		6%	17.4	620	2.7	9,400	1,200	2,400
	Dichlorvos	1%	3.2E-02	6.4	4.9E-03	140	16	26
		2.5%	6.6E-02	6.5	1.0E-02	140	16	26
		6%	0.14	6.6	2.2E-02	140	16	27
	Endosulfans (2 isomers)	1%	7.4	160 (3.0E-03) ^{vap}	1.2	5,600 (3.0E-03) ^{vap}	1,200	2,300
		2.5%	18	280 (7.0E-03) ^{vap}	2.9	7,400 (7.0E-03) ^{vap}	1,200	2,400
		6%	41	410 (1.6E-02) ^{vap}	6.8	8,400 (1.6E-02) ^{vap}	1,200	2,500
	Hexachlorocyclohexane (3 isomers), inc Lindane	1%	8.5E-02	3.7	1.3E-02	65	8.1	15
		2.5%	0.2	3.8	3.2E-02	65	8.1	15
		6%	0.46	3.8	7.7E-02	65	8.1	16

NOTES

^{sol} / ^{vap} = solubility / vapour limit (potentially use if free product identified, although highly conservative).

All GAC are based on
sandy loam soils with a pH
7.

All GAC are based on sandy loam soils with a pH 7.			LQM Generic Assessment Criteria (mg/kg) Dry weight soil					
Contaminant		SOM	Res +	Res -	Allot.	Comm.	POS _{resi}	POS _{park}
Chlorobenzenes	Chlorobenzene	1%	0.46	0.46	5.9	56	11,000	1,300 (675) ^{sol}
		2.5%	1.0	1.0	14	130	13,000	2,000 (1,520) ^{sol}
		6%	2.4	2.4	32	290	14,000	2,900
	Dichlorobenzenes (3 isomers)	1%	23	24	94	2,000 (571) ^{sol}	90,000	24,000 (571) ^{sol}
		2.5%	55	57	230	4,800 (1,370) ^{sol}	95,000	36,000 (1,370) ^{sol}
		6%	130	130	540	11,000 (3,240) ^{sol}	98,000	51,000 (3,270) ^{sol}
	Trichlorobenzenes (3 isomers)	1%	2.6	2.6	55	220	15,000	1,700 (318) ^{vap}
		2.5%	6.4	6.4	140	530	17,000	2,600 (786) ^{vap}
		6%	15	15	320	1,300	19,000	4,000 (1,880) ^{vap}
	Tetrachlorobenzenes (3 isomers)	1%	0.66	0.75	0.38	49 (39.4) ^{vap}	78	110 (39) ^{vap}
		2.5%	1.6	1.9	0.90	120 (98.1) ^{vap}	79	120
		6%	3.7	4.3	2.2	240 (235) ^{vap}	79	130
	Pentachlorobenzene	1%	5.8	19	1.2	640 (43.0) ^{sol}	100	190
		2.5%	12	30	3.1	770 (107) ^{sol}	100	190
		6%	22	38	7.0	830	100	190
	Hexachlorobenzene	1%	1.8 (0.20) ^{vap}	4.1 (0.20) ^{vap}	0.47	110 (0.20) ^{vap}	16	30
		2.5%	3.3 (0.50) ^{vap}	5.7 (0.50) ^{vap}	1.1	120	16	30
		6%	4.9	6.7 (1.2) ^{vap}	2.5	120	16	30
Chlorophenol	Chlorophenols (4 congeners)	1%	0.87 ^g	94	0.13 ^g	3,500	620	1,100
		2.5%	2.0	150	0.30	4,000	620	1,100
		6%	4.5	210	0.70	4,300	620	1,100
	Pentachlorophenol	1%	0.22	27 (16.4) ^{vap}	3.0E-02	400	60	110
		2.5%	0.52	29	8.0E-02	400	60	120
		6%	1.2	31	0.19	400	60	120
Others	Carbon Disulphide	1%	0.14	0.14	4.8	11	11,000	1,300
		2.5%	0.29	0.29	10	22	11,000	1,900
		6%	0.62	0.62	23	47	11,000	2,700
	Hexachlorobutadiene	1%	0.29	0.32	0.25	31	25	48
		2.5%	0.7	0.78	0.61	66	25	50
		6%	1.6	1.8	1.4	120	25	51
	Phenol	1%	280	750	66	760 ^{dir} (31,000)	760 ^{dir} (11,000)	760 ^{dir} (8,600)
		2.5%	550	1,300	140	1,500 ^{dir} (35,000)	1,500 ^{dir} (11,000)	1,500 ^{dir} (9,700)
		6%	1,100	2,300	280	3,200 ^{dir} (37,000)	3,200 ^{dir} (11,000)	3,200 ^{dir} (11,000)

NOTES

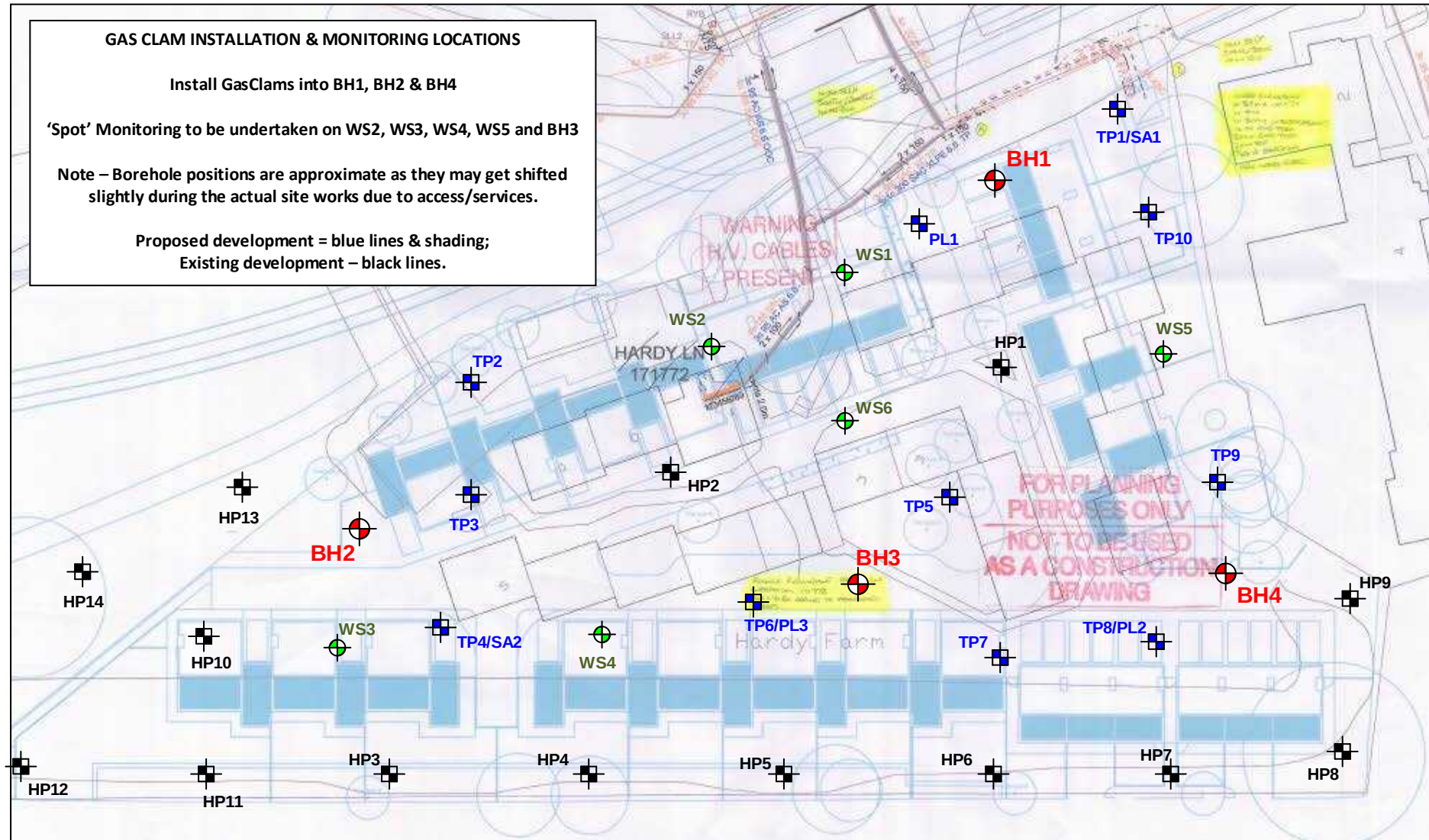
^{sol/vap} = solubility / vapour limit (potentially use if free product identified, although highly conservative).

^{dir} = S4uls based on threshold protective of direct skin contact with phenol (brackets long term exposure for illustration purposes).

^g = derived based on 2,3,4,6-tetrachlorophenol.

Appendix E

Gas Monitoring Results (2014)



-  **BH1 - Cable Tool Percussion Borehole (Large A-Frame Rig) – 9th July (BH1), 10th July (BH2 & start BH3); 11th July (finish BH3 & complete BH4).**
-  **WS4 – Windowless sampling boreholes (small rig, plan area around 1.2m x 1.5m) – all completed on 9th July (start at WS1, approx. 1hr at each position).**
-  **TP1 – Trial Pits excavated with a JCB 3CX. TP2-3 & 5-10 excavated on 10th July by approx. 2:00pm. PL1, PL2 & PL3 done in afternoon. SA1 & SA2 – soakaway test pits completed on 11th July.**
-  **HP1 – Hand excavated pits for areas of difficult access. HP10-HP19 (all behind palisade fence) done on 15th July; other excavated on 9-11th July).**

GGs DataPack®
Hardy's Farm, Chorlton-Cum-Hardy

Appendix B

Periodic 'Spot' Monitoring Record



PROJECT: GGS516
SITE: Hardy Farm, Chorlton
DATE: 21 July 2014
SPECIALIST: Andrew Brunton and Alice Johnson

QMS-SGMF
v1.6

EQUIPMENT		WEATHER CONDITIONS	GROUND CONDITIONS / GENERAL COMMENTS
Model	Serial Number	Part cloud, sunny, 23°C	Student accomadation still in use, Boreholes on surrounding land - mowed, dry lawns. Metro link to north, golf course to south of site.
GasData GFM 430 GI Dip Meter (30m) PhoCheck Tiger	10356 n/a T-105553		
		Start Pressure (mb): 1016	End Pressure (mb): 1014

ID	Time	Barometric Pressure (mb)	Line Test OK?	External Flow (ltr/hr)			TVOC (ppmv)	Steady CH4 (%v/v)	Peak CH4 (%v/v)	Steady CO2 (%v/v)	Peak CO2 (%v/v)	O2 (%v/v)	CO (ppmv)	H2S (ppmv)	SWL (mbgl)	Base Dip (mbgl)	Comments
				Initial	Duration	Steady											
Fresh Air	13:12	1016	Y	NM	N/A	NM	0.1	0.0	0.0	0.0	0.0	22.3	1	1	N/A	N/A	
BH1	13:18	1015	Y	0	N/A	0	13.6	0.0	0.0	2.2	2.2	20.5	3	2	2.80	6.65	Soft, sandy clay at base
BH2	12:00	1016	Y	0	N/A	0	2.1	0.0	0.0	6.0	6.0	7.8	1	1	3.10	6.34	Brown silt at the base
BH3	12:55	1014	Y	0	N/A	0	0.9	0.0	0.0	3.9	3.9	15.3	4	1	2.76	6.67	Brown silty clay at base
BH4	13:02	1014	Y	27	60s	0	3.8	0.1	0.1	2.8	2.8	20.2	6	2	0.49	6.37	hissing on removal of GFM tube
WS1	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	Unable to locate
WS2	13:24	1014	Y	0	n/a	0	5.0	0.0	0.0	1.5	1.5	20.5	3	1	1.77	2.56	
WS3	12:30	1015	Y	0	N/A	0	5.0	0.0	0.0	2.3	2.3	19.9	3	1	2.34	5.00	
WS4	12:43	1015	Y	0	N/A	0	0.1	0.0	14.1	0.0	7.4	3.7	6	1	2.24	3.01	21.7 O2 peak, took approx. 2 mins to reach steady value
WS5	13:08	1015	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	1.94	2.04	couldn't perform spot monitoring
Fresh air	13:30	1014	Y	n/a	n/a	n/a	0.0	0.0	0.0	0.0	0.0	22.3	3	2	N/A	n/a	

KEY: ND = No Detection, NM = Not Measured, NR = Not Recorded, N/A = Not Applicable, * = see comments, %v/v = Percentage volume by volume, ppmv = parts per million by volume, mb = milibar, Ltr/hr = litres per hour, mbgl = metres below ground level



PROJECT: GGS516
SITE: Hardy Farm, Chorlton
DATE: 22 August 2014
SPECIALIST: William Perry and Alice Johnson

QMS-SGMF
v1.6

EQUIPMENT		WEATHER CONDITIONS	GROUND CONDITIONS / GENERAL COMMENTS
Model	Serial Number	50% cloud, no rain, 12°C	Student accomadation still in use, Boreholes on surrounding land - mowed, wet lawns. Metro link to north, golf course to south of site.
GasData GFM 430 GI Dip Meter (30m) PhoCheck Tiger	10356 n/a T-105553		
		Start Pressure (mb): 1004	End Pressure (mb): 1005

ID	Time	Barometric Pressure (mb)	Line Test OK?	External Flow (ltr/hr)			TVOC (ppmv)	Steady CH4 (%v/v)	Peak CH4 (%v/v)	Steady CO2 (%v/v)	Peak CO2 (%v/v)	O2 (%v/v)	CO (ppmv)	H2S (ppmv)	SWL (mbgl)	Base Dip (mbgl)	Comments
				Initial	Duration	Steady											
Fresh Air	09:15	1004	Y	NM	N/A	NM	NM	0.0	0.0	0.0	0.0	21.2	0	0	N/A	N/A	
BH1	09:51	1006	Y	0	N/A	0	NM	0.0	0.0	2.3	2.3	19.8	0	0	2.80	6.64	Brown silt at the base
BH2	10:07	1005	Y	0	N/A	0	NM	0.0	0.0	4.0	4.0	15.5	0	0	1.90	6.61	Brown silt at the base
BH3	10:13	1005	Y	0	N/A	0	NM	0.0	0.0	11.1	11.1	3.9	0	0	3.07	6.16	Brown silt at the base
BH4	09:58	1005	Y	-16.3	20s	0.4	NM	0.8	0.8	3.0	3.0	18.9	1	2	0.56	6.37	
WS1	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	Unable to locate
WS2	09:44	1004	Y	0	N/A	0	NM	0.0	0.0	1.6	1.6	20.1	0	0	1.74	2.54	
WS3	09:19	1004	Y	0	N/A	0	NM	0.0	0.0	2.4	2.4	20.0	0	0	2.30	5.05	
WS4	09:27	1005	Y	NM	NM	NM	NM	13.1	35.2	4.3	11.6	9.3	3	1	1.86	3.03	Not gas tight - Valve was off
WS5	09:33	1004	Y	NM	NM	NM	NM	0.0	0.0	1.8	1.8	20.1	0	0	1.94	2.06	No valve or bung

KEY: ND = No Detection, NM = Not Measured, NR = Not Recorded, N/A = Not Applicable, * = see comments, %v/v = Percentage volume by volume, ppmv = parts per million by volume, mb = milibar, Ltr/hr = litres per hour, mbgl = metres below ground level

GGS DataPack®
Hardy's Farm, Chorlton-Cum-Hardy

Appendix C

Purge & Recovery Data



Ground-Gas Solutions PRT data

Location:	GGs 516
Borehole ref:	BH1
GasClam ID:	00034/04/09
Duration (mins)	87
Frequency (mins)	3
Total samples taken:	30

Location:	GGs 516
Borehole ref:	BH2
GasClam ID:	00028/04/09
Duration (mins)	87
Frequency (mins)	3
Total samples taken:	30

Location:	GGs 516
Borehole ref:	BH3
GasClam ID:	00033/04/09
Duration (mins)	90
Frequency (mins)	3
Total samples taken:	31

Duration (mins)	CH ₄ % v/v	CO ₂ % v/v	O ₂ % v/v
0	0	0	0.8
3	0	0	0
6	0	0	0
9	0	0	0
12	0	0	0
15	0	0	0
18	0	0	0
21	0	0	0
24	0	0	0
27	0	0	0
30	0	0	0
33	0	0	0.2
36	0	0	0.3
39	0	0	0.5
42	0	0	0.8
45	0	0	1
48	0	0	1.2
51	0	0	0.6
54	0	0	0.8
57	0	0	1
60	0	0	1.2
63	0	0	1.4
66	0	0	1.6
69	0	0	1.8
72	0	0	2
75	0	0	3.3
78	0	0	3.6
81	0	0	3.8
84	0	0	4.1
87	0	0	4.3

Duration (mins)	CH ₄ % v/v	CO ₂ % v/v	O ₂ % v/v
0	0	0	1.7
3	0	0	1.1
6	0	0	0.9
9	0	0	0.9
12	0	0	0.8
15	0	0	0.8
18	0	0	0.7
21	0	0	0.7
24	0	0.5	0.6
27	0	0.5	0.6
30	0	0.5	0.6
33	0	0.5	0.6
36	0	0.5	0.6
39	0	0.5	0.6
42	0	0.5	0.6
45	0	0.5	0.6
48	0	0.5	0.5
51	0	0.5	0.5
54	0	0.5	0.5
57	0	0.5	0.5
60	0	0.5	0.5
63	0	0.5	0.5
66	0	0.5	0.5
69	0	0.5	0.6
72	0	0.5	0.6
75	0	0.5	0.6
78	0	0.5	0.6
81	0	0.5	0.6
84	0	0.5	0.6
87	0	0.5	0.6

Duration (mins)	CH ₄ % v/v	CO ₂ % v/v	O ₂ % v/v
0	0	0.5	0.8
3	0	0.5	0.5
6	0	0.5	0.4
9	0	0.5	0.4
12	0	0.5	0.4
15	0	0.6	0.4
18	0	1.2	0.4
21	0	1.2	0.4
24	0	1.2	0.4
27	0	1.2	0.4
30	0	1.2	0.4
33	0	1.2	0.4
36	0	1.7	0.4
39	0	1.7	0.4
42	0	1.7	0.5
45	0	1.7	0.5
48	0	1.7	0.5
51	0	2.3	0.5
54	0	2.3	0.5
57	0	2.3	0.5
60	0	2.3	0.6
63	0	2.9	0.6
66	0	2.9	0.6
69	0	2.9	0.6
72	0	2.9	0.6
75	0	2.9	0.6
78	0	2.9	0.7
81	0	3.5	0.7
84	0	3.5	0.7
87	0	3.5	0.7
90	0	3.5	0.7

GGs DataPack®
Hardy's Farm, Chorlton-Cum-Hardy

Appendix D

Continuous Monitoring Data



Ground-Gas Solutions Time Series Data

Location:	GG5516	
Borehole ref:	BH1	
Gas/Chem ID:	0000340409	Days of monitoring: 27
Start Date:	21/07/2014 13:43	Monitoring Frequency (mins): 90
End Date:	18/08/2014 10:31	Total samples taken: 648

Minimum, Maximum and range table										
	CH ₄	CO ₂	O ₂	TVOC	H ₂ S	CO	Borehole Pressure	Atmospheric Pressure	Differential Pressure	Temperature
Min	0.0	0.0	0.0	1	0	0	985	985	-1	14.6
Max	0.0	1.2	27.0	19	0	7	1019	1019	3	26.9
Range	0.0	1.2	27.0	18	0	7	34	34		12.3

Date and Time	CH ₄ % v/v	CO ₂ % v/v	O ₂ % v/v	TVOC ppmv	H ₂ S ppmv	CO ppmv	Borehole Pressure millibars	Atmospheric Pressure millibars	Differential Pressure millibars	Temperature °C	H ₂ O	Comments / Events
21/07/2014 13:43	0.0	0.0	23.1	8	0	5	1018	1015	3	26.6		
21/07/2014 13:46	0.0	0.0	23.7	4	0	0	1015	1016	-1	26.9		
21/07/2014 15:16	0.0	0.6	23.2	12	0	4	1014	1015	-1	19.9		
21/07/2014 16:46	0.0	0.6	22.6	16	0	4	1015	1015	0	18.1		
21/07/2014 18:16	0.0	0.6	22.5	17	0	5	1015	1015	0	17.7		
21/07/2014 19:46	0.0	0.6	23.0	18	0	4	1015	1015	0	17.6		
21/07/2014 21:16	0.0	1.2	24.5	18	0	5	1015	1016	-1	17.6		
21/07/2014 22:46	0.0	1.2	25.4	19	0	4	1016	1016	0	17.6		
22/07/2014 00:16	0.0	1.2	25.9	18	0	4	1016	1017	-1	17.6		
22/07/2014 01:46	0.0	1.2	26.3	18	0	7	1017	1017	0	17.6		
22/07/2014 03:16	0.0	1.2	26.3	18	0	4	1017	1017	0	17.6		
22/07/2014 04:46	0.0	1.2	26.3	18	0	5	1017	1017	0	17.6		
22/07/2014 06:16	0.0	1.2	26.5	18	0	4	1018	1018	0	17.6		
22/07/2014 07:46	0.0	1.2	26.5	19	0	4	1018	1018	0	17.6		
22/07/2014 09:16	0.0	1.2	26.5	19	0	5	1018	1018	0	17.6		
22/07/2014 10:46	0.0	1.2	26.5	19	0	6	1018	1018	0	17.5		
22/07/2014 12:16	0.0	1.2	26.5	18	0	5	1018	1018	0	17.4		
22/07/2014 13:46	0.0	1.2	26.6	19	0	5	1018	1018	0	17.4		
22/07/2014 15:16	0.0	1.2	26.6	19	0	5	1017	1017	0	17.4		
22/07/2014 16:46	0.0	1.2	26.6	19	0	5	1017	1017	0	17.4		
22/07/2014 18:16	0.0	1.2	26.6	19	0	6	1017	1017	0	17.4		
22/07/2014 19:46	0.0	1.2	26.6	18	0	5	1016	1016	0	17.6		
22/07/2014 21:16	0.0	1.2	26.7	19	0	5	1018	1018	0	17.6		
22/07/2014 22:46	0.0	1.2	26.7	19	0	5	1019	1019	0	17.7		
23/07/2014 00:16	0.0	1.2	26.7	19	0	5	1019	1019	0	17.8		
23/07/2014 01:46	0.0	1.2	26.7	19	0	5	1019	1019	0	17.9		
23/07/2014 03:16	0.0	1.2	26.8	19	0	6	1019	1019	0	17.9		
23/07/2014 04:46	0.0	1.2	26.7	19	0	6	1019	1019	0	17.9		
23/07/2014 06:16	0.0	1.2	26.7	18	0	7	1018	1018	0	18.0		
23/07/2014 07:46	0.0	1.2	26.7	19	0	6	1018	1018	0	17.9		
23/07/2014 09:16	0.0	1.2	26.7	18	0	7	1018	1018	0	17.9		
23/07/2014 10:46	0.0	1.2	26.7	17	0	5	1017	1017	0	17.9		
23/07/2014 12:16	0.0	1.2	26.6	16	0	6	1016	1016	-1	17.9		
23/07/2014 13:46	0.0	1.2	26.6	15	0	5	1015	1016	-1	17.9		
23/07/2014 15:16	0.0	1.2	26.6	15	0	5	1015	1015	0	17.9		
23/07/2014 16:46	0.0	1.2	26.7	15	0	5	1014	1014	0	17.9		
23/07/2014 18:16	0.0	1.2	26.7	15	0	5	1014	1014	0	17.9		
23/07/2014 19:46	0.0	1.2	26.7	15	0	5	1015	1015	0	18.0		
23/07/2014 21:16	0.0	1.2	26.8	15	0	6	1015	1015	0	18.1		
23/07/2014 22:46	0.0	1.2	26.8	15	0	6	1015	1015	0	18.1		
24/07/2014 00:16	0.0	1.2	26.8	15	0	6	1015	1015	0	18.2		
24/07/2014 01:46	0.0	1.2	26.8	15	0	6	1015	1015	0	18.3		
24/07/2014 03:16	0.0	1.2	26.8	15	0	6	1014	1015	-1	18.3		
24/07/2014 04:46	0.0	1.2	26.8	15	0	5	1014	1014	0	18.3		
24/07/2014 06:16	0.0	1.2	26.8	15	0	6	1015	1015	0	18.3		
24/07/2014 07:46	0.0	1.2	26.8	15	0	5	1015	1015	0	18.3		
24/07/2014 09:16	0.0	1.2	26.8	15	0	5	1015	1015	0	18.3		
24/07/2014 10:46	0.0	1.2	26.8	14	0	5	1015	1015	0	18.2		
24/07/2014 12:16	0.0	1.2	26.8	14	0	5	1014	1014	0	18.2		
24/07/2014 13:46	0.0	1.2	26.8	14	0	5	1014	1014	0	18.1		
24/07/2014 15:16	0.0	1.2	26.8	14	0	5	1013	1013	0	18.1		
24/07/2014 16:46	0.0	1.2	26.8	14	0	6	1012	1012	-1	18.1		
24/07/2014 18:16	0.0	1.2	26.8	14	0	5	1012	1013	-1	18.2		
24/07/2014 19:46	0.0	1.2	26.8	14	0	6	1012	1013	-1	18.3		
24/07/2014 21:16	0.0	1.2	26.9	14	0	7	1013	1013	0	18.3		
24/07/2014 22:46	0.0	1.2	26.9	14	0	5	1014	1014	0	18.4		
25/07/2014 00:16	0.0	1.2	26.9	14	0	5	1014	1014	0	18.4		
25/07/2014 01:46	0.0	1.2	26.9	14	0	7	1014	1014	0	18.4		
25/07/2014 03:16	0.0	1.2	26.9	14	0	5	1014	1014	0	18.5		
25/07/2014 04:46	0.0	1.2	26.9	14	0	6	1013	1014	-1	18.5		
25/07/2014 06:16	0.0	1.2	26.9	13	0	6	1014	1014	0	18.5		
25/07/2014 07:46	0.0	1.2	26.9	13	0	6	1014	1014	0	18.4		
25/07/2014 09:16	0.0	1.2	26.9	13	0	7	1014	1014	0	18.4		
25/07/2014 10:46	0.0	1.2	26.8	13	0	5	1013	1014	-1	18.4		
25/07/2014 12:16	0.0	1.2	26.8	13	0	6	1013	1013	0	18.3		
25/07/2014 13:46	0.0	1.2	26.8	13	0	4	1012	1012	-1	18.3		
25/07/2014 15:16	0.0	1.2	26.8	13	0	6	1012	1012	0	18.3		
25/07/2014 16:46	0.0	1.2	26.8	13	0	6	1011	1012	-1	18.3		
25/07/2014 18:16	0.0	1.2	26.8	13	0	6	1011	1012	-1	18.3		
25/07/2014 19:46	0.0	1.2	26.8	13	0	7	1011	1012	-1	18.4		
25/07/2014 21:16	0.0	1.2	26.8	12	0	5	1012	1012	0	18.5		
25/07/2014 22:46	0.0	1.2	26.8	12	0	7	1012	1013	-1	18.6		
26/07/2014 00:16	0.0	1.2	26.9	12	0	6	1013	1013	0	18.6		
26/07/2014 01:46	0.0	1.2	26.9	12	0	5	1013	1013	0	18.6		
26/07/2014 03:16	0.0	1.2	26.9	12	0	5	1012	1013	-1	18.7		
26/07/2014 04:46	0.0	1.2	26.9	12	0	7	1012	1012	0	18.7		
26/07/2014 06:16	0.0	1.2	26.9	12	0	6	1012	1012	0	18.7		
26/07/2014 07:46	0.0	1.2	26.9	12	0	6	1012	1012	0	18.6		
26/07/2014 09:16	0.0	1.2	26.9	11	0	5	1012	1012	0	18.6		
26/07/2014 10:46	0.0	1.2	26.9	11	0	5	1012	1012	0	18.6		
26/07/2014 12:16	0.0	1.2	26.8	11	0	5	1011	1012	-1	18.5		
26/07/2014 13:46	0.0	1.2	26.8	11	0	5	1011	1011	0	18.4		
26/07/2014 15:16	0.0	1.2	26.8	11	0	6	1010	1010	0	18.4		
26/07/2014 16:46	0.0	1.2	26.8	11	0	6	1010	1010	0	18.4		
26/07/2014 18:16	0.0	1.2	26.8	11	0	6	1010	1010	0	18.4		
26/07/2014 19:46	0.0	1.2	26.8	11	0	6	1010	1010	0	18.5		
26/07/2014 21:16	0.0	1.2	26.8	11	0	6	1011	1011	0	18.6		
26/07/2014 22:46	0.0	1.2	27.0	10	0	7	1011	1011	0	18.6		
27/07/2014 00:16	0.0	1.2	26.9	10	0	5	1012	1012	0	18.6		
27/07/2014 01:46	0.0	1.2	26.9	10	0	7	1011	1012	-1	18.7		
27/07/2014 03:16	0.0	1.2	26.9	10	0	5	1011	1012	-1	18.7		
27/07/2014 04:46	0.0	1.2	26.9	10	0	5	1011	1012	-1	18.7		
27/07/2014 06:16	0.0	1.2	26.9	10	0	7	1011	1012	-1	18.7		
27/07/2014 07:46	0.0	1.2	26.9	10	0	6	1012	1012	0	18.6		
27/07/2014 09:16	0.0	1.2	26.9	9	0	5	1012	1012	0	18.6		
27/07/2014 10:46	0.0	1.2	26.9	9	0	4	1011	1012	-1	18.5		
27/07/2014 12:16	0.0	1.2	26.8	9	0	5	1011	1012	-1	18.5		
27/07/2014 13:46	0.0	1.2	26.8	9	0	6	1011	1011	0	18.4		
27/07/2014 15:16	0.0	1.2	26.8	9	0	6	1011	1011	0	18.4		
27/07/2014 16:46	0.0	1.2	26.8	9	0	5	1010	1010	0	18.3		
27/07/2014 18:16	0.0	1.2	26.8	9	0	5	1010	1010	0	18.3		
27/07/2014 19:46	0.0	1.2	26.8	9	0							

Date and Time	CH ₄ % v/v	CO ₂ % v/v	O ₂ % v/v	TVOC ppmv	H ₂ S ppmv	CO ppmv	Borehole Pressure millibars	Atmospheric Pressure millibars	Differential Pressure millibars	Temperature °C	Comments / Events
01/08/2014 03:16	0.0	1.2	25.2	6	0	5	1002	1002	0	17.3	
01/08/2014 04:46	0.0	1.2	25.2	6	0	7	1001	1002	-1	17.3	
01/08/2014 06:16	0.0	1.2	25.1	6	0	5	1001	1002	-1	17.3	
01/08/2014 07:46	0.0	1.2	25.1	6	0	5	1001	1001	0	17.3	
01/08/2014 09:16	0.0	1.2	25.1	6	0	6	1001	1001	0	17.3	
01/08/2014 10:46	0.0	1.2	25.0	6	0	5	1001	1000	-1	17.2	
01/08/2014 12:16	0.0	1.2	25.0	5	0	5	1000	1000	0	17.2	
01/08/2014 13:46	0.0	1.2	24.9	5	0	6	999	1000	-1	17.1	
01/08/2014 15:16	0.0	1.2	24.9	5	0	5	999	999	0	17.1	
01/08/2014 16:46	0.0	1.2	24.9	5	0	6	998	999	-1	17.1	
01/08/2014 18:16	0.0	1.2	24.8	5	0	5	998	999	-1	17.1	
01/08/2014 19:46	0.0	1.2	24.8	5	0	5	998	998	0	17.1	
01/08/2014 21:16	0.0	1.2	24.7	5	0	7	999	999	0	17.1	
01/08/2014 22:46	0.0	1.2	24.7	5	0	5	998	999	-1	17.1	
02/08/2014 03:16	0.0	1.2	24.7	5	0	7	998	999	-1	17.1	
02/08/2014 04:46	0.0	1.2	24.6	5	0	5	998	998	0	17.1	
02/08/2014 06:16	0.0	1.2	24.6	5	0	5	997	998	0	17.1	
02/08/2014 07:46	0.0	1.2	24.5	5	0	6	996	997	-1	17.1	
02/08/2014 09:16	0.0	1.2	24.4	5	0	7	996	996	0	17.1	
02/08/2014 10:46	0.0	1.2	24.4	5	0	6	995	996	-1	17.0	
02/08/2014 12:16	0.0	1.2	24.3	5	0	5	994	994	0	16.9	
02/08/2014 13:46	0.0	1.2	24.3	5	0	5	994	994	0	16.9	
02/08/2014 15:16	0.0	1.2	24.3	5	0	5	993	994	-1	16.9	
02/08/2014 16:46	0.0	0.6	24.4	5	0	5	993	993	0	16.9	
02/08/2014 18:16	0.0	0.6	24.4	5	0	7	992	993	-1	16.9	
02/08/2014 19:46	0.0	0.5	24.4	5	0	5	992	994	0	16.9	
02/08/2014 21:16	0.0	0.5	24.3	5	0	4	994	995	-1	16.9	
02/08/2014 22:46	0.0	0.6	24.3	5	0	5	995	996	-1	16.9	
03/08/2014 03:16	0.0	0.6	24.2	5	0	5	996	996	0	16.9	
03/08/2014 04:46	0.0	0.6	24.1	5	0	5	996	996	0	16.9	
03/08/2014 06:16	0.0	0.6	24.1	5	0	5	996	997	-1	16.9	
03/08/2014 07:46	0.0	0.5	24.0	5	0	6	997	997	0	16.9	
03/08/2014 09:16	0.0	0.5	24.0	5	0	7	997	998	-1	16.9	
03/08/2014 10:46	0.0	0.5	23.9	4	0	5	998	999	-1	16.8	
03/08/2014 12:16	0.0	0.6	23.9	4	0	5	999	999	0	16.8	
03/08/2014 13:46	0.0	0.5	23.9	4	0	5	1000	1000	0	16.7	
03/08/2014 15:16	0.0	0.6	23.8	4	0	6	1000	1000	0	16.6	
03/08/2014 16:46	0.0	0.6	23.7	4	0	6	1000	1001	-1	16.6	
03/08/2014 18:16	0.0	0.5	23.6	4	0	6	1001	1001	0	16.6	
03/08/2014 19:46	0.0	0.5	23.6	4	0	5	1002	1002	0	16.6	
03/08/2014 21:16	0.0	0.6	23.6	4	0	6	1003	1004	-1	16.6	
03/08/2014 22:46	0.0	0.5	23.5	4	0	7	1004	1004	0	16.6	
04/08/2014 03:16	0.0	0.6	23.4	4	0	4	1004	1005	-1	16.6	
04/08/2014 04:46	0.0	0.6	23.4	4	0	5	1005	1005	0	16.7	
04/08/2014 06:16	0.0	0.5	23.4	4	0	7	1006	1006	0	16.7	
04/08/2014 07:46	0.0	0.6	23.3	4	0	6	1007	1007	0	16.6	
04/08/2014 09:16	0.0	0.6	23.3	4	0	6	1008	1008	0	16.6	
04/08/2014 10:46	0.0	0.5	23.3	4	0	5	1008	1009	-1	16.5	
04/08/2014 12:16	0.0	0.6	23.2	4	0	6	1009	1009	0	16.4	
04/08/2014 13:46	0.0	0.6	23.1	4	0	5	1009	1009	0	16.4	
04/08/2014 15:16	0.0	0.5	23.1	4	0	6	1009	1009	0	16.4	
04/08/2014 16:46	0.0	0.6	23.1	4	0	6	1009	1009	0	16.4	
04/08/2014 18:16	0.0	0.6	22.9	4	0	6	1009	1009	0	16.4	
04/08/2014 19:46	0.0	0.6	22.9	4	0	5	1010	1010	0	16.4	
04/08/2014 21:16	0.0	0.6	22.9	4	0	5	1011	1011	0	16.4	
04/08/2014 22:46	0.0	0.5	22.9	4	0	5	1011	1011	0	16.5	
05/08/2014 03:16	0.0	0.6	22.8	4	0	6	1011	1011	0	16.6	
05/08/2014 04:46	0.0	0.6	22.8	4	0	5	1011	1011	0	16.6	
05/08/2014 06:16	0.0	0.6	22.7	4	0	7	1011	1011	0	16.6	
05/08/2014 07:46	0.0	0.5	22.6	4	0	5	1011	1011	0	16.6	
05/08/2014 09:16	0.0	0.6	22.5	4	0	6	1010	1011	-1	16.6	
05/08/2014 10:46	0.0	0.6	22.5	4	0	6	1010	1010	0	16.5	
05/08/2014 12:16	0.0	1.2	22.4	4	0	5	1010	1010	0	16.5	
05/08/2014 13:46	0.0	0.6	22.4	4	0	5	1009	1009	0	16.4	
05/08/2014 15:16	0.0	1.2	22.4	4	0	5	1009	1009	0	16.4	
05/08/2014 16:46	0.0	0.5	22.2	4	0	7	1008	1009	-1	16.4	
05/08/2014 18:16	0.0	1.2	22.2	4	0	6	1007	1008	-1	16.4	
05/08/2014 19:46	0.0	0.6	22.2	4	0	4	1007	1007	0	16.5	
05/08/2014 21:16	0.0	0.6	22.1	4	0	6	1007	1007	0	16.5	
05/08/2014 22:46	0.0	1.2	22.1	3	0	6	1006	1006	0	16.6	
06/08/2014 03:16	0.0	1.2	22.1	3	0	5	1005	1005	0	16.6	
06/08/2014 04:46	0.0	1.2	22.0	3	0	7	1004	1005	-1	16.6	
06/08/2014 06:16	0.0	0.5	21.9	3	0	5	1003	1003	-1	16.6	
06/08/2014 07:46	0.0	0.6	21.8	3	0	5	1002	1002	-1	16.6	
06/08/2014 09:16	0.0	0.6	21.7	3	0	5	1002	1002	0	16.6	
06/08/2014 10:32	0.0	0.0	22.6	1	0	5	1001	1002	-1	16.9	
06/08/2014 12:01	0.0	0.6	21.8	2	0	5	1002	1002	0	16.9	
06/08/2014 13:31	0.0	0.6	21.5	3	0	5	1003	1003	0	16.8	
06/08/2014 15:01	0.0	0.6	21.3	3	0	5	1003	1004	-1	16.7	
06/08/2014 16:31	0.0	0.5	21.1	3	0	5	1003	1004	-1	16.7	
06/08/2014 18:01	0.0	0.6	20.6	3	0	6	1003	1004	-1	16.7	
06/08/2014 19:31	0.0	0.6	20.5	3	0	7	1004	1004	0	16.8	
06/08/2014 21:01	0.0	0.6	20.0	3	0	6	1005	1005	0	16.8	
06/08/2014 22:31	0.0	0.6	20.0	3	0	5	1005	1005	0	16.8	
07/08/2014 03:01	0.0	0.5	19.9	3	0	5	1006	1006	0	16.9	
07/08/2014 04:31	0.0	0.6	19.8	3	0	5	1006	1006	0	16.8	
07/08/2014 06:01	0.0	0.6	19.7	3	0	6	1007	1007	-1	16.9	
07/08/2014 07:31	0.0	0.6	19.7	3	0	6	1007	1007	0	16.9	
07/08/2014 09:01	0.0	0.5	19.6	3	0	6	1009	1009	0	16.9	
07/08/2014 10:31	0.0	0.6	19.5	3	0	4	1009	1010	-1	16.9	
07/08/2014 12:01	0.0	0.6	19.4	3	0	6	1010	1010	0	16.8	
07/08/2014 13:31	0.0	0.6	19.2	3	0	6	1009	1010	-1	16.8	
07/08/2014 15:01	0.0	0.6	18.6	3	0	6	1009	1009	0	16.8	
07/08/2014 16:31	0.0	0.6	18.5	3	0	6	1009	1009	0	16.8	
07/08/2014 18:01	0.0	0.6	18.5	3	0	6	1009	1009	0	16.7	
07/08/2014 19:31	0.0	0.6	18.4	3	0	7	1009	1009	0	16.8	
07/08/2014 21:01	0.0	0.5	17.3	3	0	5	1009	1009	-1	16.8	
07/08/2014 22:31	0.0	0.5	17.3	3	0	6	1009	1009	0	16.8	
08/08/2014 03:01	0.0	0.6	16.8	3	0	6	1009	1009	0	16.8	
08/08/2014 04:31	0.0	0.6	16.8	3	0	6	1008	1008	0	16.8	
08/08/2014 06:01	0.0	0.5	16.7	3	0	7	1007	1008	-1	16.8	
08/08/2014 07:31	0.0	0.6	16.7	3	0	4	1007	1007	0	16.8	
08/08/2014 09:01	0.0	0.6	16.7	3	0	7	1006	1006	0	16.8	
08/08/2014 10:31	0.0	0.6	16.6	3	0	6	1005	1005	0	16.7	
08/08/2014 12:01	0.0	0.5	16.5	3	0	5	1003	1004	-1	16.6	
08/08/2014 13:31	0.0	1.2	16.3	3	0	5	1003	1003	0	16.5	
08/08/2014 15:01	0.0	0.6	16.1	3	0	6	1001	1001	0	16.4	
08/08/2014 16:31	0.0	0.6	16.1	3	0	6	1000	1001	-1	16.4	
08/08/2014 18:01	0.0	1.2	15.9	3	0	5	999	999	0	16.4	
08/08/2014 19:31	0.0	0.6	15.7	3	0	5	998	998	0	16.4	
08/08/2014 21:01	0.0	0.5	9.4	3	0	6	998	998	0	16.4	
08/08/2014 22:31	0.0	0.5	9.2	3	0	4	998	998	0	16.4	
09/08/2014 03:01	0.0	0.5	8.9	3	0	5	997	997	-1	16.4	
09/08/2014 04:31	0.0	0.6	8.6	3	0	6	997	997	0	16.4	
09/08/2014 06:01	0.0	0.6	8.1	3	0	5	996	997	-1	16.4	
09/08/2014 07:31	0.0	0.6	7.9	3	0	6	996	996	0	16.4	
09/08/2014 09:01	0.0	0.5	7.8	3	0	6	997	998	-1	16.4	

Date and Time	CH ₄ % v/v	CO ₂ % v/v	O ₂ % v/v	TVOC ppmv	H ₂ S ppmv	CO ppmv	Borehole Pressure millibars	Atmospheric Pressure millibars	Differential Pressure millibars	Temperature °C	Comments / Events
12/08/2014 21:01	0.0	0.5	19.4	2	0	6	994	995	-1	14.9	
12/08/2014 22:31	0.0	0.5	19.4	2	0	5	994	995	-1	14.9	
13/08/2014 00:01	0.0	0.5	19.5	2	0	6	995	995	0	14.9	
13/08/2014 01:31	0.0	0.5	19.5	2	0	5	995	995	0	14.9	
13/08/2014 03:01	0.0	0.5	19.5	2	0	6	994	995	-1	14.9	
13/08/2014 04:31	0.0	0.5	19.4	2	0	5	994	995	-1	14.9	
13/08/2014 06:01	0.0	0.5	19.4	2	0	4	994	995	-1	14.9	
13/08/2014 07:31	0.0	0.5	19.3	2	0	5	994	995	-1	14.9	
13/08/2014 09:01	0.0	0.5	19.2	2	0	6	995	995	-1	14.9	
13/08/2014 10:31	0.0	0.5	19.2	2	0	6	996	996	0	14.9	
13/08/2014 12:01	0.0	0.5	19.1	2	0	6	996	997	-1	14.9	
13/08/2014 13:31	0.0	0.5	19.0	2	0	5	997	997	0	14.9	
13/08/2014 15:01	0.0	0.6	18.9	2	0	5	997	998	-1	14.9	
13/08/2014 16:31	0.0	0.5	18.8	2	0	5	998	998	0	14.9	
13/08/2014 18:01	0.0	0.5	18.8	2	0	5	998	999	-1	14.9	
13/08/2014 19:31	0.0	0.5	18.7	2	0	6	999	1000	-1	14.9	
13/08/2014 21:01	0.0	0.6	18.7	2	0	4	1000	1001	-1	14.9	
13/08/2014 22:31	0.0	0.5	18.5	2	0	6	1000	1001	-1	14.9	
14/08/2014 00:01	0.0	0.5	18.4	2	0	5	1001	1001	0	14.9	
14/08/2014 01:31	0.0	0.6	18.3	2	0	7	1001	1002	-1	14.9	
14/08/2014 03:01	0.0	0.5	18.2	2	0	5	1001	1001	0	14.9	
14/08/2014 04:31	0.0	0.5	18.0	3	0	5	1001	1001	0	14.9	
14/08/2014 06:01	0.0	0.5	17.9	2	0	6	1001	1001	0	14.9	
14/08/2014 07:31	0.0	0.5	17.9	3	0	5	1001	1002	-1	14.9	
14/08/2014 09:01	0.0	0.5	17.8	2	0	5	1001	1002	-1	14.9	
14/08/2014 10:31	0.0	0.6	17.8	3	0	6	1002	1002	0	14.8	
14/08/2014 12:01	0.0	0.5	17.7	3	0	5	1002	1002	0	14.8	
14/08/2014 13:31	0.0	0.5	17.6	3	0	5	1002	1002	0	14.8	
14/08/2014 15:01	0.0	0.5	17.4	3	0	6	1002	1002	0	14.8	
14/08/2014 16:31	0.0	0.5	14.6	2	0	6	1002	1002	0	14.8	
14/08/2014 18:01	0.0	0.5	14.5	3	0	6	1003	1003	0	14.8	
14/08/2014 19:31	0.0	0.5	14.2	3	0	5	1004	1004	0	14.8	
14/08/2014 21:01	0.0	0.5	14.1	2	0	6	1004	1005	-1	14.8	
14/08/2014 22:31	0.0	0.5	14.0	2	0	5	1005	1005	0	14.9	
15/08/2014 00:01	0.0	0.5	13.9	3	0	5	1006	1006	0	14.9	
15/08/2014 01:31	0.0	0.5	13.8	3	0	7	1006	1006	0	14.9	
15/08/2014 03:01	0.0	0.5	13.7	2	0	5	1007	1007	0	14.9	
15/08/2014 04:31	0.0	0.5	13.4	2	0	6	1007	1008	-1	14.9	
15/08/2014 06:01	0.0	0.5	13.3	3	0	5	1008	1008	0	14.9	
15/08/2014 07:31	0.0	0.5	13.3	2	0	5	1009	1009	0	14.9	
15/08/2014 09:01	0.0	0.5	13.1	3	0	5	1010	1010	0	14.9	
15/08/2014 10:31	0.0	0.6	13.0	3	0	5	1011	1011	0	14.9	
15/08/2014 12:01	0.0	0.5	12.7	3	0	5	1011	1011	0	14.9	
15/08/2014 13:31	0.0	0.5	12.6	3	0	4	1011	1011	0	14.9	
15/08/2014 15:01	0.0	0.5	12.5	3	0	5	1011	1011	0	14.9	
15/08/2014 16:31	0.0	0.5	12.5	3	0	5	1011	1012	-1	14.9	
15/08/2014 18:01	0.0	0.5	12.6	3	0	5	1012	1012	0	14.9	
15/08/2014 19:31	0.0	0.5	12.6	3	0	6	1013	1013	0	15.0	
15/08/2014 21:01	0.0	0.6	12.5	3	0	6	1014	1014	0	15.1	
15/08/2014 22:31	0.0	1.2	12.4	3	0	5	1014	1014	0	15.1	
16/08/2014 00:01	0.0	0.5	12.2	3	0	5	1014	1014	0	15.1	
16/08/2014 01:31	0.0	1.2	12.1	3	0	5	1014	1014	0	15.1	
16/08/2014 03:01	0.0	0.5	12.0	3	0	5	1014	1014	0	15.2	
16/08/2014 04:31	0.0	1.2	11.8	3	0	6	1013	1013	0	15.2	
16/08/2014 06:01	0.0	1.2	11.6	3	0	5	1013	1013	0	15.2	
16/08/2014 07:31	0.0	0.5	11.5	3	0	6	1013	1013	0	15.2	
16/08/2014 09:01	0.0	1.2	10.6	3	0	4	1013	1013	0	15.1	
16/08/2014 10:31	0.0	1.2	0.0	3	0	5	1012	1013	-1	15.1	
16/08/2014 12:01	0.0	1.2	0.0	3	0	5	1012	1013	-1	15.1	
16/08/2014 13:31	0.0	1.2	0.0	3	0	5	1011	1012	-1	15.1	
16/08/2014 15:01	0.0	1.2	0.0	3	0	5	1011	1011	0	15.0	
16/08/2014 16:31	0.0	0.5	16.6	3	0	5	1010	1010	0	15.0	
16/08/2014 18:01	0.0	1.2	16.6	3	0	5	1009	1009	0	15.0	
16/08/2014 19:31	0.0	1.2	16.6	3	0	5	1008	1009	-1	15.0	
16/08/2014 21:01	0.0	1.2	16.6	3	0	5	1007	1008	-1	14.9	
16/08/2014 22:31	0.0	1.2	16.5	3	0	5	1007	1007	0	14.9	
17/08/2014 00:01	0.0	1.2	16.4	3	0	5	1005	1005	0	14.9	
17/08/2014 01:31	0.0	1.2	16.4	3	0	6	1004	1004	0	14.9	
17/08/2014 03:01	0.0	1.2	16.3	3	0	5	1002	1003	-1	14.9	
17/08/2014 04:31	0.0	1.2	16.3	3	0	5	1002	1002	0	14.9	
17/08/2014 06:01	0.0	1.2	16.2	3	0	6	1001	1002	-1	14.9	
17/08/2014 07:31	0.0	1.2	16.0	3	0	4	1001	1001	0	14.9	
17/08/2014 09:01	0.0	1.2	16.0	3	0	5	1000	1001	-1	14.9	
17/08/2014 10:31	0.0	1.2	15.8	3	0	5	1000	1000	0	14.9	
17/08/2014 12:01	0.0	1.2	15.7	3	0	5	1000	1000	0	14.8	
17/08/2014 13:31	0.0	0.5	15.6	3	0	5	999	1000	-1	14.8	
17/08/2014 15:01	0.0	1.2	15.4	3	0	6	999	999	0	14.8	
17/08/2014 16:31	0.0	1.2	15.3	3	0	5	999	999	0	14.8	
17/08/2014 18:01	0.0	1.2	15.2	3	0	6	998	999	-1	14.8	
17/08/2014 19:31	0.0	1.2	15.1	3	0	6	998	998	0	14.8	
17/08/2014 21:01	0.0	1.2	15.0	3	0	5	998	998	0	14.8	
17/08/2014 22:31	0.0	1.2	14.9	3	0	6	998	998	0	14.8	
18/08/2014 00:01	0.0	1.2	14.8	3	0	7	998	998	0	14.8	
18/08/2014 01:31	0.0	1.2	14.7	3	0	7	998	998	0	14.8	
18/08/2014 03:01	0.0	1.2	14.5	3	0	6	998	998	0	14.7	
18/08/2014 04:31	0.0	1.2	13.4	3	0	6	999	999	0	14.7	
18/08/2014 06:01	0.0	1.2	13.3	3	0	6	1000	1000	0	14.7	
18/08/2014 07:31	0.0	1.2	13.2	3	0	5	1001	1001	0	14.6	
18/08/2014 09:01	0.0	1.2	13.0	3	0	6	1002	1002	0	14.6	
18/08/2014 10:31	0.0	1.2	12.8	3	0	6	1002	1003	-1	14.6	



Ground-Gas Solutions Time Series Data

Location:	GG5516	
Borehole ref:	BH2	
Gas/chem ID:	0000280409	Days of monitoring: 27
Start Date:	21/07/2014 14:03	Monitoring Frequency (mins): 90
End Date:	18/08/2014 09:37	Total samples taken: 447

Minimum, Maximum and range table

	CH ₄	CO ₂	O ₂	TVOC	H ₂ S	CO	Borehole Pressure	Atmospheric Pressure	Differential Pressure	Temperature
Min	0.0	1.5	14.8	0	0	0	987	987	-1	16.8
Max	0.0	3.6	17.6	20	0	0	1020	1019	1	26.8
Range	0.0	2.1	2.8	20	0	0	33	32		10.0

Date and Time	CH ₄ % v/v	CO ₂ % v/v	O ₂ % v/v	TVOC ppmv	H ₂ S ppmv	CO ppmv	Borehole Pressure millibars	Atmospheric Pressure millibars	Differential Pressure millibars	Temperature °C	Comments / Events
21/07/2014 14:03	0	1.5	17.6	20	0	0	1015	1015	0	26.8	
21/07/2014 14:07	0	1.5	17.3	21	0	0	1015	1015	0	26.6	
21/07/2014 15:37	0	2	15.7	11	0	0	1016	1015	1	20.4	
21/07/2014 17:07	0	2.6	15.2	9	0	0	1016	1015	1	19.3	
21/07/2014 18:37	0	2.6	15	9	0	0	1016	1015	1	18.9	
21/07/2014 20:07	0	2.6	14.9	9	0	0	1017	1016	1	18.9	
21/07/2014 21:37	0	2.6	14.9	9	0	0	1017	1017	0	18.8	
21/07/2014 23:07	0	2.6	14.9	9	0	0	1018	1017	1	18.8	
22/07/2014 00:37	0	3.1	14.9	9	0	0	1018	1018	0	18.9	
22/07/2014 02:07	0	3.1	14.9	9	0	0	1018	1018	0	18.9	
22/07/2014 03:37	0	3.1	14.9	9	0	0	1018	1018	0	18.9	
22/07/2014 05:07	0	3.1	15	9	0	0	1019	1018	1	18.9	
22/07/2014 06:37	0	3.1	15	9	0	0	1019	1018	1	18.9	
22/07/2014 08:07	0	3.1	15	9	0	0	1020	1019	1	18.9	
22/07/2014 09:37	0	3.1	15	7	0	0	1019	1019	0	18.9	
22/07/2014 11:07	0	3.1	15	7	0	0	1019	1019	0	18.9	
22/07/2014 12:37	0	3.1	14.9	7	0	0	1019	1019	0	18.9	
22/07/2014 14:07	0	3.1	14.9	7	0	0	1019	1018	1	18.8	
22/07/2014 15:37	0	3.1	14.9	7	0	0	1019	1019	0	18.8	
22/07/2014 17:07	0	3.1	14.8	7	0	0	1018	1018	0	18.8	
22/07/2014 18:37	0	3.1	14.9	7	0	0	1018	1018	0	18.8	
22/07/2014 20:07	0	3.1	14.8	7	0	0	1019	1019	0	18.9	
22/07/2014 21:37	0	3.1	14.8	7	0	0	1020	1019	1	18.9	
22/07/2014 23:07	0	3.1	14.8	7	0	0	1020	1019	1	18.9	
23/07/2014 00:37	0	3.1	14.8	7	0	0	1020	1019	1	19	
23/07/2014 02:07	0	3.1	14.8	7	0	0	1020	1019	1	19.1	
23/07/2014 03:37	0	3.1	14.8	7	0	0	1020	1019	1	19.1	
23/07/2014 05:07	0	3.1	14.9	7	0	0	1020	1019	1	19.2	
23/07/2014 06:37	0	3.1	14.9	7	0	0	1020	1019	1	19.3	
23/07/2014 08:07	0	3.1	15	7	0	0	1019	1018	1	19.3	
23/07/2014 09:37	0	3.1	15	7	0	0	1019	1018	1	19.3	
23/07/2014 11:07	0	3.1	15	7	0	0	1018	1017	1	19.3	
23/07/2014 12:37	0	3.1	15	7	0	0	1018	1017	1	19.3	
23/07/2014 14:07	0	3.1	15	7	0	0	1017	1016	1	19.3	
23/07/2014 15:37	0	3.1	15	7	0	0	1016	1015	1	19.3	
23/07/2014 17:07	0	3.1	15	7	0	0	1015	1015	0	19.3	
23/07/2014 18:37	0	3.1	15	7	0	0	1015	1015	1	19.3	
23/07/2014 20:07	0	3.1	15	7	0	0	1015	1015	0	19.4	
23/07/2014 21:37	0	3.1	15.1	7	0	0	1015	1015	1	19.4	
23/07/2014 23:07	0	3.1	15.2	7	0	0	1016	1016	0	19.5	
24/07/2014 00:37	0	3.1	15.2	7	0	0	1016	1016	0	19.6	
24/07/2014 02:07	0	3.1	15.2	7	0	0	1016	1015	1	19.6	
24/07/2014 03:37	0	3.1	15.3	7	0	0	1016	1015	1	19.7	
24/07/2014 05:07	0	3.1	15.3	7	0	0	1016	1015	1	19.8	
24/07/2014 06:37	0	3.1	15.3	7	0	0	1016	1015	1	19.8	
24/07/2014 08:07	0	3.1	15.4	7	0	0	1016	1015	1	19.8	
24/07/2014 09:37	0	3.1	15.4	6	0	0	1016	1015	1	19.8	
24/07/2014 11:07	0	3.1	15.4	7	0	0	1016	1015	1	19.8	
24/07/2014 12:37	0	3.1	15.4	6	0	0	1015	1015	0	19.8	
24/07/2014 14:07	0	3.1	15.3	6	0	0	1015	1014	1	19.8	
24/07/2014 15:37	0	3.1	15.3	6	0	0	1014	1014	0	19.8	
24/07/2014 17:07	0	3.1	15.3	6	0	0	1014	1014	0	19.8	
24/07/2014 18:37	0	3.1	15.3	6	0	0	1014	1013	1	19.8	
24/07/2014 20:07	0	3.1	15.3	6	0	0	1014	1014	0	19.8	
24/07/2014 21:37	0	3.1	15.4	6	0	0	1015	1015	0	19.8	
24/07/2014 23:07	0	3.1	15.4	6	0	0	1015	1015	0	19.9	
25/07/2014 00:37	0	3.1	15.5	6	0	0	1016	1015	1	19.9	
25/07/2014 02:07	0	3.1	15.5	6	0	0	1015	1015	0	20	
25/07/2014 03:37	0	3.1	15.5	6	0	0	1015	1015	0	20	
25/07/2014 05:07	0	3.1	15.6	6	0	0	1015	1015	0	20.1	
25/07/2014 06:37	0	3.1	15.6	6	0	0	1015	1015	0	20.1	
25/07/2014 08:07	0	3.1	15.6	6	0	0	1015	1015	0	20.1	
25/07/2014 09:37	0	3.1	15.6	6	0	0	1015	1015	0	20.1	
25/07/2014 11:07	0	3.1	15.6	6	0	0	1015	1014	1	20.1	
25/07/2014 12:37	0	3.1	15.6	6	0	0	1014	1014	0	20	
25/07/2014 14:07	0	3.1	15.6	6	0	0	1014	1014	0	20	
25/07/2014 15:37	0	3.1	15.5	6	0	0	1013	1013	0	20	
25/07/2014 17:07	0	3.1	15.5	6	0	0	1013	1012	1	20	
25/07/2014 18:37	0	3.6	15.5	6	0	0	1013	1013	0	20.1	
25/07/2014 20:07	0	3.1	15.5	6	0	0	1013	1013	0	20.1	
25/07/2014 21:37	0	3.1	15.6	6	0	0	1014	1013	1	20.1	
25/07/2014 23:07	0	3.1	15.6	4	0	0	1014	1014	0	20.1	
26/07/2014 00:37	0	3.1	15.6	4	0	0	1014	1013	1	20.1	
26/07/2014 02:07	0	3.1	15.6	6	0	0	1014	1014	0	20.2	
26/07/2014 03:37	0	3.6	15.7	6	0	0	1013	1013	0	20.3	
26/07/2014 05:07	0	3.6	15.7	4	0	0	1014	1013	1	20.3	
26/07/2014 06:37	0	3.1	15.7	4	0	0	1013	1013	0	20.3	
26/07/2014 08:07	0	3.6	15.7	4	0	0	1013	1013	0	20.3	
26/07/2014 09:37	0	3.6	15.7	4	0	0	1013	1013	0	20.3	
26/07/2014 11:07	0	3.1	15.7	4	0	0	1013	1013	0	20.3	
26/07/2014 12:37	0	3.1	15.7	6	0	0	1013	1012	1	20.2	
26/07/2014 14:07	0	3.6	15.6	4	0	0	1012	1011	1	20.2	
26/07/2014 15:37	0	3.6	15.6	4	0	0	1012	1012	0	20.2	
26/07/2014 17:07	0	3.6	15.6	4	0	0	1011	1011	0	20.1	
26/07/2014 18:37	0	3.1	15.6	4	0	0	1011	1011	0	20.2	
26/07/2014 20:07	0	3.6	15.6	4	0	0	1011	1011	0	20.2	
26/07/2014 21:37	0	3.6	15.7	4	0	0	1012	1012	0	20.2	
26/07/2014 23:07	0	3.6	15.7	4	0	0	1013	1013	0	20.3	
27/07/2014 00:37	0	3.6	15.7	4	0	0	1013	1012	1	20.3	
27/07/2014 02:07	0	3.6	15.7	4	0	0	1013	1013	0	20.3	
27/07/2014 03:37	0	3.6	15.7	4	0	0	1013	1013	0	20.3	
27/07/2014 05:07	0	3.6	15.8	4	0	0	1013	1013	0	20.4	
27/07/2014 06:37	0	3.6	15.8	4	0	0	1013	1013	0	20.3	
27/07/2014 08:07	0	3.6	15.8	4	0	0	1013	1013	0	20.3	
27/07/2014 09:37	0	3.6	15.8	4	0	0	1013	1013	0	20.3	
27/07/2014 11:07	0	3.6	15.8	6	0	0	1013	1013	0	20.3	
27/07/2014 12:37	0	3.6	15.8	6	0	0	1013	1013	0	20.3	
27/07/2014 14:07	0	3.6	15.8	4	0	0	1012	1012	0	20.2	
27/07/2014 15:37	0	3.6	15.8	4	0	0	1012	1012	0	20.1	
27/07/2014 17:07	0	3.6	15.8	4	0	0	1012	1012	0	20.1	
27/07/2014 18:37	0	3.6	15.8	6	0	0	1012	1011	1	20.1	
27/07/2014 20:07	0	3.6	15.8	4	0	0	1011	1011	0	20.1	
27/07/2014 21:37	0	3.6	15.8	4	0	0	1012	1012	0	20.1	
27/07/2014 23:07	0	3.6	15.9	4	0	0	1012	1012	0	20.2	
28/07/2014 00:37	0	3.6	15.9	6	0	0	1011	1011	0	20.2	
28/07/2014 02:07	0	3.6	15.9	6	0	0	1011	1011	0	20.2	
28/07/2014 03:37	0	3.6	15.9	4	0	0	1011	1011	0	20.2	
28/07/2014 05:07	0	3.6	15.9	4	0	0	1011	1011	0	20.2	
28/07/2014 06:37	0	3.6	15								

Date and Time	CH ₄ % v/v	CO ₂ % v/v	O ₂ % v/v	TVOC ppmv	H ₂ S ppmv	CO ppmv	Borehole Pressure millibars	Atmospheric Pressure millibars	Differential Pressure millibars	Temperature °C	Comments / Events
01/08/2014 03:37	0	3.6	15.8	6	0	0	1004	1003	0	19	
01/08/2014 05:07	0	3.6	15.8	7	0	0	1003	1003	0	19.1	
01/08/2014 06:37	0	3.6	15.8	7	0	0	1002	1002	0	19.1	
01/08/2014 08:07	0	3.6	15.8	7	0	0	1002	1002	0	19.1	
01/08/2014 09:37	0	3.6	15.8	7	0	0	1002	1002	0	19	
01/08/2014 11:07	0	3.6	15.8	6	0	0	1002	1002	0	19	
01/08/2014 12:37	0	3.6	15.8	6	0	0	1001	1001	0	19	
01/08/2014 14:07	0	3.6	15.8	6	0	0	1001	1001	0	19	
01/08/2014 15:37	0	3.6	15.8	7	0	0	1000	1000	0	18.9	
01/08/2014 17:07	0	3.6	15.7	6	0	0	1000	1000	0	18.9	
01/08/2014 18:37	0	3.6	15.8	6	0	0	1000	1000	0	18.9	
01/08/2014 20:07	0	3.6	15.8	6	0	0	1000	1000	0	18.9	
01/08/2014 21:37	0	3.6	15.8	6	0	0	1000	1000	0	18.9	
01/08/2014 23:07	0	3.6	15.7	6	0	0	1000	1000	0	18.9	
02/08/2014 00:37	0	3.6	15.7	6	0	0	1000	1000	0	18.9	
02/08/2014 02:07	0	3.6	15.7	6	0	0	999	999	0	18.9	
02/08/2014 03:37	0	3.6	15.6	6	0	0	998	998	-1	18.9	
02/08/2014 05:07	0	3.6	15.5	6	0	0	998	998	0	18.8	
02/08/2014 06:37	0	3.6	15.5	6	0	0	997	997	0	18.8	
02/08/2014 08:07	0	3.6	15.5	6	0	0	997	997	0	18.8	
02/08/2014 09:37	0	3.6	15.4	6	0	0	996	996	0	18.8	
02/08/2014 11:07	0	3.6	15.4	6	0	0	996	996	0	18.8	
02/08/2014 12:37	0	3.6	15.3	6	0	0	995	995	-1	18.7	
02/08/2014 14:07	0	3.6	15.3	6	0	0	995	995	0	18.7	
02/08/2014 15:37	0	3.6	15.3	6	0	0	994	994	-1	18.6	
02/08/2014 17:07	0	3.6	15.2	6	0	0	994	994	0	18.6	
02/08/2014 18:37	0	3.6	15.2	6	0	0	994	995	-1	18.6	
02/08/2014 20:07	0	3.6	15.2	6	0	0	995	995	-1	18.6	
02/08/2014 21:37	0	3.6	15.3	4	0	0	996	997	-1	18.6	
02/08/2014 23:07	0	3.6	15.3	6	0	0	997	997	0	18.6	
03/08/2014 00:37	0	3.6	15.3	4	0	0	997	998	-1	18.6	
03/08/2014 02:07	0	3.6	15.3	4	0	0	998	998	0	18.7	
03/08/2014 03:37	0	3.6	15.4	6	0	0	998	998	0	18.7	
03/08/2014 05:07	0	3.6	15.4	4	0	0	998	998	0	18.7	
03/08/2014 06:37	0	3.6	15.4	4	0	0	998	999	-1	18.6	
03/08/2014 08:07	0	3.6	15.4	4	0	0	999	999	0	18.6	
03/08/2014 09:37	0	3.6	15.4	4	0	0	1000	1000	0	18.6	
03/08/2014 11:07	0	3.6	15.4	4	0	0	1000	1000	0	18.6	
03/08/2014 12:37	0	3.6	15.5	4	0	0	1001	1001	0	18.5	
03/08/2014 14:07	0	3.6	15.5	4	0	0	1001	1001	0	18.5	
03/08/2014 15:37	0	3.6	15.5	4	0	0	1001	1001	0	18.4	
03/08/2014 17:07	0	3.6	15.4	4	0	0	1002	1002	0	18.4	
03/08/2014 18:37	0	3.6	15.5	4	0	0	1003	1003	0	18.4	
03/08/2014 20:07	0	3.6	15.5	4	0	0	1004	1004	0	18.4	
03/08/2014 21:37	0	3.6	15.6	4	0	0	1005	1005	0	18.4	
03/08/2014 23:07	0	3.6	15.6	4	0	0	1005	1005	0	18.4	
04/08/2014 00:37	0	3.6	15.6	4	0	0	1006	1006	0	18.4	
04/08/2014 02:07	0	3.6	15.6	4	0	0	1006	1006	0	18.5	
04/08/2014 03:37	0	3.6	15.7	4	0	0	1007	1007	0	18.5	
04/08/2014 05:07	0	3.6	15.7	4	0	0	1007	1007	0	18.5	
04/08/2014 06:37	0	3.6	15.7	4	0	0	1008	1008	0	18.5	
04/08/2014 08:07	0	3.6	15.7	4	0	0	1009	1009	0	18.5	
04/08/2014 09:37	0	3.6	15.7	4	0	0	1009	1009	0	18.5	
04/08/2014 11:07	0	3.6	15.7	4	0	0	1010	1010	0	18.4	
04/08/2014 12:37	0	3.6	15.7	4	0	0	1011	1010	1	18.4	
04/08/2014 14:07	0	3.6	15.7	4	0	0	1011	1011	1	18.4	
04/08/2014 15:37	0	3.6	15.7	4	0	0	1011	1011	0	18.4	
04/08/2014 17:07	0	3.6	15.7	4	0	0	1011	1010	0	18.4	
04/08/2014 18:37	0	3.6	15.7	4	0	0	1011	1011	0	18.4	
04/08/2014 20:07	0	3.6	15.7	4	0	0	1011	1011	0	18.4	
04/08/2014 21:37	0	3.6	15.7	4	0	0	1012	1012	0	18.4	
04/08/2014 23:07	0	3.6	15.8	4	0	0	1012	1012	0	18.5	
05/08/2014 00:37	0	3.6	15.8	4	0	0	1013	1012	1	18.6	
05/08/2014 02:07	0	3.6	15.8	4	0	0	1013	1013	1	18.6	
05/08/2014 03:37	0	3.6	15.8	4	0	0	1013	1012	1	18.6	
05/08/2014 05:07	0	3.6	15.8	4	0	0	1012	1012	0	18.6	
05/08/2014 06:37	0	3.6	15.8	4	0	0	1012	1012	0	18.7	
05/08/2014 08:07	0	3.6	15.8	4	0	0	1012	1012	0	18.7	
05/08/2014 09:37	0	3.1	15.8	4	0	0	1012	1011	1	18.7	
05/08/2014 11:07	0	3.6	15.8	2	0	0	1011	1011	0	18.6	
05/08/2014 12:37	0	3.6	15.8	4	0	0	1011	1011	0	18.6	
05/08/2014 14:07	0	3.6	15.7	4	0	0	1011	1011	0	18.6	
05/08/2014 15:37	0	3.6	15.7	4	0	0	1011	1010	1	18.6	
05/08/2014 17:07	0	3.6	15.7	4	0	0	1010	1009	1	18.6	
05/08/2014 18:37	0	3.6	15.7	4	0	0	1009	1008	0	18.6	
05/08/2014 20:07	0	3.6	15.7	4	0	0	1008	1008	0	18.6	
05/08/2014 21:37	0	3.6	15.8	4	0	0	1008	1008	0	18.6	
05/08/2014 23:07	0	3.6	15.8	4	0	0	1007	1007	0	18.6	
06/08/2014 00:37	0	3.6	15.7	2	0	0	1007	1006	1	18.6	
06/08/2014 02:07	0	3.6	15.7	4	0	0	1005	1005	0	18.6	
06/08/2014 03:37	0	3.6	15.7	4	0	0	1005	1005	0	18.6	
06/08/2014 05:07	0	3.6	15.6	2	0	0	1004	1004	0	18.6	
06/08/2014 06:37	0	3.6	15.6	2	0	0	1004	1004	0	18.6	
06/08/2014 08:07	0	3.6	15.6	2	0	0	1003	1003	0	18.6	
06/08/2014 09:37	0	3.6	15.6	2	0	0	1003	1003	0	18.6	
06/08/2014 11:07	0	3.6	15.6	2	0	0	1003	1004	0	18.6	
06/08/2014 12:37	0	3.6	15.6	2	0	0	1004	1004	0	18.6	
06/08/2014 14:07	0	3.6	15.6	2	0	0	1004	1004	0	18.6	
06/08/2014 15:37	0	3.6	15.6	2	0	0	1005	1005	0	18.6	
06/08/2014 17:07	0	3.6	15.6	2	0	0	1005	1005	0	18.6	
06/08/2014 18:37	0	3.6	15.6	2	0	0	1005	1005	0	18.6	
06/08/2014 20:07	0	3.6	15.6	2	0	0	1006	1006	0	18.6	
06/08/2014 21:37	0	3.6	15.7	2	0	0	1007	1006	1	18.6	
06/08/2014 23:07	0	3.6	15.7	2	0	0	1007	1007	0	18.7	
07/08/2014 00:37	0	3.6	15.7	2	0	0	1007	1007	0	18.8	
07/08/2014 02:07	0	3.6	15.8	2	0	0	1008	1008	0	18.8	
07/08/2014 03:37	0	3.6	15.8	2	0	0	1008	1008	0	18.8	
07/08/2014 05:07	0	3.6	15.8	2	0	0	1008	1008	0	18.8	
07/08/2014 06:37	0	3.1	16	2	0	0	1009	1009	0	18.8	
07/08/2014 08:07	0	3.6	16	2	0	0	1010	1010	0	18.8	
07/08/2014 09:37	0	3.1	16.1	2	0	0	1011	1010	1	18.8	
07/08/2014 11:07	0	3.6	16.1	2	0	0	1011	1011	0	18.8	
07/08/2014 12:37	0	3.6	16.1	2	0	0	1011	1011	0	18.8	
07/08/2014 14:07	0	3.6	16.1	2	0	0	1011	1011	0	18.8	
07/08/2014 15:37	0	3.1	16.1	2	0	0	1011	1010	1	18.8	
07/08/2014 17:07	0	3.6	16.1	2	0	0	1011	1011	1	18.8	
07/08/2014 18:37	0	3.6	16	2	0	0	1011	1010	1	18.8	
07/08/2014 20:07	0	3.1	16.1	2	0	0	1011	1011	0	18.8	
07/08/2014 21:37	0	3.1	16.1	2	0	0	1011	1011	0	18.8	
07/08/2014 23:07	0	3.6	16.1	2	0	0	1011	1010	1	18.8	
08/08/2014 00:37	0	3.1	16.1	2	0	0	1010	1010	0	18.8	
08/08/2014 02:07	0	3.1	16.1	2	0	0	1010	1009	1	18.8	
08/08/2014 03:37	0	3.1	16.1	2	0	0	1009	1008	1	18.8	
08/08/2014 05:07	0	3.1	16.1	2	0	0	1009	1008	1	18.8	
08/08/2014 06:37	0	3.6	16.1	2	0	0	1007	1007	0	18.8	
08/08/2014 08:07	0	3.6	16.1	2	0	0	1007	1006	1	18.8	
08/08/2014 09:37	0	3.1	16	2	0	0	1005	1005	0	18.7	
08/08/2014 11:07	0	3.6	16	2	0	0	1005	1005	0	18.7	
08/08/2014 12:37	0	3.1	16	2	0	0	1004	1004	0	18.6	
08/											

Date and Time	CH ₄ % v/v	CO ₂ % v/v	O ₂ % v/v	TVOC ppmv	H ₂ S ppmv	CO ppmv	Borehole Pressure millibars	Atmospheric Pressure millibars	Differential Pressure millibars	Temperature °C	Comments / Events
12/08/2014 21:37	0	3.1	15.6	0	0	997	997	997	-1	17.3	
12/08/2014 23:07	0	3.1	15.6	0	0	997	997	997	0	17.3	
13/08/2014 00:37	0	3.1	15.6	0	0	997	997	997	0	17.3	
13/08/2014 02:07	0	3.1	15.6	0	0	996	996	997	-1	17.3	
13/08/2014 03:37	0	3.1	15.6	0	0	996	996	997	-1	17.3	
13/08/2014 05:07	0	3.1	15.6	0	0	996	996	996	0	17.3	
13/08/2014 06:37	0	3.1	15.7	0	0	996	996	997	-1	17.3	
13/08/2014 08:07	0	3.1	15.7	0	0	997	997	997	0	17.3	
13/08/2014 09:37	0	3.1	15.7	0	0	997	997	997	0	17.3	
13/08/2014 11:07	0	3.1	15.7	0	0	998	998	998	0	17.2	
13/08/2014 12:37	0	3.1	15.7	0	0	998	999	999	-1	17.2	
13/08/2014 14:07	0	3.1	15.8	0	0	999	999	999	0	17.2	
13/08/2014 15:37	0	3.1	15.8	0	0	1000	1000	1000	0	17.2	
13/08/2014 17:07	0	3.1	15.8	0	0	1000	1000	1000	0	17.1	
13/08/2014 18:37	0	3.1	15.8	0	0	1001	1001	1001	0	17.1	
13/08/2014 20:07	0	3.1	15.8	0	0	1001	1001	1001	0	17.1	
13/08/2014 21:37	0	3.1	15.9	0	0	1002	1002	1002	0	17.1	
13/08/2014 23:07	0	3.1	15.9	0	0	1002	1002	1002	0	17.1	
14/08/2014 00:37	0	3.1	15.9	0	0	1003	1003	1003	0	17.1	
14/08/2014 02:07	0	3.1	15.9	0	0	1003	1003	1003	0	17.1	
14/08/2014 03:37	0	3.1	16	0	0	1003	1003	1003	0	17.1	
14/08/2014 05:07	0	3.1	16	0	0	1002	1002	1002	0	17.1	
14/08/2014 06:37	0	3.1	16	0	0	1003	1003	1003	0	17.1	
14/08/2014 08:07	0	3.1	16	0	0	1003	1003	1003	0	17.1	
14/08/2014 09:37	0	3.1	16	0	0	1003	1003	1003	0	17.1	
14/08/2014 11:07	0	3.1	16	0	0	1004	1004	1004	0	17.1	
14/08/2014 12:37	0	3.1	16	0	0	1004	1004	1004	0	17.1	
14/08/2014 14:07	0	3.1	15.9	0	0	1004	1004	1004	0	17	
14/08/2014 15:37	0	3.1	15.9	0	0	1004	1004	1004	0	17	
14/08/2014 17:07	0	2.6	15.9	0	0	1004	1004	1004	0	17	
14/08/2014 18:37	0	3.1	15.9	0	0	1005	1005	1005	0	17	
14/08/2014 20:07	0	3.1	15.9	0	0	1006	1006	1006	0	17	
14/08/2014 21:37	0	3.1	15.9	0	0	1006	1006	1006	0	17	
14/08/2014 23:07	0	3.1	15.9	0	0	1007	1007	1007	0	17	
15/08/2014 00:37	0	3.1	15.9	0	0	1008	1008	1008	0	17.1	
15/08/2014 02:07	0	3.1	16	0	0	1008	1008	1008	0	17.1	
15/08/2014 03:37	0	3.1	16	0	0	1008	1008	1008	0	17.1	
15/08/2014 05:07	0	3.1	16	0	0	1009	1009	1009	0	17.1	
15/08/2014 06:37	0	3.1	16	0	0	1010	1010	1010	0	17.1	
15/08/2014 08:07	0	3.1	16	0	0	1011	1011	1011	0	17.1	
15/08/2014 09:37	0	3.1	16	0	0	1012	1011	1011	1	17.1	
15/08/2014 11:07	0	3.1	16	0	0	1012	1012	1012	0	17.1	
15/08/2014 12:37	0	3.1	15.9	0	0	1013	1012	1012	1	17.1	
15/08/2014 14:07	0	3.1	15.9	0	0	1013	1013	1013	0	17	
15/08/2014 15:37	0	3.1	15.9	0	0	1013	1012	1012	1	17	
15/08/2014 17:07	0	3.1	15.9	0	0	1013	1013	1013	0	17	
15/08/2014 18:37	0	3.1	15.9	0	0	1014	1014	1014	0	17	
15/08/2014 20:07	0	3.1	15.9	0	0	1015	1015	1015	0	17	
15/08/2014 21:37	0	3.1	16	0	0	1016	1015	1015	1	17.1	
15/08/2014 23:07	0	3.1	16	0	0	1016	1015	1015	1	17.1	
16/08/2014 00:37	0	3.1	16	0	0	1016	1015	1015	1	17.1	
16/08/2014 02:07	0	3.1	16	0	0	1015	1015	1015	0	17.1	
16/08/2014 03:37	0	3.1	16	0	0	1015	1015	1015	0	17.1	
16/08/2014 05:07	0	3.1	16	0	0	1015	1014	1014	1	17.1	
16/08/2014 06:37	0	3.1	16	0	0	1015	1014	1014	1	17.1	
16/08/2014 08:07	0	3.1	16	0	0	1014	1014	1014	0	17.1	
16/08/2014 09:37	0	3.1	16	0	0	1014	1014	1014	0	17.1	
16/08/2014 11:07	0	3.1	16	0	0	1014	1014	1014	0	17.1	
16/08/2014 12:37	0	3.1	16	0	0	1014	1013	1013	1	17.1	
16/08/2014 14:07	0	3.1	16	0	0	1013	1013	1013	0	17.1	
16/08/2014 15:37	0	3.1	16	0	0	1012	1012	1012	0	17.1	
16/08/2014 17:07	0	3.1	16	0	0	1012	1011	1011	1	17.1	
16/08/2014 18:37	0	3.1	16	0	0	1011	1010	1010	1	17.1	
16/08/2014 20:07	0	3.1	16	0	0	1010	1009	1009	1	17.1	
16/08/2014 21:37	0	3.1	15.9	0	0	1009	1009	1009	0	17.1	
16/08/2014 23:07	0	3.1	15.9	0	0	1007	1007	1007	0	17.1	
17/08/2014 00:37	0	3.1	15.9	0	0	1006	1006	1006	0	17.1	
17/08/2014 02:07	0	3.1	15.9	0	0	1005	1005	1005	0	17.1	
17/08/2014 03:37	0	3.1	15.9	0	0	1004	1004	1004	0	17.1	
17/08/2014 05:07	0	3.1	15.9	0	0	1003	1003	1003	0	17.1	
17/08/2014 06:37	0	3.1	15.9	0	0	1003	1003	1003	0	17	
17/08/2014 08:07	0	3.1	15.8	0	0	1002	1002	1002	0	17	
17/08/2014 09:37	0	3.1	15.8	0	0	1002	1002	1002	0	17	
17/08/2014 11:07	0	3.1	15.8	0	0	1002	1002	1002	0	17	
17/08/2014 12:37	0	3.1	15.8	0	0	1001	1001	1001	0	16.9	
17/08/2014 14:07	0	3.1	15.8	0	0	1001	1001	1001	0	16.9	
17/08/2014 15:37	0	3.1	15.9	0	0	1001	1001	1001	0	16.9	
17/08/2014 17:07	0	3.1	15.9	0	0	1000	1001	1001	-1	16.9	
17/08/2014 18:37	0	3.1	15.9	0	0	1000	1000	1000	0	16.9	
17/08/2014 20:07	0	3.1	15.9	0	0	1000	1000	1000	0	16.9	
17/08/2014 21:37	0	3.1	15.9	0	0	1000	1000	1000	0	16.9	
17/08/2014 23:07	0	3.1	15.9	0	0	1000	1000	1000	0	16.9	
18/08/2014 00:37	0	3.1	15.9	0	0	1000	1000	1000	0	16.9	
18/08/2014 02:07	0	3.1	16	0	0	1001	1001	1001	0	16.9	
18/08/2014 03:37	0	3.1	16	0	0	1000	1000	1000	0	16.9	
18/08/2014 05:07	0	3.1	16	0	0	1001	1001	1001	0	16.9	
18/08/2014 06:37	0	3.1	16	0	0	1002	1002	1002	0	16.9	
18/08/2014 08:07	0	2.6	16	0	0	1003	1003	1003	0	16.8	
18/08/2014 09:37	0	3.1	16	0	0	1004	1004	1004	0	16.8	



Ground-Gas Solutions Time Series Data

Location:	GG5516
Borehole ref:	BH3
Gas/Chem ID:	0000330409
Start Date:	21/07/2014 12:21
End Date:	18/08/2014 10:03
Days of monitoring:	27
Monitoring Frequency (mins):	90
Total samples taken:	449

Minimum, Maximum and range table										
	CH ₄	CO ₂	O ₂	TVOC	H ₂ S	CO	Borehole Pressure	Atmospheric Pressure	Differential Pressure	Temperature
Min	0.0	0.0	1.9	2	0	0	985	985	-2	16.5
Max	0.0	10.5	20.8	5	0	2	1017	1018	1	24.8
Range	0.0	10.5	18.9	3	0	2	32	33		8.3

Date and Time	CH ₄ % v/v	CO ₂ % v/v	O ₂ % v/v	TVOC ppmv	H ₂ S ppmv	CO ppmv	Borehole Pressure millibars	Atmospheric Pressure millibars	Differential Pressure millibars	Temperature °C	Comments / Events
21/07/2014 12:21	0.0	0.0	20.5	2	0	0	1013	1014	-1	24.5	
21/07/2014 12:24	0.0	0.0	20.8	2	0	0	1013	1014	-1	24.8	
21/07/2014 13:54	0.0	2.9	9.7	4	0	0	1013	1014	-1	20.4	
21/07/2014 15:24	0.0	4.1	8.8	4	0	0	1013	1014	-1	19.3	
21/07/2014 16:54	0.0	4.1	8.6	4	0	0	1013	1014	-1	19.0	
21/07/2014 18:24	0.0	4.1	8.6	4	0	0	1013	1014	-1	19.0	
21/07/2014 19:54	0.0	4.1	9.0	4	0	0	1013	1015	-2	19.1	
21/07/2014 21:24	0.0	4.7	9.6	4	0	0	1014	1015	-1	19.1	
21/07/2014 22:54	0.0	4.1	10.4	4	0	0	1014	1015	-1	19.2	
22/07/2014 00:24	0.0	4.1	11.0	4	0	0	1015	1016	-1	19.3	
22/07/2014 01:54	0.0	4.1	11.4	4	0	0	1015	1016	-1	19.3	
22/07/2014 03:24	0.0	4.1	11.6	4	0	0	1015	1016	-1	19.3	
22/07/2014 04:54	0.0	4.1	11.8	4	0	0	1016	1017	-1	19.2	
22/07/2014 06:24	0.0	4.1	11.9	4	0	0	1016	1017	-1	19.1	
22/07/2014 07:54	0.0	4.1	12.0	4	0	0	1016	1018	-2	19.1	
22/07/2014 09:24	0.0	3.5	12.2	4	0	0	1016	1018	-2	18.9	
22/07/2014 10:54	0.0	3.5	12.5	4	0	0	1016	1018	-2	18.9	
22/07/2014 12:24	0.0	3.5	12.9	4	0	0	1016	1018	-2	18.9	
22/07/2014 13:54	0.0	3.5	13.3	4	0	0	1016	1017	-1	18.9	
22/07/2014 15:24	0.0	3.5	13.7	4	0	0	1017	1017	-1	18.9	
22/07/2014 16:54	0.0	3.5	14.0	4	0	0	1015	1016	-1	19.1	
22/07/2014 18:24	0.0	2.9	14.3	4	0	0	1015	1017	-2	19.3	
22/07/2014 19:54	0.0	2.9	14.6	4	0	0	1016	1017	-1	19.4	
22/07/2014 21:24	0.0	2.9	14.8	4	0	0	1016	1018	-2	19.5	
22/07/2014 22:54	0.0	2.9	14.9	4	0	0	1017	1018	-1	19.6	
23/07/2014 00:24	0.0	2.9	15.0	5	0	0	1017	1018	-1	19.7	
23/07/2014 01:54	0.0	2.9	15.0	5	0	0	1017	1018	-1	19.8	
23/07/2014 03:24	0.0	2.9	14.8	5	0	0	1017	1018	-1	19.8	
23/07/2014 04:54	0.0	2.9	14.7	5	0	0	1017	1018	-1	19.8	
23/07/2014 06:24	0.0	2.9	14.5	5	0	0	1016	1018	-2	19.8	
23/07/2014 07:54	0.0	2.9	14.4	5	0	0	1016	1017	-1	19.7	
23/07/2014 09:24	0.0	2.9	14.5	5	0	0	1016	1017	-1	19.6	
23/07/2014 10:54	0.0	2.9	14.7	5	0	0	1015	1016	-1	19.6	
23/07/2014 12:24	0.0	2.3	15.0	5	0	0	1015	1016	-1	19.6	
23/07/2014 13:54	0.0	2.3	15.1	5	0	0	1014	1015	-1	19.6	
23/07/2014 15:24	0.0	2.3	15.2	5	0	0	1013	1014	-1	19.6	
23/07/2014 16:54	0.0	2.3	15.3	5	0	0	1013	1014	-1	19.8	
23/07/2014 18:24	0.0	2.3	15.3	5	0	0	1013	1013	-1	19.9	
23/07/2014 19:54	0.0	2.3	15.3	4	0	0	1013	1013	0	20.0	
23/07/2014 21:24	0.0	2.3	15.3	4	0	0	1013	1014	-1	20.1	
23/07/2014 22:54	0.0	2.3	15.4	4	0	0	1013	1015	-2	20.2	
24/07/2014 00:24	0.0	2.3	15.3	4	0	0	1013	1015	-2	20.2	
24/07/2014 01:54	0.0	2.3	15.3	4	0	0	1013	1014	-1	20.3	
24/07/2014 03:24	0.0	2.3	15.2	4	0	0	1013	1013	-1	20.3	
24/07/2014 04:54	0.0	2.3	15.2	4	0	0	1013	1014	-1	20.2	
24/07/2014 06:24	0.0	2.3	15.2	4	0	0	1013	1014	-1	20.1	
24/07/2014 07:54	0.0	2.3	15.1	4	0	0	1013	1013	-1	20.1	
24/07/2014 09:24	0.0	2.3	15.2	4	0	0	1013	1014	-1	19.9	
24/07/2014 10:54	0.0	2.3	15.3	4	0	0	1013	1014	-1	19.9	
24/07/2014 12:24	0.0	2.3	15.6	4	0	0	1013	1014	-1	19.9	
24/07/2014 13:54	0.0	2.3	15.9	4	0	0	1012	1013	-1	19.9	
24/07/2014 15:24	0.0	2.3	16.0	4	0	0	1011	1013	-1	19.9	
24/07/2014 16:54	0.0	2.3	16.0	4	0	0	1011	1012	-1	20.0	
24/07/2014 18:24	0.0	2.3	16.0	4	0	0	1011	1012	-1	20.1	
24/07/2014 19:54	0.0	2.3	16.1	4	0	0	1011	1012	-1	20.2	
24/07/2014 21:24	0.0	2.3	16.2	4	0	0	1012	1013	-1	20.3	
24/07/2014 22:54	0.0	2.3	16.2	4	0	0	1013	1014	-1	20.4	
25/07/2014 00:24	0.0	2.3	16.2	4	0	0	1013	1014	-1	20.4	
25/07/2014 01:54	0.0	2.3	16.1	4	0	0	1013	1014	-1	20.4	
25/07/2014 03:24	0.0	2.3	15.9	4	0	0	1012	1013	-1	20.4	
25/07/2014 04:54	0.0	2.3	15.8	4	0	0	1012	1012	-1	20.4	
25/07/2014 06:24	0.0	2.3	15.6	4	0	0	1012	1013	-1	20.3	
25/07/2014 07:54	0.0	2.3	15.5	4	0	0	1012	1012	-1	20.2	
25/07/2014 09:24	0.0	2.3	15.5	4	0	0	1012	1013	-1	20.1	
25/07/2014 10:54	0.0	2.3	15.6	4	0	0	1012	1013	-1	20.1	
25/07/2014 12:24	0.0	2.3	15.8	4	0	0	1011	1013	-1	20.0	
25/07/2014 13:54	0.0	2.3	16.0	4	0	0	1011	1012	-1	20.0	
25/07/2014 15:24	0.0	2.3	16.3	4	0	0	1011	1012	-1	20.1	
25/07/2014 16:54	0.0	2.3	16.4	4	0	0	1010	1011	-1	20.2	
25/07/2014 18:24	0.0	1.7	16.5	4	0	0	1010	1011	-1	20.3	
25/07/2014 19:54	0.0	2.3	16.6	4	0	0	1010	1011	-1	20.4	
25/07/2014 21:24	0.0	2.3	16.7	4	0	0	1011	1011	-1	20.5	
25/07/2014 22:54	0.0	1.7	16.7	4	0	0	1011	1012	-1	20.6	
26/07/2014 00:24	0.0	2.3	16.6	4	0	0	1011	1012	-1	20.6	
26/07/2014 01:54	0.0	2.3	16.5	4	0	0	1011	1012	-1	20.7	
26/07/2014 03:24	0.0	2.3	16.2	4	0	0	1011	1012	-1	20.6	
26/07/2014 04:54	0.0	2.3	16.0	4	0	0	1011	1012	-1	20.6	
26/07/2014 06:24	0.0	2.3	15.8	4	0	0	1011	1012	-1	20.6	
26/07/2014 07:54	0.0	2.3	15.6	4	0	0	1011	1011	0	20.5	
26/07/2014 09:24	0.0	2.3	15.6	4	0	0	1011	1012	-1	20.4	
26/07/2014 10:54	0.0	2.3	15.7	4	0	0	1011	1012	-1	20.3	
26/07/2014 12:24	0.0	2.3	15.9	4	0	0	1010	1011	-1	20.3	
26/07/2014 13:54	0.0	2.3	16.1	4	0	0	1009	1010	-1	20.3	
26/07/2014 15:24	0.0	2.3	16.2	4	0	0	1009	1010	-1	20.3	
26/07/2014 16:54	0.0	2.3	16.3	4	0	0	1009	1009	0	20.4	
26/07/2014 18:24	0.0	2.3	16.2	4	0	0	1009	1009	0	20.4	
26/07/2014 19:54	0.0	2.3	15.9	4	0	0	1009	1009	0	20.6	
26/07/2014 21:24	0.0	2.3	15.7	4	0	0	1009	1010	-1	20.6	
26/07/2014 22:54	0.0	2.3	15.5	4	0	0	1010	1011	-1	20.8	
27/07/2014 00:24	0.0	2.3	15.3	4	0	0	1010	1011	-1	20.8	
27/07/2014 01:54	0.0	2.3	15.1	4	0	0	1010	1010	-1	20.8	
27/07/2014 03:24	0.0	2.3	14.9	4	0	0	1010	1011	-1	20.8	
27/07/2014 04:54	0.0	2.3	14.9	4	0	0	1010	1011	-1	20.8	
27/07/2014 06:24	0.0	2.3	14.8	4	0	0	1011	1011	-1	20.7	
27/07/2014 07:54	0.0	2.3	14.7	4	0	0	1011	1011	0	20.6	
27/07/2014 09:24	0.0	2.3	14.5	4	0	0	1011	1011	0	20.5	
27/07/2014 10:54	0.0	2.9	14.1	4	0	0	1010	1010	-1	20.4	
27/07/2014 12:24	0.0	2.9	13.3	4	0	0	1010	1011	-1	20.4	
27/07/2014 13:54	0.0	2.9	12.5	4	0	0	1010	1011	-1	20.4	
27/07/2014 15:24	0.0	3.5	11.9	4	0	0	1009	1011	-2	20.4	
27/07/2014 16:54	0.0	3.5	11.4	4	0	0	1009	1010	-1	20.4	
27/07/2014 18:24	0.0	3.5	10.9	4	0	0	1009	1010	-1	20.5	
27/07/2014 19:54	0.0	4.1	10.5	4	0	0	1009	1010	-1	20.5	
27/07/2014 21:24	0.0	4.1	10.1	4	0	0	1009	1010	-1	20.6	
27/07/2014 22:54	0.0	4.1	9.9	4	0	0	1009	1010	-1	20.6	
28/07/2014 00:24	0.0	4.1	10.1	4	0	0	1009	1010	-1	20.6	
28/07/2014 01:54	0.0	4.1	10.5	4	0	0					

Date and Time	CH ₄ % v/v	CO ₂ % v/v	O ₂ % v/v	TVOC ppmv	H ₂ S ppmv	CO ppmv	Borehole Pressure millibars	Atmospheric Pressure millibars	Differential Pressure millibars	Temperature °C	Comments / Events
01/08/2014 01:54	0.0	4.1	13.4	2	0	0	1001	1002	0	19.2	
01/08/2014 03:24	0.0	4.1	13.4	2	0	0	1001	1002	-1	19.2	
01/08/2014 04:54	0.0	4.1	13.4	2	0	0	1001	1001	0	19.2	
01/08/2014 06:24	0.0	4.1	13.3	2	0	0	1000	1001	0	19.1	
01/08/2014 07:54	0.0	4.0	13.2	2	0	0	1000	1000	0	19.1	
01/08/2014 09:24	0.0	4.1	13.1	2	0	0	1000	1000	0	19.0	
01/08/2014 10:54	0.0	4.1	13.1	2	0	0	999	1000	-1	19.0	
01/08/2014 12:24	0.0	4.1	13.0	2	0	0	999	1000	-1	18.9	
01/08/2014 13:54	0.0	4.1	12.9	2	0	0	999	999	0	18.9	
01/08/2014 15:24	0.0	4.1	12.9	2	0	0	998	998	0	18.9	
01/08/2014 16:54	0.0	4.1	13.0	2	0	0	998	998	0	18.9	
01/08/2014 18:24	0.0	4.1	13.0	2	0	0	998	998	0	18.9	
01/08/2014 19:54	0.0	4.1	12.8	2	0	0	998	998	0	18.9	
01/08/2014 21:24	0.0	4.1	12.6	2	0	0	998	999	-1	18.9	
01/08/2014 22:54	0.0	4.1	12.5	2	0	0	998	998	0	18.9	
02/08/2014 00:24	0.0	4.1	12.4	2	0	0	998	998	0	18.9	
02/08/2014 01:54	0.0	4.1	12.3	2	0	0	997	998	-1	18.9	
02/08/2014 03:24	0.0	4.1	12.2	2	0	0	997	997	0	18.9	
02/08/2014 04:54	0.0	4.1	12.0	2	0	0	996	996	0	18.8	
02/08/2014 06:24	0.0	4.1	11.9	2	0	0	995	995	0	18.8	
02/08/2014 07:54	0.0	4.1	11.8	2	0	0	995	995	0	18.8	
02/08/2014 09:24	0.0	4.1	11.8	2	0	0	994	994	0	18.7	
02/08/2014 10:54	0.0	4.7	11.7	2	0	0	994	994	0	18.6	
02/08/2014 12:24	0.0	4.1	11.5	2	0	0	993	993	0	18.6	
02/08/2014 13:54	0.0	4.7	11.4	2	0	0	993	993	0	18.6	
02/08/2014 15:24	0.0	4.7	11.2	2	0	0	993	992	1	18.6	
02/08/2014 16:54	0.0	4.7	11.1	2	0	0	993	992	1	18.6	
02/08/2014 18:24	0.0	4.7	11.0	2	0	0	992	992	0	18.6	
02/08/2014 19:54	0.0	4.7	10.9	2	0	0	993	993	0	18.6	
02/08/2014 21:24	0.0	4.7	11.0	2	0	0	994	994	0	18.7	
02/08/2014 22:54	0.0	4.7	11.0	2	0	0	995	995	0	18.7	
03/08/2014 00:24	0.0	4.7	10.8	2	0	0	995	996	-1	18.7	
03/08/2014 01:54	0.0	4.7	10.6	2	0	0	995	996	-1	18.7	
03/08/2014 03:24	0.0	5.3	10.4	3	0	0	996	997	0	18.7	
03/08/2014 04:54	0.0	5.3	10.1	2	0	0	996	996	0	18.6	
03/08/2014 06:24	0.0	4.7	9.9	2	0	0	996	996	0	18.6	
03/08/2014 07:54	0.0	4.2	9.7	2	0	0	997	997	0	18.5	
03/08/2014 09:24	0.0	4.7	9.5	2	0	0	997	998	-1	18.4	
03/08/2014 10:54	0.0	4.7	9.2	2	0	0	998	998	0	18.4	
03/08/2014 12:24	0.0	5.8	8.8	3	0	0	999	999	0	18.3	
03/08/2014 13:54	0.0	5.3	8.6	2	0	0	999	1000	-1	18.3	
03/08/2014 15:24	0.0	5.2	8.3	2	0	0	999	1000	-1	18.3	
03/08/2014 16:54	0.0	5.8	8.2	2	0	0	999	1000	-1	18.3	
03/08/2014 18:24	0.0	5.8	8.0	2	0	0	1000	1000	0	18.4	
03/08/2014 19:54	0.0	5.8	7.9	2	0	0	1001	1001	0	18.4	
03/08/2014 21:24	0.0	5.8	7.8	2	0	0	1002	1003	-1	18.5	
03/08/2014 22:54	0.0	5.8	8.0	2	0	0	1003	1004	-1	18.5	
04/08/2014 00:24	0.0	5.8	8.4	2	0	0	1003	1003	-1	18.6	
04/08/2014 01:54	0.0	5.8	8.8	3	0	0	1004	1004	0	18.6	
04/08/2014 03:24	0.0	5.8	9.0	2	0	0	1004	1005	-1	18.6	
04/08/2014 04:54	0.0	5.8	9.3	2	0	0	1005	1005	-1	18.6	
04/08/2014 06:24	0.0	5.8	9.4	2	0	0	1006	1006	-1	18.4	
04/08/2014 07:54	0.0	5.8	9.6	2	0	0	1006	1006	-1	18.4	
04/08/2014 09:24	0.0	5.8	9.8	2	0	0	1007	1007	0	18.3	
04/08/2014 10:54	0.0	5.3	9.9	2	0	0	1007	1008	-1	18.3	
04/08/2014 12:24	0.0	5.8	9.8	2	0	0	1008	1008	0	18.3	
04/08/2014 13:54	0.0	5.8	9.6	2	0	0	1008	1008	0	18.2	
04/08/2014 15:24	0.0	5.3	9.4	2	0	0	1008	1009	-1	18.3	
04/08/2014 16:54	0.0	5.8	9.2	2	0	0	1009	1009	-1	18.3	
04/08/2014 18:24	0.0	5.8	9.3	2	0	0	1008	1009	-1	18.4	
04/08/2014 19:54	0.0	5.8	9.5	2	0	0	1009	1009	0	18.5	
04/08/2014 21:24	0.0	5.8	9.7	2	0	0	1009	1009	-1	18.6	
04/08/2014 22:54	0.0	5.8	10.0	2	0	0	1009	1010	-1	18.6	
05/08/2014 00:24	0.0	5.8	10.2	2	0	0	1010	1010	-1	18.6	
05/08/2014 01:54	0.0	5.2	10.2	2	0	0	1010	1011	-1	18.7	
05/08/2014 03:24	0.0	5.8	10.2	2	0	0	1010	1011	-1	18.6	
05/08/2014 04:54	0.0	5.8	10.1	2	0	0	1010	1010	0	18.6	
05/08/2014 06:24	0.0	5.8	10.0	2	0	0	1009	1010	-1	18.6	
05/08/2014 07:54	0.0	5.8	9.9	2	0	0	1009	1010	-1	18.5	
05/08/2014 09:24	0.0	5.8	10.0	2	0	0	1009	1010	-1	18.4	
05/08/2014 10:54	0.0	5.3	10.2	2	0	0	1009	1010	-1	18.4	
05/08/2014 12:24	0.0	5.8	10.4	2	0	0	1008	1009	-1	18.4	
05/08/2014 13:54	0.0	5.2	10.5	2	0	0	1009	1009	-1	18.4	
05/08/2014 15:24	0.0	5.2	10.5	2	0	0	1008	1009	-1	18.4	
05/08/2014 16:54	0.0	5.3	10.5	2	0	0	1007	1008	-1	18.4	
05/08/2014 18:24	0.0	5.2	10.6	2	0	0	1006	1007	-1	18.4	
05/08/2014 19:54	0.0	5.8	10.9	2	0	0	1006	1007	-1	18.5	
05/08/2014 21:24	0.0	5.3	11.2	2	0	0	1005	1006	-1	18.5	
05/08/2014 22:54	0.0	5.2	11.3	2	0	0	1005	1005	0	18.6	
06/08/2014 00:24	0.0	5.2	11.4	2	0	0	1004	1005	-1	18.6	
06/08/2014 01:54	0.0	5.3	11.4	2	0	0	1003	1003	-1	18.6	
06/08/2014 03:24	0.0	5.3	11.3	2	0	0	1002	1003	-1	18.6	
06/08/2014 04:54	0.0	4.7	11.2	2	0	0	1002	1002	0	18.6	
06/08/2014 06:24	0.0	5.2	11.1	3	0	0	1001	1001	-1	18.6	
06/08/2014 07:54	0.0	5.3	11.0	2	0	0	1001	1001	0	18.5	
06/08/2014 09:24	0.0	5.2	11.0	2	0	0	1001	1001	0	18.5	
06/08/2014 10:03	0.0	5.3	15.1	2	0	0	1001	1001	0	18.6	
06/08/2014 11:33	0.0	4.1	12.3	2	0	0	1001	1001	0	18.6	
06/08/2014 13:03	0.0	4.7	11.5	2	0	0	1002	1002	0	18.5	
06/08/2014 14:33	0.0	5.3	10.8	2	0	0	1002	1003	-1	18.5	
06/08/2014 16:03	0.0	5.3	10.0	2	0	0	1003	1003	0	18.6	
06/08/2014 17:33	0.0	5.3	9.4	2	0	0	1002	1002	-1	18.6	
06/08/2014 19:03	0.0	5.8	8.9	3	0	0	1003	1004	-1	18.7	
06/08/2014 20:33	0.0	5.8	8.6	3	0	0	1004	1004	0	18.7	
06/08/2014 22:03	0.0	5.8	8.7	3	0	0	1004	1005	-1	18.8	
06/08/2014 23:33	0.0	5.8	8.8	3	0	0	1004	1005	-1	18.8	
07/08/2014 01:03	0.0	5.8	9.1	2	0	0	1005	1006	-1	18.8	
07/08/2014 02:33	0.0	5.8	9.5	2	0	0	1005	1006	-1	18.8	
07/08/2014 04:03	0.0	5.8	9.8	2	0	0	1005	1006	-1	18.8	
07/08/2014 05:33	0.0	5.8	10.0	3	0	0	1006	1007	-1	18.8	
07/08/2014 07:03	0.0	5.8	10.1	3	0	0	1006	1007	-1	18.7	
07/08/2014 08:33	0.0	5.8	10.3	3	0	0	1007	1008	-1	18.6	
07/08/2014 10:03	0.0	5.3	10.5	2	0	0	1006	1006	-1	18.6	
07/08/2014 11:33	0.0	5.2	10.7	2	0	0	1008	1009	-1	18.6	
07/08/2014 13:03	0.0	5.2	10.7	2	0	0	1008	1009	-1	18.5	
07/08/2014 14:33	0.0	5.2	10.8	2	0	0	1007	1007	-1	18.5	
07/08/2014 16:03	0.0	5.3	10.9	2	0	0	1008	1009	-1	18.5	
07/08/2014 17:33	0.0	5.3	10.9	2	0	0	1008	1009	-1	18.5	
07/08/2014 19:03	0.0	5.2	11.0	2	0	0	1008	1009	-1	18.6	
07/08/2014 20:33	0.0	5.2	11.0	2	0	0	1008	1009	-1	18.6	
07/08/2014 22:03	0.0	5.2	11.0	3	0	0	1008	1009	-1	18.6	
07/08/2014 23:33	0.0	5.2	10.9	2	0	0	1008	1009	-1	18.6	
08/08/2014 01:03	0.0	5.2	10.7	3	0	0	1007	1008	-1	18.6	
08/08/2014 02:33	0.0	5.3	10.6	3	0	0	1007	1007	-1	18.6	
08/08/2014 04:03	0.0	5.2	10.4	3	0	0	1006	1006	0	18.6	
08/08/2014 05:33	0.0	5.3	10.1	2	0	0	1005	1006	-1	18.5	
08/08/2014 07:03	0.0	5.8	10.0	3	0	0	1004	1004	-1	18.4	
08/08/2014 08:33											

Date and Time	CH ₄ % v/v	CO ₂ % v/v	O ₂ % v/v	TVOC ppmv	H ₂ S ppmv	CO ppmv	Borehole Pressure millibars	Atmospheric Pressure millibars	Differential Pressure millibars	Temperature °C	Comments / Events
12/08/2014 19:03	0.0	8.8	3.5	2	0	0	994	994	0	17.2	
12/08/2014 20:33	0.0	8.8	3.4	2	0	0	994	994	0	17.2	
12/08/2014 22:03	0.0	8.8	3.5	2	0	0	994	994	0	17.3	
12/08/2014 23:33	0.0	8.8	3.7	2	0	0	994	994	-1	17.3	
13/08/2014 01:03	0.0	8.8	3.9	2	0	0	995	995	0	17.3	
13/08/2014 02:33	0.0	8.8	4.2	2	0	0	994	994	0	17.3	
13/08/2014 04:03	0.0	8.8	4.3	2	0	0	994	994	0	17.3	
13/08/2014 05:33	0.0	8.2	4.5	2	0	0	994	994	0	17.3	
13/08/2014 07:03	0.0	8.8	4.6	2	0	0	994	994	0	17.2	
13/08/2014 08:33	0.0	8.2	4.7	2	0	0	995	995	0	17.2	
13/08/2014 10:03	0.0	8.8	4.8	2	0	0	995	995	0	17.1	
13/08/2014 11:33	0.0	8.8	4.7	2	0	0	996	996	0	17.1	
13/08/2014 13:03	0.0	8.8	4.6	2	0	0	996	996	0	17.1	
13/08/2014 14:33	0.0	8.8	4.4	2	0	0	997	997	0	17.1	
13/08/2014 16:03	0.0	8.8	4.2	2	0	0	997	996	-1	17.1	
13/08/2014 17:33	0.0	8.8	4.0	2	0	0	998	998	0	17.1	
13/08/2014 19:03	0.0	8.8	3.9	2	0	0	999	999	-1	17.1	
13/08/2014 20:33	0.0	8.8	3.7	2	0	0	999	1000	-1	17.1	
13/08/2014 22:03	0.0	8.8	3.6	2	0	0	999	1000	-1	17.2	
13/08/2014 23:33	0.0	8.8	3.6	2	0	0	1000	1000	0	17.2	
14/08/2014 01:03	0.0	8.8	3.7	2	0	0	1000	1001	-1	17.1	
14/08/2014 02:33	0.0	8.8	3.8	2	0	0	1000	1001	-1	17.1	
14/08/2014 04:03	0.0	9.4	3.9	2	0	0	1000	1000	0	17.1	
14/08/2014 05:33	0.0	8.8	4.0	2	0	0	1000	1000	0	17.1	
14/08/2014 07:03	0.0	8.8	4.0	2	0	0	1000	1001	-1	17.0	
14/08/2014 08:33	0.0	8.8	4.1	2	0	0	1001	1001	0	16.9	
14/08/2014 10:03	0.0	8.8	4.2	2	0	0	1001	1001	0	16.9	
14/08/2014 11:33	0.0	8.8	4.3	2	0	0	1001	1002	-1	16.9	
14/08/2014 13:03	0.0	8.8	4.6	2	0	0	1001	1002	-1	16.9	
14/08/2014 14:33	0.0	8.8	4.7	2	0	0	1001	1002	-1	16.9	
14/08/2014 16:03	0.0	8.2	4.6	2	0	0	1002	1002	0	16.9	
14/08/2014 17:33	0.0	8.8	4.4	2	0	0	1002	1002	0	16.9	
14/08/2014 19:03	0.0	8.8	4.1	2	0	0	1002	1003	-1	16.9	
14/08/2014 20:33	0.0	9.4	4.0	2	0	0	1003	1004	-1	16.9	
14/08/2014 22:03	0.0	8.8	3.8	2	0	0	1004	1004	0	17.0	
14/08/2014 23:33	0.0	8.8	3.7	2	0	0	1004	1005	-1	17.0	
15/08/2014 01:03	0.0	8.8	3.7	2	0	0	1005	1005	-1	17.0	
15/08/2014 02:33	0.0	8.8	3.6	2	0	0	1006	1006	0	17.0	
15/08/2014 04:03	0.0	8.8	3.6	2	0	0	1006	1006	-1	17.0	
15/08/2014 05:33	0.0	8.8	3.6	2	0	0	1006	1007	-1	17.0	
15/08/2014 07:03	0.0	8.8	3.6	2	0	0	1008	1008	0	16.9	
15/08/2014 08:33	0.0	9.4	3.6	2	0	0	1008	1009	-1	16.9	
15/08/2014 10:03	0.0	9.4	3.6	2	0	0	1009	1010	-1	16.9	
15/08/2014 11:33	0.0	8.8	3.7	2	0	0	1009	1010	-1	16.8	
15/08/2014 13:03	0.0	8.8	3.8	2	0	0	1010	1011	-1	16.9	
15/08/2014 14:33	0.0	8.8	4.0	2	0	0	1010	1011	-1	16.9	
15/08/2014 16:03	0.0	8.8	4.1	2	0	0	1010	1011	-1	16.9	
15/08/2014 17:33	0.0	8.8	4.1	2	0	0	1011	1011	0	17.0	
15/08/2014 19:03	0.0	9.4	4.0	2	0	0	1011	1012	-1	17.1	
15/08/2014 20:33	0.0	9.4	3.9	2	0	0	1012	1013	-1	17.1	
15/08/2014 22:03	0.0	8.8	3.8	2	0	0	1013	1014	-1	17.2	
15/08/2014 23:33	0.0	8.8	3.7	2	0	0	1013	1014	-1	17.2	
16/08/2014 01:03	0.0	8.8	3.8	2	0	0	1013	1013	0	17.2	
16/08/2014 02:33	0.0	8.8	3.9	2	0	0	1012	1013	-1	17.2	
16/08/2014 04:03	0.0	8.8	4.0	2	0	0	1012	1013	-1	17.2	
16/08/2014 05:33	0.0	8.8	4.1	2	0	0	1012	1013	-1	17.1	
16/08/2014 07:03	0.0	9.4	4.2	2	0	0	1011	1012	-1	17.1	
16/08/2014 08:33	0.0	9.4	4.3	2	0	0	1011	1012	-1	17.1	
16/08/2014 10:03	0.0	9.4	4.4	2	0	0	1011	1012	-1	17.0	
16/08/2014 11:33	0.0	9.4	4.4	2	0	0	1011	1012	-1	17.0	
16/08/2014 13:03	0.0	9.4	4.1	2	0	0	1011	1011	0	16.9	
16/08/2014 14:33	0.0	8.8	3.9	2	0	1	1010	1011	-1	16.9	
16/08/2014 16:03	0.0	9.4	3.6	2	0	0	1009	1010	-1	16.9	
16/08/2014 17:33	0.0	9.4	3.4	2	0	0	1009	1009	0	16.9	
16/08/2014 19:03	0.0	9.4	3.2	2	0	0	1007	1008	-1	16.9	
16/08/2014 20:33	0.0	9.4	3.1	2	0	1	1006	1007	-1	16.9	
16/08/2014 22:03	0.0	9.4	3.1	2	0	0	1006	1007	-1	16.9	
16/08/2014 23:33	0.0	9.4	3.1	2	0	0	1004	1005	-1	16.9	
17/08/2014 01:03	0.0	9.4	3.1	2	0	0	1003	1004	-1	16.9	
17/08/2014 02:33	0.0	9.4	3.1	2	0	0	1002	1003	-1	16.9	
17/08/2014 04:03	0.0	9.4	3.1	2	0	0	1001	1002	-1	16.9	
17/08/2014 05:33	0.0	9.4	3.0	2	0	2	1001	1001	0	16.9	
17/08/2014 07:03	0.0	9.4	3.0	2	0	0	1000	1000	0	16.9	
17/08/2014 08:33	0.0	9.4	2.9	2	0	0	1000	1000	0	16.8	
17/08/2014 10:03	0.0	9.4	2.9	2	0	0	999	1000	-1	16.8	
17/08/2014 11:33	0.0	9.4	2.7	2	0	0	999	1000	-1	16.8	
17/08/2014 13:03	0.0	9.4	2.6	2	0	0	999	999	0	16.8	
17/08/2014 14:33	0.0	9.4	2.5	2	0	0	999	999	0	16.8	
17/08/2014 16:03	0.0	9.9	2.4	2	0	1	999	999	0	16.8	
17/08/2014 17:33	0.0	9.9	2.3	2	0	0	998	998	0	16.8	
17/08/2014 19:03	0.0	9.9	2.2	2	0	0	998	998	0	16.8	
17/08/2014 20:33	0.0	9.9	2.2	2	0	0	997	998	-1	16.8	
17/08/2014 22:03	0.0	10.5	2.1	2	0	0	997	998	-1	16.8	
17/08/2014 23:33	0.0	9.9	2.0	2	0	0	997	997	0	16.8	
18/08/2014 01:03	0.0	9.9	2.0	2	0	0	997	997	0	16.8	
18/08/2014 02:33	0.0	10.5	1.9	2	0	0	997	997	0	16.8	
18/08/2014 04:03	0.0	10.5	1.9	2	0	0	996	996	0	16.7	
18/08/2014 05:33	0.0	10.5	1.9	2	0	0	999	999	0	16.6	
18/08/2014 07:03	0.0	9.9	1.9	2	0	0	999	1000	-1	16.6	
18/08/2014 08:33	0.0	10.5	1.9	2	0	0	1001	1001	0	16.6	
18/08/2014 10:03	0.0	10.5	1.9	2	0	0	1002	1002	0	16.5	

GGs DataPack®
Hardy's Farm, Chorlton-Cum-Hardy

Appendix E

Calibration Certificates

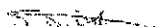
CERTIFICATE OF CALIBRATION

GasClam

CALIBRATION CERTIFICATE NO:

49333

ISSUED BY: SHAWCITY LIMITED
DATE: 06/09/2013

APPROVED SIGNATORY: 

NAME: Steven Black

CUSTOMER: Ground Gas Solutions Ltd
INSTRUMENT: GasClam
SERIAL NUMBER: 000028/04/09

CALIBRATION METHOD: CM14
AMBIENT CONDITIONS: 20°C ± 2°C and 50% (± 20%) RH

Prior to calibration the instrument was allowed to stabilise in the laboratory for at least 30 minutes.
The instrument was calibrated by exposing the sensor to known values of gas concentrations.
All gases were sampled through the complete probe and in line filter, where applicable.
The reference values are those generated by the certified source and the indicated values are those measured by the instrument.

CALIBRATION RESULTS

GAS/SOURCE	LOT No	REF. VALUE	INDICATED VALUE
Oxygen	Ambient Air	20.9% O2	20.9% O2
Nitrogen	1467959	>99.999%	0.0% O2
Methane	1467968	60.0%	60.0%
Carbon Dioxide	1467968	40.0%	40.0%
Hydrogen Sulphide	1480827	50 ppm	50 ppm
Carbon Monoxide	1500844	50 ppm	50 ppm
Isobutylene	1464995	100 ppm	100 ppm
Barometric Pressure	Digitron 2025P	1008mbar	1008mbar
Borehole Pressure	Digitron 2025P	1008mbar	1008mbar

COMMENTS:

The reported uncertainty is based on a standard uncertainty multiplied by a coverage factor of $k=2$.
This provides a level of confidence of uncertainty of approximately 95%.
The uncertainty of measurement is ±2 ppm.
The results indicate that the instrument conforms to the applicable parts of the published specification.

HEALTH & SAFETY, OCCUPATIONAL HYGIENE AND ENVIRONMENTAL MONITORING INSTRUMENTS



Instrument House
91-92 Shrivenham Hundred Business Park
Watchfield
Oxfordshire
SN6 8TY
Tel: 01793 780622
Fax: 01793 784466
service@shawcity.co.uk

SERVICE / INSPECTION SHEET

JOB NUMBER: 49333
INSTRUMENT: GasClam
SERIAL NUMBER: 000028/04/09
DATE RECEIVED: 27/08/2013

CUSTOMER: Ground Gas Solutions Ltd

[illegible]

SIGNED:

Condition Status:

OK = Good F = Faulty Blank = Not Received
RTN - Returned to Customer?

TESTS	AS REC'D	AFTER REPAIR
Battery	Fail	Ok
Flow	Ok	Ok
CO	Fail	Ok
H2S	Fail	Ok
CH4	Ok	Ok
CO2	Ok	Ok
Oxygen	Fail	Ok
PID	Fail	Ok
Barometric Px	Ok	Ok
Borehole Px	Ok	Ok
Temperature	Ok	Ok
PC Comms Test	Ok	Ok
Datalog Test	Ok	Ok

RETURNED
Empty

COMMENTS:

Instrument has been given a full upgrade kit, As requested by customer.

New batteries fitted as part of service.
New snorkel fitted as part of service.
New filters fitted as part of service.
New sensor filter fitted as part of service.
New lamp and stack fitted as part of service.
New dual H2S & CO sensor fitted as part of service.
New O2 sensor fitted as part of service.

TECHNICIAN: Steven Black

DATE: 06/09/2013

CALIBRATION CERTIFICATE NO:

51162

ISSUED BY: SHAWCITY LIMITED

DATE: 19.05.14

APPROVED SIGNATORY:



NAME: Peter Gunter

CUSTOMER: Ground Gas Solutions Ltd

INSTRUMENT: GasClam

SERIAL NUMBER: 000033/04/09

CALIBRATION METHOD: CM14

AMBIENT CONDITIONS: 20°C ± 2°C and 50% (± 20%) RH

Prior to calibration the instrument was allowed to stabilise in the laboratory for at least 30 minutes.

The instrument was calibrated by exposing the sensor to known values of gas concentrations.

All gases were sampled through the complete probe and in line filter, where applicable.

The reference values are those generated by the certified source and the indicated values are those measured by the instrument.

CALIBRATION RESULTS

GAS/SOURCE	LOT No	REF. VALUE	INDICATED VALUE
Oxygen	Ambient Air	20.9% O ₂	20.9% O ₂
Nitrogen	1604029	>99.999%	0.0% O ₂
Methane	1433851	60.0%	60.0%
Carbon Dioxide	1433851	40.0%	40.0%
Hydrogen Sulphide	1597379	50 ppm	50 ppm
Carbon Monoxide	1467966	50 ppm	50 ppm
Isobutylene	1507165	100 ppm	100 ppm
Barometric Pressure	Digitron 2025P	988 mbar	988 mbar
Borehole Pressure	Digitron 2025P	988 mbar	988 mbar

COMMENTS:

The reported uncertainty is based on a standard uncertainty multiplied by a coverage factor of $k=2$.

This provides a level of confidence of uncertainty of approximately 95%.

The uncertainty of measurement is ±2 ppm.

The results indicate that the instrument conforms to the applicable parts of the published specification.

HEALTH & SAFETY, OCCUPATIONAL HYGIENE AND ENVIRONMENTAL MONITORING INSTRUMENTS



SERVICE / INSPECTION SHEET

JOB NUMBER: 51162
INSTRUMENT: GasClam
SERIAL NUMBER: 000033/04/09
DATE RECEIVED: 07/04/2014

CUSTOMER: Ground Gas Solutions Ltd

TESTS	AS REC'D	AFTER REPAIR
Battery	Fail	Ok
Flow	Fail	Ok
CO	Fail	Ok
H2S	Fail	Ok
CH4	Fail	Ok
CO2	Fail	Ok
Oxygen	Fail	Ok
PID	Fail	Ok
Barometric Px	Fail	Ok
Borehole Px	Fail	Ok
Temperature	Fail	Ok
PC Comms Test	Fail	Ok
Datalog Test	Fail	Ok

OK = Good F = Faulty Blank = Not Received
RTN - Returned to Customer?

Filter cover damaged. New filter cover fitted.
New O rings and batteries fitted as part of service.
New snorkel and filters fitted as part of service.
New H2S/CO sensor fitted as
New O2 sensor fitted as part of service.
Main PCB had burnt out and required replacement. New PCB fitted.
PID sensor has failed, New PID sensor (complete) fitted.
Instrument cleaned, serviced, tested and calibrated.
Re-chargable battery fitted. Battery re-charged and re-fitted.

TECHNICIAN: Peter Gunter

PALUNTER

DATE: 19.05.14



CERTIFICATE OF CALIBRATION

GasClam

CALIBRATION CERTIFICATE NO:

49763

ISSUED BY: SHAWCITY LIMITED
DATE: 16.10.13

APPROVED SIGNATORY:

NAME: Peter Gunter

CUSTOMER: Ground Gas Solutions Ltd
INSTRUMENT: GasClam
SERIAL NUMBER: 000034/04/09

CALIBRATION METHOD: CM14
AMBIENT CONDITIONS: 20°C ± 2°C and 50% (± 20%) RH

Prior to calibration the instrument was allowed to stabilise in the laboratory for at least 30 minutes.
The instrument was calibrated by exposing the sensor to known values of gas concentrations.
All gases were sampled through the complete probe and in line filter, where applicable.
The reference values are those generated by the certified source and the indicated values are those measured by the instrument.

CALIBRATION RESULTS

GAS/SOURCE	LOT No	REF. VALUE	INDICATED VALUE
Oxygen	Ambient Air	20.9% O ₂	20.9% O ₂
Nitrogen	1467959	>99.999%	0.0% O ₂
Methane	1467968	60.0%	60.0%
Carbon Dioxide	1467968	40.0%	40.0%
Hydrogen Sulphide	1480827	50 ppm	50 ppm
Carbon Monoxide	1467966	50 ppm	50 ppm
Isobutylene	1504738	100 ppm	100 ppm
Barometric Pressure	Digitron 2025P	994 mbar	994 mbar
Borehole Pressure	Digitron 2025P	994 mbar	994 mbar

COMMENTS:

The reported uncertainty is based on a standard uncertainty multiplied by a coverage factor of $k=2$.
This provides a level of confidence of uncertainty of approximately 95%.
The uncertainty of measurement is ±2 ppm.
The results indicate that the instrument conforms to the applicable parts of the published specification.

HEALTH & SAFETY, OCCUPATIONAL HYGIENE AND ENVIRONMENTAL MONITORING INSTRUMENTS



Instrument House
91-92 Shrivenham Hundred Business Park
Watchfield
Oxfordshire
SN6 8TY
Tel: 01793 780622
Fax: 01793 784466
service@shawcity.co.uk

SERVICE / INSPECTION SHEET

JOB NUMBER: 49763
INSTRUMENT: GasClam
SERIAL NUMBER: 000034/04/09
DATE RECEIVED: 14/10/2013

CUSTOMER: Ground Gas Solutions Ltd

ITEMS RECEIVED	CONDITION	RTN?
Probe	YES	✓
Interface Cable	NO	
Operation Manual	NO	
Remote Start Box	NO	
Software CD	NO	
Transit Case	YES	✓
USB Serial Converter	NO	
Spare Batteries x 2	NO	
Box Spanner	NO	
Allen Key	NO	
Snorkel & Blanking Plug	NO	

SIGNED: _____

SIGNED:

Condition Status:

OK = Good F = Faulty Blank = Not Received

RTN - Returned to Customer?

TESTS	AS REC'D	AFTER REPAIR
Battery	Fail	Ok
Flow	Ok	Ok
CO	Fail	Ok
H2S	Fail	Ok
CH4	Ok	Ok
CO2	Ok	Ok
Oxygen	Fail	Ok
PID	Fail	Ok
Barometric Px	Ok	Ok
Borehole Px	Ok	Ok
Temperature	Ok	Ok
PC Comms Test	Ok	Ok
Datalog Test	Ok	Ok

COMMENTS:

New batteries fitted as part of service.
New snorkel fitted as part of service.
New filters fitted as part of service.
New O2 sensor fitted as part of service.
New CO/H2S sensor fitted as part of service.
PID sensor has failed. New sensor fitted.
New O rings fitted as part of service.
Filter cover damaged. New cover fitted.
Gas Clam bag inner fitted, foc.
Instrument cleaned, serviced, tested and calibrated.

TECHNICIAN: Peter Gunter

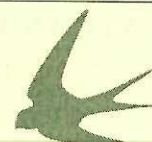
DATE: 16.10.13

TEST DATE AND CONDITIONS	
Date	20/01/14
Atmospheric Pressure	996mB
Ambient Temp	20.6°C
Envionics Serial No.	2518

GAS DATA LTD

Pegasus House
Seven Stars Estate
Wheler Rd
Coventry
CV3 4LB

Tel 02476303311 Fax 02476307711



GFM430-1 FINAL INSPECTION & CALIBRATION CHECK CERTIFICATE

FLOW CHECKS					
Calibration Flow		Instrument Flow Channels Read			
Applied Flow	Applied Pressure	Flow [Flow] (l/hour)	tol. (l/hour)	Differential Pressure [Dp] (Pa)	tol. (Pa)
-30.0 l/hour	-242 Pa	-27.8	+/-3.0	-219	+/-50
-3.0 l/hour	-11 Pa	-2.5	+/-1.0	-9	+/-6
0.0 l/hour	0 Pa	0.0	0.0	0	0.0
+3.0 l/hour	11 Pa	2.8	+/-0.5	9	+/-3
+30.0 l/hour	250 Pa	27.9	+/-3.0	226	+/-50
+60.0 l/hour	753 Pa	57.1	+/-6.0	655	+/-130
+90.0 l/hour	1483 Pa	86.3	+/-9.0	1357	+/-250

OPTIONAL GAS CHECKS							
Calibration Gas		Instrument Gas Channels Read					
Gas Type	Applied Conc.	Label Range	H2S 2000ppm	CO 2000ppm			tol. (% vol.)
N2	100%		0	0			0.0
H2S	100ppm		99	0			+/- 5.0
CO	1000ppm		74	994			+/- 5.0
							+/- 5.0
							+/- 5.0
							+/- 5.0

TEMPERATURE CHECK		
Calibration Temperature	Instrument Temperature Channel Read	
Applied Equivalent Temperature	Temperature [Temp] (°C)	tol. (°C)
-10.0 °C	-9.5	+/- 2.0
0.0 °C	0.0	+/- 1.0
30.0 °C	30.0	+/- 1.0
60.0 °C	60.0	+/- 1.0
100.0 °C	100.0	+/- 1.0

TEST DATE AND CONDITIONS	
Date	20/01/14
Atmospheric Pressure	996mB
Ambient Temp	20.6°C
Envionics Serial No.	2518

GAS DATA LTD

Pegasus House
Seven Stars Estate
Wheler Rd
Coventry
CV3 4LB
Tel 02476303311 Fax 02476307711



GFM430-1 FINAL INSPECTION & CALIBRATION CHECK CERTIFICATE

INSTRUMENT DETAILS	
Serial No	Customer
10356	Ground Gas Solutions Ltd

INSTRUMENT CHECKS			
Keyboard	✓	Pump Flow	>500cc/min
Display Contrast	✓	Pump Flow @ -200mB	300cc/min
Clock Set / Running	✓	S/W Version	G430.0024/0013
Labels Fitted	✓	Recalibration Date	20/01/15

GAS CHECKS							
Calibration Gas		Instrument Gas Channels Read					
Gas Type	Applied Conc.	CH4 (%)	tol. (% vol.)	CO2 (%)	tol. (% vol.)	O2 (%)	tol. (% vol.)
N2	100%	0.0	0.0	0.0	0.0	0.0	+0.1
CH4	5 %	4.9	+/-0.3	0.0	0.0	0.0	+0.1
	60%	60.9	+/-3.0	0.0	0.0	0.0	+0.1
CO2	5%	0.0	0.0	4.9	+/-0.3	0.0	+0.1
	40%	0.0	0.0	39.8	+/-3.0	0.0	+0.1
AIR (20.9% O2, 400ppm CO2)	100%	0.0	0.0	0.1	+0.1	20.8	+/-0.5

PRESSURE CHECKS							
Calibration Pressure		Instrument Pressure Channels Read					
Pressure @	Applied Pressure	Atmospheric [Ap] (mB)	tol. (mB)				
All ports	current atmospheric	996	+/-2.0				
Ap port (internal)	+800mB(a)	799	+/-5.0				
	+1200mB(a)	1201	+/-5.0				

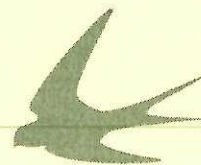
TEST DATE AND CONDITIONS	
Date	21.1.14
Atmospheric Pressure	998 mB
Ambient Temp	18.1 °C
EnviroNics Serial No.	2633

GAS DATA LTD

Pegasus House
Seven Stars Estate
Wheler Rd.
Coventry
CV3 4LB

Tel: 024 76 303311

Fax: 024 76 307711



GFM400 SERIES OUTWARD INSPECTION & QUALITY CHECK SHEET

INSTRUMENT DETAILS					
SO Number	Instrument Type	Instrument Serial Number	Job Number(s)		
307167	GFM430	10356	15427	—	—

Calibration Technician JSP

DATE 20-1-14

Inspection Technician [Signature]

DATE 21.1.14

INSTRUMENT CHECKS		Pass (P), Fail (F) or not applicable (NA)	INSTRUMENT PACKING LIST		Tick if included
Function Tests	Dust Caps Fitted	P	Instrument		✓
	Keyboard Test (All Keys)	P	Leather Case		✓
	Backlight Test	P	Instrument Strap		✓
	Clock Set / Running	P	AC Battery Charger (UK)		✓
	Comms Test	P	AC Battery Charger (EURO)		X
	Pump Flow Test (In & Out)	P	AC Battery Charger (US)		X
	Overall Leak Test (30mB)	P	Gas Sample Pipe		✓
	Battery Charge Test	P	Operation Manual (hardcopy)		X
	Service Date set to?	20.1.15	Carry Case		✓
Channel Test	Data Logging Enabled?	NA	Spares Pot		✓
	Verify CH4/LEL	P	Allen Key		✓
	Verify CO2	P	Flow Sample Pipe		✓
	Verify O2	P	Pressure Sample Pipe		X
	Verify first optional gas	P	Temperature Probe		X
	Verify second optional gas	P	Vane Anemometer		X
	Verify third optional gas	NA	USB Cable		✓
	Verify fourth optional gas	NA	USB Memory stick		X
	Verify atmospheric pressure	P	SiteMan Software	Ver	X
	Verify static pressure	NA	Internal Filter Pack	Qty	X
	Verify differential pressure	P	External Filter Pack	Qty	1
	Verify flow	P	Field Guide		X
	Verify temperature probe input	P	Extra Items:		
	Verify vane anemometer input	P			
	Jobcard(s) completed and signed	P			
	Jobcard(s) booked off database	P			
DataBase Checks	Calibration certificate completed	P			
	Complete & print QI record	NA			
Label Checks	No. of Calibration label fitted	3636	Comments		
	Warranty label fitted	P			
H2S Range	H2S Range from Sales Order	2000			
H2S Range	H2S Range from Calibration Certificate	2000			
Over-range	Over-range value correct?	P			

CHECKLIST FOR PHOCHECK TIGER PRODUCT RANGE



KIT CONTENTS

PhoCheck Tiger Instrument	✓
PhoCheck Tiger Select Instrument	
Li-ion Battery Pack	✓
Alkaline Battery Pack	
Instrument Boot	✓
Charger	✓
Power Supply (12V)	✓
Quick Start Guide (Standard)	✓
Quick Start Guide (Tiger Select)	
Warranty Registration Card	✓
USB Stick	✓
USB Cable	✓
Accessory Kit	✓

Benzene Pre-Filter Tubes (pack of 10)	
Benzene Tube Holder	
Benzene Tube Opener	

UPGRADES

H&S (STEL & TWA)	861300	
PPB (Sensitivity)	861301	
Data Logging (Full)	861303	
Single Log (Push to log)	861309	
Multi Log	861310	
Tiger Select		

QUALITY CHECK

Software version:	0.4.22
Integrity seal present?	Yes / No

Final instrument inspection date:	<i>Am?</i>	25/09/13
-----------------------------------	------------	----------

PD-FM-075-07

CALIBRATION CERTIFICATE



Date of Calibration: - 25th September 2013

Certificate Number: - 224459

Calibrated by: - M.Wadey-Leblond

Signed: - *Am?*

Customer: - Shawcity Limited

Description: - PhoCheck Tiger

Manufacturer: - ION Science Ltd

Type Number: - N/A

Serial Number: - T-107622

Calibration Due date: - September 2014

This instrument has been factory calibrated to fully documented procedures in accordance with our ISO 9001:2008 Quality Management System. Measurement standards are derived from volumetric and time sources which have been calibrated at a UKAS accredited laboratory. The following list indicates the serial numbers of equipment used during the calibration procedure.

BAR02	A-861251	C9081 / A8274 ¹			
-------	----------	----------------------------	--	--	--

¹ Gas mixtures prepared using equipment traceable to N.P.L. standards against Suppliers Certificate No

The instrument has been calibrated at a temperature of 21.0°C ± 0.25°C and a barometric pressure of 1008.7 mbar ± 2 mbar.

ION Science hereby certify that on the day of calibration the instrument was working according to the manufacturer's original sales specification as checked by the calibration procedure, unless otherwise stated.

RESULTS ON DESPATCH

Applied Concentration	Instrument Indication
99.9 ppm Isobutylene	99.6 ppm Isobutylene

The estimated applied gas uncertainty is ± 2.0%

Comments: -

PD-FM-086-04

GGs DataPack®
Hardy's Farm, Chorlton-Cum-Hardy

Appendix F

GasClam® Overview & Deployment Info.

GGG GasClam® Instrumentation Overview & Deployment Information



Introduction

GGG GasClam® instruments are in-situ borehole continuous ground-gas monitoring devices, suitable for detection of a wide range of ground gases commonly found in borehole monitoring. The equipment is ATEX approved, IP68 rated, operates safely in explosive atmospheres and can survive flooding environments. Instruments can also be secured to building walls or placed internally to monitor sub-floor spaces or indoor air.

GGG owns a large fleet of GasClam® instruments, with the following gas sensors as standard: Methane, Carbon Dioxide, Oxygen, Total Volatile Organic Compounds, Carbon Monoxide and Hydrogen Sulphide. To allow correlations to be drawn between ground-gases and environmental changes, the instruments are also fitted with sensors for atmospheric pressure, borehole pressure and temperature.

For sites where very low levels of Methane and Carbon Dioxide need to be measured, such as subfloor void or internal monitoring, GGS uses instruments fitted with low range, high resolution sensors (specification below).

Should sites be influenced by water level changes, GGS also installs equipment to provide continuous water level logging alongside continuous ground-gas monitoring.

GasClam® Sensor Specifications, Service and Maintenance

GGG GasClam® instruments are serviced and calibrated annually. Routine maintenance including the replacement of filters and operational checks are carried out at regular intervals and prior to deployment at a site. Copies of the calibration certificates for the instruments used on site are included as standard within reporting. Details of the sensor specifications are provided below:

Sensor	Method / Type	Range	Resolution
Methane (0-100%)	Infrared	0 - 100%v/v	1% of measuring range above 50%, 0.5% below 50%
*Methane (0-5%)	Infrared	0-5%v/v	0.05%
Carbon Dioxide (0-100%)	Infrared	0 - 100%v/v	1% of measuring range above 50%, 0.5% below 50%
*Carbon Dioxide (0-5%)	Infrared	0-5%v/v	0.05%
Oxygen	Electrochemical	0 - 25%v/v	0.1%
*Hydrogen Sulphide	Electrochemical	0 - 100ppmv	1ppmv
*Carbon Monoxide	Electrochemical	0 - 1000ppmv	1ppmv
*Total Volatile Organic Compounds	PID	0 - 4000ppmv	1ppmv
Atmospheric Pressure	Piezoelectric	800 - 1200mb	1mBar
Borehole Pressure	Piezoelectric	800 - 1200mb	1mBar
Temperature	Internal chip	-5°C to +50°C	1°C

* Only installed on the 0-5% High Resolution GasClam® * Only installed in VOC GasClam®

GGG GasClam® equipment is battery powered and runs off two D cell batteries. Battery life is variable and depends on the site conditions (moisture levels and temperature), GGS will schedule interim site visits to change batteries when required.

Deployment Requirements

For GGS GasClam® instruments to be deployed, standard 50mm installation standpipes are required (larger diameter boreholes can be accommodated for). Headworks with enough clearance and a suitable secure cover are also required. GGS recommends that a minimum 8 inch diameter flush fit cover (for example MW8 covers available from Stuart Wells) be used. A minimum 100mm clearance is required from the top of the 50mm standpipe to the underside of the cover. Minimum 150mm internal headworks diameter is required (75mm clear radius from centre of standpipe). Standing water level should be greater than 0.9m below the standpipe top due to the instrument halting gas sampling automatically to avoid taking water internally.

GGG also deploys GasClam® instruments within buildings or fixed to external walls within protective and secure housing to monitor indoor air or subfloor void spaces of existing buildings or for verification purposes.

If the above requirements cannot be achieved, please contact GGS to discuss site specific deployment options – there probably is one!

GasClam Insurance

GGG carries specific insurance to cover the instruments against theft from site and is included as standard as part of our service.

Ground-Gas Solutions Ltd
Greenheys
Manchester Science Park
Pencroft Way
Manchester
M15 6JJ

Telephone: 0161 232 7465

E-mail: info@ground-gassolutions.co.uk

Web: www.ground-gassolutions.co.uk

THE LAND CONSULTANCY LIMITED
Fairweather House, 4 Parker Lane, Whitestake, Preston PR4 4JX
Tel: 01772 610609; Fax: 01772 617669; M: 07771 800859
email: sfknot@thelandconsultancy.co.uk; www.thelandconsultancy.co.uk

Site:
Project Number:
Client:
Instrumentation:
Monitored By:

Hardy Farm, Chorlton-cum-Hardy
TLC676
First Step
GA2000
Dr. Stephen F. Knott

		Methane (%w/v)																																
Installation Time (secs)		30	BH1		30	BH2		30	BH3		30	BH4		WS2			WS3			WS4			WS5											
		60	90	60	90	60	90	60	90	60	90	60	90	60	90	60	90	60	90	60	90	60	90	60	90	60	90	60	90	60	90			
Date	15/08/2014	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	NR	BD	BD	BD	BD	BD	BD	BD	10.9	10.9	10.8	NR	NR	NR									

		Carbon Dioxide (%w/v)																																
Installation Time (secs)		BH1			BH2			BH3			BH4			WS2			WS3			WS4			WS5											
		30	60	90	30	60	90	30	60	90	30	60	90	30	60	90	30	60	90	30	60	90	30	60	90	30	60	90	30	60	90			
Date	15/08/2014	1.6	1.6	1.6	0.7	0.7	0.7	1.2	1.2	1.2	0.8	0.8	NR	0.8	0.8	0.8	1.5	1.6	1.6	3.9	3.9	3.9	NR	NR	NR									

		Oxygen (%v/v)																															
Installation Time (secs)		30	BH1		BH2		BH3			BH4			WS2			WS3			WS4			WS5											
		30	60	90	30	60	90	30	60	90	30	60	90	30	60	90	30	60	90	30	60	90	30	60	90	30	60	90	30	60	90		
Date	15/08/2014	19.6	19.6	19.6	18.3	18.2	18.2	14.5	14.4	14.3	20.5	20.4	NR	19.7	19.7	19.7	19.5	19.4	19.4	10.1	10.0	10.0	NR	NR	NR								

		Hydrogen Sulphide (ppm)																													
Installation Time (secs)		BH1			BH2			BH3			BH4			WS2			WS3			WS4			WS5								
		30	60	90	30	60	90	30	60	90	30	60	90	30	60	90	30	60	90	30	60	90	30	60	90	30	60	90	30	60	90
Date	15/08/2014	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	NR	BD	BD	BD	BD	BD	BD	BD	BD	BD	NR	NR	NR						

		Carbon Monoxide (ppm)																																
Installation Time (secs)		BH1			BH2			BH3			BH4			WS2			WS3			WS4			WS5											
		30	60	90	30	60	90	30	60	90	30	60	90	30	60	90	30	60	90	30	60	90	30	60	90	30	60	90	30	60	90			
Date	15/08/2014	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	NR	BD	BD	BD	BD	BD	BD	BD	BD	BD	NR	NR	NR									

Installation		Flow (l/hr) Maximum (M) & Steady State (s) Values Given																		Pressure Differential (mb)																	
		BH1 (M)	BH1 (S)	BH2 (M)	BH2 (S)	BH3 (M)	BH3 (S)	BH4 (M)	BH4 (S)	WS2 (M)	WS2 (S)	WS3 (M)	WS3 (S)	WS4 (M)	WS4 (S)	WS5 (M)	WS5 (S)											BH1	BH2	BH3	BH4	WS2	WS3	WS4	WS5		
Date	15/08/2014	BD	BD	BD	BD	BD	BD	-9.7	BD (S mmHg)	BD	BD	BD	BD	BD	BD	NR	NR											BD	BD	BD	-15.0	BD	BD	BD	NR		

Installation		Background Oxygen (%w/v)									Monitoring Point Depth (mbgl)									Standing Water Levels (mbgl)												
		BH1	BH2	BH3	BH4	WS2	WS3	WS4	WS5		BH1	BH2	BH3	BH4	WS2	WS3	WS4	WS5				BH1	BH2	BH3	BH4	WS2	WS3	WS4	WS5			
Date	15/08/2014	20.8	20.8	20.9	20.8	20.8	20.8	20.8	NR		6.80	6.78	6.62	6.40	2.50	5.07	3.02	2.07				2.89	2.60	3.20	0.48	1.75	2.38	2.25	1.95			

		Atmospheric Pressure				Weather Conditions		Ground Conditions		Pressure Trend (Last 6 hrs)*	
		start	pressure	finish	pressure						
Date	15/08/2014	13:20	1015mb	14:00	1015mb	Cloudy, sunny ints, light wind. T=16 to 20°C.		Dry.		Rising	

start - time at start of gas monitoring
finish - time at end of gas monitoring

NR - Not Recorded; BD - Below Detection (<0.1% v/v, <1ppm, <0.1l/hr or <0.1mb)
* - Pressure trends recorded with a Davis Vantage PRO 2 Weather Station, Whitestake, Nr Preston.

		Comments (including samples)																											
Date	15/08/2014	Groundwater samples taken following gas monitoring. No odours recorded from any of the water samples. Very patchy iridescent sheen recorded on the water recovered from WS2 & BH3. BH4 - Gas monitoring was terminated after 60secs due to gas sucking up the gas inlet tube.																											

CERTIFICATION OF CALIBRATION



ISSUED BY: GEOTECH LABORATORY

Date Of Calibration: 05-Mar-2014

Certificate Number: GA12194_1/12394



No. 4533

Page 1 of 2 Pages

Approved by Signatory

M. Moloney

Martin Moloney

Laboratory Inspection

GEOTECHNICAL INSTRUMENTS (UK) LTD

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Tel: +44 (0) 1926 338111 Fax: +44 (0) 1926 338110

E-mail: service@geotech.co.uk

www.geotechuk.com

Customer: *The Land Consultancy Ltd*

4 Parker Lane
Whitestake
PRESTON
PR4 4JX
UNITED KINGDOM

Description: Gas Analyser

Model: GA2000

Serial Number: GA12194

UKAS Accredited results:

Results after adjustment :

Methane (CH4)		
Certified Gas (%)	Instrument Reading (%)	Uncertainty (%)
50.0	49.3	0.94
15.1	15.2	0.64
5.0	5.0	0.41

Carbon Dioxide (CO2)		
Certified Gas (%)	Instrument Reading (%)	Uncertainty (%)
50.0	49.9	1.1
15.1	14.7	0.70
5.0	4.8	0.43

Oxygen (O2)		
Certified Gas (%)	Instrument Reading (%)	Uncertainty (%)
21.2	21.2	0.31

The inwards assessment was carried out on 27-Feb-2014.

The maximum adjustment is larger than the inwards assessment uncertainty.

Inwards assessment data is available if requested.

All concentrations are molar.

CH4, CO2 readings recorded at : 31.0 °C ± 1.5 °C

O2 reading recorded at : 22.4 °C ± 1.5 °C

Barometric Pressure : 1013 mbar ± 3 mbar

Method of Test : The analyser is calibrated in a temperature controlled chamber using reference gases.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

This certificate is issued in accordance with the laboratory accreditation requirements of the United Kingdom Accreditation Service. It provides traceability of measurement to the SI system of units and/or to units of measurement realised at the National Physical Laboratory or other recognised national metrology institutes. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory.

CERTIFICATION OF CALIBRATION

UKAS ACCREDITED CALIBRATION LABORATORY NO. 4533

Certificate Number
GA12194_1/12394

Page 2 of 2 Pages

Calibrations marked 'Non-UKAS Accredited results' on this certificate have been included for completeness.

Non-UKAS Accredited results:

Barometer (mbar)	
Reference	Instrument Reading
1013	1012

Additional Gas Cells		
Gas	Certified Gas (ppm)	Instrument Reading (ppm)
CO	500	500
H ² S	50.9	50.9

Internal Flow	
Applied (l/hr)	Instrument Reading (l/hr)
5	4.9
10	10.1

End of Certificate

Appendix F

Hazard Waste Online Output Sheets

Waste Classification Report



YUC4W-LG2GX-ER6GG

Job name

LKC 21 1012

Description/Comments

Project

LKC 21 1012

Site

Chorlton Villas

Related Documents

#	Name	Description
1	HWOL_21-02853-20210209 173539.hwol	.hwol file used to create the Job

Waste Stream Template

Example waste stream template for contaminated soils

Classified by

Name: Peter Dunn	Company: LK Group	HazWasteOnline™ Training Record:	
Date: 09 Mar 2021 16:02 GMT	Unit 29, Eton Business Park	Course	Date
Telephone: 0161 763 7200	Eton Hill Rd, Radcliffe	Hazardous Waste Classification	17 Sep 2019
	Manchester	Advanced Hazardous Waste Classification	18 Sep 2019
	M26 2ZS		

Report

Created by: Peter Dunn
Created date: 09 Mar 2021 16:02 GMT

Job summary

#	Sample Name	Depth [m]	Classification Result	Hazard properties	Page
1	WS102-ES1-28/01/2021-0.3	0.3-0.8	Non Hazardous		2
2	WS103-ES2-28/01/2021-0.2	0.2-0.6	Non Hazardous		4
3	WS104-ES1-28/01/2021-0.1	0.1-0.3	Non Hazardous		6
4	HD101-ES1-28/01/2021-0.1	0.1-0.5	Non Hazardous		9

Appendices	Page
Appendix A: Classifier defined and non CLP determinands	11
Appendix B: Rationale for selection of metal species	12
Appendix C: Version	13

Classification of sample: WS102-ES1-28/01/2021-0.3

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

Sample details

Sample Name:	LoW Code:
WS102-ES1-28/01/2021-0.3	Chapter:
Sample Depth:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
0.3-0.8 m	Entry:
Moisture content:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)
8.6%	
(wet weight correction)	

Hazard properties

None identified

Determinands

Moisture content: 8.6% Wet Weight Moisture Correction applied (MC)

#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
	CLP index number	EC Number	CAS Number								
1	arsenic { arsenic trioxide }				9.2 mg/kg	1.32	11.102 mg/kg	0.00111 %		✓	
	033-003-00-0	215-481-4	1327-53-3								
2	cadmium { cadmium oxide }				0.13 mg/kg	1.142	0.136 mg/kg	0.0000136 %		✓	
	048-002-00-0	215-146-2	1306-19-0								
3	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }				11 mg/kg	1.462	14.694 mg/kg	0.00147 %		✓	
		215-160-9	1308-38-9								
4	chromium in chromium(VI) compounds { chromium(VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex }				<0.5 mg/kg	2.27	<1.135 mg/kg	<0.000113 %			<LOD
	024-017-00-8										
5	copper { dicopper oxide; copper (I) oxide }				13 mg/kg	1.126	13.378 mg/kg	0.00134 %		✓	
	029-002-00-X	215-270-7	1317-39-1								
6	lead { lead chromate }			1	22 mg/kg	1.56	31.365 mg/kg	0.00201 %		✓	
	082-004-00-2	231-846-0	7758-97-6								
7	mercury { mercury dichloride }				<0.1 mg/kg	1.353	<0.135 mg/kg	<0.0000135 %			<LOD
	080-010-00-X	231-299-8	7487-94-7								
8	nickel { nickel chromate }				13 mg/kg	2.976	35.364 mg/kg	0.00354 %		✓	
	028-035-00-7	238-766-5	14721-18-7								
9	selenium { nickel selenate }				<0.2 mg/kg	2.554	<0.511 mg/kg	<0.0000511 %			<LOD
	028-031-00-5	239-125-2	15060-62-5								
10	zinc { zinc chromate }				38 mg/kg	2.774	96.352 mg/kg	0.00964 %		✓	
	024-007-00-3	236-878-9	13530-65-9								
11	pH				10.2 pH		10.2 pH	10.2 pH			
			PH								
12	naphthalene				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %			<LOD
	601-052-00-2	202-049-5	91-20-3								
13	acenaphthylene				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %			<LOD
		205-917-1	208-96-8								
14	acenaphthene				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %			<LOD
		201-469-6	83-32-9								

#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
	CLP index number	EC Number	CAS Number							
15	fluorene	201-695-5	86-73-7		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
16	phenanthrene	201-581-5	85-01-8		0.31 mg/kg		0.283 mg/kg	0.0000283 %	✓	
17	anthracene	204-371-1	120-12-7		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
18	fluoranthene	205-912-4	206-44-0		0.61 mg/kg		0.558 mg/kg	0.0000558 %	✓	
19	pyrene	204-927-3	129-00-0		0.57 mg/kg		0.521 mg/kg	0.0000521 %	✓	
20	benzo[a]anthracene	601-033-00-9	200-280-6		0.28 mg/kg		0.256 mg/kg	0.0000256 %	✓	
21	chrysene	601-048-00-0	205-923-4		0.28 mg/kg		0.256 mg/kg	0.0000256 %	✓	
22	benzo[b]fluoranthene	601-034-00-4	205-911-9		0.32 mg/kg		0.292 mg/kg	0.0000292 %	✓	
23	benzo[k]fluoranthene	601-036-00-5	205-916-6		0.15 mg/kg		0.137 mg/kg	0.0000137 %	✓	
24	benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5		0.32 mg/kg		0.292 mg/kg	0.0000292 %	✓	
25	indeno[123-cd]pyrene	205-893-2	193-39-5		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
26	dibenz[a,h]anthracene	601-041-00-2	200-181-8		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
27	benzo[ghi]perylene	205-883-8	191-24-2		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
28	vanadium { divanadium pentaoxide; vanadium pentoxide }	023-001-00-8	215-239-8		13 mg/kg	1.785	21.212 mg/kg	0.00212 %	✓	
Total:								0.0218 %		

Key

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

Classification of sample: WS103-ES2-28/01/2021-0.2

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

Sample details

Sample Name:	WS103-ES2-28/01/2021-0.2	LoW Code:	
Sample Depth:	0.2-0.6 m	Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Moisture content:	12%	Entry:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)
(wet weight correction)			

Hazard properties

None identified

Determinands

Moisture content: 12% Wet Weight Moisture Correction applied (MC)

#	Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
	CLP index number	EC Number	CAS Number									
1	arsenic { arsenic trioxide }				11	mg/kg	1.32	12.781	mg/kg	0.00128 %	✓	
	033-003-00-0	215-481-4	1327-53-3									
2	cadmium { cadmium oxide }				0.21	mg/kg	1.142	0.211	mg/kg	0.0000211 %	✓	
	048-002-00-0	215-146-2	1306-19-0									
3	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }				14	mg/kg	1.462	18.006	mg/kg	0.0018 %	✓	
		215-160-9	1308-38-9									
4	chromium in chromium(VI) compounds { chromium(VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex }				<0.5	mg/kg	2.27	<1.135	mg/kg	<0.000113 %		<LOD
	024-017-00-8											
5	copper { dicopper oxide; copper (I) oxide }				21	mg/kg	1.126	20.806	mg/kg	0.00208 %	✓	
	029-002-00-X	215-270-7	1317-39-1									
6	lead { lead chromate }			1	40	mg/kg	1.56	54.905	mg/kg	0.00352 %	✓	
	082-004-00-2	231-846-0	7758-97-6									
7	mercury { mercury dichloride }				0.11	mg/kg	1.353	0.131	mg/kg	0.0000131 %	✓	
	080-010-00-X	231-299-8	7487-94-7									
8	nickel { nickel chromate }				17	mg/kg	2.976	44.525	mg/kg	0.00445 %	✓	
	028-035-00-7	238-766-5	14721-18-7									
9	selenium { nickel selenate }				<0.2	mg/kg	2.554	<0.511	mg/kg	<0.0000511 %		<LOD
	028-031-00-5	239-125-2	15060-62-5									
10	zinc { zinc chromate }				83	mg/kg	2.774	202.624	mg/kg	0.0203 %	✓	
	024-007-00-3	236-878-9	13530-65-9									
11	pH		PH		10.3	pH		10.3	pH	10.3 pH		
12	naphthalene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
	601-052-00-2	202-049-5	91-20-3									
13	acenaphthylene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
		205-917-1	208-96-8									
14	acenaphthene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
		201-469-6	83-32-9									

#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
	CLP index number	EC Number	CAS Number							
15	fluorene	201-695-5	86-73-7		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
16	phenanthrene	201-581-5	85-01-8		38 mg/kg		33.44 mg/kg	0.00334 %	✓	
17	anthracene	204-371-1	120-12-7		8.6 mg/kg		7.568 mg/kg	0.000757 %	✓	
18	fluoranthene	205-912-4	206-44-0		45 mg/kg		39.6 mg/kg	0.00396 %	✓	
19	pyrene	204-927-3	129-00-0		36 mg/kg		31.68 mg/kg	0.00317 %	✓	
20	benzo[a]anthracene	601-033-00-9	200-280-6		18 mg/kg		15.84 mg/kg	0.00158 %	✓	
21	chrysene	601-048-00-0	205-923-4		18 mg/kg		15.84 mg/kg	0.00158 %	✓	
22	benzo[b]fluoranthene	601-034-00-4	205-911-9		22 mg/kg		19.36 mg/kg	0.00194 %	✓	
23	benzo[k]fluoranthene	601-036-00-5	205-916-6		7.7 mg/kg		6.776 mg/kg	0.000678 %	✓	
24	benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5		19 mg/kg		16.72 mg/kg	0.00167 %	✓	
25	indeno[123-cd]pyrene	205-893-2	193-39-5		10 mg/kg		8.8 mg/kg	0.00088 %	✓	
26	dibenz[a,h]anthracene	601-041-00-2	200-181-8		1.9 mg/kg		1.672 mg/kg	0.000167 %	✓	
27	benzo[ghi]perylene	205-883-8	191-24-2		9.2 mg/kg		8.096 mg/kg	0.00081 %	✓	
28	vanadium { divanadium pentaoxide; vanadium pentoxide }	023-001-00-8	215-239-8		19 mg/kg	1.785	29.848 mg/kg	0.00298 %	✓	
Total:								0.0572 %		

Key

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

Classification of sample: WS104-ES1-28/01/2021-0.1

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

Sample details

Sample Name:	LoW Code:
WS104-ES1-28/01/2021-0.1	Chapter:
Sample Depth:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
0.1-0.3 m	Entry:
Moisture content:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)
15%	
(wet weight correction)	

Hazard properties

None identified

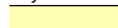
Determinands

Moisture content: 15% Wet Weight Moisture Correction applied (MC)

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
1		arsenic { arsenic trioxide }				14	mg/kg	1.32	15.712	mg/kg	0.00157 %	✓	
		033-003-00-0	215-481-4	1327-53-3									
2		boron { diboron trioxide; boric oxide }				0.45	mg/kg	3.22	1.232	mg/kg	0.000123 %	✓	
		005-008-00-8	215-125-8	1303-86-2									
3		cadmium { cadmium oxide }				0.25	mg/kg	1.142	0.243	mg/kg	0.0000243 %	✓	
		048-002-00-0	215-146-2	1306-19-0									
4		chromium in chromium(III) compounds { chromium(III) oxide (worst case) }				15	mg/kg	1.462	18.635	mg/kg	0.00186 %	✓	
			215-160-9	1308-38-9									
5		chromium in chromium(VI) compounds { chromium (VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex }				<0.5	mg/kg	2.27	<1.135	mg/kg	<0.000113 %		<LOD
		024-017-00-8											
6		copper { dicopper oxide; copper (I) oxide }				29	mg/kg	1.126	27.753	mg/kg	0.00278 %	✓	
		029-002-00-X	215-270-7	1317-39-1									
7		lead { lead chromate }			1	59	mg/kg	1.56	78.225	mg/kg	0.00501 %	✓	
		082-004-00-2	231-846-0	7758-97-6									
8		mercury { mercury dichloride }				0.15	mg/kg	1.353	0.173	mg/kg	0.0000173 %	✓	
		080-010-00-X	231-299-8	7487-94-7									
9		nickel { nickel chromate }				19	mg/kg	2.976	48.067	mg/kg	0.00481 %	✓	
		028-035-00-7	238-766-5	14721-18-7									
10		selenium { nickel selenate }				0.25	mg/kg	2.554	0.543	mg/kg	0.0000543 %	✓	
		028-031-00-5	239-125-2	15060-62-5									
11		zinc { zinc chromate }				77	mg/kg	2.774	181.568	mg/kg	0.0182 %	✓	
		024-007-00-3	236-878-9	13530-65-9									
12		TPH (C6 to C40) petroleum group				<10	mg/kg		<10	mg/kg	<0.001 %		<LOD
				TPH									
13		tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane				<0.001	mg/kg		<0.001	mg/kg	<0.0000001 %		<LOD
		603-181-00-X	216-653-1	1634-04-4									
14		benzene				<0.001	mg/kg		<0.001	mg/kg	<0.0000001 %		<LOD
		601-020-00-8	200-753-7	71-43-2									

#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
	CLP index number	EC Number	CAS Number							
15	toluene				<0.001 mg/kg		<0.001 mg/kg	<0.0000001 %		<LOD
	601-021-00-3	203-625-9	108-88-3							
16	ethylbenzene				<0.001 mg/kg		<0.001 mg/kg	<0.0000001 %		<LOD
	601-023-00-4	202-849-4	100-41-4							
17	xylene				<0.002 mg/kg		<0.002 mg/kg	<0.0000002 %		<LOD
	601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]							
18	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }				<0.5 mg/kg	1.884	<0.942 mg/kg	<0.0000942 %		<LOD
	006-007-00-5									
19	pH				9.3 pH		9.3 pH	9.3 pH		
20	naphthalene				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
	601-052-00-2	202-049-5	91-20-3							
21	acenaphthylene				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
		205-917-1	208-96-8							
22	acenaphthene				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
		201-469-6	83-32-9							
23	fluorene				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
		201-695-5	86-73-7							
24	phenanthrene				0.65 mg/kg		0.553 mg/kg	0.0000553 %	✓	
		201-581-5	85-01-8							
25	anthracene				0.19 mg/kg		0.161 mg/kg	0.0000161 %	✓	
		204-371-1	120-12-7							
26	fluoranthene				1.2 mg/kg		1.02 mg/kg	0.000102 %	✓	
		205-912-4	206-44-0							
27	pyrene				1 mg/kg		0.85 mg/kg	0.000085 %	✓	
		204-927-3	129-00-0							
28	benzo[a]anthracene				0.56 mg/kg		0.476 mg/kg	0.0000476 %	✓	
	601-033-00-9	200-280-6	56-55-3							
29	chrysene				0.54 mg/kg		0.459 mg/kg	0.0000459 %	✓	
	601-048-00-0	205-923-4	218-01-9							
30	benzo[b]fluoranthene				0.68 mg/kg		0.578 mg/kg	0.0000578 %	✓	
	601-034-00-4	205-911-9	205-99-2							
31	benzo[k]fluoranthene				0.26 mg/kg		0.221 mg/kg	0.0000221 %	✓	
	601-036-00-5	205-916-6	207-08-9							
32	benzo[a]pyrene; benzo[def]chrysene				0.68 mg/kg		0.578 mg/kg	0.0000578 %	✓	
	601-032-00-3	200-028-5	50-32-8							
33	indeno[123-cd]pyrene				0.41 mg/kg		0.349 mg/kg	0.0000349 %	✓	
		205-893-2	193-39-5							
34	dibenz[a,h]anthracene				0.11 mg/kg		0.0935 mg/kg	0.00000935 %	✓	
	601-041-00-2	200-181-8	53-70-3							
35	benzo[ghi]perylene				0.38 mg/kg		0.323 mg/kg	0.0000323 %	✓	
		205-883-8	191-24-2							
36	vanadium { divanadium pentoxide; vanadium pentoxide }				20 mg/kg	1.785	30.348 mg/kg	0.00303 %	✓	
	023-001-00-8	215-239-8	1314-62-1							
37	monohydric phenols				<0.3 mg/kg		<0.3 mg/kg	<0.00003 %		<LOD
			P1186							
Total:								0.0393 %		

Key

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

Classification of sample: HD101-ES1-28/01/2021-0.1

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

Sample details

Sample Name:	LoW Code:	
HD101-ES1-28/01/2021-0.1	Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:	Entry:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)
0.1-0.5 m		
Moisture content:		
12%		
(wet weight correction)		

Hazard properties

None identified

Determinands

Moisture content: 12% Wet Weight Moisture Correction applied (MC)

#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
	CLP index number	EC Number	CAS Number								
1	arsenic { arsenic trioxide }				12 mg/kg	1.32	13.943 mg/kg	0.00139 %	✓		
	033-003-00-0	215-481-4	1327-53-3								
2	cadmium { cadmium oxide }				0.31 mg/kg	1.142	0.312 mg/kg	0.0000312 %	✓		
	048-002-00-0	215-146-2	1306-19-0								
3	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }				15 mg/kg	1.462	19.293 mg/kg	0.00193 %	✓		
		215-160-9	1308-38-9								
4	chromium in chromium(VI) compounds { chromium (VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex }				<0.5 mg/kg	2.27	<1.135 mg/kg	<0.000113 %			<LOD
	024-017-00-8										
5	copper { dicopper oxide; copper (I) oxide }				39 mg/kg	1.126	38.64 mg/kg	0.00386 %	✓		
	029-002-00-X	215-270-7	1317-39-1								
6	lead { lead chromate }			1	38 mg/kg	1.56	52.16 mg/kg	0.00334 %	✓		
	082-004-00-2	231-846-0	7758-97-6								
7	mercury { mercury dichloride }				0.1 mg/kg	1.353	0.119 mg/kg	0.0000119 %	✓		
	080-010-00-X	231-299-8	7487-94-7								
8	nickel { nickel chromate }				18 mg/kg	2.976	47.144 mg/kg	0.00471 %	✓		
	028-035-00-7	238-766-5	14721-18-7								
9	selenium { nickel selenate }				<0.2 mg/kg	2.554	<0.511 mg/kg	<0.0000511 %			<LOD
	028-031-00-5	239-125-2	15060-62-5								
10	zinc { zinc chromate }				53 mg/kg	2.774	129.386 mg/kg	0.0129 %	✓		
	024-007-00-3	236-878-9	13530-65-9								
11	pH		PH		10.6 pH		10.6 pH	10.6 pH			
12	naphthalene				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %			<LOD
	601-052-00-2	202-049-5	91-20-3								
13	acenaphthylene				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %			<LOD
		205-917-1	208-96-8								
14	acenaphthene				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %			<LOD
		201-469-6	83-32-9								

#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
	CLP index number	EC Number	CAS Number								
15	fluorene	201-695-5	86-73-7		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %			<LOD
16	phenanthrene	201-581-5	85-01-8		1.2 mg/kg		1.056 mg/kg	0.000106 %	✓		
17	anthracene	204-371-1	120-12-7		0.3 mg/kg		0.264 mg/kg	0.0000264 %	✓		
18	fluoranthene	205-912-4	206-44-0		2.2 mg/kg		1.936 mg/kg	0.000194 %	✓		
19	pyrene	204-927-3	129-00-0		2 mg/kg		1.76 mg/kg	0.000176 %	✓		
20	benzo[a]anthracene	601-033-00-9	200-280-6		1.1 mg/kg		0.968 mg/kg	0.0000968 %	✓		
21	chrysene	601-048-00-0	205-923-4		1.1 mg/kg		0.968 mg/kg	0.0000968 %	✓		
22	benzo[b]fluoranthene	601-034-00-4	205-911-9		1.5 mg/kg		1.32 mg/kg	0.000132 %	✓		
23	benzo[k]fluoranthene	601-036-00-5	205-916-6		0.44 mg/kg		0.387 mg/kg	0.0000387 %	✓		
24	benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5		1.4 mg/kg		1.232 mg/kg	0.000123 %	✓		
25	indeno[123-cd]pyrene	205-893-2	193-39-5		0.86 mg/kg		0.757 mg/kg	0.0000757 %	✓		
26	dibenz[a,h]anthracene	601-041-00-2	200-181-8		0.22 mg/kg		0.194 mg/kg	0.0000194 %	✓		
27	benzo[ghi]perylene	205-883-8	191-24-2		0.82 mg/kg		0.722 mg/kg	0.0000722 %	✓		
28	vanadium { divanadium pentaoxide; vanadium pentoxide }	023-001-00-8	215-239-8		19 mg/kg	1.785	29.848 mg/kg	0.00298 %	✓		
Total:									0.0326 %		

Key

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

Appendix A: Classifier defined and non CLP determinands

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

Description/Comments: Data from C&L Inventory Database

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

Data source date: 17 Jul 2015

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

■ **pH** (CAS Number: PH)

Description/Comments: Appendix C4

Data source: WM3 1st Edition 2015

Data source date: 25 May 2015

Hazard Statements: None.

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

Description/Comments: Data from C&L Inventory Database

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

Data source date: 17 Jul 2015

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

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

Description/Comments: Data from C&L Inventory Database

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

Data source date: 17 Jul 2015

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

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

Description/Comments: Data from C&L Inventory Database

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

Data source date: 06 Aug 2015

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

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

Description/Comments: Data from C&L Inventory Database

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

Data source date: 06 Aug 2015

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

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

Description/Comments: Data from C&L Inventory Database

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

Data source date: 17 Jul 2015

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

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

Description/Comments: Data from C&L Inventory Database

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

Data source date: 21 Aug 2015

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

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

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

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

Data source date: 21 Aug 2015

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

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

Description/Comments: Data from C&L Inventory Database

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

Data source date: 06 Aug 2015

Hazard Statements: Carc. 2 H351

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

Description/Comments: Data from C&L Inventory Database; SDS Sigma Aldrich 28/02/2015
Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>
Data source date: 23 Jul 2015
Hazard Statements: Aquatic Acute 1 H400 , Aquatic Chronic 1 H410

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

Description/Comments: Hazard statements taken from WM3 1st Edition 2015; Risk phrases: WM2 3rd Edition 2013
Data source: WM3 1st Edition 2015
Data source date: 25 May 2015
Hazard Statements: Flam. Liq. 3 H226 , Asp. Tox. 1 H304 , STOT RE 2 H373 , Muta. 1B H340 , Carc. 1B H350 , Repr. 2 H361d , Aquatic Chronic 2 H411

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

CLP index number: 601-023-00-4
Description/Comments:
Data source: Commission Regulation (EU) No 605/2014 – 6th Adaptation to Technical Progress for Regulation (EC) No 1272/2008. (ATP6)
Additional Hazard Statement(s): Carc. 2 H351
Reason for additional Hazards Statement(s):
03 Jun 2015 - Carc. 2 H351 hazard statement sourced from: IARC Group 2B (77) 2000

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

CLP index number: 006-007-00-5
Description/Comments: Conversion factor based on a worst case compound: sodium cyanide
Data source: Commission Regulation (EC) No 790/2009 - 1st Adaptation to Technical Progress for Regulation (EC) No 1272/2008. (ATP1)
Additional Hazard Statement(s): EUH032 >= 0.2 %
Reason for additional Hazards Statement(s):
14 Dec 2015 - EUH032 >= 0.2 % hazard statement sourced from: WM3, Table C12.2

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

Description/Comments: Combined hazards statements from harmonised entries in CLP for phenol, cresols and xylenols (604-001-00-2, 604-004-00-9, 604-006-00-X)
Data source: CLP combined data
Data source date: 26 Mar 2019
Hazard Statements: Acute Tox. 3 H301 , Acute Tox. 3 H311 , Acute Tox. 3 H331 , Skin Corr. 1B H314 , Skin Corr. 1B H314 >= 3 % , Skin Irrit. 2 H315 1 £ conc. < 3 % , Eye Irrit. 2 H319 1 £ conc. < 3 % , Muta. 2 H341 , STOT RE 2 H373 , Aquatic Chronic 2 H411

Appendix B: Rationale for selection of metal species

arsenic {arsenic trioxide}

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

cadmium {cadmium oxide}

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

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

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

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

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

copper {dicopper oxide; copper (I) oxide}

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

lead {lead chromate}

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

mercury {mercury dichloride}

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

nickel {nickel chromate}

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

selenium {nickel selenate}

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

zinc {zinc chromate}

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

vanadium {divanadium pentaoxide; vanadium pentoxide}

worst case/most likely scenario

boron {diboron trioxide; boric oxide}

Reasonable case CLP species based on hazard statements/ molecular weight, physical form and low solubility. Industrial sources include: fluxing agent for glass/enamels; additive for fibre optics, borosilicate glass (edit as required)

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

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

Appendix C: Version

HazWasteOnline Classification Engine: **WM3 1st Edition v1.1, May 2018**

HazWasteOnline Classification Engine Version: 2021.60.4685.9008 (01 Mar 2021)

HazWasteOnline Database: 2021.60.4685.9008 (01 Mar 2021)

This classification utilises the following guidance and legislation:

WM3 v1.1 - Waste Classification - 1st Edition v1.1 - May 2018

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Regulations 2019 - UK: 2019 No. 720 of 27th March 2019

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

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

The Waste and Environmental Permitting etc. (Legislative Functions and Amendment etc.) (EU Exit) Regulations 2020 - UK: 2020 No. 1540 of 16th December 2020

POPs Regulation 2019 - Regulation (EU) 2019/1021 of 20 June 2019

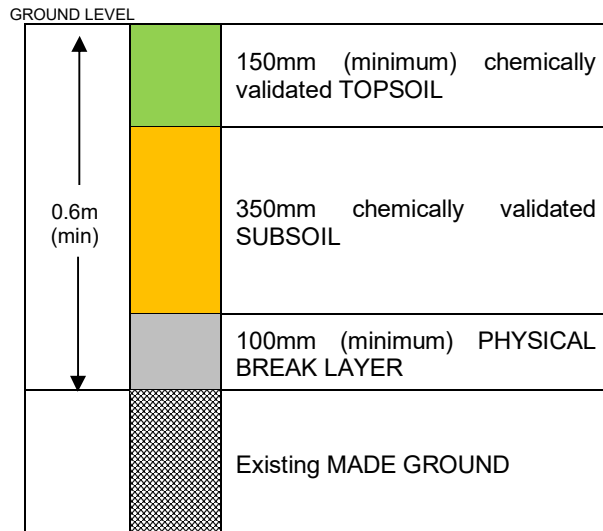
Appendix G

Environmental Cover System Construction

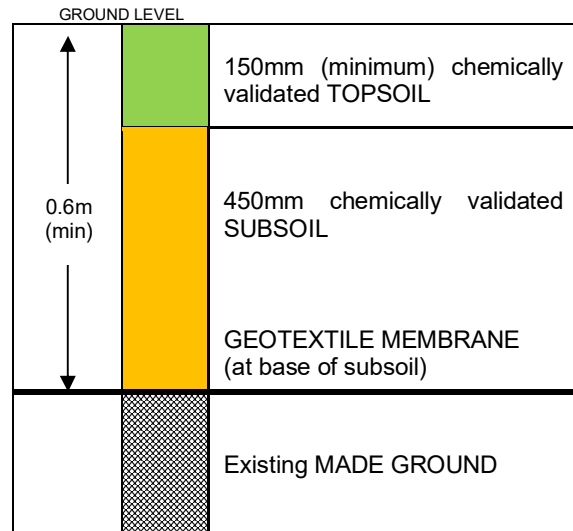
Private Gardens
Shared Landscaping

PRIVATE BACK GARDENS:

Either (physical break layer)

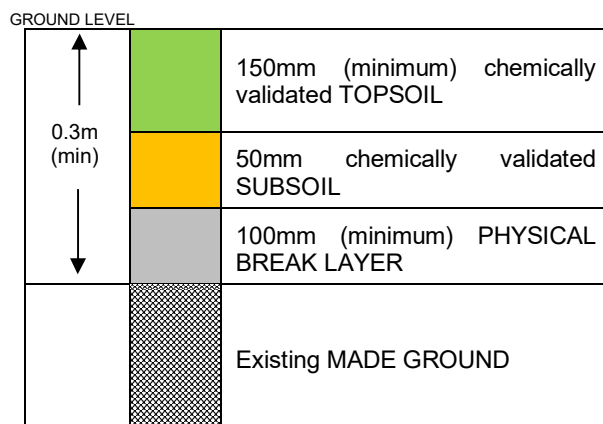


Or (geotextile membrane)

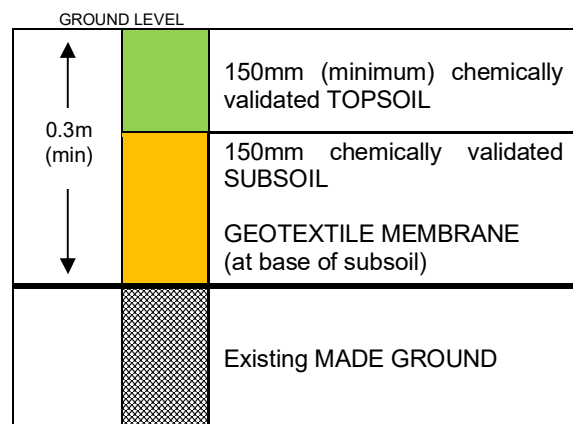


PRIVATE FRONT GARDENS / SHARED LANDSCAPING:

Either (physical break layer)



Or (geotextile membrane)



Hardstood Areas – No Remediation Required

Based across the UK with
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London, Liverpool and Glasgow.

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- » Land Remediation
- » Project Management
- » Land Drilling