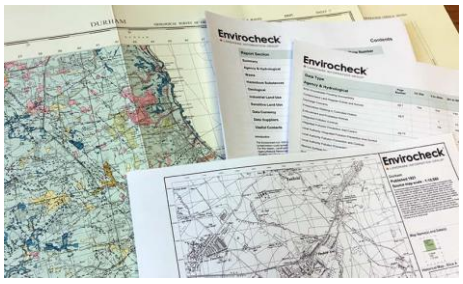



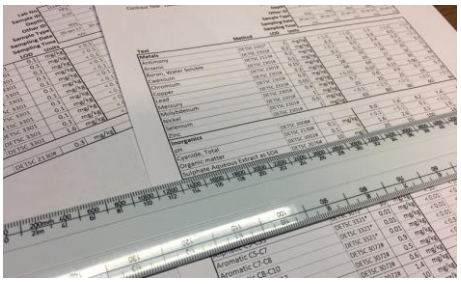

Phase 2: Site Investigation

Parkwood Road, Golcar, Huddersfield

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PHASE 2 SITE INVESTIGATION REPORT

PARKWOOD ROAD, GOLCAR, HUDDERSFIELD

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APPENDICES

Revision	Date	Prepared By	Signed
Final	April 2019	L Cassidy *Environmental Engineer*	
		Checked By	
		D Simpson *Principal Geotechnical Engineer*	
		Approved By	
		D Simpson *Principal Geotechnical Engineer*	

1 EXECUTIVE SUMMARY

Site Address	Golcar, Huddersfield
Proposed Development	The site is outlined for a residential development.
Fieldwork	• 6no. small percussive boreholes (BH1 to BH6) drilled to a maximum of 1.20mbgl with 3no. monitoring pipes in BH1, BH4 and BH5. • 8no machine excavated trial pits (TP1 to TP8) to a maximum depth of 1.40mbgl.
Ground Conditions	• Made ground was encountered to depths of between 0.15mbgl in TP3 and 0.50mbgl in BH1, BH3 & BH4. • Firm sandy gravelly clay of low cobble content clay was generally encountered down to a maximum depth of 1.20mbgl. • Clayey gravelly sand present within TPs 5-7. • Highly weathered sandstone, recovered as slightly clayey sandy gravel of low to moderate cobble content, was encountered between 0.70 and 1.20mbgl, with rockhead noted between 1.10 and 1.40mbgl. • No groundwater was encountered.
Contamination Testing Results	• Six made ground samples tested. • Elevated arsenic (TP6) and TPH and PAHs (TP2). • No asbestos fibres. • Generally slightly acidic to acidic pH noted.
Contamination Analysis	• Given the site's proposed residential land use, the levels of contamination recorded on site may pose a risk to the current and future users of the site. • If any zones of odorous, brightly coloured or suspected contaminated ground or groundwater are encountered then work should cease in that area until the material has been investigated. The results of the investigation will therefore determine whether or not remediation will be required. • Made ground classed as uncontaminated locally slightly contaminated (arsenic, TPH and PAHs) with respect to construction workers. PPE for workers. Damping down of site during dry windy conditions. • Clean cover system required for all proposed areas of soft landscaping, to 0.60mbgl based on guidance from YALPAG. • Controlled waters unlikely to be at risk. • With respect to utilities pH was diminished; as a minimum all services should be laid in clean trenches. • Sub surface concrete should be designed to DS-1 ACEC (Class AC-3z). This assumes mobile groundwater conditions.
Geotechnical Testing Results	• Cohesive deposits medium strength (50kPa-60kPa) based on in-situ hand vanes. • Cohesive materials on site have a medium volume change potential. • Moisture contents between 14 and 24%. • Sulphates between <10-35mg/l, pH slightly acidic to slightly alkaline. • 2no. soakaway tests returned infiltration rates of 3.04 and 4.29 x 10^{-6} m/sec, respectively
Geotechnical Analysis & Foundation Recommendations	• For cohesive deposits, bearing capacity of 110kN/m^2 at minimum depth of 0.90mbgl on 0.60m wide strips. • For granular deposits, bearing capacity of 110kN/m^2 at minimum depth of 0.60mbgl on 0.60m wide strips. • For foundations upon bedrock, bearing capacity of 250kN/m^2 at minimum depth of 1.10mbgl on 0.60m wide strips. • Settlements within 25mm. • Normal earthworks plant for excavations.

2 INTRODUCTION

2.1 Authorisation

The site investigation described in this report was carried out by Solmek to the instructions of Civic Engineers, on behalf of Parkwood Ventures LLP and Sir Robert Ogden Estates Ltd, on land located at Parkwood Road, Golcar, Huddersfield.

Sources of information, including previous work undertaken at the site, are detailed below:

- *Solmek Phase 1 Desk Study (S190321) March 2019.*

Reference should be made to the above report for details of the site's history and environmental setting.

2.2 Scope of Works

The site is expected to be developed with 27no residential houses with associated parking and soft landscaping.

A geotechnical and environmental investigation including a ground gas risk assessment was requested. The fieldwork and testing was generally carried out according to the recommendations of BS5930: 2015 "Code of Practice for Ground Investigations" and where applicable BS EN 1997-2:2007 with soil descriptions to BS EN 14688-1:2013 where applicable. The information provided in this report is based on the investigation fieldwork, and is subject to the comments and approval of the various regulatory authorities.

There may be other conditions prevailing on the site which have not been disclosed by this investigation and which have not been taken into account by this report. Solmek reserve the right to alter conclusions and recommendations should further information be available or provided. Any schematic representation or opinion of the possible configuration of ground conditions between exploratory holes is conjectural and given for guidance only and confirmation of intermediate ground conditions should be considered if deemed necessary.

3 SITE DESCRIPTION AND FIELDWORK

A site inspection, as recommended in BS 5930 and BS 10175, was undertaken on 14th March 2019. The site is centred at Ordnance Survey Co-ordinates 410330, 416800 and covers approximately 1.04Ha.

The site is located on a parcel of land south of Parkwood Road.

The site is roughly rectangular shaped and has a variable sloping topography. The site itself is elevated above Parkwood Road to the northwest, and the site rises upwards towards its centre. From the sites centre, the site slopes downwards to the north, east and southeast, and rises upwards to the southwest.

The far southeast of the site falls down sharply towards the southeast.

The site is currently undeveloped and consists mostly of rough grassland. Sporadic trees are present, in the west centre of the site and in the southeast of the site. The southeast area along the steep bang is vegetated and overgrown.

A small flat rectangular area is present in the northwest of the site with anecdotal evidence indicating this was formally a tennis court.

Pedestrian access is possible via steps from Parkwood Road into the site in the northwest. Vehicular access is not possible in the sites current state, however could be achieved from the adjoining building site to the southwest.

A culvert is present in the far southeast of the site.

The site is bordered on all sides by fencing.

An old Mill, recently converted to apartments, is present immediately northeast. Ongoing housing developments are present to the southeast, south and west of the site. Parkwood road runs along the northwest of the site with some housing located beyond this.

3.1 Fieldwork

The fieldwork was carried out on 4th April 2019. The extent of the investigation was:

- 6no small percussive boreholes (BH1 to BH6 inclusive) to a maximum depth of 1.20m below ground level (bgl).
  - The boreholes were evenly spread around the site to achieve maximum site coverage.
  - BH3 was specifically targeted to coincide with the area of the historic tennis courts.
- Gas monitoring wells were installed in BH's 1, 4 & 5.
  - The wells were spaced evenly around the site.
- 8no machine excavated trial pits (TP1 to TP8) were dug to a maximum depth of 1.40mbgl.
  - In-situ soakaway testing carried out in TP1 and TP6.
- Insitu testing in the exploratory positions as Standard Penetration Tests (SPTs) and hand shear vanes.

The trial pits and boreholes were backfilled with clean arisings or installations upon completion. Selected plates of the trial pits are presented in Appendix A.

Descriptions of the strata encountered in the boreholes and trial pits together with details of sampling and groundwater are presented in Appendix B of this report. A plan showing the location of the boreholes and trial pits can be found in Appendix A (Figure 2).

4 GROUND CONDITIONS

A summary of the ground conditions encountered is given below.

4.1 Made Ground

Made ground was relatively uniform across the site and was encountered to a minimum depth of 0.15mbgl (TP3) and a maximum depth of 0.50mbgl (BH1, BH3 & BH4). The made ground broadly consisted of sandy gravelly topsoil with the gravel comprising sandstone. Within BH3 and TP2, the made ground comprised black sandy gravel of brick, ash, tarmacadam and clinker.

4.2 Natural Deposits

Proven to underlie the made ground deposits across the site, natural ground generally comprised firm consistency sandy gravelly clay of low to medium plasticity, which was encountered to a maximum determination depth of 1.20mbgl. TP's 5, 6 & 7 differed as clayey gravelly sand was present instead of cohesive deposits. Within the trial pits the drift deposits were noted as being of a low cobble content, with the cobbles comprising sandstone.

4.3 Solid Geology

Brownish yellow highly weathered sandstone was encountered across the site between 0.70mbgl (BH3) and 1.20mbgl (BH1, & BH6), recovered as slightly clayey sandy gravel of low to moderate cobble content.

The boreholes were unable to penetrate the weathered sandstone layer, however within the trial pits, rockhead of sandstone was encountered across the site beneath the highly weathered deposits, at depths of between 1.10 and 1.40mbgl.

4.4 Groundwater

No groundwater was encountered within any of the exploratory positions.

It should be noted the rapid rate of advancement of the exploratory holes may mask minor seepages and it should be borne in mind that water levels fluctuate with a number of influences including season, rainfall,

dewatering and pumping activities.

5 CONTAMINATION TESTING RESULTS

The proposed development of the site is to involve the construction of 27no residential homes with areas of soft landscaping and hardstanding. The chemical results are presented in Appendix C.

5.1 Site Characterisation

Within the Solmek Phase 1 Desk Study, a preliminary conceptual model was formed based on the information obtained. The initial risk was based on the site history which recorded generally open land throughout the sites history

An overall low to high risk was provided for various receptors:

- Human Health – Low to Moderate
- Controlled Water – Very Low to Low
- Current Site Users (on-site workers/visitors) – Low
- Vegetation – Low to Moderate
- Construction Materials – Low to Moderate

5.2 Contamination Testing and Rationale

To provide information upon the possibility of ground contamination six samples of made ground were selected for shallow contamination testing. A Low to Moderate overall contamination risk was highlighted in the Phase 1 Desk Study due to previous land uses. This coupled with the end use being Residential with Home Grown Produce means that six samples are considered appropriate for testing:

- TP1 – 0.00-0.20m (Made ground – topsoil)
- TP2 – 0.00-0.20m (Made ground – granular fill)
- TP3 – 0.00-0.20m (Made ground – topsoil)
- TP4 – 0.00-0.20m (Made ground – topsoil)
- TP6 – 0.00-0.20m (Made ground – topsoil)
- TP8 – 0.00-0.20m (Made ground – topsoil)

The samples selected are considered to provide coverage of the made ground from across the site that would be most likely to be exposed during future site works.

- 6no Metals, semi-metals, non-metals, inorganic determinants
- 6no Asbestos identification screenings
- 6no Speciated Polyaromatic Hydrocarbons (PAHs)
- 6no Total Petroleum Hydrocarbon Criteria Working Group fractions (TPHCWG)

5.3 Test Results

Based on the proposed development at the site, the test results have been compared to a series of Land Quality Management (LQM) Suitable for Use Levels (S4UL) based on a residential with home grown produce land use. These are the most up to date thresholds published in December 2014.

The value for lead has been compared with the Category 4 Screening Level (March 2014) developed by Contaminated Land: Applications In Real Environments (CL:AIRE).

The test results are presented in Appendix C, and a summary is provided below in Tables 1 and 2.

TABLE 1: SUMMARY OF INORGANIC CONTAMINATION TESTING RESULTS

Determinand	Units	Number of Samples above Level of Detection	Minimum Recorded Level	Maximum Recorded Level	Residential with HGP Threshold Value	Number of Results Exceeding Threshold Value
Metals						
Cadmium	mg/kg	6	0.27	0.43	11	0
Chromium	mg/kg	6	13	37	910	0
Copper	mg/kg	6	28	71	2400	0
Lead	mg/kg	6	19	130	200*	0
Mercury	mg/kg	6	0.35	18	40	0
Nickel	mg/kg	6	17	23	180	0
Zinc	mg/kg	6	59	97	3700	0
Semi metals and non metals						
Arsenic	mg/kg	6	22	44	37**	1
Boron	mg/kg	6	0.42	0.81	290	0
Selenium	mg/kg	6	0.36	1.7	250	0
Inorganic chemicals						
Cyanide (Total)	mg/kg	1	0.50	0.7	1.49**	0
Sulphate (2:1 Water Soluble)	mg/l	1	<10	91	2000^	0
Other						
pH	pH	-	5.3	8.0	5.5^	2

* Category 4 Screening Levels, March 2014
** CLEA Software Version 1.06 (pH7 and 1%SOM)
^ EA Threshold Values
HGP Home Grown Produce

5.4 Metals, Semi Metals and Non Metals

Elevated concentrations of arsenic were encountered within TP6 (0.00-0.20m), in the southeast of the site. No other samples indicated raised levels of contamination above the S4UL threshold values, based on the six samples tested.

5.5 Inorganic Chemicals

Soluble sulphates (potentially aggressive to foundation concrete) were recorded between <10 and 91mg/l. None of the samples were elevated above levels affecting human health or the BRE Special Digest 1 500mg/l limit for the sulphate classification of concrete.

The results of the pH testing were between 5.3 and 8.0, which is consistent with acidic to alkaline conditions, however the pH of 8.0 (TP2 0.00-0.20m) is the exception, with the remaining five pH results all being between 5.3 and 5.6, indicative of acidic pH levels.

5.6 Organic Chemicals

The organic thresholds vary depending on the levels of soil organic matter (SOM).

The average SOM recorded across the site was 21.17% therefore a SOM of 6% has been used to determine the S4UL thresholds. Table 2, below, summarises the results.

TABLE 2: SUMMARY OF ORGANIC CONTAMINATION TESTING RESULTS

Determinand	Units	Number of Samples above Level of Detection	Minimum Recorded Level	Maximum Recorded Level	Residential with HGP Threshold Value at 6% SOM	Number of Results Exceeding Threshold Value
TPH Aliphatic Fractions						
Aliphatic (C5-C6)	mg/kg	0	<1	-	78	0
Aliphatic (C6-C8)	mg/kg	0	<1	-	230	0
Aliphatic (C8-C10)	mg/kg	0	<1	-	65	0
Aliphatic (C10-C12)	mg/kg	0	<1	-	330	0
Aliphatic (C12-C16)	mg/kg	1	<1	10	2400	0
Aliphatic (C16-C21)	mg/kg	1	<1	29	92000	0
Aliphatic (C21-C35)	mg/kg	4	<1	140	92000	0
Aliphatic (C35-C44)	mg/kg	1	<1	110	92000	0
TPH Aromatic Fractions						
Aromatic (C5-C7)	mg/kg	0	<1	-	140	0
Aromatic (C7-C8)	mg/kg	0	<1	-	290	0
Aromatic (C8-C10)	mg/kg	1	<1	10	83	0
Aromatic (C10-C12)	mg/kg	1	<1	36	180	0
Aromatic (C12-C16)	mg/kg	1	<1	1000	330	1
Aromatic (C16-C21)	mg/kg	1	<1	4500	540	1
Aromatic (C21-C35)	mg/kg	4	<1	8400	1500	1
Aromatic (C35-C44)	mg/kg	1	<1	810	1500	0
Speciated PAH						
Naphthalene	mg/kg	3	<0.1	57	5.6	1
Acenaphthylene	mg/kg	3	<0.1	260	420	0
Acenaphthene	mg/kg	3	<0.1	97	510	0
Fluorene	mg/kg	3	<0.1	250	400	0
Phenanthrene	mg/kg	5	<0.1	1700	220	1
Anthracene	mg/kg	4	<0.1	410	5400	0
Fluoranthene	mg/kg	5	<0.1	1300	560	1
Pyrene	mg/kg	5	<0.1	1200	1200	0
Benzo[a]anthracene	mg/kg	2	<0.1	520	11	1
Chrysene	mg/kg	2	<0.1	430	22	1
Benzo[b]fluoranthene	mg/kg	1	<0.1	410	3.3	1
Benzo[k]fluoranthene	mg/kg	1	<0.1	200	93	1
Benzo[a]pyrene	mg/kg	1	<0.1	400	2.7	1
Benzo[g,h,i]perylene	mg/kg	1	<0.1	220	36	1
Dibenz(a,h)Anthracene	mg/kg	1	<0.1	92	0.28	1
Indeno(1,2,3-c,d)Pyrene	mg/kg	1	<0.1	230	340	0
Total PAH	mg/kg	4	<2	7800	50*	1
Total Phenol	mg/kg	1	<0.3	0.44	550	0
* EA Threshold Values						

Concentrations of three aromatic TPH fractions and 10 speciated PAH contaminants were elevated, along with total PAH. All of these results relate to TP2 0.00-0.20m in the northwest of the site, coinciding with the presence of ash and tarmacadam material localised to the historic tennis court.

5.7 Asbestos

From the six samples subject to asbestos screening, no asbestos fibres were recorded in any of the samples.

5.8 Environmental Protection Act 1990: Part 2A Revised Statutory Guidance (April 2012)

This revised document explains how the Local Authority should decide if land, based on a legal interpretation, is contaminated. The document replaces the previous guidance given in Annex 3 of DEFRA Circular 01/2006, issued in accordance with section 78YA of the 1990 Environmental Protection Act.

The main objectives of the Part 2A regime are to *"identify and remove unacceptable risks to human health and*

the environment" and to *"seek to ensure that contaminated land is made suitable for its current use".* Part 2A uses a risk based approach to defining contaminated land whereby the "risk" is interpreted as *"the likelihood that harm, or pollution of water, will occur as a result of contaminants in, on or under the land"* and by *"the scale and seriousness of such harm or pollution if it did occur".*

For a relevant risk to exist a contaminant, pathway and receptor linkage must be present before the land can be considered to be contaminated. The document explains that *"for a risk to exist there must be contaminants present in, on or under the land in a form and quantity that poses a hazard, and one or more pathways by which they might significantly harm people, the environment, or property; or significantly pollute controlled waters."*

A conceptual model is used to develop and communicate the risks associated with a particular site.

To determine if land is contaminated the local authority use various categories from 1 to 4. Categories 1 and 2 include *"land which is capable of being determined as contaminated land on grounds of significant possibility of significant harm to human health."* Categories 3 and 4 *"encompass land which is not capable of being determined on such grounds".*

See Appendix E for additional notes on contamination guidelines.

6 CONCEPTUAL MODEL AND CONTAMINATION ANALYSIS

The contamination conceptual model in Table 3 identifies the potential pollution linkages present on site based on source – pathway – receptor relationships.

TABLE 3: CONCEPTUAL MODEL

Source	Pathway	Receptor	Risk Rating	Comments
Asphyxiating or explosive ground gases • Made ground • Landfills within 250m • Not in Radon Affected Area	**Ground gas migration** • Migration through permeable soils • Inhalation	**Future site users** • Adult and infant residents	Moderate /Low	Gas monitoring ongoing. Six visits over three months proposed.
		Users during development • Construction workers	Low	
Areas of contamination • Elevated PAH and TPH within TP2 • Elevated arsenic within TP6	• Inhalation	**Future site users** • Adult and infant residents	Moderate /Low	Gardens proposed – elevated contamination may pose a risk to future residents.
		Users during development • Construction workers	Moderate /Low	PPE required for construction workers.
	• Inhalation • Dust ingestion	**Users of surrounding sites** • Nearby residents	Low	Low risk during construction from dust generation. Consideration to be given to dust suppression in excessively dry/windy conditions.
	• Leaching of mobilised contaminants	**Solid geology** • Secondary Aquifer – A	Low	Medium sensitivity aquifer unlikely to be impacted by the limited contamination recorded.
		Drift geology • Not designated	Very Low	Thin drift deposits, no groundwater encountered.
	• Drainage • Lateral migration • Accumulation of contaminated sediment	**Surface water features** • River within site boundaries	Low	Limited potential due to the small size of the river and readiness to flow. Limited potential contaminants on site.
	• Uptake via roots and leaf surfaces	**Vegetation** • Proposed gardens	Low	No exceedances of phytotoxic thresholds.
Areas of contamination above service fabric or BRE Special Digest 1 thresholds	• Direct contact	**Construction Materials** • Concrete	Moderate /Low	Assuming mobile groundwater conditions, pH levels necessitate DS-1 ACES (Class 3z) concrete.
	• Direct contact	**Construction Materials** • Service Fabric	Moderate /Low	Wrapped steel pipes precluded due to diminished pH.

In general terms, future householders, construction workers and construction materials are **potentially most** at risk as pollution linkages may be present for each of these receptors. Users of the site, users of the surrounding sites, controlled waters and vegetation are considered to be at **potentially less** of a risk.

Mitigation measures to reduce the risks identified for each receptor are discussed in the following sections.

6.1 Users of the Site Once Development is Complete

The users of the site, particularly construction workers, are likely to be exposed to contaminants present in the soils beneath the site during redevelopment work. **Potential** exposure pathways include dermal absorption after contact with contaminated ground, inhalation of soil or dust, inhalation of volatised compounds, and inadvertent soil ingestion. Moreover a risk to ground/surface water receptors exists through leaching of contaminants.

To establish if the levels of contaminants present on site may pose a risk to the health of the future users of the site the results of the contamination testing have been compared to a series of LQM/CIEH S4UL based on residential with home grown produce.

The levels of contaminants across the site are generally low with only two 'hotspot' areas of concern.

Arsenic was elevated within TP6, in the southeast of the site, whilst TPH and PAH were elevated within TP2, in the northwest of the site.

The new development is expected to comprise new residential properties with associated gardens/access roads. Based on the **shallow** soil contamination testing, it is considered that the levels of contamination may pose a risk to future users of the site, as soft landscaping is proposed in the final development. This pollutant linkage however will be severed as long as all contaminated areas are covered either by buildings, hardstanding, or a clean cover system.

During the initial site strip if any zones of odorous, brightly coloured or suspected contaminated ground are encountered then work should cease in that area until the material has been tested. The results of the tests will determine whether or not remediation will be required.

The current legislation on waste involves the categorization of materials into inert waste, non reactive hazardous wastes and hazardous wastes. The determination of the category depends on DEFRA landfill directive waste acceptance criteria (WAC) testing. Material taken off site may be subject to WAC by the appropriate waste disposal company.

6.2 Construction Workers and Users of Surrounding Sites

Short term human exposure to contaminants present in soils can occur via several pathways during the construction and ground works phase of the development. These include dermal absorption after contact with contaminated ground, inhalation of soil or dust (including windblown dust), inhalation of volatised compounds, inadvertent soil ingestion and contact with contaminated groundwater.

Raised levels of arsenic (TP6) and TPH and PAHs (TP2) were detected. It is considered that such levels of contamination may pose risk to construction workers and users of surrounding sites. As good practice, full PPE must be employed in accordance with HSE guidance and safeguards should be taken to limit dust during ground works, and access to the public should be restricted. Construction workers should use gloves as a precaution when handling any fill materials. Provision of suitable hygiene facilities are needed for site workers.

Although asbestos was not detected from the soil samples subjected to testing within this investigation, the possibility still exists that asbestos containing materials may still be present on site and currently lie undetected. It is therefore advised that a 'watching brief' is undertaken during the initial site strip and any excavation works and advice sought if asbestos is found or suspected.

During dry weather, any excavations may require clean water to be sprinkled at shallow depth to prevent excess dust escaping to off-site receptors. Monitoring of dust concentrations during construction should be given careful consideration to ensure occupational exposure levels are not exceeded.

6.3 Vegetation

Plants can be affected by soil contamination in a number of ways resulting in growth inhibition, nutrient deficiencies and yellowing of leaves. Contaminants are taken up by plants through the roots and through foliage. Contaminants identified as being highly phytotoxic include boron, cadmium, copper, nickel, and zinc.

To establish if the levels of contaminants present on site may pose a risk to vegetation the results of the contamination testing have been compared to a series of threshold values published in "*Code of Good Agricultural Practice for the Protection of Soil"*. No concentrations of the phytotoxic determinants are shown as elevated from the six samples tested.

During the initial site strip, proposed soft landscaped areas should be excavated to 0.60mbgl or natural ground (whichever is the shallowest). Any deleterious materials encountered (i.e. ash, slag, brick rubble and concrete) should be removed and placed beneath areas of permanent hardcover. Topsoil and subsoil from the area of the historic tennis court (TP2, BH3) is deemed unsuitable for re-use given the elevated levels of TPH and PAH determinants, whilst topsoil from the area of TP6 is not considered suitable due to the elevated arsenic.

The cover system should include imported topsoil, to a depth of 300mm over either natural ground or clean imported subsoil at least 300mm in thickness. If insufficient topsoil is available on site then it should be imported from a reputable source. Appropriate certification would be required to ensure that the onsite or imported materials are clean and free from deleterious materials in accordance with the Local Authority Guidelines '*Verification Requirements for Cover Systems, Technical Guidance for developers, Landowners and Consultants'* (Yorkshire and Lincolnshire Pollution Advisory Group Version 3.4 – November 2017). Details of the clean cover system must be presented in a Phase 3 Remediation Statement.

6.4 Ground and Surface Water

The principal pathway by which soil contamination may reach the water environment is through a slow seepage or leaching to groundwater or surface water. The potential for contaminants to migrate along such pathways is dependent on the chemical and physical characteristics of the contaminants and the local hydrogeology.

From the site investigation undertaken, ground conditions broadly comprise thin (<0.50m) made ground of topsoil over thin drift deposits mostly comprising sandy gravelly clay, with local deposits of clayey gravelly sand noted. The cohesive deposits can be considered to have a low permeability whilst the granular deposits can be considered to have a moderate permeability. The drift deposits are not designated as an aquifer by the Environment Agency.

The published geology indicates the site is underlain by solid geology of Huddersfield White Rock of Sandstone, which is designated as a Secondary Aquifer - A by the Environment Agency. The sandstone was encountered across the site between 0.70mbgl (BH3) and 1.20mbgl (BH1, & BH6), recovered as slightly clayey sandy gravel of low to moderate cobble content, with solid rockhead encountered at depths of between 1.10 and 1.40mbgl.

The nearest surface water feature is an unnamed river located in the south of the site, which is partly culverted.

No groundwater was encountered during the investigation, however the groundwater flow is inferred to be towards the southeast, down the gradient of the site towards the watercourse.

Contamination was isolated mostly to the area of the historic tennis court in the northwest of the site, with this material likely needing removal from site to satisfy formation or clean cover system levels. The other noted exceedance of contamination thresholds related to the elevated arsenic in the southeast of the site, however this may be geogenic in nature as the material was natural, and slightly elevated arsenic was noted across the site.

Due to the generally low contamination found across the site and the aquifer designations beneath the site, the development is considered to represent a low risk to groundwater or surface water receptors.

6.5 Construction Materials

Materials at risk from potential soil contamination include inorganic matrices such as cement and concrete and also organic material; e.g. plastics and rubbers. Acid ground conditions and elevated levels of sulphates can accelerate the corrosion of building materials. Plastics and rubbers are generally used for piping and service ducts and are potentially attacked by a range of chemicals, most of which are organic, particularly petroleum based substances. Drinking water supplies can be tainted by substances that can penetrate piping and water companies enforce stringent threshold values.

BRE Special Digest One: *"Concrete in Aggressive Ground"*: 2005 3rd Edition has been used to assess the risks posed to underground concrete and to establish the design measures required to mitigate the risks. The results of the pH and water soluble sulphate tests (when converted to total potential sulphate) fall into Class DS-1 ACEC (Class AC-3z) requirements for concrete protection. This assumes mobile groundwater conditions.

The levels of potential contaminants should be compared to thresholds supplied in the UK Water Industry Research (UKWIR) publication "Guidance for the selection of Water Supply Pipes to be used in Brownfield Sites" (January 2011). A Brownfield Site is defined in the document as "Land or premises that have previously been used or developed that may be vacant or derelict". It should be noted that Brownfields sites may not be contaminated. The guidance does not apply to Greenfield Sites however water companies may have their own assessment criteria which should be checked by the developer.

Generally acidic pH levels were encountered across the site.

The concentrations of the selected determinants should be compared to the pipe material selection table in Appendix E and consultation with the appropriate water supply company is required to identify the most suitable service fabric. However, the diminished pH potentially precludes the use of wrapped steel pipes.

7 GROUND GAS ASSESSMENT

The proposed development includes the construction of residential housing

Ground gases such as carbon dioxide (CO_2), methane (CH_4), carbon monoxide (CO) and volatile organic compounds (VOCs) can be classed as a form of contamination where there is a potential risk to human health.

For this report, gas monitoring is via measuring emissions from three standpipes (BH1, BH4 & BH5) that were installed during the sitework. The gas monitoring will consist of six visits over a period of three months. The gas monitoring results will be presented as an addendum to this report.

8 GEOTECHNICAL TESTING AND ANALYSIS

Samples taken from the boreholes and trial pits underwent a series of geotechnical tests (BS 1377:1990) to aid foundation design and soil description. In addition, insitu Standard Penetration Tests (SPTs) and Hand Shear Vane Tests were undertaken at regular intervals during drilling. The geotechnical results are presented in Appendix D.

8.1 Strength and Density

Hand shear vane testing within the natural cohesive deposits returned results ranging 50kPa to 60kPa, which are indicative of medium strength conditions.

Standard Penetration Tests undertaken within the weathered sandstone at depths between 0.85-1.20mbgl yielded N values of 50+ (refusal).

8.2 Moisture Contents

Six samples recovered from the boreholes and trial pits have been subject to moisture content tests to determine the moisture profile at depths of between 0.40 and 1.00mbgl. Moisture levels were between 14% and 24%.

8.3 Atterberg Limit Determinations

Four Atterberg Limit Determination tests were carried out on samples of cohesive material to classify the fine grained soils. The results were compared to the Casagrande Chart published in BS 5930 and showed the samples to generally be clay of low to intermediate plasticity.

The Plasticity Indices ranged from 12 to 20 with equivalent moisture contents recorded above and at the corresponding plastic limits. The cohesive material can be assessed as having a **medium** shrinkage potential in relation to NHBC Guidance Chapter 4.2.

8.4 Particle Size Distribution and Sedimentation Testing

Four samples from the trial pits (TP2 0.40-0.60mbgl, TP4 0.60-0.80mbgl, TP7 0.70-0.90mbgl and TP8 0.70-0.90mbgl) were subject to Particle Size Distribution (PSD) tests in accordance with BS1377 Part 2 to aid soil descriptions. The results have been used to prepare precise soil descriptions in accordance with BS5930:2015 Section 6 and are presented in Appendix D.

8.5 pH and Sulphate Results

Five natural samples from the boreholes were tested for acidity and soluble sulphate content to assess whether the material may be potentially aggressive to building fabric. The results of the testing for pH ranged from 5.9 to 7.4 indicating acidic to slightly alkaline conditions. Soluble sulphates were recorded at levels ranging from <10mg/l to 35mg/l.

8.6 Percolation Tests

Two soakaway tests were carried out within the bases of TP1 and TP6. The results returned infiltration rates of 3.04×10^{-6} and 4.29×10^{-6} m/sec for both tests. The results are presented in Appendix D.

8.7 Foundations

Ground conditions broadly comprised drift deposits of firm consistency sandy gravelly clay (locally clayey gravelly sand) overlying weathered sandstone, recovered as slightly sandy gravel of low to medium cobble content at 0.70-1.20mbgl with rockhead of weathered sandstone at 1.10-1.40mbgl. Foundations may be situated upon the cohesive or granular drift deposits, or potentially deepened to found upon the sandstone bedrock.
It is recommended that a “dig and discover” approach is utilised prior to construction to delineate the cohesive/granular boundaries and rockhead depth beneath proposed housing plots.

8.7.1 *Foundations upon Cohesive Drift Deposits*

Based on plasticity index results, all cohesive soils at the site should be regarded as being of medium volume change potential. Foundations should therefore be placed at a minimum depth of 0.90m below original or finished ground level, whichever is the lower.

Based on a conservative shear strength of 50kN/m² a safe bearing capacity of 110kN/m² has been determined for strip foundations 0.60m wide founding on the natural clay at depths of around 0.90mbgl. Providing the safe bearing capacity is not exceed settlements have been calculated to be less than 25mm.

Foundations near existing or proposed trees should be deepened and provided with appropriate heave precautions in accordance with NHBC Standards Chapter 4.2 current guidance.

It should be recognised that clay rich soils can deteriorate fairly rapidly on exposure, particularly in periods of wet weather and frost. It would be prudent to protect all exposed soils in foundation excavations with a concrete blinding layer, particularly if they are likely to remain open for extended period of time.

Prior to placing foundation concrete, obvious soft or loose spots should be removed and replaced with suitably recompacted hardcore or lean mix concrete. In addition, all excavations should be inspected to ensure that they fully penetrate areas of disturbed ground.

8.7.2 *Foundations upon Granular Drift Deposits*

SPT results in the granular deposits indicate densities of dense, however, it is possible that these results reflect the presence of cobbles and boulders and it may therefore be prudent to assume that the granular deposits are generally loose and therefore to adopt a conservative N value of 10.

It is recommended that foundations in sand be placed at a minimum depth of 0.60m. Raft foundations could be considered as an alternative where loose sands are present.

The predicted settlement, assuming a bearing pressure of 110kN/m^2 on 0.60m wide strip footing foundations at 0.60mbgl depth has been calculated as less than 25mm.

In order to minimise disturbance of the base of foundation excavations in sand, the excavator should be fitted with a machine bucket without teeth.

8.7.3 *Deepened Foundations upon Bedrock*

The site is underlain by sandstone, which is initially highly weathered and was recovered as clayey sandy gravel of low to moderate cobble content, with solid rockhead between 1.10-1.40mbgl.

Strip footings, 0.60m wide, should be adopted placed directly onto the weathered sandstone rockhead at depths of 1.10mbgl.

The shallow weathered sandstone can be considered weak. Table 2.4 in 'Foundation Design & Construction, 6th Edition, M.J. Tomlinson' outlines a bearing capacity of 250kN/m^2 for sandstone be assumed. Providing imposed loads do not exceed the bearing capacity then settlement have been calculated at less than 25mm. The developer should also ensure the footings are placed at sufficient depth through the weathered zone to more competent bedrock to achieve the desired 250kN/m^2 allowable bearing capacity.

8.7.4 *Foundations – General Comments*

Prior to placing foundation concrete, obvious soft or loose spots should be removed and replaced with suitably recompacted hardcore or lean mix concrete. In addition, all excavations should be inspected to ensure that they fully penetrate areas of disturbed ground.

Sub-surface concrete should be Design Sulphate Class DS-1, with the site allocated an ACEC Classification of AC-3z.

Further advice should be sought from Solmek if unexpected ground conditions are encountered during redevelopment.

8.8 Excavation

Based on the nature of the ground conditions encountered, excavations should be within the capacity of normal earthworks plant. Stability of excavations will be poor in the made ground and granular deposits but should improve in the natural clay. Excavation sides should be designed, constructed and supported in accordance with the recommendations given in CIRIA Report No. 97: “Trenching Practice”.

8.9 Groundwater

No groundwater was encountered within any of the exploratory positions.

It should be noted the rapid rate of advancement of the exploratory holes may mask minor seepages and it should be borne in mind that water levels fluctuate with a number of influences including season, rainfall, dewatering and pumping activities.

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APPENDIX A:
Figures and Drawings

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Title
Site Location Plan

Project
Parkwood Road, Golcar, Huddersfield

Client
Parkwood Ventures LLP and Sir Robert Ogden Estates Ltd

Date
April 2019

Fig No.
Figure 1

Scale
On map

Key

Approx. Site Boundary

N

Solmek Ltd.
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www.solmek.com

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Contains Bing® Imagery ©Microsoft 2016

Title
Exploratory Hole Location Plan

Project
Parkwood Road, Golcar, Huddersfield.

Client
Parkwood Ventures LLP and Sir Robert Ogden Estates Ltd

Date
April 2019

Fig No.
Figure 2

Scale
On map

Key

Approx. Site Boundary

Approx. BH Location

Approx. TP Location

N

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Figure 3: Trial Pit 1

Figure 4: Trial Pit 1 Spoil

Title	**Date**
Figures 3 & 4	April 2019
Project	
Parkwood Road, Golcar, Huddersfield	
Client	
Parkwood Ventures LLP and Sir Robert Ogden Estates Ltd	

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Figure 5: Trial Pit 2

Figure 6: Trial Pit 2 Spoil

Title	**Date**
Figures 5 & 6	April 2019
Project	
Parkwood Road, Golcar, Huddersfield	
Client	
Parkwood Ventures LLP and Sir Robert Ogden Estates Ltd	

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Figure 7: Trial Pit 3

Figure 8: Trial Pit 3 Spoil

Title	**Date**
Figures 7 & 8	April 2019
Project	
Parkwood Road, Golcar, Huddersfield	
Client	
Parkwood Ventures LLP and Sir Robert Ogden Estates Ltd	

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Figure 9: Trial Pit 5

Figure 10: Trial Pit 5 Spoil

Title	**Date**
Figures 9 & 10	April 2019
Project	
Parkwood Road, Golcar, Huddersfield	
Client	
Parkwood Ventures LLP and Sir Robert Ogden Estates Ltd	

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Figure 11: Trial Pit 6

Figure 12: Trial Pit 6 Spoil

Title	**Date**
Figures 11 & 12	April 2019
Project	
Parkwood Road, Golcar, Huddersfield	
Client	
Parkwood Ventures LLP and Sir Robert Ogden Estates Ltd	

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Figure 13: Trial Pit 7

Figure 14: Trial Pit 7 Spoil

Title	**Date**
Figures 13 & 14	April 2019
Project	
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Client	
Parkwood Ventures LLP and Sir Robert Ogden Estates Ltd	

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Figure 15: Trial Pit 8

Figure 16: Trial Pit 8 Spoil

Title	**Date**
Figures 15 & 16	April 2019
Project	
Parkwood Road, Golcar, Huddersfield	
Client	
Parkwood Ventures LLP and Sir Robert Ogden Estates Ltd	

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APPENDIX B:
Borehole Logs & Trial Pit Logs

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Borehole Log

Scale 1:50 Sheet 1 of 1

BH1

Contract no:	S190321	**Site:**	Golcar, Huddersfield	**Driller:**	SR Drilling
				Plant used:	Mini Rig
				Started:	04/04/2019
Client:	Parkwood Ventures LLP and Sir Robert Ogden Estates Ltd			**Ended:**	04/04/2019
Method:	Small Percussive			**Backfilled:**	04/04/2019

GL (AOD):
Easting:
Northing:
Logged: LC
Status: FINAL

Backfill / Installation	Legend	Depth (m)	Level (m AOD)	Stratum Description	Samples and Insitu Testing: Depth (m)	Type	Results
				MADE GROUND: Brown sandy gravelly topsoil. Gravel is angular to subangular fine to coarse of sandstone.	0.20 - 0.40	B+ES	
					0.40 - 0.60	B+ES	
		0.50		Firm consistency orangeish brown sandy gravelly CLAY. Gravel is angular to subangular fine to coarse of sandstone.	0.80 - 1.20	D	
		1.20			1.20 - 1.21	SPT (S)	N=50+ (25 for 10mm/50 for 0mm)
		1.30		Brownish yellow weathered SANDSTONE. Recovered as slightly clayey sandy GRAVEL of angular to subangular fine to coarse sandstone.			
				End of Borehole at 1.300m			

Hole Diameter		Casing Depths		General Remarks	Chiselling			Ground Water				
Depth Base (m)	Diameter (mm)	Depth Base (m)	Diameter (mm)	- Hand Dug Inspection Pit Excavated - No Groundwater Encountered	From (m)	To (m)	Time (hr)	Depth Strike (m)	Depth Casing (m)	Depth Sealed (m)	Time Elapsed (min)	Water Level (m)

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Borehole Log

Scale 1:50 Sheet 1 of 1

BH2

Contract no:	S190321	**Site:**	Golcar, Huddersfield	**Driller:**	SR Drilling
				Plant used:	Mini Rig
				Started:	04/04/2019
Client:	Parkwood Ventures LLP and Sir Robert Ogden Estates Ltd			**Ended:**	04/04/2019
Method:	Small Percussive			**Backfilled:**	04/04/2019

GL (AOD):
Easting:
Northing:
Logged: LC
Status: FINAL

Backfill / Installation	Legend	Depth (m)	Level (m AOD)	Stratum Description	Samples and Insitu Testing: Depth (m)	Type	Results
				MADE GROUND: Brown sandy gravelly topsoil. Gravel is angular to subangular fine to coarse of sandstone.	0.20 - 0.40	B+ES	
		0.30		Firm consistency greyish brown slightly sandy slightly gravelly CLAY with rootlets. Gravel is angular to subangular fine to coarse of sandstone.	0.40 - 0.60	B+ES	
					0.80 - 1.00	D	
		1.10		Brownish yellow weathered SANDSTONE. Recovered as slightly clayey sandy GRAVEL of angular to subangular fine to coarse sandstone.	1.20 - 1.20	SPT (S)	N=50+ (25 for 0mm/50 for 0mm)
		1.20		End of Borehole at 1.200m			

Hole Diameter		Casing Depths		General Remarks	Chiselling			Ground Water				
Depth Base (m)	Diameter (mm)	Depth Base (m)	Diameter (mm)	- Hand Dug Inspection Pit Excavated - No Groundwater Encountered	From (m)	To (m)	Time (hr)	Depth Strike (m)	Depth Casing (m)	Depth Sealed (m)	Time Elapsed (min)	Water Level (m)

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Borehole Log

Scale 1:50 Sheet 1 of 1

BH3

Contract no:	S190321	**Site:**	Golcar, Huddersfield	**Driller:**	SR Drilling
				Plant used:	Mini Rig
				Started:	04/04/2019
Client:	Parkwood Ventures LLP and Sir Robert Ogden Estates Ltd			**Ended:**	04/04/2019
Method:	Small Percussive			**Backfilled:**	04/04/2019

GL (AOD):
Easting:
Northing:
Logged: LC
Status: FINAL

Backfill / Installation	Legend	Depth (m)	Level (m AOD)	Stratum Description	Samples and Insitu Testing		
					Depth (m)	Type	Results
				MADE GROUND: Brownish black sandy gravel of ash, brick and clinker.	0.20 - 0.50	B+ES	
		0.50		Firm consistency orangeish brown sandy gravelly CLAY. Gravel is angular to subangular fine to coarse of sandstone.	0.50 - 0.70	D	
		0.70		Brownish yellow weathered SANDSTONE. Recovered as slightly clayey sandy GRAVEL of angular to subangular fine to coarse sandstone.	0.85 - 0.85	SPT (S)	N=50+ (25 for 0mm/50 for 0mm)
		0.85		End of Borehole at 0.850m			

Hole Diameter		Casing Depths		General Remarks	Chiselling			Ground Water				
Depth Base (m)	Diameter (mm)	Depth Base (m)	Diameter (mm)		From (m)	To (m)	Time (hr)	Depth Strike (m)	Depth Casing (m)	Depth Sealed (m)	Time Elapsed (min)	Water Level (m)
				- Hand Dug Inspection Pit Excavated - No Groundwater Encountered								

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Borehole Log

Scale 1:50 Sheet 1 of 1

BH4

Contract no:	S190321	**Site:**	Golcar, Huddersfield	**Driller:**	SR Drilling
				Plant used:	Mini Rig
				Started:	04/04/2019
Client:	Parkwood Ventures LLP and Sir Robert Ogden Estates Ltd			**Ended:**	04/04/2019
Method:	Small Percussive			**Backfilled:**	04/04/2019

GL (AOD):
Easting:
Northing:
Logged: LC
Status: FINAL

Backfill / Installation	Legend	Depth (m)	Level (m AOD)	Stratum Description	Samples and Insitu Testing: Depth (m)	Type	Results
				MADE GROUND: Brown sandy gravelly topsoil. Gravel is angular to subangular fine to coarse of sandstone.	0.20 - 0.40	B+ES	
					0.40 - 0.60	B+ES	
		0.50		Firm consistency orangeish brown sandy gravelly CLAY. Gravel is angular to subangular fine to coarse of sandstone.	0.70 - 0.90	D	
		0.90		Brownish yellow weathered SANDSTONE. Recovered as slightly clayey sandy GRAVEL of angular to subangular fine to coarse sandstone.	1.00 - 1.00	SPT (S)	N=50+ (25 for 0mm/50 for 0mm)
		1.00		End of Borehole at 1.000m			

Hole Diameter		Casing Depths		General Remarks	Chiselling			Ground Water				
Depth Base (m)	Diameter (mm)	Depth Base (m)	Diameter (mm)	- Hand Dug Inspection Pit Excavated - No Groundwater Encountered	From (m)	To (m)	Time (hr)	Depth Strike (m)	Depth Casing (m)	Depth Sealed (m)	Time Elapsed (min)	Water Level (m)

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Borehole Log

Scale 1:50 Sheet 1 of 1

BH5

Contract no:	S190321	**Site:**	Golcar, Huddersfield	**Driller:**	SR Drilling
				Plant used:	Mini Rig
				Started:	04/04/2019
Client:	Parkwood Ventures LLP and Sir Robert Ogden Estates Ltd			**Ended:**	04/04/2019
Method:	Small Percussive			**Backfilled:**	04/04/2019

GL (AOD):
Easting:
Northing:
Logged: LC
Status: FINAL

Backfill / Installation	Legend	Depth (m)	Level (m AOD)	Stratum Description	Samples and Insitu Testing: Depth (m)	Type	Results
				MADE GROUND: Brown sandy gravelly topsoil. Gravel is angular to subangular fine to coarse of sandstone.	0.20 - 0.40	B+ES	
		0.40		Firm consistency orangeish brown sandy gravelly CLAY. Gravel is angular to subangular fine to coarse of sandstone.	0.40 - 0.60	B+ES	
					0.80 - 1.00	D	
		1.10		Brownish yellow weathered SANDSTONE. Recovered as slightly clayey sandy GRAVEL of angular to subangular fine to coarse sandstone.	1.20 - 1.20	SPT (S)	N=50+ (25 for 0mm/50 for 0mm)
		1.20		End of Borehole at 1.200m			

Hole Diameter		Casing Depths		General Remarks	Chiselling			Ground Water				
Depth Base (m)	Diameter (mm)	Depth Base (m)	Diameter (mm)	- Hand Dug Inspection Pit Excavated - No Groundwater Encountered	From (m)	To (m)	Time (hr)	Depth Strike (m)	Depth Casing (m)	Depth Sealed (m)	Time Elapsed (min)	Water Level (m)

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Borehole Log

Scale 1:50 Sheet 1 of 1

BH6

Contract no:	S190321	**Site:**	Golcar, Huddersfield	**Driller:**	SR Drilling
				Plant used:	Mini Rig
				Started:	04/04/2019
Client:	Parkwood Ventures LLP and Sir Robert Ogden Estates Ltd			**Ended:**	04/04/2019
Method:	Small Percussive			**Backfilled:**	04/04/2019

GL (AOD):
Easting:
Northing:
Logged: LC
Status: FINAL

Backfill / Installation	Legend	Depth (m)	Level (m AOD)	Stratum Description	Samples and Insitu Testing: Depth (m)	Type	Results
				MADE GROUND: Brown sandy gravelly topsoil. Gravel is angular to subangular fine to coarse of sandstone.	0.20 - 0.40	B+ES	
		0.40		Firm consistency orangeish brown sandy gravelly CLAY. Gravel is angular to subangular fine to coarse of sandstone.	0.40 - 0.60	B+ES	
					0.80 - 1.00	D	
		1.20			1.20 - 1.20	SPT (S)	N=50+ (25 for 5mm/50 for 0mm)
		1.25		Brownish yellow weathered SANDSTONE. Recovered as slightly clayey sandy GRAVEL of angular to subangular fine to coarse sandstone.			
				End of Borehole at 1.250m			

Hole Diameter		Casing Depths		General Remarks	Chiselling			Ground Water				
Depth Base (m)	Diameter (mm)	Depth Base (m)	Diameter (mm)	- Hand Dug Inspection Pit Excavated - No Groundwater Encountered	From (m)	To (m)	Time (hr)	Depth Strike (m)	Depth Casing (m)	Depth Sealed (m)	Time Elapsed (min)	Water Level (m)

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Trial Pit Log

TrialPit No
TP1
Sheet 1 of 1

Project Name:	Golcar, Huddersfield	Project No. S190321	Co-ords: E - N Level:
Plant Used:	JCB 3CX	Dimensions (m): Depth 1.10	Date 04/04/2019 Scale 1:26
Client:	Parkwood Ventures LLP and Sir Robert Ogden Estates Ltd		Logged LC

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.00 - 0.20	B+ES		0.20			MADE GROUND: Brown sandy gravelly topsoil. Gravel is angular to subangular fine to coarse of sandstone.
	0.50 - 0.70	B					Firm consistency orangeish brown sandy gravelly CLAY of low to medium cobble content. Gravel is angular to subangular fine to coarse of sandstone.
	0.80 - 0.90	B					
	0.90	HV	55kPa	0.90			Brownish yellow weathered SANDSTONE. Recovered as slightly clayey sandy GRAVEL of medium to high cobble content. Gravel is angular to subangular fine to coarse sandstone.
				1.10			Brownish yellow SANDSTONE.
							End of Pit at 1.100m

1
2
3
4
5

Remarks: - No Groundwater Encountered

Stability:

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Trial Pit Log

TrialPit No
TP2
Sheet 1 of 1

Project Name:	Golcar, Huddersfield	Project No. S190321	Co-ords: E - N Level:
Plant Used:	JCB 3CX	Dimensions (m): Depth 0.90	Date 04/04/2019 Scale 1:26
Client:	Parkwood Ventures LLP and Sir Robert Ogden Estates Ltd		Logged LC

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.00 - 0.20	B+ES		0.30			MADE GROUND: Brownish black sandy gravel of ash, brick and clinker.
	0.40 - 0.60	B+ES					Firm consistency orangeish brown sandy gravelly CLAY of low to medium cobble content. Gravel is angular to subangular fine to coarse of sandstone.
	0.60 - 0.70	B		0.70			Brownish yellow weathered SANDSTONE. Recovered as slightly clayey sandy GRAVEL of medium to high cobble content. Gravel is angular to subangular fine to coarse sandstone.
				0.80			Brownish yellow SANDSTONE.
							End of Pit at 0.900m

1
2
3
4
5

Remarks: - No Groundwater Encountered

Stability:

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Trial Pit Log

TrialPit No
TP3
Sheet 1 of 1

Project Name:	Golcar, Huddersfield	Project No. S190321	Co-ords: E - N Level:
Plant Used:	JCB 3CX	Dimensions (m): Depth 1.10	Date 04/04/2019 Scale 1:26
Client:	Parkwood Ventures LLP and Sir Robert Ogden Estates Ltd		Logged LC

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.00 - 0.20	B+ES		0.15			MADE GROUND: Brown sandy gravelly topsoil. Gravel is angular to subangular fine to coarse of sandstone.
	0.50 - 0.70	B					Firm consistency orangeish brown sandy gravelly CLAY of low to medium cobble content. Gravel is angular to subangular fine to coarse of sandstone.
	0.60	HV	50kPa	0.70			Brownish yellow weathered SANDSTONE. Recovered as slightly clayey sandy GRAVEL of medium to high cobble content. Gravel is angular to subangular fine to coarse sandstone.
	0.80 - 1.00	B		1.10			Brownish yellow SANDSTONE.
							End of Pit at 1.100m

Remarks: - No Groundwater Encountered

Stability:

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Trial Pit Log

TrialPit No
TP4
Sheet 1 of 1

Project Name:	Golcar, Huddersfield	Project No. S190321	Co-ords: E - N Level:
Plant Used:	JCB 3CX	Dimensions (m): Depth 1.20	Date 04/04/2019 Scale 1:26
Client:	Parkwood Ventures LLP and Sir Robert Ogden Estates Ltd		Logged LC

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.00 - 0.20	B+ES		0.20			MADE GROUND: Brown sandy gravelly topsoil. Gravel is angular to subangular fine to coarse of sandstone.
	0.60 - 0.80	B					Firm consistency orangeish brown sandy gravelly CLAY of low to medium cobble content. Gravel is angular to subangular fine to coarse of sandstone.
	0.70	HV	60kPa	0.80			Brownish yellow weathered SANDSTONE. Recovered as slightly clayey sandy GRAVEL of medium to high cobble content. Gravel is angular to subangular fine to coarse sandstone.
	1.00 - 1.20	B		1.00			Brownish yellow SANDSTONE.
				1.20			End of Pit at 1.200m

Remarks: - No Groundwater Encountered

Stability:

SOLMEK
Solmek Ltd
12-16 Yarm Road
Stockton on Tees
TS18 3NA
Tel: 01642 607083
Email: info@solmek.com

Trial Pit Log

TrialPit No
TP5
Sheet 1 of 1

Project Name:	Golcar, Huddersfield	Project No. S190321	Co-ords: E - N Level:
Plant Used:	JCB 3CX	Dimensions (m): Depth 1.10	Date 04/04/2019 Scale 1:26
Client:	Parkwood Ventures LLP and Sir Robert Ogden Estates Ltd		Logged LC

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.00 - 0.20	B+ES		0.30			MADE GROUND: Brown sandy gravelly topsoil. Gravel is angular to subangular fine to coarse of sandstone.
	0.60 - 0.80	B					Brownish orange slightly clayey gravelly SAND of low cobble content. Gravel is angular to subangular fine to coarse of sandstone.
	0.90 - 1.10	B		0.90 1.10			Brownish yellow weathered SANDSTONE. Recovered as slightly clayey sandy GRAVEL of medium to high cobble content. Gravel is angular to subangular fine to coarse sandstone. Brownish yellow SANDSTONE. End of Pit at 1.100m

1
2
3
4
5

Remarks: - No Groundwater Encountered

Stability: Poor stability in granular deposits

SOLMEK
Solmek Ltd
12-16 Yarm Road
Stockton on Tees
TS18 3NA
Tel: 01642 607083
Email: info@solmek.com

Trial Pit Log

TrialPit No
TP6
Sheet 1 of 1

Project Name:	Golcar, Huddersfield	Project No. S190321	Co-ords: E - N Level:
Plant Used:	JCB 3CX	Dimensions (m): Depth 1.40	Date 04/04/2019 Scale 1:26
Client:	Parkwood Ventures LLP and Sir Robert Ogden Estates Ltd		Logged LC

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.00 - 0.20	B+ES		0.30			MADE GROUND: Brown sandy gravelly topsoil with rootlets. Gravel is angular to subangular fine to coarse of sandstone.
	0.60 - 0.80	B		1.10			Brownish orange slightly clayey gravelly SAND of low cobble content. Gravel is angular to subangular fine to coarse of sandstone.
	1.20 - 1.40	B		1.40			Brownish yellow weathered SANDSTONE. Recovered as slightly clayey sandy GRAVEL of medium to high cobble content. Gravel is angular to subangular fine to coarse sandstone.
							Brownish yellow SANDSTONE.
							End of Pit at 1.400m

1
2
3
4
5

Remarks: - No Groundwater Encountered

Stability: Poor stability in granular deposits

SOLMEK
Solmek Ltd
12-16 Yarm Road
Stockton on Tees
TS18 3NA
Tel: 01642 607083
Email: info@solmek.com

Trial Pit Log

TrialPit No
TP7
Sheet 1 of 1

Project Name:	Golcar, Huddersfield	Project No. S190321	Co-ords: E - N Level:
Plant Used:	JCB 3CX	Dimensions (m): Depth 1.10	Date 04/04/2019 Scale 1:26
Client:	Parkwood Ventures LLP and Sir Robert Ogden Estates Ltd		Logged LC

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.00 - 0.20	B+ES		0.20			MADE GROUND: Brown sandy gravelly topsoil. Gravel is angular to subangular fine to coarse of sandstone.
	0.70 - 0.90	B					Brownish orange slightly clayey gravelly SAND of low cobble content. Gravel is angular to subangular fine to coarse of sandstone.
	0.90 - 1.10	B		0.90			Brownish yellow weathered SANDSTONE. Recovered as slightly clayey sandy GRAVEL of medium to high cobble content. Gravel is angular to subangular fine to coarse sandstone.
				1.10			Brownish yellow SANDSTONE.
							End of Pit at 1.100m

1
2
3
4
5

Remarks: - No Groundwater Encountered

Stability: Poor stability in granular deposits

SOLMEK
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12-16 Yarm Road
Stockton on Tees
TS18 3NA
Tel: 01642 607083
Email: info@solmek.com

Trial Pit Log

TrialPit No
TP8
Sheet 1 of 1

Project Name:	Golcar, Huddersfield	Project No. S190321	Co-ords: E - N Level:
Plant Used:	JCB 3CX	Dimensions (m): Depth 1.20	Date 04/04/2019 Scale 1:26
Client:	Parkwood Ventures LLP and Sir Robert Ogden Estates Ltd		Logged LC

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.00 - 0.20	B+ES		0.20			MADE GROUND: Brown sandy gravelly topsoil. Gravel is angular to subangular fine to coarse of sandstone.
	0.70 - 0.90	B		0.90			Soft to firm consistency orangeish brown sandy gravelly friable CLAY of low to medium cobble content. Gravel is angular to subangular fine to coarse of sandstone.
	1.00 - 1.20	B		1.20			Brownish yellow weathered SANDSTONE. Recovered as slightly clayey sandy GRAVEL of medium to high cobble content. Gravel is angular to subangular fine to coarse sandstone.
							Brownish yellow SANDSTONE.
							End of Pit at 1.200m

Remarks: - No Groundwater Encountered

Stability:

APPENDIX C:
Contamination Laboratory Results

Chemtest
The right chemistry to deliver results
Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

Amended Report

Report No.:	19-12015-2		
Initial Date of Issue:	16-Apr-2019	**Date of Re-Issue:**	23-Apr-2019
Client	Solmek Ltd		
Client Address:	12 Yarm Road Stockton-on-Tees TS18 3NA		
Contact(s):	Kathryn Watkin Leo Cassidy Office		
Project	S190321 Golcar Huddersfield		
Quotation No.:		**Date Received:**	08-Apr-2019
Order No.:	2977	**Date Instructed:**	08-Apr-2019
No. of Samples:	6		
Turnaround (Wkdays):	11	**Results Due:**	24-Apr-2019
Date Approved:	23-Apr-2019		
Approved By:			
Details:	Martin Dyer, Laboratory Manager Robert Monk, Technical Manager		

Chemtest
The right chemistry to deliver results

Results - Soil

Project: S190321 Golcar Huddersfield

Client: Solmek Ltd				**Chemtest Job No.:**	19-12015	19-12015	19-12015	19-12015	19-12015	19-12015
Quotation No.:				**Chemtest Sample ID.:**	806670	806671	806672	806673	806674	806675
				Sample Location:	TP1	TP2	TP3	TP4	TP6	TP8
				Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				Top Depth (m):	0.00	0.00	0.00	0.00	0.00	0.00
				Bottom Depth (m):	0.20	0.20	0.20	0.20	0.20	0.20
				Date Sampled:	04-Apr-2019	04-Apr-2019	04-Apr-2019	04-Apr-2019	04-Apr-2019	04-Apr-2019
				Asbestos Lab:	LIVERPOOL	LIVERPOOL	LIVERPOOL	LIVERPOOL	LIVERPOOL	LIVERPOOL
Determinand	**Accred.**	**SOP**	**Units**	**LOD**						
ACM Type	U	2192		N/A	-	-	-	-	-	-
Asbestos Identification	U	2192	%	0.001	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
ACM Detection Stage	U	2192		N/A	-	-	-	-	-	-
Moisture	N	2030	%	0.020	19	4.5	22	19	24	17
Soil Colour	N	2040		N/A	Brown,	Brown,	Brown,	Brown,	Brown,	Brown,
Other Material	N	2040		N/A	Stones,	Stones,	Stones,	Stones,	Stones,	Stones,
Soil Texture	N	2040		N/A	Sand,	Sand,	Sand,	Sand,	Sand,	Sand,
pH	M	2010		N/A	5.3	8.0	5.4	5.6	5.6	5.5
Boron (Hot Water Soluble)	M	2120	mg/kg	0.40	0.55	0.42	0.66	0.79	0.81	0.63
Sulphate (2:1 Water Soluble) as SO4	M	2120	mg/l	10	< 10	91	< 10	< 10	< 10	< 10
Cyanide (Total)	M	2300	mg/kg	0.50	0.70	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Arsenic	M	2450	mg/kg	1.0	22	29	29	31	44	25
Cadmium	M	2450	mg/kg	0.10	0.27	0.29	0.29	0.32	0.43	0.30
Chromium	M	2450	mg/kg	1.0	19	13	22	22	37	31
Copper	M	2450	mg/kg	0.50	33	28	46	46	71	49
Mercury	M	2450	mg/kg	0.10	2.6	0.35	0.71	0.42	12	18
Nickel	M	2450	mg/kg	0.50	17	21	17	18	23	19
Lead	M	2450	mg/kg	0.50	80	19	95	91	130	110
Selenium	M	2450	mg/kg	0.20	0.95	0.36	1.3	1.4	1.7	1.2
Zinc	M	2450	mg/kg	0.50	59	68	63	65	97	76
Organic Matter	M	2625	%	0.40	12	41	14	22	19	19
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C8-C10	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C10-C12	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C12-C16	M	2680	mg/kg	1.0	< 1.0	10	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C16-C21	M	2680	mg/kg	1.0	< 1.0	29	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C21-C35	M	2680	mg/kg	1.0	< 1.0	140	20	12	5.8	< 1.0
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	110	< 1.0	< 1.0	< 1.0	< 1.0
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	290	20	12	5.8	< 5.0
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C8-C10	M	2680	mg/kg	1.0	< 1.0	10	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C10-C12	M	2680	mg/kg	1.0	< 1.0	36	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C12-C16	M	2680	mg/kg	1.0	< 1.0	1000	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	< 1.0	4500	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C21-C35	M	2680	mg/kg	1.0	< 1.0	8400	13	15	15	< 1.0

Chemtest
The right chemistry to deliver results

Results - Soil

Project: S190321 Golcar Huddersfield

Client: Solmek Ltd		**Chemtest Job No.:**			19-12015	19-12015	19-12015	19-12015	19-12015	19-12015
Quotation No.:		**Chemtest Sample ID.:**			806670	806671	806672	806673	806674	806675
		Sample Location:			TP1	TP2	TP3	TP4	TP6	TP8
		Sample Type:			SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
		Top Depth (m):			0.00	0.00	0.00	0.00	0.00	0.00
		Bottom Depth (m):			0.20	0.20	0.20	0.20	0.20	0.20
		Date Sampled:			04-Apr-2019	04-Apr-2019	04-Apr-2019	04-Apr-2019	04-Apr-2019	04-Apr-2019
		Asbestos Lab:			LIVERPOOL	LIVERPOOL	LIVERPOOL	LIVERPOOL	LIVERPOOL	LIVERPOOL
Determinand	**Accred.**	**SOP**	**Units**	**LOD**						
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	810	< 1.0	< 1.0	< 1.0	< 1.0
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	15000	13	15	15	< 5.0
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0	< 10	15000	34	26	20	< 10
Naphthalene	M	2700	mg/kg	0.10	< 0.10	57	0.47	< 0.10	1.9	< 0.10
Acenaphthylene	M	2700	mg/kg	0.10	< 0.10	260	1.1	< 0.10	1.0	< 0.10
Acenaphthene	M	2700	mg/kg	0.10	< 0.10	97	0.40	< 0.10	1.0	< 0.10
Fluorene	M	2700	mg/kg	0.10	< 0.10	250	1.1	< 0.10	1.3	< 0.10
Phenanthrene	M	2700	mg/kg	0.10	0.44	1700	7.1	6.5	7.5	< 0.10
Anthracene	M	2700	mg/kg	0.10	< 0.10	410	1.4	1.7	1.1	< 0.10
Fluoranthene	M	2700	mg/kg	0.10	0.37	1300	6.5	6.4	5.4	< 0.10
Pyrene	M	2700	mg/kg	0.10	0.28	1200	4.9	5.7	5.8	< 0.10
Benzo[a]anthracene	M	2700	mg/kg	0.10	< 0.10	520	< 0.10	< 0.10	3.4	< 0.10
Chrysene	M	2700	mg/kg	0.10	< 0.10	430	< 0.10	< 0.10	4.2	< 0.10
Benzo[b]fluoranthene	M	2700	mg/kg	0.10	< 0.10	410	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[k]fluoranthene	M	2700	mg/kg	0.10	< 0.10	200	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[a]pyrene	M	2700	mg/kg	0.10	< 0.10	400	< 0.10	< 0.10	< 0.10	< 0.10
Indeno(1,2,3-c,d)Pyrene	M	2700	mg/kg	0.10	< 0.10	230	< 0.10	< 0.10	< 0.10	< 0.10
Dibenz(a,h)Anthracene	M	2700	mg/kg	0.10	< 0.10	92	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[g,h,i]perylene	M	2700	mg/kg	0.10	< 0.10	220	< 0.10	< 0.10	< 0.10	< 0.10
Total Of 16 PAH's	M	2700	mg/kg	2.0	< 2.0	7800	23	20	33	< 2.0
Total Phenols	M	2920	mg/kg	0.30	< 0.30	0.44	< 0.30	< 0.30	< 0.30	< 0.30

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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	Allkaline 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.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
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
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; Dibenz[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)
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.

Chemtest
The right chemistry to deliver results

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.com

APPENDIX D:
Geotechnical Laboratory Results

Laboratory Report Front Sheet

Site name	Job number
Golcar, Huddersfield	S190321

Solmek
12-16 Yarm Road,
Stockton on Tees,
TS18 3NA
01642 607083
lab@solmek.com

UKAS TESTING
7607

Client details:

Reference: S190321
Name: Solmek
Address: 12 Yarm Road,
Stockton-on-tees,
TS18 3NA

Telephone: 01642 607083
Email: lcassidy@solmek.com

FAO: L. Cassidy

Date commenced: 11/04/2019

Date reported: 25/04/2019

Observations and interpretations are outside of the UKAS Accreditiation

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

Solmek are not UKAS Accedited for the following tests; Density by Linear Measurement, Particle Density by Gas Jar, Point Load, Triaxial UU Multi Specimen, Triaxial UU Multistage and California Bearing Ratio.

Samples will be held at the laboratory for a period of 4 weeks after the report date. After the all samples will be disposed of. Should further testing be required then the office should be informed before the above date.

Signature:	Approved Signitories:
	☑ K Watkin (Lab Manager) ☐ U Mazhar (Assistant Lab Manager) ☐ I Nicholson (Technical Manager)

Summary of Classification Tests

Site name	Job number
Golcar, Huddersfield	S190321

Solmek
12-16 Yarm Road,
Stockton on Tees,
TS18 3NA
01642 607083
lab@solmek.com

UKAS TESTING
7607

Hole	Depth Top m	Depth Base m	Type	w %	Oven temp. °c	w_a %	P_a %	P_r %	w_L %	w_P %	I_P %	I_L	Plasticity class	Preparation method
BH5	0.80	1.00	B	14	105	16	88	12	25-s	13	12	0.250	CL	Tested after >425µm removed by hand
TP1	0.50	0.70	B	20	105	27	75	25	35-s	17	18	0.556	CI	Tested after >425µm removed by hand
TP2	0.40	0.60	B	24	105	26	94	6	39-s	19	20	0.350	CI	Tested after >425µm removed by hand
TP4	0.60	0.80	B	14	105	14	100	0	27-s	14	13	0.000	CL	Tested in natural condition
TP7	0.70	0.90	B	18	105									
TP8	0.70	0.90	B	15	105									

All tests found in Solmek UKAS Schedule of Accreditation are tested to standard unless otherwise indicated

Key	Description		Category	BS Test Code
w	Moisture content			BS 1377:1990 Part 2 Clause 3.2
w_a	Equivalent moisture content passing 425µm sieve			BS 1377:1990 Part 2 Clause 3.2
w_L	Liquid limit	Single point	-s	BS 1377:1990 Part 2 Clause 4.4
		Four point	-f	BS 1377:1990 Part 2 Clause 4.3
w_P	Plastic limit			BS 1377:1990 Part 2 Clause 5.2
P_a	Percentage passing 425um sieve			
P_r	Percentage retained 425um sieve			
I_P	Plasticity index			BS 1377:1990 Part 2 Clause 5.4
I_L	Liquidity index			BS 1377:1990 Part 2 Clause 5.4
	Suffix indicating test is "Not UKAS Accredited"		*	

Approved by	KW
Approval date	19/04/2019 08:41
Date report generated	25/04/2019 13:43
Report Number	SLMK_19011424

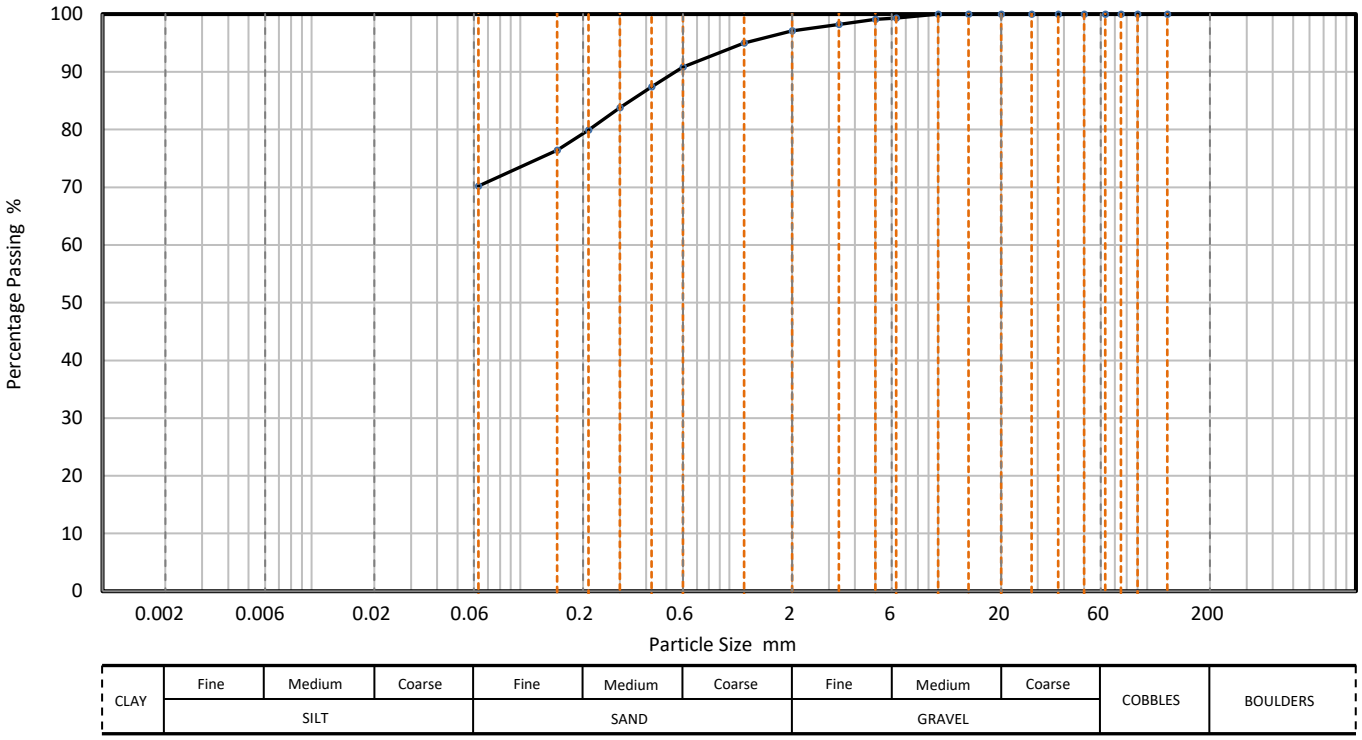
PARTICLE SIZE DISTRIBUTION

Site name	Job number
Golcar, Huddersfield	S190321

Solmek
12-16 Yarm Road,
Stockton on Tees,
TS18 3NA
01642 607083
lab@solmek.com

UKAS TESTING
7607

Hole	TP2	Lab sample ID	SLMK2019041113
Depth (Top) m	0.40	Test Method	BS 1377 - 2 : 1990 Clause 9.2
Depth (Base) m	0.6	Soil Description	Brown, slightly gravelly, slightly sandy CLAY
Sample type	B		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	99		
5	99		
3.35	98		
2	97		
1.18	95		
0.6	91		
0.425	87		
0.3	84		
0.212	80		
0.15	76		
0.063	70		

Dry Mass of sample, g	605

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	2.9
Sand	26.9
Fines <0.063mm	70.0

Grading Analysis		
D100	mm	
D60	mm	
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks
Preparation and testing in accordance with test method unless noted below

Accreditation status
Hydrometer is the usual Sedimentation method carried out by Solmek and is part of the Solmek UKAS accreditation schedule.

Approved by	KW
Approval date	25/04/2019 12:42

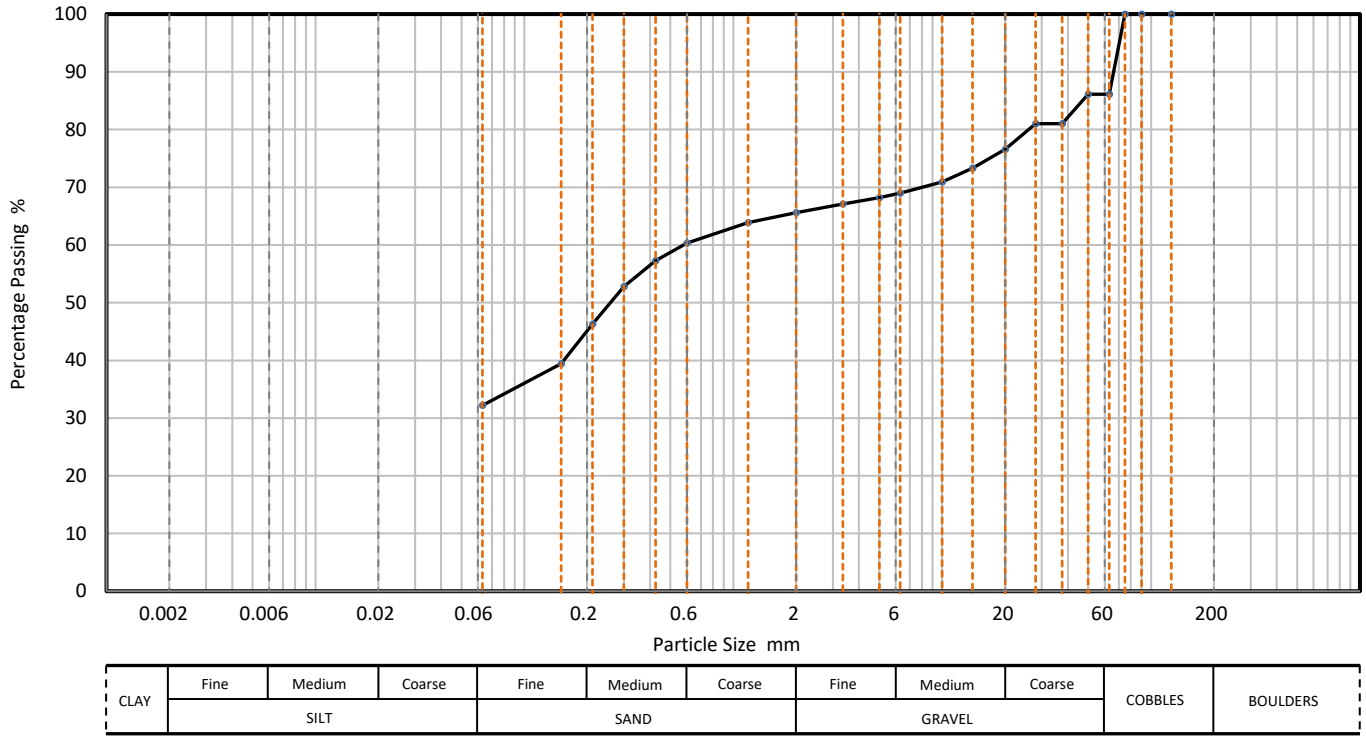
PARTICLE SIZE DISTRIBUTION

Site name	Job number
Golcar, Huddersfield	S190321

Solmek
12-16 Yarm Road,
Stockton on Tees,
TS18 3NA
01642 607083
lab@solmek.com

UKAS TESTING 7607

Hole	TP4	Lab sample ID	SLMK2019041114
Depth (Top) m	0.60	Test Method	BS 1377 - 2 : 1990 Clause 9.2
Depth (Base) m	0.8	Soil Description	Brown, slightly gravelly with cobbles, CLAYEY SAND
Sample type	B		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	86		
50	86		
37.5	81		
28	81		
20	77		
14	73		
10	71		
6.3	69		
5	68		
3.35	67		
2	66		
1.18	64		
0.6	60		
0.425	57		
0.3	53		
0.212	46		
0.15	39		
0.063	32		

Dry Mass of sample, g: 1608

Sample Proportions	% dry mass
Very coarse	13.9
Gravel	20.6
Sand	33.4
Fines <0.063mm	32.0

Grading Analysis		
D100	mm	
D60	mm	0.577
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with test method unless noted below

Accreditation status

Hydrometer is the usual Sedimentation method carried out by Solmek and is part of the Solmek UKAS accreditation schedule.

Approved by	KW
Approval date	25/04/2019 12:44

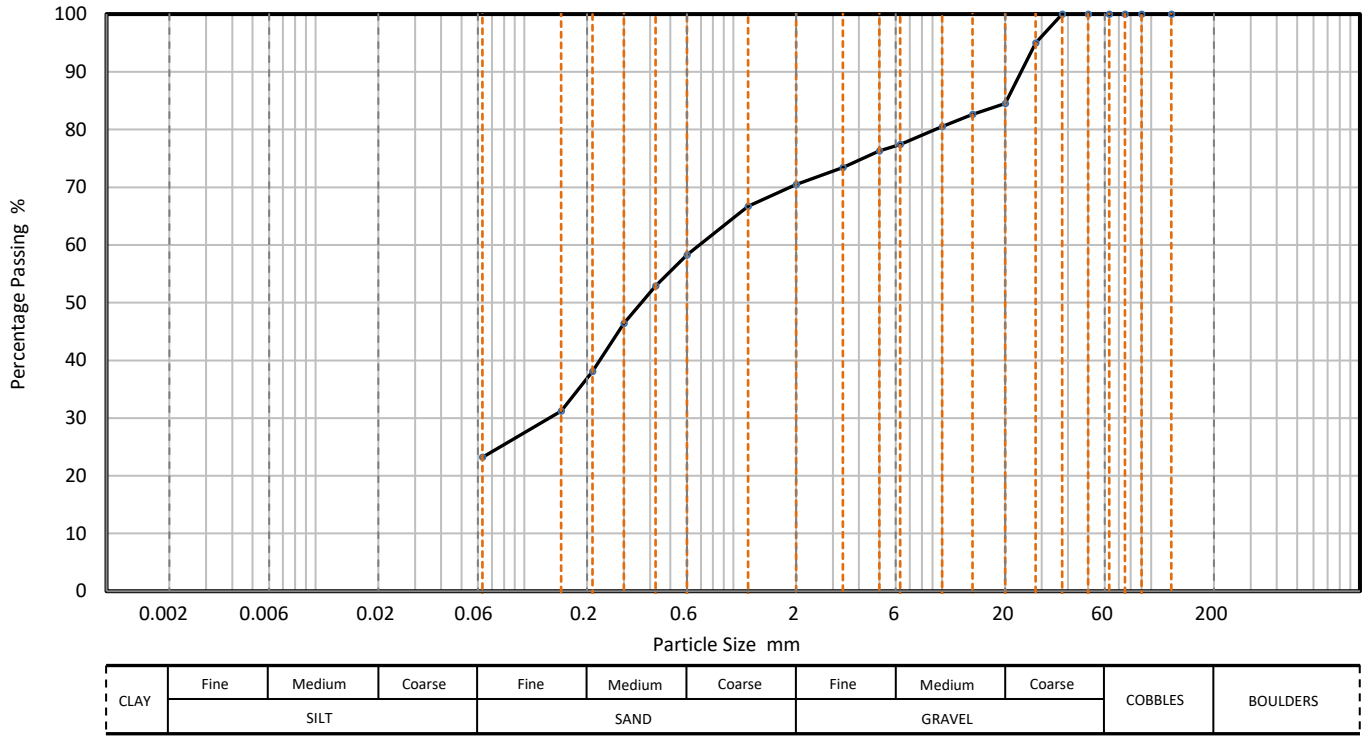
PARTICLE SIZE DISTRIBUTION

Site name	Job number
Golcar, Huddersfield	S190321

Solmek
12-16 Yarm Road,
Stockton on Tees,
TS18 3NA
01642 607083
lab@solmek.com

UKAS TESTING 7607

Hole	TP7	Lab sample ID	SLMK2019041115
Depth (Top) m	0.70	Test Method	BS 1377 - 2 : 1990 Clause 9.2
Depth (Base) m	0.9	Soil Description	Brown, slightly clayey, slightly gravelly SAND
Sample type	B		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	95		
20	85		
14	83		
10	81		
6.3	77		
5	76		
3.35	73		
2	71		
1.18	67		
0.6	58		
0.425	53		
0.3	46		
0.212	38		
0.15	31		
0.063	23		

Dry Mass of sample, g	822

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	29.5
Sand	47.3
Fines <0.063mm	23.0

Grading Analysis		
D100	mm	
D60	mm	0.688
D30	mm	0.132
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks
Preparation and testing in accordance with test method unless noted below

Accreditation status
Hydrometer is the usual Sedimentation method carried out by Solmek and is part of the Solmek UKAS accreditation schedule.

Approved by	KW
Approval date	25/04/2019 12:47

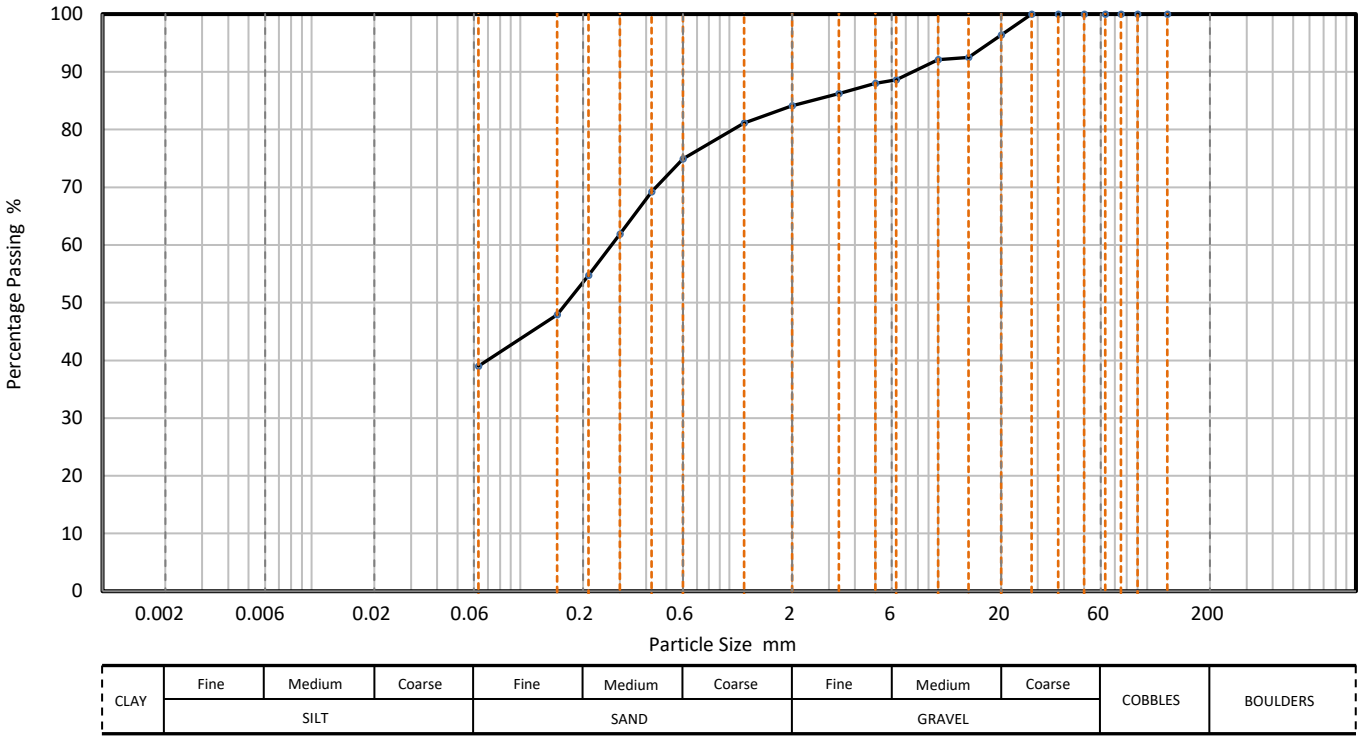
PARTICLE SIZE DISTRIBUTION

Site name	Job number
Golcar, Huddersfield	S190321

Solmek
12-16 Yarm Road,
Stockton on Tees,
TS18 3NA
01642 607083
lab@solmek.com

UKAS TESTING 7607

Hole	TP8	Lab sample ID	SLMK2019041116
Depth (Top) m	0.70	Test Method	BS 1377 - 2 : 1990 Clause 9.2
Depth (Base) m	0.9	Soil Description	Brown, slightly gravelly, CLAYEY SAND
Sample type	B		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	96		
14	93		
10	92		
6.3	89		
5	88		
3.35	86		
2	84		
1.18	81		
0.6	75		
0.425	69		
0.3	62		
0.212	55		
0.15	48		
0.063	39		

Dry Mass of sample, g: 847

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	15.9
Sand	45.1
Fines <0.063mm	39.0

Grading Analysis		
D100	mm	
D60	mm	0.274
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with test method unless noted below

Accreditation status

Hydrometer is the usual Sedimentation method carried out by Solmek and is part of the Solmek UKAS accreditation schedule.

Approved by	KW
Approval date	25/04/2019 12:49

Chemtest
The right chemistry to deliver results
Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

UKAS TESTING
2183

Final Report

Report No.:	19-12940-1
Initial Date of Issue:	23-Apr-2019
Client	Solmek Ltd
Client Address:	12 Yarm Road Stockton-on-Tees TS18 3NA
Contact(s):	Kathryn Watkin Leo Cassidy Office
Project	S190321 Golcar, Huddersfield

Quotation No.:		**Date Received:**	15-Apr-2019
Order No.:		**Date Instructed:**	15-Apr-2019
No. of Samples:	5		
Turnaround (Wkdays):	7	**Results Due:**	25-Apr-2019
Date Approved:	23-Apr-2019		
Approved By:			

Details:	Robert Monk, Technical Manager

Chemtest
The right chemistry to deliver results

Results - Soil

Project: S190321 Golcar, Huddersfield

Client: Solmek Ltd		**Chemtest Job No.:**			19-12940	19-12940	19-12940	19-12940	19-12940
Quotation No.:		**Chemtest Sample ID.:**			811165	811166	811167	811168	811169
			Sample Location:		TP1	TP2	TP4	TP7	TP8
			Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL
			Top Depth (m):		0.50	0.40	0.60	0.70	0.70
			Bottom Depth (m):		0.70	0.60	0.80	0.90	0.90
Determinand	**Accred.**	**SOP**	**Units**	**LOD**					
Moisture	N	2030	%	0.020	15	17	13	14	12
pH	U	2010		N/A	[A] 6.4	[A] 7.4	[A] 5.9	[A] 6.7	[A] 7.1
Sulphate (2:1 Water Soluble) as SO4	U	2120	mg/l	10	23	< 10	13	35	< 10

Deviations

In accordance with UKAS Policy on Deviating Samples TPS 63. Chemtest have a procedure to ensure 'upon receipt of each sample a competent laboratory shall assess whether the sample is suitable with regard to the requested test(s)'. This policy and the respective holding times applied, can be supplied upon request.The reason a sample is declared as deviating is detailed below. Where applicable the analysis remains UKAS/MCERTs accredited but the results may be compromised.

Sample:	Sample Ref:	Sample ID:	Sample Location:	Sampled Date:	Deviation Code(s):	Containers Received:
811165			TP1		A	Plastic Tub 500g
811166			TP2		A	Plastic Tub 500g
811167			TP4		A	Plastic Tub 500g
811168			TP7		A	Plastic Tub 500g
811169			TP8		A	Plastic Tub 500g

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.
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES

Chemtest
The right chemistry to deliver results

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.com

SOAKAWAY DESIGN IN ACCORDANCE WITH BRE DIGEST 365: 1991
BRE Digest 365, Figure 2, Page 5

Client:	**Parkwood Ventures LLP and Sir Robert Ogden Estates Ltd**				
Site:	**Golcar, Huddersfield**				
Job No:	**S190321**				
Pit No:	**TP6**		**Test No:**	**1**	

CALCULATION OF SOIL INFILTRATION RATE

Time (min)	Depth (m)
0	0.41
0.5	0.41
1	0.42
2	0.42
3	0.43
4	0.43
5	0.44
6	0.44
7	0.44
8	0.45
9	0.45
10	0.46
15	0.46
20	0.47
25	0.47
30	0.48
40	0.49
50	0.51
60	0.53
90	0.55
120	0.58

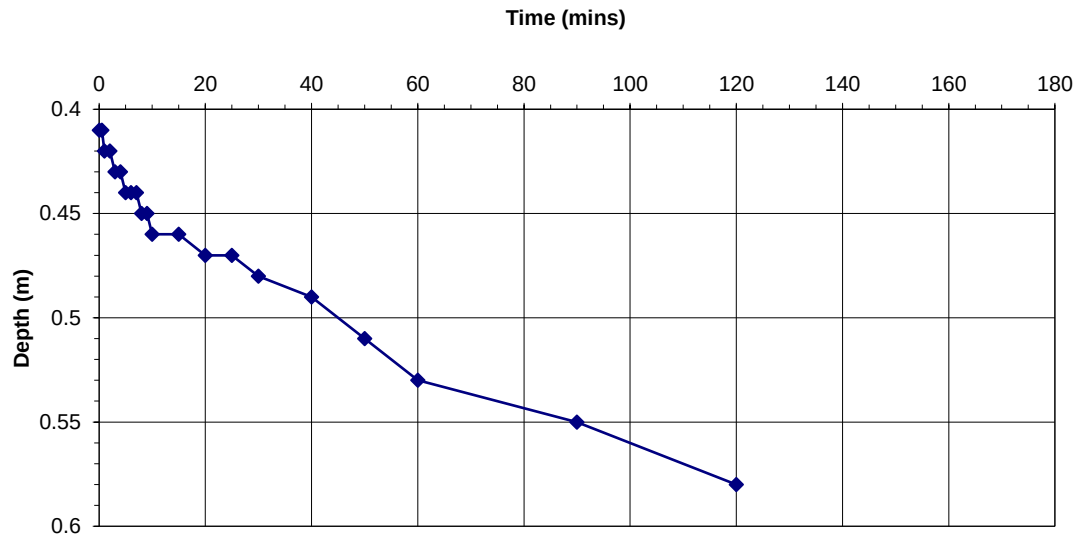
Pit Dimensions		
	Length (m) =	1.55
	Width (m) =	0.60
	Depth (m) =	1.40

Depth at start of test (m) =	2.000
Depth at end of test (m)=	2.000
75% level (m)=	0.453
50% Effective Depth	0.905
25% level (m)=	0.538
Base area of pit (m^2) =	0.930
Vp_{75-25} (m^3) =	0.079
a_{p50} (m^2) =	4.822

From the graph:	
tp 75 (min) =	9.3
tp 25 (min) =	73

Soil infiltration rate, f, (m/s) =	**4.29E-06**	**normal test**

Input by:	**LC**	**Date:**	**06/04/2019**
Checked by:	**RW**	**Date:**	**06/04/2019**



SOAKAWAY DESIGN IN ACCORDANCE WITH BRE DIGEST 365: 1991
BRE Digest 365, Figure 2, Page 5

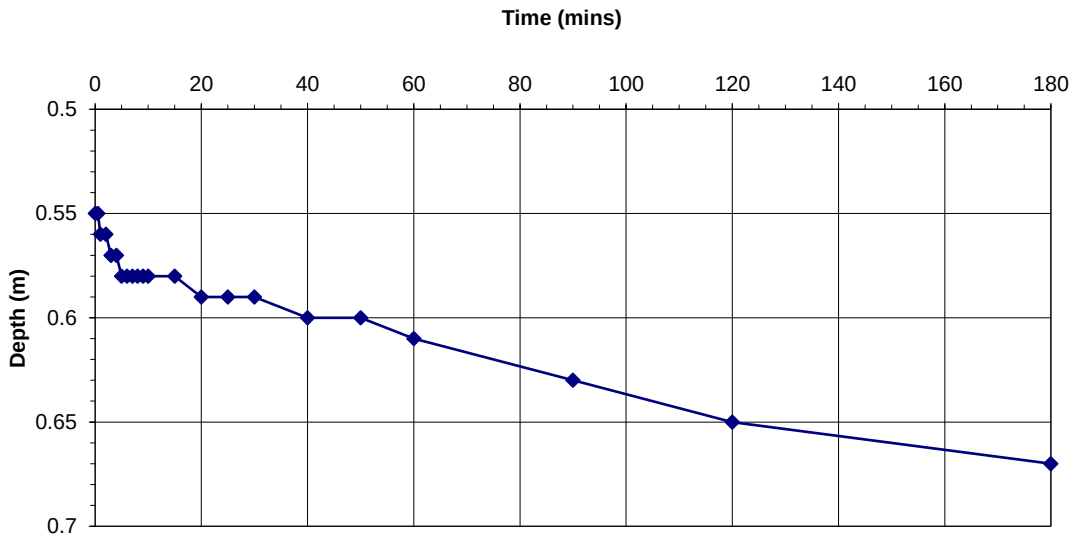
Client:	**Parkwood Ventures LLP and Sir Robert Ogden Estates Ltd**				
Site:	**Golcar, Huddersfield**				
Job No:	**S190321**				
Pit No:	**TP1**		**Test No:**	**1**	

CALCULATION OF SOIL INFILTRATION RATE

Time (min)	Depth (m)
0	0.55
0.5	0.55
1	0.56
2	0.56
3	0.57
4	0.57
5	0.58
6	0.58
7	0.58
8	0.58
9	0.58
10	0.58
15	0.58
20	0.59
25	0.59
30	0.59
40	0.6
50	0.6
60	0.61
90	0.63
120	0.65
180	0.67

Pit Dimensions	
Length (m) =	1.50
Width (m) =	0.60
Depth (m) =	1.10
Depth at start of test (m) =	2.000
Depth at end of test (m)=	2.000
75% level (m)=	0.580
50% Effective Depth	0.490
25% level (m)=	0.640
Base area of pit (m^2) =	0.900
Vp_{75-25} (m^3) =	0.054
a_{p50} (m^2) =	2.958
From the graph:	
tp 75 (min) =	5
tp 25 (min) =	105

Soil infiltration rate, f, (m/s) =	**3.04E-06**	**normal test**	
Input by:	**LC**	**Date:**	**06/04/2019**
Checked by:	**RW**	**Date:**	**06/04/2019**



APPENDIX E:
Notes on Limitations & Contamination Guidance

SOLMEK NOTES ON CONTAMINATION GUIDANCE (REF: VERSION 1/2019)

UK BACKGROUND

Environmental Protection Act 1990: Part 2A Revised Statutory Guidance (April 2012)

This revised document explains how the Local Authority should decide if land, based on a legal interpretation, is contaminated. The document replaces the previous guidance given in Annex 3 of DEFRA Circular 01/2006, issued in accordance with section 78YA of the 1990 Environmental Protection Act.

The main objectives of the Part 2A regime are to *"identify and remove unacceptable risks to human health and the environment" and* to *"seek to ensure that contaminated land is made suitable for its current use".*

Part 2A uses a risk based approach to defining contaminated land whereby the "risk" is interpreted as *"the likelihood that harm, or pollution of water, will occur as a result of contaminants in, on or under the land"* and by *"the scale and seriousness of such harm or pollution if it did occur".*

For a relevant risk to exist a contaminant, pathway and receptor linkage must be present before the land can be considered to be contaminated. The document explains that *"for a risk to exist there must be contaminants present in, on or under the land in a form and quantity that poses a hazard, and one or more pathways by which they might significantly harm people, the environment, or property; or significantly pollute controlled waters."*

A conceptual model is used to develop and communicate the risks associated with a particular site.

To determine if land is contaminated the local authority use various categories from 1 to 4. Categories 1 and 2 include *"land which is capable of being determined as contaminated land on grounds of significant possibility of significant harm to human health."*

Categories 3 and 4 *"encompass land which is not capable of being determined on such grounds".*

PRELIMINARY CONCEPTUAL MODEL

Preliminary Conceptual Models are undertaken in accordance with CIRIA C552. The Preliminary Conceptual Model assesses the consequence and the likelihood of a risk being realised to provide a risk classification, using the tables detailed below.

CONSEQUENCE OF RISK BEING REALISED (Based on C552 CIRIA, 2001)

Classification	Definition	Example
Severe	Short-term (acute) risk to human health, the environment, an element of the development or other aspect with is likely to result in *significant harm*, damage or both.	High concentrations of cyanide on the surface of an informal recreational area. Major spills of contaminants from site into controlled water. High concentrations of explosive gas in the subsurface environment that have a clear unobstructed pathway into buildings.
Moderate	Chronic damage to human health, a plausible chance that an event will occur, although the timeline is not immediate to be in the short-term.	Appreciable concentration of contamination that over the longer-term will cause significant harm i.e. high lead concentration in topsoil. Shallow mine workings that are potentially unstable but may remain in a satisfactory or stable conditions for a number of years.
Mild	Low level pollution of non-sensitive water, a feasible hazardous scenario although the timeline of such occurring can probably be considered in 10's of years.	The effect of high sulphate concentrations on structural concrete. Pollution of non-classified groundwater.
Minor	Harm, although not necessarily significant to human health, or with respect to other aspects of the development, which are considered implausible in terms of occurrence, or will have little consequential impact.	The presence of contaminants at such low concentrations that protective equipment is required during site works. Any damage to structures is minimal and will not be structural in characteristics.

PROBABILITY OF RISK BEING REALISED (C552 CIRIA, 2001)

Classification	Definition
High Likelihood	There is a viable 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 that the receptor has been harmed or polluted.
Likely	There is a viable pollutant linkage and all 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 viable 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 viable pollutant linkage but circumstances are such that it is improbable that an event would occur even in the very long term.

RISK CLASSIFICATION MATRIX (C552 CIRIA, 2001)

Risk = Probability x Consequence		Consequence			
		Severe	Moderate	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

HUMAN RECEPTORS

Human exposure to contaminants present in soils can occur via several pathways. Direct exposure pathways include dermal absorption after contact with contaminated ground, inhalation of soil or dust, inhalation of volatised compounds, and inadvertent soil ingestion (or deliberate soil ingestion in the case of some children). Other indirect pathways include human ingestion of plants grown in contaminated soil or contaminated ground or surface water. Contaminants associated with wind blown dust can affect humans on surrounding sites.

VEGETATION

Plants can be affected by soil contamination in a number of ways resulting in growth inhibition, nutrient deficiencies and yellowing of leaves. Contaminants are taken up by plants through the roots and through foliage. Contaminants identified as being highly phytotoxic include boron, cadmium, copper, lead, nickel, and zinc.

To establish if the levels of contaminants present on a site may pose a risk to vegetation the results of the contamination testing are compared to a series of threshold values published in 'Code of Good Agricultural Practice for the Protection of Soil'.

GROUNDWATER AND SURFACE WATER RECEPTORS

The principal pathway by which soil contamination may reach the water environment is through a slow seepage or leaching to groundwater or surface water. The potential for contaminants to migrate along such pathways is dependent on the chemical and physical characteristics of the contaminants and the local hydrogeology. Surface watercourses may also accumulate contamination as contaminated sediments are deposited within the water body.

Where the site investigated overlies major/principal aquifers (and in some cases minor/secondary aquifers depending on certain conditions), groundwater Source Protection Zones and areas in close proximity to groundwater abstractions, contamination test results have been compared with the Water Supply (Water Quality) Regulations 1989 and The Water Supply (Water Quality) Regulations 2000.

Should a surface water receptor, such as a fresh water environment (river, canal, stream, lake etc), or marine environment be considered sensitive in relation to a site, then test results are compared with DEFRA & SEPA Environmental Quality Standards (2004). Many of the Environmental Quality Standards are hardness ($CaCO_3$) depended. Where no hardness values are available, Solmek assume conservative values (of between 0 and 50mg/l).

In the absence of vulnerable ground and surface water environments, Solmek may compare any test results with the Environment Agency Leachate Quality Threshold Values.

DETAILED QUANTITATIVE RISK ASSESSMENT (DQRA)

In line with CLR 11- Model Procedures, a DQRA for groundwater/human health may be required following a Phase 2 investigation and before the preparation of a Phase 3 Remediation Strategy. For human health DQRA, a site specific assessment criteria is undertaken using CLEA Software Version 1.06. For groundwater DQRA, the Environment Agency Remedial Targets Worksheet Version 3.1 is used.

WASTE ACCEPTANCE CRITERIA

The WAC testing relates to materials that are to be exported from a site/development to landfill, and do not directly relate to human health specifically. The WAC test categorises materials as either inert waste, non-reactive hazardous waste, and hazardous waste.

The testing results are generally presented as certificates which can be used by site owners/contractors etc, which should be presented to the accepting waste facility or waste contractor.

CONSTRUCTION MATERIALS

Materials at risk from possible soil contaminants include inorganic matrices such as cement and concrete and also organic material such as plastics and rubbers. Acid ground conditions and high levels of sulphates can accelerate the corrosion of building materials. Where pH and soluble sulphate analysis has been undertaken, Solmek compare the test results with the guidelines presented within BRE Special Digest 1, 2005 (3rd Edition) 'Concrete in Aggressive Ground'. Plastics and rubbers are generally used for piping and service ducts and are potentially attacked by a range of chemicals, most of which are organic, particularly petroleum based substances. Drinking water supplies can be tainted by substances that can penetrate piping and water companies enforce stringent threshold values.

The levels of potential contaminants should be compared to thresholds supplied in the UK Water Industry Research (UKWIR) publication "Guidance for the selection of Water Supply Pipes to be used in Brownfield Sites" (January 2011). A Brownfield Site is defined in the document as "Land or premises that have not previously been used or developed that may be vacant or derelict". It should be noted that Brownfield sites may not be contaminated. The guidance does not apply to Greenfield Sites however water companies may have their own assessment criteria which should be checked by the developer. The table below outlines the pipe material selection threshold concentrations.

	Pipe Material (Threshold concentrations in mg/kg)					
Parameter group	**PE**	**PVC**	**Barrier pipe (PE-AL-PE)**	**Wrapped Steel**	**Wrapped Ductile Iron**	**Copper**
Extended VOC suite by purge and trap or head space and GC-MS with TIC	0.5	0.125	Pass	Pass	Pass	Pass
+ BTEX + MTBE	0.1	0.03	Pass	Pass	Pass	Pass
SVOCs TIC by purge and trap or head space and GC-MS with TIC (aliphatic and aromatic C5-C10)	2	1.4	Pass	Pass	Pass	Pass
+ Phenols	2	0.4	Pass	Pass	Pass	Pass
+ Cresols and chlorinated phenols	2	0.04	Pass	Pass	Pass	Pass
Mineral oil C11-C20	10	Pass	Pass	Pass	Pass	Pass
Mineral oil C21-C40	500	Pass	Pass	Pass	Pass	Pass
Corrosive (Conductivity, Redox and pH)	Pass	Pass	Pass	Corrosive if pH <7 and conductivity >400µS/cm	Corrosive if pH <5, Eh not neutral and conductivity >400µS/cm	Corrosive if pH <5 or >8 and Eh positive
Specific suite identified as relevant following site investigation						
Ethers	0.5	1	Pass	Pass	Pass	Pass
Nitrobenzene	0.5	0.4	Pass	Pass	Pass	Pass
Ketones	0.5	0.02	Pass	Pass	Pass	Pass
Aldehydes	0.5	0.02	Pass	Pass	Pass	Pass
Amines	Fail	Pass	Pass	Pass	Pass	Pass

REQUIREMENTS OF PARTIES WITHIN THE DEVELOPMENT PROCESS

Interested parties involved in the development process may use the data in different ways and there may be varying views and interpretation of the factual data. Local Authority staff may have a view on contamination and human health and the wider environment. The Environment Agency are concerned principally with the protection of Controlled waters. Building insurers, funders and purchasers may be primarily concerned with issues of potential commercial blight. Purchasers are also not always fully informed, and perceptions on issues associated with risk can affect the decision to purchase. Developers and construction organisations will focus on financial aspects of dealing with the contamination in the context of the development and construction programme.

RISKS & LIABILITIES FROM CONTAMINATION

In simple terms, risks associated with contamination may be considered in terms of 1) statutory risks and 2) development related risks. If contamination is severe or forms a potential hazard based on its potential to affect groundwater, surface water or human health, a statutory risk may be present, and as such, if the risk is not reduced, criminal proceedings may be instigated by a government body or local authority.

If the contamination is less severe or not considered to be mobile, it may be considered a commercial liability which could, in theory remain untreated, but which may at a later date affect the value of the property, or, with changing legislation, become a statutory risk. Commercial liabilities could give rise to civil proceedings by third parties if there are grounds for action.

♠Solmek conditions of offer, notes on limitations & basis for contract (ref: version1/2019)

These conditions accompany our tender and supercede any previous conditions issued. Solmek will prepare a report solely for the use of the Client (the party invoiced) and its agent(s). No reliance should be placed on the contents of this report, in whole or in part by 3rd parties. The report, its content and format and associated data are copyright, and the property of Solmek. Photocopying of part or all of the contents, transfer or reproduction of any kind is forbidden without written permission from Solmek. A charge may be levied against such approval, the same to be made at the discretion of Solmek. Solmek was a trading name of Hymas Geoenvironmental Ltd.

Solmek cannot be held liable and do not warrant, or otherwise guarantee the validity of information provided by third parties and subsequently used in our reports. Solmek are not responsible for the action negligent of otherwise of subcontractors or third parties.

Site investigation is a process of sampling. The scope and size of an investigation may be considered proportional to levels of confidence regarding the ground and groundwater conditions. The exploratory holes undertaken investigate only a small volume of the ground in relation to the overall size of the site, and can only provide a general indication of site conditions. The opinions provided and recommendations given in this report are based on the ground conditions as encountered within each of the exploratory holes. There may be different ground conditions elsewhere on the site which have not been identified by this investigation and which therefore have not been taken into account in this report. Reports are generally subject to the comments of the local authority and Environment Agency. The comments made on groundwater conditions are based on observations made at the time that site work was carried out. It should be noted that mobile contamination, ground gas levels and groundwater levels may vary owing to seasonal, tidal and/or weather related effects. Solmek cannot be held liable for any unrecorded or unforeseen obstructions between exploratory boreholes and trial pits. This includes instances where previous structures on the site (buried man made structures) or the presence of boulder clay (cobbles and/or boulder obstructions) have been anticipated. All types of piling operations should make allowance for obstructions within the construction budget to accommodate this. Unrecorded ancient mining may occur anywhere where seams that have been worked and influence the rock and soil above. Dissolution cavities can occur where gypsum or chalk is present. Rotary drilling is the recommended technique to prove the integrity of the rock.

Where the scope of the investigation is limited via access to information, time constraints, equipment limitations, testing, interpretation or by the client or his agents budgetary constraints, elements not set out in the proposal and excluded from the report are deemed to be omitted from the scope of the investigation.

Desk studies are generally prepared in accordance with RICS guidelines. Environmental site investigations are generally undertaken as 'exploratory investigations' in accordance with the definitions provided in paragraph 5.4 of BS 10175:2001 in order to confirm the conceptual assumptions. You are advised to familiarize yourself with the typical scope of such an investigation. No pumping of water will be undertaken unless a licence or facilities/equipment have been arranged by others.

Where the type, number or/and depth of exploratory hole is specified by others, Solmek cannot and will not be responsible for any subsequent shortfall or inadequacy in data, and any consequent shortfall in interpretation of environmental and geotechnical aspects which may be required at a later date in order to facilitate the design of permanent or temporary works.

All information acquired by Solmek in the course of investigation is the property of Solmek, and, only also becomes the joint property of the Client only on the complete settlement of all invoices relating to the project. Solmek reserve the right to use the information in commercial tendering and marketing, unless the Client expressly wishes otherwise in writing. The quoted rates do not include VAT, and payment terms are 30 days from dispatch of invoice from our offices. Quotes are subject to a site visit.

We have allowed for 1 mobilisation and normal working hours unless otherwise stated. The scope of the investigation may be reviewed following the desk study and/or fieldwork. The presence or otherwise of Japanese Knotweed or other invasive plants can be difficult to identify especially during winter months. If Japanese Knotweed or other invasive species are suspect, it should be confirmed by an ecologist. We have not allowed for acquiring services information, and cannot be responsible for damage to underground services or pipes not shown to us or not clearly shown on plans. Costs incurred will be passed on to you, and in commissioning Solmek you understand and accept that you/your agent have a contractual relationship with Solmek & you accept this. Our rates assume unobstructed, reasonably level and firm access to the exploratory positions and adequate clear working areas and headroom. We have priced on the basis that you or your client have the necessary permissions, wayleaves and approvals to access land. All boreholes and pits are backfilled with arisings except where gas monitoring pipes are installed with stopcock covers. Solmek are not responsible for any uneven surfaces as a result of siteworks and rutting and backfilled excavations may require re-levelling and/or making good by others after fieldwork is complete, and Solmek has not allowed for this. No price has been provided or requested for a return visit to remove pipework and covers. Hourly rates apply to consultancy only and do not include expenses unless otherwise shown. If warranties are required, legal costs incurred will be passed on to you assuming Solmek agree to complete such warranties, modified or otherwise and you understand and agree to pay all costs.

We reserve the right to pursue full payment of the invoice prior to release of any information including reports. We advise you/your client that we may elect to pursue our statutory rights under late payment legislation, and will apply 8% to the base rate for unreasonably late payments. Solmek are exempt from the CIS Scheme. Solmek offer to undertake work only in strict accordance with conditions covered by our current insurances, which are available for inspection. Solmek are not responsible for acts, negligent or otherwise of subcontractors and as a matter of policy cannot indemnify any other parties. Professional indemnity Insurance is limited to ten times the invoice net total except where stated otherwise by Solmek. Solmek give notice that consequential loss as a direct or indirect result of Solmek's activities or omission of the same are excluded.