

Phase 2: Site Investigation

**Proposed Pavilion, King George V Playing Fields,
Prescot**

Knowsley Council

M24-004

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PHASE 2 SITE INVESTIGATION REPORT

PROPOSED PAVILION, KING GEORGE V PLAYING FIELDS, PRESCOT

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1 EXECUTIVE SUMMARY

Site Address	• KGV Browns Field, Carr Lane South Venue, Prescot L341LU
Proposed Development	• The site is outlined for a for a new pavilion with associated parking and peripheral soft landscaping.
Fieldwork	• 6no small percussive window samples (WS01 to WS06) drilled to a maximum of 2.30mbgl with 2no. monitoring pipes in BH02 and BH04. • 1no machine excavated trial pits (TP01) to a maximum depth of 1.82mbgl with 1no in-situ soakaway test to BRE 365 standards. • 3no rotary boreholes (RBH01 to RBH03) to a maximum depth of 30.00mbgl.
Ground Conditions	• Topsoil was noted to be present within RBH01, RBH02, RBH03, TP01, WS02, WS03, WS05 & WS06, and was encountered to depths of between 0.09mbgl (TP01), and 0.20mbgl (RBH01 to RBH03). • Proven to underlie the made ground deposits across the site, natural ground generally comprised granular deposits of medium dense (locally loose) clayey sandy gravel. The supervising engineer noted that subordinate beds of clay were noted within this stratum. • Locally within WS02, a layer of very loose sand was recorded between 1.20mbgl and 1.62mbgl. • Rockhead, generally comprising interbedded sandstone, coal and mudstone, was encountered within the rotary boreholes, and was proven to the maximum termination depth of the boreholes (30.00mbgl). • Rockhead depths ranged from 0.80mbgl (WS06) to 2.30mbgl (WS05). • No groundwater was recorded during the fieldwork.
Contamination Analysis	• Given the site's proposed public open space (park) land use the levels of contamination recorded on site are unlikely to 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. • PPE for workers. Damping down of site during dry windy conditions. • Controlled waters unlikely to be at risk. • With respect to utilities pH was elevated, which may preclude the use of copper pipes; as a minimum all services should be laid in clean trenches. • Sub surface concrete should be designed to DS-1 ACEC (Class AC-1s).
Geotechnical Analysis & Foundation Recommendations	• Bearing capacity of 100kN/m² at minimum depth of 0.60mbgl on 0.60m wide strips founding upon medium dense (locally loose) gravel deposits. • Locally deepening of foundations to 1.62mbgl due to made ground and very loose sand depths. • Settlements within 25mm. • Normal earthworks plant for excavations. • No evidence of shallow mine workings has been identified during this investigation.

2 INTRODUCTION

2.1 Authorisation

The site investigation described in this report was carried out by Solmek to the instructions of Steve Wells Associates on behalf of Knowsley Council, on land located within King George V Playing Fields in Prescott (Figure 1).

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

- *Solmek Phase 1 Desk Study (M24-004) January 2024.*

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

2.2 Scope of Works

The site is expected to be developed with new pavilion with associated parking and peripheral soft landscaping.

The following steps may be required in the investigation and remediation of potentially contaminated land:

- Phase 1: Desk Study
- Phase 2: Intrusive Investigation
- Phase 3: Remediation Statement
- Phase 4: Validation Reports

Phases 1 and 2 are generally required in the redevelopment of most sites. Phases 3 and 4 are subject to the findings of the initial stages.

A geotechnical and environmental (Phase 2) investigation including a ground gas risk assessment was requested. The fieldwork and testing was generally carried out according to:

- BS 5930:2015+A1:2020 Code of Practice for Ground Investigations
- BS 10175:2011+A1:2013 Investigation of Potentially Contaminated Sites – Code of Practice.
- Rock and soil descriptions shall be in accordance with BS EN ISO 14689-1:2003, BS EN ISO 14688-1:2002 and BS EN ISO 14688-2:2004
- CIRIA C758D Abandoned Mine Workings Manual

This report forms part of a Stage 1 Risk Assessment (Generic Quantitative Risk Assessment) with respect to the Environment Agency's guidance document *Environment Agency Land Contamination Risk Management*, which replaced the now-withdrawn *Contaminated Land Report 11 – Model Procedures for the Management of Land Contamination (2004)*.

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

A site inspection, as recommended in BS 5930 and BS 10175, was undertaken on Wednesday 17th January 2024.

The site is centred at Ordnance Survey Co-ordinates 345916E, 392452N and covers approximately 5.62Ha. The site is an irregular shaped parcel of land located at King George V Playing Fields in Prescott.

The site consists of a large grass field with a carpark, pavilion and children's play area in the northwest portion. The site steps down twice to its boundary in the southwest. The field is enclosed by a green fence barrier with access points along its northeast and northwest boundary's. The site is bound by Carr Lane to the southeast, Wood Lane to the northwest and South Avenue to the northeast. Woodland bounds the site in the southeast.

The area under investigation is located just south of Wood Lane and is relatively steps down in topography towards the southeast with evenly surfaced areas of tarmac, concrete as well as unevenly surfaced soft landscaping.

4 FIELDWORK

The fieldwork was carried out in two visits, the first on 17th January 2024, and the second on 28th February 2024. The extent of the investigation was:

- 3no rotary open-hole boreholes (RBH01 to RBH03 inclusive) to a maximum depth of 30.00mbgl.
 - The boreholes were drilled to investigate the presence of shallow historic mine workings.
- 6no small percussive boreholes (WS01 to WS06 inclusive) to a maximum depth of 2.30m below ground level (bgl).
- Gas monitoring wells were installed in WS02 and WS04.
- 1no machine excavated trial pit (TP01) were dug to a maximum depth of 1.83mbgl.
 - In-situ soakaway testing in TP01.
- In-situ testing in the exploratory positions as Standard Penetration Tests (SPTs).
- Retrieval of samples for geotechnical and chemical testing.

The boreholes were backfilled with bentonite/grout and/or monitoring installations upon completion. Trial pits were backfilled in layers with arisings.

A plan showing the location of the boreholes and trial pit can be found in Appendix A (Figure 2).

5 GROUND CONDITIONS

A summary of the ground conditions encountered is given below. The exploratory hole logs are presented in Appendix B.

5.1 Topsoil

Topsoil was noted to be present within RBH01, RBH02, RBH03, TP01, WS02, WS03, WS05 & WS06, and was encountered to depths of between 0.09mbgl (TP01), and 0.20mbgl (RBH01 to RBH03). The topsoil was noted by the onsite engineer to be generally free of deleterious material.

5.2 Made Ground

Made ground was relatively uniform across the site, and was encountered to depths of between 0.50mbgl (WS06) and 1.20mbgl (WS02). The surficial made ground was noted to comprise a mixture of topsoil, tarmacadam, and concrete. Underlying this, the made ground consisted of predominantly granular material of either gravelly sand or sandy gravel, with the gravel constituents comprising sandstone, tile, glass, fabric and mudstone.

5.3 Natural Deposits

Proven to underlie the made ground deposits across the site, natural ground generally comprised granular deposits of medium dense (locally loose) clayey sandy gravel. The supervising engineer noted that subordinate beds of clay were noted within this stratum.

Locally within WS02, a layer of very loose sand was recorded between 1.20mbgl and 1.62mbgl.

Additionally, the drillers recorded boulder clay, which is a colloquial name for glacial till deposits within the rotary open-hole boreholes, however, due to the method of drilling comprising rapid advancement of probe rods, it is likely that this may be considered to comprise a mixture of granular drift and weathered bedrock.

5.4 Solid Geology

Rockhead, generally comprising interbedded sandstone, coal and mudstone, was encountered within the rotary boreholes, and was proven to the maximum termination depth of the boreholes (30.00mbgl).

Rockhead depths ranged from 0.80mbgl (WS06) to 2.30mbgl (WS05).

5.5 Groundwater

No groundwater was encountered within any of the exploratory positions during the intrusive investigation.

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.

6 CONTAMINATION TESTING RESULTS

The site is expected to be developed with new pavilion with associated parking and peripheral soft landscaping. The chemical samples were generally retrieved in line with BS ISO 18400-105:2017 *Soil Quality. Sampling*. The chemical results are presented in Appendix C.

6.1 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 site's history.

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

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

6.2 Contamination Testing and Rationale

To provide information upon the possibility of ground contamination two samples of made ground and two samples of natural material were selected for shallow contamination testing. A Low overall contamination risk was highlighted in the Phase 1 Desk Study due to previous land uses. This coupled with the end use being Public Open Space (Park) means that four samples are considered appropriate for testing. The samples selected are detailed below:

- TP01 – 0.20-0.50m (Made ground – granular)
- WS04 – 0.30-0.40m (Made ground – granular)
- WS05 – 1.00-1.50m (Natural gravel)
- WS03 – 1.00-1.20m (Natural sand)

The samples selected are considered to provide coverage of both the made ground and shallow natural strata from across the site that would be most likely to be exposed during future site works. The samples were tested for the following contaminant suites:

- 4no Metals, semi-metals, non-metals, inorganic determinants
- 4no Asbestos identification screenings
- 4no Speciated Polyaromatic Hydrocarbons (PAHs)
- 4no Total Petroleum Hydrocarbon Criteria Working Group fractions (TPHCWG)

6.3 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 Public Open Space (Park) 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 & 2.

TABLE 1: SUMMARY OF INORGANIC CONTAMINATION TESTING RESULTS

Determinand	Units	Number of Samples above Level of Detection	Minimum Recorded Level	Maximum Recorded Level	Public Open Space (Park)	Number of Results Exceeding Threshold Value
Metals						
Cadmium	mg/kg	2	<0.1	0.3	532	0
Chromium	mg/kg	3	<1	18	33000	0
Copper	mg/kg	3	<0.5	35	44000	0
Lead	mg/kg	3	<0.5	18	1300	0
Mercury	mg/kg	1	<0.1	0.34	240	0
Nickel	mg/kg	3	<0.5	20	3400	0
Zinc	mg/kg	3	<0.5	82	170000	0
Semi metals and non metals						
Arsenic	mg/kg	3	<1	10	170	0
Boron	mg/kg	1	<0.4	0.5	46000	0
Selenium	mg/kg	0	<0.2	-	1800	0
Inorganic chemicals						
Cyanide (Total)	mg/kg	0	<0.5	-	73.8**	0
Sulphate (2:1 Water Soluble)	mg/l	3	<10	34	2000^	0
Other						
pH	pH	-	7.5	8.1	5.5^	0
* Category 4 Screening Levels, March 2014 ** CLEA Software Version 1.06 (pH7 and 1% SOM) ^ EA Threshold Values						

6.4 Metals, Semi Metals and Non Metals

No samples indicated significant raised levels of contamination above the S4UL threshold values, based on the four samples tested.

6.5 Inorganic Chemicals

Soluble sulphates (potentially aggressive to foundation concrete) were recorded between <10 and 34mg/l. None of the samples were elevated above levels affecting human health, or above the BRE Special Digest 1 500mg/l limit for the sulphate classification of concrete.

The results of the pH testing were between 7.5 and 8.1. These pH levels are consistent with slightly alkaline conditions.

6.6 Organic Chemicals

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

The average SOM recorded across the site was 2.80% therefore a SOM of 2.50% 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	Public Open Space (Park) at 2.5% SOM	Number of Results Exceeding Threshold Value
TPH Aliphatic Fractions						
Aliphatic (C5-C6)	mg/kg	0	<1	-	130000	0
Aliphatic (C6-C8)	mg/kg	0	<1	-	220000	0
Aliphatic (C8-C10)	mg/kg	0	<1	-	18000	0
Aliphatic (C10-C12)	mg/kg	0	<1	-	23000	0
Aliphatic (C12-C16)	mg/kg	0	<1	-	25000	0
Aliphatic (C16-C21)	mg/kg	0	<1	-	480000	0
Aliphatic (C21-C35)	mg/kg	0	<1	-	130000	0
TPH Aromatic Fractions						
Aromatic (C5-C7)	mg/kg	0	<1	-	84000	0
Aromatic (C7-C8)	mg/kg	0	<1	-	95000	0
Aromatic (C8-C10)	mg/kg	0	<1	-	8500	0
Aromatic (C10-C12)	mg/kg	0	<1	-	9700	0
Aromatic (C12-C16)	mg/kg	0	<1	-	10000	0
Aromatic (C16-C21)	mg/kg	0	<1	-	7700	0
Aromatic (C21-C35)	mg/kg	0	<1	-	7800	0
Speciated PAH						
Naphthalene	mg/kg	0	<0.1	-	1900	0
Acenaphthylene	mg/kg	0	<0.1	-	30000	0
Acenaphthene	mg/kg	0	<0.1	-	30000	0
Fluorene	mg/kg	0	<0.1	-	20000	0
Phenanthrene	mg/kg	0	<0.1	-	6200	0
Anthracene	mg/kg	0	<0.1	-	150000	0
Fluoranthene	mg/kg	1	<0.1	0.3	6300	0
Pyrene	mg/kg	1	<0.1	0.4	15000	0
Benzo[a]anthracene	mg/kg	0	<0.1	-	56	0
Chrysene	mg/kg	0	<0.1	-	110	0
Benzo[b]fluoranthene	mg/kg	0	<0.1	-	15	0
Benzo[k]fluoranthene	mg/kg	0	<0.1	-	410	0
Benzo[a]pyrene	mg/kg	0	<0.1	-	12	0
Benzo[g,h,i]perylene	mg/kg	0	<0.1	-	1500	0
Dibenz(a,h)Anthracene	mg/kg	0	<0.1	-	1.3	0
Indeno(1,2,3-c,d)Pyrene	mg/kg	0	<0.1	-	170	0
Total PAH	mg/kg	0	<2	-	50*	0
Total Phenol	mg/kg	0	<0.3	-	1500	0
* EA Threshold Values						

No samples indicated raised levels of contamination above the S4UL threshold values, based on the four samples tested.

6.7 Asbestos

No asbestos fibres were recorded in any of the four samples subject to screening.

6.8 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.

7 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 (1.20m)	Ground gas migration - Migration through permeable soils - Inhalation	Future site users Transient adults & infants	Moderate /Low	Gas monitoring in progress, source risk rating subject to change.
		Users during development Construction workers	Low	
Areas of contamination hazardous to human health (Public Open Space (Park) Thresholds) 4no samples tested - No significantly elevated organic determinants - No significantly elevated inorganic determinants - No asbestos recorded	- Inhalation - Dust ingestion - Dermal contact	Future site users Transient adults & infants	Low	Limited availability of contaminants noted within soils analysis.
		Users during development Construction workers	Low	Consideration to be given to Health and Safety Executive: <i>Protection of Workers and the General Public During the Development of Contaminated Land</i> .
	- Inhalation - Dust ingestion	Users of surrounding sites Transient adult workers	Low	Potential low risk during remediation/construction from dust generation. Consideration to be given to dust suppression, in line with BRE: <i>The Control of Dust and Emissions from Construction and Demolition, Best Practice Guidance</i> .
	Leaching mobilised contaminants of	Drift geology Secondary Aquifer, undifferentiated.	Low	The low sensitivity aquifer is not considered to be a sensitive receptor, coupled with limited availability of contaminants within the soils analysis.
		Solid geology Secondary Aquifer – A	Low	Limited availability of contaminants in soil analysis.
	- Drainage - Lateral migration - Accumulation of contaminated sediment of	Surface water features Pond/Brook 76m south	Low	The distant surface water is unlikely to be impacted by the low contamination levels recorded.
Areas of phytotoxic contamination	Uptake via roots and leaf surfaces	Vegetation Peripheral vegetation proposed	Low	Limited availability of contaminants in soil analysis.
Areas of contamination above service fabric or BRE Special Digest 1 thresholds Slightly elevated pH	Direct contact	Construction Materials Concrete	Low	Concrete class DS-1 ACEC Class AC-1s to be used.
		Construction Materials Service Fabric	Moderate /Low	Copper piping to be avoided and prudent to lay any service within a clean bedding.

In general terms, 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, vegetation, and construction materials are considered to be **potentially** at risk from contamination in the soils on site. Controlled waters are considered to be at **potentially less** of a risk.

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

7.1 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 S4UL thresholds based on public open space (park) end use (see Tables 1 and 2).

The new development is expected to comprise new sports pavilion. Based on the **shallow** soil contamination testing, it is considered that the levels of contamination are unlikely to pose a risk to future users of the site.

7.2 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.

Although no significantly elevated levels of contamination were detected, as good practice, full PPE must be employed in accordance with Health and Safety Executive: *Protection of Workers and the General Public During the Development of Contaminated Land* 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. It is considered that such levels of contamination may pose a risk to construction workers and users of surrounding sites.

Although asbestos or other forms of contamination were 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. Works should be undertaken in line with BRE: *The Control of Dust and Emissions from Construction and Demolition, Best Practice Guidance*.

7.3 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 four samples tested.

Any areas of soft landscaping will require a suitable growing medium. Any newly proposed soft landscaped areas should be excavated to 0.50mbgl or natural ground, whichever is shallower. The suitable growing

medium should comprise 200mm topsoil over up to 300mm of subsoil. The suitable growing medium may utilise on-site materials, based on the contamination testing undertaken to date, however, care must be taken to stockpile any excavated material away from any potential sources of contamination. The topsoil and subsoil should be screened of any deleterious materials (i.e. ash, slag, brick rubble and concrete).

7.4 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 made ground of topsoil over river terrace deposits of clayey gravelly sand, with local areas of clay noted. The granular deposits can be considered to have a moderate to high permeability. The drift deposits are designated as a Secondary Aquifer – Undifferentiated by the Environment Agency.

The published geology indicates the site is underlain by solid geology of Pennine Lower Measures Formation, which is designated as a Secondary Aquifer - A by the Environment Agency. Rockhead was encountered at depths of between 0.80mbgl and 2.30mbgl.

The nearest surface water feature is a pond/brook located 76m site of the site.

No groundwater was recorded during the intrusive investigation.

No significant levels of contamination was recorded based on the four samples tested.

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

7.5 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.

7.5.1 Concrete Classification

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-1s) requirements for concrete protection. This assumes static groundwater conditions.

7.5.2 Water Supply Pipes Material Selection

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 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.

Based on the samples tested during the site investigation, levels of neutral to slightly alkaline pH (7.0 to 8.1) were recorded across the site natural samples.

The concentrations of the selected determinants should be compared to the pipe material selection table in

Appendix E, and consultation with the appropriate utility supply company is required to identify the most suitable service fabric. However, the pH levels may preclude the use of copper pipes depending on the depth of proposed service corridors.

7.6 Unexpected Contamination

If during the initial site strip or subsequent ongoing construction activities, any zones of odorous, brightly coloured or suspected contaminated ground are encountered, then the following procedure should be followed:

- Stop work in the affected area
- Contact Solmek and provide pictures of the affected area
- Solmek can visit site to investigate the material and provide guidance
- If required – Solmek can sample and test the material
- Once test results are returned, this will determine whether or not remediation will be required

7.7 Waste Classification

During the site strip and construction activities, material may be required to be removed from site. Any such material would require classification, in line with Environment Agency Technical Guidance *Waste Classification: Guidance on the classification and assessment of waste* (2015). This would classify the material as either Non-Hazardous or Hazardous Waste.

Once the material has been classified, determining the suitable landfill for disposal is governed by landfill directive Waste Acceptance Criteria (WAC) testing, with landfills categorized as Inert Waste, Stable Non-Reactive Hazardous Waste and Hazardous Waste.

If waste classification and/or WAC testing are not undertaken, material taken off site may be subject to WAC testing by the appropriate waste disposal company. The decision on whether or not to accept waste, or whether further testing is required, is at the discretion of the waste disposal company.

For this project, Waste Classification has not been requested by the client.

Solmek note that tarmac was locally present across the site which has not been tested – the client may wish to consider subjecting select tarmac samples to coal tar testing, to determine whether coal tar is present within the material. Should coal tar be present, it may require disposal as hazardous waste.

8 GROUND GAS ASSESSMENT

The proposed development includes the construction of a sports pavilion.

Ground gases such as carbon dioxide (CO₂), methane (CH₄), 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 two standpipes (WS02 & WS04) 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.

9 GEOTECHNICAL TESTING AND ANALYSIS

Samples taken from the boreholes and trial pits underwent a series of geotechnical tests at a UKAS accredited laboratory to aid foundation design and soil description. In addition, in-situ Standard Penetration Tests (SPTs) were undertaken at regular intervals during drilling. The geotechnical results are presented in Appendix D.

9.1 Strength and Density

9.1.1 SPT N Values

Standard Penetration Tests undertaken within the natural granular deposits yielded N values of between 3 and 18, indicative of very loose to medium dense deposits.

Additional SPTs within inferred bedrock recorded N values of 50+ (refusal).

9.2 Moisture Contents

Four samples have been subject to moisture content tests to determine the moisture profile. Moisture levels were between 8.6% and 30%.

9.3 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 silts and clays of low to intermediate plasticity.

The Plasticity Indices ranged from 6 to 15 with moisture contents recorded above and below the corresponding plastic limits. Although it is noted to be limited within the drift deposits, the cohesive material can be assessed as having a **low** shrinkage potential in relation to current relevant guidance.

9.4 Particle Size Distribution and Sedimentation Testing

Two samples 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.

9.5 pH and Sulphate Results

Four samples 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 7.0 to 7.8 indicating neutral to slightly alkaline conditions. Soluble sulphates were recorded at levels ranging from 12mg/l to 36mg/l.

9.6 Percolation Tests

One percolation test was carried out within the base of TP01. The soakaway failed to drain away.

Given the results encountered and the significant thickness of low permeability cohesive deposits, soakaway drainage may not be suitable for the proposed development. The results are presented in Appendix D.

9.7 Mining Assessment

The ten times seam thickness rule states that where competent rock exceeds ten times the extracted seam thickness, then no major crown holing should occur at the surface (Structural Foundations Manual; M. F. Atkinson, *Spon Press* 2003). If the competent rock cover is less than ten times the extracted seam thickness, then recommendations suggest the workings must be grouted using a mixture of pulverised fuel ash (PFA) and cement placed into the area under pressure.

Multiple situations may mean a ratio in excess of 10x seam thickness is required to prevent crown hole collapse, including but not exclusive to; steeply dipping strata, presence of groundwater, a high extraction ratio noted, and multiple seam extractions underlying the site (CIRIA C758D, Table 5.1). Additionally, weak basement rock underlying the workings has potential to cause a separate collapse mechanism via pillars sinking.

Conversely, there are scenarios where the acceptable cover criterion may be decreased from 10x seam thickness, these include where a rigid non-degradable roof strata is present to stop the upward void migration and where low residual voidage is proven either via infilling or extensive collapse (CIRIA C758D, Table 5.1).

For certain developments, a ratio of less than 10x may be addressed via bridging techniques i.e. utilising raft foundations, however this would be dependent on approval from the regulatory authorities.

Table 4 below shows a summary of the ground conditions encountered within the rotary boreholes drilled to date highlighting possible mining related information.

TABLE 4: SOLID GEOLOGY SUMMARY

Borehole Reference	Depth of coal/possible workings (mbgl)	Thickness of coal/void	Flush Returns (%)	Overlying Solid Geology Thickness (m)	Remarks
RBH01	4.20-4.40	0.20	100	2.60	Intact coal
	18.10-18.80	0.70		16.50	
RBH02	8.10-8.50	0.40	100	6.70	Intact coal
RBH03	7.30-7.70	0.40	100	5.40	Intact coal

Based on the geological plans, the site is expected to be underlain by the Sir John Mine seam.

There was no loss of flush, voids, nor other evidence that the seam encountered during drilling has been worked based on the 3no rotary boreholes drilled.

9.8 Foundations

9.8.1 Conventional Foundations upon Granular Deposits

SPT results in the granular deposits indicate densities ranging from loose to medium dense, with a localised pocket of extremely loose sand recorded within WS02 between 1.20 – 1.62mbgl. The sand deposits which are locally present on site are likely unsuitable for shallow foundations, however, the underlying gravel deposits are considered to be an appropriate founding stratum.

It is recommended that foundations in gravel be placed at a minimum depth of 0.60mbgl. However, as made ground, and very loose sand deposits have been noted to depths greater than this, consideration should be given to either deepening the foundations in their entirety, or locally stepping the foundations to ensure they are placed upon a competent strata. Where stepped, the foundations should be reinforced in line with current guidance.

Using an SPT N Value of 9, for strip foundations 0.60m wide at 0.60mbgl, an allowable bearing pressure of 100kN/m² is recommended in order to achieve settlements of less than 25mm.

Foundations on natural granular soils should be placed at a minimum depth for 0.55m. However, where shrinkable clay is present below granular soils, the depth of the granular soils layer must be greater than $\frac{3}{4}$ of the depth which would be appropriate if founding in the shrinkable clay. In addition, the thickness of granular soil below the base of the foundation must be equal to or greater than the foundation width.

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

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.

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

9.9 Groundwater

No groundwater was encountered during the intrusive investigation.

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. Therefore, water levels significantly higher than those found during this investigation may be encountered.

SOLMEK

Appendix A



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

Figure Title

Site Location Plan

Project Number

M24-004

Project Name

King George V Playing Fields, Prescot

Client

Steve Wells Associates Ltd

Date

March 2024

DRG Number

Figure 1

Scale

1:10000 @ A4 [DO NOT SCALE]

Legend Key

 Project Bounds - Project Bounds



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

Figure Title

Exploratory Hole Location Plan

Project Number

M24-004

Project Name

King George V Playing Fields, Prescott

Client

Steve Wells Associates Ltd

Date

March 2024

DRG Number

Figure 2

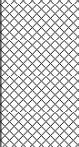
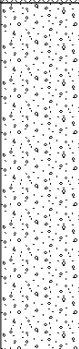
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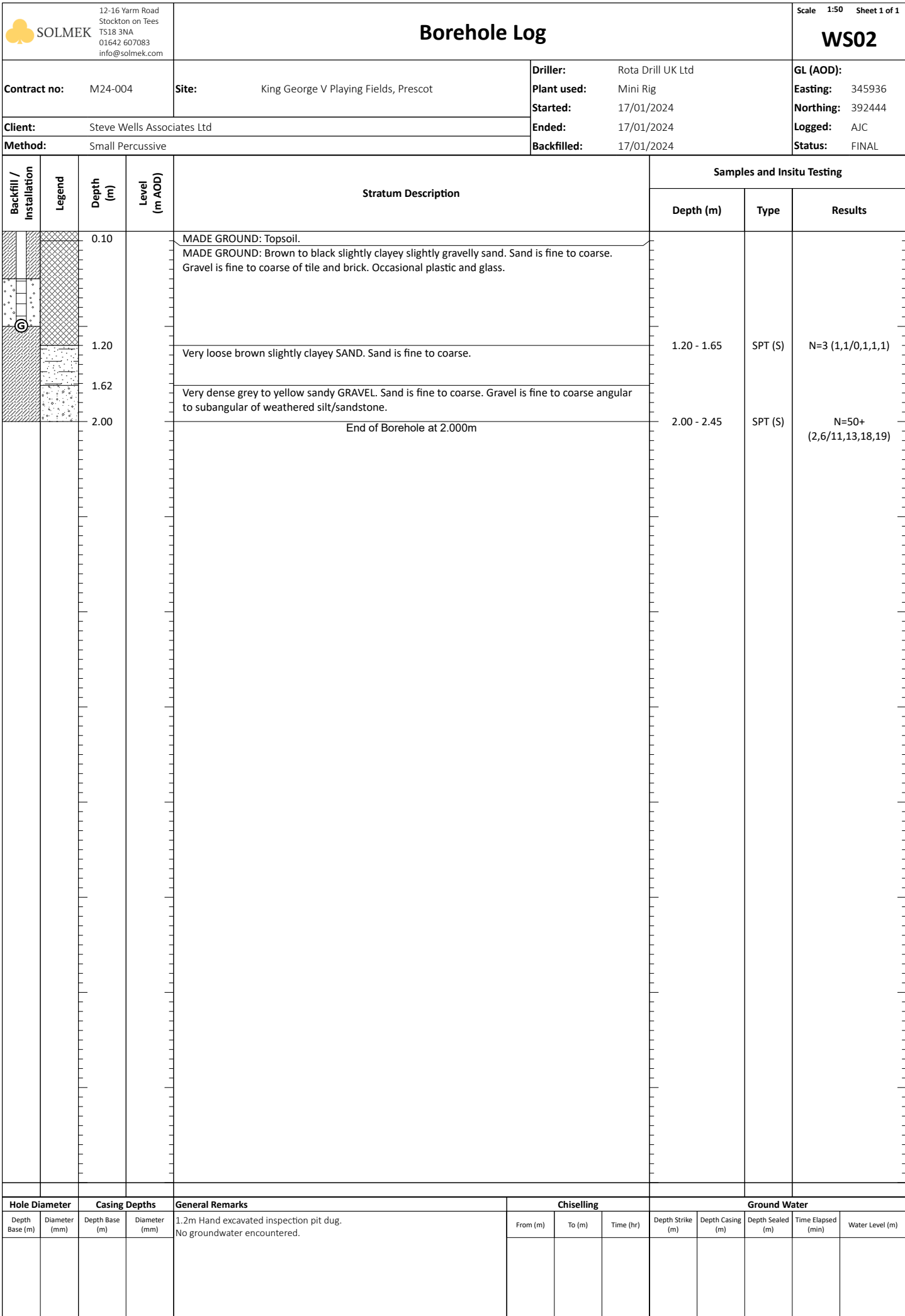
1:1000 @ A4 [DO NOT SCALE]

Legend Key

- Locations By Type - Empty
- ◆ Locations By Type - BH
- Locations By Type - RO
- Locations By Type - TP
- ▭ Project Bounds - Project Bounds

Appendix B

 SOLMEK Solmek Ltd 12-16 Yarm Road Stockton on Tees TS18 3NA Tel: 01642 607083 Email: info@solmek.com				Trial Pit Log				TrialPit No TP01 Sheet 1 of 1	
Project Name: King George V Playing Fields, Prescott				Project No. M24-004		Co-ords: 345998E - 392377N Level:		Date 17/01/2024	
Plant Used: JCB				Client: Steve Wells Associates Ltd		Dimensions (m): 1.70		Scale 1:26	
		Depth 1.82				Logged AJC			
Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
	Depth	Type	Results						
	0.10 - 0.50	B+ES		0.09			TOPSOIL with frequent roots.		1
			0.62			MADE GROUND: Brown slightly clayey slightly gravelly SAND. Sand is fine to coarse. Gravel is fine to coarse subangular to angular of mudstone and tile.			
1.00 - 1.23	B+ES					Grey brown SAND & GRAVEL. Gravel is fine to coarse angular of siltstone and mudstone. Small to medium cobbles angular of mudstone and siltstone.			
1.62 - 1.80	B+ES		1.82		End of Pit at 1.820m				
Remarks: No groundwater encountered.									
Stability: Pit wall very stable.									



 12-16 Yarm Road Stockton on Tees TS18 3NA 01642 607083 info@solmek.com		Borehole Log					Scale 1:50 Sheet 1 of 1							
Contract no: M24-004		Site: King George V Playing Fields, Prescot			Driller: Rota Drill UK Ltd		GL (AOD):							
					Plant used: Mini Rig		Easting: 345923							
Client: Steve Wells Associates Ltd					Started: 17/01/2024		Northing: 392463							
Method: Small Percussive					Ended: 17/01/2024		Logged: AJC							
					Backfilled: 17/01/2024		Status: FINAL							
Backfill / Installation	Legend	Depth (m)	Level (m AOD)	Stratum Description	Samples and Insitu Testing									
					Depth (m)	Type	Results							
   		0.10		MADE GROUND: Topsoil. MADE GROUND: Brown black slightly clayey slightly gravelly sand. Sand is fine to coarse. Gravel is fine to coarse of tile and brick. Occasional plastic and glass.										
		1.00		Medium dense grey to yellow sandy GRAVEL. Sand is fine to coarse. Gravel is fine to coarse angular to subangular of weathered silt/sandstone.	1.00 - 1.50 1.20 - 1.65	B+ES SPT (S)	N=12 (2,3/3,3,3,3)							
		2.30		Terminated due to refusal on inferred rockhead.	2.00 - 2.45	SPT (S)	N=17 (2,5/4,4,4,5)							
		2.30		End of Borehole at 2.300m										
Hole Diameter		Casing Depths		General Remarks			Chiselling			Ground Water				
Depth Base (m)	Diameter (mm)	Depth Base (m)	Diameter (mm)	1.2m Hand excavated inspection pit dug. No groundwater encountered.			From (m)	To (m)	Time (hr)	Depth Strike (m)	Depth Casing (m)	Depth Sealed (m)	Time Elapsed (min)	Water Level (m)

 SOLMEK 12-16 Yarm Road Stockton on Tees TS18 3NA 01642 607083 info@solmek.com				Rotary Open Hole Log							Scale 1:150 Sheet 1 of 1				RBH01	
Contract no: M24-004				Site: King George V Playing Fields, Prescott				Driller: ID Drilling Ltd Plant used: MI3 Started: 28/02/2024 Ended: 28/02/2024 Backfilled: 28/02/2024				GL (AOD): Easting: 345921.83 Northing: 392467.36 Logged: AJC Status: FINAL				
Client: Steve Wells Associates Ltd																
Method: Rotary open Hole																
Backfill / Installation	Legend	Depth (m)	Level (m AOD)	Stratum Description	Samples and Insitu Testing			Coring / Fractures								
					Depth (m)	Type	Results	TCR (%)	SCR (%)	RQD (%)	Fracture					
		0.20		TOPSOIL. (Driller's description).												
				Boulder CLAY. (Driller's description).												
		1.60		Weathered SANDSTONE. (Driller's description).												
		4.20		COAL. (Driller's description).												
		4.40		MUDSTONE. (Driller's description).												
		18.10		COAL. (Driller's description).												
		18.80		MUDSTONE. (Driller's description).												
			30.00		End of Borehole at 30.000m											
Hole Diameter		Casing Depths		General Remarks				Flush Returns		Ground Water						
Depth Base (m)	Diameter (mm)	Depth Base (m)	Diameter (mm)	1.20m Hand excavated inspection pit dug. No groundwater encountered.				From (m)	To (m)	Flush Type	Flush (%)	Depth Strike (m)	Depth Casing (m)	Depth Sealed (m)	Time Elapsed (min)	Water Level (m)
								1.20	30.00	Water	100					



Rotary Open Hole Log

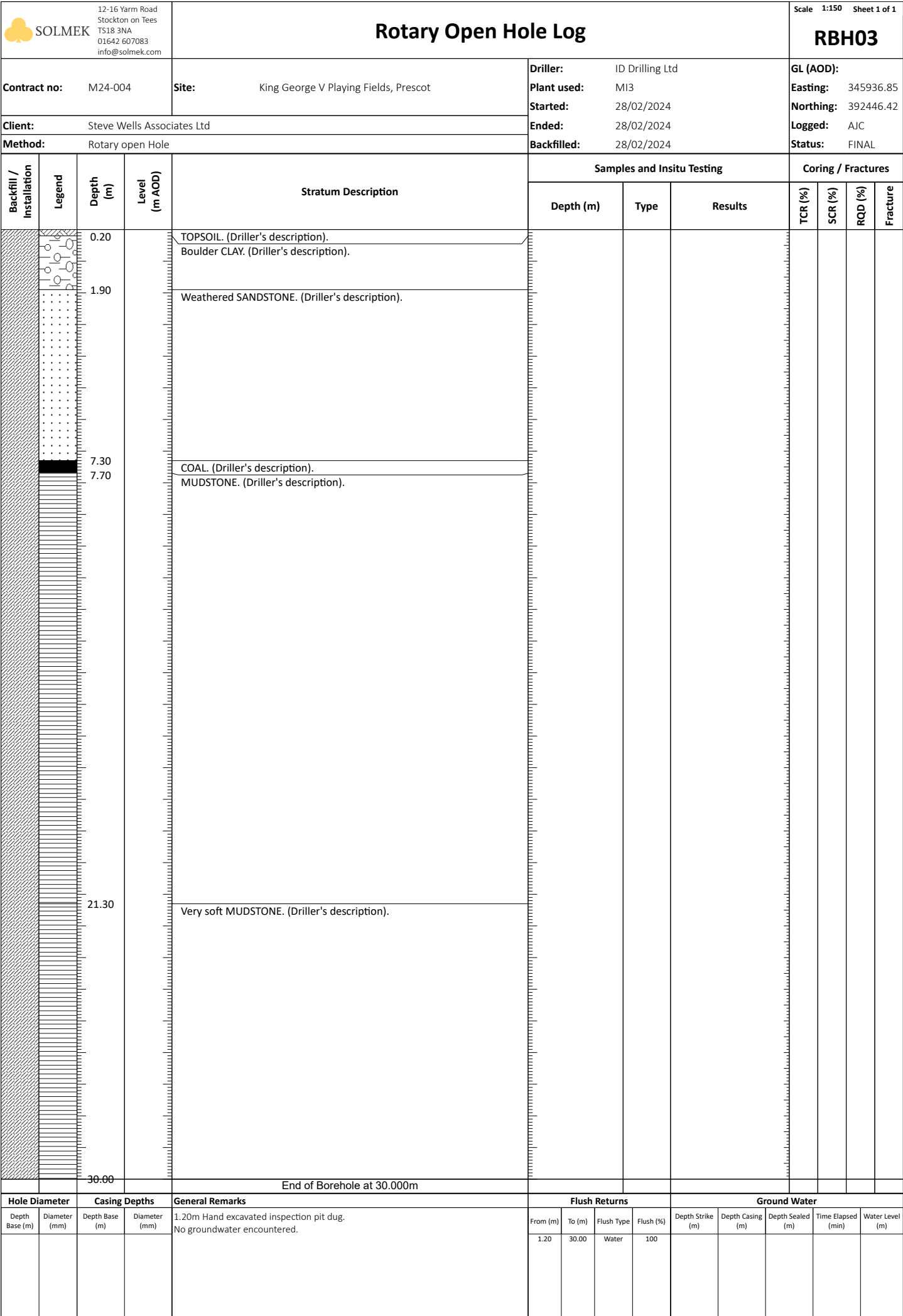
RBH02

Site: King George V Playing Fields, Prescott

GL (AOD):	
Easting:	345910.76
Northing:	392446.86
Logged:	AJC
Status:	FINAL

Method:	Rotary open Hole
----------------	------------------

Hole Diameter		Casing Depths		General Remarks	Flush Returns				Ground Water				
Depth Base (m)	Diameter (mm)	Depth Base (m)	Diameter (mm)		From (m)	To (m)	Flush Type	Flush (%)	Depth Strike (m)	Depth Casing (m)	Depth Sealed (m)	Time Elapsed (min)	Water Level (m)
				1.20m Hand excavated inspection pit dug. No groundwater encountered.	1.20	30.00	Water	100					



Appendix C



Certificate of Analysis

Certificate Number 24-02072

Issued: 07-Feb-24

Client SOLMEK
12 Yarm Road
Stockton On Tees
Cleveland
TS18 3NA

Our Reference 24-02072

Client Reference M24-004

Order No MID-0157

Contract Title KVG BROWNS FIELD, PRESCOT

Description 4 Soil samples.

Date Received 01-Feb-24

Date Started 01-Feb-24

Date Completed 07-Feb-24

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

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

Approved By

A handwritten signature in black ink, appearing to read "K. Bridgewood".

Kirk Bridgewood
General Manager





Summary of Chemical Analysis

Matrix Descriptions

Our Ref 24-02072

Client Ref M24-004

Contract Title KVG BROWNS FIELD, PRESCOT

Sample ID	Depth	Lab No	Completed	Matrix Description
TP01	0.20-0.50	2293779	07/02/2024	Brown gravelly, sandy CLAY
WS4	0.30-0.40	2293780	07/02/2024	Brown very gravelly, sandy CLAY
WS05	1.00-1.50	2293781	07/02/2024	Brown very gravelly SAND
WS03	1.00-1.20	2293782	07/02/2024	Brown gravelly, sandy CLAY

Summary of Chemical Analysis

Soil Samples

Our Ref 24-02072

Client Ref M24-004

Contract Title KVG BROWNS FIELD, PRESCOT

Lab No	2293779	2293780	2293781	2293782
Sample ID	TP01	WS4	WS05	WS03
Depth	0.20-0.50	0.30-0.40	1.00-1.50	1.00-1.20
Other ID				
Sample Type	ES	ES	ES	ES
Sampling Date	19/01/2024	19/01/2024	19/01/2024	19/01/2024
Sampling Time	n/s	n/s	n/s	n/s

Test	Method	LOD	Units				
Metals							
Arsenic	DETSC 2301#	0.2	mg/kg	< 0.2	9.5	10	8.1
Boron, Water Soluble (2.5:1)	DETSC 2311#	0.2	mg/kg	0.5	< 0.2	0.2	0.2
Cadmium	DETSC 2301#	0.1	mg/kg	< 0.1	0.1	0.3	0.2
Chromium	DETSC 2301#	0.15	mg/kg	< 0.15	11	9.6	18
Copper	DETSC 2301#	0.2	mg/kg	< 0.2	12	18	35
Lead	DETSC 2301#	0.3	mg/kg	< 0.3	12	18	10
Mercury	DETSC 2325#	0.05	mg/kg	0.34	< 0.05	< 0.05	< 0.05
Nickel	DETSC 2301#	1	mg/kg	< 1.0	17	16	20
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Zinc	DETSC 2301#	1	mg/kg	< 1.0	69	71	82
Inorganics							
pH	DETSC 2008#		pH	7.9	8.1	7.5	7.5
Cyanide, Free	DETSC 2130#	0.1	mg/kg	0.1	< 0.1	< 0.1	< 0.1
Organic matter	DETSC 2002#	0.1	%	7.0	1.5	2.3	0.4
Sulphate Aqueous Extract as SO4 (2:1)	DETSC 2076#	10	mg/l	34	16	< 10	15
Petroleum Hydrocarbons							
Aliphatic C5-C6: HS_1D_AL	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C6-C8: HS_1D_AL	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C8-C10: HS_1D_AL	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C10-C12: EH_CU_1D_AL	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5
Aliphatic C12-C16: EH_CU_1D_AL	DETSC 3072#	1.2	mg/kg	< 1.2	< 1.2	< 1.2	< 1.2
Aliphatic C16-C21: EH_CU_1D_AL	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5
Aliphatic C21-C35: EH_CU_1D_AL	DETSC 3072#	3.4	mg/kg	< 3.4	< 3.4	< 3.4	< 3.4
Aliphatic C5-C35: EH_CU+HS_1D_AL	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	< 10
Aromatic C5-C7: HS_1D_AR	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C7-C8: HS_1D_AR	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C8-C10: HS_1D_AR	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C10-C12: EH_CU_1D_AR	DETSC 3072#	0.9	mg/kg	< 0.9	< 0.9	< 0.9	< 0.9
Aromatic C12-C16: EH_CU_1D_AR	DETSC 3072#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Aromatic C16-C21: EH_CU_1D_AR	DETSC 3072#	0.6	mg/kg	< 0.6	< 0.6	< 0.6	< 0.6
Aromatic C21-C35: EH_CU_1D_AR	DETSC 3072#	1.4	mg/kg	< 1.4	< 1.4	< 1.4	< 1.4
Aromatic C5-C35: EH_CU+HS_1D_AR	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	< 10
TPH Ali/Aro Total C5-C35: EH_CU+HS_1D_Total	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	< 10
PAHs							
Naphthalene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthylene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Fluorene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Phenanthrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1

Summary of Chemical Analysis Soil Samples

Our Ref 24-02072

Client Ref M24-004

Contract Title KVG BROWNS FIELD, PRESCOT

Lab No	2293779	2293780	2293781	2293782
Sample ID	TP01	WS4	WS05	WS03
Depth	0.20-0.50	0.30-0.40	1.00-1.50	1.00-1.20
Other ID				
Sample Type	ES	ES	ES	ES
Sampling Date	19/01/2024	19/01/2024	19/01/2024	19/01/2024
Sampling Time	n/s	n/s	n/s	n/s

Test	Method	LOD	Units				
Fluoranthene	DETSC 3301	0.1	mg/kg	0.3	< 0.1	< 0.1	< 0.1
Pyrene	DETSC 3301	0.1	mg/kg	0.4	< 0.1	< 0.1	< 0.1
Benzo(a)anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Chrysene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(b)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(k)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(a)pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Indeno(1,2,3-c,d)pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Dibenzo(a,h)anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(g,h,i)perylene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
PAH 16 Total	DETSC 3301	1.6	mg/kg	< 1.6	< 1.6	< 1.6	< 1.6
Phenols							
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3

Summary of Asbestos Analysis Soil Samples

Our Ref 24-02072

Client Ref M24-004

Contract Title KVG BROWNS FIELD, PRESCOT

Lab No	Sample ID	Material Type	Result	Comment*	Analyst
2293779	TP01 0.20-0.50	SOIL	NAD	none	Lee Kerridge
2293780	WS4 0.30-0.40	SOIL	NAD	none	Lee Kerridge
2293781	WS05 1.00-1.50	SOIL	NAD	none	Lee Kerridge
2293782	WS03 1.00-1.20	SOIL	NAD	none	Lee Kerridge

Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETSC 1101 using polarised light microscopy in accordance with HSG248 and documented in-house methods. NAD = No Asbestos Detected. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'. Key: * - not included in laboratory scope of accreditation.

Information in Support of the Analytical Results

Our Ref 24-02072
 Client Ref M24-004
 Contract KVG BROWNS FIELD, PRESCOT

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
2293779	TP01 0.20-0.50 SOIL	19/01/24	GJ 250ml, PT 1L	pH + Conductivity (7 days)	BTEX / C5-C10
2293780	WS4 0.30-0.40 SOIL	19/01/24	GJ 250ml, PT 1L	pH + Conductivity (7 days)	BTEX / C5-C10
2293781	WS05 1.00-1.50 SOIL	19/01/24	GJ 250ml, PT 1L	pH + Conductivity (7 days)	BTEX / C5-C10
2293782	WS03 1.00-1.20 SOIL	19/01/24	GJ 250ml, PT 1L	pH + Conductivity (7 days)	BTEX / C5-C10

Key: G-Glass P-Plastic J-Jar T-Tub

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

Soil Analysis Notes

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

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

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

Disposal

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

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

Information in Support of the Analytical Results

List of HWOL Acronyms and Operators

Acronym	Description
HS	Headspace analysis
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent
CU	Clean-up - e.g. by florisil, silica gel
1D	GC - Single coil gas chromatography
2D	GC-GC - Double coil gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics only
AR	Aromatics only
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +)
+	Operator to indicate cumulative eg. EH+HS_Total or EH_CU+HS_Total

Det

Aliphatic C5-C6

Acronym

HS_1D_AL

Appendix A - Details of Analysis

Method	Parameter	Units	Limit of Detection	Sample Preparation	Sub-Contracted	UKAS	MCERTS
DETSC 2002	Organic matter	%	0.1	Air Dried	No	Yes	Yes
DETSC 2003	Loss on ignition	%	0.01	Air Dried	No	Yes	Yes
DETSC 2008	pH	pH Units	1	Air Dried	No	Yes	Yes
DETSC 2076	Sulphate Aqueous Extract as SO ₄	mg/l	10	Air Dried	No	Yes	Yes
DETSC 2084	Total Organic Carbon	%	0.5	Air Dried	No	Yes	Yes
DETSC 2119	Ammoniacal Nitrogen as N	mg/kg	0.5	Air Dried	No	Yes	Yes
DETSC 2130	Cyanide free	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC 2130	Cyanide total	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC 2130	Phenol - Monohydric	mg/kg	0.3	Air Dried	No	Yes	Yes
DETSC 2130	Thiocyanate	mg/kg	0.6	Air Dried	No	Yes	Yes
DETSC 2301	Arsenic	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC 2301	Barium	mg/kg	1.5	Air Dried	No	Yes	Yes
DETSC 2301	Beryllium	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC 2301	Cadmium Available	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC 2301	Cadmium	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC 2301	Cobalt	mg/kg	0.7	Air Dried	No	Yes	Yes
DETSC 2301	Chromium	mg/kg	0.15	Air Dried	No	Yes	Yes
DETSC 2301	Copper	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC 2301	Manganese	mg/kg	20	Air Dried	No	Yes	Yes
DETSC 2301	Molybdenum	mg/kg	0.4	Air Dried	No	Yes	Yes
DETSC 2301	Nickel	mg/kg	1	Air Dried	No	Yes	Yes
DETSC 2301	Lead	mg/kg	0.3	Air Dried	No	Yes	Yes
DETSC 2301	Selenium	mg/kg	0.5	Air Dried	No	Yes	Yes
DETSC 2301	Zinc	mg/kg	1	Air Dried	No	Yes	Yes
DETSC 2311	Boron (water soluble)	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC 2321	Total Sulphate as SO ₄	%	0.01	Air Dried	No	Yes	Yes
DETSC 2325	Mercury	mg/kg	0.05	Air Dried	No	Yes	Yes
DETSC 3049	Sulphur (free)	mg/kg	0.75	As Received	No	Yes	Yes
DETSC 3072	Ali/Aro C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C10-C12	mg/kg	1.5	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C12-C16	mg/kg	1.2	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C16-C21	mg/kg	1.5	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C21-C35	mg/kg	3.4	As Received	No	Yes	Yes
DETSC 3072	Aromatic C10-C12	mg/kg	0.9	As Received	No	Yes	Yes
DETSC 3072	Aromatic C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C12-C16	mg/kg	0.5	As Received	No	Yes	Yes
DETSC 3072	Aromatic C16-C21	mg/kg	0.6	As Received	No	Yes	Yes
DETSC 3072	Aromatic C21-C35	mg/kg	1.4	As Received	No	Yes	Yes
DETSC 3303	Acenaphthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Acenaphthylene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(a)pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(a)anthracene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(b)fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(k)fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(g,h,i)perylene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Dibenzo(a,h)anthracene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes

Appendix A - Details of Analysis

Method	Parameter	Units	Limit of Detection	Sample Preparation	Sub-Contracted	UKAS	MCERTS
DETSC 3303	Indeno(1,2,3-c,d)pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Naphthalene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Phenanthrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3311	C10-C24 Diesel Range Organics (DRO)	mg/kg	10	As Received	No	Yes	Yes
DETSC 3311	C24-C40 Lube Oil Range Organics (LORO)	mg/kg	10	As Received	No	Yes	Yes
DETSC 3311	EPH (C10-C40)	mg/kg	10	As Received	No	Yes	Yes
DETSC 3321	Benzene	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3321	Ethylbenzene	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3321	Toluene	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3321	Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3321	m+p Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3321	o Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 28 + PCB 31	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 52	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 101	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 118	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 153	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 138	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 180	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB Total	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3521	Ali/Aro C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3521	Aliphatic C10-C12	mg/kg	1.5	As Received	No	Yes	Yes
DETSC 3521	Aliphatic C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3521	Aliphatic C12-C16	mg/kg	1.2	As Received	No	Yes	Yes
DETSC 3521	Aliphatic C16-C21	mg/kg	1.5	As Received	No	Yes	Yes
DETSC 3521	Aliphatic C21-C35	mg/kg	3.4	As Received	No	Yes	Yes
DETSC 3521	Aromatic C10-C12	mg/kg	0.9	As Received	No	Yes	Yes
DETSC 3521	Aromatic C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3521	Aromatic C12-C16	mg/kg	0.5	As Received	No	Yes	Yes
DETSC 3521	Aromatic C16-C21	mg/kg	0.6	As Received	No	Yes	Yes
DETSC 3521	Aromatic C21-C35	mg/kg	1.4	As Received	No	Yes	Yes

Method details are shown only for those determinands listed in Annex A of the MCERTS standard. Anything not included on this list falls outside the scope of MCERTS. No Recovery Factors are used in the determination of results. Results reported assume 100% recovery. Full method statements are available on request.

End of Report

Appendix D

Laboratory Report Front Sheet		G2M Testing (Stockton) 12-16 Yarm Road, Stockton on Tees, TS18 3NA 01642 033318 info@g2mtesting.co.uk	 10258
Site name	Job number		
KVG Browns Field, Prescot	M24-004		

Client details:

Reference: M24-004
 Name: Solmek
 Address: 12 Yarm Road,
 Stockton-on-tees,
 TS18 3NA

Telephone: 01642 607083
 Email: acrane@solmek.com

FAO: Archie Crane

Samples received:

Date commenced: 01/02/2024

Date reported: 23/02/2024

Observations and interpretations are outside of the UKAS Accreditation

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

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

Signature:	Approved Signatories:
	☐ D.Anderson (Managing Director) ☒ J. Brischuk (Laboratory Manager) ☐

Summary of Classification Tests

G2M Testing (Stockton)

12-16 Yarm Road,
Stockton on Tees,
TS18 3NA

01642 033318

info@g2mtesting.co.uk



10258

Site name

Job number

KVG Browns Field, Prescott

M24-004

[illegible]

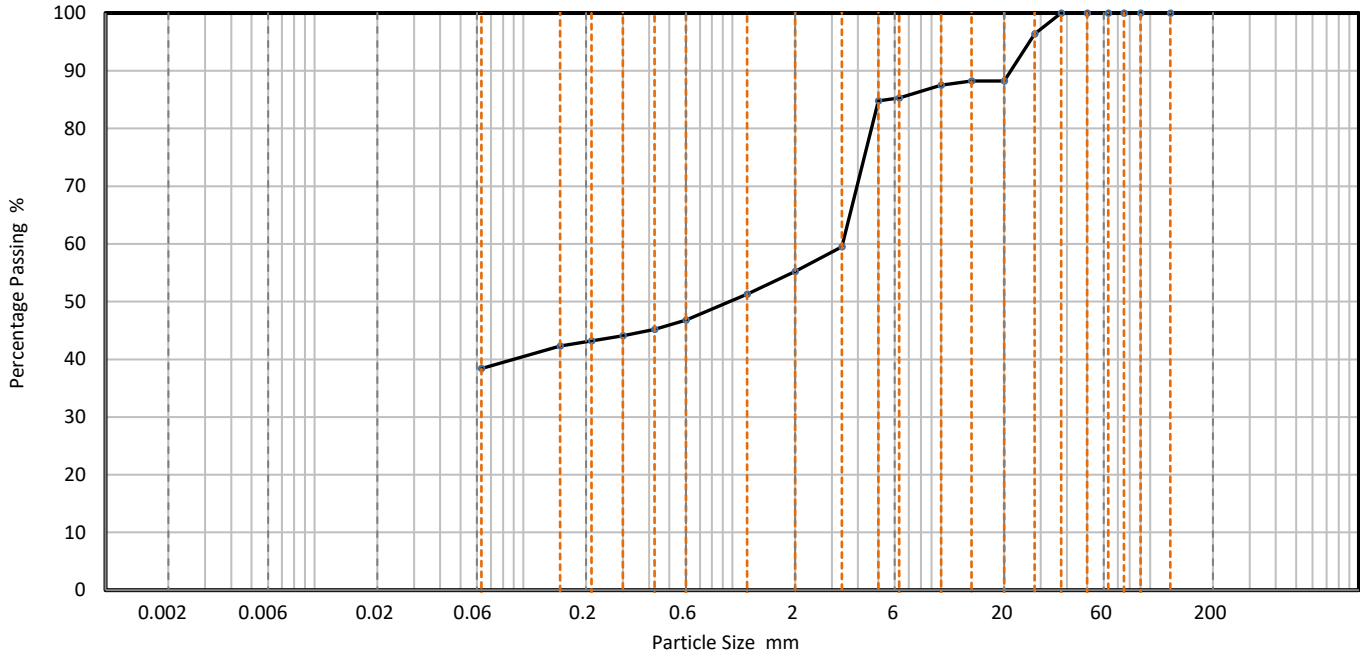
All tests found in G2M Testing UKAS Schedule of Accreditation are tested to standard unless otherwise indicated

Key	Description	Category	BS Test Code
w	Moisture content		BS 1377:1990 Part 2 Clause 3.2
wa	Equivalent moisture content passing 425µm sieve		BS 1377:1990 Part 2 Clause 3.2
wL	Liquid limit Single point Four point	-s	BS 1377:1990 Part 2 Clause 4.4
		-f	BS 1377:1990 Part 2 Clause 4.3
wP	Plastic limit		BS 1377:1990 Part 2 Clause 5.2
Pa	Percentage passing 425um sieve		
Pr	Percentage retained 425um sieve		
IP	Plasticity index		BS 1377:1990 Part 2 Clause 5.4
IL	Liquidity index		BS 1377:1990 Part 2 Clause 5.4
	Suffix indicating test is "Not UKAS Accredited"	*	

Approved by	D Anderson
Approval date	20/02/2024 13:39
Date report generated	
Report Number	

PARTICLE SIZE DISTRIBUTION		G2M Testing (Stockton) 12-16 Yarm Road, Stockton on Tees, TS18 3NA 01642 033318 info@g2mtesting.co.uk	 10258
Site name		Job number	
KVG Browns Field, Prescot		M24-004	

Hole		TP01	Lab sample ID	G2MT2024020130
Depth (Top)	m	1.62	Test Method	BS 1377 - 2 : 1990 Clause 9.2
Depth (Base)	m		Soil Description	Sandy, very Clayey, GRAVEL
Sample type		B		



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

Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	96		
20	88		
14	88		
10	88		
6.3	85		
5	85		
3.35	60		
2	55		
1.18	51		
0.6	47		
0.425	45		
0.3	44		
0.212	43		
0.15	42		
0.063	38		

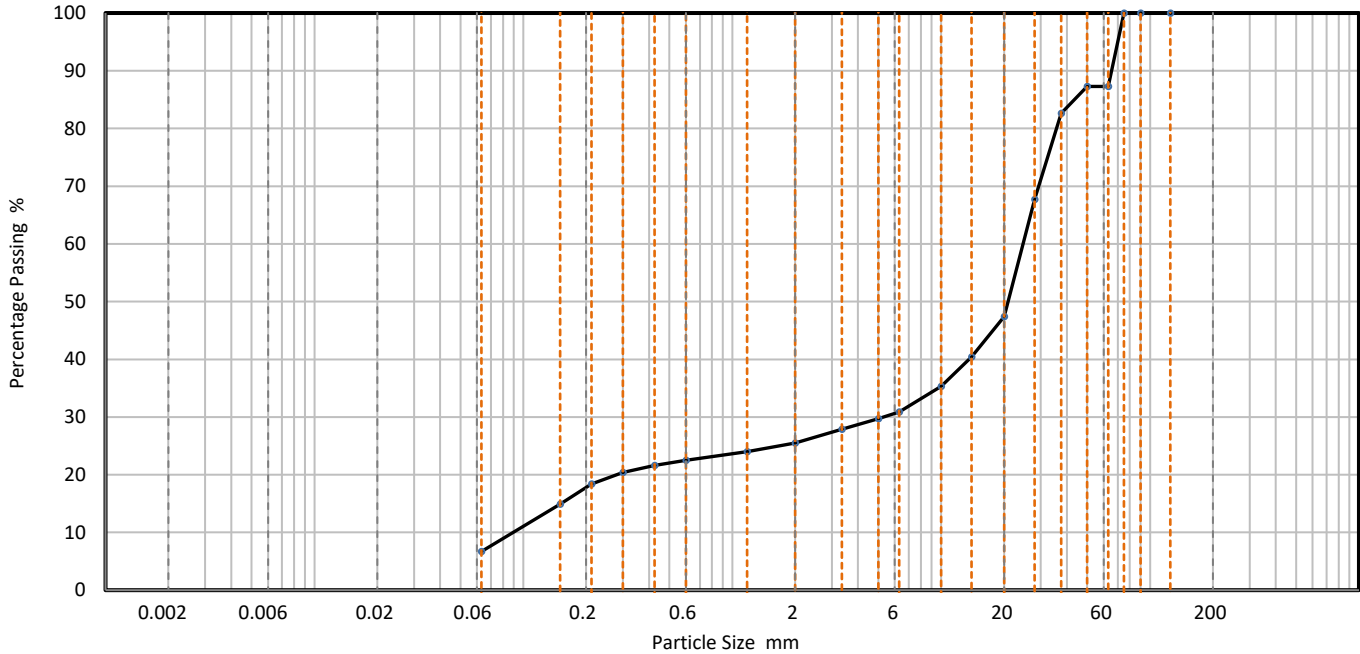
Dry Mass of sample, g	5086	
Sample Proportions	% dry mass	
Very coarse	0.0	
Gravel	44.8	
Sand	16.8	
Fines <0.063mm	38.0	
Grading Analysis		
D100	mm	
D60	mm	3.38
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		
Remarks	Preparation and testing in accordance with test method unless noted below	

Accreditation status
Hydrometer is the usual Sedimentation method carried out by G2M Testing and is part of the G2M Testing UKAS accreditation schedule.

Approved by	D Anderson
Approval date	09/02/2024 14:07

PARTICLE SIZE DISTRIBUTION		G2M Testing (Stockton) 12-16 Yarm Road, Stockton on Tees, TS18 3NA 01642 033318 info@g2mtesting.co.uk	 10258
Site name		Job number	
KVG Browns Field, Prescot		M24-004	

Hole		WS04	Lab sample ID	G2MT2024020131
Depth (Top)	m	0.50	Test Method	BS 1377 - 2 : 1990 Clause 9.2
Depth (Base)	m		Soil Description	Slightly Clayey, Cobbly, Sandy, GRAVEL
Sample type		B		



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

Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	87		
50	87		
37.5	83		
28	68		
20	47		
14	40		
10	35		
6.3	31		
5	30		
3.35	28		
2	26		
1.18	24		
0.6	23		
0.425	22		
0.3	20		
0.212	18		
0.15	15		
0.063	7		

Dry Mass of sample, g	3628
-----------------------	------

Sample Proportions	% dry mass
Very coarse	12.7
Gravel	61.8
Sand	18.8
Fines <0.063mm	7.0

Grading Analysis		
D100	mm	
D60	mm	24.6
D30	mm	5.28
D10	mm	0.0893
Uniformity Coefficient		280
Curvature Coefficient		13

Remarks
Preparation and testing in accordance with test method unless noted below
Sample was deviating in accordance with BS1377 test standard

Accreditation status
Hydrometer is the usual Sedimentation method carried out by G2M Testing and is part of the G2M Testing UKAS accreditation schedule.

Approved by	D Anderson
Approval date	06/02/2024 12:19



Certificate of Analysis

Certificate Number 24-02092

Issued: 06-Feb-24

Client SOLMEK
12 Yarm Road
Stockton On Tees
Cleveland
TS18 3NA

Our Reference 24-02092

Client Reference M24-004

Order No (not supplied)

Contract Title KVG BROWNS FIELD, PRESCOT

Description 4 Soil samples.

Date Received 01-Feb-24

Date Started 01-Feb-24

Date Completed 06-Feb-24

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

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

Approved By

Kirk Bridgewood
General Manager



Summary of Chemical Analysis

Soil Samples

Our Ref 24-02092

Client Ref M24-004

Contract Title KVG BROWNS FIELD, PRESCOT

Lab No	2293884	2293885	2293886	2293887
Sample ID	WS05	TP01	WS04	WS03
Depth	1.00-1.50	1.62-1.80	0.50-0.90	0.20-0.50
Other ID				
Sample Type	SOIL	SOIL	SOIL	SOIL
Sampling Date	19/01/2024	19/01/2024	19/01/2024	19/01/2024
Sampling Time	n/s	n/s	n/s	n/s

Test	Method	LOD	Units				
Inorganics							
pH	DETSC 2008#		pH	7.4	7.0	7.8	7.5
Sulphate Aqueous Extract as SO ₄ (2:1)	DETSC 2076#	10	mg/l	12	28	36	21

Information in Support of the Analytical Results

Our Ref 24-02092
 Client Ref M24-004
 Contract KVG BROWNS FIELD, PRESCOT

Containers Received & Deviating Samples

Lab No	Sample ID	Date		Containers Received	Holding time exceeded for tests	Inappropriate container for tests
		Sampled				
2293884	WS05 1.00-1.50 SOIL	19/01/24		PT 1L	pH + Conductivity (7 days)	
2293885	TP01 1.62-1.80 SOIL	19/01/24		PT 1L	pH + Conductivity (7 days)	
2293886	WS04 0.50-0.90 SOIL	19/01/24		PT 1L	pH + Conductivity (7 days)	
2293887	WS03 0.20-0.50 SOIL	19/01/24		PT 1L	pH + Conductivity (7 days)	

Key: P-Plastic T-Tub

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

Soil Analysis Notes

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

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

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

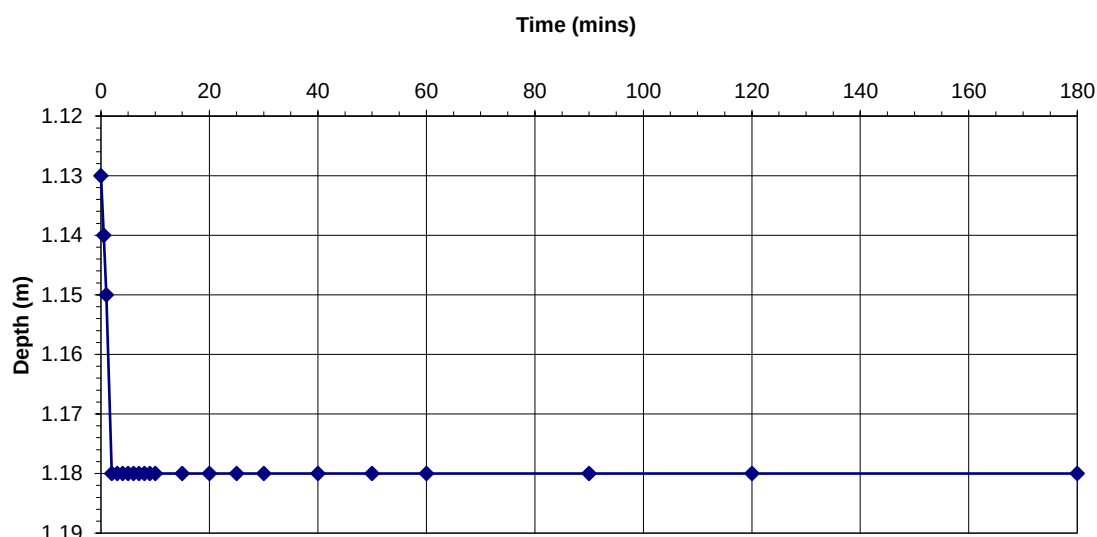
Disposal

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

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

End of Report

SOAKAWAY DESIGN IN ACCORDANCE WITH BRE DIGEST 365: 1991					
BRE Digest 365, Figure 2, Page 5					
Client: Steve Wells Associates on behalf of Knowsley Council					
Site: KVG Browns Field, Prescott		Notes:			
Job No: M24-004					
Pit No:	TP01	Test No:	1		
CALCULATION OF SOIL INFILTRATION RATE					
Time (min)	Depth (m)	Pit Dimensions	Length (m) =	1.70	
0	1.13		Width (m) =	0.55	
0.5	1.14		Depth (m) =	1.82	
1	1.15				
2	1.18	Depth at start of test (m) =		1.130	
3	1.18	Depth at end of test (m) =		1.180	
4	1.18	75% level (m) =		1.143	
5	1.18	50% Effective Depth		0.665	
6	1.18	25% level (m) =		1.168	
7	1.18				
8	1.18	Base area of pit (m ²) =		0.935	
9	1.18	Vp ₇₅₋₂₅ (m ³) =		0.023	
10	1.18	a _{0.50} (m ²) =		3.928	
15	1.18				
20	1.18	From the graph:			
25	1.18				
30	1.18				
40	1.18				
50	1.18	Soil infiltration rate, f, (m/s) =		1.04E-04 normal test	
60	1.18				
90	1.18				
120	1.18	Input by:	AJC	Date:	07/03/2024
180	1.18	Checked by:	LR	Date:	07/03/2024



Appendix E

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 <i>significant harm</i> , 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 volatilised 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 Environment Agency's guidance document Environment Agency *Land Contamination Risk Management*, which replaced the now-withdrawn *Contaminated Land Report 11 – Model Procedures for the Management of Land Contamination (2004)*, 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.

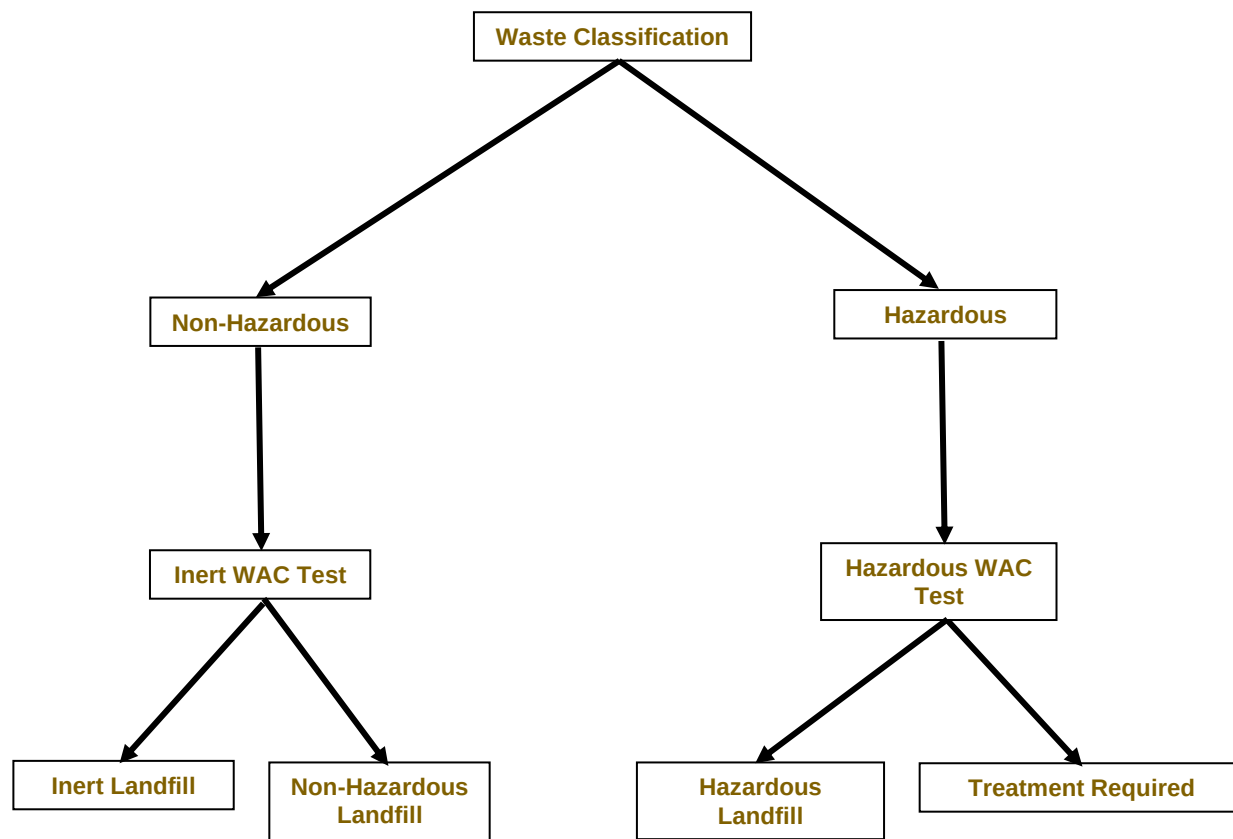
WASTE CLASSIFICATION AND WASTE ACCEPTANCE CRITERIA

During the site strip and construction activities, material may be required to be removed from site. Any such material would require classification, in line with Environment Agency Technical Guidance *Waste Classification: Guidance on the classification and assessment of waste (2015)*. This would classify the material as either Non-Hazardous or Hazardous Waste.

Once the material has been classified, determining the suitable landfill for disposal is governed by landfill directive Waste Acceptance Criteria (WAC) testing, with landfills categorized as Inert Waste, Stable Non-Reactive Hazardous Waste and Hazardous Waste. 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 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.

If waste classification and/or WAC testing are not undertaken, material taken off site may be subject to WAC testing by the appropriate waste disposal company. The decision on whether or not to accept waste, or whether further testing is required, is at the discretion of the waste disposal company.

The below flow chart provides further information on the waste classification process.



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.

Parameter group	Pipe Material (Threshold concentrations in mg/kg)					
	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: version1/2024)

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 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 10175:2011 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.