



## **Park Grove Surgery**

Burleigh Street,  
Barnsley,  
South Yorkshire,  
S70 1XY

## **Phase II Geo Environmental Site Assessment (Rev A)**

12864/5006  
July 2015

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Practical Solutions**



## Revision Record

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## **1. Introduction**

### **1.1. General Introduction**

This Report presents the findings of a Phase II Geo-environmental assessment of a site at Burleigh Street, Barnsley, South Yorkshire, S70 1XY (Grid Reference: 434757, 405975) for Park Grove Surgery.

The Intrusive Site Investigation (Phase II) comprised of boreholes and trial pits to establish the sub surface strata and remove samples for contamination and geotechnical testing. The test results combined with the findings of the intrusions will then be used to make recommendations for any remedial works which may be necessary. A site plan including positions of the boreholes and trial pits can be found in Appendix I of this report.

### **1.2. Objectives**

The intrusive investigation was conducted to assess and confirm the immediate sub-surface ground conditions and extract in-situ soil samples for laboratory testing as recommended in Phase I Report dated December 2014 by Met Engineers Ltd, to determine the geotechnical and environmental position of the site.

### **1.3. Scope of Works**

Based upon the recommendations of the Desk Study and a visual assessment of the sub-strata materials during the intrusive works, soil samples were taken for laboratory testing. CLEA Guidelines and recommendations given in Land Quality Management General Assessment Criteria have been applied to establish a risk based CLEA Model to assess the likely contamination issues and to comment on potential constraints for development of the site.

Judgement is based strictly on the findings of the specific boreholes, trial pits and soil samples tested and therefore may not be representative of the site as a whole. The findings of the intrusive investigation will also be used in conjunction with the findings of the Desk Study to establish parameters which may be used in formulating a foundation design.

### **1.4. Limitations of the Report**

Park Grove Surgery (the Client) has requested that a Phase II Site Investigation, CLEA Conceptual Model and Risk Assessment be undertaken in order to assess the suitability of the site for redevelopment. The report is not a comprehensive site characterisation and should not be construed as such.

This report has been prepared for the sole internal use and reliance of Park Grove Surgery. The report shall not be relied upon or transferred to any other parties without the express written authority of Met Engineers Limited. If any unauthorised third party comes into

possession of the report, they rely on it at their own risk and Met Engineers Limited owes them no duty of care.

The findings and opinions conveyed via this report are based on information obtained from a variety of sources as detailed within this report and which Met Engineers Limited, believes are reliable. Nevertheless, Met Engineers Limited, cannot and does not guarantee the authenticity or reliability of the information it has relied upon. The information contained in this report is to the best of our knowledge accurate at the date of issue, however, sub-surface conditions, including ground water levels, may vary, especially with time.

In preparing this report it has been assumed that all past and present occupants and Third Parties have provided accurate information, especially relating to known or potential hazards. This report does not identify deficiencies or mistakes in the information provided by the user/owner, or from any other source, except where obvious in the light of other information.

This report is relevant at the date the report was written and should be read in the light of any subsequent changes in legislation, statutory requirement or industry practices.

The report represents the technical findings and opinions of Met Engineers Limited, and does not constitute any legal advice. As such, the advice of a Solicitor may also be required.

## 2. Site History and Environmental Setting

A detailed review of the published history, hydrological, geological and available environmental information was carried out by Met Engineers in a Phase I Desk Study report dated December 2014. The following is a brief summary of those findings.

The area of land referred to as 'The Site' within this document is indicated in Appendix I.

### 2.1. Site Description

<b>Site Name</b>	Burleigh Street, Barnsley
<b>Location</b>	Grid Reference: 434757, 405975
<b>Setting</b>	<p>The site is located adjacent to Burleigh Road within the centre of Barnsley. It is irregularly shaped and 0.59 ha in size. The site slopes from the west to the east.</p> <p>The site is currently split into two areas by Burleigh Street. To the north is an area of managed grassland. Mature hedges grow around its edge. The northern boundary is a steep embankment. There is an electricity substation located on the northern boundary.</p> <p>The southern part of the site is currently being used as a car park. It appears to be within a former quarry as a 3 to 5m high wall is located along the southern boundary of the site. Another electricity substation is located along the southern boundary.</p> <p>The surrounding area has predominantly residential and light industrial land use due to its inner city location. A large office is located on the western boundary of the site.</p>
<b>Site History</b>	<p>The site has had numerous land uses over the course of the previous century. These include, a quarry, timber yards, residential streets, electricity substations and as a scrapyards. In addition roads have been built and redirected across the site. All buildings apart from the electricity sub stations were removed from site by 1993.</p> <p>The surrounding area has similarly had numerous land uses due to its inner city location. The majority of which were of residential and light industrial by nature.</p>
<b>Development Proposals</b>	It is proposed to develop the site with a doctor's surgery with associated hard standing and soft landscaped areas.

## 2.2. Geology & Soils

<b>Geology</b>	<p>Artificial Ground – None beneath the site.</p> <p>Superficial Deposits – None beneath the site.</p> <p>Bedrock Geology – Woolley Edge Rock, Sandstone</p> <p>Faults – An inferred fault is located 210m south east of the site.</p> <p>Coal Outcrops – 6No. coal seams outcrop between 21 and 187m north east of the site. All dip below the site The nearest is the Meltonfield Coal seam and is between 0 and 1.4m thick.</p>
<b>Radon</b>	<p>1 – 3 % of the properties in the area are above the radon action level however no special remedial measures are required.</p>
<b>Ground workings</b>	<p>There are 7No. historic and 2No. current ground workings located within 50m of the site.</p> <p>The nearest is a sandstone working 47m south east of the site.</p> <p>The quarry located on site is also a historic ground working.</p>

<b>Mining</b>	<p>The property is in the likely zone of influence from workings in 2 seams of coal at 150m to 390m depth, and last worked in 1939. Any ground movement from these coal workings should have stopped by now.</p> <p>In addition the property is in an area where the Coal Authority believe there is coal at or close to the surface. This coal may have been worked at some time in the past.</p> <p>The Coal Authority state that the property is not affected by any past, present or future opencast works. However as the site was a quarry and given the expected geology, it is likely that coal was removed as part of these works.</p> <p>There are no mine entries within 20m of the site.</p> <p>1No. claim for subsidence has been made for a property located 20m South of the site.</p> <p>The Groundsure report states that rare and localised small scale mining of Iron Ore may also have occurred in the vicinity of the site.</p> <p>The site is located within a “Development High Risk Area” as defined by The Coal Authority, therefore a coal mining risk assessment is required.</p> <p><b>Initial Risk Assessment -</b></p> <table border="1"> <thead> <tr> <th>Coal Mining Issue</th> <th>Yes</th> <th>No</th> <th>Risk Assessment</th> </tr> </thead> <tbody> <tr> <td>Underground coal mining (recorded at shallow depths)</td> <td></td> <td>X</td> <td>There is no evidence of shallow coal mining voids beneath the site.</td> </tr> <tr> <td>Underground coal mining (probable at shallow depths)</td> <td>X</td> <td></td> <td>The Coal Authority believe that it is likely that coal seams are beneath the site at depths of less than 30m which may have been worked in the past.</td> </tr> <tr> <td>Mine entries (shafts and adits)</td> <td></td> <td>X</td> <td>There are no known mine entries or adits.</td> </tr> <tr> <td>Coal mining geology (fissures)</td> <td>X</td> <td></td> <td>There are 6No. coal seams outcropping within 250m of the site. All dip below the site.</td> </tr> <tr> <td>Record of past mine gas emissions or potential</td> <td></td> <td>X</td> <td>No record made by the Coal Authority.</td> </tr> <tr> <td>Recorded coal mining surface hazard</td> <td>X</td> <td></td> <td>A property 20m south of the site has claimed for subsidence.</td> </tr> <tr> <td>Surface mining (opencast workings)</td> <td>X</td> <td></td> <td>Part of the site was a quarry. Based on expected geology, coal was likely removed as part of these works.</td> </tr> </tbody> </table> <p>Based on the above information, the risk to the site from shallow depth mine workings is <b>MODERATE</b>.</p>	Coal Mining Issue	Yes	No	Risk Assessment	Underground coal mining (recorded at shallow depths)		X	There is no evidence of shallow coal mining voids beneath the site.	Underground coal mining (probable at shallow depths)	X		The Coal Authority believe that it is likely that coal seams are beneath the site at depths of less than 30m which may have been worked in the past.	Mine entries (shafts and adits)		X	There are no known mine entries or adits.	Coal mining geology (fissures)	X		There are 6No. coal seams outcropping within 250m of the site. All dip below the site.	Record of past mine gas emissions or potential		X	No record made by the Coal Authority.	Recorded coal mining surface hazard	X		A property 20m south of the site has claimed for subsidence.	Surface mining (opencast workings)	X		Part of the site was a quarry. Based on expected geology, coal was likely removed as part of these works.
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<b>Natural Ground Subsidence</b>	No natural ground subsidence problems are envisaged.																																

<b>Boreholes</b>	<p>There are 52No. BGS borehole records located within 250m of the site including 7No. of which are actually located within the boundary.</p> <p>They all show made ground at the surface between 2 and 5.3m deep. This is placed directly onto sandstone bedrock.</p>
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### 2.3. Phase I Preliminary Recommendations

#### Environmental

Overall, the majority of the site is considered to have low to moderate potential to be contaminated. An intrusive site investigation is recommended to confirm this potential.

The site investigation should cover the full site, as the majority has been developed previously. A general range of contaminants should be tested for including Heavy Metals, Poly-aromatic Hydrocarbons, Total Petroleum Hydrocarbons, Asbestos and Land Gas.

Following the site investigation, options for remediation, if required, can be evaluated. Any remedial measures undertaken will inevitably reduce the environmental risk to future ownership.

#### Geotechnical

It is likely that 2-5m of made ground is present at the surface of the site based on the archive boreholes and due to the various small scale developments during the previous century. Underneath is likely to be sandstone bedrock.

The intrusive investigation should confirm the immediate sub-surface soil conditions such that foundation recommendations can be made. A series of boreholes and/or trial pits should be undertaken to allow an assessment of the underlying strata. Suitable *in-situ* and laboratory geotechnical tests should be performed as part of the investigation.

It is considered that the risk from shallow depth mining works is moderate. As such, a series of 30m rotary boreholes with water flush will be required in order to assess the risk posed by these potential workings. Based on these findings, remedial measures such as pressure grouting of the ground may be required.

### **3. Intrusive Investigation**

#### **3.1. Fieldwork**

The intrusive investigation consisted of 5No. windowless sampler boreholes, 2No. road cores, 3No. rotary boreholes and 6No. Trial Pits excavated by JCB. The intrusive investigations were carried out between 31.03.15 and 01.04.15; the location of which can be found within Appendix I. The intrusions were spread evenly across the site to give a good overview of the underlying strata. The weather was changeable throughout.

The windowless sampler boreholes and trial pits found made ground between 2.6 and 3.5m deep. This consisted of soft, ashy and sandy clays with many gravels bricks and general household waste. There were also many large sandstone boulders within the fill material. Natural ground consisted of highly weathered sandstone and mudstone.

Logs of the windowless sampler boreholes and trial pits can be found in Appendix II and III of this report respectively.

The rotary boreholes found made ground between 3.4 and 5.2m thick. Below were various strata of strong sandstone, mudstone and siltstone. Coal was found at depths of 11.4, 12.8, 11.0m with thicknesses of 0.9, 0.9, 0.7m respectively. Below was further mudstone and siltstone.

Logs of the rotary boreholes can be found within Appendix IV of this report.

The cores of the car park found the tarmac to be 0.11 and 0.12m thick in total. There was approximately 0.025m of wearing course above the subgrade. Underneath the tarmac was limestone aggregate.

Soil samples were removed for laboratory analysis from each of the trial pits for the purpose of contamination and geological purposes.

#### **3.2. Groundwater**

No groundwater was found in any of the investigation points.

#### **3.3. Gas Monitoring**

Gas and groundwater monitoring equipment was installed in 3No. borehole positions. Response zones were set from 0.5m below ground level to the base of the borehole in order to evaluate the combined gas risk from both the made ground at the surface as well as natural venting from the aquifer. Monitoring is complete.

### 3.4. **Laboratory Testing**

The desk study recommended a regime of contamination testing on soil samples recovered from the intrusive investigation. The samples were tested for contaminants including:

*Heavy Metals*  
*Polycyclic Aromatic Hydrocarbons*  
*Total Petroleum Hydrocarbons*  
*Asbestos*

Geotechnical testing was also carried out on the soils. The samples were tested for:

*pH*  
*Water Soluble Sulphate (2:1)*  
*Atterberg Limits*

## 4. Contamination Assessment

### 4.1. General

Current Environmental Legislation, in particular Part IIA of the Environmental Protection Act 1990, adopts a risk-based approach to the evaluation of contaminated sites, based on the proposed end use of the site. The commonly accepted approach is to adopt a Source-Pathway-Receptor model where the Source of the contaminant is examined in relation to potential Receptors (i.e. humans, controlled waters etc.) to determine if there is a Pathway (i.e. pollution linkage) connecting them. If any of these elements (i.e. contaminant, pathway or receptor) are absent or removed, then there is no risk.

The Department of the Environment, Food and Rural Affairs (DEFRA) have published a series of guidelines in connection with Risk Assessment. In addition The Environment Agency has produced the Contaminated Land Exposure Model (CLEA) which models guideline values for those elements which pose the greatest risk to human health. Using values derived from CLEA, a site specific, conceptual model has been used to determine any significant pollutant linkages and identify suitable risk management proposals on which remediation design (if any required) can be based. The conceptual model is summarised at the end of this section in tabular form.

Defra have recently published Category 4 Screening Levels (C4SLs) for some common contaminants and these have been used as intervention values to assess risk. Where there are no published C4SLs, Soil Guideline Values (SGV's) published by The Environment Agency, or General Assessment Criteria Values (GACs) published by Land Quality Management, have been used to assess risk.

By considering the Source-Pathway-Receptors Model, an assessment can be made as to whether the source contamination can reach a receptor. The degree and significance of any resulting risk is then determined. The categorisation of the risk is based on consideration of both:

- The likelihood or probability of an event (taking into account both the presence of the Source and the Receptor, and the integrity of the Pathway).
- The severity of the potential consequence (taking into account both the potential severity of the Source and the sensitivity of the Receptor).

The following categorisation of risk has been adopted in this report:

Very High	There is a high probability that severe harm could arise to a designated receptor from an identified hazard at the site without appropriate remedial action.
High	Harm is likely to arise to a designated receptor from an identified hazard without appropriate remedial action.

Moderate	It is possible that, without appropriate remedial action, harm could arise to a designated receptor, but it is relatively unlikely that any such harm would be severe and, if harm were to occur, it is more likely that such harm would be relatively mild.
Low	It is possible that harm could arise to a designated receptor from an identified hazard, but it is likely that, at worst, this harm, if realised, would normally be mild.
Negligible	The presence of an identified hazard does not give rise to the potential to cause any significant harm to a designated receptor on this site.

#### 4.2. Contamination Criteria for Testing

It is proposed that the site will be developed with a doctors surgery with associated hard and soft landscaped areas. All groundworks and subsequent maintenance will be undertaken by contractors. Contact between members of the public and soft landscaped areas is likely to be minimal. Therefore the proposed land use can be classified as 'commercial' in accordance with the CLEA Guidelines.

The results of the chemical analysis on the soil samples are given below and are compared against the C4SLs for commercial developments (where there are published C4SLs and SVGs and GACS where there are no published C4SLs. These values are then used as Intervention Values (IV) to assess the risk.

#### 4.3. Conceptual Site Model

**Sources** can comprise of Metals, Semi-Metals, Non-Metals, Poly Aromatic Hydrocarbons, Sulphates etc.

**Pathways** can comprise of Ingestion, Inhalation, Direct Contact etc.

**Receptors** can comprise of People, Groundwater, Watercourses etc.

The following table provides a list of the possible Sources, Pathways and Receptors that have potential to exist on this site.

Source	Pathway	Receptor
Heavy Metals	<b>a</b> – Ingestion of soils <b>b</b> – Inhalation of soil dust <b>c</b> – Direct Contact with soil <b>d</b> – Direct Contact with groundwater <b>e</b> – Migration via Groundwater	<b>A</b> – Construction Workers <b>B</b> – Future End user <b>C</b> – Aquifer <b>D</b> – Flora & Fauna
Polyaromatic Hydrocarbons	<b>a</b> – Ingestion of soils <b>b</b> – Inhalation of soil dust <b>c</b> – Direct Contact with soil <b>d</b> – Direct Contact with groundwater <b>e</b> – Migration via Groundwater <b>f</b> – Inhalation of gases	<b>A</b> – Construction Workers <b>B</b> – Future End user <b>C</b> – Aquifer <b>D</b> – Flora & Fauna
Total Petroleum Hydrocarbons	<b>a</b> – Ingestion of soils <b>b</b> – Inhalation of soil dust <b>c</b> – Direct Contact with soil <b>d</b> – Direct Contact with groundwater <b>e</b> – Migration via Groundwater <b>f</b> – Inhalation of gases	<b>A</b> – Construction Workers <b>B</b> – Future End user <b>C</b> – Aquifer <b>D</b> – Flora & Fauna

Asbestos	<b>a</b> – Ingestion of soils <b>b</b> – Inhalation of soil dust	<b>A</b> – Construction Workers <b>B</b> – Future End user
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Based on the above conceptual site model, the following sources of contamination have been investigated;

- Soils
  - Heavy Metals
  - Poly Aromatic Hydrocarbons
  - Total Petroleum Hydrocarbons
  - Asbestos

#### 4.4. Results of Contamination Testing

The following tables are summaries of the laboratory test results. Please see the key below for the origin of each intervention value.

##### Intervention Value Key

Author	Type	Land Use
DEFRA	C4SL	Commercial
The Environment Agency	SGV	Commercial
Land Quality Management	GAC	Commercial

##### Heavy Metals

Location	TP01	TP02	TP02	TP03	TP04	TP04	TP05	TP06			
Depth (m)	0.6	0.5	1.8	0.4	0.6	1.6	0.3	0.3			
Contaminant (mg/kg)										IV	Number Exceeding
Arsenic	14	4	10	8	6	<1	7	11	640	0	
Cadmium	0.8	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.1	410	0	
Copper	45	16	29	23	23	7	23	28	71700	0	
Chromium	16	5	8	9	9	7	6	12	30400	0	
Lead	263	35	120	83	83	8	38	58	23000	0	
Mercury	0.45	0.48	0.54	0.25	0.5	<0.17	0.62	<0.17	3600	0	
Nickel	17	9	12	19	12	11	9	21	1800	0	
Selenium	2	<1	<1	<1	<1	<1	<1	<1	13000	0	
Zinc	203	34	49	36	44	10	38	71	665000	0	

##### Polycyclic Aromatic Hydrocarbons

Location	TP01	TP02	TP02	TP03	TP04	TP04	TP05	TP06			
Depth (m)	0.6	0.5	1.8	0.4	0.6	1.6	0.3	0.3			
Contaminant (mg/kg)										IV	Number Exceeding
Acenaphthene	0.09	0.04	0.02	<0.01	0.26	<0.01	0.03	<0.01	85000	0	
Acenaphthylene	0.08	0.05	0.03	<0.01	0.17	<0.01	0.07	<0.01	84000	0	
Anthracene	0.57	0.34	0.17	0.03	1.81	<0.02	0.16	0.04	530000	0	
Benzo(a)anthracene	2.66	1.85	0.94	0.15	6.17	0.29	0.8	0.25	90	0	
Benzo(a)pyrene	2.24	1.61	0.86	0.13	5.42	0.29	0.77	0.22	77	0	
Benzo(b)fluoranthene	2.82	1.98	1.02	0.17	6.23	0.33	0.87	0.27	100	0	
Benzo(ghi)perylene	1.22	0.84	0.48	0.06	2.91	0.14	0.39	0.1	650	0	
Benzo(k)fluoranthene	0.99	0.7	0.39	<0.07	2.25	0.13	0.34	0.09	140	0	
Chrysene	2.7	1.82	0.96	0.16	5.8	0.28	0.75	0.25	140	0	
Dibenzo(ah)anthracene	0.35	0.24	0.11	<0.04	0.81	<0.04	0.12	<0.04	13	0	
Fluoranthene	5	3.49	1.59	0.17	12.1	0.33	1.19	0.41	23000	0	
Fluorene	0.16	0.08	0.04	<0.01	0.46	<0.01	0.07	<0.01	64000	0	
Indeno(123-cd)pyrene	1.49	1.07	0.58	0.07	3.56	0.17	0.5	0.13	60	0	
Naphthalene	0.14	0.05	0.06	<0.03	0.57	<0.03	<0.03	<0.03	200	0	
Phenanthrene	2.23	1.34	0.5	0.1	6.48	0.05	0.62	0.15	22000	0	
Pyrene	4.24	2.95	1.4	0.16	10.3	0.39	1.03	0.35	54000	0	
Total PAH	27	18.4	9.14	1.21	65.3	2.39	7.74	2.28		0	

### Total Petroleum Hydrocarbons

Location	TP01	TP02	TP02	TP03	TP04	TP04	TP05	TP06		
Depth (m)	0.6	0.5	1.8	0.4	0.6	1.6	0.3	0.3		
<b>Contaminant (mg/kg)</b>									<b>IV</b>	<b>Number Exceeding</b>
Ali >C5-C6	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	3400	0
Ali >C6-C8	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	8300	0
Ali >C8-C10	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	2100	0
Ali >C10-C12	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	10000	0
Ali >C12-C16	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	61000	0
Ali >C16-C21	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	1600000	0
Ali >C21-C35	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	1600000	0
Total Aliphatics	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		-
Aro >C5-C7	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	28000	0
Aro >C7-C8	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	59000	0
Aro >C8-C9	0.02	<0.01	0.03	0.02	0.02	<0.01	<0.01	<0.01	3700	0
Aro >C9-C10	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	17000	0
Aro >C10-C12	1.5	0.4	<0.1	<0.1	1.5	<0.1	<0.1	<0.1	36000	0
Aro >C12-C16	3.7	2.6	0.2	<0.1	1.7	<0.1	<0.1	<0.1	28000	0
Aro >C16-C21	5.6	1.6	1.1	<0.1	4.9	<0.1	0.4	<0.1	28000	0
Aro >C21-C35	6.2	3.1	1.9	<0.1	5.4	<0.1	1.4	<0.1	28000	0
Total Aromatics	16.9	7.6	3.4	<0.1	13.5	<0.1	1.8	<0.1		-
TPH (Ali & Aro)	16.9	7.7	3.4	<0.1	13.5	<0.1	1.8	<0.1		-
BTEX - Benzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	28000	0
BTEX - Toluene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	59000	0
BTEX - Ethyl Benzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	2800	0
BTEX - m & p Xylene	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	3200	0
BTEX - o Xylene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	2600	0
MTBE	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		0

### Asbestos

Location	TP01	TP02	TP02	TP03	TP04	TP04	TP05	TP06		
Depth (m)	0.6	0.5	1.8	0.4	0.6	1.6	0.3	0.3		
<b>Contaminant</b>										<b>Number Exceeding</b>
Asbestos in Soil	NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD	0

The full test certificates are included in Appendix IV of this report.

#### 4.5. Contamination Sources

Based upon the soil test results, no elevated concentrations of contaminants tested for have been found.

Source	Present
Heavy Metals	No
Poly Aromatic Hydrocarbons	No
Total Petroleum Hydrocarbons	No
Asbestos	No

#### 4.6. Pathways

Based on the proposed land use, the possible pathways that exist on site for any possible source of contamination are as follows;

- Ingestion of soils
- Inhalation of soil dust
- Direct Contact with soil
- Direct Contact with groundwater
- Migration in groundwater
- Inhalation of soil vapours

#### 4.7. Receptors

Based on the identified sources of contamination, and the present pathways, the potential receptors for the development are:-

- End User
- Construction worker
- Flora & Fauna
- Aquifer

#### 4.8. Site Specific Model

Source	Present	Receptor	Pathway	Risk
Heavy Metals	No	A – Construction Workers B – Future End user C – Flora & Fauna D – Aquifer	a – Ingestion of soils b – Inhalation of soil dust c – Direct Contact with soil d – Direct Contact with groundwater e – Migration in groundwater	Negligible
Polycyclic Aromatic Hydrocarbons	Yes	A – Construction Workers B – Future End user C – Flora & Fauna D - Aquifer	a – Ingestion of soils b – Inhalation of soil dust c – Direct Contact with soil d – Direct Contact with groundwater e – Migration in groundwater f – Inhalation of gases	Moderate
Total Petroleum Hydrocarbons	No	A – Construction Workers B – Future End user C – Flora & Fauna D - Aquifer	a – Ingestion of soils b – Inhalation of soil dust c – Direct Contact with soil d – Direct Contact with groundwater e – Migration in groundwater f – Inhalation of gases	Negligible
Asbestos	No	A - Construction Workers B - Future End user	a - Ingestion of soils b - Inhalation of soil dust	Negligible

#### 4.9. **Contamination Issues**

Based upon the conceptual site model, there are no contamination linkages present for the sources tested for.

#### 4.10. **Assessed Risks and Management**

No contamination linkages have been found.

Appropriate personal protective equipment should be worn by all contractors, accompanied with employing good personal hygiene standards (especially before eating) in order to maintain the negligible risk to construction workers on site.

A landscape gardener should be consulted in order to determine the suitability of reusing the site's soils within new soft landscaped areas.

All ground works should be monitored by a suitably qualified person and significant deviation from the findings of this document is to be reported to the Engineer immediately prior to commencing any further works.

#### 4.11. **Environmental Summary**

No contamination linkages are present on site.

Appropriate PPE and personal hygiene standards should maintain a low risk towards construction workers.

All ground works should be monitored by a suitably qualified person and any significant deviation from the findings of this document is to be reported to the Engineer immediately prior to commencing any further works.

## 5. Geotechnical Assessment

### 5.1. Geological Assessment

The results of the site investigation matched the suppositions of the desk study. 2-5m of made ground was found above sandstone bedrock. 1No. band of coal was found at approximately 12m BGL which was found to be intact.

The geotechnical conditions found across the site can be summarised as the following:

Geology	Depth struck (m)	Thickness (m min to max)	Nature of Ground
Made Ground	0	2.4 to 5.2	Ashey clay with many gravels cobbles and boulders of mixed lithology (ARTIFICIAL GROUND)
Bedrock	2.4 to 5.2	7.6 to 8.5	Hard sandstone, siltstone, and mudstone (WOLLEY EDGE ROCK)
Bedrock	11.0 to 12.8	0.7 to 0.9	Coal (MELTONFIELD COAL)
Bedrock	11.7 to 13.7	-	Hard sandstone, siltstone, and mudstone (WOLLEY EDGE ROCK)

### 5.2. Mining

Information from the desk study highlighted that the risk to the site from shallow depth coal mining works was moderate. This was predominantly due to a large number of coal seams outcropping adjacent to the northern boundary of the site. As such The Coal Authority believe that coal is present at shallow depth below the site which may have been worked at some time in the past.

3No. rotary boreholes with water flush were drilled within the footprint of the proposed building to depths of 30m. They found coal at depths of 11.4, 12.8 and 11.0m with thicknesses of 0.9, 0.9 and 0.7m respectively. All the coal was intact with no evidence of voids or workings. Based on the position of each of the boreholes the coal seam encountered, is dipping from North to South at an inclination of approximately 3.8°. Geological maps show that the seam found is likely to be Meltonfield Coal which is 0 to 1.4m thick.

The coal under the site has been proven to be intact with no indication of workings or voids present as such no remedial works are currently proposed. However dependent on the foundation solution adopted, further investigation works may be required to fully satisfy this position. Based on the site's size, location and depth to the coal seam, it is considered that removal of the coal prior to development is unachievable and planning permission for these works is likely to be declined.

### 5.3. Foundations and substructures

Based on the depth of made ground found at the surface of the site, traditional spread foundations are not considered an economical foundation solution. A raft foundation is deemed the most suitable for the development.

Current best practice suggests a rock cover to mine workings ratio of 10: 1 is required to mitigate the risk of crown holes migrating to the surface. As no workings were found, the rock cover to coal thickness ratios found on site are presented below.

	BH01	BH02	BH03
Depth of Made Ground (m)	3.7	5.2	3.4
Rock Cover (m)	7.7	7.6	7.6
Coal Thickness (m)	0.9	0.9	0.7
Rock Cover to Coal Ratio	8.6 : 1	8.4 : 1	10.9 : 1

The ratios range between 8.4:1 and 10.9:1. By utilising a raft foundation, ground bearing pressures are minimised. Competent bedrock between the surface and the coal seam was found with no voids or broken ground at seam level. Therefore it is considered that the rock cover ratios are acceptable and the risk from any potential workings not found is low. As such further investigation is not considered necessary. This position should be agreed with the local authority and warranty provider prior to commencing detailed design works.

The made ground should be removed and a well compacted, engineered stone cushion placed below the foundation. Alternatively the made ground should be excavated with all large boulders and deleterious material removed and reinstated with vibro-compaction. The replaced material should be looking to achieve a minimum allowable bearing pressure of 100kN/m<sup>2</sup>.

A steep slope runs along the north eastern boundary of the site. On the northern corner of the site, this slope has been reinforced with concrete hexagonal facing slabs. The top courses of concrete sections have failed and been removed from the slope. In addition there is evidence of bulging occurring towards the base of the slope. Dependent on ownership, it should be reinstated as part of the construction works. The foundation of the building should be designed to avoid surcharging the embankment.

Pile foundations have not been considered due to the risk of punching through unfound mine workings. Should further investigation of the coal seam prove necessary, and no such workings be found, then pile foundations could be utilised.

#### 5.4. Geotechnical Test Results

Location	TP01	TP04	TP06
Depth (m)	2.0	1.6	1.2
pH	8.56	8.15	8.1
SO <sub>4</sub> (2:1)	0.01	0.01	<0.01
Plasticity	17	-	13
% <450µm	77	-	84
Modified Plasticity	13.09	-	10.92

Based on the soil sulphate concentrations and pH levels, AC-1 conditions exist for buried concrete in accordance with BRE Special Digest 1:2005 – Concrete in Aggressive Ground.

The Atterberg limits for the soils tested, show low volume change soils exist on site.

#### 5.5. Ground Floor Construction

If a raft foundation is utilised, the ground floor will be incorporated within the foundation.

#### 5.6. Gas

Gas and water monitoring equipment was installed in 3No. positions across the site. Response zones were set from 0.5m to the base of each borehole so as to assess the risk from made ground towards the surface, as well as any natural venting from the aquifer below. Monitoring is complete.

#### Results

Date	BH Number	CH <sub>4</sub> (%)	CO <sub>2</sub> (%)	O <sub>2</sub> (%)	Atmos. Pres.(mb)	Flow (l/h)	Water (mbgl)	Depth to Bottom (m)
16.04.15	BH01	0.2	0.4	20.9	1004	0.3	DRY	2.5
	BH03	0.1	1.9	18.5	1004	0.2	DRY	3.9
	BH04	0.2	0.7	20.5	1004	0.3	DRY	3.7

Date	BH Number	CH <sub>4</sub> (%)	CO <sub>2</sub> (%)	O <sub>2</sub> (%)	Atmos. Pres.(mb)	Flow (l/h)	Water (mbgl)	Depth to Bottom (m)
01.05.15	BH01	0.2	0.6	20.7	998	0.1	DRY	2.5
	BH03	0.1	1.5	19.8	998	0.1	DRY	3.9
	BH04	0.2	0.8	20.5	997	0.3	DRY	3.7

Date	BH Number	CH <sub>4</sub> (%)	CO <sub>2</sub> (%)	O <sub>2</sub> (%)	Atmos. Pres.(mb)	Flow (l/h)	Water (mbgl)	Depth to Bottom (m)
19.05.15	BH01	0.2	1.4	20.1	985	-0.1	DRY	2.5
	BH03	0.2	1	20.3	985	0	DRY	3.9
	BH04	0.2	1.7	19.6	985	0	DRY	3.7

Date	BH Number	CH <sub>4</sub> (%)	CO <sub>2</sub> (%)	O <sub>2</sub> (%)	Atmos. Pres.(mb)	Flow (l/h)	Water (mbgl)	Depth to Bottom (m)
11.06.15	BH01	0.3	1.2	19.6	1011	-0.3	DRY	2.5
	BH03	0.3	2.1	19.1	1010	0	DRY	3.9
	BH04	0.3	1.3	19.9	1010	0	DRY	3.7

Date	BH Number	CH <sub>4</sub> (%)	CO <sub>2</sub> (%)	O <sub>2</sub> (%)	Atmos. Pres.(mb)	Flow (l/h)	Water (mbgl)	Depth to Bottom (m)
15.07.15	BH01	0.2	0.5	20.5	1005	0	DRY	2.5
	BH03	0.2	1.3	20.1	1004	0	DRY	3.9
	BH04	0.2	0.9	20.1	1004	0	DRY	3.7

Date	BH Number	CH <sub>4</sub> (%)	CO <sub>2</sub> (%)	O <sub>2</sub> (%)	Atmos. Pres.(mb)	Flow (l/h)	Water (mbgl)	Depth to Bottom (m)
24.07.15	BH01	0.3	0.1	21.1	999	0	DRY	3.7
	BH03	0.3	0.6	20.6	999	0.2	DRY	3.9
	BH04	0.2	0.5	20.6	999	0.2	DRY	2.5

#### a. Analysis

Six rounds of monitoring have been undertaken thus far. No further rounds of monitoring are proposed.

The results have been evaluated in conjunction with CIRIA Document – Assessing Risks posed by hazardous ground gases to buildings. In accordance with this document the site has been analysed as situation A. The land gas concentrations have remained stable throughout the monitoring period and the maximum concentrations of Methane and CO<sub>2</sub> recorded are 0.3 and 2.1% respectively. The

maximum flow rate recorded across the site is 0.3l/h. Therefore the GSV for the site is 0.0063 This GSV places the site within characteristic situation 1. As such, gas protection measures are not considered necessary.

#### 5.7. **Radon**

1 - 3% of properties in the area are affected by radon. However based on BRE211, radon protection measures are not required for new developments.

#### 5.8. **Drainage**

Due to the depth of made ground encountered and the level difference between the site and the surrounding area, shallow depth soakaways are not recommended as part of the drainage solution for the site.

#### 5.9. **Quarry Wall Assessment**

The southern boundary of the site is delineated by a quarry high wall approximately 4.0m high. The face is cut into hard sandstone. It is currently highly vegetated with vines and small trees and shrubs growing from the face. A concrete sectional fence runs along the top of the high wall.

The face is predominantly shear along its length. The sandstone is generally non-laminated and jointed horizontally and vertically into >1m blocks. The wall has undergone remedial work in the past with a full height block work and brick work retaining wall built against the face for a section approximately 5m wide. Based on the differing blockwork and mortar it appears that this wall has been repaired more than once however it appeared to be of sound structure on inspection.

Numerous small trees and vegetation have rooted within cracks of the wall. It may be prudent to remove all vegetation in order to prevent mechanical weathering by root action.

From visual inspection from pavement level, the wall appears to be free of any obvious faults or fractures which may cause instability in the short term. For an assessment of long term stability, a closer inspection from height by a chartered geologist would be recommended.

#### 5.10. **Car Park Assessment**

The cores of the car park showed the tarmac to be approximately 120mm thick, 25mm of which, was the surface wearing coat. Underneath was limestone gravel ballast. The tarmac was generally of sound condition with no potholes, cracks or scars visible. Road markings were heavily worn and will require re-painting in the near future.

### 5.11. **Geotechnical Summary**

Shallow depth spread foundations are not deemed suitable for the development. Raft foundations are proposed.

The ground floor type is dependent on the foundation solution adopted.

Coal was found at shallow depth, however it was intact and remedial measures are not deemed necessary.

Based on land gas results, no special gas protection measures are required.

Based on the soluble sulphate levels found, AC-1 conditions exist on site in accordance with BRE Special Digest 1:2005 – Concrete in Aggressive Ground.

Low volume change soils exist below the site.

All ground works should be monitored by a suitably qualified person and any significant deviation from the findings of this document is to be reported to the Engineer immediately prior to commencing any further works.

## 6. Conclusions

It is proposed to develop the site with a doctor's surgery with associated hard and soft landscaped areas.

No contamination linkages are present on site.

Appropriate PPE and personal hygiene standards should maintain a low risk towards construction workers.

Shallow depth spread foundations are not deemed suitable for the development. Raft foundations are proposed.

The ground floor type is dependent on the foundation solution adopted.

Coal was found at shallow depth, however it was intact and remedial measures are not deemed necessary.

Based on land gas results, no special gas protection measures are required.

Based on the soluble sulphate levels found, AC-1 conditions exist on site in accordance with BRE Special Digest 1:2005 – Concrete in Aggressive Ground.

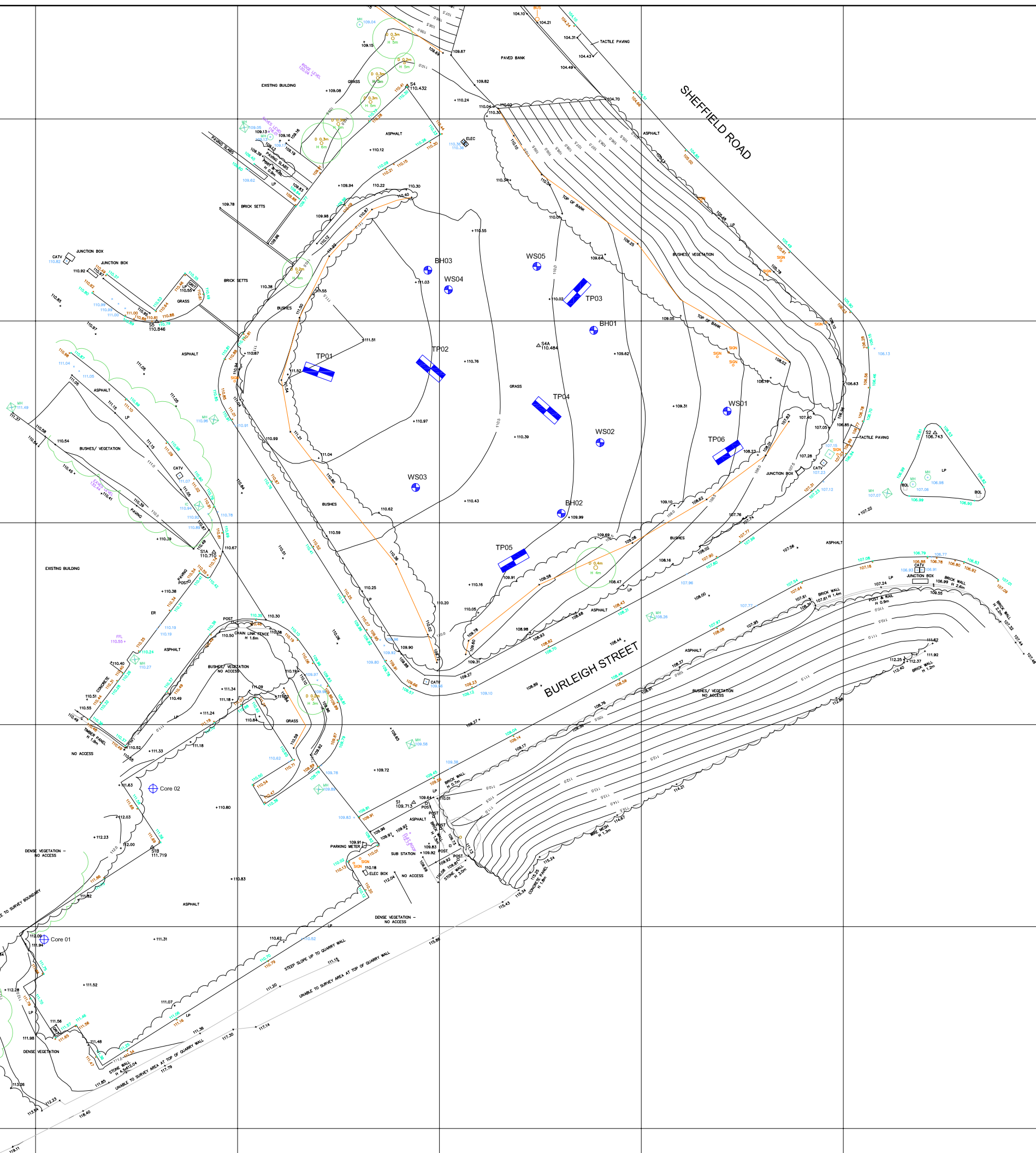
Low volume change soils exist below the site.

All ground works should be monitored by a suitably qualified person for and any significant deviation from the findings of this document is to be reported to the Engineer immediately prior to commencing any further works.

# Appendix I

## Site Investigation Plan

1. Do not scale dimensions from this drawing in either paper or electronic format.
2. To be read in conjunction with all relevant Engineer's, Architect's and Other drawings and specifications.
3. All building products to be used in strict accordance with the manufacturer's recommendations.
4. Any discrepancies are to be reported to the Engineer immediately.
5. Main Contractor to provide a detailed method statement for all works prior to commencement on site.



Rev	Date	Drawn	Description	Chk'd
-	-	-	-	-



Met Engineers Ltd  
 Southgate House  
 Pontefract Road  
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Client **Auburn Ainsley**

Project **Burleigh Street Surgery  
12864/5006**

Title **Site Investigation Plan**

Drawn	SJBF	Checked	RJS	Scale	NTS
Date	Apr 15	Date	Apr 15		

Status **INFORMATION** Original Size A3

Drawing No - Rev -

## **Appendix II**

### Windowless Sampler Logs



- GEOTECHNICAL
- ENVIRONMENTAL
- SITE INVESTIGATIONS

Cloverdale  
Haugh Head  
Wooler  
NE71 6QS

CLIENT MET ENGINEERS  
LOCATION PARK GROVE SURGEON, BARNESLEY  
JOB No. 12864/SC06  
BOREHOLE No. BH01  
RIG TYPE DART  
DATE TUES 31ST MARCH 2015  
OPERATOR S. WOOD

**DAILY RECORD SHEET**

STRATA DISCRPTION		START DEPTH	STRATA BASE (m)
GRASS OVERLYING DARK BROWN SANDS CLUSTERS			G.L.
GRAVEL TOPSOIL, ROOT MATS.			0.100
FIRM DARK BROWN SANDS GRAVEL CLUSTERS SOME BRICK, SANDSTONE / CONCRETE FRAGMENTS.			
MADE GROUND.			0.400
COMPACT BROWN / BRICK SANDS CLUSTERS WITH MANY SANDSTONE FRAGMENTS, GRAVELS, BRICK SLATE FRAGMENTS. MADE GROUND.			1.400
COMPACT YELLOW BROWN / BROWN SANDSTONE GRAVELS / FRAGMENTS, SOME POCKETS OF FINE / MEDIUM SANDS CLUSTERS. MADE GROUND.			2.600
COMPACT / RIGIDLY WEATHERED FINE / MEDIUM ORANGE BROWN / LIGHT BROWN SANDSTONE. RECOGNISED AS GRAVELS. POSSIBLE BEDROCK			
		Borehole Complete / Incomplete	2.780
CASING			
Size (mm)	From	To	
115	G.L.	1.00	
INSTALLATION			
Type	Size	Depth (m)	Seal Top (m) / Seal Bottom (m)
60S/WATER	63mm	2.60	0500-0100
CORING			
Ground	From (m)	To (m)	

TESTING: SPT(s) CPT(c) U100(u) VANE TEST(v)										
Type No.	m		U Blows	0 to 75	75 to 150	150 to 225	225 to 300	300 to 375	375 to 450	V Reading
	From	To								
S	1.00	1.45		1	1	2	1	2	5	
S	2.00	2.45		1	2	1	2	2	4	
S	2.60	2.725		8	17					
S	2.725	2.780		50						

SAMPLES: - BULK (B) DISTURBED (D)				
Type No.	m		Sampler Used (mm)	Recovery (mm)
	From	To		
	6.6	1.00	PIT/101	
	1.00	2.00	101	
	2.00	2.60	101	REFUSED

WATER				
Observation	Depth	Sealed	In Flow	Casing
NO WATER OBSERVED DURING OR ON COMPLETION OF BH				1.00

REMARKS  
ARISING DISPOSED ON SITE.

SIGNED DRILLER

CLIENT

# SWWS

- GEOTECHNICAL
- ENVIRONMENTAL
- SITE INVESTIGATIONS

Cloverdale  
Haugh Head  
Wooler  
NE71 6QS

CLIENT **MET ENGINEERS**  
LOCATION **PARK GROVE SURGERY, BARNSLBY**  
JOB No. **12864/S006**  
BOREHOLE No. **BH 02**  
RIG TYPE **DART**  
DATE **TUE 31ST MARCH 2015**  
OPERATOR **S. WOOD**

## DAILY RECORD SHEET

STRATA DESCRIPTION	START DEPTH	STRATA BASE (m)	TESTING: SPT(e) CPT(c) U100(u) VANE TEST(v)										
			Type No.	m		Blows	0 to 75	75 to 150	150 to 225	225 to 300	300 to 375	375 to 450	V Reading
				From	To		to	to	to	to			
GRASS OVERLAPPING DARK BROWN SANDY CLAY		G.L.	S	1.00	1.15		2	4	4	4	3	4	
GRAVEL TOPSOIL MOTTLED		0.350	S	1.70	1.75		25						
COMPACT DARK BROWN SANDY GRAVEL CLAY SOME BRILL SANDSTONE, LIMESTONE FRAGMENTS.			S	1.75	1.75		50						
MADE GROUND.		0.800											
LOOSE BRILL SANDY SSU CLINKER, SOME SANDSTONE FRAGMENTS, MADE GROUND.		1.100											
COMPACT FINE, MEDIUM SANDSTONE, RECOVERED AS GRAVELS, SOME POCKETS OF BROWN SANDY CLAY MADE GROUND. POSSIBLE CORNICE/BOULDER OBSTRUCTION.													
Borehole Complete / Incomplete													
<b>CASING</b>													
Size (mm)	From	To											
115	G.L.	1.70											
<b>INSTALLATION</b>													
Type	Size	Depth (m)	Seal Top (m)	Seal Bottom (m)									
<b>CORING</b>													
Ground	From (m)	To (m)											
<b>WATER</b>													
Observation	Depth	Sealed	In Flow	Casing									
NO WATER OBSERVED DURING OR ON COMPLETION OF BN				1.00									
<b>REMARKS</b>													
BN BACK FILLED WITH BRISINGS.													

SIGNED  
DRILLER



CLIENT



- GEOTECHNICAL
- ENVIRONMENTAL
- SITE INVESTIGATIONS

Cloverdale  
Haugh Head  
Wooler  
NE71 6QS

CLIENT **NET ENGINEERS**  
LOCATION **PARK GROVE SURGERY, BARNHURST**  
JOB No. **12864/S006**  
BOREHOLE No. **RN 03**  
RIG TYPE **DART**  
DATE **TUES 31ST MARCH 2015**  
OPERATOR **S. WOOD**

### DAILY RECORD SHEET

STRATA DISCRPTION	START DEPTH	STRATA BASE (m)		
GRASS OVERLIDING DARK BROWN SANDY CLAY		6L		
GRAVEL TOPSOIL, ROOTLESS		0.275		
COMPACT DARK BROWN/BLACK SANDY GRAVEL				
CLAY, SOME BRICK, ASU CLINKER, SANDSTONE FRAGMENTIS MADE GROUND		1.250		
COMPACT COMPACTLY WEATHERED FINE/ MEDIUM SANDSTONE RECOVERABLES GRAVELS MADE GROUND		3.500		
COMPACTLY WEATHERED LIGHT BROWN/ORANGE BROWN FINE, MEDIUM SANDSTONE RECOVERED BS GRAVEL, SOME COAL TRACES		4.200		
COMPACTLY/NIGIDLY WEATHERED ORANGE BROWN/ LIGHT GREY FRIABLE MUDSTONE		4.400		
NIGIDLY WEATHERED LIGHT GREY/ORANGE BROWN FINE SANDY MUDSTONE		4.845		
CASING				
Size (mm)	From	To		
115	6L	2.00		
INSTALLATION				
Type	Size	Depth (m)	Seal Top (m)	Seal Bottom (m)
GSS/WATER	63mm	4.00	0.500-0.100	
CORING				
Ground	From (m)	To (m)		

TESTING: SPT(s) CPT(c) U100(u) VANE TEST(v)										
Type No.	m		u Blows	0 to 75	75 to 150	150 to 225	225 to 300	300 to 375	375 to 450	v Reading
	From	To								
S	1.00	1.45		3	5	2	4	3	4	
S	2.00	2.45		2	2	2	2	1	2	
S	3.00	3.45		1	2	3	3	6	4	
S	4.00	4.45		8	5	6	6	7	9	
S	4.55	4.690		12	13					
S	4.690	4.845		20	28	2				

SAMPLES:-- BULK (B) DISTURBED (D)				
Type No.	m		Sampler Used (mm)	Recovery (mm)
	From	To		
	6L	1.00	P11/D1	
	1.00	2.00	D1	
	2.00	3.00	D1	
	3.00	4.00	D1	
	4.00	4.55	92 Refused	

WATER				
Observation	Depth	Sealed	In Flow	Casing
NO WATER OBSERVED DURING OR ON COMPLETION OF BN				1.00

REMARKS

ARISING DISPOSED ON SITE

SIGNED  
DRILLER

CLIENT



- GEOTECHNICAL
- ENVIRONMENTAL
- SITE INVESTIGATIONS

Cloverdale  
Haugh Head  
Wooler  
NE71 6QS

CLIENT **MET ENGINEERS**  
LOCATION **PARK GROVE SURGERY, BARNESLEY**  
JOB No. **12864/SD6**  
BOREHOLE No. **B004**  
RIG TYPE **DART**  
DATE **TUES 31<sup>ST</sup> MARCH 2015**  
OPERATOR **S. WOOD**

**DAILY RECORD SHEET**

STRATA DISCIPTION	STRATA BASE (m)			
	G.L.			
GRASS OVERLAPPING DARK BROWN SANDY CLAYEY				
GRAVELLY TOPSOIL, ROOTLESS.	0.200			
COMPACT DARK BROWN SANDY SANDSTONE				
COAL FRAGMENTS. MADE GROUND.	0.450			
LOOSE BLACK ASH CLINKER, COAL, SANDSTONE				
FRAGMENTS MADE GROUND.	1.100			
LOOSE DARK BROWN SLIGHTLY CLAYEY SANDY				
MUDSTONE, SANDSTONE ASH CLINKER FRAGMENTS				
MADE GROUND	1.900			
SOFT BROWN VERY SANDY CLAY, SOME SANDSTONE				
GRAVELS/FRAGMENTS, SOME COAL TRACES	2.800			
COMPLETELY/HIGHLY WEATHERED LIGHT BROWN/				
ORANGE BROWN FINE MEDIUM SANDSTONE				
RE COVERED AS GRAVELS, CORRE AT BASE				
POSSIBLE BEDROCK	Borehole Complete / Incomplete 3.945			
<b>CASING</b>				
Size (mm)	From To			
115	G.L. 3.00			
<b>INSTALLATION</b>				
Type	Size	Depth (m)	Seal Top (m)	Seal Bottom (m)
Gas/Water	63mm	3.80	0.50-0.70	
<b>CORING</b>				
Ground	From (m)	To (m)		

TESTING: SPT(s) CPT(c) U100(u) VANE TEST(v)										
Type No.	m		U Blows	0 to 75	75 to 150	150 to 225	225 to 300	300 to 375	375 to 450	V Reading
	From	To								
S	1.00	1.45		1	1	1	2	1	1	
S	2.00	2.45		1	1	1	1	1	2	
S	3.00	3.45		1	1	2	1	1	4	
S	3.80	3.890		16	9					
S	3.890	3.945		50						

SAMPLES: - BULK (B) DISTURBED (D)				
Type No.	m		Sampler Used (mm)	Recovery (mm)
	From	To		
	G.L.	1.00	PIT/101	
	1.00	2.00	101	
	2.00	3.00	101	
	3.00	3.80	101 Refused	

WATER				
Observation	Depth	Sealed	In Flow	Casing
NO WATER				1.00
OBSERVED :- DURING OR ON COMPLETION OF BN.				

**REMARKS**  
ARISING DISPOSED ON SITE.

SIGNED DRILLER

CLIENT



Cloverdale  
Haugh Head  
Wooler  
NE71 6QS

CLIENT: MET ENGINEERS  
LOCATION: PASH GROVE SURGEON, BARNESLEY  
JOB No: 17864 / 5006  
BOREHOLE No: BJ25  
RIG TYPE: DART  
DATE: TUES 31st MARCH 2015  
OPERATOR: S. WOOD

**DAILY RECORD SHEET**

STRATA DESCRIPTION	START DEPTH	STRATA BASE (m)		
GRASS OVERLYING DARK BROWN SANDY CLAYEY GRAVEL TOPSOIL - ROOTS		0.200		
COMPACT DARK BROWN SLIGHTLY CLAY SANDY SANDSTONE, COAL FRAGMENTS - MADE GROUND		0.400		
COMPACT BLACK SANDY BRICK RUBBLE, SLATE SANDSTONE FRAGMENTS - MADE GROUND		1.100		
COMPACT YELLOW BROWN SANDSTONE GRAVELS / FRAGMENTS SOME BRICK RUBBLE BRICK FRAGMENTS - MADE GROUND		2.500		
COMPLETELY / HIGHLY WEATHERED ORANGE BROWN / LIGHT BROWN FINE / MEDIUM SANDSTONE RECOVERED AS GRAVELS, COAL TRACES, POSSIBLE MADE GROUND		3.250		
COMPLETELY / HIGHLY WEATHERED ORANGE BROWN / LIGHT BROWN FINE MEDIUM SANDSTONE RECOVERED AS GRAVELS POSSIBLE BEDROCK		3.450		
CASING				
Size (mm)	From	To		
115	G.L.	3.00		
INSTALLATION				
Type	Size	Depth (m)	Seal Top (m)	Seal Bottom (m)
CORING				
Ground	From (m)	To (m)		

TESTING: SPT(s) CPT(c) U100(u) VANE TEST(v)										
Type No.	m		U Blows	0 to 75	75 to 150	150 to 225	225 to 300	300 to 375	375 to 450	V Reading
S 1.00	1.45			0	0	1	6	2	3	
S 2.00	2.45			1	6	4	2	3	3	
S 3.00	3.45			1	2	4	10	21	39	

SAMPLES: - BULK (B) DISTURBED (D)				
Type No.	m		Sampler Used (mm)	Recovery (mm)
G.L.	1.00		PIT 101	
1.00	2.00		101	
2.00	3.00		101	

WATER				
Observation	Depth	Sealed	In Flow	Casing
NO WATER OBSERVED - DURING OR ON COMPLETION OF BN.				3.00

REMARKS				
BN BACK FILLED WITH BRISINGS.				

SIGNED DRILLER

CLIENT

## **Appendix III**

### Trial Pit Logs

# MET Engineers Ltd

Southgate House, Pontefract Road,  
Leeds, W. Yorkshire, LS10 1SW  
Tel: 0113 200 8900 Fax: 0113 200 8901  
Web: www.metengineers.com



Exploratory Hole Ref:

**TP01**

Project Number:	12864/5006	Logged by:	Sam Fuller
Project Title:	Burleigh Street	Date:	01.04.15
Client:	Park Grove Surgery	Level (mAoD):	111.500
		Co-ords:	434747, 406000
		Method:	Trial Pits

Strata Description	Legend	Level (mAoD)	Depth (m)	Water Strike	Sample / Test		Notes
					Depth (m)	Type	
Grass and Topsoil		111.400	0.100				
Gravelly Topsoil with many brick fragments and general household waste.		110.900	0.600		0.600	TTJJVV	
Dark Brown/ Black, Ashey, Soft Clay with many wood fragments, general rubble and large sandstone boulders.  (ARTIFICIAL GROUND)		110.100	1.400				
Light Brown, Soft, Gravelly, Uncompacted Clay  (ARTIFICIAL GROUND)		109.500	2.000		2.000	BB	
Light Brown, Firm, Gravelly, Clay  (ARTIFICIAL GROUND)		108.500	3.000				
Hole Terminated							

<p><u>Notes:</u></p> <p>Ground Water: None Stability: Loose But Stable Weather: Raining Pit Dimensions: 3 x 1m</p>	<p><u>Sample Codes:</u></p> <p>D - Disturbed T - Tub J - Jar V - Vial U - U38 Tube BB - Bulk Bag</p>	<p><u>Test Codes:</u></p> <p>SVT - Shear vane DCP - Dynamic Cone</p>
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Leeds, W. Yorkshire, LS10 1SW  
Tel: 0113 200 8900 Fax: 0113 200 8901  
Web: www.metengineers.com



Exploratory Hole Ref:

**TP01**

Project Number:

12864/5006

Logged by:

Sam Fuller

Project Title:

Burleigh Street

Date:

01.04.15

Client:

Park Grove Surgery

Level (mAoD):

111.500

Co-ords:

434747, 406000

Method:

Trial Pits



# MET Engineers Ltd

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Leeds, W. Yorkshire, LS10 1SW  
Tel: 0113 200 8900 Fax: 0113 200 8901  
Web: www.metengineers.com



Exploratory Hole Ref:

**TP02**

Project Number:	12864/5006	Logged by:	Sam Fuller
Project Title:	Burleigh Street	Date:	01.04.15
Client:	Park Grove Surgery	Level (mAoD):	110.750
		Co-ords:	434761, 406001
		Method:	Trial Pits

Strata Description	Legend	Level (mAoD)	Depth (m)	Water Strike	Sample / Test		Notes
					Depth (m)	Type	
Grass and Topsoil		110.650	0.100				
Dark Brown/ Black, Sandy, Ashy, Soft Clay with many wood fragments, general rubble and large sandstone boulders.  (ARTIFICIAL GROUND)					0.500	TTJJVV	
		109.550	1.200				
Large Sandstone Flags		109.450	1.300				
Dark Brown/ Black, Sandy, Ashy, Soft Clay with many gravels, general rubble and large sandstone boulders.  (ARTIFICIAL GROUND)					1.800	TTJJVV	
		107.750	3.000				
Hole Terminated							

<p><u>Notes:</u></p> <p>Ground Water: None Stability: Loose But Stable Weather: Raining Pit Dimensions: 3 x 1m</p>	<p><u>Sample Codes:</u></p> <p>D - Disturbed T - Tub J - Jar V - Vial U - U38 Tube BB - Bulk Bag</p>	<p><u>Test Codes:</u></p> <p>SVT - Shear vane DCP - Dynamic Cone SA - Soakaway Test</p>
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Leeds, W. Yorkshire, LS10 1SW  
Tel: 0113 200 8900 Fax: 0113 200 8901  
Web: www.metengineers.com



Exploratory Hole Ref:

**TP02**

Project Number:

12864/5006

Logged by:

Sam Fuller

Project Title:

Burleigh Street

Date:

01.04.15

Client:

Park Grove Surgery

Level (mAoD):

110.750

Co-ords:

434761, 406001

Method:

Trial Pits



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Leeds, W. Yorkshire, LS10 1SW  
Tel: 0113 200 8900 Fax: 0113 200 8901  
Web: www.metengineers.com



Exploratory Hole Ref:

**TP03**

Project Number:	12864/5006	Logged by:	Sam Fuller
Project Title:	Burleigh Street	Date:	01.04.15
Client:	Park Grove Surgery	Level (mAoD):	110.000
		Co-ords:	434771, 406007
		Method:	Trial Pits

Strata Description	Legend	Level (mAoD)	Depth (m)	Water Strike	Sample / Test		Notes
					Depth (m)	Type	
Grass and Topsoil		109.800	0.200				
Dark Brown/ Black, Sandy, Ashy, Soft Clay with large sandstone boulders. (ARTIFICIAL GROUND)		109.600	0.400		0.400	TTJJVV	
Dark Brown, Sandy, Ashy, Soft Clay with occasional bricks (ARTIFICIAL GROUND)		109.300	0.700				
Orange, Sandy, Soft Clay with many sandstone gravels and occasional cobble of rubble.  (ARTIFICIAL GROUND)		108.500	1.500				
Orange, Sandy, Soft Clay with many large sandstone boulders  - Loose and collapsing  (ARTIFICIAL GROUND)		107.500	2.500				
Hole Terminated Due To Hole Collapse							

<u>Notes:</u> Ground Water: None Stability: Unstable Weather: Changeable Pit Dimensions: 3 x 1m	<u>Sample Codes:</u> D - Disturbed T - Tub J - Jar V - Vial U - U38 Tube BB - Bulk Bag	<u>Test Codes:</u> SVT - Shear vane DCP - Dynamic Cone SA - Soakaway Test
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Exploratory Hole Ref:

**TP03**

Project Number:

12864/5006

Logged by:

Sam Fuller

Project Title:

Burleigh Street

Date:

01.04.15

Client:

Park Grove Surgery

Level (mAoD):

110.000

Co-ords:

434771, 406007

Method:

Trial Pits



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Web: www.metengineers.com



Exploratory Hole Ref:

**TP04**

Project Number:	12864/5006	Logged by:	Sam Fuller
Project Title:	Burleigh Street	Date:	01.04.15
Client:	Park Grove Surgery	Level (mAoD):	110.000
		Co-ords:	434771, 405992
		Method:	Trial Pits

Strata Description	Legend	Level (mAoD)	Depth (m)	Water Strike	Sample / Test		Notes
					Depth (m)	Type	
Grass and Topsoil		109.800	0.200				
Rubble, Bricks, Sandstone Boulders, Concrete Rubble and gravels of mixed lithology		109.000	1.000		0.600	TTJJVV	
Orange, Sandy, firm Clay with many sandstone gravels cobbles and boulders.		107.600	2.400		1.400	TTJJVV	
Hole Terminated Due To Hole Collapse							

<p><u>Notes:</u></p> <p>Ground Water: None Stability: Unstable Weather: Changeable Pit Dimensions: 3 x 1m</p>	<p><u>Sample Codes:</u></p> <p>D - Disturbed T - Tub J - Jar V - Vial U - U38 Tube BB - Bulk Bag</p>	<p><u>Test Codes:</u></p> <p>SVT - Shear vane DCP - Dynamic Cone SA - Soakaway Test</p>
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Web: www.metengineers.com



Exploratory Hole Ref:

**TP04**

Project Number:

12864/5006

Logged by:

Sam Fuller

Project Title:

Burleigh Street

Date:

01.04.15

Client:

Park Grove Surgery

Level (mAoD):

110.000

Co-ords:

434771, 405992

Method:

Trial Pits



# MET Engineers Ltd

Southgate House, Pontefract Road,  
Leeds, W. Yorkshire, LS10 1SW  
Tel: 0113 200 8900 Fax: 0113 200 8901  
Web: www.metengineers.com



Exploratory Hole Ref:

**TP05**

Project Number:	12864/5006	Logged by:	Sam Fuller
Project Title:	Burleigh Street	Date:	01.04.15
Client:	Park Grove Surgery	Level (mAoD):	110.000
		Co-ords:	434765, 405976
		Method:	Trial Pits

Strata Description	Legend	Level (mAoD)	Depth (m)	Water Strike	Sample / Test		Notes
					Depth (m)	Type	
Grass and Topsoil		109.900	0.100				
Dark Brown/ Black, Sandy, Ashy, Soft Clay with many wood fragments, general rubble and large sandstone boulders.  - Old brick wall down southern side of pit  (ARTIFICIAL GROUND)					0.300	TTJJVV	
Hole Terminated Due To Large Boulder		107.500	2.500				

<p><u>Notes:</u></p> <p>Ground Water: None Stability: Unstable Weather: Changeable Pit Dimensions: 3 x 1m</p>	<p><u>Sample Codes:</u></p> <p>D - Disturbed T - Tub J - Jar V - Vial U - U38 Tube BB - Bulk Bag</p>	<p><u>Test Codes:</u></p> <p>SVT - Shear vane DCP - Dynamic Cone SA - Soakaway Test</p>
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Web: www.metengineers.com



Exploratory Hole Ref:

**TP05**

Project Number:

12864/5006

Logged by:

Sam Fuller

Project Title:

Burleigh Street

Date:

01.04.15

Client:

Park Grove Surgery

Level (mAoD):

110.000

Co-ords:

434765, 405976

Method:

Trial Pits



# MET Engineers Ltd

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Tel: 0113 200 8900 Fax: 0113 200 8901  
Web: www.metengineers.com



Exploratory Hole Ref:

**TP06**

Project Number:	12864/5006	Logged by:	Sam Fuller
Project Title:	Burleigh Street	Date:	01.04.15
Client:	Park Grove Surgery	Level (mAoD):	108.500
		Co-ords:	434787, 405988
		Method:	Trial Pits

Strata Description	Legend	Level (mAoD)	Depth (m)	Water Strike	Sample / Test		Notes
					Depth (m)	Type	
Grass and Topsoil		108.400	0.100				
Dark Brown/ Black, Sandy, Ashey, Soft Clay with many Bricks, Gravels and an old lead and clay pipe. (ARTIFICIAL GROUND)		108.100	0.400		0.300	TTJJVV	
Orange, Sandy, firm Clay with many sandstone gravels cobbles and boulders.					1.200	BB	
		105.700	2.800				
Hole Terminated							

<p><u>Notes:</u></p> <p>Ground Water: None Stability: Loose But Stable Weather: Changeable Pit Dimensions: 3 x 1m</p>	<p><u>Sample Codes:</u></p> <p>D - Disturbed T - Tub J - Jar V - Vial U - U38 Tube BB - Bulk Bag</p>	<p><u>Test Codes:</u></p> <p>SVT - Shear vane DCP - Dynamic Cone SA - Soakaway Test</p>
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Tel: 0113 200 8900 Fax: 0113 200 8901  
Web: www.metengineers.com



Exploratory Hole Ref:

**TP06**

Project Number:

12864/5006

Logged by:

Sam Fuller

Project Title:

Burleigh Street

Date:

01.04.15

Client:

Park Grove Surgery

Level (mAoD):

108.500

Co-ords:

434787, 405988

Method:

Trial Pits




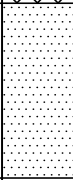
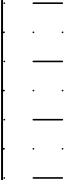

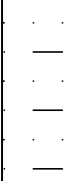
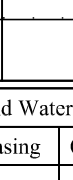
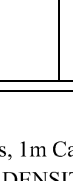
## **Appendix IV**

### Rotary Borehole Logs

# GEOL - CONSULTANTS LTD

Drillhole Log

Project : Park Grove Surgery				Drillhole No. <b>BH1</b>	
Client : Met Engineers					
Job no.	Date : 31/03/2014	Co-ordinates (m) E N	Ground Level (m)	Sheet : 1 of 3	

RUN DETAILS			STRATA				Geology	Instrument/ Backfill
			Red'cd Level	Legend	Depth (Thickness)	DESCRIPTION		
						Discontinuities	Detail	Main
					0.9			FILL clay/stone
					(2.8)			
					3.7			FILL loose stoney in sandy clay
					(1.5)			
					5.2			SANDSTONE strong
					(4.8)			
					10.0			MUDSTONE strong

Drilling Progress and Water Observations							Rotary Flush				Method/ Plant used: Hand held rotary rig with water flush
Date	Time	Depth	Casing	Core dia	Strike	Water Standing	From	To	Type	Returns	
							0	30.5	water	nil	

No Flush from 1.5m , No Voids, 1m Case, No gas  
 REFERENCE TO MATERIAL DENSITY/STRENGTH REFERES TO DRILLERS  
 INTERPRETATION FROM DRILLING PROGRESS AND CHARACTERISITICS

Logged By: SP

# GEOL - CONSULTANTS LTD

Drillhole Log

Project : Park Grove Surgery				Drillhole No. <b>BH1</b>
Client : Met Engineers				
Job no.	Date : 31/03/2014	Co-ordinates (m) E N	Ground Level (m)	Sheet : 2 of 3

RUN DETAILS			STRATA				Geology	Instrument/ Backfill
			Red'cd Level	Legend	Depth (Thick-ness)	DESCRIPTION		
						Discontinuities	Detail	Main
					(1.4)			
					11.4			MUDSTONE strong
					(0.9)			
					12.3			COAL rods pulled coal on end
					(7.7)			
					20.0			MUDSTONE siltstone bands

Drilling Progress and Water Observations							Rotary Flush				Method/ Plant used: Hand held rotary rig with water flush
Date	Time	Depth	Casing	Core dia	Water Strike	Water Standing	From	To	Type	Returns	
							0	30.5	water	nil	

No Flush from 1.5m , No Voids, 1m Case, No gas  
 REFERENCE TO MATERIAL DENSITY/STRENGTH REFERES TO DRILLERS  
 INTERPRETATION FROM DRILLING PROGRESS AND CHARACTERISITICS

Logged By: SP

# GEOL - CONSULTANTS LTD

Drillhole Log

Project : Park Grove Surgery				Drillhole No. <b>BH1</b>	
Client : Met Engineers					
Job no.	Date : 31/03/2014	Co-ordinates (m) E N	Ground Level (m)	Sheet : 3 of 3	

RUN DETAILS			STRATA				Geology	Instrument/ Backfill	
		Red'cd Level	Legend	Depth (Thick- ness)	DESCRIPTION				
					Discontinuities	Detail			Main
				30.5				MUDSTONE siltstone bands strong	

Drilling Progress and Water Observations							Rotary Flush				Method/ Plant used:  Hand held rotary rig with water flush
Date	Time	Depth	Casing	Core dia	Strike	Water Standing	From	To	Type	Returns	
							0 0.9	0.9 30.5	water water	full nil	

No Flush from 1.5m , No Voids, 1m Case, No gas  
 REFERENCE TO MATERIAL DENSITY/STRENGTH REFERES TO DRILLERS  
 INTERPRETATION FROM DRILLING PROGRESS AND CHARACTERISITICS

Logged By:  
SP

# GEOL - CONSULTANTS LTD

Drillhole Log

Project : Park Grove Surgery				Drillhole No. <b>BH2</b>	
Client : Met Engineers					
Job no.	Date : 31/03/2014	Co-ordinates (m) E N	Ground Level (m)	Sheet : 1 of 2	

RUN DETAILS			STRATA				Geology	Instrument/ Backfill
	Red'cd Level	Legend	Depth (Thickness)	DESCRIPTION				
				Discontinuities	Detail	Main		
			0.3			SOIL		
			(4.9)					
			5.2			FILL SANDSTONE loose in sandy clay		
			(0.6)					
			5.8			SANDSTONE fractured		
			(4.2)					
			10.0			MUDSTONE strong		

Drilling Progress and Water Observations							Rotary Flush				Method/ Plant used: Hand held rotary rig with water flush
Date	Time	Depth	Casing	Core dia	Strike	Water Standing	From	To	Type	Returns	
							0	13.9	water	nil	

No Flush, No Voids, Im Case, No gas  
 REFERENCE TO MATERIAL DENSITY/STRENGTH REFERES TO DRILLERS  
 INTERPRETATION FROM DRILLING PROGRESS AND CHARACTERISITICS

Logged By: SP

# GEOL - CONSULTANTS LTD

Drillhole Log

Project : Park Grove Surgery				Drillhole No. <b>BH2</b>	
Client : Met Engineers					
Job no.	Date : 31/03/2014	Co-ordinates (m) E N	Ground Level (m)	Sheet : 2 of 2	

RUN DETAILS			STRATA				Geology	Instrument/ Backfill
		Red'cd Level	Legend	Depth (Thick- ness)	DESCRIPTION			
					Discontinuities	Detail	Main	
				12.8			MUDSTONE strong	
				(0.9) 13.7			COAL	
				13.9 (0.2)			MUDSTONE	

Drilling Progress and Water Observations							Rotary Flush				Method/ Plant used: Hand held rotary rig with water flush
Date	Time	Depth	Casing	Core dia	Strike	Water Standing	From	To	Type	Returns	
							0	13.9	water	nil	




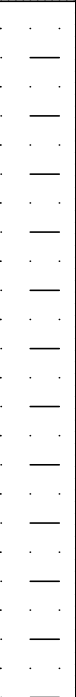
No Flush, No Voids, 1m Case, No gas  
 REFERENCE TO MATERIAL DENSITY/STRENGTH REFERES TO DRILLERS  
 INTERPRETATION FROM DRILLING PROGRESS AND CHARACTERISITICS

Logged By:  
SP

# GEOL - CONSULTANTS LTD

Drillhole Log

Project : Park Grove Surgery				Drillhole No. <b>BH3</b>
Client : Met Engineers				
Job no.	Date : 31/03/2014	Co-ordinates (m) E N	Ground Level (m)	Sheet : 1 of 3

RUN DETAILS			STRATA				Geology	Instrument/ Backfill
		Red'cd Level	Legend	Depth (Thick-ness)	DESCRIPTION			
					Discontinuities	Detail	Main	
				1.5			FILL stoney clay	
				(1.9) 3.4			FILL loose stoney sandy	
				(0.6) 4.0			SANDSTONE strong	
				(6.0) 10.0			MUDSTONE siltstone bands	

Drilling Progress and Water Observations							Rotary Flush				Method/ Plant used: Hand held rotary rig with water flush
Date	Time	Depth	Casing	Core dia	Water Strike	Water Standing	From	To	Type	Returns	
							0	30.5	water	nil	

No Flush, No Voids, 1m Case, No gas  
 REFERENCE TO MATERIAL DENSITY/STRENGTH REFERES TO DRILLERS  
 INTERPRETATION FROM DRILLING PROGRESS AND CHARACTERISITICS

Logged By: SP

# GEOL - CONSULTANTS LTD

Drillhole Log

Project : Park Grove Surgery				<b>Drillhole No.</b>  <b>BH3</b>
Client : Met Engineers				
Job no.	Date : 31/03/2014	Co-ordinates (m) E N	Ground Level (m)	Sheet : 2 of 3

RUN DETAILS			STRATA				Geology	Instrument/ Backfill
			Red'cd Level	Legend	Depth (Thickness)	DESCRIPTION		
						Discontinuities	Detail	Main
				—	(1.9)			
				—	11.0			MUDSTONE siltstone bands
				■	(0.7)			
				■	11.7			COAL
				—	(8.3)			
				—	20.0			MUDSTONE siltstone bands strong

Drilling Progress and Water Observations							Rotary Flush				Method/ Plant used:  Hand held rotary rig with water flush
Date	Time	Depth	Casing	Core dia	Strike	Water Standing	From	To	Type	Returns	
							0	30.5	water	nil	

No Flush, No Voids, 1m Case, No gas  
 REFERENCE TO MATERIAL DENSITY/STRENGTH REFERES TO DRILLERS  
 INTERPRETATION FROM DRILLING PROGRESS AND CHARACTERISITICS

Logged By:  
SP

# GEOL - CONSULTANTS LTD

Drillhole Log

Project : Park Grove Surgery				Drillhole No. <b>BH3</b>	
Client : Met Engineers					
Job no.	Date : 31/03/2014	Co-ordinates (m) E N	Ground Level (m)	Sheet : 3 of 3	

RUN DETAILS			STRATA				Geology	Instrument/ Backfill
	Red'cd Level	Legend	Depth (Thick-ness)	DESCRIPTION				
				Discontinuities	Detail	Main		
			20.0			MUDSTONE siltstonr bands strong		

Drilling Progress and Water Observations							Rotary Flush				Method/ Plant used: Hand held rotary rig with water flush
Date	Time	Depth	Casing	Core dia	Strike	Water Standing	From	To	Type	Returns	
							0	30.5	water	nil	

No Flush, No Voids, 1m Case, No gas  
 REFERENCE TO MATERIAL DENSITY/STRENGTH REFERES TO DRILLERS  
 INTERPRETATION FROM DRILLING PROGRESS AND CHARACTERISITICS

Logged By:  
SP

# Appendix V

## Core Logs

# MET Engineers Ltd

Southgate House, Pontefract Road,  
Leeds, W. Yorkshire, LS10 1SW  
Tel: 0113 200 8900 Fax: 0113 200 8901  
Web: www.metengineers.com



Exploratory Hole Ref:

**Core01**

Project Number: 12864/5006	Logged by: Sam Fuller
Project Title: Burleigh Street	Date: 31.03.15
Client: Park Grove Surgery	Level (mAoD): 111.940
	Co-ords: 434718, 405941
	Method: 150mm Core Barrel

Strata Description	Legend	Level (mAoD)	Depth (m)	Water Strike	Sample / Test		Notes
					Depth (m)	Type	
Asphalt wearing course with <5mm gravels			0.025				
Asphalt sub course with 5 - 20mm gravels			0.110				
Limestone gravels - Core Terminated							

<p><u>Notes</u></p> <p>Ground Water: None</p> <p>Stability: -</p> <p>Weather: Sunny</p> <p>Core Dimensions: 150mm diameter</p>	<p><u>Sample Codes:</u></p> <p>D - Disturbed</p> <p>T - Tub</p> <p>J - Jar</p> <p>V - Vial</p> <p>U - U100 Tube</p> <p>BB - Bulk Bag</p>	<p><u>Test Codes:</u></p> <p>SPT - Standard Penetration Test</p> <p>DP - Dynamic Probing</p> <p>VHT - Variable Head Test</p>
--	--	--

# MET Engineers Ltd

Southgate House, Pontefract Road,  
Leeds, W. Yorkshire, LS10 1SW  
Tel: 0113 200 8900 Fax: 0113 200 8901  
Web: www.metengineers.com



Exploratory Hole Ref:

**Core01**

Project Number:

12864/5006

Logged by:

Sam Fuller

Project Title:

Burleigh Street

Date:

31.03.15

Client:

Park Grove Surgery

Level (mAoD):

111.940

Co-ords:

434718, 405941

Method:

150mm Core Barrel



# MET Engineers Ltd

Southgate House, Pontefract Road,  
Leeds, W. Yorkshire, LS10 1SW  
Tel: 0113 200 8900 Fax: 0113 200 8901  
Web: www.metengineers.com



Exploratory Hole Ref:

**Core02**

Project Number:	12864/5006	Logged by:	Sam Fuller
Project Title:	Burleigh Street	Date:	31.03.15
Client:	Park Grove Surgery	Level (mAoD):	111.580
		Co-ords:	434729, 405955
		Method:	150mm Core Barrel

Strata Description	Legend	Level (mAoD)	Depth (m)	Water Strike	Sample / Test		Notes
					Depth (m)	Type	
Asphalt wearing course with <5mm gravels			0.025				
Asphalt sub course with 5 - 20mm gravels			0.115				
Limestone gravels - Core Terminated							

<p><u>Notes</u></p> <p>Ground Water: None</p> <p>Stability: -</p> <p>Weather: Sunny</p> <p>Borehole Dimensions: 150mm diameter</p>	<p><u>Sample Codes:</u></p> <p>D - Disturbed</p> <p>T - Tub</p> <p>J - Jar</p> <p>V - Vial</p> <p>U - U100 Tube</p> <p>BB - Bulk Bag</p>	<p><u>Test Codes:</u></p> <p>SPT - Standard Penetration Test</p> <p>DP - Dynamic Probing</p> <p>VHT - Variable Head Test</p>
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**MET Engineers Ltd**

Southgate House, Pontefract Road,  
Leeds, W. Yorkshire, LS10 1SW  
Tel: 0113 200 8900 Fax: 0113 200 8901  
Web: www.metengineers.com



Exploratory Hole Ref:

**Core02**

Project Number:

12864/5006

Logged by:

Sam Fuller

Project Title:

Burleigh Street

Date:

31.03.15

Client:

Park Grove Surgery

Level (mAoD):

111.580

Co-ords:

434729, 405955

Method:

150mm Core Barrel



# Appendix VI

## Soil Test Results

## FINAL ANALYTICAL TEST REPORT

**Envirolab Job Number:** 15/02128  
**Issue Number:** 1  
**Date:** 20 April, 2015

**Client:** MET Engineers Ltd  
Southgate House  
Pontefract Road  
Leeds  
LS10 1SW

**Project Manager:** Sam Fuller  
**Project Name:** Park Grove Surgery  
**Project Ref:** 12864/5006  
**Order No:** 151-2015-SAF  
**Date Samples Received:** 02/04/15  
**Date Instructions Received:** 07/04/15  
**Date Analysis Completed:** 20/04/15

**Prepared by:**

**Approved by:**



Melanie Marshall  
Laboratory Coordinator



Carolyn Field  
Sales Executive

Envirolab Job Number: 15/02128

Client Project Name: Park Grove Surgery

Client Project Ref: 12864/5006

Lab Sample ID	15/02128/1	15/02128/2	15/02128/3	15/02128/4	15/02128/5	15/02128/6	15/02128/7	15/02128/8	Units	Method ref		
Client Sample No												
Client Sample ID	TP01	TP01	TP02	TP02	TP03	TP04	TP04	TP04				
Depth to Top	0.60	2.00	0.50	1.80	0.40	0.60	1.40	1.60				
Depth To Bottom												
Date Sampled	01-Apr-15	01-Apr-15	01-Apr-15	01-Apr-15	01-Apr-15	01-Apr-15	01-Apr-15	01-Apr-15				
Sample Type	Soil - D	Soil - D	Soil - D	Soil - D	Soil - D	Soil - D	Soil - D	Soil - D				
MCERTS Sample Matrix Code	4A	5A	1A	4AB	4AE	4A	1A	1A				
% Stones >10mm <sub>A</sub> <sup>#</sup>	16.0	<0.1	22.1	6.4	18.5	9.9	5.7	<0.1			% w/w	A-T-044
pH <sub>D</sub> <sup>M#</sup>	-	8.56	-	-	-	-	-	8.15	pH	A-T-031s		
Sulphate (water sol 2:1) <sub>D</sub> <sup>M#</sup>	-	0.01	-	-	-	-	-	0.01	g/l	A-T-026s		
Arsenic <sub>D</sub> <sup>M#</sup>	14	-	4	10	8	6	<1	-	mg/kg	A-T-024s		
Cadmium <sub>D</sub> <sup>M#</sup>	0.8	-	<0.5	<0.5	<0.5	<0.5	<0.5	-	mg/kg	A-T-024s		
Copper <sub>D</sub> <sup>M#</sup>	45	-	16	29	23	23	7	-	mg/kg	A-T-024s		
Chromium <sub>D</sub> <sup>M#</sup>	16	-	5	8	9	9	7	-	mg/kg	A-T-024s		
Lead <sub>D</sub> <sup>M#</sup>	263	-	35	120	83	83	8	-	mg/kg	A-T-024s		
Mercury <sub>D</sub>	0.45	-	0.48	0.54	0.25	0.50	<0.17	-	mg/kg	A-T-024s		
Nickel <sub>D</sub> <sup>M#</sup>	17	-	9	12	19	12	11	-	mg/kg	A-T-024s		
Selenium <sub>D</sub> <sup>M#</sup>	2	-	<1	<1	<1	<1	<1	-	mg/kg	A-T-024s		
Zinc <sub>D</sub> <sup>M#</sup>	203	-	34	49	36	44	10	-	mg/kg	A-T-024s		
% Moisture BS1377 1990 pt2 cl3.2 <sup>#</sup>	-	Appended	-	-	-	-	-	-		Subcon		
Atterburg 4Pt BS1377 1990 pt2 cl4.4,5.3+5.4 <sup>#</sup>	-	Appended	-	-	-	-	-	-		Subcon		
Asbestos in Soil (inc. matrix)												
Asbestos in soil <sub>A</sub> <sup>#</sup>	NAD	-	NAD	NAD	NAD	NAD	NAD	-		A-T-045		
Asbestos ACM - Suitable for Water Absorption Test? <sub>D</sub>	N/A	-	N/A	N/A	N/A	N/A	N/A	-		Gravimetry		

Envirolab Job Number: 15/02128

Client Project Name: Park Grove Surgery

Client Project Ref: 12864/5006

Lab Sample ID	15/02128/1	15/02128/2	15/02128/3	15/02128/4	15/02128/5	15/02128/6	15/02128/7	15/02128/8	Units	Method ref		
Client Sample No												
Client Sample ID	TP01	TP01	TP02	TP02	TP03	TP04	TP04	TP04				
Depth to Top	0.60	2.00	0.50	1.80	0.40	0.60	1.40	1.60				
Depth To Bottom												
Date Sampled	01-Apr-15	01-Apr-15	01-Apr-15	01-Apr-15	01-Apr-15	01-Apr-15	01-Apr-15	01-Apr-15				
Sample Type	Soil - D	Soil - D	Soil - D	Soil - D	Soil - D	Soil - D	Soil - D	Soil - D				
MCERTS Sample Matrix Code	4A	5A	1A	4AB	4AE	4A	1A	1A				
PAH 16												
Acenaphthene <sub>A</sub> <sup>M#</sup>	0.09	-	0.04	0.02	<0.01	0.26	<0.01	-	mg/kg	A-T-019s		
Acenaphthylene <sub>A</sub> <sup>M#</sup>	0.08	-	0.05	0.03	<0.01	0.17	<0.01	-	mg/kg	A-T-019s		
Anthracene <sub>A</sub> <sup>M#</sup>	0.57	-	0.34	0.17	0.03	1.81	<0.02	-	mg/kg	A-T-019s		
Benzo(a)anthracene <sub>A</sub> <sup>M#</sup>	2.66	-	1.85	0.94	0.15	6.17	0.29	-	mg/kg	A-T-019s		
Benzo(a)pyrene <sub>A</sub> <sup>M#</sup>	2.24	-	1.61	0.86	0.13	5.42	0.29	-	mg/kg	A-T-019s		
Benzo(b)fluoranthene <sub>A</sub> <sup>M#</sup>	2.82	-	1.98	1.02	0.17	6.23	0.33	-	mg/kg	A-T-019s		
Benzo(ghi)perylene <sub>A</sub> <sup>M#</sup>	1.22	-	0.84	0.48	0.06	2.91	0.14	-	mg/kg	A-T-019s		
Benzo(k)fluoranthene <sub>A</sub> <sup>M#</sup>	0.99	-	0.70	0.39	<0.07	2.25	0.13	-	mg/kg	A-T-019s		
Chrysene <sub>A</sub> <sup>M#</sup>	2.70	-	1.82	0.96	0.16	5.80	0.28	-	mg/kg	A-T-019s		
Dibenzo(ah)anthracene <sub>A</sub> <sup>M#</sup>	0.35	-	0.24	0.11	<0.04	0.81	<0.04	-	mg/kg	A-T-019s		
Fluoranthene <sub>A</sub> <sup>M#</sup>	5.00	-	3.49	1.59	0.17	12.1	0.33	-	mg/kg	A-T-019s		
Fluorene <sub>A</sub> <sup>M#</sup>	0.16	-	0.08	0.04	<0.01	0.46	<0.01	-	mg/kg	A-T-019s		
Indeno(123-cd)pyrene <sub>A</sub> <sup>M#</sup>	1.49	-	1.07	0.58	0.07	3.56	0.17	-	mg/kg	A-T-019s		
Naphthalene <sub>A</sub> <sup>M#</sup>	0.14	-	0.05	0.06	<0.03	0.57	<0.03	-	mg/kg	A-T-019s		
Phenanthrene <sub>A</sub> <sup>M#</sup>	2.23	-	1.34	0.50	0.10	6.48	0.05	-	mg/kg	A-T-019s		
Pyrene <sub>A</sub> <sup>M#</sup>	4.24	-	2.95	1.40	0.16	10.3	0.39	-	mg/kg	A-T-019s		
PAH (total 16) <sub>A</sub> <sup>M#</sup>	27	-	18.4	9.14	1.21	65.3	2.39	-	mg/kg	A-T-019s		

Envirolab Job Number: 15/02128

Client Project Name: Park Grove Surgery

Client Project Ref: 12864/5006

Lab Sample ID	15/02128/1	15/02128/2	15/02128/3	15/02128/4	15/02128/5	15/02128/6	15/02128/7	15/02128/8	Units	Method ref		
Client Sample No												
Client Sample ID	TP01	TP01	TP02	TP02	TP03	TP04	TP04	TP04				
Depth to Top	0.60	2.00	0.50	1.80	0.40	0.60	1.40	1.60				
Depth To Bottom												
Date Sampled	01-Apr-15	01-Apr-15	01-Apr-15	01-Apr-15	01-Apr-15	01-Apr-15	01-Apr-15	01-Apr-15				
Sample Type	Soil - D	Soil - D	Soil - D	Soil - D	Soil - D	Soil - D	Soil - D	Soil - D				
MCERTS Sample Matrix Code	4A	5A	1A	4AB	4AE	4A	1A	1A				
TPH CWG												
Ali >C5-C6 <sub>A</sub> <sup>#</sup>	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	-	mg/kg	A-T-022s		
Ali >C6-C8 <sub>A</sub> <sup>#</sup>	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	-	mg/kg	A-T-022s		
Ali >C8-C10 <sub>A</sub> <sup>#</sup>	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	-	mg/kg	A-T-022s		
Ali >C10-C12 <sub>A</sub> <sup>#</sup>	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	-	mg/kg	A-T-023s		
Ali >C12-C16 <sub>A</sub> <sup>#</sup>	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	-	mg/kg	A-T-023s		
Ali >C16-C21 <sub>A</sub> <sup>#</sup>	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	-	mg/kg	A-T-023s		
Ali >C21-C35 <sub>A</sub> <sup>#</sup>	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	-	mg/kg	A-T-023s		
Total Aliphatics <sub>A</sub>	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	-	mg/kg	A-T-022+23s		
Aro >C5-C7 <sub>A</sub> <sup>#</sup>	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	-	mg/kg	A-T-022s		
Aro >C7-C8 <sub>A</sub> <sup>#</sup>	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	-	mg/kg	A-T-022s		
Aro >C8-C9 <sub>A</sub> <sup>#</sup>	0.02	-	<0.01	0.03	0.02	0.02	<0.01	-	mg/kg	A-T-022s		
Aro >C9-C10 <sub>A</sub> <sup>#</sup>	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	-	mg/kg	A-T-022s		
Aro >C10-C12 <sub>A</sub> <sup>#</sup>	1.5	-	0.4	<0.1	<0.1	1.5	<0.1	-	mg/kg	A-T-023s		
Aro >C12-C16 <sub>A</sub> <sup>#</sup>	3.7	-	2.6	0.2	<0.1	1.7	<0.1	-	mg/kg	A-T-023s		
Aro >C16-C21 <sub>A</sub> <sup>#</sup>	5.6	-	1.6	1.1	<0.1	4.9	<0.1	-	mg/kg	A-T-023s		
Aro >C21-C35 <sub>A</sub> <sup>#</sup>	6.2	-	3.1	1.9	<0.1	5.4	<0.1	-	mg/kg	A-T-023s		
Total Aromatics <sub>A</sub>	16.9	-	7.6	3.4	<0.1	13.5	<0.1	-	mg/kg	A-T-022+23s		
TPH (Ali & Aro) <sub>A</sub>	16.9	-	7.7	3.4	<0.1	13.5	<0.1	-	mg/kg	A-T-022+23s		
BTEX - Benzene <sub>A</sub> <sup>#</sup>	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	-	mg/kg	A-T-022s		
BTEX - Toluene <sub>A</sub> <sup>#</sup>	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	-	mg/kg	A-T-022s		
BTEX - Ethyl Benzene <sub>A</sub> <sup>#</sup>	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	-	mg/kg	A-T-022s		
BTEX - m & p Xylene <sub>A</sub> <sup>#</sup>	<0.01	-	<0.01	0.02	<0.01	<0.01	<0.01	-	mg/kg	A-T-022s		
BTEX - o Xylene <sub>A</sub> <sup>#</sup>	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	-	mg/kg	A-T-022s		
MTBE <sub>A</sub> <sup>#</sup>	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	-	mg/kg	A-T-022s		



Envirolab Job Number: 15/02128

Client Project Name: Park Grove Surgery

Client Project Ref: 12864/5006

Lab Sample ID	15/02128/9	15/02128/10	15/02128/11							
Client Sample No										
Client Sample ID	TP05	TP06	TP06							
Depth to Top	0.30	0.30	1.20							
Depth To Bottom										
Date Sampled	01-Apr-15	01-Apr-15	01-Apr-15							
Sample Type	Soil - D	Soil - D	Soil - D							
MCERTS Sample Matrix Code	4ABE	4A	5A							
<b>PAH 16</b>										
Acenaphthene <sub>A</sub> <sup>M#</sup>	0.03	<0.01	-						mg/kg	A-T-019s
Acenaphthylene <sub>A</sub> <sup>M#</sup>	0.07	<0.01	-						mg/kg	A-T-019s
Anthracene <sub>A</sub> <sup>M#</sup>	0.16	0.04	-						mg/kg	A-T-019s
Benzo(a)anthracene <sub>A</sub> <sup>M#</sup>	0.80	0.25	-						mg/kg	A-T-019s
Benzo(a)pyrene <sub>A</sub> <sup>M#</sup>	0.77	0.22	-						mg/kg	A-T-019s
Benzo(b)fluoranthene <sub>A</sub> <sup>M#</sup>	0.87	0.27	-						mg/kg	A-T-019s
Benzo(ghi)perylene <sub>A</sub> <sup>M#</sup>	0.39	0.10	-						mg/kg	A-T-019s
Benzo(k)fluoranthene <sub>A</sub> <sup>M#</sup>	0.34	0.09	-						mg/kg	A-T-019s
Chrysene <sub>A</sub> <sup>M#</sup>	0.75	0.25	-						mg/kg	A-T-019s
Dibenzo(ah)anthracene <sub>A</sub> <sup>M#</sup>	0.12	<0.04	-						mg/kg	A-T-019s
Fluoranthene <sub>A</sub> <sup>M#</sup>	1.19	0.41	-						mg/kg	A-T-019s
Fluorene <sub>A</sub> <sup>M#</sup>	0.07	<0.01	-						mg/kg	A-T-019s
Indeno(123-cd)pyrene <sub>A</sub> <sup>M#</sup>	0.50	0.13	-						mg/kg	A-T-019s
Naphthalene <sub>A</sub> <sup>M#</sup>	<0.03	<0.03	-						mg/kg	A-T-019s
Phenanthrene <sub>A</sub> <sup>M#</sup>	0.62	0.15	-						mg/kg	A-T-019s
Pyrene <sub>A</sub> <sup>M#</sup>	1.03	0.35	-						mg/kg	A-T-019s
PAH (total 16) <sub>A</sub> <sup>M#</sup>	7.74	2.28	-						mg/kg	A-T-019s



## **REPORT NOTES**

### **Notes - Soil chemical analysis**

All results are reported as dry weight (<40°C).

For samples with Matrix Codes 1 - 6 natural stones >10mm are removed or excluded from the sample prior to analysis and reported results corrected to a whole sample basis. For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis.

### **Notes - General**

This report shall not be reproduced, except in full, without written approval from Envirolab.

Subscript "A" indicates analysis performed on the sample as received. "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve, unless asbestos is found to be present in which case all analysis is performed on the sample as received.

All analysis is performed on the dried and crushed sample for samples with Matrix Code 7 and this supercedes any "A" subscripts.

All analysis is performed on the sample as received for soil samples from outside the European Union and this supercedes any "D" subscripts.

Superscript "M" indicates method accredited to MCERTS.

If results are in italic font they are associated with an AQC failure. These are not accredited and are unreliable.

A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.

### **TPH analysis of water by method A-T-007**

Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

### **Asbestos in soil**

Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if present as discrete fibres/fragments. Stones etc. are not removed from the sample prior to analysis.

Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed.

Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

### **Predominant Matrix Codes:**

1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER.

Samples with Matrix Code 7 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations.

### **Secondary Matrix Codes:**

A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,

E = contains roots/twigs.

IS indicates Insufficient sample for analysis.

NDP indicates No Determination Possible.

NAD indicates No Asbestos Detected.

N/A indicates Not Applicable.

Superscript # indicates method accredited to ISO 17025.

Analytical results reflect the quality of the sample at the time of analysis only. Opinions and interpretations expressed are outside the scope of our accreditation.

Please contact us if you need any further information.



**STRUCTURAL SOILS LTD**  
**TEST REPORT**



Report No. 781623 R1

1774

Date 17-April-2015 Contract 12864/5006

Client Envirolab Ltd  
Address Units 7 & 8 Sandpits Business Park  
Mottram Road  
Hyde  
SK14 3AR

For the Attention of Iain Haslock

Samples submitted by client 08/04/2015  
Testing Started 08/04/2015  
Testing Completed 17/04/2015

Client Reference 15/02128  
Client Order No. P0731849  
Instruction Type Written

UKAS Accredited Tests Undertaken

Moisture Content (oven drying method) BS1377:Part 2:1990,clause 3.2  
Liquid Limit (definitive method) BS1377:Part 2:1990,clause 4.3  
Plastic Limit BS1377:Part 2:1990,clause 5.3  
Plasticity Index Derivation BS1377:Part 2:1990,clause 5.4

\* Tests were undertaken on samples 'as received' unless otherwise stated

Please Note: Remaining samples will be retained for a period of one month from today and will then be disposed of



