

Report No	Date
20105/R1	December 2020
Project	<b>BRYNGELLI, HIRWAUN – GROUND INVESTIGATION REPORT</b>
Client	<b>CB3</b>

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<b>Report No:</b>	<b>Date:</b>
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Signed 	December 2020

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**Phase 1 Summary Page 1 of 2**

Client		CB3	
Current Site Status		The existing site is approximately rectangular, being former concrete hardstanding and grass	
Development Proposals		The development proposals are understood to comprise residential housing.	
Site Conditions	Location		The site is at Hirwaun
	History	Site	<ul style="list-style-type: none"> <li>The site was classified as an agricultural field, since the first available historic map of 1890. By 1961 a Works was shown on the site, which became noted as a Concrete Products plant in 1970. "Issues" are shown in the south west corner of the site. The club turned into a bakery. The A465 was built.</li> </ul>
		Adjacent land	<ul style="list-style-type: none"> <li>Mostly agricultural with residential developments. River running to north. To the east has been a club and bakery</li> </ul>
	Geology	<ul style="list-style-type: none"> <li>The published geology indicates Glacial Till deposits overlying Coal Measures.</li> </ul>	
Mining		<ul style="list-style-type: none"> <li>Not shown at the site.</li> </ul>	
Controlled Waters	Surface Water	<ul style="list-style-type: none"> <li>No terrestrial waters at site, but river to north and adjacent to west.</li> </ul>	
	Ground Waters	<ul style="list-style-type: none"> <li>No records of controlled waters.</li> </ul>	
Flood Risk		<ul style="list-style-type: none"> <li>1 in 30 year surface water risk.</li> </ul>	
Radon		<ul style="list-style-type: none"> <li>The site is not in an area at risk from Radon.</li> </ul>	
Landfill		<ul style="list-style-type: none"> <li>There are no landfills within the site area.</li> </ul>	

**Bryngelli, Hirwaun**  
**Phase 1 Summary Page 2 of 2**

Principle contamination issues	<p>The following contamination issues were identified during the Phase 1;</p> <ul style="list-style-type: none"> <li>No specific historic on site uses have been identified which would suggest contamination. The works may have had hydrocarbons and asbestos associated.</li> </ul>
Environmental Risk	<ul style="list-style-type: none"> <li>Significant and widespread contamination is considered unlikely, unless some processes as yet unidentified have occurred.</li> <li>Initial consideration, in advance of site investigation is that:</li> <li>The risk to end users is considered to be <b>Low</b>.</li> <li>The risk to construction/maintenance workers is considered <b>Moderate</b>. However, with appropriate PPE the risk is considered to be <b>Low</b>.</li> <li>The risk to the off site surface water and groundwater receptors is <b>Low to Very Low</b>.</li> <li>The risk to end users from marginally elevated soil gas is considered to be <b>Low</b>.</li> </ul>
Waste Management	<ul style="list-style-type: none"> <li>In advance of site investigation:</li> <li>Made ground has not yet been identified.</li> <li>Natural arisings likely to be 100% inert.</li> </ul>
Geotechnical Constraints	<p>Based on the available information, the following issues may be anticipated, and should be investigated by site investigation prior to development;</p> <ul style="list-style-type: none"> <li>Near surface soft clay.</li> <li>Below ground services.</li> <li>Potential instability of excavations.</li> <li>Potential elevated background chemical values.</li> </ul>
Services	<ul style="list-style-type: none"> <li>Below ground services may be anticipated on site including existing site drainage.</li> </ul>
Future Works	<p>The following future works/surveys may be required;</p> <ul style="list-style-type: none"> <li>Topographical survey.</li> <li>Ground Investigation to prove the ground conditions and to collect samples for soil contamination testing and assessment.</li> <li>Further soakaway testing may develop more data for design.</li> </ul>

## **1.0 INTRODUCTION**

### **1.1 Introduction**

Spectrum Geo Services (SGS) were requested by CB3 to undertake a Site Investigation Study, of a site at Bryngelli, Hirwaun, CF44 9PT.

This report includes a review of the available geological and historical information and Phase 2 Ground Investigation operations.

### **1.2 Scope of Works**

The objectives of this assessment are:

- Purchase historic maps, envirocheck report, coal report and radon report.
- Review desktop data and advise on any issues raised.
- 1 day window samples with 3 monitoring wells.
- 2 days trial pitting JBC provided by client.
- Infiltration testing. (This is concurrent with the pitting)
- CBR Test results
- 3 Return Monitoring Visits
- Allow provisional sum of £1500 (+VAT) for geotechnical and contamination testing.
- Allow for supervision of the site works by a geotechnical engineer.
- Allow for preparing a combined desktop and interpretative report.
- Allow for all security, safety fencing, preparation of risk assessments and method statements within your costs.

### **1.3 Development Proposals**

It is assumed that the intention is to develop the site for the purposes of Residential Development.

#### **1.4 Limitations**

Subsoils are inherently variable and by their very nature are hidden from view such that no investigation can be exhaustive to the extent that all soil conditions are revealed. Conditions may therefore be present beneath the site that were not apparent from the data available for review.

Unless specifically noted to the contrary, it should be assumed that this report has not been submitted to any regulatory authorities for approval. Redevelopment sites may have planning conditions attached in respect of contaminated land assessment. Where we are made aware of such conditions in advance of scoping the works, we can tailor the report to the regulatory authority requirements. Where we are not made aware of any such requirements there can be no certainty that our investigation will meet any or all the regulatory authority requirements.

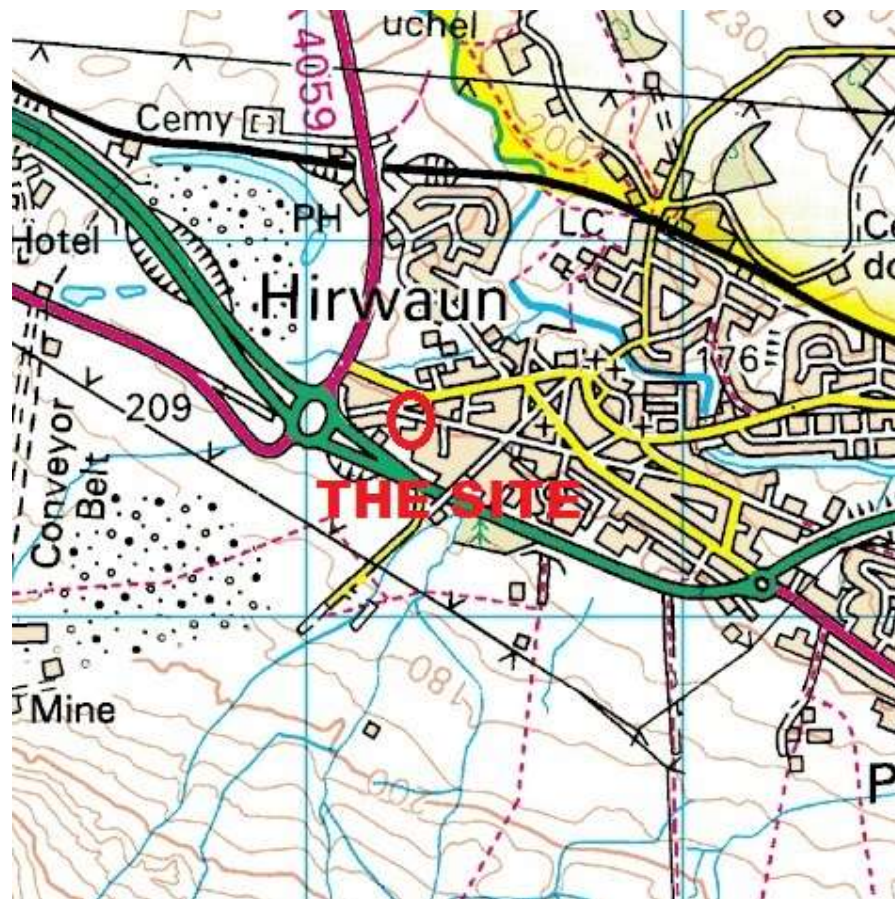


## 2.0 EXISTING SITE INFORMATION

### 2.1 Site Location

The development site is situated to the west of the Bryngelli Estate, Hirwaun, at postcode CF44 9PT.

The existing site comprised a former industrial area with areas of derelict concrete hardstanding and grass.



*Figure SGS/20105/01: Site Location Plan*

## 2.2 Published Geology

Based on data available from the BGS webviewer, the following geological setting is anticipated.

- **Superficial deposits:**
- **1:50 000 scale superficial deposits description:** *Till, Devensian - Diamicton. Superficial Deposits formed up to 2 million years ago in the Quaternary Period. Local environment previously dominated by ice age conditions (U).*

**Setting: ice age conditions (U).** *These sedimentary deposits are glacial in origin. They are detrital, created by the action of ice and meltwater, they can form a wide range of deposits and geomorphologies associated with glacial and inter-glacial periods during the Quaternary.*

- **Solid Geology:**
- **1:50 000 scale bedrock geology description:** *South Wales Lower Coal Measures Formation - Mudstone, Siltstone And Sandstone. Sedimentary Bedrock formed approximately 318 to 319 million years ago in the Carboniferous Period. Local environment previously dominated by swamps, estuaries and deltas.*

**Setting: swamps, estuaries and deltas.** *These sedimentary rocks are fluvial, palustrine and shallow-marine in origin. They are detrital, forming deposits reflecting the channels, floodplains and deltas of a river in a coastal setting (with periodic inundation from the sea).*

## 2.3 Hydrology

The site lies to the south of the Afon Cynon. The area has several small tributaries leading to that. The desk study indicates an on-site (west) Inland River not influenced by normal tidal action. This is recorded on the Water Framework Directive as water body GB109057033110.

### **3.0 DESK STUDY**

#### **3.1 Introduction**

To facilitate a Desk Study, Enviro Insight, and historical map information was procured, and is Appended.

#### **3.2 Site History**

Information about the historical development of the site and the adjacent land has been obtained from a review of the available Ordnance Survey maps. The historical land use is summarised in below:

##### **On site historical Land use**

- Between 1890 and 1919 the site was predominantly open fields with several buildings outside the boundary.
- By 1961 a Works was shown on the site, which became noted as a Concrete Products plant in 1970. A Club and Bakery had been opened to the east. “Issues” are shown in the south west corner of the site.
- By 1970, the A465 had been built to the south.
- The 1980 map shows the Club to have become a Joinery.

#### **3.3 Radon Report**

The appended radon report indicates that no radon protection measures are required.

### **3.4 Enviro Insight Report**

The Enviro Insight report assesses the recorded likelihood of occurrence of various environmental risks at the site.

- a) Historic Landfill – none,
- b) Environmental Permits – none,
- c) Landfill – none,
- d) Current land use – none,
- e) Former land use – unspecified works,
- f) Abstraction Licences – none,
- g) Surface Water abstraction Licences – none,
- h) Flooding Groundwater – low,
- i) Flooding Surface Water – 1 in 30 year
- j) Environmental Sensitivity – none,
- k) Natural Hazards – Very low/negligible,
- l) Industrial Landuse – Telecomm Mast
- m) Hydrogeology – superficial aquifer, low vulnerability

### **3.5 Coal Mining Report**

A Coal Mining Report, procured for the scheme indicates that it is unlikely that coal mining features will impact on the stability of the enquiry boundary. The report is appended.

## **4.0 SITE OPERATIONS**

### **4.1 Site Works**

Site works were undertaken on 02 and 03 December 2020 and comprised 7 Trial Pits, 3 Soakaway tests and 7 Window Sample holes. Conditions during the fieldwork were predominantly overcast and inclement. The positions are shown on Drawing SGS/20105/02, Appendix G

The work was undertaken in accordance with BS5930.

Samples were recovered of strata encountered, to allow laboratory testing to be undertaken.

Soakaway tests were undertaken in three of the trial pits.

## **5.0 LABORATORY TESTING**

### **5.1 Introduction**

On completion of site operations, selected soil and rock samples were scheduled for laboratory testing. The following laboratory testing was undertaken and is Appended.

- Atterberg Limits,
- Moisture Content,
- pH,
- Sulphate by aqueous extract,
- Metals soil suite,
- PAH,
- Organic Matter,
- Asbestos ID.

The results are presented within Appendix C.

## 6.0 SITE CONDITIONS ENCOUNTERED

### 6.1 Ground Conditions

The ground conditions encountered are summarised below. Conditions can vary in areas which are between exploratory hole positions and thus have not been investigated.

Stratum	Depth to base (m)	Remarks
Made Ground (Concrete)	0.10 – 0.30	WS1,2,3 and TP2
Made Ground (with slag and coal)	0.10 – 0.80	Absent at WS4,5,7, TP3,4 and 7
PEAT	0.10 – 0.40	WS4,6 and TP4
Firm and stiff CLAY	1.00 – 2.00	Glacial TILL
Medium dense to dense SAND and GRAVEL	(1.40) – (4.00)	Deepest at WS1. Absent at WS4,5, TP4.

**Table 6.1. Generalised Strata**

In general, the site was mantled in Made Ground and Concrete in the north.

The natural deposits comprised predominantly firm to stiff CLAY overlying medium dense to dense GRAVELS – all assumed to be Glacial TILL.

### 6.2 Groundwater Conditions

During the field operations, water was noted, as shown on the Engineering Logs. Strikes were noted between 0.4m and 2m depth in all trial pits, bar TP3.

Subsequent water monitoring visits recorded levels in the standpipes, as shown in GW1. It was noted that water levels recorded within the standpipes was shallow, during one visit being noted as being at ground level.

It should be noted that groundwater levels vary due to changes in climatic and other operations and may at time differ from those recorded.

## 7.0 GEOTECHNICAL PARAMETERS

### 7.1 Introduction

This section presents geotechnical parameters, which will be taken forward into the foundation options appraisals, and assigns parameters to the strata encountered. We have chosen not to assess geotechnical parameters of the Made Ground, as it is variable both laterally and vertically.

#### 7.1.1 Firm to Stiff CLAY

CLAY was encountered across the site. In general the CLAY was noted to be firm to stiff, however, there were areas of softening. Standard Penetration Test N Values ranged between 7 and 50, however within the upper 1.5m, an average of 17 was noted. The relationship between the SPT 'N' values and depth is noted in Figure SGS/20105/SPT. Employing correlations developed by Stroud and Butler would suggest the following;

Undrained Cohesive Strength ( $c_u$ ) = 40-75kN/m<sup>2</sup>

Coefficient of Volume Compressibility ( $m_v$ ) = 0.15m<sup>2</sup>/MN

...which equates to a firm to stiff clay of medium compressibility.

Atterberg limits analyses indicated the materials to be CL and ML, suggesting predominantly low plasticity.

#### 7.1.2 PEAT

PEAT was noted at WS6 and TP4 only. It was noted a s relatively thin stratum, which did not yield sufficient sample for testing.

Nevertheless, such deposits would normally exhibit high compressibility.

#### 7.1.3 SAND and Gravel

GRAVEL or SAND was noted at across most of the site, underlying the CLAY..

SPT 'N' values were variable and suggest a medium dense to dense stratum, which corresponds with a drained angle of friction  $\phi'$  in the order of 32°.

## **8.0 GEOTECHNICAL ASSESSMENT**

### **8.1 Introduction**

The following sections provide an assessment of the options relating to foundation options at site, making suggestions relating to potential options/assessment for bearing capacity and foundations and attack to buried concrete.

### **8.2 Foundation Options**

The firm to stiff CLAYs would provide an allowable bearing capacity in the order of 75kN/m<sup>2</sup>, however care must be taken to inspect the stratum for very soft or waterlogged zones, which would require removal and replacement with suitable granular fill. PEAT should be removed from any load bearing areas.

Should pad or strip foundations be taken into the gravels, then an allowable bearing capacity in the order of 125kN/m<sup>2</sup> is considered appropriate.

Excavations will degrade in wet conditions, and thus close support should be considered.

All formations must be inspected by a professional Geotechnical Engineer to confirm that the materials will accommodate the allowable bearing capacity calculated, and so that soft spots are identified, and removed.

The presence of slag and coke in the Made Ground across much of the northern areas should be considered carefully in the earthworks design. Such strata can develop expansive tendencies, thus damaging pavements and foundations. The foundations would likely be extended below such deposits, and block and beam flooring would reduce the risk. However, it may be prudent to further assess the risk of expansivity regarding pavement design.

### **8.3 Attack to Buried Concrete**

Laboratory testing during, noted slightly acid pH values, and a maximum soluble sulphate value of 810mg/kg, indicating Sulphate Class DS-2, in accordance with BRE Special Digest 1.



#### **8.4 Groundwater**

Groundwater was noted during the site works and monitoring period. It shows that groundwater may be encountered in excavations.

It is prudent to assume that there may be perched tables or standing water during periods of rainfall. Thus, pumping from open sumps should be accommodated for.

It should be noted that groundwater levels vary due to changes in climatic and other conditions and may therefore at times vary from those recorded during these operations.

## 9.0 CONTAMINATION TESTING

Contamination testing was undertaken on six samples, as shown in the Appendices.

The results have been compared with current Environment Agency limits for Residential Uses, with plant uptake.

Table 9.1 shows the recorded values, related to current Soil Guideline Values (SGVs), or other published values.

Thus, it is evident that no test values exceed SGVs for residential development.

It may be also that the Local Authority may require further assessment of a contamination Risk Assessment, both to on and off-site receptors.

Client Sample ID	Units	WS01	WS04	WS05	WS07	TP02	TP05	S4UL/ C4SL Resi With	S4UL/ C4SL Resi Without
Depth to Top		0.50	0.50	0.50	0.50	0.50	0.50		
Sample Type		Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES		
% Stones >10mm	% w/w	<0.1	2.9	<0.1	<0.1	<0.1	<0.1		
pH	pH	7.77	5.8	6.71	5.16	7.97	5.59		
Sulphate (acid soluble)	mg/kg	<200	<200	370	<200	810	<200		
Organic matter	% w/w	36	1.3	7.7	2.6	25.2	2.9		
Arsenic	mg/kg	13	3	13	6	3	<1	37	40
Cadmium	mg/kg	1	0.8	1.3	1.8	0.6	0.6	11	65
Copper	mg/kg	70	9	19	20	40	17	2400	7100
Chromium	mg/kg	22	17	26	28	11	19	910	910
Chromium Hex	mg/kg	<1	<1	<1	<1	<1	<1	6	6
Lead	mg/kg	12	12	28	18	11	12	190	310
Mercury	mg/kg	0.6	<0.17	<0.17	<0.17	0.19	<0.17	40	56
Nickel	mg/kg	82	13	21	23	56	16	180	180
<b>Asbestos in Soil (inc. matrix)</b>									
Asbestos in soil		NAD	NAD	NAD	NAD	NAD	NAD		
Asbestos ACM - Suitable for Water Absorption Test?		N/A	N/A	N/A	N/A	N/A	N/A	Non detected	
<b>PAH-16MS</b>									
Acenaphthene	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	1100	6000
Acenaphthylene	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	920	6000
Anthracene	mg/kg	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	11000	37000
Benzo(a)anthracene	mg/kg	<0.04	<0.04	<0.04	<0.04	0.07	<0.04	13	15
Benzo(a)pyrene	mg/kg	<0.04	<0.04	<0.04	<0.04	0.06	<0.04	3	3.2
Benzo(b)fluoranthene	mg/kg	<0.05	<0.05	0.08	<0.05	0.1	<0.05	3.7	4
Benzo(ghi)perylene	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	350	360
Benzo(k)fluoranthene	mg/kg	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	100	110
Chrysene	mg/kg	<0.06	<0.06	0.08	<0.06	0.12	<0.06	27	32
Dibenzo(ah)anthracene	mg/kg	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	0.3	0.32
Fluoranthene	mg/kg	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	890	1600
Fluorene	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	860	4500

Indeno(123-cd)pyrene	mg/kg	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	41	46
Naphthalene	mg/kg	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	13	13
Phenanthrene	mg/kg	<0.03	<0.03	0.06	<0.03	<0.03	<0.03	440	1500
Pyrene	mg/kg	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	2000	3800
Total PAH-16MS	mg/kg	<0.08	<0.08	0.22	<0.08	0.35	<0.08	17761	60984

6% SOM

**Table 9.1: Contamination Results**

## 10.0 IN-SITU TESTING

In-situ Soakaway Testing was undertaken. Calculation sheets are appended to this report.

All three tests undertaken did not achieve full tests due to extremely slow infiltration. Thus, the use of soakaways is considered unlikely, unless deeper strata would be suitable.

The site surface was very wet during the works, and plant became bogged down in several areas. CBR values were determined from DTP Penetrometer tests. Within the shallow surface deposits a value of <2.5% is considered appropriate. Care should be taken during construction to note and remove/replace any soft spots. Inclement weather will result in softening of the clays during site operations. Thus, temporary capping may be required. Peat deposits were noted, which would require removal if encountered.

Gas Monitoring was undertaken to determine the concentrations of deleterious gases. An elevated CO<sup>2</sup> record was noted – thus, site workers will require monitoring during access to excavations, due in particular to the potential for asphyxiation.

A BS8485 ground gas risk assessment has been undertaken based upon the monitoring regime and Table 2 of BS8485.

Classification	Hazard Potential	Site Characteristic GSV (l/hr)	CO2 (%)
CS1	Very Low	<0.07	<5

**Table 10. BS8485 Classification**

All in-situ testing is Appended.

## **11.0 CONCLUSIONS**

Allowable bearing capacities have been provided for each of the natural strata encountered. The clays at site will need care during construction to ensure the formation is suitable for foundations. Formations, will need to be inspected for soft/loose spots and where those are found, treated accordingly.

Groundwater was noted as being high and within typical foundation depths, thus pumping from sumps and stabilization of excavations should be allowed for.

Soakaway values were extremely low. It would be worth undertaking further testing at depth within boreholes closer to the design stage.

Based upon the monitoring data indicating a zero flow and CO<sub>2</sub> below 5%, a BS8485 classification of CS1 is considered appropriate. Radon protection measures are not considered necessary.

Contamination testing has shown there to be no elevated common determinands. Nevertheless, the LPO may require further testing, depending upon their views.

Acidic soil results were noted, and thus Sulphate Class DS-2, in accordance with BRE Special Digest 1 is recommended for buried concrete.

## **APPENDIX A**

### **Phase 1 Data**

Enviro Insight

Small Scale Historical Maps

Large Scale Historical Maps

Radon Report

## **APPENDIX B**

### **Exploratory Hole Logs**

TP01 to 7

WS01 to WS07

## **APPENDIX C**

### **Laboratory Testing**



## **APPENDIX D**

### **In-Situ Testing**

Soakaways

SA1, SA3 and SA4

DTP Penetrometers

DTP/CBR1 to 4

## **APPENDIX E**

### **Water and Gas Monitoring**

Groundwater and Gas

GW1

## **APPENDIX F**

### **Photographic Plates**

## APPENDIX G

### Drawings

Exploratory Hole Locations	SGS/20105/02
SPT'N' v Depth	SGS/20105/SPT
Atterberg Limits 'A' Line	SGS/20105/ALine



Figure SGS/20105/02