
GROUND INVESTIGATION
FOR PROPOSED DRIVE-THRU UNIT
AT CYFARTHFA RETAIL PARK
MERTHYR TYDFIL
SOUTH WALES

CARRIED OUT FOR:-

CLIENT: SAVILLS

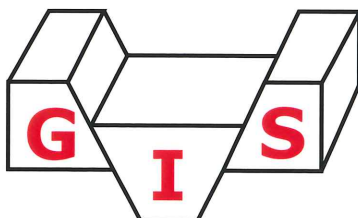
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REPORT NO: 2371

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1.0 INTRODUCTION

In March 2022 Ground Investigation Specialists Limited (GIS) received written instructions from Savills to undertake a ground investigation for the construction of a new drive-thru unit at Cyfarthfa Retail Park in Merthyr Tydfil, South Wales.

The remit of the investigation was to ascertain the nature and structure of the near surface soils in order that an assessment could be made of certain geotechnical and geoenvironmental properties relating to the construction of the new unit. The Engineer for the project was Waterman Group who prepared a generalised scope of work for the investigation.

Fieldworks were carried out between 6th and 8th April 2022 and consisted of sinking two cable percussive boreholes in the area of the proposed new building, digging two trial pits using a mechanical excavator (one for the purpose of soil infiltration testing), and undertaking one in-situ CBR test to assist in road pavement design. Standpipes were installed in both boreholes to facilitate the monitoring of ground gases over an extended period.

This report presents a factual account of the work undertaken and provides a risk-based assessment of the soil contamination levels on the site with respect to a suite of common contaminants.

A geotechnical appraisal is also given of the ground conditions relating primarily to the design of foundations for the new building, road pavement construction and stormwater disposal.

This report has been produced for the sole use of Savills and their advisors in support of the new retail development. No liability can be accepted for its use by other parties or for other development proposals.

2.0 SITE LOCATION AND DESCRIPTION

The site is situated on the southern edge of the Cyfarthfa Retail Park, which is located in the western part of Merthyr Tydfil in South Wales. The National Grid Reference for the approximate centre of the site is 303960, 206390. The approximate site outline is shown in Figure 1 below.



Figure 1: Recent Aerial Photograph Showing Approximate Site Outline in Yellow

Until recently the site was overgrown with young trees and shrubs. These had been cut to c.0.3m above ground level prior to the site investigation.

The northern site boundary is formed by the access road into Cyfarthfa Retail Park, with the main park and associated car parking beyond that to the north. To the southwest is a public footpath, beyond which is a tree covered embankment supporting an elevated section of the A 470 truck road. To the south is Pantycelyn (road), while to the immediate east is a small area of more established trees.

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3.0 SITE INVESTIGATION

3.1 Fieldwork

The approximate location of the exploratory boreholes were decided by the Engineer as shown on the site plan in section 13.0. Due to difficulties in creating access for the drilling rig, BH2 was moved closer to the building than originally planned.

The reduced levels provided on the exploratory logs are approximate as they have been extrapolated from topographical data included on Powell Dobson Architects drawing no. 18126 (05) 002.

3.1.1 Cable Percussion Boreholes (BH1 & BH2)

Between 6th and 8th April 2022, a Pilcon 1500 cable percussive boring rig was mobilised to drill two 150mm diameter boreholes in the area of the new drive-thru unit.

Following the hand excavation of a service inspection pit to a depth of 1.2m, the boreholes were advanced to depths of 10.3 and 12.4m respectively.

In order to determine the consistency of the made ground and relative density of the glacial soils encountered, Standard Penetration Tests (SPT's) were undertaken at the base of the service inspection pits (1.2m) and then at regular intervals to the base of each borehole.

Sampling was carried out in accordance with the British Standards Code of Practice for Ground Investigations B.S. 5930:2015.

Representative disturbed samples were taken at regular intervals and at major soil changes throughout the full depth of each borehole to provide a continuous soil profile.

These were logged by a Senior Ground Engineer to produce the borehole logs included in section 7.0.

Upon completion of drilling, a 50 mm diameter ground gas monitoring standpipes were installed to a depth of 6m in both boreholes.

3.1.2 Trial Pits (TP1 & TP2)

On 6th April 2022, a mechanical excavator was used to dig two trial pits (TP1 and TP2) to the respective depths of 2.5 and 1.6m.

Soil infiltration testing was carried out in TP2, the results of which are included in section 9.0 and discussed in section 5.3.

Engineer's verified logs for each excavation are included in section 8.0.

3.1.3 In-Situ California Bearing Ratio Test (CBR1)

On the same day, an in-situ CBR test was (CBR1) was carried out at a depth of 0.4 m in a mechanically excavated trial pit. The result is displayed in full in section 10.0 and discussed in section 5.4.

3.2 Laboratory Analysis

GIS specified the laboratory testing. The results are presented in full in section 11.0.

With regard to conditions considered aggressive to buried concrete, the pH value and soluble sulphate content (using a 2:1 water/soil extract) was determined for fourteen samples of material recovered from the full depth range.

Five samples of made ground have been tested for a suite of common contaminants, including arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, zinc and asbestos. Four were also tested for speciated Polycyclic Aromatic Hydrocarbons (PAH) and Total Petroleum Hydrocarbon Criteria Working Group (TPH CWG).

One sample of made ground was also selected for an extended suite of tests to satisfy the regulations for the disposal of soil to landfill.

4.0 GROUND CONDITIONS

4.1 Anticipated Geology

Reference to solid and drift editions of the British Geological Survey (BGS) sheet no. 231 for Merthyr Tydfil (1: 50,000 series), along with the online BGS lexicon, shows that the site and immediate surrounds are anticipated to be underlain by made ground (presumably associated with Cyfarthfa Ironworks) and then by glacial Till (boulder clay).

The underlying solid geology is expected to comprise Carboniferous era strata of the South Wales Lower Coal Measures Formation (SWLCM), comprising a sequence of interbedded mudstones, siltstones and sandstones with workable coal seams. The strata are shown dipping to the southwest, with the younger South Wales Middle Coal Measures Formation shown sub-cropping below the Till to the southwest. The Fairwell Rock sandstone unit is shown to the northeast of the site (and therefore dips below the site).

The BGS website includes details of boreholes and trial pits sunk very close to the site (for the proposed A 470 Taff Vale Trunk Road and the subsequent development of the retail park). It should be noted that ground levels may have altered significantly since

the sinking of the exploratory holes, as such the following also includes approximate levels above ordnance datum.

The exploratory holes encountered a widely varying thickness of made ground, from as little as 0.7m (*c.202mAOD*) in the area now occupied by the embankment for the A 470 to the southwest of the site, to in excess of 16.5m (*<c.191.1mAOD*) in the area now occupied by the retail park car park to the east of the site. The made ground generally comprised waste from the Cyfarthfa ironworks (including varying amounts of slag, cinder, coal, ash, pottery, clinker and brick), mixed with suspected spoil from nearby coal and ironstone mining operations (namely argillaceous siltstone, shale and mudstone).

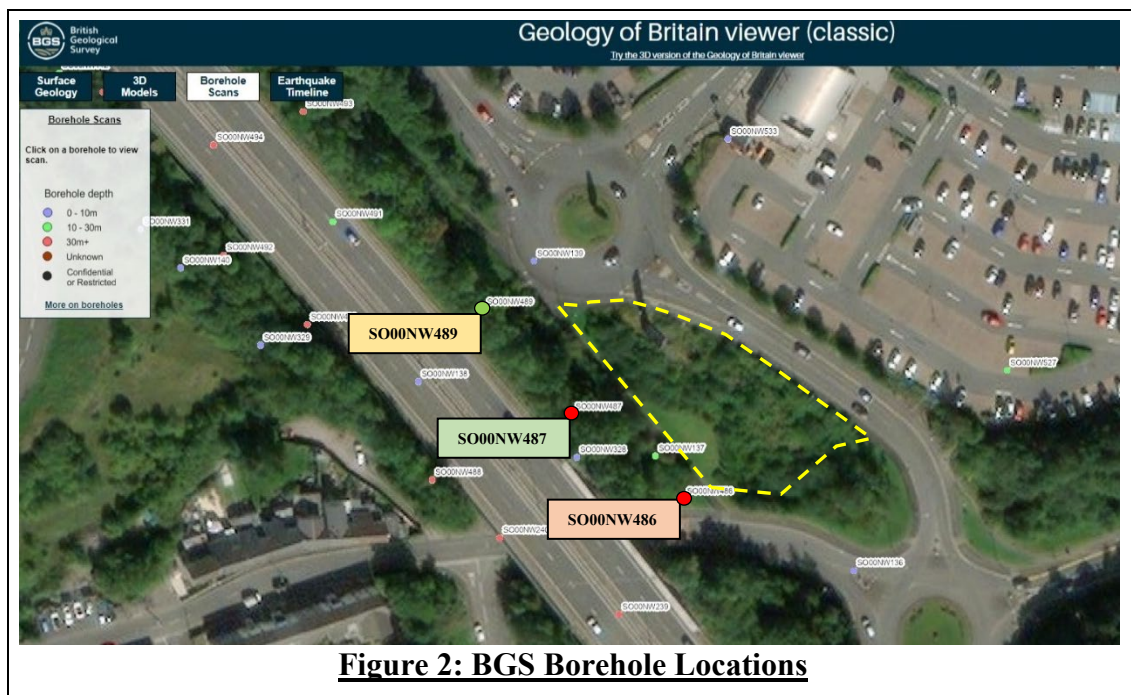
The made ground was underlain in both boreholes by a mixed assemblage of glacial deposits, comprising gravelly sands, silts and clays, described either as Boulder Clay or Kame Terrace Deposits.

At depths ranging from 5.5m (*c.196.9mAOD*) to 12.4m (*c.191.8mAOD*), the glacial deposits (or made ground) gave way SWLCM strata, comprising interbedded siltstones, mudstones and sandstones. Of note was the presence of coal seams in the three deeper mine probe boreholes drilled close to the western site boundary (borehole reference nos SO00NW486, SO00NW487 and SO00NW489). The seams ranged in thickness from 0.25 to 1.25m thick. Of particular note was a c.4.5m thick cavity which was proved below a depth of 20.0m in borehole SO00NW487. Table 1 overleaf shows the published depths and reduced levels AOD of the coal seams and the aforementioned cavity:

Table 1: Selected BGS Borehole Data

Borehole ID								
SO00NW489			SO00NW487			SO00NW486		
Strata	Depth (m)	Approx. Level (mAOD)	Strata	Depth (m)	Approx. Level (mAOD)	Strata	Depth (m)	Approx. Level (mAOD)
COAL	7.75	195.05	COAL	17.00	185.60	COAL	10.00	192.40
	9.00	193.80		17.75	184.85		10.25	192.15
COAL	18.25	184.55	CAVITY	20.00	182.60	COAL	37.25	165.15
	19.25	183.55		24.50	178.10		37.50	164.90

The published location of the boreholes is highlighted in Figure 2 below:



Savills provided GIS with a Groundsure Geo Insight Report which includes the area of the site (report ref: GS-8560188 – dated 2nd March 2022). It confirms the site is expected to be underlain by made ground, overlying glacial Till and SWLCM strata. Also of note

is the presence of the former Pen-yr-heolgerig sandstone quarry which is situated c.200m to the west of the site.

In an assessment of historical maps (none of which are included with the Geo Insight Report), Groundsure make reference to the presence of unspecified ground workings on the site, along with unspecified heaps, unspecified disused tips, an old ironstone level, refuse heaps, a cinder tip and a colliery, while the area was also shown as being affected by historical railway activity.

Groundsure state that the site is located in an area where less than 1% of properties are affected by radon gas, and as such no radon protective measures would be required in the construction of new buildings.

4.2 Mining Activity

Savills also provided GIS with a Consultants Coal Mining Report prepared by the Coal Authority (report ref: 51002967474001 - dated 2nd March 2022) which includes the development site area. The report states that there is “no past mining recorded” below the area of interest, and no “probable unrecorded shallow workings”. A mine entry (ref: 303206-041 is shown on the map included with the report situated c.140m to the west of the development area boundary.

GIS have contacted the Coal Authority with respect to the cavity identified in borehole SO00NW487 to the immediate southwest of the site. Their response is included below:

Our records and the BGS 10K section indicates the lowest coal seam is the Garw coal – the conjectured sub-crop position is to the west of the A470 and it dip to the SW. The Garw marks the bottom of the productive measures. Below this there are the Rosser Ironstones beds which are known to have been worked in the area. The cavity in SO00NW487 and old mine workings in nearby SO00NW444 are presumably associated with ironstone workings rather than coal.

4.3 Strata Encountered

Full details of the strata encountered are presented on the exploratory logs included in sections 7.0 and 8.0. However, as a brief guide, the main engineering geology horizons are described below:-

The site has been found to be underlain by a significant thickness of colliery and foundry-type waste **made ground**, extending to a depth of 6.0m (*c.200.1mAOD*) in BH1 in the eastern part of the site and 10.0m (*c.197mAOD*) in borehole BH2 in the western part. It comprised for the most part of medium dense dark grey fine to coarse angular gravel sized fragments of shaley mudstone. Below a depth of 4.0m (*c.203mAOD*) in BH2, the shaley mudstone fragments were underlain by a medium dense becoming very loose dark grey clayey sand with gravel sized fragments of mudstone and occasional coal, which overlay suspected disturbed clay and then further angular mudstone gravel. A pocket of cream, white and grey gravel and cobble sized fragments of foundry lining, ash and slag was encountered below 1.0m in TP2. Uncorrected SPT results recorded in the made ground ranged from a minimum of 2 blows for 450mm penetration at 6.0m in BH2, to a maximum of $N = 23$ at 4.0m in the same borehole.

Underlying the made ground, **glacial drift** was encountered to the base of both boreholes. In borehole BH1 it comprised medium dense brown very clayey slightly gravelly sand to 8.5 m (*c. 197.6 m AOD*) underlain by medium dense to very dense sandy fine to coarse sub-angular to sub-rounded gravel, predominantly of quartzite. Similar dense becoming very dense sandy gravel was encountered below the made ground from 10.0m (*c.197mAOD*) in BH2. Uncorrected SPT N values recorded within the glacial drift ranged from a minimum of 16 at 6.0m in BH1, to a maximum extrapolated value of 75 at 9.5m in the same borehole (as based on 50 blows for 200mm penetration).

The full thickness of the glacial drift deposits was not proved by this investigation, nor consequently the depth to the SWLCM.

4.4 Groundwater

Water levels of between 5.4m (*c.200.7mAOD*) and 5.8m (*c.201.2mAOD*) have been recorded in the standpipes installed in BH2 and BH1 respectively.

5.0 ENGINEERING COMMENTS

5.1 Introduction

Reference to Powell Dobson Architects drawing no. 18126 (05) 003 Rev B (included in section 13.0) would show that it is proposed to construct a new 1800 sq ft drive-thru retail unit in the western part of the site. The remainder of the site will be developed for car parking, with an entrance to be created from the retail park access road on the northern site boundary. Due to the fall in site levels, a low rise retaining structure will be needed around part of the southern end of the car park to create a level platform. The finished floor level for the unit will be 206.35mAOD, with the car park falling very gently to the south (from 206.43 to 206.05mAOD).

5.2 Past Mining Activity

Reference to section 4.2, and in particular the comments made by the Coal Authority, would indicate that while there appears to be no issues with past coal mining activity below the site, there is evidence to suggest that mine workings could extend below the site at shallow depth, linked to the Rosser Ironstone Beds.

Further advice should be sought from a Consulting Mining Engineer or Mining Geologist with regard to carrying out a rotary investigation and a Mining Risk Assessment to establish whether ironstone workings are present at shallow depth below the proposed Drive-Thru Unit and would affect the comments made in section 5.3 below.

5.3 Foundations

With regard to the design of foundations for the proposed retail unit, the exploratory holes have found the area to be underlain by a significant thickness of predominantly colliery waste materials (angular gravel sized shaley mudstone fragments) to depths of between 6.0m (*c.200.1mAOD*) and 10.0m (*c.197mAOD*), below which glacial deposits of medium dense to very dense sand and gravel were encountered. Uncorrected SPT results recorded in the made ground ranged from 2 blows for 450 mm penetration at 6.0 m in BH2 to N = 23 at 4.0 m in the same borehole. Within the upper 4 m the 'N' values were more consistent ranging from 9 to 23, with a mean of 14.

It is likely that the made ground has been in place for in excess of 20 years since the construction of the retail park in the late 1990's. As such, any settlement due to self-weight should have ceased by now. Unless there is a substantial rise in the water table (not considered likely from available information) it is unlikely that significant self-weight settlement will be reactivated.

It is concluded that the risk of founding in the made ground is no greater than that of other local made ground sites which have been developed for commercial use, but to reduce bearing pressures and avoid unacceptable differential settlements, consideration should be given to employing either:

- i) a reinforced semi-rigid raft foundation with perimeter downstand beams,

or,

ii) a more heavily reinforced ground beam solution (reinforcing bars top to bottom) with an independent floating floor slab. Mesh reinforcement should be placed in both the top and bottom of the slab.

Maximum safe allowable bearing pressures should not exceed 75 kN/m^2 beneath the beams and 20 kN/m^2 beneath the floor slab.

Due to the nature of the made ground, it is difficult to accurately quantify the settlement that could occur, but it should not be detrimental to the new building provided the above bearing pressures are not exceeded. As an added safeguard against excessive total/differential settlements, the formation should be carefully proof rolled prior to the construction of the foundations and additional hardcore rolled into any loose pockets that develop.

As an alternative, consideration could be given to constructing the retail unit on shallow reinforced foundations, after the load bearing/settlement characteristics of the made ground has been improved by installing vibro stone columns.

It may also be possible to employ a standard pile and beam solution, if the mining stability of the site proves favourable (reference section 5.2), with all loads being transferred through the made ground and into the more competent natural strata beneath. Reference should be made to the specialist contractors, who from knowledge of their individual design and the information contained within this report would best be able to advise on the detailed construction.

5.4 Soil Infiltration Testing

Soil infiltration testing was carried out in the granular made ground exposed in TP2.

The trial pit TP2 was 1.6 m deep and was partially filled with water on three occasions to depths of 1.30, 1.28 and 1.28m. The falling water level was recorded versus time and the results are included in full in section 9.0. Soil infiltration rates (f) of 3.3, 3.8 and 1.8×10^{-5} m/s have been calculated from the three test runs.

Based on the available information, a f of 1.8×10^{-5} m/s could be used for design purposes for soakaways constructed in the area of TP2.

5.5 Road Pavement Design

An in-situ CBR test (CBR1) was carried out at a depth of 0.4m in the granular made ground encountered in the area of the proposed car park. The CBR result (of 13%) is appended in section 10.0.

Based on the limited available data, a conservative CBR value of **5 %** should be adopted for design purposes, provided the formation is first proof rolled with a heavy vibrating roller to remove any inferior pockets.

5.6 Buried Concrete

The water-soluble sulphate and pH value testing carried out on the samples of soil would indicate that in terms of buried concrete and classifying the site as to its Aggressive Chemical Environment for Concrete (ACEC) that part of the site lying above the water table could be considered to have an ACEC Class of AC-1s as detailed in the BRE Special Digest 1 : 2005.

6.0 CONTAMINATION ASSESSMENT

6.1 Introduction

Reference to the site plan included in section 13.0 would show that the proposal is for the majority of the development to be covered by either hardstanding or the new drive-thru unit, with only limited areas of soft landscaping around the perimeter.

6.2 Soil Analysis

Five representative samples of made ground (four colliery-type waste and one foundry-type waste) have been tested for a suite of common contaminants, including arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, zinc and asbestos. Four samples were also tested for speciated Polycyclic Aromatic Hydrocarbons (PAH) and Total Petroleum Hydrocarbon Criteria Working Group (TPH CWG).

The results have been compared with Generic Assessment Criteria (GAC) for commercial land use. The “Suitable 4 Use Levels – S4UL” are used under licence and were derived using the Contaminated Land Environmental Assessment ‘CLEA’ v1.06 software methodology by the Land Quality Management (LQM)/ Chartered Institute of Environmental Health (CIEH). The only exception is lead, for which the DEFRA Category 4 Screening Level for the same land use scenario has been used.

It should be noted that the commercial screening values were not developed to be protective of groundworkers involved in direct contact with the soils. As such, residential without homegrown produce screening values are also provided to highlight any potential risks to groundworkers.

Table 2 (overleaf) provides a summary of all the made ground data and a comparison with the appropriate screening values. All the S4UL’s for the organic contaminants are appropriate to a SOM content of 2.5 %, based on a conservative assessment of the results.

Table 4: Summary of Analysis Data for Metals, Metalloids, pH, PAH, TPH & Asbestos

<u>Determinand</u>	<u>Units</u>	<u>BH1</u> 0.50m	<u>BH2</u> 0.50m	<u>TP1</u> 0.30 – 1.00m	<u>TP2</u> 0.30m	<u>TP2</u> 1.00m	<u>Commercial</u> <u>Screen</u>	<u>Residential</u> <u>Without</u> <u>Homegrown</u> <u>Produce</u> <u>Screen</u>	<u>Source</u>
		Colliery Spoil				Foundry Waste			
Arsenic	mg/kg	13	9.2	13	8.3	7.6	640	40	S4UL
Cadmium	mg/kg	<0.2	<0.2	<0.2	1	0.3	190	85	S4UL
Chromium	mg/kg	28	30	29	30	18	8600	910	S4UL
Copper	mg/kg	38	43	47	33	25	68000	7100	S4UL
Lead	mg/kg	31	32	30	212	51	2330	310	C4SL
Mercury	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	1100	56	S4UL
Nickel	mg/kg	42	47	54	22	14	980	180	S4UL
Selenium	mg/kg	1.7	1.3	1.2	3.8	0.9	12000	430	S4UL
Zinc	mg/kg	117	98	94	207	55	730000	40000	S4UL
pH	pH units	8.6	8.4	8.8	8.4	10.5	<5	<5	Arb
Asbestos	-	NAD	NAD	NAD	NAD	NAD	Nil	Nil	-
Naphthalene	mg/kg	-	<0.02	<0.02	0.04	<0.02	460	5.6	S4UL
Acenaphthylene	mg/kg	-	<0.02	<0.02	<0.02	<0.02	97000	4600	S4UL
Acenaphthene	mg/kg	-	<0.02	<0.02	<0.02	<0.02	97000	4700	S4UL
Fluorene	mg/kg	-	<0.02	<0.02	<0.02	<0.02	68000	3800	S4UL
Phenanthrene	mg/kg	-	0.02	<0.02	0.08	0.05	22000	1500	S4UL
Anthracene	mg/kg	-	<0.02	<0.02	0.03	<0.02	540000	35000	S4UL
Fluoranthene	mg/kg	-	<0.02	<0.02	0.13	0.08	23000	1600	S4UL
Pyrene	mg/kg	-	<0.02	<0.02	0.1	0.06	54000	3800	S4UL
Benzo[a]anthracene	mg/kg	-	<0.02	<0.02	0.1	0.05	170	14	S4UL
Chrysene	mg/kg	-	<0.03	<0.03	0.09	0.05	350	31	S4UL
Benzo[b]fluoranthene	mg/kg	-	<0.02	<0.02	0.15	0.08	44	4.0	S4UL
Benzo[k]fluoranthene	mg/kg	-	<0.03	<0.03	0.04	0.03	1200	110	S4UL
Benzo[a]pyrene	mg/kg	-	<0.02	<0.02	0.08	0.05	35	3.2	S4UL
Indeno[1,2,3-cd]pyrene	mg/kg	-	<0.02	<0.02	0.06	0.03	510	46	S4UL
Dibenzo[a,h]anthracene	mg/kg	-	<0.02	<0.02	<0.02	<0.02	3.6	0.32	S4UL
Benzo[g,h,i]perylene	mg/kg	-	<0.02	<0.02	0.05	0.02	4000	360	S4UL
Aromatic (>EC5-EC7)	mg/kg	-	0.01	<0.01	<0.01	<0.01	46000	690	S4UL
Aromatic (>EC7-EC8)	mg/kg	-	0.01	<0.01	<0.01	<0.01	110000	1800	S4UL
Aromatic (>EC8-EC10)	mg/kg	-	<0.01	<0.01	<0.01	<0.01	8100	110	S4UL
Aromatic (>EC10-EC12)	mg/kg	-	<1	<1	<1	1	28000	590	S4UL
Aromatic (>EC12-EC16)	mg/kg	-	1	2	2	3	37000	2300	S4UL
Aromatic (>EC16-EC21)	mg/kg	-	<1	<1	<1	<1	28000	1900	S4UL
Aromatic (>EC21-EC35)	mg/kg	-	<1	<1	<1	<1	28000	1900	S4UL
Aromatic (>EC35-EC44)	mg/kg	-	3	<1	1	<1	28000	1900	S4UL
Aliphatic (>C5-C6)	mg/kg	-	<0.1	<0.1	<0.1	<0.1	5900	78	S4UL
Aliphatic (>C6-C8)	mg/kg	-	<0.1	<0.1	<0.1	<0.1	17000	230	S4UL
Aliphatic (>C8-C10)	mg/kg	-	<0.1	<0.1	<0.1	<0.1	4800	65	S4UL
Aliphatic (>C10-C12)	mg/kg	-	<6	<6	<6	<6	23000	330	S4UL
Aliphatic (>C12-C16)	mg/kg	-	<6	<6	<6	<6	82000	2400	S4UL
Aliphatic (>C16-C35)	mg/kg	-	<15	<15	<15	<15	1700000	92000	S4UL
Aliphatic (>C35-C44)	mg/kg	-	<10	<10	<10	<10	1700000	92000	S4UL

S4UL = Suitable 4 Use Levels developed by LQM/CIH for Commercial and Residential Without Homegrown Produce land uses (2.5% SOM).

C4SL = DEFRA Category 4 Screening Levels for lead.

Arb = Arbitrary Acidity Screen.

NAD = No Asbestos Detected.

Breaches of Residential Screen are highlighted in **Yellow**; Commercial in **Red**.

Reference to Table 2 would show within the five samples of made ground tested, no contaminants of concern were detected, including asbestos. No further assessment or remedial action is considered necessary with respect to the health of end-users.

Groundworkers should wear appropriate PPE for a development of this nature. Site-won materials can be used to backfill service trenches (where appropriate) and standard PPE water supply pipes can be used.

6.3 Classification of Soils for Off-Site Disposal

In respect of determining the suitability of the soils for disposal to landfill, waste classification software has been used to identify whether the made ground materials can be classified as hazardous or non-hazardous, as defined in the EWC (European Waste Catalogue 2002).

A mean of the solid suite results (representing a mixed load of near surface soil) has been compared with the appropriate/ most likely chemical compounds as detailed in EWC Chapter 17 - Construction and demolition wastes. Full details of the classification are provided in section 11.0.

Based on the total solid test results, the made ground waste stream would be classified at this stage as “Non-Hazardous Waste”. In addition, no asbestos was detected in the five samples of made ground tested.

Waste Acceptance Criteria (WAC) testing of representative samples is subsequently required in order to establish the suitability of the materials for disposal to an inert landfill. Summaries of the solid and leachate results for the sample of made ground recovered from 0.30 – 1.00m in TP1 are presented on the final pages of the laboratory report included in section 11.0.

The WAC analysis has revealed that the sample recovered from TP1 does not exceed the Inert Waste Limit Values and as such the made ground can be disposed of at an **Inert Waste Landfill** site. The landfill operator should be contacted for final tipping costs.

6.4 Ground Gases

Monitoring for ground gases was undertaken in BH1 and BH2 on 11th and 23rd April, and 17th May 2022. The results are reproduced in full in section 12.0.

Table 3 (below) is a summary of the monitoring data.

Table 3: Summary of Gas Monitoring Data

<u>Borehole</u>	<u>Response Zone (mbgl)</u>	<u>Evidence of Ground Gas Source</u>	<u>No. of Monitoring Occasions</u>	<u>Methane (% v/v)</u>	<u>Carbon Dioxide (% v/v)</u>	<u>Oxygen (% v/v)</u>	<u>Steady Positive Flow (l/hr)</u>	<u>Water Level (mbgl)</u>	<u>Atmospheric Pressure Range (mBar)</u>
BH1	1.0 – 6.0	Made ground to 6.0m	3	<0.1	0.2	20.3 – 20.4	0	5.78 – 5.80	979 – 991
BH2	1.0 – 6.0	Made ground to 10.0m	3	<0.1	0.1 – 0.3	19.8 – 20.5	0	5.38 – Dry	

Gas Concentrations of concern are highlighted in **yellow**

No detectable levels of methane were detected, while carbon dioxide concentrations were very low in both boreholes (maximum 0.3 % v/v).

No steady positive flow was recorded, while hydrogen sulphide and carbon monoxide remained below detectable limits.

Based on the available data, and referring to the guidance set out in BS 8485:2015 ‘Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings’, the site can be classified as Characteristic Situation **CS1**, with no gas protection measures required for the new building. As stated in the Groundsure Report, no radon protection measures will be required either.

T.J. McLaren, BSc., FGS.
Senior Ground Engineer

H.S. Lister, BSc., C Sci., C. Geol., FGS.
Director

Ground Investigation Specialists Limited

7.0 BOREHOLE LOGS

GROUND INVESTIGATION SPECIALISTS LIMITED

BOREHOLE RECORD	BORING COMMENCED: 06.04.22	TYPE OF BORING: Cable Percussion	CLIENT: Savills	BOREHOLE: BH1
	BORING COMPLETED: 07.04.22	DIAMETER OF HOLE: 150 mm	ENGINEER: Waterman Structures Limited	
	GROUND LEVEL: Approx 206.1 m AOD	BOREHOLE CASING: 9.8 m	CONTRACT: Cyfarthfa Retail Park, Merthyr Tydfil	

DRILLING			SAMPLES					RESULTS OF TESTS										
DESCRIPTION OF STRATA	LEGEND	WATER LEVEL	THICK- NESS	DEPTH	REDUCED LEVEL	DEPTH	TYPE	INDEX PROPERTIES					DENSITIES		STRENGTH TESTS			IN-SITU TESTS AND REMARKS (SPT Blows)
								'N' VALUE	M/C %	LL %	PL %	PI	WET (kg/m ³)	DRY (kg/m ³)	TYPE	COHESION (kN/m ²)	ANGLE OF INTERNAL FRICTION (degrees)	
Made ground (medium dense dark grey fine to coarse angular GRAVEL sized fragments of occasionally iron-rich shaley mudstone). Includes many extremely weak very friable mudstone fragments from 1.20 – 1.80 m. Fragments more iron-rich below 4.00 m.			6.00	GL	206.10													Service inspection pit dug to 1.20 m <

GROUND INVESTIGATION SPECIALISTS LIMITED

BOREHOLE RECORD	BORING COMMENCED: 07.04.22	TYPE OF BORING: Cable Percussion	CLIENT: Savills	BOREHOLE: BH2
	BORING COMPLETED: 08.04.22	DIAMETER OF HOLE: 150 mm	ENGINEER: Waterman Structures Limited	
	GROUND LEVEL: Approx 207.0 m AOD	BOREHOLE CASING: 12.0 m	CONTRACT: Cyfarthfa Retail Park, Merthyr Tydfil	

[illegible]

GROUNDWATER OBSERVATIONS:	▼ - Final groundwater level	D - Disturbed Sample	M/C - Natural Moisture Content	'N' - Standard or Cone Penetration Test Result	S - Standard Penetration Test
Water struck at 9.0 m. Rose to 8.9 m after 20 minutes.	▼ - Groundwater first struck	E - Environmental Sample	LL - Liquid Limit	T - Undrained Triaxial	C - Cone Penetration Test
	▲ - Standpipe	T - Tub Sample	PL - Plastic Limit	M - Multi-stage Undrained Triaxial	V - Pocket Vane Test
	● - Piezometer	U - Undisturbed Sample	PI - Plasticity Index		SO ₃ - Soluble Sulphate Analysis

GROUND INVESTIGATION SPECIALISTS LIMITED

BOREHOLE RECORD	BORING COMMENCED:	07.04.22	TYPE OF BORING:	Cable Percussion	CLIENT:	Savills	BOREHOLE: BH2		
	BORING COMPLETED:	08.04.22	DIAMETER OF HOLE:	150 mm	ENGINEER:	Waterman Structures Limited		SHEET: 2 OF 2	
	GROUND LEVEL:	Approx 207.0 m AOD	BOREHOLE CASING:	12.0 m	CONTRACT:	Cyfarthfa Retail Park, Merthyr Tydfil			JOB NO: 2371

DRILLING			SAMPLES					RESULTS OF TESTS											
DESCRIPTION OF STRATA	LEGEND	WATER LEVEL	THICK-NESS	DEPTH	REDUCED LEVEL	DEPTH	TYPE	INDEX PROPERTIES					DENSITIES		STRENGTH TESTS			IN-SITU TESTS AND REMARKS (SPT Blows)	
								'N' VALUE	M/C %	LL %	PL %	PI	WET (kg/m³)	DRY (kg/m³)	TYPE	COHESION (kN/m²)	ANGLE OF INTERNAL FRICTION (degrees)		
Borehole continued .../				8.00	199.00														
Made ground (firm orange-brown silty very sandy slightly gravelly CLAY).			1.00	8.50	198.50	8.50	D16												(1.2.1.-.3.3.)
Made ground (loose dark grey angular GRAVEL sized fragments of mudstone in a silty matrix).				8.90	198.10	9.00	S17	7											
Includes some brown streaks and sub-angular quartzite gravel below 9.00 m.			1.50																
Dense brown slightly silty sandy fine to coarse sub-angular to rounded GRAVEL with occasional cobbles of quartzite and occasional red fine grained sandstone, some large cobbles.				10.00	197.00	10.00	D18												
(GLACIAL DRIFT)		2.37				10.50	S19	41											
Becomes very clayey below 11.50 m.					11.50	D20													
Becomes very dense below 12.00 m.					12.00	S21	50 blows for 220 mm penetration											(10.13.15.20.15 for 70 mm)	
					12.37	194.63													
Borehole Complete.																			
Backfilled with arisings to 6.00 m.																			
50 mm diameter ground gas monitoring standpipe installed to 6.00 m.																			
GROUNDWATER OBSERVATIONS:			 - Final groundwater level		D - Disturbed Sample		M/C - Natural Moisture Content		'N' - Standard or Cone Penetration Test Result		S - Standard Penetration Test								
Water struck at 9.0 m. Rose to 8.9 m after 20 minutes.			 - Groundwater first struck		E - Environmental Sample		LL - Liquid Limit		T - Undrained Triaxial		C - Cone Penetration Test								
			 - Standpipe		T - Tub Sample		PL - Plastic Limit		M - Multi-stage Undrained Triaxial		V - Pocket Vane Test								
			 - Piezometer		U - Undisturbed Sample		PI - Plasticity Index				SO ₃ - Soluble Sulphate Analysis								

8.0 TRIAL PIT LOGS

GROUND INVESTIGATION SPECIALISTS LIMITED

TRIAL PIT LOG

CONTRACT: Cyfartha Retail Park, Merthyr Tydfil	TRIAL PIT No. TP1
CLIENT: Savills	SHEET 1 OF 1
ENGINEER: Waterman Structures Limited	JOB No. 2371

DATES EXCAVATED: 6.04.22	GROUND LEVEL: Approx 206.0 m AOD	TECHNICIAN: TJM
EXCAVATION METHOD: JCB 3CX	CO-ORDINATES: -	WEATHER: Sunny

CROSS SECTION:

GL _____

Chippings and sapling stumps onto made ground (dark grey fine to coarse angular GRAVEL to small boulder sized fragments of shaley MUDSTONE – iron rich in places).

2.50 _____

Trial Pit Complete.

GROUND WATER OBSERVATION:

Dry

STABILITY OF EXCAVATION:

Sides uneven and very unstable – frequent collapses

SAMPLES TAKEN:

Environmental suite at 0.30 – 1.00 m and plastic tub sample at 2.00 m

IN-SITU TESTS UNDERTAKEN:

None

REMARKS:

FIG NO.

GROUND INVESTIGATION SPECIALISTS LIMITED

TRIAL PIT LOG

CONTRACT: Cyfartha Retail Park, Merthyr Tydfil	TRIAL PIT No. TP2
CLIENT: Savills	SHEET 1 OF 1
ENGINEER: Waterman Structures Limited	JOB No. 2371

DATES EXCAVATED: 6.04.22	GROUND LEVEL: Approx 205.8 m AOD	TECHNICIAN: TJM
EXCAVATION METHOD: JCB 3CX	CO-ORDINATES: -	WEATHER: Heavy Rain

CROSS SECTION:

GL	_____
	Grass, young tree and bush stumps onto made ground (dark brown silty very sandy gravelly TOPSOIL).
0.10	_____
	Made ground (dark grey sandy fine to coarse angular GRAVEL to small BOULDER sized fragments of mudstone, occasional carbonaceous mudstone, sandstone, ash, slag and coal).
0.95	_____
	Made ground (cream, white and grey sandy fine to coarse angular GRAVEL and COBBLE sized fragments of foundry lining, ash and slag).
1.60	_____
	Trial Pit Complete.

GROUND WATER OBSERVATION:

Dry

STABILITY OF EXCAVATION:

Sides uneven and unstable

SAMPLES TAKEN:

Environmental suite at 0.30 m and plastic tub sample at 1.00 and 1.60 m

IN-SITU TESTS UNDERTAKEN:

Soil Infiltration Test carried out – See separate results sheet

REMARKS:

FIG NO.

9.0

SOIL INFILTRATION TEST RESULTS

GROUND INVESTIGATION SPECIALISTS LIMITED

SOIL INFILTRATION TEST

CONTRACT: Cyfarthfa Retail Park, Merthyr Tydfil

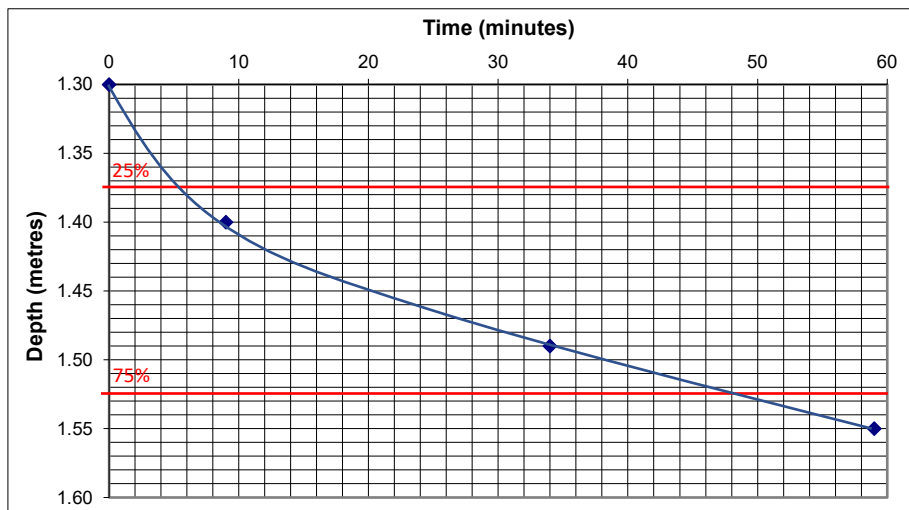
CLIENT: Savills

ENGINEER: Waterman Structures Limited

TRIAL PIT:	TP2	DATE:	6.4.22
TEST No:	Run 1	WEATHER:	Heavy Rain
EXCAVATION METHOD:	JCB 3CX	TECHNICIAN:	TJM
TEST PIT DIMENSIONS:	0.55 x 1.62 x 1.60m deep		

WATER LEVEL:	
Depth (m)	Time (min)
1.30	0
1.40	9
1.49	34
1.55	59

STRATA DESCRIPTION:	
GL	Grass, young trees and bush stumps onto made ground (dark brown silty very sandy gravelly TOPSOIL).
0.10	
	Made ground (dark grey sandy fine to coarse angular GRAVEL to small BOULDER sized fragments of mudstone, occasional carbonaceous mudstone, sandstone, ash, slag and coal).
0.95	
	Made ground (cream, white and grey sandy fine to coarse angular GRAVEL and COBBLE sized fragments of furnace lining, ash and slag).
1.60	



Width (m)	0.55
Length (m)	1.62
Depth (m)	1.60
1/2 Effective Storage Depth 75%-25% (m)	0.15
Time to fall to 75 %	48
Time to fall to 25 %	4.7
Volume 75%-25% (m ³)	0.134
Surface Area 75%-25% (m ²)	1.542
Time 75%-25% (minutes)	43.3
Soil Infiltration Rate (m/s)	3.3E-05

REMARKS:

GROUND INVESTIGATION SPECIALISTS LIMITED

SOIL INFILTRATION TEST

CONTRACT: Cyfarthfa Retail Park, Merthyr Tydfil

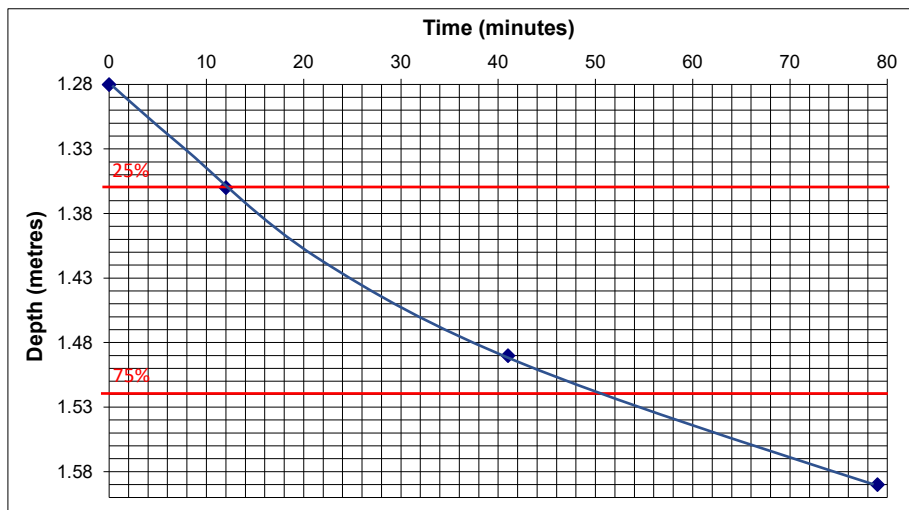
CLIENT: Savills

ENGINEER: Waterman Structures Limited

TRIAL PIT:	TP2	DATE:	6.4.22
TEST No:	Run 2	WEATHER:	Heavy Rain
EXCAVATION METHOD:	JCB 3CX	TECHNICIAN:	TJM
TEST PIT DIMENSIONS:	0.55 x 1.62 x 1.60m deep		

WATER LEVEL:	
Depth (m)	Time (min)
1.28	0
1.36	12
1.49	41
1.59	79

STRATA DESCRIPTION:
GL Grass, young trees and bush stumps onto made ground (dark brown silty very sandy gravelly TOPSOIL).
0.10
Made ground (dark grey sandy fine to coarse angular GRAVEL to small BOULDER sized fragments of mudstone, occasional carbonaceous mudstone, sandstone, ash, slag and coal).
0.95
Made ground (cream, white and grey sandy fine to coarse angular GRAVEL and COBBLE sized fragments of furnace lining, ash and slag).
1.60



Width (m)	0.55
Length (m)	1.62
Depth (m)	1.60
1/2 Effective Storage Depth 75%-25% (m)	0.16
Time to fall to 75 %	51
Time to fall to 25 %	12
Volume 75%-25% (m ³)	0.143
Surface Area 75%-25% (m ²)	1.585
Time 75%-25% (minutes)	39
Soil Infiltration Rate (m/s)	3.8E-05

REMARKS:

GROUND INVESTIGATION SPECIALISTS LIMITED

SOIL INFILTRATION TEST

CONTRACT: Cyfarthfa Retail Park, Merthyr Tydfil

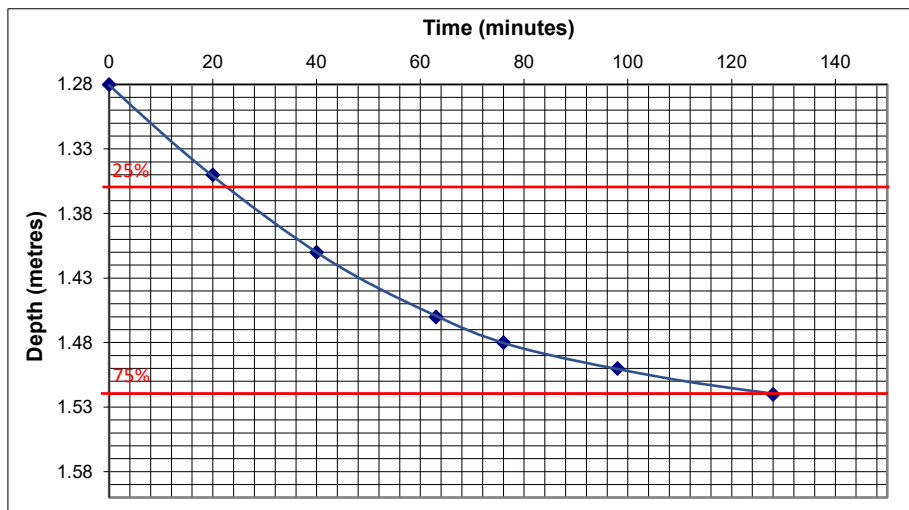
CLIENT: Savills

ENGINEER: Waterman Structures Limited

TRIAL PIT:	TP2	DATE:	6.4.22
TEST No:	Run 3	WEATHER:	Heavy Rain
EXCAVATION METHOD:	JCB 3CX	TECHNICIAN:	TJM
TEST PIT DIMENSIONS:	0.55 x 1.62 x 1.60m deep		

WATER LEVEL:	
Depth (m)	Time (min)
1.28	0
1.35	20
1.41	40
1.46	63
1.48	76
1.50	98
1.52	128

STRATA DESCRIPTION:	
GL	Grass, young trees and bush stumps onto made ground (dark brown silty very sandy gravelly TOPSOIL).
0.10	
	Made ground (dark grey sandy fine to coarse angular GRAVEL to small BOULDER sized fragments of mudstone, occasional carbonaceous mudstone, sandstone, ash, slag and coal).
0.95	
	Made ground (cream, white and grey sandy fine to coarse angular GRAVEL and COBBLE sized fragments of furnace lining, ash and slag).
1.60	



Width (m)	0.55
Length (m)	1.62
Depth (m)	1.60
1/2 Effective Storage Depth 75%-25% (m)	0.16
Time to fall to 75 %	128
Time to fall to 25 %	22
Volume 75%-25% (m ³)	0.143
Surface Area 75%-25% (m ²)	1.585
Time 75%-25% (minutes)	106
Soil Infiltration Rate (m/s)	1.4E-05

REMARKS:

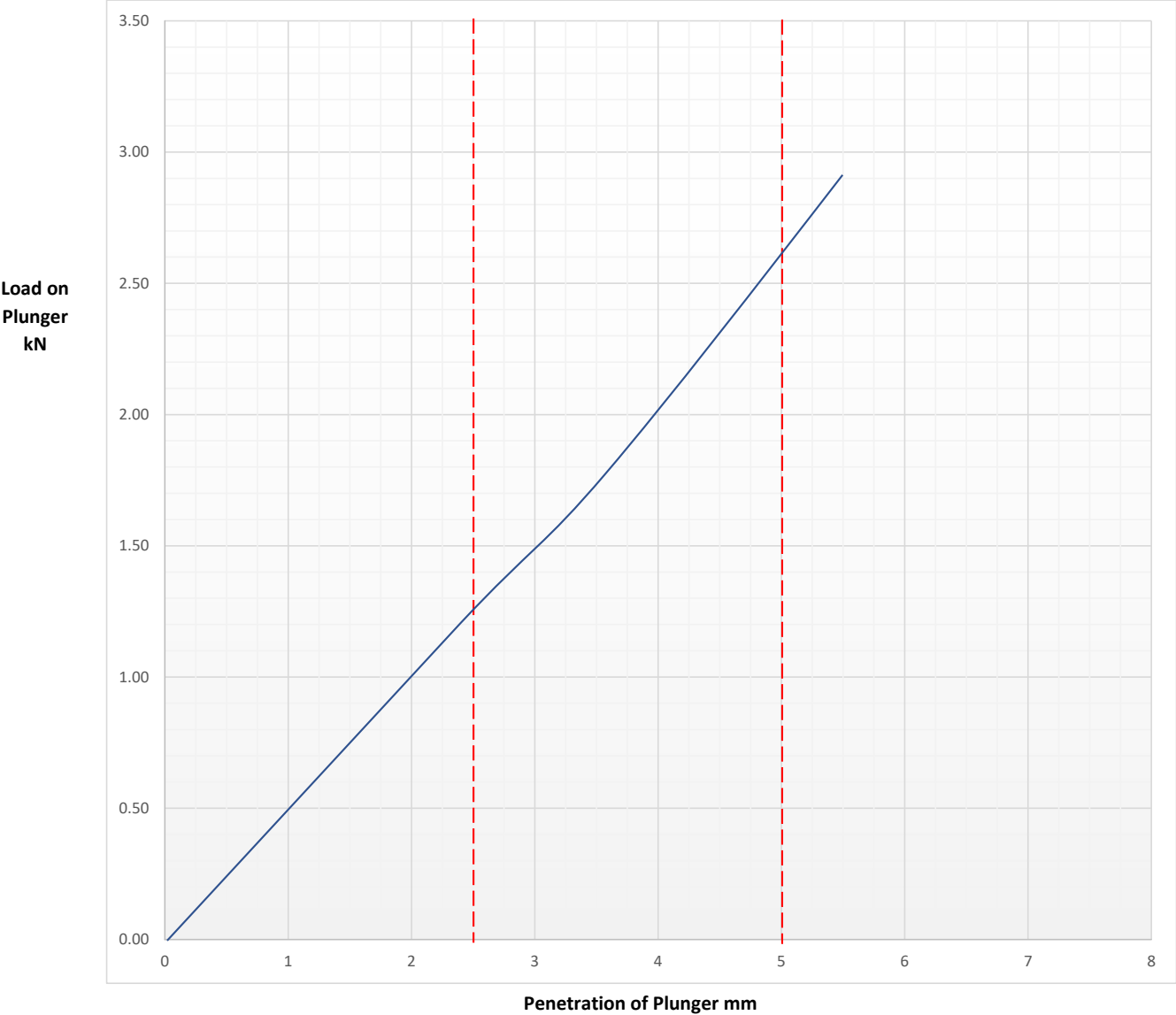
10.0 IN-SITU CALIFORNIA BEARING RATIO TEST RESULTS

GROUND INVESTIGATION SPECIALISTS LIMITED

IN-SITU CALIFORNIA BEARING RATIO TEST

CONTRACT:	Cyfarthfa Retail Par, Merthyr Tydfil		
CLIENT:	Savills	C.B.R. No. 1	
ENGINEER:	Waterman Structures Limited	DEPTH: 0.40m	

DESCRIPTION OF SAMPLE: Made ground (dark grey clayey SAND with much fine ot coarse angular shaley mudstone fragments).



PEN. mm	CORRECTED C.B.R.%
2.5	9.5
5	13

C.B.R.	13%
--------	-----

REMARKS:

11.0 SOIL CONTAMINATION TEST RESULTS



ANALYTICAL TEST REPORT

Contract no: 108223

Contract name: Merthyr Tydfil

Client reference: J2371

Clients name: Ground Investigation Specialists

Clients address: 43 Bell Place
Dudley Road
Wolverhampton
WV2 4LY

Samples received: 14 April 2022

Analysis started: 14 April 2022

Analysis completed: 03 May 2022

Report issued: 03 May 2022

Key

U	UKAS accredited test
M	MCERTS & UKAS accredited test
\$	Test carried out by an approved subcontractor
I/S	Insufficient sample to carry out test
N/S	Sample not suitable for testing
NAD	No Asbestos Detected

Approved by:

Megan Harris
Senior Reporting Administrator

Chemtech Environmental Limited

SAMPLE INFORMATION

MCERTS (Soils):

Soil descriptions are only intended to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions. MCERTS accreditation applies for sand, clay and loam/topsoil, or combinations of these whether these are derived from naturally occurring soils or from made ground, as long as these materials constitute the major part of the sample. Other materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

Lab ref	Sample id	Depth (m)	Sample description	Material removed	% Removed	% Moisture
108223-2	BH1	1.20	Loamy Clayey Sand	-	-	5.1
108223-3	BH1	3.80	Sandy Loamy Clay	-	-	8.6
108223-4	BH1	6.00	Sandy Loamy Clay	-	-	10.7
108223-5	BH1	9.00	Sandy Loamy Clay	-	-	3.3
108223-6	BH2	0.50	Sandy Clayey Loam with Gravel	-	-	7.3
108223-7	BH2	1.20	Sandy Clayey Loam with Gravel	-	-	5.1
108223-8	BH2	2.80	Sandy Clayey Loam with Gravel	-	-	15.9
108223-9	BH2	4.80	Sandy Clayey Loam with Gravel	-	-	16.6
108223-10	BH2	7.50	Sandy Loamy Clay with Roots	-	-	12.4
108223-11	BH2	11.50	Sandy Loamy Clay with Roots	-	-	9.1
108223-12	TP1	0.30-1.00	Sandy Clayey Loam with Gravel	-	-	5.5
108223-13	TP2	0.30	Sandy Loamy Clay with Gravel & Roots	-	-	12.5
108223-14	TP2	1.00	Chalkey Sand Loamy Clay with Roots	-	-	18.7

Chemtech Environmental Limited

SOILS

Lab number Sample id Depth (m) Date sampled			108223-2 BH1 1.20 06/04/2022	108223-3 BH1 3.80 06/04/2022	108223-4 BH1 6.00 06/04/2022	108223-5 BH1 9.00 07/04/2022	108223-6 BH2 0.50 07/04/2022	108223-7 BH2 1.20 07/04/2022
Test	Method	Units						
Antimony (total)	CE127 ^U	mg/kg Sb	-	-	-	-	-	-
Arsenic (total)	CE127 ^M	mg/kg As	-	-	-	-	9.2	-
Barium (total)	CE127 ^M	mg/kg Ba	-	-	-	-	-	-
Cadmium (total)	CE127 ^M	mg/kg Cd	-	-	-	-	<0.2	-
Chromium (total)	CE127 ^M	mg/kg Cr	-	-	-	-	30	-
Copper (total)	CE127 ^M	mg/kg Cu	-	-	-	-	43	-
Lead (total)	CE127 ^M	mg/kg Pb	-	-	-	-	32	-
Mercury (total)	CE127 ^M	mg/kg Hg	-	-	-	-	<0.5	-
Molybdenum (total)	CE127 ^M	mg/kg Mo	-	-	-	-	-	-
Nickel (total)	CE127 ^M	mg/kg Ni	-	-	-	-	47	-
Selenium (total)	CE127 ^M	mg/kg Se	-	-	-	-	1.3	-
Zinc (total)	CE127 ^M	mg/kg Zn	-	-	-	-	98	-
pH	CE004 ^M	units	8.7	8.5	8.2	8.6	8.4	8.6
Sulphate (2:1 water soluble)	CE061 ^U	mg/l SO ₄	22	25	14	11	18	19
Total Organic Carbon (TOC)	CE197	% w/w C	-	-	-	-	1.4	-
Estimate of OMC (calculated from TOC)	CE197	% w/w	-	-	-	-	2.4	-
PAH								
Naphthalene	CE087 ^M	mg/kg	-	-	-	-	<0.02	-
Acenaphthylene	CE087 ^M	mg/kg	-	-	-	-	<0.02	-
Acenaphthene	CE087 ^M	mg/kg	-	-	-	-	<0.02	-
Fluorene	CE087 ^U	mg/kg	-	-	-	-	<0.02	-
Phenanthrene	CE087 ^M	mg/kg	-	-	-	-	0.02	-
Anthracene	CE087 ^U	mg/kg	-	-	-	-	<0.02	-
Fluoranthene	CE087 ^M	mg/kg	-	-	-	-	<0.02	-
Pyrene	CE087 ^M	mg/kg	-	-	-	-	<0.02	-
Benzo(a)anthracene	CE087 ^U	mg/kg	-	-	-	-	<0.02	-
Chrysene	CE087 ^M	mg/kg	-	-	-	-	<0.03	-
Benzo(b)fluoranthene	CE087 ^M	mg/kg	-	-	-	-	<0.02	-
Benzo(k)fluoranthene	CE087 ^M	mg/kg	-	-	-	-	<0.03	-
Benzo(a)pyrene	CE087 ^U	mg/kg	-	-	-	-	<0.02	-
Indeno(123cd)pyrene	CE087 ^M	mg/kg	-	-	-	-	<0.02	-
Dibenz(ah)anthracene	CE087 ^M	mg/kg	-	-	-	-	<0.02	-
Benzo(ghi)perylene	CE087 ^M	mg/kg	-	-	-	-	<0.02	-
PAH (total of USEPA 16)	CE087	mg/kg	-	-	-	-	<0.34	-
TPH								
VPH Aromatic (>EC5-EC7)	CE067	mg/kg	-	-	-	-	0.01	-
VPH Aromatic (>EC7-EC8)	CE067	mg/kg	-	-	-	-	0.01	-
VPH Aromatic (>EC8-EC10)	CE067	mg/kg	-	-	-	-	<0.01	-
EPH Aromatic (>EC10-EC12)	CE250	mg/kg	-	-	-	-	<1	-
EPH Aromatic (>EC12-EC16)	CE250	mg/kg	-	-	-	-	1	-
EPH Aromatic (>EC16-EC21)	CE250	mg/kg	-	-	-	-	<1	-

Chemtech Environmental Limited

SOILS

Lab number			108223-2	108223-3	108223-4	108223-5	108223-6	108223-7
Sample id			BH1	BH1	BH1	BH1	BH2	BH2
Depth (m)			1.20	3.80	6.00	9.00	0.50	1.20
Date sampled			06/04/2022	06/04/2022	06/04/2022	07/04/2022	07/04/2022	07/04/2022
Test	Method	Units						
EPH Aromatic (>EC21-EC35)	CE250	mg/kg	-	-	-	-	<1	-
EPH Aromatic (>EC35-EC44)	CE250	mg/kg	-	-	-	-	3	-
VPH Aliphatic (>C5-C6)	CE067	mg/kg	-	-	-	-	<0.1	-
VPH Aliphatic (>C6-C8)	CE067	mg/kg	-	-	-	-	<0.1	-
VPH Aliphatic (>C8-C10)	CE067	mg/kg	-	-	-	-	<0.1	-
EPH Aliphatic (>C10-C12)	CE250	mg/kg	-	-	-	-	<6	-
EPH Aliphatic (>C12-C16)	CE250	mg/kg	-	-	-	-	<6	-
EPH Aliphatic (>C16-C35)	CE250	mg/kg	-	-	-	-	<15	-
EPH Aliphatic (>C35-C44)	CE250	mg/kg	-	-	-	-	<10	-
Subcontracted analysis								
Asbestos (qualitative)	\$	-	-	-	-	-	NAD	-

Chemtech Environmental Limited

SOILS

Lab number Sample id Depth (m) Date sampled			108223-8 BH2 2.80 07/04/2022	108223-9 BH2 4.80 07/04/2022	108223-10 BH2 7.50 07/04/2022	108223-11 BH2 11.50 07/04/2022	108223-12 TP1 0.30-1.00 06/04/2022	108223-13 TP2 0.30 06/04/2022
Test	Method	Units						
Antimony (total)	CE127 ^U	mg/kg Sb	-	-	-	-	1.3	-
Arsenic (total)	CE127 ^M	mg/kg As	-	-	-	-	13	8.3
Barium (total)	CE127 ^M	mg/kg Ba	-	-	-	-	124	-
Cadmium (total)	CE127 ^M	mg/kg Cd	-	-	-	-	<0.2	1.0
Chromium (total)	CE127 ^M	mg/kg Cr	-	-	-	-	29	30
Copper (total)	CE127 ^M	mg/kg Cu	-	-	-	-	47	33
Lead (total)	CE127 ^M	mg/kg Pb	-	-	-	-	30	212
Mercury (total)	CE127 ^M	mg/kg Hg	-	-	-	-	<0.5	<0.5
Molybdenum (total)	CE127 ^M	mg/kg Mo	-	-	-	-	<1	-
Nickel (total)	CE127 ^M	mg/kg Ni	-	-	-	-	54	22
Selenium (total)	CE127 ^M	mg/kg Se	-	-	-	-	1.2	3.8
Zinc (total)	CE127 ^M	mg/kg Zn	-	-	-	-	94	207
pH	CE004 ^M	units	8.1	7.9	8.1	8.7	8.8	8.4
Sulphate (2:1 water soluble)	CE061 ^U	mg/l SO ₄	101	36	11	<10	15	150
Total Organic Carbon (TOC)	CE197	% w/w C	-	-	-	-	1.1	7.2
Estimate of OMC (calculated from TOC)	CE197	% w/w	-	-	-	-	1.9	12.4
PAH								
Naphthalene	CE087 ^M	mg/kg	-	-	-	-	<0.02	0.04
Acenaphthylene	CE087 ^M	mg/kg	-	-	-	-	<0.02	<0.02
Acenaphthene	CE087 ^M	mg/kg	-	-	-	-	<0.02	<0.02
Fluorene	CE087 ^U	mg/kg	-	-	-	-	<0.02	<0.02
Phenanthrene	CE087 ^M	mg/kg	-	-	-	-	<0.02	0.08
Anthracene	CE087 ^U	mg/kg	-	-	-	-	<0.02	0.03
Fluoranthene	CE087 ^M	mg/kg	-	-	-	-	<0.02	0.13
Pyrene	CE087 ^M	mg/kg	-	-	-	-	<0.02	0.10
Benzo(a)anthracene	CE087 ^U	mg/kg	-	-	-	-	<0.02	0.10
Chrysene	CE087 ^M	mg/kg	-	-	-	-	<0.03	0.09
Benzo(b)fluoranthene	CE087 ^M	mg/kg	-	-	-	-	<0.02	0.15
Benzo(k)fluoranthene	CE087 ^M	mg/kg	-	-	-	-	<0.03	0.04
Benzo(a)pyrene	CE087 ^U	mg/kg	-	-	-	-	<0.02	0.08
Indeno(123cd)pyrene	CE087 ^M	mg/kg	-	-	-	-	<0.02	0.06
Dibenz(ah)anthracene	CE087 ^M	mg/kg	-	-	-	-	<0.02	<0.02
Benzo(ghi)perylene	CE087 ^M	mg/kg	-	-	-	-	<0.02	0.05
PAH (total of USEPA 16)	CE087	mg/kg	-	-	-	-	<0.34	0.97
TPH								
VPH Aromatic (>EC5-EC7)	CE067	mg/kg	-	-	-	-	<0.01	<0.01
VPH Aromatic (>EC7-EC8)	CE067	mg/kg	-	-	-	-	<0.01	<0.01
VPH Aromatic (>EC8-EC10)	CE067	mg/kg	-	-	-	-	<0.01	<0.01
EPH Aromatic (>EC10-EC12)	CE250	mg/kg	-	-	-	-	<1	<1
EPH Aromatic (>EC12-EC16)	CE250	mg/kg	-	-	-	-	2	2
EPH Aromatic (>EC16-EC21)	CE250	mg/kg	-	-	-	-	<1	<1

Chemtech Environmental Limited

SOILS

Lab number			108223-8	108223-9	108223-10	108223-11	108223-12	108223-13
Sample id			BH2	BH2	BH2	BH2	TP1	TP2
Depth (m)			2.80	4.80	7.50	11.50	0.30-1.00	0.30
Date sampled			07/04/2022	07/04/2022	07/04/2022	07/04/2022	06/04/2022	06/04/2022
Test	Method	Units						
EPH Aromatic (>EC21-EC35)	CE250	mg/kg	-	-	-	-	<1	<1
EPH Aromatic (>EC35-EC44)	CE250	mg/kg	-	-	-	-	<1	1
VPH Aliphatic (>C5-C6)	CE067	mg/kg	-	-	-	-	<0.1	<0.1
VPH Aliphatic (>C6-C8)	CE067	mg/kg	-	-	-	-	<0.1	<0.1
VPH Aliphatic (>C8-C10)	CE067	mg/kg	-	-	-	-	<0.1	<0.1
EPH Aliphatic (>C10-C12)	CE250	mg/kg	-	-	-	-	<6	<6
EPH Aliphatic (>C12-C16)	CE250	mg/kg	-	-	-	-	<6	<6
EPH Aliphatic (>C16-C35)	CE250	mg/kg	-	-	-	-	<15	<15
EPH Aliphatic (>C35-C44)	CE250	mg/kg	-	-	-	-	<10	<10
Subcontracted analysis								
Asbestos (qualitative)	\$	-	-	-	-	-	NAD	NAD

Chemtech Environmental Limited

SOILS

Lab number			108223-14
Sample id			TP2
Depth (m)			1.00
Date sampled			06/04/2022
Test	Method	Units	
Antimony (total)	CE127 ^U	mg/kg Sb	-
Arsenic (total)	CE127 ^M	mg/kg As	7.6
Barium (total)	CE127 ^M	mg/kg Ba	-
Cadmium (total)	CE127 ^M	mg/kg Cd	0.3
Chromium (total)	CE127 ^M	mg/kg Cr	18
Copper (total)	CE127 ^M	mg/kg Cu	25
Lead (total)	CE127 ^M	mg/kg Pb	51
Mercury (total)	CE127 ^M	mg/kg Hg	<0.5
Molybdenum (total)	CE127 ^M	mg/kg Mo	-
Nickel (total)	CE127 ^M	mg/kg Ni	14
Selenium (total)	CE127 ^M	mg/kg Se	0.9
Zinc (total)	CE127 ^M	mg/kg Zn	55
pH	CE004 ^M	units	10.5
Sulphate (2:1 water soluble)	CE061 ^U	mg/l SO ₄	302
Total Organic Carbon (TOC)	CE197	% w/w C	6.0
Estimate of OMC (calculated from TOC)	CE197	% w/w	10.3
PAH			
Naphthalene	CE087 ^M	mg/kg	<0.02
Acenaphthylene	CE087 ^M	mg/kg	<0.02
Acenaphthene	CE087 ^M	mg/kg	<0.02
Fluorene	CE087 ^U	mg/kg	<0.02
Phenanthrene	CE087 ^M	mg/kg	0.05
Anthracene	CE087 ^U	mg/kg	<0.02
Fluoranthene	CE087 ^M	mg/kg	0.08
Pyrene	CE087 ^M	mg/kg	0.06
Benzo(a)anthracene	CE087 ^U	mg/kg	0.05
Chrysene	CE087 ^M	mg/kg	0.05
Benzo(b)fluoranthene	CE087 ^M	mg/kg	0.08
Benzo(k)fluoranthene	CE087 ^M	mg/kg	0.03
Benzo(a)pyrene	CE087 ^U	mg/kg	0.05
Indeno(123cd)pyrene	CE087 ^M	mg/kg	0.03
Dibenz(ah)anthracene	CE087 ^M	mg/kg	<0.02
Benzo(ghi)perylene	CE087 ^M	mg/kg	0.02
PAH (total of USEPA 16)	CE087	mg/kg	0.50
TPH			
VPH Aromatic (>EC5-EC7)	CE067	mg/kg	<0.01
VPH Aromatic (>EC7-EC8)	CE067	mg/kg	<0.01
VPH Aromatic (>EC8-EC10)	CE067	mg/kg	<0.01
EPH Aromatic (>EC10-EC12)	CE250	mg/kg	1
EPH Aromatic (>EC12-EC16)	CE250	mg/kg	3
EPH Aromatic (>EC16-EC21)	CE250	mg/kg	<1

Chemtech Environmental Limited

SOILS

Lab number			108223-14
Sample id			TP2
Depth (m)			1.00
Date sampled			06/04/2022
Test	Method	Units	
EPH Aromatic (>EC21-EC35)	CE250	mg/kg	<1
EPH Aromatic (>EC35-EC44)	CE250	mg/kg	<1
VPH Aliphatic (>C5-C6)	CE067	mg/kg	<0.1
VPH Aliphatic (>C6-C8)	CE067	mg/kg	<0.1
VPH Aliphatic (>C8-C10)	CE067	mg/kg	<0.1
EPH Aliphatic (>C10-C12)	CE250	mg/kg	<6
EPH Aliphatic (>C12-C16)	CE250	mg/kg	<6
EPH Aliphatic (>C16-C35)	CE250	mg/kg	<15
EPH Aliphatic (>C35-C44)	CE250	mg/kg	<10
Subcontracted analysis			
Asbestos (qualitative)	\$	-	NAD

Chemtech Environmental Limited

SOLIDS

Lab number			108223-1
Sample id			BH1
Depth (m)			0.50
Date sampled			06/04/2022
Test	Method	Units	
Arsenic (total)	CE127	mg/kg As	13
Cadmium (total)	CE127	mg/kg Cd	<0.2
Chromium (total)	CE127	mg/kg Cr	28
Copper (total)	CE127	mg/kg Cu	38
Lead (total)	CE127	mg/kg Pb	31
Mercury (total)	CE127	mg/kg Hg	<0.5
Nickel (total)	CE127	mg/kg Ni	42
Selenium (total)	CE127	mg/kg Se	1.7
Zinc (total)	CE127	mg/kg Zn	117
pH	CE004	units	8.6
Sulphate (2:1 water soluble)	CE061	mg/l SO ₄	28
Subcontracted analysis			
Asbestos (qualitative)	\$	-	NAD

Chemtech Environmental Limited

METHOD DETAILS

METHOD	SOLIDS	METHOD SUMMARY	SAMPLE	STATUS	LOD	UNITS
CE127	Arsenic (total)	Aqua regia digest, ICP-MS	Dry		1	mg/kg As
CE127	Cadmium (total)	Aqua regia digest, ICP-MS	Dry		0.2	mg/kg Cd
CE127	Chromium (total)	Aqua regia digest, ICP-MS	Dry		1	mg/kg Cr
CE127	Copper (total)	Aqua regia digest, ICP-MS	Dry		1	mg/kg Cu
CE127	Lead (total)	Aqua regia digest, ICP-MS	Dry		1	mg/kg Pb
CE127	Mercury (total)	Aqua regia digest, ICP-MS	Dry		0.5	mg/kg Hg
CE127	Nickel (total)	Aqua regia digest, ICP-MS	Dry		1	mg/kg Ni
CE127	Selenium (total)	Aqua regia digest, ICP-MS	Dry		0.3	mg/kg Se
CE127	Zinc (total)	Aqua regia digest, ICP-MS	Dry		5	mg/kg Zn
CE004	pH	Based on BS 1377, pH Meter	As received		-	units
CE061	Sulphate (2:1 water soluble)	Aqueous extraction, ICP-OES	Dry		10	mg/l SO ₄
\$	Asbestos (qualitative)	HSG 248, Microscopy	Dry	U	-	-

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METHOD DETAILS

METHOD	SOILS	METHOD SUMMARY	SAMPLE	STATUS	LOD	UNITS
CE127	Antimony (total)	Aqua regia digest, ICP-MS	Dry	U	0.2	mg/kg Sb
CE127	Arsenic (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg As
CE127	Barium (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Ba
CE127	Cadmium (total)	Aqua regia digest, ICP-MS	Dry	M	0.2	mg/kg Cd
CE127	Chromium (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Cr
CE127	Copper (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Cu
CE127	Lead (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Pb
CE127	Mercury (total)	Aqua regia digest, ICP-MS	Dry	M	0.5	mg/kg Hg
CE127	Molybdenum (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Mo
CE127	Nickel (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Ni
CE127	Selenium (total)	Aqua regia digest, ICP-MS	Dry	M	0.3	mg/kg Se
CE127	Zinc (total)	Aqua regia digest, ICP-MS	Dry	M	5	mg/kg Zn
CE004	pH	Based on BS 1377, pH Meter	As received	M	-	units
CE061	Sulphate (2:1 water soluble)	Aqueous extraction, ICP-OES	Dry	U	10	mg/l SO ₄
CE197	Total Organic Carbon (TOC)	Carbon Analyser	Dry		0.1	% w/w C
CE197	Estimate of OMC (calculated from TOC)	Calculation from Total Organic Carbon	Dry		0.1	% w/w
CE087	Naphthalene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Acenaphthylene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Acenaphthene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Fluorene	Solvent extraction, GC-MS	As received	U	0.02	mg/kg
CE087	Phenanthrene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Anthracene	Solvent extraction, GC-MS	As received	U	0.02	mg/kg
CE087	Fluoranthene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Pyrene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Benzo(a)anthracene	Solvent extraction, GC-MS	As received	U	0.02	mg/kg
CE087	Chrysene	Solvent extraction, GC-MS	As received	M	0.03	mg/kg
CE087	Benzo(b)fluoranthene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Benzo(k)fluoranthene	Solvent extraction, GC-MS	As received	M	0.03	mg/kg
CE087	Benzo(a)pyrene	Solvent extraction, GC-MS	As received	U	0.02	mg/kg
CE087	Indeno(123cd)pyrene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Dibenz(ah)anthracene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Benzo(ghi)perylene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	PAH (total of USEPA 16)	Solvent extraction, GC-MS	As received		0.34	mg/kg
CE067	VPH Aromatic (>EC5-EC7)	Headspace GC-FID	As received		0.01	mg/kg
CE067	VPH Aromatic (>EC7-EC8)	Headspace GC-FID	As received		0.01	mg/kg
CE067	VPH Aromatic (>EC8-EC10)	Headspace GC-FID	As received		0.01	mg/kg
CE250	EPH Aromatic (>EC10-EC12)	Solvent extraction, GCxGC-FID	As received		1	mg/kg
CE250	EPH Aromatic (>EC12-EC16)	Solvent extraction, GCxGC-FID	As received		1	mg/kg
CE250	EPH Aromatic (>EC16-EC21)	Solvent extraction, GCxGC-FID	As received		1	mg/kg
CE250	EPH Aromatic (>EC21-EC35)	Solvent extraction, GCxGC-FID	As received		1	mg/kg
CE250	EPH Aromatic (>EC35-EC44)	Solvent extraction, GCxGC-FID	As received		1	mg/kg
CE067	VPH Aliphatic (>C5-C6)	Headspace GC-FID	As received		0.1	mg/kg
CE067	VPH Aliphatic (>C6-C8)	Headspace GC-FID	As received		0.1	mg/kg
CE067	VPH Aliphatic (>C8-C10)	Headspace GC-FID	As received		0.1	mg/kg

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METHOD DETAILS

METHOD	SOILS	METHOD SUMMARY	SAMPLE	STATUS	LOD	UNITS
CE250	EPH Aliphatic (>C10-C12)	Solvent extraction, GCxGC-FID	As received		6	mg/kg
CE250	EPH Aliphatic (>C12-C16)	Solvent extraction, GCxGC-FID	As received		6	mg/kg
CE250	EPH Aliphatic (>C16-C35)	Solvent extraction, GCxGC-FID	As received		15	mg/kg
CE250	EPH Aliphatic (>C35-C44)	Solvent extraction, GCxGC-FID	As received		10	mg/kg
\$	Asbestos (qualitative)	HSG 248, Microscopy	Dry	U	-	-

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DEVIATING SAMPLE INFORMATION

Comments

Sample deviation is determined in accordance with the UKAS note "Guidance on Deviating Samples" and based on reference standards and laboratory trials.

For samples identified as deviating, test result(s) may be compromised and may not be representative of the sample at the time of sampling.

Chemtech Environmental Ltd cannot be held responsible for the integrity of sample(s) received if Chemtech Environmental Ltd did not undertake the sampling. Such samples may be deviating.

Key

N	No (not deviating sample)
Y	Yes (deviating sample)
NSD	Sampling date not provided
NST	Sampling time not provided (waters only)
EHT	Sample exceeded holding time(s)
IC	Sample not received in appropriate containers
HP	Headspace present in sample container
NCF	Sample not chemically fixed (where appropriate)
OR	Other (specify)

Lab ref	Sample id	Depth (m)	Deviating	Tests (Reason for deviation)
108223-2	BH1	1.20	N	
108223-3	BH1	3.80	N	
108223-4	BH1	6.00	N	
108223-5	BH1	9.00	N	
108223-6	BH2	0.50	N	
108223-7	BH2	1.20	N	
108223-8	BH2	2.80	N	
108223-9	BH2	4.80	N	
108223-10	BH2	7.50	N	
108223-11	BH2	11.50	N	
108223-12	TP1	0.30-1.00	N	
108223-13	TP2	0.30	N	
108223-14	TP2	1.00	N	

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ADDITIONAL INFORMATION

Notes

Opinions and interpretations expressed herein are outside the UKAS accreditation scope.

Unless otherwise stated, Chemtech Environmental Ltd was not responsible for sampling.

All testing carried out at Unit 6 Parkhead, Stanley, DH9 7YB, except for subcontracted testing.

Methods, procedures and performance data are available on request.

Results reported herein relate only to the material supplied to the laboratory.

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

Samples will be disposed of 6 weeks from initial receipt unless otherwise instructed.

For soils and solids, all results are reported on a dry basis. Samples dried at no more than 30°C in a drying cabinet.

For soils and solids, analytical results are inclusive of stones, where applicable.

Waste Acceptance Criteria Testing

BS EN 12457-Part 3, 2 Stage Process



Sample Details

Contract Name Merthyr Tydfil
 Lab Number 108223-12
 Sample ID TP1 0.30-1.00
 Date Sampled 14 April 2022
 Date Received 14 April 2022
 Particle Size (<4mm) -
 Method of size reduction N/A
 Non-crushable matter N/A

Test Values

Mass of Raw Test Portion (MW) kg 0.185
 Mass of Dried Test Portion (MD) kg 0.175
 Moisture Content Ratio (MC) % 5.79
 Dry Matter Content Ratio (DR) % 94.52
 Leachant Volume (1) (L2) Litre 0.340
 Leachant Volume (2) (L8) Litre 1.400
 Eluate Volume (1) (VE1) Litre 0.200
 Eluate Volume (2) (VE2) Litre 1.060

Eluate Analysis	Conc in Eluate	
Liquid : Waste Ratio	2:1	8:1
pH (units)	8.9	9.0
Temperature (°C)	20	20
Conductivity (µS/cm)	228	90
Antimony (µg/l Sb)	0.64	0.75
Arsenic (µg/l As)	2.27	0.22
Barium (µg/l Ba)	13.8	10.4
Cadmium (µg/l Cd)	<0.07	<0.07
Chromium (µg/l Cr)	1.0	0.4
Copper (µg/l Cu)	1.0	0.9
Lead (µg/l Pb)	0.4	<0.2
Mercury (µg/l Hg)	<0.008	<0.008
Molybdenum (µg/l Mo)	<0.3	0.4
Nickel (µg/l Ni)	2.1	<0.5
Selenium (µg/l Se)	0.30	0.65
Zinc (µg/l Zn)	<1	6
Chloride (mg/l Cl)	5.0	0.7
Fluoride (mg/l F)	0.2	0.1
Sulphate (mg/l SO ₄)	96	2.1
Total Dissolved Solids (mg/l TDS)	175	70
Phenol Index (µg/l PhOH)	<10	<10
Dissolved Organic Carbon (mg/l C)	7.2	<5

Amount Leached		Council Decision 2003/33/EC Limit Values mg/kg at L:S 10:1		
2:1	10:1	Inert Waste	Non-reactive Hazardous Waste	Hazardous Waste
mg/kg	mg/kg			
0.001	0.007	0.06	0.7	5
0.005	0.005	0.5	2	25
0.028	0.108	20	100	300
<0.0002	<0.0007	0.04	1	5
0.002	0.005	0.5	10	70
0.002	0.009	2	50	100
0.001	<0.002	0.5	10	50
<0.00002	<0.00008	0.01	0.2	2
<0.0006	<0.004	0.5	10	30
0.004	<0.007	0.4	10	40
0.001	0.006	0.1	0.5	7
<0.002	<0.053	4	50	200
10	12	800	15000	25000
0.5	1.2	10	150	500
191	128	1000	20000	50000
350	820	4000	60000	100000
<0.02	<0.1	1		
14	<53	500	800	1000

Waste Analysis	Units	Result			
Total Organic Carbon	% w/w	1.1	3%	5%	6%
Loss on Ignition	% w/w	1.9			10%
BTEX	mg/kg	<0.06	6		
PCBs (7 congeners)	mg/kg	<0.045	1		
Mineral Oil (C10 - C40)	mg/kg	<19	500		
PAH (total)	mg/kg	<0.36	100		
pH	pH units	8.8		>6	
Acid Neutralisation Capacity (pH4)	mol/kg	0.02		To be evaluated	
Acid Neutralisation Capacity (pH7)	mol/kg	0.02		To be evaluated	

Disclaimer: The Landfill Waste Acceptance Criteria limits in this report are provided for guidance only and values are transcribed from the Council Decision annex 2003/33/EC. Chemtech Environmental Ltd does not take responsibility for any errors or omissions in the transcription, and all data should be verified by the end user. Results will be colour flagged to the lowest threshold value breached. Any assessments made are based on the published results from the Laboratory and make no assessment of uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. Method uncertainty levels can be provided. Waste Acceptance Criteria assessment is outside the scope of the laboratory's UKAS accreditation.

Comments

Authorised by:

Name:

Rachael Burton

Report date:

3 May 2022

Position:

Reporting Team Lead

Unit 6 Parkhead, Greencroft Industrial Park, Stanley, County Durham, DH9 7YB
 Tel 01207 528578 Email customerservices@chemtech-env.co.uk
 Vat Reg No. 772 5703 18 Registered in England number 4284013



Waste Classification Report

HazWasteOnline™ classifies waste as either **hazardous** or **non-hazardous** based on its chemical composition, related legislation and the rules and data defined in the current UK or EU technical guidance (Appendix C) (note that HP 9 Infectious is not assessed). It is the responsibility of the classifier named below to:

- understand the origin of the waste
- select the correct List of Waste code(s)
- confirm that the list of determinands, results and sampling plan are fit for purpose
- select and justify the chosen metal species (Appendix B)
- correctly apply moisture correction and other available corrections
- add the meta data for their user-defined substances (Appendix A)
- check that the classification engine is suitable with respect to the national destination of the waste (Appendix C)



EC9QX-E3Y0A-MXCSQ

To aid the reviewer, the laboratory results, assumptions and justifications managed by the classifier are highlighted in **pale yellow**.

Job name

Merthyr Tydfil

Description/Comments

Project

J 2371

Site

Classified by

Name:

Tom McLaren

Date:

13 May 2022 16:18 GMT

Telephone:

01902 717653

Company:

Ground Investigation Specialists Limited

GIS

HazWasteOnline™ provides a two day, hazardous waste classification course that covers the use of the software and both basic and advanced waste classification techniques. Certification has to be renewed every 3 years.

HazWasteOnline™ Certification:

-

Course

Hazardous Waste Classification

Date

-

Job summary

#	Sample name	Depth [m]	Classification Result	Hazard properties	Page
1	Made Ground Mean		Non Hazardous		2

Related documents

#	Name	Description
1	General Soil Default Waste Stream	waste stream template used to create this Job

Report

Created by: Tom McLaren

Created date: 13 May 2022 16:18 GMT

Appendices	Page
Appendix A: Classifier defined and non GB MCL determinands	4
Appendix B: Rationale for selection of metal species	5
Appendix C: Version	6



Classification of sample: Made Ground Mean

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

Sample details

Sample name: **Made Ground Mean** LoW Code: Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 0% Dry Weight Moisture Correction applied (MC)

#	Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number									
1	arsenic { arsenic compounds, with the exception of those specified elsewhere in this Annex } 033-002-00-5			1	8	mg/kg		8	mg/kg	0.0008 %	✓	
2	cadmium { cadmium sulfide } 048-010-00-4	215-147-8	1306-23-6	1	8	mg/kg	1.285	10.282	mg/kg	0.0008 %	✓	
3	chromium(III) oxide (worst case) 215-160-9		1308-38-9		28	mg/kg		28	mg/kg	0.0028 %	✓	
4	copper { dicopper oxide; copper (I) oxide } 029-002-00-X	215-270-7	1317-39-1		30	mg/kg	1.126	33.777	mg/kg	0.00338 %	✓	
5	lead { lead compounds with the exception of those specified elsewhere in this Annex } 082-001-00-6			1	73	mg/kg		73	mg/kg	0.0073 %	✓	
6	mercury { compounds of mercury (with the exception of mercuric sulfide and those listed separately in this Annex) } 080-002-00-6			1	0.7	mg/kg	1.39	0.973	mg/kg	0.00007 %	✓	
7	nickel { nickel dihydroxide } 028-008-00-X	235-008-5 [1] 234-348-1 [2]	12054-48-7 [1] 11113-74-9 [2]		29	mg/kg	1.579	45.805	mg/kg	0.00458 %	✓	
8	selenium { selenium compounds with the exception of cadmium selenide and those specified elsewhere in this Annex } 034-002-00-8				7	mg/kg	1.405	9.835	mg/kg	0.000983 %	✓	
9	zinc { zinc oxide } 030-013-00-7	215-222-5	1314-13-2		114	mg/kg	1.245	141.897	mg/kg	0.0142 %	✓	
10	pH PH				9	pH		9	pH	9pH		
11	TPH (C6 to C40) petroleum group TPH				<43.8	mg/kg		<43.8	mg/kg	<0.00438 %		<LOD
12	benzene 601-020-00-8	200-753-7	71-43-2		<0.06	mg/kg		<0.06	mg/kg	<0.000006 %		<LOD
13	toluene 601-021-00-3	203-625-9	108-88-3		<0.06	mg/kg		<0.06	mg/kg	<0.000006 %		<LOD
14	ethylbenzene 601-023-00-4	202-849-4	100-41-4		<0.06	mg/kg		<0.06	mg/kg	<0.000006 %		<LOD
15	xylene 601-022-00-9	202-422-2 [1] 203-396-5 [2]	95-47-6 [1] 106-42-3 [2]		<0.06	mg/kg		<0.06	mg/kg	<0.000006 %		<LOD



#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number							
		203-576-3 [3] 215-535-7 [4]	108-38-3 [3] 1330-20-7 [4]							
16	naphthalene 601-052-00-2	202-049-5	91-20-3		0.03 mg/kg		0.03 mg/kg	0.000003 %	✓	
17	acenaphthylene 205-917-1	208-96-8			0.02 mg/kg		0.02 mg/kg	0.000002 %	✓	
18	acenaphthene 201-469-6	83-32-9			0.02 mg/kg		0.02 mg/kg	0.000002 %	✓	
19	fluorene 201-695-5	86-73-7			0.02 mg/kg		0.02 mg/kg	0.000002 %	✓	
20	phenanthrene 201-581-5	85-01-8			0.04 mg/kg		0.04 mg/kg	0.000004 %	✓	
21	anthracene 204-371-1	120-12-7			0.02 mg/kg		0.02 mg/kg	0.000002 %	✓	
22	fluoranthene 205-912-4	206-44-0			0.06 mg/kg		0.06 mg/kg	0.000006 %	✓	
23	pyrene 204-927-3	129-00-0			0.05 mg/kg		0.05 mg/kg	0.000005 %	✓	
24	benzo[a]anthracene 601-033-00-9	200-280-6	56-55-3		0.05 mg/kg		0.05 mg/kg	0.000005 %	✓	
25	chrysene 601-048-00-0	205-923-4	218-01-9		0.05 mg/kg		0.05 mg/kg	0.000005 %	✓	
26	benzo[b]fluoranthene 601-034-00-4	205-911-9	205-99-2		0.07 mg/kg		0.07 mg/kg	0.000007 %	✓	
27	benzo[k]fluoranthene 601-036-00-5	205-916-6	207-08-9		0.03 mg/kg		0.03 mg/kg	0.000003 %	✓	
28	benzo[a]pyrene; benzo[def]chrysene 601-032-00-3	200-028-5	50-32-8		0.04 mg/kg		0.04 mg/kg	0.000004 %	✓	
29	indeno[123-cd]pyrene 205-893-2	193-39-5			0.03 mg/kg		0.03 mg/kg	0.000003 %	✓	
30	dibenz[a,h]anthracene 601-041-00-2	200-181-8	53-70-3		0.02 mg/kg		0.02 mg/kg	0.000002 %	✓	
31	benzo[ghi]perylene 205-883-8	191-24-2			0.03 mg/kg		0.03 mg/kg	0.000003 %	✓	
Total:								0.0394 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
•	Determinand defined or amended by HazWasteOnline (see Appendix A)
•	Speciated Determinand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
•	This determinand is defined in the EU CLP Table 3
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification



Appendix A: Classifier defined and non GB MCL determinands

arsenic compounds, with the exception of those specified elsewhere in this Annex

GB MCL index number: 033-002-00-5

Description/Comments: Worst Case: IARC considers arsenic compounds Group 1; Carcinogenic to humans

Additional Hazard Statement(s): Carc. 1A; H350

Reason for additional Hazards Statement(s):

20 Nov 2021 - Carc. 1A; H350 hazard statement sourced from: IARC Group 1 (23, Sup 7, 100C) 2012

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

Description/Comments: Data from C&L Inventory Database

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

Data source date: 17 Jul 2015

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

lead compounds with the exception of those specified elsewhere in this Annex

GB MCL index number: 082-001-00-6

Description/Comments: Least-worst case: IARC considers lead compounds Group 2A; Probably carcinogenic to humans; Lead REACH Consortium, following MCL protocols, considers many simple lead compounds to be Carcinogenic category 2

Additional Hazard Statement(s): Carc. 2; H351

Reason for additional Hazards Statement(s):

20 Nov 2021 - Carc. 2; H351 hazard statement sourced from: IARC Group 2A (Sup 7, 87) 2006; Lead REACH Consortium

www.reach-lead.eu/substanceinformation.html. Review date 29/09/2015

compounds of mercury (with the exception of mercuric sulfide and those listed separately in this Annex)

EU CLP index number: 080-002-00-6

Description/Comments: Combines the average of the conversion factors for Mercury difulminate and Mercury (II) sulphide.

Data source: Regulation 1272/2008/EC - Classification, labelling and packaging of substances and mixtures. (CLP)

Hazard Statements: Acute Tox. 2; H330 , Acute Tox. 1; H310 , Acute Tox. 2; H300 , STOT RE 2; H373 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410 , STOT RE 2; H373 >= 0.1 %

pH (CAS Number: PH)

Description/Comments: Appendix C4

Data source: WM3 1st Edition 2015

Data source date: 25 May 2015

Hazard Statements: None.

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

Description/Comments: Hazard statements taken from WM3 1st Edition 2015; Risk phrases: WM2 3rd Edition 2013

Data source: WM3 1st Edition 2015

Data source date: 25 May 2015

Hazard Statements: Flam. Liq. 3; H226 , Asp. Tox. 1; H304 , STOT RE 2; H373 , Muta. 1B; H340 , Carc. 1B; H350 , Repr. 2; H361d , Aquatic Chronic 2; H411

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

GB MCL index number: 601-023-00-4

Description/Comments:

Additional Hazard Statement(s): Carc. 2; H351

Reason for additional Hazards Statement(s):

20 Nov 2021 - Carc. 2; H351 hazard statement sourced from: IARC Group 2B (77) 2000

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

Description/Comments: Data from C&L Inventory Database

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

Data source date: 17 Jul 2015

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

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

Description/Comments: Data from C&L Inventory Database

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

Data source date: 17 Jul 2015

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



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

Description/Comments: Data from C&L Inventory Database

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

Data source date: 06 Aug 2015

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

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

Description/Comments: Data from C&L Inventory Database

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

Data source date: 06 Aug 2015

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

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

Description/Comments: Data from C&L Inventory Database

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

Data source date: 17 Jul 2015

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

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

Description/Comments: Data from C&L Inventory Database

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

Data source date: 21 Aug 2015

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

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

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

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

Data source date: 21 Aug 2015

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

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

Description/Comments: Data from C&L Inventory Database

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

Data source date: 06 Aug 2015

Hazard Statements: Carc. 2; H351

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

Description/Comments: Data from C&L Inventory Database; SDS Sigma Aldrich 28/02/2015

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

Data source date: 23 Jul 2015

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

Appendix B: Rationale for selection of metal species

arsenic {arsenic compounds, with the exception of those specified elsewhere in this Annex}

Worst case species based on risk phrases

cadmium {cadmium sulfide}

Worst case species based on risk phrases

copper {dicopper oxide; copper (I) oxide}

Most likely common species

lead {lead compounds with the exception of those specified elsewhere in this Annex}

Worst case species based on risk phrases

mercury {compounds of mercury (with the exception of mercuric sulfide and those listed separately in this Annex)}

Worst case species based on risk phrases

nickel {nickel dihydroxide}

Worst case species based on risk phrases

selenium {selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex}

Worst case species based on risk phrases

zinc {zinc oxide}

Worst case species based on risk phrases



Appendix C: Version

HazWasteOnline Classification Engine: **WM3 1st Edition v1.2.GB - Oct 2021**
HazWasteOnline Classification Engine Version: 2022.103.5089.9622 (13 Apr 2022)
HazWasteOnline Database: 2022.103.5089.9622 (13 Apr 2022)

This classification utilises the following guidance and legislation:

WM3 v1.2.GB - Waste Classification - 1st Edition v1.2.GB - Oct 2021

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

GB MCL List - version 1.1 of 09 June 2021

12.0 GROUND GAS MONITORING TEST RESULTS

GROUND INVESTIGATION SPECIALISTS LIMITED

CONTRACT: Merthyr Tydfil Retail Park	SHEET 1 OF 1 JOB No. 2371
CLIENT: Savills	
ENGINEER: Waterman Structures Limited	

DATE: 11.04.22	AIR TEMP: 12 °C	ATMOSPHERIC PRESSURE: 979 mbar	TECHNICIAN: TJM
-----------------------	------------------------	---------------------------------------	------------------------

METEOROLOGICAL AND OUTSIDE SITE CONDITIONS

STATE OF GROUND	Dry	Moist	Wet	Saturated
WIND	Calm	Light → Moderate		Strong
CLOUD COVER	None	Scattered	Broken	Overcast
PRECIPITATION	None	Slight	Moderate	Heavy

BH ID	FLOW (l/hr)	START TIME	TIME ELAPSED (mins)	METHANE (% v/v)	CARBON DIOXIDE (% V/V)	OXYGEN (% v/v)	CARBON MONOXIDE (PPM)	HYDROGEN SULPHIDE (PPM)	WATER LEVEL (mbgl)
1	15:20	0	0.5	<0.1	0.2	20.5	0	0	5.78
			1	<0.1	0.2	20.4	0	0	
			2	<0.1	0.2	20.4	0	0	
			3	<0.1	0.2	20.4	0	0	
			4	<0.1	0.2	20.4	0	0	
			5	<0.1	0.2	20.4	0	0	
2	15:30	0	0.5	<0.1	0.1	20.5	0	0	5.38
			1	<0.1	0.1	20.5	0	0	
			2	<0.1	0.1	20.5	0	0	
			3	<0.1	0.1	20.5	0	0	
			4	<0.1	0.1	20.5	0	0	
			5	<0.1	0.1	20.5	0	0	
			0.5						
			1						
			2						
			3						
			4						
			5						
			0.5						
			1						
			2						
			3						
			4						
			5						
			0.5						
			1						
			2						
			3						
			4						
			5						
			0.5						
			1						
			2						
			3						
			4						
			5						

REMARKS:	FIG No.
-----------------	----------------

GROUND INVESTIGATION SPECIALISTS LIMITED

CONTRACT: Merthyr Tydfil Retail Park	SHEET 1 OF 1 JOB No. 2371
CLIENT: Savills	
ENGINEER: Waterman Structures Limited	

DATE: 23.04.22	AIR TEMP: 10 °C	ATMOSPHERIC PRESSURE: 980 mbar	TECHNICIAN: HSL
-----------------------	------------------------	---------------------------------------	------------------------

METEOROLOGICAL AND OUTSIDE SITE CONDITIONS

STATE OF GROUND	Dry	Moist	Wet	Saturated
WIND	Calm	Light	Moderate	Strong
CLOUD COVER	None	Scattered	Broken	Overcast
PRECIPITATION	None	Slight	Moderate	Heavy

BH ID	FLOW (l/hr)	START TIME	TIME ELAPSED (mins)	METHANE (% v/v)	CARBON DIOXIDE (% V/V)	OXYGEN (% v/v)	CARBON MONOXIDE (PPM)	HYDROGEN SULPHIDE (PPM)	WATER LEVEL (mbgl)
1	13:23	0	0.5	<0.1	<0.1	20.5	0	0	5.78
			1	<0.1	<0.1	20.4	0	0	
			2	<0.1	<0.1	20.4	0	0	
			3	<0.1	<0.1	20.4	0	0	
			4	<0.1	<0.1	20.4	0	0	
			5	<0.1	0.2	20.3	0	0	
2	13:07	0	0.5	<0.1	0.2	20.1	0	0	Dry
			1	<0.1	0.2	20.1	0	0	
			2	<0.1	0.2	20.0	0	0	
			3	<0.1	0.2	19.9	0	0	
			4	<0.1	0.2	19.8	0	0	
			5	<0.1	0.2	19.8	0	0	

REMARKS:	FIG No.
-----------------	----------------

GROUND INVESTIGATION SPECIALISTS LIMITED

CONTRACT: Merthyr Tydfil Retail Park
CLIENT: Savills
ENGINEER: Waterman Structures Limited

SHEET 1 OF 1
JOB No. 2371

DATE: 17.05.22 **AIR TEMP:** 16 °C **ATMOSPHERIC PRESSURE:** 991 mbar **TECHNICIAN:** TJM

METEOROLOGICAL AND OUTSIDE SITE CONDITIONS

STATE OF GROUND	Dry	Moist	Wet	Saturated
WIND	Calm	Light	Moderate	Strong
CLOUD COVER	None	Scattered	Broken	Overcast
PRECIPITATION	None	Slight	Moderate	Heavy

BH ID	FLOW (l/hr)	START TIME	TIME ELAPSED (mins)	METHANE (% v/v)	CARBON DIOXIDE (% V/V)	OXYGEN (% v/v)	CARBON MONOXIDE (PPM)	HYDROGEN SULPHIDE (PPM)	WATER LEVEL (mbgl)
1	0	11:10	0.5	<0.1	<0.1	20.4	0	0	5.80
			1	<0.1	<0.1	20.4	0	0	
			2	<0.1	<0.1	20.4	0	0	
			3	<0.1	<0.1	20.4	0	0	
			4	<0.1	<0.1	20.4	0	0	
			5	<0.1	<0.1	20.4	0	0	
2	0	11:20	0.5	<0.1	0.3	20.1	0	0	Dry (5.40)
			1	<0.1	0.3	20.0	0	0	
			2	<0.1	0.3	20.0	0	0	
			3	<0.1	0.3	20.0	0	0	
			4	<0.1	0.3	20.0	0	0	
			5	<0.1	0.3	20.0	0	0	

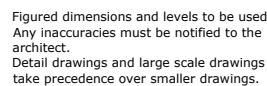
REMARKS:

FIG No.

13.0 SITE PLANS

KEY

- + 203.81 Existing levels
- + 203.81 Proposed levels - approx
-  Retaining wall
-  Ownership boundary
-  Application boundary



Rev:	Rev:
t	

Rev:	PRELIMINARY	✓
	PLANNING	
	DESIGN	
	TENDER	
	CONSTRUCTION	

powelldobson
ARCHITECTS

Contract: Drive-thru Unit
Cyfarthfa Retail Park, Merthyr Tydfil

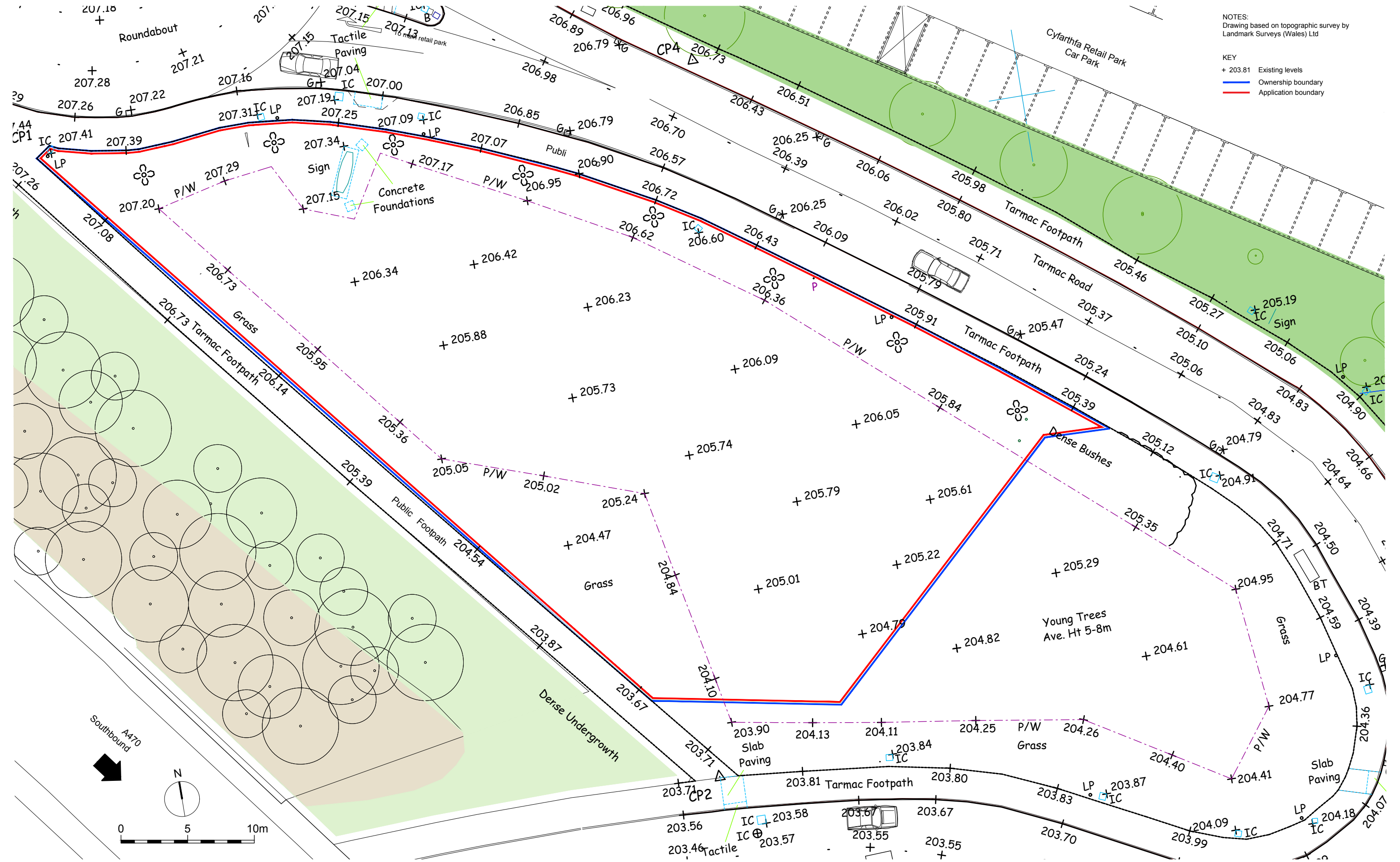
Title: Proposed Site Plan

Drawing No.	Rev.
18126 (05) 003	B

Scale: 1:250 @ A3
Date: Oct 2018
Drawn: ipf
Checked: CB

NOTES:
Drawing based on topographic survey by
Landmark Surveys (Wales) Ltd

KEY
+ 203.81 Existing levels
Ownership boundary
Application boundary



Figured dimensions and levels to be used.
Any inaccuracies must be notified to the
architect.
Detail drawings and large scale drawings
take precedence over smaller drawings.

Rev:

Rev:

Rev:

Rev:

PRELIMINARY	
PLANNING	✓
DESIGN	
TENDER	
CONSTRUCTION	

powelldobson
ARCHITECTS

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Contract: Drive-thru Unit
Cyfarthfa Retail Park, Merthyr Tydfil
Title: Existing Site Plan

Drawing No. 18126 (05) 002
Rev. -

Scale: 1:250 @ A3
Date: Oct 2018
Drawn: ipf
Checked: CB

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