



RHONDDA
GEOTECHNICAL
SERVICES

PHASE 2 CONTAMINATED LAND REPORT

N.P.T. PLANNING APP. P2022/0230

PROPOSED RESIDENTIAL DEVELOPMENT

35 PARISH ROAD

CWMGWRACH

GLYNNEATH

N.P.T.

SA11 5SW

17/09/2023

19. INFORMATION GAPS AND UNCERTAINTIES

From previous intrusive work Made Ground was known to be present on-site. The thickness and composition had not been conclusively established as the site investigation techniques were not designed for a Phase 2 report. The probability was that the made ground was less than a metre thick and contained little or no biodegradable material. The biggest uncertainty in the conceptual model was the presence or absence of contaminants and biodegradable material in the Made ground. The presence of organic soils beneath any Made Ground, although extremely unlikely, had not been completely ruled out by the drilling results and so was also still an uncertainty.

The only conclusive way to answer these questions was to carry out an intrusive site investigation, taking samples and testing them for contaminants. Judging from the previous drilling results, the extent and depth of the Made Ground could be established by trial pitting. It was very unlikely that the depth of any Made Ground would be beyond the reach of a medium sized excavator. If contaminants were detected in the laboratory analysis, leachate tests could then be carried out to assess the risk to controlled waters and the wider environment.

There was no clearly defined source area for contaminants and so a general spread of sampling locations was considered appropriate with a bias towards the garden areas of the proposed development. Depth of sampling was to be decided on an ad hoc basis, depending on the ground conditions encountered. In addition to checking for solid or liquid contaminants, the potential for on-site ground gas generation could also be quantified once the composition of any Made Ground or organic soils was established.

20. SITE INVESTIGATION AND SAMPLING METHODOLOGY

Intrusive site investigations were carried out on 27th March 2023 under the supervision of Richard Davies. Works consisted of the digging of five trial pits with a 3-ton tracked excavator. The trial pit locations are shown in Figure 17 together with the depth of any samples taken. All five pits proved natural ground beneath a thin layer of Made Ground. Most of the site was easily accessible, and the trial pit locations were selected to represent a general spread outside the proposed house footprints, concentrating on the rear garden/soft landscaping areas. Five samples were taken in all. This was considered reasonable and proportionate for an initial investigation of a development site of this size. Four

samples were taken from the Made Ground and one from the underlying natural ground. Trial pits were excavated to depths of between 0.6m- 1.2m depending on the depth of Made Ground. There was no sensory evidence of contamination in any of the pits. Groundwater was not encountered in any of the pits.

Samples of soils were collected, placed in British Standard sealed containers and immediately labelled with depth, location and sample number. Each sampling location had four samples taken. These comprised two one litre plastic tubs, one 60ml. amber glass jar and one 120ml. amber glass jar. This is the recommended quantity required for a broad general suite of testing. The samples were taken with a stainless steel trowel, cleaned between samples to avoid cross contamination. The samples were stored in cool boxes and dispatched by courier to the laboratory the following morning. This meant that the lab was in receipt of the samples within 48 hours of them being taken, and the samples were kept under correct conditions throughout. This is important to ensure the samples are “non-deviating” particularly in the case of testing for organic contaminants.

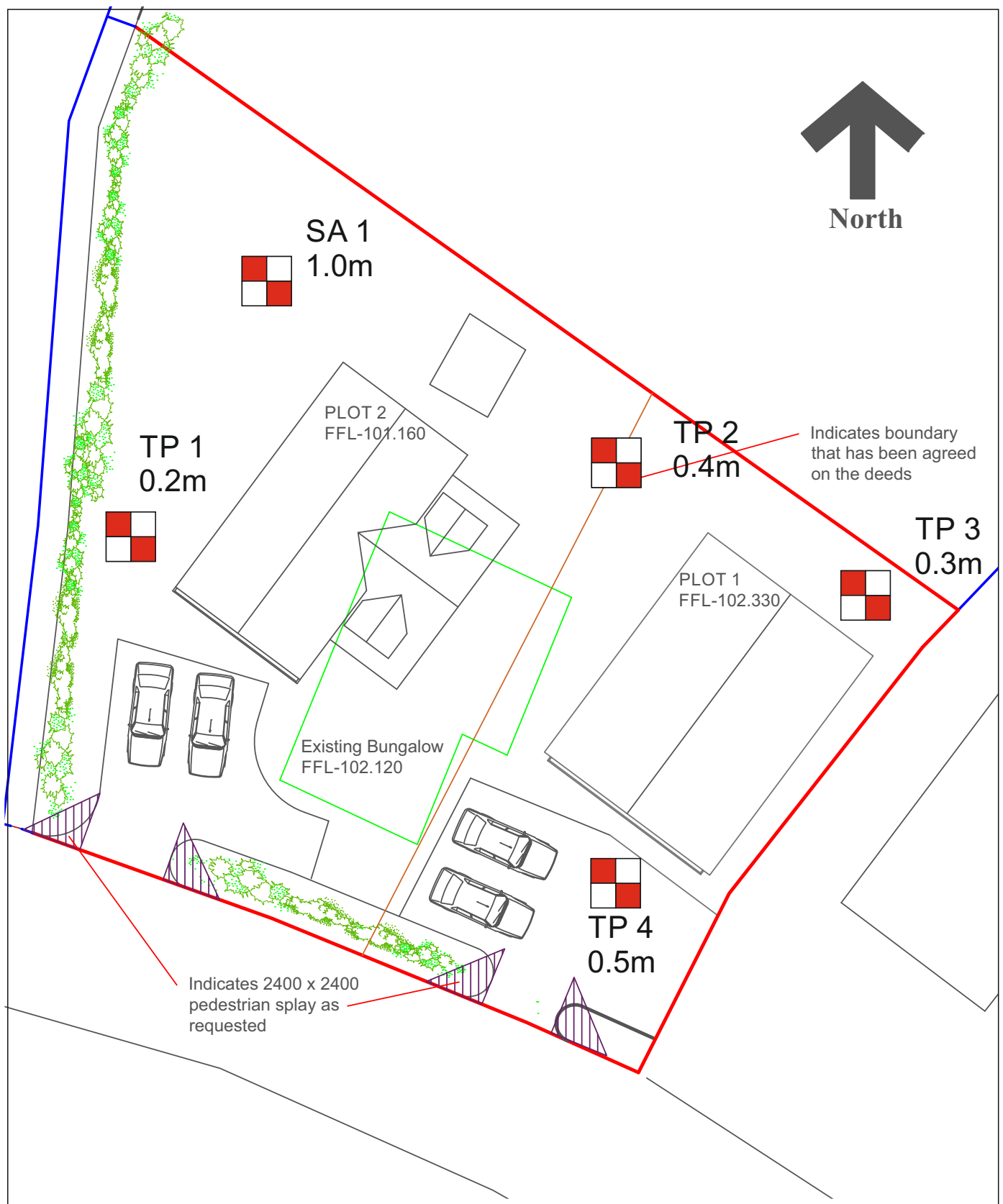


FIGURE 17

TRIAL PIT LOCATIONS AND SAMPLE DEPTHS AT 35 PARISH ROAD.

21. TESTING STRATEGY

All the samples were tested by The Environmental Laboratory Ltd (reg. 3882193) at their laboratory in East Sussex. They hold both MCERTS and UKAS accreditation (UKAS lab no.2683). Their full details can be seen on page 1 of the laboratory report 23-47419-13. The petroleum hydrocarbon analysis was subcontracted to ALS. They also hold MCERTS and UKAS accreditation (UKAS lab no.1291). The complete reports are attached as Appendix C.

A review of the Enviroinsight Report together with previous intrusive work meant the Phase 1 had concluded that there was imported Made Ground which could be a possible source of contamination. The testing scheduled was the CLEA 2.1 Suite with the addition of an asbestos screen. The substances tested for could be described as a broad general suite in common use in British contaminated land studies. High levels of petroleum hydrocarbon compounds were considered extremely unlikely, but testing was scheduled anyway. Similarly, there was no identified source of Asbestos, but its ubiquitous presence in the urban environment means it should always be tested for. The substances tested for can be split into two main categories. Organic and Inorganic compounds.

The inorganic contaminants tested for were metals:-

Arsenic, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Selenium and Zinc.

In addition, Free Cyanide was measured, and all samples were screened for Asbestos.

Total Organic Carbon and moisture were both measured. From this, a calculation is used to derive Soil Organic Matter. This is needed to risk assess levels of organic contaminants. The risk assessments for organic contaminants differ with varying S.O.M. values. A wide range of organic contaminants were tested for.

All samples were tested for P.A.H.s (Polycyclic Aromatic Hydrocarbons). Sixteen different compounds were measured. These are the USEPA16. Originating from the U.S.A. they are an internationally recognised, representative and indicative group amongst the huge number of these compounds.

T.P.H. (total petroleum hydrocarbons) analysis was split up by Carbon Banding, along conventionally normal lines (Texas Banding). An aromatic/aliphatic split

analysis was also carried out to allow further speciation of any hydrocarbon contamination detected.

The analysis for Organic contaminants also included a Phenol Suite. This contained a range of six Monohydric Phenols commonly found on contaminated sites.

22. CHOICE OF SUITABLE FOR USE VALUES (S4ULs) USED IN PHASE 2

Much work has been done in recent years on human health risk assessment for exposure to contaminated land. Originally the E.A. produced figures known as Soil Guidance Values (SGVs). These were later withdrawn, and this has resulted in the production of Generic Assessment Criteria (GACs). These are figures produced for individual substances. If the concentration of a contaminant is above its GAC, there is a potential for harm to human health (or controlled waters). Each contaminant has different levels for different exposure scenarios. For example, for any given contaminant, its GAC is far higher for a commercial development than it would be for Residential Use with consumption of homegrown produce. Many GACs have been published by Contaminated Land: Applications in real environments (CL:AIRE), Land Quality Management Ltd. (LQM) and the Environmental Industries Commission (EIC).

Due to different non-government bodies producing GACS over the years since they were introduced, LQM have produced a complete revision of their figures and renamed them Suitable for Use Levels (S4ULs). The values used in this report are S4ULs except for Lead which has a Category 4 Screening Level (C4SL) produced by the Department for the Environment, Food and Rural Affairs. Cyanide is not assessed in this way, instead it has an acute GAC, rather than one modelled on long term exposure. Asbestos also has its own safety levels governing land use.

The LQM S4ULs have been derived in accordance with the changes in exposure modelling presented within the C4SL framework, whilst still using a set of toxicological criteria that are set within the “minimal risk” range. The LQM/CIEH S4ULs were published to offer a set of collated information on the toxicity and transport properties for numerous common contaminants. They are widely considered to be suitable for use in planning assessments such as this. The most recent update was published in 2017 and reflects changes in UK human health risk assessment since the previous figures were published in 2009. All the data inputs used in the derivation of the S4ULs are presented in full in the publication

LQM/CIEH Suitable 4 Use Levels, and there is no intention to provide them here. These values are intended for use by professionals who have purchased them. To authenticate this the purchaser is supplied with an individual number to validate the report writer's entitlement to use the LQM/CIEH S4ULs. This number can be seen on the result summary sheets in Tables 3-8. The author has the right to reproduce these values here, but they remain copyright of LQM, a specialist environmental consultancy based in Nottingham.

The proposed development consists of two residential properties. Given the nature of the development, Residential Land Use with homegrown produce S4ULs are appropriately conservative. These values have been used when analysing the results for the risk assessment of the site.

23. SUMMARY OF GROUND CONDITIONS AND TEST RESULTS

The full trial pit logs to BS5930:2015 together with photographs of the trial pits can be found in Appendix B. In summary, the five pits in the proposed garden areas were all excavated through the Made Ground into the underlying gravelly Diamicton which was encountered at depths of between 0.3m-0.6m. There were no natural organic soils present. The Made Ground contained variable proportions of brick, ash and clinker. There was no visible biodegradable material in the Made Ground. Sampling was concentrated in the Made Ground with a single sample taken in the underlying Diamicton as a control. A summary of the laboratory reports on the soil testing in Appendix C has been produced overleaf in Tables 3-8. These compare the test results for each substance with its relevant S4UL value (Residential Land Use with homegrown produce scenario).

With the organic contaminants, the samples are normally subdivided based on their Soil Organic Matter (S.O.M.) as the S4UL value for each organic contaminant is controlled by the S.O.M. value. Three of the samples tested fell in the S.O.M. band >1% <2.5%. The remaining two samples had an S.O.M. of >2.5% <6%. Because of this there are two different S4UL value columns for all the organic contaminants in Tables 3-6.

Table 3 shows that there were no S4UL value exceedances in any of the samples for any of the compounds in the USEPA16 range of Polycyclic Aromatic Hydrocarbons (P.A.H.s), P.A.H. levels were either below limits of detection (LoD) or present in minute quantities in all samples.

In Table 4, every one of the T.P.H. range tested for was either below the level of detection, or only present in minute trace quantities as anticipated.

Because all the six speciated Phenols were below the level of detection in all five samples, only the Phenol Index is shown in Table 6, without speciation.

With the inorganic substances in Table 7, there was a single exceedance of the S4UL for Arsenic in the sample taken from 0.3m in TP3. There were no other exceedances for any Metal in any sample.

Cyanide levels were below the limit of detection in all five samples. Asbestos was detected in the sample from 0.4m in TP2. A gravimetric analysis was carried out which identified it as Chrysotile Lagging making up 0.004% of the total sample. The free fibre analysis revealed <0.001% consisted of free fibres.

To summarise, there was a single exceedance of the residential with produce S4UL value for Arsenic in the Made Ground. There were no exceedances of any other substances organic or inorganic in the Made Ground. The levels of all contaminants tested for in the natural ground sample were minute or below LoD. A minute fragment of Asbestos was detected in one of the samples.

Because of the Arsenic exceedance in the sample from TP3, it was decided to carry out leachate testing on it. 10:1 leachate preparation was used by the laboratory. This is superior to the older 2:1 preparation and is considered best practice in simulating natural conditions. The results are on page 6 of Report 23-47419-13 and are summarised in Table 9. All the metals, including Arsenic were below the LoD in the leachate analysis. The implications of all the laboratory results will be discussed in the risk assessments in the following section.

ALL S4ULs COPYRIGHT LAND QUALITY MANAGEMENT LIMITED. REPRODUCED WITH PERMISSION.PUBLICATION NUMBER S4UL3694.ALL RIGHTS RESERVED
ALL VALUES ARE IN mg/kg
ALL S4ULs REFER TO RESIDENTIAL WITH HOMEGROWN PRODUCE SCENARIO

SOIL ORGANIC MATTER(S.O.M.)				> 1%		> 2.5%	
CONTAMINANT	TP2 0.4m	TP4 0.5m	SA1 1.0m	S4UL	TP 1 0.2m	TP3 0.3m	S4UL
NAPHTHALENE	0.04	0.03	<0.02	2.3	0.09	0.04	5.6
ACENAPHTHYLENE	0.05	<0.02	<0.02	170	<0.02	0.06	420
ACENAPHTHENE	0.02	<0.02	<0.02	210	<0.02	0.03	510
FLOURENE	0.05	<0.02	<0.02	170	<0.02	0.03	400
PHENANTHRENE	0.76	0.12	<0.02	95	0.15	0.48	220
ANTHRACENE	0.09	0.03	<0.02	2400	0.03	0.08	5400
FLOURANTHENE	1.12	0.23	<0.02	280	0.26	1.15	560
PYRENE	0.79	0.18	<0.02	620	0.2	0.82	1200
BENZO[a]ANTHRACENE	0.54	0.13	<0.02	7.2	0.16	0.6	11
CHRYSENE	0.73	0.2	<0.02	15	0.19	0.89	22
BENZO[b]FLOURANTHENE	0.89	0.25	<0.02	2.6	0.21	1.08	3.3
BENZO[k]FLOURANTHENE	0.3	0.08	<0.03	77	0.09	0.41	93
BENZO[a]PYRENE	0.54	0.14	<0.02	2.2	0.14	0.63	2.7
INDENO[1,2,3-cd]PYRENE	0.47	0.13	<0.02	27	0.1	0.64	36
DIBENZO[a,h]ANTHRACENE	0.13	0.04	<0.02	0.24	0.02	0.16	0.28
BENZO[g,h,i]PERYLINE	0.34	0.1	<0.02	320	0.07	0.47	340
TOTAL(USEPA 16) PAHs	6.9	1.7	<0.34	N/A	1.72	7.56	N/A
TABLE 3 POLYCYCLIC AROMATIC HYDROCARBONS (USEPA16)							

SUMMARY OF TEST RESULTS PARISH ROAD, CWMGWRACH

ALL S4ULs COPYRIGHT LAND QUALITY MANAGEMENT LIMITED. REPRODUCED WITH PERMISSION.PUBLICATION NUMBER S4UL3694.ALL RIGHTS RESERVED							
ALL VALUES ARE IN mg/kg							
ALL S4ULs REFER TO RESIDENTIAL WITH HOMEGROWN PRODUCE SCENARIO							

S.O.M.		>1%				>2.5%		
CARBON BANDING		TP2 0.4m	TP4 0.5m	SA1 1.0m	S4UL	TP 1 0.2m	TP3 0.3m	S4UL
>C5-C6	ALI	<0.01	<0.01	<0.01	42	<0.01	0.01	78
>C6-C8	ALI	<0.01	<0.01	<0.01	100	<0.01	0.01	230
>C8-C10	ALI	<0.01	<0.01	<0.01	27	<0.01	0.03	65
>C10-C12	ALI	<1	<1	<1	130	<1	<1	330
>C12-C16	ALI	<1	<1	<1	1100	<1	<1	2400
>C16-C21	ALI	<1	<1	<1	65000	<1	<1	92000
>C21-C35	ALI	<1	2.7	<1		1.9	7.6	
>C35-C40	ALI	<1	<1	<1	65000	<1	<1	92000
TOTAL ALI	C5-C40	<5	<5	<5	N/A	<5	7.8	N/A
>C5-C7	ARO	<0.01	<0.01	<0.01	70	<0.01	<0.01	140
>C7-C8	ARO	<0.01	<0.01	<0.01	130	<0.01	<0.01	290
>C8-C10	ARO	<0.01	<0.01	<0.01	34	<0.01	0.02	83
>C10-C12	ARO	<1	<1	<1	74	<1	<1	180
>C12-C16	ARO	<1	<1	<1	140	<1	<1	330
>C16-C21	ARO	<1	1.4	<1	260	<1	6.3	540
>C21-C35	ARO	1.5	5.8	<1	1100	3.5	27.3	1500
>C35-C40	ARO	<1	<1	<1	1100	<1	1.6	1500
TOTAL ARO	C5-C40	<5	8.3	<5	N/A	5.2	5.2	N/A
TPH	C5-C40	<10	11	<10	N/A	<10	43	N/A
TABLE 4 TOTAL PETROLEUM HYDROCARBONS WITH CARBON BANDING AND ALIPHATIC/AROMATIC SPLIT								

SOIL ORGANIC MATTER(S.O.M.)				>1%	>2.5%		
CONTAMINANT	TP2 0.4m	TP4 0.5m	SA1 1.0m	S4UL	TP 1 0.2m	TP3 0.3m	S4UL
BENZENE	<0.09	<0.09	<0.09	0.087	<0.09	<0.09	0.17
TOLUENE	<0.07	<0.07	<0.07	130	<0.07	<0.07	290
ETYL BENZENE	<0.04	<0.04	<0.04	47	<0.04	<0.04	110
p/m XYLENE	<0.1	<0.1	<0.1	56	<0.1	<0.1	130
o-XYLENE	<0.1	<0.1	<0.1	60	<0.1	<0.1	140
TOTAL XYLENE	<0.2	<0.2	<0.2	N/A	<0.2	<0.2	N/A
TOTAL BTEX	<0.4	<0.4	<0.4	N/A	<0.4	<0.4	N/A
TABLE 5 BTEX SUBSTANCES							

SUMMARY OF TEST RESULTS PARISH ROAD, CWMGWRACH

ALL S4ULs COPYRIGHT LAND QUALITY MANAGEMENT LIMITED. REPRODUCED WITH PERMISSION.PUBLICATION NUMBER S4UL3694.ALL RIGHTS RESERVED							
ALL VALUES ARE IN mg/kg							
ALL S4ULs REFER TO RESIDENTIAL WITH HOMEGROWN PRODUCE SCENARIO							

S.O.M.	>1%				>2.5%		
	TP2 0.4m	TP4 0.5m	SA1 1.0m	S4UL	TP 1 0.2m	TP3 0.3m	S4UL
PHENOL	<5	<5	<5	280	<5	<5	550
TABLE 6 TOTAL MONOHYDRIC PHENOLS							

CONTAMINANT	TP2 0.4m.	TP4 0.5m	SA1 1.0	TP1 0.2m	TP3 0.3m	S4UL	
ARSENIC	27.7	36.9	8.6	30.2	42.9	37	
CADMIUM	0.6	0.5	1.8	0.8	0.8	11	
CHROMIUM	15.9	15.5	12.7	15.7	21.4	910	
COPPER	37.1	46.6	17.3	52.7	153	2400	
LEAD	88	80.4	12.7	131	145	200	(C4SL)
MERCURY	<0.5	0.9	<0.5	<0.5	0.7	40	
NICKEL	15.6	16.9	10.7	13.8	26.8	180	
SELENIUM	<1	1.4	1.3	1.2	1.9	250	
ZINC	226	196	38	271	263	3700	
CYANIDE	<1.0	<1.0	<1.0	<1.0	<1.0	22	GACacute
TABLE 7 TOXIC/HEAVY METALS AND CYANIDE							

	TP 2 0.4m	TP 4 0.5m	SA1 1.0m	TP 1 0.2m	TP 3 0.3m		
% FREE FIBRES	<0.001	0	0	0	0		
% DRY WEIGHT OF SAMPLE	0.004	0	0	0	0		
TABLE 8 ASBESTOS ANALYSIS							

SUMMARY OF TEST RESULTS PARISH ROAD, CWMGWACH
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CONTAMINANT	GUIDELINE VALUE SOURCE				SAMPLE VALUE			
	E.Q.S.	W.F.D.	U.K.D.W.S.	W.H.O.	TP3 0.3m			
ARSENIC	50	50	10		<5			
CADMIUM	0.45	0.25	5		<1			
CHROMIUM III	4.7		50		<5			
CHROMIUM IV	3.4				<100			
COPPER	1		2000		<5			
MERCURY	0.07		1		<0.01			
NICKEL	20		20		<5			
LEAD	0.5		10		<5			
SELENIUM			10	10	<5			
ZINC	11.9		5000		<5			
CYANIDE	1		50		N/T			
PHENOL	7.7				N/T			
M,P CRESOL					N/T			
O-CRESOL					N/T			
3,4 DIMETHYL PHENOL					N/T			
2,3 DIMETHYL PHENOL					N/T			
2,3,5 TRIMETHYL PHENOL					N/T			
TOTAL MONOHYDRIC					N/T			
NAPHTHALENE	2				N/T			
ACENAPHTHALENE	5.8				N/T			
ACENAPHTHENE	0.1				N/T			
FLOURENE					N/T			
PHENANTHRENE					N/T			
ANTHRACENE	0.1				N/T			
FLOURANTHENE	0.0063				N/T			
PYRENE					N/T			
BENZO[a]ANTHRACENE			0.1		N/T			
CHRYSENE					N/T			
BENZO[b]FLOURANTHENE			0.1		N/T			
BENZO[k]FLOURANTHENE			0.1		N/T			
BENZO[a]PYRENE	0.1		0.01		N/T			
INDENO[1,2,3]PYRENE	0.01				N/T			
DIBENZO[a,h]ANTHRACENE					N/T			
BENZO[g,h]PERYLENE			0.1		N/T			
TOTAL 16 PAH					N/T			
SOIL LEACHATE RESULTS (METALS ONLY) 35 PARISH ROAD, CWMGWRACH					ALL VALUES IN µg/litre			

TABLE 9

SOIL LEACHATE TEST RESULTS 35 PARISH ROAD, CWMGWRACH

VALUES IN RED ARE ABOVE THE LOWEST GUIDELINE WHERE TWO GUIDELINES ARE APPLICABLE

24. REVISED RISK ASSESSMENT FOR GROUND GAS

The Phase 1 desk study established there was no risk of ground gas migration from landfills or mines.

The risk from on-site gas generation was also considered unlikely in the Phase 1 but required quantification. The trial pitting established that in the area of the proposed development the Made Ground was less than 0.6m thick. The Made Ground was composed of inert granular material. There was no visible biodegradable material and no potential for gas generation.

As anticipated, there were no natural organic soils found on site. Therefore, there are no viable sources of ground gas production on the site.

The Enviroinsight Report stated that <1% of local properties are above the Radon Action Threshold. No Radon Protection Measures will need to be incorporated into the design. All the information above is reflected in the revised gas risk assessment in Table 10 overleaf. Here all residual ground gas risks from the Phase 1 have been removed. No gas protection measures will need to be incorporated into the building design.

25. RISK ASSESSMENT FOR CONTROLLED WATERS

The levels of contaminants measured at the site were generally very low. Asbestos is not soluble and need not be considered any further with regards to controlled waters. There was a single exceedance of Arsenic above acceptable levels for residential developments with gardens. The underlying natural ground was visibly of low permeability. A permeability test was carried out for SuDS. This gave a value of 2.1×10^{-6} m/s. This gives a good indication that the slight contamination in the Made Ground would be unable to migrate downwards, even the Arsenic was soluble. Assuming some degree of solubility, the possibility of lateral flow along the Made Ground/Diamicton interface into the adjacent watercourse needed to be assessed. To quantify the risk of this potential pathway to controlled waters, leachate testing of the contaminated sample was carried out. This confirmed the immobility of the Arsenic as the Arsenic level in the leachate was below LoD. Given this insolubility there is no viable pathway to controlled waters and no onward pathway to more distant environmental receptors. For this reason, the potential risk has been removed from Table 11.

26. REVISED RISK ASSESSMENT FOR SOILS

The level of Arsenic measured in a single sample at the site was above acceptable levels for residential developments with gardens for home grown produce. A small fragment of Asbestos was present in another sample. At present there are viable pathways to above ground receptors as shown in the Phase 1 C.S.M. For this reason, the potential risk has not been removed from Table 11.

27. SUMMARY OF REMEDIATION OBJECTIVES, CRITERIA AND OPTIONS

The objective of any remediation strategy is to make the land suitable for its intended use. In this case a development consisting of a pair of residential properties with soft landscaping/garden areas. Because minor contamination was detected at the site, some form of remediation will be required. There are no viable pathways to controlled waters or the wider environment. Any remediation strategy only needs to focus on breaking pathways to above ground receptors. The house footprints and driveway/parking will cover much of the plots thus breaking the pathway to above ground receptors. The standard widely accepted solution to this is to cap all garden and soft landscaping areas with a 600mm layer of certified material, separated from the underlying soil by a no-dig barrier. The barrier is normally a robust geotextile.

This process will need to follow the guidelines contained in L.C.R.M (2020) and the W.L.G.A./ C.L.I.L.C. document *Requirements for the Chemical Testing of Imported Materials for Various End Uses and Validation of Cover Systems*. It is currently unknown where any imported material will be sourced. Using the guidance in the document an Imported Materials Declaration Form will need to be completed at the time giving the origin of the material. This will include details of third-party testing of all imported material. The quantity of material imported is likely to fall in the 20m³-250m³ category. If the material has not undergone third party testing, four separate tests will be required for this quantity. The determinands will be the standard Heavy/Toxic Metals, Speciated P.A.H, T.P.H. Phenol and Asbestos. This will be carried out by a laboratory with MCERTS accreditation. The results will be analysed by a suitably qualified person to establish the imported material is fit for purpose. The analysis will then be supplied to the N.P.T. Contaminated Land Officer for their agreement as to the suitability prior to the material being imported.

When agreement is reached on the imported material, validation will be required for the capping system. The proposed depth of cover will be 600mm.

This is considered adequate for the relatively minor contamination at the site. As part of the proposed remediation strategy the process will be inspected and photographed at regular intervals during installation. On completion, the capping will be further verified by the excavation of a hand dug pit in both the garden areas. This will be photographed with a scale to confirm the depth of cover, and the cover material will be logged to BS5930.

Any contractors should be made aware of the nature of the Made Ground at the site prior to commencement of any work. It is assumed that any residual risks during the construction phase will be negated by safe working practices such as dust suppression and mandatory P.P.E. The latter is not considered a matter for planning conditions. A revised post-remediation C.S.M. is presented overleaf as Figure 18.

Richard Davies BSc.(Hons.), MSc., F.G.S.

17/09/2023

TABLE 10 FINAL GROUND GAS RISK ASSESSMENT 35 PARISH ROAD, CWMGWRACH					
SOURCE	PATHWAY	RECEPTOR	CONSEQUENCE CLASSIFICATION	RISK	FURTHER ACTION
HAZARDOUS GROUND GAS FROM OFF SITE SOURCE	INHALATION, INJURY FROM EXPLOSION	SITE USERS, VISITORS, CONSTRUCTION WORKERS	SEVERE	LOW. NO VIABLE SOURCE OR PATHWAY FOR THE MIGRATION OF LANDFILL GAS OR MINE GAS	NO FURTHER ACTION REQUIRED
HAZARDOUS GROUND GAS FROM OFF SITE SOURCE	DAMAGE FROM EXPLOSION	BUILDINGS	SEVERE		
HAZARDOUS GROUND GAS FROM ON SITE SOURCE	INHALATION, INJURY FROM EXPLOSION	SITE USERS, VISITORS, CONSTRUCTION WORKERS	SEVERE	LOW. NO POSSIBILITY OF ON SITE GAS GENERATION FROM MADE GROUND OR ORGANIC SOILS.	NO FURTHER ACTION REQUIRED
HAZARDOUS GROUND GAS FROM ON SITE SOURCE	DAMAGE FROM EXPLOSION	BUILDINGS	SEVERE		
RADON GAS	LONG TERM HAZARD FROM INHALATION	SITE USERS	SEVERE	LOW. LESS THAN 1% OF PROPERTIES AFFECTED BY RADON	NO RADON PROTECTIVE MEASURES NECESSARY

TABLE 11						
FINAL QUANTITATIVE HUMAN HEALTH RISK ASSESSMENT AND ENVIRONMENTAL RISK ASSESSMENT AT PARISH ROAD, CWMGWRACH.						
CONTAMINANT SOURCE	PATHWAYS	RECEPTORS	POTENTIAL SEVERITY	PROBABILITY OF RISK	LEVEL OF RISK	FURTHER ACTION REQUIRED
ON SITE: POTENTIAL CONTAMINATION IN SOILS/MADE GROUND. POSSIBLY ELEVATED LEVELS OF METALS HYDROCARBONS AND PAH	INGESTION, DERMAL CONTACT, INHALATION	FUTURE END USERS, VISITORS	MEDIUM	MEDIUM	MEDIUM	THE INTRUSIVE INVESTIGATION RECORDED A SINGLE SOIL SAMPLE WITH AN ARSENIC LEVEL HIGHER THAN ACCEPTABLE FOR RESIDENTIAL GARDENS. REMEDIATION STRATEGY WILL BE BASED ON GARDEN AREAS HAVING A STANDARD NO-DIG BARRIER AND 600mm CERTIFIED COVER
	CONTACT WITH CONTAMINATED GROUNDWATER	FUTURE END USERS, VISITORS AND CONSTRUCTION WORKERS	MEDIUM			
	PERMEATION OF WATER PIPES	FUTURE END USERS AND SITE VISITORS	MEDIUM			
	INGESTION OF HOME GROWN PRODUCE	FUTURE END USERS	N/A			
ON SITE: ASBESTOS AT OR NEAR GROUND SURFACE IN SOILS/MADE GROUND	INHALATION OF FIBRES IN AIRBORNE DUST	FUTURE END USERS AND SITE VISITORS	HIGH	MEDIUM	MEDIUM	A SINGLE ASBESTOS FIBRE WAS DETECTED ON SITE. STANDARD NO DIG BARRIER AND 600mm COVER FOR GARDEN AREAS.
		CONSTRUCTION WORKERS	HIGH	MEDIUM	MEDIUM	
ON SITE: POTENTIAL CONTAMINATION IN SOILS/MADE GROUND. POSSIBLY ELEVATED LEVELS OF CONTAMINANTS	RUN OFF	SURFACE DRAINAGE	MEDIUM	MEDIUM	LOW	LEACHATE TESTING DEMONSTRATED THE SLIGHT CONTAMINATION OF THE MADE GROUND AT THE SITE POSED NO THREAT TO CONTROLLED WATERS OR ENVIRONMENTAL RECEPTORS. NO FURTHER ACTION REQUIRED.
	MIGRATION THROUGH SOIL VIA LEACHING	SHALLOW GROUNDWATER				
	ONWARD MIGRATION OF GROUNDWATER	BEDROCK AQUIFER				

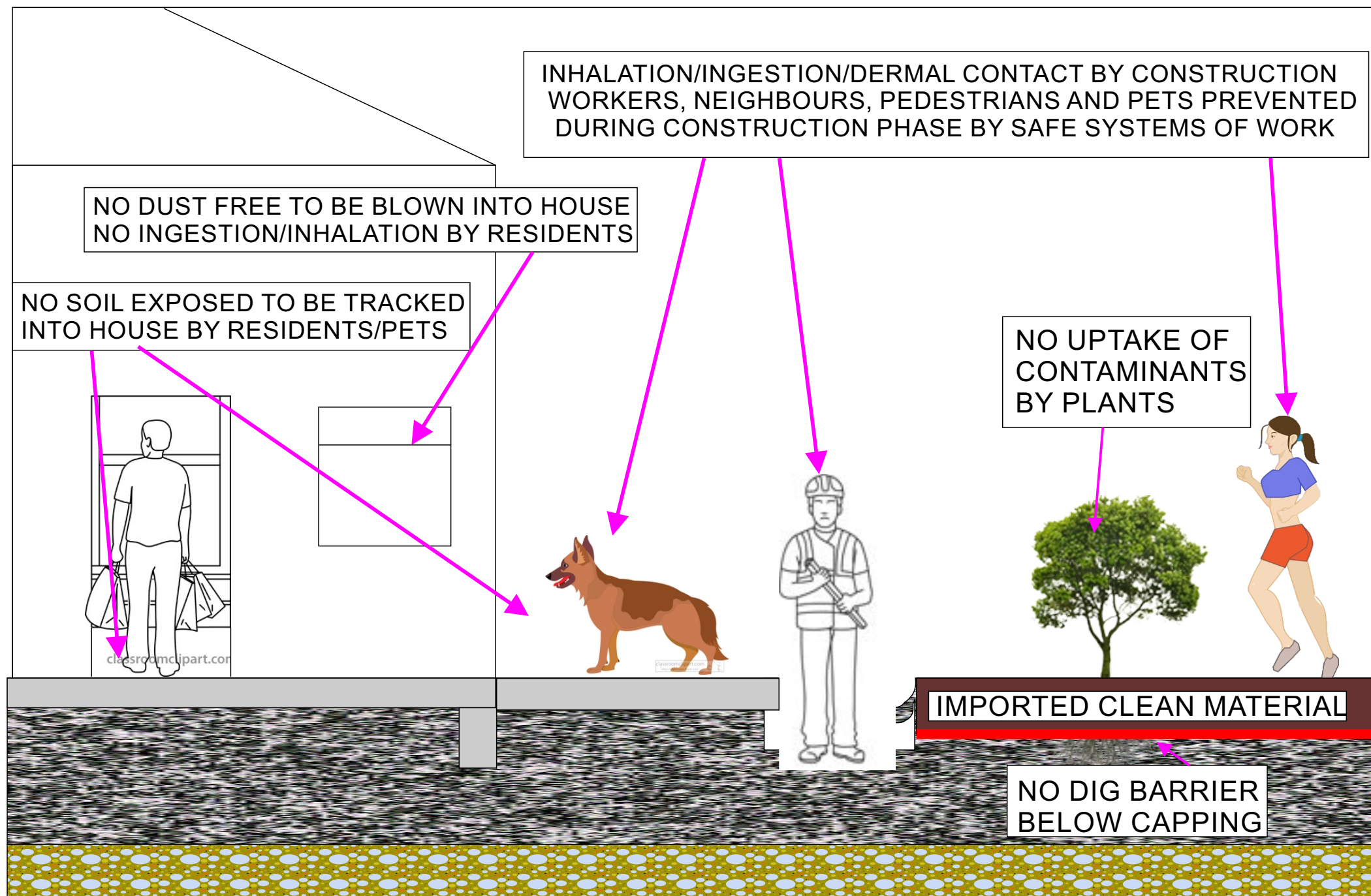


FIGURE 18 REVISED CONCEPTUAL MODEL OF SITE SHOWING ALL POTENTIAL PATHWAYS CUT DURING CONSTRUCTION BY WORK METHODS AND ON COMPLETION BY CAPPING

APPENDIX B
TRIAL PIT LOGS TO BS5930:2015
WITH PHOTOGRAPHS
35 PARISH ROAD
CWMGWRACH

Project: 35 PARISH ROAD CWMGWRACH	Project No: CG35
Described By: R.DAVIES	Trial Pit No. TP1
Date: 27/03/2023	Sheet: 1 of 1
Method / Plant TRACKED EXCAVATOR	Groundwater Observations: DRY
Stability GOOD	Strike of Face A:
Shoring NONE	Loggers Signature

FACE SKETCHES - INCLUDING ANY SIGNIFICANT FINDINGS WITHIN TRIAL PIT

Samples and Tests		Strata	
Depth (m)	Type (B,D,ES)	Depth (m)	Strata Description
		G.L.	MADE GROUND/TOPSOIL. Loose grey gravelly sandy clayey SILT. Gravel is angular, fine to medium of clinker, brick and aggregate/gravel
0.2	ES1		Firm to stiff yellowish brown gravelly sandy silty CLAY. Gravel is subangular to sunrounded, fine to coarse of Pennant Sandstone.
		0.3	
			Firm to stiff yellowish brown gravelly sandy silty CLAY. Gravel is subangular to sunrounded, fine to coarse of Pennant Sandstone.
		0.6	

Notes: ES-Environmental Soil
 EW - Environmental Water
 B - Bulk Disturbed
 D - Small Disturbed

TRIAL PIT NUMBER
TP1



TP 1

Project: 35 PARISH ROAD CWMGWRACH	Project No: CG35
Described By: R.DAVIES	Trial Pit No. TP2
Date: 27/03/2023	Sheet: 1 of 1
Method / Plant TRACKED EXCAVATOR	Groundwater Observations: DRY
Stability GOOD	Strike of Face A:
Shoring NONE	Loggers Signature

FACE SKETCHES - INCLUDING ANY SIGNIFICANT FINDINGS WITHIN TRIAL PIT

Samples and Tests		Strata	
Depth (m)	Type (B,D,ES)	Depth (m)	Strata Description
		G.L.	MADE GROUND/TOPSOIL. Loose grey gravelly sandy clayey SILT. Gravel is angular, fine to medium of clinker, brick and aggregate/gravel
0.4	ES1	0.5	Firm to stiff yellowish brown gravelly sandy silty CLAY. Gravel is subangular to sunrounded, fine to coarse of Pennant Sandstone.
		0.8	

Notes: ES-Environmental Soil
 EW - Environmental Water
 B - Bulk Disturbed
 D - Small Disturbed

TRIAL PIT NUMBER
TP2



TP 2

Project: 35 PARISH ROAD CWMGWRACH	Project No: CG35
Described By: R.DAVIES	Trial Pit No. TP3
Date: 27/03/2023	Sheet: 1 of 1
Method / Plant TRACKED EXCAVATOR	Groundwater Observations: DRY
Stability GOOD	Strike of Face A:
Shoring NONE	Loggers Signature

FACE SKETCHES - INCLUDING ANY SIGNIFICANT FINDINGS WITHIN TRIAL PIT

Samples and Tests		Strata	
Depth (m)	Type (B,D,ES)	Depth (m)	Strata Description
		G.L.	MADE GROUND/TOPSOIL. Loose grey gravelly sandy clayey SILT. Gravel is angular, fine to medium of clinker, brick and aggregate/gravel
0.3	ES1		Firm to stiff yellowish brown gravelly sandy silty CLAY. Gravel is subangular to sunrounded, fine to coarse of Pennant Sandstone.
		0.55	
			Firm to stiff yellowish brown gravelly sandy silty CLAY. Gravel is subangular to sunrounded, fine to coarse of Pennant Sandstone.
		0.8	

Notes: ES-Environmental Soil
 EW - Environmental Water
 B - Bulk Disturbed
 D - Small Disturbed

TRIAL PIT NUMBER
TP3



TP 3

Project: 35 PARISH ROAD CWMGWRACH	Project No: CG35
Described By: R.DAVIES	Trial Pit No. TP4
Date: 27/03/2023	Sheet: 1 of 1
Method / Plant TRACKED EXCAVATOR	Groundwater Observations: DRY
Stability GOOD	Strike of Face A:
Shoring NONE	Loggers Signature

FACE SKETCHES - INCLUDING ANY SIGNIFICANT FINDINGS WITHIN TRIAL PIT

Samples and Tests		Strata	
Depth (m)	Type (B,D,ES)	Depth (m)	Strata Description
		G.L.	MADE GROUND/TOPSOIL. Loose grey gravelly sandy clayey SILT. Gravel is angular, fine to medium of clinker, brick and aggregate/gravel
0.5	ES1	0.6	Firm to stiff yellowish brown gravelly sandy silty CLAY. Gravel is subangular to sunrounded, fine to coarse of Pennant Sandstone.
		0.95	

Notes: ES-Environmental Soil
 EW - Environmental Water
 B - Bulk Disturbed
 D - Small Disturbed

TRIAL PIT NUMBER
TP4



TP 4

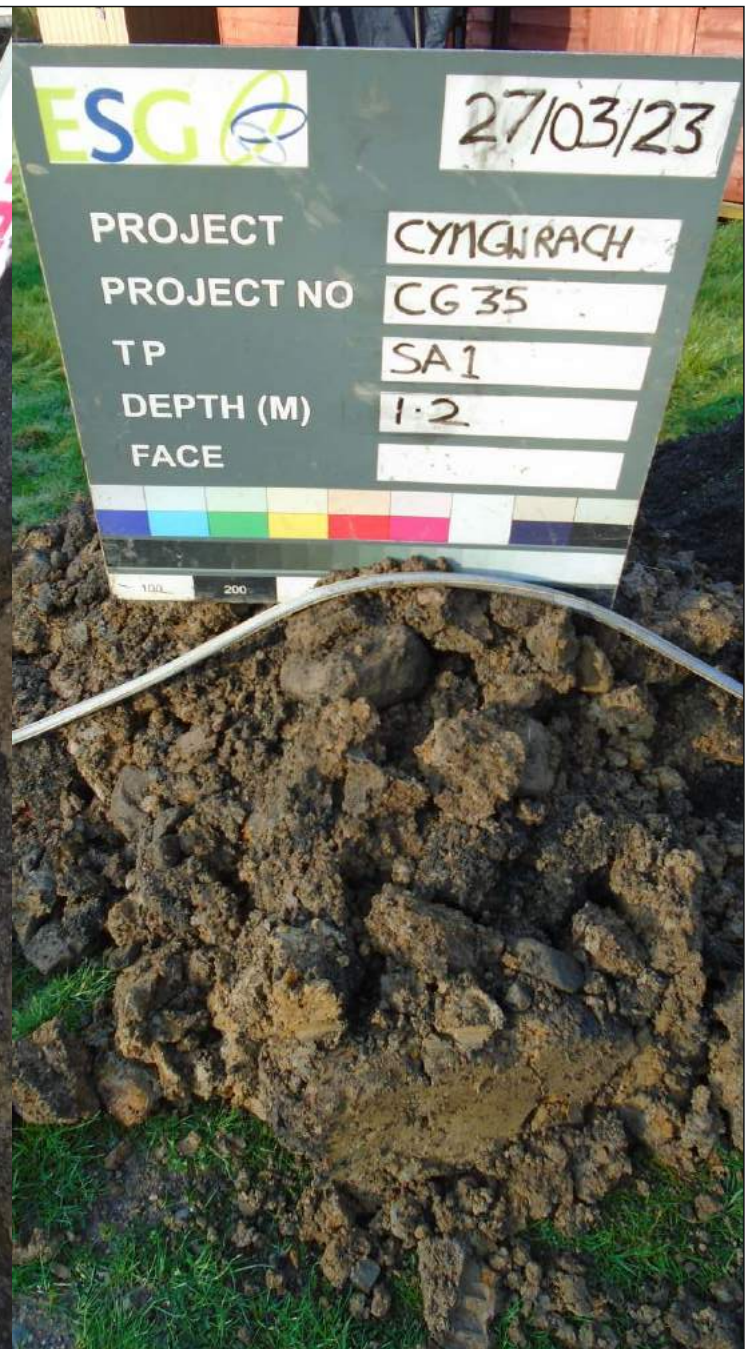
Project: 35 PARISH ROAD CWMGWRACH	Project No: CG35
Described By: R.DAVIES	Trial Pit No. SA1
Date: 27/03/2023	Sheet: 1 of 1
Method / Plant TRACKED EXCAVATOR	Groundwater Observations: DRY
Stability GOOD	Strike of Face A:
Shoring NONE	Loggers Signature

FACE SKETCHES - INCLUDING ANY SIGNIFICANT FINDINGS WITHIN TRIAL PIT

Samples and Tests		Strata	
Depth (m)	Type (B,D,ES)	Depth (m)	Strata Description
		G.L.	MADE GROUND/TOPSOIL. Loose grey gravelly sandy clayey SILT. Gravel is angular, fine to medium of clinker, brick and aggregate/gravel
		0.3	
			Firm to stiff yellowish brown gravelly, sandy, silty CLAY. Gravel is subangular to subrounded, fine to coarse of Pennant Sandstone with occasional Quartzitic Gritstone. Medium cobble content to 180mm diameter.
1	ES1	1.2	

Notes: ES-Environmental Soil
 EW - Environmental Water
 B - Bulk Disturbed
 D - Small Disturbed

TRIAL PIT NUMBER
SA1



SA 1

APPENDIX C

ELAB REPORT

23-47419-12

35 PARISH ROAD

CWMGWRACH



Unit A2
Windmill Road
Ponswood Industrial Estate
St Leonards on Sea
East Sussex
TN38 9BY

Telephone:

THE ENVIRONMENTAL LABORATORY LTD

Analytical Report Number: 23-47419

Issue: 3. Replaces Analytical Report number 23-47419; issue no.2

Date of Issue: 20/04/2023

Contact: Richard Davies

Customer Details: Rhondda Geotechnical Services
56 Meyler Street
Thomastown
Porth
CF39 8EA

Quotation No: Q22-03514

Order No: Not Supplied

Customer Reference: Soil Testing

Date Received: 29/03/2023

Date Approved: 20/04/2023

Details: 35 Parish Rd, Cwmgwrach

Approved by:

Quality Officer

Any comments, opinions or interpretations expressed herein are outside the scope of UKAS accreditation (Accreditation Number 2683)

This report may only be reproduced in full



Re-Issue Summary

Client: Rhondda Geotechnical Services
Address: 56 Meyler Street, Thomastown, Tonyrefail, Porth, CF39 8EA

Date: 20-Apr-23

Report No.: 23-47419

Issue: 2

This report replaces 23-47419, issue: 2, issued: 12 April 2023

Reason for Change

1 - Client request – additional analysis

Details of Change

<u>Sample Ref</u>	<u>Test* / Field Name</u>	<u>Previous Data</u>	<u>New Data</u>	<u>Reason</u>	<u>Changed</u>
316625	Leachate Testing Added			Added Work	13/04/2023

*If a result changed, old result is Previous data and new result is New data.

Re-issued by:

Approved by:



Sample Summary

Report No.: 23-47419, issue number 2

Elab No.	Client's Ref.	Date Sampled	Date Scheduled	Description	Deviations
316623	TP1 0.20	27/03/2023	29/03/2023	Sandy silty loam	
316624	TP2 0.40	27/03/2023	29/03/2023	Sandy silty loam	
316625	TP3 0.30	27/03/2023	29/03/2023	Sandy silty loam	
316626	TP4 0.50	27/03/2023	29/03/2023	Silty loam	
316627	SA1 1.00	27/03/2023	29/03/2023	Loamy sand	



Results Summary

2683

Report No.: 23-47419, issue number 2

ELAB Reference	316623	316624	316625	316626	316627
Customer Reference					
Sample ID					
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Location	TP1	TP2	TP3	TP4	SA1
Sample Depth (m)	0.20	0.40	0.30	0.50	1.00
Sampling Date	27/03/2023	27/03/2023	27/03/2023	27/03/2023	27/03/2023

Determinand	Codes	Units	LOD					
Soil sample preparation parameters								
Moisture Content	N	%	0.1	24.5	20.4	22.9	22.7	14.2
Material removed	N	%	0.1	41.6	40.9	45.4	40.8	40.7
Description of Inert material removed	N		0	Stones, clinker	Stones, clinker	Stones, Clinker	Stones, Clinker	Stones
Metals								
Arsenic	M	mg/kg	1	30.2	27.7	42.9	36.9	8.6
Cadmium	M	mg/kg	0.5	0.8	0.6	0.8	0.5	1.8
Chromium	M	mg/kg	5	15.7	15.9	21.4	15.5	12.7
Copper	M	mg/kg	5	52.7	37.1	153	46.6	17.3
Lead	M	mg/kg	5	131	88.0	145	80.4	12.7
Mercury	M	mg/kg	0.5	< 0.5	< 0.5	0.7	0.9	< 0.5
Nickel	M	mg/kg	5	13.8	15.6	26.8	16.9	10.7
Selenium	M	mg/kg	1	1.2	< 1.0	1.9	1.4	1.3
Zinc	M	mg/kg	5	271	226	263	196	38.0
Inorganics								
Total Cyanide	M	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Miscellaneous								
pH	M	pH units	0.1	6.7	6.5	6.1	6.0	6.4
Soil Organic Matter	U	%	0.1	3.0	2.0	3.8	2.5	1.2
Total Organic Carbon	N	%	0.01	14	7.1	22	8.7	1.3



Results Summary

2683

Report No.: 23-47419, issue number 2

ELAB Reference	316623	316624	316625	316626	316627
Customer Reference					
Sample ID					
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Location	TP1	TP2	TP3	TP4	SA1
Sample Depth (m)	0.20	0.40	0.30	0.50	1.00
Sampling Date	27/03/2023	27/03/2023	27/03/2023	27/03/2023	27/03/2023

Determinand	Codes	Units	LOD					
Phenols								
Phenol	M	mg/kg	1	< 1	< 1	< 1	< 1	< 1
M,P-Cresol	N	mg/kg	1	< 1	< 1	< 1	< 1	< 1
O-Cresol	N	mg/kg	1	< 1	< 1	< 1	< 1	< 1
3,4-Dimethylphenol	N	mg/kg	1	< 1	< 1	< 1	< 1	< 1
2,3-Dimethylphenol	M	mg/kg	1	< 1	< 1	< 1	< 1	< 1
2,3,5-trimethylphenol	M	mg/kg	1	< 1	< 1	< 1	< 1	< 1
Total Monohydric Phenols	N	mg/kg	5	< 5	< 5	< 5	< 5	< 5
Polyaromatic hydrocarbons								
Naphthalene	MS	mg/kg	0.02	0.09	0.04	0.04	0.03	< 0.02
Acenaphthylene	MS	mg/kg	0.02	< 0.02	0.05	0.06	< 0.02	< 0.02
Acenaphthene	MS	mg/kg	0.02	< 0.02	0.02	0.03	< 0.02	< 0.02
Fluorene	US	mg/kg	0.02	< 0.02	0.05	0.03	< 0.02	< 0.02
Phenanthrene	MS	mg/kg	0.02	0.15	0.76	0.48	0.12	< 0.02
Anthracene	US	mg/kg	0.02	0.03	0.09	0.08	0.03	< 0.02
Fluoranthene	MS	mg/kg	0.02	0.26	1.12	1.15	0.23	< 0.02
Pyrene	MS	mg/kg	0.02	0.20	0.79	0.82	0.18	< 0.02
Benzo(a)anthracene	US	mg/kg	0.02	0.16	0.54	0.60	0.13	< 0.02
Chrysene	MS	mg/kg	0.02	0.19	0.73	0.89	0.20	< 0.02
Benzo(b)fluoranthene	MS	mg/kg	0.02	0.21	0.89	1.08	0.25	< 0.02
Benzo(k)fluoranthene	MS	mg/kg	0.03	0.09	0.30	0.41	0.08	< 0.03
Benzo(a)pyrene	US	mg/kg	0.02	0.14	0.54	0.63	0.14	< 0.02
Indeno(1,2,3-cd)pyrene	MS	mg/kg	0.02	0.10	0.47	0.64	0.13	< 0.02
Dibenzo(a,h)anthracene	MS	mg/kg	0.02	0.02	0.13	0.16	0.04	< 0.02
Benzo[g,h,i]perylene	MS	mg/kg	0.02	0.07	0.34	0.47	0.10	< 0.02
Total PAH(16)	NS	mg/kg	0.34	1.72	6.88	7.56	1.68	< 0.34



Results Summary

2683

Report No.: 23-47419, issue number 2

ELAB Reference	316625
Customer Reference	
Sample ID	
Sample Type	SOIL
Sample Location	TP3
Sample Depth (m)	0.30
Sampling Date	27/03/2023

Determinand	Codes	Units	LOD	
Metals				
Arsenic 10:1 extract	N	ug/l	5	< 5
Boron 10:1 extract	N	ug/l	5	< 5
Cadmium 10:1 extract	N	ug/l	1	< 1
Chromium 10:1 extract	N	ug/l	5	< 5
Copper 10:1 extract	N	ug/l	5	< 5
Lead 10:1 extract	N	ug/l	5	< 5
Mercury 10:1 extract	N	ug/l	0.1	< 0.1
Nickel 10:1 extract	N	ug/l	5	< 5
Selenium 10:1 extract	N	ug/l	5	< 5
Zinc 10:1 extract	N	ug/l	5	< 5
Inorganics				
Hexavalent chromium	N	ug/l	100	< 100



Unit A2, Windmill Road, Ponswood Industrial Estate, St Leonards on Sea, East Sussex, TN38 9BY
Tel: +44 (0)1424 718618, Email: info@elab-uk.co.uk, Web: www.elab-uk.co.uk

Results Summary

Report No.: 23-47419, issue number 2

Asbestos Results

Analytical result only applies to the sample as submitted by the client. Any comments, opinions or interpretations (marked #) in this report are outside UKAS accreditation (Accreditation No2683). They are subjective comments only which must be verified by the client.

Elab No	Depth (m)	Clients Reference	Description of Sample Matrix #	Asbestos Identification	Gravimetric Analysis Total (%)	Gravimetric Analysis by ACM Type (%)	Free Fibre Analysis (%)	Total Asbestos (%)
316623	0.20	TP1	Brown Soil, Stones, Clinker, Organics	No asbestos detected	n/t	n/t	n/t	n/t
316624	0.40	TP2	Brown Soil, Stones, Clinker, Organics	Chrysotile (Lagging)	0.004	0.004 Lagging, Chrysotile	< 0.001	0.004
316625	0.30	TP3	Brown Soil, Stones, Clinker, Organics	No asbestos detected	n/t	n/t	n/t	n/t
316626	0.50	TP4	Brown Soil, Stones, Clinker	No asbestos detected	n/t	n/t	n/t	n/t
316627	1.00	SA1	Brown Soil, Stones, Clinker, Organics	No asbestos detected	n/t	n/t	n/t	n/t

Method Summary

Report No.: 23-47419, issue number 2

Parameter	Codes	Analysis Undertaken On	Date Tested	Method Number	Technique
Soil					
Leachate metals 10:1 extract	N		20/04/2023	101	ICPMS
pH	M	Air dried sample	03/04/2023	113	Electromeric
Aqua regia extractable metals	M	Air dried sample	04/04/2023	118	ICPMS
Phenols in solids	M	As submitted sample	30/03/2023	121	HPLC
Low range Aliphatic hydrocarbons soil	N	As submitted sample	11/04/2023	181	GC-MS
Low range Aromatic hydrocarbons soil	N	As submitted sample	11/04/2023	181	GC-MS
Total cyanide	M	As submitted sample	30/03/2023	204	Colorimetry
Total organic carbon/Total sulphur	N	Air dried sample	04/04/2023	210	IR
Asbestos identification	U	Air dried sample	30/03/2023	260	Microscopy
Soil organic matter	U	Air dried sample	05/04/2023	BS1377:P3	Titrimetry

Tests marked N are not UKAS accredited

Report Information

Report No.: 23-47419, issue number 2

Key

U	hold UKAS accreditation
M	hold MCERTS and UKAS accreditation
N	do not currently hold UKAS accreditation
^	MCERTS accreditation not applicable for sample matrix
*	UKAS accreditation not applicable for sample matrix
S	Subcontracted to approved laboratory UKAS Accredited for the test
SM	Subcontracted to approved laboratory MCERTS/UKAS Accredited for the test
NS	Subcontracted to approved laboratory. UKAS accreditation is not applicable.
I/S	Insufficient Sample
U/S	Unsuitable sample
n/t	Not tested
<	means "less than"
>	means "greater than"
LOD	LOD refers to limit of detection, except in the case of pH soils and pH waters where it means limit of discrimination. Soil sample results are expressed on an air dried basis (dried at < 30°C), and are uncorrected for inert material removed. ELAB are unable to provide an interpretation or opinion on the content of this report. The results relate only to the sample received. PCB congener results may include any coeluting PCBs Uncertainty of measurement for the determinands tested are available upon request Unless otherwise stated, sample information has been provided by the client. This may affect the validity of the results.

Deviation Codes

a	No date of sampling supplied
b	No time of sampling supplied (Waters Only)
c	Sample not received in appropriate containers
d	Sample not received in cooled condition
e	The container has been incorrectly filled
f	Sample age exceeds stability time (sampling to receipt)
g	Sample age exceeds stability time (sampling to analysis)

Where a sample has a deviation code, the applicable test result may be invalid.

Sample Retention and Disposal

All soil samples will be retained for a period of one month
 All water samples will be retained for 7 days following the date of the test report
 Charges may apply to extended sample storage

TPH Classification - HWOL Acronym System

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



The Environmental Laboratory Ltd
Unit A2, Windmill Road
Ponswood Industrial Estate
St. Leonards on Sea
East Sussex
TN38 9BY

Attention: Customer Services

CERTIFICATE OF ANALYSIS

Date of report Generation:	12 April 2023
Customer:	The Environmental Laboratory Ltd
Sample Delivery Group (SDG):	230404-93
Your Reference:	23-47419
Location:	Not Specified
Report No:	685221
Order Number:	11266

We received 5 samples on Tuesday April 04, 2023 and 5 of these samples were scheduled for analysis which was completed on Wednesday April 12, 2023. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data sections alone.

Chemical testing (unless subcontracted) performed at ALS Laboratories (UK) Limited Hawarden.

All sample data is provided by the customer. The reported results relate to the sample supplied, and on the basis that this data is correct.

Incorrect sampling dates and/or sample information will affect the validity of results.

The customer is not permitted to reproduce this report except in full without the approval of the laboratory.

Approved By:

-
Operations Manager





CERTIFICATE OF ANALYSIS

Validated

SDG: 230404-93
Client Ref.: 23-47419

Report Number: 685221
Location: Not Specified

Superseded Report:

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
27793798	316623 / TP1		0.20	27/03/2023
27793799	316624 / TP2		0.40	27/03/2023
27793800	316625 / TP3		0.30	27/03/2023
27793801	316626 / TP4		0.50	27/03/2023
27793802	316627 / TP5		1.00	27/03/2023

Only received samples which have had analysis scheduled will be shown on the following pages.



CERTIFICATE OF ANALYSIS

Validated

SDG: 230404-93
Client Ref.: 23-47419

Report Number: 685221
Location: Not Specified

Superseded Report:

Results Legend



Test



No Determination
Possible

Sample Types -

S - Soil/Solid
UNS - Unspecified Solid
GW - Ground Water
SW - Surface Water
LE - Land Leachate
PL - Prepared Leachate
PR - Process Water
SA - Saline Water
TE - Trade Effluent
TS - Treated Sewage
US - Untreated Sewage
RE - Recreational Water
DW - Drinking Water Non-regulatory
UNL - Unspecified Liquid
SL - Sludge
G - Gas
OTH - Other

Lab Sample No(s)

Customer
Sample Reference

AGS Reference

Depth (m)

Container

Sample Type

EPH CWG GC (S)

All

NDPs: 0
Tests: 5

X X X X X

GRO by GC-FID (S)

All

NDPs: 0
Tests: 5

X X X X X

Sample description

All

NDPs: 0
Tests: 5

X X X X X

TPH CWG GC (S)

All

NDPs: 0
Tests: 5

X X X X X

VOC MS (S)

All

NDPs: 0
Tests: 5

X X X X X



CERTIFICATE OF ANALYSIS

Validated

SDG: 230404-93
Client Ref.: 23-47419

Report Number: 685221
Location: Not Specified

Superseded Report:

Sample Descriptions

Grain Sizes

very fine	<0.063mm	fine	0.063mm - 0.1mm	medium	0.1mm - 2mm	coarse	2mm - 10mm	very coarse	>10mm
-----------	----------	------	-----------------	--------	-------------	--------	------------	-------------	-------

Lab Sample No(s)	Customer Sample Ref.	Depth (m)	Colour	Description	Inclusions	Inclusions 2
27793798	316623 / TP1	0.20	Dark Brown	Sandy Clay Loam	Stones	Vegetation
27793799	316624 / TP2	0.40	Dark Brown	Sandy Loam	Stones	Vegetation
27793800	316625 / TP3	0.30	Dark Brown	Loamy Sand	Stones	Vegetation
27793801	316626 / TP4	0.50	Dark Brown	Sandy Loam	Stones	Vegetation
27793802	316627 / TP5	1.00	Light Brown	Sandy Clay	Stones	None

These descriptions are only intended to act as a cross check if sample identities are questioned, and to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions.

We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample.

Other coarse granular materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.



Superseded Report:

Page 5 of 10

SDG: 230404-93
Client Ref.: 23-47419

Report Number: 685221
Location: Not Specified

Superseded Report:

TPH CWG (S)

[illegible]



CERTIFICATE OF ANALYSIS

Validated

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Superseded Report:

Table of Results - Appendix

Method No	Description
PM024	Soil preparation including homogenisation, moisture screens of soils for Asbestos Containing Material
TM089	Determination of Gasoline Range Hydrocarbons (GRO) by Headspace GC-FID (C4-C12)
TM116	Determination of Volatile Organic Compounds by Headspace / GC-MS
TM414	Determination of Speciated Extractable Petroleum Hydrocarbons in Soils by GCxGC-FID

NA = not applicable.

Chemical testing (unless subcontracted) performed at ALS Laboratories (UK) Limited Hawarden (Method codes TM).



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Test Completion Dates

Lab Sample No(s)	27793798	27793799	27793800	27793801	27793802
Customer Sample Ref.	316623 / TP1	316624 / TP2	316625 / TP3	316626 / TP4	316627 / TP5
AGS Ref.					
Depth	0.20	0.40	0.30	0.50	1.00
Type	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)
EPH CWG GC (S)	12-Apr-2023	12-Apr-2023	12-Apr-2023	12-Apr-2023	12-Apr-2023
GRO by GC-FID (S)	11-Apr-2023	11-Apr-2023	11-Apr-2023	11-Apr-2023	11-Apr-2023
Sample description	07-Apr-2023	07-Apr-2023	07-Apr-2023	07-Apr-2023	07-Apr-2023
TPH CWG GC (S)	12-Apr-2023	12-Apr-2023	12-Apr-2023	12-Apr-2023	12-Apr-2023
VOC MS (S)	11-Apr-2023	11-Apr-2023	11-Apr-2023	11-Apr-2023	11-Apr-2023



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Appendix

1. Results are expressed on a dry weight basis (dried at 35°C) for all soil analyses except for the following: NRA and CEN Leach tests, flash point LOI, pH, ammonium as NH₄ by the BRE method, VOC TICs and SVOC TICs.

2. If sufficient sample is received a sub sample will be retained free of charge for 15 days after analysis is completed (e-mailed) for all sample types unless the sample is destroyed on testing. The prepared soil sub sample that is analysed for asbestos will be retained for a period of 6 months after the analysis date. All bulk samples will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALS reserve the right to charge for samples received and stored but not analysed.

3. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.

4. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS/MCERTS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS/MCERTS Accredited Laboratories, in this instance a laboratory with a known track record will be utilised.

5. If no separate volatile sample is supplied by the client, or if a headspace or sediment is present in the volatile sample, the integrity of the data may be compromised. This will be flagged up as an invalid VOC on the test schedule and the result marked as deviating on the test certificate.

6. NDP - No determination possible due to insufficient/unsuitable sample.

7. Results relate only to the items tested.

8. LoDs (Limit of Detection) for wet tests reported on a dry weight basis are not corrected for moisture content.

9. **Surrogate recoveries** - Surrogates are added to your sample to monitor recovery of the test requested. A % recovery is reported, results are not corrected for the recovery measured. Typical recoveries for organics tests are 70-130%. Recoveries in soils are affected by organic rich or clay rich matrices. Waters can be affected by remediation fluids or high amounts of sediment. Test results are only ever reported if all of the associated quality checks pass; it is assumed that all recoveries outside of the values above are due to matrix affect.

10. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.

11. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the method detection limit to be raised.

12. For dried and crushed preparations of soils volatile loss may occur e.g volatile mercury.

13. For leachate preparations other than Zero Headspace Extraction (ZHE) volatile loss may occur.

14. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles GCFID/GCMS and all subcontracted analysis.

15. Analysis and identification of specific compounds using GCFID is by retention time only, and we routinely calibrate and quantify for benzene, toluene, ethylbenzenes and xylenes (BTEX). For total volatiles in the C5-C12 range, the total area of the chromatogram is integrated and expressed as ug/kg or ug/l. Although this analysis is commonly used for the quantification of gasoline range organics (GRO), the system will also detect other compounds such as chlorinated solvents, and this may lead to a falsely high result with respect to hydrocarbons only. It is not possible to specifically identify these non-hydrocarbons, as standards are not routinely run for any other compounds, and for more definitive identification, volatiles by GCMS should be utilised.

16. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

17 Data retention. All records, communications and reports pertaining to the analysis are archived for seven years from the date of issue of the final report.

General

18. **Tentatively Identified Compounds (TICs)** are non-target peaks in VOC and SVOC analysis. All non-target peaks detected with a concentration above the LoD are subjected to a mass spectral library search. Non-target peaks with a library search confidence of >75% are reported based on the best mass spectral library match. When a non-target peak with a library search confidence of <75% is detected it is reported as "mixed hydrocarbons". Non-target compounds identified from the scan data are semi-quantified relative to one of the deuterated internal standards, under the same chromatographic conditions as the target compounds. This result is reported as a semi-quantitative value and reported as Tentatively Identified Compounds (TICs). TICs are outside the scope of UKAS accreditation and are not moisture corrected.

19. Sample Deviations

If a sample is classed as deviated then the associated results may be compromised.

1	Container with Headspace provided for volatiles analysis
2	Incorrect container received
3	Deviation from method
4	Matrix interference
♦	Sample holding time exceeded in laboratory
@	Sample holding time exceeded due to late arrival of instructions or samples
§	Sampled on date not provided

20. Asbestos

When requested, the individual sub sample scheduled will be analysed in house for the presence of asbestos fibres and asbestos containing material by our documented in house method TM048 based on HSG 248 (2021), which is accredited to ISO17025. If a specific asbestos fibre type is not found this will be reported as "Not detected". If no asbestos fibre types are found all will be reported as "Not detected" and the sub sample analysed deemed to be clear of asbestos. If an asbestos fibre type is found it will be reported as detected (for each fibre type found). Testing can be carried out on asbestos positive samples, but, due to Health and Safety considerations, may be replaced by alternative tests or reported as No Determination Possible (NDP). The quantity of asbestos present is not determined unless specifically requested.

Identification of Asbestos in Bulk Materials & Soils

The results for identification of asbestos in bulk materials and soils are obtained from supplied bulk materials and soils which have been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2021).

The results for identification of asbestos in soils are obtained from a homogenised sub sample which has been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining.

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anthophyllite	-
Fibrous Tremolite	-

Visual Estimation Of Fibre Content

Estimation of fibre content is not permitted as part of our UKAS accredited test other than: - Trace - Where only one or two asbestos fibres were identified.

Respirable Fibres

Respirable fibres are defined as fibres of <3 µm diameter, longer than 5 µm and with aspect ratios of at least 3:1 that can be inhaled into the lower regions of the lung and are generally acknowledged to be most important predictor of hazard and risk for cancers of the lung.

Further guidance on typical asbestos fibre content of manufactured products can be found in HSG 264.

The identification of asbestos containing materials and soils falls within our schedule of tests for which we hold UKAS accreditation, however opinions, interpretations and all other information contained in the report are outside the scope of UKAS accreditation.