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Professional, Efficient Solutions

SOIL ANALYSIS INVESTIGATION

(PHASE 2)

SITE: THE CHALET
HOMEFIELD
CROFTHANDY
ST. DAY
REDRUTH
CORNWALL
TR16 5JB

CLIENT: MR S. WICKS
HOMEFIELD
CROFTHANDY
ST. DAY
REDRUTH
CORNWALL
TR16 5JB

Our Ref: A1150/P2/S/JW

Planning Ref: PA15/10999

Date: 27th October 2016

OS Grid Ref: SW 7363/4203

INDEX

1. Introduction

Following consultation and instruction from the client Mr S. Wicks, ASI was commissioned to conduct a Phase 2 Soil Analysis Investigation for the following site.

Site locality: The Chalet, Homefield, Crofthandy, St. Day, Redruth, Cornwall.
End-use: Proposed replacement dwelling, onsite parking and amenity area.

This report follows on from an initial Phase 1 Contaminated Land Survey (P1 CLS) produced by ourselves under report ref: A1150 P1/JW. The conclusions of the P1 CLS have determined that the potential for onsite land contamination is probable, with the primary contamination risk being associated to the following sources:

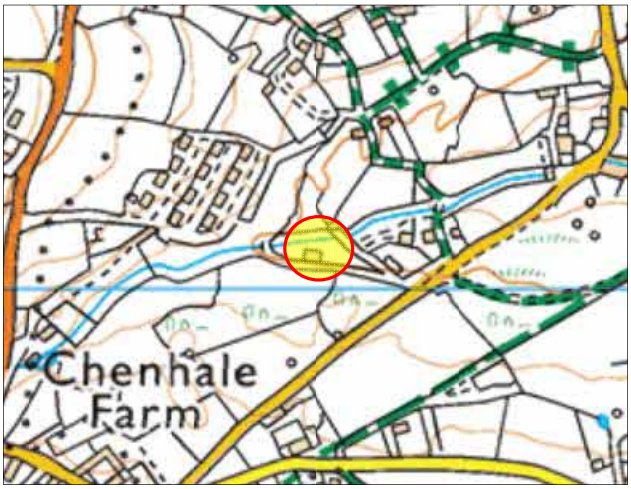
a) Site lies within the lease boundary of the historic Wheal Jewel and Carharrack Mines, with extensive tracts of mine waste throughout the site area and general locality.
b) Lode zone mineralisation indicated within proximity to the property bounds.

Due to the sites proposed end-use being for residential purposes, further investigation of the property area was necessary to identify if the development is at risk from heavy metal contaminants associated to the above contamination sources.

The primary risk from contaminants would be through long term exposure to sensitive end-users of the site, where excessive levels can be detrimental to human health, with the level of risk being dependent upon the degree of exceedance when compared to government set threshold values.

In response to these concerns, an onsite investigation and laboratory analysis of the soil horizon is required if the possibility of contamination affecting receptors such as humans, vegetables, property, eco-systems or controlled water bodies is in existence. Following review, this report should be submitted to the Local Council Authority Environmental Department for assessment.

Map & Street Plan Showing Location Of Site



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2. Geology & Hydrogeology

2.1 Geology

The geological survey map (British Geological Survey 1:50 000 series, sheet 352) shows the site as lying within sedimentary bedrock comprising of both Metamudstone and Metasandstone of the Porthtowan Formation and Hornfelsed (heat altered) Slate and Siltstone of the Mylor Slate Formation, formed during the Devonian Geological Period.

No superficial (younger/near surface) deposits are recorded within the site locality. Superficial deposits generally comprise of unconsolidated sediments such as gravel, sand, silt and clay having been lain down/transported via ice, water and wind.

Metalliferous lode zones that have the potential to introduce elevated heavy metal levels into the surrounding ground horizon are indicated within close proximity to the site.

Soil classification within site locality: freely draining acid loamy soils overlying bedrock.

2.2 Hydrogeology

Geological records indicate that the property is sited over rocks that can form minor aquifers of intermediate permeability. These can be fractured or potentially fractured rocks, which do not have a high permeability, or other formations of variable permeability including unconsolidated deposits. Although these aquifers will seldom produce large quantities of water for abstraction, they are important both for local supplies and in supplying base flow to rivers.

3. Screening Criteria

In assessing the levels of compounds in the soil at the site we have referred to both the Land Quality Management Ltd (LQM)/Chartered Institute of Environmental Health (CIEH), Generic Assessment Criteria (GAC), Suitable 4 Use Levels (S4ULs) 2014 and Soil Guideline Values (SGVs) produced by the Department for Environment, Food & Rural Affairs (DEFRA) and the Environment Agency (E.A).

In addition, in the absence of a current SGV limit for lead we have referenced the Provisional Category 4 Screening Level (pC4SL) produced by DEFRA.

Both C4SLs, GAC, S4ULs and SGVs are based upon research undertaken by the LQM/CIEH and by DEFRA and the E.A, being derived from the Contaminated Land Exposure Assessment model (CLEA). The values are founded upon scientifically based generic assessment criteria (GAC) to help evaluate long-term risks to human health from contamination in soil.

The threshold limits are utilised as trigger values. Where soil concentrations are exceeded, there may be the potential for a significant risk to human health and/or environmental impact and may require further investigative works or possible land remediation.

Within the context of this report we have referred to the evaluated sample analysis data as Site Assessment Levels (SALs). C4SLs, GAC, S4ULs and SGVs have been derived for a range of contaminants for six typical land uses as listed below:

- Residential with homegrown produce
- Residential without homegrown produce
- Allotments
- Commercial
- Public open space near residential housing (POS_{resi})
- Public open space park (POS_{park})

Due to the sites end-use scenario being for residential purposes we have selected the testing scenario as 'residential with homegrown produce'.

4. Definition of Contaminated Land

The legal definition of contaminated land from Section 78A(2) of Part IIA of the Environmental Protection Act 1990) is:

'...any land which appears to the local authority in whose area it is situated to be in such a condition, by reason of substances in, on or under the land that:

(a) significant harm is being caused or there is the significant possibility of such harm being caused; or
(b) pollution of controlled waters is being, or is likely to be, caused.

A key element of the Part IIA regime is the Source-Pathway-Receptor pollutant linkage concept. The meaning of each element is as follows:

- the *source* is the contamination in, on or under the land;
- the *pathway* is the route by which the contamination reaches the receptor; and
- the *receptor* is defined as living organisms, ecological systems or property which may be harmed.

Without the clear identification of all three elements of the pollutant linkage, land cannot be identified as contaminated land under the regime. Contaminating substances may include:

- metals and metallic compounds e.g. cadmium, arsenic, lead, nickel, chromium
- organic compounds e.g. oils, petrol, solvents
- gases e.g. methane, carbon dioxide, hydrogen sulphide

Typical causes of land contamination includes previous industrial or commercial usage, mining and the land filling of waste. Land can also become contaminated due to its proximity to contaminated areas. However, contamination does not occur solely as a result of human activities and land can be contaminated as a result of its natural state.

5. Soil Analysis & Sampling Methodology

In total 7no soil samples were collected from the proposed site area on the 11th October 2016, with the weather conditions at the time of collection being dry. The collected samples were termed S1 to S7 and consisted of gritty, blocky and compacted mine waste rock, intermixed with an overlying horizon of very shallow topsoil to an approximated depth of 0.10m bgl.

The collected samples were subsequently tested for heavy metal concentrations, acid soluble sulphate and pH levels, therefore acquiring an overall Site Assessment Level (SAL) for the development. The testing suite chosen was considered suitable in relationship to the type of potential contaminates associated to the site, with the nature of the analyses being detailed below:

Metals screen:

Arsenic, cadmium, chromium (III), chromium (VI), lead, mercury, nickel, selenium, copper, zinc

Others:

Acid soluble sulphate (SO_4), pH

Chemical analysis was undertaken by Chemtest Ltd (UKAS accredited), of which the full results are presented in Annex 2.

5.1 Collection & Site Information

Please note that subsequent to the writing of the Phase 1 Contaminated Land Survey, the boundaries of the application area have been amended, with the site being reduced in size, details of the revised site bounds can be referenced within Annex 1: Site Plan.

The survey was supervised by a qualified site geologist, with the excavation works being undertaken by the clients appointed subcontractor utilising a 3 tonne mini swing shovel excavator and posthole spade. Due to the presence of mine waste and the potential for mine workings to exist, the sample collection ran concurrently with an onsite drilling investigation, of which was conducted within the proposed raft foundation area of the new residential dwelling.

Conclusions from the drilling survey identified that the general site locality was overlain be consistent mine waste to depths ranging from 1.50m to 2.75m bgl and subsequently underlain by metamorphosed mudstones and sandstones of the Porthtowan Formation. For full details please refer to report A1150 GPI/JW, dated 25th October 2016, of which the client holds details.

The sampling layout was selected to acquire suitable coverage of the new site area where possible and therefore provide an accurate analytical assessment of the existing ground horizon within the property bounds. No samples were collected from the existing driveway due to this section of the site remaining as such, with proposals to resurface this area following construction of the dwelling.

Samples were collected from the excavation areas by trowel, with the sampling tool being cleaned prior to the retrieval of each sample.

Following retrieval, the collected samples were then subsequently stored in sealed plastic sample collection tubs and a storage container (cool box), for transportation to Chemtest Ltd for laboratory analysis.

The samples were obtained from an approximate depth of 0.30m bgl and were subsequently tested to determine the level of heavy metal contaminants, acid soluble sulphate (SO4) and pH content. The upper ground horizon is viewed to pose the most potential risk to the end-user, via dermal, inhalation and ingestion pathways from heavy metal contaminants.

Due to the raft foundation proposed for the site and the lack of available subsoil, all samples consisted of homogenous mine waste and minor topsoil.

Through the drilling survey, moderately flowing groundwater was identified at a depth of approximately 1.40m bgl. However, it should be noted that within the area of drilling the former ground elevation had been lowered by 0.50m bgl in preparation for the foundation raft, with the true depth to groundwater within the existing site bounds and proposed amenity areas to be estimated at 1.90m bgl.

For sample locations please refer to Annex 1: Site Plan for details.

6. Soil Sample Composition Table

Sample No.	Sample Type & Depth	Sample Identification & Description
S1 S2 S3 S4 S5 S6 S7	Mine waste horizon (0.30m bgl)	Laboratory classification: SOIL Colour - ranging from brown (intermixed topsoil), cream to off pink, coarse, gritty and blocky mine waste.
	Topsoil/subsoil	No discernible topsoil or subsoil horizon recorded.
Recorded by: Sample collection date: Weather conditions:		J. Williamson 11th October 2016 Dry

7. C4SLs (lead), GAC, S4ULs and SGVs Threshold Values

The C4SLs, GAC, S4ULs and SGVs threshold values are intended to indicate to an assessor the level at which harm could be caused to receptors i.e. human beings, eco-systems, vegetables and fruit. The values represent the total amount of contaminants contained within a sample of analysed soil, the resulting value being expressed in mg/kg.

The chosen site scenario is for 'residential with homegrown produce' with the values highlighted in bold for ease of reference.

7.1 Table 1: Heavy Metals

The chosen site scenario is for 'residential with homegrown produce' with values highlighted in green for ease of reference.

Element	Land usage scenario	Land usage scenario	Land usage scenario	Land usage scenario
	Public open space near residential housing (POS resi)/ Public open space park (POS park)	Commercial	Allotment	Residential with/without homegrown produce
	(mg/kg dry weight soil)	(mg/kg dry weight soil)	(mg/kg dry weight soil)	(mg/kg dry weight soil)
Arsenic	79/170	640	43	**37**/40
Cadmium	120/532	190	1.9	**11**/85
Chromium (III)	1500/33000	8600	18000	**910**/910
Chromium (VI hex)	-	35	2.1	**4.3**
Lead	760/1400	2700	84	**210**/330
Mercury (inorganic)	120/240	1100	19	**40**/56
Nickel	230/3400	980	230	**180**/180
Selenium	1100/1800	12000	88	**250**/430
Phytotoxic: plant affecting				
Copper	12000/44000	68000	520	**2400**/7100
Zinc	81000/170000	730000	620	**3700**/40000

Heavy metals are the non-degradable metals. These metals are toxic and posses high density. Heavy metals occur in the earth's crust naturally. Some of the heavy metals are lead, cadmium, mercury, arsenic and chromium. High concentration of heavy metals causes poisoning. The main sources of heavy metals are domestic waste water and urban run-off, industrial waste water, agricultural activities and mining activities.

8. Sample Information

Please refer to Annex 2: Laboratory Results and section 8.2: Arithmetic Mean Values for Heavy Metal Concentrations and section 8.3: US95 Calculations (Mean Value Test) for Failing Heavy Metal Contaminants. All soil values are based on total concentrations, i.e. arsenic 37mg/kg (total).

Where relevant, the percentage level of acid soluble sulphate deemed to present potentially aggressive ground conditions for concrete foundation design will be highlighted in section 8.1: Laboratory Analysis Results (below). Necessary recommendations (if required) for design sulphate class (DS class) will be referenced within section 8.5: Acid Soluble Sulphate Recommendations.

Chosen site scenario: 'Residential with homegrown produce'.

8.1 Laboratory Analysis Results

Sample Identification: Mine waste/with minor intermixed topsoil horizon S1 to S7

Primary Heavy Metals Affecting Human Health									
Samples	S1	S2	S3	S4	S5	S6	S7		
	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)		
Arsenic	550	75	2200	2200	4100	2700	1900		
Cadmium	0.29	0.11	0.57	0.22	0.50	0.25	0.33		
Chromium (III)	21	16	26	14	16	15	25		
Chromium (VI)	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50		
Lead	140	41	200	230	240	190	160		
Mercury (inorganic)	0.20	<0.10	0.65	0.61	0.93	0.90	0.76		
Nickel	17	10	15	12	17	19	28		
Selenium	<0.20	<0.20	<0.20	0.38	0.47	<0.20	<0.20		

Primary Heavy Metals Affecting Plants (phytotoxic)									
Samples	S1	S2	S3	S4	S5	S6	S7		
	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)			
Copper	230	52	530	410	760	460	680		
Zinc	180	67	280	110	280	150	160		
pH Units	8.3	7.2	7.6	5.7	7.6	7.6	7.2		
Acid Soluble Sulphate %	0.049	0.019	0.75	0.20	0.17	0.10	0.079		

Values failing S4ULs, SGVs, C4SL threshold limits have been highlighted in red.
Recommended action level for Acid Soluble Sulphate 0.24% SO_3 for concrete in aggressive ground conditions for subsoil/foundation horizon only (Specifying Concrete to BS EN 206-1/BS 8500).

8.2 Arithmetic Mean Values For Heavy Metal Concentrations

The samples utilised for representative sample mean values and maximum and lower sample values are derived from the upper ground horizon, as defined below.

Sample Identification: Mine waste/with minor intermixed topsoil horizon - S1 to S7

Element	Sample Mean	Maximum Value	Lowest Value	Residential (with homegrown produce) S4ULs/SGVs/C4SLs
	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Arsenic	1960	4100	75	37
Cadmium	0.32	0.57	0.11	11
Chromium (III)	19	26	16	910
Chromium (VI)	<0.50	<0.50	<0.50	4.3
Lead	172	240	41	210
Mercury (inorganic)	0.59	0.93	<0.10	40
Nickel	17	28	10	180
Selenium	0.26	0.47	<0.20	250
Copper	446	760	52	2400
Zinc	175	280	67	3700
Values failing S4ULs, SGVs, C4SL threshold limits have been highlighted in red.				

8.3 US95 Calculations (Mean Value Test) For Failing Heavy Metal Contaminants

8.3.1 Calculated Site Assessment Level (SAL/US95) for arsenic

Sample Identification: Arsenic - S1 to S7

A1150: The Chalet

Arsenic		Data Set A			Logs
Sample No.					
S1		550			2.740
S2		75			1.875
S3		2200			3.342
S4		2200			3.342
S5		4100			3.613
S6		2700			3.431
S7		1900			3.279
Total		13725		Total	21.623
Number of samples	N	7		Number of samples	N 7
Arithmetic sample mean	X	1960.714		Arithmetic sample mean	Y 3.089
Unbiased sample deviation	S	1340.853		Unbiased sample deviation	Sy 0.599
Confidence limit	t	1.943		Maximum value	X 3.613
sqr.rt of number of samples	n	2.646			
therefore US95	=	**2945**		**Maximum Value Test (T)**	= **0.875**
SGVs in mg/kg				**Critical Value**	= **1.830**
Residential with plant uptake = **37**					
US95 (upper bound): A number that can be equal to or greater than any number in given data set.					

8.3.2 Calculated Site Assessment Level (SAL/US95) for lead

Sample Identification: Lead - S1 to S7

A1150 The Chalet

Lead	Data Set A		Logs
Sample No.			
S1	140		2.146
S2	41		1.613
S3	200		2.301
S4	230		2.362
S5	240		2.380
S6	190		2.279
S7	160		2.204
Total	1201	Total	15.285
Number of samples	N 7	Number of samples	N 7
Arithmetic sample mean	X 171.571	Arithmetic sample mean	Y 2.184
Unbiased sample deviation	S 67.606	Unbiased sample deviation	Sy 0.265
value for 95th percentile Confidence limit	t 1.943	Maximum value	X 2.380
sqr.rt of number of samples	n 2.646		
therefore US95 =	**221**	**Maximum Value Test (T) =**	**0.743**
pC4SL in mg/kg		**Critical Value =**	**1.830**
Residential with plant uptake = **210**			

US95 (upper bound): A number that can be equal to or greater than any number in given data set.

8.4 Identified Failing Substances

The following heavy metal contaminants have been identified to have an elevated result that exceeds current guidance limits and should be utilised to assess the level of heavy metals within the ground horizon at the site locality.

Sample Identification: Arsenic - S1 to S7

A Mean Value Test (US95) calculation for arsenic has been produced for the above sample locations.

Site Assessment Level for arsenic concentration of:

SAL (US95) for arsenic:	2945.00 mg/kg
S4UL guidance limit for arsenic:	37.00 mg/kg
Risk classification:	High

Sample Identification: Lead - S1 to S7

A Mean Value Test (US95) calculation for lead has been produced for the above sample locations.

Site Assessment Level for lead concentration of:

SAL (US95) for lead	221.00 mg/kg
C4SL guidance limit for lead:	210.00 mg/kg
Risk classification:	Low-medium

8.5 Acid Soluble Sulphate Recommendations

Pyrite (iron sulphide) can occur naturally, or arise from industrial wastes and if slowly oxidised in the soil can give rise to sulphuric acid and sulphide ions in acid solution, in turn potentially affecting concrete for foundations.

Current guidance Specifying Concrete to BS EN 206-1/BS 8500 delineates various suitable grades of concrete that can be utilised for the development foundations, with the grade of concrete increasing in strength relative to the level of acid soluble sulphate (SO4) detected. Generally, values exceeding 0.24% SO4 would require a higher grade of concrete.

The sample analysis data has returned a site mean value obtained from mine waste with minor intermixed topsoil at a depth of approximately 0.30m bgl as:

Acid Soluble Sulphate % level and pH unit for sample locations S1 to S7

(SO_4) 0.20%, pH - 7.3

Please note as no discernible subsoil horizon/foundation elevation samples were obtained at the site locality, we would recommend as a precautionary measure that the developer consult with their architect and/or concrete supplier with respect to a suitable grade of concrete, with the information provided to be utilised for guidance purposes only.

9. Soil Analysis Conclusions & Recommendations

Under the currently published Suitable 4 Use Levels (S4ULs), Soil Guidance Values (SGVs) and Category 4 Screening Level for lead (C4SL), the resulting soil analysis shows that the site has an exceedance of the following heavy metal contaminants:

Failing elements: arsenic and lead (mine waste with minor/intermixed topsoil horizon)

The sample values are based upon total concentrations, i.e. an amount of contaminant contained within a kilogram of sample material and are used to gain an understanding of the overall contaminant levels and therefore level of risk. Elevated levels of heavy metals can potentially cause human health risks via the growing and consuming of homegrown produce from contaminated land (over long term periods) or exposure to land if levels are excessively high.

A risk categorisation is intended to convey to the client and Local Authorities that the ground horizon within the area of sampling would be considered a potential hazard to human health from the following exposure pathways: dermal (contact with skin), inhalation (dust particles) and ingestion (growing of home grown produce). In addition, dependant on concentrations, eco-systems can be affected, or groundwater water sources should potable water abstraction be proposed for the development.

Determination for arsenic:

Samples S1 to S7 have returned a Site Assessment Level (US95) value of 2945 mg/kg for arsenic, which exceeds the S4UL value of 37 mg/kg for 'residential sites with homegrown produce'. It would be considered based upon the current threshold value that arsenic poses a high contamination risk at the site locality.

We note that sample location S2 returned a considerably lower level than the remaining site values, this is possibly due to an area of imported soil within this section of the site. However, this low value when compared to the overall Site Assessment Level would not modify the remedial recommendations of this report.

Determination for lead:

Samples S1 to S7 have returned a Site Assessment Level (US95) value of 221 mg/kg for lead, which exceeds the C4SL value of 210 mg/kg for 'residential sites with homegrown produce'. It would be considered based upon the current threshold value that lead poses a low to medium contamination risk at the site locality.

Other Tested Elements

All other tested elements were below current threshold values.

Remedial Recommendations & Options

It has been determined that a contamination risk to receptors exists at the site locality via heavy metal concentrations within the upper ground horizon, of which has been identified to comprise primarily of compacted mine waste with minor intermixed topsoil.

The depth of mine waste has been proven from a previous drilling survey undertaken by ourselves to extend to 1.50m - 2.75m bgl (see report ref: A1150 GPI/JW) and therefore any remedial works will be located within the existing upper surface horizon only, with no interaction of the underlying ground water table, estimated to lie at 1.90m bgl.

To progress, a remedial options appraisal needs to be proposed to satisfactorily break potential contamination pathways. The intention of a remedial options appraisal is to ascertain which remedial option, or combination of options are appropriate to break pollutant linkages and to then establish which option, either singly or in combination offer the best approach to satisfactory remediate the site area.

The three stages of options appraisal are:

1) Identifying feasible remediation options for each relevant pollutant linkage.

2) Carrying out an evaluation of feasible remediation options to identify the most appropriate option for any particular linkage.

3) Producing a remediation strategy that addresses all relevant pollution linkages, where appropriate by combining remediation options.

1: Remediation options

Suggested remedial action to include either:

a) Overlying of existing exposed ground horizons within the site locality by suitable hard standing break layers.

b) Overlying of existing exposed ground horizons within the site locality by soft surfacing materials, with suitable underlying break layers to be incorporated.

c) Removal of existing ground horizon to a licensed landfill facility and incorporation of suitable break layers, with subsequent infilling with clean certified soil or similar material.

2: Remediation action

We would consider the most effective and cost efficient remediation methodology within the development area to be a combination of remedial actions a, b, c.

In addition, we would advise that contaminant resistant PE/barrier water supply pipes, set within suitable ducting are to be installed for all potable water provision.

3: Remediation Strategy & Verification

In order to satisfy the Local Authority that these contaminants have been either removed, treated or contained, a Phase 3 Site Remediation Strategy must be completed to demonstrate how the site can be safely developed in respect of the end users.

The Phase 3 remediation strategy will be completed upon finalisation of the development plan for the site and will be based upon the types of surfacing required for the completed site layout. A Phase 4 Verification Report will then be required as the final report, this will be issued upon completion of the development works in order to verify that the Phase 3 recommendations have been satisfied. We would be pleased to advise on the correct course of action for the site to progress.

Following the above conclusions and recommendations we have no further comments to make within the scope of this report.

10. Notes

1. This report relates to the area defined within the report.

2. The report should not be used in any way in connection with adjacent properties.

3. The conclusions and recommendations sections of this site report only relate to the form and extent of development outlined herein for this specific property only and they should not be taken as suitable for any other form or extent of development within the boundaries of this property without further consultation with Approved Site Investigations Ltd.

4. This report is confidential to the named client(s) and we have no liability toward any person not party to commissioning this report.

5. This report may not be reproduced or distributed to third parties without our prior permission other than to directly facilitate the sale or development of the property concerned.

6. This report may not be resold without our prior permission.

7. Unless otherwise expressly stated, nothing in this report shall create or confer any rights or other benefits pursuant to the Contracts (Rights of Third Parties) Act 1999 in favour of any person other than the person commissioning this report.

[redacted]

Approved Site Investigations Ltd

Verified by:
Mr. J.R Williamson (Managing Director)
HND (Industrial Mining Geology)
Dip CSM

11. ANNEXES

Annex 1: Site Plan

Annex 2: Laboratory Results

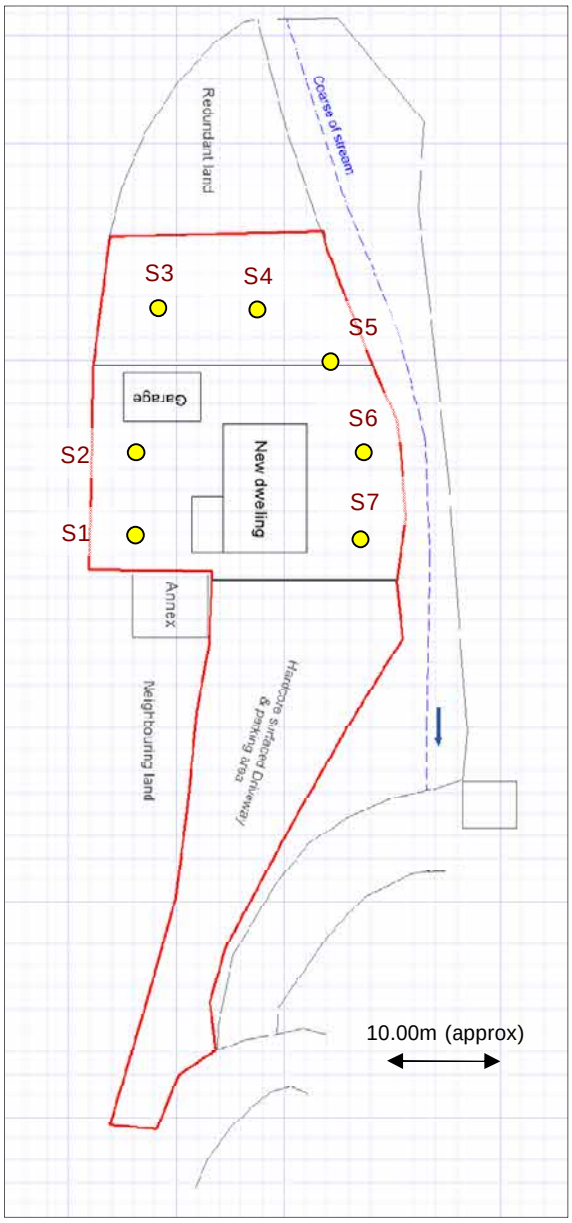
Annex 3: Site Photographs

Annex 4: References

Annex 1: Site Plan

SITE PLAN

Sample location plan with proposed site overlay



North

Land at:

The Chalet
Homefield
Crofthandy
St. Day
Redruth
Cornwall

Sample collection date:

11th October 2016

Site inspected by:

Mr J.R Williamson

Position:
Site Investigation Manager

Revised site plan drawn by ASI

Notes:

- Not to scale, for diagrammatic purposes only.
- Site boundary indicated by the red line.
- Total site area estimated at 937m^2.
- Sample location points indicated in yellow.

Annex 2: Laboratory Results

Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.co.uk

Final Report

Report No.:	16-24785-1
Initial Date of Issue:	19-Oct-2016
Client	Approved Site Investigation
Client Address:	Duchy Business Park Wilson Way Redruth Cornwall TR15 3RT
Contact(s):	Jeremy Williamson
Project	A1150 Croft
Quotation No.:	Q15-03981
Order No.:	
No. of Samples:	7
Turnaround (Wkdays):	5
Date Approved:	19-Oct-2016
Approved By:	
Details:	Glynn Harvey, Laboratory Manager

Date Received:	13-Oct-2016
Date Instructed:	13-Oct-2016
Results Due:	19-Oct-2016

Chemtest
The right chemistry to deliver results

Results - Soil

Project: A1150 Croft

Client: Approved Site Investigation			**Chemtest Job No.:**		16-24785	16-24785	16-24785	16-24785	16-24785	16-24785	16-24785
Quotation No.: Q15-03981			**Chemtest Sample ID.:**		364819	364820	364821	364822	364823	364824	364825
			Client Sample ID.:		1	2	3	4	5	6	7
			Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Date Sampled:		11-Oct-2016	11-Oct-2016	11-Oct-2016	11-Oct-2016	11-Oct-2016	11-Oct-2016	11-Oct-2016
Determinand	**Accred.**	**SOP**	**Units**	**LOD**							
Moisture	N	2030	%	0.020	13	17	15	15	14	16	14
pH	U	2010		N/A	8.3	7.2	7.6	5.7	7.6	7.6	7.2
Sulphate (Acid Soluble)	U	2430	%	0.010	0.049	0.019	0.75	0.20	0.17	0.10	0.079
Arsenic	U	2450	mg/kg	1.0	550	75	2200	2200	4100	2700	1900
Cadmium	U	2450	mg/kg	0.10	0.29	0.11	0.57	0.22	0.50	0.25	0.33
Chromium	U	2450	mg/kg	1.0	21	16	26	14	16	15	25
Copper	U	2450	mg/kg	0.50	230	52	530	410	760	460	680
Mercury	U	2450	mg/kg	0.10	0.20	< 0.10	0.65	0.61	0.93	0.90	0.76
Nickel	U	2450	mg/kg	0.50	17	10	15	12	17	19	28
Lead	U	2450	mg/kg	0.50	140	41	200	230	240	190	160
Selenium	U	2450	mg/kg	0.20	< 0.20	< 0.20	< 0.20	0.38	0.47	< 0.20	< 0.20
Zinc	U	2450	mg/kg	0.50	180	67	280	110	280	150	160
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.co.uk

Annex 3: Overview of Site Photographs

Photograph 1.

View: east

Central extent of site area, showing location of new dwelling.

Photograph 2.

View: south-west

Sample collection area, showing mine waste underlying shallow topsoil horizon.

Photograph 3.

View: west

Sample location S1.

Photograph 4.

View: west

Sample location S2.

Photograph 5.

View: west

Sample location S3, showing topsoil and mine waste horizon.

Photograph 6.

View: south

Sample location S4.

Photograph 7.

View: west

Sample location S5.

Photograph 8.

View: west

Sample location S6.

Photograph 9.

View: north

Sample location S7.

Annex 4: References

BS EN 206-1/BS 8500 Concrete for normal use (2004)

BSI 10175:2011 Investigation of Potentially Contaminated Sites - Code of Practice

BRE Special Digest 1 Concrete in Aggressive Ground (August 2001)

CIRCA Report C552 Contaminated Land Risk Assessment, A Guide To Good Practice (2001)

CLR7 Assessment of Risks to Human Health from Land Contamination: An Overview of the Development of Soil Guideline Values and Related Research (Defra and Environment Agency, 2002a).

CLR8 Potential Contaminants for the Assessment of Land (Defra and Environment Agency, 2002b)

CLR9 Contaminants in Soil: Collation of Toxicological Data and Intake Values for Humans (Defra and Environment Agency, 2002c)

CLR10/11 The Contaminated Land Exposure Assessment Model (CLEA): Technical Basis and Algorithms (Defra and Environment Agency, 2002d)

CLR11 Model Procedures for the Management of Land Contamination (2004)

CLEA Briefing Note 1 (Environment Agency 2004a)

CLEA Briefing Note 3 (Environment Agency 2004c)

EA Guidance for the Safe Development of Housing on Land Affected by Contamination

EA Guidance Waste Destined for Disposal in Landfills (2002)

EA Using Soil Guideline Values, Science report: SC050021 /SGV introduction (March 2009)

E.A Soil Guideline Values

LQM/CIEH GAC Suitable 4 use levels (S4ULs) 2014

Category 4 Screening Levels (SP1010) for Assessment of Land Affected by Contamination (September 2014)

PPG 5 Works In, Near or Liable to Affect Watercourses

PPG 7: Fueling Stations Construction & Operation

Sampling Strategies for Contaminated Land, DETR, 1994, (CLR4)

SEPA Special Waste Regulations (1996)

ASI Core Services:

- ✔ Non Interpretive Environmental Reports
- ✔ Contaminated Land Surveys (Phase 1)
- ✔ Soil & Water Analysis Reports (Phase 2)
- ✔ Land Remediation Reports (Phase 3)
- ✔ Site Verification & Completion Reports (Phase 4)
- ✔ Drilling & Ground Profiling Investigations
- ✔ Trenching & Foundation Inspections
- ✔ Shaft & Mining Feature Securing Works
- ✔ Historic Mine Searches (arranged upon request)

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- Provide competitive pricing tailored to your site requirements.

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