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PROJECT NAME

LISKEARD CATTLE MARKET, ADDITIONAL

REPORT

GROUND INVESTIGATION REPORT (GIR)

CLIENT

MWJV LTD

REFERENCE NO

RP7610-GIR

September 2021

REVISION RECORD					
Revision	Project No.	Document Reference	Date	Author(s)	Checker(s)
00	RP7610-GIR	RP710_liskeard Cattle Market, Additional_GIR_Rev00	September 2021	OC	RL/PG

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APPENDICES

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1 INTRODUCTION

1.1 Commission

Red Rock Geoscience Ltd ('Red Rock') was commissioned by Ward Willams Associates, acting on behalf of MWJV, to undertake an Intrusive Ground Investigation for the proposed redevelopment at Liskeard Cattle Market.

This report was required to complete site assessment following previous investigations (ref:RP7348....) where areas of the site were not accessible to investigations. This report should be read in combination with those previous reports.

A factual and interpretative report was required on the investigation.

1.2 Development Proposals

The development proposals comprise a commercial redevelopment including a creative works, market facilities with associated car parking and access roads.

The development is therefore a commercial scheme which will be assessed in a Commercial & Industrial Land Use to cater for the most sensitive land use proposed.

An outline of the proposals is shown on the Exploratory Hole Location Plan, enclosed in Appendix A.

1.3 Objectives

The geo-environmental objectives of this assessment were to determine whether any contamination is present on site to assist with the safe development.

It should be noted that this investigation is focused towards the proposed developments at the site and may need to be re-assessed should the development proposals be revised.

Environmental regulators use the Source-Pathway-Receptor (SPR) pollution linkage concept when assessing the risk posed by a contaminated site. For a liability to arise, each stage of the pollution linkage must be present. The desk study details the historical and current site uses and establishes environmental sensitivity of the site thus allowing a preliminary conceptual site model identifying potential contaminant sources, migration pathways, and possible receptors to be developed. An assessment of pollutant linkages based on the findings of the desk study and investigation works is also presented.

It should be noted that references to the word 'contamination' in this report do not relate to the statutory definition of Part IIA Contaminated Land (amended in 2000) in accordance with the Department of the Environment, Transport and the Regions[1]. In the context of this report a wider term is used to cover all cases where the actual or suspected presence of substances in, on or under the land may cause risks to people, property, human activities or the environment, regardless of whether or not the land meets the current statutory definition of Part IIA.

Reference should be made to the 'General Notes and Limitations' included in Appendix F at the end of this report, which provide information on the procedures followed in the investigation and data assessment, and explains the context within which this report should be read.

[1] Department of the Environment, Transport & the Regions, 2000, Environmental Protection Act 1990: Part IIA.

The current report was developed on the basis of the various current publications by UK policy makers, in particular the NHBC Standards[2] and model procedures by DEFRA[3].

The geo-environmental sections of this report only address potential ground contamination issues and do not include issues pertaining to ecology, habitat, or wider environmental concerns. Appropriate professionals with expertise in these areas should be consulted.

1.4 Site Description

The site is located in the centre of Liskeard in Cornwall, and is centred on the National Grid Reference 225002, 064391.

The site is located within an urban area. It is irregular in size, previously the site of Liskeard Cattle Market. The site has been demolished and is now boarded by wooden fencing panels. Two cabins are located on the eastern section of the site, directly under where the buildings had been demolished. A Large carpark bounds the site to the north and west, directly east and south are commercial and residential properties.

1.5 Published Geological Information

Published geological information shows the site to underlain by strata of the Saltash Formation – Slate and Siltstone which is likely to be overlain by Residual Soils derived from the in-situ weathering of the bedrock. Some Made Ground may also be present as a result of the sites development. Also shown on the geological map to the north of the subject site is an unnamed igneous intrusion likely to be formed of Microgabbro.

1.6 Background Information

Red Rock previously undertook an investigation on the land immediately south and east of the site with this area of site inaccessible due to the presence of buildings. Further work was recommended once demolition had taken place. A summary of the findings are detailed below from Report Reference RP7348_Liskeard Cattle Market GIR, September 2020. An addendum Letter Report was re-issued in September 2021.

- Ground conditions generally comprise Made Ground overlying Residual Soil and in turn, the Saltash Formation.

- Traditional strip foundations will be suitable for a net safe bearing capacity of up to 150kN/m^2. A fully suspended floor is recommended.

- As long as areas are hard surfaced, no remedial measures will be required. A single sample of lead recorded a value above the commercial guideline values.

- Three Made Ground samples and a single natural ground sample were classified as Non-hazardous however an additional two samples were classified as Hazardous.

- One sample of Made Ground recorded solid and leachate parameters in concentrations below the inert waste thresholds however one sample had elevated TOC.

- The Letter Report concluded that no remedial measures will be required and that soakaways will provide a suitable form of drainage.

[2] NHBC, 2019, Standards.

[3] https://www.gov.uk/guidance/land-contamination-how-to-manage-the-risks, based on Environment Agency, 2016, Model procedures for the management of land contamination. Contaminated Land Report 11.

2 FIELDWORK

2.1 Methodology

The investigation comprised three (3 no.) Trial Pits (TP01-TP03).

The ground investigation fieldwork was undertaken in general accordance with BS 5930 (2015)[4]. Samples collected were typically classed a Category 'C' in accordance with BSI (2007)[5], and assessment of strength and consistency were undertaken using traditional field techniques as described in BSI (2002)[6]. Soils have been logged, generally in accordance with BSI (2004)[7]. Where relevant, the bedrock was logged in accordance with BSI (2003)[8].

The locations of the exploratory holes are shown on the Exploratory Hole Location Plan, enclosed as Appendix A.

The fieldwork was undertaken on the 23rd August 2021 and was supervised full-time by an engineering geologist.

2.2 Trial Pits

Three (3 no.) trial pits were excavated using a JCB 3CX to depths of between 1.70 and 2.50m below existing ground level to provide information on geo-environmental conditions. The trial pits were positioned by Red Rock in relation to development layouts, within the access limitations imposed by the existing site layout. A number of site cabins were present on site, as well as services so locations for exploratory holes were limited.

The profiles of strata, or other features, were recorded as excavation proceeded and measurements taken from ground level. Trial pits were entered where safe to do so to allow logging, in-situ testing and sampling. Subsoil samples were taken where appropriate for subsequent laboratory examination and analyses.

TP02 encountered an old clay pipe at approximately 1.20m. The pit was fenced off and left open and the pipe remained dry for this period.

On completion, the trial pits were backfilled with arisings.

4 British Standards Institute. (2015). BS 5930 with Addendum 2: Code of practice for site investigations. London: BSI.

5 British Standards Institute. (2007). BS EN 1997-2: Eurocode 7 – Geotechnical design. Part 2 Ground investigation and testing. London: BSI.

6 British Standards Institute. (2002). BS EN ISO 14688-1:2002. Geotechnical investigation and testing – Identification and classification of soil – Part 1: Identification and description: London BSI

7 British Standards Institute (2004). BS EN ISO14688-2:2004. Geotechnical investigation and testing – Identification and classification of soil – Part 2: Principles for a classification. London: BSI

8 British Standards Institute. (2003). BS EN ISO 14689-1: Geotechnical investigation and testing – Identification and classification of rock – Part 1: Identification and description. London: BSI

3 LABORATORY TESTING

3.1 Contamination Laboratory Testing

On the basis of the past site usage and observations during the intrusive investigations, the following chemical testing was undertaken on selected near surface soil samples.

Table 3.1: Geo-environmental Laboratory Testing - Soils

Test	Number of Samples
Metal & metalloid suite: arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium and zinc and pH	4
Total Petroleum Hydrocarbons (3-Band Speciation)	3
Speciated Polycyclic Aromatic Hydrocarbons	4
Asbestos	3
Organic Matter	4

The geo-environmental Laboratory test results are enclosed as Appendix C.

4 GROUND CONDITIONS ENCOUNTERED

4.1 Strata Encountered

The strata sequence encountered in the exploratory holes were in general agreement with that expected based on the published information, and are summarised below:

4.2 Made Ground

Below the concrete, material interpreted as Made Ground was encountered only in TP02, to a depth of 1.4m. This material comprised dark brown, slightly sandy clayey gravel. This material also included frequent cobbles and occasional fragments of brick and wood. A clay pipe was encountered at 1.20m.

4.3 Residual Soil

Material interpreted as Residual Soil was encountered in TP01-TP03, to proven depths of between 1.60 and 2.00m. These materials typically comprised a medium dense to very dense, dark greyish brown, slightly clayey slightly sandy GRAVEL. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone and micro gabbro. This material also contains frequent cobbles.

4.4 Saltash Formation

Material interpreted as the Saltash Formation was encountered below the Residual Soil in TP01, to a depth of 2.50m. This material typically comprised a grey, extremely weak MUDSTONE. The mudstone is weathered, with frequent brown clay infilling.

4.5 Signs of Contamination

Although Made Ground was encountered in TP02, there was no visual or olfactory evidence of contamination noted.

4.6 Groundwater

Groundwater was not encountered during the investigation.

5 GEO-ENVIRONMENTAL ASSESSMENT

5.1 Assessment of Geo-environmental Results

Generic Assessment Criteria for Human Health

The Contaminated Land Exposure Assessment (CLEA) model enables the derivation of site-specific assessment criteria for contaminants present on a site. The most recent model (CLEA v1.07) was released in September 2009 together with guidance documents including toxicological reports for selected contaminants and standard land use scenarios. In addition, Land Quality Management (LQM) in association with Chartered Institute of Environmental Health (CIEH) published in 2009 Generic Assessment Criteria (GAC) values for a number of other contaminants not included in the EA publication. The 2009 generic assessment criteria values have been revised in 2015 and published as 'Suitable For Use Levels' (S4ULs) which have been utilised in this report for assessment of contaminant levels. In addition, guideline values for use in Part IIA determinations ('Category 4 screening Levels' – C4SLs) were also published in 2014 by DEFRA which included lead. In the absence of a lead S4UL, the C4SL for lead was utilised.

In view of the development proposals, the site is being considered under a Commercial & Industrial Land Use scenario and the human health generic assessment criteria guideline values used in this assessment are enclosed in Appendix D.

Laboratory contamination results are included as Appendix C. The assessment of the results is summarised, and where appropriate, discussed in further detail below.

Assessment of Soil Test Results

The following table summarises the assessment of the soil test results and provides comments and remedial recommendations.

Table 5.1: Assessment of Geo-environmental Soil Results

Determinants	No of Samples Tested (Made Ground)	No of Samples Tested (Natural Ground)	Comments	Recommendations
Metals & Metalloids	1	3	Metal and metalloids were recorded in very low concentrations, all below their respective commercial / industrial land use guidelines. Statistical analyses not required.	No remedial measures required
Polycyclic Aromatic Hydrocarbons (PAHs)	1	3	Very low PAH concentrations detected, all below their respective commercial / industrial land use guidelines.	No remedial measures required
Total Petroleum Hydrocarbons (3-Band Speciation)	2	1	Very low TPH concentrations detected, all below their respective commercial / industrial land use guidelines.	No remedial measures required
Asbestos	2	1	Asbestos not detected in any of the samples screened	No remedial measures required

5.2 Assessment of Pollutant Linkages

A number of exposure pathways link the contamination to the receptor and potential risks are dependent on active pathways. The qualitative assessment of potential pollutant linkages based on the findings of the investigations involves the matching of the identified sources of contamination to the receptors through the possible migration pathways. These links must be completed for there to be any risk associated with the site and its development.

This assessment is presented in terms of the Source (S), Pathway (P) and Receptor (R) concept and applying a qualitative value judgement to this appraisal. The assessment assigns a level of risk to each SPR link based on the probability and potential consequence of the risk being realized. The risk phrases and matrices are enclosed in Appendix E.

5.3 Geo-environmental Recommendations

Geo-environmental test results recorded metal, metalloid, and hydrocarbon contamination below their respective commercial / industrial guidelines. Asbestos was not detected in the samples screened. The site is considered of Negligible risk to human health the wider environment and remedial measures are not required with respect to soils and groundwater.

According to a previous desk study investigation undertaken by third parties, the site is located within an area affected by radon and full radon protection is required.

The following are general recommendations in line with good practice:

- Adequate precautions and appropriate personal hygiene and safety protocols should be employed by all construction workers on site at all times.
- Regular inspections should be carried out by ground workers during any excavation work, and advice should be sought in the event that unexpected ground conditions are encountered. Should any visual or olfactory signs of contamination be found during construction works, soils should be tested and assessed.
- Should further testing and assessment occur, where unacceptable risks are identified, appropriate remedial measures would need to be implemented. A detailed remediation strategy should be prepared, any remedial works and associated clean-up levels would need to be discussed with and approved by the Regulatory Authorities. Additionally, a Validation Statement would need to be prepared upon completion of any remedial works, detailing the works undertaken and the results of the associated validation testing.

Table 5.2: Geo-Environmental Risk Assessment

Receptors	Contaminant Sources	Probability of Pollutant Linkage Being Present	Severity of Consequence if Contaminant and Pollutant Linkage Present	Risk Assessment	Recommendations
Human Health	PAHs and metals below the commercial land use guidelines	2 - UNLIKELY (Pollutant linkage may be present, but the circumstances are such that an event is improbable, even in the long term)	4 - MEDIUM (Chronic human health effects)	VERY LOW RISK (Probability x Severity = 6 to 9)	The risk has been classified as NEGLIGIBLE or VERY LOW. Contamination unlikely and further assessment not required. Personal protective equipment during all site works recommended as good practice.
	Asbestos: Asbestos sources not identified	2 - UNLIKELY (Pollutant linkage may be present, but the circumstances are such that an event is improbable, even in the long term)	5 - SEVERE (Acute or fatal human health effects)	LOW RISK (Probability x Severity = 10 to 12)	Potential asbestos sources not identified. Further assessment not required.
Human Health - Ground Gas	Radon: The site is within an area likely to be affected by radon gas.	5 - HIGH LIKELIHOOD (There may be a pollutant linkage present and an event appears very likely in the short term or almost inevitable in the long term; or there is already evidence of harm to receptor)	4 - MEDIUM (Chronic human health effects)	HIGH (Probability x Severity = 20)	Full radon protection required.

Table 5.2: Geo-Environmental Risk Assessment

Receptors	Contaminant Sources	Probability of Pollutant Linkage Being Present	Severity of Consequence if Contaminant and Pollutant Linkage Present	Risk Assessment	Recommendations
	Additional Ground Gas Sources (excluding radon): No ground gas sources identified within 250m of the site.	2 - UNLIKELY (Pollutant linkage may be present, but the circumstances are such that an event is improbable, even in the long term)	4 - MEDIUM (Chronic human health effects)	VERY LOW RISK (Probability x Severity = 6 to 9)	Potential ground gas sources (excluding radon) not identified within 250m. Further assessment not required.
Flora and Fauna	No visual signs of vegetation distress or any indication that soils may be toxic to Fauna or Flora. Any impact to vegetation would be localised in nature.	2 - UNLIKELY (Pollutant linkage may be present, but the circumstances are such that an event is improbable, even in the long term)	3 - MILD (Damage to non-sensitive ecosystems or species)	VERY LOW RISK (Probability x Severity = 6 to 9)	The risk has been classified as NEGLIGIBLE or VERY LOW. Contamination unlikely and further assessment not required in view of the expected ground conditions and proposals.
Water Resources	Very low concentrations of arsenic and PAHs.	2 - UNLIKELY (Pollutant linkage may be present, but the circumstances are such that an event is improbable, even in the long term)	3 - MILD (Damage to non-sensitive controlled waters)	VERY LOW RISK (Probability x Severity = 6 to 9)	The risk has been classified as NEGLIGIBLE or VERY LOW. Contamination unlikely and further assessment not required in view of the expected ground conditions and proposals.

Table 5.2: Geo-Environmental Risk Assessment

Receptors	Contaminant Sources	Probability of Pollutant Linkage Being Present	Severity of Consequence if Contaminant and Pollutant Linkage Present	Risk Assessment	Recommendations
Future Built Environment	Very low concentrations of arsenic and PAHs.	2 - UNLIKELY (Pollutant linkage may be present, but the circumstances are such that an event is improbable, even in the long term)	3 - MILD (Minor damage buildings or structures)	VERY LOW RISK (Probability x Severity = 6 to 9)	The risk has been classified as NEGLIGIBLE or VERY LOW. Contamination unlikely and further assessment not required.

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Appendix A. EXPLORATORY HOLE LOCATION PLAN

KEY

Trial Pit

Project	Liskeard Cattle Market, Cornwall
Title	Exploratory Hole Location Plan
Drawing no	DW01
Revision	RV00
Scale	Not To Scale

RED ROCK GEO

Red Rock Geoscience Ltd
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Appendix B. TRIAL PIT RECORDS

Trial Pit Log

RED ROCK GEO			TrialPit No TP01 Sheet 1 of 1
Project Name: Liskeard Cattle Market	Project No. RP7610	Co-ords: Level:	Date 23/08/2021
Location: Liskeard		Dimensions (m): 2.20 × 0.60, Depth 2.50	Scale 1:25
Client: MWJV			Logged OC

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.20			Concrete
	0.40	ES					Medium dense dark brown slightly clayey slightly sandy GRAVEL. Gravel is fine to coarse, sub-angular to sub-rounded mudstone (RESIDUAL SOIL).
	0.90	ES		1.00			Medium dense dark greyish brown slightly clayey slightly sandy GRAVEL. Gravel is fine to coarse, sub-angular to sub-rounded mudstone. Material also contains frequent cobbles and occasional boulders (RESIDUAL SOIL).
	1.20	ES		1.60			Light grey extremally weak MUDSTONE. Mudstone is weathered, frequent brown clay infilling (SALTASH FORMATION).
				2.50			End of Pit at 2.50m

1 2 3 4 5

Remarks: CAT scanned prior to excavation. No groundwater encountered. Excavated using a JCB 3CX. Trial Pit terminated at target depth. Trial pit backfilled upon completion.

Stability: Unstable - Minor wall collapse

AGS

Trial Pit Log

RED ROCK GEO

TrialPit No: TP02
Sheet 1 of 1

Project Name: Liskeard Cattle Market	Project No. RP7610	Co-ords:	Date 23/08/2021
Location: Liskeard		Dimensions (m): 2.20 × 0.60	Scale 1:25
Client: MWJV		Depth 2.00	Logged OC

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
							Concrete
				0.20			
	0.30	ES					Tarmac
				0.35			
	0.50	ES					Medium dense dark brown slightly sandy clayey GRAVEL. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone and micro-gabbro. Material also contains frequent cobbles and fragments of brick and wood (MADE GROUND).
	0.90	ES					
							Between the depths of 1.20 and 1.40m: An old drain was found across the pit.
				1.40			Medium dense dark brown slightly clayey sandy GRAVEL. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone and micro-gabbro. Material also contains frequent cobbles (RESIDUAL SOIL).
				2.00			End of Pit at 2.00m

Remarks: CAT scanned prior to excavation. No groundwater encountered. Excavated using a JCB 3CX. Trial Pit terminated at target depth. Trial pit backfilled upon completion. An old dry drain was identified at approximately 1.20m.

Stability: Stable

AGS

Trial Pit Log

RED ROCK GEO

TrialPit No: TP03
Sheet 1 of 1

Project Name: Liskeard Cattle Market	Project No. RP7610	Co-ords:	Date 23/08/2021
Location: Liskeard		Dimensions (m): 2.00 × 0.60	Scale 1:25
Client: MWJV		Depth 1.70	Logged OC

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.20			Concrete
	0.30	ES					Medium dense dark greyish brown slightly clayey slightly sandy GRAVEL. Gravel is fine to coarse, sub-angular to sub-rounded mudstone. Material also contains frequent cobbles and rootlets (RESIDUAL SOIL).
	0.60	ES					
	1.00	ES					
				1.50			Very dense dark greyish brown slightly clayey sandy GRAVEL. Gravel is fine to coarse, sub-angular to sub-rounded mudstone and microgabbro. Material also contains frequent cobbles (RESIDUAL SOIL).
				1.70			End of Pit at 1.70m

Remarks: CAT scanned prior to excavation. No groundwater encountered. Excavated using a JCB 3CX. Trial Pit terminated due to hard strata. Trial pit backfilled upon completion.

Stability: Stable

AGS

Appendix C. GEO-ENVIRONMENTAL LABORATORY TEST RESULTS

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f: 01923 237404
e: reception@i2analytical.com

Analytical Report Number : 21-95404

Project / Site name:	Liskeard Cattle Market	**Samples received on:**	25/08/2021
Your job number:	RP7610	**Samples instructed on/ Analysis started on:**	26/08/2021
Your order number:	RP7610	**Analysis completed by:**	08/09/2021
Report Issue Number:	1	**Report issued on:**	08/09/2021
Samples Analysed:	4 soil samples		

Signed: Izabela Wójcik

Izabela Wójcik
Technical Reviewer (Reporting Team)
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils - 4 weeks from reporting
leachates - 2 weeks from reporting
waters - 2 weeks from reporting
asbestos - 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

Analytical Report Number: 21-95404
Project / Site name: Liskeard Cattle Market
Your Order No: RP7610

Lab Sample Number				1987484	1987485	1987486	1987487
Sample Reference				TP01	TP02	TP03	TP01
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.90	0.50	0.60	0.40
Date Sampled				23/08/2021	23/08/2021	23/08/2021	23/08/2021
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**				
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	11	13	11	13
Total mass of sample received	kg	0.001	NONE	1.0	1.0	1.0	1.0
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	-
General Inorganics							
pH - Automated	pH Units	N/A	MCERTS	7.3	7.8	7.4	7.1
Organic Matter (automated)	%	0.1	MCERTS	0.3	0.9	0.4	1.2
Speciated PAHs							
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Chrysene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Total PAH							
Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	< 0.80	< 0.80	< 0.80	< 0.80
Heavy Metals / Metalloids							
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	75	74	44	78
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0	< 4.0
Chromium (III)	mg/kg	1	NONE	40	31	44	40
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	40	31	44	40
Copper (aqua regia extractable)	mg/kg	1	MCERTS	40	54	34	44
Lead (aqua regia extractable)	mg/kg	1	MCERTS	37	260	36	69
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	81	60	68	75
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	180	190	170	230

Analytical Report Number: 21-95404
Project / Site name: Liskeard Cattle Market
Your Order No: RP7610

Lab Sample Number				1987484	1987485	1987486	1987487
Sample Reference				TP01	TP02	TP03	TP01
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.90	0.50	0.60	0.40
Date Sampled				23/08/2021	23/08/2021	23/08/2021	23/08/2021
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**				
Petroleum Hydrocarbons							
Petroleum Range Organics (C6 - C10)	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	-
TPH (C10 - C25)	mg/kg	10	MCERTS	< 10	< 10	< 10	-
TPH (C25 - C40)	mg/kg	10	MCERTS	< 10	< 10	< 10	-

U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number : 21-95404
Project / Site name: Liskeard Cattle Market

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
1987484	TP01	None Supplied	0.9	Brown clay and sand with gravel.
1987485	TP02	None Supplied	0.5	Brown clay and sand with gravel.
1987486	TP03	None Supplied	0.6	Brown clay and sand with gravel.
1987487	TP01	None Supplied	0.4	Brown clay and sand with gravel.

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Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	MCERTS
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
PRO (Soil)	Determination of hydrocarbons C6-C10 by headspace GC-MS.	In-house method based on USEPA8260	L088-PL	W	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
TPH Oils (Soils)	Determination of extractable hydrocarbons in soil by GC-MS/FID.	In-house method with silica gel split/clean up.	L076-PL	D	MCERTS
DRO (Soil)	Determination of extractable hydrocarbons in soil by GC-MS/FID.	In-house method with silica gel split/clean up.	L076-PL	D	MCERTS
Cr (III) in soil	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
Organic matter (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.
For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Appendix D. GENERIC ASSESSMENT CRITERIA VALUES

RED ROCK GEO

Generic Assessment Criteria for Protection of Human Health

Commercial / Industrial		Assessment Criteria	Statutory	Non-Statutory	Plymouth	West Devon	Atkins	Statutory Part 2A
			SGVs (1)	S4ULs (2)	(3)	(4)	(5)	C4SLs (6)
Metals and Metalloids Cyanide (mg/Kg)	Arsenic	640.00	640.00	640.00				640.00
	Cadmium	230.00	230.00	190.00 (7)				410.00
	Chromium III	8,600.00		8,600.00				
	Chromium VI	33.00		33.00				49.00
	Copper	68,000.00		68,000.00				
	Mercury inorganic	1,100.00	Withrawn	1,100.00				
	Nickel	980.00		980.00				
	Lead	6,000.00			6,000.00 (6)			6,000.00
	Selenium	12,000.00	13,000.00	12,000.00				
	Zinc	730,000.00		730,000.00				
	Berylium	12.00		12.00				
	Boron	240,000.00		240,000.00				
	Mercury Elemental	25.80	Withrawn	25.80 (8)				
	Mercury Methyl	320.00	Withrawn	320.00				
	Vanadium	9,000.00		9,000.00				
	Cyanide	34.00					34.00	

Commercial / Industrial		Assessment Criteria S4ULs (2)			Statutory Part 2A
		1%	2.5%	6%	C4SLs (6)
PAH Congeners (mg/Kg)	Naphthalene	76.40 (7)	183.00 (7)	432.00 (7)	
	Acenaphthylene	83,000.00	97,000.00	100,000.00	
	Acenaphthene	84,000.00	97,000.00	100,000.00	
	Fluorene	63,000.00	68,000.00	71,000.00	
	Phenanthrene	22,000.00	22,000.00	23,000.00	
	Anthracene	520,000.00	540,000.00	540,000.00	
	Fluoranthene	23,000.00	23,000.00	23,000.00	
	Pyrene	54,000.00	54,000.00	54,000.00	
	Benzo(a)anthracene	170.00	170.00	180.00	
	Chrysene	350.00	350.00	350.00	
	Benzo(b)fluoranthene	44.00	44.00	45.00	
	Benzo(k)fluoranthene	1,200.00	1,200.00	1,200.00	
	Benzo(a)pyrene	35.00	35.00	36.00	76.00
	Indeno(1,2,3-cd)pyrene	500.00	510.00	510.00	
	Dibenzo(ah)Anthracene	3.50	3.60	3.60	
	Benzo(g,h,i)perylene	3,900.00	4,000.00	4,000.00	
	Coal Tar (3)	15.00	15.00	15.00	

Commercial / Industrial		Assessment Criteria S4ULs (2)			Statutory Part 2A
		1%	2.5%	6%	C4SLs (6)
TPH Speciation (mg/Kg)	TPH Aliphatic EC5-6	304.00 (8)	558.00 (8)	1,150.00 (8)	
	TPH Aliphatic EC6-8	144.00 (8)	322.00 (8)	736.00 (8)	
	TPH Aliphatic EC8-10	78.00 (8)	190.00 (8)	451.00 (8)	
	TPH Aliphatic EC10-12	48.00 (8)	118.00 (8)	283.00 (8)	
	TPH Aliphatic EC12-16	24.00 (8)	59.00 (8)	142.00 (8)	
	TPH Aliphatic EC16-35	1,600,000.00	170,000.00	1,800,000.00	
	TPH Aliphatic EC35-44	1,600,000.00	170,000.00	1,800,000.00	
	TPH Aromatic EC5-7	1,220.00 (8)	2,260.00 (8)	4,710.00 (8)	
	TPH Aromatic EC7-8	869.00 (8)	1,920.00 (8)	4,360.00 (8)	
	TPH Aromatic EC8-10	613.00 (8)	1,500.00 (8)	3,580.00 (8)	
	TPH Aromatic EC10-12	364.00 (8)	899.00 (8)	2,150.00 (8)	
	TPH Aromatic EC12-16	36,000.00	37,000.00	38,000.00	
	TPH Aromatic EC16-21		28,000.00		
	TPH Aromatic EC21-35		28,000.00		
	TPH Aromatic EC35-44		28,000.00		
	TPH Ali / Aro EC44-70		28,000.00		
	TPH 3-Band C6-10	78.00 (8)	190.00 (8)	451.00 (8)	
	TPH 3-Band C10-21	24.00 (8)	59.00 (8)	142.00 (8)	
	TPH 3-Band C21-40		28,000.00		

Commercial / Industrial		Assessment Criteria S4ULs / GAC		
		1%	2.5%	6%
Misc. Organics (mg/Kg)	BTEX Benzene (1)	27.00	47.00	90.00
	BTEX Toluene (1)	869.00 (8)	1,920.00 (8)	4,360.00 (8)
	BTEX Ethylbenzene (1)	518.00 (8)	1,220.00 (8)	2,840.00 (8)
	BTEX m Xylene (1)	478.00 (8)	1,120.00 (8)	2,620.00 (8)
	BTEX p Xylene (1)	625.00 (8)	1,470.00 (8)	3,460.00 (8)
	BTEX o Xylene (1)	576.00 (8)	1,350.00 (8)	3,170.00 (8)
	Phenol (1)	440.00	690.00	1,300.00
	Chlorophenols (1)	3,500.00	4,000.00	4,300.00
	Pentachlorophenol (1)		400.00	
	Methyl Tributyl Ether (MTBE) (2)	7,900.00	13,000.00	2,400.00
	Tributyl Tin oxide (TBTO) (2)	130.00	180.00	200.00
	1,2,4-trimethylbenzene (2)	42.00	99.00	220.00
	Isopropylbenzene (2)	1,400.00	3,300.00	7,700.00
	Propylbenzene (2)	4,100.00	9,700.00	21,000.00
	Cresols (total) (2)	160,000.00	180,000.00	
	Styrene (2)	3,300.00	6,500.00	11,000.00

Notes:

(1) Environment Agency SGV, 2009
(2) LQM / CIEH S4UL, 2015 and where unavailable CL:AIRE 2009 or In-House derived using CLEA UK V1.07 with C4SL setting
(3) Arsenic criteria based on Clark, L.M., 2012, A critical review of the policy for arsenic risk assessments in Plymouth, Master of Science Dissertation
(4) West Devon Borough Council, Arsenic Advice Note for Environmental Health Officers
(5) No guideline value has been published for cyanide for the UK setting. A generic value derived by ATKINS is used
(6) DEFRA, 2014, Category 4 Screening Levels (C4SLs)
(7) LQM / CIEH GAC, 2015, based on a lifetime exposure via the oral, inhalation and dermal pathways
(8) Value set at the vapour saturation limit. The CLEA UK model does not take into consideration oral or dermal exposure via direct contact with free phase product, nor does it consider inhalation exposure from vapours derived from free phase product (i.e. LNAPLs and DNAPLs). as a result, the model can under-estimate the risk at higher soil concentrations. This may happen when the calculated S4UL or SGV exceeds the soil saturation limit. On this basis the SGV/S4UL should be set at, or equal to, the aqueous or vapour soil saturation limits (whichever the lowest). However, where the vapour inhalation pathway is not considered to be a critical pathway (i.e. <10% of exposure total) this rule can be over-ridden. This has been the approach of the EA and LQM/CIEH and EIC/AGS/CL:AIRE in the generation of their respective generic assessment criteria values.

It is generally the approach of Red Rock Geoscience Ltd to set the GACs at the vapour saturation limit unless the vapour inhalation pathway is less than 10% of the total exposure.

Notes on the Derivation of Generic Assessment Criteria (SGVs / S4ULs):

* Calculation of SGVs and S4ULs reflect a minimal risk approach
* The typical soil scenario considered appropriate for the derivation of the generic value was SANDY LOAM
* All chemical parameters as per CLEA UK default values. Default pH=7. Default Soil Organic Matter (SOM)=1%, 2.5 or 3%, and 6%
* Metals and Metalloids not sensitive to soil organic matter variations
* Vapour inhalation rates updated as per USEPA 2011
* Exposure values changed as per S4UL publication, 2015. All other soil, land use, and exposure parameters were taken as per EA Publication EA SC050021/SR3 "Updated Technical Background to the CLEA Model", 2009

Notes on Lead:

The calculation of a generic assessment criteria for lead differs from the calculation of guideline values for other contaminants in that it uses the blood level concentrations as opposed to ingestion and inhalation intake concentrations. The approach taken by DEFRA for the calculation of the C4SL for lead utilised the IEUBK and Carlisle & Wade models to estimate intake values on the basis of blood level concentrations that could then be used in the CLEA UK model. As a result the CLEA UK Model can now be used to calculate a GAC for lead. However, in the absense of data for calculation of a lead GAC reflecting the minimal risk approach, the C4SL approach reflecting a low level of toxicological concern is used instead.

Appendix E. RISK PHRASES & MATRICES

RISK PHRASES AND MATRICES

Classification of Probability of Risk	
Classification	**Definition**
High Likelihood	There may be a pollutant linkage present and an event appears very likely in the short term or almost inevitable in the long term; or there is already evidence of harm to receptor.
Likely	Pollutant linkage may be present, and it is probable that there will be a long term risk and possibly a short term risk.
Low Likelihood	Pollutant linkage may be present, and it is possible that there will be a long term risk, though not certain
Unlikely	Pollutant linkage may be present, but the circumstances are such that an event is improbable, even in the long term.
No Risk Identified	No contaminants identified above guideline values likely to pose a risk to human health, fauna, flora, the water resources or the future built environment.

Classification of Severity of Consequence	
Classification	**Definition**
Severe	Acute risks to human health Catastrophic damage to buildings and property Major pollution of controlled waters
Medium	Chronic risk to human health Pollution of sensitive controlled waters Significant effects on sensitive ecosystems or species Significant damage to buildings or structures
Mild	Pollution of non-sensitive waters Minor damage to buildings or structures
Minor	Requirement for protective equipment during site works to mitigate health effects Damage to non-sensitive ecosystems or species
None Identified	Damage to human health, and the wider environment not expected. Requirement for basic protective equipment during site works still required as good practice.

Risk Matrix of Probability and Consequence		Consequences				
		Severe	**Medium**	**Mild**	**Minor**	**None**
Probability of Risk	**High Likelihood**	Very High	High	Moderate	Low	Very Low
	Likely	High	Moderate	Low	Very Low	Negligible
	Low Likelihood	Moderate	Low	Very Low	Negligible	Negligible
	Unlikely	Low	Very Low	Negligible	Negligible	Negligible
	No Risk identified	Very Low	Negligible	Negligible	Negligible	Negligible

NOTES:

Contaminated Land Risk Assessment involves the matching of the identified potential sources of contamination to the receptors through the possible migration pathways. These links must be completed for there to be any risk associated with the site.

This assessment of pollutant linkages is presented in terms of the Source (S), Pathway (P) and Receptor (R) concept and applying a qualitative value judgement to this appraisal. The assessment assigns a level of risk to each SPR link based on the probability and potential consequence of the risk being realised. The scale of risk is based on matrices as presented in the tables.

Appendix F. GENERAL NOTES AND LIMITATIONS

General Notes

The report has been prepared for the exclusive use of the Client named in the document and copyright remains with Red Rock Geoscience Ltd (RRG). Prior written permission must be obtained to reproduce all or part of the report. It has been prepared on the understanding that you will only disclose its contents to parties directly involved in the current investigation, preparation, and development of the site. Further copies may be obtained with the Client's written permission, from RRG who retains the master copy of the report.

Reports are prepared for the specific purpose stated in the document and in relation to the nature and extent of proposals made available to RRG. The recommendations should not be used for other schemes on or adjacent to the site. The assessment of the factual data, where called for, is provided to assist the Client and his Engineer and/or Advisers in the preparation of the designs.

All assessments and recommendations should be forwarded to the relevant planning authorities for comment and approval prior to implementation.

Phase I Assessments

Phase I desk study reports are largely based on data supplied by third parties and is therefore interpreted in accordance with the guidance notes and limitations provided by the data supplier.

Site walkover comments are based on simple observation by the Engineer and do not include extensive environmental, geotechnical, or structural surveys.

Phase II Assessments

Phase II site investigation reports are based on the ground and groundwater conditions encountered in the exploratory holes, together with the results of field and laboratory testing in the context of the proposed development. There may be special conditions appertaining to the site, which have not been revealed by the investigation and which may not have been taken into account in the report. RRG cannot be responsible for any changes in ground conditions following completion of fieldwork (e.g. subsequent spillages, leakages, excavations, etc. on or adjacent to the site).

Positioning of exploratory holes depends on the existence of utility services, existing structures, and / or access restrictions.

Methods of design and/or construction other than those proposed or referred to in the report may require consideration during the evolution of the proposals and if this is the case further assessment of the geotechnical data appropriate to these methods would be required.

The accuracy of results reported depends upon the technique of measurement, investigation, and test used and these values should not be regarded necessarily as characteristics of the strata as a whole.

The evaluation and conclusions do not preclude the variation in ground conditions between the test holes. Hence this report should be used in this context and not be construed necessarily as a comprehensive characterisation of the entire site conditions.

The samples selected for environmental and geotechnical laboratory testing are prepared and tested by an UKAS accredited and when possible or necessary MCERTS accredited external laboratory.

Any unavoidable variations from specified procedures are identified in the report.

Whilst reports may have expressed an opinion on possible configurations of strata between or beyond exploratory holes, or on the possible presence of features based on visual, verbal, written, cartographical, photographic, or published evidence, this is for guidance only and no liability can be accepted for its accuracy.

Ground conditions should be monitored during the construction of the works by ground-workers and the recommendations of the report re-evaluated as necessary.

Any comments on groundwater conditions have been based on observations made at the time of the investigation, unless specifically stated otherwise. It should be noted, however, that the observations are subject to the method and speed of boring, drilling, or excavation and that groundwater levels will vary due to seasonal effects and rainfall.

Where the investigation has taken account of possible effects of gases from fill or natural sources within, below, or outside the site, assessment has been based on current guidance provided by the CIRIA 665 Publication.

Unless specifically stated, the investigation has not taken account of any environmental soil or water guideline values other than the current and approved guideline values for the United Kingdom. Where these are not available, others such as the Canadian Environmental Guidelines, the US EPA guidelines and/or European Union Drinking Water Standards may be used as indicative only.

Site-specific assessment criteria values have been calculated using the current CLEA UK model V1.07, published by the Environment Agency in 2015.