

Technical Note

Project: Coed Darcy

Subject: NSR Embankment Ground Investigation Summary

Client:	Revantage		
Project No:	04020	Version:	A
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Date:	26/11/2024	Approved:	Charlotte Smith

I Introduction

This technical note has been prepared to provide a summary of ground investigation completed on the North Site Reservoir (NSR) embankment at Coed Darcy, located at the former Llandarcy Oil Refinery in Neath Port Talbot. The embankment is located at the western end of the NSR, as shown on the drawing presented in Appendix A.

Since the closure of Llandarcy Oil Refinery the NSR no longer serves a purpose and Revantage intend to complete a formal discontinuance process which will include drawing down the water, removal of the existing reservoir embankment, minor reprofiling of the sides of the shallow valley and reinstating the natural surface water flows. The embankment is approximately 10m high and approximately 250m in length. Historical records suggest the embankment has a relatively linear puddle clay core and the slopes are understood to have been formed with material largely won from the local area. Stone rip rap is visible at the water level on the upstream side of the embankment.

The purpose of this technical note is to provide a summary of the ground investigation undertaken, an overview of the ground conditions recorded, and the findings of a generic quantitative human health risk assessment and a preliminary appraisal of risks to controlled waters. The overall aim of the work is to establish the soils' suitability for reuse within the wider NSR footprint.

Assessment of the geotechnical properties of the embankment soils is beyond the scope of this technical note.

2 Ground Investigation

2.1 Scope of Works

The scope of the works was defined in Stillwater Associates Ground Investigation Specification and Invitation to Tender document, dated May 2023. PJA provided geo-environmental input to the ground investigation specification. The ground investigation was carried in July 2024 by Terra Firma under the direction of Stillwater Associates.

The completed scope of works comprised the following:

- 6no. handheld windowless sampling boreholes to depths of 2m and 5m along the eastern and western slopes of the embankment;
- 1no. hand-excavated trial pit to a depth of 0.50mbgl;
- 5no. windowless sampling boreholes to depths of between 3.30m to 13m, with Standard Penetration Testing (SPTs) at 1m intervals along the crest of the embankment;
- Logging of excavated soils in accordance with BS 5930:2015+A1:2020; and
- Collection of environmental samples and disturbed and undisturbed geotechnical samples for laboratory analysis.

Boreholes were backfilled with bentonite on completion of excavation and the hand-excavated trial pit was backfilled with arisings.

2.2 Environmental Sampling

Environmental soil samples were recovered by a Terra Firma engineer from all borehole locations and dispatched under full chain of custody to Eurofins Chemest Ltd, a UKAS-accredited laboratory.

Thirteen Made Ground samples collected from depths ranging from 0.10m to 10.60m were scheduled for the following suite of analysis:

- Metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, vanadium, and zinc)
- Asbestos identification
- pH
- Soil organic matter
- Total Petroleum Hydrocarbons Criteria Working Group (TPHCWG)
- Polycyclic Aromatic Hydrocarbons (PAH) US EPA 16
- Benzene, toluene, ethylbenzene, and xylene (BTEX)

Five deviations were reported by the analytical laboratory, associated with TPHCWG and BTEX analysis in samples collected from WLS1, WLS2, HHWS1, HHWS2 and HHWS4, due to the samples' age exceeding the stability time.

Samples from a range of depths were selected for laboratory analysis with the aim of chemically characterising representative materials from different parts of the embankment.

2.3 Geotechnical Sampling and In Situ Testing

Bulk samples were retrieved from boreholes at an approximate frequency of one sample per borehole. Disturbed samples were collected at an approximate frequency of four samples per borehole.

Standard Penetration Tests (SPTs) were performed from the base of the inspection pit at approximately 1m intervals in windowless sampling boreholes. Undisturbed samples (U100s) were obtained from windowless sampling boreholes WLS2, WLS4 and WLS5.

3 Recorded Ground Conditions

3.1 'At Surface' Made Ground

Made Ground encountered from ground level generally comprised brown, organic-rich sandy gravelly clay with gravels consisting of fine to coarse, sub-angular to sub-rounded sandstone. Typically the cover of Made Ground encountered from the surface extended to a depth of 0.10mbgl.

At surface, soils in exploratory holes HHWS5 and HHWS6 located on the upstream slope of the embankment comprised soft greyish brown, stained black, sandy gravelly clay with a high cobble content extending beyond the base of the boreholes which terminated at 3mbgl and 5mbgl respectively. Cobbles were recorded as angular to rounded sandstone and gravels consisted of fine to coarse, sub-angular to sub-rounded sandstone.

Soils encountered from the surface in HP01 comprised brown sand and gravel, with gravel comprising fine to coarse, sub-angular to sub-rounded construction material, brick, concrete and sandstone.

3.2 Embankment Made Ground

Soils forming the embankment slopes beneath surface soils appeared to comprise reworked natural soils generally described as soft to very soft, brown, grey, red, and blue sandy, gravelly clay with cobbles. Cobbles are recorded as angular to rounded sandstone with gravels consisting of fine to coarse, sub-angular to sub-rounded sandstone. Stiff to very stiff soils were

encountered with depth which may represent the underlying natural superficial deposits which are recorded by the British Geological Survey as glacial Till, however all soils were logged as Made Ground.

The puddle clay core of the embankment which is understood to be present does not appear to have been encountered during the ground investigation.

3.3 Groundwater

No groundwater was encountered in any of the exploratory locations.

3.4 Evidence of Contamination

Soils to be retained and reused to create the final post-discontinuance landform must comply with the visual and olfactory system set out in the sitewide Section 106 Agreement, achieving a score of '2,2' or better. The classification system rates soils' appearance and odour using a defined scale, which is provided in Table 1 below.

Table 1: Aesthetic Classification System

Class	Visual	Olfactory
0	No visible staining of soil, no visible suspect ACM*.	No detectable odour on soil.
1	Occasional staining of soil, no visible suspect ACM*.	Faint odour on soil.
2	Frequent staining of soil.	Distinct, but not strong odour on soil.
3	Occasional heavy staining of soil.	Strong odour on soil.
4	Heavy staining of soil.	Strong odour discernible in ambient air.
5	Visible hydrocarbon present.	Overwhelming odour.

*Visible suspect ACM refers to asbestos containing materials visible to the naked eye, which a reasonable and prudent person used to managing asbestos may suspect to be asbestos containing.

No visual or olfactory criteria were applied to the soils during the investigation however visual and olfactory criteria values have been retrospectively assigned in the table below to soils where evidence of hydrocarbons has been noted on exploratory hole logs.

Table 2: Summary of Visual and Olfactory Evidence of Contamination

Location ID	Depth (m)	Comments	V/O Score	Hole Location
HP01	0.00-0.40	Strong hydrocarbon odour.	0, 3	Toe of upstream slope at southern extent of embankment
	0.40-0.50	Black oily heavily contaminated clay. Strong hydrocarbon odour.	5, 3	
HHWS5	0.00-3.00	Strong hydrocarbon odour and black staining.	2, 3	Toe of upstream slope towards northern part of embankment
HHWS6	0.00-5.00	Strong hydrocarbon odour and black staining.	2, 3	Toe of upstream slope approximately centrally on embankment

Location ID	Depth (m)	Comments	V/O Score	Hole Location
WLS2	5.00-5.50	Strong hydrocarbon odour.	0, 3	Crest of embankment towards the north
WLS3	2.30-2.60	Strong hydrocarbon odour.	0, 3	Crest of embankment located centrally
	2.70-2.90	Strong hydrocarbon odour.	0, 3	
	3.10-12.00	Hydrocarbon odour.	0, 2	
WLS4	5.30-5.50	Strong hydrocarbon odour.	0, 3	Crest of embankment towards the south
WLS5	3.60-3.80	Strong hydrocarbon odour.	0, 3	Crest of embankment towards the south

Exploratory hole logs are presented in Appendix B.

4 Human Health Generic Quantitative Risk Assessment

4.1 Introduction

It is proposed to reuse the embankment soils to create the proposed post-discontinuance landform. A human health generic quantitative risk assessment has been undertaken to determine if there are potential unacceptable risks to human health based on the proposals for the site to be used as 'open pasture'.

Laboratory analytical results have been compared with Generic Assessment Criteria (GAC) for a public park land use as defined in 'SP1010 – Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination' published by CL:AIRE, and 'The LQM/CIEH S4ULs for Human Health Risk Assessment'. This is considered to be a conservative approach because there is anticipated to be no formal public access to the site.

Laboratory analytical data have been compared with relevant published assessment criteria from the following sources:

- Defra Category 4 Screening Levels (C4SLs); and
- Land Quality Management & Chartered Institute of Environmental Health (LQM & CIEH, 2015) Suitable for use levels (S4ULs).

S4ULs are based on health criteria that represent minimal or tolerable levels of risks to health, ensuring that the resulting assessment criteria are 'suitable for use' under planning. The C4SLs derived by DEFRA represent more pragmatic contaminant levels below which there is no significant possibility of significant harm, and a site would not be classed as 'Contaminated Land'.

S4UL based on a 1% soil organic matter content have been used, which represents the most conservative approach.

4.2 Data Assessment

No exceedances of the adopted GAC were recorded, and no asbestos was detected in any of the samples analysed.

Environmental samples were taken from depths where visual and olfactory evidence of contamination was observed in HHWS5, HHWS6, WLS4, and WLS5, as summarised in Table 1. TPH fractions were recorded above the limit of detection in all four samples, but no exceedances of the respective GAC were recorded. The highest TPH concentrations were recorded in a near-surface sample taken at a depth of 0.30-0.40m from HHWS5 which was located at the toe of the upstream embankment.

Soils in HP01 located at the southern part of the upstream toe of the embankment were identified as heavily contaminated with hydrocarbons and were not sampled.

Laboratory certificates along with a comparison of laboratory data against the adopted GAC are presented in Appendix C.

5 Preliminary Appraisal of Risks to Controlled Waters

Laboratory analytical data for soils have been reviewed to assess the chemical profile of the embankment material in relation to potential risks to controlled waters. The key contaminants of concern, taking into account the presence of the former Llandarcy oil refinery, are considered to be petroleum hydrocarbons and polycyclic aromatic hydrocarbons. Laboratory leachate analysis has not been carried out on the basis that this is unrepresentative for organic compounds.

Polycyclic aromatic hydrocarbons were recorded below the limit of detection in 12 out of 13 soil samples.

Aliphatic and aromatic TPH fractions recorded above the limit of detection in 10 out of 13 soil samples were generally of the banding C12 and above which have generally low solubilities in water.

No significantly elevated metals concentrations were recorded in the soil samples analysed. On the basis that the embankment is understood to have been formed largely from natural materials sourced from the immediate surrounding area, the concentrations recorded may be representative of natural concentrations in soils in the area.

6 Conclusions

Based on the findings of the ground investigation the embankment appears to have been constructed from re-worked natural soils comprising sandy gravelly clay with some cobbles. The puddle clay core of the embankment was not encountered.

The laboratory analytical dataset as a whole suggests that embankment soils are likely to be largely suitable for reuse from a chemical perspective.

Surface materials on the upstream slope of the embankment are characterised by hydrocarbon staining and may require a degree of management prior to reuse.

Soils around the far southern part of the upstream toe of the embankment were identified as heavily contaminated with hydrocarbons and were not sampled. It is possible that these soils represent accumulated sediment at the base of the NSR, rather than embankment material. Soils in this area are therefore anticipated to require remediation to enable their reuse, or potentially off-site disposal.

Visual and olfactory evidence of contamination was recorded at various depths and whilst not corresponding with unacceptable concentrations of contaminants, soils with aesthetic scores greater than 2,2 may require a degree of management prior to reuse.

7 Recommendations

Confirmatory visual and olfactory assessment, sampling and laboratory analysis is recommended prior to reuse of materials. This is likely to be best undertaken following complete drawdown of water and during removal of the embankment where the material forming the embankment will be fully accessible. Segregation of materials with potentially unacceptable levels of contamination is recommended under a watching brief.

Where remediation and material improvement are deemed necessary, this will need to be supported by visual and olfactory assessment and/or validation testing to demonstrate improvement in material quality and compliance with the relevant criteria.

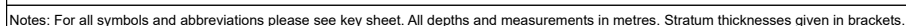
Appendix A Drawings



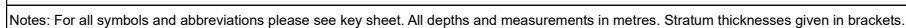
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Project Number: CA-24-017
Drawing Title: DRAFT SI LOCATION DRAWING
Drawing Number: 01
Scale: Not to scale

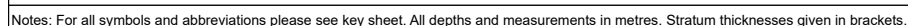
KEY	 SI Locations	

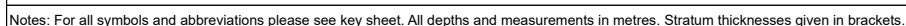
Appendix B Exploratory Hole Logs

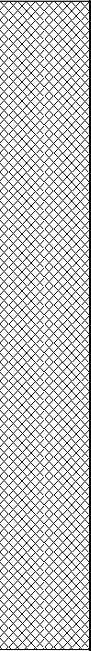
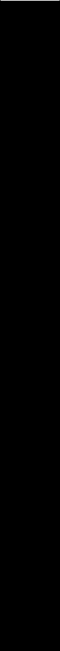
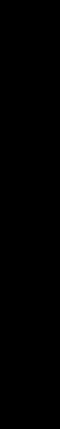


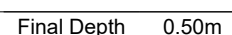
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Project Name Coed Darcy Reservoir				Project No. CA-24-017		Date to				Hole Type WS			
Client Clearwater Associates				Co-ords E: 271216.14 N: 196425.49 L:		Water Strike Details Depth Strike After 20 mins Remarks				Logged By MP			
Contractor SGT Ltd			Plant Used Hand Held Window Sampler							Approved By			
										Scale 1:50			
Samples and Results			Depth, (Thickness)		Level		Stratum Description				Legend	Well	
Results	Type	Depth											
	B ES	0.10 - 1.00 0.10 - 1.20		(0.10) 0.10			Brown organic rich gravelly sandy CLAY. Gravel is fine to coarse sub angular to sub rounded of sandstone. Sand is fine to coarse. (Made Ground) Grey and brown gravelly sandy CLAY with low cobble content. Cobbles are angular sandstone. Gravel is fine to coarse sub angular to rounded of sandstone. Sand is fine to coarse. (Made Ground)						
				(0.90)									
			1	1.00			NO RECOVERY (Made Ground)						
				(0.70)									
	ES	1.70 - 1.80		1.70			Very soft light brown slightly gravelly sandy CLAY. Gravel is angular and subangular fine to coarse sandstone. Sand is fine to coarse. (Made Ground)						
			2	(0.80)									
				2.50			Soft light brown gravelly sandy CLAY. Gravel is angular and subangular fine to coarse sandstone. Sand is fine to coarse. (Made Ground)						
	ES	2.70 - 2.80		3									
				(1.50)									
			4	4.00			End of Borehole at 4.00m						
				5									
				6									
Remarks												Borehole Diameter	
1] Borehole terminated on refusal. 2] On completion borehole backfilled with bentonite. 3] No groundwater recorded.												Base Depth	Diameter
Notes: For all symbols and abbreviations please see key sheet. All depths and measurements in metres. Stratum thicknesses given in brackets.													

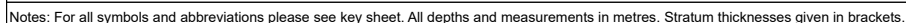






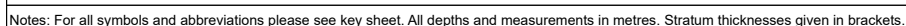
		Consulting Geotechnical, Geo-Environmental Engineers & Site Investigation Contractors		Cardiff Office 5 Deryn Court Wharfedale Road Pentwyn Cardiff CF23 7HA		Exeter Office The Slate Barn Lower Lowley Dunsford Exeter EX6 7BP		Portsmouth Office Technopole Kingston Crescent North End Portsmouth PO2 8FA		Borehole No. HHWS6 Sheet 1 of 1					
Project Name Coed Darcy Reservoir				Project No. CA-24-017		Date to				Hole Type WS					
Client Clearwater Associates				Co-ords E: 271244.28 N: 196442.56 L:		Water Strike Details Depth Strike After 20 mins Remarks				Logged By MP					
Contractor SGT Ltd			Plant Used Hand Held Window Sampler							Approved By					
										Scale 1:50					
Samples and Results			Depth, (Thickness)		Level		Stratum Description				Legend Well				
Results		Type	Depth												
		B	0.10 - 0.90				Soft greyish brown stained black gravelly sandy CLAY with high cobble content. Cobbles are angular to rounded of sandstone. Gravel is fine to coarse sub angular to sub rounded of sandstone. Sand is fine to coarse. Strong hydrocarbon odor. (Made Ground)								
		ES	0.50 - 0.60												
		ES	1.50 - 1.70		(3.00)										
		D	1.70 - 1.80												
		ES	2.40 - 2.50												
		D	2.60 - 2.70												
		ES	3.50 - 3.60												
		D	3.60 - 3.70												
							End of Borehole at 5.00m								
		ES	4.60 - 4.70												
		D	4.80 - 4.90												
Remarks												Borehole Diameter			
1] Borehole terminated on refusal. 2] On completion borehole backfilled with bentonite. 3] No groundwater recorded.												Base Depth		Diameter	
Notes: For all symbols and abbreviations please see key sheet. All depths and measurements in metres. Stratum thicknesses given in brackets.															



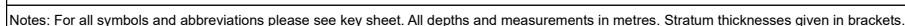


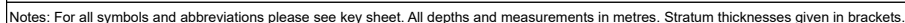
		Consulting Geotechnical, Geo-Environmental Engineers & Site Investigation Contractors		Cardiff Office 5 Deryn Court Wharfedale Road Pentwyn Cardiff CF23 7HA		Exeter Office The Slate Barn Lower Lowley Dunsford Exeter EX6 7BP		Portsmouth Office Technopole Kingston Crescent North End Portsmouth PO2 8FA		Borehole No. WLS2 Sheet 1 of 2			
Project Name Coed Darcy Reservoir				Project No. CA-24-017		Date to				Hole Type WS			
Client Clearwater Associates				Co-ords E: 271194.27 N: 196502.20 L:		Water Strike Details Depth StrikeAfter 20 minsRemarks				Logged By MP			
Contractor GK Drilling Ltd				Plant Used Window Sampler						Approved By			
										Scale 1:50			
Samples and Results			Depth, (Thickness)	Level	Stratum Description					Legend	Well		
Results	Type	Depth											
N=6 (1,1/2,1,1,2)	B	0.20 - 1.00	(0.10) 0.10		Brown organic rich gravelly sandy CLAY. Gravel is fine to coarse sub angular to sub rounded of sandstone. Sand is fine to coarse. (Made Ground)								
	ES	0.50 - 0.60	(0.70)		Grey mottled brown gravelly sandy CLAY. Gravel is fine to coarse sub angular to sub rounded of sandstone. Sand is fine to coarse. (Made Ground)								
	SPT(S)	1.20	0.80 (0.25)	1	Blueish grey mottled brown gravelly sandy CLAY. Gravel is fine to coarse sub angular to sub rounded of sandstone. Sand is fine to coarse. (Made Ground)								
	ES D	1.40 - 1.50 1.50 - 1.60	1.05 (0.45)		Soft red slightly gravelly sandy CLAY. Gravel is fine sub rounded sandstone. Sand is fine to coarse. (Made Ground)								
blows=21	ES U D	2.60 - 2.70 2.65 2.70 - 2.80	1.50 (0.40)		Soft grey CLAY. (Made Ground)								
	SPT(S)	3.00	1.90 (0.60)	2	soft red slightly gravelly sandy CLAY. Gravel is fine sub rounded sandstone. Sand is fine to coarse. (Made Ground)								
	ES U D	2.60 - 2.70 2.65 2.70 - 2.80	2.50 (0.50)		Very soft grey CLAY. (Made Ground)								
	SPT(S)	3.00	3.00	3	Interbedded soft to stiff grey CLAY and red slightly gravelly sandy CLAY. Gravel is fine sub rounded sandstone. Sand is fine to coarse. Hydrocarbon odor within both types of clay. (Beds are 100mm to 700mm thick). (Made Ground)								
N=10 (1,2/1,2,3,4)	ES D	4.50 - 4.60 4.60 - 4.70	(0.60)										
	SPT(S)	5.00	2.50 (0.50)										
	ES D	5.70 - 5.80 5.80 - 5.90	5.00 (6.95)										
	SPT(S)	6.00	6.00	6									
N=13 (1,2/4,4,2,3)	ES D	6.40 - 6.50 6.50 - 6.60											
	SPT(S)	7.00											
Remarks 1] Borehole terminated on refusal. 2] On completion borehole backfilled with bentonite. 3] No groundwater recorded.												Borehole Diameter Base DepthDiameter	
Notes: For all symbols and abbreviations please see key sheet. All depths and measurements in metres. Stratum thicknesses given in brackets.													

		Consulting Geotechnical, Geo-Environmental Engineers & Site Investigation Contractors		Cardiff Office 5 Deryn Court Wharfedale Road Pentwyn Cardiff CF23 7HA		Exeter Office The Slate Barn Lower Lowley Dunsford Exeter EX6 7BP		Portsmouth Office Technopole Kingston Crescent North End Portsmouth PO2 8FA		Borehole No. WLS2 Sheet 2 of 2		
Project Name Coed Darcy Reservoir				Project No. CA-24-017		Date to				Hole Type WS		
Client Clearwater Associates				Co-ords E: 271194.27 N: 196502.20 L:		Water Strike Details Depth StrikeAfter 20 minsRemarks				Logged By MP		
Contractor GK Drilling Ltd				Plant Used Window Sampler						Approved By		
										Scale 1:50		
Samples and Results			Depth, (Thickness)		Level		Stratum Description				Legend	Well
Results	Type	Depth										
N=18 (1,1/3,4,5,6)	ES	7.80 - 7.90					Interbedded soft to stiff Grey CLAY and red slightly gravelly sandy CLAY. Gravel is fine sub rounded sandstone. Sand is fine to coarse. Hydrocarbon odor within both types of clay. (Beds are 100mm to 700mm thick). (Made Ground)					
	D	7.90 - 8.00										
	SPT(S)	8.00										
N=88 (7,8/11,14,13,50)	ES	8.40 - 8.50					7.00 to 8.00m - 7.0-8.0m Soft					
	D	8.60 - 8.70										
	SPT(S)	9.00					8.00 to 9.00m - 8.0-9.0m Stiff					
	ES	9.60 - 9.70					9.00 to 10.00m - 9.0-10.0m Very stiff					
	D	9.80 - 9.90										
	SPT(S)	9.00										
	ES	9.60 - 9.70					Stiff becoming very stiff grey gravelly sandy CLAY. Gravel is fine to coarse sub angular to sub rounded of sandstone. (Made Ground)					
	D	9.80 - 9.90										
	SPT(S)	9.00					End of Borehole at 10.00m					
	ES	10.30 - 10.40										
	SPT(S)	9.00										
	ES	9.60 - 9.70										
	D	9.80 - 9.90										
	SPT(S)	9.00										
	ES	9.60 - 9.70										
	D	9.80 - 9.90										
	SPT(S)	9.00										
	ES	9.60 - 9.70										
	D	9.80 - 9.90										
	SPT(S)	9.00										
	ES	9.60 - 9.70										
	D	9.80 - 9.90										
	SPT(S)	9.00										
	ES	9.60 - 9.70										
	D	9.80 - 9.90										
	SPT(S)	9.00										
	ES	9.60 - 9.70										
	D	9.80 - 9.90										
	SPT(S)	9.00										
	ES	9.60 - 9.70										
	D	9.80 - 9.90										
	SPT(S)	9.00										
	ES	9.60 - 9.70										
	D	9.80 - 9.90										
	SPT(S)	9.00										
	ES	9.60 - 9.70										
	D	9.80 - 9.90										
	SPT(S)	9.00										
	ES	9.60 - 9.70										
	D	9.80 - 9.90										
	SPT(S)	9.00										
	ES	9.60 - 9.70										
	D	9.80 - 9.90										
	SPT(S)	9.00										
	ES	9.60 - 9.70										
	D	9.80 - 9.90										
	SPT(S)	9.00										
	ES	9.60 - 9.70										
	D	9.80 - 9.90										
	SPT(S)	9.00										
	ES	9.60 - 9.70										
	D	9.80 - 9.90										
	SPT(S)	9.00										
	ES	9.60 - 9.70										
	D	9.80 - 9.90										
	SPT(S)	9.00										
	ES	9.60 - 9.70										
	D	9.80 - 9.90										
	SPT(S)	9.00										
	ES	9.60 - 9.70										
	D	9.80 - 9.90										
	SPT(S)	9.00										
	ES	9.60 - 9.70										
	D	9.80 - 9.90										
	SPT(S)	9.00										
	ES	9.60 - 9.70										
	D	9.80 - 9.90										
	SPT(S)	9.00										
	ES	9.60 - 9.70										
	D	9.80 - 9.90										
	SPT(S)	9.00										
	ES	9.60 - 9.70										
	D	9.80 - 9.90										
	SPT(S)	9.00										
	ES	9.60 - 9.70										
	D	9.80 - 9.90										
	SPT(S)	9.00										
	ES	9.60 - 9.70										
	D	9.80 - 9.90										
	SPT(S)	9.00										
	ES	9.60 - 9.70										
	D	9.80 - 9.90										
	SPT(S)	9.00										
	ES	9.60 - 9.70										
	D	9.80 - 9.90										
	SPT(S)	9.00										
	ES	9.60 - 9.70										
	D	9.80 - 9.90										
	SPT(S)	9.00										
	ES	9.60 - 9.70										
	D	9.80 - 9.90										
	SPT(S)	9.00										
	ES	9.60 - 9.70										
	D	9.80 - 9.90										
	SPT(S)	9.00										
	ES	9.60 - 9.70										
	D	9.80 - 9.90										
	SPT(S)	9.00										
	ES	9.60 - 9.70										
	D	9.80 - 9.90										
	SPT(S)	9.00										
	ES	9.60 - 9.70										
	D	9.80 - 9.90										
	SPT(S)	9.00										
	ES	9.60 - 9.70										
	D	9.80 - 9.90										
	SPT(S)	9.00										
	ES	9.60 - 9.70										
	D	9.80 - 9.90										
	SPT(S)	9.00										
	ES	9.60 - 9.70										
	D	9.80 - 9.90										
	SPT(S)	9.00										
	ES	9.60 - 9.70										
	D	9.80 - 9.90										
	SPT(S)	9.00										
	ES	9.60 - 9.70										
	D	9.80 - 9.90										
	SPT(S)	9.00										
	ES	9.60 - 9.70										
	D	9.80 - 9.90										
	SPT(S)	9.00										
	ES	9.60 - 9.70										
	D	9.80 - 9.90										
	SPT(S)	9.00										
	ES	9.60 - 9.70										
	D	9.80 - 9.90										
	SPT(S)	9.00										
	ES	9.60 - 9.70										
	D	9.80 - 9.90										
	SPT(S)	9.00										
	ES	9.60 - 9.70										
	D	9.80 - 9.90										
	SPT(S)	9.00										
	ES	9.60 - 9.70										
	D	9.80 - 9.90										
	SPT(S)	9.00										
	ES	9.60 - 9.70										
	D	9.80 - 9.90										
	SPT(S)	9.00										
	ES	9.60 - 9.70										
	D	9.80 - 9.90										
	SPT(S)	9.00										
	ES	9.60 - 9.70										
	D	9.80 - 9.90										
	SPT(S)	9.00										
	ES	9.60 - 9.70										
	D	9.80 - 9.90										
	SPT(S)	9.00										
	ES	9.60 - 9.70										
	D	9.80 - 9.90										
	SPT(S)	9.00										
	ES	9.60 - 9.70										
	D	9.80 - 9.90										
	SPT(S)	9.00										
	ES	9.60 - 9.70										
	D	9.80 - 9.90										
	SPT(S)	9.00										
	ES	9.60 - 9.70			</							



		Consulting Geotechnical, Geo-Environmental Engineers & Site Investigation Contractors		Cardiff Office 5 Deryn Court Wharfedale Road Pentwyn Cardiff CF23 7HA		Exeter Office The Slate Barn Lower Lowley Dunsford Exeter EX6 7BP		Portsmouth Office Technopole Kingston Crescent North End Portsmouth PO2 8FA		Borehole No. WLS4 Sheet 1 of 2		
Project Name Coed Darcy Reservoir				Project No. CA-24-017		Date to				Hole Type WS		
Client Clearwater Associates				Co-ords E: 271246.38 N: 196416.38 L:		Water Strike Details Depth Strike After 20 mins Remarks				Logged By MP		
Contractor GK Drilling Ltd				Plant Used Window Sampler						Approved By		
								Scale 1:50				
Samples and Results			Depth, (Thickness)		Level		Stratum Description				Legend Well	
Results			Type		Depth							
N=5 (1,1/2,1,1,1)			B		0.30 - 0.50		Brown organic rich gravelly sandy CLAY. Gravel is fine to coarse sub angular to sub rounded of sandstone. Sand is fine to coarse. (Made Ground)					
blows=27			SPT(S)		1.20		Soft grey mottled brown gravelly sandy CLAY. Gravel is fine to coarse sub angular to sub rounded of sandstone. Sand is fine to coarse. (Made Ground)					
			ES		1.50 - 1.60		1.20 to 7.00m - 1.2-3.0m Soft					
			D		1.70 - 1.80							
			U		2.00							
N=7 (1,2/2,1,2,2) blows=21			ES		2.60 - 2.70		Red slightly gravelly sandy CLAY. Gravel is fine sub rounded sandstone. Sand is fine to coarse. (Made Ground)					
			D		2.80 - 2.90		Grey CLAY. (Made Ground)					
			U		3.00							
			SPT(S)		3.00		Soft red slightly gravelly sandy CLAY. Gravel is fine sub rounded sandstone. Sand is fine to coarse. (Made Ground)					
			D		3.40 - 3.50		Soft grey CLAY. (Made Ground)					
blows=34			ES		3.60 - 3.70							
			U		4.00							
			ES		4.70 - 4.80		Interbedded soft to stiff Grey CLAY and red slightly gravelly sandy CLAY. Gravel is fine sub rounded sandstone. Sand is fine to coarse. Hydrocarbon odor within both types of clay. (Beds are 100mm to 700mm thick). (Made Ground)					
N=7 (1,1/1,1,2,3)			D		4.80 - 4.90		5.30 to 5.50m - 5.3-5.5m Strong hydrocarbon odor					
			SPT(S)		5.00							
			ES		5.40 - 5.50							
blows=30			D		5.50 - 5.60							
			U		6.00							
			ES		6.60 - 6.70							
			D		6.80 - 6.90							
N=20 (2,2/4,4,5,7)			SPT(S)		7.00							
Remarks 1] Borehole terminated on refusal. 2] On completion borehole backfilled with bentonite. 3] No groundwater recorded.										Borehole Diameter Base Depth Diameter		
Notes: For all symbols and abbreviations please see key sheet. All depths and measurements in metres. Stratum thicknesses given in brackets.												





Appendix C Laboratory Analytical Data



Final Report

Report No.: 24-25727-1

Initial Date of Issue: 16-Aug-2024

Re-Issue Details:

Client Terra Firma

Client Address: 5 Deryn Court
Wharfedale Road
Pentwyn
Cardiff
CF23 7HA

Contact(s): Michael Watkins
Morgan Peregrine

Project CA-24-017 Coed Darcy

Quotation No.: **Date Received:** 12-Aug-2024

Order No.: **Date Instructed:** 12-Aug-2024

No. of Samples: 13

Turnaround (Wkdays): 5 **Results Due:** 16-Aug-2024

Date Approved: 16-Aug-2024

Approved By:

Details: David Smith, Technical Director

For details about application of accreditation to specific matrix types, please refer to the Table at the back of this report

Results - Soil

Project: CA-24-017 Coed Darcy

Client: Terra Firma		Chemtest Job No.:		24-25727	24-25727	24-25727	24-25727	24-25727	24-25727	24-25727	24-25727	24-25727	24-25727
Quotation No.:		Chemtest Sample ID.:		1849631	1849642	1849650	1849654	1849662	1849664	1849667	1849669		
Order No.:		Client Sample Ref.:		1	12	21	25	33	35	38	40		
		Client Sample ID.:		WLS1E1	WLS2E9	WLS3E7	WLS3E11	WLS4E5	WLS4E7	WLS5E1	WLS5E3		
		Sample Location:		WLS1	WLS2	WLS3	WLS3	WLS4	WLS4	WLS5	WLS5		
		Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL		
		Top Depth (m):		0.40	8.40	6.50	10.50	5.40	7.30	1.20	3.60		
		Bottom Depth (m):		0.50	8.50	6.60	10.60	5.50	7.40	1.30	3.70		
		Date Sampled:		23-Jul-2024	25-Jul-2024	30-Jul-2024	30-Jul-2024	30-Jul-2024	30-Jul-2024	30-Jul-2024	30-Jul-2024		
		Asbestos Lab:		DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM		
Determinand	HWOL Code	Accred.	SOP	Units	LOD								
ACM Type		U	2192		N/A	-	-	-	-	-	-	-	-
Asbestos Identification		U	2192		N/A	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
Moisture		N	2030	%	0.020	10	18	19	23	25	24	7.8	13
Soil Colour		N	2040		N/A	Brown	Brown	Brown	Brown	Brown	Brown	Brown	Brown
Other Material		N	2040		N/A	Stones and Roots	Stones and Roots	Stones and Roots	Stones and Roots	Stones	Stones	Stones	Stones
Soil Texture		N	2040		N/A	Clay	Clay	Clay	Clay	Clay	Clay	Clay	Clay
pH at 20C		M	2010		4.0	6.6	8.9	8.4	7.8	8.3	8.6	7.5	8.9
Arsenic		M	2455	mg/kg	0.5	17	11	13	14	12	9.8	10	3.1
Cadmium		M	2455	mg/kg	0.10	0.34	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Chromium		M	2455	mg/kg	0.5	14	54	33	40	32	32	26	44
Copper		M	2455	mg/kg	0.50	32	19	19	15	16	13	6.6	17
Mercury		M	2455	mg/kg	0.05	0.06	< 0.05	< 0.05	< 0.05	< 0.05	0.08	< 0.05	< 0.05
Nickel		M	2455	mg/kg	0.50	24	62	33	36	32	30	21	59
Lead		M	2455	mg/kg	0.50	23	27	20	31	21	22	13	14
Selenium		M	2455	mg/kg	0.25	0.64	1.0	0.79	1.1	0.64	0.77	0.51	1.0
Vanadium		U	2455	mg/kg	0.5	14	49	35	47	37	35	29	31
Zinc		M	2455	mg/kg	0.50	95	100	76	120	76	77	50	61
Aliphatic VPH >C5-C6	HS_2D_AL	U	2780	mg/kg	0.05	[B] < 0.05	[B] < 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Aliphatic VPH >C6-C7	HS_2D_AL	U	2780	mg/kg	0.05	[B] < 0.05	[B] < 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Aliphatic VPH >C7-C8	HS_2D_AL	U	2780	mg/kg	0.05	[B] < 0.05	[B] < 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Aliphatic VPH >C6-C8 (Sum)	HS_2D_AL	N	2780	mg/kg	0.10	[B] < 0.10	[B] < 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Aliphatic VPH >C8-C10	HS_2D_AL	U	2780	mg/kg	0.05	[B] < 0.05	[B] < 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Total Aliphatic VPH >C5-C10	HS_2D_AL	U	2780	mg/kg	0.25	[B] < 0.25	[B] < 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25
Aliphatic EPH >C10-C12 MC	EH_2D_AL_#1	M	2690	mg/kg	2.00	[B] < 2.0	[B] < 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	2.5
Aliphatic EPH >C12-C16 MC	EH_2D_AL_#1	M	2690	mg/kg	1.00	[B] < 1.0	[B] < 1.0	< 1.0	< 1.0	100	3.8	< 1.0	23
Aliphatic EPH >C16-C21 MC	EH_2D_AL_#1	M	2690	mg/kg	2.00	[B] < 2.0	[B] < 2.0	< 2.0	< 2.0	140	6.3	< 2.0	45
Aliphatic EPH >C21-C35 MC	EH_2D_AL_#1	M	2690	mg/kg	3.00	[B] < 3.0	[B] < 3.0	5.9	< 3.0	180	4.7	< 3.0	190
Aliphatic EPH >C35-C40 MC	EH_2D_AL_#1	N	2690	mg/kg	10.00	[B] < 10	[B] < 10	< 10	< 10	38	< 10	< 10	42
Total Aliphatic EPH >C10-C35 MC	EH_2D_AL_#1	M	2690	mg/kg	5.00	[B] < 5.0	[B] < 5.0	6.3	< 5.0	420	15	< 5.0	260
Total Aliphatic EPH >C10-C40 MC	EH_2D_AL_#1	N	2690	mg/kg	10.00	[B] < 10	[B] < 10	< 10	< 10	460	15	< 10	300
Aromatic VPH >C5-C7	HS_2D_AR	U	2780	mg/kg	0.05	[B] < 0.05	[B] < 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Aromatic VPH >C7-C8	HS_2D_AR	U	2780	mg/kg	0.05	[B] < 0.05	[B] < 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Aromatic VPH >C8-C10	HS_2D_AR	U	2780	mg/kg	0.05	[B] < 0.05	[B] < 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Total Aromatic VPH >C5-C10	HS_2D_AR	U	2780	mg/kg	0.25	[B] < 0.25	[B] < 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25

Results - Soil

Project: CA-24-017 Coed Darcy

Client: Terra Firma			Chemtest Job No.:		24-25727	24-25727	24-25727	24-25727	24-25727	24-25727	24-25727	24-25727	24-25727
Quotation No.:			Chemtest Sample ID.:		1849631	1849642	1849650	1849654	1849662	1849664	1849667	1849669	
Order No.:			Client Sample Ref.:		1	12	21	25	33	35	38	40	
			Client Sample ID.:		WLS1E1	WLS2E9	WLS3E7	WLS3E11	WLS4E5	WLS4E7	WLS5E1	WLS5E3	
			Sample Location:		WLS1	WLS2	WLS3	WLS3	WLS4	WLS4	WLS5	WLS5	
			Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	
			Top Depth (m):		0.40	8.40	6.50	10.50	5.40	7.30	1.20	3.60	
			Bottom Depth (m):		0.50	8.50	6.60	10.60	5.50	7.40	1.30	3.70	
			Date Sampled:		23-Jul-2024	25-Jul-2024	30-Jul-2024	30-Jul-2024	30-Jul-2024	30-Jul-2024	30-Jul-2024	30-Jul-2024	
			Asbestos Lab:		DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	
Determinand	HWOL Code	Accred.	SOP	Units	LOD								
Aromatic EPH >C10-C12 MC	EH_2D_AR_#1	U	2690	mg/kg	1.00	[B] < 1.0	[B] < 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic EPH >C12-C16 MC	EH_2D_AR_#1	U	2690	mg/kg	1.00	[B] < 1.0	[B] < 1.0	< 1.0	< 1.0	23	< 1.0	< 1.0	< 1.0
Aromatic EPH >C16-C21 MC	EH_2D_AR_#1	U	2690	mg/kg	2.00	[B] 3.5	[B] < 2.0	< 2.0	< 2.0	34	< 2.0	< 2.0	4.6
Aromatic EPH >C21-C35 MC	EH_2D_AR_#1	U	2690	mg/kg	2.00	[B] < 2.0	[B] < 2.0	6.3	< 2.0	4.2	< 2.0	< 2.0	< 2.0
Aromatic EPH >C35-C40 MC	EH_2D_AR_#1	N	2690	mg/kg	1.00	[B] < 1.0	[B] 14	3.5	2.2	2.8	1.6	1.4	2.4
Total Aromatic EPH >C10-C35 MC	EH_2D_AR_#1	U	2690	mg/kg	5.00	[B] < 5.0	[B] < 5.0	7.6	< 5.0	61	< 5.0	< 5.0	< 5.0
Total Aromatic EPH >C10-C40 MC	EH_2D_AR_#1	N	2690	mg/kg	10.00	[B] < 10	[B] 14	11	< 10	64	< 10	< 10	< 10
Total VPH >C5-C10	HS_2D_Total	U	2780	mg/kg	0.50	[B] < 0.50	[B] < 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Total EPH >C10-C35 MC	EH_2D_Total_#1	U	2690	mg/kg	10.00	[B] < 10	[B] < 10	14	< 10	480	15	< 10	270
Total EPH >C10-C40 MC	EH_2D_Total_#1	N	2690	mg/kg	10.00	[B] < 10	[B] 14	17	< 10	530	17	< 10	310
Organic Matter		M	2625	%	0.40	1.9	0.59	0.79	1.1	1.7	0.86	0.72	< 0.40
Naphthalene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthylene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.21	< 0.10
Acenaphthene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.34	< 0.10
Fluorene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.29	< 0.10
Phenanthrene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	4.3	< 0.10
Anthracene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.86	< 0.10
Fluoranthene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	6.4	< 0.10
Pyrene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	5.0	< 0.10
Benzo[a]anthracene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	4.0	< 0.10
Chrysene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	3.5	< 0.10
Benzo[b]fluoranthene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	3.7	< 0.10
Benzo[k]fluoranthene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	1.4	< 0.10
Benzo[a]pyrene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	2.3	< 0.10
Indeno(1,2,3-c,d)Pyrene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	1.3	< 0.10
Dibenz(a,h)Anthracene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.61	< 0.10
Benzo[g,h,i]perylene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	1.3	< 0.10
Total Of 16 PAH's		M	2700	mg/kg	2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	36	< 2.0
Benzene		M	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene		M	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene		M	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
m & p-Xylene		M	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-Xylene		M	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

Results - Soil

Project: CA-24-017 Coed Darcy

Client: Terra Firma		Chemtest Job No.:				24-25727	24-25727	24-25727	24-25727	24-25727
Quotation No.:		Chemtest Sample ID.:				1849674	1849679	1849682	1849685	1849690
Order No.:		Client Sample Ref.:				45	50	53	56	61
		Client Sample ID.:				HHWSE2	HHWS2E3	HHWS4E1	HHWS5E1	HHWS6E3
		Sample Location:				HHWS1	HHWS2	HHWS4	HHWS5	HHWS6
		Sample Type:				SOIL	SOIL	SOIL	SOIL	SOIL
		Top Depth (m):				1.60	2.70	0.10	0.30	2.40
		Bottom Depth (m):				1.70	2.80	1.20	0.40	2.50
		Date Sampled:				24-Jul-2024	24-Jul-2024	24-Jul-2024	31-Jul-2024	30-Jul-2024
		Asbestos Lab:				DURHAM	DURHAM	DURHAM	DURHAM	DURHAM
Determinand	HWOL Code	Accred.	SOP	Units	LOD					
ACM Type		U	2192		N/A	-	-	-	-	-
Asbestos Identification		U	2192		N/A	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
Moisture		N	2030	%	0.020	8.7	11	11	12	14
Soil Colour		N	2040		N/A	Brown	Brown	Brown	Brown	Brown
Other Material		N	2040		N/A	Stones and Roots	Stones	Stones and Roots	Stones and Roots	Stones
Soil Texture		N	2040		N/A	Loam	Clay	Clay	Clay	Clay
pH at 20C		M	2010		4.0	5.6	6.6	5.8	< 4.0	8.4
Arsenic		M	2455	mg/kg	0.5	15	12	17	15	11
Cadmium		M	2455	mg/kg	0.10	0.71	< 0.10	0.70	0.41	0.14
Chromium		M	2455	mg/kg	0.5	13	15	18	17	12
Copper		M	2455	mg/kg	0.50	30	22	31	39	26
Mercury		M	2455	mg/kg	0.05	0.07	0.06	0.14	1.2	0.07
Nickel		M	2455	mg/kg	0.50	27	28	33	38	21
Lead		M	2455	mg/kg	0.50	29	17	26	83	19
Selenium		M	2455	mg/kg	0.25	0.79	0.80	0.87	1.2	0.62
Vanadium		U	2455	mg/kg	0.5	14	15	19	28	14
Zinc		M	2455	mg/kg	0.50	100	74	120	120	75
Aliphatic VPH >C5-C6	HS_2D_AL	U	2780	mg/kg	0.05	[B] < 0.05	[B] < 0.05	[B] < 0.05	< 0.05	< 0.05
Aliphatic VPH >C6-C7	HS_2D_AL	U	2780	mg/kg	0.05	[B] < 0.05	[B] < 0.05	[B] < 0.05	< 0.05	< 0.05
Aliphatic VPH >C7-C8	HS_2D_AL	U	2780	mg/kg	0.05	[B] < 0.05	[B] < 0.05	[B] < 0.05	< 0.05	< 0.05
Aliphatic VPH >C6-C8 (Sum)	HS_2D_AL	N	2780	mg/kg	0.10	[B] < 0.10	[B] < 0.10	[B] < 0.10	< 0.10	< 0.10
Aliphatic VPH >C8-C10	HS_2D_AL	U	2780	mg/kg	0.05	[B] < 0.05	[B] < 0.05	[B] < 0.05	< 0.05	< 0.05
Total Aliphatic VPH >C5-C10	HS_2D_AL	U	2780	mg/kg	0.25	[B] < 0.25	[B] < 0.25	[B] < 0.25	< 0.25	< 0.25
Aliphatic EPH >C10-C12 MC	EH_2D_AL_#1	M	2690	mg/kg	2.00	[B] < 2.0	[B] < 2.0	[B] < 2.0	40	< 2.0
Aliphatic EPH >C12-C16 MC	EH_2D_AL_#1	M	2690	mg/kg	1.00	[B] < 1.0	[B] < 1.0	[B] < 1.0	3300	110
Aliphatic EPH >C16-C21 MC	EH_2D_AL_#1	M	2690	mg/kg	2.00	[B] < 2.0	[B] 6.1	[B] < 2.0	6200	260
Aliphatic EPH >C21-C35 MC	EH_2D_AL_#1	M	2690	mg/kg	3.00	[B] < 3.0	[B] 230	[B] < 3.0	4800	210
Aliphatic EPH >C35-C40 MC	EH_2D_AL_#1	N	2690	mg/kg	10.00	[B] < 10	[B] 37	[B] < 10	830	42
Total Aliphatic EPH >C10-C35 MC	EH_2D_AL_#1	M	2690	mg/kg	5.00	[B] < 5.0	[B] 240	[B] < 5.0	14000	590
Total Aliphatic EPH >C10-C40 MC	EH_2D_AL_#1	N	2690	mg/kg	10.00	[B] < 10	[B] 280	[B] < 10	15000	630
Aromatic VPH >C5-C7	HS_2D_AR	U	2780	mg/kg	0.05	[B] < 0.05	[B] < 0.05	[B] < 0.05	< 0.05	< 0.05
Aromatic VPH >C7-C8	HS_2D_AR	U	2780	mg/kg	0.05	[B] < 0.05	[B] < 0.05	[B] < 0.05	< 0.05	< 0.05
Aromatic VPH >C8-C10	HS_2D_AR	U	2780	mg/kg	0.05	[B] < 0.05	[B] < 0.05	[B] < 0.05	< 0.05	< 0.05
Total Aromatic VPH >C5-C10	HS_2D_AR	U	2780	mg/kg	0.25	[B] < 0.25	[B] < 0.25	[B] < 0.25	< 0.25	< 0.25

Results - Soil

Project: CA-24-017 Coed Darcy

Client: Terra Firma		Chemtest Job No.:	24-25727	24-25727	24-25727	24-25727	24-25727
Quotation No.:		Chemtest Sample ID.:	1849674	1849679	1849682	1849685	1849690
Order No.:		Client Sample Ref.:	45	50	53	56	61
		Client Sample ID.:	HHWSE2	HHWS2E3	HHWS4E1	HHWS5E1	HHWS6E3
		Sample Location:	HHWS1	HHWS2	HHWS4	HHWS5	HHWS6
		Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL
		Top Depth (m):	1.60	2.70	0.10	0.30	2.40
		Bottom Depth (m):	1.70	2.80	1.20	0.40	2.50
		Date Sampled:	24-Jul-2024	24-Jul-2024	24-Jul-2024	31-Jul-2024	30-Jul-2024
		Asbestos Lab:	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM
Determinand	HWOL Code	Accred.	SOP	Units	LOD		
Aromatic EPH >C10-C12 MC	EH_2D_AR_#1	U	2690	mg/kg	1.00	[B] < 1.0	[B] < 1.0
Aromatic EPH >C12-C16 MC	EH_2D_AR_#1	U	2690	mg/kg	1.00	[B] < 1.0	[B] < 1.0
Aromatic EPH >C16-C21 MC	EH_2D_AR_#1	U	2690	mg/kg	2.00	[B] < 2.0	[B] < 2.0
Aromatic EPH >C21-C35 MC	EH_2D_AR_#1	U	2690	mg/kg	2.00	[B] < 2.0	[B] < 2.0
Aromatic EPH >C35-C40 MC	EH_2D_AR_#1	N	2690	mg/kg	1.00	[B] < 1.0	[B] 2.0
Total Aromatic EPH >C10-C35 MC	EH_2D_AR_#1	U	2690	mg/kg	5.00	[B] < 5.0	[B] < 5.0
Total Aromatic EPH >C10-C40 MC	EH_2D_AR_#1	N	2690	mg/kg	10.00	[B] < 10	[B] < 10
Total VPH >C5-C10	HS_2D_Total	U	2780	mg/kg	0.50	[B] < 0.50	[B] < 0.50
Total EPH >C10-C35 MC	EH_2D_Total_#1	U	2690	mg/kg	10.00	[B] < 10	[B] 240
Total EPH >C10-C40 MC	EH_2D_Total_#1	N	2690	mg/kg	10.00	[B] < 10	[B] 280
Organic Matter		M	2625	%	0.40	1.7	1.1
Naphthalene		M	2700	mg/kg	0.10	< 0.10	< 0.10
Acenaphthylene		M	2700	mg/kg	0.10	< 0.10	< 0.10
Acenaphthene		M	2700	mg/kg	0.10	< 0.10	< 0.10
Fluorene		M	2700	mg/kg	0.10	< 0.10	< 0.10
Phenanthrene		M	2700	mg/kg	0.10	< 0.10	< 0.10
Anthracene		M	2700	mg/kg	0.10	< 0.10	< 0.10
Fluoranthene		M	2700	mg/kg	0.10	< 0.10	< 0.10
Pyrene		M	2700	mg/kg	0.10	< 0.10	< 0.10
Benzo[a]anthracene		M	2700	mg/kg	0.10	< 0.10	< 0.10
Chrysene		M	2700	mg/kg	0.10	< 0.10	< 0.10
Benzo[b]fluoranthene		M	2700	mg/kg	0.10	< 0.10	< 0.10
Benzo[k]fluoranthene		M	2700	mg/kg	0.10	< 0.10	< 0.10
Benzo[a]pyrene		M	2700	mg/kg	0.10	< 0.10	< 0.10
Indeno(1,2,3-c,d)Pyrene		M	2700	mg/kg	0.10	< 0.10	< 0.10
Dibenz(a,h)Anthracene		M	2700	mg/kg	0.10	< 0.10	< 0.10
Benzo[g,h,i]perylene		M	2700	mg/kg	0.10	< 0.10	< 0.10
Total Of 16 PAH's		M	2700	mg/kg	2.0	< 2.0	< 2.0
Benzene		M	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0
Toluene		M	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0
Ethylbenzene		M	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0
m & p-Xylene		M	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0
o-Xylene		M	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0

Deviations

In accordance with UKAS Policy on Deviating Samples TPS 63. Chemtest have a procedure to ensure 'upon receipt of each sample a competent laboratory shall assess whether the sample is suitable with regard to the requested test(s)'. This policy and the respective holding times applied, can be supplied upon request. The reason a sample is declared as deviating is detailed below. Where applicable the analysis remains UKAS/MCERTs accredited but the results may be compromised.

Sample:	Sample Ref:	Sample ID:	Sample Location:	Sampled Date:	Deviation Code(s):	Containers Received:
1849631	1	WLS1E1	WLS1	23-Jul-2024	B	Amber Glass 250ml
1849631	1	WLS1E1	WLS1	23-Jul-2024	B	Plastic Tub 1000g
1849642	12	WLS2E9	WLS2	25-Jul-2024	B	Amber Glass 250ml
1849642	12	WLS2E9	WLS2	25-Jul-2024	B	Plastic Tub 1000g
1849674	45	HHWSE2	HHWS1	24-Jul-2024	B	Amber Glass 250ml
1849674	45	HHWSE2	HHWS1	24-Jul-2024	B	Plastic Tub 1000g
1849679	50	HHWS2E3	HHWS2	24-Jul-2024	B	Amber Glass 250ml
1849679	50	HHWS2E3	HHWS2	24-Jul-2024	B	Plastic Tub 1000g
1849682	53	HHWS4E1	HHWS4	24-Jul-2024	B	Amber Glass 250ml
1849682	53	HHWS4E1	HHWS4	24-Jul-2024	B	Plastic Tub 1000g

Test Methods

SOP	Title	Parameters included	Method summary	Water Accred.
2010	pH Value of Soils	pH at 20°C	pH Meter	
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <30°C.	
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930	
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry	
2455	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.	
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.	
2690	EPH A/A Split	Aliphatics: >C10–C12, >C12–C16, >C16–C21, >C21– C35, >C35– C40 Aromatics: >C10–C12, >C12–C16, >C16–C21, >C21– C35, >C35– C40	Acetone/Heptane extraction / GCxGC FID detection	
2700	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-FID	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenzo[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Dichloromethane extraction / GC-FID (GC-FID detection is non-selective and can be subject to interference from co-eluting compounds)	
2760	Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule	Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds.	
2780	VPH A/A Split	Aliphatics: >C5–C6, >C6–C7,>C7–C8,>C8-C10 Aromatics: >C5–C7,>C7-C8,>C8–C10	Water extraction / Headspace GCxGC FID detection	

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"
SOP	Standard operating procedure
LOD	Limit of detection

This report shall not be reproduced except in full, and only with the prior approval of the laboratory.

Any comments or interpretations are outside the scope of UKAS accreditation.

The Laboratory is not accredited for any sampling activities and reported results relate to the samples 'as received' at the laboratory.

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 EPH, VPH, TPH, BTEX, VOCs, SVOCs, PCBs, Phenols.

For all other tests the samples were dried at $\leq 30^{\circ}\text{C}$ 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
- E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 30 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.

Water Sample Category Key for Accreditation

- DW - Drinking Water
- GW - Ground Water
- LE - Land Leachate
- NA - Not Applicable

Report Information

PL - Prepared Leachate
PW - Processed Water
RE - Recreational Water
SA - Saline Water
SW - Surface Water
TE - Treated Effluent
TS - Treated Sewage
UL - Unspecified Liquid

Clean Up Codes

NC - No Clean Up
MC - Mathematical Clean Up
FC - Florisil Clean Up

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 - Aromatic only
2D - GC-GC – Double coil gas chromatography
#1 - EH_2D_Total but with humics mathematically subtracted
#2 - EH_2D_Total but with fatty acids mathematically subtracted
+ - Operator to indicate cumulative e.g. EH+EH_Total or EH_CU+HS_Total

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

NSR Embankment

		Chemtest Job No.:				24-25727	24-25727	24-25727	24-25727	24-25727	24-25727	24-25727	24-25727		
		Chemtest Sample ID.:				1849631	1849642	1849650	1849654	1849662	1849664	1849667	1849669		
		Client Sample Ref.:				1	12	21	25	33	35	38	40		
		Client Sample ID.:				WLS1E1	WLS2E9	WLS3E7	WLS3E11	WLS4E5	WLS4E7	WLS5E1	WLS5E3		
		Sample Location:				WLS1	WLS2	WLS3	WLS3	WLS4	WLS4	WLS5	WLS5		
		Sample Type:				SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL		
		Top Depth (m):				0.40	8.40	6.50	10.50	5.40	7.30	1.20	3.60		
		Bottom Depth (m):				0.50	8.50	6.60	10.60	5.50	7.40	1.30	3.70		
		Date Sampled:				23-Jul-2024	25-Jul-2024	30-Jul-2024	30-Jul-2024	30-Jul-2024	30-Jul-2024	30-Jul-2024	30-Jul-2024		
		Asbestos Lab:				DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM		
Determinand	HWOL	Accred.	SOP	Units	LOD									S4UL	C4SL
ACM Type		U	2192		N/A	-	-	-	-	-	-	-	-		
Asbestos Identification		U	2192		N/A	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected		
Moisture		N	2030	%	0.020	10	18	19	23	25	24	7.8	13		
Soil Colour		N	2040		N/A	Brown	Brown	Brown	Brown	Brown	Brown	Brown	Brown		
Other Material		N	2040		N/A	Stones and Roots	Stones and Roots	Stones and Roots	Stones and Roots	Stones	Stones	Stones	Stones		
Soil Texture		N	2040		N/A	Clay	Clay	Clay	Clay	Clay	Clay	Clay	Clay		
pH at 20C		M	2010		4.0	6.6	8.9	8.4	7.8	8.3	8.6	7.5	8.9		
Arsenic		M	2455	mg/kg	0.5	17	11	13	14	12	9.8	10	3.1	170	
Cadmium		M	2455	mg/kg	0.10	0.34	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	532	
Chromium		M	2455	mg/kg	0.5	14	54	33	40	32	32	26	44	220	
Copper		M	2455	mg/kg	0.50	32	19	19	15	16	13	6.6	17	44000	
Mercury		M	2455	mg/kg	0.05	0.06	< 0.05	< 0.05	< 0.05	< 0.05	0.08	< 0.05	< 0.05	68	
Nickel		M	2455	mg/kg	0.50	24	62	33	36	32	30	21	59	800	
Lead		M	2455	mg/kg	0.50	23	27	20	31	21	22	13	14		1300
Selenium		M	2455	mg/kg	0.25	0.64	1.0	0.79	1.1	0.64	0.77	0.51	1.0	1800	
Vanadium		U	2455	mg/kg	0.5	14	49	35	47	37	35	29	31	5000	
Zinc		M	2455	mg/kg	0.50	95	100	76	120	76	77	50	61	170000	
Aliphatic VPH >C5-C6	HS_2D	U	2780	mg/kg	0.05	[B] < 0.05	[B] < 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	95000	
Aliphatic VPH >C6-C7	HS_2D	U	2780	mg/kg	0.05	[B] < 0.05	[B] < 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05		
Aliphatic VPH >C7-C8	HS_2D	U	2780	mg/kg	0.05	[B] < 0.05	[B] < 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05		
Aliphatic VPH >C6-C8 (Sum)	HS_2D	N	2780	mg/kg	0.10	[B] < 0.10	[B] < 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	150000	
Aliphatic VPH >C8-C10	HS_2D	U	2780	mg/kg	0.05	[B] < 0.05	[B] < 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	14000	
Total Aliphatic VPH >C5-C10	HS_2D	U	2780	mg/kg	0.25	[B] < 0.25	[B] < 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25		
Aliphatic EPH >C10-C12 MC	EH_2D_	M	2690	mg/kg	2.00	[B] < 2.0	[B] < 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	2.5	21000	
Aliphatic EPH >C12-C16 MC	EH_2D_	M	2690	mg/kg	1.00	[B] < 1.0	[B] < 1.0	< 1.0	< 1.0	100	3.8	< 1.0	23	25000	
Aliphatic EPH >C16-C21 MC	EH_2D_	M	2690	mg/kg	2.00	[B] < 2.0	[B] < 2.0	< 2.0	< 2.0	140	6.3	< 2.0	45		
Aliphatic EPH >C21-C35 MC	EH_2D_	M	2690	mg/kg	3.00	[B] < 3.0	[B] < 3.0	5.9	< 3.0	180	4.7	< 3.0	190		
Aliphatic EPH >C16-C35 MC (sum)							<5.0	7.9	<5.0	320	11.0	<5.0	235	450000	
Aliphatic EPH >C35-C40 MC	EH_2D_	N	2690	mg/kg	10.00	[B] < 10	[B] < 10	< 10	< 10	38	< 10	< 10	42	450000	
Total Aliphatic EPH >C10-C35 MC	EH_2D_	M	2690	mg/kg	5.00	[B] < 5.0	[B] < 5.0	6.3	< 5.0	420	15	< 5.0	260		
Total Aliphatic EPH >C10-C40 MC	EH_2D_	N	2690	mg/kg	10.00	[B] < 10	[B] < 10	< 10	< 10	460	15	< 10	300		
Aromatic VPH >C5-C7	HS_2D	U	2780	mg/kg	0.05	[B] < 0.05	[B] < 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	76000	
Aromatic VPH >C7-C8	HS_2D	U	2780	mg/kg	0.05	[B] < 0.05	[B] < 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	87000	
Aromatic VPH >C8-C10	HS_2D	U	2780	mg/kg	0.05	[B] < 0.05	[B] < 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	7200	
Total Aromatic VPH >C5-C10	HS_2D	U	2780	mg/kg	0.25	[B] < 0.25	[B] < 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25		
Aromatic EPH >C10-C12 MC	EH_2D_	U	2690	mg/kg	1.00	[B] < 1.0	[B] < 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	9200	
Aromatic EPH >C12-C16 MC	EH_2D_	U	2690	mg/kg	1.00	[B] < 1.0	[B] < 1.0	< 1.0	< 1.0	23	< 1.0	< 1.0	< 1.0	10000	
Aromatic EPH >C16-C21 MC	EH_2D_	U	2690	mg/kg	2.00	[B] 3.5	[B] < 2.0	< 2.0	< 2.0	34	< 2.0	< 2.0	4.6	7600	
Aromatic EPH >C21-C35 MC	EH_2D_	U	2690	mg/kg	2.00	[B] < 2.0	[B] < 2.0	6.3	< 2.0	4.2	< 2.0	< 2.0	< 2.0	7800	
Aromatic EPH >C35-C40 MC	EH_2D_	N	2690	mg/kg	1.00	[B] < 1.0	[B] 14	3.5	2.2	2.8	1.6	1.4	2.4	7800	
Total Aromatic EPH >C10-C35 MC	EH_2D_	U	2690	mg/kg	5.00	[B] < 5.0	[B] < 5.0	7.6	< 5.0	61	< 5.0	< 5.0	< 5.0		
Total Aromatic EPH >C10-C40 MC	EH_2D_	N	2690	mg/kg	10.00	[B] < 10	[B] 14	11	< 10	64	< 10	< 10	< 10		
Total VPH >C5-C10	HS_2D_	U	2780	mg/kg	0.50	[B] < 0.50	[B] < 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50		
Total EPH >C10-C35 MC	EH_2D_To	U	2690	mg/kg	10.00	[B] < 10	[B] < 10	14	< 10	480	15	< 10	270		
Total EPH >C10-C40 MC	EH_2D_To	N	2690	mg/kg	10.00	[B] < 10	[B] 14	17	< 10	530	17	< 10	310		
Organic Matter		M	2625	%	0.40	1.9	0.59	0.79	1.1	1.7	0.86	0.72	< 0.40		
Naphthalene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	1200	
Acenaphthylene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.21	< 0.10	29000	
Acenaphthene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.34	< 0.10	29000	
Fluorene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.29	< 0.10	20000	
Phenanthrene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	4.3	< 0.10	6200	
Anthracene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.86	< 0.10	150000	
Fluoranthene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	6.4	< 0.10	6300	

[illegible]

NSR Embankment

		Chemtest Job No.:				24-25727	24-25727	24-25727	24-25727	24-25727		
		Chemtest Sample ID.:				1849674	1849679	1849682	1849685	1849690		
		Client Sample Ref.:				45	50	53	56	61		
		Client Sample ID.:				HHWSE2	HHWS2E3	HHWS4E1	HHWS5E1	HHWS6E3		
		Sample Location:				HHWS1	HHWS2	HHWS4	HHWS5	HHWS6		
		Sample Type:				SOIL	SOIL	SOIL	SOIL	SOIL		
		Top Depth (m):				1.60	2.70	0.10	0.30	2.40		
		Bottom Depth (m):				1.70	2.80	1.20	0.40	2.50		
		Date Sampled:				24-Jul-2024	24-Jul-2024	24-Jul-2024	31-Jul-2024	30-Jul-2024		
		Asbestos Lab:				DURHAM	DURHAM	DURHAM	DURHAM	DURHAM		
Determinand	HWOL Code	Accred.	SOP	Units	LOD						S4UL	C4SL
ACM Type		U	2192		N/A	-	-	-	-	-		
Asbestos Identification		U	2192		N/A	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected		
Moisture		N	2030	%	0.020	8.7	11	11	12	14		
Soil Colour		N	2040		N/A	Brown	Brown	Brown	Brown	Brown		
Other Material		N	2040		N/A	Stones and Roots	Stones	Stones and Roots	Stones and Roots	Stones		
Soil Texture		N	2040		N/A	Loam	Clay	Clay	Clay	Clay		
pH at 20C		M	2010		4.0	5.6	6.6	5.8	< 4.0	8.4		
Arsenic		M	2455	mg/kg	0.5	15	12	17	15	11	170	
Cadmium		M	2455	mg/kg	0.10	0.71	< 0.10	0.70	0.41	0.14	532	
Chromium		M	2455	mg/kg	0.5	13	15	18	17	12	220	
Copper		M	2455	mg/kg	0.50	30	22	31	39	26	44000	
Mercury		M	2455	mg/kg	0.05	0.07	0.06	0.14	1.2	0.07	68	
Nickel		M	2455	mg/kg	0.50	27	28	33	38	21	800	
Lead		M	2455	mg/kg	0.50	29	17	26	83	19		1300
Selenium		M	2455	mg/kg	0.25	0.79	0.80	0.87	1.2	0.62	1800	
Vanadium		U	2455	mg/kg	0.5	14	15	19	28	14	5000	
Zinc		M	2455	mg/kg	0.50	100	74	120	120	75	170000	
Aliphatic VPH >C5-C6	HS_2D_AL	U	2780	mg/kg	0.05	[B] < 0.05	[B] < 0.05	[B] < 0.05	< 0.05	< 0.05	95000	
Aliphatic VPH >C6-C7	HS_2D_AL	U	2780	mg/kg	0.05	[B] < 0.05	[B] < 0.05	[B] < 0.05	< 0.05	< 0.05		
Aliphatic VPH >C7-C8	HS_2D_AL	U	2780	mg/kg	0.05	[B] < 0.05	[B] < 0.05	[B] < 0.05	< 0.05	< 0.05		
Aliphatic VPH >C6-C8 (Sum)		N	2780	mg/kg	0.10	[B] < 0.10	[B] < 0.10	[B] < 0.10	< 0.10	< 0.10	150000	
Aliphatic VPH >C8-C10	HS_2D_AL	U	2780	mg/kg	0.05	[B] < 0.05	[B] < 0.05	[B] < 0.05	< 0.05	< 0.05	14000	
Total Aliphatic VPH >C5-C10	HS_2D_AL	U	2780	mg/kg	0.25	[B] < 0.25	[B] < 0.25	[B] < 0.25	< 0.25	< 0.25		
Aliphatic EPH >C10-C12 MC	EH_2D_AL_#1	M	2690	mg/kg	2.00	[B] < 2.0	[B] < 2.0	[B] < 2.0	40	< 2.0	21000	
Aliphatic EPH >C12-C16 MC	EH_2D_AL_#1	M	2690	mg/kg	1.00	[B] < 1.0	[B] < 1.0	[B] < 1.0	3300	110	25000	
Aliphatic EPH >C16-C21 MC	EH_2D_AL_#1	M	2690	mg/kg	2.00	[B] < 2.0	[B] 6.1	[B] < 2.0	6200	260		
Aliphatic EPH >C21-C35 MC	EH_2D_AL_#1	M	2690	mg/kg	3.00	[B] < 3.0	[B] 230	[B] < 3.0	4800	210		
Aliphatic EPH >C16-C35 MC (sum)						<5.0	236.1	<5	11000	470	450000	
Aliphatic EPH >C35-C40 MC	EH_2D_AL_#1	N	2690	mg/kg	10.00	[B] < 10	[B] 37	[B] < 10	830	42	450000	
Total Aliphatic EPH >C10-C35 MC	EH_2D_AL_#1	M	2690	mg/kg	5.00	[B] < 5.0	[B] 240	[B] < 5.0	14000	590		
Total Aliphatic EPH >C10-C40 MC	EH_2D_AL_#1	N	2690	mg/kg	10.00	[B] < 10	[B] 280	[B] < 10	15000	630		
Aromatic VPH >C5-C7	HS_2D_AR	U	2780	mg/kg	0.05	[B] < 0.05	[B] < 0.05	[B] < 0.05	< 0.05	< 0.05	76000	
Aromatic VPH >C7-C8	HS_2D_AR	U	2780	mg/kg	0.05	[B] < 0.05	[B] < 0.05	[B] < 0.05	< 0.05	< 0.05	87000	
Aromatic VPH >C8-C10	HS_2D_AR	U	2780	mg/kg	0.05	[B] < 0.05	[B] < 0.05	[B] < 0.05	< 0.05	< 0.05	7200	
Total Aromatic VPH >C5-C10	HS_2D_AR	U	2780	mg/kg	0.25	[B] < 0.25	[B] < 0.25	[B] < 0.25	< 0.25	< 0.25		
Aromatic EPH >C10-C12 MC	EH_2D_AR_#1	U	2690	mg/kg	1.00	[B] < 1.0	[B] < 1.0	[B] < 1.0	6.0	< 1.0	9200	
Aromatic EPH >C12-C16 MC	EH_2D_AR_#1	U	2690	mg/kg	1.00	[B] < 1.0	[B] < 1.0	[B] < 1.0	1900	48	10000	
Aromatic EPH >C16-C21 MC	EH_2D_AR_#1	U	2690	mg/kg	2.00	[B] < 2.0	[B] < 2.0	[B] < 2.0	2600	81	7600	
Aromatic EPH >C21-C35 MC	EH_2D_AR_#1	U	2690	mg/kg	2.00	[B] < 2.0	[B] < 2.0	[B] < 2.0	57	7.0	7800	
Aromatic EPH >C35-C40 MC	EH_2D_AR_#1	N	2690	mg/kg	1.00	[B] < 1.0	[B] 2.0	[B] < 1.0	36	14	7800	
Total Aromatic EPH >C10-C35 MC	EH_2D_AR_#1	U	2690	mg/kg	5.00	[B] < 5.0	[B] < 5.0	[B] < 5.0	4500	140		
Total Aromatic EPH >C10-C40 MC	EH_2D_AR_#1	N	2690	mg/kg	10.00	[B] < 10	[B] < 10	[B] < 10	4600	150		
Total VPH >C5-C10	HS_2D_Total	U	2780	mg/kg	0.50	[B] < 0.50	[B] < 0.50	[B] < 0.50	< 0.50	< 0.50		
Total EPH >C10-C35 MC	EH_2D_Total_#1	U	2690	mg/kg	10.00	[B] < 10	[B] 240	[B] < 10	19000	720		
Total EPH >C10-C40 MC	EH_2D_Total_#1	N	2690	mg/kg	10.00	[B] < 10	[B] 280	[B] < 10	20000	780		
Organic Matter		M	2625	%	0.40	1.7	1.1	3.6	6.6	1.5		
Naphthalene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	1200	
Acenaphthylene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	29000	
Acenaphthene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	29000	
Fluorene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	20000	
Phenanthrene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	6200	
Anthracene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	150000	
Fluoranthene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	6300	

		Client Sample ID.:				HHWSE2	HHWS2E3	HHWS4E1	HHWS5E1	HHWS6E3		
		Sample Location:				HHWS1	HHWS2	HHWS4	HHWS5	HHWS6		
		Sample Type:				SOIL	SOIL	SOIL	SOIL	SOIL		
		Top Depth (m):				1.60	2.70	0.10	0.30	2.40		
		Bottom Depth (m):				1.70	2.80	1.20	0.40	2.50		
		Date Sampled:				24-Jul-2024	24-Jul-2024	24-Jul-2024	31-Jul-2024	30-Jul-2024		
Pyrene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	15000	
Benzo[a]anthracene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	49	
Chrysene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	93	
Benzo[b]fluoranthene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	13	
Benzo[k]fluoranthene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	370	
Benzo[a]pyrene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	11	
Indeno(1,2,3-c,d)Pyrene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	150	
Dibenz(a,h)Anthracene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	1.1	
Benzo[g,h,i]perylene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	1400	
Total Of 16 PAH's		M	2700	mg/kg	2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0		
Benzene		M	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	< 1.0	< 1.0	90	
Toluene		M	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	< 1.0	< 1.0		
Ethylbenzene		M	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	< 1.0	< 1.0	87000	
m & p-Xylene		M	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	< 1.0	< 1.0	17000	
o-Xylene		M	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	< 1.0	< 1.0	17000	