

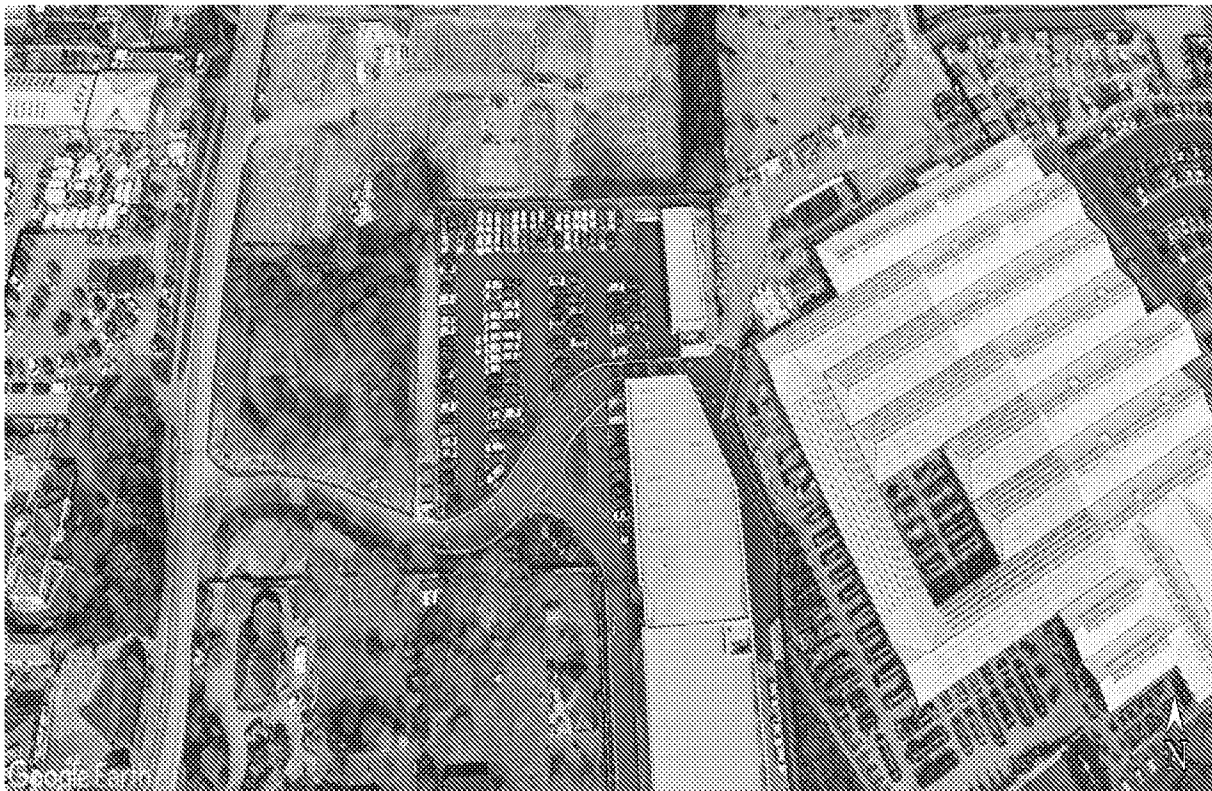
**PHASE 2
GEOTECHNICAL AND GEO-ENVIRONMENTAL
SITE INVESTIGATION**

**CAFFYNS VOLVO
WORTHING**

FOR

CAFFYNS PLC (EASTBOURNE)

ISSUE 1



46357-002

11 January 2022

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**CAFFYNS VOLVO
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FOR

CAFFYNS PLC (EASTBOURNE)

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APPENDICES

Appendix 1 Exploratory Hole Location Plan, drawing reference 46537/001

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Window Sample Logs (WS01 to WS03)

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Appendix 4 Chemical Test Results (Chemtest 21-45533)
Table of Assessment Values
Geotechnical Test Results (GEO/34572)

1.0 EXECUTIVE SUMMARY

1. The approximately 0.25 hectare site is located to the east of Roundstone Lane on the southern side of Angmering in West Sussex.
2. The site currently comprises an unoccupied area of scrubland.

3. Historically, other than a greenhouse no development has occurred on site. The surrounding area has been a combination of residential and commercial/industrial uses.
4. The geology across the site comprises superficial River Terrace Deposits overlying the New Pit Chalk Formation.
5. The superficial deposits comprise a Secondary A Aquifer, while the underlying chalk is classified as a Principal Aquifer. The site does not lie within a groundwater Source Protection Zone.
6. No ground gas precautions are considered necessary.
7. The ground conditions comprise made ground over firm slightly sandy clay becoming more sandy and gravelly with depth.
8. Groundwater was not encountered during the investigation, however a subsequent round of groundwater monitoring recorded water at 3.56 m bgl in one of the monitoring wells.
9. Traditional pad foundations are expected to be appropriate, taken through any made ground and founded at an expected minimum depth of 750 mm in natural clay strata.
10. The clay has a low volume change potential and therefore foundations will require deepening where within the influence of past or present trees.
11. A ground bearing floor slab is expected to be appropriate.
12. Variable infiltration rates of between 0.24×10^{-6} and 15×10^{-6} m/sec were recorded, with an average value of around 2 to 3×10^{-6} m/sec considered a reasonable value for design purposes.
13. Two samples of made ground recorded phytotoxic concentrations of mercury, but no determinants were recorded exceeding human health assessment values. It is recommended that a 300 mm capping layer of clean soil is provided in any landscaped areas in order to provide a suitable growing medium. No further remedial measures are considered necessary.
14. DS-2 AC-2 sulphate precautions are recommended for concrete in contact with the made ground, however can be reduced to DS-1 AC-1 for concrete in contact with the natural ground only.
15. The conclusions made in this report are subject to agreement by the approving bodies and your warranty provider.

2.0 INTRODUCTION

2.1 Terms of Reference

This report presents the findings of a Phase 2 (intrusive) geotechnical and geo-environmental site investigation carried out by Eastwood & Partners (Consulting Engineers) Ltd for Caffyns PLC (Eastbourne). Any other parties using the information in this report do so at their own risk and any duty of care is excluded.

2.2 Context

Eastwood & Partners completed a Phase 1 report for the site previously. Report reference 46357-001, dated 16 December 2021, should be read in conjunction with this report.

No other intrusive site investigations are known to have been undertaken on the site in the past.

2.3 Aims and Objectives

The aims and objectives of this investigation were as follows. To:

- Detail the ground conditions and their geotechnical properties enabling outline foundation proposals to be made for the proposed development;
- Carry out tiered risk assessment to establish the likely risks to future receptors, involving the use of generic assessment criteria and where unacceptable risks are identified, site specific assessment criteria within a detailed quantitative risk assessment;
- Identify feasible remediation options if unacceptable risks are highlighted; and
- Develop an appropriate remediation strategy where remediation is required.

2.4 Scope of Investigation

The investigation consisted of intrusive site works and laboratory analysis. The findings were used to test the conceptual model and produce a final risk assessment. The intrusive works comprised trial pits and window sample boreholes which were undertaken to enable:

- Examination of the upper few metres of ground;
- In situ description of soils, enabling any localised lateral and vertical changes in soil conditions to be logged;
- Assessment of any contamination identified using visual and olfactory methods;

- Collection of soil samples for geotechnical and chemical testing;
- Completion of infiltration testing; and
- Installation of gas and groundwater monitoring wells.

2.5 Limitations of Investigation

This report is based on the assumption that the site will be developed as a car sales showroom and workshop and that levels will not alter significantly. If this is not the case, the advice given in this report may not be appropriate.

Where assessments of site areas affected in particular ways are given, these are approximate. All information, comments and opinions given in this report are based on the documentary information examined. This report considers the ground and groundwater and does not cover any buildings or their fabric or the constituents of any existing hardstanding. Risks to ecological receptors, such as bats, have not been considered.

3.0 SITE DESCRIPTION

The approximately 0.25 hectare site is located to the east of Roundstone Lane on the southern side of Angmering in West Sussex. The site is approximately square on plan and is centred on grid reference 507440, 103310.

The site is covered with shrub vegetation. In the middle of the site are macadam covered pathways, with soft landscaped/gravel covered areas in between. A number of trees are present both within the site and around the site boundaries.

The site is relatively level at around 10 m Above Ordnance Datum (AOD).

The site is bordered by residential properties to the north and south, Caffyns Audi car dealership to the east and a combination of residential properties and further commercial/industrial units to the west on the far side of Roundstone Lane.

In the south east corner of the site is a green box structure which is assumed to house a gas governor serving the adjoining Audi dealership.

Photos of the site are included in the Appendix.

4.0 SUMMARY OF PHASE 1 ASSESSMENT

A Phase 1 assessment of the site was undertaken by Eastwood & Partners previously, reference 46357-001. The pertinent points are summarised in the sections below.

4.1 Site History

A review of the historical maps has indicated that no development, other than the presence of a large greenhouse, associated with an adjacent plant nursery, has occurred at the site.

The surrounding area was predominantly a combination of agricultural and residential, with a number of plant nurseries. From 2000 onwards, the number of nurseries decreases and are replaced by a combination of housing and commercial/industrial land uses.

4.2 Geology

The solid geology at the site is shown to be the New Pit Chalk Formation and this is overlain by superficial River Terrace Deposits.

No faults are shown to cross the site.

The Envirocheck notes that the potential for ground dissolution stability hazards, i.e. dissolution features, on the site is 'very low'.

4.3 Hydrogeology

The Envirocheck identifies the River Terrace Deposits as a Secondary A Aquifer and the New Pit Chalk Formation as a Principal Aquifer.

4.4 Ground Gas

No radon precautions are required and there are no historical or active landfill sites in proximity to the site. Ground gas precautions are therefore not considered to be required.

4.5 Potential Pollutant Linkages

The table overleaf details the possible sources and associated contaminants of concern, pathways and receptors which were identified by the Phase 1 report:

Source	Potential Contaminants	Potential Pathways	Potential Receptors
Made ground	Heavy metals/metalloids Asbestos PAHs Sulphates	Ingestion, inhalation, direct contact Root Uptake Migration through ground Direct Contact	Site users Principal Aquifer Below ground concrete Water supply pipes
Topsoil	Heavy metals/metalloids		
Natural Ground	Sulphates	Direct Contact	Below ground concrete

5.0 GROUND INVESTIGATION

5.1 Site Works

Eastwood & Partners visited the site between 20 and 22 December 2021 and completed four trial pits (TP01 to TP04) and three window sample holes (WS01 to WS03) across the site to depths of between 1 and 4 m.

Copies of all exploratory hole logs are presented in Appendix 2, and their locations are plotted on the Exploratory Hole Location Plan, Drawing number 46357/001 in Appendix 1.

5.2 Laboratory Testing

Two samples of natural clay were dispatched for geotechnical testing at Geolabs. The results are presented in Appendix 4 and discussed further in Section 7.

Seven samples of made ground and two samples of natural ground were dispatched for chemical testing. Soil samples were taken in 500 g plastic tubs and 250 ml amber glass jars and were analysed at Chemtest Laboratories, using MCERTs accredited methodologies where available.

The chemical test results are presented in Appendix 4 and are discussed further in Sections 8 and 9.

6.0 GROUND CONDITIONS

6.1 Made Ground

Made ground was encountered from ground level in all of the trial pits and window sample holes. It was found to comprise dark brown sandy gravelly clay with the gravel element comprising brick and flint with additional materials, such as plastic and glass. Black geotextile was also identified within this material. It reached depths of between 0.2 and 0.4 m below ground level (bgl).

6.2 Natural Ground

Natural ground was found underlying the made ground. This typically comprised firm brown slightly sandy clay which became more gravelly and sandy with depth. The gravel was generally fine to coarse subangular to angular flint and chalk. These strata are considered to represent the River Terrace Deposits and the base of this strata was not proven in any of the exploratory holes.

6.3 Obstructions

No obstructions were encountered in any of the exploratory holes.

6.4 Groundwater

Groundwater was not encountered in any of the trial pits or window sample holes during the investigation. One round of groundwater monitoring has been undertaken to date and water was only encountered in one of the three monitoring wells, WS3, at a depth of 3.56 m bgl.

It should be noted however, that groundwater levels can vary in the long term as well as in response to seasonal changes.

7.0 GEOTECHNICAL APPRAISAL

7.1 General

Our investigation indicates that the ground conditions beneath site are homogenous with little variation noted. The ground conditions comprise shallow made ground over natural ground of firm sandy, becoming gravelly clay. Groundwater was not encountered in any of the exploratory holes during the investigation, but was later recorded at 3.56 m in one of the wells..

7.2 Geotechnical Testing

Two samples of natural ground were sent for geotechnical testing. The results are enclosed in Appendix 4 (GEO/34572) and summarised below:

Trial Pit	Depth (m)	Moisture Content	Liquid Limit	0.4 x Liquid Limit	Potentially Desiccated?	Modified Plasticity Index (%)	Volume Change Potential
TP03	1.4	23.9	36	14.4	N	16	Low
WS02	2-2.2	22.3	35	14	N	16.8	Low

Based on the results above, it is considered that the cohesive River Terrace Deposits should be classed as having a low volume change potential in accordance with NHBC Standards, Chapter 4.2.

7.3 Foundations

Traditional pad foundations, taken through any made ground into natural, non-desiccated River Terrace Deposits strata, are expected to be appropriate. Due to the low volume change potential of the cohesive soils, the minimum depth should be 750 mm below finished or original ground level, whichever is the lower.

At the minimum founding depths, an allowable bearing capacity of 100 kN/m² is likely to be achieved. In localised areas, should soft spots be encountered at the founding depth then the foundations should be deepened further onto more competent strata.

In addition, foundations within clay soils will need to be deepened where past, present or proposed trees are within influencing distance of the foundation.

7.4 Ground Floors

Ground bearing floor slabs are expected to be appropriate.

7.5 Superstructure Precautions

Additional superstructure precautions are not considered to be required due to the ground

conditions.

7.6 Excavation Problems

All of the trial pits remained dry and stable whilst open. However, due to the granular nature of some of the strata encountered deeper in the trial pits, potentially excavation instability and side collapse during the construction works could occur, particularly if excavations are left open for prolonged periods of time.

Support will be required in accordance with current Health and Safety Regulations wherever access is required to trenches deeper than 1.2 m or less where there is risk of collapse.

Groundwater was not encountered in any of the trial pits or window sample holes during investigation, but was later recorded at a depth of 3.56 m bgl in one of the monitoring wells. At this depth groundwater is not likely to affect construction works. However, it must be appreciated that groundwater levels can vary in the long term as well as in response to seasonal changes.

7.7 Problems due to Past Development

An underground gas main pipe crosses the east of the site and other services are present along the northern site boundary. Suitable easements will need to be maintained around these if they are not going to be re-routed.

7.8 Surface Water Drainage

Infiltration testing was carried out as part of the investigation in three trial pits, TP01 to TP03. The locations are shown on the Exploratory Hole Location Plan (Appendix 1), and the infiltration test results and trial pit logs are presented in Appendix 2.

The table below details the infiltration rates recorded in each pit.

Trial Pit	Test Ref	BRE365 Infiltration Rate ($\times 10^{-6}$ m/sec)	Average Infiltration Rate ($\times 10^{-6}$ m/sec)
TP01	T1	~	0.24
TP02	T1	14	15
	T2	7	3.1
	T3	8.5	3.8
TP03	T1	~	8.4
	T2	1.9	2
	T3	6	3

The infiltration rate in TP01 was significantly slower than that recorded in TP02 and 03 and as a result, repeat tests and determination of the BRE365 infiltration rate was not possible.

7.9 Road Design

Based upon the ground conditions observed a CBR value of at least 2% is likely to be applicable. It is recommended that CBR tests are undertaken along any proposed roads prior to construction so that accurate CBR values can be obtained. The ground should be assumed to be frost susceptible and a minimum construction thickness of 450 mm will therefore apply.

8.0 REFINEMENT OF OUTLINE CONCEPTUAL MODEL

8.1 Source Characterisation

An outline conceptual model, detailing the possible sources and associated contaminants of concern, potential pathways and receptors identified in the Phase 1 study was detailed in Section 4.6.

This section of the report documents the works undertaken to obtain information to test and refine this model enabling a risk assessment to be produced and, where significant risks are expected, remediation recommendations.

8.2 Ground Conditions

Our investigations indicate that the majority of the site is surfaced with made ground. Underlying the made ground was natural ground comprised the sandy becoming gravelly clays of the River Terrace Deposits. Groundwater was not encountered in any of the exploratory holes during the investigation but was later recorded at 3.56 m bgl in one of the monitoring wells.

8.3 Gas Precautions

No radon precautions are required at the site and no landfill sites were identified within 250 m. Made ground was not encountered to a significant depth and therefore ground gas precautions are not considered to be necessary.

8.4 Unexpected Contamination

Visual and olfactory evidence of possible significant contamination was not encountered in any of the exploratory holes.

8.5 Chemical Testing

Seven samples of made ground and two samples of natural ground were despatched for chemical testing. Each of the samples was analysed for the suite of contaminants listed below:

Contaminant Type	Actual Contaminants
Metals/Metalloids	Arsenic, cadmium, chromium (VI and total), lead, mercury, nickel, selenium, copper and zinc
pH	pH
PAHs	Speciated polycyclic aromatic hydrocarbons (PAH)
Sulphates	Water soluble sulphate, total (acid soluble sulphate) and sulphur

All eight samples of made ground were also screened for asbestos.

8.6 Assessment Criteria

As the site is to be developed with a car showroom, the assessment criteria relating to a commercial/industrial end use have been adopted.

Tables detailing the relevant assessment concentrations used are included in Appendix 4.

8.7 Chemical Test Results

A copy of the chemical test results (Chemtest report 21-45533) are included in Appendix 4. Some preliminary risk assessment is undertaken in this section of the report where determinants can be readily discounted.

8.7.1 Made Ground

None of the seven made ground samples recorded any elevated concentrations of contaminants with regards to human health. However, two samples of made ground recorded phytotoxic concentrations of mercury of 2.9 and 4.7 mg/kg compared to the assessment value of 1 mg/kg.

Asbestos was not detected in any of the seven samples tested.

8.7.2 Natural Ground

None of the samples of natural ground recorded elevated concentrations of any determinants.

8.8 Sulphates

In accordance with BRE Special Digest 1 (2005), the site has been categorised as a brownfield location in relation to the Aggressive Chemical Environment. Groundwater is expected to be mobile through the near surface soils.

All of the samples for made and natural ground were tested for sulphates. Water-soluble sulphate concentrations of <10 mg/l to 32 mg/l were recorded. Total potential sulphate ranged from 0.033% to 0.087%. The pH ranged from 7.8 to 8.4. The values for both water soluble sulphate and total potential sulphate fall into Design Sulphate Class DS-1 and the pH values fall into Aggressive Chemical Environment Class (ACEC) AC-1.

However, due to the heterogenous nature of made ground, it is recommended that DS-2 AC-2 sulphate precautions are included in any concrete in contact with the made ground.

8.9 Significant Pollutant Linkages

The following significant pollutant linkages have thus been identified.

Source	Potential Contaminants	Pathway	Receptor
Made ground	Phytotoxic mercury	Root uptake	Plants

9.0 RISK ASSESSMENT

9.1 Human Health – Future Residents and Visitors

None of the samples of made and natural ground recorded elevated concentrations of determinants above the generic human health assessment values. It is therefore concluded that the soils across the site do not pose a significant risk to human health and further remediation is not required.

9.2 Human Health – Construction Workers

Groundworkers employed during the construction phase of the development are most at risk of harm due to them having direct contact with affected soils. However, the contact is generally of short duration, and all competent ground workers will be aware of the potential risks associated with handling soils. Therefore, the overall risk to the health of construction workers is considered to be low.

Normal site procedures, such as the wearing of gloves when handling soils and the washing of hands prior to eating, should be implemented at all times.

Any unusual, brightly coloured, ashy or odorous material or material suspected of containing asbestos encountered during construction should be brought to the attention of the site staff and investigated.

9.3 Plants

Two samples of made ground recorded phytotoxic concentrations of mercury. For any limited soft landscaping areas a 300 mm layer of clean soil should be provided to provide a suitable growing medium.

9.4 Gas Precautions

Ground gas precautions are not considered to be necessary.

9.5 Controlled Waters

Some slightly elevated phytotoxic concentrations of mercury were detected in the made ground during the investigation. These contaminants are not expected to be soluble and downward migration is not anticipated. Therefore the potential risk to controlled waters is considered to be negligible.

9.6 Construction Materials

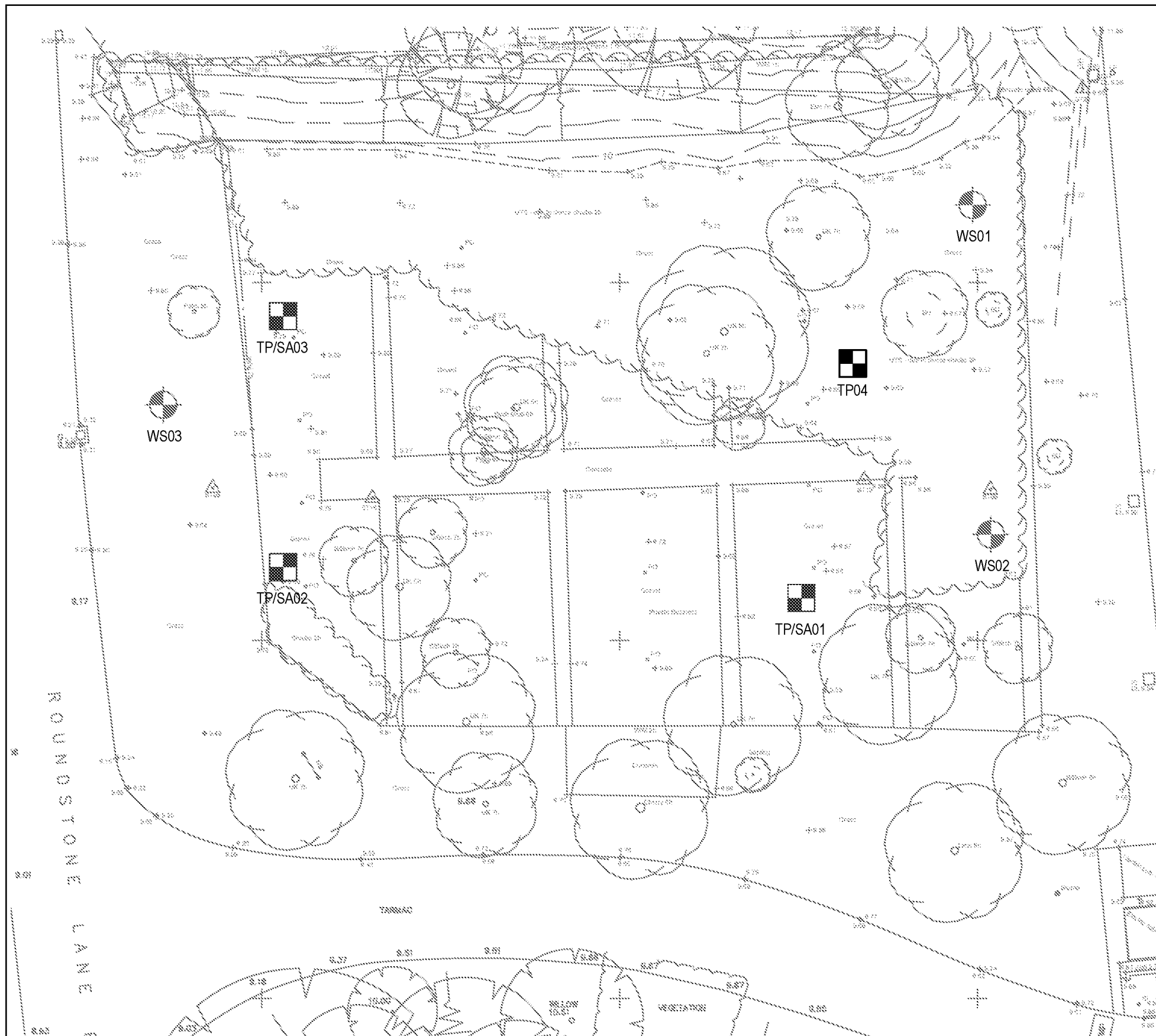
As discussed in Section 8.8, the concentration of sulphates and pH recorded in both the made ground and the natural ground resulted in a concrete classification of DS-1 AC-1. Therefore no sulphate precautions would be required.

However, due to the heterogenous nature of made ground, it is recommended that DS-2 AC-2 sulphate precautions are incorporated where concrete is in contact with made ground.

The chemical test results will need to be submitted to the water supplier for review so that appropriate water supply pipes can be selected.

Appendix 1

Exploratory Hole Location Plan, drawing reference 46357/001



INFORMATION WITHIN THIS DRAWING IS NOT NECESSARILY PRODUCED TO SCALE.
ALWAYS USE FIGURED DIMENSIONS AND CO-ORDINATES - IF IN DOUBT, ASK.



Approximate location of trial pit excavated by Eastwood and Partners on 20.12.2021.



Approximate location of trial pit and also soakaway test undertaken by Eastwood and Partners on 20.12.2021.



Approximate location of window sample borehole supervised by Eastwood and Partners on 20.12.2021.

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CAFFYNS PLC (EASTBOURNE)

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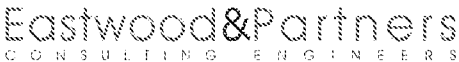
EXPLORATORY HOLE LOCATION PLAN

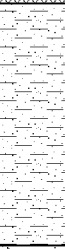
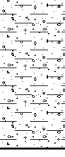
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Appendix 2

Trial Pit Logs (TP01 to TP04)

Window Sample Logs (WS01 to WS03)

							TrialPit No TP01 Sheet 1 of 1	
Project Name Volvo Worthing				Project No. 46357		Co-ords: - Level:		Date 20/12/2021
Location: Roundstone Lane, Angmering						Dimensions: m		Scale 1:25
Client: Caffyns						Depth: 1.60m		Logged

Samples & In Situ Testing			Depth (m)	Level (mAOD)	Legend	Stratum Description	
Depth (m)	Type	Results					
			0.30			MADE GROUND: Soft dark brown slightly sandy gravelly CLAY with black cloth, water standpipe and fragments of glass. Gravel is fine to medium subangular to angular flint. Sand is fine to coarse.	
			1.10			Firm brown slightly sandy CLAY with occasional Gravel. Gravel is fine to medium subangular to angular flint and chalk Sand is fine to coarse.	1
			1.60			Firm orangish brown slightly sandy gravelly CLAY. Gravel is fine to coarse subangular to angular flint. Sand is fine to coarse.	
						Trialpit Complete at 1.600m	2
							3
							4

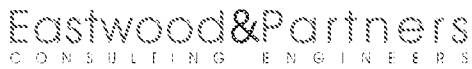
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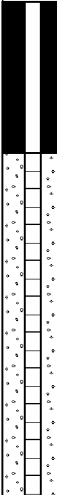
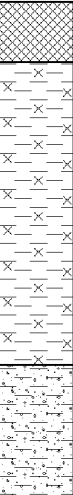
Stability:

Eastwood&Partners CONSULTING ENGINEERS						TrialPit No TP02 Sheet 1 of 1	
Project Name Volvo Worthing			Project No. 46357		Co-ords: - Level:		Date 20/12/2021
Location: Roundstone Lane, Angmering					Dimensions: m		Scale 1:25
Client: Caffyns					Depth: 1.00m		Logged
Samples & In Situ Testing			Depth (m)	Level (mAOD)	Legend	Stratum Description	
Depth (m)	Type	Results					
			0.20			MADE GROUND: Soft dark brown slightly sandy gravelly CLAY with black cloth. Gravel is fine to medium subangular to angular flint. Sand is fine to coarse.	
						Firm brown slightly sandy CLAY. Sand is fine to coarse.	
			1.00			Trialpit Complete at 1.000m	
Remarks: Stability:							

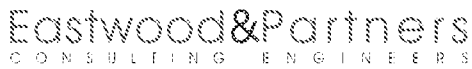
Eastwood&Partners CONSULTING ENGINEERS						TrialPit No TP03 Sheet 1 of 1	
Project Name Volvo Worthing			Project No. 46357		Co-ords: - Level:		Date 20/12/2021
Location: Roundstone Lane, Angmering					Dimensions: m		Scale 1:25
Client: Caffyns					Depth: 1.40m		Logged
Samples & In Situ Testing			Depth (m)	Level (mAOD)	Legend	Stratum Description	
Depth (m)	Type	Results					
			0.20			MADE GROUND: Soft dark brown slightly sandy gravelly CLAY with black cloth and fragments of brick. Gravel is fine to medium subangular to angular flint. Sand is fine to coarse.	
						Firm brown slightly sandy CLAY. Sand is fine to coarse.	
			1.40			Trialpit Complete at 1.400m	
Remarks:							
Stability:							

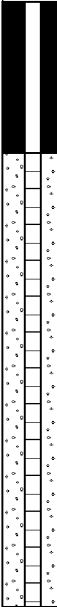
Eastwood&Partners CONSULTING ENGINEERS						TrialPit No TP04 Sheet 1 of 1		
Project Name Volvo Worthing			Project No. 46357		Co-ords: - Level:		Date 20/12/2021	
Location: Roundstone Lane, Angmering					Dimensions: m		Scale 1:25	
Client: Caffyns					Depth: 2.80m		Logged	
Samples & In Situ Testing			Depth (m)	Level (mAOD)	Legend	Stratum Description		
Depth (m)	Type	Results						
			0.20			MADE GROUND: Soft dark brown slightly sandy gravelly CLAY with black cloth and fragments of glass and brick. Gravel is fine to medium subangular to angular flint. Sand is fine to coarse.		
			1.85			Firm brown slightly sandy CLAY. Sand is fine to coarse.		
					2.70		Firm light brown mottled orange slightly sandy CLAY with occasional Gravel. Gravel is fine to coarse subangular to angular flint.	
						2.80		Firm orangish brown slightly sandy gravelly CLAY. Gravel is fine to coarse subangular to angular flint. Sand is fine to coarse.
						Trialpit Complete at 2.800m		
Remarks:								
Stability:								

						Borehole No. WS01 Sheet 1 of 1	
Project Name Volvo Worthing				Project No. 46357		Co-ords:	
Location: Roundstone Lane, Angmering						Level:	
Client: Caffyns						Dates: 20/12/2021	
Logged By EJD							

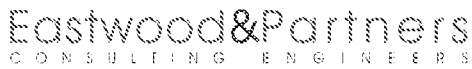
Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20 - 0.30			0.40		MADE GROUND: Soft dark brown slightly sandy CLAY with occasional gravel. Sand is fine to coarse. Gravel is fine to medium subangular to angular flint. Mendip type 2 gravel and fragments of brick present. Firm brown silty CLAY. Sand is fine to coarse.		
		1.00 - 1.10 1.00	SPT	N=8 (1,1/2,2,2,2)			<u>Less silty from 1.3 m</u> <u>Brown mottled orange from 1.6 m</u>	1	
		2.00 - 2.20 2.00	SPT	N=11 (4 for 75mm/2,3,3,3)	2.40			2	
		3.00 - 3.20 3.00	SPT	N=7 (1,1/2,1,2,2)	3.30		Firm brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse subangular to angular flint.	3	
End of Borehole at 3.300m								4	
								5	
								6	
								7	
								8	
								9	

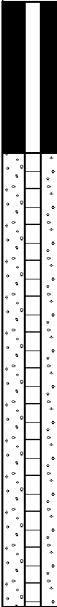
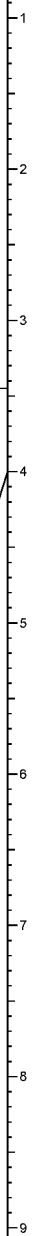
Remarks	
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								Borehole No. WS02 Sheet 1 of 1	
Project Name Volvo Worthing				Project No. 46357		Co-ords:		Hole Type WS	
Location: Roundstone Lane, Angmering						Level:		Scale 1:50	
Client: Caffyns						Dates: 20/12/2021		Logged By EJD	

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20 - 0.35			0.40		MADE GROUND: Soft dark brown slightly sandy CLAY with occasional gravel and fragments of brick. Gravel is fine to medium subangular to angular flint. Sand is fine to coarse.		
								Firm brown slightly sandy CLAY. Sand is fine to coarse.	
		1.00	SPT	N=9 (1,1/2,2,2,3)			Slightly gravelly from 0.9 m. Gravel is fine to coarse subangular to angular flint	1	
		1.20 - 1.30							
								Very gravelly from 1.6 m	
			2.00	SPT	N=8 (1,2/2,2,2,2)	1.90		Firm brown mottled orange slightly sandy slightly silty CLAY. Sand is fine to coarse.	2
		2.40 - 2.50						Occasional gravel present. Gravel is fine to coarse subangular to angular flint	
								More sandy from 2.4 m	
			3.00	SPT	N=9 (2,2/2,2,2,3)	2.70		Firm brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse subangular to angular flint.	3
						3.20			Yellowish brown SAND. Sand is fine to coarse.
					3.60			Firm brown slightly gravelly sandy CLAY. Gravel is fine to coarse subangular to angular flint. Sand is fine to coarse.	
		4.00	SPT	N=13 (2,3/3,3,3,4)	4.00		End of Borehole at 4.000m	4	
								5	
								6	
								7	
								8	
								9	

Remarks							
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								Borehole No. WS03 Sheet 1 of 1	
Project Name Volvo Worthing				Project No. 46357		Co-ords:		Hole Type WS	
Location: Roundstone Lane, Angmering						Level:		Scale 1:50	
Client: Caffyns						Dates: 20/12/2021		Logged By EJD	

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description			
		Depth (m)	Type	Results							
		0.10 - 0.20			0.25		MADE GROUND: Soft dark brown slightly sandy CLAY with thin rootlets. Occasional fragments of brick and glass are present. Sand is fine to coarse. Gravel is fine to medium subangular to angular flint. Firm brown slightly sandy CLAY. Sand is fine to coarse.				
		0.60 - 0.70					<u>Coarse flint gravel</u>				
	1.00	SPT	N=9 (1,2/2,2,2,3)	<u>More silty with depth from 1.0 m</u>							
	1.50 - 1.60			<u>Slightly gravelly from 1.6 m</u>							
	2.00	SPT	N=11 (1,2/2,2,3,4)								
	3.00	SPT	N=14 (2,2/3,3,4,4)	<u>Very Gravelly from 3.0 m. Gravel is fine to coarse subangular to angular flint</u>							
	3.60 - 3.70			Firm brown slightly sandy slightly silty CLAY with patches of light brown clayey silt. Sand is fine to coarse.							
	4.00	SPT	N=14 (2,3/3,3,4,4)	<u>Less gravelly from 3.45 m</u> <u>Occasional gravel at 3.9 m. Gravel is fine to coarse subangular to angular flint</u>							
	End of Borehole at 4.000m										

Remarks	

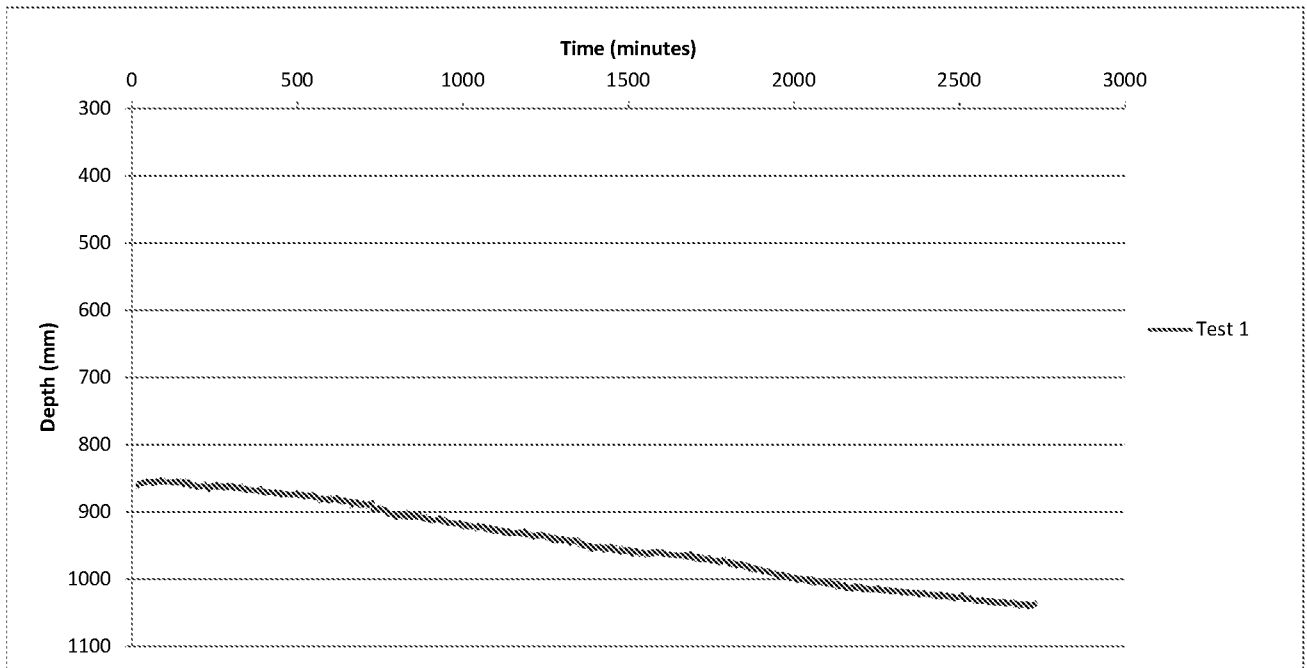
Appendix 3

Infiltration Test Results (SA/TP01 to SA/TP03)

Infiltration Test Results and Calculation of Infiltration Rates

Site: 46357 - Volvo Worthing
Client: Caffyns PLC (Eastbourne)
Test Reference: SA/TP01

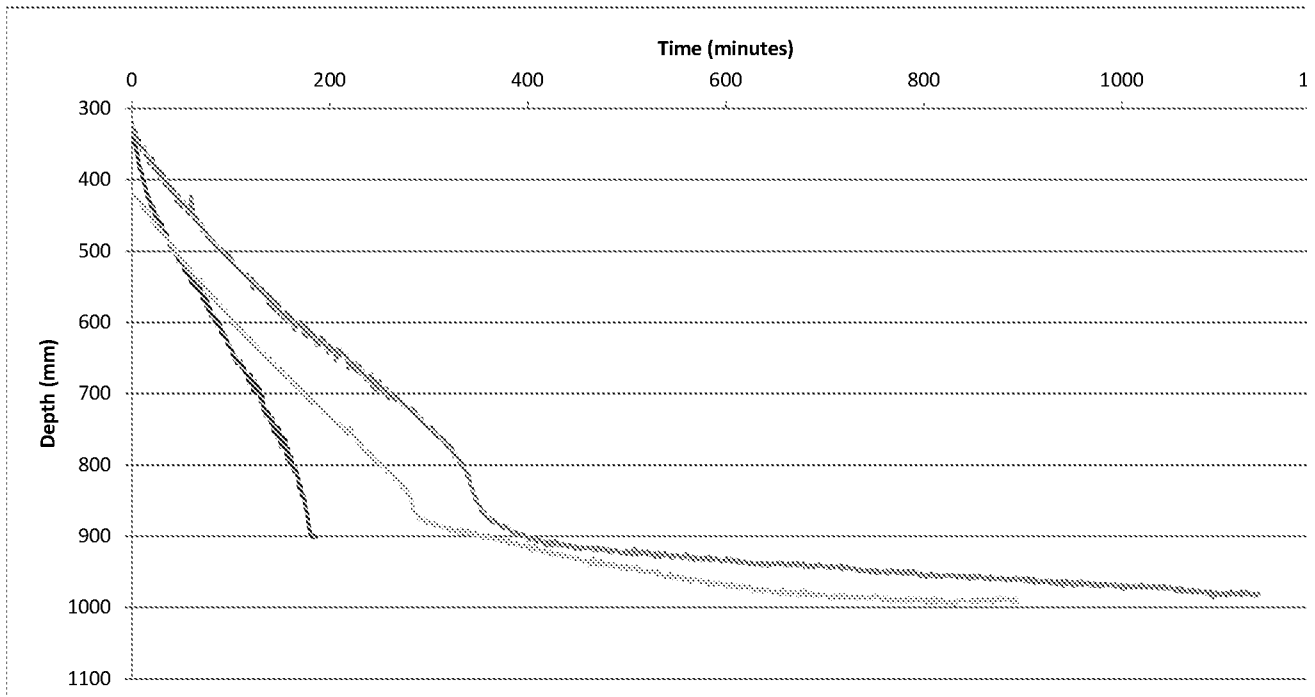
Test 1		Test 2		Test 3	
Pit Dimensions		Pit Dimensions		Pit Dimensions	
Trial pit length (mm)	1400	Trial pit length (mm)		Trial pit length (mm)	
Trial pit width (mm)	400	Trial pit width (mm)		Trial pit width (mm)	
Trial pit depth (mm)	1600	Trial pit depth (mm)		Trial pit depth (mm)	
Plan area (m ²)	0.56	Plan area (m ²)		Plan area (m ²)	
Depth to water at start of test (mm)	832	Depth to water at start of test (mm)		Depth to water at start of test (mm)	
End time (sec)	163800	End time (sec)		End time (sec)	
Final depth	1036	Final depth		Final depth	
75% Effective depth (mm)	1024	75% Effective depth (mm)		75% Effective depth (mm)	
25% Effective depth (mm)	1408	25% Effective depth (mm)		25% Effective depth (mm)	
Time at 75% effective depth - t_{p75} (sec)	142860	Time at 75% effective depth - t_{p75} (sec)		Time at 75% effective depth - t_{p75} (sec)	
Time at 25% effective depth - t_{p25} (sec)	N/A	Time at 25% effective depth - t_{p25} (sec)		Time at 25% effective depth - t_{p25} (sec)	
Effective Storage volume of water (m ³)	0.43008	Effective Storage volume of water (m ³)		Effective Storage volume of water (m ³)	
V_{p75-25} (m ³)	0.21504	V_{p75-25} (m ³)		V_{p75-25} (m ³)	
Internal surface area - a_{p50} (m ²)	1.9424	Internal surface area - a_{p50} (m ²)		Internal surface area - a_{p50} (m ²)	
t_{p75-25} (sec)	N/A	t_{p75-25} (sec)		t_{p75-25} (sec)	
BR365 Soil Infiltration Rate	N/A	BR365 Soil Infiltration Rate		BR365 Soil Infiltration Rate	
Average Soil Infiltration Rate	2.4E-07	Average Soil Infiltration Rate		Average Soil Infiltration Rate	
Testing completed by	EJD	Calculation completed by	EJD	Calculation checked by	RAN
Date	20-22/12/2021	Date	17/01/2022	Date	19/01/2022



Infiltration Test Results and Calculation of Infiltration Rates

Site: Volvo Worthing
Client: Caffyns PLC (Eastbourne)
Test Reference: SA/TP02

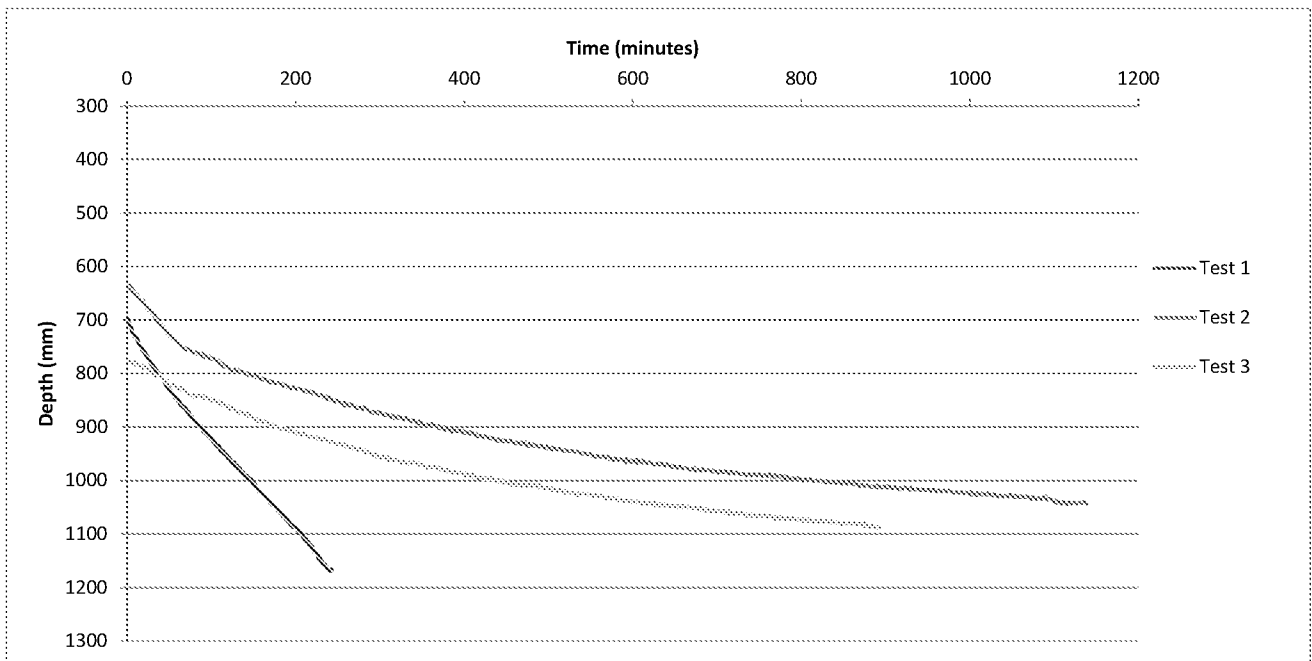
Test 1		Test 2		Test 3	
Pit Dimensions		Pit Dimensions		Pit Dimensions	
Trial pit length (mm)	1600	Trial pit length (mm)	1600	Trial pit length (mm)	1600
Trial pit width (mm)	400	Trial pit width (mm)	400	Trial pit width (mm)	400
Trial pit depth (mm)	1000	Trial pit depth (mm)	1000	Trial pit depth (mm)	1000
Plan area (m ²)	0.64	Plan area (m ²)	0.64	Plan area (m ²)	0.64
Depth to water at start of test (mm)	323	Depth to water at start of test (mm)	319	Depth to water at start of test (mm)	417
End time (sec)	11160	End time (sec)	68280	End time (sec)	53700
Final depth	901	Final depth	983	Final depth	992
75% Effective depth (mm)	492	75% Effective depth (mm)	489	75% Effective depth (mm)	563
25% Effective depth (mm)	831	25% Effective depth (mm)	830	25% Effective depth (mm)	854
Time at 75% effective depth - t_{p75} (sec)	2400	Time at 75% effective depth - t_{p75} (sec)	4980	Time at 75% effective depth - t_{p75} (sec)	4800
Time at 25% effective depth - t_{p25} (sec)	10140	Time at 25% effective depth - t_{p25} (sec)	20580	Time at 25% effective depth - t_{p25} (sec)	16980
Effective Storage volume of water (m ³)	0.43328	Effective Storage volume of water (m ³)	0.43584	Effective Storage volume of water (m ³)	0.37312
V_{p75-25} (m ³)	0.21664	V_{p75-25} (m ³)	0.21792	V_{p75-25} (m ³)	0.18656
Internal surface area - a_{p50} (m ²)	1.994	Internal surface area - a_{p50} (m ²)	2.002	Internal surface area - a_{p50} (m ²)	1.806
t_{p75-25} (sec)	7740	t_{p75-25} (sec)	15600	t_{p75-25} (sec)	12180
BR365 Soil Infiltration Rate	1.4E-05	BR365 Soil Infiltration Rate	7.0E-06	BR365 Soil Infiltration Rate	8.5E-06
Average Soil Infiltration Rate	1.5E-05	Average Soil Infiltration Rate	3.1E-06	Average Soil Infiltration Rate	3.8E-06
Testing completed by	EJD	Calculation completed by	EJD	Calculation checked by	RAN
Date	20-22/12/2021	Date	17/01/2022	Date	19/01/2022



Infiltration Test Results and Calculation of Infiltration Rates

Site: Volvo Worthing
Client: Caffyns PLC (Eastbourne)
Test Reference: SA/TP03

Test 1		Test 2		Test 3	
Pit Dimensions		Pit Dimensions		Pit Dimensions	
Trial pit length (mm)	1800	Trial pit length (mm)	1800	Trial pit length (mm)	1800
Trial pit width (mm)	400	Trial pit width (mm)	400	Trial pit width (mm)	400
Trial pit depth (mm)	1400	Trial pit depth (mm)	1169	Trial pit depth (mm)	1088
Plan area (m ²)	0.72	Plan area (m ²)	0.72	Plan area (m ²)	0.72
Depth to water at start of test (mm)	695	Depth to water at start of test (mm)	637	Depth to water at start of test (mm)	772
End time (sec)	14580	End time (sec)	68282	End time (sec)	53700
Final depth	1169	Final depth	1043	Final depth	1088
75% Effective depth (mm)	871	75% Effective depth (mm)	770	75% Effective depth (mm)	851
25% Effective depth (mm)	1224	25% Effective depth (mm)	1036	25% Effective depth (mm)	1009
Time at 75% effective depth - t_{p75} (sec)	4320	Time at 75% effective depth - t_{p75} (sec)	12000	Time at 75% effective depth - t_{p75} (sec)	14640
Time at 25% effective depth - t_{p25} (sec)	N/A	Time at 25% effective depth - t_{p25} (sec)	65880	Time at 25% effective depth - t_{p25} (sec)	27960
Effective Storage volume of water (m ³)	0.5076	Effective Storage volume of water (m ³)	0.38304	Effective Storage volume of water (m ³)	0.22752
V_{p75-25} (m ³)	0.2538	V_{p75-25} (m ³)	0.19152	V_{p75-25} (m ³)	0.11376
Internal surface area - a_{p50} (m ²)	2.271	Internal surface area - a_{p50} (m ²)	1.8904	Internal surface area - a_{p50} (m ²)	1.4152
t_{p75-25} (sec)	N/A	t_{p75-25} (sec)	53880	t_{p75-25} (sec)	13320
BR365 Soil Infiltration Rate	N/A	BR365 Soil Infiltration Rate	1.9E-06	BR365 Soil Infiltration Rate	6.0E-06
Average Soil Infiltration Rate	8.4E-06	Average Soil Infiltration Rate	2.0E-06	Average Soil Infiltration Rate	3.0E-06
Testing completed by	EJD	Calculation completed by	EJD	Calculation checked by	RAN
Date	20-22/12/2021	Date	17/01/2022	Date	19/01/2022



Appendix 4

Chemical Test Results (Chemtest 21-45533)

Table of Assessment Values



Chemtest

Eurofins Chemtest Ltd
Depot Road
Newmarket
CB8 0AL

Tel: 01638 606070

Email: info@chemtest.com

Final Report

Report No.: 21-45533-1

Initial Date of Issue: 10-Jan-2022

Client Eastwood & Partners

Client Address: St. Andrews House
23 Kingfield Road
Sheffield
South Yorkshire
S11 9AS

Contact(s): Elliot Dean

Project 46357 Roundstone Lane, Angmering

Quotation No.: **Date Received:** 23-Dec-2021

Order No.: **Date Instructed:** 23-Dec-2021

No. of Samples: 9

Turnaround (Wkdays): 11 **Results Due:** 10-Jan-2022

Date Approved: 10-Jan-2022

Approved By:



Details: Stuart Henderson, Technical
Manager

Results - Soil

Project: 46357 Roundstone Lane, Angmering

Client: Eastwood & Partners	Chemtest Job No.:		21-45533	21-45533	21-45533	21-45533	21-45533	21-45533	21-45533	21-45533	21-45533	21-45533	21-45533
Quotation No.:	Chemtest Sample ID.:		1346464	1346465	1346466	1346467	1346468	1346469	1346470	1346471	1346472	1346472	1346472
Order No.:	Client Sample Ref.:		MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG
	Sample Location:		TP01	TP02	TP03	TP04	WS01	WS02	WS03	TP01	TP02	TP02	TP02
	Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
	Top Depth (m):		0.30	0.20	0.20	0.20	0.20	0.20	0.10	1.00	0.60	0.60	0.60
	Bottom Depth (m):		0.30	0.20	0.20	0.20	0.30	0.35	0.20	1.00	0.60	0.60	0.60
	Date Sampled:		20-Dec-2021	20-Dec-2021	20-Dec-2021	20-Dec-2021	20-Dec-2021	20-Dec-2021	20-Dec-2021	20-Dec-2021	20-Dec-2021	20-Dec-2021	20-Dec-2021
	Asbestos Lab:		DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM			
Determinand	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	No Asbestos Detected
Moisture	N	2030	%	0.020	13	13	17	19	13	17	23	17	17
Soil Colour	N	2040		N/A	Brown	Brown	Brown	Brown	Brown	Brown	Brown	Brown	Brown
Other Material	N	2040		N/A	Stones and Roots	Stones and Roots	Stones and Roots	Stones, Roots and Wood	Stones and Roots	Roots	Stones and Roots	Stones	Stones
Soil Texture	N	2040		N/A	Sand	Sand	Clay	Sand	Sand	Clay	Sand	Sand	Clay
pH	M	2010		4.0	8.4	8.1	7.9	7.8	8.0	8.3	7.8	8.1	8.0
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010	0.015	0.032	0.011	0.020	0.013	0.011	0.012	0.011	< 0.010
Total Sulphur	M	2175	%	0.010	0.022	0.028	0.019	0.029	0.011	0.018	0.023	0.013	0.022
Sulphate (Acid Soluble)	U	2430	%	0.010	0.031	0.029	0.034	0.011	0.017	0.018	0.025	0.012	0.014
Arsenic	M	2450	mg/kg	1.0	26	21	27	20	25	21	15	25	22
Cadmium	M	2450	mg/kg	0.10	0.17	< 0.10	0.22	0.21	< 0.10	0.14	< 0.10	< 0.10	< 0.10
Chromium	M	2450	mg/kg	1.0	30	22	22	23	23	23	15	31	23
Copper	M	2450	mg/kg	0.50	21	19	17	20	13	13	10	14	12
Mercury	M	2450	mg/kg	0.10	0.34	0.39	2.9	4.7	0.12	0.15	0.12	0.13	< 0.10
Nickel	M	2450	mg/kg	0.50	21	17	20	18	20	20	14	29	21
Lead	M	2450	mg/kg	0.50	76	53	43	74	23	32	27	17	16
Selenium	M	2450	mg/kg	0.20	< 0.20	< 0.20	0.21	< 0.20	< 0.20	< 0.20	< 0.20	0.27	0.20
Zinc	M	2450	mg/kg	0.50	88	80	78	110	51	56	42	59	46
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Naphthalene	M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthylene	N	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthene	M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluorene	M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Phenanthrene	M	2800	mg/kg	0.10	< 0.10	0.31	0.54	< 0.10	< 0.10	< 0.10	0.51	< 0.10	< 0.10
Anthracene	M	2800	mg/kg	0.10	< 0.10	0.11	0.14	< 0.10	< 0.10	< 0.10	0.13	< 0.10	< 0.10
Fluoranthene	M	2800	mg/kg	0.10	0.33	0.65	1.4	0.39	< 0.10	0.14	1.5	< 0.10	< 0.10
Pyrene	M	2800	mg/kg	0.10	0.30	0.59	1.3	0.37	< 0.10	0.11	1.3	< 0.10	< 0.10
Benzo[a]anthracene	M	2800	mg/kg	0.10	0.15	0.29	0.67	0.16	< 0.10	< 0.10	0.82	< 0.10	< 0.10
Chrysene	M	2800	mg/kg	0.10	0.17	0.38	0.72	0.21	< 0.10	< 0.10	0.83	< 0.10	< 0.10
Benzo[b]fluoranthene	M	2800	mg/kg	0.10	0.27	0.53	1.1	0.34	< 0.10	< 0.10	1.1	< 0.10	< 0.10
Benzo[k]fluoranthene	M	2800	mg/kg	0.10	0.11	0.19	0.40	0.11	< 0.10	< 0.10	0.39	< 0.10	< 0.10
Benzo[a]pyrene	M	2800	mg/kg	0.10	0.19	0.37	0.63	0.21	< 0.10	< 0.10	0.74	< 0.10	< 0.10
Indeno(1,2,3-c,d)Pyrene	M	2800	mg/kg	0.10	< 0.10	< 0.10	0.62	< 0.10	< 0.10	< 0.10	0.70	< 0.10	< 0.10
Dibenz(a,h)Anthracene	N	2800	mg/kg	0.10	< 0.10	< 0.10	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10

Results - Soil

Project: 46357 Roundstone Lane, Angmering

Client: Eastwood & Partners	Chemtest Job No.:		21-45533	21-45533	21-45533	21-45533	21-45533	21-45533	21-45533	21-45533	21-45533
Quotation No.:	Chemtest Sample ID.:		1346464	1346465	1346466	1346467	1346468	1346469	1346470	1346471	1346472
Order No.:	Client Sample Ref.:		MG	MG	MG	MG	MG	MG	MG	MG	MG
	Sample Location:		TP01	TP02	TP03	TP04	WS01	WS02	WS03	TP01	TP02
	Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
	Top Depth (m):		0.30	0.20	0.20	0.20	0.20	0.20	0.10	1.00	0.60
	Bottom Depth (m):		0.30	0.20	0.20	0.20	0.30	0.35	0.20	1.00	0.60
	Date Sampled:		20-Dec-2021	20-Dec-2021	20-Dec-2021	20-Dec-2021	20-Dec-2021	20-Dec-2021	20-Dec-2021	20-Dec-2021	20-Dec-2021
	Asbestos Lab:		DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM		
Determinand	Accred.	SOP	Units	LOD							
Benzo[g,h,i]perylene	M	2800	mg/kg	0.10	< 0.10	< 0.10	0.52	< 0.10	< 0.10	0.59	< 0.10
Total Of 16 PAH's	N	2800	mg/kg	2.0	< 2.0	3.4	8.1	< 2.0	< 2.0	8.6	< 2.0

Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	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 <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2175	Total Sulphur in Soils	Total Sulphur	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.
2450	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.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazine.
2800	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-MS	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-MS

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

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis

All Asbestos testing is performed at the indicated laboratory

Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

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

If you require extended retention of samples, please email your requirements to:

customerservices@chemtest.com

Contaminant	Intended Land Use				
	Commercial/Industrial End Use (mg/kg)				
	Human Health	Phytotoxicity			
		pH 5.0-5.5	pH 5.5-6.0	pH 6.0-6.5	pH >7.0
Arsenic	640	50			
Cadmium	190	3			
Chromium (III)	8600	400			
Chromium (VI)	33	-			
Lead	1100-6000	300			
Mercury	25.8	1			
Nickel	980	50	60	75	110
Selenium	12,000				
Copper	68,000	80	100	135	200
Zinc	730,000	200	200	200	300

Notes:

The assessment concentrations for arsenic, cadmium, chromium (III), chromium (VI), copper, nickel, mercury, selenium and zinc are taken from Nathanail, C.P., McCaffrey, C., Gillett, A.G., Ogden, R.C., and Nathanail, J.F., 2015, 'The LQM/CIEH S4ULs for Human Health Risk Assessment', Land Quality Press, Nottingham. These are also all based on a sandy loam soil and 6% soil organic matter.

The assessment concentration for lead is the Category 4 Screening Level produced by Contaminated Land; Applications in Real Environments (CL:AIRE) and outlined in Appendix H of their report SP1010.

The threshold value is not intended to be applied to individual sample results where materials are similar, as the levels of contaminants will have a natural variability across the site. The modified mean value should instead be compared with the threshold value.

The assessment values for phytotoxicity are levels at which plant growth is thought to be affected. These are taken from the maximum permissible and advisable concentrations in soil after application of soil sludge given in the '*The Code of Good Agricultural Practice for the Protection of Soil*', MAFF, 1998.

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 Eastwood & Partners CONSULTING ENGINEERS St Andrew's House 23 Kingfield Road Sheffield S11 9AS Tel: (0114) 2554554 Fax: (0114) 2554330	CAFFYNS VOLVO WORTHING CAFFYNS PLC (EASTBOURNE) ASSESSMENT CRITERIA – COMMERCIAL
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Organic Compounds	Intended Land Use Commercial (mg/kg)		
	1% SOM	2.5% SOM	6% SOM
Naphthalene	190 (76.4) ^{sol}	460 (183) ^{sol}	1100 (432) ^{sol}
Acenaphthene	84000 (57.0) ^{sol}	97000 (141) ^{sol}	100000
Acenaphthylene	83000 (86.1) ^{sol}	97000 (212) ^{sol}	100000
Fluorene	63000 (30.9) ^{sol}	68000	71000
Phenanthrene	22000	22000	23000
Anthracene	520000	540000	540000
Fluoranthene	23000	23000	23000
Pyrene	54000	54000	54000
Benzo(a)anthracene	170	170	180
Chrysene	350	350	350
Benzo(b)fluoranthene	44	44	45
Benzo(k)fluoranthene	1200	1200	1200
Benzo(a)pyrene	35	35	36
Dibenz(a,h)anthracene	3.5	3.6	3.6
Indeno(1,2,3-cd)pyrene	500	510	510
Benzo(g,h,i)perylene	3900	4000	4000
Phenol	760	1500	3200
Benzene	27	47	90
Toluene	56000 (869) ^{vap}	110000 (1920) ^{vap}	180000 (4360) ^{vap}
Ethylbenzene	5700 (518) ^{vap}	13000 (1220) ^{vap}	27000 (2840) ^{vap}
o-Xylene	6600 (478) ^{sol}	15000 (1120) ^{sol}	33000 (2620) ^{sol}
m-Xylene	6200 (625) ^{vap}	14000 (1470) ^{vap}	31000 (3460) ^{vap}
p-Xylene	5900 (576) ^{sol}	14000 (1350) ^{sol}	30000 (3170) ^{sol}

^{sol} = S4ULs presented exceeds the solubility saturation limit, which is presented in brackets.

^{vap} = S4ULs presented exceeds the vapour saturation limit, which is presented in brackets.

The assessment criteria for the sixteen polycyclic aromatic hydrocarbon (PAH) species covered under the USEPA test have been taken from Nathanail, C.P., McCaffrey, C., Gillett, A.G., Ogden, R.C., and Nathanail, J.F., 2015, 'The LQM/CIEH S4ULs for Human Health Risk Assessment', Land Quality Press, Nottingham.. These are also all based on a sandy loam soil and 6% soil organic matter. This is also the case for phenol at 1% and 2.5% SOM. These are also all based on a sandy loam soil.

The assessment values for phenol (6% SOM) and the BTEX compounds are the Soil Guideline Values derived by DEFRA and Environment Agency using the 'Contaminated Land Exposure Assessment' model. These are outlined in the Environment Agency's Science Report series SC050021.

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TPH Fraction	Intended Land Use Commercial (mg/kg)		
	1% SOM	2.5% SOM	6% SOM
Aliphatic EC 5-6	3200 (304) ^{sol}	5900 (558) ^{sol}	12000 (1150) ^{sol}
Aliphatic EC >6-8	7800 (144) ^{sol}	17000 (322) ^{sol}	40000 (736) ^{sol}
Aliphatic EC >8-10	2000 (78) ^{sol}	4800 (190) ^{vap}	11000 (451) ^{vap}
Aliphatic EC >10-12	9700 (48) ^{sol}	23000 (118) ^{vap}	47000 (283) ^{vap}
Aliphatic EC >12-16	59000 (24) ^{sol}	82000 (59) ^{sol}	90000 (142) ^{sol}
Aliphatic EC >16-35	1,600,000	1,700,000	1,800,000
Aliphatic EC >35-44	1,600,000	1,700,000	1,800,000
Aromatic EC 5-7 (benzene)	26000 (1220) ^{sol}	46000 (2260) ^{sol}	86000 (4710) ^{sol}
Aromatic EC >7-8 (toluene)	56000 (869) ^{vap}	110000 (1920) ^{sol}	180000 (4360) ^{vap}
Aromatic EC>8-10	3500 (613) ^{vap}	8100 (1500) ^{vap}	17000 (3580) ^{vap}
Aromatic EC >10-12	16000 (364) ^{sol}	28000 (899) ^{sol}	34000 (2150) ^{sol}
Aromatic EC >12-16	36000 (169) ^{sol}	37000	38000
Aromatic EC >16-21	28000	28000	28000
Aromatic EC >21-35	28000	28000	28000
Aromatic EC >35-44	28000	28000	28000
Aliphatic + Aromatic EC >44-70	28000	28000	28000

^{sol} = S4ULs presented exceeds the solubility saturation limit, which is presented in brackets.

^{vap} = S4ULs presented exceeds the vapour saturation limit, which is presented in brackets.

The assessment criteria for each of the petroleum hydrocarbon fractions have been taken from Nathanail, C.P., McCaffrey, C., Gillett, A.G., Ogden, R.C., and Nathanail, J.F., 2015, 'The LQM/CIEH S4ULs for Human Health Risk Assessment', Land Quality Press, Nottingham.. These are also all based on a sandy loam soil.

Within the Environment Agency Science Report P5-080/TR3, Askari, K. & Pollard, S., 2005 '*The UK Approach for Evaluating Human Health Risks from Petroleum Hydrocarbons in Soils*' it is stated that the assessment values should not be considered individually; instead the potential additive effects should be calculated. This is achieved by calculating an individual Hazard Quotient (HQ) for each fraction. The HQ is the proportion of the assessment concentration represented by the recorded concentration. The HQs are then added together to form a Hazard Index (HI) and where this exceeds unity a potential significant risk to human health may exist.

Where only a TPH screen is undertaken, the assessment value used should be taken as the most onerous value given for individual carbon bands, as described above. This should be the assessment for Aliphatic band EC>8-10, assuming a SOM value of 1%. The assessment value should therefore be taken as 2,100 mg/kg.

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Appendix 5

Geotechnical Test Results (GEO/34572)

