

25th October 2019

Mr Albert Brazil
Lovedean Lane,
Waterlooville
PO8 9RN

By email only: [REDACTED]

Dear Mr Brazil,

RE: Proposed Residential Development, Lovedean Lane, Waterlooville – Supplementary Environmental Investigation

Please find attached OEC Report A10965/191025/L1 detailing the results of the intrusive ground investigation works at the above site.

If you have any questions, please do not hesitate to contact us.

Yours sincerely

For Omnia Environmental Consulting



Richard Durrant
Geo-Environmental Consultant



Grace Larcombe
Geo-Environmental Consultant

Attachments

- Attachment 1: Site Figures
- Attachment 2: Exploratory Borehole Logs
- Attachment 3: Chemical Laboratory Results
- Attachment 4: Origin on GAC values

ENVIRONMENTAL ASSESSMENT REPORT

Site Address	Proposed Residential Development, Lovedean Lane, Waterlooville
Grid Reference	468747, 112257

1.0 Objectives & Terms of Reference

Omnia Environmental Consulting (OEC) were commissioned by Mr Brazil to undertake a Phase II site investigation in the area of the former chalk pit at the site of Lovedean Lane, Waterlooville to assist in the discharge of constraints as set out by Havant Borough Council. The objective of the report is to provide further assessment of the Made Ground in the area of the former chalk pit (WS103) towards the south of the site, to address the concerns raised by Havant Borough Council (ref: APP/18/01107) of the potential for previously identified impacted Made Ground to present a risk to the underlying Principal Aquifer identified as the Havant & Bedhampton Springs (Chalk Aquifer).

The investigation is proposed both as a delineation exercise, to delineate the extent of Made Ground in the area of the former chalk pit, and to obtain soils samples of the Made Ground for chemical testing to comprise leachate testing, identified as the appropriate method to assess the risk to controlled waters between OEC and HBC via email correspondence between G.Larcombe and J.Driver on the 05/09/2019.

A site location plan and intrusive location plan are presented within Attachment 1.

2.0 Background

The site has previously been subject to a Phase I and II report prepared by Omnia Environmental Consulting (OEC) entitled 'Residential Development, Lovedean Lane, Waterlooville, Hampshire, PO8 9RN, dated July 2018 ref A10965/1.0. The report identified elevated concentrations of cadmium and Poly-Aromatic Hydrocarbons (PAH) within the Made Ground within location WS101 and was considered to have the potential to cause a significant risk to human health. Further works were undertaken in August 2018 comprising multiple hand dug pits in the vicinity of WS101 which identified further contamination of lead and PAH within the near surface soils.

The site layout has been since updated (Reference: DD264) and the risk to human health is required to be readdressed. This is in line with comments from the Contaminated Land Officer at Havant Borough Council

Environmental Health at Havant Borough Council made comment on the two phases of investigation. It was concluded that due to the limited amount of soil samples, there was insufficient evidence to characterise the identified contamination in WS101 as an isolated hotspot and that further testing was recommended in the area of the former Chalk Pit (WS103) to assess the risk of contamination leaching to the underlying Principal Aquifer.

The Phase I Desk Top Study identified an Old Chalk Pit dated c.1868-1973, which was located in the eastern portion of the site located under the proposed Plot 2 and Plot 3 in the provided drawing reference DD264. OEC report A10965/1.0 identified a 3.50m thickness of Made Ground overlying cohesive soils within location WS103, consistent with the approximate location of the former Chalk Pit.

From review of previous reports and the councils comments, alongside a response from Portsmouth Water it is considered that further investigation works were required in order to confirm the depth of the Made Ground and delineate the extent of the former chalk pit as well as to assess the risk to controlled waters via soil leachate testing, given that the site overlies the Havant and Bedhampton Springs classified

as a Principal Aquifer.

3.0 Site Description

The site at Lovedean Lane, Waterloooville is situated approximately 2.7km north of Waterloooville Town Centre and was accessed from Lovedean Lane in the east.

Reference should be made to the site walkover in the Phase II report, as detailed within OEC report ref: A10965/1.0, dated July 2018, for a comprehensive discussion on site setting, although a summary of the site use at the time of the investigation is detailed below:

The site comprised a roughly rectangular parcel of land, narrowing towards the north. A single building was located in the centre of the site which was in a poor state of repair. The north of the site comprised an area capped with a sub-base material and the south of the site was an area of unkempt soft landscaping. The site was bound by wooden fencing around the perimeter of the site with residential houses immediately beyond. The topography on site generally sloped towards the south. The western area of the site was elevated by approximately 1.5-2.0m comprising of woodland contain mature deciduous trees.

4.0 Scope of works

As set out within OEC cost proposal ref A10965/190815/L1 the scope of works comprised trial pitting by mechanical excavator to a maximum depth of 3.0-4.0mbgl in the area of the former chalk pit (WS103), with subsequent laboratory testing of selected soil samples.

5.0 Site Work

The return site investigation works were undertaken on 17th September 2019 by an OEC representative.

The site investigation comprised the advancement of 6no. trial pits across the former chalk pit as set out on Figure 2.0 and Figure 3.0.

5.1 Ground Conditions Encountered

The return ground investigation encountered the following geology:

5.1.1 Made Ground

Made Ground was encountered within TP201 and TP204 to a maximum depth of 3.00m bgl. Generally Made Ground comprised a soft to firm brown and brown and black, sandy, gravelly CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse flint, frequent brick, concrete, metal fragments and pipes and chalk with medium cobble content. Occasional cobbles and boulders of brick and concrete were noted.

The base of the made ground was encountered at 3.0m bgl within TP201 and 2.0m bgl within TP204, however with reference to information from the previous report the maximum depth of made ground encountered in the former chalk pit was 3.5m bgl.

5.1.2 Superficial Deposits – Head Deposits

Superficial deposits attributing to Head Deposits were encountered within five (5no.) intrusive locations. Superficial deposits were encountered to a maximum depth of 3.5m bgl.

In TP201 Head Deposits immediately underlying the Made Ground and comprised a soft of firm, brown mottled red and grey silty CLAY with occasional angular to sub-angular fine to coarse flint. Superficial deposits were encountered from ground level at TP202, TP203, TP205 and TP206 and are typically described as a brown/grey and orange slightly sandy to sandy CLAY which is occasionally gravelly. Sand is fine to coarse. Gravel is angular to sub-angular, fine to coarse flint.

5.1.3 Bedrock Deposits – Tarrant Chalk Formation

Made Ground and Superficial deposits were underlain by bedrock attributed to the Tarrant Chalk Formation, recorded in TP202 (2.00-2.50m bgl), TP203 (0.50-1.50m bgl) and TP204 (2.00-2.50m bgl). The base of the unit was not encountered during the ground investigation.

The Chalk bedrock was recovered as structureless CHALK comprised a creamish white sandy GRAVEL. Gravel is a weak, low density, with frequent black specks and rounded in a brownish cream matrix (Grade Dc). The unit was encountered below superficial deposits with the exception of TP204 where Chalk was underlying the Made Ground at 2.0m bgl.

Exploratory boreholes are presented in Attachment 2.

6.0 Laboratory Analysis

Selected soil samples were submitted to Element Materials Technology for leachate testing of CLEA metals suite and speciated Polycyclic Aromatic Hydrocarbons (PAH).

The analytical results have been directly compared to the UK Drinking Water Standards (UKDWS) due to the presence of the underlying principal aquifer. However, where a determinant does not have a UK DWS screening value, OEC have used the WFD EQS 2010 (Freshwater in England and Wales) value to adopt a conservative approach. This comparison is detailed within Table 1 below.

Chemical analysis results are presented in Attachment 3.

Table 1.0 Summary of Leachate Analysis (CLEA metals suite and PAH for Freshwater in England and Wales)

Determinant	Units	Adopted EQS	n	MC	Loc. of Ex	Assessment
CLEA metals						
Arsenic	µg/l	10	5	9.7	n/a	No Further Action Required
Boron	µg/l	1000	5	42	n/a	No Further Action Required
Cadmium	µg/l	5	5	<0.5	n/a	No Further Action Required
Chromium	µg/l	50	5	2.1	n/a	No Further Action Required
Copper**	µg/l	2000	5	<7	n/a	No Further Action Required
Lead	µg/l	10	5	9	n/a	No Further Action Required
Mercury	µg/l	1	5	<1	n/a	No Further Action Required
Nickel	µg/l	20	5	4	n/a	No Further Action Required
Selenium	µg/l	10*	5	<2	n/a	No Further Action Required
Zinc**	µg/l	125*	5	104	n/a	No Further Action Required
PAH						
Anthracene	µg/l	0.1	5	0.128	TP201 at 2.20mbgl	Further Action Required
Fluoranthene	µg/l	0.1*	5	0.394 0.223 0.275	TP201 at 2.20mbgl TP201 at 3.0-3.50mbgl TP204 at 1.20mbgl	Further Action Required
Benzo(bk)fluoranthene	µg/l	0.003*	5	0.279 0.707 0.508 0.468 0.08	TP201 at 1.20mbgl TP201 at 2.20mbgl TP201 at 3.00-3.50mbgl TP204 at 1.2mbgl TP204 at 2.00-2.50mbgl	Further Action Required
Naphthalene	µg/l	2.4*	5	<0.1	n/a	No Further Action Required
Benzo(a)pyrene	µg/l	0.010	5	0.207 0.468 0.248 0.285 0.041	TP201 at 1.20mbgl TP201 at 2.20mbgl TP201 at 3.00-3.50mbgl TP204 at 1.20mbgl TP204 at 2.00-2.50mbgl	Further Action Required
Indeno(123cd)pyrene	µg/l	0.002*	5	0.18 0.304	TP201 at 1.20mbgl TP201 at	Further Action Required

				0.285 0.222 0.035	2.20mbgl TP201 at 3.00-3.50mbgl TP204 at 1.20mbgl; TP204 at 2.00-2.50mbgl	
Benzo(ghi)perylene	µg/l	0.002*	5	0.17 0.236 0.265 0.154 0.026	TP201 at 1.20mbgl TP201 at 2.20mbgl TP201 at 3.00-3.50mbgl TP204 at 1.20mbgl TP204 at 2.00-2.50mbgl	Further Action Required
PAHs (Sum of 4)***	µg/l	0.1*	5	1.247 0.141	TP201 at 2.20mbgl TP204 at 2.00-2.50mbgl	Further Action Required

Notes

*Screening Criteria adopted from WFD EQS 2010 (Freshwater in England and Wales) where a UK DWS determinant is not available.

**Hardness sensitive (CaCO₃mg/l)

*** Specified compounds are benzo(b)fluoranthene (CAS 205-99-2), benzo(k)fluoranthene (CAS 207-08-9), benzo(g,h,i)perylene (CAS 191-24-2) and indeno(1,2,3-c,d)pyrene (CAS 193-39-5). The parametric value applies to the sum of the concentrations of the individual compounds detected and quantified in the monitoring process.

A water hardness of 305mg/l has been adopted for the site with reference to Portsmouth Water Quality dataset provided on <https://www.portsmouthwater.co.uk/about-us/water-quality/> for the zone of Lovedean. The zone is interpreted to have 'Hard' groundwater.

With reference to Table 1.0, it can be seen that the adopted screening criteria have been exceeded for the following determinants;

- Anthracene
- Fluoranthene
- Benzo(b/k)fluoranthene
- Benzo(a)pyrene
- Indeno (1,2,3cd)pyrene
- Benzo(ghi)perylene

6.1 Discussion

A review of laboratory data indicates that PAH concentrations exceed the adopted screening criteria were detected in locations TP201 and TP204 within Made Ground and the underlying superficial and Chalk deposits. Based on the laboratory testing of selected soil samples the investigation has identified that there is a risk to controlled waters by leaching of Lead and PAH from the Made Ground into the underlying Chalk Aquifer.

From review of the BGS Hydrogeological Map of Hampshire and Isles of Wight (1:100,000) the elevation of the potentiometric surface of the groundwater within the Chalk is approximately +30mAOD in the area of the site. Utilising a site elevation of approximately +62m AOD based on Ordnance Survey mapping, it is

anticipated that groundwater within the Chalk will be encountered at a depth of approximately 32m bgl beneath the site.

Furthermore, the leachate preparation is widely considered to represent a very worst-case scenario, due to the fact that the preparation method is not directly representative of conditions that are likely to occur on site.

However, elevated concentrations of PAH were identified within TP201 and TP204 through the total thickness of Made Ground, which are considered to have the potential to present a significant risk to controlled waters. It is therefore considered that remedial works will be required in the area of the historic Chalk Pit in order to sever the pollution linkage and demonstrate betterment. This is likely to involve the removal of Made Ground in the Chalk Pit area.

7.0 Conclusions and Recommendations

It is recommended that a Remediation Method Statement (RMS) is produced to detail the works required to render the site suitable for the intended end use and render the pollution linkage into the underlying Principal Aquifer inactive.

This is likely to comprise the removal of impacted material in the area of the former Chalk Pit, that is considered to present a risk to controlled waters. The remedial works should be detailed within a standalone Remedial Method Statement (RMS) which should be submitted to the local authority for approval before the commencement of any remedial works on site.

Should any previously unidentified obvious visual or olfactory evidence of contamination be encountered in areas of the site during site clearance and/or ground works, then site works should be halted, and contact made with a suitably qualified environmental consultant. As determined appropriate by the Consultant, further investigation and sampling may be required to determine the appropriate actions. Upon completion contact should be made with the relevant regulatory authority to achieve signoff of the works.

Attachment 1

Figures

Key

[illegible]

David Friedman and Corwin
3-6 The Quarterly

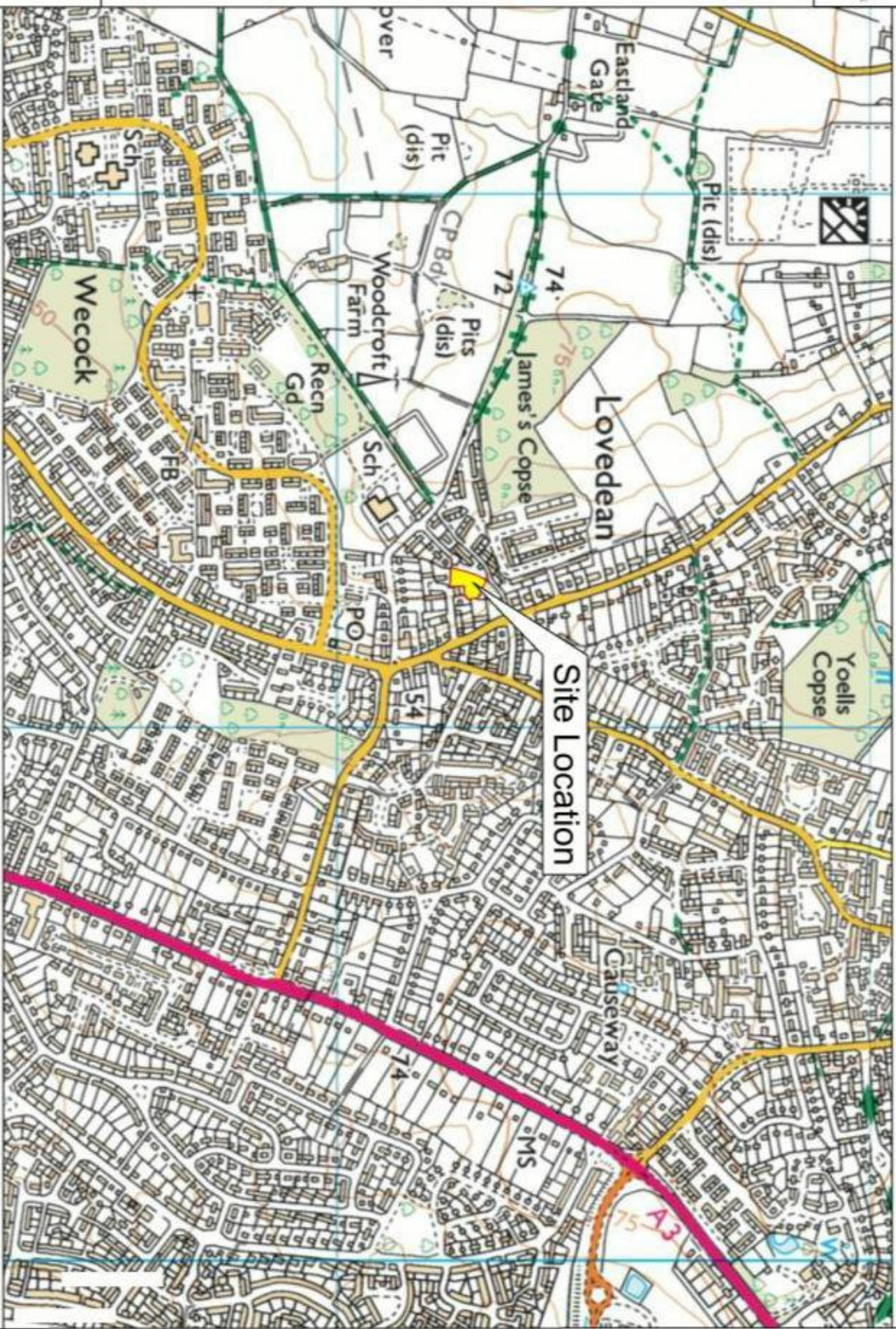
1991-1992

114400 中国地质大学

1. <http://www.burtonmanning.com>
2. <http://www.burtonmanning.com>



ENVIRONMENTAL CONSULTING



Job Title:

Client:

lovedean lane, Waterloo

Mr Brazil

Project Notes

A10965

Date _____

30/09/19

Drawing Title:

Figure 1.0 - Site Location

2008

1 square = 1km²

References

G.Larcombe

Key



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OMNIA

ENVIRONMENTAL CONSULTING



Job Title:

Lovedean Lane, Waterlooville

Client:

Mr Brazil

Project No:

A10965

Date:

30/09/2019

Drawing Title:

Figure 2.0 - Proposed Site
Development Layout

Drawn by:

R.Durrant

Authorised by:

G.Larcombe

Scale:

NTS

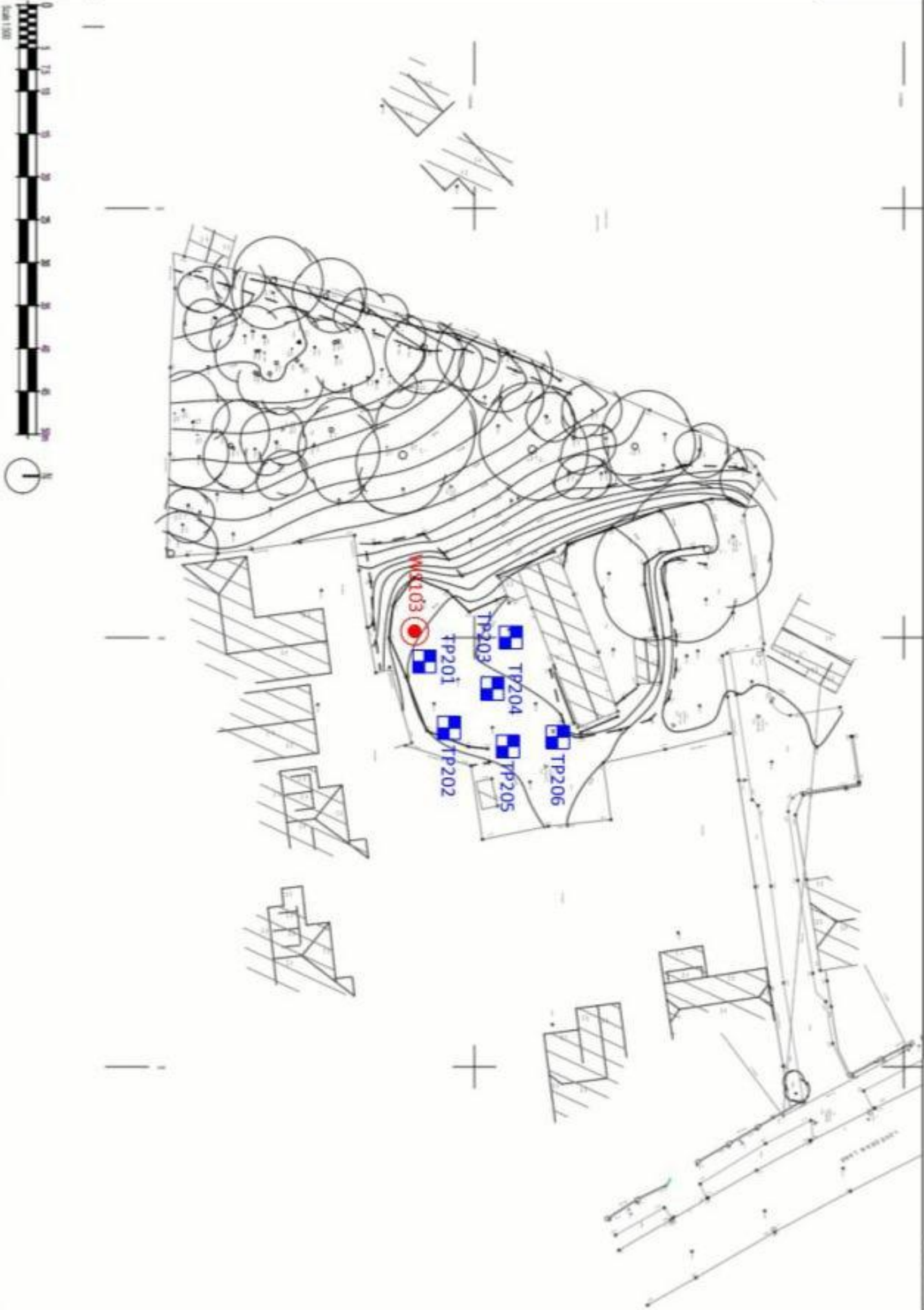
Key



- Approximate Trial Pit Locations
- Approximate Windowless Sample Location previously identifying great thickness of Made Ground from Initial Investigation (A10965/1.0)

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Job Title:

Lovedean Lane, Waterlooville

Client:

Mr Brazil

Project No:

A10965

Date:

30/09/2019

Drawing Title:

Figure 3.0 - Intrusive Location Plan

Drawn By:

R.Durrant

Authorised By:

G.Larcombe

Scale:

NTS

The Global Fund has awarded any 100,000,000 dollars to support the fight against HIV/AIDS, tuberculosis and malaria. The fund is a partnership between the World Bank, the United Nations, the International Monetary Fund, the World Health Organization, and the United Nations Development Programme. The fund is a partnership between the World Bank, the United Nations, the International Monetary Fund, the World Health Organization, and the United Nations Development Programme. The fund is a partnership between the World Bank, the United Nations, the International Monetary Fund, the World Health Organization, and the United Nations Development Programme.

David Friedman and Corwin Smiley

340 The Observer

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active-ATP

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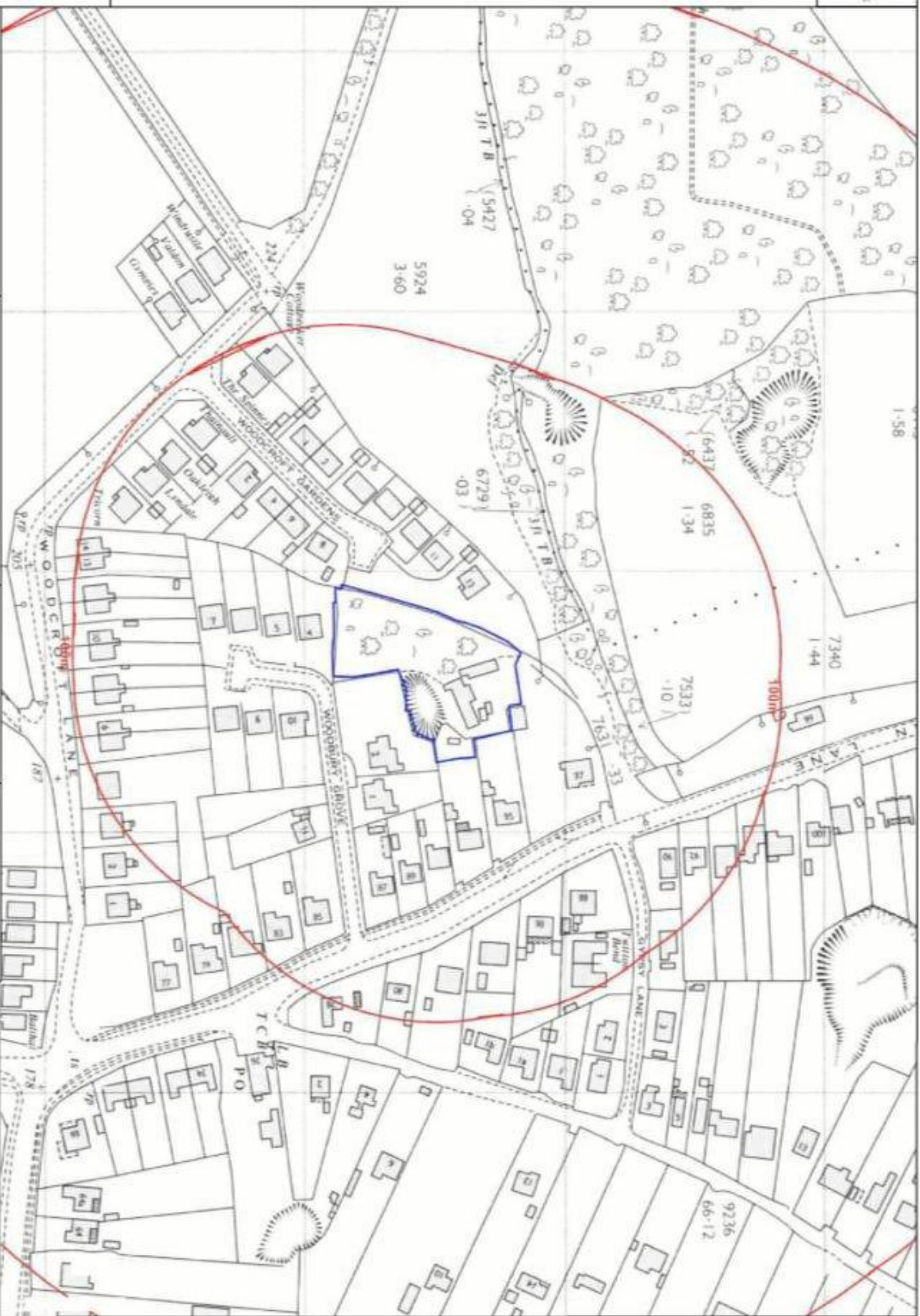
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ENVIRONMENTAL CONSULTING

c.1958-1963 Groundsure Map



Attachment 2

Exploratory Borehole Logs



3-6 The Quarterdeck
Port Solent
Portsmouth
PO6 4TP

Trial Pit Log

Trialpit No

TP201

Sheet 1 of 1

Project Name: Lovedean Lane

Project No.
A10965

Co-ords: -
Level:

Date
17/09/2019

Location: 97b Lovedean Lane, Waterloooville, PO8 9RN

Dimensions
(m):

2.5

Depth
3.50

0.6

Scale
1:20

Logged
RD

Client: Mr A. Brazil

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.20			Dark brown fine to coarse silty SAND. (TOPSOIL)
	0.50	ES					Soft to firm brown sandy CLAY. Sand is fine to coarse. Frequent cobble and boulders of angular and sub- angular brick and concrete. Frequent metal fragments. (MADE GROUND)
	1.20	ES		1.20			Soft to firm black and brown sandy CLAY. Sand is fine to coarse. Frequent angular to subangular chalk, brick and concrete. Frequent metal pipes and fragments. (MADE GROUND)
	2.20	ES					
	3.00 - 3.50	ES		3.00			Soft to firm brown mottled red and grey silty CLAY. Occasional angular to sub-angular fine to coarse flint. (HEAD DEPOSITS)
				3.50			
							End of pit at 3.50 m

Remarks: Cleared by Cable Avoidance Tool. No groundwater encountered.

Stability: Stable



Trial Pit Log

Trialpit No

TP202

Sheet 1 of 1

Project Name:	Lovedean Lane
---------------	---------------

Project No.	A10965
-------------	--------

Co-ords:	-
Level:	

Date
17/09/2019

Location: 97b Lovedean Lane, Waterloooville, PO8 9RN

Dimensions
(m):

2.5

Scale

1:20

Client: Mr A. Brazil

Depth
2.50

0.6

Logged
RD

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.15			Wood chipping cover (MADE GROUND)
	0.50	ES					Soft grey slightly sandy CLAY. Sand is fine to coarse. Frequent organic material and rootlets. Occasional ceramic pottery. (MADE GROUND)
	1.00	ES		1.00			Soft to firm brown slightly sandy CLAY. Sand is fine to coarse. Occasional organic material. (HEAD DEPOSITS)
	1.50	ES					Recovered as creamish white sandy GRAVEL. Gravel is a weak, low density, with frequent black specks and rounded in a brownish cream matrix (Grade Dc). Occasional pockets of a soft brown sandy CLAY. (TARRANT CHALK FORMATION)
	2.00 - 2.50	ES		2.00			End of pit at 2.50 m
				2.50			

Remarks: Cleared by Cable Avoidance Tool. No groundwater encountered.

Stability: Stable





3-6 The Quarterdeck
Port Solent
Portsmouth
PO6 4TP

Trial Pit Log

Trialpit No

TP203

Sheet 1 of 1

Project Name: Lovedean Lane

Project No.
A10965

Co-ords: -
Level:

Date
17/09/2019

Location: 97b Lovedean Lane, Waterloooville, PO8 9RN

Dimensions
(m):

1.5

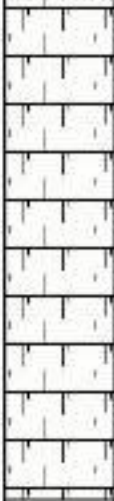
Depth
1.50

0.6

Scale
1:20

Logged
RD

Client: Mr A. Brazil

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.50	ES		0.50			Soft brown slightly sandy CLAY. Sand is fine to coarse. (Topsoil)
	1.00 - 1.50	ES		1.50			Recovered as creamish white sandy GRAVEL. Gravel is a weak, low density, with frequent black specks and rounded in a brownish cream matrix (Grade Dc). Occasional pockets of a soft brown sandy CLAY. (TARRANT CHALK FORMATION)
							End of pit at 1.50 m

Remarks: Cleared by Cable Avoidance Tool. No groundwater encountered.

Stability: Stable





3-6 The Quarterdeck
Port Solent
Portsmouth
PO6 4TP

Trial Pit Log

Trialpit No

TP204

Sheet 1 of 1

Project Name: Lovedean Lane

Project No.
A10965

Co-ords: -
Level:

Date
17/09/2019

Location: 97b Lovedean Lane, Waterloooville, PO8 9RN

Dimensions
(m):

2.2

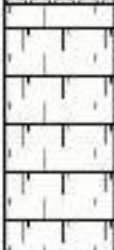
Depth
2.50

0.6

Scale
1:20

Logged
RD

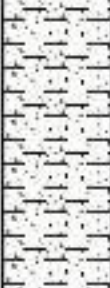
Client: Mr A. Brazil

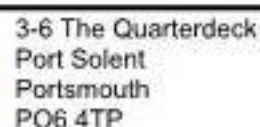
Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.50	ES					Soft brown and black sandy CLAY. Sand is fine to coarse. Frequent metal fragment and glass. Frequent cobbles and boulders of angular and sub-angular brick and concrete. (MADE GROUND)
	1.20	ES					
	2.00 - 2.50			2.00			
				2.50			Creamish white sandy GRAVEL. Gravel is a weak, low density, with frequent black specks and rounded in a brownish cream matrix (Grade Dc). Occasional pockets of a soft brown sandy CLAY. (TARRANT CHALK FORMATION)
							End of pit at 2.50 m

Remarks: Cleared by Cable Avoidance Tool. No groundwater encountered.

Stability: Stable



 3-6 The Quarterdeck Port Solent Portsmouth PO6 4TP		Trial Pit Log			Trialpit No TP205 Sheet 1 of 1		
Project Name: Lovedean Lane		Project No. A10965		Co-ords: - Level:		Date 17/09/2019	
Location: 97b Lovedean Lane, Waterloooville, PO8 9RN				Dimensions (m): 0.6 2.6		Scale 1:20	
Client: Mr A. Brazil				Depth 2.00		Logged RD	
Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.50	ES		0.50			Soft grey sandy CLAY. Sand is fine to coarse. (HEAD DEPOSITS)
	1.10	ES		1.40			Soft brown sandy CLAY. Sand is fine to coarse. Occasional angular to sub-angular fine to coarse flint. (HEAD DEPOSITS)
	2.00	ES		2.00			Soft orange slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is angular and sub-angular fine to coarse flint. Occasional cobbles of flint. (HEAD DEPOSITS)
End of pit at 2.00 m							
Remarks: Cleared by Cable Avoidance Tool. No groundwater encountered.							
Stability: Stable							



Trialpit No

TP206

Sheet 1 of 1

Project Name:	Lovedean Lane
---------------	---------------

Project No.	A10965
-------------	--------

Co-ords: -

Level:

Date _____

17/09/2019

Location: 97b Lovedean Lane, Waterlooville, PO8 9RN

Dimensions

15

Depth
2.00

0.6

Scale

1:20

Logged
RD

Client: Mr A. Brazil

- 1
- 2
- 3
- 4

Remarks: Cleared by Cable Avoidance Tool. No groundwater encountered.

Stability: Stable



Attachment 3
Chemical Testing Results

Omnia
3-6 The Quarterdeck
Port Solent
Portsmouth
PO6 4TP



Attention :	Grace Larcombe
Date :	25th September, 2019
Your reference :	A10965
Our reference :	Test Report 19/15216 Batch 1
Location :	Lovedean Waterlooville
Date samples received :	19th September, 2019
Status :	Final report
Issue :	1

Nineteen samples were received for analysis on 19th September, 2019 of which five were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.

All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Authorised By:

Bruce Leslie
Project Manager

Please include all sections of this report if it is reproduced

Element Materials Technology

Client Name: Omnia
Reference: A10965
Location: Lovedean Waterlooville
Contact: Grace Larcombe
EMT Job No: 19/15216

Report : CEN 10:1 1 Batch

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	1-3	4-6	7-9	10-12	13-15								
Sample ID	TP201	TP201	TP201	TP204	TP204								
Depth	1.20	2.20	3.00-3.50	1.20	2.00-2.50								
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T								
Sample Date	17/09/2019	17/09/2019	17/09/2019	17/09/2019	17/09/2019								
Sample Type	Soil	Soil	Soil	Soil	Soil								
Batch Number	1	1	1	1	1								
Date of Receipt	19/09/2019	19/09/2019	19/09/2019	19/09/2019	19/09/2019								
											LOD/LOR	Units	Method No
Dissolved Arsenic [#]	<2.5	<2.5	<2.5	9.7	3.4						<2.5	ug/l	TM30/PM14
Dissolved Boron [#]	27	27	<12	42	21						<12	ug/l	TM30/PM14
Dissolved Cadmium [#]	<0.5	<0.5	<0.5	<0.5	<0.5						<0.5	ug/l	TM30/PM14
Dissolved Chromium [#]	<1.5	2.1	<1.5	<1.5	<1.5						<1.5	ug/l	TM30/PM14
Dissolved Copper [#]	<7	<7	<7	<7	<7						<7	ug/l	TM30/PM14
Dissolved Lead [#]	<5	5	<5	9	<5						<5	ug/l	TM30/PM14
Dissolved Mercury [#]	<1	<1	<1	<1	<1						<1	ug/l	TM30/PM14
Dissolved Nickel [#]	<2	4	3	<2	<2						<2	ug/l	TM30/PM14
Dissolved Selenium [#]	<3	<3	<3	<3	<3						<3	ug/l	TM30/PM14
Dissolved Zinc [#]	8	104	15	14	8						<3	ug/l	TM30/PM14
PAH MS													
Naphthalene	<0.1	<0.1	<0.1	<0.1	<0.1						<0.1	ug/l	TM4/PM30
Acenaphthylene	0.034	0.093	0.062	0.046	<0.013						<0.013	ug/l	TM4/PM30
Acenaphthene	<0.013	0.033	<0.013	<0.013	<0.013						<0.013	ug/l	TM4/PM30
Fluorene	<0.014	0.028	<0.014	<0.014	<0.014						<0.014	ug/l	TM4/PM30
Phenanthrene	0.028	0.156	0.064	0.071	0.019						<0.011	ug/l	TM4/PM30
Anthracene	0.057	0.128	0.068	0.055	<0.013						<0.013	ug/l	TM4/PM30
Fluoranthene	0.094	0.394	0.223	0.275	0.049						<0.012	ug/l	TM4/PM30
Pyrene	0.098	0.430	0.210	0.261	0.044						<0.013	ug/l	TM4/PM30
Benzo(a)anthracene	0.085	0.285	0.156	0.174	0.032						<0.015	ug/l	TM4/PM30
Chrysene	0.087	0.286	0.187	0.190	0.036						<0.011	ug/l	TM4/PM30
Benzo(bk)fluoranthene	0.279	0.707	0.508	0.468	0.080						<0.018	ug/l	TM4/PM30
Benzo(a)pyrene	0.207	0.468	0.248	0.285	0.041						<0.016	ug/l	TM4/PM30
Indeno(123cd)pyrene	0.180	0.304	0.285	0.222	0.035						<0.011	ug/l	TM4/PM30
Dibenzo(ah)anthracene	0.03	0.05	0.03	0.04	<0.01						<0.01	ug/l	TM4/PM30
Benzo(ghi)perylene	0.170	0.236	0.265	0.154	0.026						<0.011	ug/l	TM4/PM30
PAH 16 Total	1.349	3.598	2.296	2.241	0.362						<0.195	ug/l	TM4/PM30
Benzo(b)fluoranthene	0.20	0.51	0.37	0.34	0.06						<0.01	ug/l	TM4/PM30
Benzo(k)fluoranthene	0.08	0.20	0.14	0.13	0.02						<0.01	ug/l	TM4/PM30
PAH Surrogate % Recovery	81	79	71	74	71						<0	%	TM4/PM30

Please see attached notes for all abbreviations and acronyms

Client Name: Omnia
Reference: A10965
Location: Lovedean Waterlooville
Contact: Grace Larcombe

[illegible]

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating. Only analyses which are accredited are recorded as deviating if set criteria are not met.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 19/15216

SOILS

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overestimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory.

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.

Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

Please include all sections of this report if it is reproduced

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Measurement Uncertainty

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above calibration range, the result should be considered the minimum value. The actual result could be significantly higher, this result is not accredited.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

EMT Job No: 19/15216

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465 and BS1377.	PM0	No preparation is required.			AR	
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.			AR	Yes
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.			AR	
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM14	Analysis of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for dissolved metals and acidified if required.	Yes		AR	Yes
NONE	No Method Code	PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465 and BS1377.			AR	

Attachment 4

Origin of UK Drinking Water Standards (UK DWS) and DWS WFD EQS 2010 (Freshwater in England and Wales)



guardians of drinking water quality
DRINKING WATER INSPECTORATE

What are the drinking water standards?

Drinking water must be 'wholesome' and this is defined in law by standards for a wide range of substances, organisms and properties of water in regulations. The standards are set to be protective of public health and the definition of wholesome reflects the importance of ensuring that water quality is acceptable to consumers. There is good agreement amongst worldwide on the science behind the setting of health based standards for drinking water and this expert evidence is documented by the World Health Organisation in the Guidelines for Drinking Water Quality. You can look up all the background information to standards of water safety [here](#). The legal standards in the UK are those which are set in Europe in the Drinking Water Directive 1998 together with national standards set to maintain the high quality of water already achieved. The standards are strict and include wide safety margins. They cover:

- **micro-organisms**
- **chemicals such as nitrate and pesticides**
- **metals such as lead and copper**
- **the way water looks and how it tastes**

The full regulations can be found [here](#). An explanation of the organisms and substances tested for regularly can be found in the Chief Inspectors Report [here](#). This guide also explains how drinking water is regulated in England and Wales.

Terms Explained

Parameter	Substance or organism tested for routinely in drinking water
EU requirement	These are the standards and specifications set in the EU Drinking Water Directive and apply in all the member states of the European Union
National requirement	These are national standards and specifications in the regulations which apply only in the UK.
Concentration or value or specification	Maximum or minimum or range allowed in drinking water
Point of compliance	The point where the legal standards apply, normally this is the consumers tap but it may be at the water works.
µg/l	Micrograms per litre (parts per billion)
mg/l	Milligrams per litre (parts per million)

MICROBIOLOGICAL PARAMETERS

Part I: Directive requirements			
<i>Parameters</i>	<i>Concentration or Value maximum)</i>	<i>Units of Measurement</i>	<i>Point of compliance</i>
Enterococci	0	number/100ml	Consumers' taps
<i>Escherichia coli</i> (<i>E. coli</i>)	0	number/100ml	Consumers' taps

Part II: National requirements			
<i>Parameters</i>	<i>Concentration or Value maximum)</i>	<i>Units of Measurement</i>	<i>Point of compliance</i>
Coliform bacteria	0	number/100ml	Service reservoirs* and water treatment works
<i>Escherichia coli</i> (<i>E. coli</i>)	0	number/100ml	Service reservoirs and water treatment works

Note: *Compliance required as to 95% of samples from each service reservoir

CHEMICAL PARAMETERS

Part I: Directive requirements			
<i>Parameters</i>	<i>Concentration or Value maximum)</i>	<i>Units of Measurement</i>	<i>Point of compliance</i>
Acrylamide	0.10	µg/l	(i)
Antimony	5.0	µgSb/l	Consumers' taps
Arsenic	10	µgAs/l	Consumers' taps
Benzene	1.0	µg/l	Consumers' taps
Benzo(a)pyrene	0.010	µg/l	Consumers' taps
Boron	1.0	mgB/l	Consumers' taps
Bromate	10	µgBrO ₃ /l	Consumers' taps
Cadmium	5.0	µgCd/l	Consumers' taps
Chromium	50	µgCr/l	Consumers' taps
Copper(ii)	2.0	mgCu/l	Consumers' taps
Cyanide	50	µgCN/l	Consumers' taps
1, 2 dichloroethane	3.0	µg/l	Consumers' taps
Epichlorohydrin	0.10	µg/l	(i)
Fluoride	1.5	mgF/l	Consumers' taps
Lead (ii)	25 (up to 25 th December 2013)	µgPb/l	Consumers' taps
	10 (on and after 25th December 2013)	µgPb/l	Consumers' taps
Mercury	1.0	µgHg/l	Consumers' taps
Nickel (ii)	20	µgNi/l	Consumers' taps
Nitrate (iii)	50	mgNO ₃ /l	Consumers' taps
Nitrite (iii)	0.50	mgNO ₂ /l	Consumers' taps
	0.10		Treatment works
Pesticides (iv)(v)			
Aldrin	0.030	µg/l	Consumers' taps
Dieldrin	0.030	µg/l	Consumers' taps
Heptachlor	0.030	µg/l	Consumers' taps
Heptachlor epoxide	0.030	µg/l	Consumers' taps
other pesticides	0.10	µg/l	Consumers' taps
Pesticides: Total (vi)	0.50	µg/l	Consumers' taps
Polycyclic aromatic hydrocarbons (vii)	0.10	µg/l	Consumers' taps
Selenium	10	µgSe/l	Consumers' taps



Tetrachloroethene and Trichloroethene (viii)	10	µg/l	Consumers' taps
Trihalomethanes: Total (ix)	100	µg/l	Consumers' taps
Vinyl chloride	0.50	µg/l	(i)

Notes:

- i) The parametric value refers to the residual monomer concentration in the water as calculated according to specifications of the maximum release from the corresponding polymer in contact with the water. This is controlled by product specification.
 - ii) See also regulation 6(6)
 - iii) See also regulation 4(2)(d)
 - iv) See the definition of "pesticides and related products" in regulation 2
 - v) The parametric value applies to each individual pesticide.
 - vi) "Pesticides: Total" means the sum of the concentrations of the individual pesticides detected and quantified in the monitoring procedure.
 - vii) The specified compounds are:
 - benzo(b)fluoranthene
 - benzo(k)fluoranthene
 - benzo(ghi)perylene
 - indeno(1,2,3-cd)pyrene.
 - viii) The parametric value applies to the sum of the concentrations of the individual compounds detected and quantified in the monitoring process.
- The parametric value applies to the sum of the concentrations of the individual compounds detected and quantified in the monitoring process.
- ix) The specified compounds are:
 - chloroform
 - bromoform

- dibromochloromethane
- bromodichloromethane.

The parametric value applies to the sum of the concentrations of the individual compounds detected and quantified in the monitoring process.

National requirements

<i>Parameters</i>	<i>Concentration or Value (maximum unless otherwise stated)</i>	<i>Units of Measurement</i>	<i>Point of compliance</i>
Aluminium	200	µgAl/l	Consumers' taps
Colour	20	mg/l Pt/Co	Consumers' taps
Iron	200	µgFe/l	Consumers' taps
Manganese	50	µgMn/l	Consumers' taps
Odour	<1 at 25°C	Dilution number	Consumers' taps
Sodium	200	mgNa/l	Consumers' taps
Taste	<1 at 25°C	Dilution number	Consumers' taps
Tetrachloromethane	3	µg/l	Consumers' taps
Turbidity	4	NTU	Consumers' taps

Last updated: January 2010

Determinand	Units	Hardness Banding (CaCO ₃ mg/l)	Freshwater EQS	Source
Arsenic	ug/l		50	WFD EQS 2010 (Freshwater in England & Wales)
Boron	ug/l		2000	Freshwater EQS (AA) - Dangerous Substances Directive (List II)
Cadmium	ug/l	<40	<0.08	WFD EQS 2010 (Freshwater in England & Wales)
		40-50	0.08	
		50-100	0.09	
		100-200	0.15	
		>200	0.25	
Chromium	ug/l		4.7	(AA) WFD EQS 2010 (Freshwater in England & Wales)
Copper	ug/l	0-50	1	WFD EQS 2010 (Freshwater in England & Wales)
		50-100	6	
		100-250	10	
		>250	28	
Cyanide (Free)	ug/l		1	(AA) WFD EQS 2010 (Freshwater in England & Wales)
Iron	ug/l		1000	(AA) WFD EQS 2010 (Freshwater in England & Wales)
Lead	ug/l		7.2	(AA) WFD EQS 2010 (Freshwater in England & Wales)
Mercury	ug/l		0.05	(AA) WFD EQS 2010 (Freshwater in England & Wales)
Nickel	ug/l		20	(AA) WFD EQS 2010 (Freshwater in England & Wales)
Selenium	ug/l		10	Drinking Water Directive
Sulphate	mg/l		400	Freshwater EQS (AA) - Dangerous Substances Directive (List II)
Zinc	ug/l	0-50	8	(AA) WFD EQS 2010 (Freshwater in England & Wales)
		50-100	50	
		100-250	75	
		>250	125	
pH			6 to 9	Freshwater EQS (AA) - Dangerous Substances Directive (List II)
Organics				
Phenol (total)	ug/l		7.7	(AA) WFD EQS 2010 (Freshwater in England & Wales)
MTBE	ug/l		30	Ireland (IGV)
TPH Aliphatic				
Aliphatic C5-C6	ug/l		15,000	WHO Petroleum Products in Drinking Water
Aliphatic C6-C8	ug/l		15,000	WHO Petroleum Products in Drinking Water
Aliphatic C8-C10	ug/l		300	WHO Petroleum Products in Drinking Water
Aliphatic C10-C12	ug/l		300	WHO Petroleum Products in Drinking Water
Aliphatic C12-C16	ug/l		300	WHO Petroleum Products in Drinking Water
Aliphatic C16-C21	ug/l		300	WHO Petroleum Products in Drinking Water
Aliphatic C21-C35	ug/l		300	WHO Petroleum Products in Drinking Water
TPH Aromatic				
Aromatic C5-C7	ug/l		10	(AA) WFD EQS 2010 (Freshwater in England & Wales)
Aromatic C7-C8	ug/l		50	Freshwater EQS (AA) - Dangerous Substances Directive (List II)
Aromatic C8-C10	ug/l		20	Freshwater EQS (AA) - Dangerous Substances Directive (List II)
Aromatic C10-C12	ug/l		100	WHO Petroleum Products in Drinking Water
Aromatic C12-C16	ug/l		100	WHO Petroleum Products in Drinking Water
Aromatic C16-C21	ug/l		90	WHO Petroleum Products in Drinking Water
Aromatic C21-C35	ug/l		90	WHO Petroleum Products in Drinking Water
BTEX				
Benzene	ug/l		10	(AA) WFD EQS 2010 (Freshwater in England & Wales)
Toluene	ug/l		50	(AA) WFD EQS 2010 (Freshwater in England & Wales)
Ethylbenzene	ug/l		20	Freshwater EQS (AA) - Dangerous Substances Directive (List II)
Xylenes	ug/l		30	(AA) WFD EQS 2010 (Freshwater in England & Wales)
PAH				
Anthracene	ug/l		0.1	(AA) WFD EQS 2010 (Freshwater in England & Wales)
Benzo(a)Pyrene	ug/l		0.005	(AA) WFD EQS 2010 (Freshwater in England & Wales)
Fluoranthene	ug/l		0.1	(AA) WFD EQS 2010 (Freshwater in England & Wales)
Naphthalene	ug/l		2.4	(AA) WFD EQS 2010 (Freshwater in England & Wales)
Benzo(b/k)fluoranthene	ug/l		0.003	(AA) WFD EQS 2010 (Freshwater in England & Wales)
Benzo(ghi)perylene & Indeno(1,2,3-cd)perylene	ug/l		0.002	(AA) WFD EQS 2010 (Freshwater in England & Wales)