

Remediation Validation Certificate – Site of former Underground Fuel Tank

CLIENT	Paul Scammel
SITE ADDRESS	157 Milton Road, Cowplain, Hampshire PO8 8RE
PROJECT NUMBER	GWPR2540
ENGINEER ON-SITE	James Harvey, Ground and Water Limited
DATE	12 th June 2018
RELEVANT DOCUMENTATION	- Ground and Water Desk Study Report – GWPR1606/DS/May 2016 - Ground and Water Ground Investigation Report – GWPR1606/GIR/May 2016
PROPOSED REMEDIATION STRATEGY	Human Health – Tank removal and potential TPH contamination It was recommended that further investigation would be required once the underground fuel tanks had been removed from beneath the former car park, to confirm that no leaks or spillages have occurred.

REMEDICATION UNDERTAKEN A site visit was undertaken by a Ground and Water Limited Engineer on the 22nd May 2018, to inspect and sample the soils surrounding the removed underground fuel tank.

Five cylindrical tanks ~2.00m tall were noted to have been removed from the ground. The void excavated was ~15.70m long x 7.6m wide. The pit was shallow to the east (0.32m bgl) and deepened to the west (1.20m bgl). The shape and depth of the void can be seen in Figure 2 and Photographs can be seen in Appendix A. Given the size of the tanks noted, the base of the excavation would be expected to be ~3.00 – 3.50m bgl, therefore backfilling of the void had occurred prior to validation sampling.

The visual inspection revealed Made Ground surrounding the former tanks was encountered from ground level for the full depth of the void. Samples of the Made Ground were taken from the base and all four sides: B1/1.20, B1/1.34, B2/1.56, S1/0.90, S2/1.00, S3/0.70 and S4/1.14m bgl. A sampling location plan can be seen in Figure 2. A broad summary of the strata encountered can be seen below.

Broad Summary of Strata Encountered (B1 – B2 and S1 – S4)		
Strata	Depth Encountered (m bgl)	Thickness (m)
MADE GROUND: (B2, S3, S4) Brick Paving.	GL	0.07
MADE GROUND: (S1) Brick wall	GL	0.35
MADE GROUND: (S3, S4) Concrete.	0.07	0.08
MADE GROUND: (TPFE1/WS1) Concrete.	0.35	0.20
MADE GROUND: (B1 – B2 & S1 – S4) Light brown clayey gravelly sand. Sand is fine to coarse grained. Gravel is abundant, fine to coarse, sub-angular to sub-rounded flint (20%), brick (30%), concrete (30%), porcelain (10%) and metal (10%).	GL – 0.35	0.35 – 1.40
MADE GROUND: (B2, S1 – S4) Dark Brown sandy clayey gravel. Sand is fine to coarse grained. Gravel is abundant, fine to cobble sized, brick (30%), concrete (30%) and flint (40%).	0.50 – 0.80	0.20 – 0.76

A strong hydrocarbon type (diesel) odour was noted across the void specifically in the perched water. Photographs showing the extent of the void can be seen in Appendix A.

5No. samples were screened for semi-metals and heavy metals and speciated Polyaromatic Hydrocarbons (PAHs) speciated TPH Fuel Oils, including a full aliphatic/aromatic split, BTEX compounds and Volatile Organic Compounds (VOC's) as these were the contaminants of concern identified in the Conceptual Site Model (Ground and Water Ground Investigation Report – GWPR1606/GIR/May 2016). The depth of sampling and type of material can be seen below:

- B1 – Perched water sample
- B2/1.56m bgl – Made Ground (Brown sandy clay with stones)
- S1/0.90m bgl – Made Ground (Brown sandy clay)
- S2/1.00m bgl – Made Ground (Brown sandy clay with stones)
- S4/1.14m bgl – Made Ground (Brown sandy clay with stones)

The results of the screening can be seen in Appendix B.

The results of the chemical laboratory testing were compared to the LQM/CIEH Suitable 4 Use Levels (S4UL) for a **'Residential with homegrown produce'** land-use scenario, as this was considered the most appropriate land-use scenario. The C4SL LLTC for Lead was compared to a **'Residential with homegrown produce'** land-use scenario.

No levels of determinands were found to exceed the guideline levels for a **'Residential with Home-grown Produce'** land-use scenario within the four Made Ground samples tested. However highly elevated levels of PAH, TPH and BTEX were identified within the one water sample tested.

The groundwater results were compared with the following EQS/UK Drinking Water Standards, the results can be seen tabulated overleaf.

Tabulated Standards For Groundwater Results				
Determinant	Units	EQS Source	EQS Level	Exceeded Levels
Arsenic	µg/l	DWS	10	23.0
Boron	µg/l	DWS	1000	36.0
Cadmium	µg/l	DWS	5	<0.4
Chromium	µg/l	DWS	50	7
Copper	µg/l	DWS	2000	15
Lead	µg/l	DWS	10	47.0
Mercury	µg/l	DWS	1	0.15
Nickel	µg/l	DWS	20	35.0
Selenium	µg/l	DWS	10	6
Vanadium	µg/l	EQS Freshwater	20 – 60	70
Zinc	µg/l	DWS	5000	<2
Naphthalene	µg/l	EQS Freshwater	10	91
Acenapythlene	µg/l	EQS Freshwater		0.04
Acenaphthene	µg/l	DWS	0.1	0.22
Fluorene	µg/l	DWS	0.1	0.79
Phenathrene	µg/l	DWS	0.1	0.58
Anthracene	µg/l	DWS	0.1	0.03
Fluoranthene	µg/l	EQS Freshwater	0.1	0.04
Benzo(a)anthracene	µg/l	DWS	0.1	<0.01
Chrysene	µg/l	DWS	0.1	<0.01
Benzo(a)pyrene	µg/l	DWS	0.01	<0.01
Benzo(b)fluoranthene + Benzo(k)fluoranthene	µg/l	EQS Freshwater	0.03	<0.01
Benzo(g,h,i)perylene + Indeno(1,2,3-cd)pyrene	µg/l	EQS Freshwater	0.002	<0.008
(1)Total Polycyclic Aromatic Hydrocarbons (PAH)	µg/l	DWS	0.1	92.73
Total Petroleum Hydrocarbons (TPH)	µg/l	PWSR	10	15836
Benzene	µg/l	DWS	1	377
Toluene	µg/l	EQS Freshwater	50	2900
Ethylbenzene	µg/l	WHO Health	300	2690
Xylene	µg/l	EQS Freshwater	30	4370
VOC	No other VOC detected over laboratory detection limits.			

The sample of perched water identified highly elevated levels of determinands, however, due to the cohesive nature of the ground this was not considered to be a risk to groundwater.

The results of the groundwater analysis and vapour risk assessment can be seen tabulated overleaf.

Groundwater Guideline Values and General Acceptance Criteria Results		
Substance	Sample Location	
	Where available GACgwvap were exceeded.	
	GACgwvap (µg/l) "Residential" Land-Use Scenario	Groundwater Samples (µg/l)
Benzene	210	377µg/l
Ethylbenzene	10,000	Results below detection limit
Toluene	230,000	Results below detection limit
TPH Aliphatic EC5-EC6	1,900	Results below detection limit
TPH Aliphatic >EC6-EC8	1,500	Results below detection limit
TPH Aliphatic >EC8-EC10	57	110µg/l
TPH Aliphatic >EC10-EC12	37	75µg/l
TPH Aromatic >EC5-EC7	210,000	Results below detection limit
TPH Aromatic >EC7-EC8	220,000	Results below detection limit
TPH Aromatic >EC8-EC10	1,900	8900µg/l
TPH Aromatic >EC10-EC 12	6,800	Results below detection limit
TPH Aromatic >EC12-EC16	39,000	Results below detection limit
meta-Xylene	9,500	Results below detection limit
ortho-Xylene	12,000	Results below detection limit
para-Xylene	9,900	Results below detection limit

The chemical testing identified four elevated levels relating to Benzene, TPH Aliphatic >EC8 – EC10, TPH Aliphatic EC10 – EC12 and TPH Aromatic >EC8 – EC10 above the guideline GACgwvap values for a "Residential" land use scenario.

Overall, the vapour risk from groundwater was considered to be low. The elevated level was noted in a finite source of perched water, no significant contaminated saturated aquifer is present beneath the site. With the addition of a ventilated sub-floor it was considered the elevated VOC's were unlikely to pose a risk to the end user. However, further risk assessment is considered necessary to confirm.

It is recommended that a return visit is undertaken with a windowless sampler to bypass the infilled material and retrieve samples from the base of the tanks and the underlying natural ground to determine if further remediation is required.

**REMEDICATION
WITH RESPECT TO
SOIL
CONTAMINATION
COMPLETED TO A
SATISFACTORY
STANDARD IN
ACCORDANCE WITH
DOCUMENTATION**

Date: 12th June 2018

Signed:



James Harvey

Geotechnical and Geo-Environmental Engineer – Ground and Water Limited

The following Figures and Appendices complete this report:

Figure 1 **Trial Hole Location Plan**

Figure 2 **Void Technical Drawing**

Appendix A **Photographs of northern wall of void**

Appendix B **Chemical Laboratory Test Results**



Key

Void
Excavation



NOT TO SCALE

Project:

157 Milton Road, Cowplain, Hampshire PO8 8RE

Client:

PD Scammell Ltd

Date:

June 2018

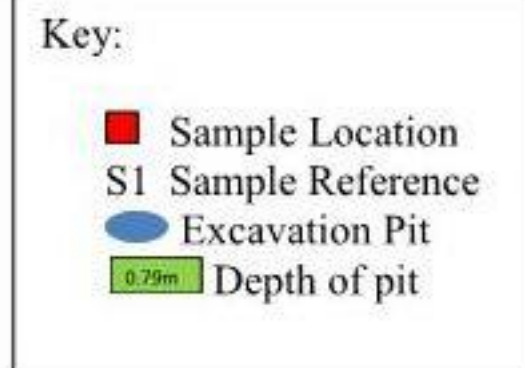
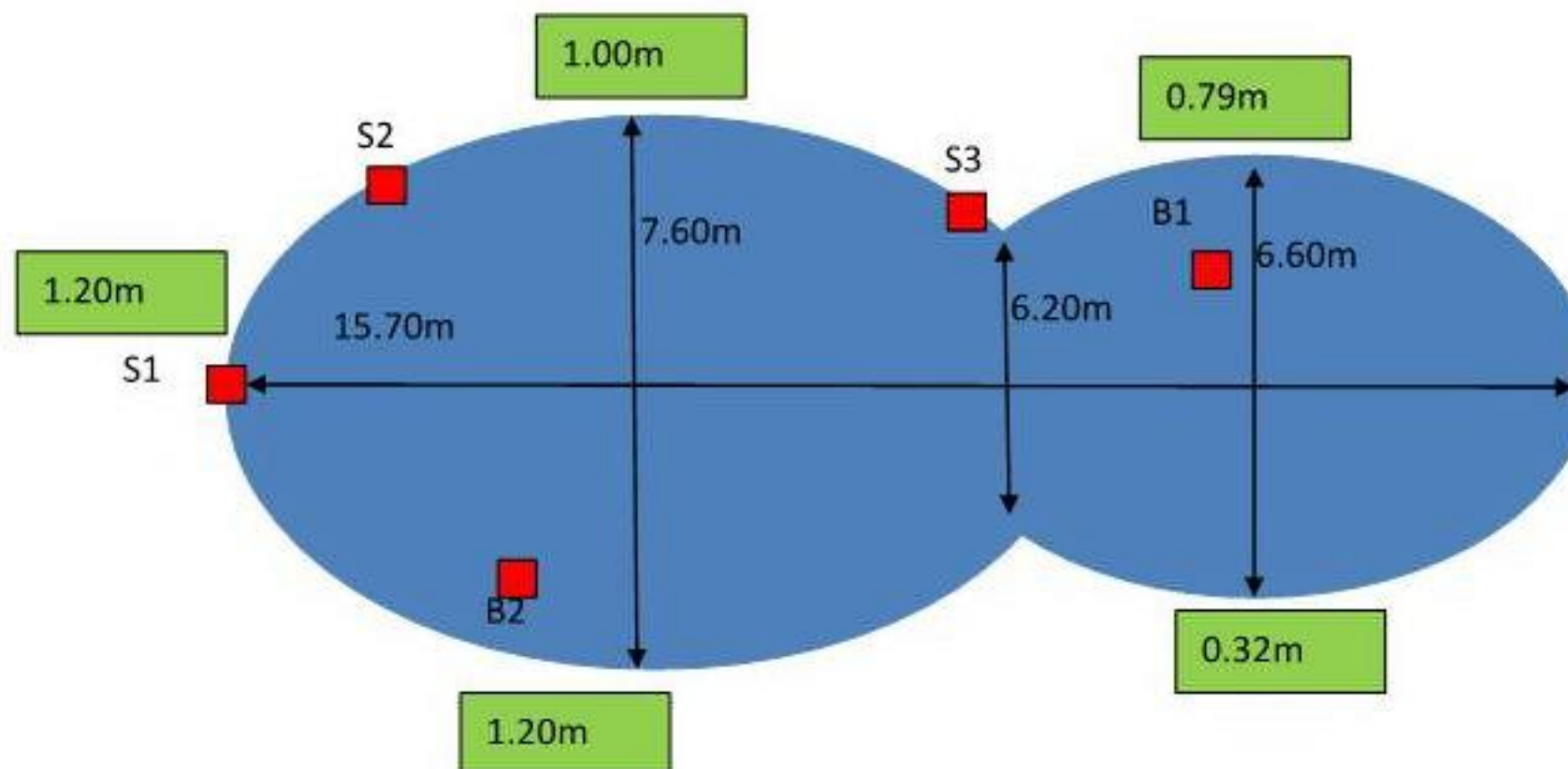
Ref:

GWPR2540

Site Location Plan

Figure 1

ground&water



NOT TO SCALE

Project:		157 Milton Road, Cowplain, Hampshire PO8 8RE	
Client:	PD Scammell Ltd	Date:	June 2018
Schematic Diagram of Extent, Locations and Sampling of Tank excavation (Phase I)		Ref:	GWPR2540

Figure 2

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APPENDIX A
Photographs of northern wall of void

Photograph 1: View of tank excavation, looking south-west.



Photograph 2: View of tank excavation, looking south-east.



Project:
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Client:
PD Scammell Ltd.

Date:
June 2018

Appendix A: Site Photographs

Ref:
GWPR2540

Plate 1:

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Photograph 3: View of the tanks that had been excavated from the ground, located in the north-west of the site. View looking north.



Photograph 4: Inspection of tank, filled with foam.



Project: 157 Milton Road, Cowplain, Hampshire PO8 8RE		Plate 2: 
Client: PD Scammell Ltd.	Date: June 2018	
Appendix A: Site Photographs	Ref: GWPR2540	

Photograph 5: Depth of the pit at the north-eastern extent (0.78m).



Photograph 6: Depth of pit at the south-eastern extent (0.78m).



Project:
157 Milton Road, Cowplain, Hampshire PO8 8RE

Client:
PD Scammell Ltd.

Date:
June 2018

Appendix A: Site Photographs

Ref:
GWPR2540

Plate 3:

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Photograph 7: Depth of the pit at the south-western extent (1.20m).



Photograph 8: Depth of the pit at the western extent (1.20m).



Project:
157 Milton Road, Cowplain, Hampshire PO8 8RE

Client:
PD Scammell Ltd.

Date:
June 2018

Appendix A: Site Photographs

Ref:
GWPR2540

Plate 4:

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Photograph 9: Depth of the pit at the north-western extent (1.00m).



Project:
157 Milton Road, Cowplain, Hampshire PO8 8RE

Client:
PD Scammell Ltd

Date:
June 2018

Appendix A: Site Photographs

Ref:
GWPR2540

Plate 5:

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APPENDIX B
Chemical Laboratory Test Results



James Harvey
Ground & Water Ltd
2 The Long Barn
Norton Farm
Selborne Road
Alton
Hampshire
GU34 3NB

DETS Ltd
Unit 1
Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Kent
ME17 2JN
t: 01622 850410
russell.jarvis@qlsenvironmental.com

DETS Report No: 18-75732

Site Reference: 157 Milton Road, Cowplain, Waterlooville, Hants, PO8 8RE

Project / Job Ref: GWPR2540

Order No: None Supplied

Sample Receipt Date: 24/05/2018

Sample Scheduled Date: 24/05/2018

Report Issue Number: 1

Reporting Date: 01/06/2018

Authorised by:



Russell Jarvis
Associate Director of Client Services

Authorised by:



Dave Ashworth
Deputy Quality Manager

Soil Analysis Certificate						
DETS Report No: 18-75732	Date Sampled	22/05/18	22/05/18	22/05/18	22/05/18	
Ground & Water Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	
Site Reference: 157 Milton Road, Cowplain, Waterloooville, Hants, PO8 8RE	TP / BH No	B2	S2	S4	S1	
Project / Job Ref: GWPR2540	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	
Order No: None Supplied	Depth (m)	1.56	1.00	1.14	0.90	
Reporting Date: 01/06/2018	QTSE Sample No	336141	336142	336143	336144	

Determinand	Unit	RL	Accreditation				
Asbestos Screen ^(S)	N/a	N/a	ISO17025	Not Detected	Not Detected	Not Detected	Not Detected
pH	pH Units	N/a	MCERTS	8.1	8.1	9.1	7.7
Total Cyanide	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2
W/S Sulphate as SO ₄ (2:1)	mg/l	< 10	MCERTS	72	60	204	55
W/S Sulphate as SO ₄ (2:1)	g/l	< 0.01	MCERTS	0.07	0.06	0.20	0.05
Organic Matter	%	< 0.1	MCERTS	0.8	0.8	1	1.1
Total Organic Carbon (TOC)	%	< 0.1	MCERTS	0.4	0.4	0.6	0.7
Arsenic (As)	mg/kg	< 2	MCERTS	7	4	8	3
W/S Boron	mg/kg	< 1	NONE	< 1	< 1	< 1	< 1
Cadmium (Cd)	mg/kg	< 0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2
Chromium (Cr)	mg/kg	< 2	MCERTS	32	20	20	18
Chromium (hexavalent)	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2
Copper (Cu)	mg/kg	< 4	MCERTS	20	6	11	6
Lead (Pb)	mg/kg	< 3	MCERTS	17	10	30	11
Mercury (Hg)	mg/kg	< 1	NONE	< 1	< 1	< 1	< 1
Nickel (Ni)	mg/kg	< 3	MCERTS	34	10	9	8
Selenium (Se)	mg/kg	< 3	NONE	< 3	< 3	< 3	< 3
Vanadium (V)	mg/kg	< 2	NONE	52	30	33	32
Zinc (Zn)	mg/kg	< 3	MCERTS	110	40	117	36
Total Phenols (monohydric)	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C.
Subcontracted analysis (S)

Soil Analysis Certificate - Speciated PAHs

DETS Report No: 18-75732	Date Sampled	22/05/18	22/05/18	22/05/18	22/05/18
Ground & Water Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: 157 Milton Road, Cowplain, Waterloooville, Hants, PO8 8RE	TP / BH No	B2	S2	S4	S1
Project / Job Ref: GWPR2540	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied
Order No: None Supplied	Depth (m)	1.56	1.00	1.14	0.90
Reporting Date: 01/06/2018	QTSE Sample No	336141	336142	336143	336144

Determinand	Unit	RL	Accreditation					
Naphthalene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	0.15	< 0.1	
Acenaphthylene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Acenaphthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Fluorene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Phenanthrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Benzo(a)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Chrysene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Benzo(b)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Benzo(k)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Benzo(a)pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Dibenz(a,h)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Benzo(ghi)perylene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Total EPA-16 PAHs	mg/kg	< 1.6	MCERTS	< 1.6	< 1.6	< 1.6	< 1.6	

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C

Soil Analysis Certificate - TPH CWG Banded

DETS Report No: 18-75732	Date Sampled	22/05/18	22/05/18			
Ground & Water Ltd	Time Sampled	None Supplied	None Supplied			
Site Reference: 157 Milton Road, Cowplain, Waterlooville, Hants, PO8 8RE	TP / BH No	B2	S1			
Project / Job Ref: GWPR2540	Additional Refs	None Supplied	None Supplied			
Order No: None Supplied	Depth (m)	1.56	0.90			
Reporting Date: 01/06/2018	QTSE Sample No	336141	336144			

Determinand	Unit	RL	Accreditation					
Aliphatic >C5 - C6	mg/kg	< 0.01	NONE	< 0.01	< 0.01			
Aliphatic >C6 - C8	mg/kg	< 0.05	NONE	0.36	< 0.05			
Aliphatic >C8 - C10	mg/kg	< 2	MCERTS	17	< 2			
Aliphatic >C10 - C12	mg/kg	< 2	MCERTS	7	< 2			
Aliphatic >C12 - C16	mg/kg	< 3	MCERTS	< 3	< 3			
Aliphatic >C16 - C21	mg/kg	< 3	MCERTS	< 3	< 3			
Aliphatic >C21 - C34	mg/kg	< 10	MCERTS	< 10	91			
Aliphatic (C5 - C34)	mg/kg	< 21	NONE	24	91			
Aromatic >C5 - C7	mg/kg	< 0.01	NONE	< 0.01	< 0.01			
Aromatic >C7 - C8	mg/kg	< 0.05	NONE	< 0.05	< 0.05			
Aromatic >C8 - C10	mg/kg	< 2	MCERTS	< 2	< 2			
Aromatic >C10 - C12	mg/kg	< 2	MCERTS	3	< 2			
Aromatic >C12 - C16	mg/kg	< 2	MCERTS	< 2	< 2			
Aromatic >C16 - C21	mg/kg	< 3	MCERTS	< 3	< 3			
Aromatic >C21 - C35	mg/kg	< 10	MCERTS	< 10	< 10			
Aromatic (C5 - C35)	mg/kg	< 21	NONE	< 21	< 21			
Total >C5 - C35	mg/kg	< 42	NONE	< 42	91			

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C.

Soil Analysis Certificate - BTEX / MTBE

DETS Report No: 18-75732	Date Sampled	22/05/18	22/05/18			
Ground & Water Ltd	Time Sampled	None Supplied	None Supplied			
Site Reference: 157 Milton Road, Cowplain, Waterlooville, Hants, PO8 8RE	TP / BH No	B2	S1			
Project / Job Ref: GWPR2540	Additional Refs	None Supplied	None Supplied			
Order No: None Supplied	Depth (m)	1.56	0.90			
Reporting Date: 01/06/2018	QTSE Sample No	336141	336144			

Determinand	Unit	RL	Accreditation			
Benzene	ug/kg	< 2	MCERTS	< 2	< 2	
Toluene	ug/kg	< 5	MCERTS	< 5	< 5	
Ethylbenzene	ug/kg	< 2	MCERTS	< 2	< 2	
p & m-xylene	ug/kg	< 2	MCERTS	< 2	< 2	
o-xylene	ug/kg	< 2	MCERTS	< 2	< 2	
MTBE	ug/kg	< 5	MCERTS	< 5	< 5	

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C.

Water Analysis Certificate						
DETS Report No: 18-75732	Date Sampled	22/05/18				
Ground & Water Ltd	Time Sampled	None Supplied				
Site Reference: 157 Milton Road, Cowplain, Waterloooville, Hants, PO8 8RE	TP / BH No	B1				
Project / Job Ref: GWPR2540	Additional Refs	None Supplied				
Order No: None Supplied	Depth (m)	None Supplied				
Reporting Date: 01/06/2018	QTSE Sample No	336140				

Determinand	Unit	RL	Accreditation	(hs)				
pH	pH Units	N/a	ISO17025	10.6				
Total Cyanide	ug/l	< 5	NONE	< 5				
Sulphate as SO ₄	mg/l	< 1	ISO17025	59				
Arsenic (dissolved)	ug/l	< 5	ISO17025	23				
Boron (dissolved)	ug/l	< 5	ISO17025	36				
Cadmium (dissolved)	ug/l	< 0.4	ISO17025	< 0.4				
Chromium (dissolved)	ug/l	< 5	ISO17025	7				
Chromium (hexavalent)	ug/l	< 20	NONE	< 20				
Copper (dissolved)	ug/l	< 5	ISO17025	15				
Lead (dissolved)	ug/l	< 5	ISO17025	47				
Mercury (dissolved)	ug/l	< 0.05	ISO17025	0.15				
Nickel (dissolved)	ug/l	< 5	ISO17025	35				
Selenium (dissolved)	ug/l	< 5	ISO17025	6				
Vanadium (dissolved)	ug/l	< 5	ISO17025	70				
Zinc (dissolved)	ug/l	< 2	ISO17025	< 2				
Total Phenols (monohydric)	ug/l	< 10	NONE	212				

Subcontracted analysis ^{SD}

Insufficient sample ^{IS}

Unsuitable Sample ^{US}

(hs) Please note deviating sample due to head space in container



DETS Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

Water Analysis Certificate - Speciated PAH					
DETS Report No: 18-75732	Date Sampled	22/05/18			
Ground & Water Ltd	Time Sampled	None Supplied			
Site Reference: 157 Milton Road, Cowplain, Waterloooville, Hants, PO8 8RE	TP / BH No	B1			
Project / Job Ref: GWPR2540	Additional Refs	None Supplied			
Order No: None Supplied	Depth (m)	None Supplied			
Reporting Date: 01/06/2018	QTSE Sample No	336140			

Determinand	Unit	RL	Accreditation	(hs)			
Naphthalene	ug/l	< 0.01	NONE	91			
Acenaphthylene	ug/l	< 0.01	NONE	0.04			
Acenaphthene	ug/l	< 0.01	NONE	0.22			
Fluorene	ug/l	< 0.01	NONE	0.79			
Phenanthrene	ug/l	< 0.01	NONE	0.58			
Anthracene	ug/l	< 0.01	NONE	0.03			
Fluoranthene	ug/l	< 0.01	NONE	0.04			
Pyrene	ug/l	< 0.01	NONE	0.03			
Benzo(a)anthracene	ug/l	< 0.01	NONE	< 0.01			
Chrysene	ug/l	< 0.01	NONE	< 0.01			
Benzo(b)fluoranthene	ug/l	< 0.01	NONE	< 0.01			
Benzo(k)fluoranthene	ug/l	< 0.01	NONE	< 0.01			
Benzo(a)pyrene	ug/l	< 0.01	NONE	< 0.01			
Indeno(1,2,3-cd)pyrene	ug/l	< 0.01	NONE	< 0.01			
Dibenz(a,h)anthracene	ug/l	< 0.01	NONE	< 0.01			
Benzo(ghi)perylene	ug/l	0.008	NONE	< 0.008			
Total EPA-16 PAHs	ug/l	< 0.01	NONE	92.73			



DETS Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

Water Analysis Certificate - TPH CWG Banded					
DETS Report No: 18-75732	Date Sampled	22/05/18			
Ground & Water Ltd	Time Sampled	None Supplied			
Site Reference: 157 Milton Road, Cowplain, Waterlooville, Hants, PO8 8RE	TP / BH No	B1			
Project / Job Ref: GWPR2540	Additional Refs	None Supplied			
Order No: None Supplied	Depth (m)	None Supplied			
Reporting Date: 01/06/2018	QTSE Sample No	336140			

Determinand	Unit	RL	Accreditation	(hs)				
Aliphatic >C5 - C6	ug/l	< 10	NONE	21				
Aliphatic >C6 - C8	ug/l	< 10	NONE	< 10				
Aliphatic >C8 - C10	ug/l	< 10	NONE	110				
Aliphatic >C10 - C12	ug/l	< 10	NONE	75				
Aliphatic >C12 - C16	ug/l	< 10	NONE	< 10				
Aliphatic >C16 - C21	ug/l	< 10	NONE	< 10				
Aliphatic >C21 - C34	ug/l	< 10	NONE	< 10				
Aliphatic (C5 - C34)	ug/l	< 70	NONE	206				
Aromatic >C5 - C7	ug/l	< 10	NONE	377				
Aromatic >C7 - C8	ug/l	< 10	NONE	2903				
Aromatic >C8 - C10	ug/l	< 10	NONE	8900				
Aromatic >C10 - C12	ug/l	< 10	NONE	3100				
Aromatic >C12 - C16	ug/l	< 10	NONE	350				
Aromatic >C16 - C21	ug/l	< 10	NONE	< 10				
Aromatic >C21 - C35	ug/l	< 10	NONE	< 10				
Aromatic (C5 - C35)	ug/l	< 70	NONE	15630				
Total >C5 - C35	ug/l	< 140	NONE	15836				

(hs) Please note deviating sample due to head space in container

Water Analysis Certificate - BTEX / MTBE						
DETS Report No: 18-75732	Date Sampled	22/05/18				
Ground & Water Ltd	Time Sampled	None Supplied				
Site Reference: 157 Milton Road, Cowplain, Waterlooville, Hants, PO8 8RE	TP / BH No	B1				
Project / Job Ref: GWPR2540	Additional Refs	None Supplied				
Order No: None Supplied	Depth (m)	None Supplied				
Reporting Date: 01/06/2018	QTSE Sample No	336140				

Determinand	Unit	RL	Accreditation	(hs)				
Benzene	ug/l	< 1	ISO17025	377				
Toluene	ug/l	< 5	ISO17025	2900				
Ethylbenzene	ug/l	< 5	ISO17025	2690				
p & m-xylene	ug/l	< 10	ISO17025	2900				
o-xylene	ug/l	< 5	ISO17025	1470				
MTBE	ug/l	< 10	ISO17025	21				

(hs) Please note deviating sample due to head space in container

Water Analysis Certificate - Volatile Organic Compounds (VOC)

DETS Report No: 18-75732	Date Sampled	22/05/18			
Ground & Water Ltd	Time Sampled	None Supplied			
Site Reference: 157 Milton Road, Cowplain, Waterlooville, Hants, PO8 8RE	TP / BH No	B1			
Project / Job Ref: GWPR2540	Additional Refs	None Supplied			
Order No: None Supplied	Depth (m)	None Supplied			
Reporting Date: 01/06/2018	QTSE Sample No	336140			

Determinand	Unit	RL	Accreditation	(hs)			
Dichlorodifluoromethane	ug/l	< 5	ISO17025	< 5			
Vinyl Chloride	ug/l	< 5	ISO17025	< 5			
Chloromethane	ug/l	< 5	ISO17025	< 5			
Chloroethane	ug/l	< 5	ISO17025	< 5			
Bromomethane	ug/l	< 5	ISO17025	< 5			
Trichlorofluoromethane	ug/l	< 5	ISO17025	< 5			
1,1-Dichloroethene	ug/l	< 5	ISO17025	< 5			
MTBE	ug/l	< 10	ISO17025	21			
trans-1,2-Dichloroethene	ug/l	< 5	ISO17025	< 5			
1,1-Dichloroethane	ug/l	< 5	ISO17025	< 5			
cis-1,2-Dichloroethene	ug/l	< 5	ISO17025	< 5			
2,2-Dichloropropane	ug/l	< 5	ISO17025	< 5			
Chloroform	ug/l	< 5	ISO17025	< 5			
Bromochloromethane	ug/l	< 10	ISO17025	< 10			
1,1,1-Trichloroethane	ug/l	< 5	ISO17025	< 5			
1,1-Dichloropropene	ug/l	< 5	ISO17025	< 5			
Carbon Tetrachloride	ug/l	< 5	ISO17025	< 5			
1,2-Dichloroethane	ug/l	< 10	ISO17025	< 10			
Benzene	ug/l	< 1	ISO17025	377			
1,2-Dichloropropane	ug/l	< 5	ISO17025	< 5			
Trichloroethene	ug/l	< 5	ISO17025	< 5			
Bromodichloromethane	ug/l	< 5	ISO17025	< 5			
Dibromomethane	ug/l	< 5	ISO17025	< 5			
TAME	ug/l	< 5	ISO17025	< 5			
cis-1,3-Dichloropropene	ug/l	< 5	ISO17025	< 5			
Toluene	ug/l	< 5	ISO17025	2903			
trans-1,3-Dichloropropene	ug/l	< 5	ISO17025	< 5			
1,1,2-Trichloroethane	ug/l	< 10	ISO17025	< 10			
1,3-Dichloropropane	ug/l	< 5	ISO17025	< 5			
Tetrachloroethene	ug/l	< 5	ISO17025	< 5			
Dibromochloromethane	ug/l	< 5	ISO17025	< 5			
1,2-Dibromoethane	ug/l	< 5	ISO17025	< 5			
Chlorobenzene	ug/l	< 5	ISO17025	< 5			
1,1,1,2-Tetrachloroethane	ug/l	< 5	ISO17025	< 5			
Ethyl Benzene	ug/l	< 5	ISO17025	2685			
m,p-Xylene	ug/l	< 10	ISO17025	2899			
o-Xylene	ug/l	< 5	ISO17025	1467			
Styrene	ug/l	< 5	ISO17025	84			
Bromoform	ug/l	< 10	ISO17025	< 10			
Isopropylbenzene	ug/l	< 5	ISO17025	< 5			
1,1,2,2-Tetrachloroethane	ug/l	< 10	ISO17025	< 10			
1,2,3-Trichloropropane	ug/l	< 5	ISO17025	< 5			
n-Propylbenzene	ug/l	< 5	ISO17025	66			
Bromobenzene	ug/l	< 5	ISO17025	< 5			
2-Chlorotoluene	ug/l	< 5	ISO17025	< 5			
1,3,5-Trimethylbenzene	ug/l	< 5	ISO17025	392			
4-Chlorotoluene	ug/l	< 5	ISO17025	< 5			
tert-Butylbenzene	ug/l	< 5	ISO17025	< 5			
1,2,4-Trimethylbenzene	ug/l	< 5	ISO17025	1286			
sec-Butylbenzene	ug/l	< 5	ISO17025	< 5			
p-Isopropyltoluene	ug/l	< 5	ISO17025	< 5			
1,3-Dichlorobenzene	ug/l	< 5	ISO17025	< 5			
1,4-Dichlorobenzene	ug/l	< 5	ISO17025	< 5			
n-Butylbenzene	ug/l	< 5	ISO17025	< 5			
1,2-Dichlorobenzene	ug/l	< 5	ISO17025	< 5			
1,2-Dibromo-3-chloropropane	ug/l	< 10	ISO17025	< 10			
Hexachlorobutadiene	ug/l	< 5	ISO17025	< 5			

(hs) Please note deviating sample due to head space in container



DETS Ltd
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Soil Analysis Certificate - Sample Descriptions

DETS Report No: 18-75732	
Ground & Water Ltd	
Site Reference: 157 Milton Road, Cowplain, Waterlooville, Hants, PO8 8RE	
Project / Job Ref: GWPR2540	
Order No: None Supplied	
Reporting Date: 01/06/2018	

QTSE Sample No	TP / BH No	Additional Refs	Depth (m)	Moisture Content (%)	Sample Matrix Description
336141	B2	None Supplied	1.56	13.8	Brown sandy clay with stones
336142	S2	None Supplied	1.00	7.2	Brown sandy clay with stones
336143	S4	None Supplied	1.14	13.2	Brown sandy clay with stones
336144	S1	None Supplied	0.90	7.5	Brown sandy clay

Moisture content is part of procedure E003 & is not an accredited test.

Insufficient Sample ^{1/5}

Unsuitable Sample ^{1/6}

Soil Analysis Certificate - Methodology & Miscellaneous Information

DETS Report No: 18-75732

Ground & Water Ltd

Site Reference: 157 Milton Road, Cowplain, Waterlooville, Hants, PO8 8RE

Project / Job Ref: GWPR2540

Order No: None Supplied

Reporting Date: 01/06/2018

Matrix	Analysed On	Determinand	Brief Method Description	Method No
Soil	D	Boron - Water Soluble	Determination of water soluble boron in soil by 2:1 hot water extract followed by ICP-OES	E012
Soil	AR	BTEX	Determination of BTEX by headspace GC-MS	E001
Soil	D	Cations	Determination of cations in soil by aqua-regia digestion followed by ICP-OES	E002
Soil	D	Chloride - Water Soluble (2:1)	Determination of chloride by extraction with water & analysed by ion chromatography	E009
Soil	AR	Chromium - Hexavalent	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1.5 diethylenetriamine followed by colorimetry	E016
Soil	AR	Cyanide - Complex	Determination of complex cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Free	Determination of free cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Total	Determination of total cyanide by distillation followed by colorimetry	E015
Soil	D	Cyclohexane Extractable Matter (CEM)	Gravimetrically determined through extraction with cyclohexane	E011
Soil	AR	Diesel Range Organics (C10 - C24)	Determination of hexane/acetone extractable hydrocarbons by GC-FID	E004
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of saturated calcium sulphate followed by electrometric measurement	E022
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of water followed by electrometric measurement	E023
Soil	D	Elemental Sulphur	Determination of elemental sulphur by solvent extraction followed by GC-MS	E020
Soil	AR	EPH (C10 - C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH Product ID	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH TEXAS (C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID for C8 to C40. C6 to C8 by headspace GC-MS	E004
Soil	D	Fluoride - Water Soluble	Determination of Fluoride by extraction with water & analysed by ion chromatography	E009
Soil	D	FOC (Fraction Organic Carbon)	Determination of fraction of organic carbon by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	D	Loss on Ignition @ 450°C	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace	E019
Soil	D	Magnesium - Water Soluble	Determination of water soluble magnesium by extraction with water followed by ICP-OES	E025
Soil	D	Metals	Determination of metals by aqua-regia digestion followed by ICP-OES	E002
Soil	AR	Mineral Oil (C10 - C40)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge	E004
Soil	AR	Moisture Content	Moisture content; determined gravimetrically	E003
Soil	D	Nitrate - Water Soluble (2:1)	Determination of nitrate by extraction with water & analysed by ion chromatography	E009
Soil	D	Organic Matter	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	PAH - Speciated (EPA 16)	Determination of PAH compounds by extraction in acetone and hexane followed by GC-MS with the use of surrogate and internal standards	E005
Soil	AR	PCB - 7 Congeners	Determination of PCB by extraction with acetone and hexane followed by GC-MS	E008
Soil	D	Petroleum Ether Extract (PEE)	Gravimetrically determined through extraction with petroleum ether	E011
Soil	AR	pH	Determination of pH by addition of water followed by electrometric measurement	E007
Soil	AR	Phenols - Total (monohydric)	Determination of phenols by distillation followed by colorimetry	E021
Soil	D	Phosphate - Water Soluble (2:1)	Determination of phosphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO ₄) - Total	Determination of total sulphate by extraction with 10% HCl followed by ICP-OES	E013
Soil	D	Sulphate (as SO ₄) - Water Soluble (2:1)	Determination of sulphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO ₄) - Water Soluble (2:1)	Determination of water soluble sulphate by extraction with water followed by ICP-OES	E014
Soil	AR	Sulphide	Determination of sulphide by distillation followed by colorimetry	E018
Soil	D	Sulphur - Total	Determination of total sulphur by extraction with aqua-regia followed by ICP-OES	E024
Soil	AR	SVOC	Determination of semi-volatile organic compounds by extraction in acetone and hexane followed by GC-MS	E006
Soil	AR	Thiocyanate (as SCN)	Determination of thiocyanate by extraction in caustic soda followed by acidification followed by addition of ferric nitrate followed by colorimetry	E017
Soil	D	Toluene Extractable Matter (TEM)	Gravimetrically determined through extraction with toluene	E011
Soil	D	Total Organic Carbon (TOC)	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	TPH CWG (ali: C5- C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C34, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C35. C5 to C8 by headspace GC-MS	E004
Soil	AR	TPH LQM (ali: C5-C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C35, C35-C44, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35, C35-C44)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C44. C5 to C8 by headspace GC-MS	E004
Soil	AR	VOCs	Determination of volatile organic compounds by headspace GC-MS	E001
Soil	AR	VPH (C6-C8 & C8-C10)	Determination of hydrocarbons C6-C8 by headspace GC-MS & C8-C10 by GC-FID	E001

D Dried
AR As Received

Soil Analysis Certificate - Methodology & Miscellaneous Information

DETS Report No: 18-75732

Ground & Water Ltd

Site Reference: 157 Milton Road, Cowplain, Waterlooville, Hants, PO8 8RE

Project / Job Ref: GWPR2540

Order No: None Supplied

Reporting Date: 01/06/2018

Matrix	Analysed On	Determinand	Brief Method Description	Method No
Water	UF	Alkalinity	Determination of alkalinity by titration against hydrochloric acid using bromocresol green as the end point	E103
Water	UF	BTEX	Determination of BTEX by headspace GC-MS	E101
Water	F	Cations	Determination of cations by filtration followed by ICP-MS	E102
Water	UF	Chemical Oxygen Demand (COD)	Determination using a COD reactor followed by colorimetry	E112
Water	F	Chloride	Determination of chloride by filtration & analysed by ion chromatography	E109
Water	F	Chromium - Hexavalent	Determination of hexavalent chromium by acidification, addition of 1,5 diphenylcarbazide followed by	E116
Water	UF	Cyanide - Complex	Determination of complex cyanide by distillation followed by colorimetry	E115
Water	UF	Cyanide - Free	Determination of free cyanide by distillation followed by colorimetry	E115
Water	UF	Cyanide - Total	Determination of total cyanide by distillation followed by colorimetry	E115
Water	UF	Cyclohexane Extractable Matter (CEM)	Gravimetrically determined through liquid:liquid extraction with cyclohexane	E111
Water	F	Diesel Range Organics (C10 - C24)	Determination of liquid:liquid extraction with hexane followed by GC-FID	E104
Water	F	Dissolved Organic Content (DOC)	Determination of DOC by filtration followed by low heat with persulphate addition followed by IR detection	E110
Water	UF	Electrical Conductivity	Determination of electrical conductivity by electrometric measurement	E123
Water	F	EPH (C10 - C40)	Determination of liquid:liquid extraction with hexane followed by GC-FID	E104
Water	F	EPH TEXAS (C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C40)	Determination of liquid:liquid extraction with hexane followed by GC-FID for C8 to C40. C6 to C8 by headspace GC-MS	E104
Water	F	Fluoride	Determination of Fluoride by filtration & analysed by ion chromatography	E109
Water	F	Hardness	Determination of Ca and Mg by ICP-MS followed by calculation	E102
Leachate	F	Leachate Preparation - NRA	Based on National Rivers Authority leaching test 1994	E301
Leachate	F	Leachate Preparation - WAC	Based on BS EN 12457 Pt1, 2, 3	E302
Water	F	Metals	Determination of metals by filtration followed by ICP-MS	E102
Water	F	Mineral Oil (C10 - C40)	Determination of liquid:liquid extraction with hexane followed by GC-FID	E104
Water	F	Nitrate	Determination of nitrate by filtration & analysed by ion chromatography	E109
Water	UF	Monohydric Phenol	Determination of phenols by distillation followed by colorimetry	E121
Water	F	PAH - Speciated (EPA 16)	Determination of PAH compounds by concentration through SPE cartridge, collection in dichloromethane followed by GC-MS	E105
Water	F	PCB - 7 Congeners	Determination of PCB compounds by concentration through SPE cartridge, collection in dichloromethane followed by GC-MS	E108
Water	UF	Petroleum Ether Extract (PEE)	Gravimetrically determined through liquid:liquid extraction with petroleum ether	E111
Water	UF	pH	Determination of pH by electrometric measurement	E107
Water	F	Phosphate	Determination of phosphate by filtration & analysed by ion chromatography	E109
Water	UF	Redox Potential	Determination of redox potential by electrometric measurement	E113
Water	F	Sulphate (as SO ₄)	Determination of sulphate by filtration & analysed by ion chromatography	E109
Water	UF	Sulphide	Determination of sulphide by distillation followed by colorimetry	E118
Water	F	SVOC	Determination of semi-volatile organic compounds by concentration through SPE cartridge, collection in dichloromethane followed by GC-MS	E106
Water	UF	Toluene Extractable Matter (TEM)	Gravimetrically determined through liquid:liquid extraction with toluene	E111
Water	UF	Total Organic Carbon (TOC)	Low heat with persulphate addition followed by IR detection	E110
Water	F	TPH CWG (ali: C5-C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C34, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35)	Determination of liquid:liquid extraction with hexane, fractionating with SPE followed by GC-FID for C8 to C35. C5 to C8 by headspace GC-MS	E104
Water	F	TPH LQM (ali: C5-C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C35, C35-C44, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35, C35-C44)	Determination of liquid:liquid extraction with hexane, fractionating with SPE followed by GC-FID for C8 to C44. C5 to C8 by headspace GC-MS	E104
Water	UF	VOCs	Determination of volatile organic compounds by headspace GC-MS	E101
Water	UF	VPH (C6-C8 & C8-C10)	Determination of hydrocarbons C6-C8 by headspace GC-MS & C8-C10 by GC-FID	E101

Key

F Filtered
UF Unfiltered