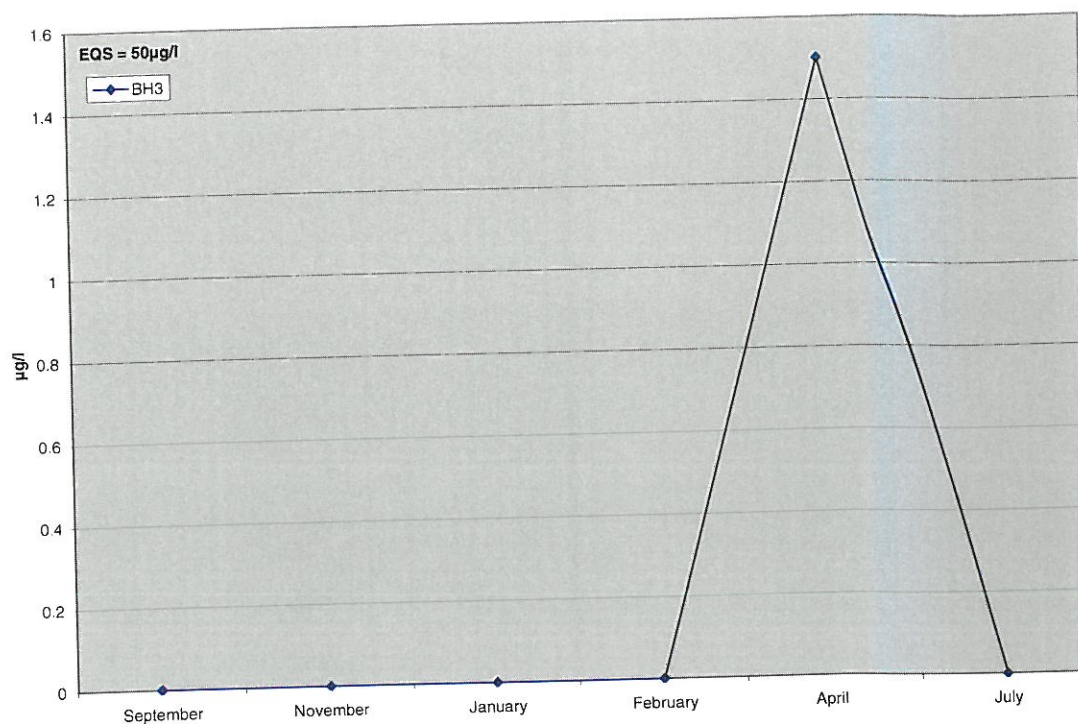
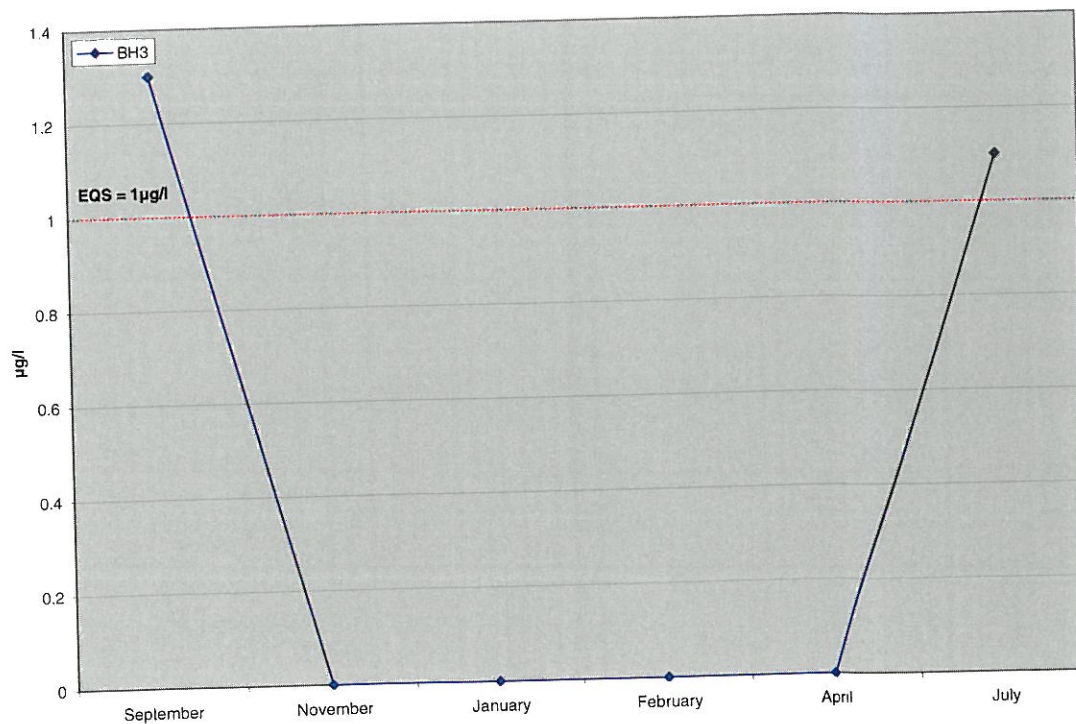


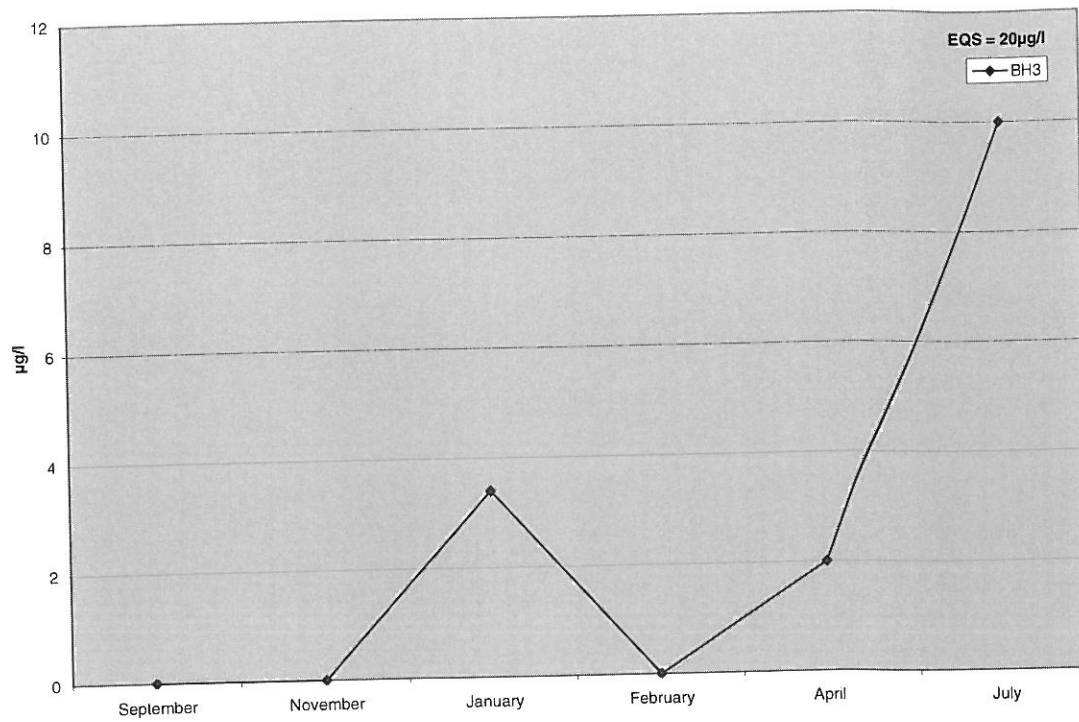
Lead (total)



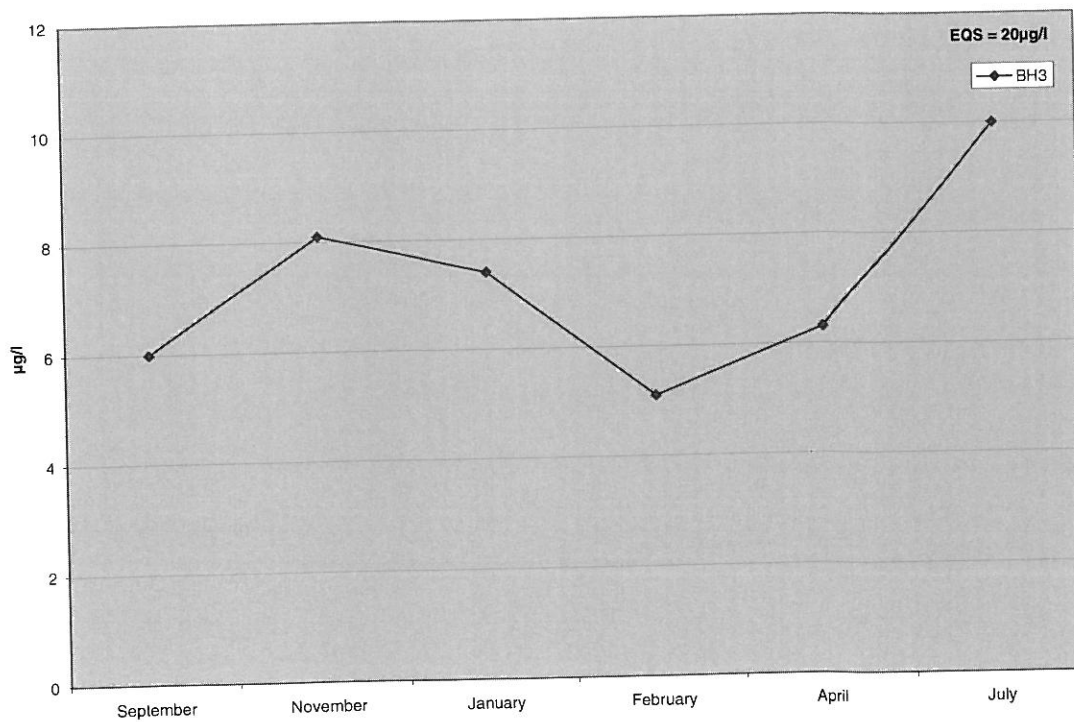
Mercury



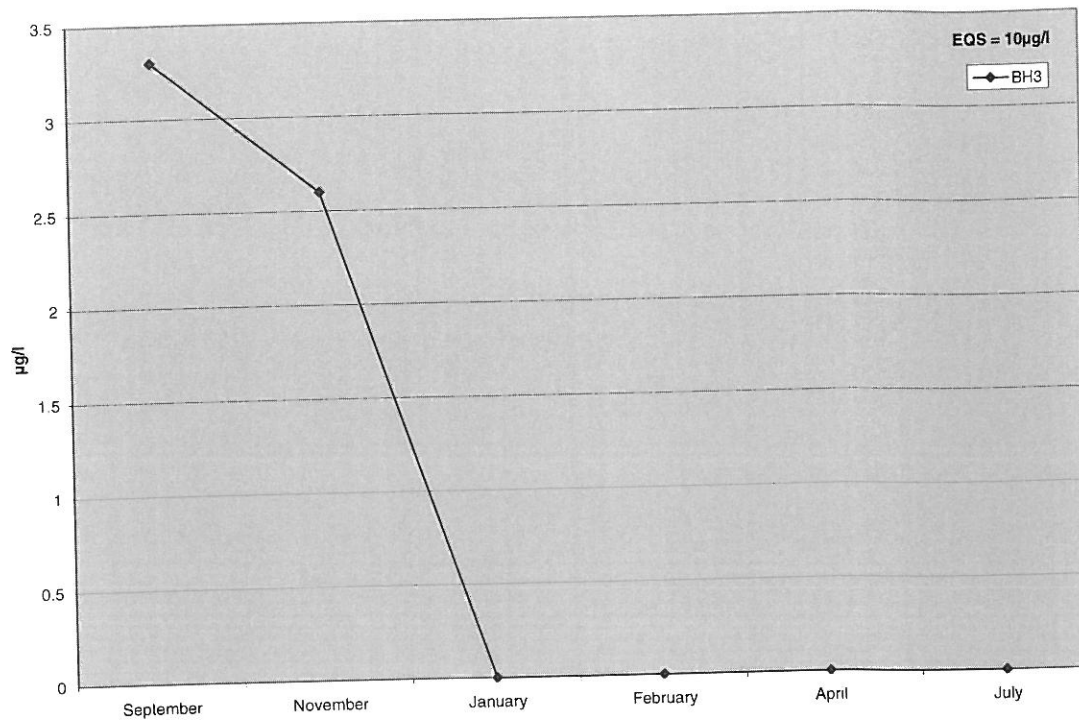
Nickel (dissolved)



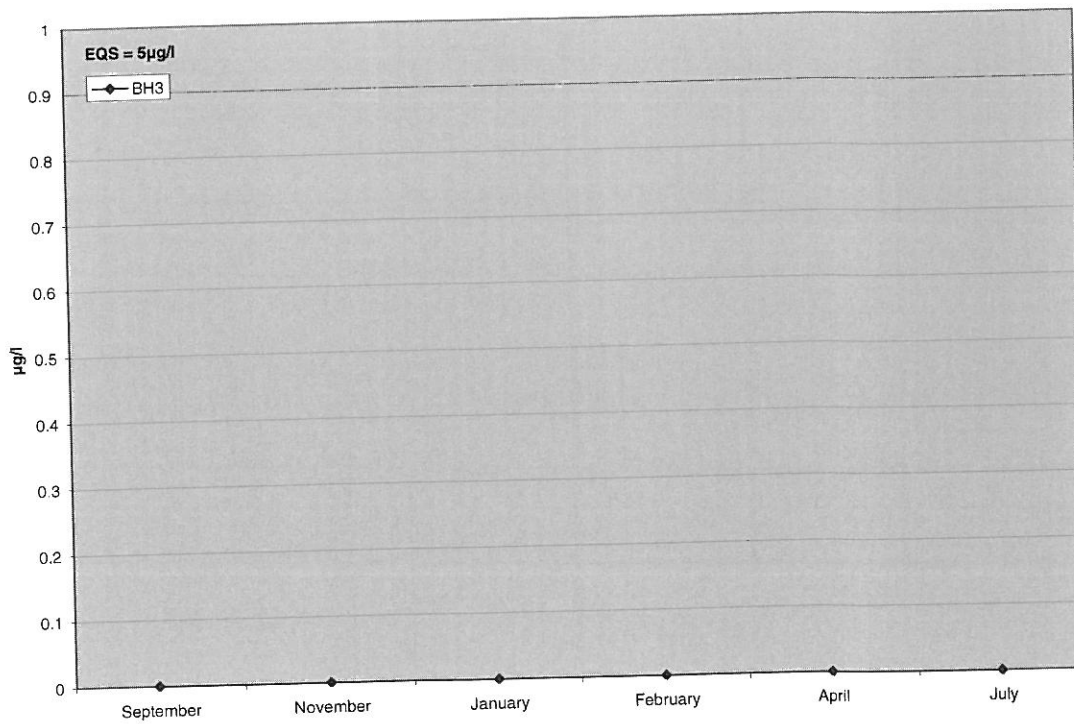
Nickel (total)



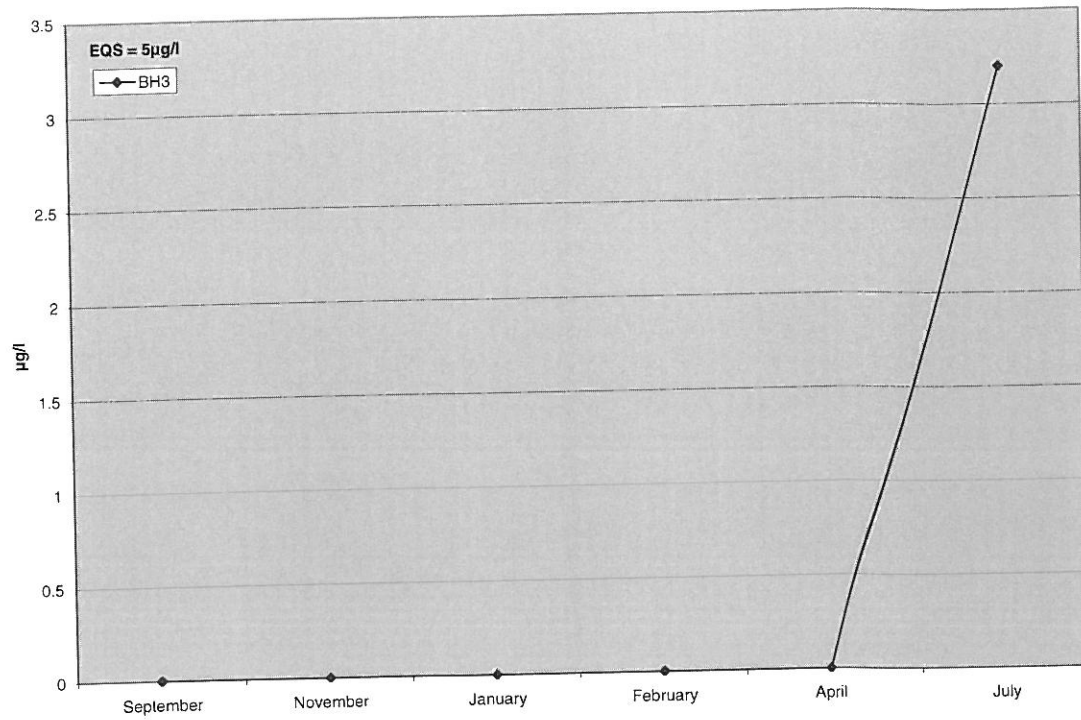
Selenium



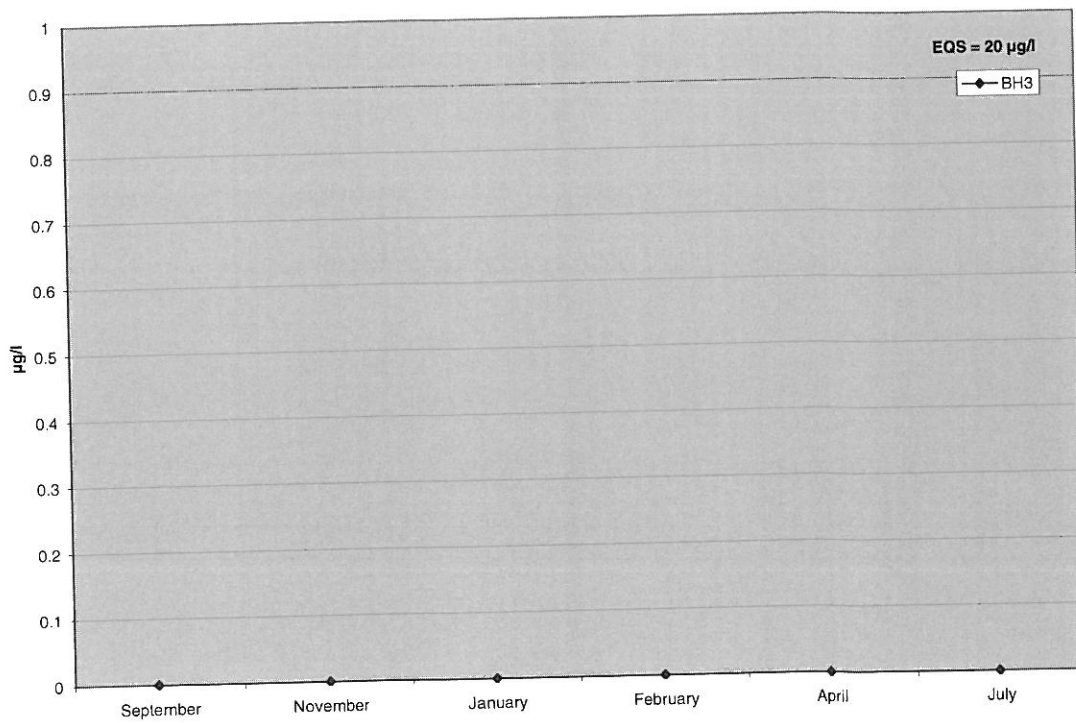
Antimony (dissolved)



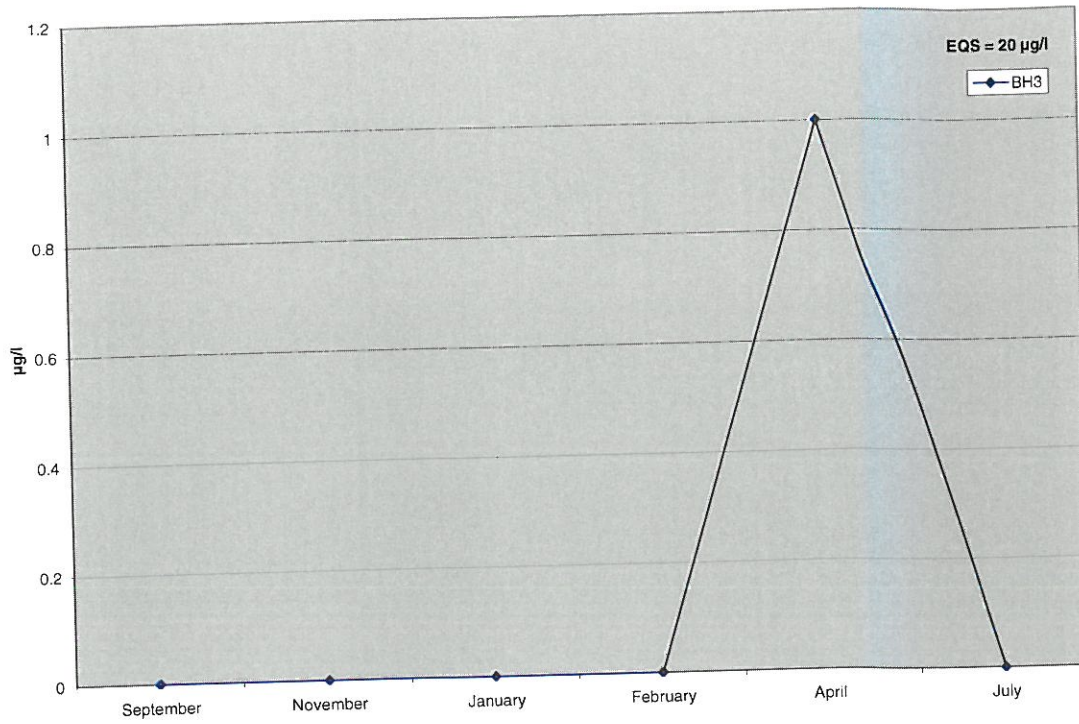
Antimony (total)



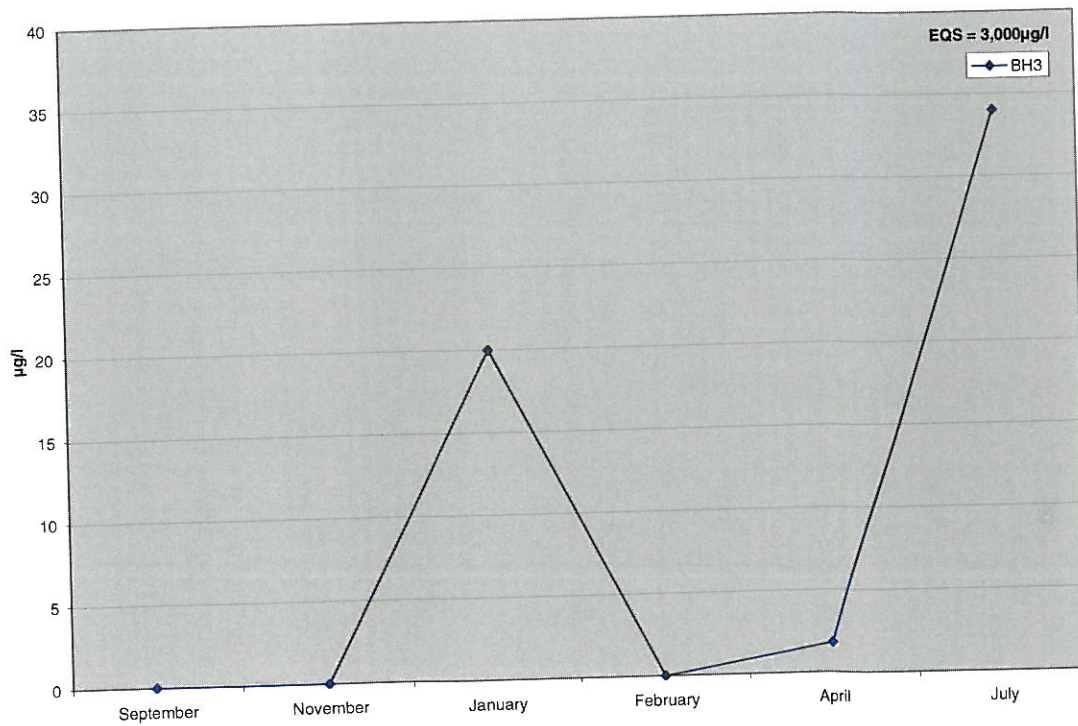
Vanadium (dissolved)



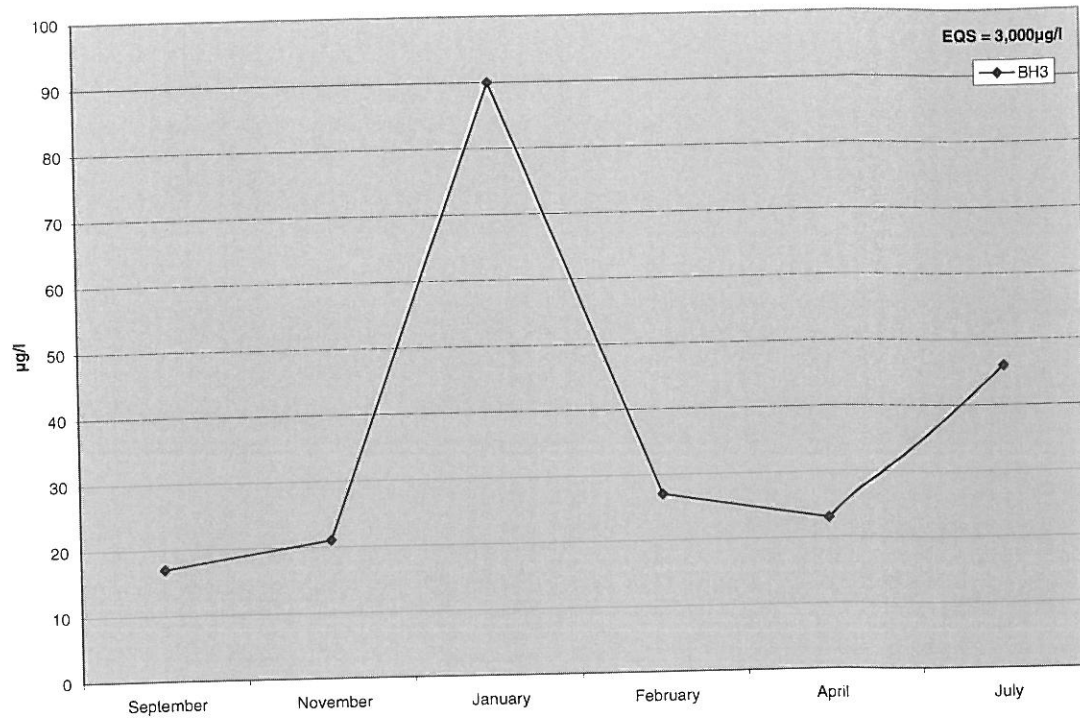
Vanadium (total)



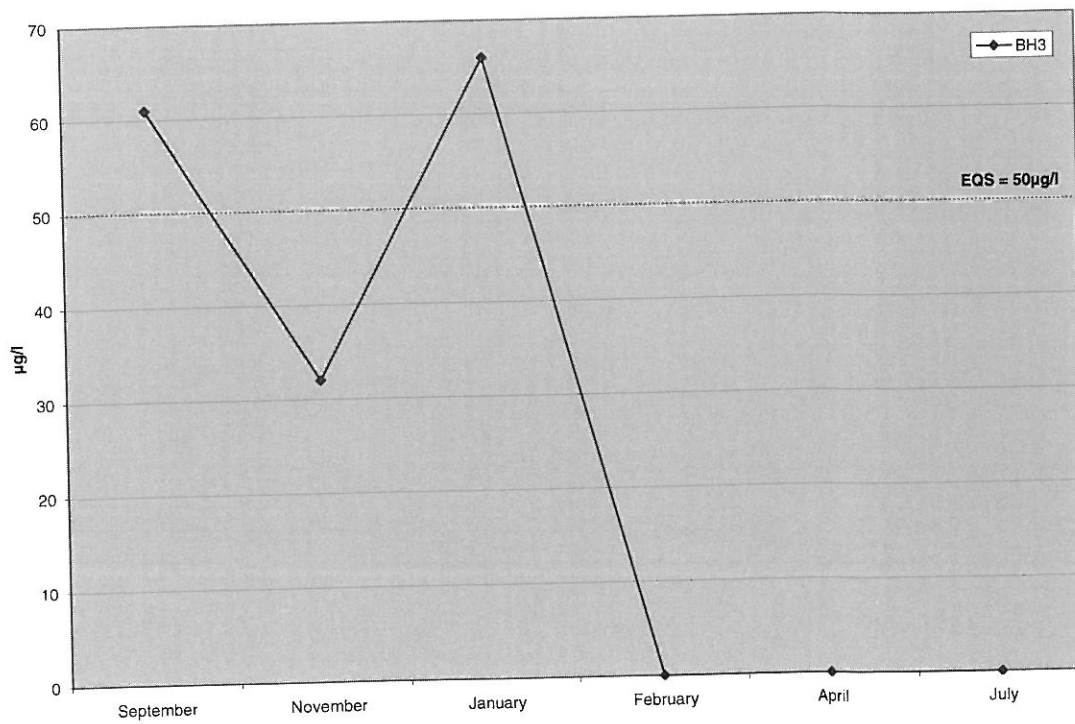
Zinc (dissolved)



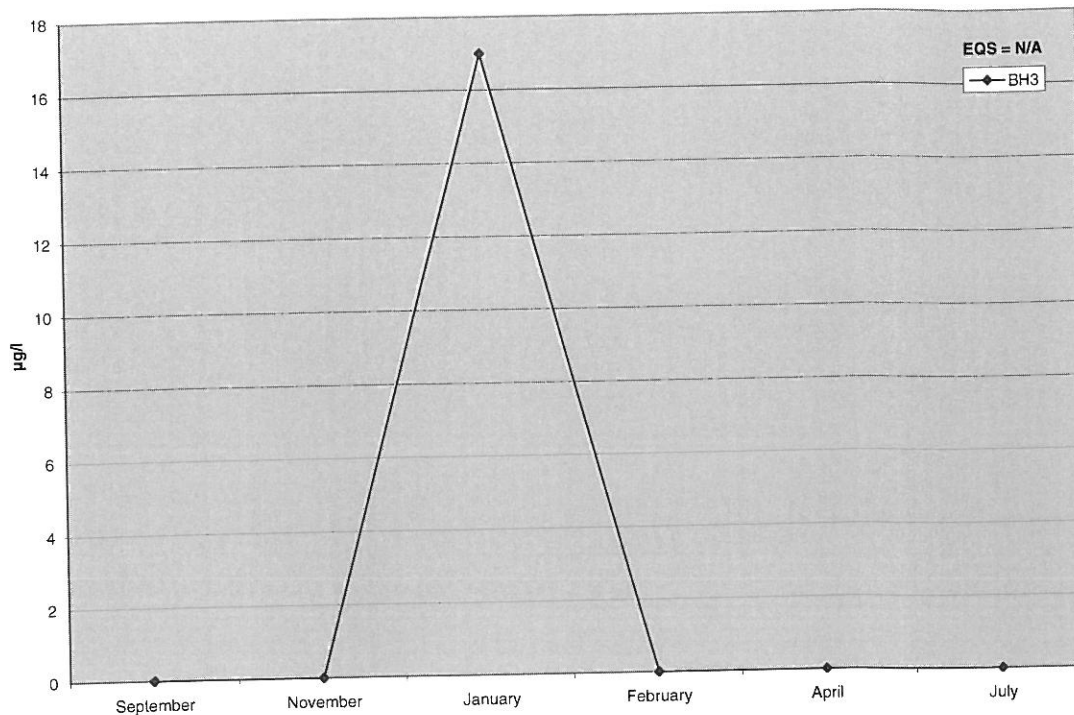
Zinc (total)



Total Petroleum Hydrocarbons (TPH) (Aqueous Phase)



Polycyclic Aromatic Hydrocarbons (PAH) (Total EPA 16)



The analysis indicates that values for: -

- pH was within limits but was on an increasing trend throughout the period of monitoring;
- Biological oxygen demand (BOD) exceeded limits for April;
- COD exceeded limits in April and July but was on a decreasing trend throughout monitoring period;
- Electrical conductivity has no limits. The conductivity was on an increasing trend throughout the period of monitoring. Conductivity has a direct relationship with dissolved solid concentration. The increase in conductivity could indicate that the rate of solution of compounds contained within the waste deposited on site is increasing;
- Alkalinity and chloride concentrations were within limits but were both on an increasing trend;
- Ammonia concentration was over limit in February and in general was on an increasing trend over the monitoring period;
- Cyanide not detected;
- Iron Total and soluble concentrations exceeded limits in February and in general were on an increasing trend over the monitoring period;
- Sulphide within limits;
- TOC was within limits and on a decreasing trend, possibly indicating break down by biodegradation (Natural Attenuation);
- Sulphate concentration exceeded limits in September, November, January and July;
- Arsenic concentrations were within limits but were on an increasing trend throughout the monitoring period;

- Barium concentrations exceeded limits in September but were on a decreasing trend throughout the monitoring period;
- Beryllium concentration within limits;
- Boron and Cadmium, Chromium, Copper, lead and Antimony concentrations were within limits but all were on an increasing trend;
- Mercury concentrations exceeded limits in September and July with an increasing trend at the end of the monitoring period;
- Nickel concentrations were within limits but on an increasing trend throughout the monitoring period;
- Selenium concentrations were within limits and on a decreasing trend;
- Vanadium and zinc concentrations were within limits and there is no trend visible;
- TPH concentrations exceeded limits in September and January but were on a decreasing trend possibly due to natural attenuation;
- PAH concentration spiked in January although there was no trend visible.

3.3 Gas

Monthly monitoring of gas was undertaken between September 2010 and August 2011 for methane (CH₄), carbon dioxide (CO₂) and oxygen (O₂). The results are presented in Table 5.

The Environment Agency (EA) document *The surrender of permits for the permanent deposit of waste* (2010) states that in order to comply with completion criteria, the maximum concentration of methane in waste must be less than 1.5% by volume and the maximum concentration of carbon dioxide in waste must be less than 5% by volume throughout the entire waste body for at least two years.

Table 5 – Monthly Gas Monitoring Results

Borehole Location	Date	O ₂ %	CH ₄ %	CO ₂ %
1	September 2010	0.2	13	7
2		16.2	0	1.4
3		12.3	0	4.2
4		1.4	0	2.5
1	October 2010	1.7	10	5.2
2		18	0	1.7
3		2	47	9
4		1.2	0	5.1
1	November 2010	1.3	5	6
2		19.8	0	0.7
3		17.1	1	1.2
4		1.8	1.5	3.2
1	December 2010	1.4	1.3	5.2
2		19.7	0	0.1
3		10.8	1.4	2.3
4		4	0	4.2
1	January 2011	0.2	6	4
2		19.3	0	0.6
3		9.2	4.9	2.7

4		0.6	0	2.7
1	February 2011	0.7	5.3	3
2		18.4	0.1	1.1
3		13	2.2	1.7
4		3.2	0	2.7
1	March 2011	0.2	4.5	4.4
2		19.1	2.2	1.5
3		16	0	1.7
4		1.6	0	3.1
1	May 2011	0.4	5	7
2		16.6	0	2.9
3		14.4	0.8	2.7
4		0.8	0.5	3.1
1	April 2011	0.7	1	5
2		18.5	0	0.9
3		15.9	0.1	1.1
4		2	0.9	2.2
1	June 2011	0.4	5	7
2		16.6	0.6	2.9
3		14.4	0.8	2.7
4		0.8	0.5	3.1
1	July 2011	5.5	9	5
2		20.4	0	0.1
3		3.5	4.6	7
4		1.2	2.5	3.3
1	August 2011	0.4	4	3
2		20.2	2	1.1
3		15	0.5	2
4		2.2	0	2.4

With the exception of April 2011 gas results indicated that methane and / or carbon dioxide levels exceeded the requirements of the EA for the surrender of permits.

The ground investigation conducted by Mott MacDonald in 2005 proved the presence of coal beneath the site, which may provide a natural source of methane and carbon dioxide.

3.4 Summary of Contamination from all available data

3.4.1 Soil

Analysis has indicated elevated levels of naphthalene, Indeno[1,2,3-cd]pyrene and benzo[a]pyrene in samples from the ground investigation conducted in March 2005.

Analysis has indicated elevated levels of arsenic, barium and lead in samples obtained in August 2010. However, US₉₅ values show that the site is below the SGV for arsenic and lead. Subsequent samples obtained in September 2010 did not indicate elevated levels of any contaminants tested.

3.4.2 Water

Analysis has indicated elevated levels of antimony, cyanide (total), barium and selenium in groundwater and surface water samples from the ground investigation conducted by Mott MacDonald in March 2005.

The determinands exceeding EQS's / GAC's in surface water over the period September 2010 to August 2011 are summarised in the following table.

Table 5 – Summary of Surface Water Determinands Exceeding EQS's / GAC's

Determinand	EQS / GAC	Mean Concentration			
		SW1	SW2	SW3	All
Ammoniacal Nitrogen ^{*2}	0.5 mg NH ₄ /l	0.62	0.59	1.36	0.86
Iron (dissolved) ^{*1*2}	(2,000) ^{*1} (200) ^{*2} µg/l	220.0 0	228.75	182.50	210.00
Iron (total) ^{*1*2}	(2,000) ^{*1} (200) ^{*2} µg/l	742.5 0	731.25	898.75	790.83
Mercury	1 µg/l	1.47	0.75	0.82	1.01
*1 Surface Waters (Abstraction for Drinking Water) (Classification) Regulations 1996					
*2 Water Supply (Water Quality) Regulations 2000					

In the instances of ammoniacal nitrogen and dissolved iron the mean concentrations indicate that the surface waters entering the site (SW3 and SW2) have higher mean concentrations than surface waters from the site (SW1). However, mean concentrations of total iron and mercury are higher in SW1 than in both SW2 and SW3 suggesting that further investigation is required.

Groundwater sampled during the site investigation in August 2010 indicated elevated levels of barium.

The results of determinands exceeding EQS's / GAC's in groundwater over the period September 2010 to July 2011 are summarised in Table 6.

Table 6 – Summary of Groundwater Determinands Exceeding EQS's / GAC's

Determinand	EQS / GAC	Mean Concentration
		BH3
Iron (total) ^{*1}	2,000 µg/l	2,118
Mercury ^{*2}	1 µg/l	1.20
Total Petroleum Hydrocarbons (TPH) ^{*1}	50 µg/l	53.00
*1 Surface Waters (Abstraction for Drinking Water) (Classification) Regulations 1996		
*2 Water Supply (Water Quality) Regulations 2000		

The analysis indicates that values for biological oxygen demand (BOD), chemical oxygen demand (COD), ammoniacal nitrogen, total iron, mercury, sulphate and total petroleum hydrocarbons have exceeded guideline values at some point over the monitoring period. The majority of the inorganic determinands show an increasing trend throughout the monitoring period. Organic compound show a decreasing trend

possibly indicating that natural attenuation of these pollutants could be occurring through natural biodegradation.

3.4.3 Gas

Elevated levels of carbon dioxide and methane were recorded in BH1 – BH4 throughout the monitoring period from September 2010 to August 2011.

The concentrations were above those recommended for Completion Criteria.

4.0 REFERENCES

- Environment Agency. 2008. *Environmental permitting regulations: site condition report – guidance and templates.*
- Environment Agency. 2010. *The surrender of permits for the permanent deposition of waste: technical guidance on the surrender of permits for landfills, deposit for recovery sites and mining waste operations.*
- BS 10175:2011 *Investigation of potentially contaminated sites: Code of Practice*
- Environmental Protection Act. 1990. Part IIA Contaminated Land
- DEFRA / Environment Agency. 2004. *Model procedures for the management of contaminated land: Contaminated Land Report 11 (CLR 11)*
- DETR / CIRIA. 2001. *Contaminated land risk assessment: a guide to good practice (CIRIA C552)*
- DEFRA / Environment Agency. 2002. *The Contaminated Land Exposure Assessment (CLEA) model: technical basis and algorithms (CLR 10)*
- Association of Geotechnical & Geoenvironmental Specialists (AGS) / The Environmental Industries Commission (EIC). 2010. *Soil generic assessment criteria for human health risk assessment. Contaminated Land: Applications in Real Environments (CL:AIRE).* London
- The Water Supply (Water Quality) Regulations 2000
- Department of the Environment, Transport and the Regions (DETR). 1989. *Water and the Environment - The implementation of European Community directives on pollution caused by certain dangerous substances discharged into the aquatic environment.* (Circular 07/89)
- DEFRA / EA. 2011. Chemical Standards Database. Available at: <http://87.84.223.229/ChemicalStandards> [Accessed: October 2011]
- Surface Waters (Abstraction for Drinking Water) (Classification) Regulations 1996
- Council Directive concerning the quality required of surface water intended for the abstraction of drinking water in the Member States (Surface Water Directive) (Repealed)
- Water Research Council (WRC). 1984. *Determination of pollutants in effluents: Proposed environmental quality standards for vanadium in water and associated materials.*

- Land Quality Management (LQM) & Chartered Institute of Environmental Health (CIEH). 2009. *The LQM/CIEH Generic Assessment Criteria for Human Health Risk Assessment (2nd Ed.)*

APPENDIX A

Site Plan

 TRIAL PIT LOCATIONS
(EXCAL LIMITED)

 GROUNDWATER AND
LANDFILL GAS
MONITORING
BOREHOLE (EXCAL
LIMITED)

 LANDFILL BOUNDARY

 SURFACE WATER
MONITORING LOCATIONS
(EXCAL LIMITED)

 TRIAL PIT LOCATIONS
(MOTT MACDONALD)

 LANDFILL GAS
MONITORING
BOREHOLE (MOTT
MACDONALD)

Job:
Carmarthenshire County Council
Site Investigation, Trostre Landfill

Title:
Monitoring Locations:
EXCAL and Mott MacDonald

Date: October 2011

Scale: 1:1250

Drawn by: RH / SA

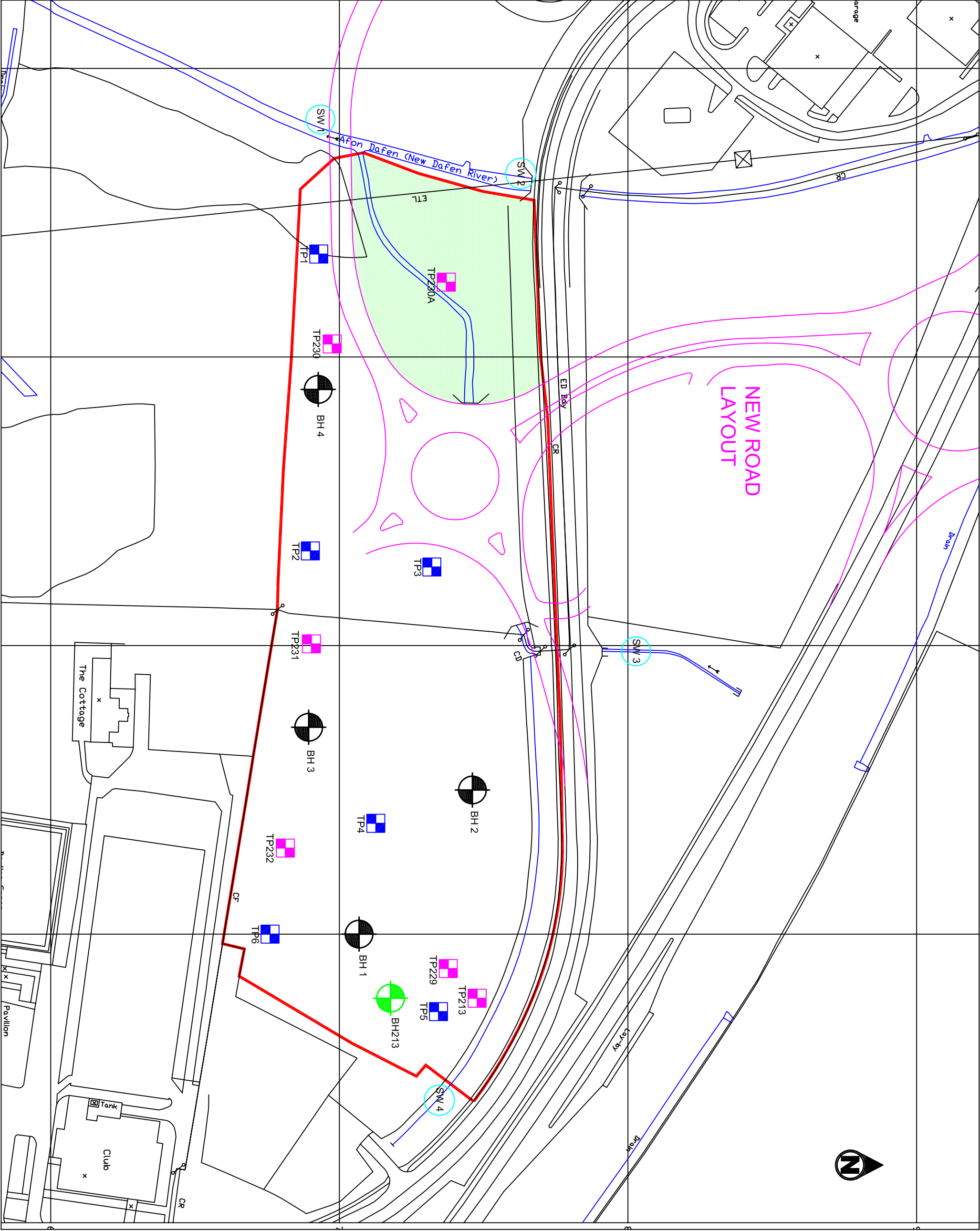
Checked by: CW

EXCAL LIMITED
EXCAL House
Capel Hendre Industrial Estate
Carmarthenshire
SA18 3SJ

Tel: 01269 831606 Fax: 01269 841867
Website: www.excaluk.com Email: reception@excaluk.com

Drawing No: 44-05-02.D02

Revision No: **Date:**



APPENDIX B
Chemical Testing Results

**EXCAL LIMITED
MONITORING DATA
SEPTEMBER 2010 – AUGUST 2011**

LABORATORY TEST REPORT

Report Date
16 September 2010

ExCAL UK Ltd
1 St Marys Street
Carmarthen
Carmarthenshire
SA31 1TN

FAO Tex Roberts

Results of analysis of 3 samples
received 8 September 2010

Trostre B

Login Batch No

Chemtest LIMS ID

Sample ID

Sample No

Depth

Matrix

SOP↓ Determinand↓

1010 pH
1300 Cyanide (total)
1325 Sulfide
1610 Total Organic Carbon
1220 Sulfate
1450 Arsenic
Barium
Beryllium
Boron
Cadmium
Chromium (total)
Copper
Lead
Mercury
Nickel
Selenium
Vanadium
Zinc

120803

AF27603

SW

1

WATER

7.1

<0.05

<0.050

3.8

43

<1.0

44

<1.0

42

<0.080

3.6

2.8

2.0

<0.50

3.8

<1.0

<1.0

13

<10

<0.1

<0.1

<0.1

<0.1

<0.1

<0.1

<0.1

<0.1

<0.1

<0.1

<0.1

<0.1

<0.1

<0.1

<0.1

WATER

7.3

<0.05

<0.050

3.7

41

<1.0

36

<1.0

40

<0.080

3.4

1.5

<1.0

<0.50

4.3

1.1

<1.0

11

<10

<0.1

<0.1

<0.1

<0.1

<0.1

<0.1

<0.1

<0.1

<0.1

<0.1

<0.1

<0.1

<0.1

<0.1

WATER

7.2

<0.05

<0.050

6.4

81

1.5

99

<1.0

180

<0.080

5.3

1.5

<1.0

<0.50

6.6

1.3

<1.0

31

<10

<0.1

<0.1

<0.1

<0.1

<0.1

<0.1

<0.1

<0.1

<0.1

<0.1

<0.1

<0.1

<0.1

<0.1

CAS No↓

PH

57125

18496258

TOC

14808798

7440382

7440393

7440417

7440428

7440439

7440473

7440508

7439921

7439976

7440020

7782492

7440622

7440666

91203

208968

83329

86737

85018

120127

206440

129000

56553

1670 TPH (Aqueous Phase)

1700 Naphthalene

Acenaphthylene

Acenaphthene

Fluorene

Phenanthrene

Anthracene

Fluoranthene

Pyrene

Benzo[a]anthracene

All tests undertaken between 09/09/2010 and 16/09/2010

* Accreditation status

This report should be interpreted in conjunction with the notes on the accompanying cover page.

Column page 1

Report page 1 of 2

LIMS sample ID range AF27603 to AF27605

FAO Tex Roberts

Trostre B

		120803			
		AF27603	AF27604	AF27605	
		SW	SW	SW	
		1	2	3	
		WATER	WATER	WATER	
1700	Chrysene				
	Benzo[b]fluoranthene	218019 µg l ⁻¹	<0.1	<0.1	<0.1
	Benzo[k]fluoranthene	205992 µg l ⁻¹	<0.1	<0.1	<0.1
	Benzo[a]pyrene	207089 µg l ⁻¹	<0.1	<0.1	<0.1
	Dibenzo[a,h]anthracene	50328 µg l ⁻¹	<0.1	<0.1	<0.1
	Indeno[1,2,3-cd]pyrene	53703 µg l ⁻¹	<0.1	<0.1	<0.1
	Benzo[g,h,i]perylene	193395 µg l ⁻¹	<0.1	<0.1	<0.1
	PCBs as Aroclor 1242	191242 µg l ⁻¹	<1	<1	<1
1810	Catechols	53469219 mg l ⁻¹	< 0.005	< 0.005	< 0.005
1920	Phenol		< 0.005	< 0.005	< 0.005
	Cresols		< 0.005	< 0.005	< 0.005
	Xylenols		< 0.005	< 0.005	< 0.005
	Naphthols		< 0.005	< 0.005	< 0.005
	Trimethyl phenols		< 0.005	< 0.005	< 0.005
	Phenols (total)		< 0.03	< 0.03	< 0.03

Trostre Landfill

		120964					
		AF34650	AF34651	AF34652	AF34653		
		SW	SW	SW	BH		
		1	2	3	3		
		WATER	WATER	WATER	WATER		
1700	Chrysene	<0.1	<0.1	<0.1	<0.1		<0.1
	Benzo[b]fluoranthene	<0.1	<0.1	<0.1	<0.1		<0.1
	Benzo[k]fluoranthene	<0.1	<0.1	<0.1	<0.1		<0.1
	Benzo[a]pyrene	<0.1	<0.1	<0.1	<0.1		<0.1
	Dibenzo[a,h]anthracene	<0.1	<0.1	<0.1	<0.1		<0.1
	Indeno[1,2,3-cd]pyrene	<0.1	<0.1	<0.1	<0.1		<0.1
	Benzo[g,h,i]perylene	<0.1	<0.1	<0.1	<0.1		<0.1
	Total (of 16) PAHs	<2	<2	<2	<2		<2
	1810 PCBs as Aroclor 1242	<1	<1	<1	<1		<1
1920	Catechols	<0.005	<0.005	<0.005	<0.005		<0.005
	Phenol	<0.005	<0.005	<0.005	<0.005		<0.005
	Cresols	<0.005	<0.005	<0.005	<0.005		<0.005
	Xylenols	<0.005	<0.005	<0.005	<0.005		<0.005
	Naphthols	<0.005	<0.005	<0.005	<0.005		<0.005
	Trimethyl phenols	<0.005	<0.005	<0.005	<0.005		<0.005
	Phenols (total)	< 0.03	<0.03	<0.03	<0.03		<0.03

LABORATORY TEST REPORT

Results of analysis of 4 samples
received 10 November 2010

Trostre B - EC1405

Report Date

06 December 2010

		114636			
		AF46925	AF46926	AF46927	AF46928
		SW1	SW2	SW3	BH3
		1	2	3	3
		08/11/2010	08/11/2010	08/11/2010	08/11/2010
		WATER	WATER	WATER	WATER
CAS No↓	Units↓	* U			
PH	-	7.0	6.9	6.6	6.6
57125	mg l ⁻¹	< 0.05	< 0.05	< 0.05	< 0.05
18496258	mg l ⁻¹	< 0.050	< 0.050	< 0.050	< 0.050
TOC	mg l ⁻¹	8.1	6.2	6.4	9.2
14808798	mg l ⁻¹	28	28	45	340
7440382	µg l ⁻¹	1.9	1.4	< 1.0	3.8
7440428	µg l ⁻¹	40	39	74	150
7440393	µg l ⁻¹	25	25	43	76
7440417	µg l ⁻¹	< 1.0	< 1.0	< 1.0	< 1.0
7440439	µg l ⁻¹	< 0.080	< 0.080	< 0.080	< 0.080
7440473	µg l ⁻¹	4.4	6.1	4.9	8.4
7440508	µg l ⁻¹	2.1	2.6	1.4	< 1.0
7439976	µg l ⁻¹	< 0.50	< 0.50	< 0.50	< 0.50
7440020	µg l ⁻¹	4.2	6.6	4.7	8.1
7439921	µg l ⁻¹	< 1.0	< 1.0	< 1.0	< 1.0
7782492	µg l ⁻¹	4.3	2.3	1.8	2.6
7440622	µg l ⁻¹	< 1.0	< 1.0	< 1.0	< 1.0
7440666	µg l ⁻¹	17	28	62	21
	µg l ⁻¹	< 10	< 10	< 10	32

Login Batch No		114636		
Chemtest LIMS ID		AF46925	AF46926	AF46927
Sample ID		SW1	SW2	SW3
Sample No		1	2	3
Sampling Date		08/11/2010	08/11/2010	08/11/2010
Depth				
Matrix				
SOP↓	Determinand↓			
1010	pH	7.0	6.9	6.6
1300	Cyanide (total)	<0.05	<0.05	<0.05
1325	Sulfide	<0.050	<0.050	<0.050
1610	Total Organic Carbon	8.1	6.2	9.2
1220	Sulfate	28	28	340
1450	Arsenic	1.9	1.4	3.8
	Boron	40	39	150
	Barium	25	25	76
	Beryllium	<1.0	<1.0	<1.0
	Cadmium	<0.080	<0.080	<0.080
	Chromium (total)	4.4	6.1	8.4
	Copper	2.1	2.6	<1.0
	Mercury	<0.50	<0.50	<0.50
	Nickel	4.2	6.6	8.1
	Lead	<1.0	<1.0	<1.0
	Selenium	4.3	2.3	2.6
	Vanadium	<1.0	<1.0	<1.0
	Zinc	17	28	21
1670	TPH (Aqueous Phase)	<10	<10	32

LABORATORY TEST REPORT

Results of analysis of 3 samples
received 7 December 2010

Trostre B - EC1420

Report Date
22 December 2010

		133021			
		AF55613	AF55614	AF55615	
		SW1	SW2	SW3	
		03/12/2010	03/12/2010	03/12/2010	
		WATER	WATER	WATER	
1450 Zinc	7440666	U	54	120	
1470 Iron (total)	7439896	N	260	810	
1670 TPH (Aqueous Phase)		U	14	37	
1701 PAH (total EPA 16)		U	<2	<2	
1900 2-sec-Butyl-4,6-dinitrophenol	88857	N	<0.0002	<0.0002	
4-Chloro-3-methylphenol	59507	N	<0.0002	<0.0002	
2-Chlorophenol	95578	N	<0.0002	<0.0002	
2,4-Dichlorophenol	120832	N	<0.0002	<0.0002	
2,6-Dichlorophenol	87650	N	<0.0002	<0.0002	
2,4-Dimethylphenol	105679	N	<0.0002	<0.0002	
2,4-Dinitrophenol	51285	N	<0.0002	<0.0002	
2-Methyl-4,6-dinitrophenol	534521	N	<0.0002	<0.0002	
2-Methylphenol	95487	N	<0.0002	<0.0002	
3-Methylphenol	108394	N	<0.0002	<0.0002	
4-Methylphenol	106445	N	<0.0002	<0.0002	
2-Nitrophenol	88755	N	<0.0002	<0.0002	
4-Nitrophenol	100027	N	<0.0002	<0.0002	
Pentachlorophenol	87865	N	<0.0002	<0.0002	
Phenol	108952	N	<0.0002	<0.0002	
2,3,4,5-Tetrachlorophenol	4901513	N	<0.0002	<0.0002	
2,3,4,6-Tetrachlorophenol	58902	N	<0.0002	<0.0002	
2,3,5,6-Tetrachlorophenol	935955	N	<0.0002	<0.0002	
2,3,4-Trichlorophenol	15950660	N	<0.0002	<0.0002	
2,3,5-Trichlorophenol	933788	N	<0.0002	<0.0002	
2,3,6-Trichlorophenol	933755	N	<0.0002	<0.0002	
2,4,5-Trichlorophenol	95954	N	<0.0002	<0.0002	
2,4,6-Trichlorophenol	88062	N	<0.0002	<0.0002	
3,4,5-Trichlorophenol	609198	N	<0.0002	<0.0002	

All tests undertaken between 08/12/2010 and 15/12/2010

* Accreditation status

This report should be interpreted in conjunction with the notes on the accompanying cover page.

Column page 1

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LIMS sample ID range AF55613 to AF55615