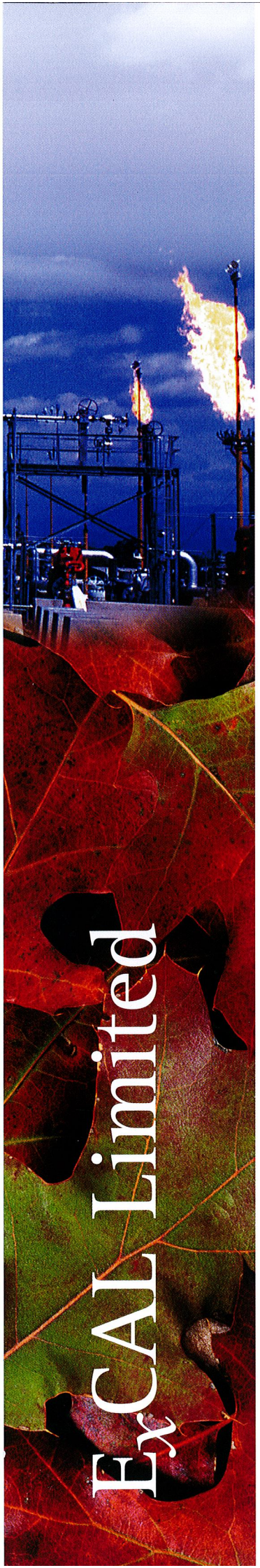

MORGAN AM&T

GROUNDWATER MONITORING REPORT

APRIL 2015

Prepared for:

Morgan AM&T
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DOCUMENT CONTROL SHEET

PROJECT:	**MORGAN AM&T**
TITLE:	**GROUNDWATER MONITORING REPORT**

PROJECT REF:	**48-01-08-15**
REPORT No.:	48-01-08.R1

PREPARED BY:

C Gray: .....

APPROVED BY:

S Whitehouse: pp .....

Version	Date	Amendments
Original	April 2015	

MORGAN AM&T

GROUNDWATER MONITORING REPORT

Contents Page

1.0 INTRODUCTION

ExCAL Limited have been commissioned to undertake groundwater monitoring and sampling on behalf of Morgan AM&T in accordance with their Site Protection and Monitoring Programme.

The primary operations of the Morgan AM&T site include the manufacture and sale of a range of carbon sub-components for the electrical and mechanical engineering industries.

Six boreholes were chosen for monitoring and sampling labelled BH5CH2M, BH6CH2M, BH7CH2M, BHA, BHD and WS11 as seen in Drawing 48-01-08.D01 in Appendix A – Drawings.

The groundwater monitoring and sampling was carried out in March 2015 and this report provides the sampling methodology, record forms and the results of monitoring.

All laboratory analysis has been undertaken at a UKAS accredited laboratory.

2.0 GROUNDWATER MONITORING AND SAMPLING PROGRAMME

The procedures that were adopted for the monitoring of groundwater and collection of water samples are described below.

2.1 Site Equipment

The following site equipment was utilised to undertake sampling and monitoring: -

- Log book;
- Site location plan;
- Level meter;
- Dedicated bailer;
- Peristaltic pump;
- Decontamination equipment;
- Sampling equipment (bottles, labels and chain of custody forms).

2.2 Well Purging

Monitoring wells are always purged prior to each sample collection; this involves the removal of 'stagnant' water that has been in contact with atmospheric gases, the well casing and screen materials. This is because the contact outlined can affect the water chemistry; oxygen can diffuse into the water and dissolved gases can oxidise or volatilise.

Additionally organics may be absorbed by the well casing and trace elements may also be leached from the well casing. Purging ensures a representative sample is obtained from the groundwater.

2.2.1 Purging Procedure

The following procedure for purging was followed: -

1. Dip water Level and Well Depth and Measure Internal Well Diameter;

2. Calculate Well Volume (50mm well: 0.5m = 1L and 35mm well: 1m = 1L);

3. Remove 3 x well volume using either dedicated bailer or peristaltic pump;

4. If the well purges dry, the water should be allowed to recover 90% of the pre-purge water level (or for two hours, whichever occurs first) prior to sampling;

5. In the case of sampling from domestic, industrial or public supply wells where a pump is permanently fixed within the well, the well should be pumped long enough to flush any pipework. If well construction details are available, the well should be purged of three well volumes. If this information is not available, the well should be pumped for approx. 15 minutes prior to sampling or until pH, temperature and specific conductivity stabilise. Care should be taken to adjust the pumping rate if necessary to avoid pumping the well dry. (see Note 1).

   (NOTE 1: Pumping a well dry would lead to aeration of the well, resulting in volatile loss or change in the chemical characteristics of the aquifer nearest to the well. This will prevent a representative sample being collected).

2.3 Sample Collection

Groundwater samples were collected immediately on completion of purging to ensure a representative sample was obtained.

Samples were collected through a suction pump at all locations, except for BH5CH2M where a dedicated bailer was used due to the tube for the suction pump becoming blocked.

2.3.1 Sampling Procedure

The following procedure was followed during sample collection (following purging): -

1. For the bailer - lower bailer into well using nylon cord. Nylon cord should be knotted or marked in meter lengths and the bailer should be lowered to the midpoint of the screened well section. Care should be taken to minimise agitation and exposure to the atmosphere;

2. Dispose of water from the first two bailers;

3. When sampling for volatiles, take from the third bailer (ensure volatiles are placed in 60ml water vials with Teflon lid);

4. Sample for other determinants thereafter (ensure use of appropriate sample containers);

5. For the peristaltic pump - assemble the pump, tubing, and power source, if necessary;

6. Lower tubing down the well, ensuring it is fully submerged in the groundwater;

7. Sample for other determinants thereafter (ensure use of appropriate sample containers);

8. Record date and time of sample collection, the collection method, parameters to be analysed, the number and type of sample containers and any other information that may be relevant to interpretation;

9. Ensure all sample bottles are correctly labelled with the site reference number and borehole location;

10. All samples submitted to the laboratory must be accompanied by the laboratories chain of custody form.

.

3.0 RESULTS OF LABORATORY ANALYSIS

Results of the laboratory analysis undertaken on the samples collected in March 2015 are presented in Table 1 below.

Table 1 – Laboratory results

Determinand	Unit	BH5CH2M	BHD	BH6CH2M	BH7CH2M	BHA	WS11
pH	pH units	8.05	8.06	7.50	6.66	7.95	7.91
Alkalinity	$mg.l^{-1}$ HCO_3	248.9	144.0	513.6	104.92	148.8	87.84
Nitrate	$mg.l^{-1}$ NO_3	1.42	3.14	1.50	1.75	2.14	10.76
Ammonia	$mg.l^{-1}$ NH_4	0.07	0.03	0.05	2.73	0.01	<0.01
Chloride	$mg.l^{-1}$	14.90	9.90	9.80	11.30	8.40	13.30
Total Organic Carbon	$mg.l^{-1}C$	22.77	22.42	61.01	7.50	25.96	14.56
TPH	$mg.l^{-1}$	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
PAH	$mg.l^{-1}$	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12
VOC's	$\mu g.l^{-1}$	<50.00	<50.00	<50.00	<50.00	<50.00	<50.00
Sodium	$mg.l^{-1}$	18.00	6.00	6.90	32.00	11.00	14.00
Potassium	$mg.l^{-1}$	13.00	5.70	15.00	13.00	6.70	6.50
Magnesium	$mg.l^{-1}$	10.00	4.60	15.00	20.00	5.50	3.70
Calcium	$mg.l^{-1}$	140.0	49.00	210.0	220.0	79.00	42.00
Iron	$\mu g.l^{-1}$	460.0	180.0	880.0	3400	530.0	190.0

The results for Total Organic Carbon in Table 1 are relatively high, especially in the sample collected from BH6CH2M. The remaining results of the samples are at acceptable levels.

When comparing the results to the most recent monitoring undertaken in 2010, there are no large differences between the findings, apart from between the 2010 TOC (Total Organic Carbon) results and 2015 TOC results.

Table 2 below displays the results for TOC in 2010.

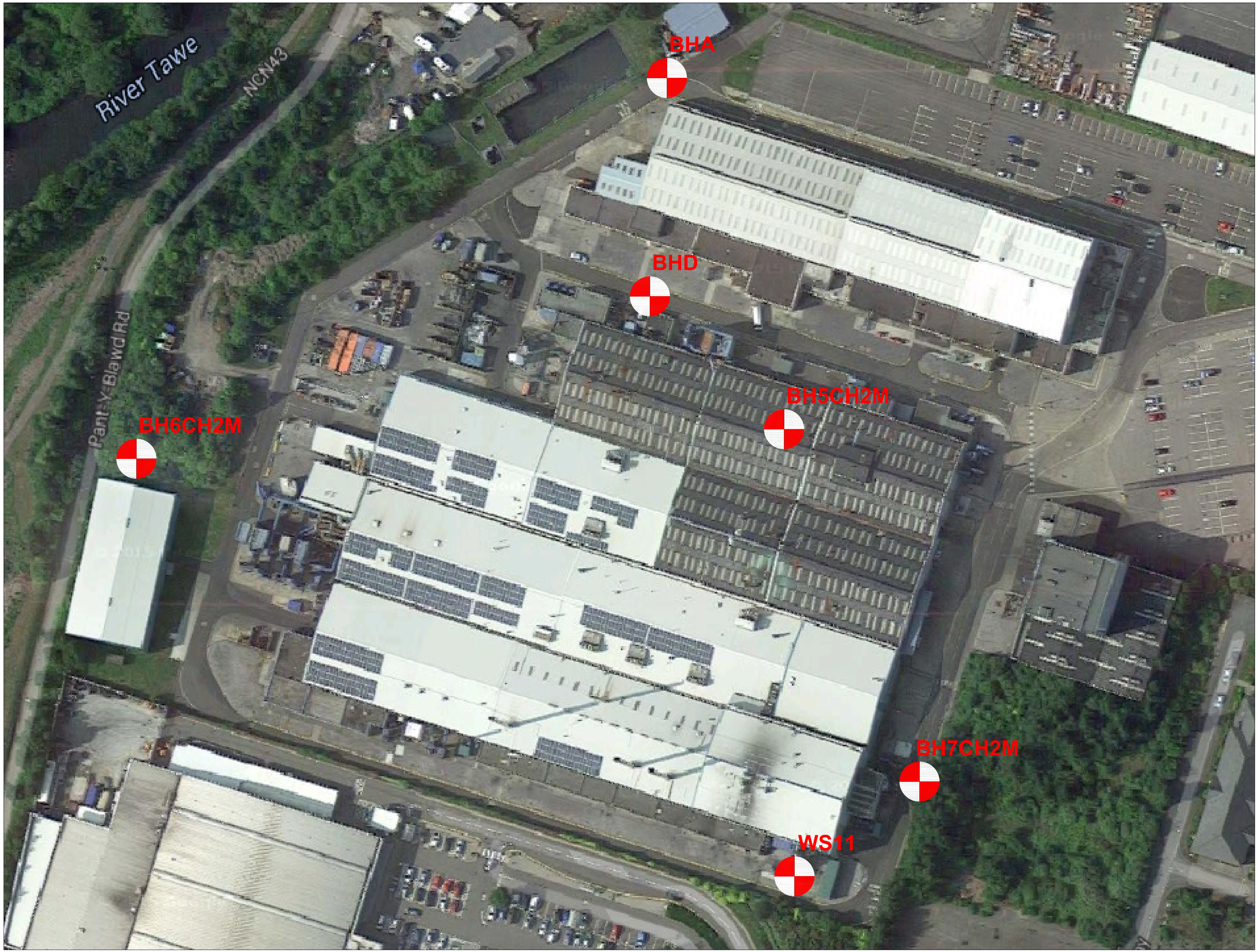
Table 2 – 2010 Laboratory Results

Determinand	Unit	BH5CH2M	BHD	BH6CH2M	BH7CH2M	BHA	WS11
TOC	mg/L	17.0	29.0	22.9	9.9	-	7.13

The increase in TOC could be due to a number of factors. One source for the increase could be hydrocarbons e.g. an oil leak or spill. Another could be from natural sources such as degrading vegetation. Without further investigation it is not possible to be certain of the source and therefor the reason for the increase in TOC levels.

APPENDIX A

Drawing



Notes:	A3

Borehole locations

Job:
Morgan AM&T - Groundwater monitoring

Title:
Borehole locations

Date:	March 2015
Scale:	NTS
Drawn by:	CG
Checked by:	

ExCAL Limited
ExCAL House,
Capel Hendre Ind. Est.,
Ammanford,
Carmarthenshire,
SA18 3SJ
Tel: 01269 831606
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Website: www.excaluk.com
E-mail: info@excaluk.com

Drawing No: 48-01-08.D01

Revision No:	Date:

APPENDIX B

Purging Record Forms

Borehole Purging Record Form		Sheet …1… of ……2
Site Name Morriston	**EA Permit Number** VP3339PD	**Survey Reference** Groundwater Survey – March 2015
Site Operator Morgan AM&T	**Weather Conditions** Showers, Wet	**Survey Personnel** **Adam Whitehouse, Conor Gray**

	Monitoring Point or Sample Reference No.				
	BH5CH2M	BHD	BH6CH2M	BH7CH2M	BHA

Strategy and Equipment Used						
Purge Strategy	(Use code)					
Purge equipment	(State type)	Bailer	Peristaltic pump	Peristaltic pump	Peristaltic pump	Peristaltic pump
Dedicated pump?	(Y/N)	N	N	N	N	N
Flow measurement	(Method)	VOLUME	VOLUME	VOLUME	VOLUME	VOLUME

Monitoring Point Measurements and Well Volume Estimate						
Date of measurement	dd/mm/yy	09/03/15	09/03/15	09/03/15	09/03/15	09/03/15
Liner ID:	(mm)	50	50	50	50	50
Datum point	-	GL	GL	GL	GL	GL
Depth of water:	(mbd)	1.76	2.10	2.01	1.33	1.89
Depth to base:	(mbd)	4.87	4.93	5.95	4.60	4.58
Depth to water:	(metres)	3.11	2.83	3.94	2.55	2.69
Well volume	(litres)	3.46	4.12	3.94	2.61	3.71
3 x well volume	(litres)	10.36	12.36	11.83	7.83	11.13

Purging Record						
Start time of purging	hh:min	13:20	12:45	11:40	10:45	12:15
End time of purging	(hh:min)		13:10	12:04	11:00	12:37
Purge duration	(min)		25 min	24 min	15 min	22 min
Purging rate	(l/min)		0.5 L per Min	0.5 L per Min	0.5 L per Min	0.5 L per Min
Volume purged	Litres	10.36	12.36	11.83	7.83	11.13
No of well volume	No.	3	3	3	3	3
Depth to water after purge	(mbd)	-	-	-	-	-
Pumped dry?	(Y/N)	N	N	N	N	N

Water Quality Measurements (if applicable)						
Use flow through cell	(Y/N)					
Temp	(deg C)					
pH	-					
EC	(S/cm)					
DO	(mg/l or %)					
Eh	mV					

Quality Assurance				**Data Processing Trail**		
	Name	Date	Initials		Date	Initials
Survey:				**Schedule Completed:**		
QC Manager:				**Data Validated:**		
Manager:				**Computer Updated:**		

Borehole Purging Record Form		Sheet …2… of ……2
Site Name Morriston	**EA Permit Number** VP3339PD	**Survey Reference** Groundwater Survey March 2015
Site Operator Morgan AM&T	**Weather Conditions** Showers, Wet	**Survey Personnel** **Adam Whitehouse, Conor Gray**
	Monitoring Point or Sample Reference No.	
	WS 11	

Strategy and Equipment Used						
Purge Strategy	(Use code)					
Purge equipment	(State type)	Peristaltic pump				
Dedicated pump?	(Y/N)	N				
Flow measurement	(Method)	VOLUME				

Monitoring Point Measurements and Well Volume Estimate						
Date of measurement	dd/mm/yy	09/03/15				
Liner ID:	(mm)	50				
Datum point	-	GL				
Depth of water:	(mbd)	1.55				
Depth to base:	(mbd)	4.91				
Depth to water:	(metres)	3.36				
Well volume	(litres)	3.04				
3 x well volume	(litres)	9.13				

Purging Record						
Start time of purging	hh:min	11:12				
End time of purging	(hh:min)	11:31				
Purge duration	(min)	19 min				
Purging rate	(l/min)	0.5 L per Min				
Volume purged	Litres	9.13				
No of well volume	No.	3				
Depth to water after purge	(mbd)	-				
Pumped dry?	(Y/N)	N				

Water Quality Measurements (if applicable)						
Use flow through cell	(Y/N)					
Temp	(deg C)					
pH	-					
EC	(S/cm)					
DO	(mg/l or %)					
Eh	mV					

Quality Assurance				**Data Processing Trail**		
	Name	Date	Initials		Date	Initials
Survey:				**Schedule Completed:**		
QC Manager:				**Data Validated:**		
Manager:				**Computer Updated:**		

APPENDIX C

Certificate of Analysis

Conor Gray
ExCAL Limited
ExCAL House
Capel Hendre Industrial Estate
Ammanford
Carmarthenshire
SA18 3SJ

Decus Research Limited
ExCAL House
Capel Hendre Industrial Estate
Ammanford
Carmarthenshire
SA18 3SJ

Tel: 01269 844558
Fax: 01269 841867
Email: info@decusuk.com

Certificate of Analysis Number: 1253 Rev.1

Project/Site name:	Morganite		Samples Taken:	09-03-2015
Job Number:	-		Samples Received:	09-03-2015
Order Number:	EC2566		Analysis Complete:	23-03-2015
Sample Matrix:	Water		Report Issued:	26-03-2015
			Sampled By:	Client

Disposal Times:

All water samples will be retained for a period of two weeks and all soil samples retained for a period of one month following the date of the issued certificate.

Approved by: Adam Whitehouse
Signature:
Title: Quality Manager

UKAS TESTING
4303

Decus Research Ltd

ExCAL Limited
ExCAL House
Capel Hendre Ind Est
Carmarthenshire
SA18 3SJ

FAO: C.Gray

CERTIFICATE OF ANALYSIS 1253

Rev.1

Results of analysis of 6 sample received on the 09/03/2015

Report Date
26th March 2015

Code	Determinand	Units	*	Sample Identification			
Laboratory Sample Number:				**090315002**	**090315003**	**090315004**	**090315005**
Client Sample Reference:				BH5CH2M	BHD	BH6CH2M	BH7CH2M
Sample Date:				09/03/15	09/03/15	09/03/15	09/03/15
Sample Depth:				N/A	N/A	N/A	N/A
Sample Matrix:				Water	Water	Water	Water
INORG-L01	pH	pH units	A	8.05	8.06	7.50	6.66
INORG-L09	Alkalinity	$mg.l^{-1}$ HCO_3	A	248.9	144.0	513.6	104.92
INORG-L11	Nitrate	$mg.l^{-1}$ NO_3	N	1.42	3.14	1.50	1.75
INORG-L12	Ammonia	$mg.l^{-1}$ NH_4	A	0.07	0.03	0.05	2.73
INORG-L13	Chloride	$mg.l^{-1}$	A	14.90	9.90	9.80	11.30
INORG-L18	Total Organic Carbon	$mg.l^{-1}$ C	A	22.77	22.42	61.01	7.50
ORG-L01	TPH	$mg.l^{-1}$	N	<0.10	<0.10	<0.10	<0.10
ORG-L02	PAH	$mg.l^{-1}$	N	<0.12	<0.12	<0.12	<0.12
1760	VOC's	$\mu g.l^{-1}$	S	<50.00	<50.00	<50.00	<50.00
1415	Sodium	$mg.l^{-1}$	S	18.00	6.00	6.90	32.00
1415	Potassium	$mg.l^{-1}$	S	13.00	5.70	15.00	13.00
1415	Magnesium	$mg.l^{-1}$	S	10.00	4.60	15.00	20.00
1415	Calcium	$mg.l^{-1}$	S	140.0	49.00	210.0	220.0
1450	Iron	$\mu g.l^{-1}$	S	460.0	180.0	880.0	3400

* Accreditation Status
Tests marked 'A' hold UKAS accreditation
Tests marked 'N' do not hold UKAS accreditation
Tests marked 'S' were sub-contracted to an approved laboratory
Any comments or interpretations are beyond the scope of UKAS accreditation

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FAO: C.Gray

CERTIFICATE OF ANALYSIS 1253

Rev.1

Results of analysis of 6 sample received on the 09/03/2015

Report Date
26th March 2015

Code	Determinand	Units	*	Sample Identification			
Laboratory Sample Number:				**090315006**	**090315007**		
Client Sample Reference:				BHA	WS11		
Sample Date:				09/03/15	09/03/15		
Sample Depth:				N/A	N/A		
Sample Matrix:				Water	Water		
INORG-L01	pH	pH units	A	7.95	7.91		
INORG-L09	Alkalinity	$mg.l^{-1}$ HCO_3	A	148.8	87.84		
INORG-L11	Nitrate	$mg.l^{-1}$ NO_3	N	2.14	10.76		
INORG-L12	Ammonia	$mg.l^{-1}$ NH_4	A	0.01	<0.01		
INORG-L13	Chloride	$mg.l^{-1}$	A	8.40	13.30		
INORG-L18	Total Organic Carbon	$mg.l^{-1}$ C	A	25.96	14.56		
ORG-L01	TPH	$mg.l^{-1}$	N	<0.10	<0.10		
ORG-L02	PAH	$mg.l^{-1}$	N	<0.12	<0.12		
1760	VOC's	$\mu g.l^{-1}$	S	<50.00	<50.00		
1415	Sodium	$mg.l^{-1}$	S	11.00	14.00		
1415	Potassium	$mg.l^{-1}$	S	6.70	6.50		
1415	Magnesium	$mg.l^{-1}$	S	5.50	3.70		
1415	Calcium	$mg.l^{-1}$	S	79.00	42.00		
1450	Iron	$\mu g.l^{-1}$	S	530.0	190.0		

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FAO: C.Gray

CERTIFICATE OF ANALYSIS 1253

Rev.1

Results of analysis of 6 sample received on the 09/03/2015

Report Date
26th March 2015

Analytical Method	Method Code	Accreditation Status
Determination of pH in waters by electrode probe meter (In-house method)	INORG-L01	ISO 17025
Determination of Ammonia in waters by colorimetric photometer (In-house method)	INORG-L12	ISO 17025
Determination of Chloride by colorimetric photometer (In-house method)	INORG-L13	ISO 17025
Determination of Alkalinity of waters by titration (In-house method)	INORG-L09	ISO 17025
Determination of Nitrate by colorimetric photometer (In-house method)	INORG-L11	None
Determination of metals in waters by ICP-OES (Na, K, Ca, Mg) (Sub-Contracted)	1415	ISO 17025
Determination of metals in waters by ICP-OES (Fe) (Sub-Contracted)	1450	ISO 17025
Determination of TOC in waters by colorimetric photometer (In-house method)	INORG-L18	ISO 17025
Determination of total petroleum hydrocarbons in waters by GC-FID (In-house method)	ORG-L01	None
Determination of Polyaromatic hydrocarbons in waters by GC-FID (In-house method)	ORG-L02	None
Determination of VOC's in waters by GC-MS (Sub-contracted)	1760	None

**********END OF REPORT**********

* Accreditation Status
Tests marked 'A' hold UKAS accreditation
Tests marked 'N' do not hold UKAS accreditation
Tests marked 'S' were sub-contracted to an approved laboratory
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