CAULMERT LIMITED

Engineering, Environmental & Planning
Consultancy Services

Brookhill Landfill Site

Flintshire County Council Waste Management Services

Quarterly Monitoring Review

October – December 2016

Prepared by:

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APPROVAL RECORD

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Approved	Diana Brookshaw	**Date**	31/01/2017

DISCLAIMER

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1.0 INTRODUCTION

1.1 Background

1.1.1 This report has been compiled in compliance with the Environmental Permit (EP) BV7273 – Variation Notice Number YP3835MJ for Brookhill Landfill Site, held by Flintshire County Council (FCC) Waste Management Services, which requires that the monitoring data collected at the site is reviewed quarterly. The data reviewed by this report was collected between the 1st of October to the 31st of December 2016.

1.1.2 This report records the monitoring data for landfill gas, leachate, groundwater, surface water and dust, and discusses this data in relation to emission limits set in the EP. This data will also be compiled into an Annual Monitoring Review in accordance with the EP, to be submitted by the 31st of January 2017.

1.2 Site Location and Surrounding Land-use

1.2.1 Brookhill Landfill Site is located approximately 1.5 km north of Buckley, Flintshire, North Wales at NGR SJ 278 656. The site is accessed via the Pinfold Industrial Estate, Pinfold Lane, which is located off the A494 Mold to Ewloe Road.

1.2.2 The site is bound to the east by a wooded, disused railway leading to open grassland. Agricultural land lies to the west of the site. The Pinfold Industrial Estate and a number of residential properties (on the outskirts of Buckley, approximately 400 m away) are situated to the south of the site. A restored refuse tip (Ewloe Barn Landfill) lies to the north of the site. It is currently rough grassland leading to open grazing land and some woodland.

1.2.3 The landfill site has been developed in a former quarry, which was worked for Buckley Fireclay and the siltstones and mudstones beneath the Fireclay (known as the Warrant) for use in the manufacturing of bricks and tiles.

1.2.4 In 1997, in preparation for the engineering for the landfill site, further Fireclay was removed together with a quantity of coal in the quarry base under agreement with the Coal Authority.

1.2.5 Brookhill Landfill Site started accepting waste in 1999. The wastes permitted at the site were stipulated within the site permit. The general waste streams which were permitted at the site through its history can be summarised as:

- Domestic food and organic wastes – approximately 60%,
- Non-hazardous industrial wastes, (including plastic, paper, cardboard, wood, stone and sand, etc) – approximately 40%,
- Most special wastes (allowed until June 2004).

1.2.6 The special wastes which were tipped at the site were accepted pre-June 2004 (under the WML for the site). Therefore they would have been deposited predominantly within Cell 1, and the lower parts of Cells 2, 3 and 4. It is unlikely that any of the waste tipped in Cells 5 and 6 contains any 'special waste' waste streams.

1.2.7 The site ceased accepting waste in late 2007. The final capping and restoration phases were completed in 2010.

2.0 LANDFILL GAS

2.1 Monitoring regime

2.1.1 Routine landfill gas monitoring is carried out on a weekly basis at perimeter locations BH1 to BH25 and monthly at 23 in-waste locations. Perimeter borehole locations are shown on Drawing 2231.EMP.01, enclosed. Methane, carbon dioxide, oxygen and atmospheric pressure are recorded on each visit.

2.1.2 Methane and carbon dioxide data from all perimeter boreholes are displayed in a summary table and time-series graphs in Appendix 1. The landfill gas data obtained during the review period was compared with the limits stipulated in the EP. Monitoring data gathered at in-waste gas monitoring locations is also listed in Appendix 1.

2.2 In-waste Boreholes

2.2.1 The gas field at Brookhill Landfill Site is monitored and balanced on a regular basis. In accordance with Condition 4.2.2 of the EP, landfill gas monitoring data for the in-waste boreholes for this review period is included in Appendix 1.

2.2.2 The average methane concentration in the GV wells (44.7 %) was similar to that recorded in the previous quarter (44.1 %). The average carbon dioxide concentration (34.8 %) was also similar to that recorded in the previous quarter (34.2 %).

2.2.3 The maximum H_2S concentration the GV wells was 17 ppm in well GV45.

2.3 Perimeter Boreholes

Methane

2.3.1 None of the monitored perimeter gas boreholes were in breach of their respective methane EP limits during this review.

2.3.2 Similar to the previous quarter, no methane was detected at any time during the quarter in BH1, BH4, BH5, BH6, BH7, BH10, BH11, BH12, BH13, BH14, BH15, BH16, BH19, BH23, BH24 and BH25.

2.3.3 The highest methane concentrations were detected at BH8 (29.2 %) and BH9 (28.6 %). No increasing trends were observed, with consistent methane concentrations at both locations throughout this review period. These concentrations are compliant with the EP limits for these locations and are very similar to that of the previous quarter.

Carbon Dioxide

2.3.4 Carbon dioxide was recorded in all perimeter gas boreholes during the review period but remained below the relative EP limits throughout the review period in all locations.

2.3.5 The maximum recorded carbon dioxide concentration was 3.6 % in BH20.

3.0 GROUNDWATER

3.1 Introduction

3.1.1 Borehole locations are shown on Drawing 2231.EMP.01, enclosed. Groundwater levels were recorded on a monthly basis in monitoring boreholes GW1 – GW8.

3.1.2 Collected samples were analysed for the range of determinants listed below:

pH, electrical conductivity, ammoniacal nitrogen, chloride and dissolved oxygen.

3.1.3 All groundwater samples collected on the 15th of December were also analyzed for the following quarterly and annual parameters:

Total organic carbon, alkalinity, ammoniacal nitrogen, chloride, chemical oxygen demand, electrical conductivity, dissolved oxygen, pH, sulphate, total oxidized nitrogen, cadmium, calcium, chromium, copper, iron, lead, magnesium, manganese, nickel, potassium, sodium, zinc, benzene, ehtylbenzene, m,p-xylene, BTEX, xylenes, toluene.

3.1.4 Table S4.4 in the EP requires that GW2A, GW3A and GW4 are controlled by individual limits for ammoniacal nitrogen, chloride, nickel, zinc, total xylenes and toluene. The EP limit for total xylenes has been set at 0.011 mg/l, as agreed in a meeting with NRW on the 16th of April 2013.

3.1.5 Revised EP limits for ammoniacal nitrogen and chloride were proposed in report reference 1629.9.FCC.JDM.ÅKS.A0[1], submitted to NRW on the 11th of July 2013 and is awaiting review.

3.1.6 Time-series graphs and a results summary of the laboratory analysis data are included in Appendix 2.

3.2 Groundwater Levels

3.2.1 Groundwater levels were recorded on the 28th of October, 8th of December and the 15th of December 2016. Time series graphs of the groundwater levels are included in Appendix 2.

3.3 Groundwater Quality

3.3.1 Exceedances of the EP limit for ammoniacal nitrogen (1.7 mg/l) were observed in GW2A, GW3A and GW4 during the review period. Maximum concentrations of ammoniacal nitrogen in GW2A, GW3A and GW4 were 14.4 mg/l, 64.8 mg/l and 44.1 mg/l respectively.

[1] Caulmert Ltd. July 2013. Groundwater Quality Compliance Level Review. 1629.9.FCC.JDM.ÅKS.A0.

3.3.2 Exceedances of the EP limit for chloride (60 mg/l) were also observed in GW2A, GW3A and GW4 during the review period. Maximum chloride concentrations were 136 mg/l, 160 mg/l and 96 mg/l respectively.

3.3.3 Maximum ammoniacal nitrogen concentrations in the remaining locations ranged between <0.2 mg/l in GW6 and 23.3 mg/l in GW8.

3.3.4 Chloride concentrations in locations with no EP limits ranged between a minimum of 30.5 mg/l in GW6 and a maximum of 365 mg/l in GW1.1. As in the previous review period, chloride concentrations in GW1.1 remained relatively high throughout the review period.

3.3.5 Electrical conductivity ranged between a minimum of 0.71 mS/cm in GW6 and GW7A and a maximum of 2.89 mS/cm in GW1.

3.3.6 Dissolved oxygen concentrations were generally low and ranged between a minimum of <0.3 mg/l in six locations and a maximum of 2.9 mg/l in GW7.

3.3.7 The pH in the groundwater locations ranged from 6.6 in GW1.1 to 8.0 in GW2A and GW6.

3.3.8 In the quarterly monitoring round, no xylenes or toluene were detected in any of the locations.

3.3.9 Nickel and zinc concentrations remained an order of magnitude below the respective EP limits at all locations.

4.0 LEACHATE

4.1 Introduction

4.1.1 Leachate levels at leachate chambers LC1B, LC2B, LC4B and LC6B and remote leachate monitoring points R1B, R2B, R3, R4B, R5 and R6B were recorded monthly. Well locations are shown on Drawing Number 2231.EMP.01, enclosed. No results for LC3 and LC5 are reported, as agreed with Natural Resources Wales on the 16th of April 2013.

4.1.2 The leachate treatment plant at the site accepts leachate from Brookhill Landfill Site and the nearby Standard Landfill Site. The treated effluent is discharged to public sewer and is therefore subject to a trade effluent agreement (Discharge Consent, DC).

4.1.3 Samples collected in December from the leachate chambers only were analyzed for the suite below:

Cyanide (free and total), cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, zinc, mineral oil, SVOCs, VOCs, combined pesticides / herbicides, miscellaneous organics and TICS.

4.1.4 The treated leachate discharge (Final Discharge, FD) was sampled and analysed for:

Alkalinity, ammoniacal nitrogen, biochemical oxygen demand (BOD), chemical oxygen demand (COD), chloride, chromium, copper, iron, lead, nickel, nitrate, nitrite, organic carbon, pH, sodium, sulphate, suspended solids, TPH and zinc

4.1.5 Data summaries of leachate and discharge quality can be found in Appendix 3.

4.2 Leachate Levels

4.2.1 Table S4.1 in the EP requires that leachate levels must not exceed 2m above the base of each cell. This trigger level was discussed in the Leachate Management Plan. Following an assessment of the lowest achievable leachate levels for each landfill cell, new EP limits were proposed for Cells 2, 3, 4 and 5. These levels, detailed in Table 2 below, were agreed in a meeting between Alison Soper of the Environment Agency and representatives from Flintshire County Council Waste Management Services (then AD Waste Ltd) and Caulmert on the 17th of September 2009.

Table 2: Leachate Level EP limits

Landfill Cell	Monitoring Points	Revised Limit (m)
Cell 1	LC1B & R1	2.0
Cell 2	LC2B & R2	3.0
Cell 3	R3	5.5
Cell 4	LC4B & R4	3.0
Cell 5	R5	3.0
Cell 6	LC6B & R6	2.0

4.2.2 Leachate levels recorded during this review period are summarised in Table 3 below.

Table 3: Leachate Head Data (exceedances highlighted in yellow)

Landfill Cell	Monitoring Point	October (m above base)	November (m above base)	December (m above base)	Trigger Limit
Cell 1	**BK LC 1B**	1.89	1.87	1.93	2.00
	BK R1 B	2.14	2.11	2.07	
Cell 2	**BK LC 2B**	0.83	0.81	0.85	3.00
	BK R2B	1.76	1.79	1.85	
Cell 3	**BK R3**	1.06	1.09	1.11	5.50
Cell 4	**BK LC 4B**	0.81	0.62	0.69	3.00
	BK R4B	2.62	2.61	2.54	
Cell 5	**BK R5**	4.15	2.96	2.96	3.00
Cell 6	**BK LC 6B**	0.85	0.93	0.91	2.00
	BK R6B	0.61	0.67	0.74	

4.2.3 The leachate level exceeded the EP limit in R5 in October, but decreased for the remainder of the review period. Leachate level at R1B was marginally above the trigger limit throughout the review.

4.2.4 Leachate levels at all other locations remained below their respective trigger limits throughout the review.

4.3 Leachate Quality

4.3.1 No free cyanide was detected in the leachate chambers. Total cyanide was recorded in LC3 – LC6, were concentrations ranged between <0.05 mg/l in LC1B, LC3 and LC4B and 0.12 mg/l in LC5 and LC6.

4.3.2 No mercury was detected in the leachate chambers. Metals cadmium, calcium, chromium, copper, iron, lead, magnesium, manganese, nickel and zinc were generally low in concentration.

4.3.3 Mineral oil concentrations ranged between 0.0339 mg/l in LC1B and 0.753 mg/l in LC2B.

4.3.4 Of the hazardous substances analysed during December, a total of 40 were detected in the leachate. Leachate quality tables are presented in Appendix 3.

4.4 Final Discharge to Sewer

4.4.1 COD concentration exceeded the revised consent limit (2000 mg/l) on two occasions – 3000 mg/l on the 10th of October and 4070 mg/l on the 28th of October. Concentrations were below the limit on all other occasions.

4.4.2 The discharge limit for suspended solids (500 mg/l) was exceeded twice during the review period, at 2040 mg/l on the 28th of October and 605 mg/l on the 11th of November. The concentration was otherwise below the trigger limit throughout the review period.

5.0 SURFACE WATER

5.1 Introduction

5.1.1 Surface water samples are taken from three locations, SW2, P2 and P4. Water flows in a northerly direction alongside the outside perimeter fence of the western boundary of the site and accumulates in a pond at SW2 before slowly seeping through a man-made underground bypass drain which runs along the outside of the site towards the northern boundary. P2 is a pond to the west, which collects surface water run-off from the landfill. P4 is located in a field to the north west of the site, beyond landfill gas monitoring borehole BH10.

5.1.2 As agreed with NRW, water in P2 is only sampled when there is the likelihood of an overflow to the discharge point[2]. No samples were taken for P2 during this review period.

5.1.3 Collected samples were analysed for the range of determinants listed below:

Ammoniacal nitrogen, chloride, chemical oxygen demand (COD), pH and total suspended solids

5.1.4 In the EP, Table S4.3 requires that only location P2 be controlled by chemical quality limits. Monitoring locations are shown on Drawing 2231.EMP.01, enclosed. A summary of the laboratory analysis data is included in Appendix 4.

5.2 Surface Water Quality

5.2.1 Ammoniacal nitrogen at P4 ranged from 0.88 mg/l to 1.14 mg/l. Chloride concentration was relatively low and ranged from 52 mg/l to 57 mg/l. COD at P4 ranged between 78 mg/l and 95 mg/l, while pH ranged between 7.7 and 8.0 and suspended solids between 13 mg/l and 54 mg/l.

5.2.2 Ammoniacal nitrogen at SW2 ranged from 0.32 mg/l to 0.38 mg/l. Chloride concentration ranged from 134 mg/l to 198 mg/l. COD at SW2 ranged between 59 mg/l and 62 mg/l, while pH ranged between 7.3 and 7.4 and suspended solids between 24 mg/l and 42 mg/l.

[2] E-mail correspondence, 14.07.2014, Alison Soper (NRW) to Phil Mulhall (FCC).

6.0 DUST

6.1 Introduction

6.1.1 Dust monitoring was undertaken between the 09/12/2016 to the 09/01/2017 as required by the EP.

6.1.2 Location 1 was located on a bund by leachate storage tanks and opposite the transfer pad. Location 2 was on the site perimeter near the leachate treatment plant. Location 3 was in Oaks Farm.

6.2 Dust Results

6.2.1 Dust monitoring results are shown in Table 4 below:

Table 4: Results from dust monitoring at Brookhill

Monitoring Locations	Total Suspended Solids (mg/l)	Result (mg/m²/day)	Trigger Level (mg/m²/day)
Location 1	64	51	200
Location 2	260	207	200
Location 3	78	62	200

6.2.2 Deposited dust concentration was slightly above the EP trigger level at Location 2 only. This is likely an anomaly as an algal bloom was observed in the water sample. There are currently no operations at the closed landfill site that would likely result in dust emissions.

7.0 CONCLUSIONS

7.1 Landfill Gas

7.1.1 Landfill gas concentration was monitored at locations around the site perimeter on a weekly basis. During this review period, none of the monitored perimeter gas boreholes were in breach of their respective methane or carbon dioxide EP limits.

7.1.2 During this review period methane concentrations remained below the instrumental detection limit of 0.1 % in many of the boreholes on site. The highest concentrations were, as expected, in BH8 and BH9. These boreholes have individually set EP limits, which were not exceeded during this review period.

7.1.3 The maximum carbon dioxide concentration was recorded in BH19.

7.2 Groundwater

7.2.1 The EP limits for ammoniacal nitrogen and chloride were exceeded in GW2A, GW3A and GW4 during the review period.

7.2.2 The concentrations of most determinants were similar to those recorded in the previous quarter.

7.3 Leachate

7.3.1 Exceedances of the EP limits for leachate levels were recorded in locations R1B throughout the review period and in R5 during October. Leachate levels at all other locations remained below their respective trigger limits throughout the review.

7.3.2 Of the hazardous substances analysed during December, a total of 40 were detected in the leachate.

7.3.3 In the final discharge, the COD discharge consent limit was exceeded on two occasions, as was the discharge limit for suspended solids.

7.4 Surface Water

7.4.1 No samples were collected from P2 during the review period. Concentrations at P4 and SW2 were relatively low throughout the review period.

7.5 Dust

7.5.1 Deposited dust concentration was slightly above the EP trigger level at Location 2 only.

NOTES

1. SURVEY INFORMATION PROVIDED BY SOUTH STAFFS SURVEYS, TITLE: UPDATE SURVEY, REF: 4839a.dwg. DATE: 07.08.2015.

LEGEND

BH14	GAS BOREHOLE
GW	GAS EXTRACTION WELL
GW5	GROUND WATER MONITORING BOREHOLE
LC5	LEACHATE WELL
SW2	SURFACE WATER MONITORING POINT
CV	COAL VENT
	LEACHATE MONITORING POINT

REV	MODIFICATIONS	BY	CH	AP	DATE

FLINTSHIRE COUNTY COUNCIL WASTE MANAGEMENT SERVICES

BROOKHILL LANDFILL SITE

ENVIRONMENTAL MONITORING PLAN

DRAWN BY: RWG	DATE: 01.03.2016	
CHECKED BY: JM	SCALE @ A1: 1:750	
APPROVED BY: JM	ISSUE: Fn	REVISION: -

DRAWING NUMBER: 2231.EMP.01

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APPENDIX 1 – LANDFILL GAS

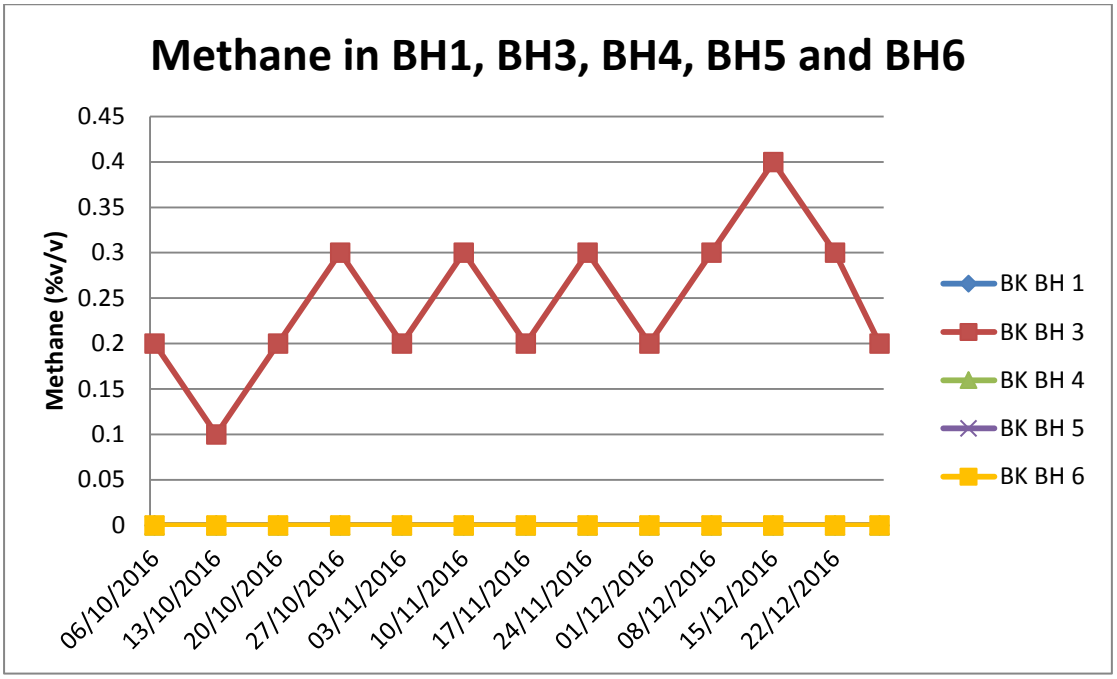
Table 1: Perimeter Landfill Gas Monitoring Data Summary

Location	Data	CH4 (%v/v)	Trigger (%v/v)	CO2 (%v/v)	Trigger (%v/v)
BK BH 1	Min	0.00	1	1.20	8.8
	Max	0.00		3.00	
	Average	0.00		2.25	
	Count	13		13	
BK BH 3	Min	0.10	1	1.00	3.1
	Max	0.40		1.60	
	Average	0.25		1.31	
	Count	13		13	
BK BH 4	Min	0.00	1	1.00	5.1
	Max	0.00		1.60	
	Average	0.00		1.31	
	Count	13		13	
BK BH 5	Min	0.00	1	0.40	1.5
	Max	0.00		0.90	
	Average	0.00		0.59	
	Count	13		13	
BK BH 6	Min	0.00	1	0.60	1.5
	Max	0.00		0.90	
	Average	0.00		0.72	
	Count	13		13	
BK BH 7	Min	0.00	1	1.40	10
	Max	0.00		2.60	
	Average	0.00		2.00	
	Count	13		13	
BK BH 8	Min	27.60	32.2	1.00	3.6
	Max	29.20		1.50	
	Average	28.59		1.35	
	Count	13		13	
BK BH 9	Min	27.80	29.6	1.20	10.4
	Max	28.60		2.40	
	Average	28.20		1.88	
	Count	13		13	
BK BH 10	Min	0.00	1	1.00	3.9
	Max	0.00		1.90	
	Average	0.00		1.42	
	Count	13		13	
BK BH 11	Min	0.00	1	2.00	6.5
	Max	0.00		3.00	
	Average	0.00		2.45	
	Count	13		13	
BK BH 12	Min	0.00	1	1.40	6.6
	Max	0.00		1.90	
	Average	0.00		1.65	
	Count	13		13	
BK BH 13	Min	0.00	1	2.00	9.4
	Max	0.00		2.90	
	Average	0.00		2.30	
	Count	13		13	

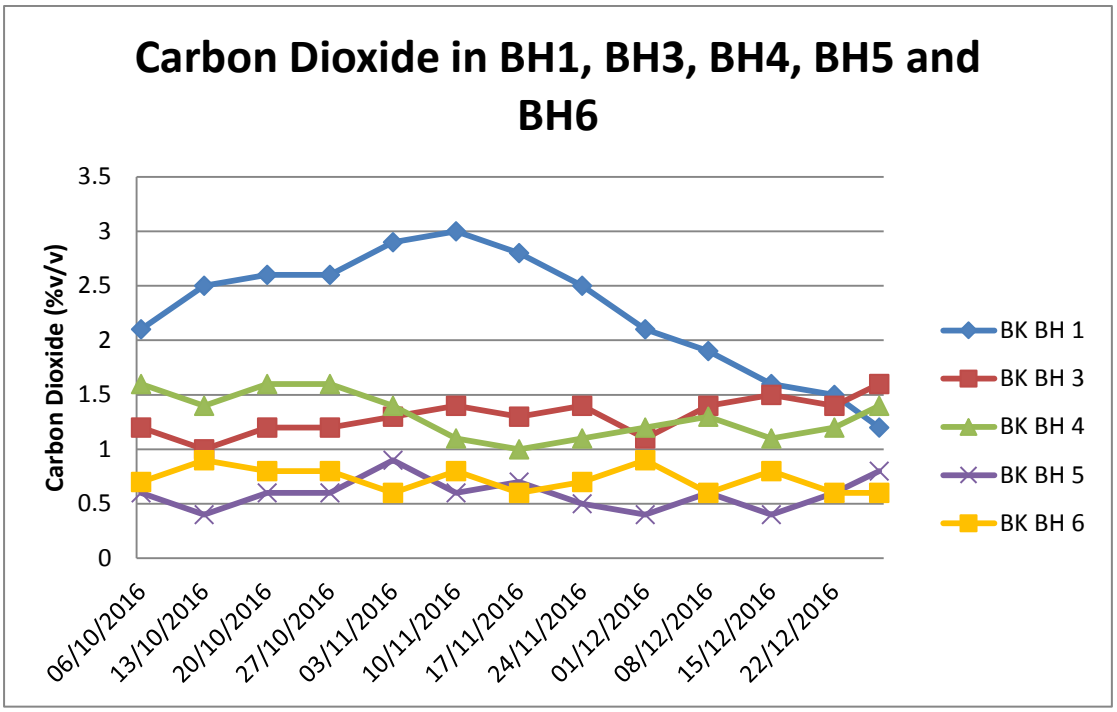
APPENDIX 1 – LANDFILL GAS

Location	Data	CH4 (%v/v)	Trigger (%v/v)	CO2 (%v/v)	Trigger (%v/v)
BK BH 14	Min	0.00	1	1.40	3.5
	Max	0.00		1.80	
	Average	0.00		1.54	
	Count	13		13	
BK BH 15	Min	0.00	1	1.10	17.6
	Max	0.00		2.30	
	Average	0.00		1.86	
	Count	13		13	
BK BH 16	Min	0.00	1	1.50	11.4
	Max	0.00		3.00	
	Average	0.00		2.39	
	Count	13		13	
BK BH 17	Min	0.20	1	2.00	12.9
	Max	0.40		3.00	
	Average	0.28		2.42	
	Count	13		13	
BK BH 18	Min	0.10	6.8	1.40	21.2
	Max	0.50		2.70	
	Average	0.25		2.12	
	Count	13		13	
BK BH 19	Min	0.00	1	1.40	11.2
	Max	0.00		3.00	
	Average	0.00		2.28	
	Count	13		13	
BK BH 20	Min	0.10	1	1.60	17.6
	Max	0.40		3.60	
	Average	0.27		2.58	
	Count	13		13	
BK BH 21	Min	0.10	1	1.10	11.4
	Max	0.40		1.90	
	Average	0.18		1.41	
	Count	13		13	
BK BH 23	Min	0.00	1	1.80	7.3
	Max	0.00		2.90	
	Average	0.00		2.28	
	Count	13		13	
BK BH 24	Min	0.00	1	0.60	1.5
	Max	0.00		0.80	
	Average	0.00		0.69	
	Count	13		13	
BK BH 25	Min	0.00	1	1.50	9.9
	Max	0.00		2.60	
	Average	0.00		2.08	
	Count	13		13	

APPENDIX 1 – LANDFILL GAS

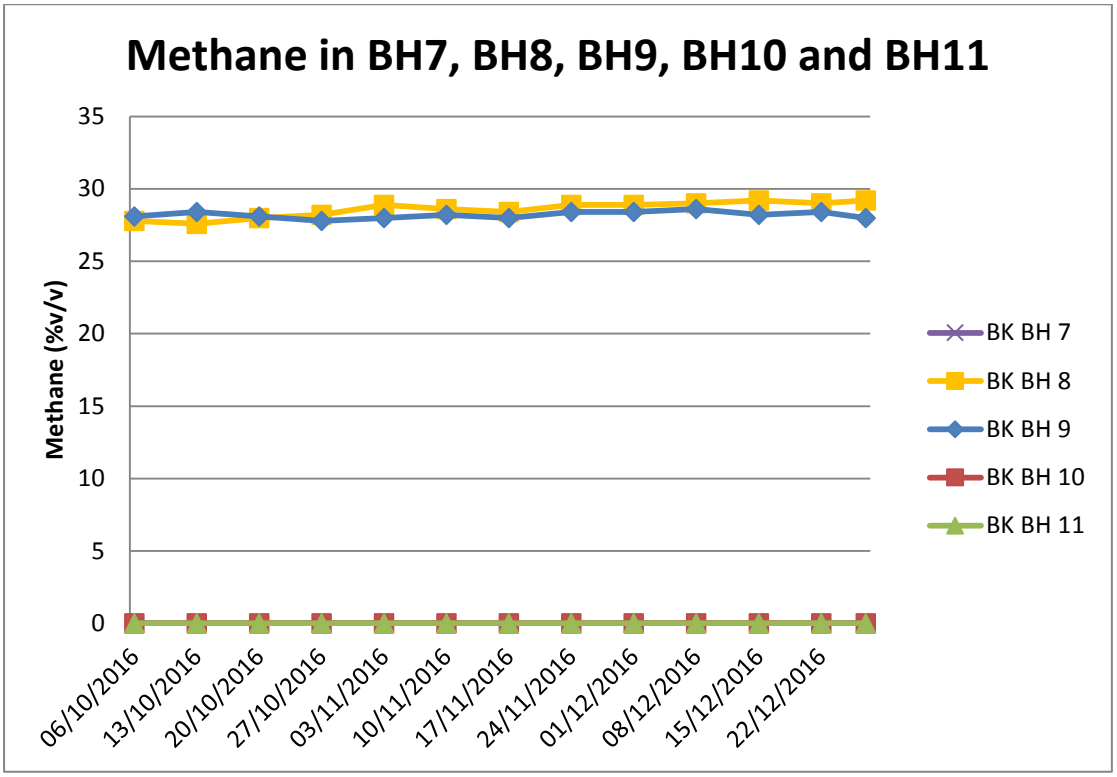


Graph 1: Methane in BH1, BH3, BH4, BH5 and BH6

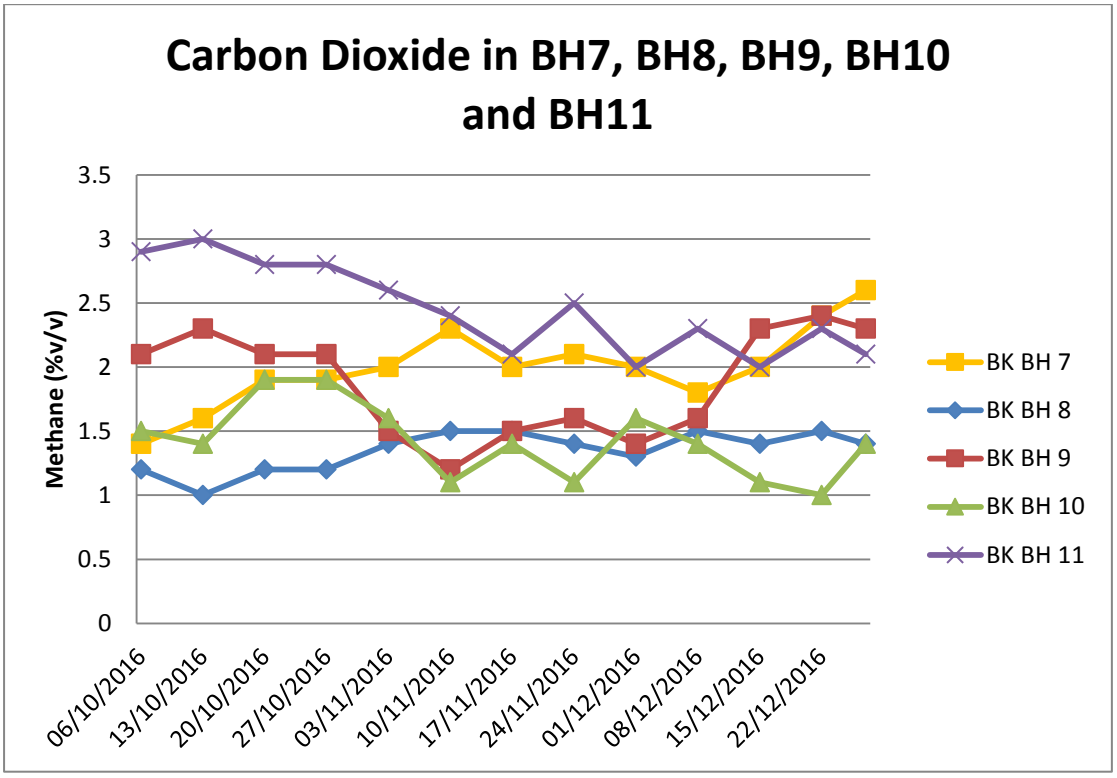


Graph 2: Gas: Carbon dioxide in BH1, BH3, BH4, BH5 and BH6

APPENDIX 1 – LANDFILL GAS

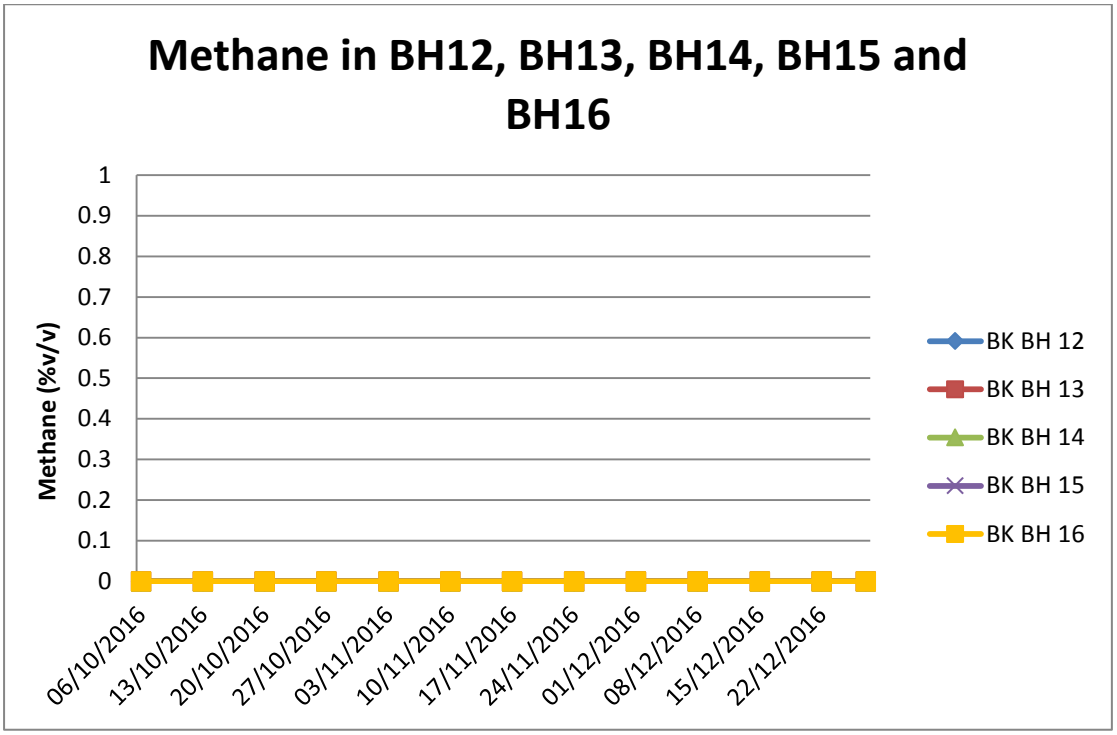


Graph 3: Methane in BH7, BH8, BH9, BH10 and BH11

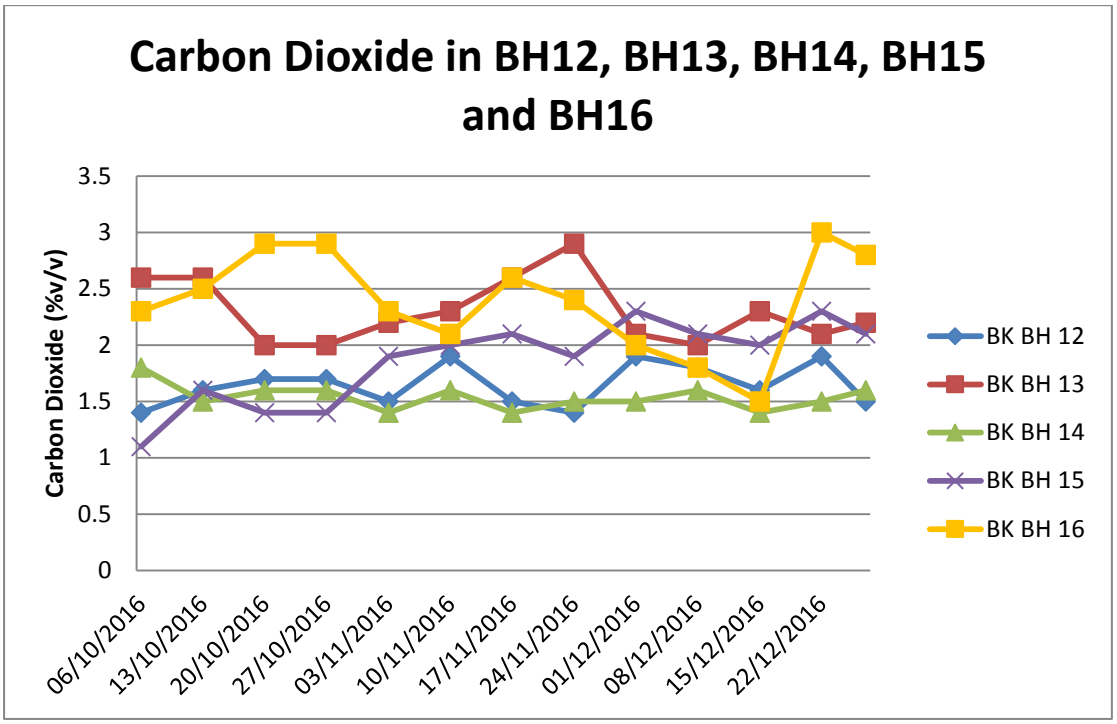


Graph 4: Carbon dioxide in BH7, BH8, BH9, BH10 and BH11

APPENDIX 1 – LANDFILL GAS

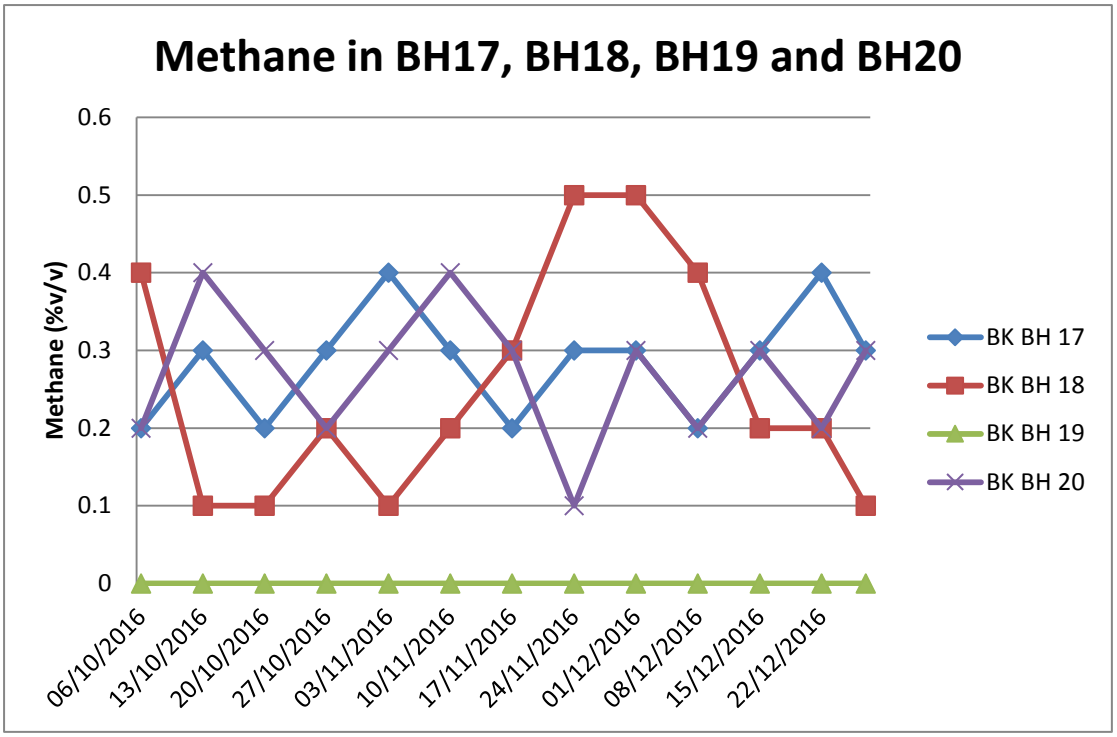


Graph 5: Methane in BH12, BH13, BH14, BH15 and BH16

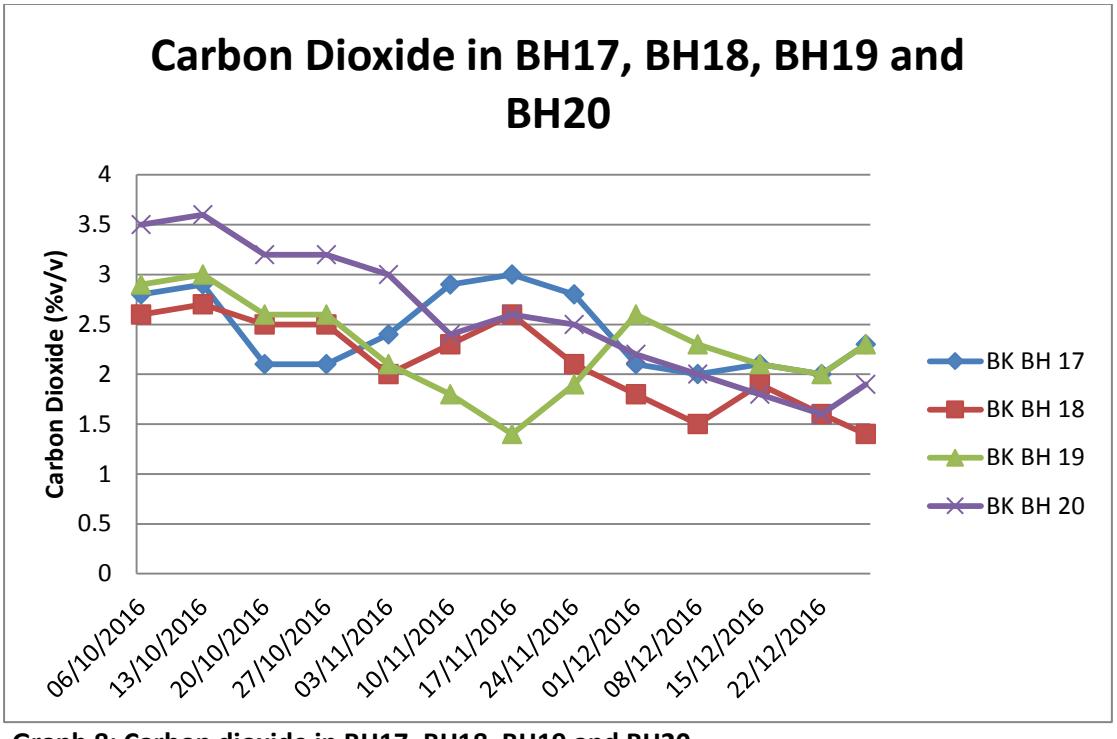


Graph 6: Carbon dioxide in BH12, BH13, BH14, BH15 and BH16

APPENDIX 1 – LANDFILL GAS

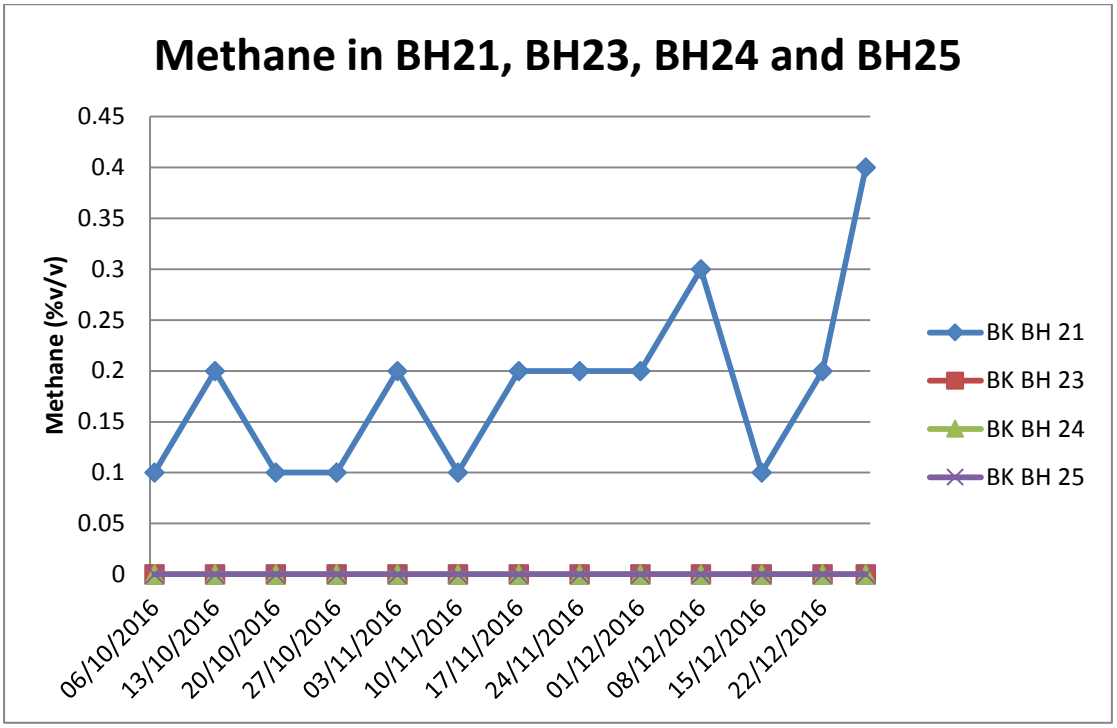


Graph 7: Methane in BH17, BH18, BH19 and BH20

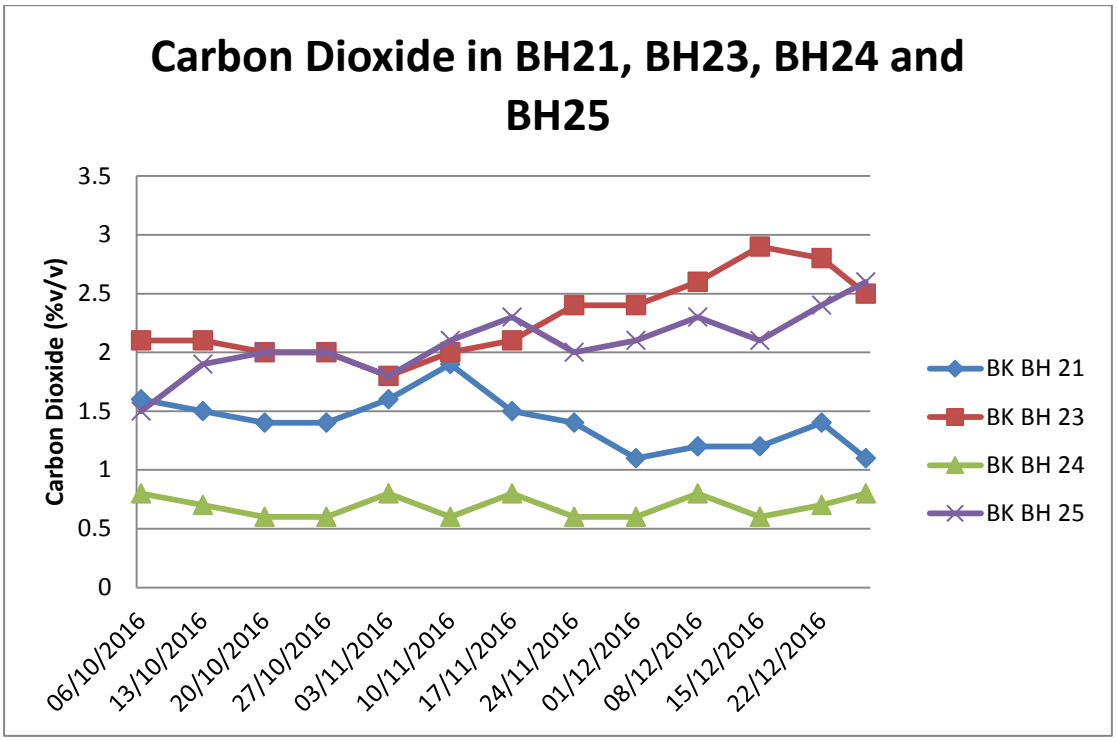


Graph 8: Carbon dioxide in BH17, BH18, BH19 and BH20

APPENDIX 1 – LANDFILL GAS



Graph 9: Methane in BH21, BH23, BH24 and BH25



Graph 10: Carbon dioxide in BH21, BH23, BH24 and BH25

APPENDIX 1 – LANDFILL GAS

Table 2: In waste landfill gas monitoring data summary

Monitoring Point	Date	CH4 (%)	CO2 (%)	O2 (%)	CO (ppm)	H2S (ppm)
B+C Manifold	12/10/2016	49	36.8	0.3	9	11
	16/11/2016	49.6	35.9	0.4	9	7
	14/12/2016	50.2	36.9	0.5	7	4
Flare	12/10/2016	51.2	38.9	0.4	10	7
	12/10/2016	51.1	38.9	0.4	9	7
	16/11/2016	49.6	38.8	0.6	12	8
	16/11/2016	49.9	38.6	0.6	11	8
	14/12/2016	49.2	37.8	0.5	11	9
	14/12/2016	49.2	37.9	0.5	11	8
GV / LC3.1 + LC3 MAN	12/10/2016	47.1	36	0.8	11	8
	16/11/2016	48	37.2	0.8	10	9
	14/12/2016	48.6	37.2	0.9	4	9
GV 2.1	12/10/2016	49.2	38.9	0.2	6	0
	16/11/2016	49.6	38	0.4	5	4
	14/12/2016	49.2	37.8	0.3	6	11
GV 2.2	12/10/2016	47.5	36.4	1.1	8	9
	16/11/2016	47.8	36.3	1	10	10
	14/12/2016	47.5	36.9	1.1	10	9
GV 2.2+ LC2B MAN	12/10/2016	48.2	35.9	1.2	10	10
	16/11/2016	48.5	36.2	1.1	11	12
	14/12/2016	48	36.5	1.2	8	11
GV 22	12/10/2016	42.1	36	2.5	8	9
	16/11/2016	43	37.4	2.1	9	2
	14/12/2016	44.5	37.4	1.9	9	3
GV 35 (New Well)	12/10/2016	19.9	22.6	1.8	6	8
	16/11/2016	20.1	23.9	1.7	10	7
	14/12/2016	20.9	24.9	1.5	8	9
GV 36 (New Well)	12/10/2016	20.4	20.4	4.9	6	9
	16/11/2016	22.9	21.9	4.5	8	4
	14/12/2016	23.9	22.3	4.2	6	3
GV 37 (New Well)	12/10/2016	50.3	36.9	0.2	5	8
	16/11/2016	49.8	37.4	0.3	7	8
	14/12/2016	49.9	36.9	0.2	3	11
GV 38 (New Well)	12/10/2016	45.8	34.8	1.3	12	9
	16/11/2016	46.9	35.9	1.1	9	6
	14/12/2016	46	35.5	1	10	10
GV 39 (New Well)	12/10/2016	46.2	37.2	1.5	10	8
	16/11/2016	46	36.5	1.4	12	5
	14/12/2016	46.2	35.9	1.3	9	3
GV 40 (New Well)	12/10/2016	46.2	37	1	11	7
	16/11/2016	45.8	36.9	1.1	14	3
	14/12/2016	45.2	36.4	1	8	9
GV 41 (New Well)	12/10/2016	46.1	36.9	1.2	3	4
	16/11/2016	45.3	35.9	1.3	4	9
	14/12/2016	45.9	36	1	8	7
GV 42 (New Well)	12/10/2016	42.6	35.6	1.2	6	6
	16/11/2016	39.9	36.5	1.2	9	7
	14/12/2016	40	35.9	1.1	10	8
GV 43 (New Well)	12/10/2016	46.8	36.9	1.1	3	11
	16/11/2016	47	36.5	1.2	7	7
	14/12/2016	46.8	36	1.2	11	16

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Monitoring Point	Date	CH4 (%)	CO2 (%)	O2 (%)	CO (ppm)	H2S (ppm)
GV 44 (New Well)	12/10/2016	41	35.6	1.2	3	6
	16/11/2016	39.7	36	1.3	8	11
	14/12/2016	39.5	36.2	1.4	14	12
GV 45 (New Well)	12/10/2016	46.8	37	1.2	8	9
	16/11/2016	47.1	37.4	1	14	12
	14/12/2016	47.2	37	1.1	17	17
GV 46 (New Well)	12/10/2016	48.2	38.9	0.4	10	9
	16/11/2016	47.5	38	0.3	9	6
	14/12/2016	48	36.5	0.4	11	11
GV 47 (New Well)	12/10/2016	46.9	37	1	11	6
	16/11/2016	46	36	1	10	11
	14/12/2016	46.2	36.2	1.1	9	12
GV 48 (New Well)	12/10/2016	60	40	0	8	8
	16/11/2016	59.8	40	0	9	5
	14/12/2016	60	40	0	8	4
GV 49 (New Well)	12/10/2016	45.5	34.9	1.1	12	9
	16/11/2016	45.9	35.2	1	10	6
	14/12/2016	46.2	35.4	1.1	6	9
GV B	12/10/2016	49.6	37.1	0.2	9	12
	16/11/2016	50	34.9	0.3	11	9
	14/12/2016	50.5	35.6	0.4	10	7
GV C	12/10/2016	48.2	36.9	0.4	9	10
	16/11/2016	49	37	0.5	6	3
	14/12/2016	49.8	37.5	0.6	6	2
GV1	12/10/2016	34	27.9	1.2	9	6
	16/11/2016	33.6	25.6	1.4	10	5
	14/12/2016	34.5	26.9	1.3	8	6
GV10	12/10/2016	42.1	35.2	1.2	17	8
	16/11/2016	41.9	35.9	1.3	4	14
	14/12/2016	42.3	35.2	1.2	9	9
GV11	12/10/2016	44.7	33.6	1.1	7	11
	16/11/2016	45	33	1.2	5	4
	14/12/2016	44.5	34.5	1.1	6	11
GV12	12/10/2016	51.4	36.8	0.4	9	9
	16/11/2016	50.4	36.8	0.4	13	12
	14/12/2016	50.1	36.5	0.3	12	3
GV12+R3 Manifold	12/10/2016	51	36	0.6	9	9
	16/11/2016	50	36.5	0.5	11	11
	14/12/2016	49.8	35.6	0.4	11	6
GV13	12/10/2016	1.9	2.4	19.1	13	6
	16/11/2016	1.6	2.6	20	7	5
	14/12/2016	1.9	2.9	19.8	9	3
GV14	12/10/2016	50	37.4	0.4	10	8
	16/11/2016	49.8	37.1	0.6	10	6
	14/12/2016	49.2	36.7	0.5	5	6
GV15	12/10/2016	49.6	37.9	0.6	911	9
	16/11/2016	49	36	0.4	7	10
	14/12/2016	49.5	36.5	0.4	7	5
GV16	12/10/2016	45.2	37	1	8	12
	16/11/2016	45.6	36.5	1.1	8	10
	14/12/2016	46.9	36.2	1	4	6
GV17	12/10/2016	43.9	34.9	2.1	6	6
	16/11/2016	44	35	2	9	7
	14/12/2016	45	36.3	2	11	11

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Monitoring Point	Date	CH4 (%)	CO2 (%)	O2 (%)	CO (ppm)	H2S (ppm)
GV17+LC4 Manifold	12/10/2016	45	35.4	2.6	6	8
	16/11/2016	45.8	35.6	2.4	8	9
	14/12/2016	46.3	36	2.3	8	11
GV18	12/10/2016	50.4	38	0.5	3	8
	16/11/2016	49.2	37	0.4	2	7
	14/12/2016	49.2	37	0.4	3	8
GV23	12/10/2016	50.2	37	0.5	7	9
	16/11/2016	49.8	37	0.3	10	9
	14/12/2016	49.5	35.9	0.4	11	8
GV24	12/10/2016	51.6	36.2	0.3	9	8
	16/11/2016	50.2	36.9	0.6	7	5
	14/12/2016	49.6	36	0.5	8	6
GV25	12/10/2016	42.9	36	1.3	8	6
	16/11/2016	42	37.9	1.4	11	6
	14/12/2016	43.9	35.9	1.2	7	11
GV26	12/10/2016	50.4	36.7	0.1	9	7
	16/11/2016	50.4	36.4	0.2	12	6
	14/12/2016	50.4	36.4	0.2	11	9
GV26 + 27 Manifold	12/10/2016	51.2	36.9	0.3	9	8
	16/11/2016	50.5	37	0.4	9	3
	14/12/2016	50.1	37.5	0.5	10	5
GV27	12/10/2016	51.9	37.5	0.4	9	8
	16/11/2016	51.2	37.5	0.5	11	2
	14/12/2016	49.9	37.5	0.5	9	6
GV28	12/10/2016	51	36.4	0.1	8	9
	16/11/2016	50.9	36.4	0.1	7	8
	14/12/2016	50.2	36.4	0.1	8	9
GV28+ 29 Manifold	12/10/2016	50.6	37	0.2	10	8
	16/11/2016	50.4	37.2	0.3	8	8
	14/12/2016	49.9	37.5	0.4	9	8
GV29	12/10/2016	50.2	37	0.3	12	8
	16/11/2016	50.2	37	0.3	9	6
	14/12/2016	49.5	37	0.3	9	8
GV3	12/10/2016	52.6	35.9	0.2	8	3
	16/11/2016	50.1	36.5	0.3	9	4
	14/12/2016	50	36.9	0.4	6	5
GV30	12/10/2016	46.8	35.4	1.3	16	9
	16/11/2016	47.2	35.9	1.2	3	7
	14/12/2016	47	36	1	8	11
GV31	12/10/2016	45	35.9	1	10	14
	16/11/2016	44.9	36.2	1	12	15
	14/12/2016	44.5	36	1.1	10	16
GV32	12/10/2016	44.9	34.9	1.1	11	6
	16/11/2016	45.2	35.6	1.2	14	9
	14/12/2016	45.9	35.9	1	12	12
GV33	12/10/2016	45.2	36.9	1.2	7	3
	16/11/2016	44.8	37	1.1	8	3
	14/12/2016	45.3	36.4	1	11	14
GV34	12/10/2016	44.8	37	1	8	9
	16/11/2016	45.3	36.9	1.1	9	8
	14/12/2016	45.9	36.5	1	10	8
GV4	12/10/2016	46	35.6	1.1	11	9
	16/11/2016	46.5	34.9	1	6	7
	14/12/2016	46.8	35.2	1	4	2

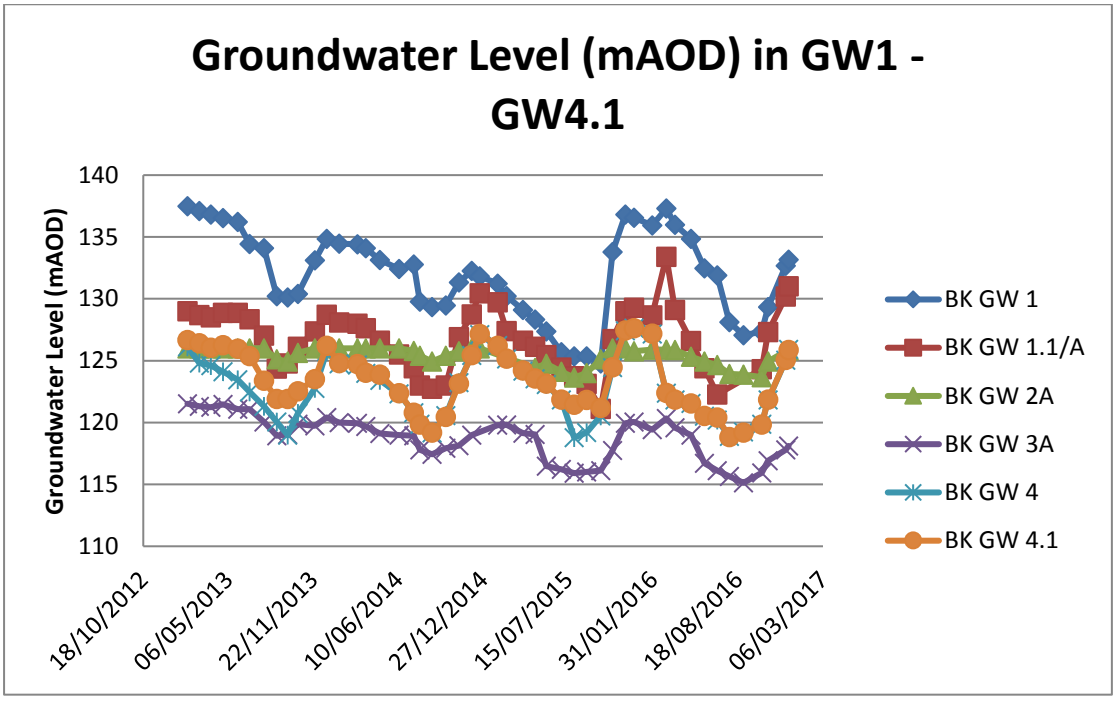
APPENDIX 1 – LANDFILL GAS

Monitoring Point	Date	CH4 (%)	CO2 (%)	O2 (%)	CO (ppm)	H2S (ppm)
GV6	12/10/2016	45.1	35.2	1	12	8
	16/11/2016	46.9	36.4	1.1	9	4
	14/12/2016	46.5	37	1.1	12	3
GV7	12/10/2016	30	27.9	2.5	9	6
	16/11/2016	31.9	28.7	2.6	6	6
	14/12/2016	30.5	29.8	2.5	11	3
GV8	12/10/2016	35.9	32	2.4	8	8
	16/11/2016	32.7	33.6	2.4	8	3
	14/12/2016	31.7	32.9	2.2	9	6
GV9	12/10/2016	49.2	37.5	0.5	8	7
	16/11/2016	48.5	37	0.4	7	8
	14/12/2016	48.9	36.9	0.3	8	8
GVA	12/10/2016	32.9	27.5	5.2	11	7
	16/11/2016	33.9	26.7	5	8	7
	14/12/2016	34.5	27.9	4.9	8	5
LC1B	12/10/2016	35.9	35.4	2.2	11	7
	16/11/2016	36.9	36	2	8	8
	14/12/2016	37	36.8	1.9	11	8
LC2B	12/10/2016	48.5	35.6	1.4	12	3
	16/11/2016	49	35.8	1.3	13	14
	14/12/2016	48.6	36	1.3	8	13
LC2R?	12/10/2016	50	37.4	0.2	9	7
	16/11/2016	50.1	37.9	0.3	7	7
	14/12/2016	50.2	36.8	0.4	7	9
LC3	12/10/2016	46	33.9	2.5	8	10
	16/11/2016	46.2	34.5	2.3	6	7
	14/12/2016	46	33.9	2	3	10
LC3.1	12/10/2016	47.1	36	0.8	11	8
	16/11/2016	48	37.2	0.8	12	5
	14/12/2016	48.6	37.2	0.9	6	7
LC4	12/10/2016	46.5	36	2.9	5	10
	16/11/2016	46.6	35.9	2.7	6	11
	14/12/2016	46.9	36	2.6	5	10
LC4B	12/10/2016	48.5	37	1.2	18	9
	16/11/2016	48.2	36.5	1.1	14	8
	14/12/2016	48.6	36	1.2	3	8
LC5	12/10/2016	46	36.2	3.2	7	9
	16/11/2016	46.5	35.9	3.3	8	7
	14/12/2016	47	34.9	3	4	11
LC6	12/10/2016	47.2	35	2.5	8	7
	16/11/2016	46.9	34.9	2.4	10	4
	14/12/2016	45.9	35.9	2.6	1	2
LC6B	12/10/2016	50.8	36.5	0.6	9	8
	16/11/2016	51	35.9	0.9	7	7
	14/12/2016	51.2	36.5	0.8	7	9
PW1	12/10/2016	1.2	0.3	14	9	12
	16/11/2016	1.5	0.4	13.5	11	4
	14/12/2016	1.9	0.5	12.9	11	6
PW2	12/10/2016	33.6	18.6	3.2	8	9
	16/11/2016	34.5	19	3.4	14	2
	14/12/2016	33.6	19.8	2.6	5	8
PW3	12/10/2016	34.9	20	2.9	5	10
	16/11/2016	32.9	19.8	2.5	6	6
	14/12/2016	33.2	19.9	2.1	6	9

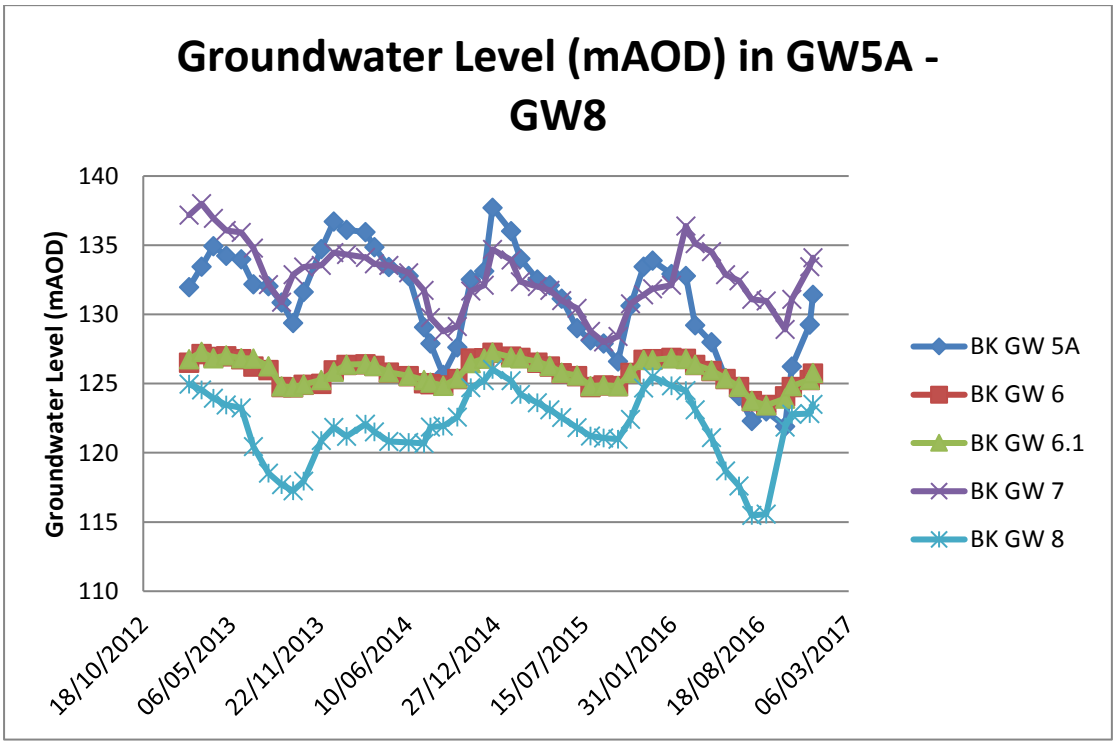
APPENDIX 1 – LANDFILL GAS

Monitoring Point	Date	CH4 (%)	CO2 (%)	O2 (%)	CO (ppm)	H2S (ppm)
PW4	12/10/2016	46	36.5	1.1	5	12
	16/11/2016	46.2	35.9	1.2	6	6
	14/12/2016	46.5	36	1.3	8	6
PW5	12/10/2016	32.5	25.1	1.6	10	13
	16/11/2016	33.6	26.4	1.7	12	8
	14/12/2016	34.5	26.9	1.5	9	1
PW6	12/10/2016	33.9	26.9	2.5	9	8
	16/11/2016	34.1	25.7	2.4	10	8
	14/12/2016	34.5	26.8	2.9	8	4
R1	12/10/2016	46	35	1.2	4	12
	16/11/2016	47.6	35.6	1.2	8	9
	14/12/2016	47.5	36.2	1	4	10
R1 + R1B Manifold	12/10/2016	48.2	36	0.6	8	11
	16/11/2016	48.5	36.5	0.7	8	9
	14/12/2016	48.2	36.9	0.8	6	9
R1B	12/10/2016	48.6	37.5	0.4	7	14
	16/11/2016	49	37	0.5	9	7
	14/12/2016	49.1	37.4	0.6	8	7
R2B	12/10/2016	49.2	38	0.6	8	18
	16/11/2016	48.7	37.8	0.7	7	5
	14/12/2016	49	38	0.8	3	5
R3	12/10/2016	49.6	35.2	0.7	8	8
	16/11/2016	49.4	35.4	0.7	9	10
	14/12/2016	49	35.8	0.6	11	7
R4B	12/10/2016	42	35.2	3.8	9	2
	16/11/2016	41.8	36.2	3.6	6	8
	14/12/2016	42.6	36.9	3.5	2	6
R6B	12/10/2016	51.2	37.9	0.5	8	6
	16/11/2016	50.9	38	0.6	9	4
	14/12/2016	51	38.6	0.2	14	4

APPENDIX 2 - GROUNDWATER



Graph 1: Groundwater level as mAOD at locations GW1 – GW4.1



Graph 2: Groundwater level as mAOD at locations GW5 – GW8

APPENDIX 2 - GROUNDWATER

Table 1: Monthly monitoring data (exceedances highlighted)

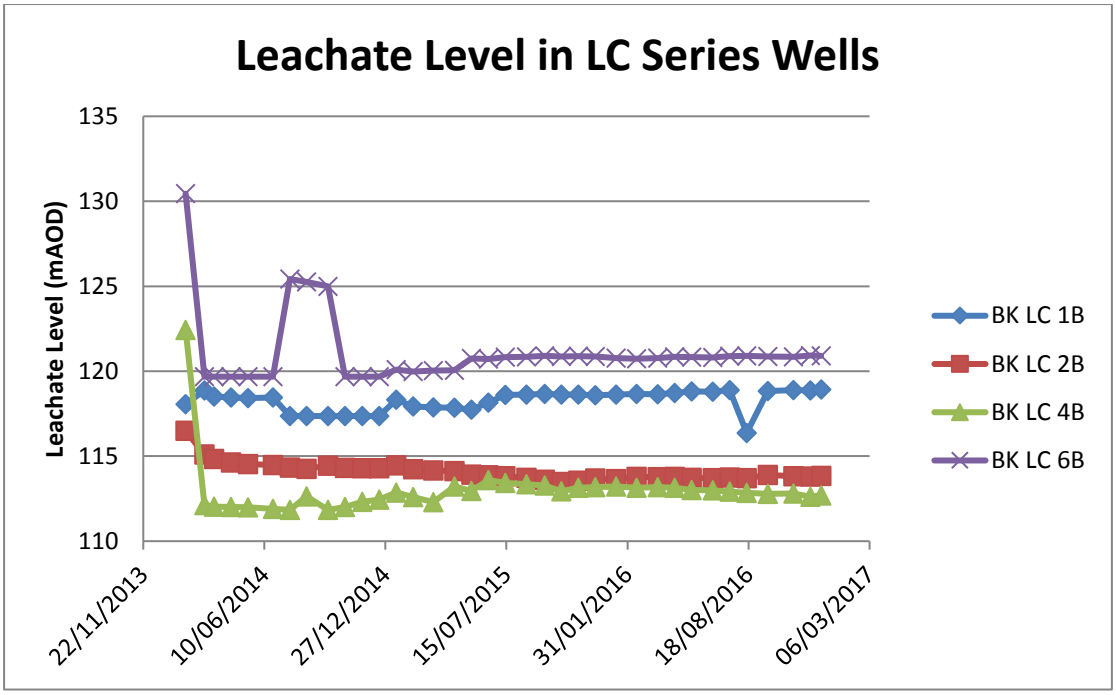
Location	Parameter	Ammoniacal N	Chloride	Conductivity	Dissolved Oxygen	pH
	Units	mg/l as N	mg/l	mS/cm	mg/l	pH Units
GW1	28/10/2016	19.6	365.0	2.62	0.69	7.79
	09/12/2016	7.2	86.4	2.85	1.05	7.52
	15/12/2016	11.3	95.2	2.89	2.03	7.39
GW1.1	28/10/2016	7.0	256.0	1.39	<0.3	7.02
	09/12/2016	1.6	183.0	1.45	<0.3	6.55
	15/12/2016	10.6	270.0	1.57	<0.3	7.08
GW2A	Trigger	1.7	60	N/A	N/A	N/A
	28/10/2016	11.8	124.0	1.37	<0.3	8.00
	09/12/2016	12.0	136.0	1.39	1.00	7.01
	15/12/2016	14.4	135.0	1.45	1.04	7.35
GW3A	Trigger	1.7	60	N/A	N/A	N/A
	28/10/2016	25.8	160.0	1.63	<0.3	7.08
	09/12/2016	49.0	126.0	1.76	0.93	6.93
	15/12/2016	64.8	127.0	1.79	1.7	7.18
GW4	Trigger	1.7	60	N/A	N/A	N/A
	28/10/2016	44.1	71.5	0.81	<0.3	7.74
	09/12/2016	38.0	89.7	0.87	<0.3	6.84
	15/12/2016	44.0	95.7	0.929	0.62	7.17
GW5A	28/10/2016	6.5	43.1	0.75	0.49	7.12
	09/12/2016	5.9	48.8	0.81	2.37	6.98
	15/12/2016	6.07	169.0	1.16	<0.3	7.08
GW6	28/10/2016	<0.2	30.8	0.71	2.44	7.63
	09/12/2016	<0.2	30.8	0.68	2.22	7.53
	15/12/2016	<0.2	30.5	0.692	<0.3	8.03
GW7	28/10/2016	2.3	139.0	0.72	1.08	7.80
	09/12/2016	1.7	154.0	0.71	1.46	7.62
	15/12/2016	1.9	151.0	0.734	2.88	7.7
GW8	28/10/2016	19.0	148.0	1.34	0.64	7.05
	09/12/2016	19.1	160.0	1.26	0.63	6.67
	15/12/2016	23.3	158.0	1.37	1.65	7.04

APPENDIX 2 - GROUNDWATER

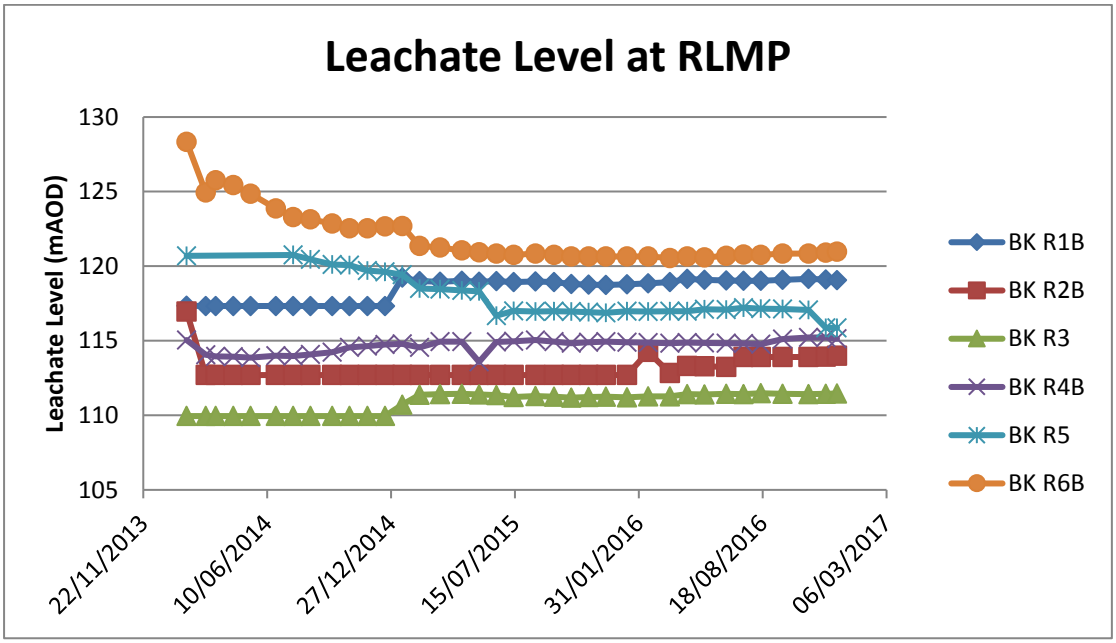
Table 2: Quarterly monitoring data (exceedances highlighted)

Sample Description		GW1	GW1.1	GW2A	GW3A	GW4	GW5A	GW6	GW7	GW8	GW2A, GW3A, GW4 Trigger
Date Sampled		15/12/2016	15/12/2016	15/12/2016	15/12/2016	15/12/2016	15/12/2016	15/12/2016	15/12/2016	15/12/2016	
Carbon											
Organic Carbon, Total	mg/l	47.7	16.5	13.6	18.8	14.1	6.66	6.48	4.75	9.3	
Inorganics											
Alkalinity, Total as CaCO3	mg/l	1120	195	645	475	405	350	295	200	505	
COD, unfiltered	mg/l	320	70.5	56.7	100	308	46.2	48.8	36	48.7	
Conductivity @ 20 deg.C	mS/cm	2.89	1.57	1.45	1.79	0.929	1.16	0.692	0.734	1.37	
Oxygen, dissolved	mg/l	2.03	<0.3	1.04	1.7	0.62	<0.3	<0.3	2.88	1.65	
pH	pH Units	7.39	7.08	7.35	7.18	7.17	7.08	8.03	7.7	7.04	
Sulphate	mg/l	1460	325	163	460	<2	139	77.7	<2	117	
Total Oxidised Nitrogen as NO3	mg/l	0.773	<0.3	<0.3	26.4	<0.3	2.28	25.8	<0.3	0.359	
Filtered (Dissolved) Metals											
Cadmium (diss.filt)	mg/l	<0.00008	<0.00008	<0.00008	0.000096	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	
Calcium (diss.filt)	mg/l	761	121	189	174	64.8	121	89.6	23.6	103	
Chromium (diss.filt)	mg/l	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	
Copper (diss.filt)	mg/l	0.00214	<0.00085	<0.00085	0.00402	<0.00085	<0.00085	0.00296	<0.00085	<0.00085	
Iron (diss.filt)	mg/l	-	38.5	0.0323	0.0472	0.18	0.0444	<0.019	<0.019	0.0368	
Lead (diss.filt)	mg/l	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
Magnesium (diss.filt)	mg/l	-	59.9	48	46.8	20.6	43	28.3	34.9	37.7	
Manganese (diss.filt)	mg/l	2.04	9.33	5.58	1.17	1.43	1.39	0.00119	0.13	0.521	
Nickel (diss.filt)	mg/l	0.00716	0.0453	0.0177	0.045	0.0141	0.0329	0.00129	0.00137	0.0369	0.15
Potassium (diss.filt)	mg/l	-	18.4	31.9	48.4	27	19.8	19.5	21.6	36.5	
Sodium (diss.filt)	mg/l	-	120	79.6	110	45.6	77.2	20.1	71.3	121	
Zinc (diss.filt)	mg/l	0.0165	0.00925	0.00431	0.00933	0.00258	0.00429	0.00383	0.00143	0.00317	0.254
TPH Criteria Working Group (TPH CWG)											
Benzene	mg/l	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	
Ethylbenzene	mg/l	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
m,p-Xylene	mg/l	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	
o-Xylene	mg/l	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	
Sum of detected BTEX	mg/l	<0.028	<0.028	<0.028	<0.028	<0.028	<0.028	<0.028	<0.028	<0.028	
Sum of detected Xylenes	mg/l	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011	0.011
Toluene	mg/l	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	0.004

APPENDIX 3



Graph 1: Leachate Levels as mAOD at LC Series Wells



Graph 2: Leachate Levels as mAOD at Remote Leachate Monitoring Points

APPENDIX 3

Table 2: Quarterly monitoring data from leachate chambers

Parameters	Units	LC1B	LC2B	LC3	LC4B	LC5	LC6
Inorganics							
Cyanide, Free	mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Cyanide, Total	mg/l	<0.05	0.053	<0.05	<0.05	0.118	0.12
Filtered (Dissolved) Metals							
Cadmium (diss.filt)	mg/l	<0.00008	0.000131	<0.00008	<0.00008	<0.0008	<0.0008
Chromium (diss.filt)	mg/l	0.0549	0.135	0.0654	0.0956	0.187	0.183
Copper (diss.filt)	mg/l	0.271	0.0941	0.0966	0.0722	0.387	0.0231
Iron (diss.filt)	mg/l	9.27	8.41	12.2	12.4	4.73	4.36
Lead (diss.filt)	mg/l	0.00414	0.00421	0.00259	0.00419	0.0117	0.00486
Manganese (diss.filt)	mg/l	0.564	0.17	0.307	0.376	0.337	0.341
Mercury (diss.filt)	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	-	-
Nickel (diss.filt)	mg/l	0.198	0.367	0.243	0.28	0.334	0.312
Zinc (diss.filt)	mg/l	0.341	0.103	0.163	0.181	0.249	0.104
Mineral Oil / Oils & Greases							
Mineral oil >C10 C40 (aq)	mg/l	0.0339	0.753	0.0165	0.212	0.0947	0.126
Semi-Volatile Organic Compounds (SVOCs)							
1,2,4-Trichlorobenzene (aq)	mg/l	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008
1,2-Dichlorobenzene (aq)	mg/l	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008
1,3-Dichlorobenzene (aq)	mg/l	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008
1,4-Dichlorobenzene (aq)	mg/l	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008
2,4,5-Trichlorophenol (aq)	mg/l	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008
2,4,6-Trichlorophenol (aq)	mg/l	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008
2,4-Dichlorophenol (aq)	mg/l	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008
2,4-Dimethylphenol (aq)	mg/l	<0.008	0.00874	<0.008	<0.008	0.0992	0.107

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Parameters	Units	LC1B	LC2B	LC3	LC4B	LC5	LC6
2,4-Dinitrotoluene (aq)	mg/l	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008
2,6-Dinitrotoluene (aq)	mg/l	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008
2-Chloronaphthalene (aq)	mg/l	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008
2-Chlorophenol (aq)	mg/l	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008
2-Methylnaphthalene (aq)	mg/l	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008
2-Methylphenol (aq)	mg/l	<0.008	0.0322	<0.008	<0.008	0.0589	0.0613
2-Nitroaniline (aq)	mg/l	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008
2-Nitrophenol (aq)	mg/l	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008
3-Nitroaniline (aq)	mg/l	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008
4-Bromophenylphenylether (aq)	mg/l	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008
4-Chloro-3-methylphenol (aq)	mg/l	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008
4-Chloroaniline (aq)	mg/l	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008
4-Chlorophenylphenylether (aq)	mg/l	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008
4-Methylphenol (aq)	mg/l	<0.008	0.0116	<0.008	<0.008	5.46	4.54
4-Nitroaniline (aq)	mg/l	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008
4-Nitrophenol (aq)	mg/l	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008
Azobenzene (aq)	mg/l	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008
Benzo(k)fluoranthene (aq)	mg/l	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008
bis(2-Chloroethoxy)methane (aq)	mg/l	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008
bis(2-Chloroethyl)ether (aq)	mg/l	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008
bis(2-Ethylhexyl) phthalate (aq)	mg/l	<0.016	0.0738	<0.016	0.0336	0.155	0.188
Butylbenzyl phthalate (aq)	mg/l	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008
Carbazole (aq)	mg/l	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008
Dibenzofuran (aq)	mg/l	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008
Diethyl phthalate (aq)	mg/l	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008

APPENDIX 3

Parameters	Units	LC1B	LC2B	LC3	LC4B	LC5	LC6
Dimethyl phthalate (aq)	mg/l	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008
Hexachlorobenzene (aq)	mg/l	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008
Hexachlorobutadiene (aq)	mg/l	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008
Hexachlorocyclopentadiene (aq)	mg/l	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008
Hexachloroethane (aq)	mg/l	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008
Isophorone (aq)	mg/l	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008
n-Dibutyl phthalate (aq)	mg/l	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008
n-Dioctyl phthalate (aq)	mg/l	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Nitrobenzene (aq)	mg/l	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008
n-Nitroso-n-dipropylamine (aq)	mg/l	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008
Pentachlorophenol (aq)	mg/l	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008
Phenol (aq)	mg/l	<0.008	<0.008	<0.008	<0.008	6.13	5.13
Total SVOC TIC	mg/l	0.325	30	4.28	14.9	64.1	83
Volatile Organic Compounds (VOCs)							
1,1,1,2-Tetrachloroethane	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1,1-Trichloroethane	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1,2,2-Tetrachloroethane	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1,2-Trichloroethane	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1-Dichloroethane	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1-Dichloroethene	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1-Dichloropropene	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2,3-Trichlorobenzene	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2,3-Trichloropropane	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2,4-Trichlorobenzene	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2,4-Trimethylbenzene	mg/l	0.00268	0.0236	<0.001	0.0127	0.0124	0.0138

APPENDIX 3

Parameters	Units	LC1B	LC2B	LC3	LC4B	LC5	LC6
1,2-Dibromo-3-chloropropane	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2-Dibromoethane	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2-Dichlorobenzene	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2-Dichloroethane	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2-Dichloropropane	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,3,5-Trichlorobenzene	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,3,5-Trimethylbenzene	mg/l	0.00142	0.00545	0.00224	0.00325	0.00249	0.00276
1,3-Dichlorobenzene	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,3-Dichloropropane	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,4-Dichlorobenzene	mg/l	<0.001	<0.001	<0.001	<0.001	0.00407	<0.001
2,2-Dichloropropane	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
2-Chlorotoluene	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
4-Chlorotoluene	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
4-iso-Propyltoluene	mg/l	0.00146	0.0426	0.00992	0.0233	0.00991	0.0109
Benzene	mg/l	0.0014	0.00335	0.00132	0.00242	0.00824	0.00448
Bromobenzene	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bromochloromethane	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bromodichloromethane	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bromoform	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bromomethane	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Carbon disulphide	mg/l	<0.001	<0.001	<0.001	<0.001	0.00282	0.00184
Carbontetrachloride	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chlorobenzene	mg/l	0.00114	0.00244	<0.001	0.00173	0.00687	0.00772
Chloroethane	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chloroform	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

APPENDIX 3

Parameters	Units	LC1B	LC2B	LC3	LC4B	LC5	LC6
Chloromethane	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
cis-1,2-Dichloroethene	mg/l	<0.001	<0.001	<0.001	<0.001	0.00777	0.00864
cis-1,3-Dichloropropene	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dibromochloromethane	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dibromomethane	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dichlorodifluoromethane	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dichloromethane	mg/l	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Ethylbenzene	mg/l	0.0021	0.0498	<0.001	0.023	0.0219	0.0253
Hexachlorobutadiene	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Isopropylbenzene	mg/l	<0.001	0.00179	<0.001	0.00107	<0.001	0.00102
m,p-Xylene	mg/l	0.00486	0.0986	0.00319	0.0462	0.0539	0.0606
Methyl tertiary butyl ether (MTBE)	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Naphthalene	mg/l	0.00187	0.0116	0.0083	0.00785	0.0153	0.0113
n-Butylbenzene	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
o-Xylene	mg/l	0.00539	0.0315	0.0118	0.017	0.0231	0.0262
Propylbenzene	mg/l	<0.001	0.00249	<0.001	0.00141	0.00106	0.00122
sec-Butylbenzene	mg/l	<0.001	0.00106	<0.001	<0.001	<0.001	<0.001
Styrene	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
tert-Amyl methyl ether (TAME)	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
tert-Butylbenzene	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Tetrachloroethene	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Toluene	mg/l	0.00125	0.0285	<0.001	0.0139	0.0404	0.0438
trans-1,2-Dichloroethene	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
trans-1,3-Dichloropropene	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Trichloroethene	mg/l	<0.001	<0.001	<0.001	<0.001	0.00112	<0.001

APPENDIX 3

Parameters	Units	LC1B	LC2B	LC3	LC4B	LC5	LC6
Trichlorofluoromethane	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Vinyl chloride	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	0.001
Combined Pesticides / Herbicides							
Aldrin	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
alpha-Hexachlorocyclohexane (HCH / Lindane)	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Azinphos-ethyl	mg/l	0.00101	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Azinphos-methyl	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
beta-Hexachlorocyclohexane (HCH / Lindane)	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Carbophenothion	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Chlorfenvinphos	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Chlorothalonil	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Chlorpyriphos	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Chlorpyriphos methyl	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
cis-Chlordane	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Diazinon	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Dichlorvos	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Dieldrin	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Dimethoate	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Disulfoton	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Endosulphan I	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Endosulphan II	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Endosulphan sulphate	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Endrin	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Ethion	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Etrimphos	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001

APPENDIX 3

Parameters	Units	LC1B	LC2B	LC3	LC4B	LC5	LC6
Fenitrothion	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Fenthion	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
gamma-Hexachlorocyclohexane (HCH / Lindane)	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Heptachlor	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Heptachlor epoxide	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Hexachlorobenzene	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Isodrin	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Malathion	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Methyl parathion	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Mevinphos	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
o,p-DDE	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
o,p-DDT	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
o,p-Methoxychlor	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
o,p-TDE (DDD)	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
p,p-DDE	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
p,p-DDT	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
p,p-Methoxychlor	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
p,p-TDE (DDD)	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Parathion	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Pendimethalin	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Permethrin I	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Permethrin II	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Phosalone	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Pirimiphos-methyl	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001

APPENDIX 3

Parameters	Units	LC1B	LC2B	LC3	LC4B	LC5	LC6
Propetamphos	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Quintozene (PCNB)	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Tecnazene	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Telodrin	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Trans-chlordane	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Triadimefon	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Triallate	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Triazophos	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Trifluralin	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Miscellaneous Organics							
Dibutyl tin	mg/l	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015
Tetrabutyl tin	mg/l	<0.00006	<0.00006	<0.00006	<0.00006	<0.00006	<0.00006
Tributyl tin	mg/l	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003
Triphenyl tin	mg/l	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003
TICS							
Benzeneacetic acid	mg/l	-	-	-	-	13.3	18.4
Benzenecarboxylic acid	mg/l	-	-	-	-	5.69	4.65
Benzenepropanoic acid	mg/l	-	-	-	-	4.61	5.12
Butylbenzenesulfonamide	mg/l	-	0.362	-	0.644	-	-
Ethylheptanoic acid	mg/l	-	-	-	-	1.14	1.48
Methyl(methylethyl)Cyclohexenol	mg/l	-	0.629	-	-	-	-
Methylbenzenepropanoic acid	mg/l	-	-	-	-	3.01	4.05
mixed hydrocarbons	mg/l	0.0915	6.33	0.524	0.228	2.53	4.78
Phenol(methylethylidene)bis-	mg/l	-	12.3	0.319	8.51	16	22.1
Tertbutylbenzoic acid	mg/l	-	0.349	-	0.164	-	-

APPENDIX 3

Parameters	Units	LC1B	LC2B	LC3	LC4B	LC5	LC6
Tertbutylhydroxyphenylpropionic acid	mg/l	-	1.62	0.289	0.498	1.88	2.37
Tertbutylphenol	mg/l	-	0.43	-	0.355	1.45	2.54
Trimethylbicycloheptanone	mg/l	-	-	-	0.156	-	-
trimethylhexanoic acid	mg/l	0.234	7.96	3.15	3.48	14.4	17.4

APPENDIX 3

Table 3: Final Discharge (FD) monitoring data (exceedances highlighted)

Final Discharge	Ammoniacal Nitrogen	pH	COD	Suspended Solids	Chromium	Copper	Lead	Nickel	Zinc	Nitrate as N	Nitrite as N	Alkalinity
	mg/l	pH Units	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
Date / Trigger	50	>5<10	2000	500	2	2	2	2	2	-	-	-
10/10/2016	<2	-	3000	-	0.056	0.052	0.006	0.19	0.21	-	0.0	94
21/10/2016	<1	8.1	1480	412	0.057	0.048	0.011	0.20	0.32	906	<0.0152	725
28/10/2016	2.1	7.7	4070	2040	-	-	-	-	-	1080	1.0	1050
11/11/2016	0.4	7.8	1650	605	0.057	0.044	0.003	0.21	0.10	1080	<0.0152	420
09/12/2016	0.9	8.3	1140	121	-	-	-	-	-	1110	0.3	635
15/12/2016	46.2	-	1910	-	0.131	0.060	0.006	0.27	0.14	-	1.9	1190
Minimum	<1	7.7	1140	121	0.056	0.044	0.003	0.19	0.10	906	<0.0152	94
Maximum	46.2	8.3	4070	2040	0.131	0.060	0.011	0.27	0.32	1110	1.9	1190
Average	8.8	8.0	2208	795	0.075	0.051	0.006	0.22	0.19	1044	0.5	686
Count	6	4	6	4	4	4	4	4	4	4	6	6

APPENDIX 4 – SURFACE WATER

Table 1: Monthly monitoring data

Location	Parameter	Ammoniacal N	Chloride	COD	pH	Suspended Solids
	Units	mg/l as N	mg/l	mg/l	pH Units	mg/l
P4	28/10/2016	1.14	57	95	7.7	54
	09/12/2016	1.06	52	78	7.8	27
	15/12/2016	0.88	55	87	8.0	13
SW2	09/12/2016	0.38	134	62	7.3	24
	15/12/2016	0.32	198	59	7.4	42

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