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**The Environmental Permitting (England
and Wales) Regulations 2010**

**Permit: EPR/NP3638ZS
Peterborough Energy from Waste Facility**

Annual Performance Report 2016

Prepared by:
Kathryn Goldacre
EHS Manager
Viridor Waste Management Ltd
Peterborough ERF
Fourth Drove
Peterborough
PE1 5UR

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Quality Assurance

This report has been prepared with all reasonable skill, care and diligence. Information reported herein is based on the interpretation of data collected and has been accepted in good faith as being accurate and valid.

Report Details

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Name: Kathryn Goldacre

Position: Environmental Health and Safety Manager

1. Introduction

Peterborough Energy from Waste (EfW) facility is located on the eastern side of Peterborough and occupies an area of 4.5 hectares within the Fengate Industrial Estate, approximately 2.5km south-east of the city centre.

The facility has a capacity of 85,000 tonnes per year and generates electricity to be used internally and exported to the National Grid. The facility design and layout of the steam turbine allows for potential heat export to local users.

In accordance with the requirements of Condition 4.2.3 and Schedule 4 of Permit EPR/NP3638ZS issued by the Environment Agency to Viridor Peterborough Limited (Viridor) on 1 February 2013, Viridor is required to submit as summary of the environmental monitoring works undertaken at the site on a quarterly basis. Such reports will form the basis of the annual performance report which is to be submitted to the Environment Agency by 31 January of each year in accordance with Condition 4.2.2 of the Permit.

Viridor note, in line with Permit variation dated 1st November 2016; 30 minute carbon monoxide (CO) average monitoring was replaced with CO 10 minute average monitoring.

This report summarises the environmental and performance data collected at the site 1st January 2016 – 31st December 2016 and fulfils the requirement of Chapter IV, Article 55(2) of the Industrial Emissions Directive.

The report will cover the following areas of environmental and performance monitoring:

- Section 2 – Point Source Emissions to Air
- Section 3 – Point Source Emissions to Water
- Section 4 – Residue Quality Monitoring Requirements
- Section 5 – Performance Parameters

2. Point Source Emissions to Air

2.1. Introduction

Permit Condition 3.5.1(a) and Tables S3.1 and S3.1(a) set out the requirements for performance monitoring of the point source emissions to air arising at sample point A1.

A summary of the point source emissions to air monitoring data at sample point A1 across the four quarters of 2016 is included as Table 1. Analysis from periodic monitoring undertaken during the same period is included as Table 2.

Viridor note, in line with Permit variation dated 1st November 2016; 30 minute carbon monoxide (CO) average monitoring was replaced with CO 10 minute average monitoring.

Submission of the annual performance data for R1 was made on

2.2 Commentary on Data

During the review period, the recorded concentrations remained compliant with the limits set out in Permit Tables S3.1 and S3.1(a), with exception to the events listed below. During the 2016 period, Line 1 was operational 93.5% of the time (boiler availability).

The annual QAL2 was completed 11th – 13th October except dust on which an AST test was performed over the same period. The dust measurements on duty and standby analysers passed the requirements of AST and the current calibration function remains valid.

The new calibrations functions derived from the QAL2 measurements for the gases were applied by Envirosoft on 14th December 2016.

Note 1: Results recorded by both, periodic and continuous monitoring are within the range expected for the energy recovery operation, with exception to the exceedances detailed in 2.3 below.

2.3 Schedule Notices Issued

Three schedule notices have been submitted within 2016.

02/05/2016 – Schedule 5 notification submitted for two CO spikes each affecting a half hour limit.

06/09/2016 – Schedule 5 notification submitted for data showing a CO and TOC breach. The plant was in shutdown at the time, having ceased feeding waste over 1hr before and the grate was clear, but due to a fault related to burners firing the CEMS system did not receive the plant off signal.

17/11/2016 – Schedule 5 notification was submitted for a breach of half hourly averages of HCl. This was one spike in HCl values but due to its timing affected two half hour periods with a half hourly average of 66.8mg/Nm³ in the first half hour and 97.7 mg/Nm³ in the second half hour compared to an ELV of 60 mg/Nm³.

Table 1: Emissions to Air from A1 CEMS

Releases to Air from Incinerators – Continuous Monitoring												
Parameter	Limit	Reference Period	A1 Quarter 1		A1 Quarter 2		A1 Quarter 3		A1 Quarter 4		Test Method	Uncertainty *
			Max	Avg	Max	Avg	Max	Avg	Max	Avg		
Oxides of nitrogen	150 mg/m ³	Daily average	124.3	115.7	118.0	115.1	116.7	114.66	136	118	BS EN 15267-3	*
	400 mg/m ³	½ hourly average	172.4	115.7	141.5	115.2	155.8	114.47	200	118.73		*
Particulate Matter	10 mg/m ³	Daily average	0.8	0.54	0.9	0.5	1.3	0.62	1.8	1.2		*
	30 mg/m ³	½ hourly average	3.8	0.5	7.1	0.5	4.3	0.67	23.6	1.2		*
TOC	10 mg/m ³	Daily average	0.2	0.12	0.4	0.15	0.3	0.18	1.6	0.4		*
	20 mg/m ³	½ hourly average	2.5	0.1	9.2	0.2	168 ^{\$} Ex sch 5 max= 0.8	0.23	1.8	0.4		*
Hydrogen chloride	10 mg/m ³	Daily average	7.4	5.3	7.1	5.4	6.6	5.07	8.4	5.88		*
	60 mg/m ³	½ hourly average	53.3	5.3	42.2	5.5	26.7	5.00	97.7 ^{\$\$\$} Ex sch 5 max= 12	5.96		*
Sulphur dioxide	50 mg/m ³	Daily average	23.9	15.9	21.2	13.75	30.4	13.73	29	16.69		*
	200 mg/m ³	½ hourly average	69.0	15.9	78.3	13.6	56.2	13.53	151	16.77		*
Carbon monoxide	50 mg/m ³	Daily average	1.2	0.19	6.5	0.31	2.4	0.25	2.9	0.3		*
	100 mg/m ³	½ hourly average (prior to permit variation)	48.7	0.2	170.9 ^{\$} Ex sch 5 max = 41.4	0.3	3059.5 ^{\$\$} Ex sch 5 max = 100	1.07	23.7	0.2		*
Carbon monoxide	150 mg/m ³	10 minute average	N/A	N/A	N/A	N/A	N/A	N/A	98	0.3		*

* Note. CEMS data figures are adjusted for the method uncertainty.

** Note. Max values observed did not require a Schedule Notification, as 95% of the values within the associated 24 hour periods were compliant

Note: ^{\$} Schedule 5 submitted for CO ½ hr breach 2nd May 2016

Note: ^{\$\$} Schedule 5 submitted for CO and TOC breach recorded during a shutdown period on 6th September 2016.

Note: ^{\$\$\$} Schedule 5 submitted for HCl breach on 17th November 2016 reaching a maximum of 97.7mg/Nm³.

Table 2: Emissions to Air from A1 and A2 (Periodic)

Releases to Air from Incinerators – Periodic Monitoring						
Substance / Parameter	Emission Limit Value	A1				Test Method
		Q1	Q2	Q3	Q4	
Nitrous oxide	None set mg/m ³	0.83	0.91	0.07	0.03	M22 / FTIR
Hydrogen fluoride	2 mg/m ³	0.03 (at or below LOD)	0.12	0.19	1.3	SRM BS ISO 15713
Cd and Th and their compounds	0.05 mg/m ³	0.002	0.0007	0.001	0.002	SRM BS EN 14385
Hg and its compounds	0.05 mg/m ³	0.001	0.001	0.003	0.0003	SRM BS EN 13211 / MID 14385
Sb, As, Pb, Cr, Co, Cu, Mn, Ni, V and their compounds	0.5 mg/m ³	0.28	0.03	0.018	0.04	SRM BS EN 14385
Dioxins & Furans (I-TEQ)	0.1 ng/m ³	0.001	0.0022	0.0054	0.0056	SRM BS EN 1948
Dioxins & Furans (WHO- TEQ Humans / Mammals)	None set ng/m ³	0.002	0.0022	0.0049	0.0059	
Dioxins & Furans (WHO- TEQ Fish)	None set ng/m ³	0.002	0.0025	0.0055	0.0060	
Dioxins & Furans (WHO- TEQ Birds)	None set ng/m ³	0.003	0.0040	0.0086	0.0110	
PCBs (WHO-TEQ Humans / Mammals)	None set ng/m ³	0.0003	0.0011	0.0010	0.0003	
PCBs (WHO-TEQ Fish)	None set ng/m ³	0.00003	0.0001	0.0000	0.0000	
PCBs (WHO-TEQ Birds)	None set ng/m ³	0.005	0.0025	0.0033	0.0027	SRM BS EN 1948

Anthanthrene	None set $\mu\text{g}/\text{m}^3$	<0.0121	<0.0138	<0.0152	<0.0131	SRM BS ISO 11338
Benzo(a)anthracene	None set $\mu\text{g}/\text{m}^3$	<0.0121	0.10	<0.0152	<0.0131	
Benzo(a)pyrene	None set $\mu\text{g}/\text{m}^3$	<0.0121	<0.0138	<0.0152	<0.0131	
Benzo(b)fluoranthene	None set $\mu\text{g}/\text{m}^3$	<0.0121	0.03	<0.0152	<0.0131	
Benzo(b)naphth(2,1-d)thiophene	None set $\mu\text{g}/\text{m}^3$	<0.0121	<0.0138	<0.0152	<0.0131	
Benzo(c)phenanthrene	None set $\mu\text{g}/\text{m}^3$	<0.0121	0.03	<0.0152	<0.0131	
Benzo(ghi)perylene	None set $\mu\text{g}/\text{m}^3$	<0.0121	<0.0138	<0.0152	<0.0131	
Benzo(k)fluoranthene	None set $\mu\text{g}/\text{m}^3$	<0.0121	0.04	<0.0152	<0.0131	
Dibenzo (a,i) pyrene	None set $\mu\text{g}/\text{m}^3$	<0.0121	<0.0138	<0.0152	<0.0131	
Cholanthrene	None set $\mu\text{g}/\text{m}^3$	<0.0121	0.08	<0.0152	<0.0131	
Chrysene	None set $\mu\text{g}/\text{m}^3$	<0.0121	0.03	<0.0152	<0.0131	
Cyclopenta(cd)pyrene	None set $\mu\text{g}/\text{m}^3$	<0.0121	<0.0138	<0.0152	<0.0131	
Dibenzo(ah)anthracene	None set $\mu\text{g}/\text{m}^3$	<0.0121	0.28	<0.0152	<0.0131	
Fluoranthene	None set $\mu\text{g}/\text{m}^3$	<0.0121	<0.0138	0.06	0.10	
Indeno(123-cd)pyrene	None set $\mu\text{g}/\text{m}^3$	<0.0121	1.04	<0.0152	<0.0131	
Naphthalene	None set $\mu\text{g}/\text{m}^3$	0.29	<0.0138	0.20	0.30	

3. Point Source Emissions to Water

3.1. Introduction

Permit Condition 3.5.1(a) and Table S3.2 requires Viridor to ensure sample point W1 is free of oil, grease and visible solids

3.2 Commentary on Data

Periodic checks on the monitoring point W1 have indicated that the sample point has remained free of oil grease.

3.3 Schedule Notices Issued

No Permit limit exceedances were recorded during the review period for emissions to water.

4. Residue Quality Monitoring Requirements

4.1 Introduction

Permit Condition 3.5.1(c) and Table S4.4 require Viridor to undertake residue quality monitoring at minimum monthly intervals for both bottom ash and air pollution control residues.

4.2 Commentary on Data

Incinerator Bottom Ash

Figures shown in Table 3 are the analysis undertaken during 2016 which has followed the criteria laid out in the ESA protocol.

Results recorded for incinerator bottom ash were all within the permit limit of 3% TOC. Other measures on the ESA protocol all measures are within the expected range for an energy recovery facility with the exception of Three samples in a row across June and July. which had results exceeding the threshold for HP14, Ecotoxicity due to elevated copper combined with slightly elevated lead results. This high average value was due to a very high %RSD and one or two very elevated results within the 11 replicates which are averaged suggesting unreliable results. As laid out in the ESA protocol for IBA this does not immediately cause the site to be declared hazardous but requires 12 rapid samples over a 6 week period. We instigated the 12 rapid samples using a different laboratory, WRc, who develop many of the IBA protocols alongside the Agency, with the two monthly samples usually taken also going to the usual laboratory.

On completion all results from both laboratories are non-hazardous against WM3, as reported to the Agency on 6th October 2016.

The test laboratory also, after investigation, deemed the laboratory results of sample PBR0028 (third of the high results) as invalid and repeated the complete analysis. This repeat has shown this sample to be non-hazardous for all measures under WM3, not above the limits for HP14 which would mean there was not a three in a row exceedance however we have completed the 12 rapid samples to further prove this.

Air Pollution Control Residues

Figures displayed in Table 4 are the analysis undertaken during 2016.

Results recorded for air pollution control residues are within the expected range for an energy recovery facility.

4.3 Schedule Notices Issued

No Permit limit exceedances were recorded during the review period for residue quality.

Table 3a: Residue Quality IBA - Jan - Jun

Residue quality							
Parameter	Limit	Normal Operation					
		Bottom ash					
		Line 1					
Month		Jan 16	Feb 16	Mar 16	Apr 16	May 16	Jun 16
Total Organic Carbon	3%	0.7%	0.9%	1.2%	0.7	0.8	<0.5
Antimony (mg/kg)	---	102	198	138	212	219	125
Cadmium (mg/kg)	---	65.1	12.7	9.21	21.8	26.9	16.0
Thallium (mg/kg)	---	0.11	<0.1	<0.1	<0.1	<0.1	<0.1
Mercury (mg/kg)	---	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Lead (mg/kg)	---	749	831.6	471.1	694	937.0	2586
Chromium (mg/kg)	---	137	167	153	163	175	245
Copper (mg/kg)	---	2052	2341.7	1569.5	2046.9	1929.9	5304
Manganese (mg/kg)	---	950	1039	864	851	761	671
Nickel (mg/kg)	---	100	85.2	81.6	88.1	207	68.9
Arsenic (mg/kg)	---	9.2	15.1	12.2	23.7	17.8	10.4
Cobalt (mg/kg)	---	51.4	24.9	22.8	29.1	29.6	13.6
Vanadium (mg/kg)	---	44.0	48.3	36.3	44.5	44.1	28.9
Zinc (mg/kg)	---	2590	2658.3	2154.5	3182.0	2853.4	5225.8
Dioxins WHO 2005-TEQ (ng/kg)	---	0.74	2.13	1.64	2.05	7.75	1.83
Furans WHO 2005-TEQ (ng/kg)	---	0.85	1.30	1.81	1.03	2.45	1.80
PCB (WHO 2005-TEQ) (ng/kg)	---	0.00073	0.301	0.462	2.58	2.73	0.28

Table 3b: Residue Quality IBA - Jul - Dec

Residue quality							
Parameter	Limit	Normal Operation					
		Bottom ash					
		Line 1					
Month		Jul 16	Aug 16	Sept 16	Oct 16	Nov 16	Dec 16
Total Organic Carbon	3%	0.8	0.5	0.8	0.8	0.7	0.5
Antimony (mg/kg)	---	126	131	157	261	123	150
Cadmium (mg/kg)	---	24.0	12.9	19.9	34.8	18.5	17.6
Thallium (mg/kg)	---	<0.1	<0.1	<0.1	<0.1	0.13	0.13
Mercury (mg/kg)	---	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Lead (mg/kg)	---	535.0	519.3	514.3	571.8	723.4	877.7
Chromium (mg/kg)	---	131	134	112	33.3	120	178
Copper (mg/kg)	---	2042.9	1598.7	1957.4	626	1903.8	2694.6
Manganese (mg/kg)	---	881	779	843	321	813	1244
Nickel (mg/kg)	---	80.7	71.0	63.8	<10	71.6	114.0
Arsenic (mg/kg)	---	18.8	10.9	15.7	45.9	10.6	14.1
Cobalt (mg/kg)	---	58.4	21.7	37.7	3.2	41.7	77.0
Vanadium (mg/kg)	---	36.6	25.8	27.2	<10	47.1	74.8
Zinc (mg/kg)	---	3380.9	3024.5	3088.9	11830	2428.0	3400.1
Dioxins WHO 2005-TEQ (ng/kg)	---	5.08	1.71	2.57	0.598	0.642	5.572
Furans WHO 2005-TEQ (ng/kg)	---	7.78	5.72	1.22	0.285	0.591	2.33
PCB (WHO 2005-TEQ) (ng/kg)	---	0.037	4.50	0.22	1.17	0.080	2.23

Table 4a: Residue Quality APCr - Jan - Jun

Residue quality							
Parameter	Limit	Normal Operation					
		APCr					
		Line 1					
Month		Jan 16	Feb 16	Mar 16	Apr 16	May 16	Jun 16
Antimony (mg/kg)	---	387	564	709	697	569	1014
Cadmium (mg/kg)	---	143	230	393	376	334	268
Thallium (mg/kg)	---	0.44	0.76	0.99	1.20	1.05	1.06
Mercury (mg/kg)	---	6.91	8.56	9.18	9.78	6.35	8.14
Lead (mg/kg)	---	1121	1425	1695	1990	1954	1883
Chromium (mg/kg)	---	26.5	23.1	36.2	36.6	27.8	58.7
Copper (mg/kg)	---	510	504	559	716	665	665
Manganese (mg/kg)	---	353	351	301	339	325	320
Nickel (mg/kg)	---	<10	10.6	<10	11.9	<10	15.0
Arsenic (mg/kg)	---	28.2	28.5	40.0	50.1	46.1	44.9
Cobalt (mg/kg)	---	3.0	2.7	2.6	3.1	3.2	3.3
Vanadium (mg/kg)	---	<10	<10	<10	<10	<10	<10
Zinc (mg/kg)	---	8178	10360	12550	15170	15710	11040
Dioxins WHO 2005-TEQ (ng/kg)	---	53.77	35.02	46.32	33.13	35.15	33.75
Furans WHO 2005-TEQ (ng/kg)	---	95.99	58.49	96.22	43.72	84.84	57.41
PCB (WHO 2005- TEQ) (ng/kg)	---	6.21	88.59	2.95	2.62	1.31	2.29

Table 4b: Residue Quality APCr - Jul – Dec

Residue quality							
Parameter	Limit	Normal Operation					
		APCr					
		Line 1					
Month		Jul 16	Aug 16	Sept 16	Oct 16	Nov 16	Dec 16
Antimony (mg/kg)	---	387	921	831	774	798	496
Cadmium (mg/kg)	---	143	359	328	308	315	223
Thallium (mg/kg)	---	0.44	1.12	1.04	1.06	1.12	0.74
Mercury (mg/kg)	---	6.91	7.33	13.6	27.0	9.08	13.4
Lead (mg/kg)	---	1121	2224	1932	1906	1963	1110
Chromium (mg/kg)	---	26.5	69.0	45.9	33.3	46.0	30.3
Copper (mg/kg)	---	510	617	656	626	668	547
Manganese (mg/kg)	---	353	380	360	321	377	394
Nickel (mg/kg)	---	<10	17.7	<10	<10	11.2	16.6
Arsenic (mg/kg)	---	28.2	69.0	74.7	45.9	51.2	35.2
Cobalt (mg/kg)	---	3.0	5.4	3.2	3.2	4.7	4.2
Vanadium (mg/kg)	---	<10	<10	<10	<10	<10	30.0
Zinc (mg/kg)	---	8178	12900	15130	11830	15450	9145
Dioxins WHO 2005-TEQ (ng/kg)	---	40.41	272.58	13.35	29.075	125.72	57.625
Furans WHO 2005-TEQ (ng/kg)	---	68.88	622.73	49.46	55.089	256.29	88.956
PCB (WHO 2005- TEQ) (ng/kg)	---	2.62	74.93	3.39	2.354	31.872	4.096

5. Performance Parameters

5.1 Introduction

Condition 4.2.2(b), (c), Table S4.2 and S4.3 of the Permit set out the reporting criteria for production and performance parameters.

5.2 Commentary on Data

The annual production and performance data for 2016 is summarised in Tables 5 and 6.

Table 5: Production 1

Annual Production Data		
Parameter	2016	Units
Total mass of waste accepted	84454.35	tonnes
Total mass of separately collected fractions	0	
Electricity generated	62850.46	MWh
Electricity exported to the National Grid	55747.44	
Energy exported as steam (if any)	0	

Table 6: Performance 1

Annual Performance Data		
Parameter	2016	Units
Waste burnt	82702.38	tonnes
Water Usage (process)	0.38m ³ /tonne	m ³ /tonne waste incinerated
Energy Usage (Includes imported and parasitic usage)	0.089 MWh/tonne waste incinerated (7373.4 MWh used *)	MWh/tonne waste incinerated
Gas oil consumption	109014 litres used	kg/tonne waste incinerated
Total Ammonia used	3.29 kg/tonne (271.78 tonnes used)	
Total acid abatement reagent used	16.38 kg/tonne (1354.52 tonnes used)	
Total Powdered Activated Carbon used	0.38 kg/tonne (31.43 tonnes used)	
Total Air Pollution Control residues disposed of	23.56 kg/tonne (1948.3 tonnes produced)	
Total bottom ash generated	232.16 kg/tonne (19200.64 tonnes produced)	
Total bottom ash recycled/reused	All ash reprocessed/recycled	
Total bottom ash disposed of	0	