



Bolton ERF

Annual Performance Report 2016



**Annual performance report for Bolton Energy Recovery Facility
Permit number BS3042 IM
Year 2016**

1 Introduction.

Bolton Energy Recovery Facility, Raikes Lane, Bolton, BL3 2NH, is operated by Viridor as part of the Greater Manchester Waste Disposal Authority PFI contract

The plant burns mixed municipal waste from Bolton MBC, Bury MBC, Salford CC, Rochdale MBC and, from June 2015, Blackburn & Darwen MBC in varying quantities. The plant also incinerates commercial waste, trade waste and confiscated items from the police and customs

For further copies of this report or any comment please contact S. Robinson, Plant Manager, at Viridor, Bolton Energy Recovery Facility, Raikes Lane, Bolton, BL3 2NH

2 Plant Description.

The installation is a single incinerator designed to have a capacity to burn municipal waste at approximately 16 tonnes an hour. Waste types are brought to the site by road transport (mainly council collection vehicles and bulk transfer vehicles) which enters the site via a weighbridge

Acceptable waste is discharged into a reception pit with a holding capacity of 1530m³ and any excess is discharged onto the floor of the tipping hall, both of which are enclosed within a building. Waste is transferred from the reception pit to the incinerator feed hopper by crane operated grab. From the hopper, it falls by gravity onto the inclined four hearth rocking grate

Primary, combustion air is provided by two primary air fans upwards through the grate and secondary combustion air is provided by a separate fan, via ports in the roof of the furnace.

Supplementary oil fired burners are used to ensure that the combustion temperature of the waste combustion gases are raised to a minimum of 850°C at all times when waste is being burned on the incinerator grates and particularly during start up and shut down

Heat from the burning of the waste is used in the heat recovery boiler to raise steam which is then used to drive a steam turbine which is coupled to a generator via a gearbox. The generated electricity is used for powering plant auxiliaries, using 11kV to 440v step down transformers. The surplus generated electricity is exported to the national grid via 11kV to 33kV transformers

In the event that the turbine/generator set is off-line, the site imports electricity via the same transformers but in the reverse direction i.e. 33kV to 11kV

The site has an additional standby connection to a 6.6kV electricity supply for emergency use i.e. it has sufficient capacity to allow the plant to be safely shut down in the event of a failure of the 33kV connection. There are electrical interlocks in place which prevent the site being connected to both the 33kV and the 6.6kV at the same time

Within the first pass of the boiler very dilute ammonia is injected to control the oxides of nitrogen (NO_x) of the combustion gases. This ammonia injection is controlled by a selective, non-catalytic reduction (SNCR) system. Feedback signals of the NO_x concentration are fed to the SNCR from the continuous emissions monitoring system (CEMS) at the chimney. Recipes within the SNCR then regulate the ammonia injection concentration to ensure all emission limit values (ELV's) are met

On exiting the heat recovery boiler the combustion gases pass into a reaction area where lime and activated carbon are injected into the gas stream to remove acid gases, dioxins, heavy metals and organic vapours

The gases then pass through a four cell bag filter where the scrubbing agents and the dust in the combustion gases are collected before the cleaned gases are discharged to atmosphere via a 61 metre high chimney stack. A proportion of the scrubbing reagents are recycled in the process to ensure maximum use of the lime

Storage silos are provided for the lime, activated carbon, recycled reagent and the atmospheric pollution control residue (APCr).

Incinerator bottom ash (IBA) is discharged from the incinerator grate and falls into a water quenching trough. The ash is drained of surplus water as it moves up a slow moving, inclined chain ash conveyor before dropping onto an inclined belt conveyor. An over-band magnet recovers ferrous metal from the ash and the residual ash is stored within a covered building before being sent for reuse

Duty and standby CEMS are installed in the gas ducting upstream of the chimney stack to analyse the exhaust gases from the process. These include particulates, sulphur dioxide, NOx, carbon monoxide, hydrogen chloride, TOC and ammonia

Water is abstracted from the River Croal for use in the twin cell, hybrid cooling tower and for process use such as the water in the quench trough. Blow down water from the cooling tower is returned to the River Croal

Surface water from the flue gas treatment (FGT) and ash quenching area is recycled back to the process. Solids that are filtered from the river water, along with some of the river water, are discharged to public sewer.

3 Summary of plant operations

(a) The plant is single furnace

Permitted Waste types in tonnes		
Waste type	Limitation	Total
Mixed Municipal waste	Domestic, bulky and street market collections	85800.31
Commercial Waste	Cardboard, packaging and confidential documents	3.26
Animal by- product	International catering waste	0
Trade waste	Similar to household waste	584.56
Confiscated Items	Brought in by police/customs	0.72

(b)

Total Plant operational hours were 7112hrs = 80.96% availability	
Total turbine operational hours were 7033 = 80.07% availability	
Planned shutdown (1077hrs from April 29 th to 13 th June)	1077 hrs
Significant plant failures	
Boiler tube failure	493hrs
Grate fouling	61hrs
Refractory damage	32hrs

See Appendix 1 for full summary of plant availability and downtime

(c)

Residues Produced in tonnes		
Bottom Ash	Air Pollution Control	Ferrous Metal
17602	3169	1759
Recovered	Hazardous Landfill	Recovered

(d)

Electricity Produced MW/h		
Generated	Exported	Average MW/h
53456MWh	43439MWh	7.51MWh Generated
		6.11MWh Exported

4 Summary of Plant Emissions

(a)

Pollutants Measured continuously to Air

Particulate	Total hydrocarbons (THC)	Hydrogen Chloride (HCl)	Carbon Monoxide (CO)	Sulphur Dioxide (SO ₂)	Oxides of Nitrogen (NO _x)	Ammonia (NH ₃)
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Pollutants Measured continuously to Water

Temperature	Free Chlorine	pH
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Pollutants Measured Periodically to Air

Bi-annually			
Particulate	Total hydrocarbons (THC)	Hydrogen Chloride	Carbon Monoxide
Sulphur Dioxide (SO ₂)	Oxides of Nitrogen (NO _x)	Dioxins/Furans I-TEQ	Ammonia (NH ₃)
Nitrous Oxide N ₂ O	Dioxin-like PCB's (WHO-TEQ ¹) Humans/mammals)	PAH's	
Quarterly			
Hydrogen Fluoride (HF)	Cadmium/Thallium & their compounds	Mercury & its compounds	Sb,As,Pb,Cr, Co,Cu,Mn, N & V and their compounds (Heavy metals)

(b) The Continuous Emissions Monitoring System (CEMS) was operating normally for 100% of the burning hours

(c) CEM's data - see Appendix 2

(d) Periodic emissions monitoring results (mg/m³ unless stated)

	Q1	Q2	Q3	Q4
Particulate		2.5		8.3
TOC		1.57		0.86
HCL		11		2.5
HF	0.05	1.21	0.74	0.56
CO		14.93		21
SO ₂		8.91		22
NO _x		230		177
N ₂ O		0.44		4.1
Dioxins& Furans		0.0028ng/m ³		0.0072ng/m ³
NH ₃		0.37		0.1
Metals	0.1	0.16	0.04	0.09
Cadmium/ Thallium	0.002	0.0014	0.002	0.0014
Mercury	0.003	0.0014	0.003	0.0023
Dioxins & furans (WHO-TEQ)				
Humans/mammals		0.003ng/m ³		0.007ng/m ³
Fish minimum		0.003ng/m ³		0.011ng/m ³
Birds minimum		0.006ng/m ³		0.007ng/m ³
Dioxin –like PCBs (WHO-TEQ)				
Humans/mammals		0.0012ng/m ³		0.0005ng/m ³
Fish minimum		0.0001ng/m ³		0.0001ng/m ³
Birds minimum		0.002ng/m ³		0.002ng/m ³
PAH's (WID suite)		3.74ug/m3		1.66ug/m3

5 Summary of plant compliance.

(a)

Percentage of time the plant was compliant with the permit conditions						
Particulate	TOC	HCL	CO	SO ₂	NO _x	NH ₃
100%	100%	100%	100%	100%	100%	99.993%

(b) Non-Compliances

A breach of the half hourly ELV for ammonia was reported on 28th March 2016.

14.76 mg/m³ was recorded as the half hourly average at an average flow rate of 30167.09 Nm³/h (against a permitted average of 10mg/m³). The exceedance occurred when waste was prevented from entering the furnace by a blockage at the bottom of the furnace feedchute.

During the planned shutdown in May the bottom of the feed chute was completely re-designed to minimise the risk of recurrence

(c) Abnormal operations (maximum 60 hrs per year)

No hours were claimed as abnormal operations in 2016

(d) Complaints

One complaint was received and was ongoing for a number of months from a local resident regarding 'smoke' from the installation. The complaint was investigated by the Plant Manager and identified as steam issuing from various parts of the plant during normal operations. An offer of a site visit for the resident was given via the EA Officer responsible for the site but the offer was not taken up

(e) Formal Enforcement Actions

No formal enforcement action

(f) Operator Monitoring Assessment (OMA)

An OMA was carried out by the EA in July and an overall score of 93% was achieved

Recommendations for improvement included:

- A written procedure for the management of CEMS, monthly QAL3's and maintenance
- Auditing the on-site sampling contractor during routine testing and functional checks using a standard template
- Improved use of zero and span checks on the QAL3 procedure

6 Summary of plant improvements

The following improvements have been carried out during 2016:

- No.2 primary air fan was completely overhauled
- The two main cooling water pumps were replaced for more energy efficient models
- Work has continued on improving the design of the grate teeth to further improve the quality of the combustion process
- A furnace optimisation system fitted in 2015 has been further improved by increasing the pressure of the water mist system so that furnace temperatures are better controlled. This has minimised furnace refractory damage
- The river water pipe that brings water onto site from the River Croal was found fractured and subsequently repaired, reducing the need for using towns water in the cooling towers
- The drive mechanisms on grate 3 drive shafts have been replaced with a keyless system. Similar modifications are planned on the remaining two grates during the May 2017 planned shutdown
- Cabling and isolators have been upgraded on the two main air compressors
- 'Vibro' motors have now been fitted to all four grate hoppers to prevent build-up of ash deposits which were previously causing problems with jamming the under-grate mechanisms. The vibration has proved very effective in keeping the hoppers clear
- 'Bang & Clean' sonic cleaning methods continued to be employed throughout the year to prevent dust build up in key areas of the furnace ducting into the boiler to avoid unnecessary shutdowns
- The south wall and division wall of the boiler first pass have been replaced. This was the reason for the prolonged shutdown in May and June
- A sprinkler fire protection system has now been installed in both the main tipping hall and in the TLS building. Water cannon have been installed over the reception pit
- General improvement in various access platforms
- Additional access door into the furnace to further reduce the risk of manual handling type accidents during shutdowns

7 Summary of information made available

- (a) Bolton Energy Facility Liaison Forum meets every six months in May and November. Representatives attend from the three ward Councils, Local Residents Associations, Environmental Agency, Bolton Environmental Health Organisation and Viridor (Greater Manchester). The agenda covers the following topics:-

1. Complaints
2. Plant Performance
3. Waste Incinerated, Bottom Ash, APCr produced
4. Electricity Generated
5. Report on ERF Emission Performance and Monitoring program
6. Environment Agency Report & Comments
7. Education Centre update
8. Household Waste Recycling Centre update
9. Community issues – Bolton MBC
10. Community issues – residents representatives
11. Any other business

Minutes from the meeting are circulated to all who attended

(b) Bolton Energy Recovery Facility information is available at:

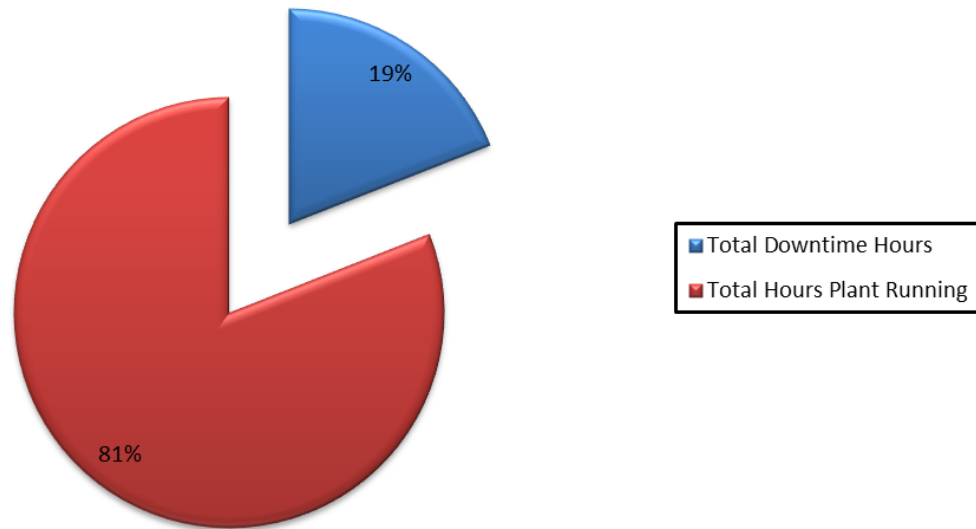
Environment Agency
Appleton House
430 Birchwood Boulevard
Birchwood
Warrington
WA3 7WD

Bolton Environment Department
Weston House
Weston Street
Bolton
Lancashire
BL3 2AR.

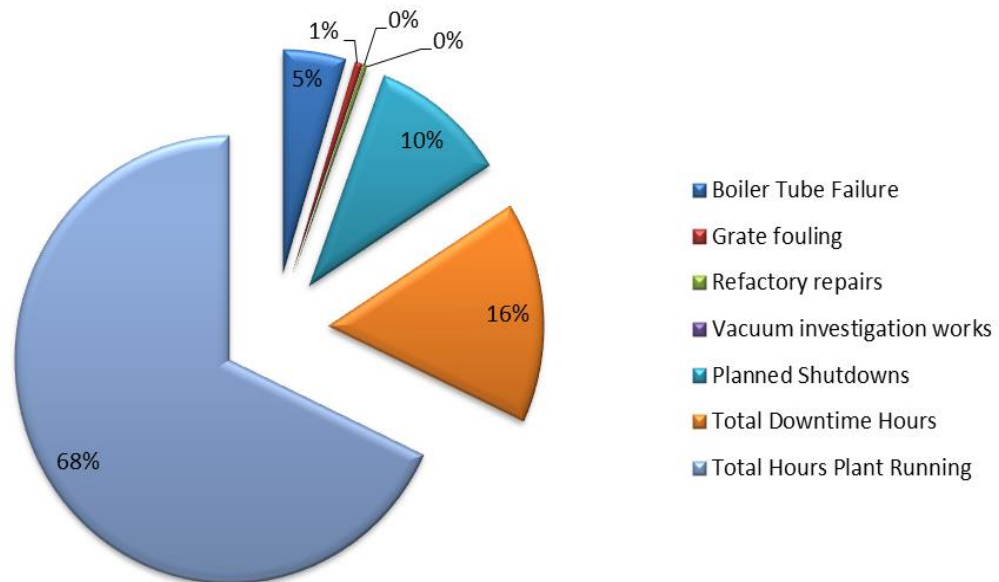
Karen Hall
Communications Manager
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Unit 4 Hurstwood court
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Appendix 1

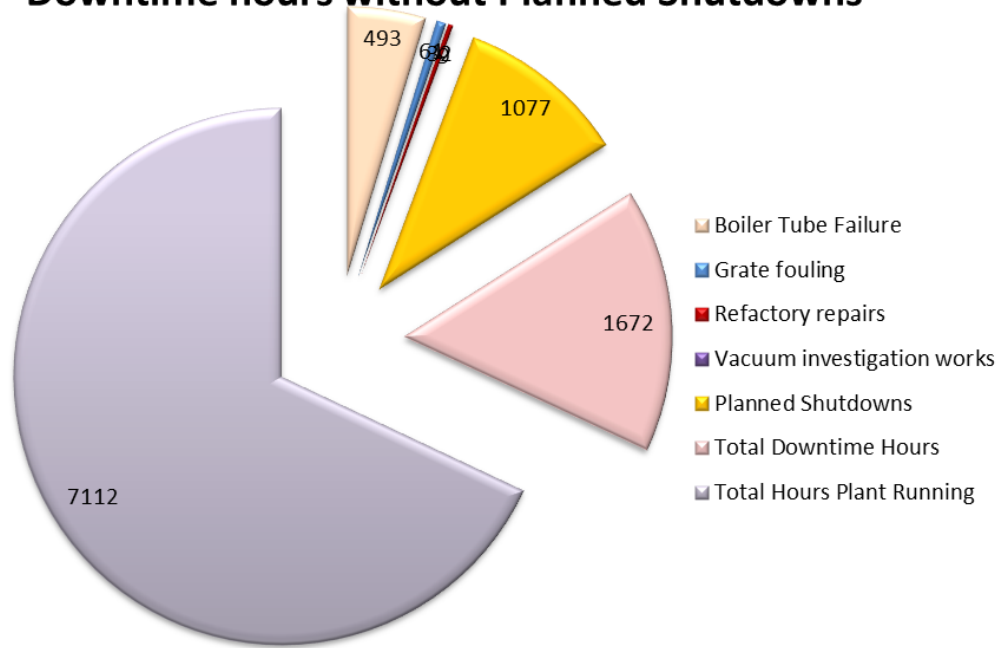
Bolton ERF Availability 2016



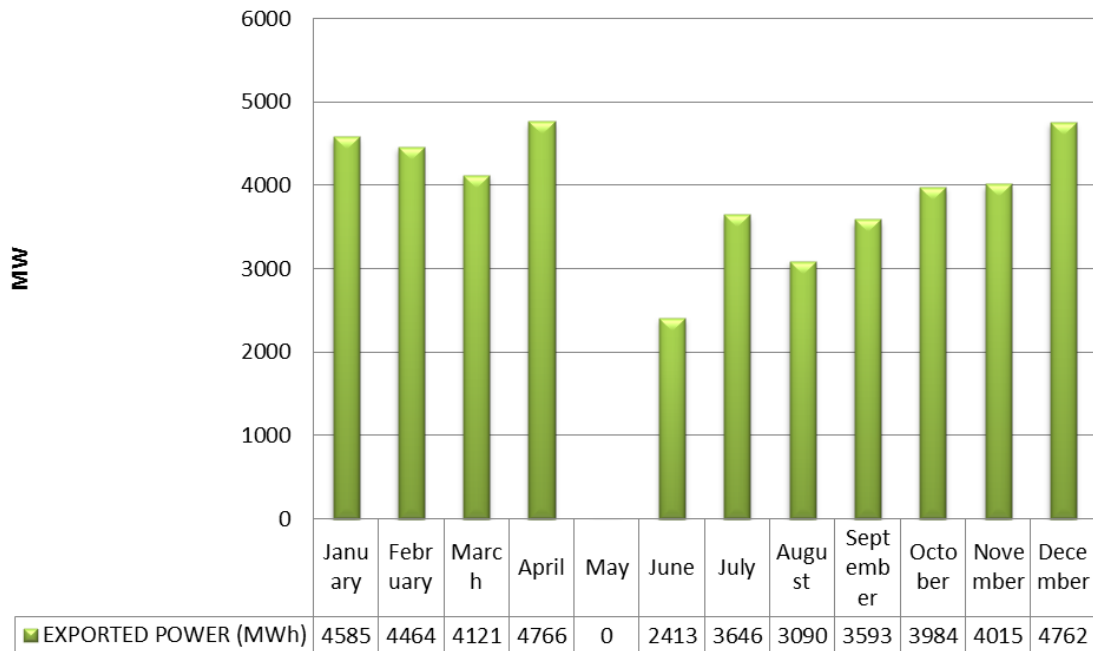
Downtime analysis without Planned Shutdowns



Downtime hours without Planned Shutdowns



EXPORTED POWER (mw) BY MONTH



Appendix 2

2016	Monthly Emissions																											
	Jan-16							Feb-16							Mar-16							Apr-16						
	particulate	NH ₃	NOx	SO ₂	THC	HCL	CO (10 min)	particulate	NH ₃	NOx	SO ₂	THC	HCL	CO (10 min)	particulate	NH ₃	NOx	SO ₂	THC	HCL	CO (10 min)	particulate	NH ₃	NOx	SO ₂	THC	HCL	CO (10 min)
Half hour limit emission limit	30	10	400	200	20	60	150	30	10	400	200	20	60	150	30	10	400	200	20	60	150	30	10	400	200	20	60	150
Monthly Max half hour	2.7	4.9	301.1	23.2	19.7	12.5	16.4	6.3	6.1	309	29.9	12.7	19.9	20.6	2.1	14.8	274.4	71.6	3.2	19.3	6.3	1.7	5.0	222.1	47.7	9.0	24.2	18.2
Monthly Mean half hour	0.5	0.3	164.8	6.7	1.0	8.9	1.7	1.0	0.7	153.4	5.5	0.8	9.0	2.3	0.5	0.5	145.5	0.6	0.7	9.1	3.5	0.5	0.4	154.6	3.2	0.9	9.0	2.2
Monthly Minimum half hour	0.0	0.0	89.4	0.6	0.0	2.2	0.0	0.3	0.0	76.7	0.0	0.0	2.2	0.0	0.2	0.0	82.2	0.0	0.2	1.3	0.6	0.2	0.0	86.8	0.0	0.0	0.6	0.0
Daily emission limit	10.0	n/a	200.0	50.0	10.0	10.0	50.0	10.0	n/a	200.0	50.0	10.0	10.0	50.0	10.0	n/a	200.0	50.0	10.0	10.0	50.0	10	n/a	200	50	10	10	50
Monthly Maximum daily avg.	0.9	1.1	192.2	9.3	3.0	9.5	5.1	4.2	2.4	193.4	9.8	2.9	9.4	8.9	0.8	1.3	167.4	1.7	1.4	9.6	16.3	0.7	0.7	187.4	7.0	1.8	9.4	10.0
	May-16							Jun-16							Jul-16							Aug-16						
	particulate	NH ₃	NOx	SO ₂	THC	HCL	CO (10 min)	particulate	NH ₃	NOx	SO ₂	THC	HCL	CO (10 min)	particulate	NH ₃	NOx	SO ₂	THC	HCL	CO (10 min)	particulate	NH ₃	NOx	SO ₂	THC	HCL	CO (10 min)
Half hour limit emission limit	30	10	400	200	20	60	150	30	10	400	200	20	60	150	30	10	400	200	20	60	150	30	10	400	200	20	60	150
Monthly Max half hour								16.4	5.3	313.0	28.1	5.0	21.7	13.4	8.3	4.8	289.1	21.8	5.8	20.2	33.8	2.8	8.9	305.1	33.9	15.6	26.3	8.7
Monthly Mean half hour								0.7	0.6	157.9	8.1	2.2	9.0	1.8	1.0	0.5	158.9	4.4	1.0	9.0	2.7	0.7	1.0	160.0	10.8	0.9	9.1	1.5
Monthly Minimum half hour								0.0	0.0	133.5	0.0	0.0	1.3	0.0	0.2	0.0	82.3	0.0	0.0	2.4	0.0	0.1	0.0	98.9	0.0	0.0	2.8	0.0
Daily emission limit	10	n/a	200	50	10	10	50	10	n/a	200	50	10	10	50	10	n/a	200	50	10	10	50	10	n/a	200	50	10	10	50
Monthly Maximum daily avg.								3.1	1.8	174.6	11.7	2.8	9.8	4.4	3.4	1.9	186.8	9.6	2.5	9.5	12.2	1.4	2.6	188.3	20.3	3.0	9.7	5.1
	Sep-16							Oct-16							Nov-16							Dec-16						
	particulate	NH ₃	NOx	SO ₂	THC	HCL	CO (10 min)	particulate	NH ₃	NOx	SO ₂	THC	HCL	CO (10 min)	particulate	NH ₃	NOx	SO ₂	THC	HCL	CO (10 min)	particulate	NH ₃	NOx	SO ₂	THC	HCL	CO (10 min)
Half hour limit emission limit	30	10	400	200	20	60	150	30	10	400	200	20	60	150	30	10	400	200	20	60	150	30	10	400	200	20	60	150
Monthly Max half hour	2.9	7.8	280.0	23.4	3.2	16.1	12.6	2.6	5.9	264.0	24.9	19.6	21.7	17.1	9.6	7.1	284.6	17.6	6.5	17.0	11.8	13.0	8.9	251.2	19.2	3.0	18.0	2.8
Monthly Mean half hour	0.9	0.9	134.6	10.4	0.3	9.2	1.2	0.9	1.0	138.6	7.5	0.3	9.2	0.8	1.8	0.8	147.6	7.7	0.7	9.2	1.1	2.7	0.4	149.3	3.8	0.6	9.2	1.4
Monthly Minimum half hour	0.2	0.0	90.1	0.0	0.0	2.8	0.0	0.3	0.0	94.7	0.1	0.0	2.4	0.0	0.5	0.0	97.3	1.8	0.0	3.3	0.0	0.4	0.0	88.6	0.4	0.0	3.7	0.0
Daily emission limit	10	n/a	200	50	10	10	50	10	n/a	200	50	10	10	50	10	n/a	200	50	10	10	50	10	n/a	200	50	10	10	50
Monthly Maximum daily avg.	1.2	1.6	159.1	16.0	0.8	9.6	8.5	1.5	2.5	155.9	9.0	0.8	9.6	8.2	3.0	2.0	171.6	9.5	2.2	9.5	14.9	5.3	1.0	159.3	5.0	1.4	9.5	6.6



January 2017