

# Annual performance report for: Thames Water Beckton Sludge Powered Generator

Permit Number: EPR/ ZP3833BK

Year: 2018

This report is required under the Industrial Emissions Directive's Article 55(2) requirements on reporting and public information on waste incineration plants and co-incineration plants, which require the operator to produce an annual report on the functioning and monitoring of the plant and make it available to the public.

## 1. Introduction

Name and address of plant	Beckton Sludge Powered Generator Jenkins Lane Barking Essex IG11 0AD
Description of waste input	Sewage sludge
Operator contact details if members of the public have any questions	Marlon Esau marlon.esau@thameswater.co.uk

## 2. Plant description

The Sludge Powered Generator (SPG) comprises of 3 identical process streams served by common utility systems. The overall dewatering and incineration capacity is 13.5 tonnes dry solids (TDS) per hour, equal to 4.5 TDS/h for each incineration stream.

The thickened mixture of primary and secondary surplus activated sludge is supplied to the sludge draw-off tanks, which work as a buffer for the batch-operated dewatering process. Sludge is dewatered via 8 (7 duty/1 standby) membrane filter presses using a solution of polyelectrolyte from a storage and make up plant as flocculation aid.

Sludge cake discharged from the presses is transferred and distributed via a trough chain conveyor system to 3 cake storage silos, one for each incineration stream. Sludge cake is then drawn from the silo and transferred to a rotary feeder at the incinerator. The throughput of each stream is calculated via integration of the silo loads and can be adjusted through the variable speed silo discharge screw conveyor.

Sludge incineration takes place in a fluidised bed incinerator. This consists of a cylindrical, brick-lined vertical combustion chamber where, in the lower part, a sand bed is kept in fluidizing motion by the injection of combustion air (fluidising air) through the nozzle grate. A start up burner is fitted to the inlet of a combustion chamber attached to the bottom section of the incinerator (wind box) below the nozzle grate. To enable auto-thermal (no external fuel source) operation under normal conditions fluidising air supplied through combustion chamber and wind box will be preheated in a 3 stage system.

Flue gas leaving the incinerator passes through a waste heat recovery boiler. High pressure steam of 42 bar(a) and 400°C is generated and fed to a steam turbine for power generation.

The flue gas cleaning process comprises of dust separation in a cyclone, a circulating fluidised bed process for mercury removal and a multi stage scrubbing process removing pollutants to meet the emission standard. Concentrations of the relevant contaminants are continuously monitored prior to flue gas being released into the atmosphere through a single multi flue stack.

### 3. Summary of Plant Operation

Other waste received- sewage sludge	42,994 tonnes
Total waste received	42,994 tonnes
Total plant operational hours	Incineration Line 1: 6,418 hrs Incineration Line 2: 6,078 hrs Incineration Line 3: 4,744 hrs
Total hours of “abnormal operation” (see permit for definition)	05h14 hours
Total quantity of incinerator bottom ash (IBA) produced	0 tonnes
Disposal or recovery route for IBA	n/a
Did any batches of IBA test as hazardous? If yes, state quantity	n/a
Total quantity of air pollution control (APC) residues produced	2,668 tonnes
Disposal or recovery route for APC residues	Disposal
Total electricity generated for export to the National Grid	30,828 MWh

#### Additional Information

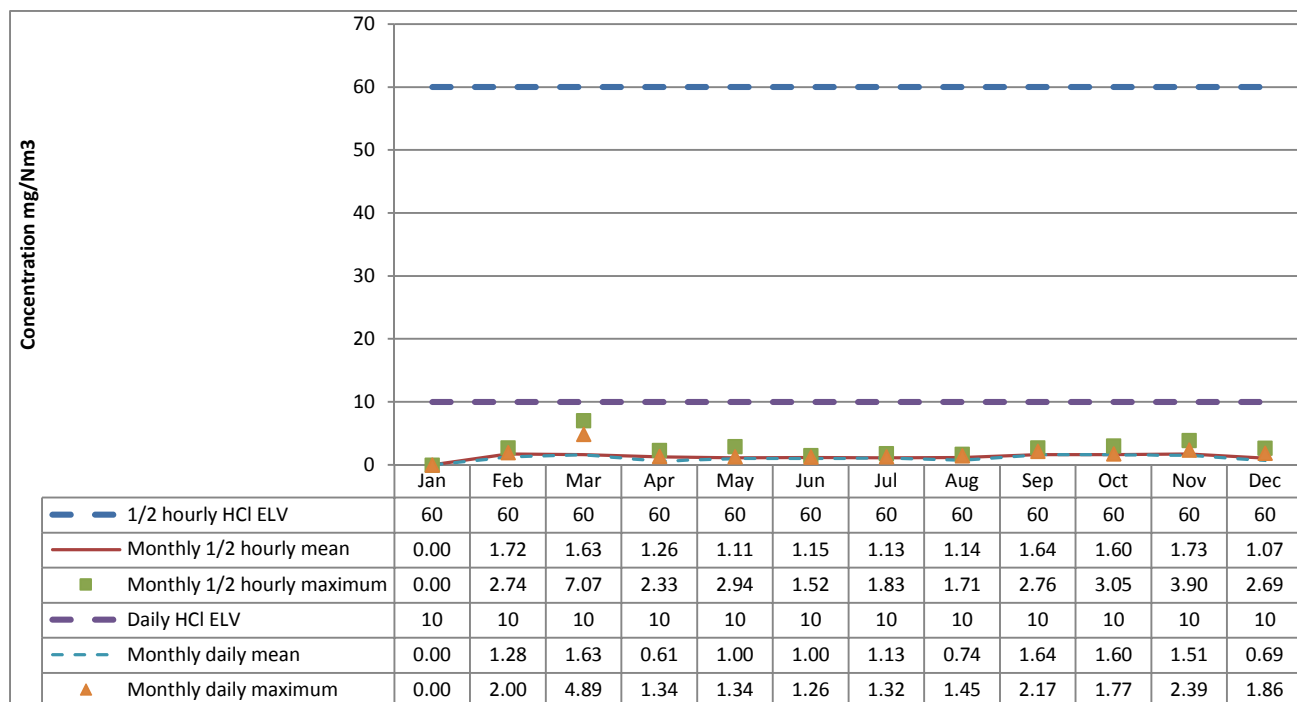
Total quantity of incinerator fly ash produced	3,713 tonnes
Disposal or recovery route for fly ash	Disposal
Did any batches of fly ash test as hazardous? If yes, state quantity	Yes, 3,713 tonnes

## 4. Summary of Plant Emissions

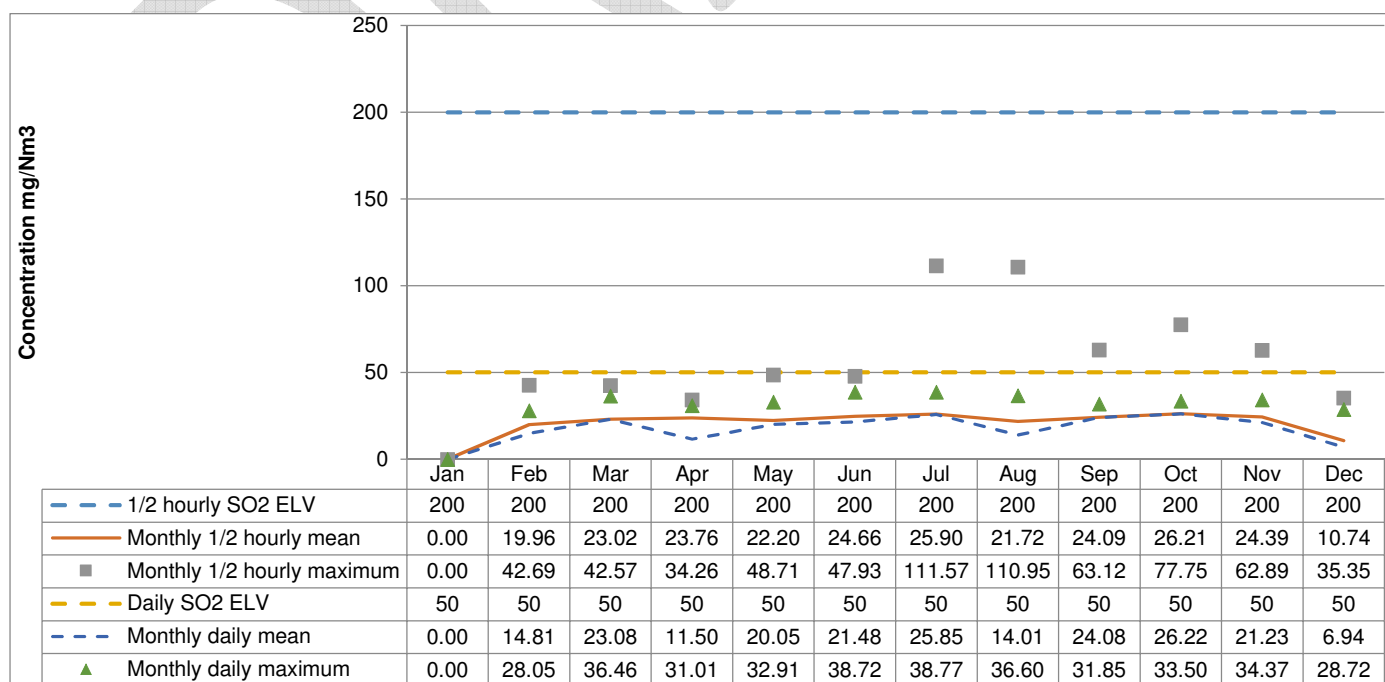
### 4.1 Summary of continuous emissions monitoring results for emissions to air

The following charts show the performance of the plant against its emission limit values (ELVs) for substances that are continuously monitored.

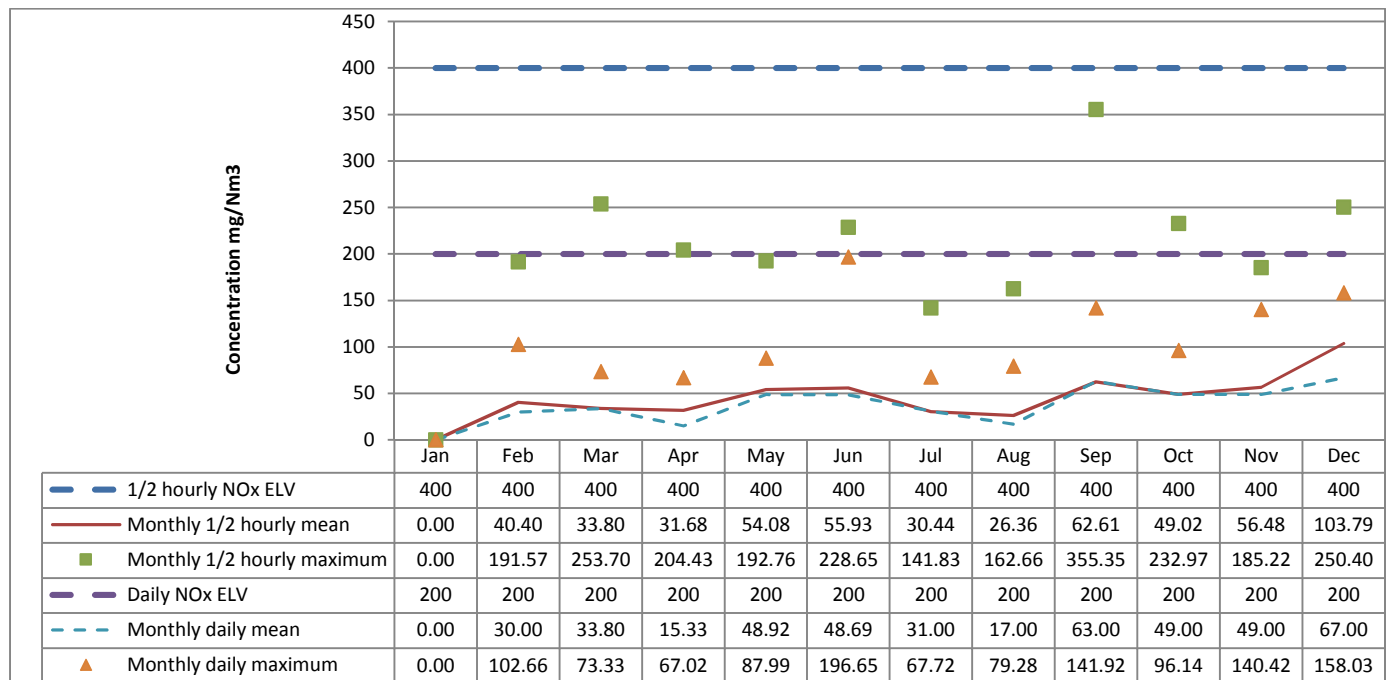
#### Line 1 - Hydrogen chloride



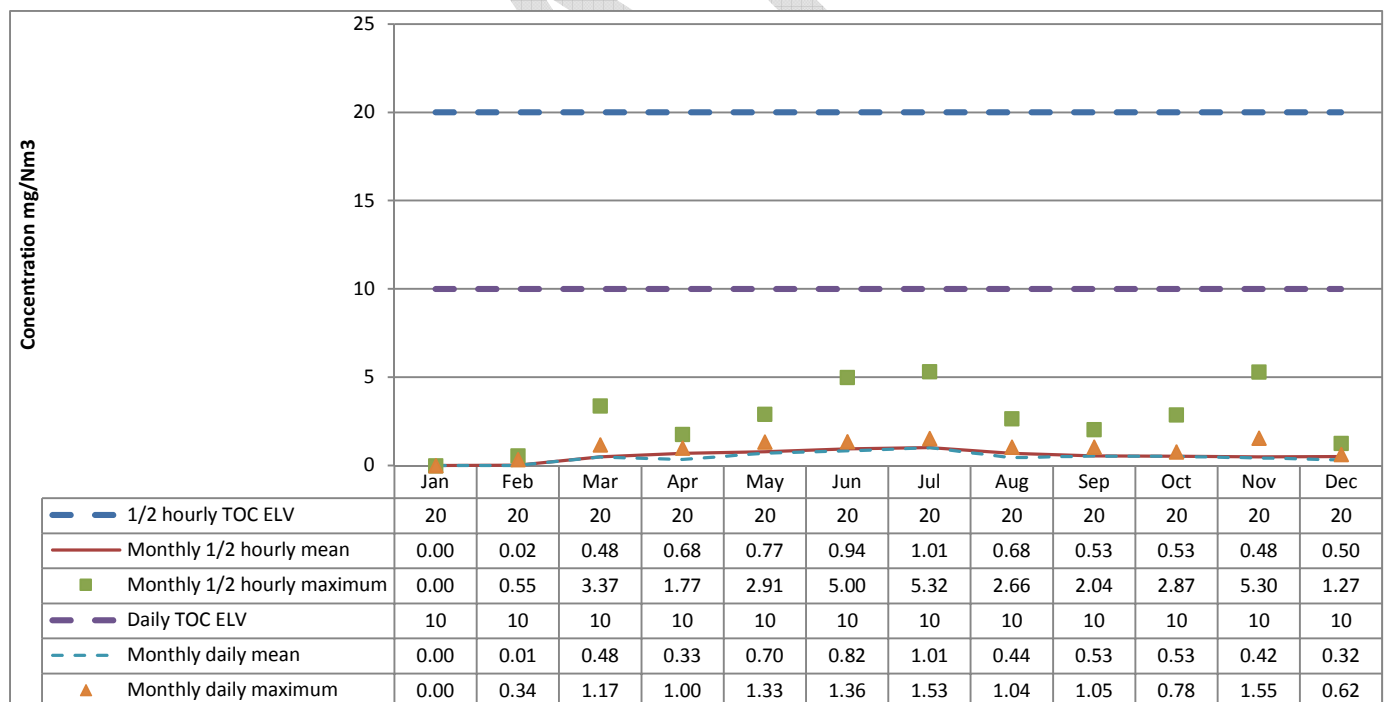
#### Line 1 – Sulphur dioxide



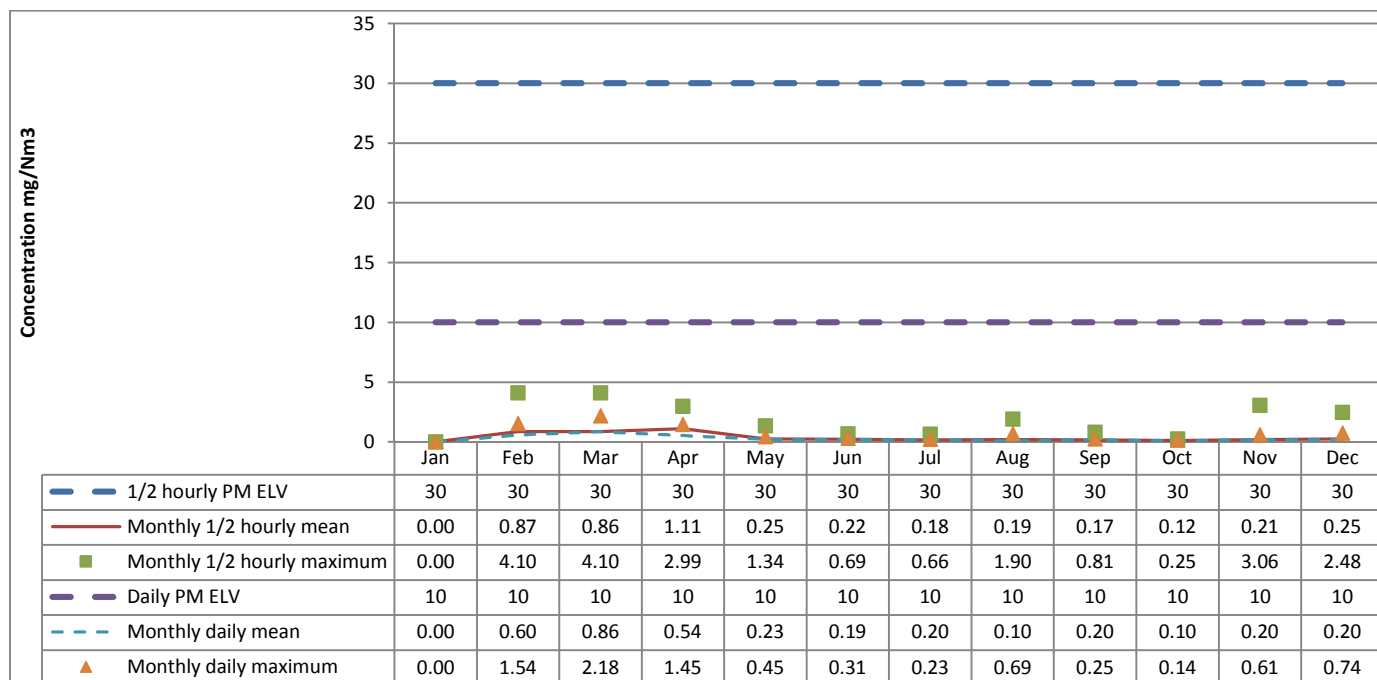
## Line 1 – Oxides of nitrogen



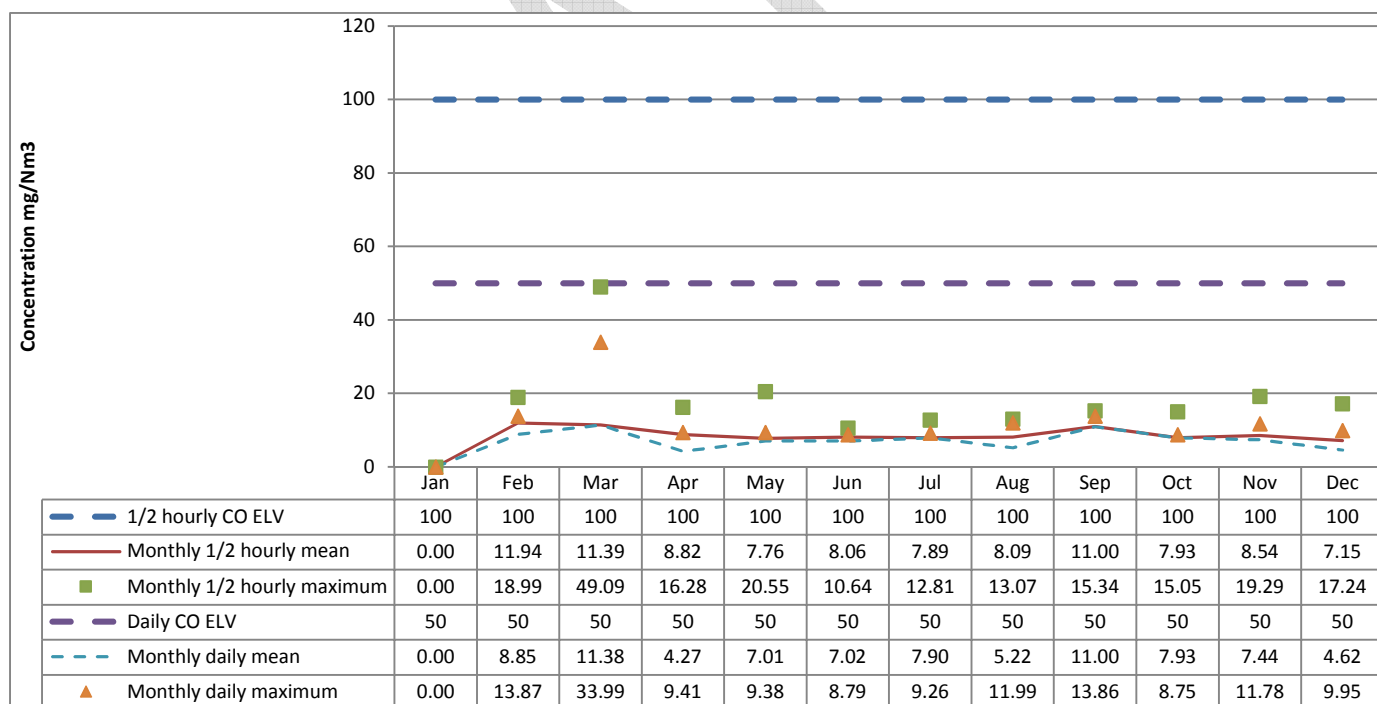
## Line 1 – Total organic carbon



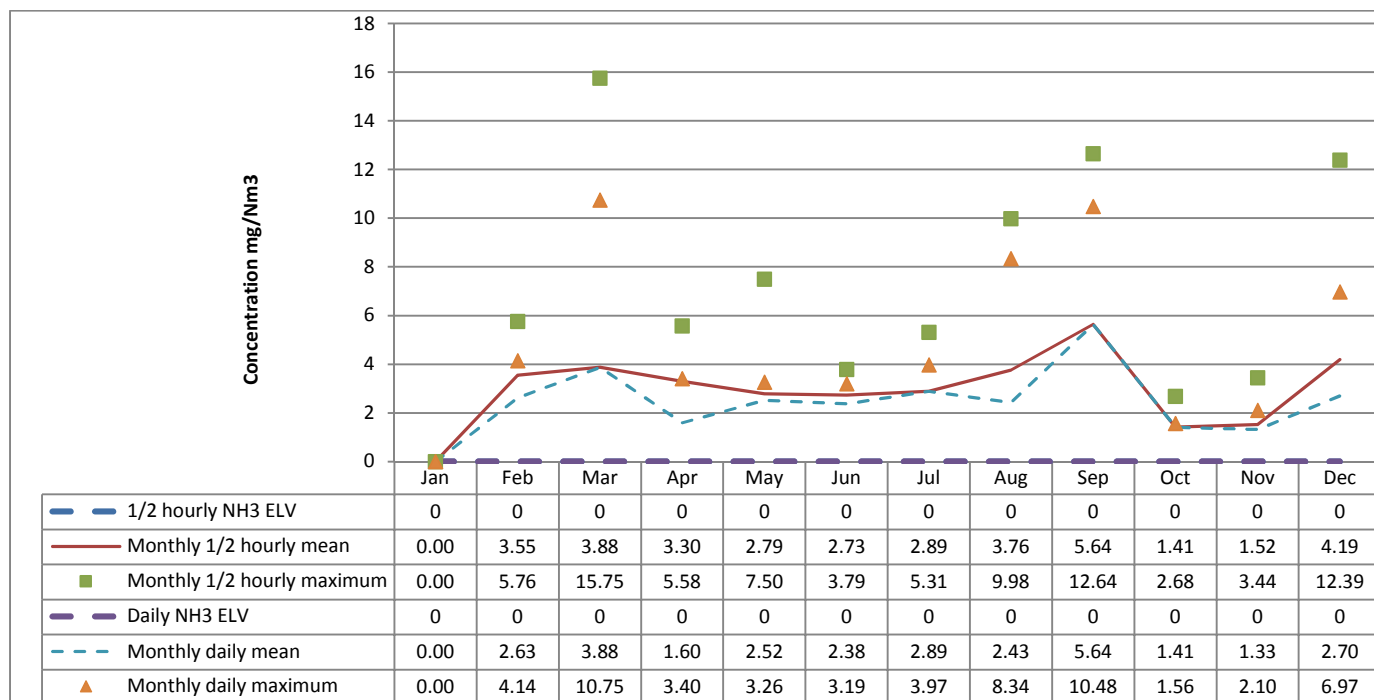
## Line 1 – Particulates



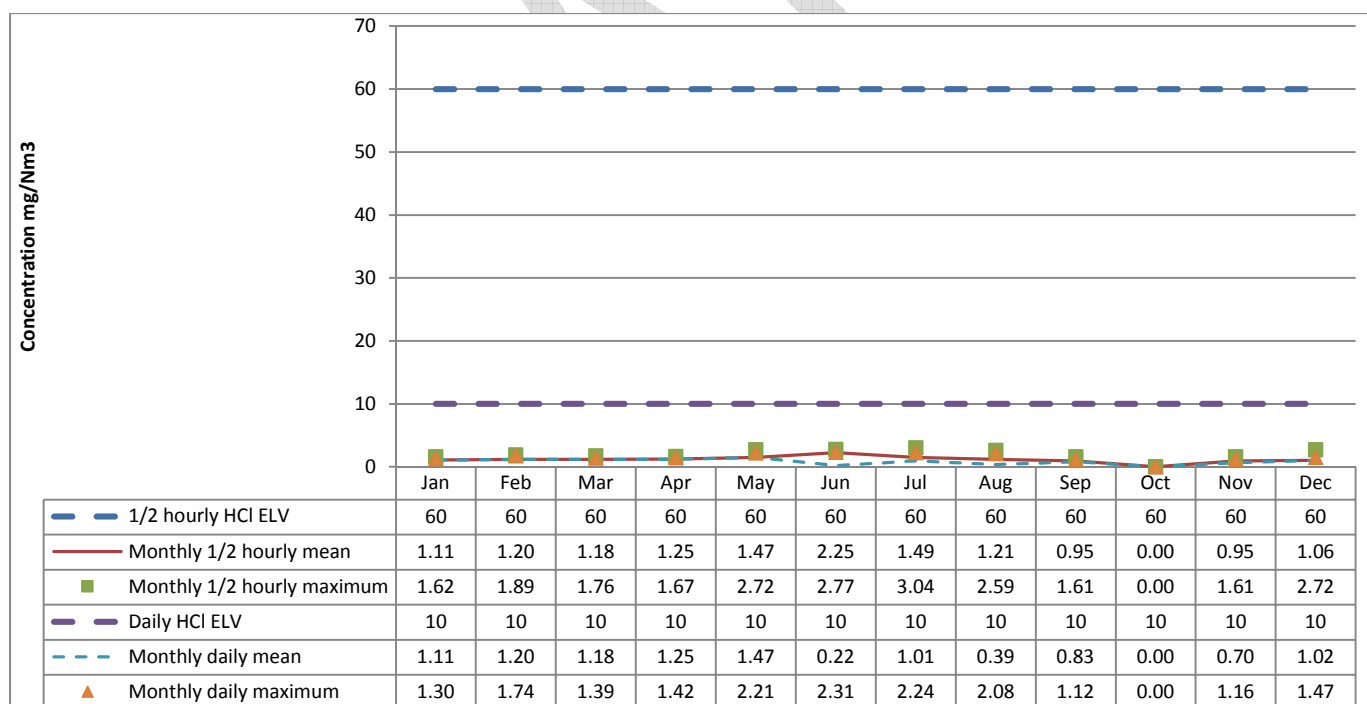
## Line 1 – Carbon monoxide



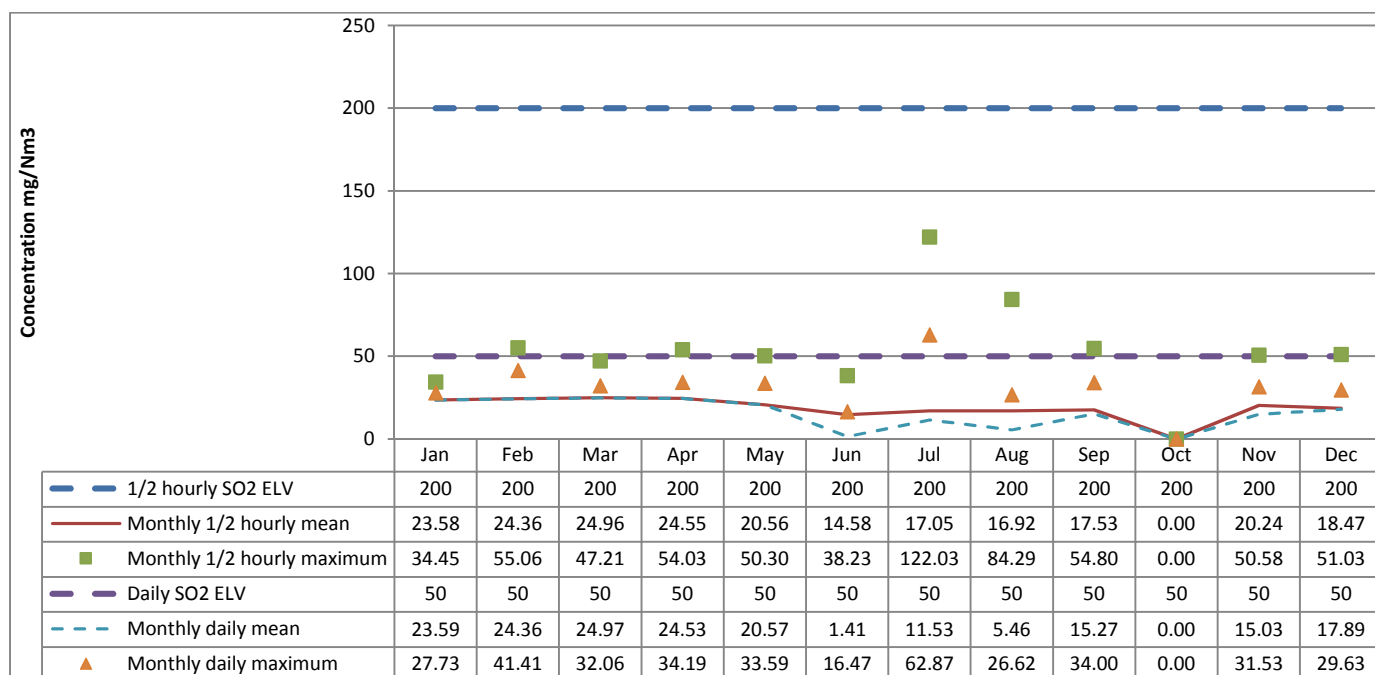
## Line 1 – Ammonia



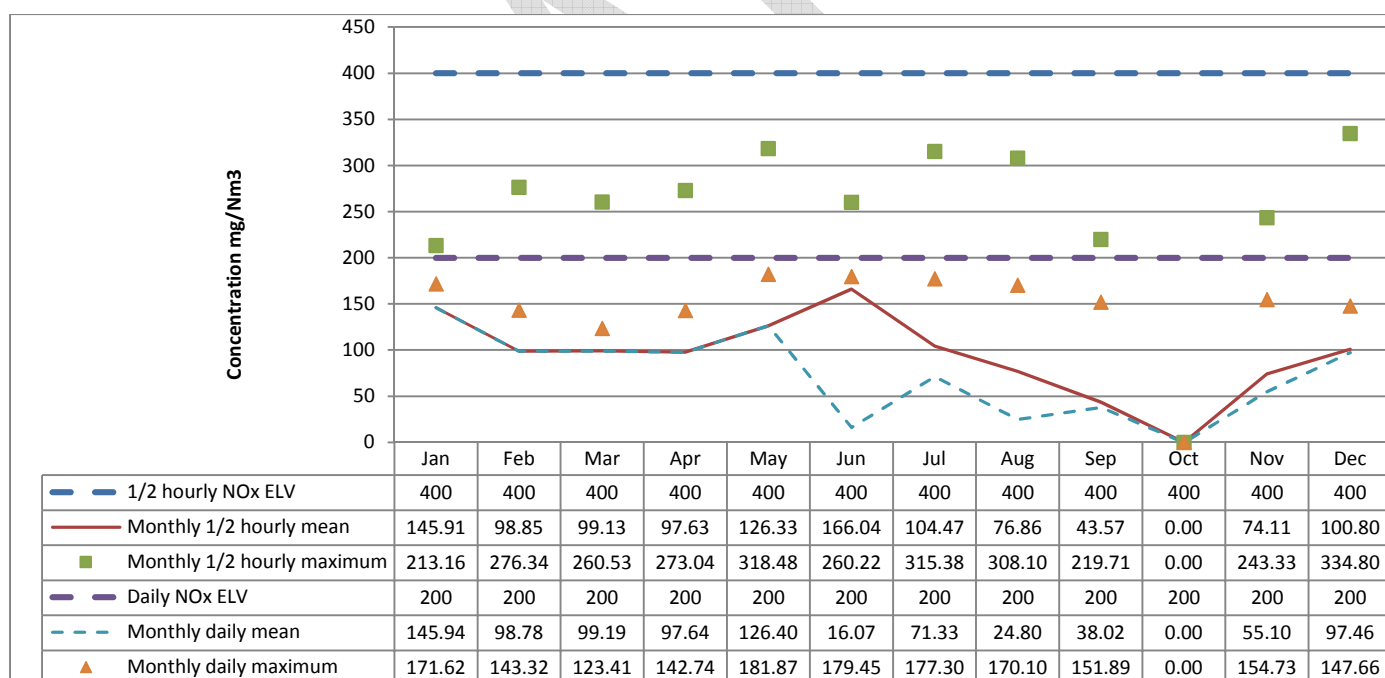
## Line 2 - Hydrogen chloride



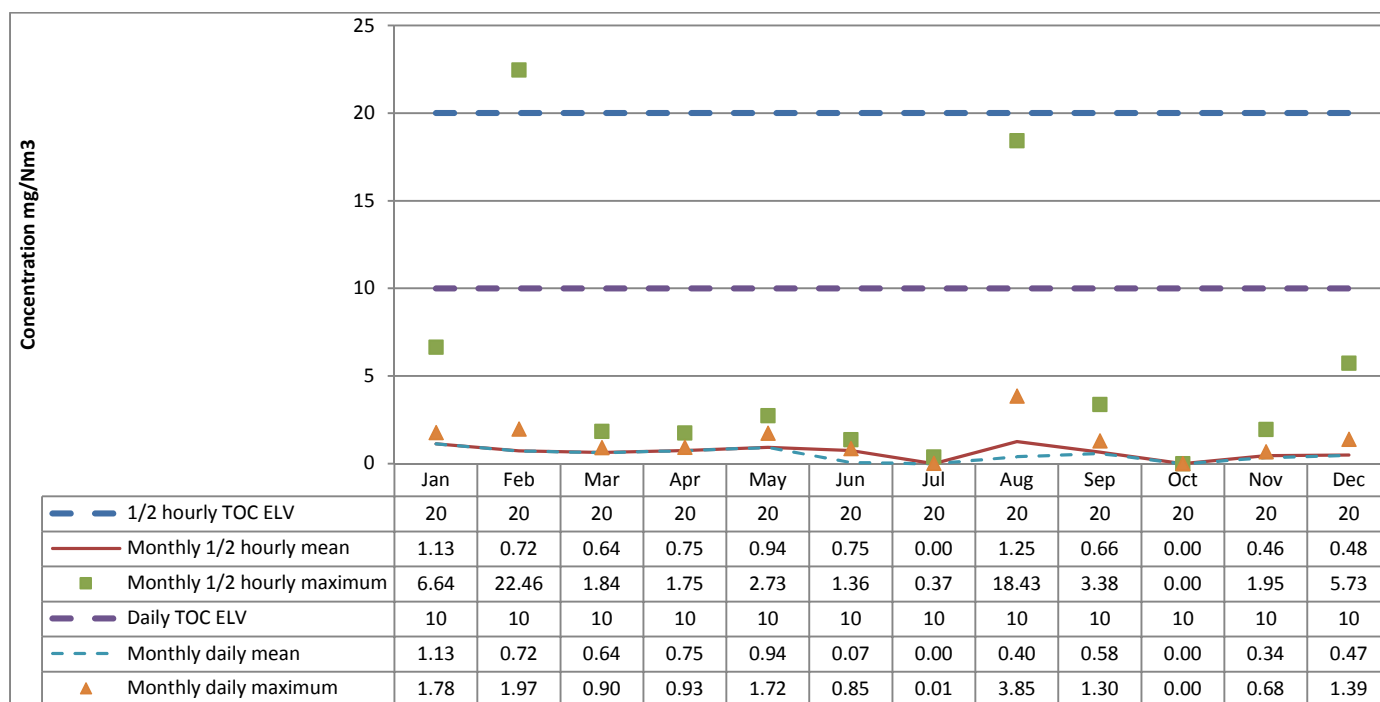
## Line 2 – Sulphur dioxide



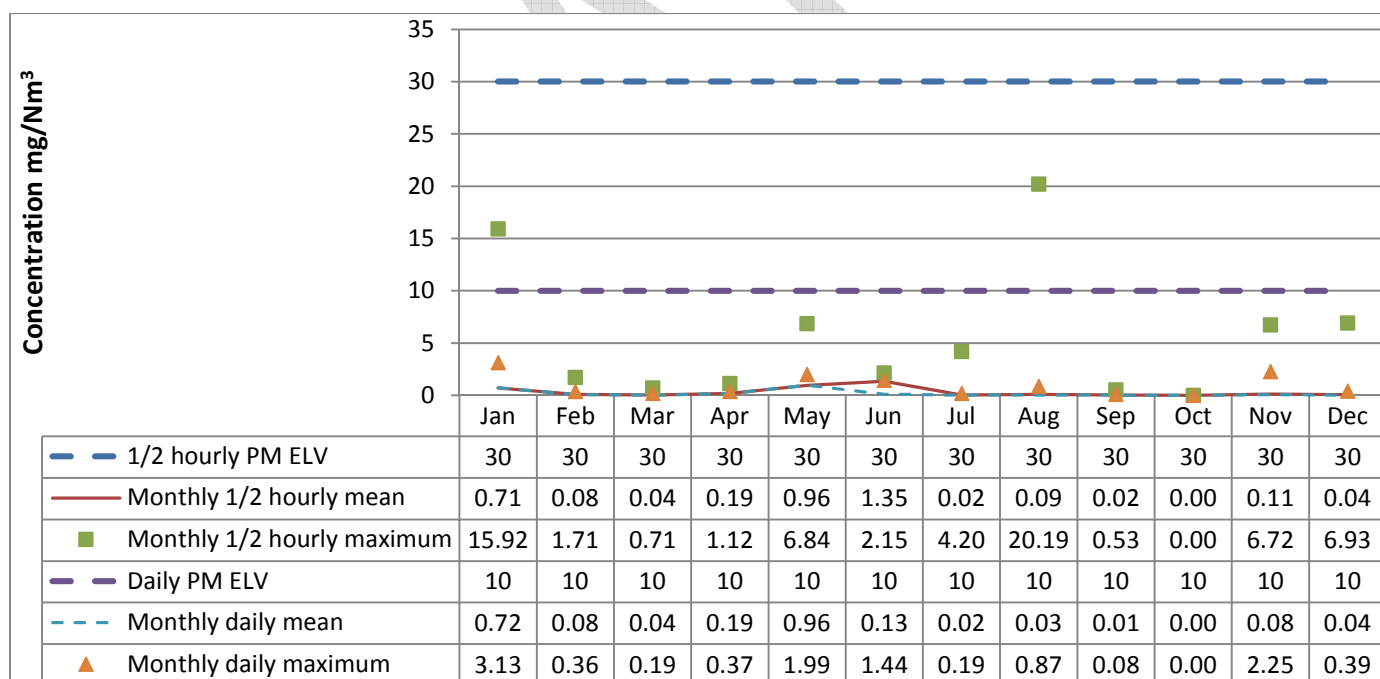
## Line 2 – Oxides of nitrogen



## Line 2 – Total organic carbon

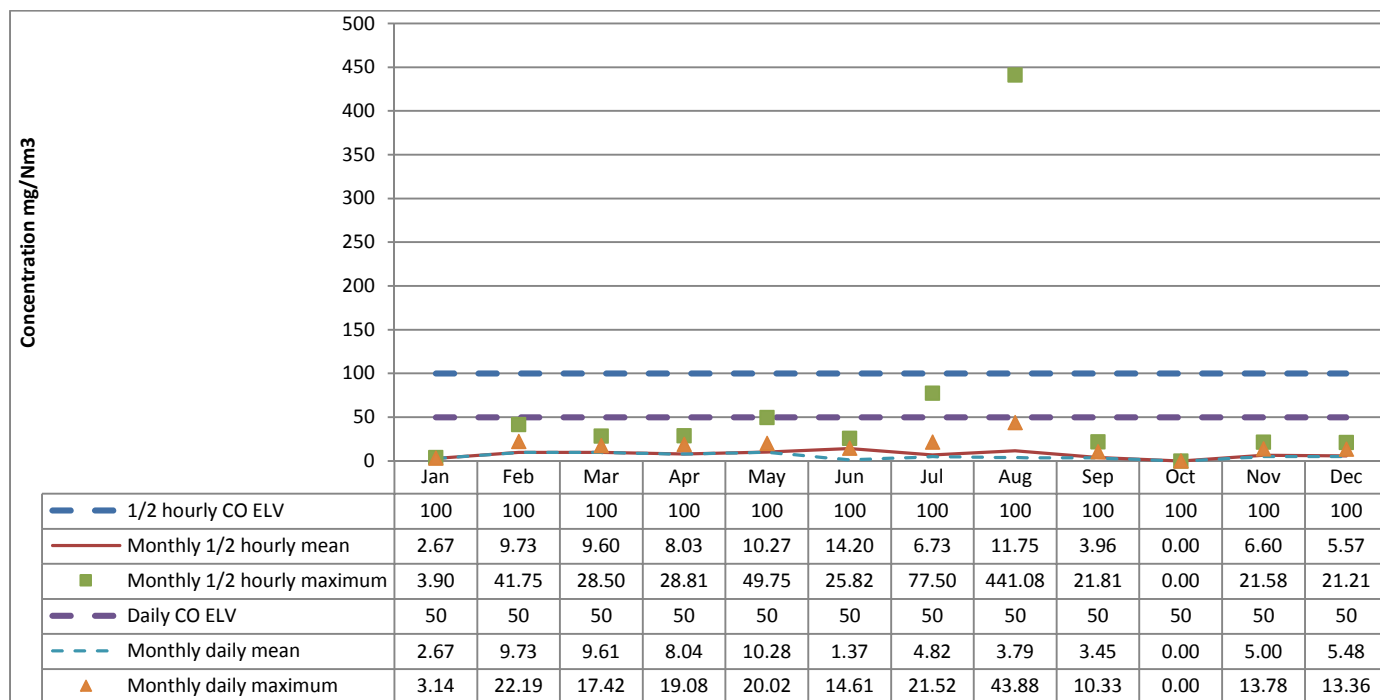


## Line 2 – Particulates

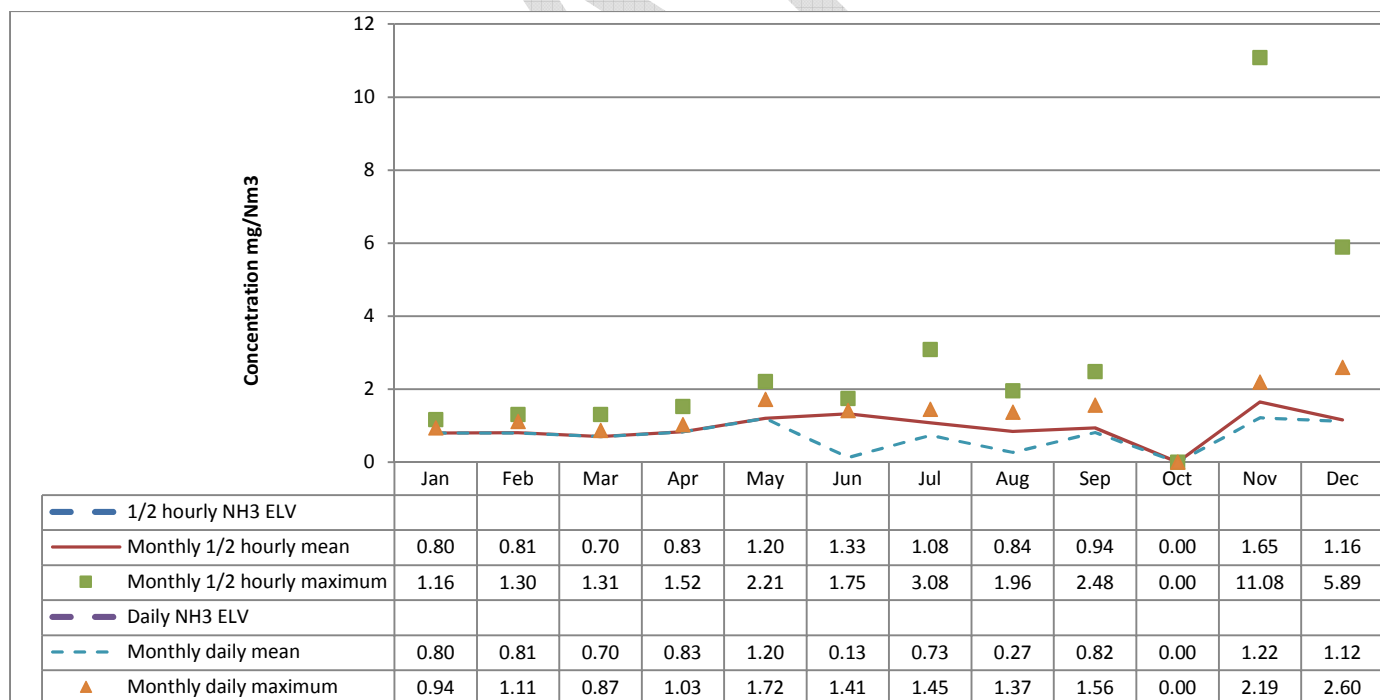




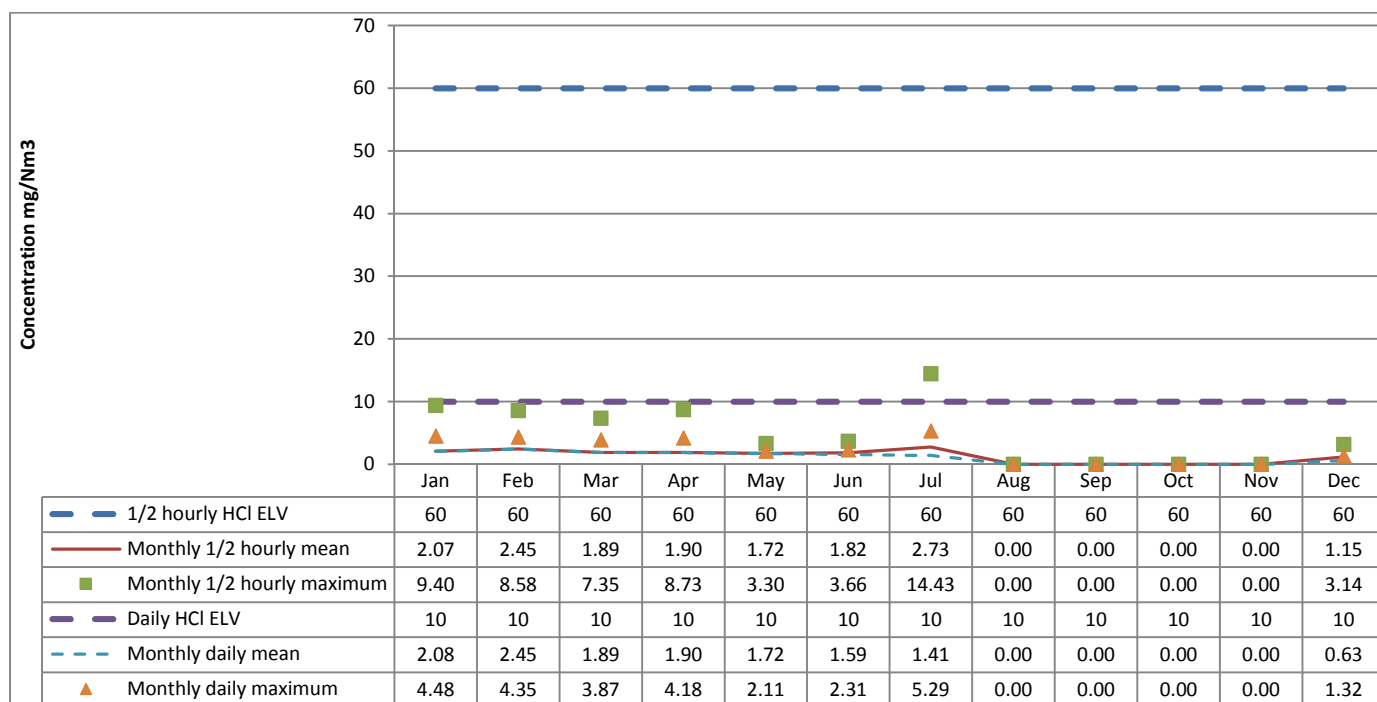
## Line 2 – Carbon monoxide



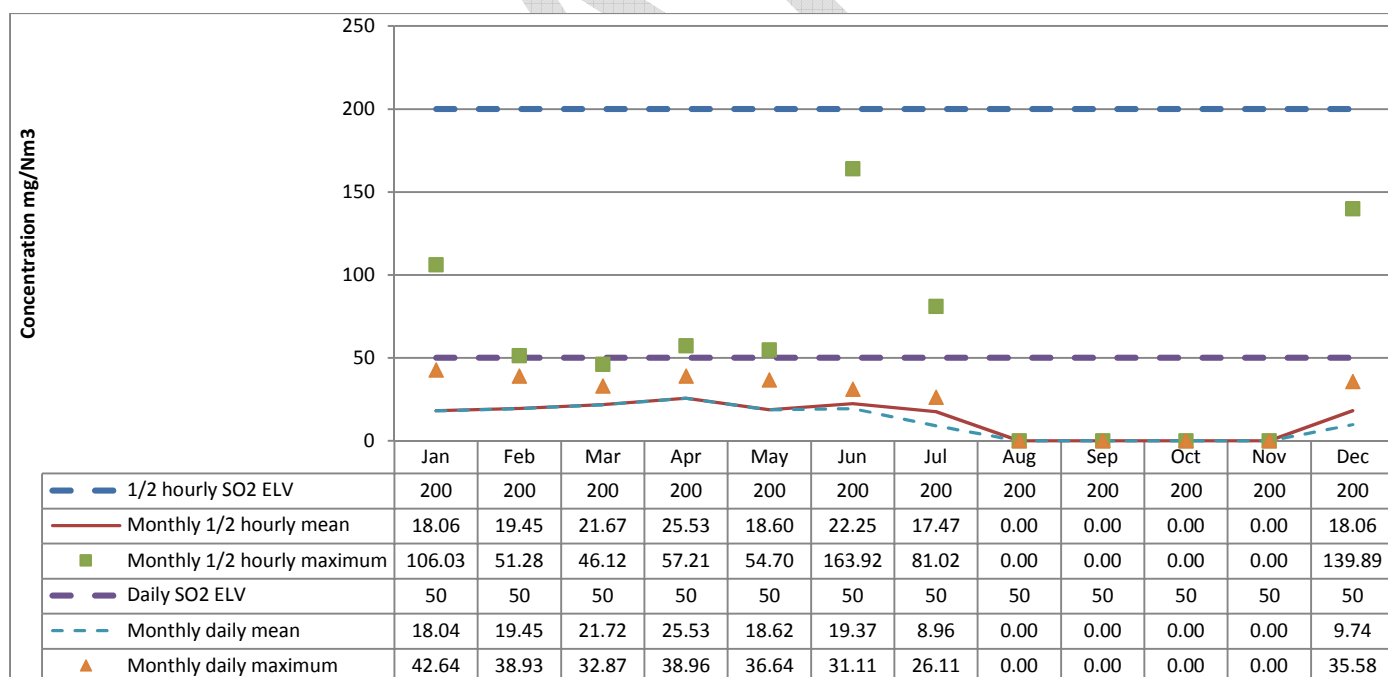
## Line 2 – Ammonia



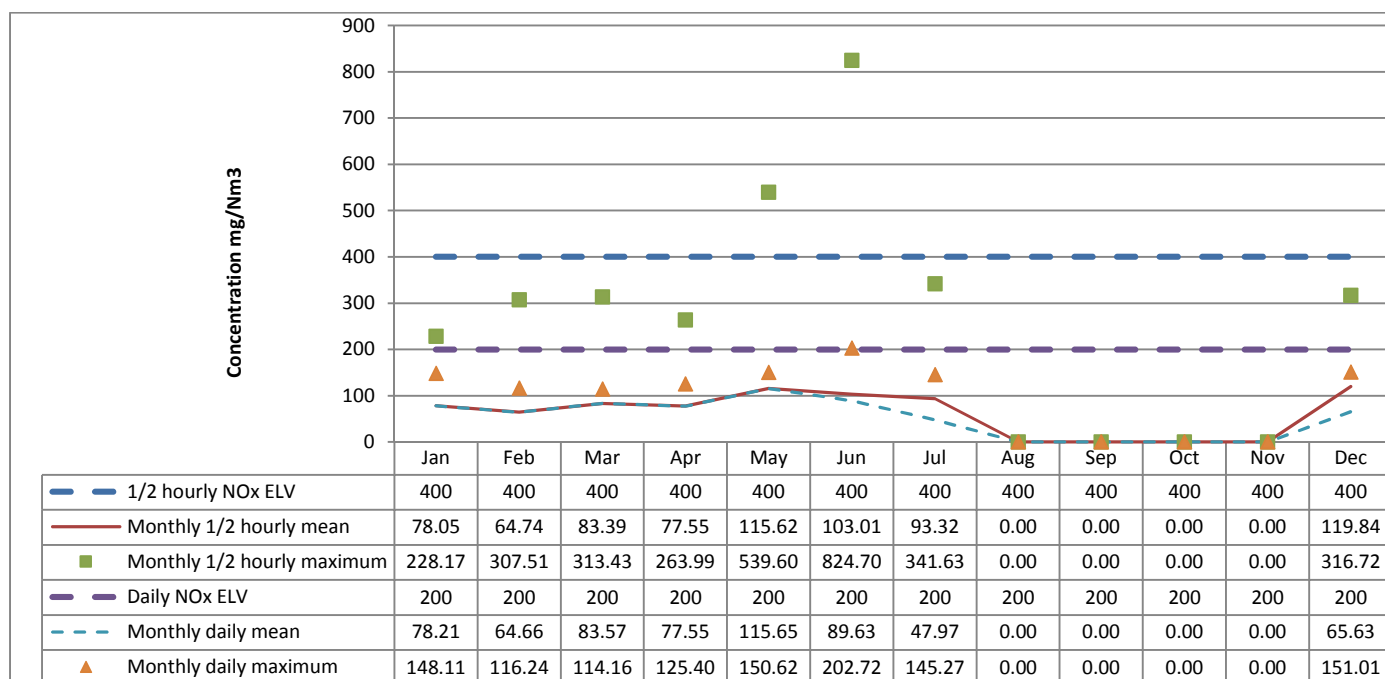
### Line 3 - Hydrogen chloride



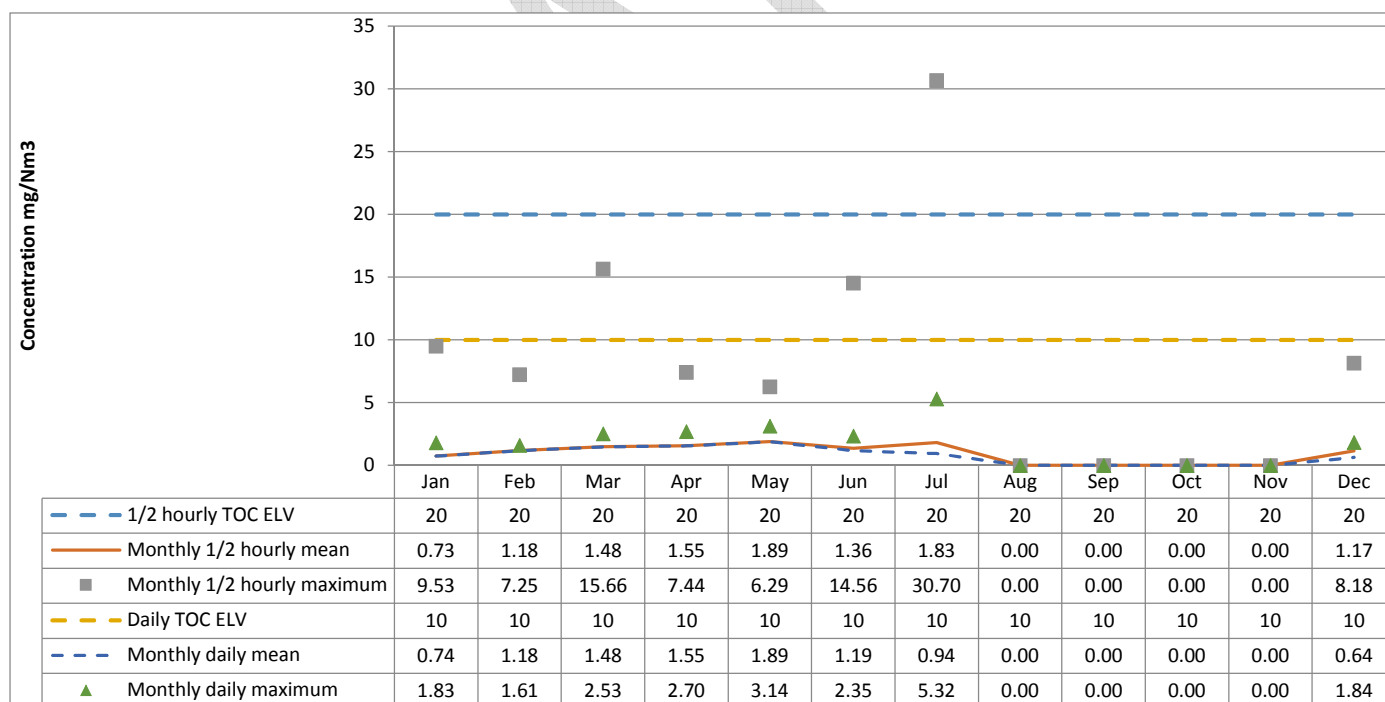
### Line 3 – Sulphur dioxide



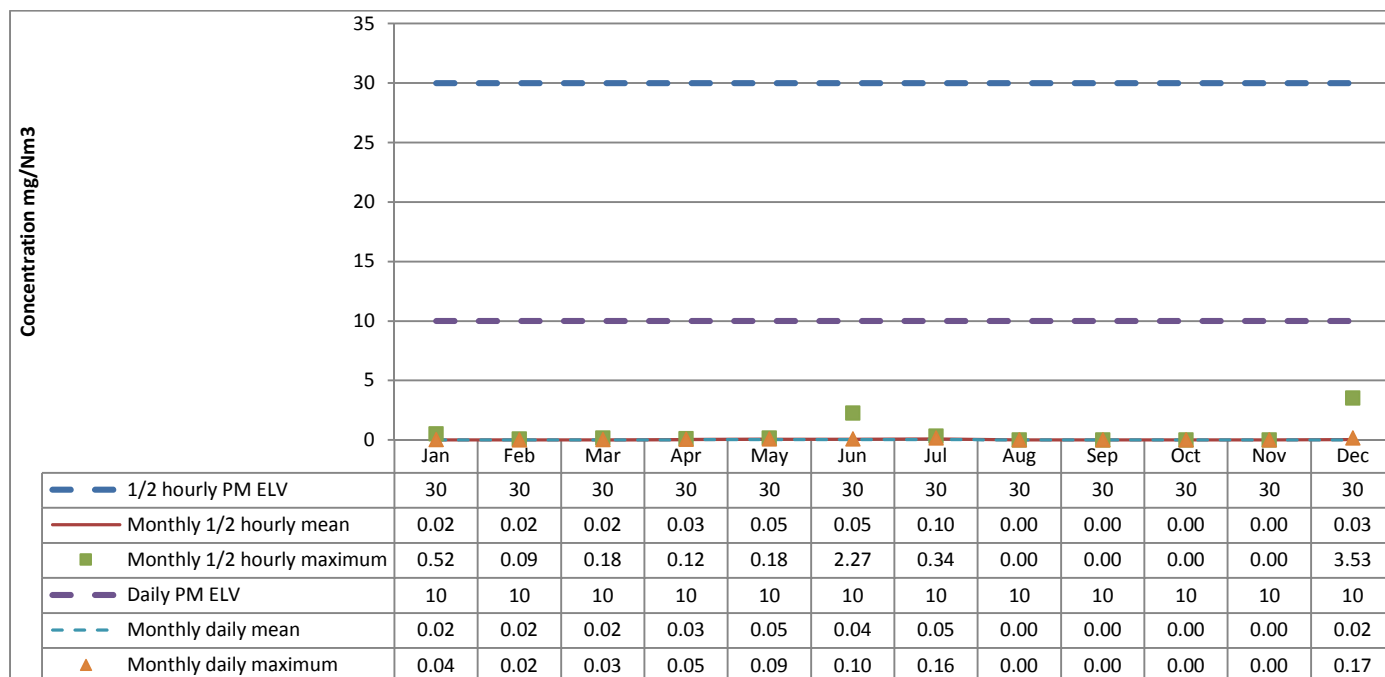
### Line 3 – Oxides of nitrogen



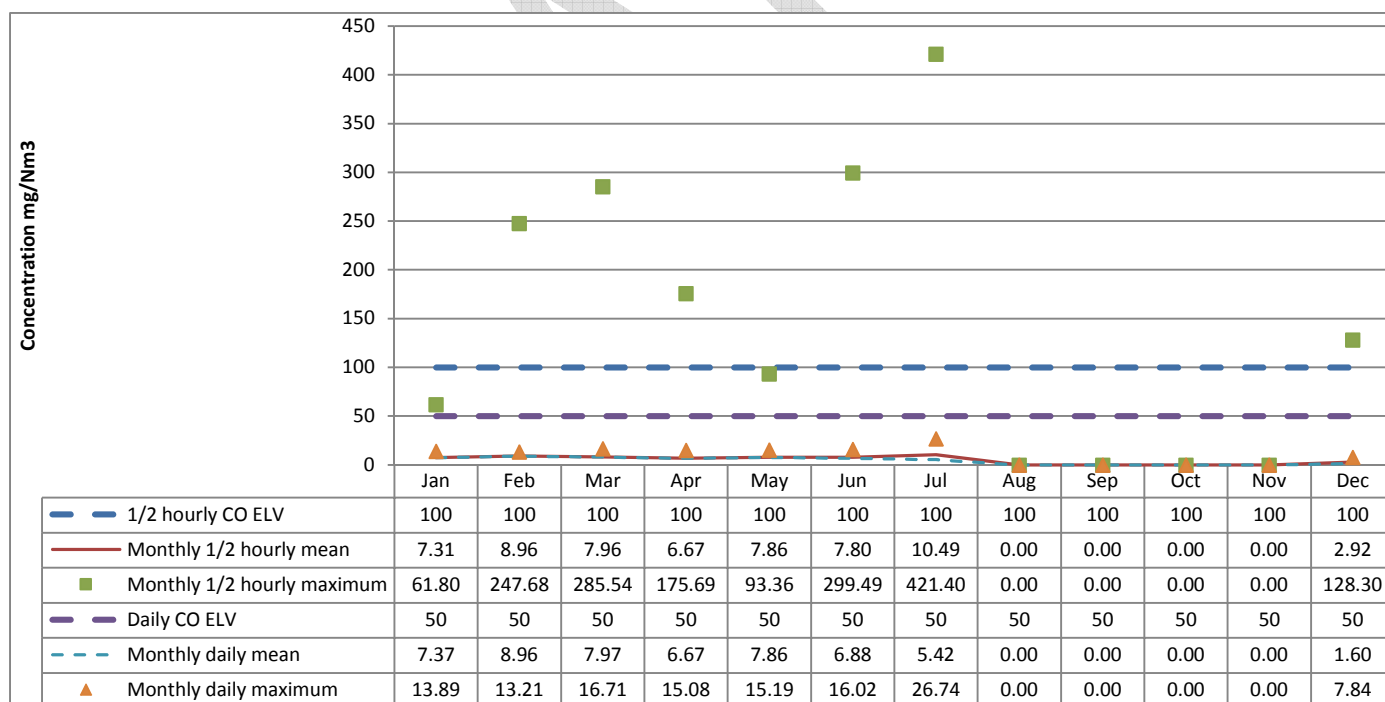
### Line 3 – Total organic carbon



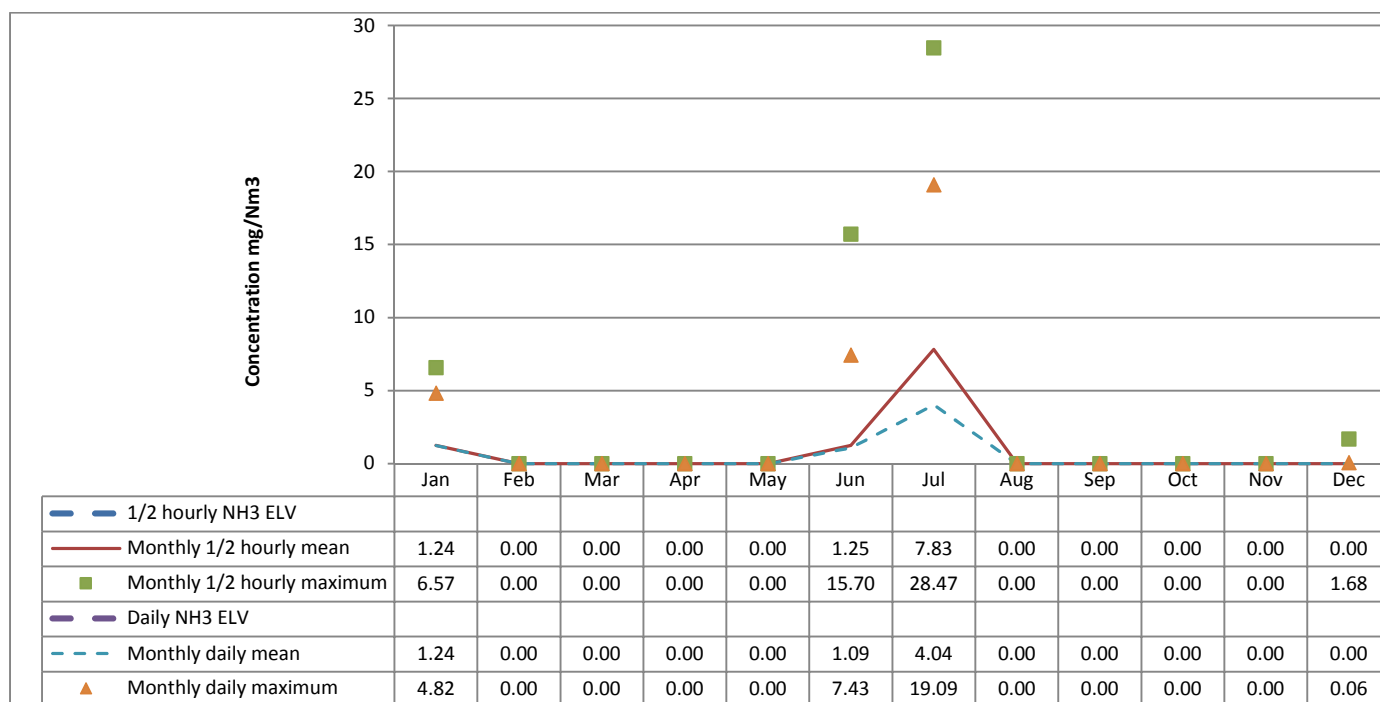
## Line 3 – Particulates



## Line 3 – Carbon monoxide



### Line 3 – Ammonia



## 4.2 Summary of periodic monitoring results for emissions to air

The table below shows the results of periodically monitored substances.

### Line 1

Substance	Emission limit value	Results	
		Not operational at time of testing	18 - 28/09/18
Mercury and its compounds	0.05 mg/m <sup>3</sup>	-	0.005 mg/m <sup>3</sup>
Cadmium & thallium and their compounds (total)	0.05 mg/m <sup>3</sup>	-	0.001 mg/m <sup>3</sup>
Sb, As, Pb, Cr, Co, Cu, Mn, Ni and V and their compounds (total)	0.5 mg/m <sup>3</sup>	-	0.134 mg/m <sup>3</sup>
Dioxins and furans (I-TEQ)	0.1 ng/m <sup>3</sup>	-	0.0137 ng/m <sup>3</sup>
Hydrogen Fluoride	2 mg/m <sup>3</sup>	-	0.05 mg/m <sup>3</sup>

**Line 2**

Substance	Emission limit value	Results	
		08 - 11/05/18	Not operational at time of testing
Mercury and its compounds	0.05 mg/m <sup>3</sup>	0.003 mg/m <sup>3</sup>	-
Cadmium & thallium and their compounds (total)	0.05 mg/m <sup>3</sup>	0.001 mg/m <sup>3</sup>	-
Sb, As, Pb, Cr, Co, Cu, Mn, Ni and V and their compounds (total)	0.5 mg/m <sup>3</sup>	0.114 mg/m <sup>3</sup>	-
Dioxins and furans (I-TEQ)	0.1 ng/m <sup>3</sup>	0.0077 ng/m <sup>3</sup>	-
Hydrogen Fluoride	2 mg/m <sup>3</sup>	0.02 mg/m <sup>3</sup>	-

**Line 3**

Substance	Emission limit value	Results	
		08 – 11/05/18	Not operational at time of testing
Mercury and its compounds	0.05 mg/m <sup>3</sup>	0.001 mg/m <sup>3</sup>	-
Cadmium & thallium and their compounds (total)	0.05 mg/m <sup>3</sup>	0.0009 mg/m <sup>3</sup>	-
Sb, As, Pb, Cr, Co, Cu, Mn, Ni and V and their compounds (total)	0.5 mg/m <sup>3</sup>	0.368 mg/m <sup>3</sup>	-
Dioxins and furans (I-TEQ)	0.1 ng/m <sup>3</sup>	0.0145 ng/m <sup>3</sup>	-
Hydrogen Fluoride	2 mg/m <sup>3</sup>	0.04 mg/m <sup>3</sup>	-

### 4.3 Summary of monitoring results for emissions to water

Total suspended solids

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily ELV (mg/m <sup>3</sup> )	300											
Monthly maximum	347	112	451	445	2260	385	144	336	268	33	132	37
Monthly average	47	43	100	130	192	82	53	45	19	10	22	12

### 5.1 Summary of any notifications or non-compliances under the permit

Date	Summary of notification or non-compliance	Reason	Measures taken to prevent reoccurrence
22/08/18	Notification for half-hour CO ELV exceedance – compliant with permit under abnormal conditions	Occurred during start-up and steady state conditions not achieved.	Cake feed stopped.
15/12/18	Notification for half-hour NOx ELV exceedance – compliant with permit under abnormal conditions	Occurred during “start-up/shutdown” on CEMS and therefore not reportable as an exceedance.	Error in reporting spreadsheet to be rectified.
19/12/18	Notification for half-hour CO ELV exceedance – compliant with permit under abnormal conditions	Cake feed hydraulic pack tripped. No cake being fed therefore abnormal condition.	Update CEMS to include hydraulic pack failures as “out-of-operation”.
24/12/18	Notification for half-hour CO ELV exceedance – compliant with permit under abnormal conditions	Cake feed hydraulic pack tripped. No cake being fed therefore abnormal condition.	Update CEMS to include hydraulic pack failures as “out-of-operation”.

### 5.2 Summary of any complaints received and actions to taken to resolve them.

Date of complaint	Summary of complaint	Reason for complaint including whether substantiated by the operator or the EA	If substantiated, measures to prevent reoccurrence
	None		

## 6. Summary of plant improvements

**Summary of any permit improvement conditions that have been completed within the year and the resulting environmental benefits.**

None

**Summary of any changes to the plant or operating techniques which required a variation to the permit and a summary of the resulting environmental impact.**

None

**Summary of any other improvements made to the plant or planned to be made and a summary of the resulting environmental benefits.**

Stream 3 baghouse abatement plant, including precipitation chamber, refurbishment resulting in increased operating efficiency and improved baghouse performance for capturing air pollution control residues.

Stream 3 ash transfer screws replacement for improved operational performance and reliability.

Stream 3 ash cyclone refurbishment resulting in increased operating efficiency and cyclone performance.

Annual planned shutdown schedule for statutory inspections and maintenance programme for all 3 streams.

Continued refurbishment of the flue gas ducts on all streams.

Emissions Room air conditioning system overhaul.

Press 8 full membrane cloth replacement for improved dewatering plant performance.



DRAFT