Annual Performance Report 2019

Permit EPR/FP3134GU

Ardley Energy Recovery Facility

Viridor Waste Management Limited

Year:	2019		
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Distribution

Copy	Name, Role	No.

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.

Plant Description and Design

Ardley Energy from Waste (EFW) facility is located close to junction 10 of the M40. The facility has a design capacity to process 300,000 tonnes per year of residual municipal waste and has the capability of generating 26.9MW of electricity.

In accordance with the requirements of Condition 4.2.3, Schedule 4 and Table S5.1 of Permit EPR/FP3134GU issued by Environment Agency to Viridor Waste Management Limited (Viridor) on 29 September 2010, Viridor is required to submit a summary of the environmental monitoring works undertaken at the site on a quarterly basis. Such reports will form the basis of the annual environmental review report, which is to be submitted to the Environment Agency by 31 March as agreed in writing with the Environment Agency of each year in accordance with Condition 4.2.2 of the Permit.

Viridor note, in line with Permit variation dated 21 April 2015; 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 – 31st December 2019 and fulfils the requirement of Chapter IV Article 55(2) of the Industrial Emissions Directive.

Summary of Operational Processes and Procedures

Incoming waste is mainly received Oxfordshire County Council Waste Partnership, the rest is received from third party businesses. Waste is received into an enclosed waste bunker. The waste is loaded into one of two furnaces, which combust the waste at >850oC. The hot gases are put through a variety if heat exchangers used to heat demineralised water to create superheated steam which drives a turbine generator. the turbine generator produces around 27MWh and exports around 23MWh. Combusted waste (incinerator bottom ash) is sent to a third party within the footprint of the facility for further processing. The gasses are treated with Lime, Activated carbon and Urea to remove potential pollution leaving the stack. The powder containing reacted gas particulates (APCr) is removed and sent via a third party for reprocessing. Emissions are monitored via Continuous Emissions Monitoring equipment (CEMs) provided by A1-CBISS.

Operational Data

Plant Size		326,300	tonnes pa	MWth	MWe
No. of combustion lines	2		No. of Turbines:	1	

Waste types received	Unit	Q1	Q2	Q3	Q4	**Year Total**	%
Household / Local Authority	tonnes	33,267	46,970	53,677	52,502	**186,417**	66.6%
Commercial & Industrial		32,664	11,090	23,389	26,220	**93,364**	33.4%
Hazardous		-	-	-	-	**-**	-
Clinical		-	-	-	-	**-**	-
Waste wood (biomass)		-	-	-	-	**-**	-
Refuse derived fuel		-	-	-	-	**-**	-
Solid recovered fuel		-	-	-	-	**-**	-
Other [Please specify]						**-**	-
Other [Please specify]							
Other [Please specify]							
Total waste received		**65,931**	**58,060**	**77,067**	**78,722**	**279,780**	100.0%
Rejected Waste						**-**	-
Waste transferred out						**-**	-

Energy Useage / Export	Unit	Q1	Q2	Q3	Q4	**Year Total**	KWh/te
Power Generated	MWh	18,053	-	-	-	**18,053**	64.5
Power Exported		16,142	-	-	-	**16,142**	57.7
Power Used on site		6,042	5,244	6,201	6,323	**23,810**	85.1
Power Imported		4,343	5,315	6,267	6,323	**22,248**	79.5
Parasitic Load	%	27.9%	-	-	-	59.9%	
Thermal Energy Produced	GWh	-	-	-	-	**-**	-
Thermal Energy Exported		-	-	-	-	**-**	-
R1 value		Not calculated, loss of generation capability				Design / Operational / n/a	

Waste Disposal & Recovery	Unit	Q1	Q2	Q3	Q4	**Year Total**	% inputs
APC Residues - produced	tonnes	1,365	1,304	1,601	1,736	**6,006**	2.1%
IBA - produced		15,351	9,494	11,006	10,944	**46,795**	16.7%
Metals recycling		1,057	795	1,007	1,041	**3,900**	1.4%
		-	-	-	-	**-**	-
Other		-	-	-	-	**-**	-
Other		-	-	-	-	**-**	-

Raw Material Usage	Unit	Q1	Q2	Q3	Q4	**Year Total**	kg or Ltr /te
Mains Water	m^3	7,208	8,873	7,229	6,491	**29,801**	106.52
Other Water	m^3					**-**	-
Ammonia / Urea	kgs	102,000	113,000	101,000	99,000	**415,000**	1.48
Activated Carbon	kgs	16,000	28,000	18,000	17,000	**79,000**	0.28
Lime / hydrated lime	kgs	688,000	633,000	724,000	936,000	**2,981,000**	10.65
Fuel oil	ltrs	125,180	129,000	87,080	138,000	**479,260**	1.71
Gas	cf	-	-	-	-	**-**	-
Other		-	-	-	-	**-**	-

Summary of Hours	Line/Uni	Q1	Q2	Q3	Q4	**Year Total**	
Hours of waste combustion, total	1	1,822	1,667	2,167	2,121	**7,777**	88.8%
Hours of waste combustion, total	2	1,949	1,666	2,191	2,129	**7,935**	90.6%
Hours of turbine operations, total	1	624	-	-	-	**624**	7.1%
Hours of heat / steam export		-	-	-	-	**-**	n/a
Abnormal Events	qty.	-	1	-	-	**1**	yes
Abnormal operation	hours		1.17	-	-	**1**	0.01%
Permit Breaches	qty.	2	1	-	-	**3**	yes

Summary of Plant Operations and Maintenance during the reporting year

On 27 January 2019, a generator stator earth occurred at Ardley, resulting in the loss of generation capability. The generator was removed from Ardley on the 8th March 2019 for repairs within the UK. On 18th October 2019 the generator was removed from the UK to the Original Equipment Manufacturer in Austria to complete the repairs. The generator returned to Ardley on 23 January 2020 and began export 6 February 2020.
The plant operated steadily throughout the year of 2019 with 1807 hrs off burning waste across both lines including the annual shutdown outage period and the removal of the generator from site.
The annual shutdown outage commenced on 06 May 2019 concluding on 01 June 2019 during which the plant combustion systems and FGT and ancillary systems underwent checks, and as required repair, and legal compliance inspections under PSSR were carried out.
In June the plant successfully underwent continuation audits of 9001 and 14001 and the conversion to ISO45001.
The CEMS underwent QAL2 calibration checks in March 2019 and the calibration factors were applied. HCL checks failed to provide a valid function on both lines and repeat checks were carried out in August 2019, during which the HCL function passed for L1 and the calibration factors applied. Line 2 HCL checks failed to provide a valid function. Viridor have employed the National Physical Laboratories (NPL) to investigate the failures and recommend further actions. Final report due April 2020.

Summary of Residue Handling for the reporting year

All IBA produced on site (including the metal content) is conveyed to the Fortis IBA facility, based within the footprint of Ardley ERF, for reprocessing. They remove and recycle the ferrous and non-ferrous metals and then create IBAA (Incinerator Bottom Ash Aggregate) from the remaining material. Their Aggregates team then utilise this in various construction and highways projects. There have been no hazardous results from IBA testing in 2019.
APCr is collected by direct transfer from the on site silo into transport tanker by Grundons and goes to one of three reprocesses or for disposal. APCr to the O.C.O Technology Ltd (formally Carbon8) site at Brandon (EPR/JP3332FK), Anonmouth (EPR/HP3638WW), or Leeds (EPR/TP3737YG) is taken through their accelerated carbonation technology. These carbonated wastes are blended with binders and fillers and pelletised to form an aggregate. APCr sent to Grundon APCr plant at Wingmoor Farm landfill site, Gloucestershire (EPR/NP3831ST) is mixed with water before it is transferred to a hazardous waste cell in the landfill.

2019 Annual Reporting Performance Form 1

Permit EPR/FP3134GU
Facility: Ardley Energy Recovery Facility

Operator: Viridor Waste Management Limited
Form: Performance 1

Reporting Period from: 01 January 2019 to: 31 December 2019

2019 Annual Reporting of Waste Disposal and Recovery

Waste Description	Disposal Route(s)	Disposal Tonnes	Recovery Tonnes	% / tonne of waste incinerated
1) Hazardous Wastes				
APC Residues	OCO Technology		5,541.24	1.98%
APC Residues	Grundon	464.66		0.17%
				-
Total Hazardous Waste		464.66	5,541.24	2.15%
2) Non-Hazardous Wastes				
IBA	Fortis IBA		46,795.0	16.7%
Ferrous Metal	VRM		2,714.0	1.0%
Total Non-Hazardous Waste		0.0	49,509.0	17.7%
TOTAL WASTE		**464.7**	**55,050.2**	19.8%

Operator's comments :

All IBA produced on site (including the metal content) is reprocessed by Fortis IBA who seperate the ferrous and non-ferrous metals to return to Ardley ERF and create IBAA (Incinerator Bottom Ash Aggregate) from the remaining material. Metals returned to Ardley ERF are managed through Viridor Resource Management for recycling.
APCr is taken either through OCO Technologies accelerated carbonation technology where carbonated wastes are blended with binders and fillers and pellitised to form an aggregate, or are send to Hazardous waste landfill.

2019 Annual Reporting of Water and Other Raw Material Usage

Raw Material	Usage	Unit	Specific Useage	Unit
Mains Water	29801	m^3	0.11	m^3/te
Total Water	29801	m^3	0.11	m^3/te
Urea / Ammonia	415000	kg	1.48	kg/te
Activated Carbon	79000	kg	0.28	kg/te
Lime / hydrated lime / Sodium Bicarb.	2981000	kg	10.65	kg/te

Operator's comments :

Raw Materials Usage to be reviewed in 2020.

2019 Annual Reporting of other performance indicators

Parameter	Results by Line							
	A1	A2	A3	A4	A5		Turbine 1	Turbine 2
Operating hours for the year, hours	7777	7935					624	
Number of periods of abnormal operation, qty.	0	1						
Cumulative hours of abnormal operation for this year, hours	0	1.17						

Operator's comments :

Turbine hours reflect loss of generation capacity

Signed: H.Edwards Date: 31/03/2020

2019 Annual Reporting of Energy Usage/Export

Permit EPR/FP3134GU Operator: Viridor Waste Management Limited

Facility: Ardley Energy Recovery Facility Form: Energy 1

Reporting Period from: 01 January 2019 to: 31 December 2019

Energy Source	Energy Usage	Unit	Specific Useage (KWh/tonne incinerated
Electricity Produced	18,053	MWh	64.53
Electricity Imported	22248	MWh	79.52
Electricity Exported	16,142	MWh	57.70
Gas Oil	407.37	tonnes	
Steam/hot water exported	0	GWh	-

Operator's comments :
Electricity figures reflect loss of generation capacity. Mass diesel (gas oil) calculated with density = 0.85 kg/l (tonnes=(litres fuel oil used*0.85)/1000))

Signed: H.Edwards Date: 31/03/2020

Summary of Permit Compliance

Compliance with permit limits for continuously monitored pollutants

The plant met its emission limits as shown in the table below:

Substance	Percentage time compliant during operation	
	Half-hourly limit	Daily limit
Particulates	100%	100%
Oxides of nitrogen	99.997%	99.695%
Sulphur dioxide	100%	100%
Carbon monoxide	100% 95% of 10-min averages	100%
Total organic carbon	100%	100%
Hydrogen chloride	100%	100%

1/2 hourly % = (No. half hour exceedance / (2 x 15712)) x 100, 15712hrs running during year across 2 lines

Daily % = (No.Daily exceedance / (No. operational hours/24)) x 100

Summary of any notifications or non-compliances under the permit

Date	Summary of notification or non-compliance [including Line/Reference]	Reason	Measures taken to prevent reoccurrence
07/01/2019	An elevated level for the daily average of Oxides of Nitrogen of 208.48 mg/m3. Monitoring Point A2.	The elevated level is thought to be a result of blockages in the Urea dosing lines caused by urea clumping in bags provided by an alternative supplier which have blocked the hopper.	Checks on incoming material. Supplier relationship
February 2018 – January 2019	Investigation into service issues with Ardley ERF's CEMS provider identified that the output functions from the QAL2 carried out in September 2017 (reported to Viridor in February 2018), had not been entered into the CEMS system. Impacted both lines.	Personell changes impacting on roles and responsibilities of individuals.	Formal clarification on roles and responsibilities. Introduction of a physical record of checks on the Input QAL functions.
29/03/2019	False elevated reading for particulates at A2. No impact	Blockage on probe cleared by air purge	No impact
03/05/2019	An elevated level for the half hour average of Oxides of Nitrogen with a measurement of 414.21 mg/m3. Recorded 1 hours 10 mins of abnormal operations. Monitoring point A2.	The elevated level was a result of blockages in the dosing lines caused by the failure of belts on the urea blower system, preventing urea delivery into the combustion chamber.	Planned Preventative maintenenace reviewed.

05//05/2019	False elevated reading for particulates at A2. No impact	Filter on the blower of the stream 2 dust analyser had taken in a quantity of dust which was blocking the airflow to the probe. The inlet was cleaned of dust and the probe instantaneously dropped	No Impact. Planned Prevantative Maintenance action raised to check the filter weekly.
25/05/2019	For a period following “Incineration On” status being achieved for Line 1 following a maintenance period, Line 1 CEMS was not recording readings for VOC due to a fault on the FID analyser. All other emissions-to-air readings were recording data and reading within emissions limit values. CO levels showed little variaability, demonstrating combustion control.	On 23rd May 2019, the site suffered a power cut causing the FID analyser to alarm as the Hydrogen Helium (H2/HE) pilot light extinguished. These alarms were not cleared by the Control & Instrumentation (C&I) Technicians at the time due to the maintenance works ongoing on both lines.	Updated site documentation to cover this scenario Toolbox talk issued to all staff.Management instruction issued to ensure midniht CDAS readings are signed by the shift teams.
06/11/2019	On receipt of periodic testing, it was identified that A1 observed elevated Dioxins & Furans levels of 0.18 ng/m3 against a permit limit of 0.1 ng/m3. It is noted that all other results for both lines returned compliant as expected. The periodic reading for Dioxins & Furans at A2 was 0.00083 ng/m3.	Unknown. Consultant employed to carry out investigation and provide formal report. Awaiting report.	Repeat Monitoring carried out in Febuary 2020. Results returned within limits. Awaiting report.

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

Date	Summary of complaint [including Line/Reference]	Reason *	Measures taken to prevent reoccurrence
	No permit complaints received		

*** including whether substantiated by the operator or the EA**

Summary of Plant Improvements

Summary of any efficiency improvements that have been completed within the year.
Energy effiiciency - all admin block and plant lighting is replaced with LED energy efficient light fittings

Summary of any permit improvement conditions that have been completed within the year and the resulting environmental benefits.
None, all IC's complete

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.
Permit varied and consolidated October 2019 to include a new waste type, 18 01 04, to the list of waste types accepted on site. An amendment was also made to the averaging period for CO monitoring in Schedule 4. No environmental impact.

Summary of any other improvements made to the plant or planned to be made and a summary of the resulting environmental benefits.
None

Details of Public & Stakeholder Liasion

Summary of events held during the reporting year.	
Date	**Description**
Quarterly	Public Liaison Meetings held with councillors and residents of Middleton Stoney, Ardley & Fewcott
Bi-Annually	Waste Collection Authority Meetings
2 days	Heritage Open Days - open days for general public
188 events	Community engagements including School and local group visits and site tours
Work Experience week	Students from Bicester Technology Studio and Futures Institute Banbury
As requested	Environment Agency visits and site tours - as requested

List of events planned for next year	
Date	**Description**
	As above

If you wish to be involved in the public liasion programme, please contact enquiries@viridor.co.uk

Residue Quality Monitoring Requirements

Summary of monitoring undertaken and compliance
IBA undergoes quarterly sampling as required by permit condition 3.5.1c and table 4.4 including TOC (separate lines), dioxins & furans and metals. TOC has a limit of <3%.
24 samples of IBA are taken each year (including the 4 permit complaince samples) to undergo basic hazard analysis as required by the ESA protocol.
APCr is sampled quarterly as per permit condition 3.5.1c and table 4.5

Commentary on any specific events	
Date & Event	**Description**

Residue Quality Monitoring Results			
Parameter (unit)	**Limit**	**Normal Operation**	
		Bottom ash	**APC Residues**
Loss on Ignition (%)	<5%		
ToC (%)	<3%	1.2	
No. of Assessments Undertaken	---	4 Permit compliance samples 24 ESA hazard assessment - (including 4 above).	4
No. of Hazardous Assessments	---	0	

Comments :
All IBA remained non-hazardous as per the ESA protocol within 2019. TOC Value above is average of the four quarters of samples on each line (8 samples).

Emissions to Water

Summary of monitoring undertaken and compliance
Permit Condition 3.5.1(a) and Table S4.2 requires Viridor to ensure sample point W1 is free of oil and grease.
Sample point W1 has remained free of oil and grease. No Permit limit exceedances were recorded for W1 during the review period for emissions to water.

Commentary on any specific events	
Date & Event	**Description**

Emissions to Water / Sewer

Parameter	Monitoring Frequency	Limit	Target	Max.	Average
Oil & Grease	Not set	free of oil and grease			

Emissions to Air (periodically monitored)

Summary of monitoring undertaken, standards used and compliance
All analysis below completed by permit specified BS EN method other than nitrous oxide which was completed by allowed alternative method M22. Monitoring was undertaken in February and November 2019

Results of emissions to air that are periodically monitored

Substance	Ref. Period	Emission Limit Value	Average H1			Average H2	
			A1	A2		A1	A2
Hydrogen fluoride	1 hr	1 mg/m^3	0.016	0.019		<0.027	< 0.031
Cd and Th and their compounds	6-8hrs	0.05 mg/m^3	0.0011	0.0006		<0.00090	0.00083
Hg and its compounds	6-8hrs	0.05 mg/m^3	0.0022	0.0008		0.0034	0.0015
Sb, As, Pb, Cr, Co, Cu, Mn, Ni, V and their compounds	6-8hrs	0.5 mg/m^3	0.0225	0.0203		0.084	0.014
Dioxins & Furans (I-TEQ)	6-8hrs	0.1 ng/m^3	0.019	0.0072		0.0077	0.00083
PCBs (WHO-TEQ Humans / Mammals)	6-8hrs	None set ng/m^3	0.001	0.00003		0.00048	0.0001
PCBs (WHO-TEQ Fish)	6-8hrs	None set ng/m^3	0.0001	0.00001		0.000021	0.0000057
PCBs (WHO-TEQ Birds)	6-8hrs	None set ng/m^3	0.004	0.001		0.00089	0.00039
Anthanthrene	6-8hrs	None set µg/m^3	<0.0125	<0.0125		<0.00066	<0.00092
Benzo(a)anthracene	6-8hrs	None set µg/m^3	<0.0125	<0.0125		0.0016	<0.00092
Benzo(a)pyrene	6-8hrs	None set µg/m^3	<0.0125	<0.0125		<0.00066	<0.00092
Benzo(b)fluoranthene	6-8hrs	None set µg/m^3	<0.0125	<0.0125		0.0038	<0.00092
Benzo(b)naptho(2,1-d) thiophene	6-8hrs	None set µg/m^3	<0.0125	<0.0125		<0.00066	<0.00092
Benzo(c)phenanthrene	6-8hrs	None set µg/m^3	<0.0125	<0.0125		0.00066	<0.00092
Benzo(ghi)perylene	6-8hrs	None set µg/m^3	<0.0125	<0.0125		0.0015	<0.00092
Benzo(k)fluoranthene	6-8hrs	None set µg/m^3	<0.0125	<0.0125		0.0022	<0.00092
Cholanthrene	6-8hrs	None set µg/m^3	<0.0125	<0.0125		<0.00066	<0.00092
Chrysene	6-8hrs	None set µg/m^3	<0.0125	<0.0125		0.0037	<0.00092
Cyclopenta(cd)pyrene	6-8hrs	None set µg/m^3	<0.0125	<0.0125		<0.00066	<0.00092
Dibenzo(ai)pyrene	6-8hrs	None set µg/m^3	<0.0125	<0.0125		<0.00066	<0.00092
Dibenzo(ah)anthracene	6-8hrs	None set µg/m^3	<0.0125	<0.0125		<0.00066	<0.00092
Fluoranthene	6-8hrs	None set µg/m^3	<0.0125	0.03		0.0057	<0.00092
Indeno(123-cd) pyrene	6-8hrs	None set µg/m^3	<0.0125	<0.0125		0.0016	0.0017
Naphthalene	6-8hrs	None set µg/m^3	0.12	0.011		0.13	0.16

Comments :

Results from the November monitoring campaigns showed elevated readings for Dioxins and PCB's. Re-monitoring was carried out in Febuary 2020, the results of the repeat monitoring are shown in the table above.

Emissions to Air (continously monitored)

Summary of monitoring undertaken, standards used and compliance
All results below monitored by CEMs. No invalid days of data.
Monthly max daily mean including false readings from probe blockage. No environmental impact. 1/2 hourly mean including false readings from probe blockage. No environmental impact.

Results of emissions to air that are continuously monitored

Substance	Reference Period	Emission Limit Value	A1		A2							
			Max.	Avg.	Max.	Avg.						
Oxides of nitrogen	Daily mean	200 mg/m^3	188	176.9	208	173.1						
	½ hourly mean	400 mg/m^3	380	177.8	414	172.8						
Particulates	Daily mean	10 mg/m^3	1	1	24	1						
	½ hourly mean	30 mg/m^3	1	0.98	1125	0.3						
Total Organic Carbon	Daily mean	10 mg/m^3	1	0.1	1	0.3						
	½ hourly mean	20 mg/m^3	4	0.04	7	0.3						
Hydrogen chloride	Daily mean	10 mg/m^3	8	5	7	4						
	½ hourly mean	60 mg/m^3	32	4.9	57	4.1						
Sulphur dioxide	Daily mean	50 mg/m^3	37	15.6	38	16						
	½ hourly mean	200 mg/m^3	140	15.5	115	16						
Carbon monoxide	Daily mean	50 mg/m^3	13	4.9	19	4.3						
	95%ile 10-min avg *	150 mg/m^3 *	11.4	5.1	10.7	4.3						
Ammonia	Daily mean	No limit set	5	1.2	8	1.5						

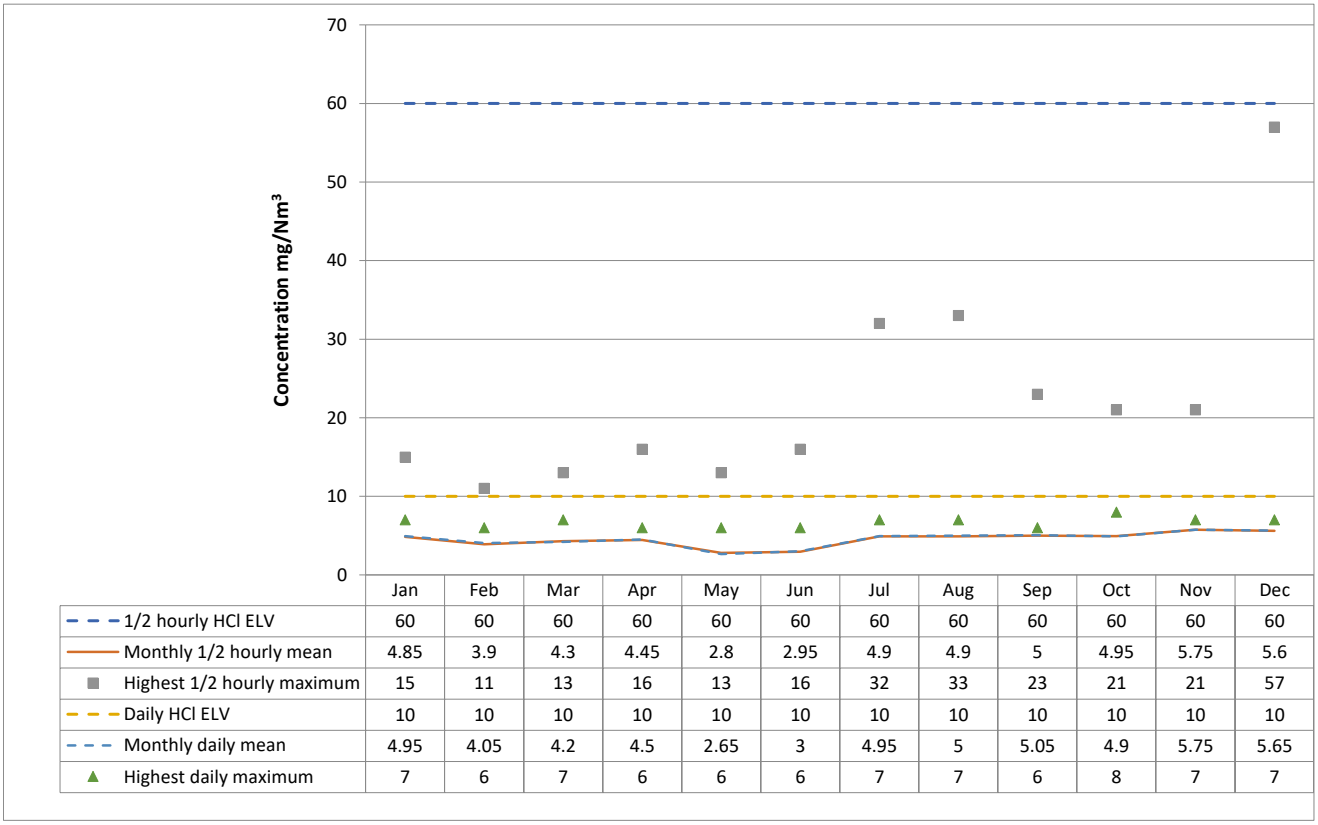
* = delete or amend as appropriate

Comments :

Particulates Maximum reflects a false readings reported following a probe filter blockage. No ELV breach and no environmental impact.

Monitoring of Hydrogen Chloride emissions **Whole Installation** *See Notes in Cell Q3*

mg/Nm^3	1/2 Hourly Reference Periods			Daily Reference Periods		
2019	**1/2 hourly HCl ELV**	**Monthly 1/2 hourly mean**	**Highest 1/2 hourly maximum**	**Daily HCl ELV**	**Monthly daily mean**	**Highest daily maximum**
Jan	60	4.85	15	10	4.95	7
Feb	60	3.9	11	10	4.05	6
Mar	60	4.3	13	10	4.2	7
Apr	60	4.45	16	10	4.5	6
May	60	2.8	13	10	2.65	6
Jun	60	2.95	16	10	3	6
Jul	60	4.9	32	10	4.95	7
Aug	60	4.9	33	10	5	7
Sep	60	5	23	10	5.05	6
Oct	60	4.95	21	10	4.9	8
Nov	60	5.75	21	10	5.75	7
Dec	60	5.6	57	10	5.65	7

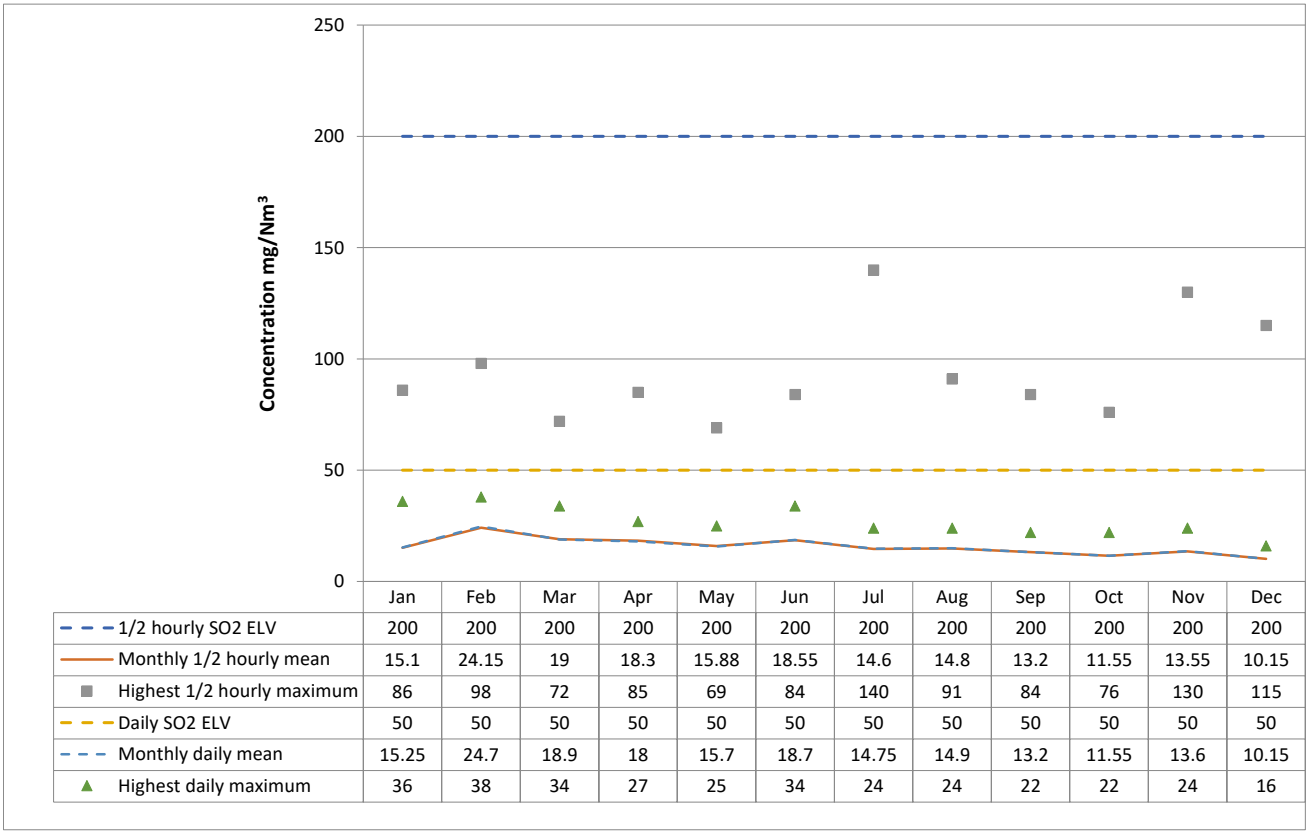


	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1/2 hourly HCl ELV	60	60	60	60	60	60	60	60	60	60	60	60
Monthly 1/2 hourly mean	4.85	3.9	4.3	4.45	2.8	2.95	4.9	4.9	5	4.95	5.75	5.6
Highest 1/2 hourly maximum	15	11	13	16	13	16	32	33	23	21	21	57
Daily HCl ELV	10	10	10	10	10	10	10	10	10	10	10	10
Monthly daily mean	4.95	4.05	4.2	4.5	2.65	3	4.95	5	5.05	4.9	5.75	5.65
Highest daily maximum	7	6	7	6	6	6	7	7	6	8	7	7

Comments :

Monitoring of Sulphur dioxide emissions **Whole Installation** *See Notes in Cell Q3*

mg/Nm^3	1/2 Hourly Reference Periods			Daily Reference Periods		
2019	**1/2 hourly SO2 ELV**	**Monthly 1/2 hourly mean**	**Highest 1/2 hourly maximum**	**Daily SO2 ELV**	**Monthly daily mean**	**Highest daily maximum**
Jan	200	15.1	86	50	15.25	36
Feb	200	24.15	98	50	24.7	38
Mar	200	19	72	50	18.9	34
Apr	200	18.3	85	50	18	27
May	200	15.88	69	50	15.7	25
Jun	200	18.55	84	50	18.7	34
Jul	200	14.6	140	50	14.75	24
Aug	200	14.8	91	50	14.9	24
Sep	200	13.2	84	50	13.2	22
Oct	200	11.55	76	50	11.55	22
Nov	200	13.55	130	50	13.6	24
Dec	200	10.15	115	50	10.15	16

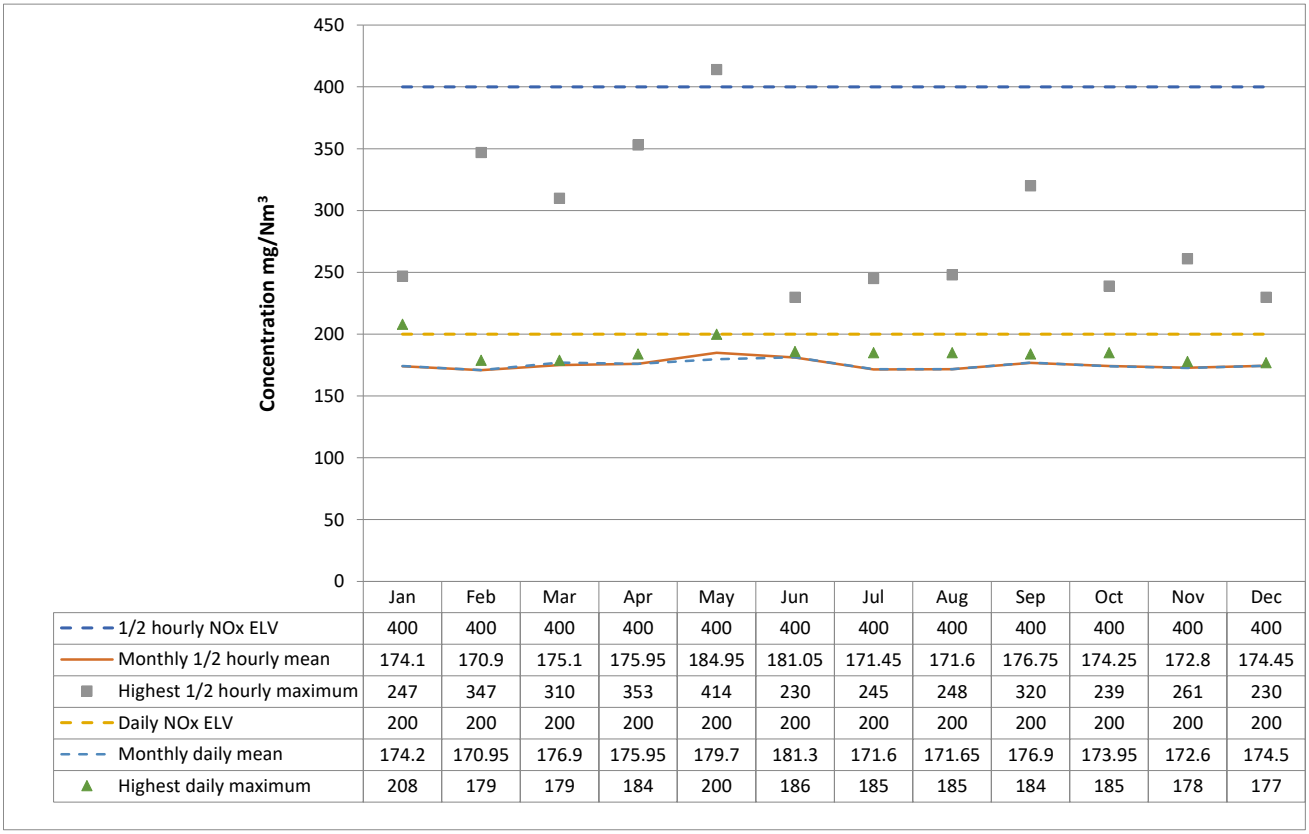


	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1/2 hourly SO2 ELV	200	200	200	200	200	200	200	200	200	200	200	200
Monthly 1/2 hourly mean	15.1	24.15	19	18.3	15.88	18.55	14.6	14.8	13.2	11.55	13.55	10.15
Highest 1/2 hourly maximum	86	98	72	85	69	84	140	91	84	76	130	115
Daily SO2 ELV	50	50	50	50	50	50	50	50	50	50	50	50
Monthly daily mean	15.25	24.7	18.9	18	15.7	18.7	14.75	14.9	13.2	11.55	13.6	10.15
Highest daily maximum	36	38	34	27	25	34	24	24	22	22	24	16

Comments :

Monitoring of Oxides of Nitrogen emissions **Whole Installation** *See Notes in Cell Q3*

mg/Nm^3	1/2 Hourly Reference Periods			Daily Reference Periods		
2019	**1/2 hourly NOx ELV**	**Monthly 1/2 hourly mean**	**Highest 1/2 hourly maximum**	**Daily NOx ELV**	**Monthly daily mean**	**Highest daily maximum**
Jan	400	174.1	247	200	174.2	208
Feb	400	170.9	347	200	170.95	179
Mar	400	175.1	310	200	176.9	179
Apr	400	175.95	353	200	175.95	184
May	400	184.95	414	200	179.7	200
Jun	400	181.05	230	200	181.3	186
Jul	400	171.45	245	200	171.6	185
Aug	400	171.6	248	200	171.65	185
Sep	400	176.75	320	200	176.9	184
Oct	400	174.25	239	200	173.95	185
Nov	400	172.8	261	200	172.6	178
Dec	400	174.45	230	200	174.5	177



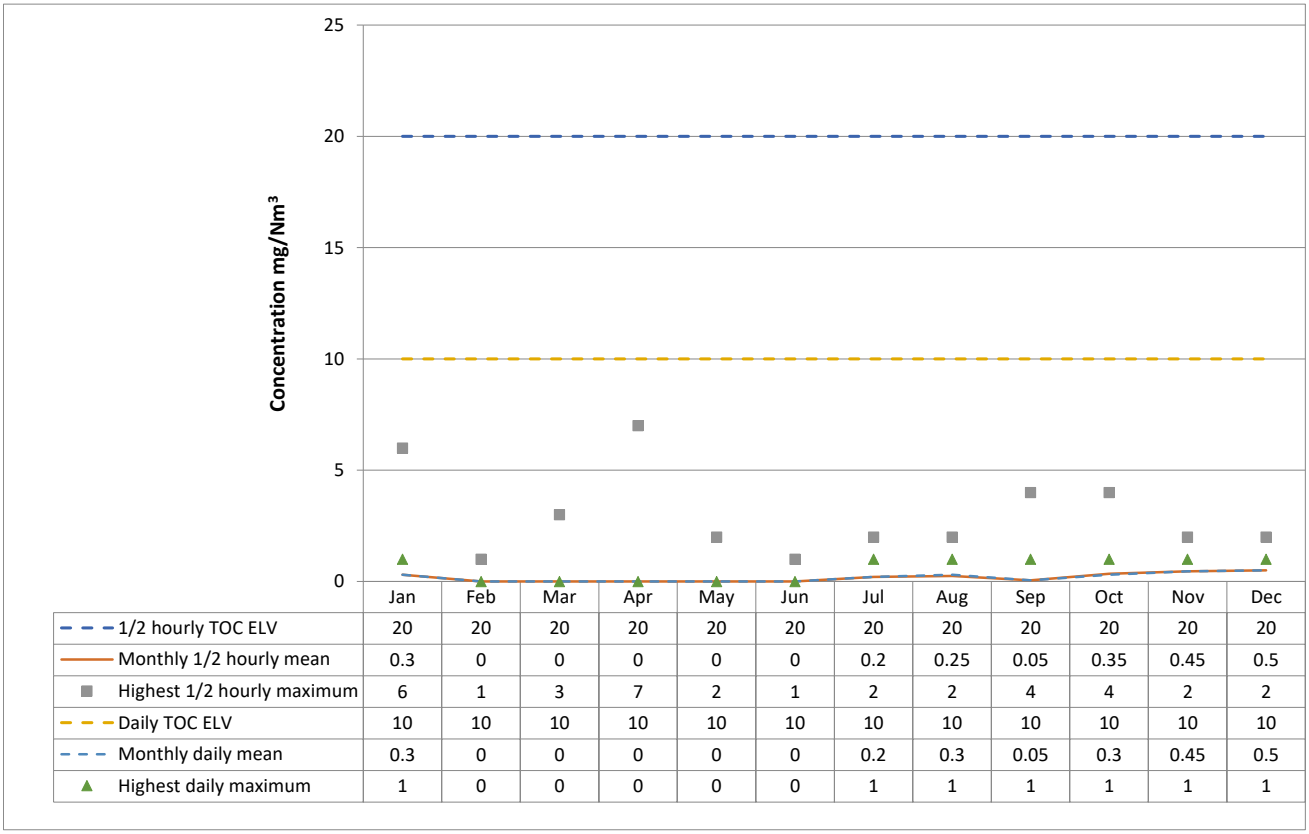
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1/2 hourly NOx ELV	400	400	400	400	400	400	400	400	400	400	400	400
Monthly 1/2 hourly mean	174.1	170.9	175.1	175.95	184.95	181.05	171.45	171.6	176.75	174.25	172.8	174.45
Highest 1/2 hourly maximum	247	347	310	353	414	230	245	248	320	239	261	230
Daily NOx ELV	200	200	200	200	200	200	200	200	200	200	200	200
Monthly daily mean	174.2	170.95	176.9	175.95	179.7	181.3	171.6	171.65	176.9	173.95	172.6	174.5
Highest daily maximum	208	179	179	184	200	186	185	185	184	185	178	177

Comments :

Jan 19, A2 - An elevated level for the daily average of Oxides of Nitrogen of 208.48 mg/m3 as a result of blockages in the Urea dosing lines caused by urea clumping in bags provided by an alternative supplier.
May 19, A2 - An elevated level for the half hour average of Oxides of Nitrogen with a measurement of 414.21 mg/m3. Recorded 1 hours 10 mins of abnormal operations due to blockages in the dosing lines caused by the failure of fan belts on the urea blower system, preventing urea delivery into the combustion chamber.

Monitoring of Total organic carbon emissions **Whole Installation** *See Notes in Cell Q3*

mg/Nm^3	1/2 Hourly Reference Periods			Daily Reference Periods		
2019	**1/2 hourly TOC ELV**	**Monthly 1/2 hourly mean**	**Highest 1/2 hourly maximum**	**Daily TOC ELV**	**Monthly daily mean**	**Highest daily maximum**
Jan	20	0.3	6	10	0.3	1
Feb	20	0	1	10	0	0
Mar	20	0	3	10	0	0
Apr	20	0	7	10	0	0
May	20	0	2	10	0	0
Jun	20	0	1	10	0	0
Jul	20	0.2	2	10	0.2	1
Aug	20	0.25	2	10	0.3	1
Sep	20	0.05	4	10	0.05	1
Oct	20	0.35	4	10	0.3	1
Nov	20	0.45	2	10	0.45	1
Dec	20	0.5	2	10	0.5	1

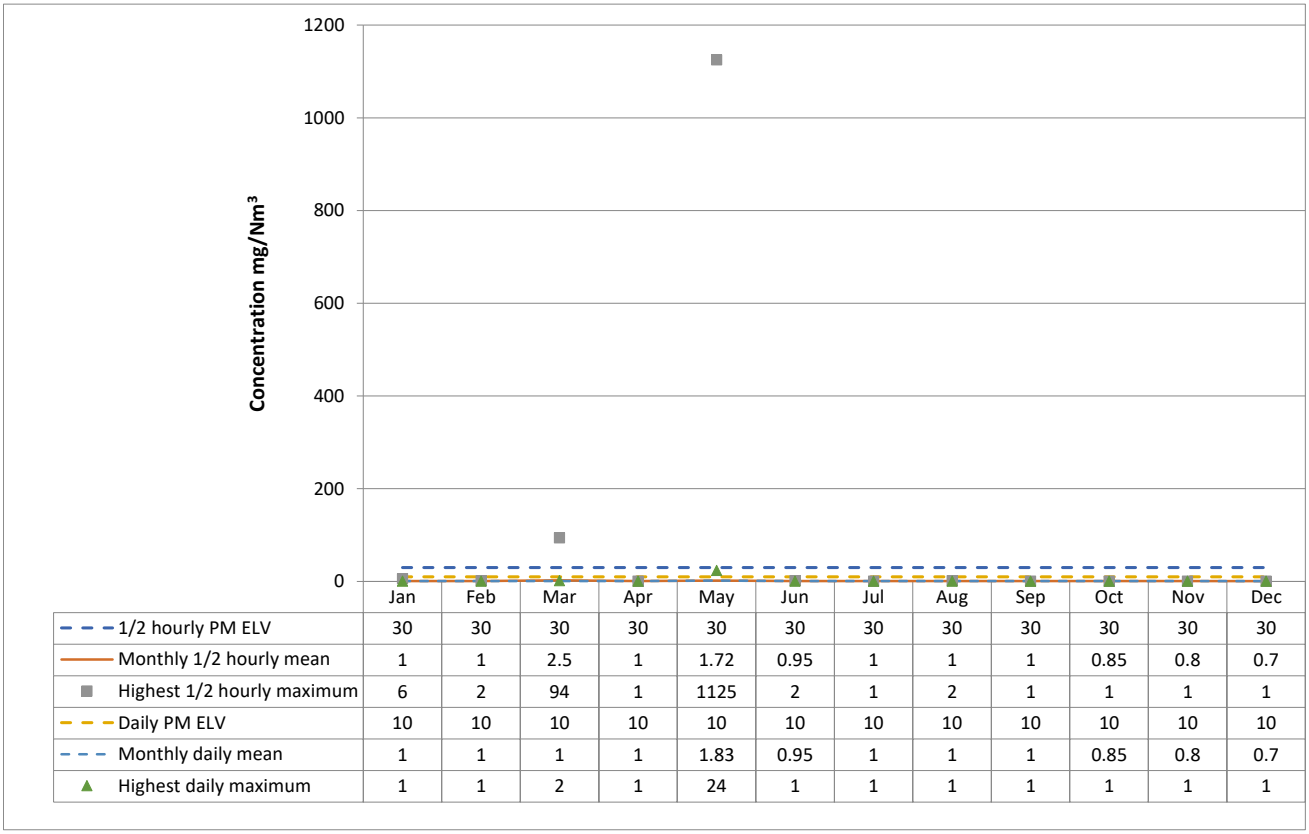


	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1/2 hourly TOC ELV	20	20	20	20	20	20	20	20	20	20	20	20
Monthly 1/2 hourly mean	0.3	0	0	0	0	0	0.2	0.25	0.05	0.35	0.45	0.5
Highest 1/2 hourly maximum	6	1	3	7	2	1	2	2	4	4	2	2
Daily TOC ELV	10	10	10	10	10	10	10	10	10	10	10	10
Monthly daily mean	0.3	0	0	0	0	0	0.2	0.3	0.05	0.3	0.45	0.5
Highest daily maximum	1	0	0	0	0	0	1	1	1	1	1	1

Comments :

Monitoring of Particulate matter emissions **Whole Installation** *See Notes in Cell Q3*

mg/Nm^3	1/2 Hourly Reference Periods			Daily Reference Periods		
2019	**1/2 hourly PM ELV**	**Monthly 1/2 hourly mean**	**Highest 1/2 hourly maximum**	**Daily PM ELV**	**Monthly daily mean**	**Highest daily maximum**
Jan	30	1	6	10	1	1
Feb	30	1	2	10	1	1
Mar	30	2.5	94	10	1	2
Apr	30	1	1	10	1	1
May	30	1.72	1125	10	1.83	24
Jun	30	0.95	2	10	0.95	1
Jul	30	1	1	10	1	1
Aug	30	1	2	10	1	1
Sep	30	1	1	10	1	1
Oct	30	0.85	1	10	0.85	1
Nov	30	0.8	1	10	0.8	1
Dec	30	0.7	1	10	0.7	1



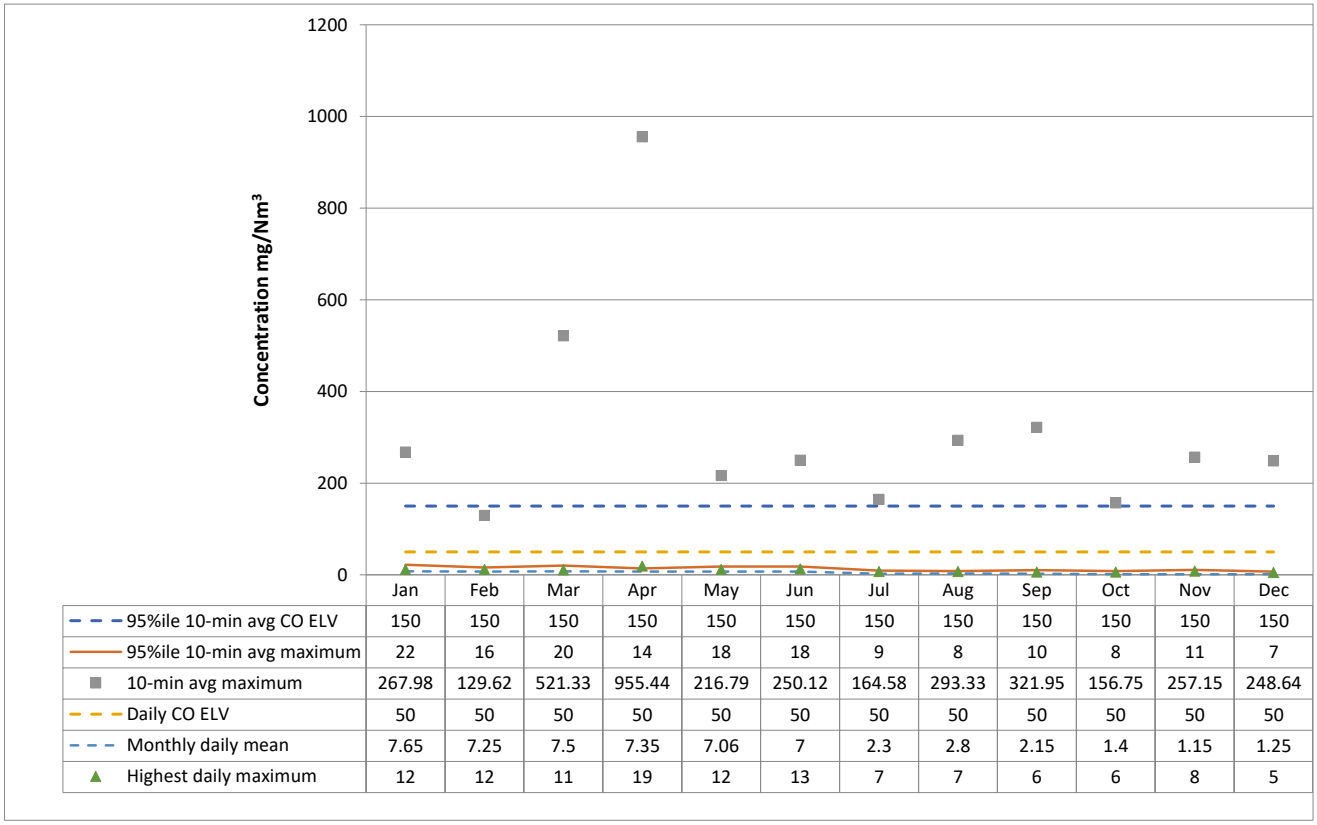
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1/2 hourly PM ELV	30	30	30	30	30	30	30	30	30	30	30	30
Monthly 1/2 hourly mean	1	1	2.5	1	1.72	0.95	1	1	1	0.85	0.8	0.7
Highest 1/2 hourly maximum	6	2	94	1	1125	2	1	2	1	1	1	1
Daily PM ELV	10	10	10	10	10	10	10	10	10	10	10	10
Monthly daily mean	1	1	1	1	1.83	0.95	1	1	1	0.85	0.8	0.7
Highest daily maximum	1	1	2	1	24	1	1	1	1	1	1	1

Comments :

Data for particulates includes the two false readings reported during the period, this has impacted on the half hourly and daily averages reported. No ELV breach occured and no environmental impact.

Monitoring of Carbon Monoxide (10-minute avg) **Whole Installation** *See Notes in Cell S3*

mg/Nm^3	10-minute Reference Periods				Daily Reference Periods		
2019	**95%ile 10-min avg CO ELV**	**95%ile 10-min avg maximum**	**Monthly CO 10-min avg mean**	**10-min avg maximum**	**Daily CO ELV**	**Monthly daily mean**	**Highest daily maximum**
Jan	150	22	7.55	267.98	50	7.65	12
Feb	150	16	7.25	129.62	50	7.25	12
Mar	150	20	7.5	521.33	50	7.5	11
Apr	150	14	7.35	955.44	50	7.35	19
May	150	18	8.55	216.79	50	7.06	12
Jun	150	18	7.05	250.12	50	7	13
Jul	150	9	2.3	164.58	50	2.3	7
Aug	150	8	2.8	293.33	50	2.8	7
Sep	150	10	2.15	321.95	50	2.15	6
Oct	150	8	1.4	156.75	50	1.4	6
Nov	150	11	1.15	257.15	50	1.15	8
Dec	150	7	1.35	248.64	50	1.25	5



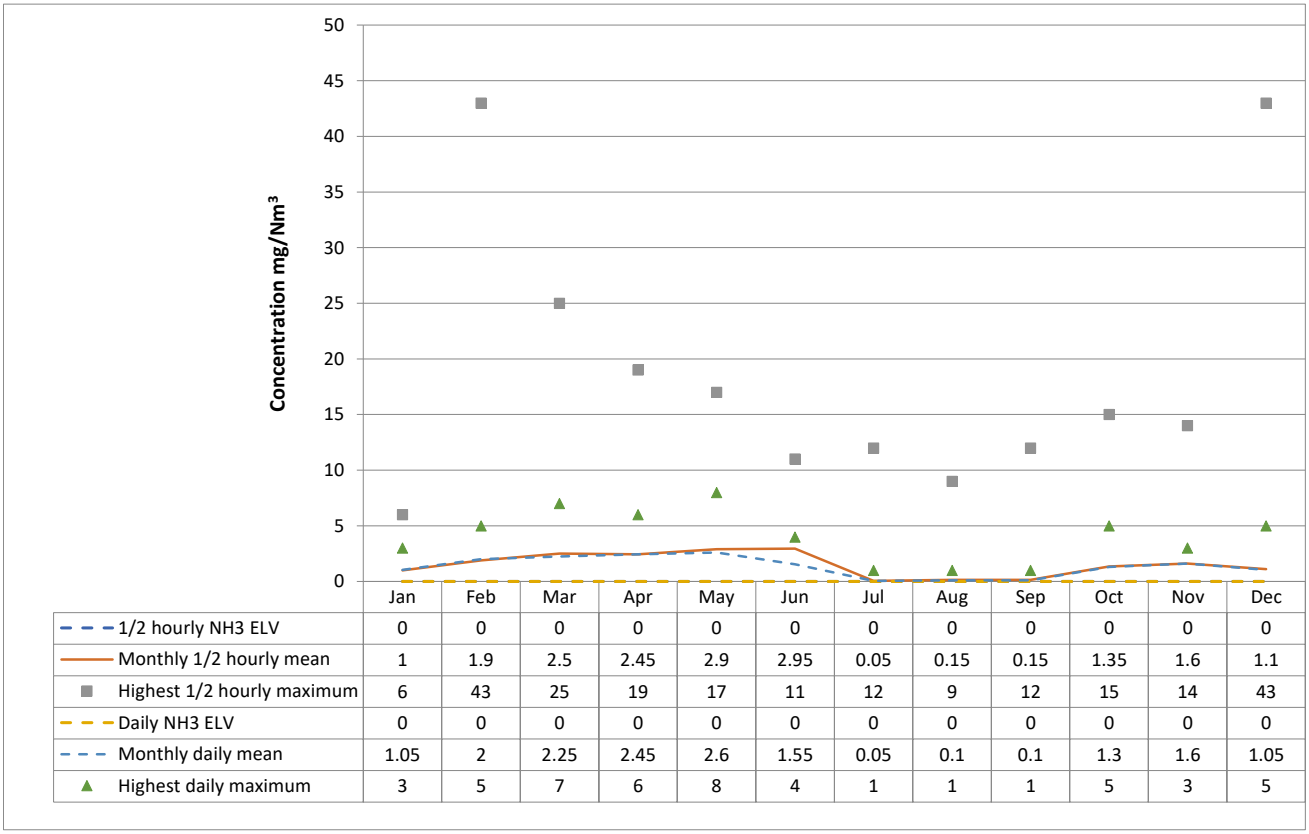
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
95%ile 10-min avg CO ELV	150	150	150	150	150	150	150	150	150	150	150	150
95%ile 10-min avg maximum	22	16	20	14	18	18	9	8	10	8	11	7
10-min avg maximum	267.98	129.62	521.33	955.44	216.79	250.12	164.58	293.33	321.95	156.75	257.15	248.64
Daily CO ELV	50	50	50	50	50	50	50	50	50	50	50	50
Monthly daily mean	7.65	7.25	7.5	7.35	7.06	7	2.3	2.8	2.15	1.4	1.15	1.25
Highest daily maximum	12	12	11	19	12	13	7	7	6	6	8	5

Comments :

May figures exclude average for 5th May as only 7 10-minutes were recorded for this day due to plant shut down therefore daily ELV compliance should not be applied. December figures eclude average for 21 Dec as only 14 10-minutes were recorded for this day due to plant shut down therefore daily ELV compliance should not be applied. Environment Agency explanatory note: The 10-minute average ELV is based on the “95th percentile”. In this case this means that 95% of the 10 minute averages in the relevant 24-hour period (i.e. 137) must be below 150 mg/Nm3, and 5% (i.e. 7) are allowed to be any value above 150 mg/Nm3. Whilst we expect operators to minimise CO emissions at all times, it is perfectly acceptable for the value of the maximum 10-minute average to be above 150 mg/Nm3, provided the 95th percentile ELV has been met for that period.

Monitoring of Ammnonia emissions **Whole Installation** *See Notes in Cell Q3*

mg/Nm^3	1/2 Hourly Reference Periods			Daily Reference Periods		
2019	**1/2 hourly NH3 ELV**	**Monthly 1/2 hourly mean**	**Highest 1/2 hourly maximum**	**Daily NH3 ELV**	**Monthly daily mean**	**Highest daily maximum**
Jan	N/A	1	6	N/A	1.05	3
Feb	N/A	1.9	43	N/A	2	5
Mar	N/A	2.5	25	N/A	2.25	7
Apr	N/A	2.45	19	N/A	2.45	6
May	N/A	2.9	17	N/A	2.6	8
Jun	N/A	2.95	11	N/A	1.55	4
Jul	N/A	0.05	12	N/A	0.05	1
Aug	N/A	0.15	9	N/A	0.1	1
Sep	N/A	0.15	12	N/A	0.1	1
Oct	N/A	1.35	15	N/A	1.3	5
Nov	N/A	1.6	14	N/A	1.6	3
Dec	N/A	1.1	43	N/A	1.05	5



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1/2 hourly NH3 ELV	0	0	0	0	0	0	0	0	0	0	0	0
Monthly 1/2 hourly mean	1	1.9	2.5	2.45	2.9	2.95	0.05	0.15	0.15	1.35	1.6	1.1
Highest 1/2 hourly maximum	6	43	25	19	17	11	12	9	12	15	14	43
Daily NH3 ELV	0	0	0	0	0	0	0	0	0	0	0	0
Monthly daily mean	1.05	2	2.25	2.45	2.6	1.55	0.05	0.1	0.1	1.3	1.6	1.05
Highest daily maximum	3	5	7	6	8	4	1	1	1	5	3	5

Comments :

An indicated ELV value of zero in the table above means that no ammonia limit is set in the permit.