



MVV Environment Baldovie Ltd
Energy from Waste



Pollution Prevention and Control (Scotland) Regulations
2012

PPC/A/1003157

Annual Report

2019



Contents

Introduction	1
Emissions to Air.....	2
Continuous Monitoring of Emissions to Air	2
Mass Emissions from CEMS	8
Periodic Monitoring	9
Variations to Permit	9
Permit Compliance.....	9
Incidents Reported.....	9
Complaints	10
Total Organic Carbon (TOC) in Bottom Ash	10
Fly Ash and Cyclone Ash.....	10
CEMS Calibration Checks	10
Permitted Quantities of Waste	11
Energy Recovery.....	11
Abnormal Operation and Breakdowns	11
Summary of Breakdown, Outages and Interruptions to Normal Operation	11
Summary of Overall Performance	13
Appendix 1 Summary of Mass Emissions from CEMS 2019	1
Figure 1 B1 NO _x Annual Emission	2
Figure 2 B2 NO _x Annual Emission	2
Figure 3 B1 CO Annual Emission	3
Figure 4 B2 CO Annual Emission	3
Figure 5 B1 Annual Emission SO ₂	4
Figure 6 B2 Annual Emission SO ₂	4
Figure 7 Boiler 1 Annual Emission HCl	5
Figure 8 B2 Annual Emission HCl.....	5
Figure 9 B1 Annual Emission NH ₃	6
Figure 10 B2 Annual Emission NH ₃	6
Figure 11 B1 Annual Emission TOC	7
Figure 12 B2 Annual Emission TOC	7
Figure 13 B1 Annual Emission Dust.....	8
Figure 14 B2 Annual Emission Dust.....	8
Figure 15 Total Mass Emissions from Periodic Monitoring	9
Figure 16 Electrical Energy Produced	11
Figure 17 Material Inputs and Outputs.....	13



Introduction

The MVV Environment Baldovie Ltd (MEB) Energy from Waste (EfW) facility is located on the north easterly outskirts of Dundee, Scotland. The facility features two bubbling fluidised bed boilers, each with a thermal output of 17 MWth, firing at design rate, an average 7.5 tph of waste per unit. The boilers are operated on refuse derived fuel which is prepared on site through the treatment of household and industrial waste which is received at the site from the locality, primarily from Dundee and Angus Councils.

The steam generated by the boilers is supplied to a condensing steam turbine for the generation of up to 10.5 MWe of electrical power. The power is generated at 11 kV and after supplying power to run the plant, the balance is exported directly to the local Distribution Network Operator. The plant was constructed during 1998 to 2000 and has been in operation since March 2000 with various plant improvements and modifications made since operations commenced.

MVV Umwelt purchased the site in November 2018. In addition to the thermal treatment of residual waste, MVV Umwelt's portfolio includes the use of wind energy, biomass and biowaste as well as the production of biomethane. MVV across Europe have an installed capacity of 426 megawatts of electricity from renewable energies alone, 196 megawatts of which is in the form of onshore wind power.

Since the takeover, significant investment in replacement and upgraded equipment has been made, resulting in improved reliability and efficiency, together with consistent and sustainable improvement in environmental performance.

MVV are constructing a completely new Combined Heat and Power (CHP) facility – a moving grate plant, alongside and to the south of the existing fluidised bed plant. This plant is due to be commissioned in summer 2020 and has the capability to supply up to 20 tonnes of steam for process use from the steam turbine extraction pass-out. This is in addition to the capability to export 9.9 MWe should the steam pass-out not be utilised.

The operation of both plants is regulated under a common PPC Permit (PPC/A/1003157)

Whilst the Permit currently reflects MVV's original intention to cease operating and de-commission the fluidised bed facility when commissioning of the moving grate plant was complete, a detailed review of the current and planned capacity for dealing with residual waste in Scotland showed a capacity gap exists, and that a lifetime extension of the existing fluidised bed facility would be a viable and beneficial option. Parallel operation of both plants would provide a total capacity for approximately 220,000 tonnes of residual waste, with the lifetime extension of the fluidised bed facility providing otherwise unplanned incremental capacity for treating 110,000 tonnes per year and which would be available by summer 2020.

An application for Variation of the Permit has therefore been prepared on the basis of continuing the operation of the fluidised bed plant alongside the moving grate plant for a period of up to ten years.

This change is being made, taking into account a Best Available Techniques (BAT) review of both plants will probably be required in order to demonstrate that the requirements of the recent BAT Ref for Incineration of Waste are achievable for both plants.



Emissions to Air

Continuous Monitoring of Emissions to Air

As required by Condition 6.3.9 and 6.1.1 Quarterly reports for Q1-Q4 2019 required by condition 6.3.9 were submitted to SEPA at the appropriate times. Graphical tables, illustrating the percentage of the allowance used for compliance with Condition 6.1.8 (a) and (b) were also submitted.

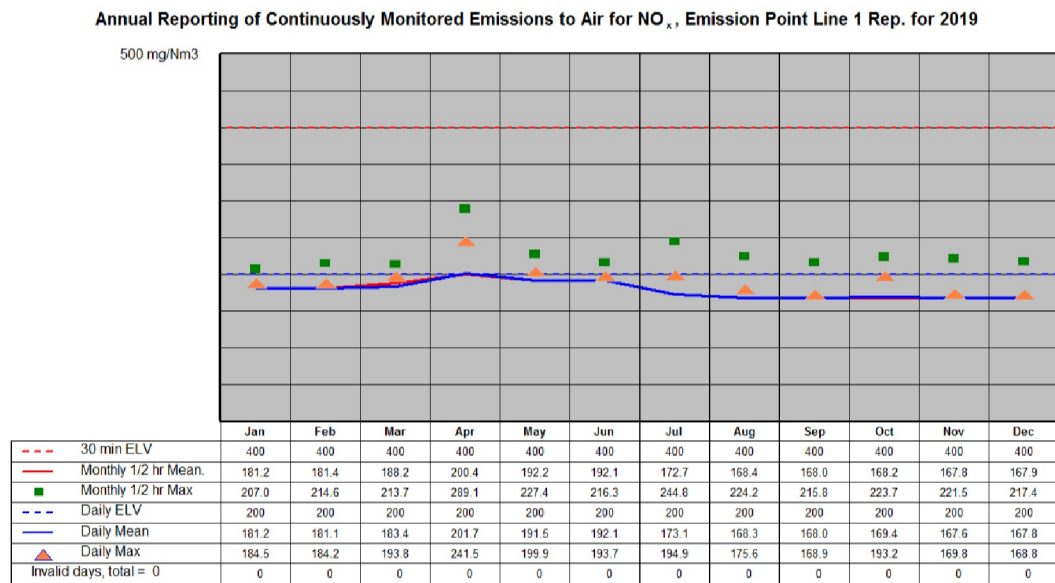


Figure 1 B1 NO_x Annual Emission

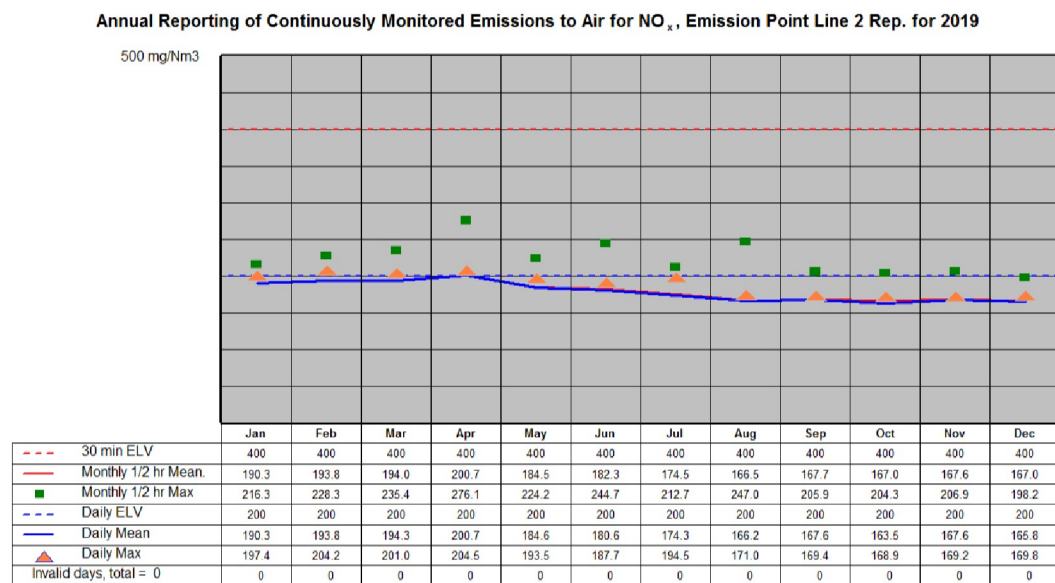


Figure 2 B2 NO_x Annual Emission



Annual Reporting of Continuously Monitored Emissions to Air for CO, Emission Point Line 1 Rep. for 2019

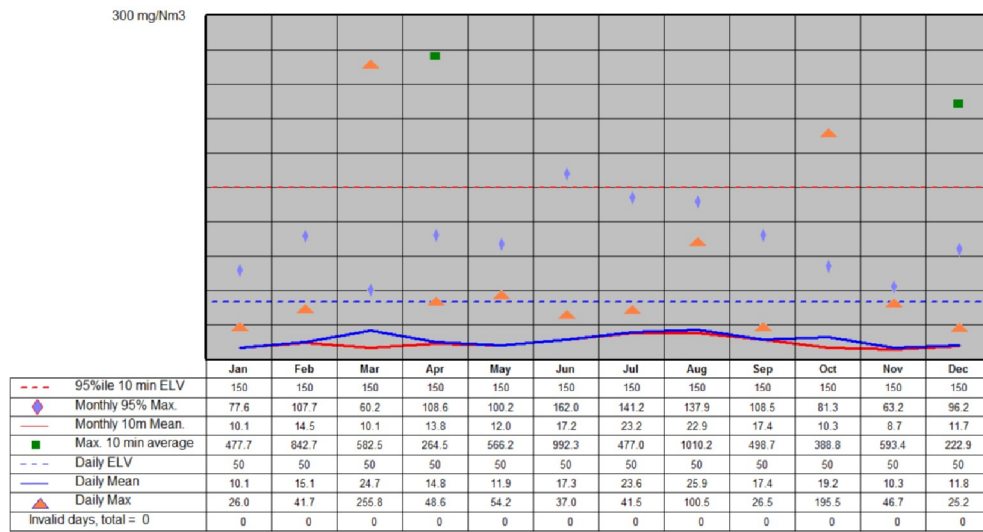


Figure 3 B1 CO Annual Emission

Annual Reporting of Continuously Monitored Emissions to Air for CO, Emission Point Line 2 Rep. for 2019

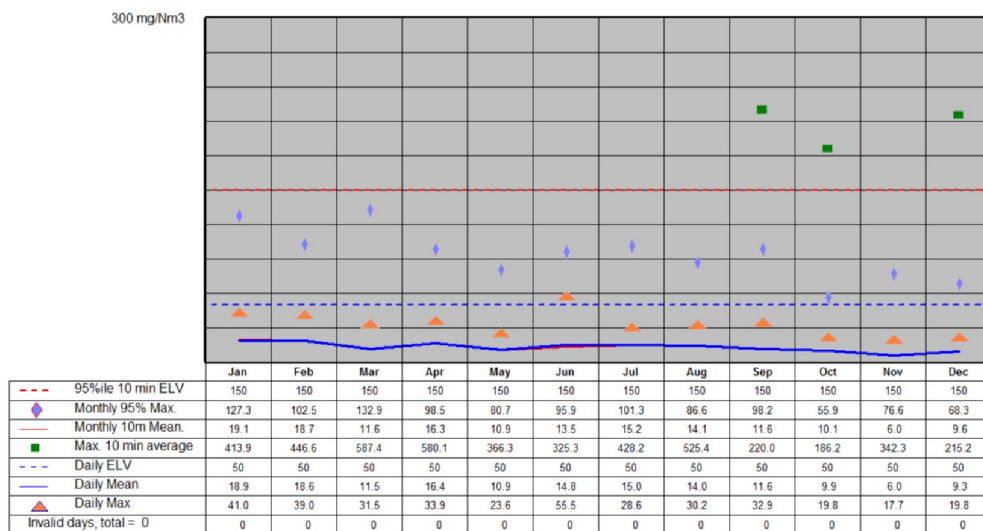
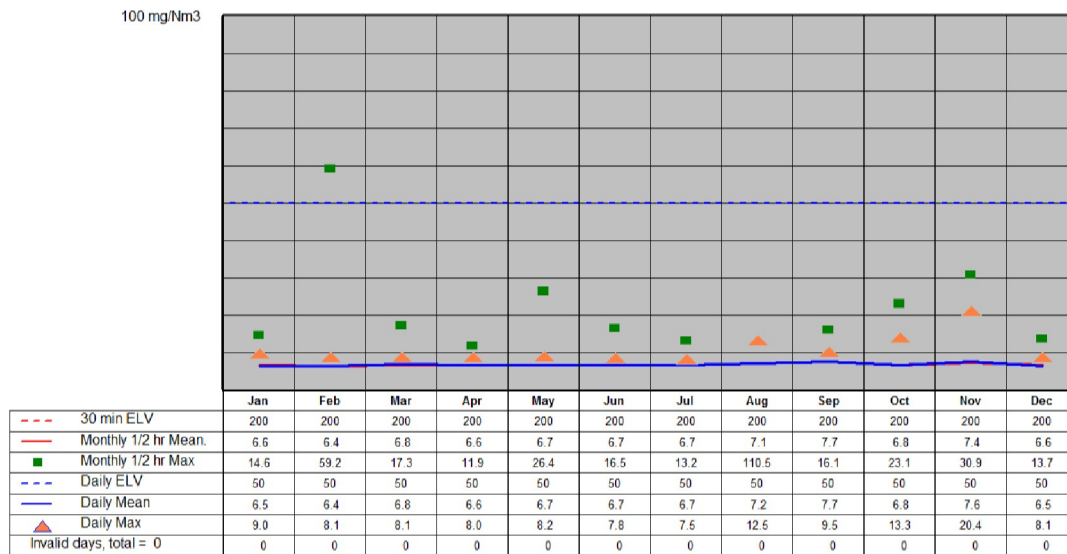
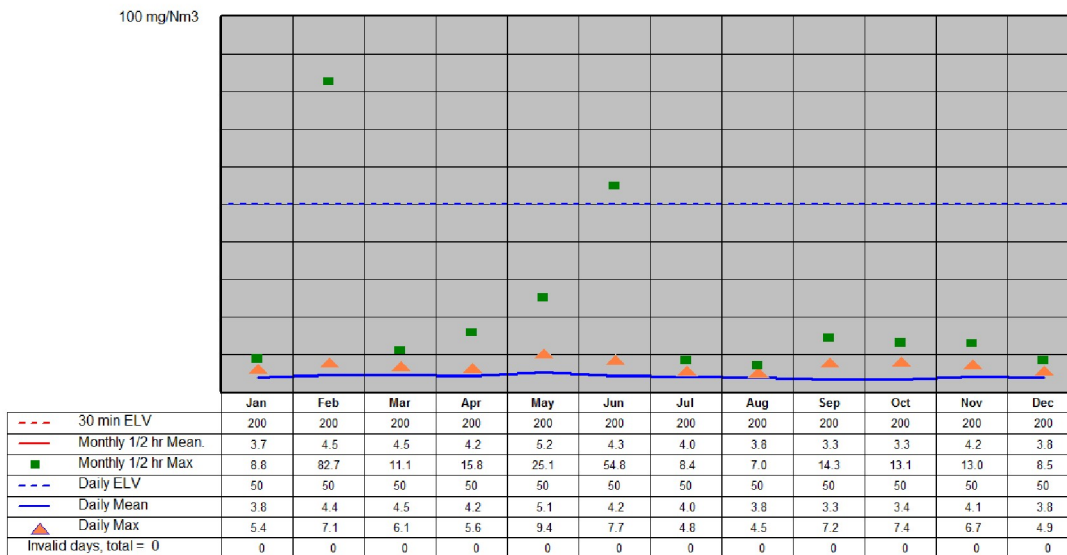


Figure 4 B2 CO Annual Emission

Annual Reporting of Continuously Monitored Emissions to Air for SO₂, Emission Point Line 1 Rep. for 2019Figure 5 B1 Annual Emission SO₂Annual Reporting of Continuously Monitored Emissions to Air for SO₂, Emission Point Line 2 Rep. for 2019Figure 6 B2 Annual Emission SO₂



Annual Reporting of Continuously Monitored Emissions to Air for HCl, Emission Point Line 1 Rep. for 2019

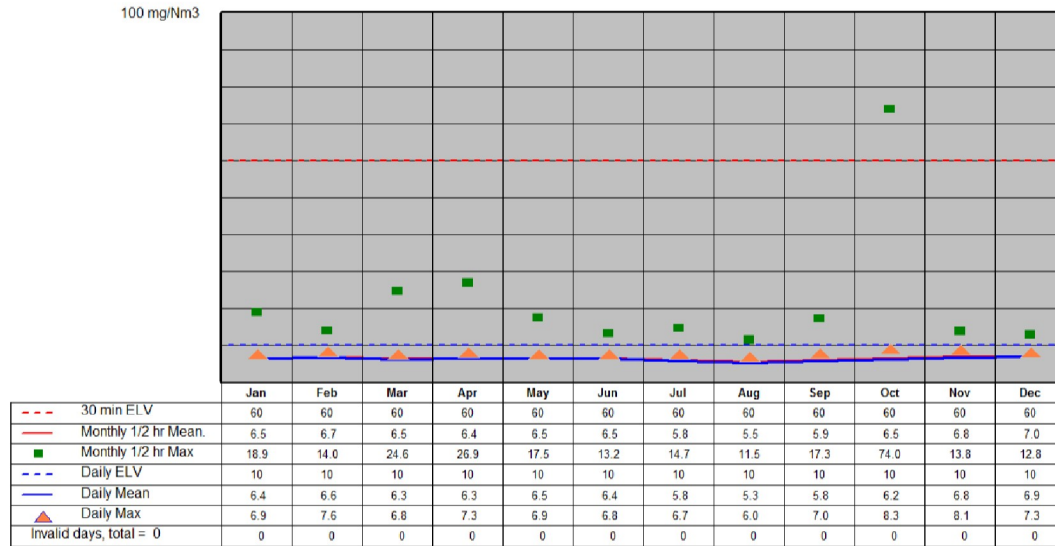


Figure 7 Boiler 1 Annual Emission HCl

Annual Reporting of Continuously Monitored Emissions to Air for HCl, Emission Point Line 2 Rep. for 2019

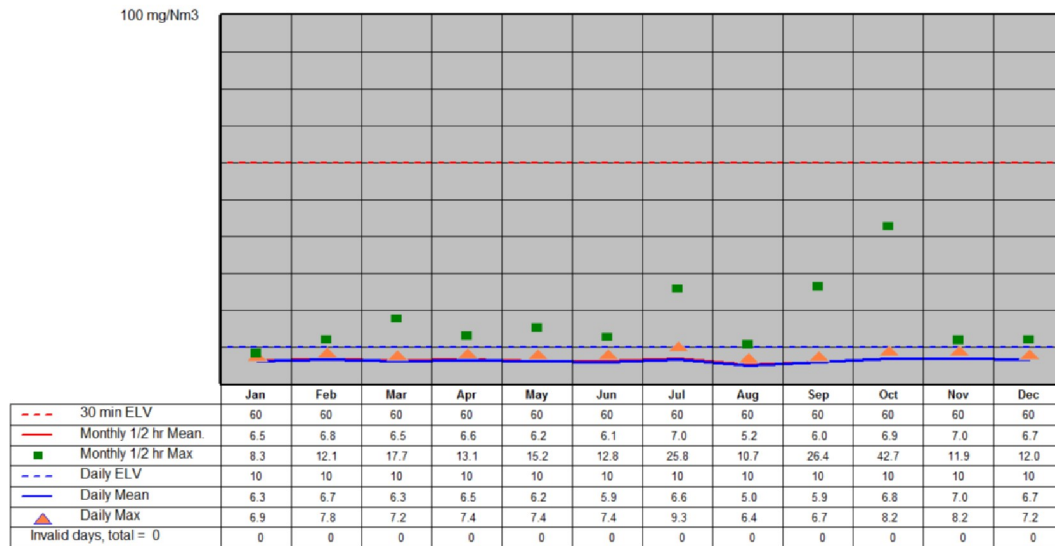
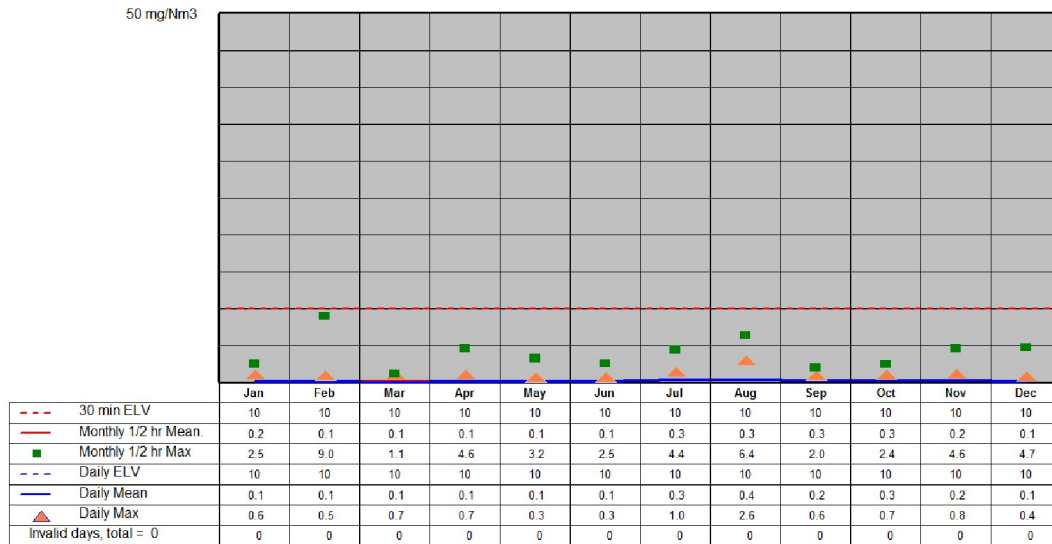
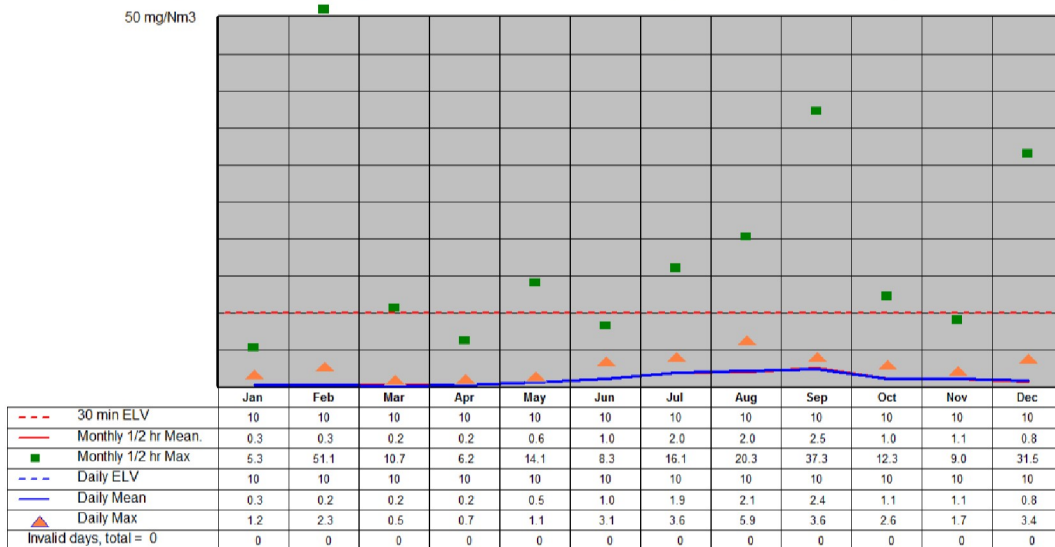


Figure 8 B2 Annual Emission HCl

Annual Reporting of Continuously Monitored Emissions to Air for NH_3 , Emission Point Line 1 Rep. for 2019Figure 9 B1 Annual Emission NH_3 Annual Reporting of Continuously Monitored Emissions to Air for NH_3 , Emission Point Line 2 Rep. for 2019Figure 10 B2 Annual Emission NH_3



Annual Reporting of Continuously Monitored Emissions to Air for TOC, Emission Point Line 1 Rep. for 2019

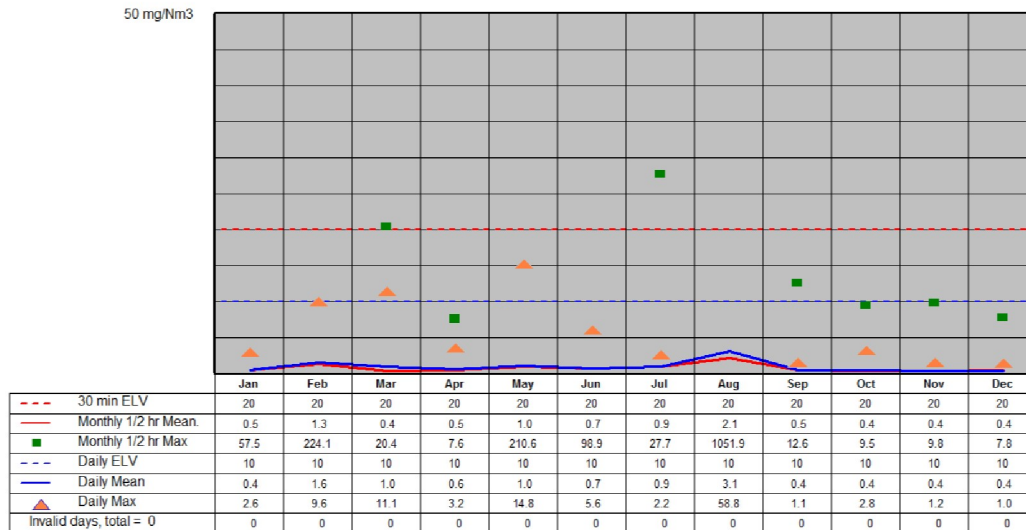


Figure 11 B1 Annual Emission TOC

Annual Reporting of Continuously Monitored Emissions to Air for TOC, Emission Point Line 2 Rep. for 2019

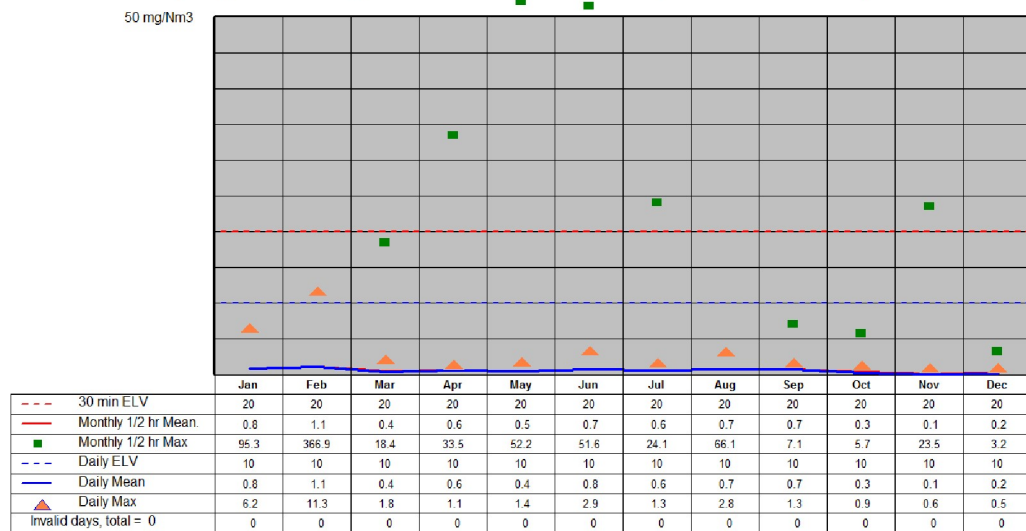


Figure 12 B2 Annual Emission TOC



Annual Reporting of Continuously Monitored Emissions to Air for Dust, Emission Point Line 1 Rep. for 2019

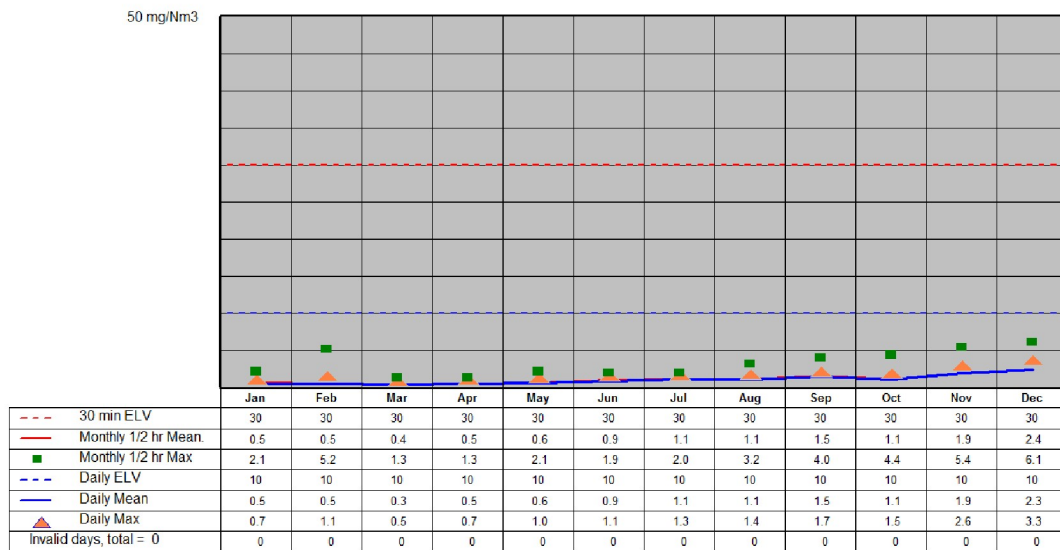


Figure 13 B1 Annual Emission Dust

Annual Reporting of Continuously Monitored Emissions to Air for Dust, Emission Point Line 2 Rep. for 2019

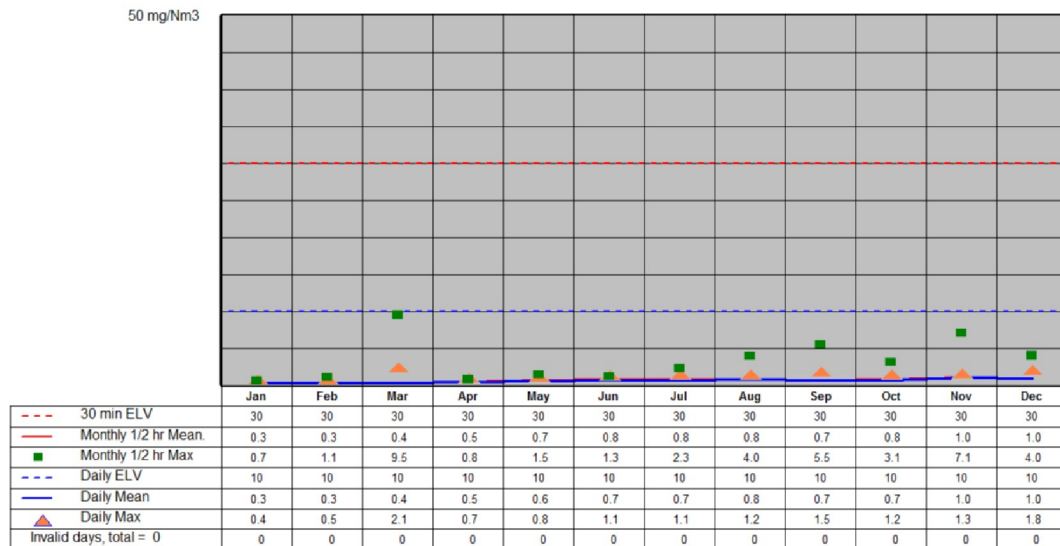


Figure 14 B2 Annual Emission Dust

Mass Emissions from CEMS

A summary table of mass emission from the continuous monitoring system is included as Appendix 1



Periodic Monitoring

As required by Condition 6.4.5

Periodic monitoring reports were submitted for the first 6 months and second 6 months of 2019 for stack emissions to air. All components were compliant with Permit ELVs.

Total Mass Emissions from Periodic Monitoring			
Parameter	Boiler 1 kg/y	Boiler2 kg/y	Total Mass Emission kg
Dioxins & Furans	2.04E-06	9.58E-07	2.99755E-06
Cd & Th	2.04	0.6242	2.66370
Heavy metals	53.09	19.4506	72.53596
Hg	0.4596	0.4935	0.95314
HF	2.23	7.2577	9.48394
NH ₃	150.81	153.8630	304.67369
PCB	2.48E-07	0.0000	3.29765E-07
PAH	2.5667	3.0337	5.60037

Figure 15 Total Mass Emissions from Periodic Monitoring

Variations to Permit

The following key aspects of the Permit were subject to variation in 2019

“The Contents Table, Interpretation of Terms, Schedules 1,2,3,4,5 and 6, and all Annexes, are deleted and replaced with the following Contents Table Interpretation of Terms, and Schedules 1,2,3,4,5,6,7 and 8”

This comprehensive variation was to introduce regulation for the construction and commissioning of the new Moving Grate Plant, alongside the operation of the Fluidised Bed Plant, until commissioning of the Moving Grate Plant was complete.

Permit Compliance

Incidents Reported

In total there were 10 incident reports reported to SEPA during 2019. 4 of these reports were related to breakdown situations requiring maintenance and inspection. 3 of the incident reports were discarded under the compliance assessment scoring due to insufficient valid emissions data sets after bringing boilers back onto waste after repair. There were 2 incident reports for minor breaches of the 95%ile 10-minute rolling 24hr period for CO ELV, although emissions were still within the daily average ELV. 1 further incident report was submitted due to an external contractor accidentally disconnecting an ammonia lance. This reportable incident was identified from the operational downtime report but resulted in no emissions exceedance or harm to the environment.

Scrutiny of external contractor emission monitoring reports by MEB identified the test contractor had incorrectly calculated the emission correction to reference conditions, by applying correction for



moisture to gaseous determinands which were already expressed as dry gas. Further investigation confirmed that the same error had been made by the same contractor during the QAL2 calibration of the Continuous Emissions Monitoring System (CEMS) the previous year. This resulted in incorrect calibration factors being applied to the CEMS and a consequent slight under-reporting of those determinands for part of 2018 and 2019.

SEPA were made fully aware of the situation and issued an advisory letter requiring that the CEMS data be re-calculated using the correct calibration factors to assess the situation. The re-calculation revealed a small number of marginal exceedances of the ½ h average 97%ile ELVs.

A minor breach was recorded on each line, to account for the initial ELV exceedances, but subsequent ones were not, as SEPA had agreed the action to be taken culminating in the revised QAL2 and subsequent reset of the calibration factors.

A new procurement procedure was followed to contract a new company to conduct the revised QAL2 with a follow up audit from SEPA to check compliance.

Complaints

Several complaints were received via the site and SEPA. These were dealt with accordingly via site procedures.

5 complaints (14 June, 26 June, 12 July, 01 Aug and 07 Dec) were received from the north east of the site which were investigated and found to be not substantiated as offensive odour.

2 complaints were received, with no supporting evidence, for black smoke/dirty emissions. MEB provided evidence of continuous monitoring to SEPA demonstrating stable operations and no harm to the environment with photographic evidence provided for the second incident that demonstrated this to be condensing vapour from the cooling towers in specific weather conditions.

2 noise complaints were received by the site. 1 of these complaints was raised in the evening for a scraping-on-metal sound coming from the site. This was traced to the loading/unloading of ash containers with a voluntary corrective action for enforced silent hour operations unless during an emergency. The other complaint wasn't able to be identified as site-related.

Total Organic Carbon (TOC) in Bottom Ash

Condition 5.1.1a and 8.1.5

TOC analysis of bottom ash was carried out in Q1-Q4 inclusive and reports forwarded to SEPA. Results were consistently extremely low and well below the limit of 3% required by Condition 5.1.1.a)

Fly Ash and Cyclone Ash

Condition 2.4.1 and 8.1.6

Ash analysis for Q1 – Q4 for both fly ash and cyclone ash was carried out and reports reported to SEPA.

All results of analysis were typical of previous years'

CEMS Calibration Checks

QAL 3 checks and drift review were carried out by MEB in accordance with Condition 6.2.11 of the Permit.



An early QAL2 calibration program was carried out due to the incident described above. The mandatory maximum period between QAL2 calibration is 5 years, but earlier QAL2 calibration may be required in irregular circumstances.

Permitted Quantities of Waste

Condition 4.2.2.a) limits the Fluidised Bed Plant to 150000 tonnes of waste incinerated in any calendar year.

In 2019, the total of waste received was 98303 tonnes, of which 96231 tonnes was incinerated, and 2072 tonnes rejected to landfill.

Detailed, itemised quarterly returns of waste(s) incinerated (by EWC code) were sent to SEPA's Waste Data Unit throughout 2019.

Energy Recovery

The fluidised bed plant is optimised for recovery of electrical energy only, and no heat is exported.

Electrical energy produced and exported showed significant improvement from the previous year 2018.

Electrical Energy Produced		
Gross generated	65617 MWh	(up 10.045%)
Exported	47112 MWh	(up 11.82%)
Imported	347 MWh	(down 37.14%)

Figure 16 Electrical Energy Produced

A further concealed efficiency was the direct export of 405 MWh provided to supply the construction site and Contractors' Village, thus avoiding the adverse impact of using diesel generators for the construction period and will continue into 2020.

Abnormal Operation and Breakdowns

No Abnormal Operating Events were recorded under the provisions of Section 5.4 Abnormal Operation and Breakdowns.

Summary of Breakdown, Outages and Interruptions to Normal Operation

Total Running Time

for each of Line 1/2 was as follows:

Line 1 – 7254 hours, or 82.81% run time (increase in run time from 73.77% in 2018)

Line 2 – 7331 hours, or 83.69% run time (increase in run time from 75.30% in 2018)

A summary of planned/unplanned downtime due to breakdowns was presented for all quarters in 2019.



Planned Outage Periods

March 2019 outage start date: 06/03/2019. Returned to waste: Morning of 27/03/2019.

October 2019 outage start date: 03/10/2019. Returned to waste: Evening of 21/10/2019.

Two planned outages took place in 2019 to enable essential maintenance and target improvements where necessary.

Works included extensive cleaning of the boiler internals and flue gas treatment systems, surveying plant that is not normally accessible during normal operation and conducting necessary repairs where needed (e.g. over-plating under-insulation corrosion of ductwork and equipment casings). Targeted replacement of tubes within both boilers has significantly reduced the potential for tube leaks in areas previously identified with erosion. The addition of superheater tube protection shields in the areas around the soot blowers of both boilers will provide further protection against erosion and help prolong the life of these components. A ceramic surface coating has been applied to a selection of furnace tubes on line 1 as a trial based on experience at other MVV plants. The coating provides a hard-wearing thin surface layer to extend the life of the tubes.

Unplanned Downtime

The most frequent cause of unplanned downtime or forced outage was still boiler tube leakage, although this being almost exclusively in areas of original tubing, and which will be selectively replaced at the next outage in 2020.



Summary of Overall Performance

The increased throughput of waste compared to previous years' reflects the continued increased reliability and availability of the plant generally (99551t in 2019, 94261t in 2018).

The control of the nature of waste being sent for incineration from the Waste Transfer Station is now by MEB, although the activity is regulated under a separate Waste Management Licence. There has been greater scrutiny of the waste, and the better selections and discard of unsuitable wastes has resulted in higher reject rates.

Ammonia use in 2018 (119t) was almost half that used in 2017 (270t) due primarily to enhancements made to the feedback control loops in the automation system. A feedforward element was added to link the controller response to boiler load and flue gas volumes. However, the ammonia use in 2019 increased as setpoints were lowered in order to compensate for the incorrect calibration factors described earlier

Dust emission has improved significantly as a result of the upgraded bag filter media installed in 2018. Mass emission is higher on line 1 than line 2 due primarily to the calibration factor applied following the QAL2 check calibration programme carried out at the end of 2017. However, the combined mass emission for dust was only 19% of equivalent mass emission at the permitted ELV.

Electrical energy produced and exported increased by 2240 MWh, and in-house energy consumption increased by 807MWh, due mainly to the provision of construction supplies for the new moving grate facility, and the new pre-shredder installation.

A summary of Inputs and Outputs to the Fluidised Bed Plant is shown in the following table

Material	Tonnes
MSW received	98303
Rejects to landfill	2072
Bottom ash	14991
Cyclone ash	5435
Filter ash	2789
Ferrous metal recovered	2619
Non-ferrous metal recovered	29
Electrical energy exported	47112 MWh
Specific Energy production	479.25 kWh/t of waste

Figure 17 Material Inputs and Outputs



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10/02/2020

Appendix 1 Summary of Mass Emissions from CEMS 2019

BOILER # 1				BOILER # 2				TOTAL	
	Hrs Run		Run time		Hrs Run		Run time	Total Hrs On Waste	Waste Received / tonnes
	7254.00		82.81%		7331.00		83.69%	14585.00	98302.66
Parameter	Yearly Hrly Avg mg N m ³	Mass Emission Rate kg/hr	Yearly Mass Emission Kg	Parameter	Yearly Hrly Avg mg N m ³	Mass Emission Rate kg/hr	Yearly Mass Emission Kg	Total Mass Emission tonnes	Specific Mass Emission kg / tonnes waste
HCl	6.38	0.2526	1832.71	HCl	6.44	0.2550	1869.58	3.70	0.000038
SO ₂	6.80	0.2693	1953.36	SO ₂	4.10	0.1624	1190.26	3.14	0.000032
VOC	0.77	0.0305	221.19	VOC	0.58	0.0230	168.38	0.39	0.000004
Dust	1.09	0.0432	313.11	Dust	0.69	0.0273	200.31	0.51	0.000005
NOX	178.90	7.0844	51390.53	NOX	179.70	7.1161	52168.28	103.56	0.001053
CO	14.70	0.5821	4222.70	CO	13.10	0.5188	3803.03	8.03	0.000082
CO ₂		6996.3	50751461.76	CO ₂		6996.3	51290180.07	102041.6	1038.0

Figure 18 Mass Emissions from CEMS 2019