REVIEW REPORT

Eugene/Springfield Water Pollution Control Facility **Permit No. 202537**
410 River Avenue
Eugene, Oregon
www.ci.springfield.or.us/MWMCPartners/treatmentplant.html

Source Information:

SIC	4952
NAICS	221320

Source Categories (LRAPA Title 37, Table 1)	B.65: Sewage treatment facilities employing internal combustion engines for digester gases C.3: Source electing to maintain a baseline or netting basis C.4: Source requesting a PSEL equal to or greater than the SER
Public Notice Category	II

Compliance and Emissions Monitoring Requirements:

Unassigned emissions	n
Emission credits	n
Compliance schedule	n
Source test date	n

COMS	n
CEMS	n
Ambient monitoring	n

Reporting Requirements:

Annual report (due date)	March 15
SACC (due date)	n
Quarterly report (due dates)	n

Monthly report (due dates)	n
Excess emissions report	y
Other reports	n

Air Programs:

NSPS (list subparts)	A, IIII
NESHAP (list subparts)	A, ZZZZ
CAM	n
Regional Haze (RH)	n
Synthetic Minor (SM)	n
Part 68 Risk Management	n
Title V	n
ACDP (SIP)	n
New Source Review (NSR)	n
Prevention of Significant Deterioration (PSD)	n
Acid Rain	n
Clean Air Mercury Rule (CAMR)	n
TACT	y

1. General Background Information

The Eugene/Springfield Water Pollution Control Facility, located at 410 River Avenue in Eugene, operates a wastewater treatment plant that serves the Eugene and Springfield municipal area. The emission units regulated by the permit are the following:

Emission Unit (EU) Number	Emission Unit	Description
EU-1	Engine Generator-Set	Jenbacher Genset, 1143 BHP, 7.3 MMBtu/hr, biogas-fired, installed in 1997 Pollution control device: Miratech "L" CO catalytic converter
EU-2	Boiler	Hurst, 200 HP, 8.2 MMBtu/hr, 4-pass scotch-marine fire tube, biogas and natural gas-fired, installed 2018
EU-3	Biogas Flares	Two (2) Shand & Jurs 97300 waste gas flares, 8" burner, 76,000 scf/hr, biogas and natural gas-fired, installed 2018
EU-4	Wastewater Treatment Operations	Emissions from wastewater treatment operations Pollution control device: Biofiltration system and four (4) activated carbon filter odor/pollutant control vessels
Categorically Insignificant Activity	Emergency Generator	Caterpillar, 200 kW, diesel-fired emergency generator, subject to NSPS Subpart IIII

The digester gas is derived from two (2) sludge holding tanks and four (4) primary digesters. The biofilter and activated carbon vessels are also used to control odorous gas, along with controlling regulated pollutant emissions from portions of the wastewater treatment process. The facility operates continuously (8,760 hrs/yr). During the previous permit term, temporary boiler EU-5 was added through the permit modification process on April 3, 2018, but has been removed in this permit action due to the addition of the new Hurst permanent boiler that replaced the Kewanee boiler in EU-2. The Varec Flare in EU-3 was removed during the previous permit term and was replaced with two Shand & Jurs flares, which were incorporated through a permit modification on June 21, 2018. The emergency generator in the Categorically Insignificant Activity emission unit was incorporated through this permit renewal through a Notice of Intent to Construct application received June 27, 2018.

2. Reasons for Permit Action

The facility operates a process listed in LRAPA Title 37, Table 1 Part B.65 and is, therefore, required to obtain a permit. The facility's primary permitted activity has been changed in this renewal from B.25 – Electrical power generation from combustion to B.65 – Sewage treatment facilities employing internal combustion engines for digester gases, which more accurately reflects the facility's source category. The SIC code has also been updated in this permitting action to 4952 – Sewerage Systems to better represent facility operations. This is an existing facility applying for a renewed permit as a Standard ACDP. Due to the facility's election to maintain a baseline and requesting PSELs equal to or above the SER, the facility must obtain a Standard ACDP as required in LRAPA Title 37, Table 1 Part C.3 and C.4, respectively. Lane Regional Air Protection Agency (LRAPA) has reviewed the permit renewal application received

on February 12, 2016. The contents of the application and additional correspondence with the facility were the basis for the calculations and content within this review report. The primary reason for this permit action is to renew the expired permit.

3. Compliance Summary

The most recent full compliance evaluation was conducted on September 8, 2016, and is documented in LRAPA files. The evaluation concluded that the facility was in compliance with its permit and applicable regulations. There have been no enforcement actions against this facility.

4. Performance Test

No performance testing has been conducted at this facility.

5. Emission Factor Development

For previous permit renewals, the facility developed VOC emission factors for the wastewater treatment operations (EU-4) based on plant influent and effluent 24-hour grab composite samples that were tested using EPA analytical test methods (Methods 624, 625, 8260 and 8270). During the review of this permit renewal, it was determined that the previous VOC emission factors included acetone results in the total, which is an exempt VOC as defined in 40 CFR 51.100(s). Utilizing the VOC and HAP data provided by the facility from 1997 through 2016, new average VOC, total HAP, and single HAP emission factors (for Phenol) have been developed for EU-4 and are included in the permit, which have removed acetone emissions contributions. Phenol was the only HAP that was consistently estimated at over one (1) ton per year of emissions. The emission factors were set at the conservative “dry weather flow” values for all emitted pollutants. The baseline VOC emissions will not be revised, since review of the facility’s 1996 “Master Plan” in the LRAPA files affirmed that the original determination of VOC emissions for EU-4 excluded acetone. Detailed calculations are attached to this review report.

6. Emissions

Pollutant	Baseline Emission Rate		Netting Basis	Plant Site Emission Limit (PSEL)			Increase over netting basis	SER
	Previous (tons/yr)	Proposed (tons/yr)	Proposed (tons/yr)	Previous PSEL (tons/yr)	Proposed PSEL (tons/yr)	PSEL Increase (tons/yr)	(tons/yr)	(tons/yr)
PM	0	0	0	N/A	N/A	0	0	25
PM_{10}	0	0	0	N/A	N/A	0	0	15
$PM_{2.5}$	N/A	N/A	0	N/A	N/A	0	0	10
VOC	7.2	7.2	7.2	46	46	0	39	40
NO_x	59	59	59	98	98	0	39	40
CO	79	79	79	99	99	0	20	100
SO_2	0	0	0	N/A	N/A	0	0	40
Single HAP	N/A	N/A	0	N/A	9	9	0	10
Total HAP	N/A	N/A	0	N/A	24	24	0	25
GHG	N/A	2,890	2,890	N/A	74,000	74,000	71,110	75,000

i. The VOC, NO_X, and CO netting basis were determined in previous permitting actions and no changes have been made. The VOC netting basis emissions were calculated for the baseline year 1978 and include the emissions from water treatment operations. The NO_X and CO netting basis emissions remain for this renewal from prior to the retirement of the Waukesha Genset in early 2006. The netting basis for NO_x and CO were established from calculations based on a historical PSD review that reset to 1983 emission levels in accordance with LRAPA 42-0046(3)(e)(C). These emissions include the Waukesha engine-generator, the Kewanee Boiler and the waste gas flare burner.

ii. A baseline emission rate is not required for $PM_{2.5}$ in accordance with the definition of "baseline emission rate" in LRAPA Title 12. The baseline for greenhouse gas (GHG) is set to the actual GHG emissions from 2008, calculated using updated global warming potentials for CH_4 (25) and N_2O (298).

iii. The PSELs are set in accordance with Section 42-0040, 42-0041 and 42-0060. Although the facility emits less than the Significant Emission Rate (SER) for VOC and NOx, the PSELs are set at the netting basis plus 39 tons/year, or one (1) ton less than the 40 ton/year SER, because the facility has elected to utilize the established netting bases for these pollutants. The facility no longer has the potential to emit above the 100 ton/year major source threshold for the pollutant CO, since the Waukesha Genset was retired, so the CO source specific PSEL has been set equal to the generic PSEL level.

iv. No PSELs for PM, PM_{10}, $PM_{2.5}$, and SO_2 are being set because the potential to emit is less than the de minimis level of one ton per year for PM, PM_{10}, $PM_{2.5}$, and SO_2.

v. The proposed HAP PSELs have been set at LRAPA's Generic PSEL levels in accordance LRAPA 42-0060(2), since the projected emission levels are less than Generic PSEL level but greater than the de minimis emission levels for these pollutants.

7. Federally Enforceable Limits

A prior permit for the facility limited total fuel combusted in the Waukesha Genset, now retired, to 33,200 MMBtu per rolling 12-month period. The limit was required to ensure that emissions of CO did not reach the Title V Major source threshold of 100 tons per year. After decommissioning the Waukesha Genset, the facility no longer had the potential to emit above the 100 tons/year major source threshold for CO, so the synthetic minor limits for CO were removed during the previous permit renewal.

8. Additional Emission Limitations

The facility is subject to the visible emissions standards in LRAPA 32-010(3), the non-combustion particulate grain loading standards in LRAPA 32-015(2)(b)(B) and LRAPA 32-015(2)(c), and the combustion particulate grain loading standards in LRAPA 32-030(1)(b) and LRAPA 32-030(2). The facility is subject to the highest and best requirement of LRAPA 32-005. Operation of well-maintained fuel-burning equipment should assure compliance with the grain loading and visible emissions limits.

To ensure the highest and best operation of the waste gas flares in EU-3, the permit utilizes requirements for flares that are subject to the general control device requirements of 40 CFR 60.18(b) under Subpart A of the New Source Performance Standards (NSPS). Although the flares are not subject to any NSPS, the NSPS requirements provide an achievable set of operational requirements to ensure maximum efficiency under LRAPA 32-007.

The facility is required to conduct inspections and maintenance of the biofilter and activated carbon odor control vessels in EU-4 to assure compliance with the highest and best requirement and to prepare and follow an LRAPA-approved Operation and Maintenance (O&M) Plan to formalize procedures related to pollution control devices to maintain odors at the lowest practicable levels. The currently approved O&M plan establishes a continuous operation schedule for the biofilter except for periods of maintenance or malfunction. Since one or more of the activated carbon filters control odorous processes that have only intermittent potential to create odor, or inconsistent sources of odor, the O&M establishes the need and intended design for intermittent operation of the activated carbon filters.

9. Hazardous Air Pollutants (HAPs)

The aggregated HAP emissions from the fuel-burning equipment in EU-1, EU-2 and EU-3 is 2.96 tons per year. From the data provided from the facility from the years 1997 through 2016, the HAP emissions from the wastewater treatment operations in EU-4 projected for dry weather design flow, or 49 million gallons per day, are 4.0 tons per year, with the highest single HAP contributor, phenol, calculated at 1.7 tons per year. A major source of HAPs is a facility that has the potential to emit 10 tons/year or more of any single HAP or 25 tons/year or more of combined HAPs; therefore, this facility is considered an area source of HAPs. Detailed HAP calculations can be found in the attachment to this review report.

The Jenbacher Genset in EU-1 is subject to the National Emission Standards for Hazardous Air Pollutants (NESHAP) for Spark Ignition Reciprocating Internal Combustion Engines (SI RICE) as specified in 40 CFR Subpart ZZZZ. As defined in 40 CFR 63.6590(1)(iii), the Jenbacher Genset is considered an existing stationary RICE because it is located at an area source of HAP emissions and the unit was constructed before June 12, 2006. The permit contains the emission limits and testing requirements as specified in Subpart ZZZZ. The requirements are to perform periodic maintenance on the four-stroke lean burn (4SLB) engine according to a schedule specified in the rule and to maintain the appropriate records. There are no emission limitations and therefore no performance testing is required.

The facility is not applicable to the NESHAP for Publicly Owned Treatment Works (40 CFR 63 Subpart VVV) because the facility does not fall within either of the two following source subcategories: Group 1, where regardless of whether the facility is a major area source of HAP an industrial user complies with a NESHAP using the treatment and controls of the facility, or Group 2, where the facility is a major source of HAP. The facility is also not applicable to the NESHAP for Industrial, Commercial, and Institutional Boilers at Area Sources (40 CFR 63 Subpart JJJJJJ) due to the operation of a gas-fired boiler as defined in the subpart.

10. Typically Achievable Control Technology (TACT)

LRAPA Title 32-008 requires an existing emission unit at a facility to meet TACT if the emissions unit has emissions of criteria pollutants greater than ten (10) tons per year of any gaseous pollutant or five (5) tons per year of particulate, the emissions unit is not subject to the emissions standards under LRAPA Title 32, Title 33, Title 44, or Title 46 for the pollutants emitted, and the facility is required to have a permit. The Jenbacher Genset in EU-1 emits more than 10 tons/year of CO, but it is subject to the RICE NESHAP Subpart ZZZZ for CO; therefore, it is not required to meet TACT. The other emission units emit less than the TACT emission thresholds specified above and are therefore not required to be evaluated for TACT.

11. New Source Review (NSR) and Prevention of Significant Deterioration (PSD)

Because the proposed PSELs for all regulated pollutants are below the Significant Emission Rates (SERs) in LRAPA Title 12, the facility is neither subject to NSR requirements for PM_{10} nor the PSD requirements for $PM_{2.5}$, SO_X, NO_X, CO, and VOC.

12. New Source Performance Standards (NSPS)

The emergency generator in the Categorically Insignificant Activity emission unit is subject to the requirements of the RICE NSPS Subpart IIII for Stationary Compression Ignition Internal Combustion Engines, which details requirements for the operation and maintenance of emergency generators. Although there is no time limit for the operation of an emergency stationary internal combustion engine in emergency situations, the operation to perform maintenance and testing of such units must be limited to 50 hours per year.

The permittee is not subject to NSPS Subpart O, Standards of Performance for Sewage Treatment Plants because the facility combusts biogas in generators and does not combust sludge in incinerators. NSPS Subpart GG for Stationary Gas Turbines is not applicable to the Jenbacher Genset in EU-1 since the maximum heat input for the unit is 8.1 gigajoules per hour (see LRAPA construction approval letter dated August 6, 1997) as compared with the NSPS threshold of 10.7 gigajoules/hr.

The Jenbacher Genset in EU-1 is also not applicable to the RICE NSPS Subpart JJJJ for Stationary Spark Ignition (SI) Landfill/Digester Gas Engines since it was constructed before the NSPS trigger date of 2008 for lean burn engines. The boiler in EU-2 is not applicable to NSPS Subpart Dc for Small Industrial-Commercial-Institutional Steam Generating Units because the boiler is rated below 10 MMBtu/hr.

13. Continuous Compliance

To ensure compliance with the annual PSELs, the permittee is required to keep a 12-month rolling record of the following information for a period of five (5) years from date of entry.

Emission Unit (EU)	Monitoring Parameter (units)	Minimum Recording Frequency
EU-1	Gas burned in the genset (cubic feet)	Monthly
EU-1	Hours of operation of the genset (hours)	Monthly
EU-1	Maintenance performed in accordance with the Subpart ZZZZ NESHAP.	Upon occurrence
EU-2	Gas burned in the boiler (cubic feet)	Monthly
EU-3	Gas burned in the waste gas flare (cubic feet)	Monthly
EU-4	Wastewater effluent volume (million gallons)	Monthly
Categorically Insignificant Activity	Hours of operation of the emergency generator (hours) and classification of the operation	Upon occurrence

14. Reporting Requirements

The facility is required to submit an annual report by ***March 15th*** of each year that includes 12-month rolling emissions, greenhouse gas emissions per OAR 340 Division 215, and any entries in the upset log as required by Condition G15.

15. Public Notice

The draft permit will be on public notice from August 2, 2018 to September 5, 2018. Written comments may be submitted during the 35-day comment period. If requested by ten (10) or more individuals or an individual representing a group of more than ten (10) individuals, there will be a public hearing following the comment period.

After the comment period and hearing (if requested), LRAPA will respond to comments received and then take final action to issue or deny the permit within 45 days of the close of the public comment or hearing period.

KE/CMW
07/31/2018

Baseline Emissions Calculations

Waukesha Engines

Design Capacity (bhp)	675
Design Capacity (MMBtu/hr)	8.589

Pollutant	Emission Factor (g/hp-hr)	Emission Factor (lb/MMBtu)	Annual Emissions (tons)
PM/PM_{10}	-	7.45E-03	0.280
SO_2	-	5.88E-04	0.022
NO_x	9.0	-	58.7
CO	12	-	78.2
VOC	1.0	-	6.5

Notes: Total digester gas produced limited operation to one of the two Waukesha Engines at any time at max capacity. Emission Factors for PM & SO_2 are from AP-42, Table 1.4-1, Emission Factors for Natural Gas Combustion, July 1998. Emission Factors for NO_x, CO & VOC are from the manufacturer for the engine fired on digester gas. Engine operation assumed at 8760 hours.

Kewanee Boiler

Digester Gas Produced (MMscf/yr)	1.88

Pollutant	Emission Factor (lb/MMscf)	Annual Emissions (tons/yr)
PM/PM_{10}	7.6	0.01
SO_2	0.6	0.001
NO_x	100	0.09
CO	84	0.08
VOC	5.5	0.01

Notes: 1983 Digester gas produced at the facility: 103,100 (1983 population) x 1 scf/day/person x 365 days/yr = 37,631,500 scf/yr
The boiler burned an estimated 5% of the total digester gas in 1983.
The quantity of digester gas burned in the boilers in million cubic feet during 1983: 37,631,500 scf/1,000,000 x 5% = 1.88 MMscf
Emission Factors are from AP-42, Table 1.4-1, Emission Factors for Natural Gas Combustion, July 1998.

Waste Gas Flare (Varec)

Pollutant	Estimated Gas Throughput (MMBtu)	Emission Factor (lb/MMBtu)	Emissions (tons/yr)
NO_x	5644.7	0.068	0.2
CO	5644.7	0.37	1.0

Notes: The Waste Gas Burner (flare) burned an estimated 25% of the total digester gas in 1983. The average rating for digester gas assumed at 600 Btu/scf (Wastewater Engineering, Metcalf and Eddy, Third Edition, 1991).
Total Btu burned by the waste gas burner in 1983: 37,631,500 scf x 25% x 600 Btu/scf/1,000,000 = 5,644.73 MMBtu.
Emission Factors are from AP-42, Table 13.5-1, Emission Factors for Flare Operations.

Wastewater Treatment Operations

Pollutant	Wastewater Treated (10^6 gal/day)	Emission Factor (lb VOC/10^6 gal)	Emissions (tons/yr)
VOC	28.5	1.38	7.20

Notes: Emissions are a ratio of the emissions estimated from the "Master Plan" Appendices on file at LRAPA, since no flow data exists for the baseline year 1978. Flow data was estimated based on population and rainfall, and since 1989 was a comparable year to 1978, this ratio of plant flow and population was used to determine the emission factor.
Per capita plant flow 1989: 43,170,000 gals/151,245 people = 285.4 gallons/day/person
Proportionally, the 1978 plant flow is: 285.4 gallons/day/person x 99,750 people = 28.5 mgd (million gallons per day).
Treatment process VOCs (Master Plan) with plant flow of 38.3 mgd were 9.67 tons, EF= (9.67ton) / (38.3mgd*365d) / (2000lb/ton)

Accumulative Baseline

Pollutant	Annual (tons/yr)	Baseline Year
PM/PM_{10}	0.29	1983
SO_2	0.02	1983
NO_x	58.9	1983
CO	79.3	1983
VOC	7.2	1978

Potential to Emit Calculations

Jenbacher Genset (EU-1)

Design Capacity (bhp)	1,143
Design Capacity (MMBtu/hr)	7.304

Pollutant	Emission Factor (g/hp-hr)	Emission Factor (lb/MMBtu)	Emission Factor (lb/MMcf)	Annual Emissions (tons)
$PM/PM_{10}/PM_{2.5}$	-	0.012	7.2	0.38
SO_2	-	0.0065	3.9	0.21
NO_x	1.5	0.517	310.5	16.6
CO	2.8	0.966	579.6	30.9
VOC	0.6	0.207	124.2	6.6

Notes: The Jenbacher engine replaced one of the original Waukesha engines in 1997. Estimates at capacity assume continuous operation (8,760 hrs/yr) and a heating value of 600 Btu/scf for digester gas. Emission Factors for NO_x, CO and VOC are from a March 28, 2000, gas analysis taken by Jenbacher Energy Systems Ltd and the $PM/PM_{10}/PM_{2.5}$ and SO_2 emission factors are from AP-42, Table 1.4-1, Emission Factors for Natural Gas Combustion, July 1998.

Hurst Boiler (EU-2)

Digester Gas Capacity (scf/hr)	15,000

Pollutant	Emission Factor (lbs/MMscf)	Annual Emissions (tons/yr)
$PM/PM_{10}/PM_{2.5}$	7.6	0.5
SO_2	0.6	0.039
NO_x	100	6.6
CO	84	5.5
VOC	5.5	0.4

Notes: The boiler is assumed to operate continuously (8760 hrs/yr). Boiler Emission Factors are from AP-42, Table 1.4-1, Emission Factors for Natural Gas Combustion, July 1998.

Shand & Jurs Waste Gas Flares (EU-3)

Pollutant	Maximum Gas Throughput (MMBtu)	Estimated 25% Use (MMBtu/yr)	Emission Factor (lbs/MMBtu)	Emissions (tons/yr)
NO_x	399,456	99,864	0.068	3.4
CO	399,456	99,864	0.31	15.5
HC (VOC surrogate)	399,456	99,864	0.14	7.0

Notes: The design capacity for the flares is 76,000 scf/hr of digester gas and a heating value of 600 Btu/scf for digester gas has been assumed for these calculations. Only one flare is operated in EU-3 at any given time. Emission Factors are from AP-42, Table 13.5-1 and Table 13.5-2, Emission Factors for Flare Operations.

Wastewater Treatment Operations (EU-4)

Pollutant	Wastewater Treated (10^6 gal/day)	Emission Factor (lb VOC/10^6 gal)	Emissions (tons/yr)
VOC	59.5	0.715	7.8

Notes: The emission factor was derived from plant influent flow and estimated emissions from historic (1997-2016) water grab sampling. Reduced this permit cycle due to the previous permit's inclusion of acetone into the VOC emissions calculation.

Potential to Emit

Pollutant	Annual (tons/yr)
$PM/PM_{10}/PM_{2.5}$	0.50
SO_2	0.57
NO_x	26.5
CO	51.9
VOC	21.7

Actual Emissions – 2017

Jenbacher Genset (EU-1)

Digester Gas Combusted (scf)	40,257,159

Pollutant	Emission Factor (g/hp-hr)	Emission Factor (lb/MMBtu)	Emission Factor (lb/MMcf)	Annual Emissions (tons)
$PM/PM_{10}/PM_{2.5}$	-	0.012	7.2	0.14
SO_2	-	0.0065	3.9	0.08
NO_x	1.5	0.517	310.5	6.2
CO	2.8	0.966	579.6	11.7
VOC	0.6	0.207	124.2	2.5

Notes: Emissions calculated for actual digester gas combusted in 2017 with an assumed heating value of 600 Btu/scf for the digester gas. Emission Factors for NO_x, CO and VOC are from a March 28, 2000, gas analysis taken by Jenbacher Energy Systems Ltd and the $PM/PM_{10}/PM_{2.5}$ and SO_2 emission factors are from AP-42, Table 1.4-1, Emission Factors for Natural Gas Combustion, July 1998.

Kewanee Boiler (EU-2)

Digester Gas Combusted (scf)	25,590,903
Natural Gas Combusted (scf)	366,130

Pollutant	Emission Factor (lbs/MMscf)	Annual Emissions (tons/yr)
$PM/PM_{10}/PM_{2.5}$	7.6	0.099
SO_2	0.6	0.008
NO_x	100	1.298
CO	84	1.090
VOC	5.5	0.071

Notes: Boiler Emission Factors are from AP-42, Table 1.4-1, Emission Factors for Natural Gas Combustion, July 1998, and emissions calculated using an assumed heating value of 600 Btu/scf for the digester gas.

Varec Waste Gas Flare (EU-3)

Pollutant	2017 Gas Throughput (scf)	Emission Factor (lbs/MMBtu)	Emissions (tons/yr)
NO_x	101,051,894	0.068	2.1
CO	101,051,894	0.31	9.4
HC (VOC surrogate)	101,051,894	0.14	4.2

Notes: Emission Factors are from AP-42, Table 13.5-1 and Table 13.5-2, Emission Factors for Flare Operations, and emissions calculated using an assumed heating value of 600 Btu/scf for the digester gas.

Wastewater Treatment Operations (EU-4)

Pollutant	Wastewater Treated (10^6 gal/day)	Emission Factor (lb VOC/10^6 gal)	Emissions (tons/yr)
VOC	36.2	0.715	4.7

Notes: The emission factor was derived from plant influent flow and estimated emissions from historic (1997-2016) water grab sampling.

2017 Actual Emissions

Pollutant	Annual (tons/yr)
$PM/PM_{10}/PM_{2.5}$	0.24
SO_2	0.09
NO_x	9.6
CO	22.2
VOC	11.5

Development of VOC and HAP Emission Factor for Wastewater Treatment Operations (EU-4)

Average of years 1997-2016	EF	Emissions
	lb/MG	tons/yr
Total VOC - Average Daily Flow	0.494	3.055
Total VOC - Dry Weather Flow	0.715	4.420
Total HAP - Average Daily Flow	0.444	2.742
Total HAP - Dry Weather Flow	0.643	3.971
Single HAP: Phenol - Average Daily Flow	0.185	1.153
Single HAP: Phenol - Dry Weather Flow	0.266	1.657

Data from 2010-2016					
HAP	Est. Avg. Annual LB	Average daily plant flow: 34.37 mgd lb/MG	Emissions at Average daily plant flow ton/yr	Dry weather design flow: 49 mgd lb/MG	Emissions at Dry weather design flow ton/yr
1,2-Diphenylhydrazine	6.421	0.001	0.003	0.001	0.005
1,4-Dichlorobenzene	19.299	0.002	0.010	0.002	0.014
Benzene	0.735	0.0001	0.0004	0.0001	0.001
Bis(2-ethylhexyl) phthalate	490.133	0.039	0.245	0.055	0.348
Chloroform	120.181	0.010	0.060	0.014	0.085
Chloromethane	1.974	0.0002	0.001	0.0002	0.001
Di-n-butyl phthalate	54.510	0.004	0.027	0.006	0.039
Dimethyl phthalate	3.572	0.000	0.002	0.000	0.003
Ethylbenzene	6.157	0.000	0.003	0.001	0.004
Methylene chloride	308.043	0.024	0.154	0.035	0.219
N-Nitrosodimethylamine	556.864	0.044	0.278	0.063	0.396
Naphthalene	3.257	0.0003	0.002	0.0004	0.002
Phenol	3120.380	0.248	1.560	0.352	2.218
Tetrachloroethene	9.859	0.001	0.005	0.001	0.007
Toluene	447.612	0.036	0.224	0.051	0.318
Trichloroethene	1.750	0.0001	0.001	0.0002	0.001
Xylene isomers, Total	31.276	0.002	0.016	0.004	0.022
Non-HAP					
2-Butanone	607.691	0.048	0.304	0.069	0.432
Acenaphthylene	4.518	0.000	0.002	0.001	0.003
Benzyl butyl phthalate	92.840	0.007	0.046	0.010	0.066
Bromodichloromethane	4.426	0.0004	0.002	0.0005	0.003
Di-n-octyl phthalate	4.203	0.0003	0.002	0.0005	0.003
Diethyl phthalate	189.342	0.015	0.095	0.021	0.135
Exempt VOC					
Acetone	18313.767	1.4546	9.1569	2.0678	13.01675
Total HAP	5182.02	0.412	2.59	0.585	3.68
Total VOC	6085.04	0.483	3.04	0.687	4.33

Data from 1997-2010					
HAP	Est. Avg. Annual LB	Average daily plant flow: 33.3 mgd lb/MG	Emissions at Average daily plant flow ton/yr	Dry weather design flow: 49 mgd lb/MG	Emissions at Dry weather design flow ton/yr
4-Methyl-2-pentanone (MIBK)	434.202	0.036	0.22	0.053	0.32
4-Methylphenol (p-Cresol)	2415.675	0.199	1.21	0.292	1.78
Benzene	10.594	0.001	0.01	0.001	0.01
Bis(2-ethylhexyl)phthalate	370.907	0.030	0.19	0.045	0.27
Chloroform	9.059	0.001	0.00	0.001	0.01
Ethylbenzene	28.183	0.002	0.01	0.003	0.02
Methylene chloride	113.235	0.009	0.06	0.014	0.08
Phenol	1489.666	0.122	0.74	0.180	1.10
Tetrachloroethene (PERC)	131.856	0.011	0.07	0.016	0.10
Toluene	534.065	0.044	0.27	0.065	0.39
Xylene isomers (Total)	249.897	0.021	0.12	0.030	0.18
Non-Hap					
Diethyl phthalate	22.773	0.002	0.01	0.003	0.02
2-Butanone (MEK)	219.269	0.018	0.11	0.027	0.16
4-Chloro-3-methylphenol	106.692	0.009	0.05	0.013	0.08
Exempt VOC					
Acetone	18221.088	1.498	9.11	2.204	13.41
Total HAP	5787.34	0.476	2.894	0.700	4.258
Total VOC	6136.07	0.504	3.068	0.742	4.515

HAP Emissions Estimations for Fuel Burning Emission Units

Jenbacher Genset (EU-1)

HAP	Emission Factor[1]	Annual Emissions	Annual Emissions
	lb/MMBTU	lbs/yr	tons/yr
1,1,2,2-Tetrachloroethane	4.00E-05	2.56E+00	1.28E-03
1,1,2-Trichloroethane	3.18E-05	2.03E+00	1.02E-03
1,3 -Butadiene	2.67E-04	1.71E+01	8.54E-03
1,3-Dichloropropene	2.64E-05	1.69E+00	8.44E-04
2,2,4 -Trimethylpentane	2.50E-04	1.60E+01	7.99E-03
2-Methylnapthalene	3.32E-05	2.12E+00	1.06E-03
Acenaphthene	1.33E-06	8.51E-02	4.25E-05
Acenaphthylene	5.53E-06	3.54E-01	1.77E-04
Acetaldehyde	8.36E-03	5.35E+02	2.67E-01
Acrolein	5.14E-06	3.29E-01	1.64E-04
Benzene	4.40E-04	2.81E+01	1.41E-02
Benzo(b)fluoranthene	1.66E-07	1.06E-02	5.31E-06
Benzo(e)pyrene	4.15E-07	2.65E-02	1.33E-05
Benzo(g,h,i)perylene	4.14E-07	2.65E-02	1.32E-05
Biphenyl	2.12E-04	1.36E+01	6.78E-03
Carbon Tetrachloride	3.67E-05	2.35E+00	1.17E-03
Chlorobenzene	3.04E-05	1.94E+00	9.72E-04
Chloroform	2.85E-05	1.82E+00	9.11E-04
Chrysene	6.93E-07	4.43E-02	2.22E-05
Ethyl benzene	3.97E-05	2.54E+00	1.27E-03
Ethylene Dibromide	4.43E-05	2.83E+00	1.42E-03
Fluoranthene	1.11E-06	7.10E-02	3.55E-05
Fluorene	5.67E-06	3.63E-01	1.81E-04
Formaldehyde	5.28E-02	3.38E+03	1.69E+00
Methanol	2.50E-03	1.60E+02	7.99E-02
Methylene Chloride	2.00E-05	1.28E+00	6.39E-04
n-hexane	1.11E-03	7.10E+01	3.55E-02
Naphthalene	7.44E-05	4.76E+00	2.38E-03
PAH	2.69E-05	1.72E+00	8.60E-04
Phenanthrene	1.04E-05	6.65E-01	3.33E-04
Phenol	2.40E-05	1.53E+00	7.67E-04
Pyrene	1.36E-06	8.70E-02	4.35E-05
Styrene	2.36E-05	1.51E+00	7.55E-04
Tetrachloroethane	2.48E-06	1.59E-01	7.93E-05
Toluene	4.08E-04	2.61E+01	1.30E-02
Vinyl Chloride	1.49E-05	9.53E-01	4.76E-04
Xylene	1.84E-04	1.18E+01	5.88E-03
		Total	**2.14**

[1]NOTE: Reference AP-42 Table 3.2-2, calculated at 7.30 MMBtu/hr.

Hurst Boiler (EU-2)

HAP	Emission Factor[2]	Annual Emissions	Annual Emissions
	lb/10^6 scf	lb/yr	tons/yr
2-Methylnaphthalene	2.4E-05	3.15E-03	1.58E-06
3-Methylchloranthrene	1.8E-06	2.37E-04	1.18E-07
7,12-Dimethylbenz(a)anthracene	1.6E-05	2.10E-03	1.05E-06
Acenaphthene	1.8E-06	2.37E-04	1.18E-07
Acenaphthylene	1.8E-06	2.37E-04	1.18E-07
Anthracene	2.4E-06	3.15E-04	1.58E-07
Benz(a)anthracene	1.8E-06	2.37E-04	1.18E-07
Benzene	2.1E-03	2.76E-01	1.38E-04
Benzo(a)pyrene	1.2E-06	1.58E-04	7.88E-08
Benzo(b)fluoranthene	1.8E-06	2.37E-04	1.18E-07
Benzo(g,h,i)perylene	1.2E-06	1.58E-04	7.88E-08
Benzo(k)fluoranthene	1.8E-06	2.37E-04	1.18E-07
Chrysene	1.8E-06	2.37E-04	1.18E-07
Dibenzo(a,h)anthracene	1.2E-06	1.58E-04	7.88E-08
Dichlorobenzene	1.2E-03	1.58E-01	7.88E-05
Fluoranthene	3.0E-06	3.94E-04	1.97E-07
Fluorene	2.8E-06	3.68E-04	1.84E-07
Formaldehyde	7.5E-02	9.86E+00	4.93E-03
Hexane	1.8E+00	2.37E+02	1.18E-01
Ideno(1,2,3-cd)pyrene	1.8E-06	2.37E-04	1.18E-07
Naphthalene	6.1E-04	8.02E-02	4.01E-05
Phenanthrene	1.7E-05	2.23E-03	1.12E-06
Pyrene	5.0E-06	6.57E-04	3.29E-07
Toluene	3.4E-03	4.47E-01	2.23E-04
Arsenic	2.0E-04	2.63E-02	1.31E-05
Beryllium	1.2E-05	1.58E-03	7.88E-07
Cadmium	1.1E-03	1.45E-01	7.23E-05
Chromium	1.4E-03	1.84E-01	9.20E-05
Cobalt	8.4E-05	1.10E-02	5.52E-06
Manganese	3.8E-04	4.99E-02	2.50E-05
Mercury	2.6E-04	3.42E-02	1.71E-05
Nickel	2.1E-03	2.76E-01	1.38E-04
Selenium	2.4E-05	3.15E-03	1.58E-06
		Total	**0.124**

[2]NOTE: Reference AP-42 Table 1.4-3, calculated at 15,000 scf/hr.

HAP Emissions Estimations for Fuel Burning Emission Units (continued)

Shand & Jurs Flare (EU-3)

HAP	Emission Factor[3]	Annual Emissions	Annual Emissions
	lb/10^6 scf	lb/yr	tons/yr
2-Methylnaphthalene	2.4E-05	1.60E-02	7.99E-06
3-Methylchloranthrene	1.8E-06	1.20E-03	5.99E-07
7,12-Dimethylbenz(a)anthracene	1.6E-05	1.07E-02	5.33E-06
Acenaphthene	1.8E-06	1.20E-03	5.99E-07
Acenaphthylene	1.8E-06	1.20E-03	5.99E-07
Anthracene	2.4E-06	1.60E-03	7.99E-07
Benz(a)anthracene	1.8E-06	1.20E-03	5.99E-07
Benzene	2.1E-03	1.40E+00	6.99E-04
Benzo(a)pyrene	1.2E-06	7.99E-04	3.99E-07
Benzo(b)fluoranthene	1.8E-06	1.20E-03	5.99E-07
Benzo(g,h,i)perylene	1.2E-06	7.99E-04	3.99E-07
Benzo(k)fluoranthene	1.8E-06	1.20E-03	5.99E-07
Chrysene	1.8E-06	1.20E-03	5.99E-07
Dibenzo(a,h)anthracene	1.2E-06	7.99E-04	3.99E-07
Dichlorobenzene	1.2E-03	7.99E-01	3.99E-04
Fluoranthene	3.0E-06	2.00E-03	9.99E-07
Fluorene	2.8E-06	1.86E-03	9.32E-07
Formaldehyde	7.5E-02	4.99E+01	2.50E-02
Hexane	1.8E+00	1.20E+03	5.99E-01
Ideno(1,2,3-cd)pyrene	1.8E-06	1.20E-03	5.99E-07
Naphthalene	6.1E-04	4.06E-01	2.03E-04
Phenanthrene	1.7E-05	1.13E-02	5.66E-06
Pyrene	5.0E-06	3.33E-03	1.66E-06
Toluene	3.4E-03	2.26E+00	1.13E-03
Arsenic	2.0E-04	1.33E-01	6.66E-05
Beryllium	1.2E-05	7.99E-03	3.99E-06
Cadmium	1.1E-03	7.32E-01	3.66E-04
Chromium	1.4E-03	9.32E-01	4.66E-04
Cobalt	8.4E-05	5.59E-02	2.80E-05
Manganese	3.8E-04	2.53E-01	1.26E-04
Mercury	2.6E-04	1.73E-01	8.65E-05
Nickel	2.1E-03	1.40E+00	6.99E-04
Selenium	2.4E-05	1.60E-02	7.99E-06
[3]NOTE: Reference AP-42 Table 1.4-3, calculated at max 76,000 scf/hr.		**Total**	**0.628**

Emissions Summary	**Emissions**	
Total HAP – Combined Fuel Burning Emission Units	2.90	tons/year