TECHNICAL INFORMATION UPDATE - NOTICE OF CONSTRUCTION APPLICATION FOR INSTALLATION OF ADVANCED WASTEWATER TREATMENT FACILITIES

LAMB WESTON INC.
PASCO, WA PLANT

May 2026

Coal Creek Environmental Associates

Mukilteo, WA

Project 240302.17

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INTRODUCTION

This document updates technical information submitted by Lamb Weston in July 2025, as well as several additional data submittals, in conjunction with a Notice of Construction Application for the installation of advanced wastewater treatment facilities (*the project*) at the Lamb Weston, Inc (*Lamb Weston*) Pasco Plant located at 960 Glade Road, Pasco, WA 99301 (*the plant*).

This update addresses changes in project equipment since the original application was prepared. Principal changes made since the July 2025 application include:

- Selecting a smaller boiler (8.23 MMBtuh current vs. 16.45 MMBtuh in the original application). Emissions estimates and stack release parameters have been updated based on the current boiler.
- Specifying a different flare (Varec 244E enclosed flare), with associated changes in emission estimates and stack release parameters.
- Decreasing the size of emergency generator engines, such that these emissions units are exempt from permitting.

As a result of these changes, limits on the combined amount of biogas fired in the boiler and the flare are no longer required, and each of these emissions units can be permitted at maximum capacity independent of each other. This simplifies permitting conditions and maximizes flexibility for future operations.

PROJECT DESCRIPTION

The project will upgrade the plant's existing wastewater treatment facilities to provide anaerobic treatment of organics in the waste stream, biological nutrient removal, and reverse osmosis to reduce dissolved solids. The purified water will then be reused as process water within the plant. Reject brine from the reverse osmosis process will be further concentrated using mechanical vapor recompression, which is a closed system that has no releases to atmosphere. The project does not involve changes in existing wastewater treatment units; the existing wastewater treatment units will provide pretreatment for the advanced treatment facilities that are being installed.

Figure 1 shows the project location.

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Figure 1. Project Location

Biogas produced from the anaerobic reactors will be treated for hydrogen sulfide removal and then will be combusted in a boiler to provide heated water for the wastewater treatment process. The hydrogen sulfide removal process will produce biogas with a maximum hydrogen sulfide concentration of 300 ppmvd.

The boiler will be capable of operating on natural gas, biogas, or a blend of both fuels. A flare will also be provided to dispose of biogas that is not combusted in the boiler. For permitting purposes, both emissions units are assumed to operate simultaneously at full capacity using biogas.[1]

The project includes various tanks and unit processes to manage solids generated during the process, some of which will be malodorous. To control odors, this equipment will be covered and vented to a foul air oxidizer.

Three diesel-fired emergency generators will also be installed. The aggregate power of the generators is 495 hp (energy input). Comfort heating for the process building will be electric.

As part of this Notice of Construction application, Lamb Weston is also requesting that Condition 4.e.i of Approval Order No. 24AQ-E012 be deleted. The Spray Tower for the Sly No. 8 Venturi scrubber addressed in this portion of the permit does not exist. Appendix A contains background information and correspondence on this request.

ANTICIPATED CONSTRUCTION START DATE AND COMPLETION DATES

Site preparation and building construction:	2025
Installation of equipment:	2026
Anticipated construction completion:	2027

OPERATING SCHEDULE AND PRODUCTION RATES

The project is designed to accommodate future increases in wastewater flow. The flare capacity is 400 Normal cubic meters per hour.[2] The biogas is expected have 75% methane content, yielding a maximum flare heat input rate of 11.4 MMBtuh.

The boiler will have a maximum heat input rating of 8.23 MMBtuh. If project energy demands from the boiler exceed the available biogas energy supply, natural gas will be co-fired to allow full heat output from the boiler to be achieved, as needed. Although the project intent is to maximize biogas combustion in the boiler, the project design does provide for firing the boiler exclusively with natural gas, while routing all biogas to the flare.

The emergency generators will be three Cat Model XQ125 Tier IV compliant engines, each of which will have a maximum power input of 165 hp, yielding an aggregate power input of 495 hp. In accordance with 40 CFR §60.4211(f), the emergency generators will operate a maximum of 100 hours per year. The 100 hour per year limit will include all non-emergency operations, including maintenance and testing as well as a maximum of 50 hours per year of non-emergency operation. Because the generators are emergency internal combustion engines with an aggregate brake horsepower that is less than or equal to 500 brake horsepower, they are exempt from permitting.

[1] The boiler can also be fired with natural gas. Maximum emissions occur during natural gas firing.
[2] 15,185 standard cubic feet per hour (scfh).

PROCESS FLOW

Figure 2 is a process schematic showing air emissions units, emissions control devices, and release points. Table 1 lists the individual sludge and solids management units that will be vented to the foul air oxidizer.

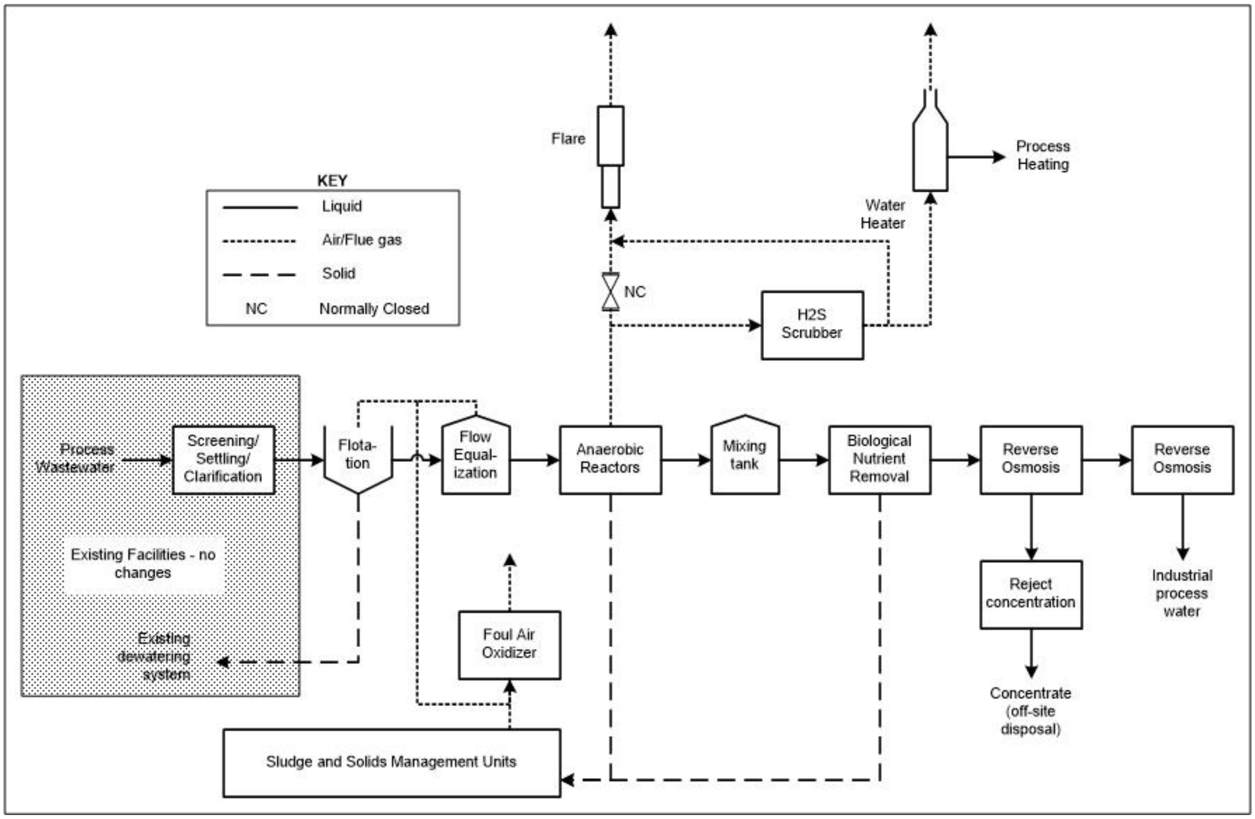

Figure 2. Process Schematic

The project will have the following emissions units and release points:

Emissions Unit	Emissions Controls	Release Points
Anaerobic Reactors	Hydrogen sulfide scrubber Flare Boiler	Boiler Stack Flare Stack
Boiler (Water Heater)	Low-NOx burners	Boiler Stack
Flotation tank	Foul Air Oxidizer	Foul Air Oxidizer Stack.
Sludge and Solids Management Units – See Table 1.	Foul Air Oxidizer	Foul Air Oxidizer Stack.

SITE MAPS

Figure 3 shows overall Lamb Weston land ownership at the Pasco plant. As indicated, Lamb Weston has significant property ownership on both sides of Glade Road. Figure 3 also shows the site security fenceline, which is used as the ambient air boundary in project ambient impacts analysis. Figure 4 is a site map, showing the location of the project within the facility site. Figure 5 is a project site plan, showing the locations of project emissions units in more detail.

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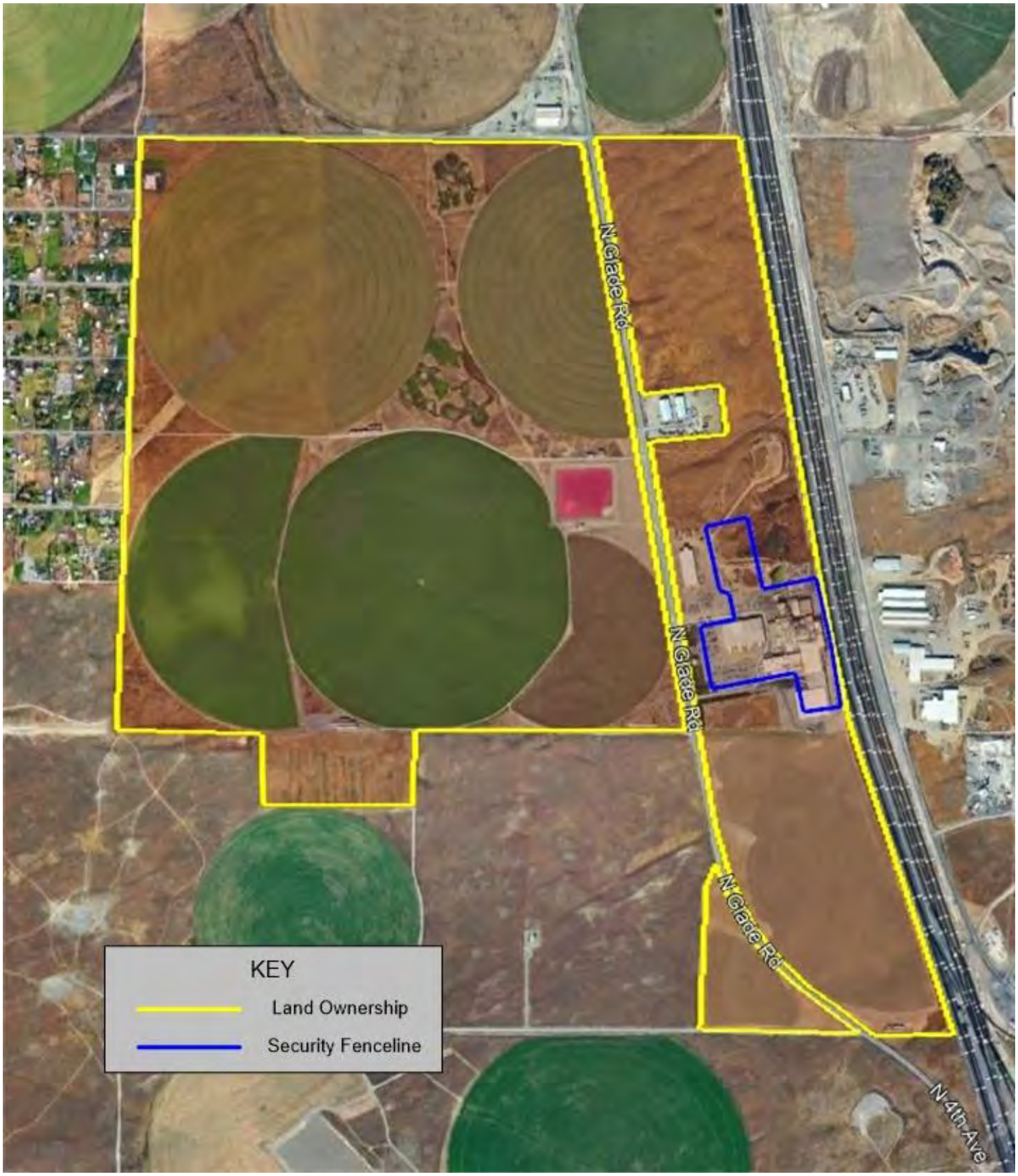

Figure 3. Property Boundaries

Figure 4. Site Map

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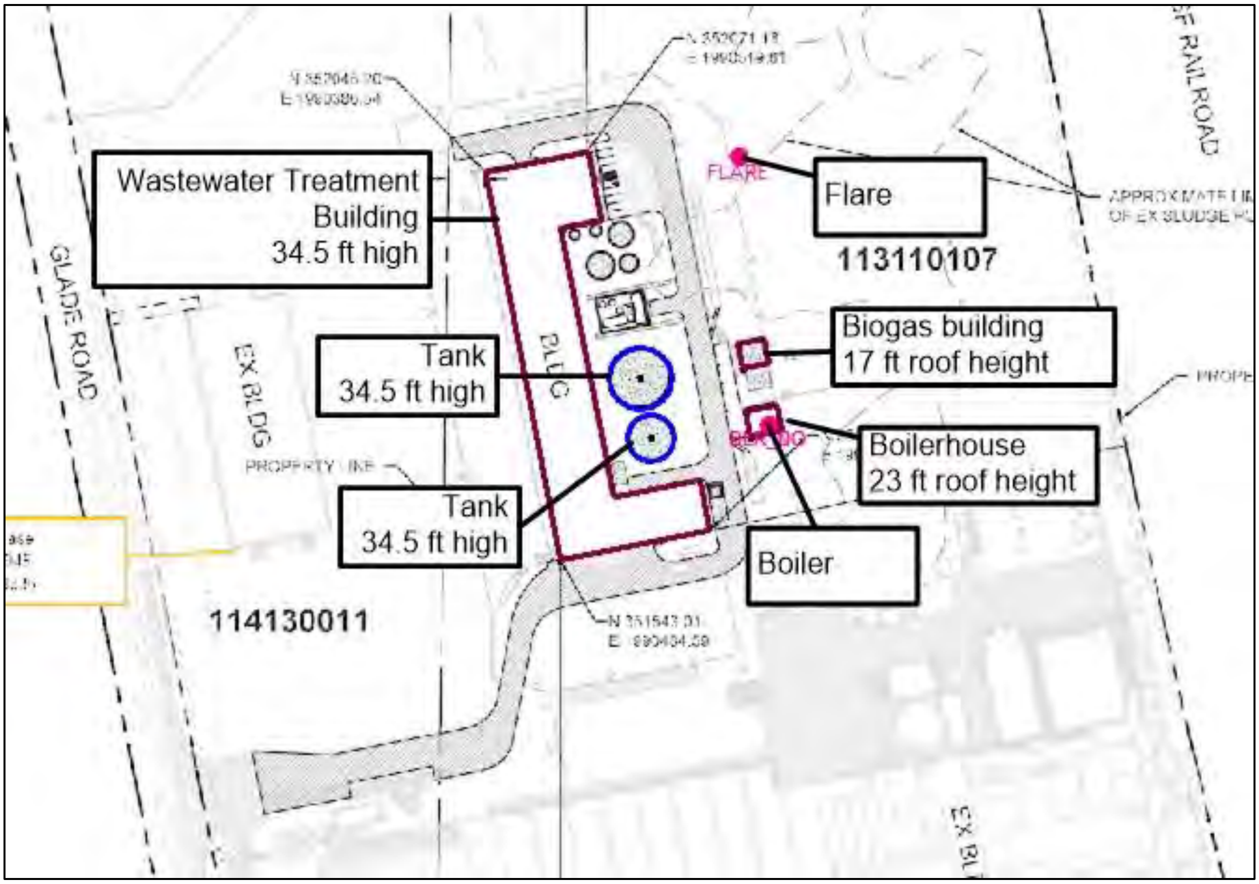


Figure 5. Project Site Plan

Manufacturer Specification Sheets

Appendix B contains manufacturer specification and data sheets for the following equipment:

- Boiler
- Flare
- Hydrogen sulfide removal system
- Foul air oxidizer.

Fuel Specifications

As noted previously, the project includes an 8.23 MMBtuh boiler and an 11.4 MMBtuh flare. The boiler can be fired by natural gas, project biogas, or a mixture of the two. The flare will combust only biogas. Specifications for these fuels are provided below:

Fuel	Specification	Emissions Units using the Fuel
Natural gas	Commercial Pipeline Natural Gas	Boiler
Biogas	Estimated HHV: 750 Btu/scf Methane fraction: 75 %vol Hydrogen Sulfide • Untreated: 5300 ppmvd • Treated: 300 ppmvd	Boiler Flare

SEPA COMPLIANCE

Franklin County issued a SEPA DNS for the project. A copy of the DNS is included in Appendix C.

EMISSION ESTIMATES FOR CRITERIA POLLUTANTS

Criteria air pollutants (*CAPs*) are produced by the combustion of natural gas and/or biogas in the boiler and biogas in the flare. No criteria air pollutant emissions are associated with the foul air oxidizer.

Tables 2 through 5 present estimated project air emissions. The basis for these estimates is discussed below.

OPERATING SCENARIOS

The project is designed so that the biogas produced by the treatment facilities can be combusted by either an on-site boiler to provide hot water for process heating or in a flare. All biogas not combusted in the boiler will be combusted in the flare. Emissions estimates are based on simultaneous operation of both the boiler and the flare at maximum capacity using biogas.

BOILER

As discussed previously, the boiler will be dual-fired to combust biogas, natural gas, or a blend of the two fuels. Boiler emissions are calculated based on full firing with biogas.[3] Appendix B includes a vendor data sheet for the boiler. Table 2 summaries CAP emissions from the boiler.

Boiler NOx emissions are based on a vendor emission guarantee of 30 ppmvd NOx at 3% excess oxygen. This is the most stringent NOx emissions guarantee that Lamb Weston was able to

[3] Although the boiler is also capable of being fired with natural gas, boiler emissions estimates are based on firing with digester gas because this scenario leads to higher emissions of sulfur dioxide and hydrogen sulfide. Emissions of all other pollutants are the same for either fuel.

identify for a boiler equipped for dual firing of natural gas and biogas. The vendor CO emissions guarantee is 50 ppmvd at 3% excess oxygen.

Sulfur dioxide emissions from combusting biogas are mass balance calculations based on 99% conversion of hydrogen sulfide in the biogas feed to SO_2 during combustion.[4]

Emission factors for PM_{10}, $PM_{2.5}$, and VOC are from AP-42, Chapter 1.4. The Pb emission factor is from Ventura County APCD AB 2588 Combustion Emission Factors.

The AP-42 and Ventura County APCD emission factors are stated in lb/MMscf. These emission factors are converted to lb/MMBtu based on a natural gas HHV of 1050 Btu/scf. By converting to lb/MMBtu, these factors can be used with the biogas without correcting for the inert fraction of the biogas.

FLARE

The flare will be a Varec 244E enclosed flare. This flare was selected to provide high efficiency destruction of sulfides and VOC. CO and NOx emissions factors for the flare are provided by the vendor. The VOC emission factor is from AP-42, Table 13.5-1. Sulfur dioxide emissions from combusting biogas in the flare are mass balance calculations based on 99% conversion of sulfide in the biogas feed to SO_2 during combustion. PM and Pb emissions are based on AP-42 Chapter 1.4 emission factors for natural gas combustion and are converted to lb/MMBtu assuming a natural gas HHV of 1050 Btu/scf. Table 3 summarizes CAP emissions from the flare.

Appendix B includes vendor information for the flare.

FUGITIVE CAP EMISSIONS

There are no fugitive sources of CAP emissions associated with this project.

CAP EMISSIONS SUMMARY

Table 4 summarizes CAP emissions for the project, including a comparison with the emission thresholds in WAC 173-400-030(30). As shown, emission thresholds are exceeded for SO_2, NOx, CO, $PM_{2.5}$, and VOC.

EMISSION ESTIMATES FOR TOXIC AIR POLLUTANTS

Toxic Air Pollutants (*TAPs*) are produced by fuel combustion in the boiler, and the flare. Table 5 presents emission factors used to calculate TAP emissions for these emissions units. TAP emissions for biogas are assumed to be the same as for natural gas when expressed in lb/MMBtu.

[4] Note that the biogas feed to the boiler is pretreated to reduce the sulfide content of the biogas to 300 ppmvd.

Table 6 provides estimated emissions for TAPs. Table 6 also compares estimated TAP emissions with the de minimis and small quantity emission rate (*SQER*) for each TAP compound. As indicated, emissions of the following TAPs exceed SQER levels and require dispersion modeling to document compliance with Acceptable Source Impact Levels (*ASILs*):

- 7,12-Dimethylbenz[a]anthracene
- Cadmium and compounds
- Chromium(VI) and compounds
- Ethyl Benzene
- Formaldehyde
- Hydrogen sulfide
- Sulfur Dioxide

FOUL AIR EMISSIONS

Table 1 is an inventory of foul air sources associated with the project. No emissions data are available for the sludge and solids management units that are potential sources of foul air. The odor generation activities are similar to those at many wastewater treatment facilities, though the specific constituents associated with wastewater solids management vary widely depending on the characteristics of the influent wastewater and the wastewater treatment and solids management processes and operations.

Based on analyses of foul air from solids management processes (excluding biosolids digestion) at municipal wastewater treatment treatments, the foul air may include various sulfides, disulfides, mercaptans, and amines.

Air collected from foul air units is treated for odor removal prior to release to atmosphere. The odor control system is a custom designed Steinde Environment system that provides photodecomposition and ozonolysis, followed by activated carbon treatment.

Figure 6 shows the layout of the foul air oxidation system. The numbered units are:

1: Particulate pre-filter

2: Photo-oxidation

3 and 4: Activated carbon (parallel operation)

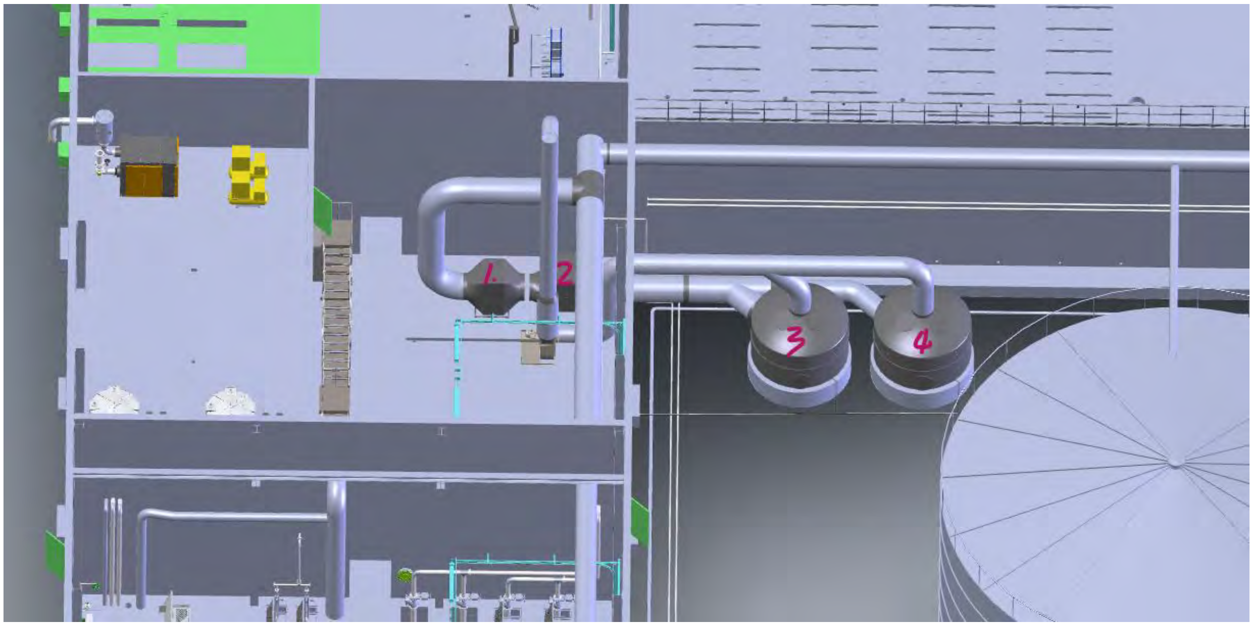


Figure 6. Odor Control System Layout

The photooxidation system is proposed because of its ability to destroy odor compounds that are resistant to other treatment technologies such as biofilters, chemical scrubbers, and systems that use only activated carbon. The activated carbon in this project will provide polishing treatment for the photo-oxidized air stream, removing organic compounds that are breakdown products from the photo-oxidation process, as well as providing removal for odor compounds that may not have been fully destroyed in the photo-oxidation reactor.

Expected performance of the system is presented below:

Parameter	Untreated air	After Photo Oxidation	After Carbon Filter	Total removal
Odor (OU/m³)	10 000 – 30 000	Approx. 2 000 - 6000	Approx. 100 – 500	95 – 99+ %
H2S (ppmv)	5 – 50	1 – 10	< 0.1	98 – 99+ %
VOCs (ppmv)	20 – 200	4 – 40	< 1 – 2	95 – 99 %

Appendix B includes vendor data for the foul air treatment system.

REGULATORY ANALYSIS

Applicable air quality requirements are discussed below.

EMISSION STANDARDS

New Source Performance Standards and National Emission Standards for Hazardous Air Pollutants

New source performance standards potentially applicable to this project are discussed below.

40 CFR Part 60 Subpart A §60.18 (c)-(f). – General Control Device and Work Practice Requirements – Flares

40 CFR §60.18 (c)-(f) contains work practice standards for flares. Per 40 CFR §60.18(a)(1), because the flare is not regulated under another subpart of 40 CFR Parts 60 or 61, these standards are not applicable.

In addition, the background and regulatory history for these flare work practice requirements shows that these standards are based on data from open flares at refineries and chemical plants, where combustion conditions differ significantly from the controlled combustion conditions in an enclosed flare.

40 CFR Part 60 Subpart Dc – New Source Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units

NSPS Subpart Dc applies to newly constructed, modified, or reconstructed steam generating units that commenced construction after June 9, 1989, and that have a maximum design heat input capacity greater or equal to 10 MMBtuh and less than 100 MMBtuh. Because the heat input capacity for the boiler is 8.23 MMBtuh, the boiler is exempt from this standard.

40 CFR Part 60 Subpart IIII—Standards of Performance for Stationary Compression Ignition Internal Combustion Engines

NSPS Subpart IIII applies to stationary compression-ignition internal combustion engines that commenced construction or were reconstructed or modified after July 11, 2005. Although the emergency generators are exempt from permitting, they are subject to this standard.

The requirements of Subpart IIII applicable to owners and operators of emergency engines are as follows:

- Install an engine that complies with the emission standards for new nonroad CI engines in 40 CFR § 60.4202, for all pollutants, for the same model year and maximum engine power for their 2007 model year and later emergency stationary CI ICE.

- Combust only Ultra Low Sulfur Diesel (*ULSD*) fuel:

  - Maximum sulfur content of 15 ppm.

  - Minimum cetane index of 40 or maximum aromatic content of 35 volume percent.

- Install a non-resettable hour meter prior to startup of the engine.
- If the engine is equipped with a diesel particulate filter to comply with the emission standards in 40 CFR §60.4204, install a backpressure monitor that notifies the owner or operator when the high backpressure limit of the engine is approached.
- Operate and maintain the stationary CI internal combustion engine and control device according to the manufacturer's emission-related written instructions.
- Change only those emission-related settings that are permitted by the manufacturer.
- Limit any non-emergency use of the engine to no more than 100 hours per year. This includes all operations for purposes of maintenance and testing. (There is no limit on emergency use.)

40 CFR Part 63, Subpart ZZZZ - National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines

NESHAP ZZZZ includes requirements that are applicable to all reciprocating internal combustion engines. Although the emergency generators are exempt from permitting, they are subject to this standard.

Per 40 CFR §63.6590(c)(1), for new or reconstructed compression ignition engines at area sources of HAP emissions, compliance with NSPS Subpart IIII meets the requirements of NESHAP ZZZZ, and no further requirements apply for the engines under NESHAP ZZZZ.

Subpart JJJJJJ - National Emission Standards for Hazardous Air Pollutants for Industrial, Commercial, and Institutional Boilers Area Sources

Per 40 CFR §63.11195(e), gas-fired boilers are exempt from the NESHAP.

Federal Air Emissions Permitting Requirements

The two federal air permitting programs are Prevention of Significant Deterioration program for “major” sources of air pollutants and the Title V permitting program. Emissions from this project and the facility are less than the applicability thresholds for these programs.

State of Washington Air Emissions Permitting Requirements

Applicable State of Washington limits and standards are included in WAC 173-400 and WAC 173-460.

Notice of Construction (NOC) and New Source Review (NSR)

WAC 173-400-110(2) requires that a notice of construction application be filed and an order of approval issued by Ecology prior to the establishment of the facility.

Use of Best Available Control Technology (BACT)

WAC 173-400-113(2) requires that a new source or modification employ BACT for all pollutants not previously emitted or whose emissions would increase because of the new source or modification.

Air Quality Impacts Assessment

WAC 173-400-113(3) requires that air quality impacts from a project not cause or contribute to a violation of an ambient air quality standard. An air quality impacts assessment is required for SO_2, NOx, CO, and $PM_{2.5}$. Dispersion modeling is not required for impacts related to VOC emissions for the project.

Toxic Air Pollutants

WAC 173-460 contains Washington rules regarding control of TAPs emissions. In general, if emissions of a TAP exceed the de minimis level for that TAP, tBACT is required for control of emissions. Further, if emissions exceed the Small Quantity Emission Rate (*SQER*) for that TAP, dispersion modeling is needed to demonstrate the ambient impact is less than the Acceptable Source Impact Level (*ASIL*) for that TAP, and if impacts exceed the ASIL, then additional assessments and mitigation measures may be required. For this project, ambient impacts for all TAP emissions that exceed SQER levels are less than the applicable ASILs.

BEST AVAILABLE CONTROL TECHNOLOGY

RECENT BACT DETERMINATIONS FOR SIMILAR PROJECTS

This project is similar to the nearby Burnham SEV Pasco Resource Recovery Center (*PRRC*). Both projects generate biogas from anaerobic treatment of high strength food processing wastewater, use boilers to provide process heat, and have flares to combust excess biogas. Given the similarities of the projects, Ecology's determination of BACT for the PPRC is used as a baseline for evaluating BACT for this project.

To help in assessing the applicability of the PRRC BACT determination to this project, the table below compares features of this project and the PRRC.

Parameter	Lamb Weston Pasco	PRRC
Biogas Production, maximum, scfm	• 436 (based on combined full-fire operation of boiler and flare)	• 4280
Biogas sulfide removal	• 300 ppm treated	• 95% removal • 200 ppm treated
Boiler characteristics	• 1 boiler @ 8.23 MMBtuh • NG or desulfurized biogas (300 ppm H_2S) • 30 ppm NOx emissions guarantee	• 2 boilers @ 54 MMBtuh total • NG-fired • Ultra low-NOx (9 ppm)
Flare operating scenario	• 1 flare – 11.4 MMBtuh thermal capacity – 300 ppm H_2S	2 flares @ 152 MMBtuh total Project has two operating scenarios • Scenario 1: – Desulfurized biogas 200 ppm H2S – 60 MMBtuh max • Scenario 2: – Biogas 4000 ppm H2S – 152 MMBtuh max – 4642 hr/yr max
Flare operating parameters	• 500 °F to 860 °F • 99% H2S DRE	• 1400 °F to 1800 °F • >0.7 sec retention time • 99% H_2S DRE

As indicated above, maximum biogas generation for this project will be about 10% of the biogas generated in the PRRC project. This difference in size makes use of added emissions control technologies significantly less feasible for this project.

Both projects have similar performance in removing hydrogen sulfide from biogas. Scrubbed biogas for this project has larger H_2S concentration because the untreated biogas for this project has a higher H_2S content than the PRRC biogas (5000 ppm and 4000 ppm, respectively). Notably, with this project all biogas routed to the flares will be scrubbed. In contrast, when the PRRC operates in Scenario 2 (which can be as much as 4642 hr/yr), the flared biogas will be untreated.

For this project, the boiler can be fired with natural gas, biogas, or a blend of the two. The burners for this boiler have a 30 ppm NOx emissions guarantee versus the 9 ppm NOx emissions guarantee for the PRRC. In contacting boiler vendors, 30 ppm is the lowest NOx emissions guarantee available for a boiler combusting biogas.

Flare destruction efficiency is a key parameter. Both the flare for this project and the PRRC flare have 99% destruction efficiency for H_2S.

For the PRRC project, Ecology determined BACT/tBACT as set forth below:[5]

> *4. Emissions*
>
> *...*
>
> *b. Best Available Control Technology | Best Available Control Technology for Toxics*
>
> *In the analysis, the consultant proposed and successfully demonstrated that Ultra-Low NOx burners, good combustion controls, and using pipeline quality natural gas is BACT for the two boilers.*
>
> *...*
>
> *For the Flare, the consultant proposed and successfully demonstrated good combustion practices and ensuring the burning temperature is BACT.*

BACT/tBACT Assessment

Boiler

The primary difference between the boiler proposed for this project and the PRRC boilers is the capability for combusting biogas in the project boilers. The use of biogas precludes the use of Ultra-Low NOx burners; the best available NOx control is 30 ppmvd NOx (at 3% oxygen). Biogas burned in the boilers will be treated for hydrogen sulfide removal with a removal efficiency of 94%.

Accordingly, BACT for the boiler is use of 30 ppmv low-NOx burners, good combustion controls, and firing the boiler only with pipeline quality natural gas or biogas with a maximum sulfide concentration of 300 ppmv.

Flare

The physical characteristics of the flare for this project and the PRRC flares are similar. Both flares provide 99% destruction efficiency for hydrogen sulfide in the feed gas. A major difference between this project and the PRRC is that in PRRC operating scenario 2, the flared biogas will not be desulfurized. For this project all biogas routed to flares will be desulfurized, which is a higher level of emissions control than employed at the PRRC.

Accordingly, BACT for the flare is hydrogen sulfide removal for all biogas combusted in the flare, good combustion practices and ensuring that a flame is present in the flare when the flare is in

[5] Technical Support Document, Notice of Construction Approval Order No. 23AQ-E035, Burnham SEV, AQPID No. A0210192, Pasco, WA

operation. The Varec 244E flare does not use a minimum temperature or residence time to ensure compliance with vendor emissions guarantee.

Foul Air Oxidizer

No counterpart to the foul air oxidizer was identified in the PRRC application and permitting materials available to us. The proposed facility will use an advanced treatment system using a particulate prefilter followed by photo-oxidation to provide high performance oxidation/destruction of foul air compounds. Activated carbon is also included to provide additional removal of odor compounds. This level of treatment exceeds the level of treatment, commonly used for odor control at wastewater treatment facilities.

Accordingly, BACT for the foul air oxidizer is operation and maintenance of the unit in good condition and in accordance with vendor recommendations.

AIR QUALITY IMPACT ASSESSMENT

An air quality impact assessment was conducted for air pollutants exceeding modeling emissions thresholds identified in Tables 4 and 6.[6] Appendix D describes the ambient impact analysis. Results of the ambient impacts assessment are summarized below. As shown, all modeled impacts are below associated significance thresholds.

Air Pollutant	Averaging Time	Significance Threshold,[7] µg/m³	Modeled Impact µg/m³	Modeled Impact % of Threshold
Sulfur Dioxide	1-hr	30	17.29	58%
	3-hr	25	13.25	53%
	24-hr	5	4.58	92%
	Annual	1.0	0.87	87%
Nitrogen Oxides	1-hr	7.5	6.38	85%
	Annual	1.0	0.36	36%
$PM_{2.5}$	24-hr	1.2	0.32	27%
	Annual	0.3	0.06	21%
Carbon Monoxide	1-hr	2,000	18	1%
	8-hr	500	14.66	3%
7,12-Dimethylbenz[a]anthracene	Annual	8.50E-06	1.48E-07	2%

[6] As noted previously, dispersion modeling is not required for impacts related to VOC emissions.
[7] Significant contribution level for criteria air pollutants; Acceptable Source Impact Level (*ASIL*) for Toxic Air Pollutants,

Cadmium & Compounds, NOS	Annual	2.40E-04	1.02E-05	4%
Chromium(VI) & compounds, NOS	Annual	4.00E-06	5.19E-07	13%
Ethyl Benzene	Annual	4.00E-01	4.72E-03	1%
Formaldehyde	Annual	1.70E-01	1.02E-01	60%
Hydrogen Sulfide	24-hr	9.00E+00	2.44E-02	0%
Sulfur dioxide	1-hr	6.60E+02	1.88E+01	3%

Table 1
Sludge and Solids Management Units Vented to Foul Air Oxidizer

Number	Tag (location ventilation point)	Equipment/area	No. Connection points	Pipe size (inch)	Estimated air discharge per connection (Nm3/h)	Velocity vent. Pipe (m/s)	Total required ventilation (Nm3/h)
1	SMP01.T01	Sump for wastewater after clarifier	2	10	834	4.57	1668
2	FLT01.DAF01.T01	Flotation 1	1	6	150	2.28	150
3	FLT01.DAF02.T01	Flotation 2	1	6	150	2.28	150
4	FLT01.PSS01.T01	Buffer tank for sludge from DAF	1	3	25	1.52	25
5	ATT03.T01	Equalization tank underground	4	16	1724.1	3.692	6896
6	ATT01.T01	Buffer tank before DAF	1	12	800	3.046	800
7	ATT02.T01	Emergency buffer tank	1	12	800	3.046	800
8	PSF01.T01	UASB effluent tank ("hot water tank")	1	8	633.6	5.427	634
9	SLS01.T01	Sludge tank 1 for anaerobic sludge	1	10	237.12	1.300	237
10	SLS02.T01	Sludge tank 2 for anaerobic sludge	1	10	237.12	1.300	237
11	STS01.MST01.TM01	Thickening machine	1	3	50	3.05	50
12	STS01.MST02.TM01	Thickening machine	1	3	50	3.05	50
13	SDW01.DEW01.DC01	Dewatering Waste Activated Sludge	1	6	100	1.52	100

Table 1
Sludge and Solids Management Units Vented to Foul Air Oxidizer

Number	Tag (location ventilation point)	Equipment/area	No. Connection points	Pipe size (inch)	Estimated air discharge per connection (Nm3/h)	Velocity vent. Pipe (m/s)	Total required ventilation (Nm3/h)
14	SDW01.DEW02.DC01	Dewatering Waste Activated Sludge	1	6	100	1.52	100
15	SLS03.T01	Sludge storage tank for thickened sludge (and UASB sludge)	1	10	831.6	4.56	832
16	SRW01.T01	Reject water tank	1	8	247.5	2.12	248
17	SLU02.T01	Hopper for dewatered WAS/flotation sludge	1	10	862.92	4.73	863
Minimum needed point ventilation Capacity Nm3/h							13839
Capacity of odor control system (Nm3/h)							20000

Table 2

Potential Criteria Air Pollutant Emissions from Boiler – Full Fire with Biogas

	Emission Factor		Operating Rate				Potential to Emit	
			Hourly		Annual			
Pollutant	Value	Units	Rate	Units	Rate	Units	lb/hr	ton/yr
SO2	0.089	lb/MMBtu	8.23	MMBtuh	8.23	MMBtuh	0.732	3.21
H2S	0.00048	lb/MMBtu	8.23	MMBtuh	8.23	MMBtuh	0.004	0.02
NOx	0.036	lb/MMBtu	8.23	MMBtuh	8.23	MMBtuh	0.300	1.31
CO	0.037	lb/MMBtu	8.23	MMBtuh	8.23	MMBtuh	0.304	1.33
PM2.5	0.007	lb/MMBtu	8.23	MMBtuh	8.23	MMBtuh	0.060	0.26
PM10	0.007	lb/MMBtu	8.23	MMBtuh	8.23	MMBtuh	0.060	0.26
VOC	0.005	lb/MMBtu	8.23	MMBtuh	8.23	MMBtuh	0.043	0.19
Pb	4.8E-07	lb/MMBtu	8.23	MMBtuh	8.23	MMBtuh	3.9E-06	1.7E-05

Table 3

Potential Criteria Air Pollutant Emissions from Flare

	Emission Factor		Operating Rate				Emissions	
			Hourly		Annual			
Pollutant	Value	Units	Rate	Units	Rate	Units	lb/hr	Ton/yr
SO2	66.74	lb SO2/MMscf	0.0152	MMscf/hr	0.0152	MMscf/hr	1.014	4.44
H2S	0.358	lb H2S/MMscf	0.0152	MMscf/hr	0.0152	MMscf/hr	0.005	0.024
NOx	0.06	lb/MMBtu	11.39	MMBtuh	11.39	MMBtuh	0.683	2.99
CO	0.20	lb/MMBtu	11.39	MMBtuh	11.39	MMBtuh	2.278	9.98
PM2.5	0.007	lb/MMBtu	11.39	MMBtuh	11.39	MMBtuh	0.082	0.36
PM10	0.007	lb/MMBtu	11.39	MMBtuh	11.39	MMBtuh	0.082	0.36
VOC	0.14	lb/MMBtu	11.39	MMBtuh	11.39	MMBtuh	1.594	6.98
Pb	4.8E-07	lb/MMBtu	11.39	MMBtuh	11.39	MMBtuh	5.4E-06	2.4E-05

Table 4

Criteria Air Pollutant Emissions Summary

		Hourly Emissions, lb/hr							Annual Emissions													
									Ton/yr							% of Emission Threshold†						
Operating Conditions		SO2	NOx	CO	PM2.5	PM10	VOC	Pb	SO2	NOx	CO	PM2.5	PM10	VOC	Pb	SO2	NOx	CO	PM2.5	PM10	VOC	Pb
Boiler	8.23 MMBtuh Biogas	0.005	0.300	0.304	0.060	0.060	0.043	3.9E-06	0.02	1.31	1.33	0.26	0.26	0.19	1.7E-05	1%	66%	27%	52%	35%	9%	0.34%
Flare	11.39 MMBtuh Biogas	1.014	0.683	2.278	0.082	0.082	1.594	5.4E-06	4.44	2.99	9.98	0.36	0.36	6.98	2.4E-05	222%	150%	200%	72%	48%	349%	0.48%
Project Potential to Emit:		1.018	0.983	2.582	0.142	0.142	1.638	9.3E-06	4.46	4.31	11.31	0.62	0.62	7.17	4.1E-05	223%	215%	226%	124%	83%	359%	0.82%

† WAC 173-400-030(30)

Table 5

Toxic Air Pollutant Emission Factors

	Emission Factor, lb/MMBtu							
	Boiler				Flare			
WA Toxic Air Pollutant ID	AP-42†	CATEF‡	Ventura APCD	Maximum	AP-42†	CATEF‡	Ventura APCD	Maximum
1,4-Dichlorobenzene	1.14E-06	NA	NA	1.14E-06	1.14E-06	NA	NA	1.14E-06
3-Methylcholanthrene	1.71E-09	NA	NA	1.71E-09	1.71E-09	NA	NA	1.71E-09
7,12-Dimethylbenz[a]anthracene	1.52E-08	NA	NA	1.52E-08	1.52E-08	NA	NA	1.52E-08
Acetaldehyde	NA	8.07E-06	2.95E-06	8.07E-06	NA	8.07E-06	4.10E-05	4.10E-05
Acrolein	NA	NA	2.57E-06	2.57E-06	NA	NA	9.52E-06	9.52E-06
Arsenic & Inorganic Arsenic Compounds, NOS	1.90E-07	NA	NA	1.90E-07	1.90E-07	NA	NA	1.90E-07
Benz[a]anthracene	1.71E-09	NA	NA	1.71E-09	1.71E-09	NA	NA	1.71E-09
Benzene	2.00E-06	2.05E-06	5.52E-06	5.52E-06	2.00E-06	2.05E-06	1.51E-04	1.51E-04
Benzo[a]pyrene	1.14E-09	NA	NA	1.14E-09	1.14E-09	NA	NA	1.14E-09
Benzo[b]fluoranthene	1.71E-09	NA	NA	1.71E-09	1.71E-09	NA	NA	1.71E-09
Benzo[k]fluoranthene	1.71E-09	NA	NA	1.71E-09	1.71E-09	NA	NA	1.71E-09
Beryllium & compounds, NOS	1.14E-08	NA	NA	1.14E-08	1.14E-08	NA	NA	1.14E-08
Cadmium & Compounds, NOS	1.05E-06	NA	NA	1.05E-06	1.05E-06	NA	NA	1.05E-06
Chromium(III), soluble particulates, NOS	1.28E-06	NA	NA	1.28E-06	1.28E-06	NA	NA	1.28E-06
Chromium(VI) & compounds, NOS	5.33E-08	NA	NA	5.33E-08	5.33E-08	NA	NA	5.33E-08
Chrysene	1.71E-09	NA	NA	1.71E-09	1.71E-09	NA	NA	1.71E-09
Cobalt and compounds, NOS	8.00E-08	NA	NA	8.00E-08	8.00E-08	NA	NA	8.00E-08
Copper & Compounds	8.10E-07	NA	NA	8.10E-07	8.10E-07	NA	NA	8.10E-07
Dibenz[a,h]anthracene	1.14E-09	NA	NA	1.14E-09	1.14E-09	NA	NA	1.14E-09
Ethyl benzene	NA	NA	6.57E-06	6.57E-06	NA	NA	1.38E-03	1.38E-03
Formaldehyde	7.14E-05	6.63E-05	1.17E-05	7.14E-05	7.14E-05	6.63E-05	1.11E-03	1.11E-03
Hexane	1.71E-03	NA	4.38E-06	1.71E-03	1.71E-03	NA	2.76E-05	1.71E-03
Hydrogen Sulfide	NA	NA	NA	NA	NA	NA	NA	NA
Indeno[1,2,3-cd]pyrene	1.71E-09	NA	NA	1.71E-09	1.71E-09	NA	NA	1.71E-09
Manganese & Compounds	3.62E-07	NA	NA	3.62E-07	3.62E-07	NA	NA	3.62E-07
Mercury, Elemental	2.48E-07	NA	NA	2.48E-07	2.48E-07	NA	NA	2.48E-07
Naphthalene	5.81E-07	NA	2.86E-07	5.81E-07	5.81E-07	NA	1.05E-05	1.05E-05
Nickel & Compounds, NOS	2.00E-06	NA	NA	2.00E-06	2.00E-06	NA	NA	2.00E-06

Table 5

Toxic Air Pollutant Emission Factors

WA Toxic Air Pollutant ID	Emission Factor, lb/MMBtu							
	Boiler				Flare			
	AP-42†	CATEF‡	Ventura APCD	Maximum	AP-42†	CATEF‡	Ventura APCD	Maximum
Nitrogen dioxide	NA	NA	NA	NA	NA	NA	NA	NA
Propylene	NA	NA	5.05E-04	5.05E-04	NA	NA	2.32E-03	2.32E-03
Selenium & Selenium Compounds (other than Hydrogen Selenide)	2.29E-08	NA	NA	2.29E-08	2.29E-08	NA	NA	2.29E-08
Sulfur dioxide	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	3.24E-06	NA	2.52E-05	2.52E-05	3.24E-06	NA	5.52E-05	5.52E-05
Vanadium (fume or dust)	2.19E-06	NA	NA	2.19E-06	2.19E-06	NA	NA	2.19E-06
Xylene (mixture)	NA	NA	1.88E-05	1.88E-05	NA	NA	2.76E-05	2.76E-05

Notes:

† From AP-42, Section 1.4, for external natural gas combustion

‡ From CATEF emission factors for natural gas combustion in boilers

Table 6

Toxic Air Pollutant Emissions

Toxic Air Pollutant	Averaging Period	TAP Emissions, lb/hr				TAP Summary				HAP Emissions, ton/yr
		Boiler		Flare						
		Emission Factor, lb/MMBtu*	Heat Input Rate = 8.23 MMBtuh	Emission Factor, lb/MMBtu*	Heat Input Rate = 11.39 MMBtuh	lb/hr	lb/ averaging period	% of De Minimis	% of SQER	
1,4-Dichlorobenzene	year	1.14E-06	9.41E-06	1.14E-06	1.30E-05	2.2E-05	2.0E-01	27%	1.3%	9.8E-05
3-Methylcholanthrene	year	1.71E-09	1.41E-08	1.71E-09	1.95E-08	3.4E-08	2.9E-04	38%	1.8%	1.5E-07
7,12-Dimethylbenz[a]anthracene	year	1.52E-08	1.25E-07	1.52E-08	1.74E-07	3.0E-07	2.6E-03	3795%	187.1%	1.3E-06
Acetaldehyde	year	8.07E-06	6.64E-05	4.10E-05	4.66E-04	5.33E-04	4.67E+00	156%	77.8%	2.33E-03
Acrolein	24-hr	2.57E-06	2.12E-05	9.52E-06	1.08E-04	1.30E-04	3.11E-03	239%	12.0%	5.68E-04
Arsenic & Inorganic Arsenic Compounds, NOS	year	1.9E-07	1.6E-06	1.9E-07	2.2E-06	3.7E-06	3.3E-02	1309%	66.8%	1.6E-05
Benz[a]anthracene	year	1.7E-09	1.4E-08	1.7E-09	2.0E-08	3.4E-08	2.9E-04	1%	0.0%	1.5E-07
Benzene	year	5.5E-06	4.5E-05	1.5E-04	1.7E-03	1.8E-03	1.6E+01	1551%	73.8%	7.8E-03
Benzo[a]pyrene	year	1.1E-09	9.4E-09	1.1E-09	1.3E-08	2.2E-08	2.0E-04	2%	0.1%	9.8E-08
Benzo[b]fluoranthene	year	1.7E-09	1.4E-08	1.7E-09	2.0E-08	3.4E-08	2.9E-04	1%	0.0%	1.5E-07
Benzo[k]fluoranthene	year	1.7E-09	1.4E-08	1.7E-09	2.0E-08	3.4E-08	2.9E-04	1%	0.0%	1.5E-07
Beryllium & compounds, NOS	year	1.1E-08	9.4E-08	1.1E-08	1.3E-07	2.2E-07	2.0E-03	58%	2.9%	9.8E-07
Cadmium & Compounds, NOS	year	1.0E-06	8.6E-06	1.0E-06	1.2E-05	2.1E-05	1.8E-01	9476%	461.7%	9.0E-05
Chromium(III), soluble particulates, NOS	24-hr	1.3E-06	1.1E-05	1.3E-06	1.5E-05	2.5E-05	6.0E-04	163%	8.1%	1.1E-04
Chromium(VI) & compounds, NOS	year	5.3E-08	4.4E-07	5.3E-08	6.1E-07	1.0E-06	9.2E-03	27776%	1410.2%	4.6E-06
Chrysene	year	1.7E-09	1.4E-08	1.7E-09	2.0E-08	3.4E-08	2.9E-04	0%	0.0%	1.5E-07
Cobalt and compounds, NOS	24-hr	8.0E-08	6.6E-07	8.0E-08	9.1E-07	1.6E-06	3.8E-05	10%	0.5%	6.9E-06
Copper & Compounds	1-hr	8.1E-07	6.7E-06	8.1E-07	9.2E-06	1.6E-05	1.6E-05	0%	0.0%	-
Dibenz[a,h]anthracene	year	1.1E-09	9.4E-09	1.1E-09	1.3E-08	2.2E-08	2.0E-04	5%	0.2%	9.8E-08
Ethyl Benzene	year	6.6E-06	5.4E-05	1.4E-03	1.6E-02	1.6E-02	1.4E+02	4302%	211.8%	6.9E-02
Formaldehyde	year	7.1E-05	5.9E-04	1.1E-03	1.3E-02	1.3E-02	1.2E+02	8302%	430.5%	5.8E-02
Hexane	24-hr	1.7E-03	1.4E-02	1.7E-03	2.0E-02	3.4E-02	8.1E-01	31%	1.6%	1.5E-01
Hydrogen Sulfide	24-hr	4.8E-04	3.9E-03	4.8E-04	5.4E-03	9.4E-03	2.2E-01	3035%	149.7%	-
Indeno[1,2,3-cd]pyrene	year	1.7E-09	1.4E-08	1.7E-09	2.0E-08	3.4E-08	2.9E-04	1%	0.0%	1.5E-07

Table 6

Toxic Air Pollutant Emissions

Toxic Air Pollutant	Averaging Period	TAP Emissions, lb/hr				TAP Summary				HAP Emissions, ton/yr
		Boiler		Flare						
		Emission Factor, lb/MMBtu*	Heat Input Rate = 8.23 MMBtuh	Emission Factor, lb/MMBtu*	Heat Input Rate = 11.39 MMBtuh	lb/hr	lb/ averaging period	% of De Minimis	% of SQER	
Manganese & Compounds	24-hr	3.6E-07	3.0E-06	3.6E-07	4.1E-06	7.1E-06	1.7E-04	15%	0.8%	3.1E-05
Mercury, Elemental	24-hr	2.5E-07	2.0E-06	2.5E-07	2.8E-06	4.9E-06	1.2E-04	106%	5.3%	2.1E-05
Naphthalene	year	5.8E-07	4.8E-06	1.0E-05	1.2E-04	1.2E-04	1.1E+00	453%	22.6%	5.4E-04
Nickel & Compounds, NOS	year	2.0E-06	1.6E-05	2.0E-06	2.3E-05	3.9E-05	3.4E-01	1109%	55.4%	1.7E-04
Nitrogen dioxide	1-hr	NA	1.5E-01	NA	3.4E-01	4.9E-01	4.9E-01	107%	56.5%	-
Propylene	24-hr	5.0E-04	4.2E-03	2.3E-03	2.6E-02	3.1E-02	7.3E-01	7%	3.3%	-
Selenium & Selenium Compounds (other than Hydrogen Selenide)	24-hr	2.3E-08	1.9E-07	2.3E-08	2.6E-07	4.5E-07	1.1E-05	0%	0.0%	2.0E-06
Sulfur dioxide	1-hr	8.9E-02	7.3E-01	8.9E-02	1.0E+00	1.7E+00	1.7E+00	380%	145.5%	-
Toluene	24-hr	2.5E-05	2.1E-04	5.5E-05	6.3E-04	8.4E-04	2.0E-02	0%	0.0%	3.7E-03
Vanadium (fume or dust)	24-hr	2.2E-06	1.8E-05	2.2E-06	2.5E-05	4.3E-05	1.0E-03	279%	13.9%	-
Xylene (mixture)	24-hr	1.9E-05	-	2.8E-05	3.1E-04	3.1E-04	7.5E-03	1%	0.0%	1.4E-03
									Total:	0.29

Notes:

* Based on 1050 MMBtu/scf NG.

‡ H_2S and SO_2 emissions based on H_2S destruction efficiency.

APPENDIX A

BACKGROUND INFORMATION FOR REQUEST FOR MODIFICATION OF CONDITION 4.E.I OF APPROVAL ORDER NO. 24AQ-E012

From: Kruse, Andrew (ECY) <AKRU461@ECY.WA.GOV>
Sent: Monday, May 5, 2025 9:00 AM
To: McKibben, Jon <Jon.Mckibben@lambweston.com>; Poffenroth, John C. (ECY) <JPOF461@ECY.WA.GOV>
Subject: RE: Sly 8

[FROM EXTERNAL SOURCE] Be vigilant before responding, clicking links, or opening attachments. Verify, then Trust. Think before you Click.

Yes, because it is a formal permit change to an issued permit, it needs to go through the process. However, it can be roped into the NOC App for the permit consolidation. 😊

Thank you,

Andy Kruse, P.E.
ENVIRONMENTAL ENGINEER
AIR QUALITY PROGRAM – COMMERCIAL INDUSTRIAL UNIT
WASHINGTON DEPARTMENT OF ECOLOGY - EASTERN REGION
SPOKANE, WA
akru461@ecy.wa.gov
(509)405-0299 (cell)

From: McKibben, Jon <Jon.Mckibben@lambweston.com>
Sent: Monday, May 5, 2025 8:48 AM
To: Kruse, Andrew (ECY) <AKRU461@ECY.WA.GOV>; Poffenroth, John C. (ECY) <JPOF461@ECY.WA.GOV>
Subject: FW: Sly 8

External Email

Found it. Still need to include in NOC application?

From: Poffenroth, John C. (ECY) <JPOF461@ECY.WA.GOV>
Sent: Tuesday, February 6, 2024 2:02 PM
To: McKibben, Jon <Jon.Mckibben@lambweston.com>
Cc: Kruse, Andrew (ECY) <AKRU461@ECY.WA.GOV>; Wright, Gail (ECY) <GWRI461@ECY.WA.GOV>; Prisock, Brian (ECY) <BRPR461@ECY.WA.GOV>
Subject: RE: Sly 8

[FROM EXTERNAL SOURCE] Be vigilant before responding, clicking links, or opening attachments. Verify, then Trust. Think before you Click.

Hi Jon,

- Andy and I reviewed your email, the current permit, and the submitted NOC application and agree Lamb Weston Pasco needs to install controls that will guarantee the air emissions at the exhaust of the Sly #8 Scrubber do not exceed what was proposed and ultimately permitted. These controls include a Spray Tower and Quench system at the inlet of the Sly #8 Scrubber. However,
- We also agree that if Lamb Weston Pasco performs a source test of the Sly #8 Scrubber by January 30, 2025, that demonstrate emissions are the same or lower than what was proposed in the NOC application, then LW-Pasco can submit an NOC application to have Approval Condition 4(e)(i)(A – D) updated to reflect the installed, complaint air emission controls.

If you would like to discuss this further, we would be happy to do a Teams call.

John Poffenroth
Department of Ecology
Air Quality Program
C/I Unit Compliance/Enforcement
Eastern Regional Office
Email: john.poffenroth@ecy.wa.gov
Cell: 509-481-1794

Lamb Weston Proprietary

From: McKibben, Jon <Jon.Mckibben@lambweston.com>
Sent: Monday, February 5, 2024 2:11 PM
To: Poffenroth, John C. (ECY) <JPOF461@ECY.WA.GOV>
Subject: Sly 8

External Email

Afternoon Herr Poffenroth,

Per our discussion this AM. In the NOC that was recently given to us concerning the Sly 8, a section from the Connell permit was added to the NOC for uniformity. However, upon further review Connell uses what they term a “Spray Tower” which is not something that comes standard with a Sly 8 and therefore was not included in our purchase from Sly. However, after calling Marvin Price from LW Connell it appears this “Spray Tower” is a water spray prior to the fryer gases going into the venturi itself. A pre-quench, before the pre-quench spray if you will. The Current design for the Sly 8 at LW Pasco does not have this “spray tower”, however we do plan on employing some similar if we indeed need this.

Working with our consultant, we had pre-planned on leaving connection points available for additional sprays in the duct work themselves if we needed this based off of source testing etc. Essentially this would do the same thing as a spray tower, but would only hook this up if we needed it and through an additional NOC etc. We don't have a drawing yet for this as I believe this part of the drawing is a week or two out.

Attached is a copy of general flow arrangement of our current Sly 8.

Thoughts?

Jon McKibben, MPH, CSP, CHMM
Environmental Manager, Pasco Plant
960 N Glade Rd | Pasco, WA, 99301-
P:509-905-2340 | C:801-361-7967
www.lambweston.com

SEEING POSSIBILITIES IN POTATOES

APPENDIX B

VENDOR TECHNICAL DATA

Cleaver-Brooks Boiler Expected **Steam Perf. Data** -

- -
30 - PPM Nox System

BACKGROUND INFORMATION				
Date	04/23/26			
Author	Justin Womble			
Customer	Inrigo			
City & State	Pasco, WA			
Boiler Model	CBLE-4W		The ASME Power Test Code , PTC 4.1 Heat Loss Method equations were used to calculate fuel-to- steam efficiencies. The listed efficiency accounts for loss up the stack , boiler radiation and convection losses.	
Design Pressure (psig)	150			
Furnace Volume (cuft)	47			
Heating Surface (sqft)	1000			
ENTHALPY				
Steam Enthalpy, hg (Btu/lb)	1193	1193	1193	1193
Feedwater Enthalpy, hfw (Btu/lb)	229	229	229	229
LOAD				
Operating BHP	**200**	**150**	**100**	**50**
Steam Flow Rate, (lbm/hr)	6,942	5,207	3,471	1,736
Firing Rate	**100%**	**75%**	**50%**	**25%**
Fuel Type	**Bio-Gas**	**Bio-Gas**	**Bio-Gas**	**Bio-Gas**
EXCESS AIR				
Excess Air Leaving Boiler	15.0%	15.0%	15.0%	35.0%
O2 Leaving Boiler	2.9%	2.9%	2.9%	5.7%
CO2 Leaving Boiler	12.3%	12.3%	12.3%	10.4%
PRESSURE				
Steam Operating Pressure, (psig)	125	125	125	125
TEMPERATURES				
Flue Gas Temp. Leaving Boiler (°F)	416	400	385	369
Feedwater Temperature, (°F)	260	260	260	260
Combustion Air Temperature (°F)	80	80	80	80
Steam Temperature (°F)	353	353	353	353
ENERGY				
Heat Output , (Btu/hr)	6,695,000	5,021,250	3,347,500	1,673,750
HHV Fuel-to-Steam Efficiency (%)	81.33	81.52	81.90	80.06
HHV Heat Input (Btu.hr)	8,231,416	6,159,813	4,087,425	2,090,520

Cleaver-Brooks Boiler Expected **Steam Performance Data** -

\- -
30 - PPM Nox System

BACKGROUND INFORMATION

Date	04/23/26
Author	Justin Womble
Customer	Inrigo
City & State	Pasco, WA
Boiler Model	CBLE-4W
Design Pressure (psig)	150
Furnace Volume (cuft)	47
Heating Surface (sqft)	1000

The ASME Power Test Code , PTC 4.1 Heat Loss Method equations were used to calculate fuel-to- steam efficiencies. The listed efficiency accounts for loss up the stack , boiler radiation and convection losses.

HEAT LOSS				
Dry Gas (%)	6.55	6.24	5.93	6.63
H2 and H2O in Fuel (%)	11.53	11.46	11.39	11.32
Moisture in Air (%)	0.08	0.08	0.07	0.08
Radiation & Conv. (%)	0.50	0.70	0.70	1.90
Total Heat Loss (%)	18.66	18.48	18.09	19.93
FLOW RATES				
Gas LHV (Btu/SCF)	689	689	689	689
Gas HHV (Btu/SCF)	764	764	764	764
HHV Gas Flow Rate (SCFH)	10,774	8,063	5,350	2,736
Gas LHV (Btu/lb)	11,894	11,894	11,894	11,894
Gas HHV (Btu/lb)	13,189	13189	13,189	13189
Gas Flow Rate (lb/hr)	624	467	310	159
Dry Air Weight (lb/lb fuel)	10.97	10.97	10.97	12.88
Air for Combustion (lb/hr)	6,849	5,125	3,401	2,042
Flue Gas to Stack (lb/hr)	7,518	5,626	3,733	2,212
RESISTANCE				
Furnace Pressure (in WC)	6.22	3.48	1.53	0.54
Burner Press. Drop (in WC)	17.35	9.72	4.28	1.50
Net Resistance (in WC)	23.57	13.20	5.81	2.04
HEAT RELEASE				
Furnace Heat Release (Btu/hr/cuft)	117,424	87,872	58,308	29,822
Furnace Heat Release Rate (Btu/hr/sqft)	69,758	52,202	34,639	17,716
Heat Absorption Rate (Btu/hr/sqft)	6,735	5,052	3,368	1,684

Cleaver-Brooks Boiler Expected Emission Data

Producing Steam Firing **Bio-Gas**

BACKGROUND INFORMATION

Date	04/23/26	Boiler Model	CBLE-4W
Author	Justin Womble	Altitude (feet)	390
Customer	Inrigo	Operating Pressure (psig)	125.00
City & State	Pasco, WA	Furnace Volume (cuft)	47
		ce Heat Release (btu/hr/cu ft)	69,758
		Heating Surface (sqft)	1000
		Nox System	30

Bio-Gas		Firing Rate			
		25%	**50%**	**75%**	**100%**
Horsepower		50	100	150	200
Input , Btu/hr		2,091,000	4,087,000	6,160,000	8,231,000
CO	ppm	50	50	50	50
	lb/MMBtu	0.0408	0.0408	0.0408	0.0408
	lb/hr	0.09	0.17	0.25	0.34
	tpy	0.374	0.731	1.101	1.472
NOx	ppm	30	30	30	30
	lb/MMBtu	0.0402	0.0402	0.0402	0.0402
	lb/hr	0.08	0.16	0.25	0.33
	tpy	0.368	0.720	1.085	1.450
NO	ppm	25.5	25.5	25.5	25.5
	lb/MMBtu	0.034	0.034	0.034	0.034
	lb/hr	0.07	0.14	0.21	0.28
	tpy	0.29	0.58	0.87	1.16
NO_2	ppm	4.5	4.5	4.5	4.5
	lb/MMBtu	0.006	0.006	0.006	0.006
	lb/hr	0.01	0.02	0.04	0.05
	tpy	0.07	0.14	0.22	0.29
SOx	ppm	3.70	3.70	3.70	3.70
	lb/MMBtu	0.0069	0.0069	0.0069	0.0069
	lb/hr	0.0144	0.0282	0.0425	0.0568
	tpy	0.063	0.124	0.186	0.249
VOCs	ppm	13	13	13	13
(Non-Methane Only)	lb/MMBtu	0.0061	0.0061	0.0061	0.0061
	lb/hr	0.013	0.025	0.037	0.050
VOCs does not include any background VOC emissions.	tpy	0.056	0.109	0.164	0.219
PM10 (Filterable)	ppm	N/A	N/A	N/A	N/A
	lb/MMBtu	0.0075	0.0075	0.0075	0.0075
	lb/hr	0.016	0.031	0.046	0.062
	tpy	0.069	0.134	0.202	0.270
PM10 (Condensable)	lb/MMBtu	0.0125	0.0125	0.0125	0.0125
	lb/hr	0.026	0.051	0.077	0.103
	tpy	0.114	0.224	0.337	0.451
PM2.5 (Filterable)	lb/MMBtu	0.0075	0.0075	0.0075	0.0075
	lb/hr	0.016	0.031	0.046	0.062
	tpy	0.069	0.134	0.202	0.270
PM2.5 (Condensable)	lb/MMBtu	0.0125	0.0125	0.0125	0.0125
	lb/hr	0.026	0.051	0.077	0.103
	tpy	0.114	0.224	0.337	0.451
Exhaust Data					
Temperature, F		369	385	400	416
Flow	ACFM	750	1,291	1,983	2,700
	SCFM (70 Degrees Fah.)	491	830	1,250	1,671
	DSCFM	444	737	1,111	1,485
	lb/hr	2,212	3,733	5,626	7,518
Velocity	ft/sec	8.96	15.42	23.68	32.24
	ft/min	538	925	1,421	1,934

Notes:

1) All ppm levels are corrected to dry at 3% oxygen.
2) Emission data based on 80% boiler efficiency.
3) % H2O , by volume in exhaust gas is **17.28** % O2, by volume **2.41**
4) Water vapor in exhaust gas is **101.51** lbs/MMBtu of fuel fired
5) CO2 produced is **146.04** lbs/MMBtu of fuel fired
6) Particulate is exclusive of any particulates in combustion air or other sources of residual particulates from material.
   PM level indicated on this form is based on combustion air and fuel being clean and turndown up to 4:1.
7) Heat input is based on high heating value (HHV).
8.) Emission produced in tons per year (tpy) is based on 24 hours per day for 365 days = 8,760 hours per year
9.) Exhaust data is based on a clean and properly sealed boiler.
10.) Emission data is based on a burner turndown of 4 to 1 above 40 hp.

13) Hydrogen Sulfide content in fuel = **0.030** %, by volume.
14) Fuel High Heating Value = **764** Btu/FT^3

These records may be available upon request. To find out if there are more records for this project, contact Ecology's Public Records Office.

- Online: https://ecology.wa.gov/footer-pages/public-records-requests
- Public Records Officer email: PublicRecordsOfficer@ecy.wa.gov • Call: 360-407-6040

Para averiguar si existen más registros sobre ese proyecto, póngase en contacto con la oficina de archivos públicos del Departamento de Ecología, envíe un correo electrónico a publicrecordsofficer@ecy.wa.gov, o llame al 360-407-6040

STANDARD SPECIFICATION

1. Enclosed Waste Gas Burner

A. Design Parameters

1. Waste Gas burner shall have a 6-inch size ANSI RF flanged inlet connection.
2. The burner shall have no visible flame and designed to combust digester gas efficiently without limiting the gas flow range.

B. Combustion Parameters

1. Nominal Digester Gas Composition:
   a) Total Polluting Components as H2S: 1%
   b) All combustibles as Methane 55-60%
   c) CO2: 35-40%
   d) H2 and N2 1%
   e) Specific Gravity (relative to air) 0.86
   f) Moisture Content: 100% saturated
   g) Maximum Gas Flow Rate: 8050 SCFH
   h) Gas temperature: ambient
   i) Heating Value: 550-650 BTU/SCF
   j) Minimum gas pressure at flare inlet: 10inches W.C.

C. Performance Requirements

Required destruction efficiency: 99%
Max. NOx Generation (1 hr average): 0.060 lbs/MMBTU input
Max. CO concentration in the flue gas: 300 lbs/MMBTU
Max. noise level measured at 10ft. from the stack: 85 dBA

D. Material of Construction

1. The flare shall be constructed to allow combustion air to be naturally inspired to obtain proper air-gas mixture. This shall be done without the use of motorized dampers, blowers or like devices. Refractory lining on the combustion chamber is not allowed.
2. The flare stack shall be constructed with 304 SS chambers having 10 Ga#2B wall thickness. All stack piping will be 1-1/4" 304 SS SCH 40, all other stack materials to be mild steel.
3. The burner base, pedestal and waste gas inlet manifold shall be constructed of carbon steel with a 3-4 mil P-Series TGIC Polyester topcoat powder coating for corrosion resistance. The burner base and pedestal is designed to secure the stack firmly to be foundation and comes with 1" diameter bolt holes.
4. Operator shall have complete access to the main manifold in the base of the flare for removal and replacement of the individual flare nozzles, and for maintenance on the piping. Unit shall not have any screens blocking access to the burners. Flare shall have a sectional manifold to accommodate removal and repair of the individual headers.
5. Venturi housings shall be cast 347 SS with lock-in place flow conditioners. Fabricated venturi nozzles shall not be allowed.
6. The pilot gas piping provided with the flare shall be supplied in SS with 316 SS Continuous Pilot and Retention nozzles.
7. The inlet flare manifold shall be provided with insulation.
8. Provided lifting lungs and built in wire support.

E. Pilot Gas Supply

1. Continuous flame nozzle shall be mounted integral to the burner and shall have a long profile flame. Pilot shall be inclined 45 degrees off vertical. Pilot flame shall extend through waste gas flow profile to ensure ignition of waste gas regardless of the flow rate. Unprotected pilot shall withstand winds up to 110 mph (177 km/h) without the use of downdraft protectors, vortex vanes or other flow restricting devices.
2. Waste gas burner shall operate using natural gas at XXX psig (or inch WC) supply pressure.
3. When the burner is on mixed and ignited at ground level, remote from the burner stack a minimum of 15 feet to a maximum of 100 feet away from the burner tip. Specifically, no component of the ignition system shall be mounted to the burner stack or shroud; nor shall heat shields be substituted in an attempt to protect such devices from the heat of combustion.

F. Theory of Operation

1. Start-up sequence initiates through the Dry contacts. The start-up sequence will open the continuous pilot solenoid valve and the flame retention solenoid valve.
2. The continuous and ignition retention line receives a constant air/gas supply from the air/gas mixing chamber on the blower-driven panel.
3. The transformer sends voltage to the spark plug.
4. This generates a flame front. The Retention Nozzle catches the Flame front and lights the Continuous Nozzle.
5. The three-way explosion proof solenoid valve is energized, opening the regulator and permitting flow of digester gas to the burner for combustion.
6. LOCAL START OPERATION – In “AUTO” mode, the burner and the pilot will remain lit and will attempt reignition in case the pilot is lost. Ignition will continue to occur until PILOT ON indication is achieved. If the flare system fails to reignite in a set amount of Spark On attempts, the flare goes into system failure. The solenoid valves closes, and the System Failure Dry Contact changes state.

G. Pilot Gas Control Components

The Automatic ignition system shall consist of the following components:

1. Continuous pilot nozzle that shall burn a stoichiometric air/gas mixture.
2. Retention flame retention nozzle that flows pilot gas upon demand during the ignition cycle.
3. Type K 316SS thermocouple with thermowell installed in the continuous pilot nozzle.
4. Valve and regulator package for controlling the pilot fuel gas. Package shall include:
   Isolation valves
   Pressure Regulators
   Pressure gauges
   Air Blower
   An explosion proof solenoid valve,
5. Gas inlet connection shall be 1” NPT. Gas outlet connections shall be 2” NPT to the continuous flame line and 1/2“NPT to the flame retention line.
6. Spark Plug.

H. Burner Controls

1. NEMA 4X, 316 SS Construction
2. Three-position selector switch for OFF/HAND/AUTO modes
3. Type K Thermocouple Pilot flame monitoring
4. Status indicators for “Pilot On”, “Pilot Off”, “System Alarm”, “Retention Valve Open”, “Continuous Valve Open”, “Main Gas Line Open”, “System Standby”, Explosion-Proof Control Panel Status indicators for “Pilot On”, “Pilot Off”, “Spark On”, “Retention Valve Open”, and “System Alarm”
5. Field adjustable setpoints for, Pilot purge time, Spark time, Thermocouple Hot, Reignition attempts
6. Heater and thermostat
7. Manual ignition button

8. SPDT dry contacts for Pilot On/Off and System Alarm
9. 120VAC, 1Ph, 60Hz power required
10. 15Amp fused protection
11. Certified UL 508A

2. Pressure Regulator and Flame Trap Assembly

A. Pressure relief and flame trap assembly shall have 6 inch size flanged connections. Valve shall be set to relieve pressure at __” WC.

B. A large spring-loaded diaphragm shall control regulator valve. Regulator shall operate normally closed and shall maintain a back pressure within approximately 10% of the setting. The spring barrel shall include a glass-enclosed pointer and scale to indicate setting. A spring adjusting screw shall permit setting adjustments without disassembling the diaphragm housing. Setting range shall be from 2” WC (mm wg) to 12” WC (mm wg) pressure.

C. Construction shall be low copper cast aluminum body, diaphragm and spring housings, and diaphragm inner plate. Inner valve shall include low copper aluminum pallet with 304 SS stems and bushings. Diaphragm shall be molded BUNA-N rubber with Nylon reinforcement. Setting spring shall be zinc plated steel. Valve shall include ½” NPT connections for the pressure sensing line and atmospheric vent line. Tubing provided by Contractor per the manufacturer’s recommendations.

D. The unit shall come with a three-way solenoid valve. The solenoid valve will open and close the regulator based on PILOT ON/OFF indication from the burner control panel.

E. Flame arrester net free area through the bank assembly shall be not less than three times the corresponding size standard pipe. Entire bank assembly shall slide easily out of the arrester housing to facilitate inspection and cleaning. Removing or replacing the bank assembly shall not require support for alignment, jackscrew for extending the housing, and shall not place a strain on the connecting piping. Bank frame shall be extensible and shall be filled with corrugated rectangular shaped bank sheets. Construction shall be low copper cast aluminum. Bank assembly shall include low copper aluminum frame with 316 SS bank sheets.

F. The assembly shall be interconnected with a thermal bypass shut-off valve. Valve shall be the spring-actuated double acting needle type. Bypass valve shall operate within 15 seconds when the thermal element reaches 260°F (127°C). Bypass valve shall automatically close the regulator by applying full upstream gas pressure on the upper portion of the diaphragm. Fusible element shall be replaceable without disassembling the valve. By-pass valve assembly shall be constructed of aluminum and stainless steel with BUNA-N “O” rings. Regulator, flame arrester, and bypass valve shall be factory assembled as a single unit. Flanges shall be drilled to ANSI 150 FF Flanged dimensions. Assembly shall be leak proof to 5 psig.

3. Low Pressure Drip Trap

A. Low pressure manual drip trap shall have 1 inch size NPT inlet and outlet connections. Drip trap shall be the rotating disc type. Gas escaping to atmosphere is not possible regardless of the disc position. An air inlet port shall be provided to permit free flow of condensate from reservoir when draining. All ports shall be “O” ring sealed. Storage capacity shall be 6 quarts.

B. Construction shall be low copper cast aluminum body, cover plate, disc, and handle. Disc shall be anodized. Internal working parts and fasteners shall be stainless steel. “O” rings shall be Neoprene.

C. Maximum working pressure shall be 5 psig.

D. Manual low pressure drip trap shall be of Varec 246 series.

4. Pressure/ Vacuum Relief Valve & Flame arrester

A. Pressure and vacuum relief valve with flame arrester shall have 6 inch size flanged connections. Pressure relief shall be set at XXX” WC. Capacity shall be not less than XXX SCFM at XXX” WC. Vacuum relief shall be set at XXX ”WC.

B. Relief valve and flame arrester shall be two independent items of equipment. Valve shall be field installed on the flame arrester by means of a bolted and gasketed flanged connection.

C. Valve pressure and vacuum ports shall be oversized to keep overpressure to a minimum. Pallets and seat rings shall be replaceable and interchangeable. Pallets shall be dead weight loaded, and both centre and side guided for stability. They shall incorporate replaceable "air cushion" Teflon® seat inserts. HDPE protective screens shall be provided at the pressure and vacuum ports, located external of the pallets.

D. The valve body and cover shall be low copper cast aluminum. Spun hood, seat rings, and pallet assemblies shall be low copper aluminum. Guideposts shall be 304 stainless steel.

E. Flame arrester net free area through the bank assembly shall be not less than three times the corresponding size standard pipe. Entire bank assembly shall slide easily out of the arrester housing to facilitate inspection and cleaning. Removing or replacing the bank assembly shall not require removing the Pressure and Vacuum Relief Valve off-line, nor shall it require support for the valve and proper alignment, jackscrew for extending the housing. Bank frame shall be extensible and shall be filled with corrugated rectangular shaped bank sheets. Alternating flat and crimped ribbon sheets are not an acceptable substitute. Flame arrester shall be self draining.

F. Arrester housing construction shall be low copper cast aluminum. Bank assembly shall include a low copper aluminum frame and 316 SS sheets. Flanges shall be drilled to ANSI 150 FF Flanged dimensions. Relief valve and flame arrester combination shall be VAREC 5810B Series.

G. "All-Weather" feature shall be provided to protect the valve in temperatures ranging from -25°F to +200°F (-32°C to +93°C).

5. Safety selector Valve

A. Install a Safety Selector Valve (SSV) with two Pressure and Vacuum Relief Valve and Flame Arrester Assemblies to allow performing maintenance on one unit while the other is kept in operation. The valve design shall prevent the possibility of leaving the digester unprotected at any time during the switch-over of the operating Pressure and Vacuum Relief (PVR) Valve and Flame Arrester Assembly.

B. Valve shall have built in seat equalization. This is defined as the pressure being uniform and equalized across the SSV seat during change-over in order to facilitate the change-over process. During the change-over, pressure shall be applied to both sides of the seating surface. Valves, wherein pressure is only applied on one seating surface during change-over, is not allowed. There shall be no special tools required to operate the unit and must not require more than 80 ft-lb of force. Valves requiring greater than 80 ft-lb of force shall be supplied with explosion proof electric actuators.

C. A bright red indicator manufactured in stainless steel is included to provide positive indication of active pressure and vacuum relief and flame arrester. There shall be means to accommodate a locking device to prevent unwanted access to either of the Pressure and Vacuum Relief (PVR) Valve and Flame Arrester Assembly.

D. The SSV shall have a pressure drop through the active device of no greater than 3% of the flow with the pressure relief valve fully open. Valve design shall have Cv values which are verified in an ASME certified flow test facility. Testing shall have been witnessed by an ASME observer and test reports shall be supplied as part of the submittal process. Cv shall, at a minimum, be as defined in the following tables:

2"	255
3"	612
4"	1061
6"	2713
8"	4512
10"	6930

E. Packing design shall be tested to ASTM E427, Method A Halogen leak Test, to reduce the possibility of fugitive emissions. The SSV shall come with threaded ports on both process sides. The threaded ports shall come with 1" manual hand valves constructed in stainless steel. The Safety Selector Valve shall be rated for a minimum pressure of 15 psig at 100° F and shall be rated for a maximum temperature of 400° F. The unit shall come with ANSI 150 FF Flanged Connections.

F. Material shall be as follows:
Body, Base: Aluminum;
Rotor, Indicator and Seat: 316 SS
Isolation Disk, Index Shaft, Retraction Bushing: 17-4 stainless steel;
Hardware: SS
Soft Goods: Teflon

6. Insulating Jackets

A. Units shall be provided with an easily removable 1” thick insulation jacket. The insulating jacket shall be constructed with a silicone impregnated woven glass cloth lining with a 1” thick, 6-lb density fiber glass insulating material. Through-cover quilting pins provide firm support for the insulation. The pins shall keep the insulation from shifting inside the liner and jacket for dimensional stability and uniform heat retention. The silicone lining has inside seams and folded closing seams with two parallel rows of stitching. The specially made insulating jacket shall be attached to the unit with a combination of Velcro and cinch belts. When specifying with flame arrester: The jacket must allow access to the flame arrester bank assembly during maintenance without removing the entire jacket.

From:	Yinghong Gao
To:	snelson coalcreekenv.com
Cc:	Chapple, Michael; Andreas Smedsrud; Viggo Andre Bjerkelund
Subject:	FW: FW: Flare and air permit questions
Date:	Wednesday, December 17, 2025 12:01:30 AM
Attachments:	image006.png

Hi Steve,

Please see the response from Jim Groman in the attached emails.

Med vennlig hilsen/Best regards,

Yinghong Gao, Ph.D.
Process Engineer at Inrigo AS
Phone: +47 412 38 000
Mobile: +47 980 54 580
Email: Yinghong@inrigo.no
Industriveien 43B,
7080 Heimdal Norway
www.Inrigo.no

From: Palis, Mel <mel.palis@veolia.com>
Sent: Wednesday, December 17, 2025 12:16 AM
To: Yinghong Gao <yinghong@inrigo.no>
Cc: Alexander McGee <alexander.mcgee@veolia.com>; Viggo Andre Bjerkelund <viggo@inrigo.no>; Jack Kuhar <jack.kuhar@veolia.com>
Subject: Fwd: FW: Flare and air permit questions

Yinghong,

Please see below the flare exhaust stack information provided by Jim Groman who is the Varec contact of Stephen Nelson (of Coal Creek Environmental). *Jim indicated that the stack temperatures are estimated*.

Let me know if you have any questions. Thank you.

Regards,

Mel Palis, PE

Project Manager, NORAM

WATER TECH

3600 Horizon Blvd / Suite 100 / Trevose, PA 19053 USA

www.veolia.com

---------- Forwarded message ---------
From: **Jim Groman** <Jim.Groman@ovivowater.com>
Date: Tue, 16 Dec 2025 at 13:29
Subject: RE: FW: Flare and air permit questions
To: Rusty Sirwaitis <Rusty.Sirwaitis@ovivowater.com>, Palis, Mel <mel.palis@veolia.com>
Cc: Monica Brittain <Monica.Brittain@ovivowater.com>, Jack Kuhar <jack.kuhar@veolia.com>, Alexander McGee <alexander.mcgee@veolia.com>

Biogas flow rate (Nm3/h)	Biogas CH4 percentage	Combustion temperature (°F/°C)	Flue gas flow rate (biogas + combustion air) (acfm)
400 Flare capacity	75%	860 F	24,830
228 Max biogas load	75%	714 F	14,153
177 Average biogas load	75%	550 F	10,988

Please note that these temperatures are estimated only, as we do not control the temperature, and the tuning of the flare may result in slightly lower o higher excess air requirements.

Best Regard,

Jim Groman
Division Manager - Varec Biogas and Biosolids Management & Resource Recovery Group
15061 Springdale St., Suite 210, Huntington Beach, CA 92649
P: 714-220-9923 **C:** 714-317-7856
Privacy Policy | ovivowater.com| varec-biogas.com

From: Palis, Mel <mel.palis@veolia.com>
Sent: Tuesday, December 16, 2025 9:05 AM
To: Rusty Sirwaitis <Rusty.Sirwaitis@ovivowater.com>
Cc: Monica Brittain <Monica.Brittain@ovivowater.com>; Jack Kuhar <jack.kuhar@veolia.com>; Alexander McGee <alexander.mcgee@veolia.com>
Subject: Fwd: FW: Flare and air permit questions

Rusty,

Please see below our customer's email (Yinghong Gao from Inrigo) asking about the *exhaust stack temperature* which is needed for them to conduct dispersion modeling as required by the Washington DOE.

She also provided the email from their permitting engineer (Coal Creek Environmental) and the Varec engineer (Jim Groman of Huntington Beach) who they've been working with in similar projects. (Both contact information is provided in the email trail below.)

Let me know how we can resolve this issue.

Thank you,

Mel Palis, PE

Project Manager, NORAM

WATER TECH

3600 Horizon Blvd / Suite 100 / Trevose, PA 19053 USA

www.veolia.com

---------- Forwarded message ---------

From: **Yinghong Gao** <yinghong@inrigo.no>
Date: Tue, 16 Dec 2025 at 10:44
Subject: FW: Flare and air permit questions
To: Mel Palis <mel.palis@veolia.com>
Cc: Kuhar, Jack <jack.kuhar@veolia.com>, Andreas Smedsrud <Andreas@inrigo.no>, Viggo Andre Bjerkelund <viggo@inrigo.no>

Hi Mel,

I got the feedback from the consultant. He needs stack exhaust temperature to do dispersion modeling. He also gives the contact of Varec. Could you please check this with your contact person in Varec? Thanks.

Med vennlig hilsen/Best regards,

Yinghong Gao, Ph.D.
Process Engineer at Inrigo AS
Phone: +47 412 38 000
Mobile: +47 980 54 580
Email: Yinghong@inrigo.no
Industriveien 43B,
7080 Heimdal Norway
www.Inrigo.no

From: snelson coalcreekenv.com <snelson@coalcreekenv.com>
Sent: Monday, December 15, 2025 2:39 PM
To: Yinghong Gao <yinghong@inrigo.no>
Cc: Chapple, Michael <michael.chapple@lambweston.com>; McKibben, Jon <jon.mckibben@lambweston.com>; Wade Entezar <Wade@inrigo.no>; Andreas Smedsrud <Andreas@inrigo.no>; Viggo Andre Bjerkelund <viggo@inrigo.no>
Subject: RE: Flare and air permit questions

Hi Yinghong –

We do not need stack temperature as a performance requirement for the flare. But we do need stack temperature to do dispersion modeling - stack temperature is a mandatory data requirement. Modeling cannot be completed without it.

I have permitted numerous Varec flares, including with agencies listed in the Veolia response, and getting an estimated stack temperature for modeling purposes has not been a problem.

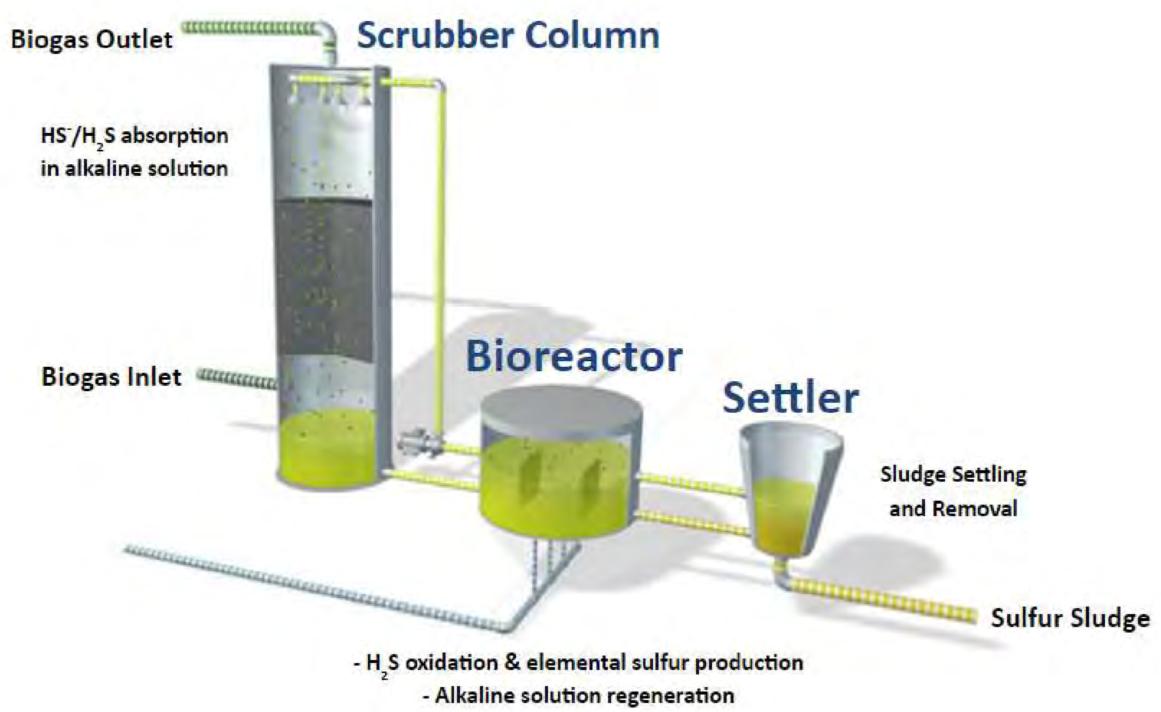
Most, if not all, of my Varec projects have involved Jim Groman. Contact data below:

Jim Groman
Division Manager - Varec Biogas and Biosolids Management & Resource Recovery Group
15061 Springdale St., Suite 210, Huntington Beach, CA 92649
P: 714-220-9923 **C:** 714-317-7856

****

Stephen J. Nelson, PE
Coal Creek Environmental Associates, LLC
Phone: 425-373-4888
Cell: 425-922-0444

Sulfothane Scrubber System



Biogas is introduced into a scrubber column where it is mixed and separated with wash water, removing H_2S and some CO_2 under alkaline conditions. No air (O_2 and N_2) will be added. Thus the composition of the biogas will remain almost unchanged except for the removal of H_2S.
In a second step the charged scrubber water will enter a slightly aerated tank where sulfur bacteria oxidize all H_2S to produce elemental sulfur and recover alkalinity. The H_2S-free (uncharged) wash water will be returned and re-used in the scrubber.

Pre-treatment

Existing equipment shall be in good working order for removing foam, solids and fluids from the digester entrapped in the biogas before entering the Sulfothane scrubber.

Scrubber

The main components of the scrubber column are as follows:

- Wash water sump – located at the bottom of the column
- Biogas entry
- Packing column
- Wash water entry / biogas sedation
- Demister
- Biogas Outlet

The biogas enters the lower section of the scrubber column. It passes in upflow mode through the packing bed, where it is thoroughly mixed with counter current falling caustic wash water. Above the packing bed, after a short sedation zone, the cleaned biogas passes a demister to retain remaining wash water drops and leaves the column through the outlet connection.

Within the packing bed the H_2S from the biogas is absorbed by a slightly alkaline wash water (pH 8-9), which is sprayed downwards on top of the package bed.

The absorption of H_2S proceeds according to the following equation:

$$H_2S + NaOH \rightarrow NaHS + H_2O$$

For this process alkalinity in the form of caustic soda is essential and consumed during the absorption process.

The packing itself consists of material with high specific surface area per volume, which optimizes the contact between the biogas and the wash water, while allowing enough void space to allow the gas to pass through with low head loss. Clogging of the package bed is prevented by the process itself as no oxygen is involved to form elemental sulfur in the scrubber. The packing material is supported on a grid.

From the bottom of the packing bed the loaded wash water falls into a collection sump located at the base of the scrubber column connected to the aeration tank.. The sump also serves as a degassing tank and water lock to prevent biogas entering the Aeration Tank.

Aeration Tank

The charged wash water enters the enclosed Aeration Tank from the communicating scrubber sump and is mixed with air, which is introduced at the bottom of the tank.

Sulfur-transforming bacteria (Thiobacillus sp.) inside the bioreactor convert the dissolved sulfide into elemental sulfur, regenerating caustic soda in the process. These bacteria grow very fast and are known to be quite resistant to varying process conditions.

In the Sulfothane process, the alkalinity consumed due to the absorption of H_2S is compensated by the oxidation of hydrogen sulfide to elemental sulfur under controlled oxygen conditions:

$$NaHS + ½O_2 \rightarrow S^o + NaOH \qquad (1)$$

The caustic soda is thereby recovered.

Due to a minimal side reaction, a small part of the dissolved H_2S will also be oxidized to sulfate, as follows:

$$2NaHS + 4O_2 \rightarrow 2NaHSO_4 \leftrightarrow Na_2SO_4 + H_2SO_4 \qquad (2)$$

As a result of this side reaction, a small amount of caustic soda is required and is lost to neutralize the sulfuric acid formed. The preference of the two competing biological reactions is guided by a sensitive air control system, using a redox potential measurement.

At the base of the bioreactor a non-clogging air injection system distributes air evenly across the reactor volume. This air distribution system consists of a number of air headers with aeration nozzles. The air is provided by a variable frequency controlled air blower.

The exhaust air leaves the covered bioreactor via the vent gas nozzles, which could be connected to an existing vent gas system, if required (by others). Under normal operating conditions the H_2S content in the air from the bioreactor will be low (below 1 ppmv).

Inside the bioreactor a separate, non-aerated compartment provides a degassing zone. The water-sulfur-bacteria mixture enters this zone by gravity. From here the wash water pump returns wash water for reuse into the top of the scrubber column and to a separate settling tank to remove the elemental sulfur solids.

Sulfur Tank

The tank is used to sample, monitor and control the suspended solids content in the system. The tank is continuously filled by a slip stream of the wash water pump and overflows back to the Aeration Tank. The sulfur solids are decanted in the cone bottom and pumped away for disposal by others.

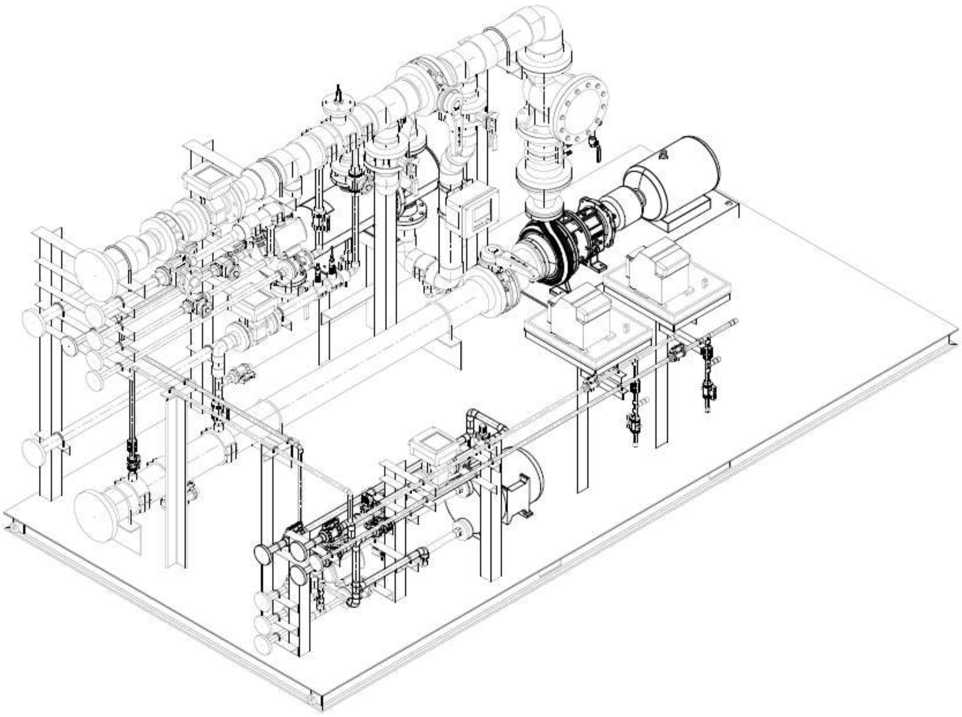
If required, a small bleed stream may be withdrawn from the system to prevent the build-up of sodium sulfate and other salts in the system, which are caused by the side-reaction (2). The bleed stream (containing sodium salts and some sulfur particles) is harmless and can generally be discharged without problems.

Minor liquid and chemical losses in the form of sulfur sludge and bleed stream have to be replaced by addition of caustic soda and softened water.

The conversion of H_2S into elemental sulfur is a biological process and requires a small amount of nutrients for healthy bacteria growth and operation of the plant which are dosed in a single nutrient blend.

Sulfothane Process Skid

The Sulfothane process skid will have all pumps and analytical instrumentation installed and piped. The skid will be supplied as per Veolia's standards with main liquid process piping in schedule 80 PVC, schedule 80 CPVC for chemicals and schedule 40 carbon steel for compressed air. Skid base and all supports are epoxy coated carbon steel. An example Sulfothane process skid is shown below.



APPENDIX 4 - PROCESS GUARANTEE AND PERFORMANCE TEST - SULFOTHANE

This document describes the terms and conditions related to the Process Guarantee given by Veolia. The provisions herein shall prevail over any other Contract terms and conditions governing the Process Guarantee.

I. **Basis of Design**

A. Purchaser hereby agrees to and certifies the Basis of Design is as provided in Annex A.

B. Any change in the production processes and/or raw materials incorporated in the production process may have a negative impact on the treatment facility. It is therefore agreed by the Parties that: (i) the Purchaser shall inform Veolia of any such changes in a timely manner in order to allow the Parties to assess any impact on the Basis of Design and/or the facility; (ii) Veolia shall assess the consequences of such changes on the Process Guarantee and/or Performance Test; and (iii) the parties shall meet to agree on any required Variation Order to the Contract.

II. **Process Guarantee**

A. The Process Guarantee as defined in Annex B, and subject to compliance with the conditions herein, shall be conclusively and finally demonstrated through the successful completion of the Performance Test as described herein below.

B. Veolia's obligation to comply with the Process Guarantee is strictly subject to and conditioned on the following criteria being in effect during start-up, operation and Performance Test periods:

(1) The Biogas is in compliance with the Basis of Design in accordance with Section I above ("Compliant Influent");

(2) The operation of the equipment is within its design limits

(3) The operation of the equipment is in accordance with Veolia's Operation and Maintenance manual and/or Veolia's direction;

(4) Veolia's unrestricted access to the site and any and all relevant data and documentation for the facility and its operation;

(5) All existing equipment and facilities of Purchaser are in good condition and free of defect;.

(6) Programming of process controls identified in Veolia's written instructions, as well as programming of process equipment controls which are outside of Veolia's scope but which affect Veolia's process, have been completed in accordance with Veolia's requirements;

(7) Purchaser has strictly complied with Veolia's specifications related to engineering, quality control, erection, material selection for the process, mechanical, electrical or instrumentation scope of supply.

C. A Performance Test Protocol shall be prepared and agreed by the Parties before the start of feeding Biogas (sometimes referred to as "Influent" in this document) to the facility.

III. **Performance Test**:

A. <u>Activities and Responsibilities</u>

1. During start-up, operation, and Performance Test periods, the Purchaser shall be responsible to provide trained, competent operators who will operate the facility in accordance with Section II.B.2 above.

2. The Performance Test shall commence at a mutually agreeable time no later than 7 days after Veolia's written notice to Purchaser.

3. The Performance test shall be conducted over a four (4) consecutive hour period, following the requirements of the agreed upon Performance Test Protocol.

4. If by one (1) month after the facility is ready to accept Influent, the design flow and / or sulfur load is not available, the Performance Test may be conducted on as much biogas flow and sulfur load as is available.

5. This Process Guarantee will be considered fully satisfied upon completion of the Performance Test demonstrating that the facility has delivered Treated Biogas (sometimes referred to as "Effluent" in this document) per the applicable requirements as defined in Annex B. Veolia will then execute and submit the Certificate of Acceptance for signing by Purchaser (Annex C). The effective date for acceptance shall be the date the Performance Test was completed.

6. The Certificate of Acceptance may include reference to minor outstanding work (Punch List items) which will not substantially affect the use of the facility and Veolia shall then correct and complete this work as soon as reasonably practicable.

7. During the Performance Test, if operations are interrupted for the repair or replacement of equipment necessary to the Performance Test, the equipment shall be repaired or replaced (at the cost of the party who is responsible for the damage) and the period of downtime will be added to the length of the Performance Test.

B. Unavailability of Compliant Influent or other obstacles to the Performance Test

1. Non-Compliant Influent. If, after the commencement of the Performance Test, the Purchaser is unable to continuously deliver Compliant Influent to the facility, the Non-Compliant Influent shall attempt to be treated, while Purchaser makes every effort to bring the Influent into compliance. Veolia shall assist Purchaser and use commercially reasonable efforts to adjust Equipment and/or operating and maintenance guidelines to optimize performance of the facility under the prevailing conditions.

Despite the efforts described above, if after the commencement of the Performance Test, any Influent samples taken during such Test are Non-Compliant Influent, then that hour's results and any following hours impacted will be excluded from the Performance Test's final results and excluded results will be considered passed.

2. Disagreement over Compliant Influent. Should the Parties disagree on whether the Influent is Compliant Influent or not, Veolia may take additional Influent and Effluent samples and conduct laboratory and/or site testing, and as applicable, either the Performance Test will be delayed (if not yet commenced) or rescheduled. The Contract Schedule and date of the Performance Test will be adjusted accordingly as provided in the applicable section of the Contract, until the results of such laboratory tests are issued. If the laboratory testing confirms the Influent is Non-Compliant Influent, Purchaser shall reimburse Veolia for its costs and expenses associated with the laboratory testing and extension of Contract.

3. Should Compliant Influent not be available, or should the prerequisites for Performance Test not be met by Purchaser within the time frames provided herein (as described in III.A.4), or the Performance Test otherwise fail due to any other reasons not attributable to Veolia, (e.g., operator error), the requirement to meet the Process Guarantee shall be waived by the Purchaser, and the Purchaser shall promptly execute a Certificate of Acceptance effective the last day of the originally scheduled Performance Test.

4. In the case that the Performance Test cannot be executed within 6 months from notification of shipment by Veolia, the requirement to meet the Process Guarantee shall be waived by the Purchaser, and the Purchaser shall promptly execute a Certificate of Acceptance.

C. Failure of the Performance Test Due to Veolia

Should the Facility fail to successfully complete the first Performance Test:

1. Veolia will be given the opportunity and a reasonable time to adjust or modify the facility in accordance

with Veolia's scope of supply, or the operating protocols, all at Veolia's cost and expense, up to the limit of liability provided in the Contract, and to prepare for a Subsequent Performance Test. At Veolia's request, Veolia shall be granted two (2) additional opportunities to successfully complete a Subsequent Performance Test.

More specifically, in the case of failure of the Performance Test, Veolia will provide Purchaser within 14 days an assessment with the analysis of the situation and a root cause analysis with the most likely reason(s) for the Test failure. Together with the assessment, Veolia will provide an action plan with an outline of modifications to the facility, or modus of operation, and Veolia will expedite such modifications within a reasonable time in order to get ready for a subsequent Performance test.

2. Veolia and Purchaser will meet and discuss the feasibility and desirability of continuing with the facility as designed, or as necessarily adjusted to reflect the facility's current conditions. In the event the Parties decide not to carry out any additional Performance Test, the Parties will negotiate a fair sum to be placed on the value of the facility as provided as a basis for a final settlement.

IV. Test Methods and Sampling Requirements

Specific Parameter	Technique (Test methods or instrument)	Measurement Location	Sample Type	Frequency
Biogas Flowrate	Flowmeter	At a properly calibrated and verified flow meter upstream of the system	N/A	Continuous
Sulfate, TSS, Settleable solids	Standard Methods	At aeration tank	Grab	Hourly
pH & ORP	Supplied pH/ORP Probe	At pH/ORP probe location	N/A	Continuous
Temperature	Supplied Temperature Transmitter	At temperature transmitter location	N/A	Continuous
Biogas H_2S	Drager Tube	At the inlet of the Scrubber and the outlet of the scrubber	Grab	Hourly

<u>Notes and Conditions:</u>
The analysis of samples shall be performed at Purchaser's expense by a mutually agreed independent testing laboratory (or owner's facility); Veolia reserves the right to witness the sampling and testing and to take portions of the samples for analysis in its own laboratories. Results of analyses shall be provided to Veolia as soon as they are received from external laboratories.

ANNEX A – BASIS OF DESIGN

Purchaser is responsible for the correctness, accuracy, sufficiency and relevance of the Influent characterization and other data and information of this Annex.

Compliant Influent Parameters

1. The facility is designed to treat biogas generated from the wastewater treatment plant of the Purchaser, as measured at the Influent battery limit, with the characteristics outlined below. The facility runs 24 hours per day, 7 days per week typical operation.

Parameter	Units	Design
Biogas Flow	scfm	130
Biogas Flow	Nm3/hr	220*
H_2S inlet	ppmv	<5,640
Pressure	Inches of Water Column	12
Pressure	millibar	30
CH_4	Vol %	75-80
CO_2	Vol %	20-25
H_2O	Vol %	saturated
Temperature	°C	32

i. Influent composition will be as measured via the hourly grab samples.

ii. Average data will be over the consecutive 4-hour Performance Test period.

iii. The Biogas or Sufothane make up water will not contain substances in concentrations which are inhibitory to bacterial activity such as, but not limited to: solvents, lubricants, preservatives, quaternary ammonia compounds, or mineral oils.

iv. It is assumed that caustic and micronutrients addition systems are capable of dosing necessary amounts of nutrients to facilitate optimal biological activity.

v. If the biogas is non-compliant for any of the design parameters during the Performance Test period, those data points, and any subsequent data points which have been affected by the same out-of-specification conditions, will be treated as passed as per III.B.1.

ANNEX B – PROCESS GUARANTEE

Veolia warrants and represents that the during the Performance Test, the facility will produce Treated Biogas (Effluent) at the battery limit with the discharge parameters as listed in the table below:

From the Sulfothane:

Parameter	Unit	Value
H_2S	ppmv	<300

Notes:

i. Treated Biogas will be as measured via the hourly grab samples.

ii. Treated Biogas will meet the above criteria on average basis for the length of the performance test.

ANNEX C - CERTIFICATE OF ACCEPTANCE

The undersigned representative of Veolia Water Technologies ______________ hereby certifies that the facility has successfully completed the Performance Test as of ______ *[Date]* as required by the Contract between Veolia Water Technologies and **Client**.

Veolia Water Technologies

By: ____

Name: ____

Title: ____

Date: ___________________

ACCEPTANCE:

Purchaser hereby agrees that the Facility has successfully completed the Performance Test as of the date written above and the Facility is accepted.

MINOR OUTSTANDING WORKS:

Veolia shall correct within the periods indicated thereof the minor outstanding works and defects as per the attachment to this Certificate.

Client

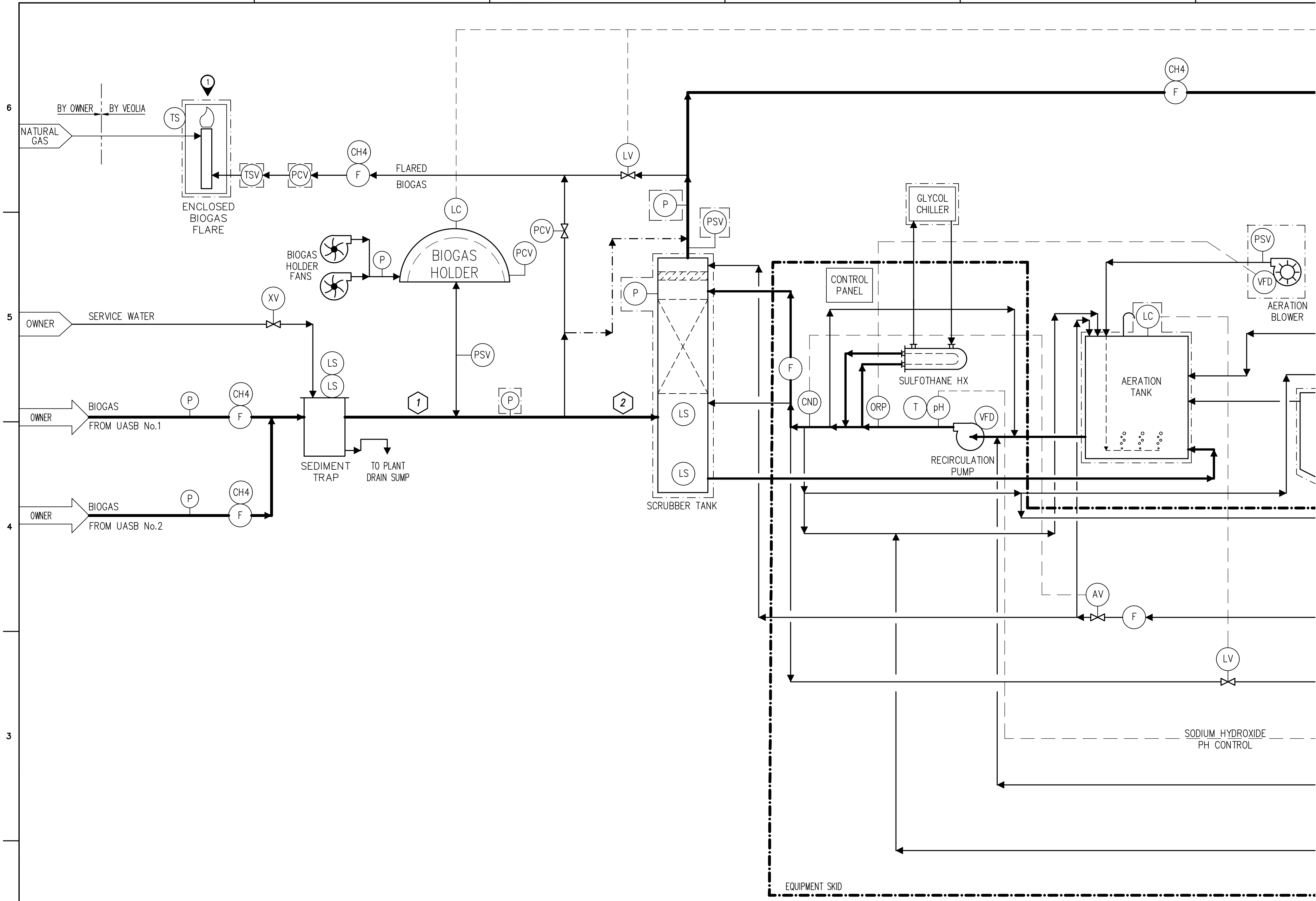
By: ____

Name: ____

Title: ____

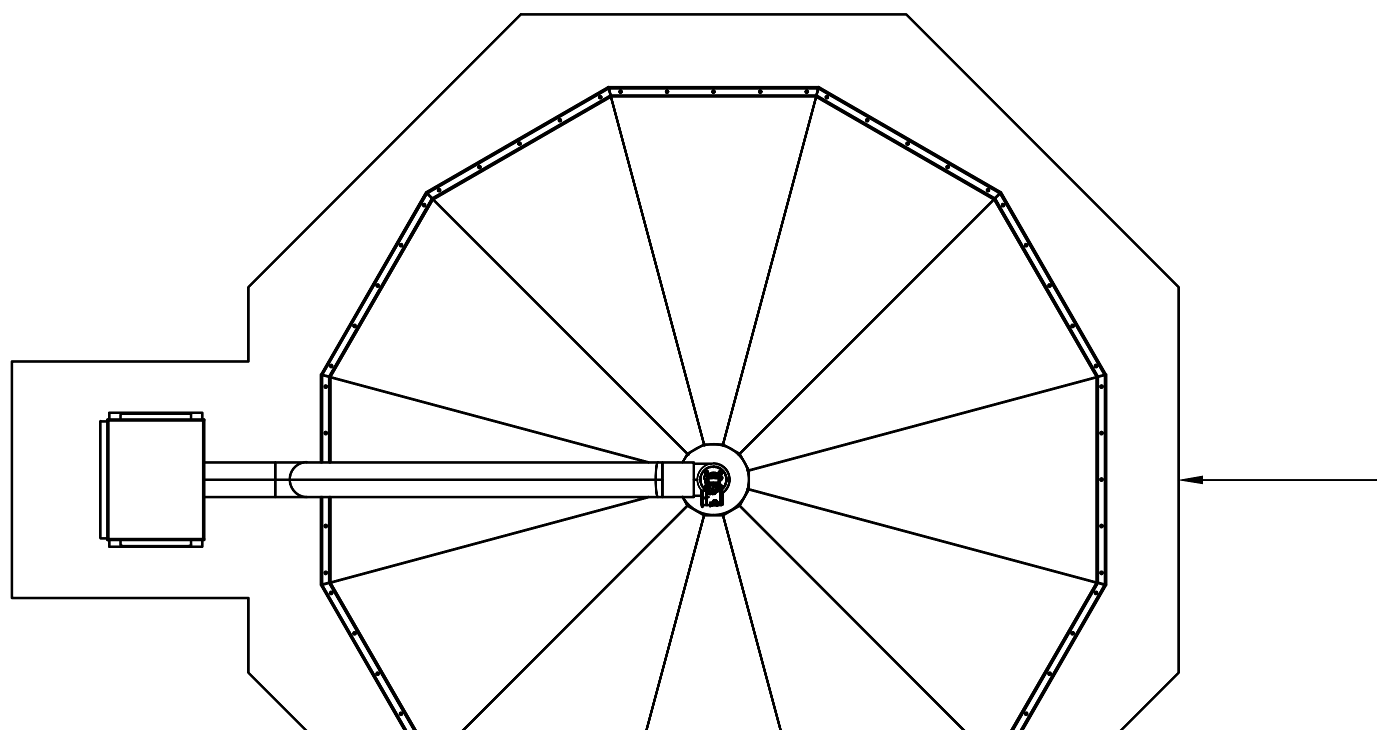
Date: __________________

APPENDIX 5 - PRELIMINARY SULFOTHANE PFD & LAYOUT



BIOGAS (MAX DESIGN)

PARAMETER	UNITS	1 DIGESTER BIOGAS	2 SULFOTHANE INLET	3 SULFOTHANE OUTLET



A B

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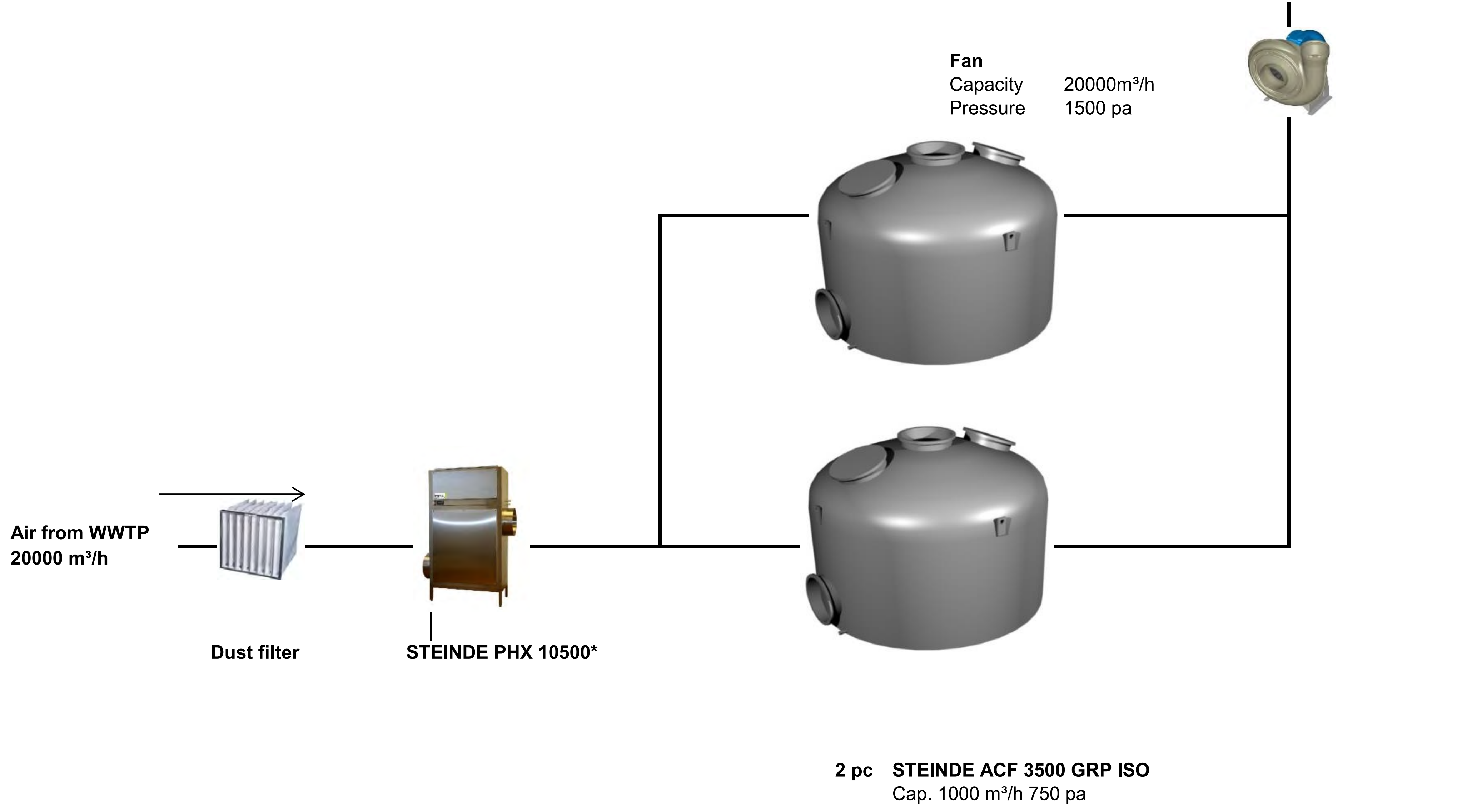

STEINDE Environmental AS

Kunde:	Inrigo	*Dato:*	13.09.2024
Dokument:	PFD prosjekt	*Versjon:*	1
Prosjektnr.	10273	*Sign.:*	VS

INRIGO

STEINDE Environmental AS

PHX

STEINDE-PHX

STEINDE PHX is a photooxidation filter that combines irradiation of the gas using UV rays and ozone production.

The unit comes with internal control, automatic flushing, pressure control and all necessary safety functions.

Communication: MODBUS TCP-IP.
- Controlled from external PLC or integrated PLC.
-All models are connected to 230VAC.

Material: AISI 316L

PRODUCT	Dim LxWxH mm	Flow m3/h	Lamps	Flange	Effect W
STEINDE PHX 300	400x220x1820	500	3	Ø200	350
STEINDE PHX 500	400x350x1820	1000	5	Ø315	400
STEINDE PHX 1000	550x420x1820	2000	10	Ø400	600
STEINDE PHX 1500	650x520x1820	3000	15	Ø500	800
STEINDE PHX 2000	700x650x1820	4000	20	Ø630	1050
STEINDE PHX 2800	840x670x1820	5600	28	Ø630	1350
STEINDE PHX 3600	1550x700x1820	7200	36	Ø800	1700
STEINDE PHX 4000	1020x820x1820	8000	40	Ø800	1850
STEINDE PHX 4800	1100x960x1820	9600	48	Ø800	2200
STEINDE PHX 6000	1100x1200x1820	12000	60	Ø800	2650
STEINDE PHX 7000	1100x1200x1820	14500	70	1100x800	3150
STEINDE PHX 8000	1100x1200x1820	17500	80	1100x800	3600
STEINDE PHX 10500	1550x1400x1820	20000	105	1350x800	4700

Conn: Drainage 32 mm and water 1/2 ”<PHX 4800 and 1”> PHX 6000
Option:
O3 sensor that gives an alarm in the event of an gas leak.

STEINDE Environmental AS
Org. no. NO 924 934 093 MVA

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N-3735 Skien
Norway

Tel. +47 35 90 19 00
E-mail: post@no.steinde.com
Web: www.steinde.com

STEINDE Environmental AS

ACF

STEINDE-ACF

STEINDE ACF is a very efficient carbon filter designed for cost-effective and optimal odor cleaning. The carbon filter removes most odors, and gives an emission up to 98-99% odor reduction.

STEINDE ACF comes in a tailor-made size, dimensioned and adapted to the current air flow, and has a low pressure drop, which results in low energy requirements and a quiet fan.

The right dimension gives the coal a long life, and the need for supervision is minimal. The filter can be placed outside (insulated) or inside.

PRODUCT	Ca. dim. in mm, other format on request	Flow m3/h at 800 pa	Coal kg	Pipedim mm
STEINDE ACF 600	H: 1300 D:iØ600	290	75	160
STEINDE ACF 800	H: 1300 D:iØ800	485	150	200
STEINDE ACF 900	H: 1500 D:iØ900	650	175	200
STEINDE ACF 1000	H: 1500 D:iØ1000	780	225	250
STEINDE ACF 1200	H: 1700 D:iØ1200	1200	300	250
STEINDE ACF 1400	H: 1900 D:iØ1400	1600	425	315
STEINDE ACF 1600	H: 1900 D:iØ1600	2200	500	400
STEINDE ACF 2000	H: 2100 D:iØ2000	3000	1000	400
STEINDE ACF 2400	H: 2200 D:iØ2400	4250	1500	500
STEINDE ACF 3000	H: 2450 D:iØ3000	7300	2000	630
STEINDE ACF 3500	H: 2600 D:iØ3500	10500	2500	800

STEINDE Environmental AS
Org. no. NO 924 934 093 MVA

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E-mail: post@no.steinde.com
Web: www.steinde.com

" The Green Thread "

STEINDE
Environmental AS

Background Miljø-Teknologi AS - a success story

Miljø-Teknologi AS was founded in 1994, by Bjørn Steinde. The company started working on odor control and reducing emissions to air. Bjørn suffered a stroke in 2002, and Vegard, the son, took responsibility for taking the company forward. MT was the leader and the experts in the industry. There were 7 employees in Miljø-Teknologi AS.

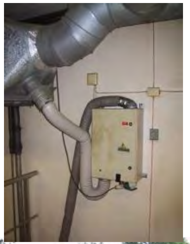
In April 2017, Yara Norge AS bought 100% of the shares from the Steinde family. After two years, Yara chose to steer the focus towards the core business of fertilizers and chemicals.

Miljø-Teknologi AS focused on:

- Customers' needs
- Product development and customization
- High competence
- One stop shop consept
- Unique service

Vision:
Give people in contact with polluting environment a better everyday life.

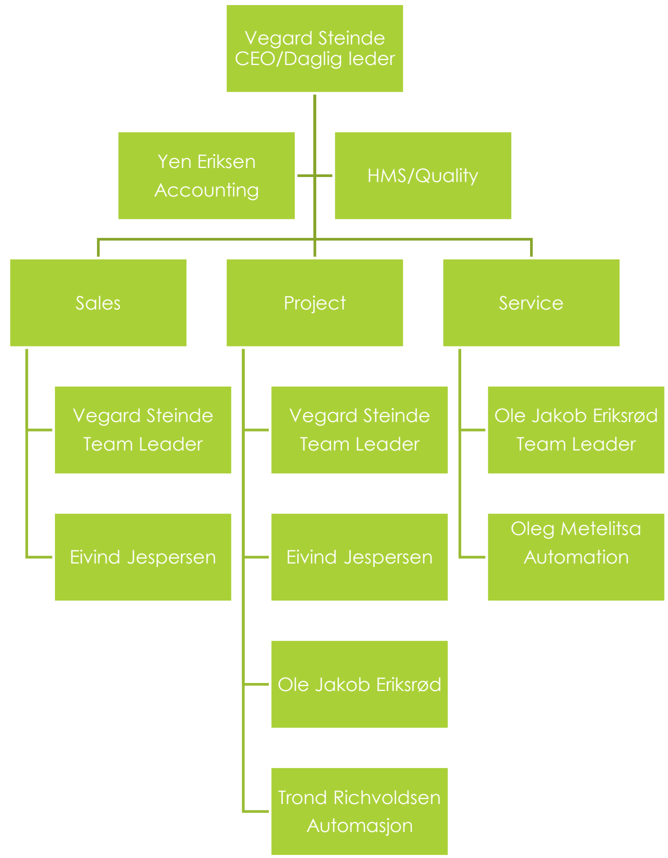
The solutions were based on experience and development in collaboration with customers and suppliers.



Who we are?

- Company: STEINDE Environmental AS
- Area Europa/India
- Consept
  - Gas and Odour Control Systems
  - Odour prevention
  - Consultancy
  - Service / Automation 4.0
- "State of Art" Solutions
- Network World Wide

Organisasjonsplan



STEINDE
Environmental AS

Vision

We'll take care of the environment and give people a better everyday life

Business idea

We will develop, produce and deliver solutions and services within air emissions, with the highest possible effect for the smallest possible environmental footprint

STEINDE Environmental AS

Production	STEINDE Environmental AS	Distributors
Workshops: PE/PP GRP Steel Fans Automation	Development Design Project management Sales Logistics Service	Local market presence SE (STEINDE E. AB) Cruise ship, DK, India

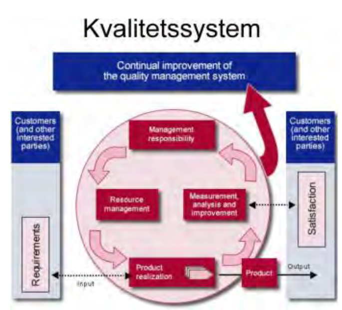
We work towards these industries:

- Wastewater Industry (municipalities)
- Biogas
- Food industry
- Feed industry
- Waste industry
- Aquaculture – sludge treatment
- Cruise vessels
- Other industry

STEINDE Environmental has unique competence to provide good and flexible solutions to our customers. We dimension and produces both standard products and tailor-made solutions to meet our customers' needs.

"My pleasure"

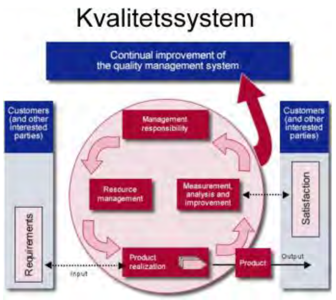
- Be the beacon of the industry
- Define industry standard
- Documentation
- Delivery time
- QualityDesign
- Efficiency
- Protective equipment



STEINDE Environmental AS

The Green Tread – Team Work

- HESQ – Health, Environment, Safety and Quality
- TEAM Work
- Projects from A to Z



STEINDE Environmental AS

The Green Tread HESQ

- HESQ
  - Health
    - Healthy solutions for everyone
    - Environment
    - Odor is pollution and must be cleaned
    - Environmental Friendly solutions
  - Safety
    - Your and others safey
  - Quality
    - Safe solutions that last longer

The Green Tread – Team Work

- Who knows where the shoe presses?
  - The end customer
  - The circumstances
  - Authorities
  - Future possibilities/limitations

- We have the experience
- Competence and local experience are fun in a good process
- **Cooperation = The key to success**

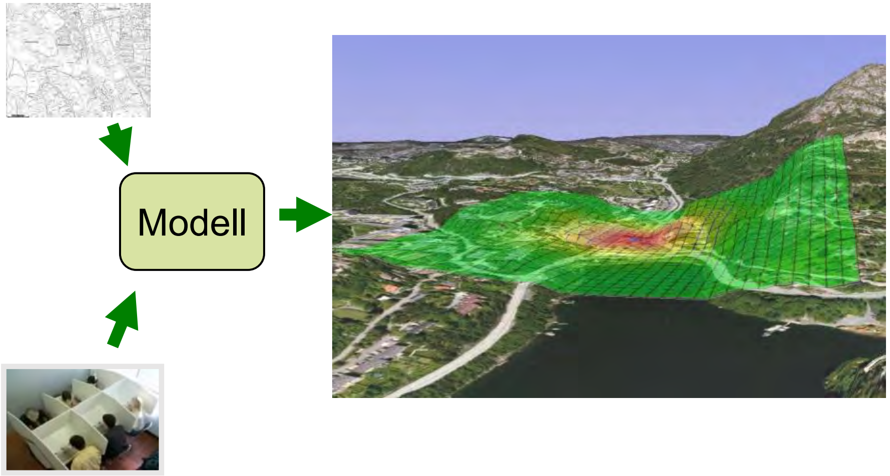
STEINDE Environmental AS

Solutions

- STEINDE ACF — Activated Carbon filter
- STEINDE PHX — Photo Oxidation Filter
- STEINDE PHC — Combined Filter
- STEINDE SCR — Scrubbers
- STEINDE BBX — Biofilter
- STEINDE SFX — Sulphur reduction filter
- STEINDE IOT — Odour measurement and modelling
- STEINDE CHS — Chemicals

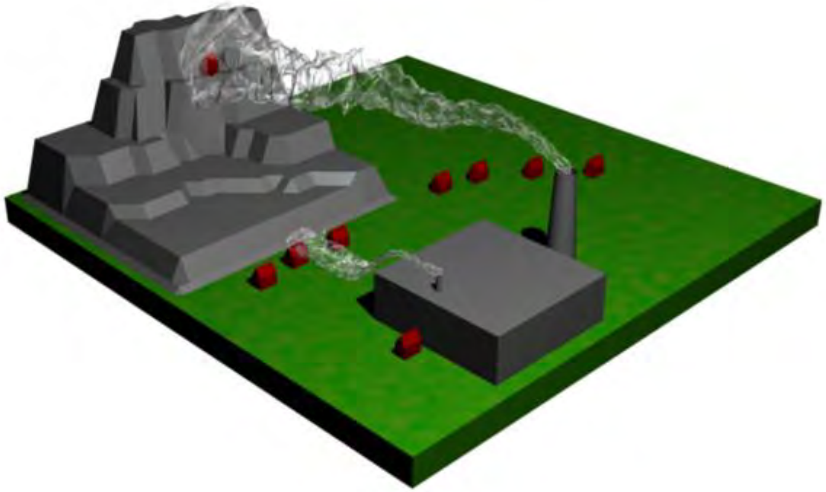
STEINDE IOT

- Odour messurement
- Gas measurement
- Dispersion modelling



STEINDE IOT

- **Risk assessment**



Sted: Horsøy
Dato: 07.09.2022

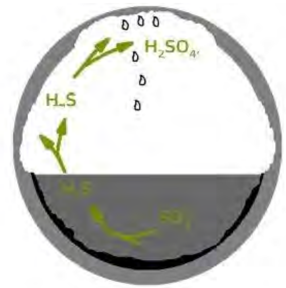
Beskrivelse	t_y	P	P_{korr}	P_{korr}	Q	K (m)	d_{nabo} (m)	I
Notat Norconsult	8760	1,000	100,000	1,00	705	128	68	1,88

STEINDE Environmental AS

STEINDE IOT H_2S detection

- **H_2S**

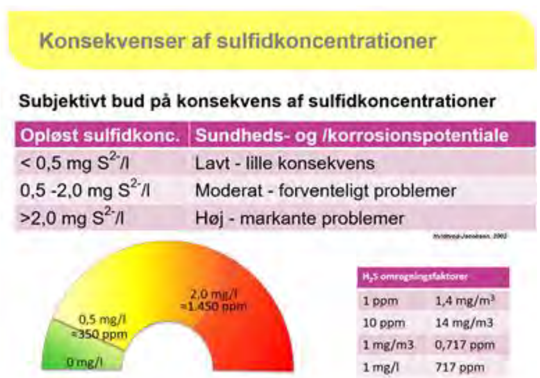
'A large and growing Community problem''



$H_2S + O_2 \rightarrow S^o \rightarrow SO_4^{2-} + H^+$

Thiobacillus

- **Corrosive**
- **Poisionous**
- **Odourous**
- **Measurable**
- **Removeable**
  - Air treatment filters
- **Prevention (Chemicals**
  - Nitrates
  - Oxidisers



Konsekvenser af sulfidkoncentrationer

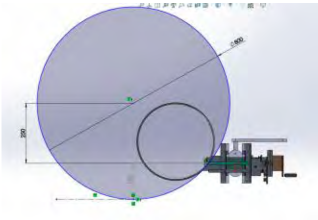
Subjektivt bud på konsekvens af sulfidkoncentrationer

Opløst sulfidkonc.	Sundheds- og /korrosionspotentiale
< 0,5 mg S^{2-}/l	Lavt - lille konsekvens
0,5 -2,0 mg S^{2-}/l	Moderat - forventeligt problemer
>2,0 mg S^{2-}/l	Høj - markante problemer

H_2S omregningsfaktorer	
1 ppm	1,4 mg/m^3
10 ppm	14 mg/m3
1 mg/m3	0,717 ppm
1 mg/l	717 ppm

STEINDE CHS

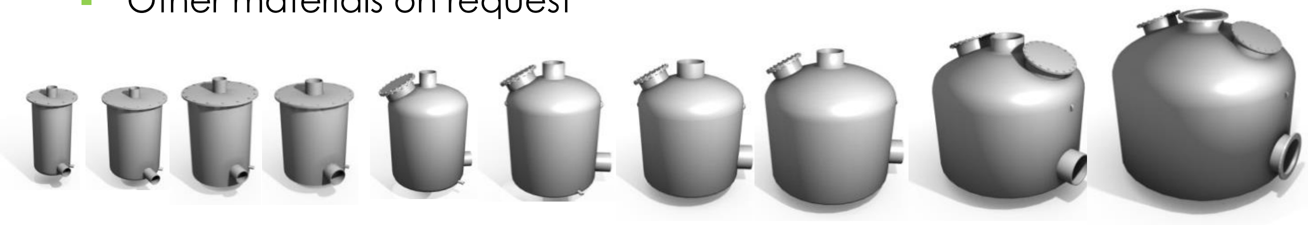
- **Measurement - Sulfilogger**
- **Dosing system**
- **Chemicals**
  - Forebygging
    - Ferric Nitrate
    - Calsium Nitrate
    - Natrium Nitrate
  - End of pipe
    - MUSOL
    - Ferric chlorude



STEINDE ACF

- **Activated Carbon Filters**
  - Adsorption
  - 1g of AC has a surface area > 1000 m3
- **V-Series**
  - 2 sizes
    - < 100 m3/h
    - < 200 m3/h
  - Built in fan - EC motor
  - Materials
    - AISI 304
    - Vinylester

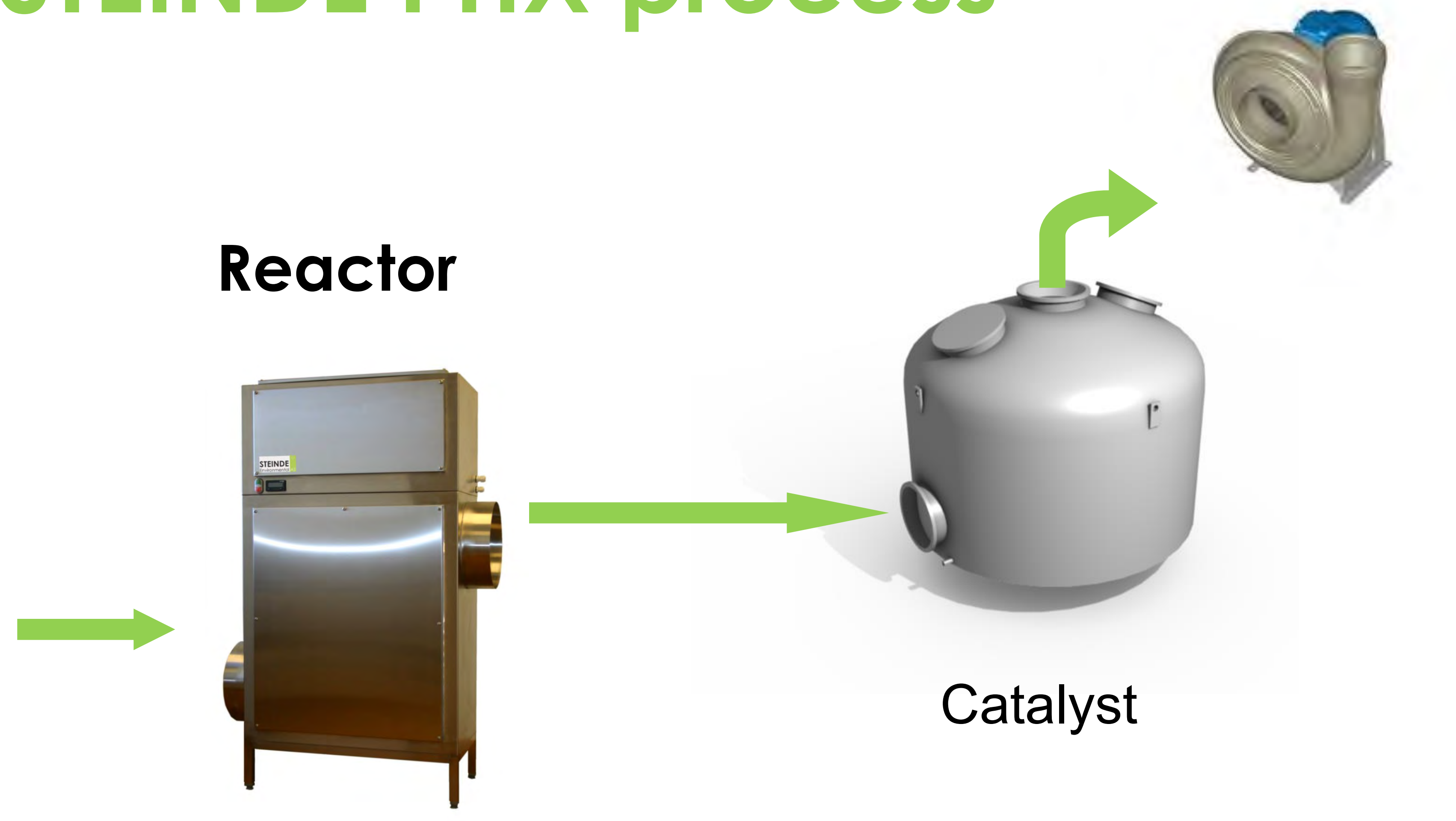
- **Tailor made filters**
  - GRP Fiberglass
  - GRP ISO – Insulated Fiberglass
  - PE – Poly Ethylene
  - SS – Stainless steel AISI 316L
  - Other materials on request



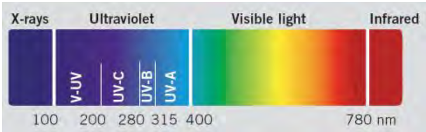
STEINDE Environmental AS

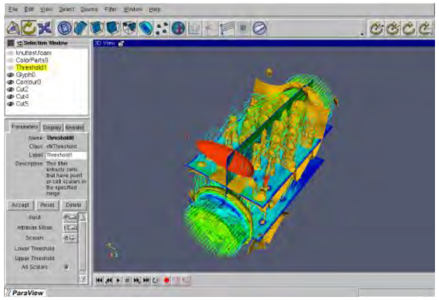
STEINDE PHX process

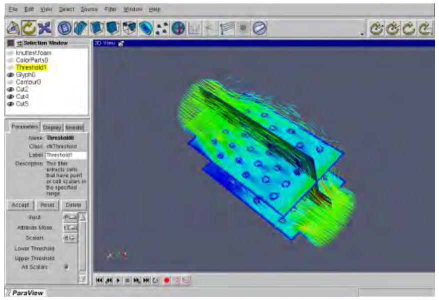
STEINDE PHX process



STEINDE PHX



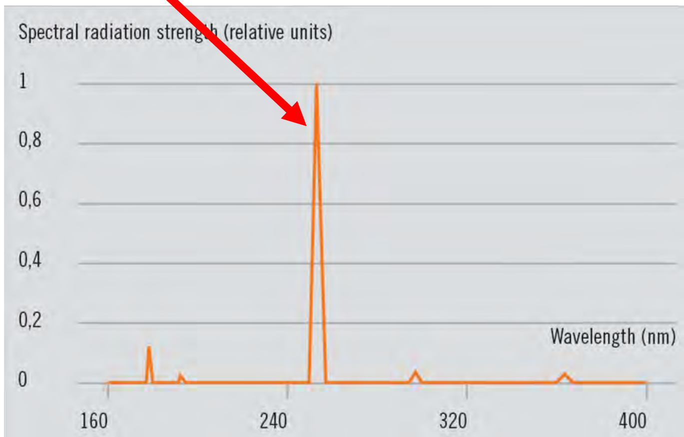




STEINDE
Environmental AS

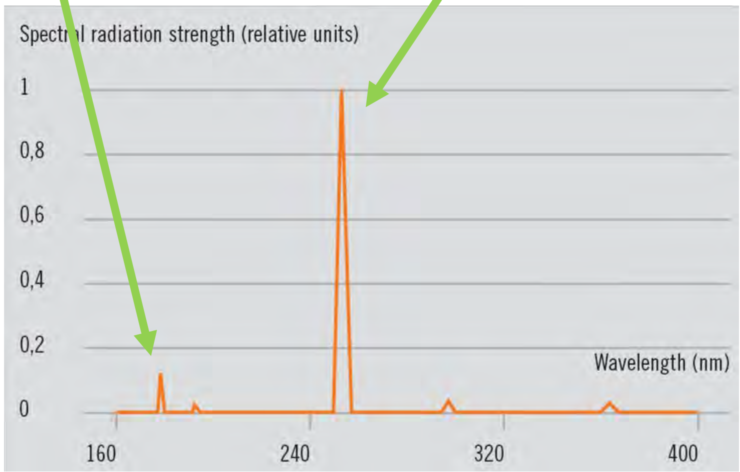
STEINDE PHX

- Direct photolysis of unsaturated compounds (C = C and aromatics)
- Produktion of singlet oxygen



STEINDE PHX

Ozone Production **Ozone destruction**



STEINDE Environmental AS

STEINDE PHX

$O_3 + OH^- \xrightarrow{k_1} HO_2^\bullet + O_2^{\bullet-}$ $k_1 = 70\ M^{-1}.s^{-1}$ (HO_2: hydroperoxide radical)

$HO_2^\bullet \overset{k_2}{\rightleftarrows} O_2^{\bullet-} + H^+$ k_2 (ionization ct) $= 10^{-4.8}$ (O_2^- : superoxide radical ion

$O_3 + O_2^{\bullet-} \xrightarrow{k_2} O_3^{\bullet-} + O_2$ $k_2 = 1.6 \times 10^9\ M^{-1}.s^{-1}$ (O_3^-: ozonide radical ion)

$O_3^{\bullet-} + H^+ \underset{k_{-3}}{\overset{k_3}{\rightleftarrows}} HO_3^\bullet$ $k_3 = 5.2 \times 10^{10}\ M^{-1}.s^{-1}$; $k_{-3} = 2.3 \times 10^2\ s^{-1}$; $pK_a=6.2$

$HO_3^\bullet \xrightarrow{k_4} OH^\bullet + O_2$ $k_4 = 1.1 \times 10^5\ s^{-1}$

$O_3 + OH^\bullet \xrightarrow{k_5} HO_4^\bullet$ $k_5 = 2.0 \times 10^9\ M^{-1}.s^{-1}$

$HO_4^\bullet \xrightarrow{k_6} HO_2^\bullet + O_2$ $k_6 = 2.8 \times 10^4\ s^{-1}$

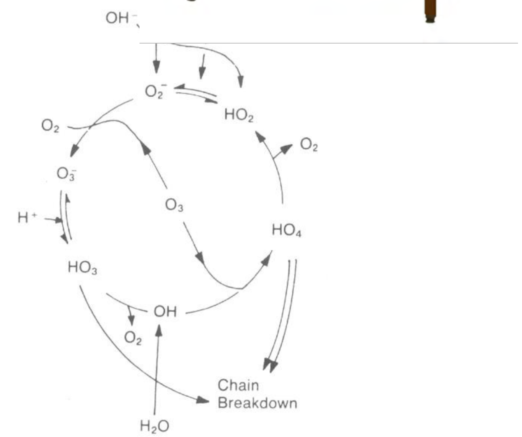
$HO_4^\bullet + HO_4^\bullet \rightarrow H_2O_2 + 2\,O_3$

$HO_4^\bullet + HO_3^\bullet \rightarrow H_2O_2 + O_3 + O_2$

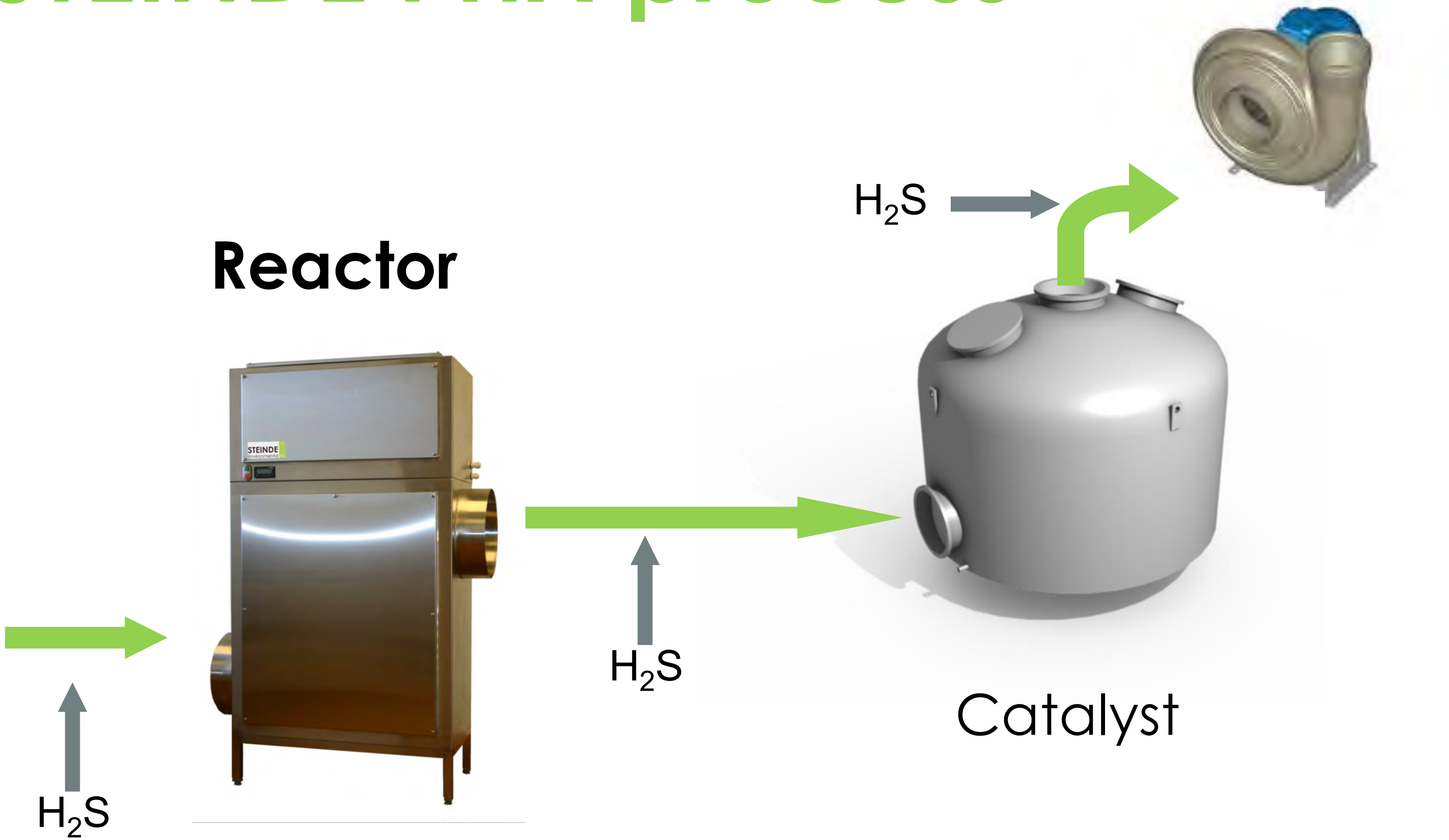
$OH^\bullet + CO_3^{2-} \xrightarrow{k_7} OH^- + CO_3^{\bullet-}$ $k_7 = 4.2 \times 10^8\ M^{-1}.s^{-1}$

$CO_3^{\bullet-} + O_3 \rightarrow$ products $(CO_2 + O_2^{\bullet-} + O_2)$

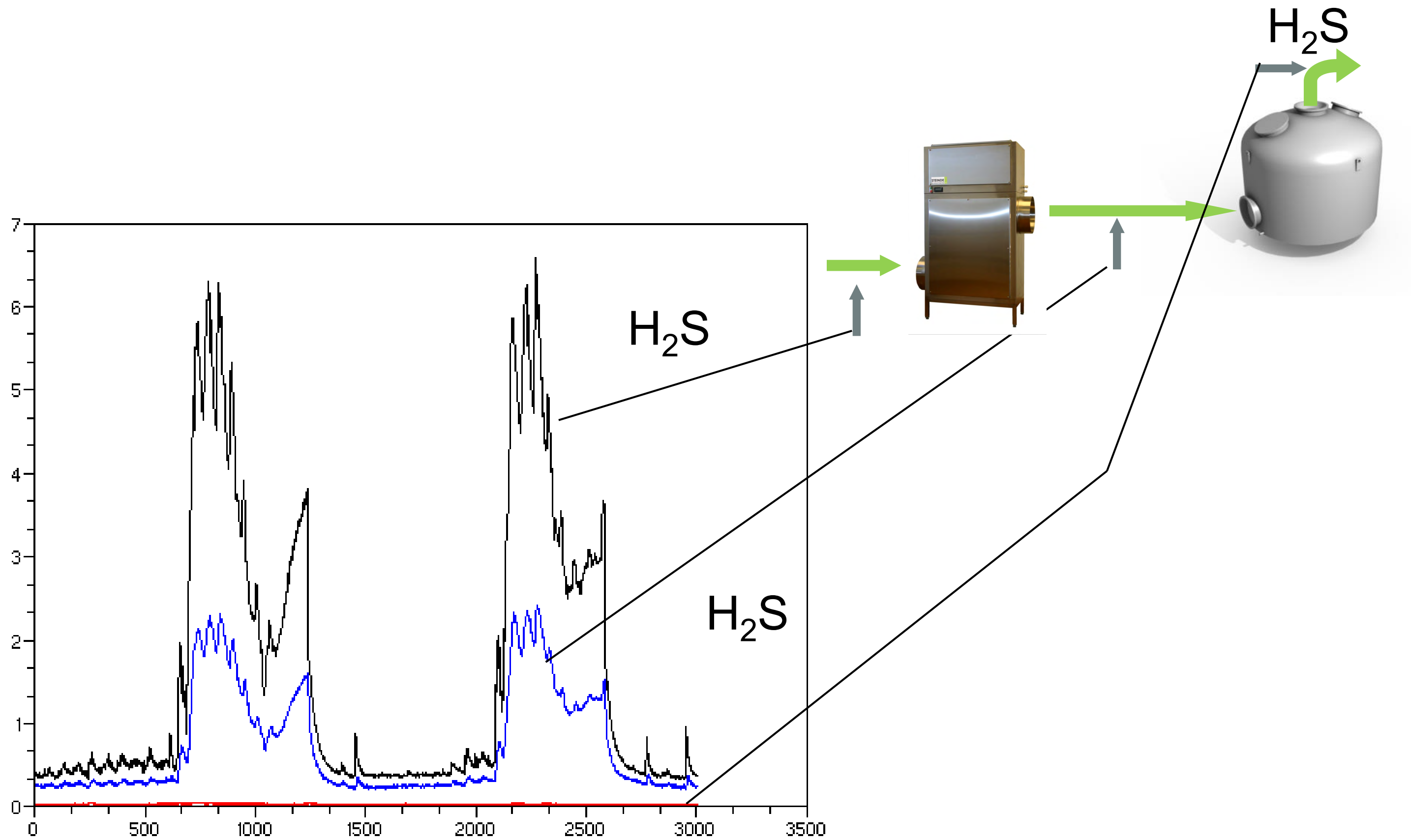
$OH^\bullet + HCO_3^- \xrightarrow{k_8} OH^- + HCO_3^\bullet$ $k_8 = 1.5 \times 10^7\ M^{-1}.s^{-1}$



STEINDE PHX process



STEINDE PHX process



STEINDE PHX

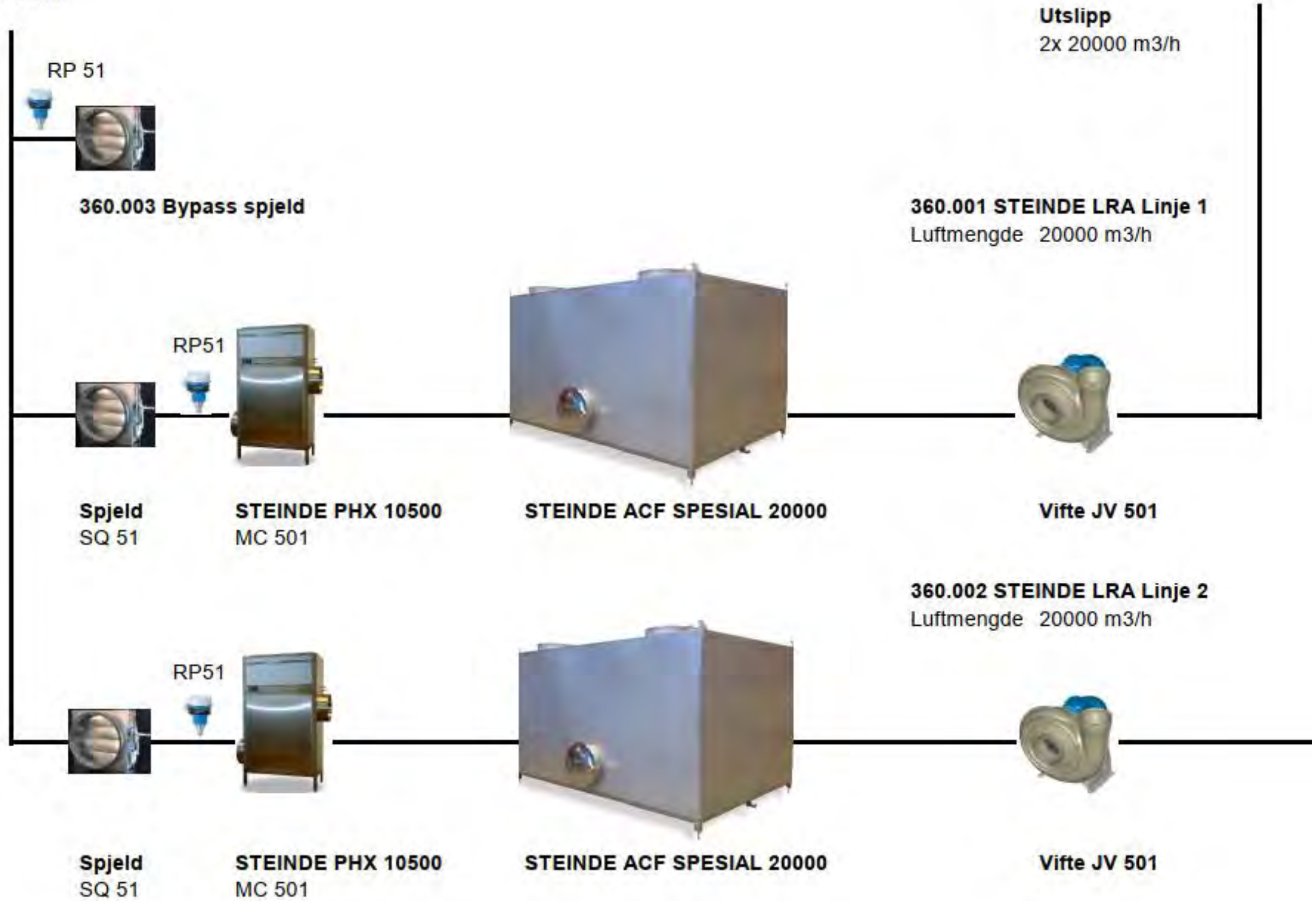
- Photo Oxidation Systems

- Based on UV-C and Ozone
- Advansed oxidation

STEINDE PHX + ACF

STEINDE Environmental AS

Total luftmengde 40.000 m3/h
Avtrekk fra avløpstunell for rentvann

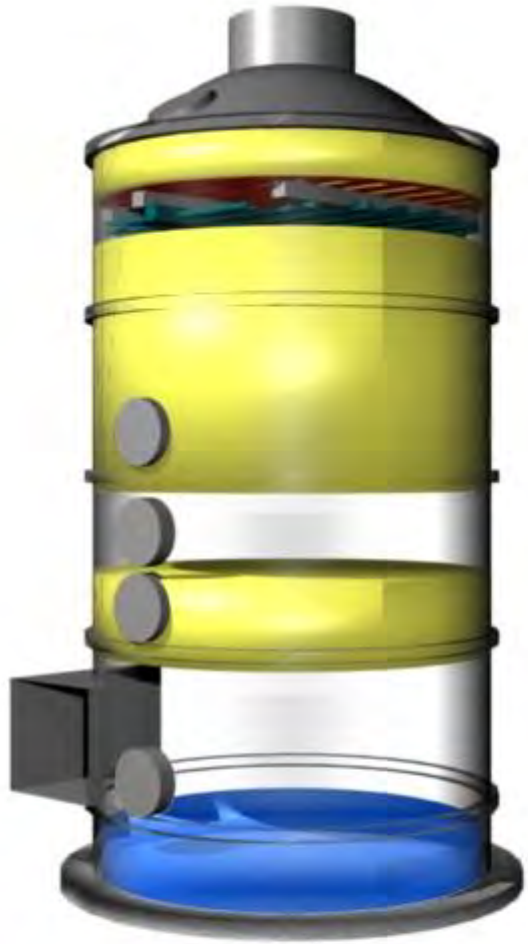


STEINDE SCR - Scrubbere

- **Biogas**
- **Biofilter kondisjonering**
- **Slamtørkeanlegg**
- **Næringsmiddelindustri**
- **Fórfabrikker**

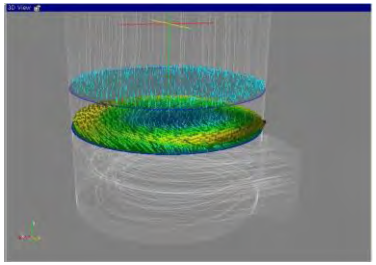
STEINDE SCR

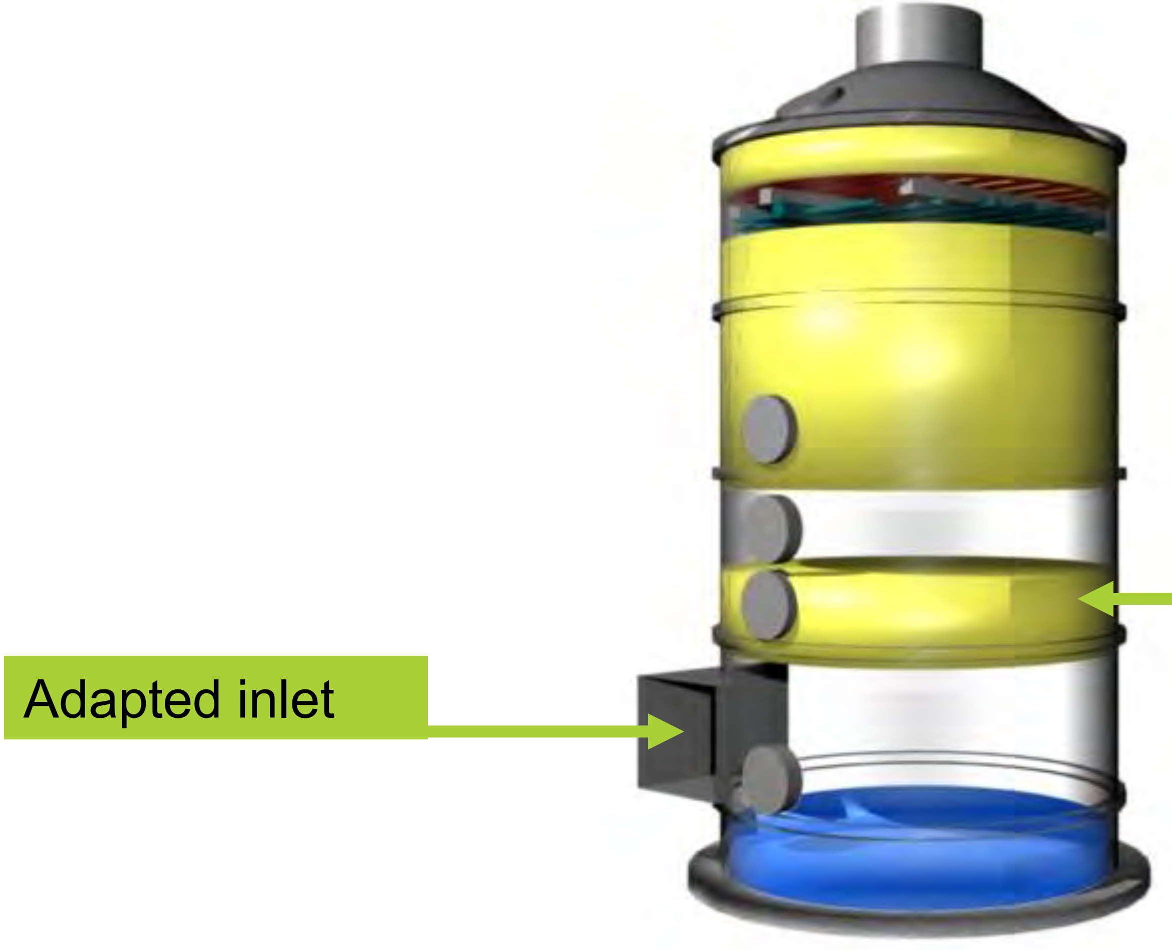
STEINDE SCR



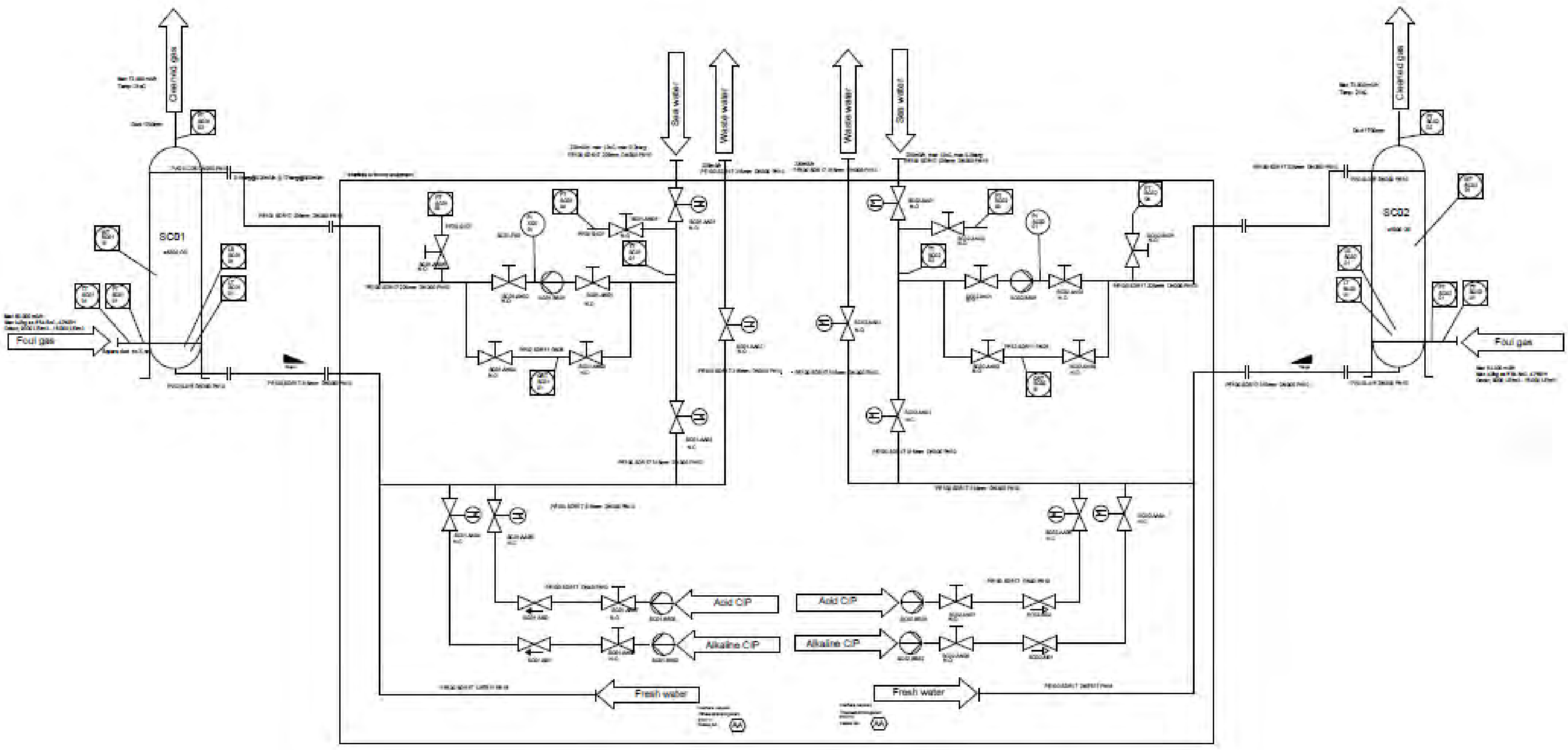
STEINDE Environmental AS

STEINDE SCR





FLOW diagram

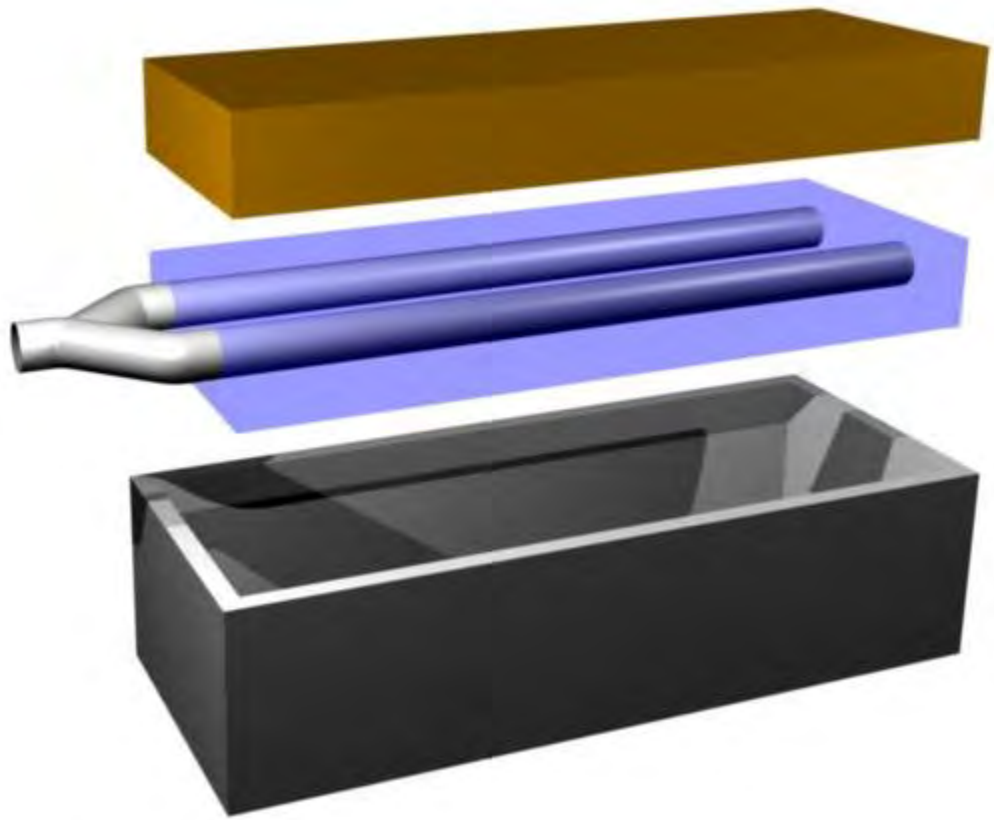


STEINDE Environmental AS

STEINDE BBX - Biofilter

STEINDE Environmental AS

STEINDE BBX - biofilter



Biofilter media

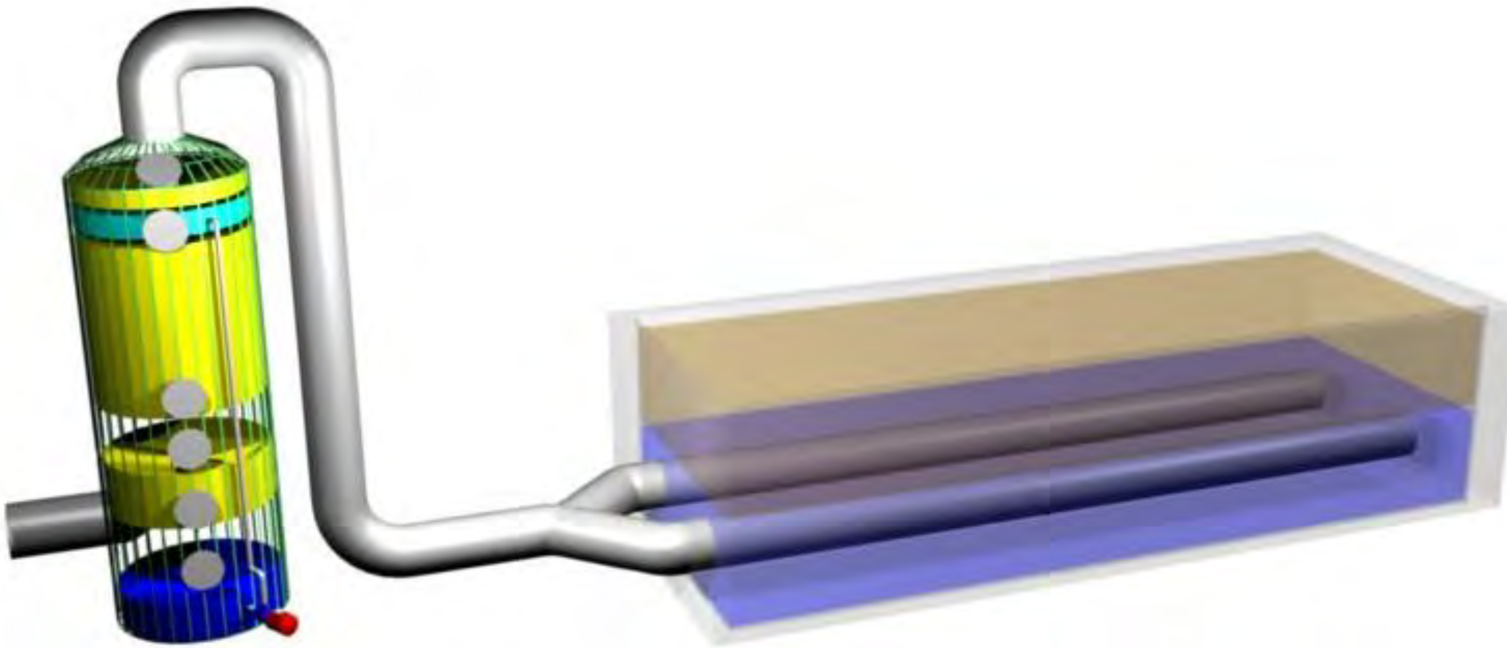
- **Mineral media**

- **Organic media**

STEINDE Environmental AS

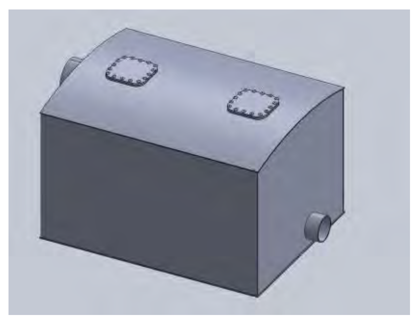
STEINDE SCR + BBX

- For high temperatures
- Water soluble compunds as ammonia



STEINDE SFX

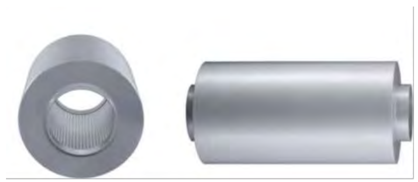
- **Sulphur/H2S reduction filters**



STEINDE Environmental AS

STEINDE FANS

STEINDE Plastics

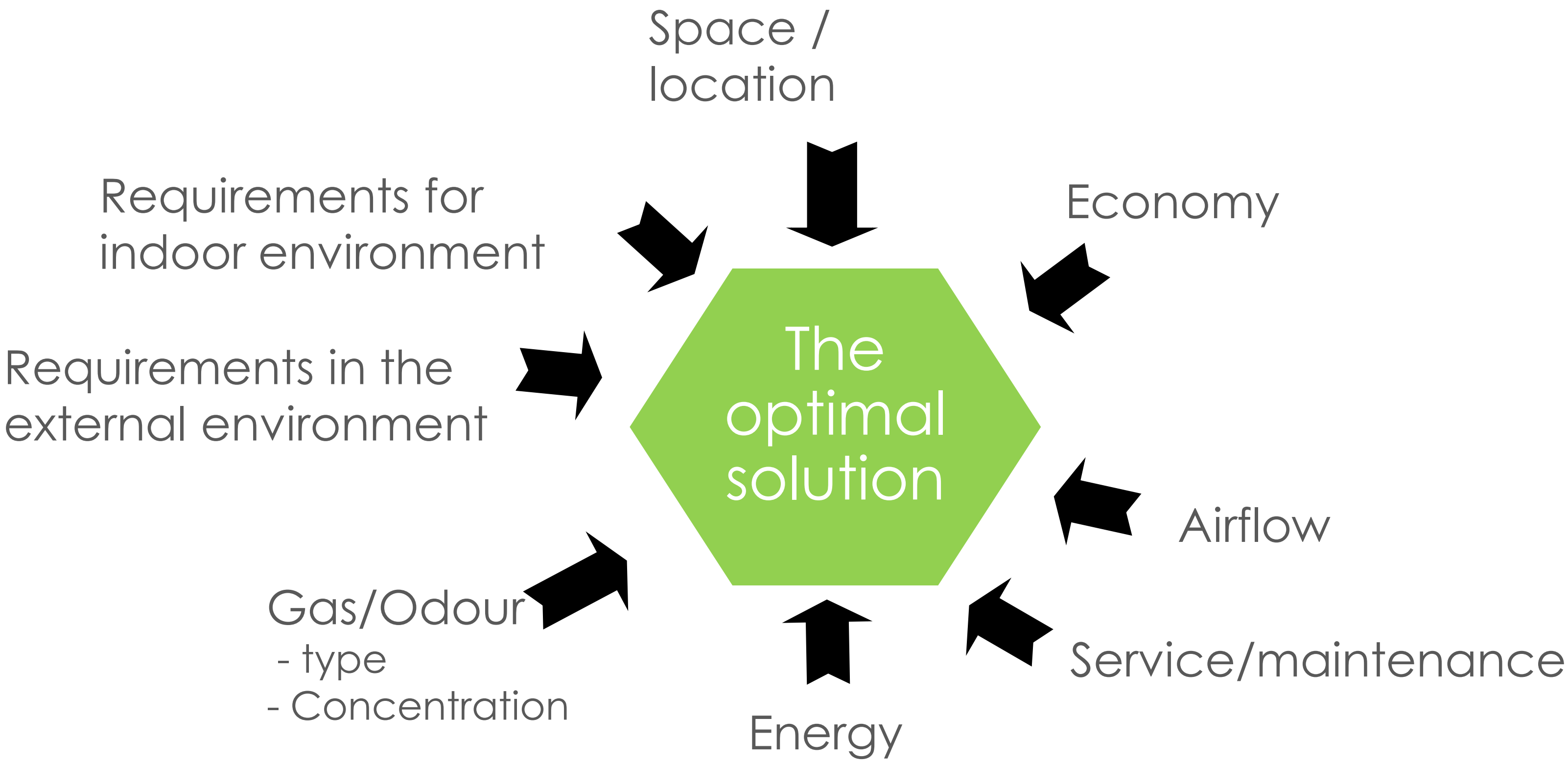


STEINDE Service

- We take responsibility for the entire facility
- Maintenance
- Gas/Odour measurements
- Dispersion analysis

STEINDE Environmental AS

The Green Tread



STEINDE Environmental AS

Thank you for your attention ☺

«Environmental results based on steps in the right direction "

APPENDIX C

SEPA DOCUMENTATION

FRANKLIN COUNTY

PLANNING AND BUILDING DEPARTMENT

STATE ENVIRONMENTAL POLICY ACT (SEPA)
DETERMINATION OF NONSIGNIFICANCE (DNS)

Name of Proposal:	Lamb Weston Pasco Facility Treatment Plant
Description of Proposal:	The proposed project consists of constructing a 54,500 square foot treatment facility on the existing Lamb Weston property in Pasco, Washington. The additional treatment will enable Lamb Weston to treat its process wastewater so that it can be reused within the facility and reduce nutrients in the process water that is land applied on the existing land treatment system. The overall property that the facility is located on is approximately 70 acres. The proposed improvements will impact approximately 6 of the 70 acres. This is phase 2 (final phase) of a phased project.
Proponent:	Lamb Weston, Inc. Contact: Kerry Volland 960 Glade Road North Pasco, WA 99301 kerry.volland@lambweston.com
File Number:	SEPA 2025-04
Phase 1 SEPA Record #:	202502007
Location of Proposal:	960 Glade Road North, Pasco, WA 99301
Legal Description:	Parcel Number(s): 113-110-107 (Previously # # 113-110-106 and 113-110-124) That portion of government lot 6, in the northwest quarter of section 6, township 9 north, range 30 east, W.M., lying west of the westerly right of way line of Burlington Northern Railway right of way (formerly Northern Pacific Railway), in Franklin County, Washington; and that portion of government lot 7, section 6, township 9 north, range 3- east, W.M., lying west of the westerly right of way line of the Northern Pacific Railway Company's right of way, recorded in Franklin County, Washington.
Lead Agency:	Franklin County

FINDINGS:

1. **Earth:**
   a. The site is disturbance is approximately 6 acres (of the total 70 acres) in size and is relatively flat.
   b. The make-up of the soil on site is mainly Quincy loamy fine sand.
   c. No soil will be removed from the site.
   d. Total excavation and fill will be approximately 16,400 cubic yards.
   e. Imported structural fill will be needed below the building footprint.
   f. Limited erosion is possible during construction and the project will implement best management practices per Ecology's Stormwater manual for Eastern Washington.
   g. Approximately 70% of the disturbed area will be covered by an impervious surface.
   h. A stormwater Technical Information Report was prepared by AHBL that includes a Geotechnical Engineering Evaluation prepared by GeoProfessional Innovation Corporation.

2. **Air:**
   a. Dust and construction equipment emissions will occur during construction.
   b. An air permit will be submitted.
   c. Standard dust control measures will be implemented, including site watering.
   d. After the construction phase, typical vehicle emissions are anticipated and will be included in the air permit.

3. **Water:**
   a. The are several man-made sedimentation ponds on the site. These ponds will be closed by approval of an artificial pond closure submitted to the Department of Ecology.
   b. The closest water body is an irrigation canal approximately 2.8 miles away and will not be impacted.
   c. The proposed project is outside the floodplain.
   d. A storm drainage plan will be prepared and implemented.

4. **Plants:**
   a. All vegetation within the 6 acre footprint will be removed. Native vegetation north of the 6 acre limit will be maintained.
   b. All disturbed areas not covered by impervious surfaces after project completion will be seed to native grasses.

5. **Animals:**
   There are no know ETS Species on site.

6. **Energy and Natural Resources:**
Energy efficient fixtures will be used on site.

7. **Environmental Health:**
   a. There are no know environmental hazards on site.
   b. Heavy equipment noise associated with the daytime construction will occur.

8. **Land and Shoreline Use:**
   a. The project is in the General Industrial (I-2) zone and surrounded by industrial and farming activities.
   b. Franklin County is a Right to Farm area. The Franklin County Right to Farm Ordinance, as amended, shall apply to all activities and uses in this area.

9. **Housing:**
There will be no impact on housing.

10. **Aesthetics:**
An 88-foot evaporator stack will be visible.

11. **Light and Glare:**
No impact from light and glare is anticipated.

12. **Recreation:**
There will be no impact on recreation.

13. **Historic and Cultural Preservation:**
There are no historic or archeological sites on or near the site according to the WISAARD database.

14. **Transportation:**
   a. There will be a slight increase in truck and vehicle traffic during construction.
   b. After construction, 1-2 truck per day increase is anticipated, but will not adversely impact the roads.

15. **Public Services:**
There will be a slight need for additional fire protection due to an additional building.

16. **Utilities:**
   a. A new electric connection will be needed from Franklin County Public Utility District.
   b. A new connection to the existing City of Pasco sanitary sewer main will be made.
   c. Water connection and refuse disposal will use existing on site services.

MITIGATION MEASURES:

1. Recommendations from the Stormwater Technical Information report will be followed. This includes the Geotechnical Engineering Evaluation.

2. Best Management Practices (BMP) to minimize dust during construction shall be used, such as watering the site in accordance with Franklin County's Clean Air and Dust control ordinances.

3. An air permit will be submitted.

4. An artificial pond closure plan will be submitted to the Department of Ecology.

5. A storm drainage plan will be prepared and implemented.

6. All disturbed areas not covered by impervious surfaces will be seeded to native grass after the ground disturbances are complete.

7. An Inadvertent Discover Plan shall be prepared and implemented for the project through all phases of construction.

The lead agency for this proposal has determined that it does not have a probable significant adverse impact on the environment. An environmental impact statement (EIS) is not required under RCW 43.21C.030 (2)(c). This decision was made after review of a completed environmental checklist and other information on file with the lead agency. This information is available to the public on request. This DNS is issued in accordance with WAC 197-11-340. There is a 14-day comment period on this DNS. Appeals must be filed within 14 days of this determination.

Responsible official: ***Wesley McCart***

Position/Phone: ***Franklin Building and Planning Director – (509) 545-3521***

Address: ***502 W Boeing St, Pasco, Washington 99301***

Date/Signature: ***6/18/2025*** -

APPENDIX D

AMBIENT IMPACTS ANALYSIS

MAY 2026 UPDATE

This ambient impacts analysis is part of the Notice of Construction Application for the installation of advanced wastewater treatment facilities at the Lamb Weston, Inc., Pasco, WA Plant (*the project*). An ambient impacts analysis was submitted as part of the original application for the project. That original application has been revised to reflect changes in project design and operation scenarios. This analysis updates the original ambient impacts to incorporate those changes, and it also incorporates comments provided by the Washington Department of Ecology for the prior project ambient impacts analysis.

In this document, figures are presented in line with the text. Small tables are included with the text and are not numbered. Larger tables are numbered tables and located at the back of the document.

PROJECT DESCRIPTION

EMISSION UNITS

The project involves the installation of advanced wastewater treatment facilities at the Lamb Weston, Inc (*Lamb Weston*) Pasco Plant located at 960 Glade Road, Pasco, WA 99301 (*the plant*). The project will upgrade the plant's existing wastewater treatment facilities to provide anaerobic treatment of organics in the waste stream, biological nutrient removal, and reverse osmosis to reduce dissolved solids. The purified water will then be reused as process water within the plant. Reject brine from the reverse osmosis process will be further concentrated by on-site evaporation, with the concentrate disposed of off-site.

Project features that are included in the ambient impacts analysis are described below:

- Biogas produced from the anaerobic reactors will be treated for hydrogen sulfide removal. The hydrogen sulfide removal process will produce biogas with a maximum hydrogen sulfide concentration of 300 ppmvd.
- The treated biogas will be combusted in a boiler to provide heated water for the wastewater treatment process. The boiler will be capable of operating on natural gas, biogas, or a blend of both fuels.
- A flare will be provided to dispose of biogas that is not combusted in the boiler.

For permitting purposes, both the boiler and the flare are assumed to operate simultaneously at full capacity using biogas.

OPERATING SCHEDULE AND PRODUCTION RATES

The project is designed to accommodate future increases in wastewater flow. The flare capacity is 400 Normal cubic meters per hour.[1] The biogas is expected have 75% methane content, yielding a maximum flare heat input rate of 11.4 MMBtuh, respectively.

The boiler will have a maximum heat input rating of 8.23 MMBtuh. If project energy demands from the boiler exceed the available biogas energy supply, natural gas will be co-fired to increase the boiler. Although the project intent is to maximize biogas combustion in the boiler, the

[1] 15,185 standard cubic feet per hour (scfh).

project design does provide for firing the boiler exclusively with natural gas, while routing all biogas to the flare.

The wastewater facilities will operate 8760 hours per year.

For permitting purposes, both the flare and the boiler are assumed to operate simultaneously at full capacity combusting biogas. This is the maximum emissions scenario.[2]

MODELING OVERVIEW

Estimates of emissions are presented in a project calculations workbook that is being provided with this application. Table 1 presents estimated criteria air pollutant (*CAP*) emissions and compares CAP emissions to the applicable emission thresholds in WAC 173-400-030(30). As shown, emission thresholds are exceeded for SO_2, NOx, CO, $PM_{2.5}$, and VOC.

A project significant impacts analysis was conducted for CAPs except VOC to demonstrate that the project will not contribute to an exceedance of a NAAQS.[3]

Table 2 presents estimated TAP emissions for each of the operating scenarios and compares TAP emissions to the applicable SQERs. Emission rates that exceed applicable SQERs are highlighted in Table 2. As indicated, emissions of the following TAPs exceed SQER levels and require dispersion modeling to document compliance with Acceptable Source Impact Levels (*ASILs*):

- 7,12-Dimethylbenz[a]anthracene
- Cadmium and compounds
- Chromium(VI) and compounds
- Ethyl Benzene
- Formaldehyde
- Hydrogen sulfide
- Sulfur Dioxide

MODEL SELECTION

Modeling was conducted using the current versions of the AERMOD model and associated pre-processor programs, as detailed below.

- AERMOD: 24142
- AERMET: 24142
- AERMINUTE: 15272
- AERMAP: 24142
- AERSURFACE: 24142
- BPIPPRM: 04274

[2] As noted in the text, the boiler can also be fired with natural gas or a blend of natural gas and biogas. Maximum sulfur dioxide and hydrogen sulfide emissions occur when combusting biogas. Estimated emissions of other pollutants are the same regardless of the fuel type.

[3] Project emissions are below the threshold for modeling VOC contributions to ambient impacts.

AERMOD was run with the following options:

- Actual receptor elevations and hill-height scales.
- 1.5-meter receptor flagpole heights
- Complex and intermediate terrain algorithms.
- No urban option selected.

AERMOD execution was managed in a Microsoft Windows operating system interface using BEEST for Windows, Version 12.13b. BEEST for Windows is a modeling manager for AERMOD modeling and is maintained and distributed by Providence Engineering and Environmental Group LLC.[4]

MODEL SETUP

The model consists of the following features:

- Sources

  Modeled sources are the project boiler and the flare. Both sources are point sources with vertical discharge. Table 3 provides stack release data for each source.

- Buildings and Structures

  The following process buildings and structures were included in the model:

  1. The process building constructed for the project. This is the dominant structure at the site.
  2. Two process tanks that are part of the treatment plant.
  3. Boilerhouse
  4. Biogas building

  No buildings in the plant production area have projected downwash impacts zones that overlay the project site.

RECEPTOR GRID

Ambient air boundaries were established following property ownership boundaries on the east side of Glade Road. Fencing and signage will be installed to ensure restricted public access.

Following Ecology guidance[5], a nested fenceline receptor grid layout was created using the following parameters:

Distance from Fenceline, m	Grid Spacing, m
0 – 150	12.5

[4] 1201 Main Street, Baton Rouge, LA. www.providenceeng.com
[5] Washington Department of Ecology Air Program Guidance AQP-GUI-2019 AERMOD APP Review. August 2019.

Distance from Fenceline, m	Grid Spacing, m
150 – 400	25
400 – 900	50
900 – 2,000	100
2,000 – 4,500	300
4,500 – 10,000	600

Figures 1 through 3 depict the model. Figure 1 shows the project site layout, including stack locations and the site building.

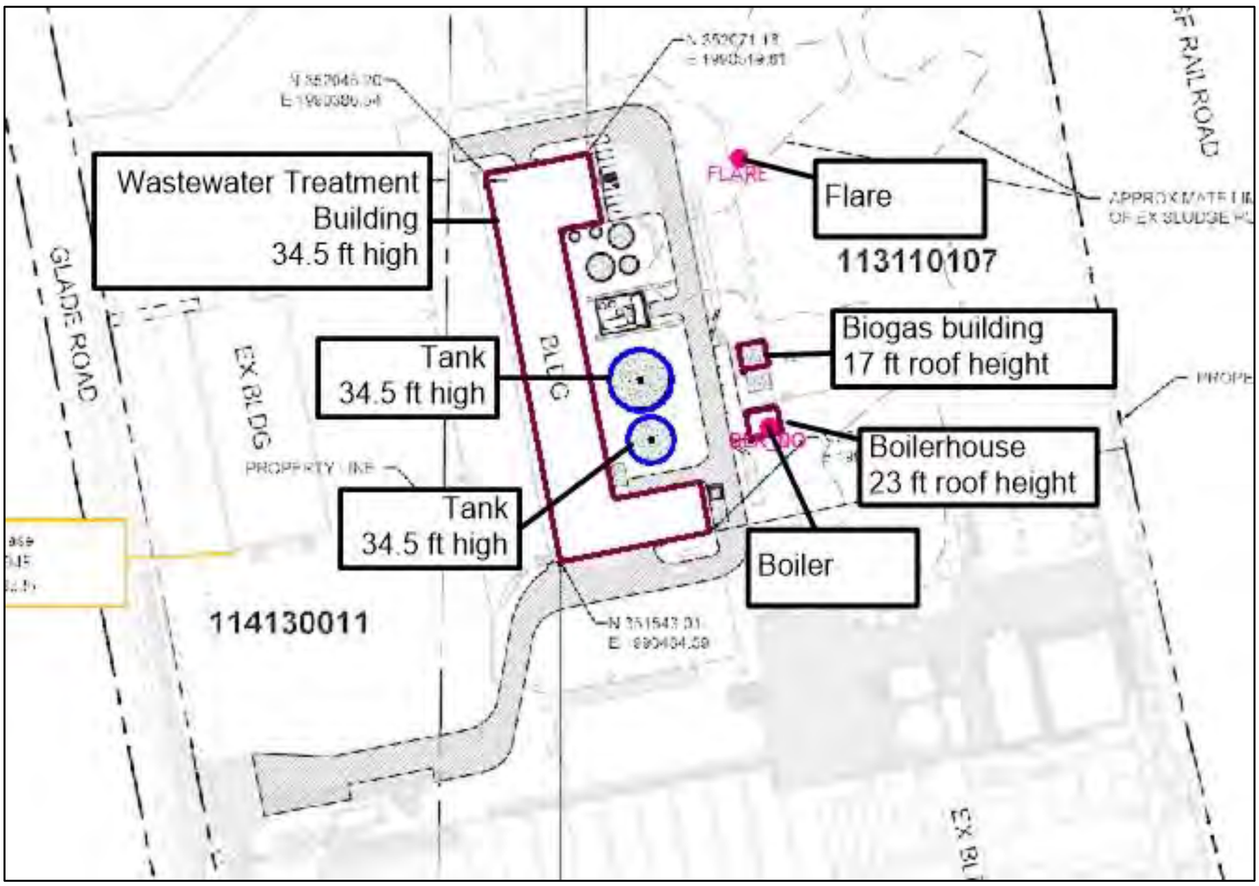


Figure 1. Project Layout

Figure 2 shows the plant area and the ambient air boundary. Figure 2 also shows the 12.5-meter fenceline receptor grid.

Figure 2. Site Map with Fenceline and Fenceline Receptor Grid

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Figure 3 shows the total receptor grid.

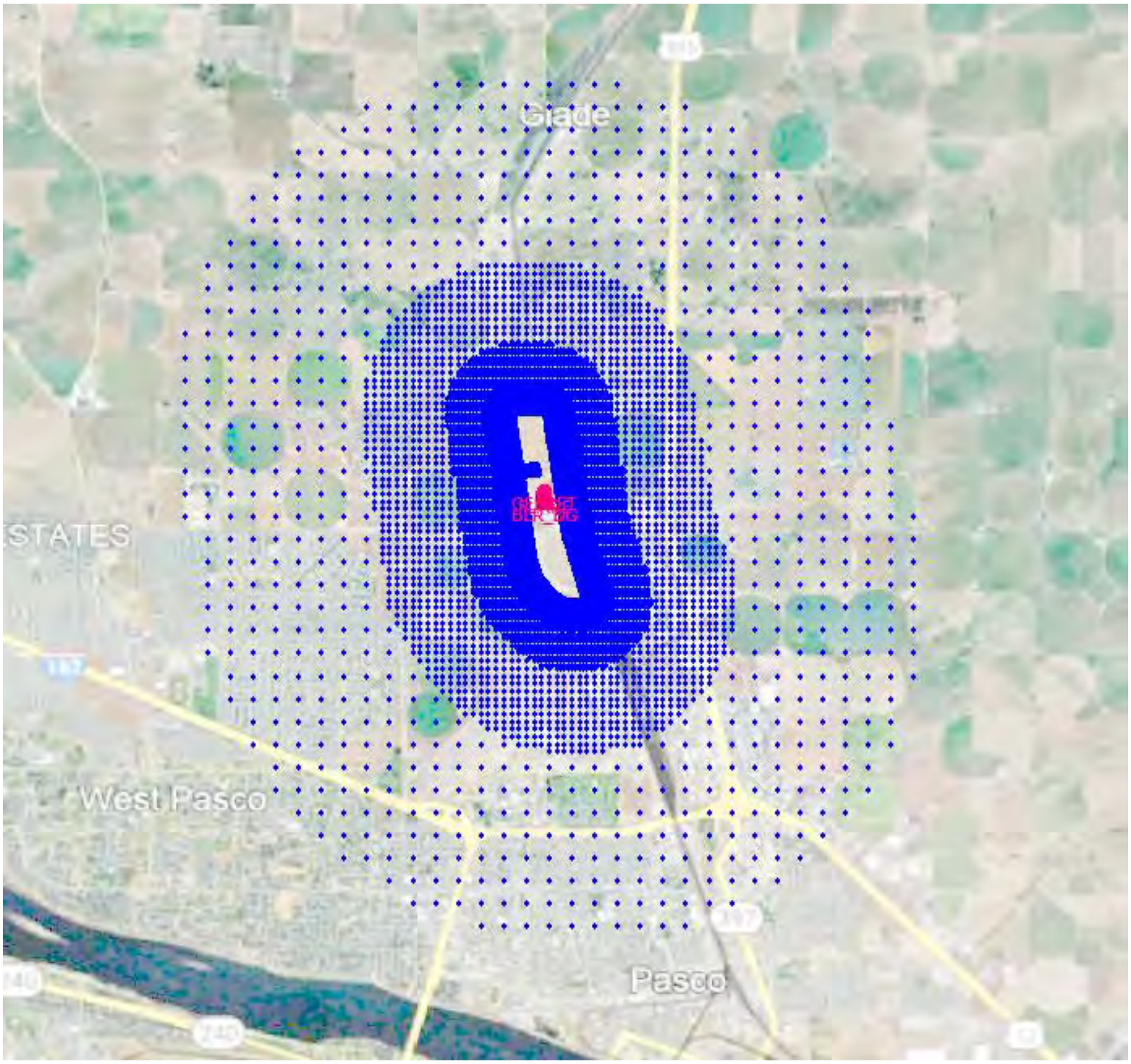

Figure 3. Total Receptor Grid

Modeling Domain and AERMAP Processing

The geodomain for the receptor grid was calculated using 10% slope criteria. The calculated geolimits for the domain extended from LAT/LONG 46.125/-119.250 on the SW corner to 46.500/-118.875 on the NE corner. Figure 4 shows the domain limits calculation. Figure 5 shows the calculated geo domain limits.

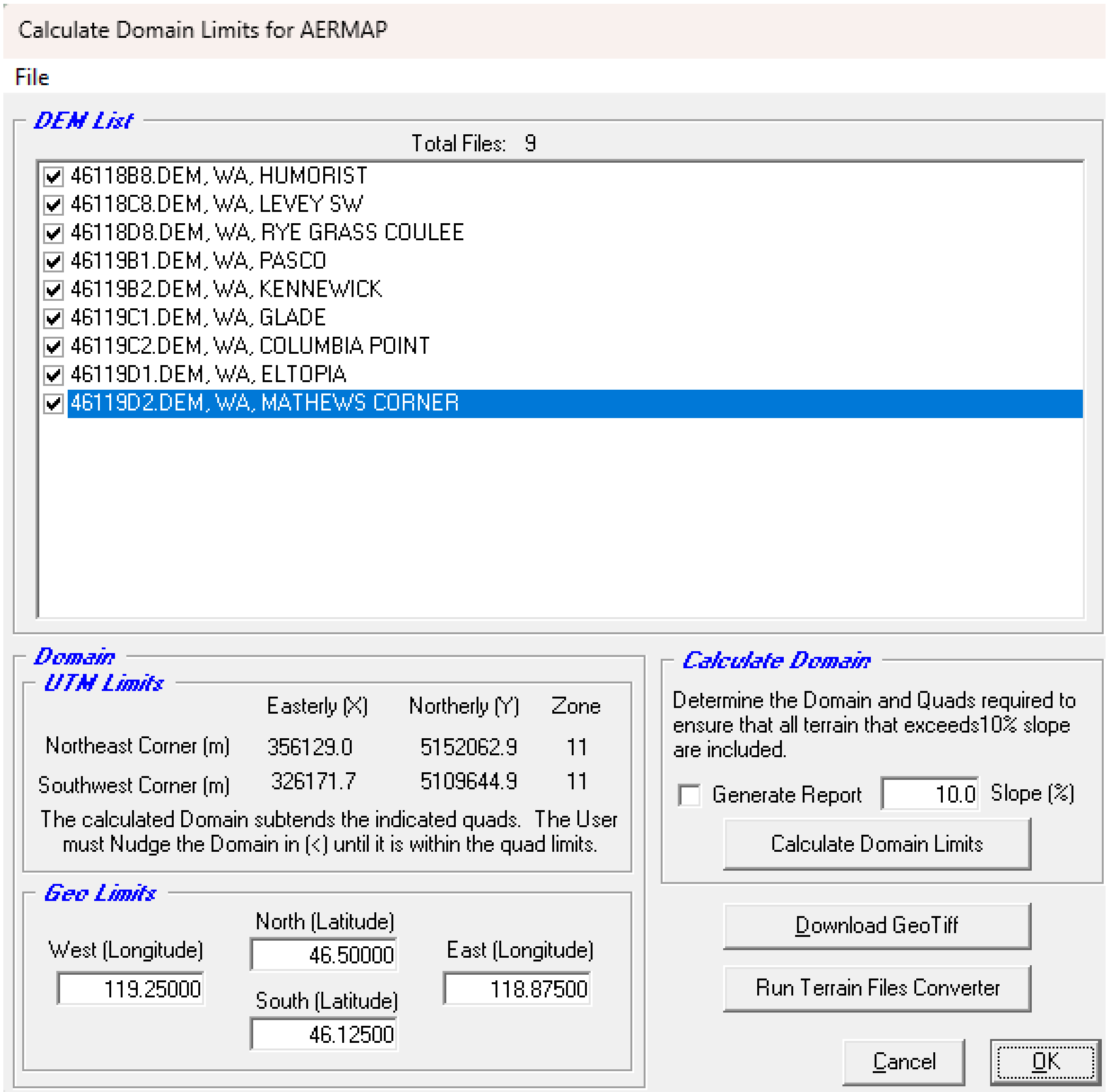

Figure 4. Geo Domain Limits Calculation

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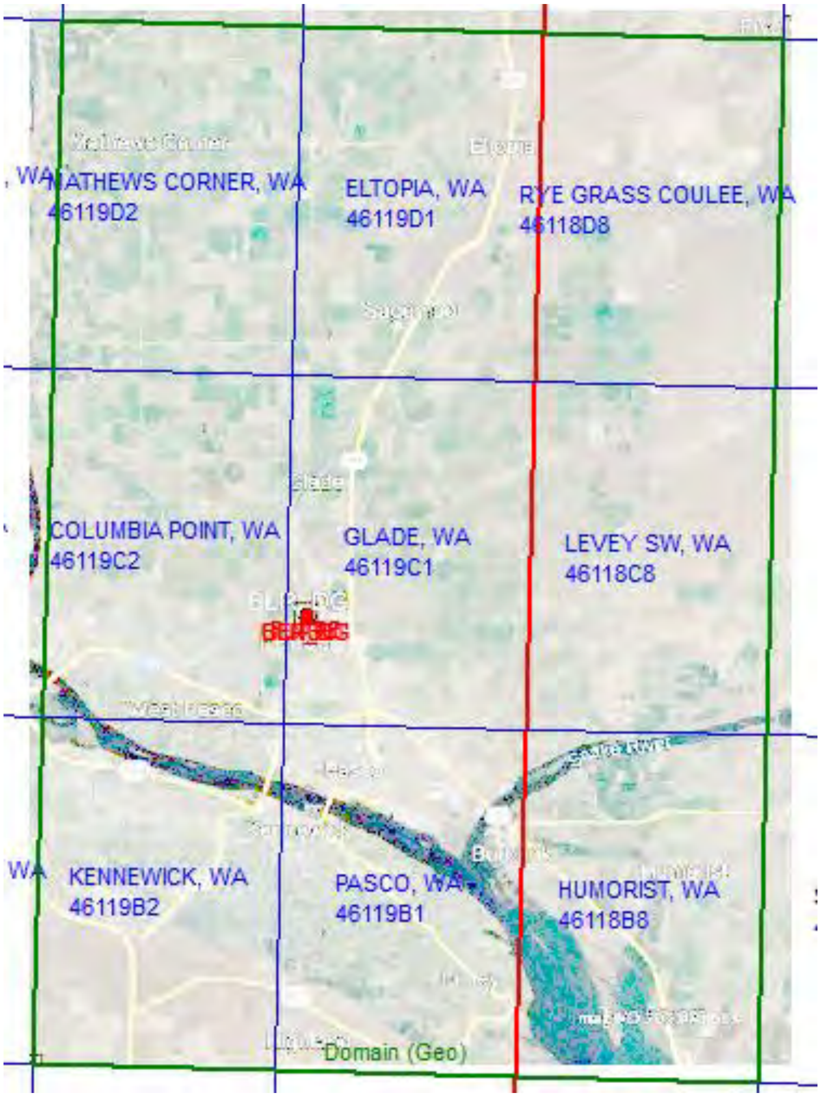

Figure 5. Calculated Geodomain Area

AERMAP processing was then conducted using a NED 1983 file spanning these limits. AERMAP was used to establish base elevations for sources and buildings, and elevation and hill height data for receptors.

METEOROLOGIC DATA

Modeling was conducted with a 5-year surface meteorologic data set from Tri-Cities Airport, WBAN 24163. Hourly meteorologic data (ishd format) for the years 2020-2024 were obtained from the National Climatic Data Center[6] and a concatenated 5-year meteorological data set was

[6] ftp://ftp.ncdc.noaa.gov/pub/data/noaa/.

prepared using these data. Upper air data for Spokane Airport /Geiger Field, WBAN 24157, for the same years were obtained in fsl format from the NOAA/ESRL Radiosonde Database[7].

Figure 6 is a wind rose for the concatenated file.

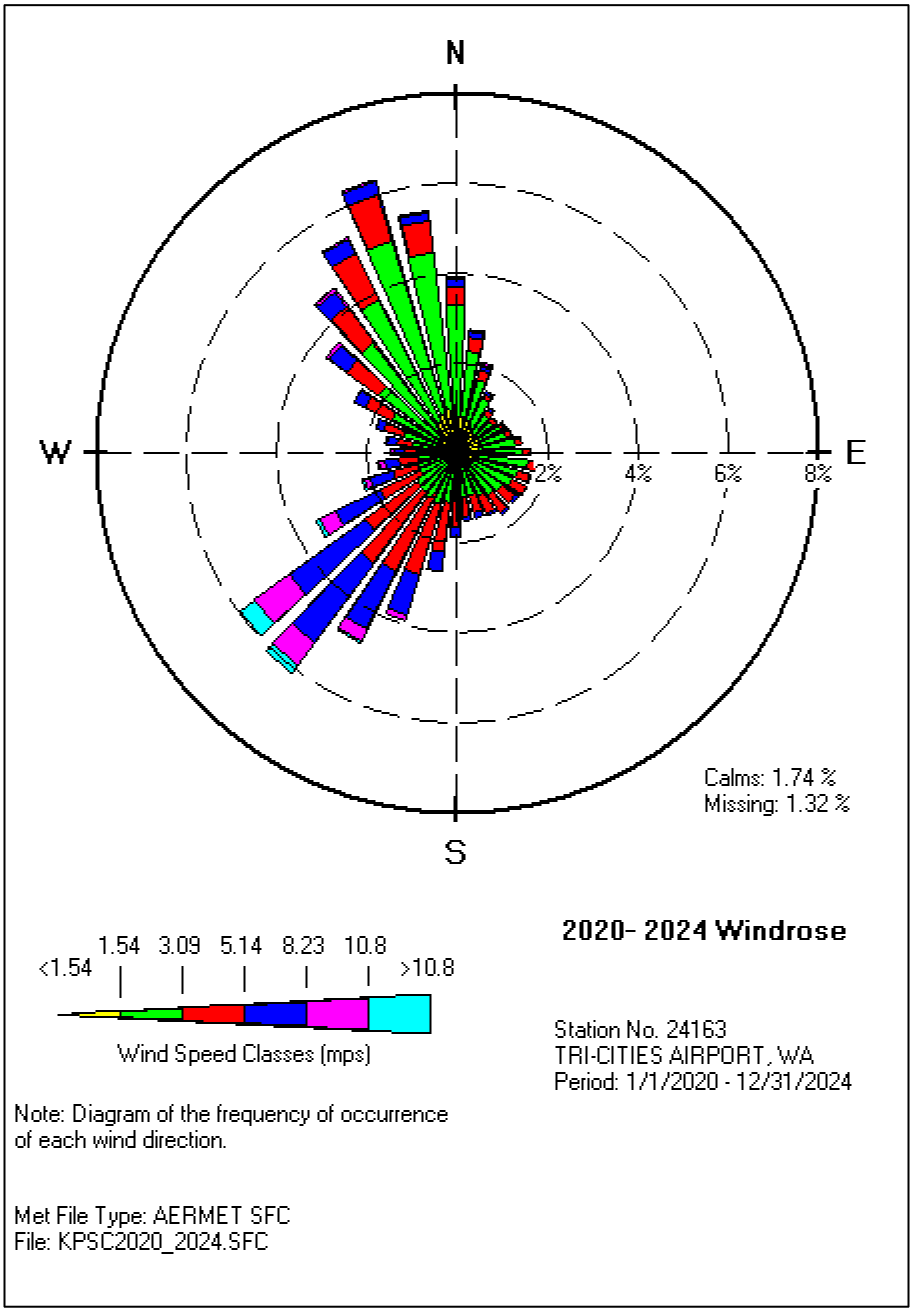

Figure 6. Wind Rose for Concatenated 5-yr Meteorological Data File

[7] http://www.esrl.noaa.gov/raobs/.

AERSURFACE was used to develop surface characteristics for the Tri-Cities airport ASOS station using National Land Cover Dataset (*NLCD*) 2021 files for Land Cover, Impervious Surfaces, and Tree Canopy. Google Earth was used to refine the latitude and longitude coordinates for the ASOS station. Figure 7 shows parameters used in AERSURFACE processing.

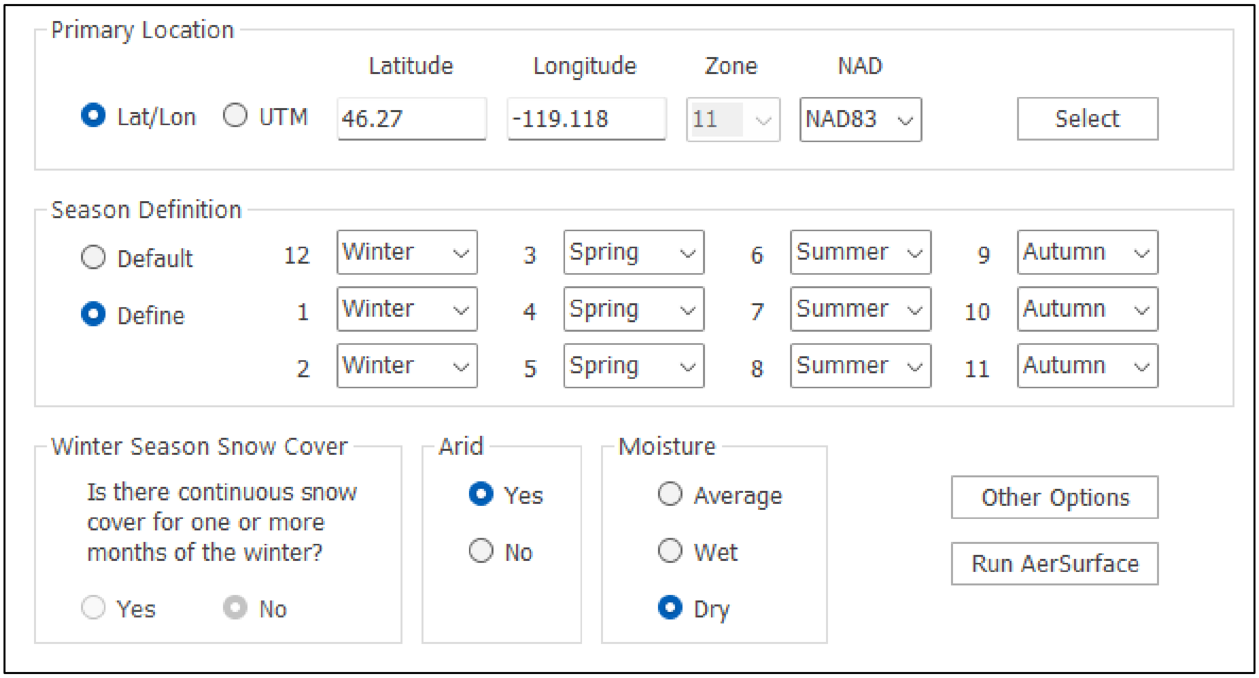

Figure 7. AERSURFACE Parameter Selections

The primary site characteristics developed by AERSURFACE are shown below:

Time Frequency	Wind Sector	Surface Albedo	Bowen Ratio	Surface Roughness
Annual	1 of 12	0.18	2.32	0.095
Annual	2 of 12	0.18	2.32	0.142
Annual	3 of 12	0.18	2.32	0.123
Annual	4 of 12	0.18	2.32	0.108
Annual	5 of 12	0.18	2.32	0.089
Annual	6 of 12	0.18	2.32	0.118
Annual	7 of 12	0.18	2.32	0.115
Annual	8 of 12	0.18	2.32	0.127
Annual	9 of 12	0.18	2.32	0.114
Annual	10 of 12	0.18	2.32	0.121

Time Frequency	Wind Sector	Surface Albedo	Bowen Ratio	Surface Roughness
Annual	11 of 12	0.18	2.32	0.105
Annual	12 of 12	0.18	2.32	0.113

The surface and upper air meteorologic data were then processed in AERMET to generate surface and upper air meteorologic data files for use in AERMOD.[8]

POLLUTANTS MODELED AND EMISSIONS RATES

Modeling was conducted for all CAPs with emissions exceeding applicable emission thresholds (except VOC) and for TAPs with emissions exceeding applicable SQERS. Table 4 shows the averaging period and model output selected for comparison with ASILs. Table 5 provides the source emissions rates for each modeled air pollutant.

Note that emissions for 7,12-Dimethylbenz[a]anthracene, cadmium, chromium(VI), ethylbenzene, and formaldehyde are modeled using micro-lbs per hour because the lb/hr emission rates of these constituents are near the lower end of the AERMOD modeling range. Accordingly, AERMOD output for these constituents is in pg/m^3 instead µg/m^3. The modeled impacts for these pollutants are divided by 1,000,000 to adjust the results back to lb/hr emission rate impacts.

NITROGEN DIOXIDE CHEMISTRY

ARM2 was used for nitrogen dioxide chemistry during modeling. The minimum and maximum NO_2/NOx ratios are 0.5 and 0.9, respectively.

RESULTS OF MODELING

Tables 6 presents modeled ambient impacts for each air pollutant and averaging time modeled. Table 7 compares the modeled ambient impacts with the significance threshold for each pollutant. As Table 7 indicates, all ambient impacts are less than applicable significance thresholds.

Figures 8 through 24 show contours of model runs for the maximum impact for each pollutant modeled. These figures demonstrate that the largest impacts are fenceline impacts in the project area. Note that in Figures 18 through 22, concentrations are presented in pg/m^3.

[8] AERMET processing for hour 11 on June 11, 2023, generated errors for the Surface Friction Velocity and Monin-Obukhov Length parameters. Further investigation indicated this error occurs when there is a reported value for wind speed, but no corresponding data for wind direction. This should be processed as missing data, but AERMET is not currently programmed to recognize this condition. Accordingly, the SFC file for 2023 was manually edited to flag Surface Friction Velocity and Monin-Obukhov Length as "missing data" for hour 11 on June 11, 2023. The US EPA Air Quality Modeling Group confirmed the existence of this "bug" and affirmed manual editing of the SFC file to correct the error.

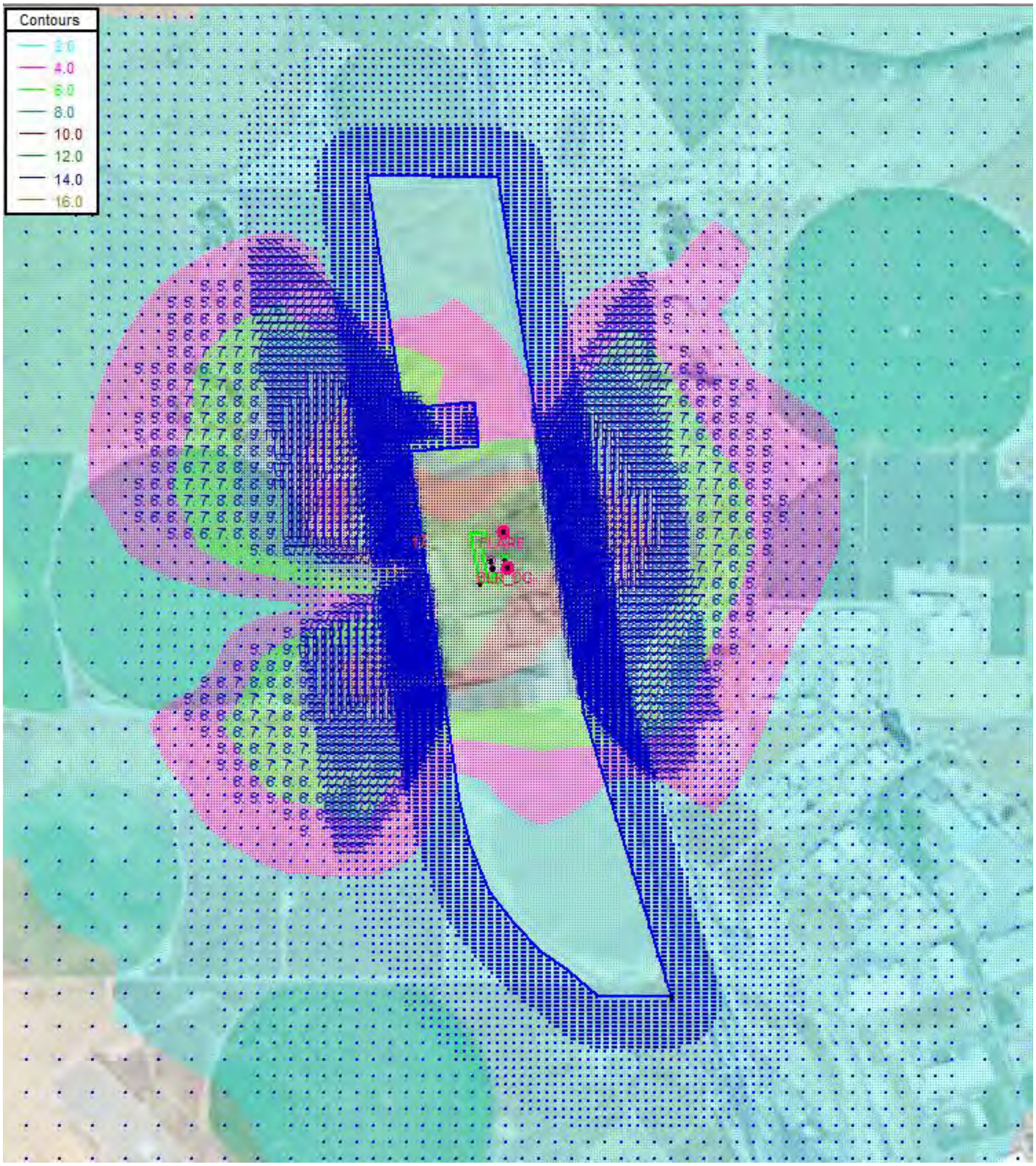

Figure 8. Maximum Daily 1-hr SO_2 Averaged Over Years 2020-2024, μg/m³

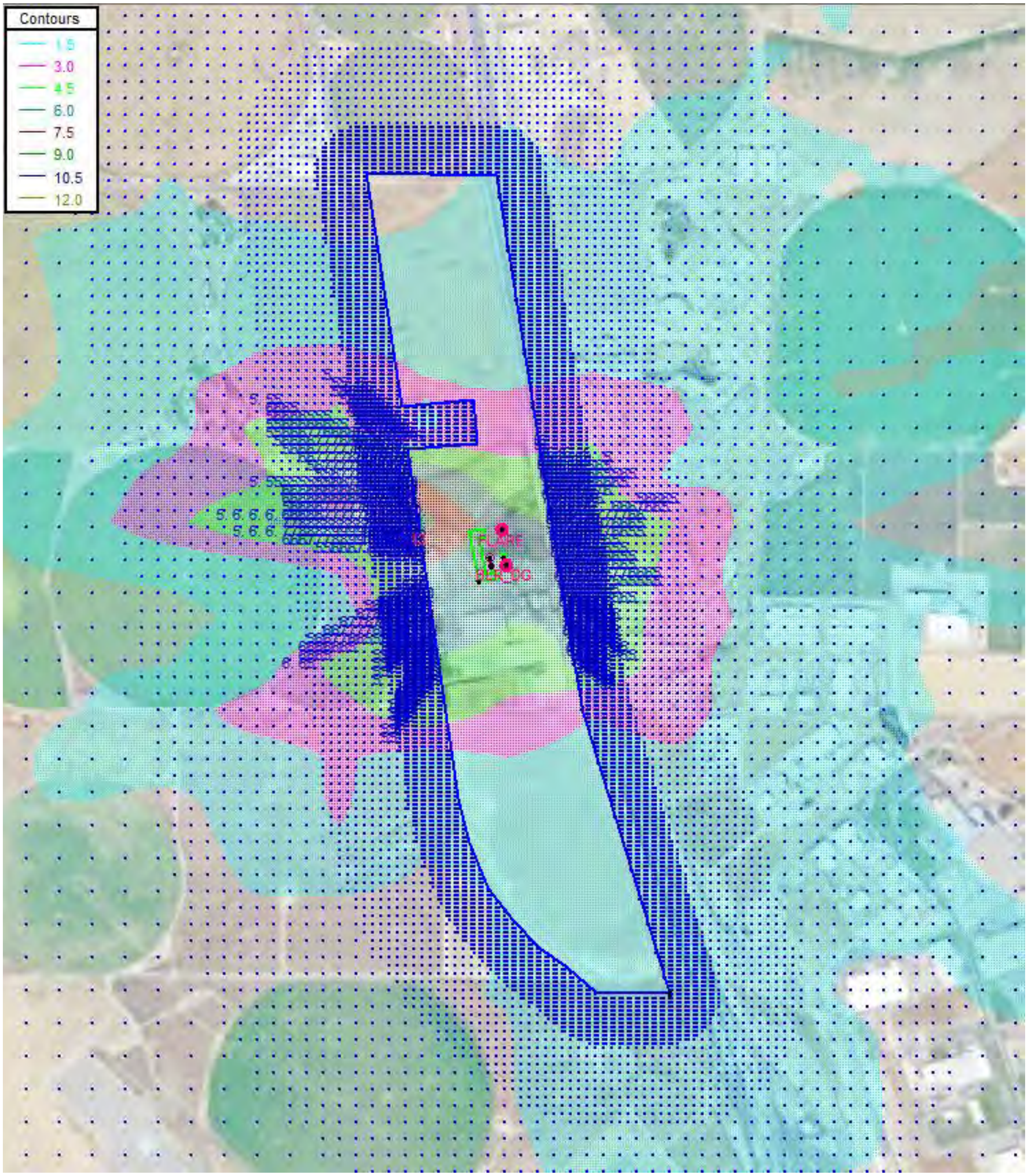

Figure 9. Maximum 3-hr SO_2 (Year 2021), µg/m³

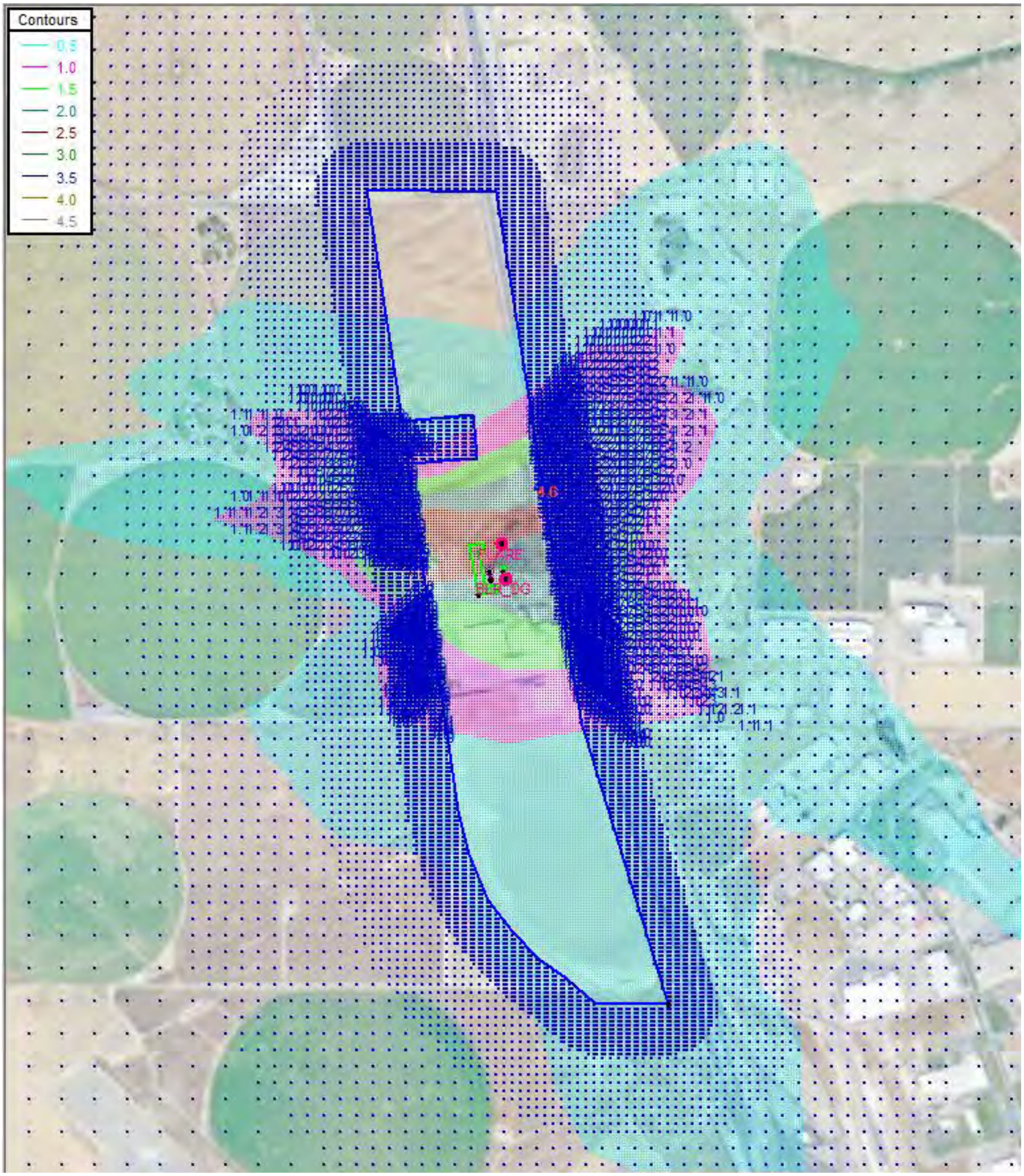

Figure 10. Maximum 24-hr SO_2 (Year 2020), µg/m³

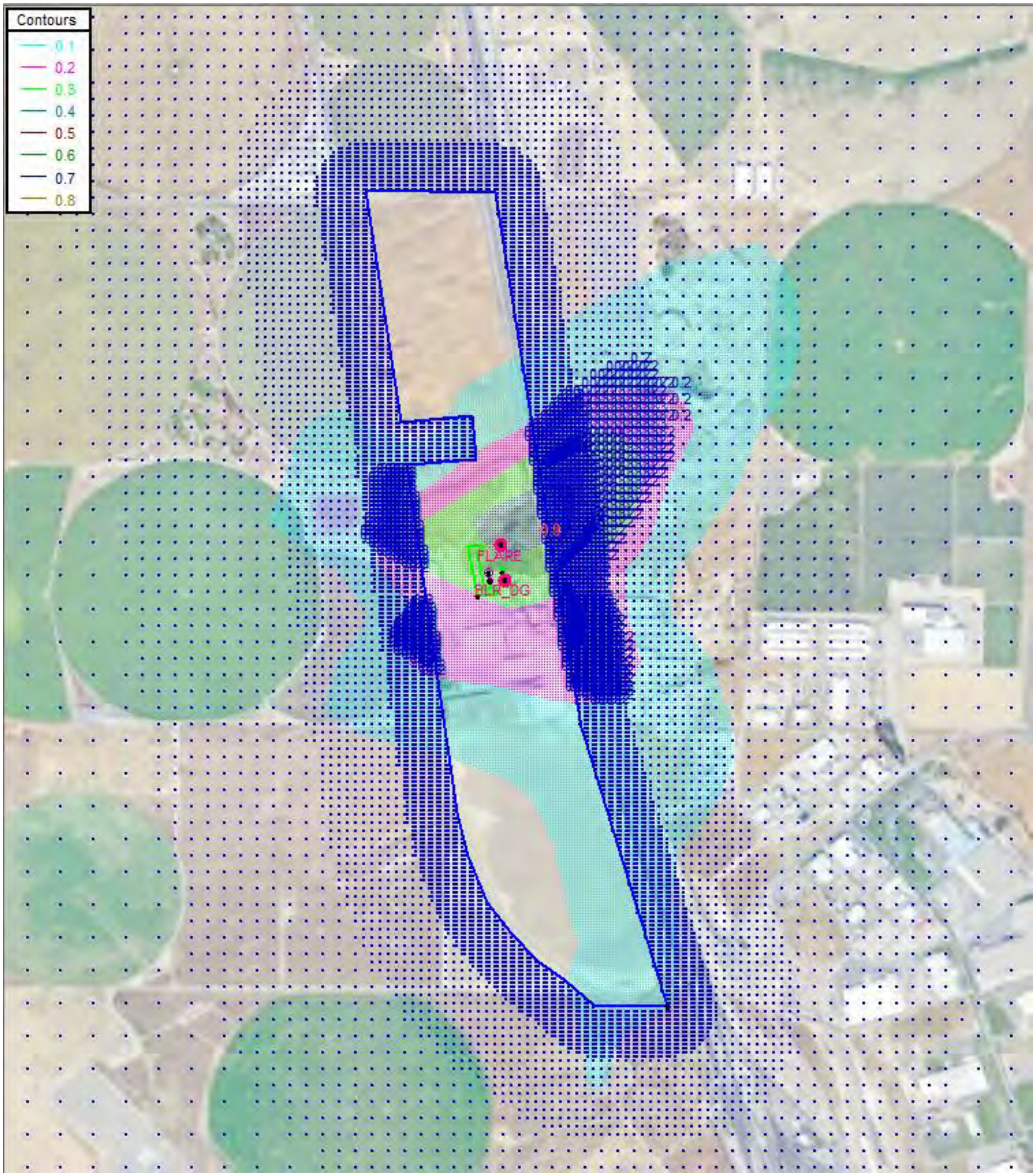

Figure 11. Maximum Annual SO_2 (Year 2020), µg/m³

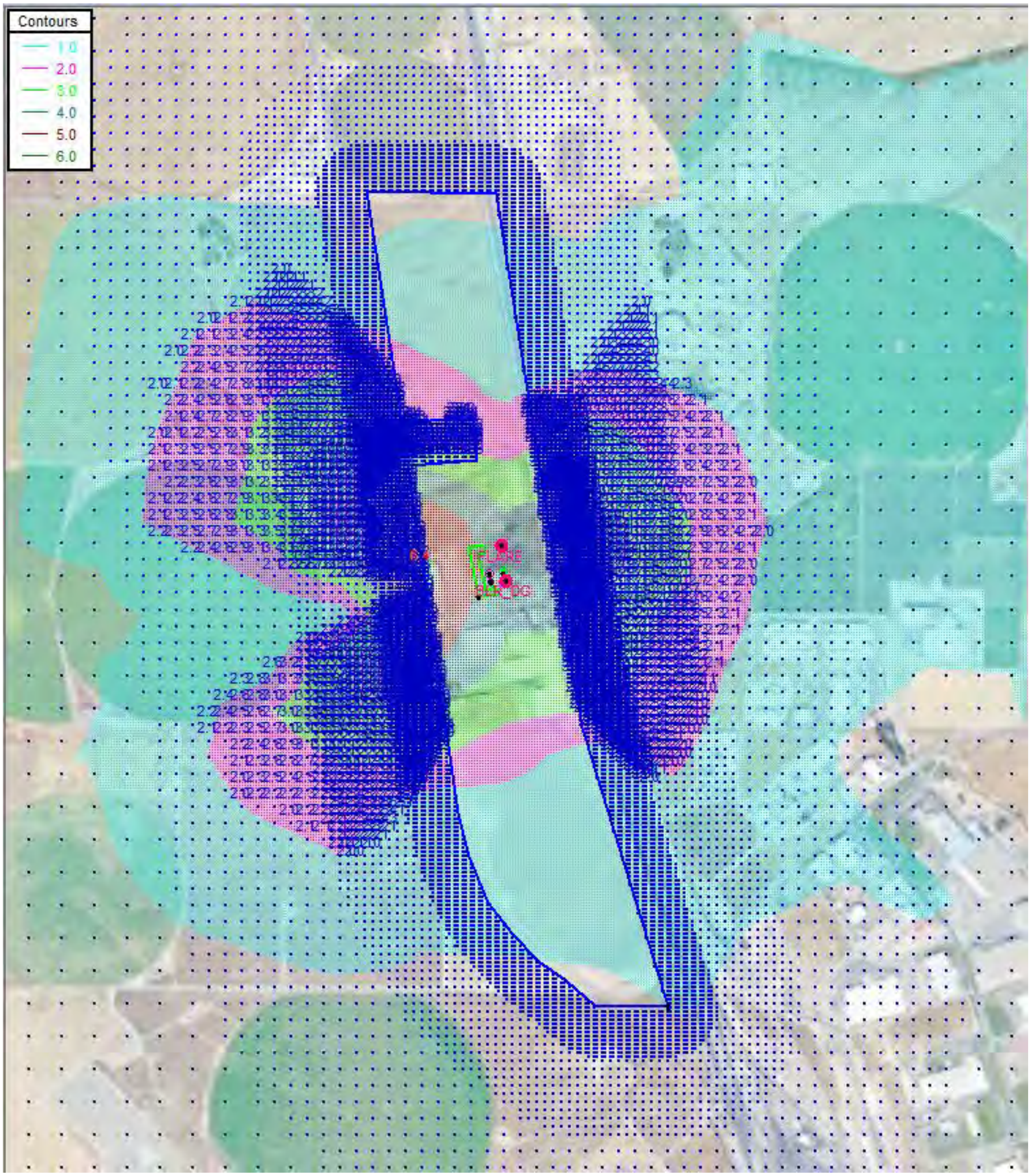

Figure 12. Maximum Daily 1-hr NO_2 Averaged Over Years 2020-2024, μg/m³

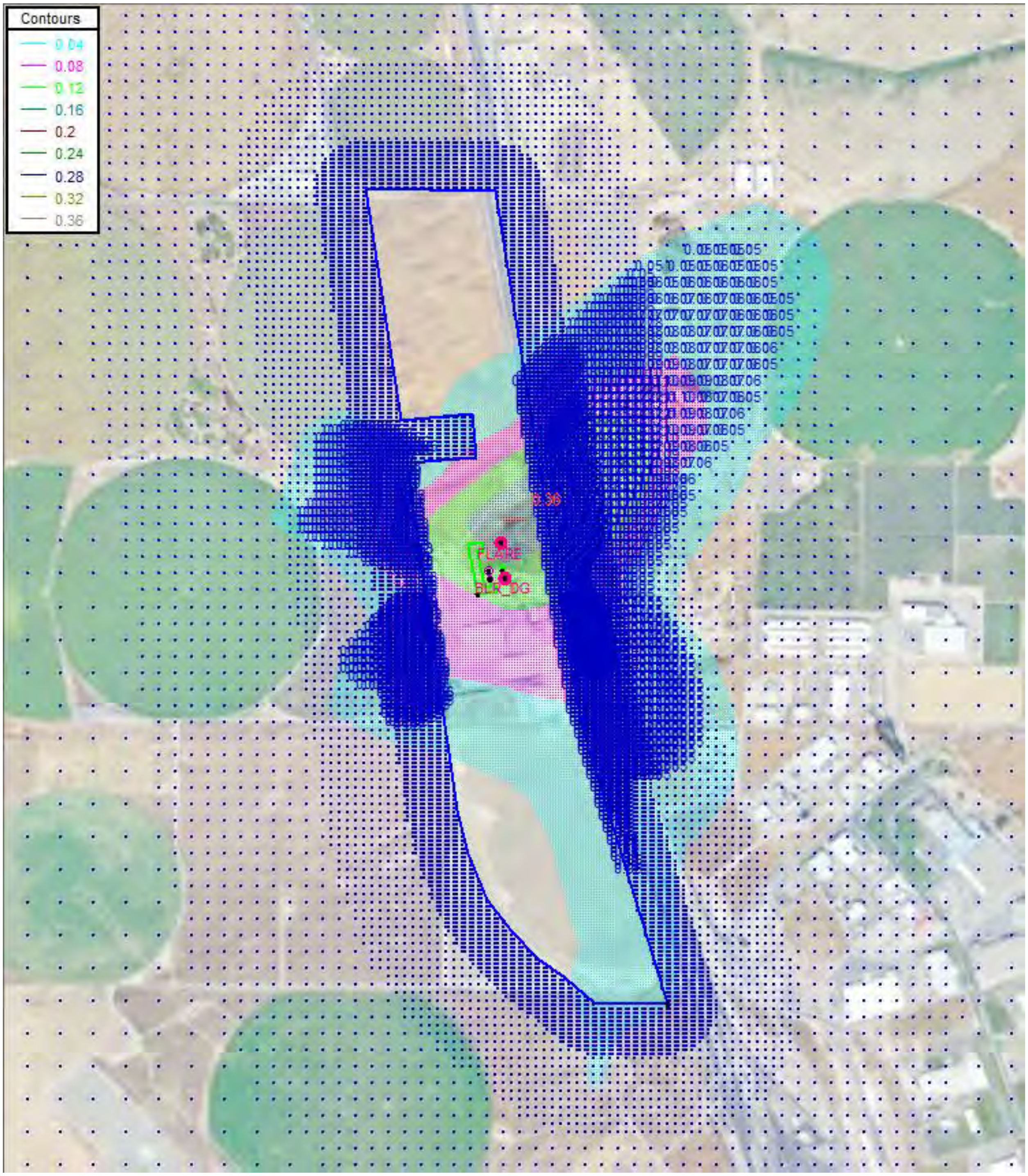

Figure 13. Maximum Annual NO_2 (Year 2020), μg/m³

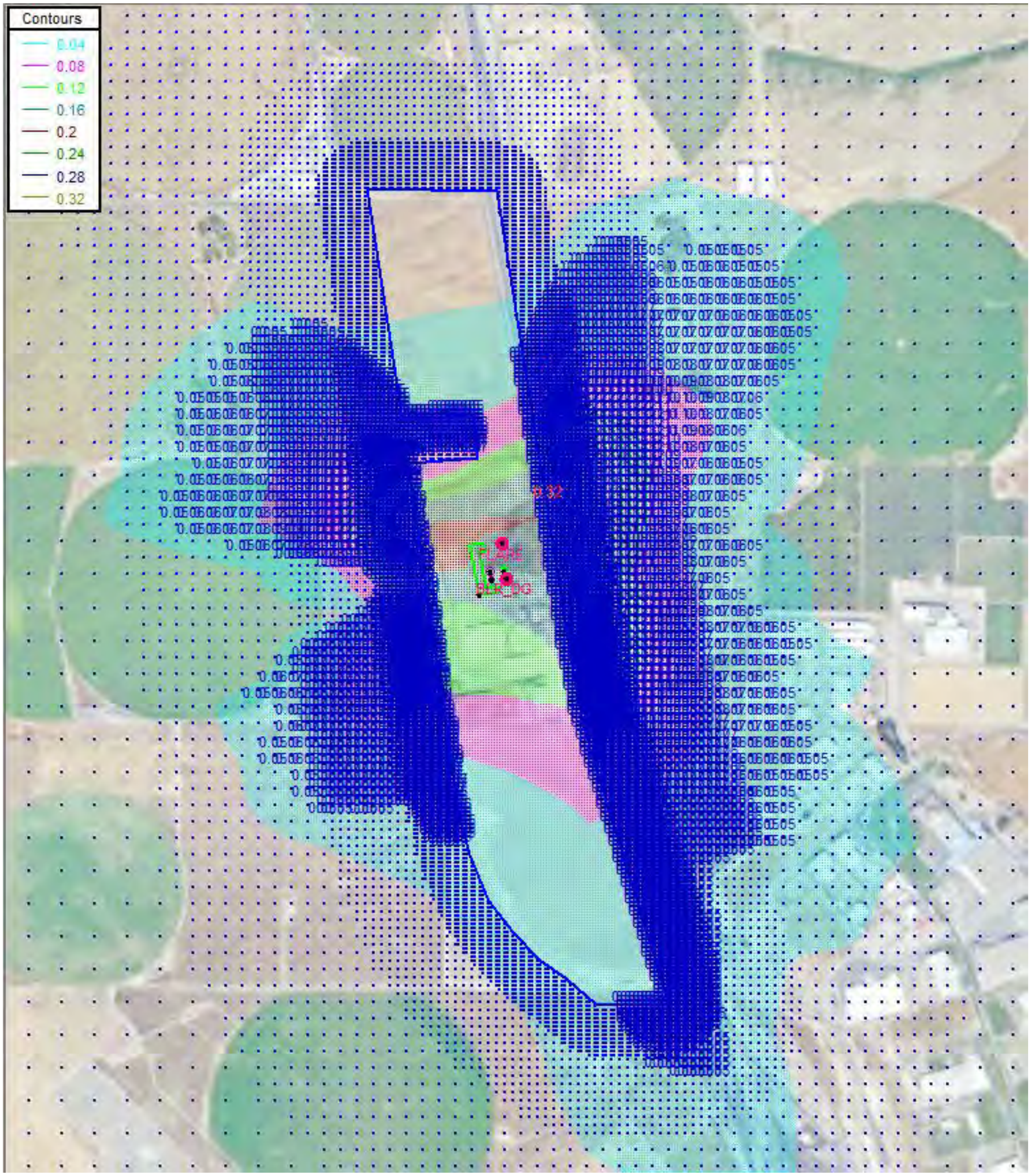

Figure 14. Maximum Annual 24-hr $PM_{2.5}$ Averaged Over Years 2020-2024, µg/m^3

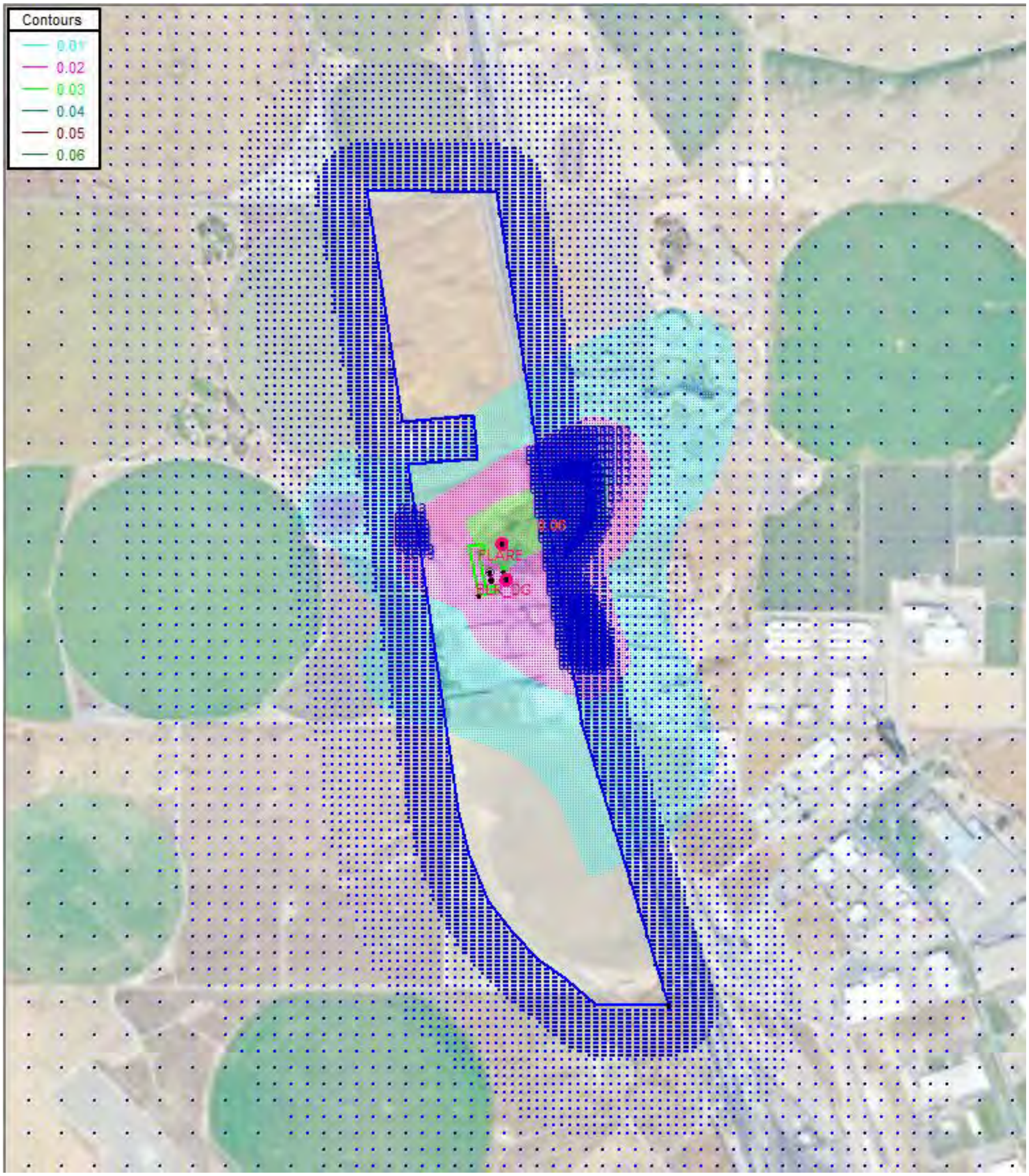

Figure 15. Biogas to Boiler – Maximum Annual $PM_{2.5}$ Averaged Over Years 2020-2024, µg/m³

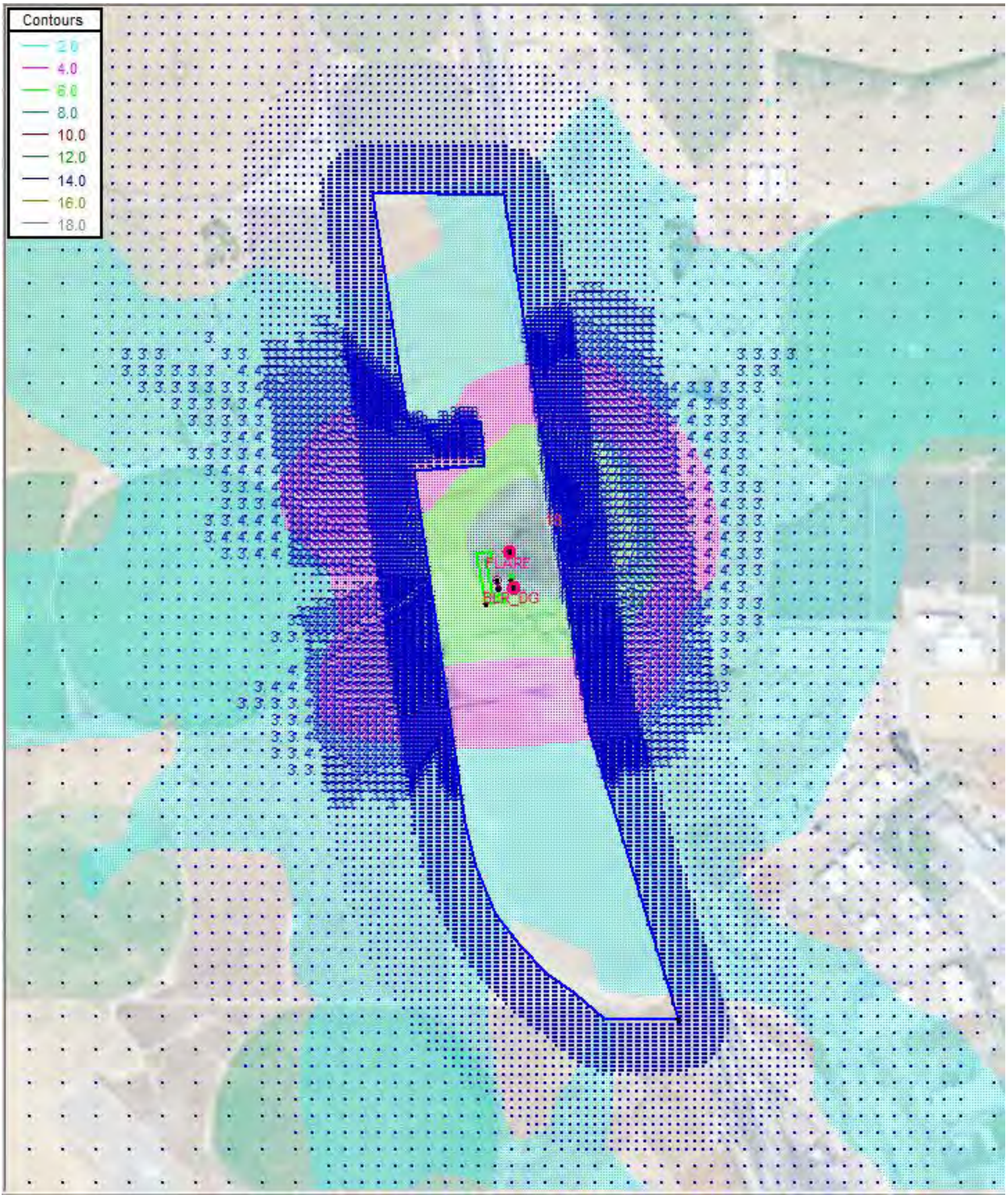

Figure 16. Maximum 1-hr CO (Year 2022), μg/m³

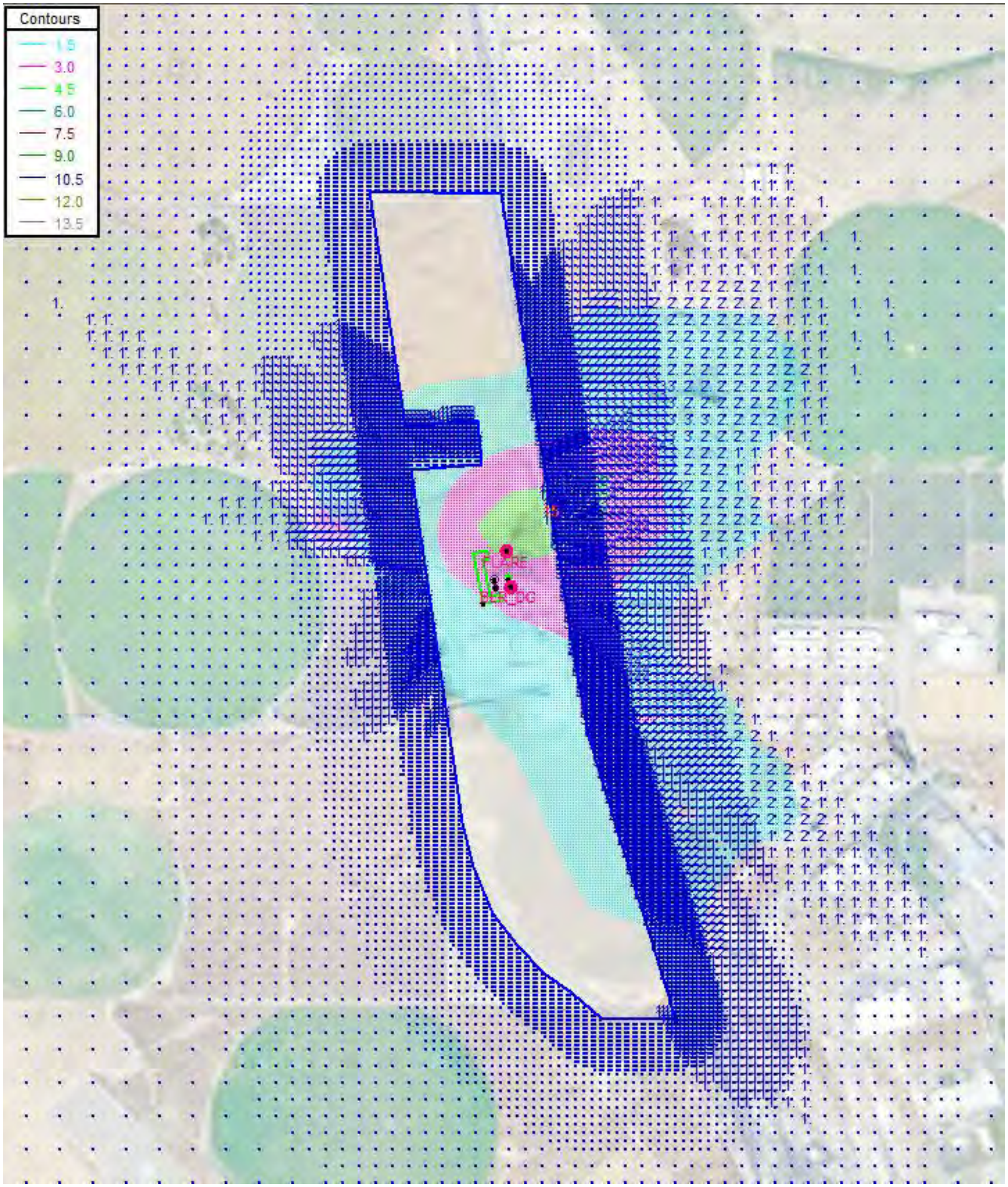

Figure 17. Maximum 8-hr CO (Year 2024), µg/m³

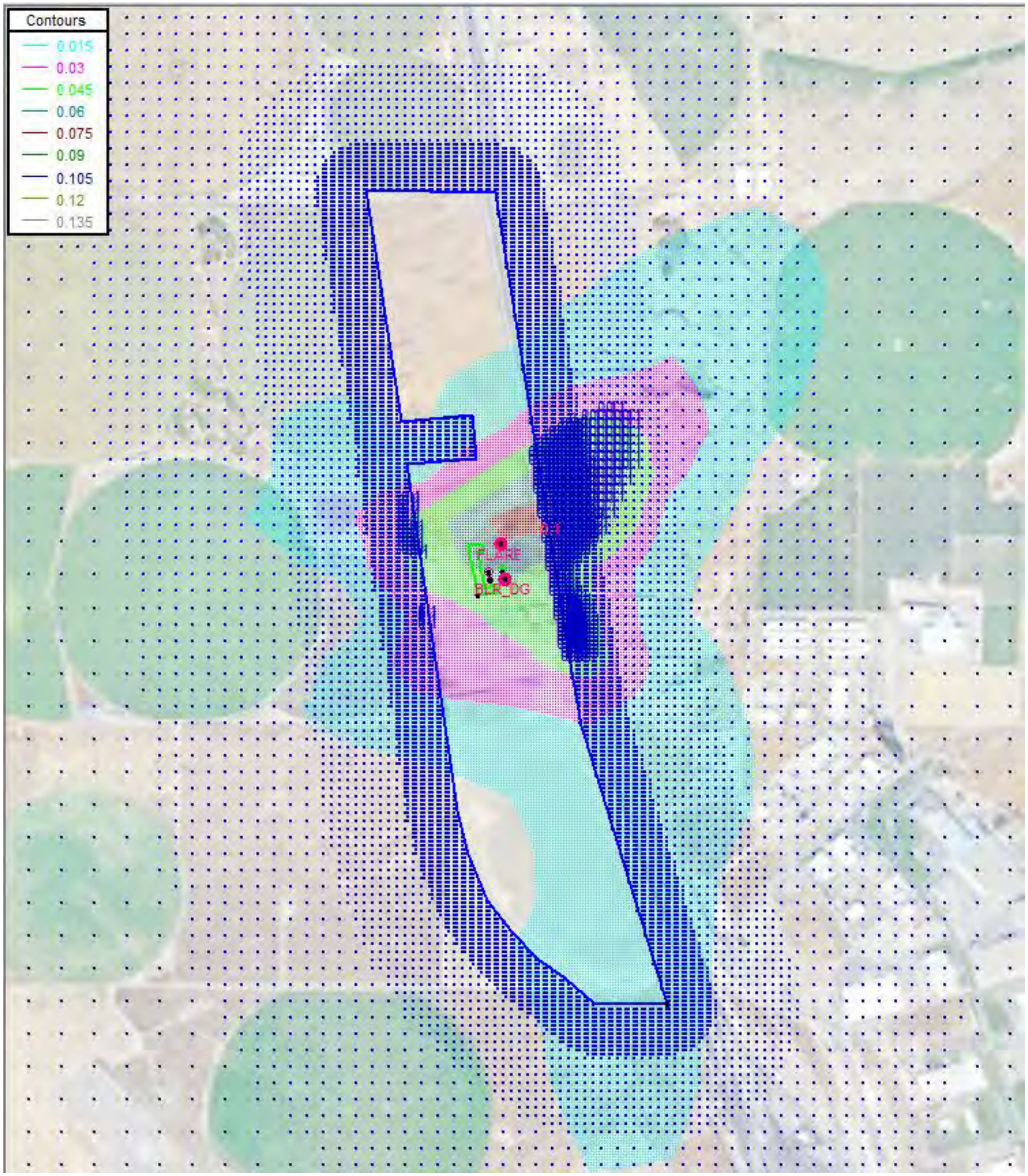

Figure 18. Maximum Annual 7,12-Dimethylbenz(a)anthracene (Year 2020), pg/m³

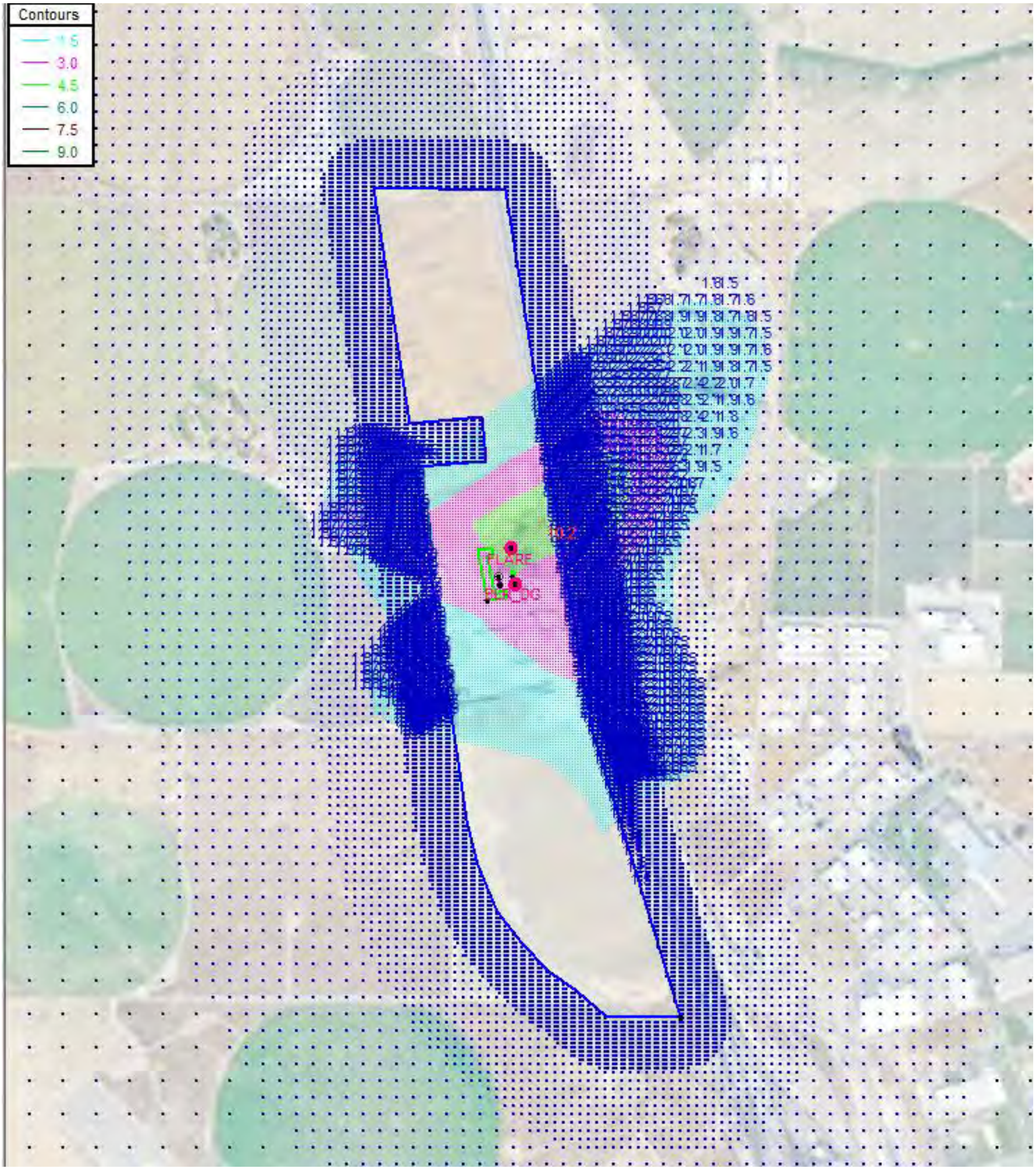

Figure 19. Maximum Annual Cadmium (Year 2020), pg/m³

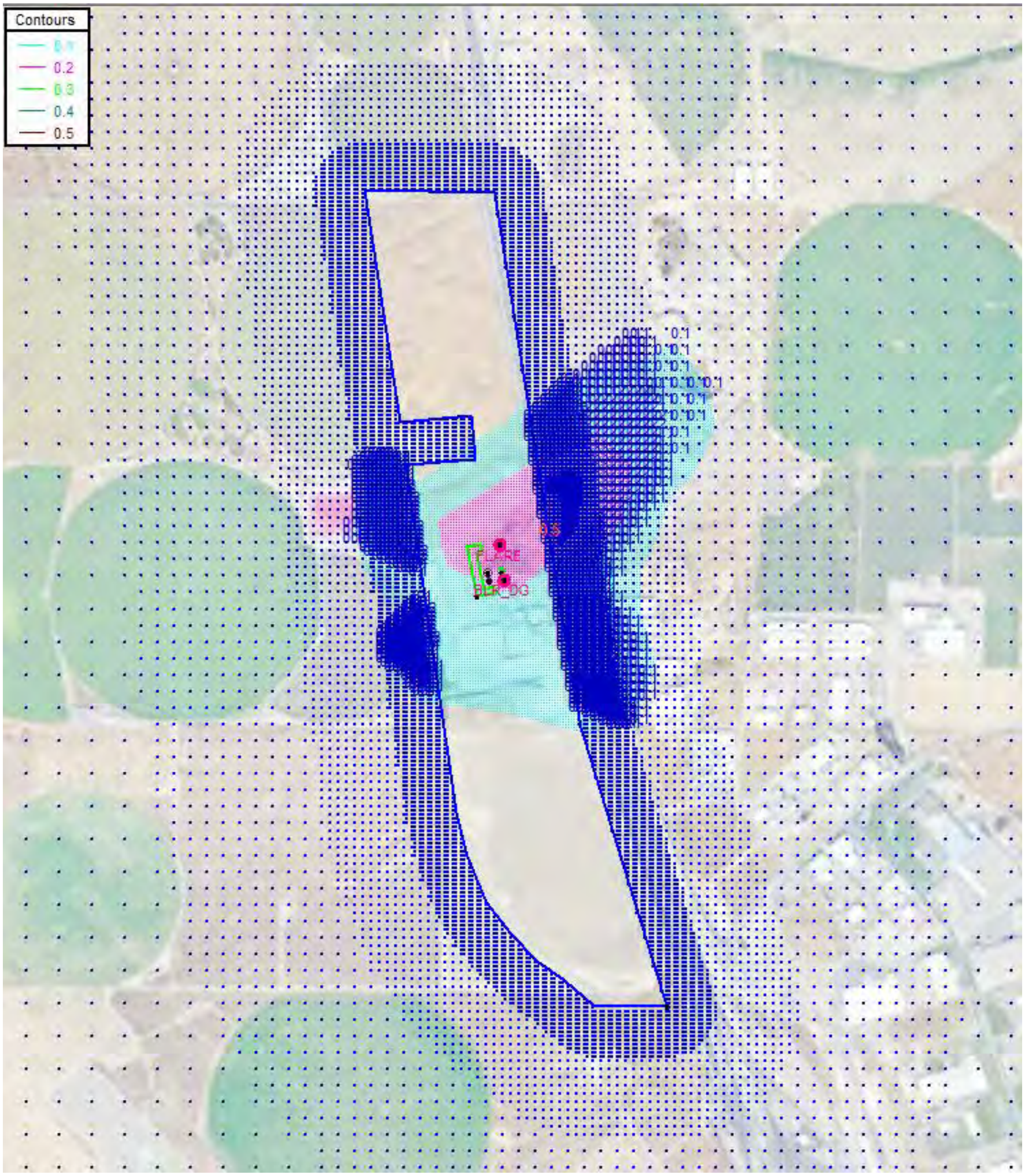

Figure 20. Maximum Annual Chromium(VI) (Year 2020), pg/m³

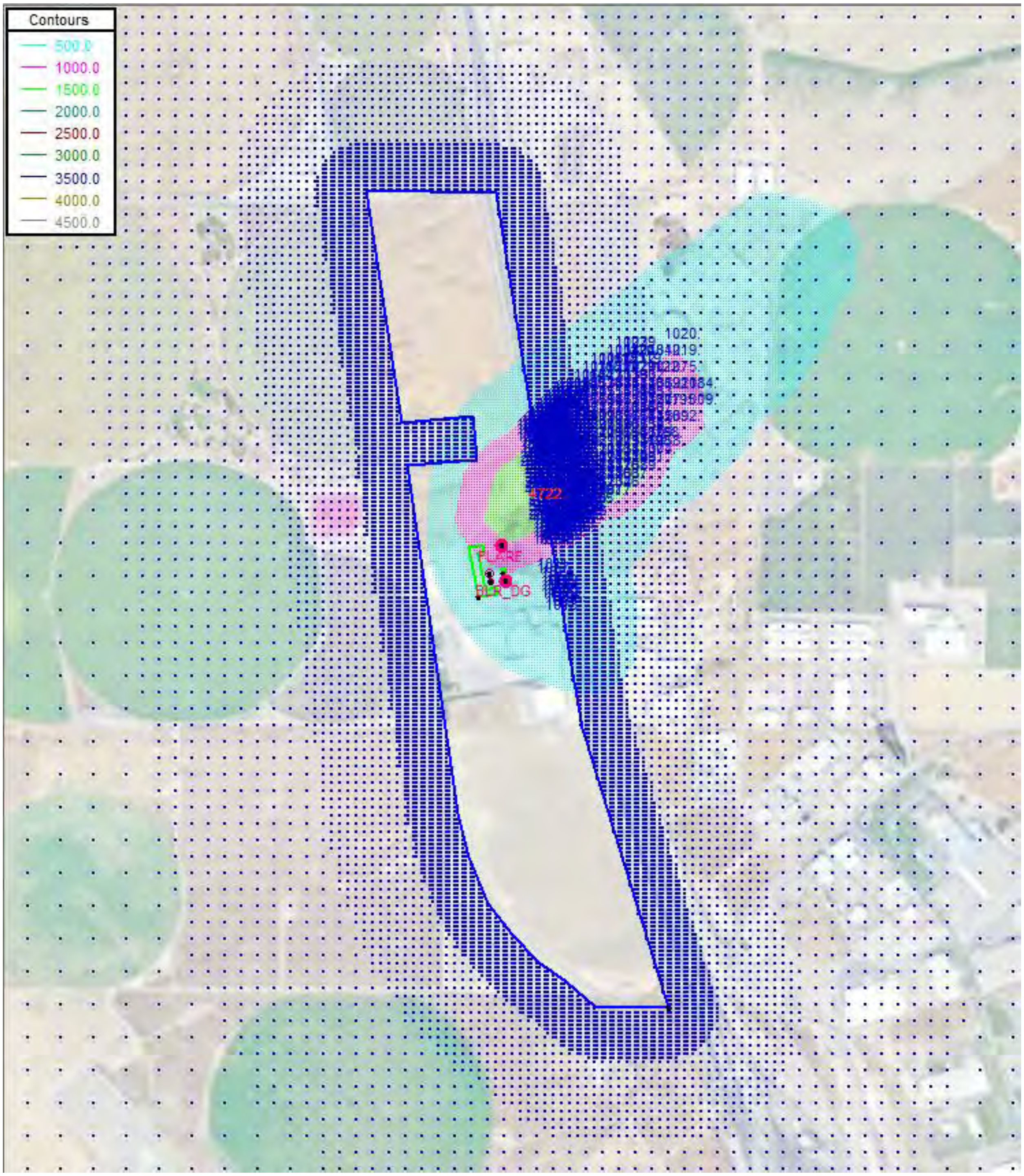

Figure 21. Maximum Annual Ethyl Benzene (Year 2020), pg/m³

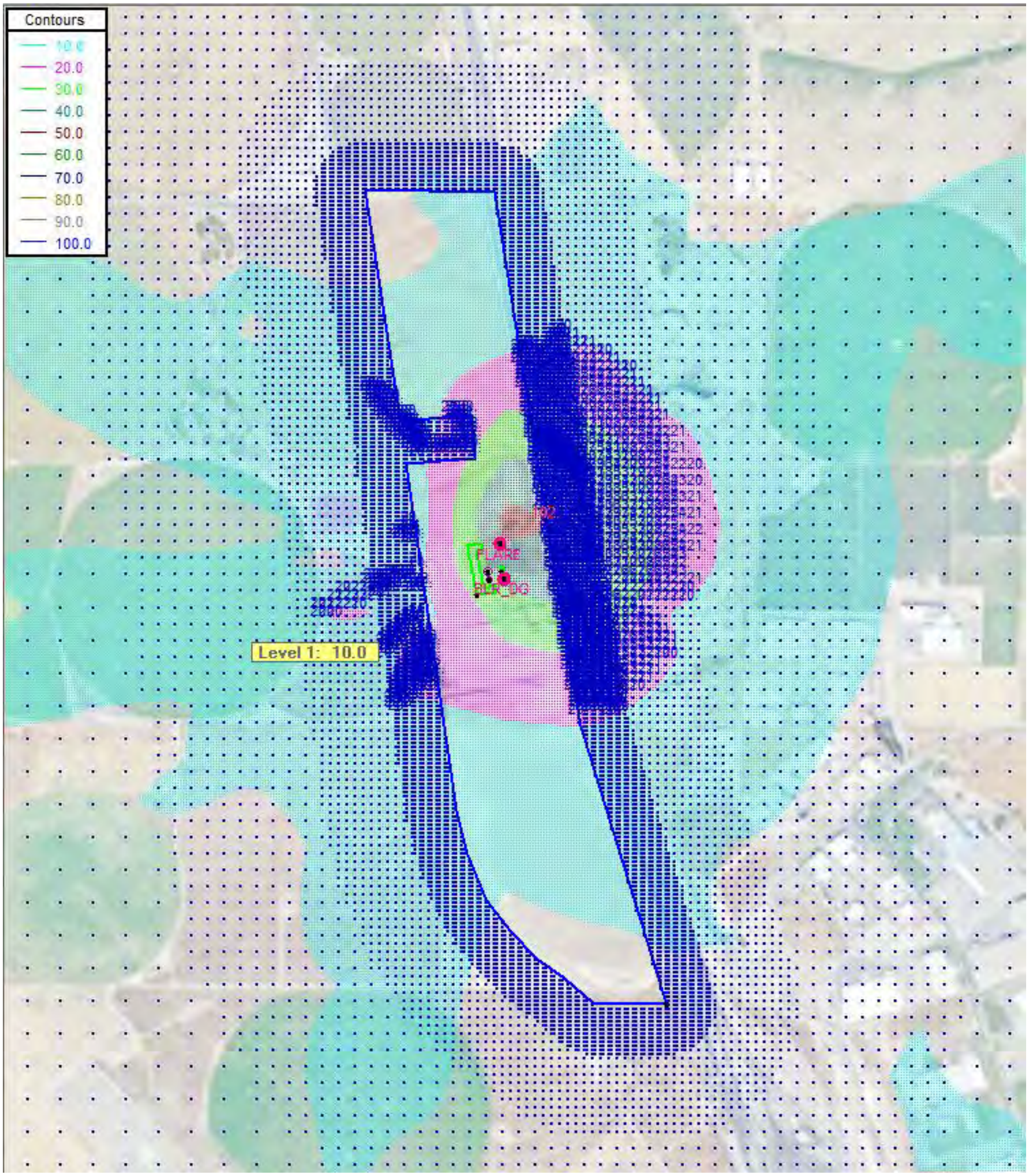

Figure 22. Maximum Annual Formaldehyde (Year 2022), pg/m³

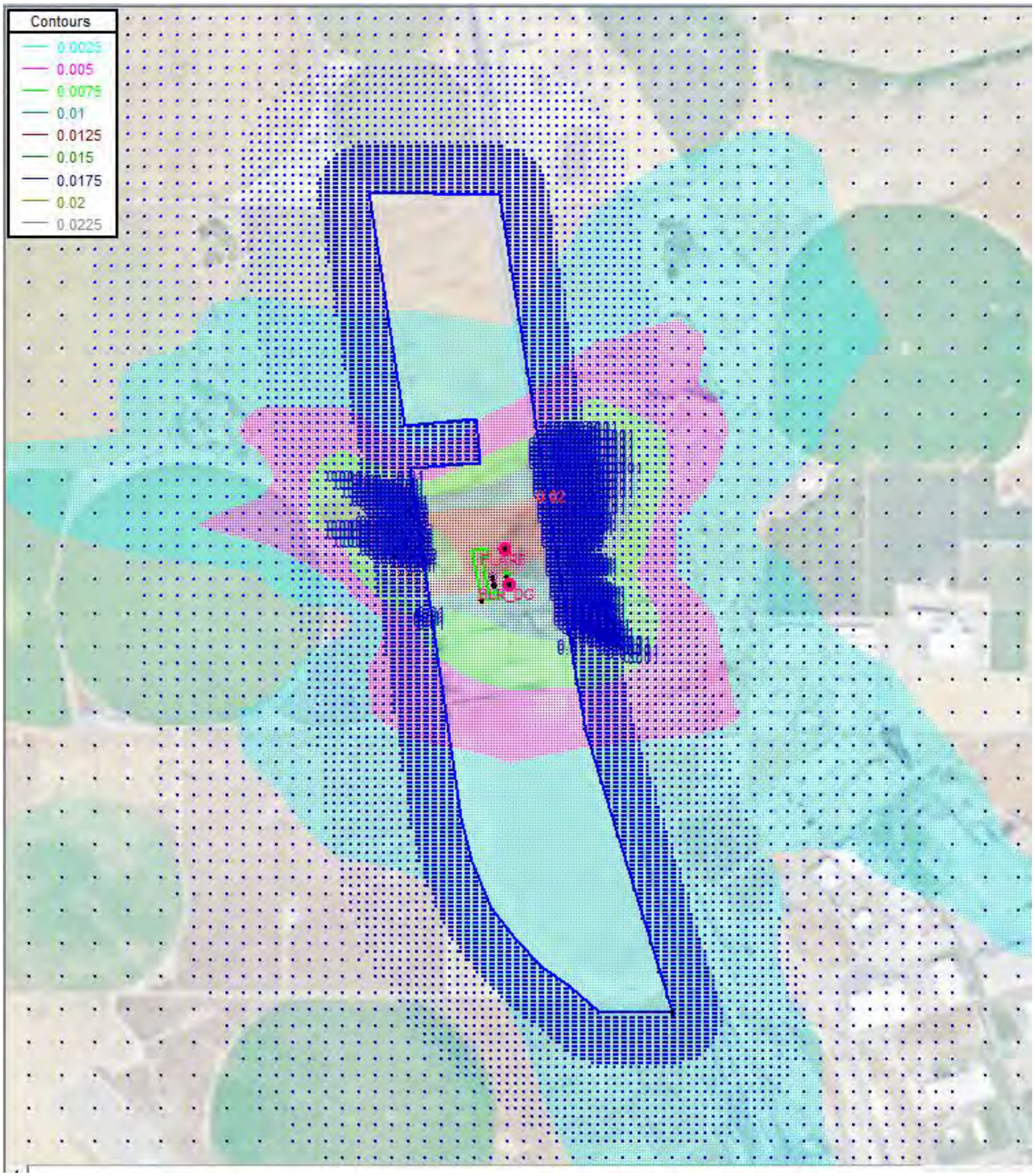

Figure 23. Maximum 1-hr Hydrogen Sulfide (Year 2020), µg/m³

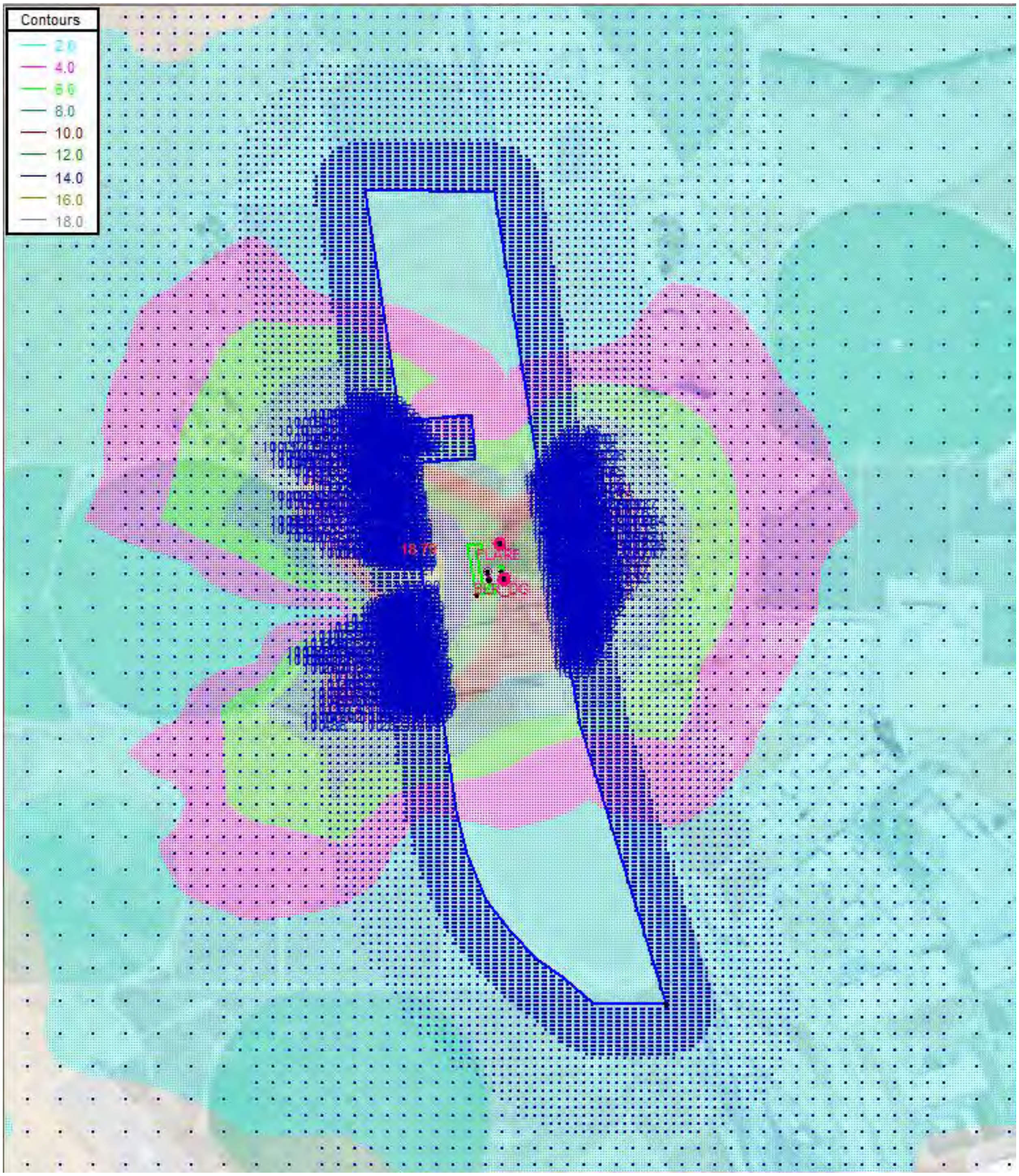

Figure 24. Maximum 1-hr Sulfur Dioxide (Year 2023), pg/m³

MODELING INPUT AND OUTPUT FILES

A link will be provided to a DropBox folder containing all input and output files for the AERMOD environment.

Table 1

Criteria Air Pollutant Potential to Emit and Comparison with Emission Thresholds

Operating Conditions		Hourly Emissions, lb/hr							Annual Emissions													
									Ton/yr							% of Emission Threshold†						
		SO2	NOx	CO	PM2.5	PM10	VOC	Pb	SO2	NOx	CO	PM2.5	PM10	VOC	Pb	SO2	NOx	CO	PM2.5	PM10	VOC	Pb
Boiler	8.23 MMBtuh Biogas	0.005	0.300	0.304	0.060	0.060	0.043	3.9E-06	0.02	1.31	1.33	0.26	0.26	0.19	1.7E-05	1%	66%	27%	52%	35%	9%	0.34%
Flare	11.39 MMBtuh Biogas	1.014	0.683	2.278	0.082	0.082	1.594	5.4E-06	4.44	2.99	9.98	0.36	0.36	6.98	2.4E-05	222%	150%	200 %	72%	48%	349%	0.48%
Project Potential to Emit:		1.018	0.983	2.582	0.142	0.142	1.638	9.3E-06	4.46	4.31	11.31	0.62	0.62	7.17	4.1E-05	223%	215%	226 %	124%	83%	359%	0.82%

† WAC 173-400-030(30)

Table 2
Toxic Air Pollutant Emissions and Comparison with De Minimis and SQER Thresholds

Toxic Air Pollutant	Averaging Period	TAP Emissions, lb/hr				TAP Summary				HAP Emissions, ton/yr
		Boiler		Flare						
		Emission Factor, lb/MMBtu*	Heat Input Rate = 8.23 MMBtuh	Emission Factor, lb/MMBtu*	Heat Input Rate = 11.39 MMBtuh	lb/hr	lb/ averaging period	% of De Minimis	% of SQER	
1,4-Dichlorobenzene	year	1.14E-06	9.41E-06	1.14E-06	1.30E-05	2.2E-05	2.0E-01	27%	1.3%	9.8E-05
3-Methylcholanthrene	year	1.71E-09	1.41E-08	1.71E-09	1.95E-08	3.4E-08	2.9E-04	38%	1.8%	1.5E-07
7,12-Dimethylbenz[a]anthracene	year	1.52E-08	1.25E-07	1.52E-08	1.74E-07	3.0E-07	2.6E-03	3795%	187.1%	1.3E-06
Acetaldehyde	year	8.07E-06	6.64E-05	4.10E-05	4.66E-04	5.33E-04	4.67E+00	156%	77.8%	2.33E-03
Acrolein	24-hr	2.57E-06	2.12E-05	9.52E-06	1.08E-04	1.30E-04	3.11E-03	239%	12.0%	5.68E-04
Arsenic & Inorganic Arsenic Compounds, NOS	year	1.9E-07	1.6E-06	1.9E-07	2.2E-06	3.7E-06	3.3E-02	1309%	66.8%	1.6E-05
Benz[a]anthracene	year	1.7E-09	1.4E-08	1.7E-09	2.0E-08	3.4E-08	2.9E-04	1%	0.0%	1.5E-07
Benzene	year	5.5E-06	4.5E-05	1.5E-04	1.7E-03	1.8E-03	1.6E+01	1551%	73.8%	7.8E-03
Benzo[a]pyrene	year	1.1E-09	9.4E-09	1.1E-09	1.3E-08	2.2E-08	2.0E-04	2%	0.1%	9.8E-08
Benzo[b]fluoranthene	year	1.7E-09	1.4E-08	1.7E-09	2.0E-08	3.4E-08	2.9E-04	1%	0.0%	1.5E-07
Benzo[k]fluoranthene	year	1.7E-09	1.4E-08	1.7E-09	2.0E-08	3.4E-08	2.9E-04	1%	0.0%	1.5E-07
Beryllium & compounds, NOS	year	1.1E-08	9.4E-08	1.1E-08	1.3E-07	2.2E-07	2.0E-03	58%	2.9%	9.8E-07
Cadmium & Compounds, NOS	year	1.0E-06	8.6E-06	1.0E-06	1.2E-05	2.1E-05	1.8E-01	9476%	461.7%	9.0E-05
Chromium(III), soluble particulates, NOS	24-hr	1.3E-06	1.1E-05	1.3E-06	1.5E-05	2.5E-05	6.0E-04	163%	8.1%	1.1E-04
Chromium(VI) & compounds, NOS	year	5.3E-08	4.4E-07	5.3E-08	6.1E-07	1.0E-06	9.2E-03	27776%	1410.2%	4.6E-06
Chrysene	year	1.7E-09	1.4E-08	1.7E-09	2.0E-08	3.4E-08	2.9E-04	0%	0.0%	1.5E-07
Cobalt and compounds, NOS	24-hr	8.0E-08	6.6E-07	8.0E-08	9.1E-07	1.6E-06	3.8E-05	10%	0.5%	6.9E-06
Copper & Compounds	1-hr	8.1E-07	6.7E-06	8.1E-07	9.2E-06	1.6E-05	1.6E-05	0%	0.0%	-
Dibenz[a,h]anthracene	year	1.1E-09	9.4E-09	1.1E-09	1.3E-08	2.2E-08	2.0E-04	5%	0.2%	9.8E-08
Ethyl Benzene	year	6.6E-06	5.4E-05	1.4E-03	1.6E-02	1.6E-02	1.4E+02	4302%	211.8%	6.9E-02
Formaldehyde	year	7.1E-05	5.9E-04	1.1E-03	1.3E-02	1.3E-02	1.2E+02	8302%	430.5%	5.8E-02
Hexane	24-hr	1.7E-03	1.4E-02	1.7E-03	2.0E-02	3.4E-02	8.1E-01	31%	1.6%	1.5E-01
Hydrogen Sulfide	24-hr	4.8E-04	3.9E-03	4.8E-04	5.4E-03	9.4E-03	2.2E-01	3035%	149.7%	-
Indeno[1,2,3-cd]pyrene	year	1.7E-09	1.4E-08	1.7E-09	2.0E-08	3.4E-08	2.9E-04	1%	0.0%	1.5E-07
Manganese & Compounds	24-hr	3.6E-07	3.0E-06	3.6E-07	4.1E-06	7.1E-06	1.7E-04	15%	0.8%	3.1E-05
Mercury, Elemental	24-hr	2.5E-07	2.0E-06	2.5E-07	2.8E-06	4.9E-06	1.2E-04	106%	5.3%	2.1E-05
Naphthalene	year	5.8E-07	4.8E-06	1.0E-05	1.2E-04	1.2E-04	1.1E+00	453%	22.6%	5.4E-04
Nickel & Compounds, NOS	year	2.0E-06	1.6E-05	2.0E-06	2.3E-05	3.9E-05	3.4E-01	1109%	55.4%	1.7E-04
Nitrogen dioxide	1-hr	NA	1.5E-01	NA	3.4E-01	4.9E-01	4.9E-01	107%	56.5%	-
Propylene	24-hr	5.0E-04	4.2E-03	2.3E-03	2.6E-02	3.1E-02	7.3E-01	7%	3.3%	-

Table 2

Toxic Air Pollutant Emissions and Comparison with De Minimis and SQER Thresholds

Toxic Air Pollutant	Averaging Period	TAP Emissions, lb/hr				TAP Summary				HAP Emissions, ton/yr
		Boiler		Flare						
		Emission Factor, lb/MMBtu*	Heat Input Rate = 8.23 MMBtuh	Emission Factor, lb/MMBtu*	Heat Input Rate = 11.39 MMBtuh	lb/hr	lb/ averaging period	% of De Minimis	% of SQER	
Selenium & Selenium Compounds (other than Hydrogen Selenide)	24-hr	2.3E-08	1.9E-07	2.3E-08	2.6E-07	4.5E-07	1.1E-05	0%	0.0%	2.0E-06
Sulfur dioxide	1-hr	8.9E-02	7.3E-01	8.9E-02	1.0E+00	1.7E+00	1.7E+00	380%	145.5%	-
Toluene	24-hr	2.5E-05	2.1E-04	5.5E-05	6.3E-04	8.4E-04	2.0E-02	0%	0.0%	3.7E-03
Vanadium (fume or dust)	24-hr	2.2E-06	1.8E-05	2.2E-06	2.5E-05	4.3E-05	1.0E-03	279%	13.9%	-
Xylene (mixture)	24-hr	1.9E-05	-	2.8E-05	3.1E-04	3.1E-04	7.5E-03	1%	0.0%	1.4E-03
									Total:	0.29

Notes:

* Based on 1050 MMBtu/scf NG.

‡ H_2S and SO_2 emissions based on H_2S destruction efficiency.

Table 3
Stack Release Parameters

Parameter	Boiler	Flare
Model Source ID	BLR_DG	FLARE
Emission Units	Boiler – biogas firing	Flare
Stack Release Type	Vertical, unimpeded	Vertical, unimpeded
Easting X, m	337156	337145
Northing Y, m	5128387	5128492
Base Elevation, m	126.35	126.90
Stack Height, ft	40	25
Temperature, °F	416	860
Exit Velocity, fps	32.23	30.35
Stack Diameter, ft	1.33	4.17

Table 4
Modeled Pollutants, Averaging Times, and Output Selections

Air Pollutant	Averaging Time	Selected Output	Purpose(s)
Sulfur Dioxide	1-hr	1st-highest maximum daily 1-hr result averaged over 5 years	Comparison with Significant Impact Level
	3-hr	Highest maximum 3-hr average	
	24-hr	Highest maximum 24-hr average	
	Annual	Highest maximum annual average	
Nitrogen Dioxide	1-hr	1st-highest maximum daily 1-hr result averaged over 5 years	
	Annual	Highest maximum annual average	
$PM_{2.5}$	24-hr	1st-highest maximum 24-hr result averaged over 5 years	
	Annual	Highest maximum annual result averaged over 5 years	
Carbon Monoxide	1-hr	Highest maximum 1-hr average	
	8-hr	Highest maximum 8-hr average	
7,12-Dimethylbenz[a]anthracene	Annual	Highest maximum annual average	Comparison with Toxic Air Pollutant ASIL
Cadmium and compounds	Annual	Highest maximum annual average	
Chromium(VI) and compounds	Annual	Highest maximum annual average	
Ethylbenzene	Annual	Highest maximum annual average	
Formaldehyde	Annual	Highest maximum annual average	
Hydrogen Sulfide	24-hr	Highest maximum 24-hr average	
Sulfur Dioxide (as TAP)	1-hr	Highest maximum 1-hr average	

Table 5
Source Emission Rates

Pollutant	Units	Boiler – BG Fired	Flare
Sulfur Dioxide	lb/hr	0.732	1.014
	ton/yr	3.208	4.439
Nitrogen Oxides	lb/hr	0.300	0.683
	ton/yr	1.314	2.993
$PM_{2.5}$	lb/hr	0.060	0.082
	ton/yr	0.261	0.361
Carbon Monoxide	lb/hr	0.304	2.278
7,12-Dimethylbenz[a]anthracene	µlb/hr†	0.125	0.174
Cadmium and compounds	µlb/hr†	8.622	11.93
Chromium(VI) and compounds	µlb/hr†	0.439	0.607
Ethyl Benzene	µlb/hr†	54.1	15,663
Formaldehyde	µlb/hr†	588	12,680
Hydrogen Sulfide	lb/hr	0.0039	0.0054

† µlb/hr = micro-lb/hr.

Table 6
Ambient Impacts Summary

Pollutant	Averaging time	Time Period	Output Option	Impact, µg/m³	Receptor UTM, meters	
					Easting	Northing
Sulfur Dioxide	1-hr	2020-2024	1st-highest maximum daily 1-hr result averaged over 5 years	17.29	336900.0	5128425.0
	3-hr	2020	Maximum 3-hr average	12.25	337375.0	5128412.5
		2021		13.25	336900.0	5128425.0
		2022		10.62	336875.0	5128562.5
		2023		11.98	337312.5	5128450.0
		2024		11.81	336925.0	5128200.0
		2020-2024	Highest maximum 3-hr average	13.25	336900.0	5128425.0
	24-hr	2020	Maximum 24-hr average	4.58	337287.5	5128612.5
		2021		4.28	337300.0	5128487.5
		2022		3.55	337287.5	5128612.5
		2023		3.93	337287.5	5128600.0
		2024		4.19	337287.5	5128575.0
		2020-2024	Highest maximum 24-hr average	4.58	337287.5	5128612.5
	Annual	2020	Maximum annual average	0.87	337300.0	5128500.0
		2021		0.79	337300.0	5128512.5
		2022		0.75	337300.0	5128512.5
		2023		0.70	337300.0	5128500.0
		2024		0.85	337300.0	5128512.5
		2020 - 2024	Highest maximum annual average	0.87	337300.0	5128500.0

Table 6
Ambient Impacts Summary

Pollutant	Averaging time	Time Period	Output Option	Impact, µg/m³	Receptor UTM, meters Easting	Receptor UTM, meters Northing
Nitrogen Dioxide	1-hr	2020-2024	1st-highest maximum daily 1-hr result averaged over 5 years	6.38	336900.0	5128425.0
	Annual	2020	Maximum annual average	0.36	337287.5	5128587.5
		2021		0.32	337287.5	5128550.0
		2022		0.30	337287.5	5128550.0
		2023		0.27	337287.5	5128550.0
		2024		0.34	337287.5	5128587.5
		2020 - 2024	Highest maximum annual average	0.36	337287.5	5128587.5
$PM_{2.5}$	24-hr	2020-2024	1st-highest maximum 24-hr result averaged over 5 years	0.32	337287.5	5128612.5
		2020 - 2024	Highest maximum annual result averaged over 5 years	0.06	337300.0	5128512.5
Carbon Monoxide	1-hr	2020	Maximum 1-hr average	17.60	337300.0	5128537.5
		2021		18.30	337300.0	5128500.0
		2022		18.32	337287.5	5128550.0
		2023		16.44	337287.5	5128562.5
		2024		16.80	337287.5	5128550.0
		2020-2024	Highest maximum 1-hr average	17.10	337287.5	5128550.0
	8-hr	2020	Maximum 8-hr average	13.35	337287.5	5128600.0
		2021		13.52	337275.0	5128625.0
		2022		13.50	337275.0	5128625.0
		2023		14.02	337287.5	5128600.0
		2024		14.66	337287.5	5128575.0
		2020-2024	Highest maximum 8-hr average	14.66	337287.5	5128575.0

Table 6
Ambient Impacts Summary

Pollutant	Averaging time	Time Period	Output Option	Impact, µg/m³	Receptor UTM, meters	
					Easting	Northing
7,12-Dimethylbenz[a]anthracene	Annual	2020	Maximum annual average	1.48E-07	337300.0	5128500.0
		2021		1.34E-07	337300.0	5128512.5
		2022		1.28E-07	337300.0	5128512.5
		2023		1.19E-07	337300.0	5128500.0
		2024		1.46E-07	337300.0	5128512.5
		2020 - 2024	Highest maximum annual average	1.48E-07	337300.0	5128500.0
Cadmium and compounds	Annual	2020	Maximum annual average	1.02E-05	337300.0	5128500.0
		2021		9.26E-06	337300.0	5128512.5
		2022		8.83E-06	337300.0	5128512.5
		2023		8.23E-06	337300.0	5128500.0
		2024		1.01E-05	337300.0	5128512.5
		2020 - 2024	Highest maximum annual average	1.02E-05	337300.0	5128500.0
Chromium(VI) and compounds	Annual	2020	Maximum annual average	5.19E-07	337300.0	5128500.0
		2021		4.71E-07	337300.0	5128512.5
		2022		4.50E-07	337300.0	5128512.5
		2023		4.19E-07	337300.0	5128500.0
		2024		5.12E-07	337300.0	5128512.5
		2020 - 2024	Highest maximum annual average	5.19E-07	337300.0	5128500.0
Ethylbenzene	Annual	2020	Maximum annual average	4.72E-03	337287.5	5128612.5
		2021		3.75E-03	337275.0	5128625.0
		2022		3.25E-03	337275.0	5128625.0
		2023		2.86E-03	337287.5	5128612.5
		2024		4.06E-03	337275.0	5128625.0
		2020 - 2024	Highest maximum annual average	4.72E-03	337287.5	5128612.5

Table 6
Ambient Impacts Summary

Pollutant	Averaging time	Time Period	Output Option	Impact, µg/m³	Receptor UTM, meters	
					Easting	Northing
Formaldehyde	Annual	2020	Maximum annual average	9.80E-02	337300.0	5128537.5
		2021		1.02E-01	337300.0	5128500.0
		2022		1.02E-01	337287.5	5128550.0
		2023		9.15E-02	337287.5	5128562.5
		2024		9.99E-02	337287.5	5128562.5
		2020 - 2024	Highest maximum annual average	1.02E-01	337287.5	5128550.0
Hydrogen Sulfide	24-hr	2020	Maximum 24-hr average	0.024	337287.5	5128612.5
		2021		0.023	337300.0	5128487.5
		2022		0.019	337287.5	5128612.5
		2023		0.021	337287.5	5128600.0
		2024		0.022	337287.5	5128575.0
		2020 - 2024	Highest maximum 24-hr average	0.024	337287.5	5128612.5
Sulfur Dioxide	1-hr	2020	Maximum 1-hr average	18.04	336925.0	5128237.5
		2021		18.40	336900.0	5128412.5
		2022		17.85	336925.0	5128225.0
		2023		18.79	336900.0	5128437.5
		2024		18.65	336925.0	5128262.5
		2020 - 2024	Highest maximum 1-hr average	18.79	336900.0	5128437.5

Table 7
Comparison of Modeled Impact with Significance Thresholds

Pollutant	Averaging Period	Significance Threshold†, µg/m3	Modeled Impact	
			µg/m3	% of ASIL
Sulfur Dioxide	1-hr	30	17.29	58%
	3-hr	25	13.25	53%
	24-hr	5	4.58	92%
	Annual	1.0	0.87	87%
Nitrogen Dioxide	1-hr	7.5	6.38	85%
	Annual	1.0	0.36	36%
$PM_{2.5}$	24-hr	1.2	0.32	27%
	Annual	0.3	0.06	21%
Carbon Monoxide	1-hr	2,000	18	1%
	8-hr	500	14.66	3%
7,12-Dimethylbenz[a]anthracene	Annual	8.50E-06	1.48E-07	2%
Cadmium and compounds	Annual	2.40E-04	1.02E-05	4%
Chromium(VI) and compounds	Annual	4.00E-06	5.19E-07	13%
Ethylbenzene	Annual	4.00E-01	4.72E-03	1%
Formaldehyde	Annual	1.70E-01	1.02E-01	60%
Hydrogen Sulfide	24-hr	9.00E+00	2.44E-02	0%
Sulfur Dioxide	1-hr	6.60E+02	1.88E+01	3%

† Significant Impact Level for criteria air pollutants. Acceptable Source Impact Level for toxic air pollutants.

LambWeston
POSSIBILITIES IN POTATOES

Terry Steinert, Environmental Manager
960 Glade Road N
Pasco, WA 99301

March 3, 2026

via email

Ms. Jenny Filipy
Washington Department of Ecology
4601 N. Monroe St.
Spokane, WA 99205-1295

Re: Lamb Weston, Inc. – Pasco Facility
Notice of Construction – Approval Order No. 24AQ-E012

Dear Ms. Filipy;

Lamb Weston, Inc. (LW) operates a potato processing facility at 960 Glade Road N, Pasco, WA (the "Facility"). The Facility operates under Approval Order No. 24AQ-E012. On July 10, 2025, LW submitted a Notice of Construction (NOC) to construct a tertiary treatment plant that includes a flare and package boiler. Smaller, exempt emergency engines will also be part of the project.

In conjunction with review of the July 10, 2025 NOC, LW respectfully requests the Department of Ecology consider the following revisions to the existing conditions of 24AQ-E012:

- **Remove Condition 4.e.i**. Conditions for a spray tower on the Line 2 Sly 8 Scrubber were demonstrated to not be needed through source testing. This equipment does not exist on the Pasco Sly 8 Scrubber as discussed in previous conversations with Ecology.

- **Modify Condition 4.e.ii.E**. The condition requires temperature monitoring of the liquid inlet inline temperature. Temperature is monitored in the recirculation tank and not in line. Temperature of the recirc tank is believed to be nearly equivalent to the liquid inlet inline temperature. The requested modification more accurately describes the physical setup.

- **Modify Condition 4.f.i**. The condition lists the design specifications of prequench water delivered before the Sly 8 venturi to be a minimum of 8 gpm at 40 psig. This description is a design specification. The system is equipped to monitor prequench flow but not pressure (40 psig is the typical pressure in a water line). Lamb Weston requests the condition reflect that pressure monitoring is not required for compliance demonstration.

• **Modify Condition 5.a**. The Reyco Air Wash and Sly 8 Scrubber have flow meters monitoring the liquid flow rate to each unit. Flow on the Reyco is controlled by manual valve manipulation. Flow on the Sly 8 is controlled by pump pressure but monitored by flow meter. Lamb Weston requests the parenthetical (monitored using pump pressure) be removed as it is not accurate.

• **Remove Condition 5.c**. This condition has been satisfied.

• **Modify Condition 6.f**. The condition requires, among other things, instrumentation to monitor blowdown flow rate and the scrubber liquid pH on the Sly 6 Scrubber. There is a meter on the makeup flow line but not on the blowdown line, so Lamb Weston requests the condition be revised to reflect this. Concerning pH, the original installation included a system that metered caustic into the recirculation tank, controlled by the pH of recirculation water in the tank. Use of the pH control loop was discontinued as the setup resulted in caustic emitted from the stack. In its place, a program of manual caustic addition was implemented based on flow to the scrubber sprays. Lamb Weston is evaluating restarting the caustic metering pump to be controlled from flow to the scrubber sprays. The requirement to monitor scrubber liquor pH is obsolete and Lamb Weston requests that it be deleted.

• **Move Condition 6.h**. This condition is associated with the Sly 6 scrubber on the Lines 7/8 fryers and not the retrogrades. It should be moved under the Production Lines 7 and 8 Requirements section and renumbered as 6.g.

• **Modify Condition 6.h.i**. As with condition 4.f.i, condition 6.h.i lists the design specifications of prequench water delivered before the Sly 6 venturi to be a minimum of 6 gpm at 40 psig. A meter is being installed on this line to measure prequench flow but there is no instrumentation to monitor pressure. Lamb Weston requests the condition reflect that pressure monitoring is not required for compliance demonstration (see previous comment under 4.f.i).

• **Modify Condition 7.e**. The condition references Condition 7.e (itself) for the list of monitoring data that must be recorded and included in source test reports. Lamb Weston believes the reference should be to Condition 6.f

• **Clarify Conditions 8 and 9**. The facility maintains Operations and Maintenance (O&M) manuals for the Reyco Air Wash and the Sly 6 and Sly 8 Scrubbers separately from the refrigeration system which is also regulated under the PSM and RMP programs. These programs are more specific in their requirements. Rather than keep O&M

information in separate documents where consistency is challenging to maintain, Lamb Weston requests that the O&M requirements be allowed in the separate PSM/RMP documents. The condition as currently written implies a single document.

- **Modify Condition 12.e**. Both Sly scrubbers are equipped with pre-quench systems upstream of the venturis. The condition requires weekly inspections but both systems are closed and require control device shutdowns to extract the sprays from the duct work for inspection. Such shutdowns would be impractical and very expensive. Lamb Weston proposes that flow measurement be sufficient for compliance purposes in lieu of physical inspection.

Many of these changes were discussed with Mr. Eric Steffensen during his recent visits to the facility. Removing and moving conditions will result in renumbering subsequent conditions which have not been detailed in this letter. If you have any questions or need further information, please contact Mr. Terry Steinert, Environmental Manager at 509.375.5850 or terry.steinert@lambweston.com.

Thanak you for your consideration of these improvements and clarifications.

Sincerely,

Kerry Volland, Plant Manager

cc: Terry Steinert
Jon McKibben, Lamb Weston