ALLIANT
ENVIRONMENTAL, LLC

October 30, 2020

Albuquerque Environmental Health Department
Air Quality Program, Stationary Source Permitting
1 Civic Plaza, Room 3023
Albuquerque, NM 87102

RECEIVED
ENVIRONMENTAL HEALTH
20 OCT 29 PM 3:08

RE: Albuquerque Bernalillo County Water Utility Authority
Southside Water Reclamation Plant
4201 2nd St. SW, Albuquerque, NM 87105
Air Quality Construction Permit Modification Application

Dear Mr. Tavarez:

Alliant Environmental, LLC (Alliant Environmental) is submitting a new and revised Air Quality Construction permit modification application on behalf of the Albuquerque Bernalillo County Water Utility Authority (Water Authority) for its existing Southside Water Reclamation Plant (SWRP). The SWRP is currently authorized under ATC Permit No. 0786-M3-RV1. This permit modification application includes everything the Air Quality Program and the Water Authority discussed in great detail during the 16 collaborative meetings that were held over the past 16 months and another pre-application meeting held on October 16, 2020 via GoToMeeting (online).

The Water Authority is proposing to update emissions associated with the operation of their existing Southside Water Reclamation Plant and the proposes installation and operation of emissions control equipment on the existing four cogeneration engines. This permit revision will result in significant reductions of nitrogen dioxide (NO2), sulfur dioxide (SO2), carbon monoxide (CO), volatile organic compounds (VOCs) and hazardous air pollutants (HAPs) emissions (more than **550 tons per year in total reductions** for the sum of all criteria pollutants and HAPs being reduced). In addition, the Water Authority will be installing a new coarse screening facility onsite. Emissions from the new screening facility will be controlled with an activated carbon filter.

Air dispersion modeling for both controlled and uncontrolled emissions for all pollutants and respective averaging times for which there is a National or New Mexico Ambient Air Quality Standard was performed and a complete modeling report discussing the results and all modeling files are submitted with this application. A Separate, standalone, air dispersion modeling report and all electronic files is being submitted in addition to the full modeling report in the complete permit modification application, for easier review by the Air Quality Program air dispersion modeling group. Both reports include one data compact disk, each including all electronic permit application and modeling files, including AERMOD files. This provides the Air Quality Program with several copies of the application.

Please note that the Water Authority made some minor changes, in addition to Air Quality Program's comments in its Letter of Administrative Incompleteness to the Water Authority dated September 30, 2020. Such changes include changing one of the emergency generators, adding one emergency generator and updating any data that was not available at the time of the last application submittal. Therefore, emission rates are slightly different compared to the last submittal. In fact, the last application submittal should not be referenced anymore.

If you have any questions regarding this submittal or require additional information, please feel free to contact Charles Leder at (505) 289-3401 or by email at cleder@abcwua.org or me at (505) 205-4819 or by e-mail at mschluep@alliantenv.com.

Sincerely,

ALLIANT ENVIRONMENTAL, LLC

Martin R. Schluep
Principal

Albuquerque Bernalillo County Water Utility Authority
Southside Water Reclamation Plant
Authority-to-Construct Permit No. 0786-M3-RV1
Modification Application

October 30, 2020

Prepared for:

Albuquerque Bernalillo County Water Utility Authority
4201 2nd Street SW
Albuquerque, NM 87105

Prepared by:

Alliant Environmental, LLC
7804 Pan American Fwy. NE, Suite 5
Albuquerque, NM 87109

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ACRONYMS AND ABREVIATIONS

AAQS	Ambient Air Quality Standards
AEHD	Albuquerque Environmental Health Department
AQP	Air Quality Program
EPA	Environmental Protection Agency
^{o}F	Degrees Fahrenheit
ft	feet
gal	Gallon(s)
GLC_{max}	Maximum Ground Level Concentration
H_2S	Hydrogen Sulfide
HAP	Hazardous Air Pollutant
lb/hr	Pounds per hour
MMBtu/hr	Million British thermal units per hour
NESHAPS	National Emission Standards for Hazardous Air Pollutants
NMAC	New Mexico Administrative Code
NSPS	New Source Performance Standards
$PM/PM_{10}/PM_{2.5}$	Particulate Matter & Particulate Matter < 10 or 2.5 microns
POTW	Publicly Owned Treatment Works
PSD	Prevention of Significant Deterioration
tpy	Tons per year
PM	Particulate Matter
ug	Micrograms
m^3	Cubic meter
VOC	Volatile Organic Compounds
yr	Year(s)

1. Introduction

1.1 General Information

In accordance with New Mexico Administrative Code (NMAC) 20, Chapter 11, Part 41 of the Albuquerque Environmental Health Department (AEHD) Air Quality Program (AQP) Rules and Regulations, Albuquerque Bernalillo County Water Utility Authority (Water Authority) is applying for a New Source Review (NSR) construction permit modification for proposed changes to its Southside Water Reclamation Plant (SWRP).

This document includes all required information pertaining to the project. This submittal includes a completed Long Form Application (Long Form) for air pollutant sources in Bernalillo County, process flow diagrams, process descriptions, an area map, plot plans, emissions calculation data, 20 NMAC Chapter 11, Part 41 General Application Requirements, and permit application review fee assessment.

Technical questions regarding the application may be referred to:

Mr. Charles Leder
4201 2nd Street, SW
Albuquerque, NM 87105
(505) 289-3401

Certification by the applicant's official representative that the information in this application is accurate is included with the Application Long Form included in Appendix B. The completed City of Albuquerque Environmental Health Department (AEHD) permit application checklist is also located in Appendix B to ensure that the required items have been included in this application.

2. Process Descriptions & Process Flow Diagrams

2.1 Overview

The Water Authority owns and operates the SWRP which is a publicly owned treatment works (POTW) and treats up to 76 million gallons per day of wastewater collected in Albuquerque and Bernalillo County. The treated water is discharged into the Rio Grande River. The treatment process creates digester gas which is combusted in cogeneration engines that drive electrical generators to produce electricity. Of the total amount of power generated, 97% is used on-site with the remainder sold to PNM. In addition to treated water and electricity, the facility produces dewatered sludge, some of which is processed into compost at an off-site facility (Soils Amendment Facility located approximately 13 miles from the SWRP site) and sold. The facility operates under Standard Industrial Classification (SIC) 4952, Sewerage Systems, or North American Industrial Classification System Code 221320, Sewage Treatment Facilities. The SWRP is located at 4201 2nd Street SW in Albuquerque, New Mexico. A site location map of the facility is shown in Figure 2.1 on page 2-7. Two facility plot plans are provided in Figure 2.2 and 2.3 on pages 2-8 and 2-9. The facility operates 24 hours per day, 7 days per week, 52 weeks per year. Equipment and processes used at the facility are explained in this section and process flow diagrams can be seen in Figures 2-4 and 2-5 starting on page 2-10.

Over the last few years, the Water Authority has implemented procedures to reduce H_2S emissions from the SWRP wastewater. Injections of ferric chloride ($FeCl_3$) in the collection system, upstream of the SWRP, and injections of hydrogen peroxide at the SWRP and elsewhere in the upstream collection system have shown to reduce dissolved sulfides such as Hydrogen Sulfide (H_2S) in the SWRP wastewater stream. The $FeCl_3$ reacts with the H_2S and allows it to settle out of the water instead of being emitted to the air. Upstream wastewater pH adjustments are also being made to assist in the removal of dissolved sulfides from the influent water.

2.2 Coarse Screening Facility at Valley Interceptor (EU: 1)

The Water Authority is proposing to add an additional pretreatment source to this permit, the Coarse Screening Facility at Valley Interceptor (Emission Unit (EU): 1), which will be installed at the Valley Interceptor location within the property boundaries of the SWRP. H_2S emissions at the Coarse Screening Facility will be controlled with an activated carbon filter. This includes foul air collected from the head space of covered flow channels in the building and all ventilation air exhausted from the building. Other pollutants emitted at the Coarse Screening Facility include Volatile Organic Compounds (VOCs) and Hazardous Air Pollutants (HAPs). No control efficiencies are being claimed for VOCs and HAPs. The Coarse Screening Facility is enclosed within a building; therefore, under normal operating conditions, it assumed that 100% of the fugitive emissions are captured.

2.3 North Preliminary Treatment Facility (EU: 2)

Wastewater from the Water Authority's collection system is conveyed to the SWRP for processing and final discharge to the Rio Grande. The SWRP is permitted by the USEPA under NPDES Permit #NM0022250 to treat up to 76 million gallons per day (MGD) of wastewater.

The process begins with the screening of the influent stream to collect any large solids such as boards, rocks, and other debris. The flow stream is then sent to grit removal facilities to extract the fine grit and dirt in the flow stream. The effluent is then sent to the primary clarifiers. Potential emissions to the air from the North Preliminary Treatment Facility (PTF) include: VOCs, HAPs, and H_2S. H_2S Emissions from the PTF are controlled with two Bohn biofilters and an activated carbon filter. These devices treat foul air collected from the head space of covered flow channels in the North PTF. Fugitive emissions from storage bins that store screening and grit materials are collected by foul air ducts above the bins and treated by one of the Bohn biofilters. Field measurements collected by the Water Authority showed that H_2S concentrations measured in the bins that store screening and grit material are less than 20 parts per billion (ppb). The PTF roll-off dumpster H_2S study is included in Appendix A. No control efficiencies for HAPs and VOCs are being claimed for the biofilters or the activated carbon filter.

The North Preliminary Treatment Facility was commissioned in August of 2015 and replaced facilities formerly used for this purpose that are located immediately south and referred to as "the old PTF". The Air Quality Program acknowledged the decommissioning of the old PTF (see Appendix I). With this permit revision application, the Water Authority requests approval of the construction and operation of the new North PTF commissioned in August of 2015.

2.4 Primary Clarifiers (EU: 3-10)

SWRP uses primary clarifiers (PCs) to separate the settleable solids, floating solids, and greases (all of these combined materials are called sludge) from the liquid. The clarified liquid and the collected sludge continue through the treatment process as two separate flow streams. The sludge streams are pumped to a Sludge Blending Tank where they combine with other waste streams prior to introduction into the digestion system. The clarified liquid is pumped to the activated sludge process tanks (Activated Sludge and Nitrogen Removal System) for further treatment. Potential emissions to the air from the primary clarifiers include VOCs, HAPs, and H_2S. The Water Authority recently completed renovations on its four largest, 150-foot diameter primary clarifiers (PCs 5-8) that provide all required primary treatment for the maximum permitted wastewater flow of 76 MGD. These four 150-foot diameter units are each equipped with dome covers that collect all emissions from the primary treatment process. A new air handling system collects foul air from beneath the covers and conveys it to a Bohn biofilter to control H_2S. The Bohn biofilter replaced four smaller compost media biofilters that had previously been used to control H_2S emissions collected from PCs 5-8 (one biofilter per clarifier). No control efficiencies by this device are being claimed for any HAP or VOC compounds present in the foul air. With this permit revision application, the Water Authority requests approval of the construction and operation of the new Bohn biofilter that replaced the four smaller compost media biofilters. The four smaller biofilters were demolished as part of the renovations of PCs 5-8.

With the completion of major renovations to PCs 5 - 8, the four smaller, 120-foot diameter primary clarifier units (PCs 1-4) will rarely be used. These times will be limited to when one of the four PC 5-8 units needs to be taken from service for inspection, maintenance, or repair. During these times, PCs 2 and 4 will be placed in service to take the place of one of the larger PC

5-8 units. PCs 2 and 4 currently have air collection systems for the outlet weirs of each tank along with compost media biofilters that remove H_2S from the collected air. These two clarifiers are being upgraded to have dome covers like those on PCs 5-8 which will give 100% capture of fugitive emissions from PCs 2 and 4. The odorous air collected from each clarifier will be treated using an activated carbon filter to control H_2S. There will be one carbon filter system for each clarifier. The clarifier dome covers and carbon filters are now being designed by the Water Authority with construction planned during calendar year 2021. No control efficiencies by the future carbon filters are being claimed for any HAP or VOC compounds present in the collected air.

The remaining two PC units (PCs 1 and 3) are being converted into simple holding tanks that will only be used to temporarily store wastewater when needed to perform certain plant maintenance procedures during low flow conditions or during emergency conditions. As described, PCs 1 and 3 will no longer be used to provide primary treatment at SWRP. Potential VOC, HAP and H_2S emissions for these two holding tanks are included in the emission calculations provided in Appendix A.

2.5 Activated Sludge and Nitrogen Removal System (EU: 11a – 14b)

The clarified liquid is sent to fourteen (14) large basins that have been configured to remove dissolved ammonia and remaining carbonaceous wastes in the water by both anoxic (without free oxygen) and aerobic (aerated) processes using separate chambers with mixers and aeration systems. The process uses “activated sludge” which is a combination of various microbes that break down wastes in the liquid and grow more microbes. These microbes release CO_2 and nitrogen gases. The treated effluent is then sent to final clarifiers to separate the activated sludge from the liquid. Potential emissions to the air from this aerobic biological treatment are VOCs and HAPs.

2.6 Final Clarifiers (EU: 15-26)

The twelve (12) final clarifiers separate the activated sludge by sedimentation from the liquid stream. From the final clarifiers the effluent is sent to the ultra-violet disinfection facility for final disinfection of the liquid. The heavier sludge or Return Activated Sludge (RAS) is collected and pumped back into the head of the basins to repeat the treatment process again to keep the microbe population at the desired level. A portion of the activated sludge is wasted and pumped to the Secondary Sludge Thickening process as Waste Activated Sludge (WAS) to be thickened. Potential emissions to the air from the final clarifiers are VOCs and HAPs.

2.7 Ultra-Violet Disinfection Facility (EU: 37)

All effluent from the Final Clarifiers is filtered by a set of 2-millimeter screens designed to remove candy wrappers, fruit labels, algae, etc. and is then irradiated with Ultra-Violet (UV) light to neutralize pathogens. There are three sets of parallel channels equipped with banks of UV lamps that perform the disinfection. Each UV channel has a capacity to treat 60 MGD of effluent. The UV Disinfection system was placed in service in April 2011 and followed the decommissioning of the formerly used Chlorination and Dechlorination Facility. Air emissions from the UV disinfection system and process are negligible. Combustion emissions associated with the emergency diesel generator (EU: 37) located at this facility are accounted for.

2.8 Secondary Sludge Thickening (DAF/RDT) (EU: 32)

The WAS stream is processed to thicken and concentrate the Activated Sludge. The thickened WAS is then pumped to the Sludge Blending Tank. The clarified liquid stream is returned to the Activated Sludge and Nitrogen Removal System basins for further processing. The thickening process currently in use at SWRP is Dissolved Air Flotation (DAF). This process takes a mixture of WAS, polymer coagulant, and clarified effluent that has been supersaturated with air to cause the sludge solids to “float” and thicken. Air emissions from the Secondary Sludge Thickening process include VOCs. The Water Authority is in the process of changing its Secondary Sludge Thickening process to one that uses Rotary Drum Thickeners (RDTs). In comparing the current DAF process with the RDT process being installed, VOC emissions from the process are expected to be the same or less with RDTs because they don’t use compressed air in the thickening process that can otherwise promote the stripping of VOC compounds in WAS.

2.9 Sludge Blending Tank (EU: 48)

The sludge streams from Secondary Sludge Thickening and Primary Clarifiers are pumped to and mixed in the Sludge Blending Tank. The mixture from the tank is introduced into ten (10) Primary Digesters for further breakdown. The effluent from the tank has a solids content less than 10%. Air emissions from the Sludge Blending Tank are limited to those from a ventilation system that pulls odorous, H_2S-laden air from the tank headspace and conveys it for treatment using an activated carbon filter (EU: 48).

2.10 Anaerobic Digesters and Cogeneration Facilities (EU: 27-30)

The sludge stream from the sludge blending tank is introduced into the ten (10) anaerobic primary digesters for a period of approximately three (3) weeks where the sludge is mixed and maintained at 98 degrees Fahrenheit (°F) to allow anaerobic breakdown of sludge solids and grease into primarily methane (CH_4) and carbon dioxide (CO_2) gases. The digested sludge is then pumped to the four (4) Secondary Digesters for additional digestion and storage of the digested sludge before sending the sludge to the dewatering facility. The gas stream from the digesters is collected and stored until it is compressed and sent to the SWRP's cogeneration engines where power is generated and heat recovered to warm the digesters and for SWRP building heat. The digested liquid mixture is sent to a dewatering facility to increase the solids to approximately 20% before disposal off site. The sludge is returned to the headworks of the SWRP to be reprocessed. Air emissions are negligible from the digesters. Principal combustion emissions from the cogeneration engines (EU: 27, 28, 29, and 30) are nitrogen oxides (NO_x), carbon monoxide (CO), Volatile Organic Compounds (VOC), sulfur dioxide (SO_2), particulate matter (PM), and hazardous air pollutants (HAPs).

This permit modification application proposes a major emissions reductions project for the four cogeneration engines (EU: 27, 28, 29, and 30). The Water Authority will install Selective Catalytic Reduction on all four engines to reduce NO_x emissions by at least 51%. A by-product of SCR control is ammonia. Small amounts of ammonia air emissions will be emitted to the atmosphere as shown in the emission calculations shown in Appendix A. In addition, oxidation catalyst systems will be installed on all four engines to reduce CO by 76% and VOCs and Formaldehyde by 48%, and total HAPs by 44%. Detailed vendor specifications and emission calculations are provided in Appendix A. This major capitol investment will reduce SWRP emissions to below the Prevention of Significant Deterioration (PSD) and major Title V permit threshold, making this site a synthetic minor source.

2.11 Natural Gas Combustion Equipment (EU: 31, 43, and 44)

There is miscellaneous natural gas-fired combustion equipment at the SWRP. This equipment consists of one (1) cogeneration boiler and two (2) high pressure hot water cleaning units (HOTSY's). Natural gas combustion emissions associated with the natural gas combustion equipment include NO_x, CO, SO_2, VOCs, HAPs, and PM. The emissions estimates presented in this permit modification application are conservatively based on the equipments' continuous operation (8,760 hours per year).

2.12 Operational Work Practice

Emissions during malfunction, startup, and shutdown are not expected to differ from regular operations for the water treatment process as the overall process will not be affected. The water treatment process is to operate 8,760 hours per year and as one unit may be shutdown for maintenance, an identical process unit will be operated to account for the shutdown unit.

For fuel-burning equipment, startup and shutdown procedures are normally completed in less than a few minutes. During cold startup, a unit may emit at a higher rate than normal as the unit warms up to operating temperature; however, if the unit has been shutdown for a sufficiently long time that a warm up is required, the small excess emissions occurring during warm up will be more than offset by the lack of emission during the shutdown period. Similarly, if the unit is restarted while warm there should be no excess emissions as the unit is already at operating temperature.

Any emissions during malfunction, startup, and shutdown will be minimized through the application of industry standard and/or manufacturer recommended operating and maintenance practices. The Water Authority's engineers and trained technicians are responsible for the timely and effective execution of these actions.

The Water Authority will comply with the requirements of 20.11.41 NMAC, and 20.11.42 NMAC including taking the appropriate steps to minimize emissions. A detailed Operating and Maintenance Strategy for the site's engines and boilers is located in Appendix D.

2.13 Flares (EU: 34-36)

The SWRP operates three co-located gas flares used to flare digester gas if the cogeneration engines can't burn all the digester gas. Emissions associated with the flares include NO_x, CO, PM, SO_2, H_2S, VOCs and HAPs. The annual operation of the flares will be limited to 2,160 hours per year per flare.

2.14 Emergency Generator Engines (EU: 37-42 and 50)

Combustion emissions associated with the diesel-powered emergency generator engines include NO_x, CO, SO_2, VOCs, HAPs, and PM. The controlled emissions estimates presented in this permit modification application for the emergency engines are based on 200 hours per year operation per emergency generator engine.

2.15 Unleaded Gasoline Fuel Tank (EU: 33)

A 2,000 gallon unleaded gasoline storage tank and dispensing facility is operated at the site to fuel SWRP's vehicle fleet as needed. VOC emissions are emitted to the air from this facility.

2.16 Odor Control Units (EU: 45-49)

In addition to the above discussed control systems, the SWRP operates the following additional odor control systems to control H_2S emissions:

- Tijeras Canyon Interceptor Carbon System (EU: 45 activated carbon filter)
- South Blower Building Carbon System (EU: 46 activated carbon filter)
- South Activated Sludge Pump Station Carbon System (EU: 47 activated carbon filter)
- Sludge Blending Tank Carbon System (EU: 48 activated carbon filter)
- Sludge Dewatering Facility Bohn Biofilter (EU: 49 Bohn biofilter)

2.17 Exempt Sources

An inventory of exempt miscellaneous natural gas fueled combustion sources is included in the emission calculations. These sources are boilers or water heaters used for comfort heating or domestic hot water.

1:20000 scale

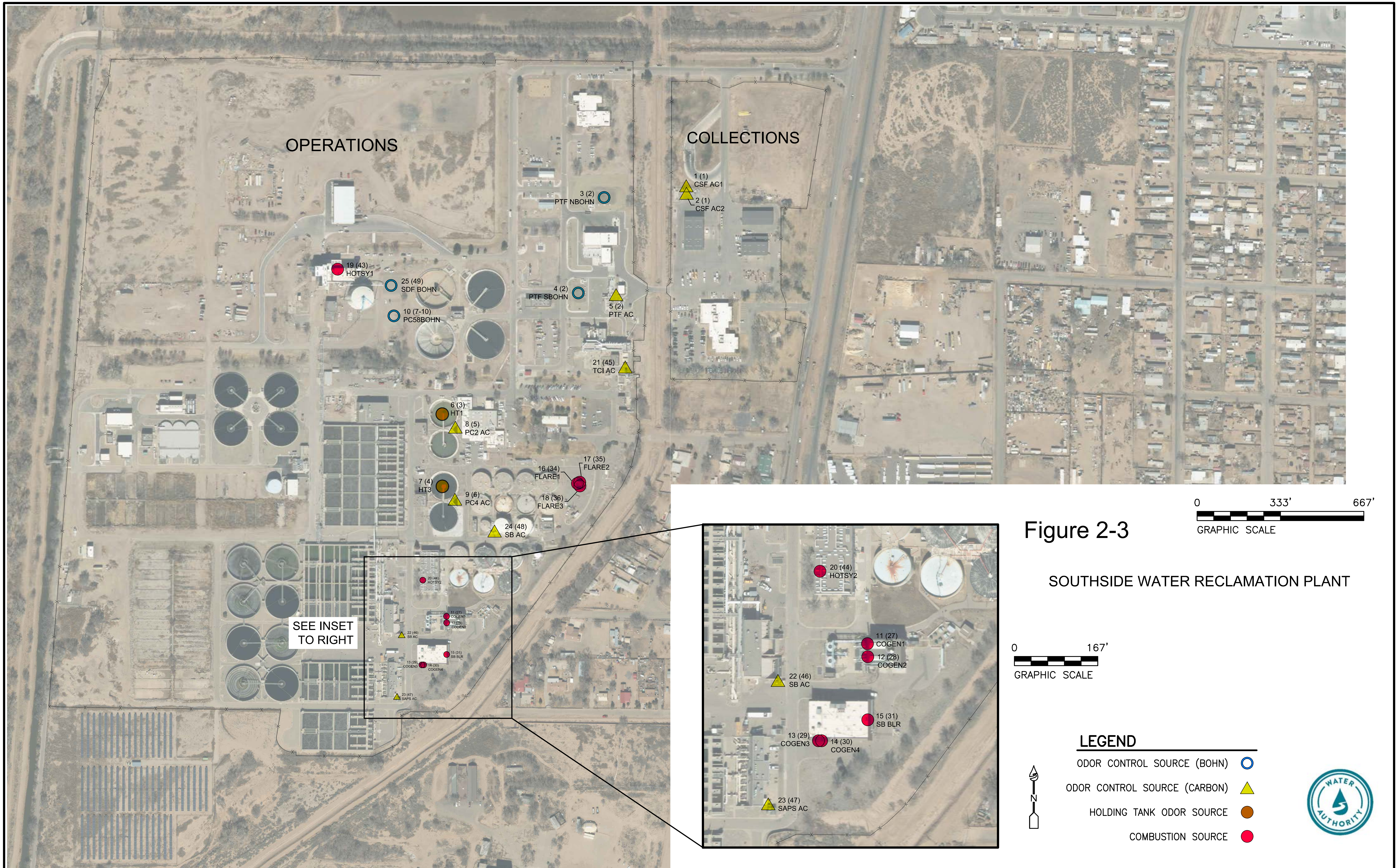
Universal Transverse Mercator (UTM) Projection Zone 13
North American Datum of 1983

Magnetic declination of 9E at center of map on March 17, 2011

ALLIANT ENVIRONMENTAL, LLC			**Area Map**	**Albuquerque Bernalillo County Water Utility Authority**		
Scale: 1:20,000	Drawn by: MDF	Date: 8/20/2020	**Southside Water Reclamation Plant** N 35° 1' 1.7" Latitude W 106° 39' 57.7" Longitude	Project No.: 082-002	File Name: **SWRP Area Map**	Figure: 2-1
	Chk'd by:	Date:				

Albuquerque Bernalillo County
Water Utility Authority

SOUTHSIDE WATER RECLAMATION PLANT (SWRP)
GENERAL SITE PLAN



LEGEND

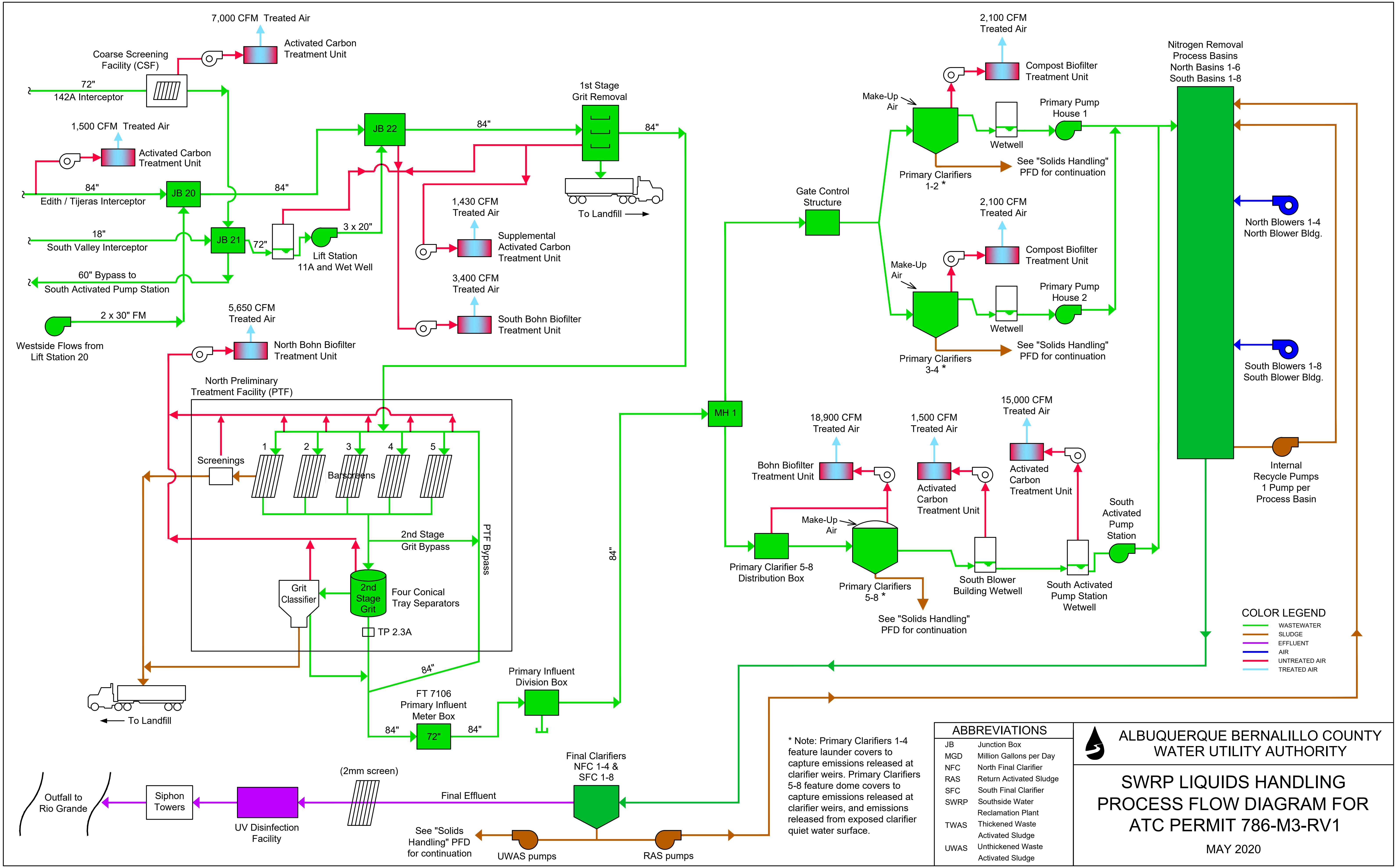
ODOR CONTROL SOURCE (BOHN)	○
ODOR CONTROL SOURCE (CARBON)	▲
HOLDING TANK ODOR SOURCE	●
COMBUSTION SOURCE	●

Figure 2-3

SOUTHSIDE WATER RECLAMATION PLANT

June 2020

C:\Users\esilva\Documents\a) Projects\Leica SWRP Field Genius Surveys\SWRP fence survey Nov 2019\June 2020 emissions exhibit for Charlie\SWRP UTM metric Emission source points converted back to NMSP for imagery 06–09–20.dwg LT: 11x17 Plotted: June 9, 2020



COLOR LEGEND

🟩	WASTEWATER
🟫	SLUDGE
🟪	EFFLUENT
🟦	AIR
🟥	UNTREATED AIR
🟦	TREATED AIR

* Note: Primary Clarifiers 1-4 feature launder covers to capture emissions released at clarifier weirs. Primary Clarifiers 5-8 feature dome covers to capture emissions released at clarifier weirs, and emissions released from exposed clarifier quiet water surface.

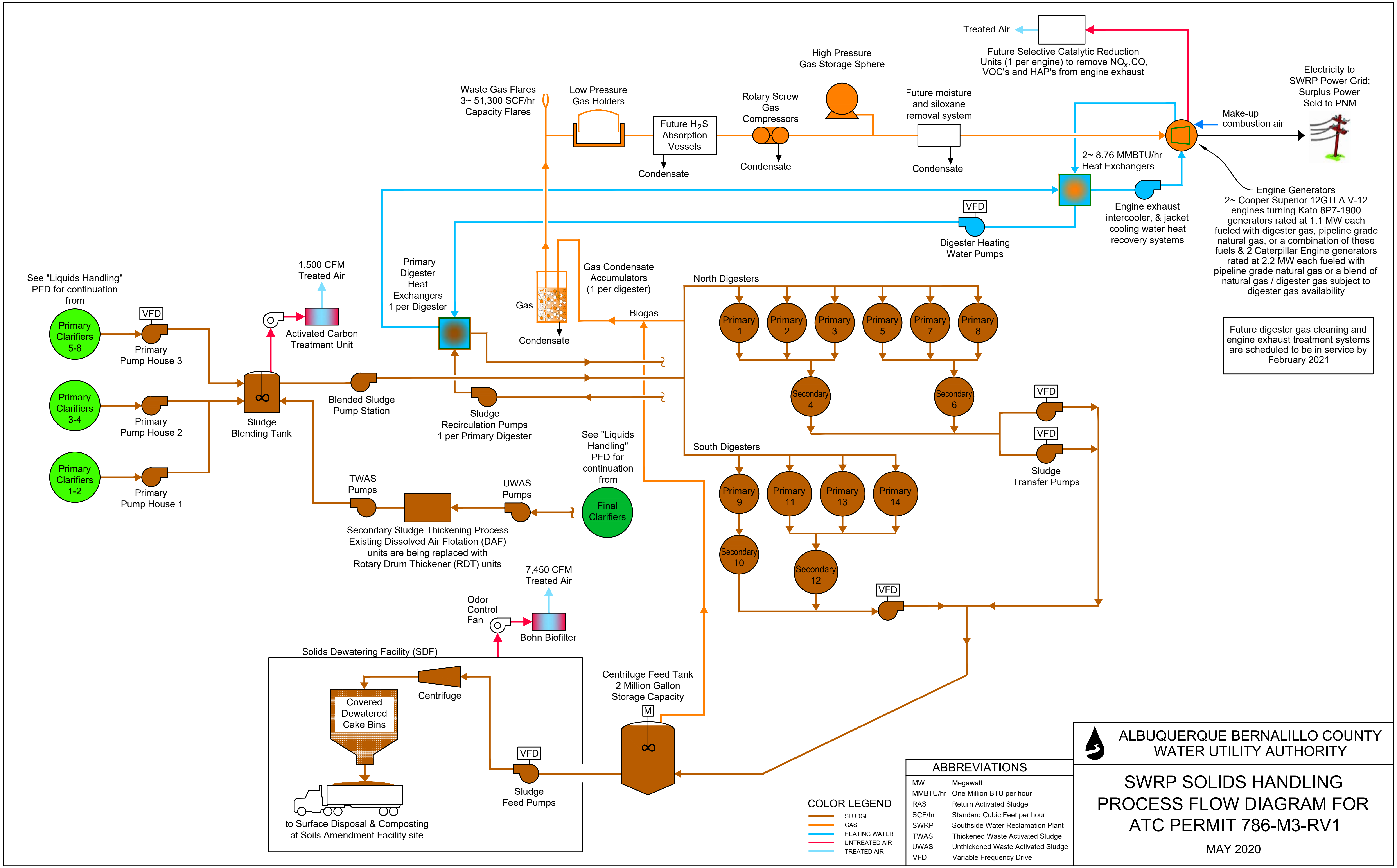
ABBREVIATIONS

JB	Junction Box
MGD	Million Gallons per Day
NFC	North Final Clarifier
RAS	Return Activated Sludge
SFC	South Final Clarifier
SWRP	Southside Water Reclamation Plant
TWAS	Thickened Waste Activated Sludge
UWAS	Unthickened Waste Activated Sludge

ALBUQUERQUE BERNALILLO COUNTY
WATER UTILITY AUTHORITY

SWRP LIQUIDS HANDLING PROCESS FLOW DIAGRAM FOR ATC PERMIT 786-M3-RV1

MAY 2020



ALBUQUERQUE BERNALILLO COUNTY
WATER UTILITY AUTHORITY

SWRP SOLIDS HANDLING PROCESS FLOW DIAGRAM FOR ATC PERMIT 786-M3-RV1

MAY 2020

ABBREVIATIONS

MW	Megawatt
MMBTU/hr	One Million BTU per hour
RAS	Return Activated Sludge
SCF/hr	Standard Cubic Feet per hour
SWRP	Southside Water Reclamation Plant
TWAS	Thickened Waste Activated Sludge
UWAS	Unthickened Waste Activated Sludge
VFD	Variable Frequency Drive

3. Project Discussion

3.1 Project Summary

This permit modification application proposes the following:

- Update all Emission Unit (EU) numbers associated with the SWRP;
- Update all water treatment process equipment emissions (clarifiers, activated sludge, final clarifiers, etc.) using TOXCHEM as approved by the Air Quality Program to estimate emissions for VOCs, HAPs, and H_2S;
- Update emissions associated with the cogeneration engines (EU: 27, 28, 29, and 30). The revised uncontrolled emissions are based on updated Caterpillar engines (EU: 27 and 28) horsepower ratings; changes to all four engines' brake specific fuel consumption; the use of 7-year average stack test data; NO_x, CO, and VOC emission factors from 40 CFR Part 60, Subpart JJJJ for EU: 29; updated PM emission factors to match PM_{10} and $PM_{2.5}$ factors; and updated HAP emission estimates for formaldehyde and total HAPs from all combustion equipment. The cogeneration units will be equipped with Selective Catalytic Reduction (SCR) and oxidation catalyst to control and considerably reduce NO_x, CO, VOC, and HAPs; Prior to being used as an engine fuel source, the digester gas will be treated to remove H_2S, moisture, and siloxanes to help preserve the life of catalyst media in the engine emission treatment systems;
- The North Preliminary Treatment Facility (PTF) was commissioned in August of 2015 and replaced facilities formerly used for this purpose that are located immediately south and referred to as "the old PTF". With this permit revision application, the Water Authority requests approval of the construction and operation of the new North PTF commissioned in August of 2015, including emissions for VOC, HAP, and H2S which will be routed to a combination of two bohn biofilters and an activated carbon unit to control H_2S;
- Permit VOC, HAP and H_2S emissions for a new coarse screening facility (EU: 1) which will be routed to an activated carbon filter to control H_2S emissions;
- Clarifiers #1 and #3 will be re-purposed as holding tanks to store waste water in case of emergencies or for maintenance purposes on Clarifiers #5 through #8.;
- Clarifiers #2 and #4 weirs were covered and are only used as back-up for emergencies or for maintenance on Clarifiers #5 through #8;
- Clarifiers #5 through #8 have been covered and emissions will now be treated by one Bohn biofilter;
- Update NO_x, CO, and VOC emission factors for the flares to use factors more representative of wastewater treatment digester gas and site-specific data;
- Update the VOC emissions for the unleaded gasoline fuel storage tank to account for the worst-case scenario of gasoline (RVP 13) storage throughout the year;
- For the UV Facility Emergency Generator, the SO_2 emission rate calculation was modified to account for the permit requirement for the use of ultra-low sulfur diesel fuel as per 40 CFR 80.510(b);
- Update information and number of proposed on-site emergency generators;

- Revise H_2S control efficiencies from all activated carbon filters and biofilters to 98%;
- Update Miscellaneous External Combustion Sources sources and emissions based on process specific fuel-burning equipment.

Based on the proposed controls for the cogeneration engines and associated controlled emission calculations contained in this permit application, the Water Authority is proposing to decrease the SWRP facility-wide limit for NO_x, CO, VOCs, SO_2, $PM_{10}/PM_{2.5}$, formaldehyde and total HAPs. Revised SWRP facility-wide H_2S emissions will slightly increase with the proposed modifications and calculations based on TOXCHEM modeling. Requested facility-wide permit limits can be seen in the AEHD, Air Quality Program Application Long Form in Appendix B and in the detailed emission calculations and equipment and emission factor specific documentation included in Appendix A.

4. Emission Estimates

This section describes the rationale and methodologies used to estimate emissions associated with this permitting action. Table 4-1 shows a summary of all Emission Units and descriptions.

Table 4-1: Emission Units and Descriptions

EU# This Application	Former EU#	Name
1	-	Coarse Screening Facility at Valley Interceptor
2	1	North Prelim Trt Facility (Screenings & Grit Removal)
3-4	3, 5	Primary Clarifier Holding Tanks #1 and #3
5-6	4, 6	Primary Clarifiers #2 and #4
7-10	7-10	Primary Clarifiers #5-8
11a-14b	11a-14b	Activated Sludge Group #11a-11f 12a-12d 13a-13b 12a-14b
15-26	15-26	Final Clarifier #1-12
27	27	Cogeneration Engine #1
28	28	Cogeneration Engine #2
29	29	Cogeneration Engine #3
30	30	Cogeneration Engine #4
31	31	Cogeneration Boiler
32	62	Secondary Sludge Thickening (DAF/RDT)
33	67	Unleaded Fuel Tank
34-36	70-72	Gas Flare #1, #2, #3
37	75	UV Facility Emergency Generator
38	-	North PTF Emergency Generator 0.5 MW
39	-	PPH1/2 Emergency Generator 1 MW
40	-	SAPS Emergency Generator 2 MW
41	-	Blower Bldg. Emergency Generator 3 MW
42	-	North Blower Bldg. Emergency Generator 0.75 MW
43	-	Dewatering Bldg. "HOTSY"
44	-	DAF/RDT Bldg. "HOTSY"
45	-	Tijeras Canyon Interceptor Carbon System
46	-	South Blower Building Carbon System
47	-	South Activated Sludge Pump Station Carbon System
48	-	Sludge Blending Tank Carbon System
49	-	Sludge Dewatering Facility Bohn Biofilter
50	-	Wang Server Room Emergency Generator 0.15 MW
51	-	Paved Haul Roads

Note: Former EU# refers to the numbering listed in ATC Permit #786-M3

4.1 Wastewater Treatment Process Emissions (EU: 1 through 26 and 32)

Emissions of VOCs, HAPs, and H_2S from the wastewater treatment process were estimated using TOXCHEM modeling software with data for compounds present in the raw wastewater. A TOXCHEM Modeling Protocol was approved by the Air Quality Program prior to submittal of the application and is provided in Appendix E whereas Appendix F presents the HAP Inspection and Monitoring Plan used to determine which HAP compounds are present in the raw, untreated wastewater entering SWRP. Information on all process equipment and control equipment efficiencies were all verified by Water Authority personnel. Appendix A includes unit-specific uncontrolled and controlled emission rate calculations and explanations. All uncontrolled annual emission rates are based on 8,760 hr/yr.

4.2 Combustion Equipment Emissions

4.2.1 Cogeneration Engines (EU: 27 through 30)

The uncontrolled emissions for NO_x, CO and VOC from cogeneration engines EU: 27, 28, 30 were estimated using stack test data, averaged over the last seven (7) years and 8,760 hours per year (hr/yr) operation. Engine EU: 29 emissions for NO_x, CO and VOC were estimated using 40 CFR Part 60, Subpart JJJJ factors for four-stroke lean burn (4SLB) engines, with a horsepower greater than 500, burning digester gas as fuel, and manufactured after July 1, 2010. EU: 29 is the only cogeneration engine manufactured after July 1, 2007 and is therefore the only engine with 40 CFR 60 Subpart JJJJ applicability.

SO_2 emissions from all engines were estimated using engine test data, averaged over the last six (6) years (SO_2 was not tested for in 2014). PM and HAP emissions are based on AP-42 Chapter 3, Table 3.2-2 (07/2000) factors for 4SLB engines. Manufacturer, nameplate, or stack test data (horse power, fuel flow rates, etc.) were used, as applicable. Controlled emission rates are based on lower than vendor guaranteed control efficiencies. Detailed emission calculations are included in Appendix A.

4.2.2 Natural Gas Combustion Equipment (EU: 31, 43, and 44)

Emissions for NO_x, CO, VOC, HAP, SO_2, and PM from EU: 31 (Cogeneration Boiler), EU: 43 and EU: 44 (HOTSY's – high pressure hot water cleaning units) were estimated using AP-42, Chapter 1.4 (External Combustion Sources, Natural Gas Combustion, 07/1998) emission factors. Manufacturer or nameplate data were used to estimate emissions, as applicable.

4.3 Other Equipment

4.3.1 Flares (EU: 34 through 36)

Flare emissions were estimated using AP-42 Chapter 1.4 for VOC, HAP, and PM emissions from natural gas combustion, AP-42 Chapter 13.5 for NO_x and CO from industrial flares, and site-specific digester gas H_2S concentrations for H_2S and SO_2 emissions.

4.3.2 Unleaded Gasoline Storage Tank (EU: 33)

Emissions from the 2,000 gallons capacity unleaded gasoline tank were estimated using EPA's TANKS 4.0.9d program. Gasoline (RVP 13) was used for the tank's contents, as a worst-case scenario.

4.3.3 Emergency Diesel Generators (EU: 37 through 42 and EU 50)

Manufacturer data (emission factors and rates), EPA Tier 2 factors, and AP-42 Chapter 3.3 for engines 600 hp or less and Chapter 3.4 for engines greater than 600 hp emissions factors for NO_x, CO. VOC, SO_2 and PM was used to estimate emission from the emergency diesel generators. HAP emissions factors from AP-42 Chapter 3.3 and 3.4 (10/1996) Table 3.4-3 and 3.4-4 were used to calculated HAP emissions from the emergency generators.

4.3.4 Odor Control Units (EU: 45 through 49)

Site specific flow rates and samples H_2S inlet concentrations were used in the TOXCHEM model to estimate H_2S emissions from the following odor control units:

- Tijeras Canyon Interceptor Carbon System (EU: 45 activated carbon filter)
- South Blower Building Carbon System (EU: 46 activated carbon filter)
- South Activated Sludge Pump Station Carbon System (EU: 47 activated carbon filter)
- Sludge Blending Tank Carbon System (EU: 48 activated carbon filter)
- Sludge Dewatering Facility Bohn Biofilter (EU: 49 Bohn biofilter)

The control efficiency used for all H_2S controls is 98%. Documentation to prove that 98% reduction in H_2S emission is applicable is provided in Appendix G.

Appendix A shows detailed emission calculations for the SWRP equipment and processes and a summary of proposed facility-wide emissions.

5. Air Quality Impacts Analysis

The Water Authority is required to demonstrate compliance with National and New Mexico Ambient Air Quality Standards (N/NMAAQS) for all criteria pollutants (NO_2, CO, SO_2, $PM_{2.5/10}$, and H_2S). Per the Air Quality Program's specific request, all criteria pollutants and averaging times were modeled for the proposed uncontrolled and controlled emissions rates. Since the engine control installation process will take some time, two modeling scenarios have been prepared and both uncontrolled and controlled emission rates were modeled. Scenario 1 (Phase 1) includes uncontrolled emission rates, except for EU: 27, Caterpillar engine #1. This will be the first cogeneration engine to get controls installed. This is proposed as Phase 1 of the engine controls installation, which reflects the worst case in terms of emission rates since the engine will not operate until the controls are installed. After this engine is controlled, EU: 28 will be taken off line for installation of controls and so forth until all cogeneration engines operate with controls. Once the controls are installed, the engines will automatically turn off in case of control failure.

The following pollutants and averaging times were modeled and evaluated against their respective National/New Mexico Ambient Air Quality Standards (N/NMAAQS):

- 1-Hour and Annual NO_2
- 1-, 3-, 24-Hour and Annual SO_2 (Note: if the model passes the 1-hr SO_2 N/NMAAQS, the 3-hr, 24-hr and annual standards are automatically met as well)
- 1-Hour and 8-Hour CO
- 24-Hour and Annual $PM_{2.5}$
- 24-Hour PM_{10}
- 1-Hour H_2S

The Southside Water Reclamation Plant is located in an area that is classified by the United States Environmental Protection Agency (US EPA) as in attainment with the NAAQS for all regulated pollutants. The impact analysis demonstrates that all criteria pollutants and all associated averaging periods are less than the respective N/NMAAQS at the SWRP fence line or beyond. A detailed modeling report is provided in Appendix H.

6. Regulatory Applicability

6.1 Compliance with AEHD AQP NMAC Rules and Regulations

20.11.1 NMAC – General Provisions

20.11.1 NMAC adopts non-enforceable air quality goals for ambient air quality as well as the enforceable National Ambient Air Quality Standards (NAAQS) and New Mexico Ambient Air Quality Standards (NMAAQS). The NMAAQS, 20.2.3 NMAC, specify maximum allowable ambient concentrations of the criteria pollutants NO_2, CO SO_2, particulate matter (TSP, PM_{10}, and $PM_{2.5}$), total reduced sulfur, and H_2S.

Ambient impacts of process related criteria pollutants are being reduced with this permit revision application and were evaluated in this application. H_2S emissions are to increase with this application and an ambient impact analysis of the NMAAQS was performed for H_2S. The summarized results of the impacts analysis are shown in Section 5 and detailed air quality impacts analysis and report is provided in Appendix H.

20.11.2 NMAC – Permit Fees

The Water Authority will pay the required fees on an annual basis, as required.

20.11.5 NMAC – Visible Air Contaminants

This regulation limits visible emissions from stationary sources. The Water Authority will meet the requirements of this rule.

20.11.8 NMAC – Ambient Air Quality Standards

The Federal and State ambient air quality standards will continue to be met for the SWRP, as discussed in Section 5 and Appendix H.

20.11.20 NMAC – Fugitive Dust Control

This regulation requires the use of reasonable precautions to prevent particulate matter that is generated from becoming airborne. Emissions of particulate matter from the SWRP are predominantly from the combustion of natural gas or digester gas. In addition, there are transient fugitive dust impacts associated with ongoing construction work at the SWRP site. The Water Authority requires all contractors working at the site to comply with the Air Quality Program's requirements for fugitive dust control on construction projects, and will therefore continue to meet applicable requirements of this rule.

20.11.41 NMAC – Construction Permit

The Albuquerque – Bernalillo County Air Quality Control Board Construction Permit regulation, 20.11.41 NMAC applies to every person who intends to construct, operate, modify, relocate or make a technical revision to a source that is subject to 20.11.41 NMAC or who has authority to operate a source that triggers the emission thresholds in Subsection B of 20.11.41.2 NMAC, except as otherwise provided. This includes construction permit requirements for any stationary source, new or modified, that has a pre-controlled emission rate exceeding 10 pounds per hour or

25 tons per year of any regulated air contaminant for which there are national or New Mexico Ambient Air Quality Standards (AAQS). The regulation also requires that any source exceeding either of these thresholds obtain a permit prior to commencing construction. This regulation ensures that a facility will not cause or contribute to air pollution in violation of any AAQS. The objective of this regulation is to establish the requirements for obtaining a construction permit, construction permit modification, relocation and administrative and technical permit revision. This permit application is being submitted to request a modification to the existing permit to reflect the modifications listed in Section 3.

20.11.41.13.E(1) NMAC – Application for Permit - Content

This permit modification application includes a completed permit application Long Form provided by the Air Quality Program (AQP) (see Appendix B).

20.11.41.13.E(2) NMAC – Application for Permit - Content

The name, street and post address of the applicant is provided on page 1-1, on the application form in Appendix B of this application, and on the public notice documents.

20.11.41.13.E(3) NMAC – Application for Permit - Content

The date this revised application was submitted to the AQP is provided on title page of this application and the signature page on the application form in Appendix B.

20.11.41.13.E(4) NMAC – Application for Permit - Content

This application text and Appendices A through H include attachments, including emission calculations, computations, and all other analyses used to provide information to describe the potential emission rate and nature of all regulated air contaminants that the existing and proposed operations emit, and the emissions that the source will emit under routine operations. Emissions associated with malfunction, startup and shutdown, if any, are discussed below under 20.11.41.13.E(5). AERMOD air dispersion modeling was performed for all pollutants and a detailed modeling report is included in Appendix H of this application.

20.11.41.13.E(5) NMAC – Application for Permit - Content

The following are the minimum elements that shall be included in the permit application before the department can determine whether the application is administratively complete and ready for technical review. It is not necessary to include an element if the department has issued a written waiver regarding the element and the waiver accompanies the application. However, the department shall not waive any federal requirements. The permit application shall include:

(5) an operational and maintenance strategy detailing:

(a) The steps the applicant will take if a malfunction occurs that may cause emission of a regulated air contaminant to exceed a limit that is included in the permit:
Emissions during malfunction, startup, and shutdown of process equipment are not expected to differ from regular operations. Should a malfunction of any equipment occur, the operation of the equipment will be shutdown immediately.

Any emissions during malfunction, startup, and shutdown will be minimized through the application of industry standard and/or manufacturer recommended operating and maintenance practices and as previously discussed.

(b) The nature of emissions during startup or shutdown of the source and the source's air pollution equipment:

A detailed Operating and Maintenance Strategy for the site's engines and boilers is located in Appendix D.

(c) The steps the applicant will take to minimize emissions during routine startup or shutdown

Any emissions during malfunction, startup, and shutdown will be minimized through the application of industry standard and/or manufacturer recommended operating and maintenance practices as previously discussed. Operations will be shut down during high wind episodes and as directed by the Air Quality Program. A detailed Operating and Maintenance Strategy for the site's engines and boilers is located in Appendix D.

20.11.41.13.E(6) NMAC – Application for Permit - Content

A USGS aerial topo map downloaded from http://map-pass.mytopo.com is included on page 2-7 of this application.

20.11.41.13.E(7) NMAC – Application for Permit - Content

A aerial plot plans and process flow diagrams of the facility showing the proposed operations are provided on pages 2-8 through 2-11 of this application.

20.11.41.13.E(8) NMAC – Application for Permit - Content

A complete description of the facility, process and emission sources is discussed on previous pages of this application. Process flow diagrams are provided starting on page 2-10 of this application.

20.11.41.13.E(9) NMAC – Application for Permit - Content

Emission Source UTM Coordinates:

EU #	Source Description	UTM E (m)	UTM N (m)
1	Coarse Screening Facility at Valley Interceptor: 1N (Activated Carbon Unit)	348424.30	3876615.39
	Coarse Screening Facility at Valley Interceptor: 1S (Activated Carbon Unit)	348347.03	3876396.73
2	North Prelim Trt Facility (Screenings & Grit Removal) (Activated Carbon Unit)	348337.19	3876485.01
	North Prelim Trt Facility (Screenings & Grit Removal) (North Bohn Biofilter)	348324.00	3876606.00
	North Prelim Trt Facility (Screenings & Grit Removal) (South Bohn Biofilter)	348291.00	3876490.00
3	Primary Clarifier Holding Tank #1	348123.39	3876344.53
4	Primary Clarifier Holding Tank #3	348122.38	3876256.50
5	Primary Clarifier #2 (Activated Carbon Unit)	348139.00	3876325.91

6	Primary Clarifier #4 (Activated Carbon Unit)	348137.37	3876238.08
7	Primary Clarifier #5 (Bohn Biofilter)	348066.00	3876465.00
8	Primary Clarifier #6 (Bohn Biofilter)		
9	Primary Clarifier #7 (Bohn Biofilter)		
10	Primary Clarifier #8 (Bohn Biofilter)		
11a-14b	Activated Sludge Group #11a-11f 12a-12d 13a-13b 12a-14b	Activated Sludge Area	
15-26	Final Clarifiers #1-12	347897.71	3876091.95
		347895.11	3876355.34
27	Caterpillar Cogen Engine	348125.50	3876097.99
28	Caterpillar Cogen Engine	348125.56	3876090.09
29	Superior Cogen Engine	348094.85	3876039.20
30	Superior Cogen Engine	348096.84	3876039.20
31	Cogen Boiler	348125.14	3876051.59
32	Secondary Sludge Thickening (DAF/RDT)	348106.00	3876153.00
33	Unleaded Fuel Tank	348447.73	3876563.37
34	Flare 1	348287.10	3876257.90
35	Flare 2	348290.01	3876259.39
36	Flare 3	348289.96	3876254.88
37	UV Facility Emergency Generator	347761.00	3876302.00
38	North PTF Emergency Generator 0.5 MW	TBD	TBD
39	PPH1/2 Emergency Generator 1 MW	TBD	TBD
40	SAPS Emergency Generator 2 MW	TBD	TBD
41	Blower Bldg. Emergency Generator 3 MW	TBD	TBD
42	North Blower Bldg. Emergency Generator 1 MW	TBD	TBD
43	Dewatering Bldg. "HOTSY"	347998.14	3876522.73
44	DAF/RDT Bldg. "HOTSY"	348097.10	3876142.52
45	Tijeras Canyon Interceptor Carbon System	348347.03	3876396.73
46	South Blower Building Carbon System	348071.06	3876075.08
47	South Activated Sludge Pump Station Carbon System	348067.31	3875997.03
48	Sludge Blending Tank Carbon System	348185.29	3876198.82
49	Sludge Dewatering Facility Bohn Biofilter	348063.00	3876502.00
50	Wang Server Room Emergency Generator 0.75 MW	TBD	TBD

Note: No. 51 is reserved for paved haul roads.

Controls:

The cogeneration engines (EU: #27, 28, 29, and 30) will utilize Selective Catalytic Reduction (SCR) and oxidation catalyst to control NO_2, CO, and VOC/HAP emissions. Claimed reduction efficiencies are: 51% for NO_x, 76% for CO and 48% for VOC and Formaldehyde and 44% for total HAPs, as presented in the emissions calculations and on the application Long Form.

Annual flare emissions (EU: 34, 35, and 36) are controlled by limiting the annual operating hours for each of three flares to 2,160 hours per year.

Hydrogen Sulfide (H_2S) emissions at various locations are controlled either by activated carbon absorption or by utilizing a Bohn biofilter. Detailed information for each H_2S emission unit are provided in the emission calculations in Appendix A and on the application Long Form.

All haul roads at the facility for hauling various materials and byproducts off-site are paved roads. This corresponds with the maximum control applicable for haul roads. Detailed haul road emissions are presented in the emission calculations in Appendix A.

20.11.41.13.E(10) NMAC – Application for Permit - Content

The Water Utility Authority will continue to keep daily records of hours of operation of the facility and maintain records of daily, monthly, and annual throughputs, as applicable, for the facility. Any engine maintenance (oil changes, etc.) will be documented and records kept on file.

20.11.41.13.E(11) NMAC – Application for Permit - Content

The maximum and normal operating schedule of the source is seven (7) days per week and 24 hours per day.

20.11.41.13.E(12) NMAC – Application for Permit - Content

No other relevant information should be applicable; however, if the Air Quality Program requires further information on anything applicable to this permit application, the Water Utility Authority will provide such information as available.

20.11.41.13.E(13) NMAC – Application for Permit - Content

The signed signature page certifying to the accuracy of all information as represented in this application and attachments is located in Appendix B.

20.11.41.13.E(14) NMAC – Application for Permit - Content

A review fee check has previously been submitted to the Air Quality Program.

20.11.41.13.E(15) NMAC – Application for Permit - Content

All public notice requirements have been fulfilled and proof is provided in Appendix C of this application.

20.11.42 NMAC – Operating Permits

The SWRP currently operates under Title V Operating Permit number 1418-M2. Once the Air Quality Program authorizes the revised Air Quality Construction Permit, the SWRP will be considered a synthetic minor source and a request to void Operating Permit will be submitted to the Air Quality Program. Until the authorization of the revised Construction Permit occurs, the Water Authority will continue to meet the requirements of the Operating Permit and 20.11.42 NMAC, including all applicable requirements under Subpart VVV.

20.11.47 NMAC – Emission Inventory Requirements

The Water Authority is currently in compliance with this rule and will continue to meet the requirements under this part.

20.11.49 NMAC – Excess Emissions

The Water Authority will report any excess emissions as specified under 20.11.49 NMAC.

20.11.63 – New Source Performance Standards

This regulation incorporates the Federal New Source Performance Standards (NSPS) regulations under 40 CFR Part 60. The Water Authority will continue to comply with applicable requirements under this part.

20.11.64 – Emission Standards for Hazardous Air Pollutants

This regulation incorporates the Federal National Emission Standards for Hazardous Air Pollutants (NESHAP) regulations under 40 CFR Part 61 and Part 63. The Water Authority will continue to comply with applicable requirements under these parts.

20.11.65 – Volatile Organic Compounds

This regulation pertains to sources of hydrocarbon vapors from facilities and sources not otherwise regulated or exempted by 40 CFR Part 60. The unleaded fuel tank (EU: 67) at the SWRP will continue to comply with any applicable requirements under this regulation.

6.2 New Source Performance Standards (NSPS)

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

This regulation applies to steam generating units that commence construction, modification, or reconstruction after June 9, 1989 and that has a design heat input capacity between 10 MMBtu/hr and 100 MMBtu/hr. EU: 31 (Cogeneration Boiler) at the SWRP will continue to meet the requirements of Subpart Dc.

40 CFR Part 60, Subpart Kb – Standards of Performance for Volatile Organic Liquid Storage Vessels

This regulation applies to volatile organic liquid storage vessels with storage capacity greater than 75 cubic meters (19,810 gallons) and constructed, reconstructed, or modified after July 23, 1984. The tank onsite (EU: 67) stores gasoline, a volatile organic liquid, but has a storage capacity less than 19,800 gallons; therefore, this regulation is not applicable.

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

This regulation applies to owners or operators of stationary CI ICE that commence construction, modification or reconstruction after July 11, 2005. Emission Units (EU): 37, 39, 40, 41, and 50 (emergency diesel generators) will meet the requirements of Subpart IIII. EU: 38 and 42 are exempt from this rule since they were respectively manufactured in 1983 and 1996.

40 CFR Part 60, Subpart JJJJ – Standards of Performance for Stationary Spark Ignition Internal Combustion Engines

Subpart JJJJ is applicable to spark ignition internal combustion engines that commenced construction after June 12, 2006. EU: 29 (Cogeneration Engine #3) will continue to meet the requirements of Subpart JJJJ. EU: 27, 28, and 30 were all constructed prior to June 12, 2006 and are therefore not subject to Subpart JJJJ. All other engines included in this application are compression ignition engines and therefore Subpart JJJJ does not apply.

6.3 National Emission Standards for Hazardous Air Pollutants (NESHAPs)

National Emission Standards for Hazardous Air Pollutants (NESHAPs) are emissions standards for hazardous air pollutants (HAPs) primarily applicable to major sources of HAPs. NESHAP emission limits are established on the basis of a maximum achievable control technology (MACT) determination for the source. A major source of HAPs is defined as having potential emissions in excess of 25 tons per year (tpy) for total HAPs and/or potential emissions in excess of 10 tpy for any individual HAP. The SWRP is an existing major source for Hazardous Air Pollutants but there are no applicable Subparts to equipment or processes under 40 CFR Part 61. With this revision application, the SWRP will become a synthetic minor source of HAPs.

6.4 NESHAPs for Source Categories (MACT)

40 CFR Part 63, Subpart VVV - NESHAP for Publicly Owned Treatment Works

The SWRP is considered a reconstructed Group 2 (non-industrial) Publicly Owned Treatment Works (POTW) as defined in 40 CFR 63, Subpart VVV. The Water Authority will continue to meet the requirements of this regulation for the SWRP.

40 CFR Part 63, Subpart ZZZZ – NESHAP for Stationary Reciprocating Internal Combustion Engines (RICE)

This regulation applies to owners and operators of stationary Reciprocating Internal Combustion Engines (RICE) located at major and area sources of HAP emissions. The SWRP is considered a major source of HAPs and the Water Authority will continue to meet the applicable requirements of Subpart ZZZZ for the engines onsite and all offsite emergency generators.

40 CFR Part 63, Subpart DDDDD – NESHAP for Industrial, Commercial, and Institutional Boilers and Process Heaters

The Industrial/Commercial/Institutional Boilers and Process Heaters MACT for major sources regulates HAP emissions from new and existing industrial, commercial, or institutional boilers and process heaters located at major sources of HAP emissions. Boilers/heaters at the SWRP must comply with Subpart DDDDD, except for any exempt sources such as hot water heaters or boilers used for comfort heating. All these exempt sources (listed on the application Long Form) are each less than 5 MMBtu/hr and burn only natural gas. These units are only required to have a tune-up every 5 years. EU: 31 (Cogeneration Boiler) is rated greater than 12.55 MMBtu/hr and burns natural gas; therefore, Table 3 to Subpart DDDDD of Part 63 – Work Practice Standards, No. 4 for existing boilers, is applicable. The requirement is to conduct a tune-up of the boiler or process heater annually per 40 CFR 63.7540. This work practice standard will be met by the Water Authority.

40 CFR Part 63, Subpart CCCCCC – NESHAP for Gasoline Dispensing Facilities

This Regulation is applicable to Gasoline Dispensing Facilities (GDF). A GDF is defined as any stationary facility which dispenses gasoline into the fuel tank of a motor vehicle, motor vehicle engine, nonroad vehicle, or nonroad engine, including a nonroad vehicle or nonroad engine used solely for competition. These facilities include, but are not limited to, facilities that dispense gasoline into on- and off-road, street, or highway motor vehicles, lawn equipment, boats, test engines, landscaping equipment, generators, pumps, and other gasoline fueled engines and equipment. As the estimated facility monthly throughput would be less than 10,000 gallons of gasoline, the requirements of Subpart CCCCCC are applicable and the requirements of §63.11116 must be met. The Water Authority will continue to comply with the applicable requirements under Subpart CCCCCC.

6.5 Non-attainment Review

Not Applicable. See Section 7.1

6.6 Prevention of Significant Deterioration (PSD)

Not Applicable. See Section 7.2

7. PSD & NNSR

7.1 Non-Attainment New Source Review (NNSR)

The SWRP is located in Bernalillo County which has been designated as attainment for all National Ambient Air Quality Standards (NAAQS). As such, NNSR regulatory requirements are not applicable.

7.2 Prevention of Signification Deterioration (PSD)

The SWRP is not one of the 28 named sources in 20.11.61.26 NMAC, Table 1 but it is considered an existing PSD major source as CO emissions are permitted over 250 tpy. The modifications included in this application would qualify as a project, as defined under 20.11.61, but does not constitute a major modification under NMAC PSD rules; a PSD review was completed for this project and can be seen in the emissions calculations in Appendix A.

Baseline years were selected based on the following regulatory guidance:

Per Albuquerque-Bernalillo County Air Quality Control Board regulation 20.11.61 Prevention of Significant Deterioration, Paragraph 7(I)(2): For an existing emissions unit (other than an electric utility steam generating unit), baseline actual emissions means the average rate, in tons per year, at which the emissions unit actually emitted the pollutant during any consecutive 24-month period selected by the owner or operator within the ten (10) year period immediately preceding either the date the owner or operator begins actual construction of the project, or the date a complete permit application is received by the department for a permit required either under 20.11.61 NMAC or under a plan approved by the administrator, whichever is earlier, except that the 10 year period shall not include any period earlier than November 15, 1990. 20.11.61.7(I)(2)(d): A different consecutive 24-month period can be used for each regulated NSR pollutant. 20.11.61.7(I)(3): For new emissions units, the baseline actual emissions for purposes of determining the emissions increase that will result from the initial construction and operation shall equal to zero.

8. Permit Application Review Fee

This permit modification application is being submitted to authorize the revisions listed in Section 3 to Air Quality Construction Permit #0786-M3-RV1. This application is considered an initial permit modification application. A review fee table and the calculated review fee is submitted with this permit modification application.

APPENDIX A

Emission Calculations and Supporting Documentation

Water Authority – Southside Water Reclamation Plant

Emissions Summary (Per October 28, 2020)

Uncontrolled Emissions																						
EU# This ATC	Former EU#		NOx		CO		VOC		SO_2		PM_{10}		$PM_{2.5}$		H_2S		Formaldehyde		Total HAPs		Ammonia	
		Name	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
1	-	Coarse Screening Facility at Valley Interceptor	-	-	-	-	0.00005	0.0002	-	-	-	-	-	-	0.0002	0.0007	0.0000	0.0000	0.0000	0.0002	-	-
2	1	North Prelim Trt Facility (Screenings & Grit Removal)	-	-	-	-	0.0008	0.0035	-	-	-	-	-	-	0.0006	0.0026	0.0002	0.0007	0.0007	0.0032	-	-
3-4	3, 5	Primary Clarifier Holding Tanks #1 and #3	-	-	-	-	0.0086	0.0379	-	-	-	-	-	-	0.000002	0.00001	0.0018	0.0078	0.0077	0.0336	-	-
5-6	4, 6	Primary Clarifiers #2 and #4					0.0148	0.0647							0.0781	0.3422	0.0035	0.0153	0.0135	0.0591		
7-10	7-10	Primary Clarifiers #5-8	-	-	-	-	0.0667	0.2922	-	-	-	-	-	-	0.4140	1.8132	0.0120	0.0526	0.0670	0.2936	-	-
11a-14b	11a-14b	Activated Sludge Group #11a-11f 12a-12d 13a-13b 12a-14b	-	-	-	-	0.0221	0.0966	-	-	-	-	-	-	-	-	0.0036	0.0159	0.0206	0.0903	-	-
15-26	15-26	Final Clarifiers #1-12	-	-	-	-	0.0063	0.0276	-	-	-	-	-	-	-	-	0.0002	0.0011	0.0061	0.0266	-	-
27	27	Cogeneration Engine #1	5.2000	22.7760	16.4000	71.8320	5.5000	24.0900	0.8000	3.5040	0.2018	0.8840	0.2018	0.8840	-	-	1.0670	4.6735	1.4588	6.3898	-	-
28	28	Cogeneration Engine #2	3.9000	17.0820	14.0000	61.3200	3.1000	13.5780	0.1600	0.7008	0.2018	0.8840	0.2018	0.8840	-	-	1.0670	4.6735	1.4588	6.3898	-	-
29	29	Cogeneration Engine #3	7.2765	31.8711	14.5530	63.7421	2.3000	10.0740	0.9000	3.9420	0.1235	0.5408	0.1235	0.5408	-	-	0.6527	2.8590	0.8924	3.9089	-	-
30	30	Cogeneration Engine #4	6.4000	28.0320	8.1000	35.4780	3.1000	13.5780	0.2500	1.0950	0.1430	0.6264	0.1430	0.6264	-	-	0.7561	3.3119	1.0338	4.5281	-	-
31	31	Cogeneration Boiler	1.2307	5.3904	1.0338	4.5279	0.0677	0.2965	0.0074	0.0323	0.0935	0.4097	0.0935	0.4097	-	-	0.0009	0.0040	0.0232	0.1015	-	-
32	62	Secondary Sludge Thickening (DAF/RDT)	-	-	-	-	0.0046	0.0202	-	-	-	-	-	-	-	-	0.00004	0.0002	0.0047	0.0208	-	-
33	67	Unleaded Fuel Tank	-	-	-	-	0.2188	0.9585	-	-	-	-	-	-	-	-	-	-	-	-	-	-
34-36	70-72	Gas Flare #1, #2, #3	7.2035	31.5514	32.8395	143.8371	0.8465	3.7075	2.4167	10.5851	1.1696	5.1230	1.1696	5.1230	0.0262	0.1148	0.0115	0.0506	0.3005	1.3161	-	-
37	75	UV Facility Emergency Generator	7.5062	32.8769	0.6122	2.6812	0.1166	0.5107	0.0064	0.0279	0.0437	0.1915	0.0437	0.1915	-	-	0.0003	0.0013	0.0058	0.0255	-	-
38	-	North PTF Emergency Generator 0.5 MW	18.2400	79.8912	4.1800	18.3084	0.5358	2.3468	0.0092	0.0404	0.5320	2.3302	0.5320	2.3302	-	-	0.0004	0.0017	0.0073	0.0320	-	-
39	-	PPH1/2 Emergency Generator 1 MW	12.9775	56.8416	2.1684	9.4976	0.2300	1.0073	0.3614	1.5829	0.3614	1.5829	0.3614	1.5829	-	-	0.0007	0.0032	0.0139	0.0607	-	-
40	-	SAPS Emergency Generator 2 MW	31.3437	137.2854	1.8925	8.2889	0.4731	2.0722	0.0591	0.2590	0.1774	0.7771	0.1774	0.7771	-	-	0.0014	0.0063	0.0271	0.1186	-	-
41	-	Blower Bldg. Emergency Generator 3 MW	49.3841	216.3022	1.8994	8.3193	0.6648	2.9118	0.0475	0.2080	0.3799	1.6639	0.3799	1.6639	-	-	0.0021	0.0093	0.0400	0.1750	-	-
42	-	North Blower Bldg. Emergency Generator 0.75 MW	17.6100	77.1318	3.2200	14.1036	0.6000	2.6280	0.0135	0.0589	0.5200	2.2776	0.5200	2.2776	-	-	0.0005	0.0024	0.0103	0.0010	-	-
43	-	Dewatering Bldg. "HOTSY"	0.0706	0.3094	0.0593	0.2599	0.0039	0.0170	0.0004	0.0019	0.0054	0.0235	0.0054	0.0235	-	-	0.00005	0.0002	0.0013	0.0058	-	-
44	-	DAF/RDT Bldg. "HOTSY"	0.0706	0.3094	0.0593	0.2599	0.0039	0.0170	0.0004	0.0019	0.0054	0.0235	0.0054	0.0235	-	-	0.00005	0.0002	0.0013	0.0058	-	-
45	-	Tijeras Canyon Interceptor Carbon System	-	-	-	-	-	-	-	-	-	-	-	-	0.1958	0.8575	-	-	-	-	-	-
46	-	South Blower Building Carbon System	-	-	-	-	-	-	-	-	-	-	-	-	0.2898	1.2692	-	-	-	-	-	-
47	-	South Activated Sludge Pump Station Carbon System	-	-	-	-	-	-	-	-	-	-	-	-	0.0096	0.0418	-	-	-	-	-	-
48	-	Sludge Blending Tank Carbon System	-	-	-	-	-	-	-	-	-	-	-	-	0.0313	0.1372	-	-	-	-	-	-
49	-	Sludge Dewatering Facility Bohn Biofilter	-	-	-	-	-	-	-	-	-	-	-	-	0.0010	0.0042	-	-	-	-	-	-
50	-	Wang Server Room Emergency Generator 0.15 MW	1.5543	6.8080	0.6107	2.6749	0.0130	0.0569	0.4039	1.7689	0.0449	0.1967	0.0449	0.1967	-	-	0.0012	0.0051	0.0037	0.0162	-	-
51	-	Paved Haul Roads	-	-	-	-	-	-	-	-	0.0531	0.0722	0.0130	0.0177	-	-	-	-	-	-	-	-
		TOTAL	**169.97**	**744.46**	**101.63**	**445.13**	**17.90**	**78.39**	**5.44**	**23.81**	**4.06**	**17.61**	**4.02**	**17.55**	**1.05**	**4.58**	**3.58**	**15.70**	**5.40**	**23.60**	**-**	**-**

Former EU# refers to the numbering listed in ATC 786-M3

Controlled Emissions																						
	Former EU#		NOx		CO		VOC		SO_2		PM_{10}		$PM_{2.5}$		H_2S		Formaldehyde		Total HAPs		Ammonia	
EU		Name	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
1	-	Coarse Screening Facility at Valley Interceptor	-	-	-	-	0.00005	0.0002	-	-	-	-	-	-	0.000003	0.00001	0.0000	0.0000	0.0000	0.0002	-	-
2	1	North Prelim Trt Facility (Screenings & Grit Removal)	-	-	-	-	0.0008	0.0035	-	-	-	-	-	-	0.000012	0.0001	0.0002	0.0007	0.0007	0.0032	-	-
3-4	3, 5	Primary Clarifier Holding Tanks #1 and #3	-	-	-	-	0.0086	0.0379	-	-	-	-	-	-	0.000002	0.00001	0.0018	0.0078	0.0077	0.0336	-	-
5-6	4, 6	Primary Clarifiers #2 and #4					0.0148	0.0647							0.0016	0.0068	0.0035	0.0153	0.0135	0.0591		
7-10	7-10	Primary Clarifiers #5-8	-	-	-	-	0.0667	0.2922	-	-	-	-	-	-	0.0083	0.0363	0.0120	0.0526	0.0670	0.2936	-	-
11a-14b	11a-14b	Activated Sludge Group #11a-11f 12a-12d 13a-13b 12a-14b	-	-	-	-	0.0221	0.0966	-	-	-	-	-	-	-	-	0.0036	0.0159	0.0206	0.0903	-	-
15-26	15-26	Final Clarifiers #1-12	-	-	-	-	0.0063	0.0276	-	-	-	-	-	-	-	-	0.0002	0.001	0.01	0.03	-	-
27	27	Cogeneration Engine #1	2.5480	11.1602	3.9360	17.2397	2.8600	12.5268	0.8000	3.5040	0.2018	0.8840	0.2018	0.8840	-	-	0.5548	2.4302	0.8153	3.5710	0.1573	0.6481
28	28	Cogeneration Engine #2	1.9110	8.3702	3.3600	14.7168	1.6120	7.0606	0.1600	0.7008	0.2018	0.8840	0.2018	0.8840	-	-	0.5548	2.4302	0.8153	3.5710	0.1573	0.6481
29	29	Cogeneration Engine #3	3.5655	15.6168	3.4927	15.2981	1.1960	5.2385	0.9000	3.9420	0.1235	0.5408	0.1235	0.5408	-	-	0.3394	1.4867	0.4988	2.1845	0.1080	0.4451
30	30	Cogeneration Engine #4	3.1360	13.7357	1.9440	8.5147	1.6120	7.0606	0.2500	1.0950	0.1430	0.6264	0.1430	0.6264	-	-	0.3932	1.7222	0.5778	2.5306	0.1080	0.4451
31	31	Cogeneration Boiler	1.2307	5.3904	1.0338	4.5279	0.0677	0.2965	0.0074	0.0323	0.0935	0.4097	0.0935	0.4097	-	-	0.0009	0.0040	0.0232	0.1015	-	-
32	62	Secondary Sludge Thickening (DAF/RDT)	-	-	-	-	0.0046	0.0202	-	-	-	-	-	-	-	-	0.00004	0.0002	0.005	0.02	-	-
33	67	Unleaded Gas Fuel Tank	-	-	-	-	0.2188	0.9585	-	-	-	-	-	-	-	-	-	-	-	-	-	-
34-36	70-72	Gas Flare #1, #2, #3	7.2035	7.7798	32.8395	35.4667	0.8465	0.9142	2.4167	2.6100	1.1696	1.2632	1.1696	1.2632	0.0262	0.0283	0.01	0.012	0.30	0.32	-	-
37	75	UV Facility Emergency Generator	7.5062	1.8765	0.6122	0.1530	0.1166	0.0292	0.0064	0.0016	0.0437	0.0109	0.0437	0.0109	-	-	0.0003	0.0001	0.01	0.001	-	-
38	-	North PTF Emergency Generator 0.5 MW	18.2400	1.8240	4.1800	0.4180	0.5358	0.0536	0.0092	0.0009	0.5320	0.0532	0.5320	0.0532	-	-	0.0004	0.00004	0.01	0.001	-	-
39	-	PPH1/2 Emergency Generator 1 MW	12.9775	1.2978	2.1684	0.2168	0.2300	0.0230	0.3614	0.0361	0.3614	0.0361	0.3614	0.0361	-	-	0.0007	0.0001	0.01	0.001	-	-
40	-	SAPS Emergency Generator 2 MW	31.3437	3.1344	1.8925	0.1892	0.4731	0.0473	0.0591	0.0059	0.1774	0.0177	0.1774	0.0177	-	-	0.0014	0.0001	0.03	0.003	-	-
41	-	Blower Bldg. Emergency Generator 3 MW	49.3841	4.9384	1.8994	0.1899	0.6648	0.0665	0.0475	0.0047	0.3799	0.0380	0.3799	0.0380	-	-	0.0021	0.0002	0.04	0.004	-	-
42	-	North Blower Bldg. Emergency Generator 0.75 MW	17.6100	1.7610	3.2200	0.3220	0.6000	0.0600	0.0135	0.0013	0.5200	0.0520	0.5200	0.0520	-	-	0.0005	0.0001	0.01	0.001	-	-
43	-	Dewatering Bldg. "HOTSY"	0.0706	0.3094	0.0593	0.2599	0.0039	0.0170	0.0004	0.0019	0.0054	0.0235	0.0054	0.0235	-	-	0.0001	0.0002	0.001	0.01	-	-
44	-	DAF/RDT Bldg. "HOTSY"	0.0706	0.3094	0.0593	0.2599	0.0039	0.0170	0.0004	0.0019	0.0054	0.0235	0.0054	0.0235	-	-	0.0001	0.0002	0.001	0.01	-	-
45	-	Tijeras Canyon Interceptor Carbon System	-	-	-	-	-	-	-	-	-	-	-	-	0.0039	0.0172	-	-	-	-	-	-
46	-	South Blower Building Carbon System	-	-	-	-	-	-	-	-	-	-	-	-	0.0058	0.0254	-	-	-	-	-	-
47	-	South Activated Sludge Pump Station Carbon System	-	-	-	-	-	-	-	-	-	-	-	-	0.00019	0.0008	-	-	-	-	-	-
48	-	Sludge Blending Tank Carbon System	-	-	-	-	-	-	-	-	-	-	-	-	0.0006	0.0027	-	-	-	-	-	-
49	-	Sludge Dewatering Facility Bohn Biofilter	-	-	-	-	-	-	-	-	-	-	-	-	0.00002	0.0001	-	-	-	-	-	-
50	-	Wang Server Room Emergency Generator 0.15 MW	1.5543	0.1554	0.6107	0.0611	0.0130	0.0013	0.4039	0.0404	0.0449	0.0045	0.0449	0.0045	-	-	0.0012	0.0001	0.0037	0.0004	-	-
51	-	Paved Haul Roads	-	-	-	-	-	-	-	-	0.0531	0.0722	0.0130	0.0177	-	-	-	-	-	-	-	-
		TOTAL	**158.35**	**77.66**	**61.31**	**97.83**	**11.18**	**34.91**	**5.44**	**11.98**	**4.06**	**4.94**	**4.02**	**4.89**	**0.05**	**0.12**	**1.88**	**8.18**	**3.26**	**12.83**	**0.53**	**2.19**
Former EU# refers to the numbering listed in ATC 786-M3																						
		Below Title V Limit?	**Yes**		**Yes**		**Yes**		**Yes**		**Yes**		**Yes**		**Yes**		**Yes**		**Yes**			

Water Authority – Southside Water Reclamation Plant

EU #	Source Description	UTM E (m)	UTM N (m)
1	Coarse Screening Facility at Valley Interceptor: 1N (Activated Carbon Unit)	348424.30	3876615.39
	Coarse Screening Facility at Valley Interceptor: 1S (Activated Carbon Unit)	348347.03	3876396.73
2	North Prelim Trt Facility (Screenings & Grit Removal) (Activated Carbon Unit)	348337.19	3876485.01
	North Prelim Trt Facility (Screenings & Grit Removal) (North Bohn Biofilter)	348324.00	3876606.00
	North Prelim Trt Facility (Screenings & Grit Removal) (South Bohn Biofilter)	348291.00	3876490.00
3	Primary Clarifier Holding Tank #1	348123.39	3876344.53
4	Primary Clarifier Holding Tank #3	348122.38	3876256.50
5	Primary Clarifier #2 (Activated Carbon Unit or Bio Tower)	348139.00	3876325.91
6	Primary Clarifier #4 (Activated Carbon Unit or Bio Tower)	348137.37	3876238.08
7	Primary Clarifier #5 (Biofilter)	348066.00	3876465.00
8	Primary Clarifier #6 (Biofilter)		
9	Primary Clarifier #7 (Biofilter)		
10	Primary Clarifier #8 (Biofilter)		
11a-14b	Activated Sludge Group #11a-11f 12a-12d 13a-13b 12a-14b	Activated Sludge Area	
15-26	Final Clarifiers #1-12	347897.71	3876091.95
		347895.11	3876355.34
27	Caterpillar Cogen Engine	348125.50	3876097.99
28	Caterpillar Cogen Engine	348125.56	3876090.09
29	Superior Cogen Engine	348094.85	3876039.20
30	Superior Cogen Engine	348096.84	3876039.20
31	Cogen Boiler	348125.14	3876051.59
32	Secondary Sludge Thickening (DAF/RDT)	348106.00	3876153.00
33	Unleaded Fuel Tank	348447.73	3876563.37
34	Flare 1	348287.10	3876257.90
35	Flare 2	348290.01	3876259.39
36	Flare 3	348289.96	3876254.88
37	UV Facility Emergency Generator	347761.00	3876302.00
38	North PTF Emergency Generator 0.5 MW	TBD	TBD
39	PPH1/2 Emergency Generator 1 MW	TBD	TBD
40	SAPS Emergency Generator 2 MW	TBD	TBD
41	Blower Bldg. Emergency Generator 3 MW	TBD	TBD
42	North Blower Bldg. Emergency Generator 0.75 MW	TBD	TBD
43	Dewatering Bldg. "HOTSY"	347998.14	3876522.73
44	DAF/RDT Bldg. "HOTSY"	348097.10	3876142.52
45	Tijeras Canyon Interceptor Carbon System	348347.03	3876396.73
46	South Blower Building Carbon System	348071.06	3876075.08
47	South Activated Sludge Pump Station Carbon System	348067.31	3875997.03
48	Sludge Blending Tank Carbon System	348185.29	3876198.82
49	Sludge Dewatering Facility Bohn Biofilter	348063.00	3876502.00
50	Wang Server Room Emergency Generator 150 kW	TBD	TBD

Water Authority – Southside Water Reclamation Plant

Inventory of Exempt Miscellaneous Natural Gas-fueled Combustion Sources located on the Southside Water Reclamation Plant Campus

These sources meet each of the criteria in 20.11.41.2(F)(3) NMAC i.e., fueled with natural gas at a rate of < 5,000,000 BTU/hr and used for either comfort heating or hot water for domestic (personal) use.

Description	Model #	Serial #	BTU/HR (input)	Location	Purpose	Year in Service
Ambirad Tubular Infrared Radiant Heater SE Corner	SC38-S60-D	A4783-C3215	130,000	Vactor Building	comfort heating	1990
Ambirad Tubular Infrared Radiant Heater SW Corner	SC38-S60-D	A4783-C3216	130,000	Vactor Building	comfort heating	1990
Ambirad Tubular Infrared Radiant Heater NW Corner	SC38-S50-D	A4783-C3213	130,000	Vactor Building	comfort heating	1990
Ambirad Tubular Infrared Radiant Heater NE Corner	SC38-S50-D	A4783-C3214	130,000	Vactor Building	comfort heating	1990
Ambirad Tubular Infrared Radiant Heater SW Corner	SC/ER/GX38DA	100916935502	100,000	Vehicle Maintenance Garage	comfort heating	1990
Ambirad Tubular Infrared Radiant Heater NW Corner	SC/ER/GX38DA	100916935506	100,000	Vehicle Maintenance Garage	comfort heating	1990
Ambirad Tubular Infrared Radiant Heater SE Corner	SC29-S40	A4783-C3259	100,000	Vehicle Maintenance Garage	comfort heating	1990
Reznor	HCRPB125-S2J	EATB66H5N09006/TE	125,000	Water Quality Laboratory	comfort heating	1989
Reznor	CRPB125-S2J	EATB66H5N09006/TE	125,000	Water Quality Laboratory	comfort heating	1989
Reznor	RDH100	EBHE83Y2N02628TE	88,000	Water Quality Laboratory	comfort heating	1989
Reznor	RDH100	EBHE83Y2N02629TE	88,000	Water Quality Laboratory	comfort heating	1989
McQuay Heating Unit SE Corner	RWS800BA	3VE00033 14	787,988	Water Quality Laboratory	comfort heating	1989
Reznor	HCRPB125-S2J	EATB66H5N09007/TE	125,000	Water Quality Laboratory	comfort heating	1989
Reznor	CRPB125-S2J	EATB66H5N09005/TE	125,000	Water Quality Laboratory	comfort heating	1989
Reznor	CRPB125-S2J	EATB66H5N09004/TE	125,000	Water Quality Laboratory	comfort heating	1989
Water Quality Laboratory Central Heating Unit 1	600NCSS-SC2GK2F	792516-15	300,000	Water Quality Laboratory	comfort heating	1991
Water Quality Laboratory Central Heating Unit 2	600NCSS-SC2GK2F	792516-15	300,000	Water Quality Laboratory	comfort heating	1991
Training Building space heater-east	48TCEA06A2A3A0A0A0	4111C59941	115,000	Training Building	comfort heating	unknown
Training Building space heater-middle	48TCEA06A2A3A0A0A0	4211C79380	115,000	Training Building	comfort heating	unknown
Training Building space heater-west	48TCEA06A2A3A0A0A1	3810G40200	115,000	Training Building	comfort heating	unknown
Training Building hot water heater	MI504S6EN10	TB4843208	50,000	Training Building	domestic hot water	unknown
WATER QUALITY LAB BOILER	G100-200	URNG0508G00773	199,900	Water Quality Laboratory	comfort heating	1991
O&M WATER HEATER	3WA54	VGLN0306111976	70,000	O&M / Warehouse Bldg	domestic hot water	2019
State hot water heater	SBD-100-199NE 118	1705104786997	199,000	Administration Bldg	domestic hot water	2017
Weil-McLane hydronic hot water heating boiler	LG8-8		910,000	Administration Bldg	comfort heating	1988
DEWATERING hydronic hot water heating boiler	MI504S6EN10	TB4843208	2,000,000	Dewatering Bldg	comfort heating	2015

Total Heat Input (BTU/hr), all sources = 6,782,888

Year listed for "**Year in Service**" reflects year when the facility in which the listed asset was installed was commissioned.
The assets listed are typically operated "as is" without modification until they fail and are then replaced.

Water Authority – Southside Water Reclamation Plant

Wastewater Treatment Emission Calculations

Plant Design Capacity: **76.0** **Million Gallons per Day (MGD)**

Proposed Capture and Control Efficiencies:

	Coarse Screening Facility (EU 1)	Preliminary Treatment (EU 2)			Primary Clarifier Holding Tank Un-covered 1 (EU 3)	Primary Clarifier Holding Tank Un-covered 3 (EU 4)	Primary Clarifier 2 (covered) (EU 5)	Primary Clarifier 4 (covered) (EU 6)	Primary Clarifiers 5, 6, 7, 8 (EU 7-10)	Activated Sludge (EU 11a-14b)	Final Clarifiers (EU 15-26)	Secondary Sludge Thickening (DAF/RDT) (EU 32)
H_2S Control	Carbon System	Carbon System	North Bohn BF	South Bohn BF	-	-	Carbon Filter or Bio Tower	Carbon Filter or Bio Tower	Bohn BF	-	-	-
Capture Efficiency	100%	100%			0%	0%	100%	100%	100%	0%	0%	0%
VOC/HAP Control Efficiency	0%	0%			0%	0%	0%	0%	0%	0%	0%	0%
H_2S Control Efficiency	98%	98%			0%	0%	98%	98%	98%	-	-	-

Notes:

The Coarse Screening Facility and Preliminary Treatment Facility are enclosed within buildings; therefore, it assumed that 100% of the fugitive emissions are captured.

The Coarse Screening Facility is controlled using an activated carbon filter with a 98% control efficiency for H_2S. This facility is not covered by 40 CFR Part 63, Subpart VVV regs.

The Preliminary Treatment Facility (EU 2) is one emission unit controlled using a combination of 2 Bohn biofilters (North and South) and 1 activated carbon filter with a 98% control efficiency for H_2S for each device.

No control efficiencies for VOCs or HAPs are being claimed from these controls.

Primary Clarifiers 2 and 4 will be covered; therefore, a 100% capture efficiency was assumed. Control for H_2S in air collected from these clarifiers will be using either an activated carbon filter or a bio-tower with 98% control efficiency. No control efficiencies for VOCs or HAPs are being claimed for this control device.

Primary Clarifier Holding Tanks 1 and 3 will be un-covered. These two former primary clarifiers will be used as holding tanks during emergency or maintenance situations when flow to the secondary treatment process needs to be temporarily halted.

Primary Clarifiers 5, 6, 7, 8 are covered; therefore, a 100% capture efficiency was assumed.

All four Primary Clarifiers (#5-8) are routed to a Bohn biofilter with a 98% control efficiency for H_2S. No control efficiencies for VOCs or HAPs are being claimed for this biofilter.

Uncontrolled Emission Rates (lb/hr):

(From TOXCHEM Model)

	Uncontrolled Emissions by Process											
Individual HAPs/VOCs/H_2S	**Coarse Screening Facility (Carbon System) (lb/hr)**	**Preliminary Treatment (Carbon System) (lb/hr)**	**Preliminary Treatment (North Bohn BF) (lb/hr)**	**Preliminary Treatment (South Bohn BF) (lb/hr)**	**Primary Clarifier Holding Tank Un-covered 1 (lb/hr)**	**Primary Clarifier Holding Tanks Un-covered 3 (lb/hr)**	**Primary Clarifier 2 with Covers (lb/hr)**	**Primary Clarifier 4 with Covers (lb/hr)**	**Primary Clarifiers 5, 6, 7, 8 (Total all four) (lb/hr)**	**Activated Sludge (lb/hr)**	**Final Clarifiers (lb/hr)**	**Secondary Sludge Thickening (DAF / RDT) (lb/hr)**
Propionaldehyde	0.00002	0.00032			0.00207	0.00207	0.01		0.02	0.00752	0.00215	0.00023
Acetaldehyde	0.00001	0.00010			0.00057	0.00057	0.002		0.01	0.00001	0.00000	0.00001
Formaldehyde	0.00001	0.00017			0.00089	0.00089	0.003		0.01	0.00363	0.00024	0.00004
2-Butanone (Not a HAP)	0.00001	0.00011			0.00056	0.00056	0.002		0.01	0.00286	0.00023	0.00003
Toluene	0.00000	0.00003			0.00007	0.00007	0.0005		0.01	0.00006	0.00000	0.00023
Dichlorobenzene(1,4) (-P)	0.00000	0.00001			0.00002	0.00002	0.0002		0.002	0.00005	0.00000	0.00006
Chloroform (Trichloromethane)	0.00000	0.00004			0.00007	0.00007	0.0006		0.01	0.00397	0.00005	0.00019
Methylene Chloride (Not a VOC)	0.00000	0.00002			0.00006	0.00006	0.0005		0.004	0.00081	0.00001	0.00004
Xylene (-M and -P)	0.00000	0.00000			0.00001	0.00001	0.0001		0.001	0.00363	0.00363	0.00363
Dichloropropane(1,2) (-P)	0.00000	0.00000			0.00001	0.00001	0.0001		0.001	0.00002	0.00000	0.00002
Tetrachloroethene (Not a VOC)	0.00000	0.00001			0.00002	0.00002	0.0002		0.004	0.00061	0.00000	0.00013
Carbon Disulfide	0.00000	0.00002			0.00003	0.00003	0.0003		0.01	0.00031	0.00000	0.00017
Hydrogen Sulfide (Not VOC or HAP)	0.00017	**0.0001**	**0.0003**	**0.0002**	**0.00000**	**0.00000**	**0.039**	**0.039**	**0.41**	-	-	-
TOTAL **HAPs**	**0.00004**	**0.001**			**0.008**		**0.013**		**0.07**	**0.02**	**0.01**	**0.005**
VOCs	**0.00005**	**0.001**			**0.009**		**0.015**		**0.07**	**0.02**	**0.01**	**0.005**
H_2S	**0.0002**	**0.0006**			**0.000002**		**0.078**		**0.41**	**-**	**-**	**-**

H_2S emissions for the site are expected to be emitted in the initial stages of treatment (i.e., preliminary treatment facility and primary clarification processes). In addition, as the Activated Sludge, Secondary Clarifiers and DAF operate under aerobic conditions, H_2S emissions are not expected from these processes.

After primary treatment, screened, de-gritted, and settled wastewater flows to the activated sludge basins. In these basins, suspended and dissolved organic material in the wastewater is broken down by microorganisms in an aerobic environment. Dissolved oxygen levels in the basins are continuously monitored to help control and regulate the air supply fed to each basin so that an optimal, aerobic environment is maintained for the microorganisms as needed to oxidize wastewater organics. Given the oxygen-rich environment maintained in these basins, emissions of hydrogen sulfide from the Activated Sludge basins, the Final Clarifiers, and the DAF at the SWRP are considered negligible.

Controlled H_2S Emission Rates (lb/hr):

H_2S Control Efficiency 98%

	Controlled H_2S Emissions by Process											
	Coarse Screening Facility (Carbon System) (lb/hr)	**Preliminary Treatment (Carbon System) (lb/hr)**	**Preliminary Treatment (North Bohn BF) (lb/hr)**	**Preliminary Treatment (South Bohn BF) (lb/hr)**	**Primary Clarifier Holding Tank 1; Un-covered (lb/hr)**	**Primary Clarifier Holding Tank 3; Un-covered (lb/hr)**	**Primary Clarifier 2 (covered) (lb/hr)**	**Primary Clarifier 4 (covered) (lb/hr)**	**Primary Clarifiers 5, 6, 7, 8 (lb/hr)**	**Activated Sludge (lb/hr)**	**Final Clarifiers (lb/hr)**	**Secondary Sludge Thickening (DAF / RDT) (lb/hr)**
H_2S	**0.000003**	**0.000002**	**0.00001**	**0.000003**	**0.000001**	**0.000001**	**0.0008**	**0.0008**	**0.008**	**-**	**-**	**-**
TOTAL **H_2S**	**0.000003**	**0.00001**			**0.000002**		**0.002**		**0.008**	**-**	**-**	**-**
									(0.002 each)			

All annual emission rates are based on 8,760 hours per year and 2,000 lb per to. Example Calculation: 0.001 lb/hr x 8,760 hours per year / 2,000 lb per ton = 0.004 tpy

Annual emissions are presented on the Emission Summary page and on the application long form.

Primary Clarifier Holding Tanks 1 and 3:

Emissions calculated using TOXCHEM treating each clarifier as an unmixed equalization basin.

Modeled scenario is filling one uncovered clarifier, holding for 24 hours, then emptying.

Influent chemical concentrations are 150% of highest value of chemicals gathered during sampling conducted in September 2019 and November 2019, includes H_2S.

Volume of each clarifier = 3.04 m liquid depth x 935 m^2 surface area = 2,890 m^3 volume, or 2,890,000 Liters of volume.

Wastewater flow rate = 2,890,000 Liters / 24 hours. There are no H_2S controls for these two clarifiers which have been re-purposed as holding tanks.

Water Authority – Southside Water Reclamation Plant

Wastewater Treatment Emissions - TOXCHEM Model Results for H_2S Calculations

Using design flowrate, measured H_2S Concentration + 50% safety factor, and no emission control

TOXCHEM Inputs

H_2S Influent concentration:	0.269	mg/L	(From 12/04/19 influent grab sample, Dissolved Sulfide +50% safety factor)
Plant pH:	7.79		(From 12/04/19 influent grab sampling event)
Temperature:	21.5	C	(From 12/04/19 influent grab sampling event)
Plant influent flowrate:	76	MGD	(Plant design capacity)
Clarifier 2,4 Full Covered:	NO	*Covers on Weirs only	

Odor Control Units: This modeling does not account for any H_2S emission reductions from odor control units.

Notes on Plant Flow: 53.2 MGD of the 76 MGD will be processed by 3 units in the group of Clarifiers 5-8 (5,6,7 or 5,7,8 or 6,7,8 or 5,6,8)

Remaining 22.8 MGD of the 76 MGD flow will be split evenly between Clarifiers 2 & 4

Flow through the Coarse Screening Facility is 20 MGD which only handles flow from the Valley Interceptor

		Airflow	**H_2S Emission**			**Concentration**
	TOXCHEM Emission Point	**cfm**	**gram/day**	**lb/hr**	**ton/year**	**ug/m3**
CSF	EP01 - Coarse Screen Carbon System	8,300	0.6	0.00006	0.00026	18.8
Preliminary Treatment	EP01.5 - Supplemental Carbon System	1,500	1.2	0.00011	0.00047	193
	EP02 - South Bohn Biofilter	3,400	1.8	0.00017	0.00073	131
	EP03 - North Bohn Biofilter	5,560	3.4	0.00031	0.00138	151
Clarifier 2	EP04 - Clarifier 2 (11.4 MGD) (Weir)	2,100	414	0.03803	0.16656	48,305
	Clarifier 2 - Surface Emission*	1,360	11	0.00104	0.00454	2,034
Clarifier 4	EP05 - Clarifier 4 (11.4 MGD) (Weir)	2,100	414	0.03803	0.16656	48,305
	Clarifier 4 - Surface Emission*	1,360	11	0.00104	0.00454	2,034
Clarifiers 5-8	EP06 - Clarifiers 5,6,7 (17.73 MGD each)	18,900	4506	0.41396	1.81316	58,428
		Total =	5,364	0.49	2.16	

*Airflow for surface emission is an estimate of flow from natural convection over entire uncovered surface based on flux chamber testing

Water Authority – Southside Water Reclamation Plant

Wastewater Treatment Emissions - Odor (H_2S) Control Units EU 45-49)

	Flow Rate		H_2S Concentration	H_2S Emission Rates		Uncontrolled	Uncontrolled	98% Control Efficiency	98% Control Efficiency	Control Device
Emission Units	**ft^3/min**	**m^3/min**	**ug/m^3**	**ug/min H_2S**	**ug/hr H_2S**	**lb/hr H_2S**	**tpy H_2S**	**lb/hr H_2S**	**tpy H_2S**	
Tijeras Canyon Interceptor (EU 45)	1,500	42.5	34,847	1,480,100	88,806,000	**0.20**	**0.86**	**0.0039**	**0.02**	Activated Carbon
South Blower Building (EU 46)	1,500	42.5	51,573	2,190,600	131,436,000	**0.29**	**1.27**	**0.0058**	**0.03**	Activated Carbon
South Activated Sludge Pump Station (EU 47)	15,000	425	170	72,200	4,332,000	**0.01**	**0.04**	**0.00019**	**0.001**	Activated Carbon
Sludge Blending Tank (EU 48)	1,500	42.5	5,575	236,800	14,208,000	**0.03**	**0.14**	**0.0006**	**0.003**	Activated Carbon
Sludge Dewatering Facility (EU 49)	7,450	211	34	7,200	432,000	**0.001**	**0.004**	**0.00002**	**0.0001**	Bohn Biofilter

All annual emission rates are based on 8,760 hours per year and 2,000 lb per ton. Example Calculation: 0.20 lb/hr x 8,760 hours per year / 2,000 lb per ton = 0.86 tpy
Annual emissions are presented on the Emission Summary page and on the application long form.

H_2S concentrations are from site specific field measurements.

Uncontrolled H_2S Emission Rate Sample Calculation:

Flow Rate (m^3/min) x Concentration (ug/m^3) = ug/min
(ug/min) x (60 min/hr) = ug/hr
Convert ug to lb: 1 ug = 2.2046 x 10^{-9} lb

(42.48 m^3/min) x (34,847 ug/m^3) x (60 min/hr) x (2.2046 x 10^{-9} lb/ug) = 0.20 lb/hr H_2S

Water Authority – Southside Water Reclamation Plant

Caterpillar G3612

Emission unit number(s):	27	
Source description:	Natural gas engine	
Manufacturer:	Caterpillar	
Model:	G3612	
Aspiration:	TA	
Engine Type:	4SLB	
Sea level hp:	3192	hp, value verified by engine nameplate
Heat input (Nat Gas):	20.2	MMBtu/hr, based on brake specific fuel consumption and horsepower
Heat input (Dig Gas):	11.9	MMBtu/hr, estimated using fuel heat inputs
Annual Operating Hours:	8760	hours
Heating Value of Nat Gas:	1020	Btu/scf
Heating Value of Dig Gas:	599	Btu/scf, average based on the last 5 years of site-specific data
Brake Specific Fuel Consumption:	6331	Btu/hp-hr, value verified through engine specification sheet

Control (SCR and Oxidation Catalyst):

NOx	51%	Reduction
CO	76%	Reduction
NMHC (VOC)	48%	Reduction
Formaldehyde (HCHO)	48%	Reduction

Note: The claimed control efficiencies in these calculations are lower than those theoretically achievable by the Oxidative catalyst / SCR system supplier and reflect an approriate safety factor for this particular application

Note: HAP removal data collected by the catalyst system vendor is limited to that for formaldehyde, acrolein, acetaldehyde, & ethylene dibromide. Therefore, control efficiencies are only applied to these four HAP compounds resulting in a total HAPs reduction of 44%.

Uncontrolled Emission Rates:

	NOx	CO	NMHC	SO_2	TSP	PM-10	PM-2.5	HCHO	HAPs	
Unit 27	**5.20**	**16.40**	**5.50**	**0.80**	**0.20**	**0.20**	**0.20**	**1.07**	**1.46**	lb/hr
	22.78	**71.83**	**24.09**	**3.50**	**0.88**	**0.88**	**0.88**	**4.67**	**6.39**	tpy

Controlled Emission Rates:

	NOx	CO	NMHC	SO_2	TSP	PM-10	PM-2.5	HCHO	HAPs	Ammonia	
Unit 27	**2.55**	**3.94**	**2.86**	**0.80**	**0.20**	**0.20**	**0.20**	**0.55**	**0.82**	**0.16**	lb/hr
	11.16	**17.24**	**12.53**	**3.50**	**0.88**	**0.88**	**0.88**	**2.43**	**3.57**	**0.65**	tpy

Note: The requested permitted emission rates are the maximum of the estimated rates of either the use of digester gas or natural gas as fuel for the engine.

Digester Gas & Natural Gas Blend Calculations

NOx[A]	CO[A]	VOC[A]	SO_2[A]	TSP[B]	PM-10[B]	PM-2.5[B]	HCHO[C]	HAPs[C]		
				0.009987	0.009987	0.009987	0.0528		lb/MMBtu	AP-42, Table 3.2-2
5.2	14.0	5.5	0.80	0.12	0.12	0.12	0.63	0.86	lb/hr	Refer to Notes
5.20	**14.00**	**5.50**	**0.80**	**0.12**	**0.12**	**0.12**	**0.63**	**0.86**	lb/hr	Hourly emission rate
22.78	**61.32**	**24.09**	**3.50**	**0.52**	**0.52**	**0.52**	**2.74**	**3.75**	tpy	Annual emission rate

Natural Gas Calculations

NOx[A]	CO[A]	VOC[A]	SO_2[A]	TSP[B]	PM-10[B]	PM-2.5[B]	HCHO[C]	HAPs[C]		
				0.009987	0.009987	0.009987	0.0528		lb/MMBtu	AP-42, Table 3.2-2
4.6	16.4	5.3	0.80	0.20	0.20	0.20	1.07	1.46	lb/hr	Refer to Notes
4.60	**16.40**	**5.30**	**0.80**	**0.20**	**0.20**	**0.20**	**1.07**	**1.46**	lb/hr	Hourly emission rate
20.15	**71.83**	**23.21**	**3.50**	**0.88**	**0.88**	**0.88**	**4.67**	**6.39**	tpy	Annual emission rate

Notes:

[A] NOx and SO_2 pound per hour rates are based on a 7-year maximum from annual engine emission tests. CO pound per hour rates are based on a 7-year maximum from annual engine emission tests. VOC pound per hour rates are based on a 5-year maximum from annual engine emission tests.

[B] TSP and PM emission factors are based on AP-42, Table 3.2-2 factors, for 4SLB engines (PM filterable + PM Condensable = Total PM).

[C] HAP emissions were based on AP-42, table 3.2-2 factors, for 4SLB engines

CO_2	CH_4	CO_2e	For informational purposes only
2222.94	25.26	2854.46	**lb/hr**
9736.48	110.64	**12502.53**	**tpy**

AP-42 Table 3.2-2

One ton of CH_4 = 25 tons CO_2e

Water Authority – Southside Water Reclamation Plant
Caterpillar G3612

Emission Unit No. 27

AP-42 Factors for Emission Rates from Table 3.2-2 (7/00)

				Uncontrolled		Controlled	
		Emission Rate Digester Gas		**Emission Rate Natural Gas**		**Emission Rate Natural Gas**	
HAP	**lb/MMBtu**	**(lb/hr)**	**(tpy)**	**(lb/hr)**	**(tpy)**	**(lb/hr)**	**(tpy)**
1,1,2,2-Tetrachloroethane	4.00E-05	4.74E-04	2.08E-03	8.08E-04	3.54E-03	8.08E-04	3.54E-03
1,1,2-Trichloroethane	3.18E-05	3.77E-04	1.65E-03	6.43E-04	2.81E-03	6.43E-04	2.81E-03
1,3-Butadiene	2.67E-04	3.17E-03	1.39E-02	5.40E-03	2.36E-02	5.40E-03	2.36E-02
1,3-Dichloropropene	2.64E-05	3.13E-04	1.37E-03	5.34E-04	2.34E-03	5.34E-04	2.34E-03
2-Methylnaphthalene	3.32E-05	3.94E-04	1.72E-03	6.71E-04	2.94E-03	6.71E-04	2.94E-03
2,2,4-Trimethylpentane	2.50E-04	2.96E-03	1.30E-02	5.05E-03	2.21E-02	5.05E-03	2.21E-02
Acenaphthene	1.25E-06	1.48E-05	6.49E-05	2.53E-05	1.11E-04	2.53E-05	1.11E-04
Acenaphthylene	5.53E-06	6.56E-05	2.87E-04	1.12E-04	4.89E-04	1.12E-04	4.89E-04
Acetaldehyde	8.36E-03	9.91E-02	4.34E-01	**1.69E-01**	**7.40E-01**	**8.79E-02**	**3.85E-01**
Acrolein	5.14E-03	6.10E-02	2.67E-01	**1.04E-01**	**4.55E-01**	**5.40E-02**	**2.37E-01**
Benzene	4.40E-04	5.22E-03	2.29E-02	8.89E-03	3.89E-02	8.89E-03	3.89E-02
Benzo(b)fluoranthene	1.66E-07	1.97E-06	8.62E-06	3.35E-06	1.47E-05	3.35E-06	1.47E-05
Benzo(e)pyrene	4.15E-07	4.92E-06	2.16E-05	8.39E-06	3.67E-05	8.39E-06	3.67E-05
Benzo(g,h,i)perylene	4.14E-07	4.91E-06	2.15E-05	8.37E-06	3.66E-05	8.37E-06	3.66E-05
Biphenyl	2.12E-04	2.51E-03	1.10E-02	4.28E-03	1.88E-02	4.28E-03	1.88E-02
Carbon tetrachloride	3.67E-05	4.35E-04	1.91E-03	7.42E-04	3.25E-03	7.42E-04	3.25E-03
Chlorobenzene	3.04E-05	3.61E-04	1.58E-03	6.14E-04	2.69E-03	6.14E-04	2.69E-03
Chloroform	2.85E-05	3.38E-04	1.48E-03	5.76E-04	2.52E-03	5.76E-04	2.52E-03
Chrysene	6.93E-07	8.22E-06	3.60E-05	1.40E-05	6.13E-05	1.40E-05	6.13E-05
Ethylbenzene	3.97E-05	4.71E-04	2.06E-03	8.02E-04	3.51E-03	8.02E-04	3.51E-03
Ethylene dibromide	4.43E-05	5.25E-04	2.30E-03	**8.95E-04**	**3.92E-03**	**4.66E-04**	**2.04E-03**
Flouranthene	1.11E-06	1.32E-05	5.77E-05	2.24E-05	9.82E-05	2.24E-05	9.82E-05
Formaldehyde	5.28E-02	6.26E-01	2.74E+00	**1.07E+00**	**4.67E+00**	**5.55E-01**	**2.43E+00**
Methanol	2.50E-03	2.96E-02	1.30E-01	5.05E-02	2.21E-01	5.05E-02	2.21E-01
Methylene chloride	2.00E-05	2.37E-04	1.04E-03	4.04E-04	1.77E-03	4.04E-04	1.77E-03
n-Hexane	1.11E-03	1.32E-02	5.77E-02	2.24E-02	9.82E-02	2.24E-02	9.82E-02
Naphthalene	7.44E-05	8.82E-04	3.86E-03	1.50E-03	6.59E-03	1.50E-03	6.59E-03
PAH	2.69E-05	3.19E-04	1.40E-03	5.44E-04	2.38E-03	5.44E-04	2.38E-03
Phenanthrene	1.04E-05	1.23E-04	5.40E-04	2.10E-04	9.21E-04	2.10E-04	9.21E-04
Phenol	2.40E-05	2.85E-04	1.25E-03	4.85E-04	2.12E-03	4.85E-04	2.12E-03
Pyrene	1.36E-06	1.61E-05	7.06E-05	2.75E-05	1.20E-04	2.75E-05	1.20E-04
Styrene	2.36E-05	2.80E-04	1.23E-03	4.77E-04	2.09E-03	4.77E-04	2.09E-03
Tetrachloroethane	2.48E-06	2.94E-05	1.29E-04	5.01E-05	2.20E-04	5.01E-05	2.20E-04
Toluene	4.08E-04	4.84E-03	2.12E-02	8.25E-03	3.61E-02	8.25E-03	3.61E-02
Vinyl chloride	1.49E-05	1.77E-04	7.74E-04	3.01E-04	1.32E-03	3.01E-04	1.32E-03
Xylene	1.84E-04	2.18E-03	9.56E-03	3.72E-03	1.63E-02	3.72E-03	1.63E-02
	TOTAL	**0.86**	**3.75**	**1.46**	**6.39**	**0.82**	**3.57**

Water Authority – Southside Water Reclamation Plant

Caterpillar G3612

Emission unit number(s):	28	
Source description:	Natural gas engine	
Manufacturer:	Caterpillar	
Model:	G3612	
Aspiration:	TA	
Engine Type:	4SLB	
Sea level hp:	3192	hp, value verified by engine nameplate
Heat input (Nat Gas):	20.2	MMBtu/hr, based on brake specific fuel consumption and horsepower
Heat input (Dig Gas):	11.9	MMBtu/hr, estimated using fuel heat inputs
Annual Operating Hours:	8760	hours
Heating Value of Nat Gas:	1020	Btu/scf
Heating Value of Dig Gas:	599	Btu/scf, average based on the last 5 years of site-specific data
Brake Specific Fuel Consumption:	6331	Btu/hp-hr, value verified through engine specification sheet

Control (SCR and Oxidation Catalyst):

NOx	51%	Reduction
CO	76%	Reduction
NMHC (VOC)	48%	Reduction
Formaldehyde (HCHO)	48%	Reduction

Note: The claimed control efficiencies in these calculations are lower than those theoretically achievable by the Oxidative catalyst / SCR system supplier and reflect an approriate safety factor for this particular application

Note: HAP removal data collected by the catalyst system vendor is limited to that for formaldehyde, acrolein, acetaldehyde, & ethylene dibromide. Therefore, control efficiencies are only applied to these four HAP compounds resulting in a total HAPs reduction of 44%.

Uncontrolled Emission Rates:

	NOx	CO	NMHC	SO$_2$	TSP	PM-10	PM-2.5	HCHO	HAPs	
Unit 28	**3.90**	**14.00**	**3.10**	**0.16**	**0.20**	**0.20**	**0.20**	**1.07**	**1.46**	lb/hr
	17.08	**61.32**	**13.58**	**0.70**	**0.88**	**0.88**	**0.88**	**4.67**	**6.39**	tpy

Controlled Emission Rates:

	NOx	CO	NMHC	SO$_2$	TSP	PM-10	PM-2.5	HCHO	HAPs	Ammonia	
Unit 28	**1.91**	**3.36**	**1.61**	**0.16**	**0.20**	**0.20**	**0.20**	**0.55**	**0.82**	**0.16**	lb/hr
	8.37	**14.72**	**7.06**	**0.70**	**0.88**	**0.88**	**0.88**	**2.43**	**3.57**	**0.65**	tpy

Note: The requested permitted emission rates are the maximum of the estimated rates of either the use of digester gas or natural gas as fuel for the engine.

Digester Gas & Natural Gas Blend Calculations

NOx^A	CO^A	VOC^A	SO$_2$^{A}	TSP^B	PM-10^B	PM-2.5^B	HCHO^C	HAPs^C		
				0.009987	0.009987	0.009987	0.0528		lb/MMBtu	AP-42, Table 3.2-2
3.2	13.7	3.1	0.16	0.12	0.12	0.12	0.63	0.86	lb/hr	Refer to Notes
3.20	**13.70**	**3.10**	**0.16**	**0.12**	**0.12**	**0.12**	**0.63**	**0.86**	lb/hr	Hourly emission rate
14.02	**60.01**	**13.58**	**0.70**	**0.52**	**0.52**	**0.52**	**2.74**	**3.75**	tpy	Annual emission rate

Natural Gas Calculations

NOx^A	CO^A	VOC^A	SO$_2$^{A}	TSP^B	PM-10^B	PM-2.5^B	HCHO^C	HAPs^C		
				0.009987	0.009987	0.009987	0.0528		lb/MMBtu	AP-42, Table 3.2-2
3.9	14.0	3.1	0.16	0.20	0.20	0.20	1.07	1.46	lb/hr	Refer to Notes
3.90	**14.00**	**3.10**	**0.16**	**0.20**	**0.20**	**0.20**	**1.07**	**1.46**	lb/hr	Hourly emission rate
17.08	**61.32**	**13.58**	**0.70**	**0.88**	**0.88**	**0.88**	**4.67**	**6.39**	tpy	Annual emission rate

Notes:

A NOx and SO$_2$ pound per hour rates are based on a 7-year maximum from annual engine emission tests. CO pound per hour rates are based on a 7-year maximum from annual engine emission tests. VOC pound per hour rates are based on a 5-year maximum from annual engine emission tests.

B TSP and PM emission factors are based on AP-42, Table 3.2-2 factors, for 4SLB engines (PM filterable + PM Condensable = Total PM).

C HAP emissions were based on AP-42, table 3.2-2 factors, for 4SLB engines

CO$_2$	CH$_4$	CO2$_e$	For informational purposes only
2222.94	25.26	2854.46	**lb/hr**
9736.48	110.64	**12502.53**	**tpy**

AP-42 Table 3.2-2

One ton of CH$_4$ = 25 tons CO$_2$e

Water Authority – Southside Water Reclamation Plant

Caterpillar G3612

Emission Unit No. 28

AP-42 Factors for Emission Rates from Table 3.2-2 (7/00)

				Uncontrolled		Controlled	
		Emission Rate Digester Gas		Emission Rate Natural Gas		Emission Rate Natural Gas	
HAP	**lb/MMBtu**	**(lb/hr)**	**(tpy)**	**(lb/hr)**	**(tpy)**	**(lb/hr)**	**(tpy)**
1,1,2,2-Tetrachloroethane	4.00E-05	4.74E-04	2.08E-03	8.08E-04	3.54E-03	8.08E-04	3.54E-03
1,1,2-Trichloroethane	3.18E-05	3.77E-04	1.65E-03	6.43E-04	2.81E-03	6.43E-04	2.81E-03
1,3-Butadiene	2.67E-04	3.17E-03	1.39E-02	5.40E-03	2.36E-02	5.40E-03	2.36E-02
1,3-Dichloropropene	2.64E-05	3.13E-04	1.37E-03	5.34E-04	2.34E-03	5.34E-04	2.34E-03
2-Methylnaphthalene	3.32E-05	3.94E-04	1.72E-03	6.71E-04	2.94E-03	6.71E-04	2.94E-03
2,2,4-Trimethylpentane	2.50E-04	2.96E-03	1.30E-02	5.05E-03	2.21E-02	5.05E-03	2.21E-02
Acenaphthene	1.25E-06	1.48E-05	6.49E-05	2.53E-05	1.11E-04	2.53E-05	1.11E-04
Acenaphthylene	5.53E-06	6.56E-05	2.87E-04	1.12E-04	4.89E-04	1.12E-04	4.89E-04
Acetaldehyde	8.36E-03	9.91E-02	4.34E-01	**1.69E-01**	**7.40E-01**	**8.79E-02**	**3.85E-01**
Acrolein	5.14E-03	6.10E-02	2.67E-01	**1.04E-01**	**4.55E-01**	**5.40E-02**	**2.37E-01**
Benzene	4.40E-04	5.22E-03	2.29E-02	8.89E-03	3.89E-02	8.89E-03	3.89E-02
Benzo(b)fluoranthene	1.66E-07	1.97E-06	8.62E-06	3.35E-06	1.47E-05	3.35E-06	1.47E-05
Benzo(e)pyrene	4.15E-07	4.92E-06	2.16E-05	8.39E-06	3.67E-05	8.39E-06	3.67E-05
Benzo(g,h,i)perylene	4.14E-07	4.91E-06	2.15E-05	8.37E-06	3.66E-05	8.37E-06	3.66E-05
Biphenyl	2.12E-04	2.51E-03	1.10E-02	4.28E-03	1.88E-02	4.28E-03	1.88E-02
Carbon tetrachloride	3.67E-05	4.35E-04	1.91E-03	7.42E-04	3.25E-03	7.42E-04	3.25E-03
Chlorobenzene	3.04E-05	3.61E-04	1.58E-03	6.14E-04	2.69E-03	6.14E-04	2.69E-03
Chloroform	2.85E-05	3.38E-04	1.48E-03	5.76E-04	2.52E-03	5.76E-04	2.52E-03
Chrysene	6.93E-07	8.22E-06	3.60E-05	1.40E-05	6.13E-05	1.40E-05	6.13E-05
Ethylbenzene	3.97E-05	4.71E-04	2.06E-03	8.02E-04	3.51E-03	8.02E-04	3.51E-03
Ethylene dibromide	4.43E-05	5.25E-04	2.30E-03	**8.95E-04**	**3.92E-03**	**4.66E-04**	**2.04E-03**
Flouranthene	1.11E-06	1.32E-05	5.77E-05	2.24E-05	9.82E-05	2.24E-05	9.82E-05
Formaldehyde	5.28E-02	6.26E-01	2.74E+00	**1.07E+00**	**4.67E+00**	**5.55E-01**	**2.43E+00**
Methanol	2.50E-03	2.96E-02	1.30E-01	5.05E-02	2.21E-01	5.05E-02	2.21E-01
Methylene chloride	2.00E-05	2.37E-04	1.04E-03	4.04E-04	1.77E-03	4.04E-04	1.77E-03
n-Hexane	1.11E-03	1.32E-02	5.77E-02	2.24E-02	9.82E-02	2.24E-02	9.82E-02
Naphthalene	7.44E-05	8.82E-04	3.86E-03	1.50E-03	6.59E-03	1.50E-03	6.59E-03
PAH	2.69E-05	3.19E-04	1.40E-03	5.44E-04	2.38E-03	5.44E-04	2.38E-03
Phenanthrene	1.04E-05	1.23E-04	5.40E-04	2.10E-04	9.21E-04	2.10E-04	9.21E-04
Phenol	2.40E-05	2.85E-04	1.25E-03	4.85E-04	2.12E-03	4.85E-04	2.12E-03
Pyrene	1.36E-06	1.61E-05	7.06E-05	2.75E-05	1.20E-04	2.75E-05	1.20E-04
Styrene	2.36E-05	2.80E-04	1.23E-03	4.77E-04	2.09E-03	4.77E-04	2.09E-03
Tetrachloroethane	2.48E-06	2.94E-05	1.29E-04	5.01E-05	2.20E-04	5.01E-05	2.20E-04
Toluene	4.08E-04	4.84E-03	2.12E-02	8.25E-03	3.61E-02	8.25E-03	3.61E-02
Vinyl chloride	1.49E-05	1.77E-04	7.74E-04	3.01E-04	1.32E-03	3.01E-04	1.32E-03
Xylene	1.84E-04	2.18E-03	9.56E-03	3.72E-03	1.63E-02	3.72E-03	1.63E-02
	TOTAL	**0.86**	**3.75**	**1.46**	**6.39**	**0.82**	**3.57**

Water Authority – Southside Water Reclamation Plant

Cooper-Superior 12-GTLA

Emission unit number(s):	29	
Source description:	Natural gas engine	
Manufacturer:	Cooper Superior	
Model:	12-GTLA	
Aspiration:	TA	
Engine Type:	4SLB	
Sea level hp:	1650	hp, value verified by engine nameplate
Heat input (Nat Gas):	12.4	MMBtu/hr, based on brake specific fuel consumption and horsepower
Heat input (Dig Gas):	7.3	MMBtu/hr, estimated using fuel heat inputs
Annual Operating Hours:	8760	hours
Heating Value of Nat Gas:	1020	Btu/scf
Heating Value of Dig Gas:	599	Btu/scf, average based on the last 5 years of site-specific data
Engine Gas Flow Rate	202	scf/min
Brake Specific Fuel Consumption:	7492	Btu/hp-hr = (1020 Btu/scf) x (202 scf/min from stack test) x (60min/hr) / (1650 hp)

Control (SCR and Oxidation Catalyst):

NOx	51%	Reduction
CO	76%	Reduction
NMHC (VOC)	48%	Reduction
Formaldehyde (HCHO)	48%	Reduction

Note: The claimed control efficiencies in these calculations are lower than those theoretically achievable by the Oxidative catalyst / SCR system supplier and reflect an approriate safety factor for this particular application

Note: HAP removal data collected by the catalyst system vendor is limited to that for formaldehyde, acrolein, acetaldehyde, & ethylene dibromide. Therefore, control efficiencies are only applied to these four HAP compounds resulting in a total HAPs reduction of 44%.

Uncontrolled Emission Rates:

	NOx	CO	NMHC	SO_2	TSP	PM-10	PM-2.5	HCHO	HAPs	
Unit 29	**7.28**	**14.55**	**2.30**	**0.90**	**0.12**	**0.12**	**0.12**	**0.65**	**0.89**	lb/hr
	31.87	**63.74**	**10.07**	**3.94**	**0.54**	**0.54**	**0.54**	**2.86**	**3.91**	tpy

Controlled Emission Rates:

	NOx	CO	NMHC	SO_2	TSP	PM-10	PM-2.5	HCHO	HAPs	Ammonia	
Unit 29	**3.57**	**3.49**	**1.20**	**0.90**	**0.12**	**0.12**	**0.12**	**0.34**	**0.50**	**0.11**	lb/hr
	15.62	**15.30**	**5.24**	**3.94**	**0.54**	**0.54**	**0.54**	**1.49**	**2.18**	**0.45**	tpy

Note: The requested permitted emission rates are the maximum of the estimated rates of either the use of digester gas or natural gas as fuel for the engine.

Straight Digester Gas Calculations

NOx^{A}	CO^{A}	VOC^{A}	$SO_2{}^{B}$	TSP^{C}	PM-10^{C}	PM-2.5^{C}	HCHO^{D}	HAPs^{D}		
				0.009987	0.009987	0.009987	0.0528		lb/MMBtu	AP-42, Table 3.2-2
			0.90				0.38	0.52	lb/hr	Refer to Notes
2.0	4.0	0.47							g/hp-hr	40 CFR 60 Subpart JJJJ, Table 1
7.28	**14.55**	**1.71**	**0.90**	**0.07**	**0.07**	**0.07**	**0.38**	**0.52**	lb/hr	Hourly emission rate
31.87	**63.74**	**7.49**	**3.94**	**0.32**	**0.32**	**0.32**	**1.68**	**2.29**	tpy	Annual emission rate

Natural Gas Calculations

NOx^{B}	CO^{B}	VOC^{B}	$SO_2{}^{B}$	TSP^{C}	PM-10^{C}	PM-2.5^{C}	HCHO^{D}	HAPs^{D}		
				0.009987	0.009987	0.009987	0.0528		lb/MMBtu	AP-42, Table 3.2-2
5.5	8.1	2.3	0.80				0.65	0.89	lb/hr	Refer to Notes
									g/hp-hr	40 CFR 60 Subpart JJJJ, Table 1
5.50	**8.10**	**2.30**	**0.80**	**0.12**	**0.12**	**0.12**	**0.65**	**0.89**	lb/hr	Hourly emission rate
24.09	**35.48**	**10.07**	**3.50**	**0.54**	**0.54**	**0.54**	**2.86**	**3.91**	tpy	Annual emission rate

Notes:

[A] NOx, CO, and VOC emission factors are limited based on 40 CFR 60 Subpart JJJJ, Table 1 for Landfill/Digester Gas engines >500-hp manufactured after 7/1/2010.

[B] NOx and SO_2 pound per hour rates are based on a 7-year maximum from annual engine emission tests. CO pound per hour rates are based on a 7-year maximum from annual engine emission tests. VOC pound per hour rates are based on a 5-year maximum from annual engine emission tests.

[C] TSP and PM emission factors are based on AP-42, Table 3.2-2 factors, for 4SLB engines (PM filterable + PM Condensable = Total PM).

[D] HAP emissions were based on AP-42, table 3.2-2 factors, for 4SLB engines

CO_2	CH_4	$CO2_e$	For informational purposes only
1359.86	15.45	1746.19	**lb/hr**
5956.20	67.68	**7648.31**	**tpy**

AP-42 Table 3.2-2

One ton of CH_4 = 25 tons CO_2e

Water Authority – Southside Water Reclamation Plant

Cooper-Superior 12-GTLA

Emission Unit No. 29

AP-42 Factors for Emission Rates from Table 3.2-2 (7/00)

				Uncontrolled		Controlled	
		Emission Rate Digester Gas		**Emission Rate Natural Gas**		**Emission Rate Natural Gas**	
HAP	**lb/MMBtu**	**(lb/hr)**	**(tpy)**	**(lb/hr)**	**(tpy)**	**(lb/hr)**	**(tpy)**
1,1,2,2-Tetrachloroethane	4.00E-05	2.90E-04	1.27E-03	4.94E-04	2.17E-03	4.94E-04	2.17E-03
1,1,2-Trichloroethane	3.18E-05	2.31E-04	1.01E-03	3.93E-04	1.72E-03	3.93E-04	1.72E-03
1,3-Butadiene	2.67E-04	1.94E-03	8.48E-03	3.30E-03	1.45E-02	3.30E-03	1.45E-02
1,3-Dichloropropene	2.64E-05	1.92E-04	8.39E-04	3.26E-04	1.43E-03	3.26E-04	1.43E-03
2-Methylnaphthalene	3.32E-05	2.41E-04	1.05E-03	4.10E-04	1.80E-03	4.10E-04	1.80E-03
2,2,4-Trimethylpentane	2.50E-04	1.81E-03	7.94E-03	3.09E-03	1.35E-02	3.09E-03	1.35E-02
Acenaphthene	1.25E-06	9.07E-06	3.97E-05	1.55E-05	6.77E-05	1.55E-05	6.77E-05
Acenaphthylene	5.53E-06	4.01E-05	1.76E-04	6.84E-05	2.99E-04	6.84E-05	2.99E-04
Acetaldehyde	8.36E-03	6.06E-02	2.66E-01	**1.03E-01**	**4.53E-01**	**5.37E-02**	**2.35E-01**
Acrolein	5.14E-03	3.73E-02	1.63E-01	**6.35E-02**	**2.78E-01**	**3.30E-02**	**1.45E-01**
Benzene	4.40E-04	3.19E-03	1.40E-02	5.44E-03	2.38E-02	5.44E-03	2.38E-02
Benzo(b)fluoranthene	1.66E-07	1.20E-06	5.27E-06	2.05E-06	8.99E-06	2.05E-06	8.99E-06
Benzo(e)pyrene	4.15E-07	3.01E-06	1.32E-05	5.13E-06	2.25E-05	5.13E-06	2.25E-05
Benzo(g,h,i)perylene	4.14E-07	3.00E-06	1.32E-05	5.12E-06	2.24E-05	5.12E-06	2.24E-05
Biphenyl	2.12E-04	1.54E-03	6.74E-03	2.62E-03	1.15E-02	2.62E-03	1.15E-02
Carbon tetrachloride	3.67E-05	2.66E-04	1.17E-03	4.54E-04	1.99E-03	4.54E-04	1.99E-03
Chlorobenzene	3.04E-05	2.21E-04	9.66E-04	3.76E-04	1.65E-03	3.76E-04	1.65E-03
Chloroform	2.85E-05	2.07E-04	9.06E-04	3.52E-04	1.54E-03	3.52E-04	1.54E-03
Chrysene	6.93E-07	5.03E-06	2.20E-05	8.57E-06	3.75E-05	8.57E-06	3.75E-05
Ethylbenzene	3.97E-05	2.88E-04	1.26E-03	4.91E-04	2.15E-03	4.91E-04	2.15E-03
Ethylene dibromide	4.43E-05	3.21E-04	1.41E-03	**5.48E-04**	**2.40E-03**	**2.85E-04**	**1.25E-03**
Flouranthene	1.11E-06	8.05E-06	3.53E-05	1.37E-05	6.01E-05	1.37E-05	6.01E-05
Formaldehyde	5.28E-02	3.83E-01	1.68E+00	**6.53E-01**	**2.86E+00**	**3.39E-01**	**1.49E+00**
Methanol	2.50E-03	1.81E-02	7.94E-02	3.09E-02	1.35E-01	3.09E-02	1.35E-01
Methylene chloride	2.00E-05	1.45E-04	6.35E-04	2.47E-04	1.08E-03	2.47E-04	1.08E-03
n-Hexane	1.11E-03	8.05E-03	3.53E-02	1.37E-02	6.01E-02	1.37E-02	6.01E-02
Naphthalene	7.44E-05	5.40E-04	2.36E-03	9.20E-04	4.03E-03	9.20E-04	4.03E-03
PAH	2.69E-05	1.95E-04	8.55E-04	3.33E-04	1.46E-03	3.33E-04	1.46E-03
Phenanthrene	1.04E-05	7.54E-05	3.30E-04	1.29E-04	5.63E-04	1.29E-04	5.63E-04
Phenol	2.40E-05	1.74E-04	7.63E-04	2.97E-04	1.30E-03	2.97E-04	1.30E-03
Pyrene	1.36E-06	9.87E-06	4.32E-05	1.68E-05	7.36E-05	1.68E-05	7.36E-05
Styrene	2.36E-05	1.71E-04	7.50E-04	2.92E-04	1.28E-03	2.92E-04	1.28E-03
Tetrachloroethane	2.48E-06	1.80E-05	7.88E-05	3.07E-05	1.34E-04	3.07E-05	1.34E-04
Toluene	4.08E-04	2.96E-03	1.30E-02	5.04E-03	2.21E-02	5.04E-03	2.21E-02
Vinyl chloride	1.49E-05	1.08E-04	4.73E-04	1.84E-04	8.07E-04	1.84E-04	8.07E-04
Xylene	1.84E-04	1.33E-03	5.85E-03	2.27E-03	9.96E-03	2.27E-03	9.96E-03
	TOTAL	**0.52**	**2.29**	**0.89**	**3.91**	**0.50**	**2.18**

Water Authority – Southside Water Reclamation Plant

Cooper-Superior 12-GTLA

Emission unit number(s):	30	
Source description:	Natural gas engine	
Manufacturer:	Cooper-Superior	
Model:	12-GTLA	
Aspiration:	TA	
Engine Type:	4SLB	
Sea level hp:	1650	hp, value verified by engine nameplate
Heat input (Nat Gas):	14.3	MMBtu/hr, based on brake specific fuel consumption and horsepower
Heat input (Dig Gas):	8.4	MMBtu/hr, estimated using fuel heat inputs
Annual Operating Hours	8760	hours
Heating Value of Nat Gas:	1020	Btu/scf
Heating Value of Dig Gas:	599	Btu/scf, average based on the last 5 years of site-specific data
Engine Gas Flow rate	234	scf/min
Brake Specific Fuel Consumption:	8679	Btu/hp-hr Btu/hp-hr = (1020 Btu/scf) x (234 scf/min from stack test) x (60min/hr) / (1650 hp)

Control (SCR and Oxidation Catalyst):

NOx	51%	Reduction
CO	76%	Reduction
NMHC (VOC)	48%	Reduction
Formaldehyde (HCHO)	48%	Reduction

Note: The claimed control efficiencies in these calculations are lower than those theoretically achievable by the Oxidative catalyst / SCR system supplier and reflect an approriate safety factor for this particular application

Note: HAP removal data collected by the catalyst system vendor is limited to that for formaldehyde, acrolein, acetaldehyde, & ethylene dibromide. Therefore, control efficiencies are only applied to these four HAP compounds resulting in a total HAPs reduction of 44%.

Uncontrolled Emission Rates:

	NOx	CO	NMHC	SO_2	TSP	PM-10	PM-2.5	HCHO	HAPs	
Unit 30	**6.40**	**8.10**	**3.10**	**0.25**	**0.14**	**0.14**	**0.14**	**0.76**	**1.03**	lb/hr
	28.03	**35.48**	**13.58**	**1.10**	**0.63**	**0.63**	**0.63**	**3.31**	**4.53**	tpy

Controlled Emission Rates:

	NOx	CO	NMHC	SO_2	TSP	PM-10	PM-2.5	HCHO	HAPs	Ammonia	
Unit 30	**3.14**	**1.94**	**1.61**	**0.25**	**0.14**	**0.14**	**0.14**	**0.39**	**0.58**	**0.11**	lb/hr
	13.74	**8.51**	**7.06**	**1.10**	**0.63**	**0.63**	**0.63**	**1.72**	**2.53**	**0.45**	tpy

Note: The requested permitted emission rates are the maximum of the estimated rates of either the use of digester gas or natural gas as fuel for the engine.

Straight Digester Gas Calculations

NOx^A	CO^A	VOC^A	SO_2^{A}	TSP^B	PM-10^B	PM-2.5^B	HCHO^C	HAPs^C		
				0.009987	0.009987	0.009987	0.0528		lb/MMBtu	AP-42, Table 3.2-2
3.6	7.0	1.4	0.25				0.44	0.61	lb/hr	Refer to Notes
3.60	**7.00**	**1.40**	**0.25**	**0.08**	**0.08**	**0.08**	**0.44**	**0.61**	lb/hr	Hourly emission rate
15.77	**30.66**	**6.13**	**1.10**	**0.37**	**0.37**	**0.37**	**1.94**	**2.66**	tpy	Annual emission rate

Natural Gas Calculations

NOx^A	CO^A	VOC^A	SO_2^{A}	TSP^B	PM-10^B	PM-2.5^B	HCHO^C	HAPs^C		
				0.009987	0.009987	0.009987	0.0528		lb/MMBtu	AP-42, Table 3.2-2
6.4	8.1	3.1	0.07				0.76	1.03	lb/hr	Refer to Notes
6.40	**8.10**	**3.10**	**0.07**	**0.14**	**0.14**	**0.14**	**0.76**	**1.03**	lb/hr	Hourly emission rate
28.03	**35.48**	**13.58**	**0.31**	**0.63**	**0.63**	**0.63**	**3.31**	**4.53**	tpy	Annual emission rate

Notes:

A NOx and SO_2 pound per hour rates are based on a 7-year maximum from annual engine emission tests. CO pound per hour rates are based on a 7-year maximum from annual engine emission tests. VOC pound per hour rates are based on a 5-year maximum from annual engine emission tests.

B TSP and PM emission factors are based on AP-42, Table 3.2-2 factors, for 4SLB engines (PM filterable + PM Condensable = Total PM).

C HAP emissions were based on AP-42, table 3.2-2 factors, for 4SLB engines

CO_2	CH_4	$CO2_e$	For informational purposes only
1575.29	17.90	2022.81	**lb/hr**
6899.76	78.41	**8859.92**	**tpy**

AP-42 Table 3.2-2

One ton of CH_4 = 25 tons CO_2e

Water Authority – Southside Water Reclamation Plant

Cooper-Superior 12-GTLA

Emission Unit No. 30

AP-42 Factors for Emission Rates from Table 3.2-2 (7/00)

				Uncontrolled		Controlled	
		Emission Rate Digester Gas		**Emission Rate Natural Gas**		**Emission Rate Natural Gas**	
HAP	**lb/MMBtu**	**(lb/hr)**	**(tpy)**	**(lb/hr)**	**(tpy)**	**(lb/hr)**	**(tpy)**
1,1,2,2-Tetrachloroethane	4.00E-05	3.36E-04	1.47E-03	5.73E-04	2.51E-03	5.73E-04	2.51E-03
1,1,2-Trichloroethane	3.18E-05	2.67E-04	1.17E-03	4.55E-04	1.99E-03	4.55E-04	1.99E-03
1,3-Butadiene	2.67E-04	2.24E-03	9.83E-03	3.82E-03	1.67E-02	3.82E-03	1.67E-02
1,3-Dichloropropene	2.64E-05	2.22E-04	9.72E-04	3.78E-04	1.66E-03	3.78E-04	1.66E-03
2-Methylnaphthalene	3.32E-05	2.79E-04	1.22E-03	4.75E-04	2.08E-03	4.75E-04	2.08E-03
2,2,4-Trimethylpentane	2.50E-04	2.10E-03	9.20E-03	3.58E-03	1.57E-02	3.58E-03	1.57E-02
Acenaphthene	1.25E-06	1.05E-05	4.60E-05	1.79E-05	7.84E-05	1.79E-05	7.84E-05
Acenaphthylene	5.53E-06	4.65E-05	2.04E-04	7.92E-05	3.47E-04	7.92E-05	3.47E-04
Acetaldehyde	8.36E-03	7.03E-02	3.08E-01	**1.20E-01**	**5.24E-01**	**6.23E-02**	**2.73E-01**
Acrolein	5.14E-03	4.32E-02	1.89E-01	**7.36E-02**	**3.22E-01**	**3.83E-02**	**1.68E-01**
Benzene	4.40E-04	3.70E-03	1.62E-02	6.30E-03	2.76E-02	6.30E-03	2.76E-02
Benzo(b)fluoranthene	1.66E-07	1.39E-06	6.11E-06	2.38E-06	1.04E-05	2.38E-06	1.04E-05
Benzo(e)pyrene	4.15E-07	3.49E-06	1.53E-05	5.94E-06	2.60E-05	5.94E-06	2.60E-05
Benzo(g,h,i)perylene	4.14E-07	3.48E-06	1.52E-05	5.93E-06	2.60E-05	5.93E-06	2.60E-05
Biphenyl	2.12E-04	1.78E-03	7.80E-03	3.04E-03	1.33E-02	3.04E-03	1.33E-02
Carbon tetrachloride	3.67E-05	3.08E-04	1.35E-03	5.26E-04	2.30E-03	5.26E-04	2.30E-03
Chlorobenzene	3.04E-05	2.55E-04	1.12E-03	4.35E-04	1.91E-03	4.35E-04	1.91E-03
Chloroform	2.85E-05	2.40E-04	1.05E-03	4.08E-04	1.79E-03	4.08E-04	1.79E-03
Chrysene	6.93E-07	5.82E-06	2.55E-05	9.92E-06	4.35E-05	9.92E-06	4.35E-05
Ethylbenzene	3.97E-05	3.34E-04	1.46E-03	5.69E-04	2.49E-03	5.69E-04	2.49E-03
Ethylene dibromide	4.43E-05	3.72E-04	1.63E-03	**6.34E-04**	**2.78E-03**	**3.30E-04**	**1.44E-03**
Flouranthene	1.11E-06	9.33E-06	4.09E-05	1.59E-05	6.96E-05	1.59E-05	6.96E-05
Formaldehyde	5.28E-02	4.44E-01	1.94E+00	**7.56E-01**	**3.31E+00**	**3.93E-01**	**1.72E+00**
Methanol	2.50E-03	2.10E-02	9.20E-02	3.58E-02	1.57E-01	3.58E-02	1.57E-01
Methylene chloride	2.00E-05	1.68E-04	7.36E-04	2.86E-04	1.25E-03	2.86E-04	1.25E-03
n-Hexane	1.11E-03	9.33E-03	4.09E-02	1.59E-02	6.96E-02	1.59E-02	6.96E-02
Naphthalene	7.44E-05	6.25E-04	2.74E-03	1.07E-03	4.67E-03	1.07E-03	4.67E-03
PAH	2.69E-05	2.26E-04	9.90E-04	3.85E-04	1.69E-03	3.85E-04	1.69E-03
Phenanthrene	1.04E-05	8.74E-05	3.83E-04	1.49E-04	6.52E-04	1.49E-04	6.52E-04
Phenol	2.40E-05	2.02E-04	8.83E-04	3.44E-04	1.51E-03	3.44E-04	1.51E-03
Pyrene	1.36E-06	1.14E-05	5.01E-05	1.95E-05	8.53E-05	1.95E-05	8.53E-05
Styrene	2.36E-05	1.98E-04	8.69E-04	3.38E-04	1.48E-03	3.38E-04	1.48E-03
Tetrachloroethane	2.48E-06	2.08E-05	9.13E-05	3.55E-05	1.56E-04	3.55E-05	1.56E-04
Toluene	4.08E-04	3.43E-03	1.50E-02	5.84E-03	2.56E-02	5.84E-03	2.56E-02
Vinyl chloride	1.49E-05	1.25E-04	5.48E-04	2.13E-04	9.35E-04	2.13E-04	9.35E-04
Xylene	1.84E-04	1.55E-03	6.77E-03	2.64E-03	1.15E-02	2.64E-03	1.15E-02
TOTAL		**0.61**	**2.66**	**1.03**	**4.53**	**0.58**	**2.53**

Water Authority – Southside Water Reclamation Plant

CoGen Engines Ammonia Slip from SCR Control

10 ppm ammonia = nominal emission rate for unreacted ammonia not used in the catalytic reduction of NOx to N2 (Miratech)
6.953 mg/cubic meter for concentration of ammonia in the gas stream; based on assumption of standard temperature (25 degrees C) and pressure (1 atmosphere)

Dry scfm airflows as reported by Alliance Source Testing - see Appendix J of this Application which contains their report that was re-issued on 8/28/20

4,154 scfm, dry = maximum average exhaust gas flow rate on the Cooper-Superior engines plus 15%
249,228 scf per hour dry air
7,063 standard cubic meters per hour of dry air

49,107 mg ammonia per hour
0.049 kg ammonia per hour
0.108 lbs/hour of ammonia
0.445 tons per year of ammonia for each Cooper-Superior engine = ammonia emission rate for EU29 and EU30 *each*

6,048 scfm, dry = maximum average exhaust gas flow rate on the Caterpillar engines plus 15%.
362,871 scf per hour dry air
10,283 standard cubic meters per hour of dry air

71,499 mg ammonia per hour
0.071 kg ammonia per hour
0.157 lbs/hour of ammonia
0.648 tons per year of ammonia for each Caterpillar engine = ammonia emission rate for EU27 and EU28 *each*

2.19 tons per year ammonia; all 4 engines

Water Authority – Southside Water Reclamation Plant

Cogeneration Boiler

Emission unit number(s): 31
Source description: Natural gas fired boiler
Manufacturer: Sellers Engineering
Model: S300 W Model 15 Senior

Fuel Consumption

Input heat rate:	12.553	MMBtu/hr	Maximum nameplate
Fuel heat value:	1020	Btu/scf	Natural gas fuel heat value (from AP-42, Chapter 1.4)
Fuel rate:	0.012	MMscf/hr	Input heat rate / fuel heat value
Annual Operating Hours:	8760	hours	Calculated based on NG usage, Annual Consumed Volume (MMscf) ÷ Fuel rate (MMscf/hr)

Emission Calculations

NOx	CO	VOC	SO_2	TSP[1]	PM-10[1]	PM-2.5[1]	HCHO[2]	HAPs[2]		
100.0	84.0	5.5	0.60	7.6	7.6	7.6			lb/MMscf	AP-42 Tables 1.4-1 and 1.4-2 (7/98)
1.23	**1.03**	**0.07**	**0.01**	**0.09**	**0.09**	**0.09**	**0.0009**	**0.02**	lb/hr	Hourly emission rate
5.39	**4.53**	**0.30**	**0.03**	**0.41**	**0.41**	**0.41**	**0.004**	**0.10**	tpy	Annual emission rate

[1] Assumes PM (Total) = TSP = PM-10 = PM-2.5
[2] HAPs emissions estimated using AP-42 factors.

CO_2	CH_4	$CO2_e$	For informational purposes only
1476.82	0.03	1477.53	**lb/hr**
6468.49	0.12	**6471.59**	**tpy**

AP-42 Table 1.4-2
One ton of CH_4 = 25 tons CO_2e

Water Authority – Southside Water Reclamation Plant

Cogeneration Boiler

AP-42 Factors for Pollutant Mass Emission Rates, Table 1.4-3

HAP	lb/MMscf	lb/MMBtu*
2-Methylnaphthalene	2.40E-05	2.35E-08
3-Methylchloranthrene	1.80E-06	1.76E-09
7,12-Dimethylbenz(a)anthracene	1.60E-05	1.57E-08
Acenaphthene	1.80E-06	1.76E-09
Acenaphthylene	1.80E-06	1.76E-09
Anthracene	2.40E-06	2.35E-09
Benz(a)anthracene	1.80E-06	1.76E-09
Benzene	2.10E-03	2.06E-06
Benzo(a)pyrene	1.20E-06	1.18E-09
Benzo(b)fluoranthene	1.80E-06	1.76E-09
Benzo(g,h,i)perylene	1.20E-06	1.18E-09
Benzo(k)fluoranthene	1.80E-06	1.76E-09
Chrysene	1.80E-06	1.76E-09
Dibenzo(a,h)anthracene	1.20E-06	1.18E-09
Dichlorobenzene	1.20E-03	1.18E-06
Fluoranthene	3.00E-06	2.94E-09
Fluorene	2.80E-06	2.75E-09
Formaldehyde	7.50E-02	7.35E-05
Hexane	1.80E+00	1.76E-03
Indeno(1,2,3-cd)pyrene	1.80E-06	1.76E-09
Naphthalene	6.10E-04	5.98E-07
Phenanthrene	1.70E-05	1.67E-08
Pyrene	5.00E-06	4.90E-09
Toluene	3.40E-03	3.33E-06
Lead	5.00E-04	4.90E-07

AP-42, Table 1.4-2

Maximum HAP Emission Rates

HAP	Uncontrolled Emission Rate	
	(lb/hr)	(tpy)
2-Methylnaphthalene	2.95E-07	1.29E-06
3-Methylchloranthrene	2.22E-08	9.70E-08
7,12-Dimethylbenz(a)anthracene	1.97E-07	8.62E-07
Acenaphthene	2.22E-08	9.70E-08
Acenaphthylene	2.22E-08	9.70E-08
Anthracene	2.95E-08	1.29E-07
Benz(a)anthracene	2.22E-08	9.70E-08
Benzene	2.58E-05	1.13E-04
Benzo(a)pyrene	1.48E-08	6.47E-08
Benzo(b)fluoranthene	2.22E-08	9.70E-08
Benzo(g,h,i)perylene	1.48E-08	6.47E-08
Benzo(k)fluoranthene	2.22E-08	9.70E-08
Chrysene	2.22E-08	9.70E-08
Dibenzo(a,h)anthracene	1.48E-08	6.47E-08
Dichlorobenzene	1.48E-05	6.47E-05
Fluoranthene	3.69E-08	1.62E-07
Fluorene	3.45E-08	1.51E-07
Formaldehyde	**9.23E-04**	**4.04E-03**
Hexane	2.22E-02	9.70E-02
Indeno(1,2,3-cd)pyrene	2.22E-08	9.70E-08
Naphthalene	7.51E-06	3.29E-05
Phenanthrene	2.09E-07	9.16E-07
Pyrene	6.15E-08	2.70E-07
Toluene	4.18E-05	1.83E-04
Lead	6.15E-06	2.70E-05
Total	**0.02**	**0.10**

Water Authority – Southside Water Reclamation Plant

Unleaded AST System

Emission unit number(s): 33
Source description: Unleaded gasoline dispensing facility
Manufacturer: ConVault
AST Color: White
Volume: 2,000 gallons
Model: UL List #2085
Annual Throughput 50,000 gal/yr Estimated throughput

Emission Calculations:

VOC Emissions Summary: lbs/yr = 1917.06 Emissions estimated by TANKS 4.0.9d
tons/yr = 0.96
operating hrs/yr = 8760
lbs/hr= 0.22

*Emissions were estimated using EPA's TANKS 4.0.9d program with a worst-case scenario for tank contents of Gasoline (RVP 13).

Water Authority – Southside Water Reclamation Plant

Flare Combustion Sources

Unit Numbers:	34, 35, 36	The 3 flares are combined as one emission source	
Flare Gas Rate (total):	449.4	MMscf/yr per flare	
Flare Gas Rate (total):	51,300	scf/hr	Design capacity per flare supplied by Charles Leder on 10-30-2019; see manufacturer's data sheet
Average Fuel Heating Value:*	688	Btu/scf	ABCWUA records plus 15% safety factor
Firing Rate:	35.3	MMBtu/hr	Based on flare gas rate (scf/hr) rating (per flare)
Number of Flares	3		
Hours of Operation Uncontrolled:	8,760	hours per year	
Hours of Operation Controlled:	2,160	hours per year (90 days per flare per year)	
Average Annual H_2S Content:*	94.9	ppmv	ABCWUA records plus 15% safety factor

*Digester gas fuel heating value and annual H_2S content were averaged from 7 years of site-specific data (2013-2019) and a safety factor of 15% was added.

Uncontrolled Emission Rates (8760 hrs/yr) Per Flare

	NOx	CO	VOC	SO_2[1]	H_2S[1]	PM-10[2]	PM-2.5[2]	HCHO[3]	HAPs[3]		
	0.068	0.31								lb/MMBtu	AP-42, Tables 13.5-1 and 13.5-2
			5.50					0.08		lb/MMscf	AP-42, Table 1.4-1
					94.9					ppmv	Site-Specific H_2S content
						7.6	7.6			lb/MMScf	AP-42 Table 1.4-2
Per Flare	**2.40**	**10.95**	**0.28**	**0.81**	**0.01**	**0.39**	**0.39**	**0.004**	**0.10**	lb/hr (total)	
	10.52	**47.95**	**1.24**	**3.53**	**0.04**	**1.71**	**1.71**	**0.02**	**0.44**	tpy (total)	
Total All Three Flares	**7.20**	**32.84**	**0.85**	**2.42**	**0.03**	**1.17**	**1.17**	**0.01**	**0.30**	lb/hr (total)	
	31.55	**143.84**	**3.71**	**10.59**	**0.11**	**5.12**	**5.12**	**0.05**	**1.32**	tpy (total)	

[1] Assume 98% combustion efficiency of H_2S and 100% conversion from H_2S to SO_2

H_2S (lb/hr) = 2% * H_2S concentration (ppmv)/10^6 * Flare Gas Rate (scf/hr) * 1 lb-mole/379 scf * 34 lb/1 lb-mole H_2S

SO_2 (lb/hr) = 98% * H_2S concentration (ppmv)/10^6 * Flare Gas Rate (scf/hr) * 1 lb-mole/379 scf * 64 lb/1 lb-mole SO_2

[2] Assumes PM (Total) = TSP = PM-10 = PM-2.5. All PM (Total = Condensible + Filterable) is assumed to be less than 1.0 micrometer in diameter.

[3] HAPs emissions were estimated using AP-42, Table 1.4-3 factors.

Example Calculation for NOx, CO and VOC (lb/hr) = (lb/MMBtu)*(MMBtu/hr)

Example Calculation for TSP/PM (lb/hr) = (µg/L) / (1,000,000 µg/g) * (0.002205 lb/g) * (L/0.035 ft^3) * (scf/hr)

Controlled Emission Rates (2,160 hrs/yr) Per Flare

	NOx	CO	VOC	SO_2[1]	H_2S[1]	PM-10[2]	PM-2.5[2]	HCHO[3]	HAPs[3]		
	0.068	0.31								lb/MMBtu	AP-42, Tables 13.5-1 and 13.5-2
			5.50					0.08		lb/MMscf	AP-42, Table 1.4-1
					94.9					ppmv	Site-Specific H_2S content
						7.6	7.6			lb/MMScf	AP-42 Table 1.4-2
Per Flare	**2.40**	**10.95**	**0.28**	**0.81**	**0.01**	**0.39**	**0.39**	**0.004**	**0.10**	lb/hr (total)	
	2.59	**11.82**	**0.30**	**0.87**	**0.009**	**0.42**	**0.42**	**0.004**	**0.11**	tpy (total)	
Total All Three Flares	**7.20**	**32.84**	**0.85**	**2.42**	**0.03**	**1.17**	**1.17**	**0.01**	**0.30**	lb/hr (total)	
	7.78	**35.47**	**0.91**	**2.61**	**0.03**	**1.26**	**1.26**	**0.01**	**0.32**	tpy (total)	

[1] Assume 98% combustion efficiency of H_2S and 100% conversion from H_2S to SO_2

H_2S (lb/hr) = 2% * H_2S concentration (ppmv)/10^6 * Flare Gas Rate (scf/hr) * 1 lb-mole/379 scf * 34 lb/1 lb-mole H_2S

SO_2 (lb/hr) = 98% * H_2S concentration (ppmv)/10^6 * Flare Gas Rate (scf/hr) * 1 lb-mole/379 scf * 64 lb/1 lb-mole SO_2

[2] Assumes PM (Total) = TSP = PM-10 = PM-2.5. All PM (Total = Condensible + Filterable) is assumed to be less than 1.0 micrometer in diameter.

[3] HAPs emissions were estimated using AP-42, Table 1.4-3 factors.

Example Calculation for NOx, CO and VOC (lb/hr) = (lb/MMBtu)*(MMBtu/hr)

Example Calculation for TSP/PM (lb/hr) = (µg/L) / (1,000,000 µg/g) * (0.002205 lb/g) * (L/0.035 ft^3) * (scf/hr)

Water Authority – Southside Water Reclamation Plant

Flare Combustion Sources

Emission Unit Nos. 34, 35, 36 The 3 flares are combined as one emission source

AP-42 Factors for Emission Rates from Table 1.4-3

		Uncontrolled (8760hrs/yr)		**Controlled (2,160 hrs/yr)**	
HAP	**lb/MMScf**	**(lb/hr)**	**(tpy)**	**(lb/hr)**	**(tpy)**
2-Methylnaphthalene	2.40E-05	1.23E-06	5.39E-06	1.23E-06	1.33E-06
3-Methylcholanthrene	1.80E-06	9.23E-08	4.04E-07	9.23E-08	9.97E-08
7,12-Dimethylbenz(a)anthracene	1.60E-05	8.21E-07	3.60E-06	8.21E-07	8.86E-07
Acenaphthene	1.80E-06	9.23E-08	4.04E-07	9.23E-08	9.97E-08
Acenaphthylene	1.80E-06	9.23E-08	4.04E-07	9.23E-08	9.97E-08
Anthracene	2.40E-06	1.23E-07	5.39E-07	1.23E-07	1.33E-07
Benz(a)anthracene	1.80E-06	9.23E-08	4.04E-07	9.23E-08	9.97E-08
Benzene	2.10E-03	1.08E-04	4.72E-04	1.08E-04	1.16E-04
Benzo(a)pyrene	1.20E-06	6.16E-08	2.70E-07	6.16E-08	6.65E-08
Benzo(b)fluoranthene	1.80E-06	9.23E-08	4.04E-07	9.23E-08	9.97E-08
Benzo(g,h,i)perylene	1.20E-06	6.16E-08	2.70E-07	6.16E-08	6.65E-08
Benzo(k)fluoranthene	1.80E-06	9.23E-08	4.04E-07	9.23E-08	9.97E-08
Chrysene	1.80E-06	9.23E-08	4.04E-07	9.23E-08	9.97E-08
Dibenzo(a,h)anthracene	1.20E-06	6.16E-08	2.70E-07	6.16E-08	6.65E-08
Dichlorobenzene	1.20E-03	6.16E-05	2.70E-04	6.16E-05	6.65E-05
Fluoranthene	3.00E-06	1.54E-07	6.74E-07	1.54E-07	1.66E-07
Fluorene	2.80E-06	1.44E-07	6.29E-07	1.44E-07	1.55E-07
Formaldehyde	**7.50E-02**	**3.85E-03**	**1.69E-02**	**3.85E-03**	**4.16E-03**
Hexane	1.87E+00	9.59E-02	4.20E-01	9.59E-02	1.04E-01
Indeno(1,2,3-cd)pyrene	1.80E-06	9.23E-08	4.04E-07	9.23E-08	9.97E-08
Naphthalene	6.10E-04	3.13E-05	1.37E-04	3.13E-05	3.38E-05
Phenanathrene	1.70E-05	8.72E-07	3.82E-06	8.72E-07	9.42E-07
Pyrene	5.00E-06	2.57E-07	1.12E-06	2.57E-07	2.77E-07
Toluene	3.40E-03	1.74E-04	7.64E-04	1.74E-04	1.88E-04
TOTAL		**0.10**	**0.44**	**0.10**	**0.11**

Water Authority – Southside Water Reclamation Plant

UV Facility Emergency Generator

Emission unit number(s):	37		
Source description:	Diesel Engine		
Manufacturer:	Cummins		
Model:	QSX15-G9 DEFJ-4141205		
Serial No.	7.9E+07		
Sea level hp:	661	hp	Manufacture Date: 11/2009
Annual Hours of Operation:	500	hours	
Maximum Fuel Consumption:	30.3	gal/hr	
Fuel Density:	7.0	lb/gal	
Fuel Heat Value:	18390	Btu/lb	
Fuel Heat Value:	0.13	MMBtu/gal	
Heat Input:	3.90	MMBtu/hr	

Emission Calculations

Uncontrolled Emissions (maximum operating hours 8,760 hours/year)

NOx[1]	CO	VOC[1]	SO_2[2]	PM[3]		
5.15	0.42	0.08	-	0.03	g/hp-hr	Manufacturer Data
-	-	-	15	-	ppmw	Ultra-low sulfur requirement for diesel fuel
7.51	0.61	0.12	0.006	0.04	lb/hr	Hourly Emission Rate
32.88	2.68	0.51	0.03	0.19	tpy	Annual emission rate

Notes:

[1] Temission factors from vendor specification sheet (Cummins Power Generation)

[2] SO_2 emissions (lb/hr) = 15 ppm / 10,000 / 100 * 7 lb/gal * 64 lb SO_2 / 32 lb S * 30.3 gal/hr = 0.006 lb/hr

[3] PM = TSP = PM-10 = PM-2.5 (conservative assumption)

Example calculation for NOx, CO, VOC, PM (lb/hr) = (g/hp-hr)*(hp)*(0.002205 lb/g)

Controlled Emissions (maximum operating hours 500 hours/year)

NOx	CO	VOC	SO_2	PM*	
7.51	**0.61**	**0.12**	**0.006**	**0.04**	**lb/hr**
1.88	**0.15**	**0.03**	**0.002**	**0.01**	**tpy**

CO_2	
766.76	**lb/hr**
191.69	**tpy**

AP-42 Table 3.4-1
For informational purposes only

HAP Emission Calculations

Benzene	Toluene	Xylenes	rmaldehy	Acetaldehyde	Acrolein	Naphthalene	Total HAPs		
0.00078	0.00028	0.00019	0.000079	0.000025	0.0000079	0.00013	0.0015	lb/MMBtu	AP 42 Table 3.4-3 & 4
3.03E-03	**1.10E-03**	**7.53E-04**	**3.08E-04**	**9.83E-05**	**3.07E-05**	**5.07E-04**	**5.82E-03**	Hourly emission rate (lb/hr)	
1.33E-02	**4.80E-03**	**3.30E-03**	**1.35E-03**	**4.31E-04**	**1.35E-04**	**2.22E-03**	**2.55E-02**	Uncontrolled annual emission rate (tpy)	
7.57E-04	**2.74E-04**	**1.88E-04**	**7.69E-05**	**2.46E-05**	**7.69E-06**	**1.27E-04**	**1.46E-03**	Controlled annual emission rate (tpy)	

Water Authority - Southside Water Reclamation Plant

North Preliminary Treatment Facility (PTF) Emergency Generator 0.5MW

Emission unit number(s):	38		
Source description:	Diesel Engine		
Manufacturer:	Cummins		
Model:	VTA1710G1		Manufacture Date: 07/1983
Serial No.:	37107032		
Horse Power:	760	hp	
Annual Hours of Operation:	200	hours	
Maximum Fuel Consumption:	38.0	gal/hr	
Fuel Density:	7.0	lb/gal	
Fuel Heat Value:	18390	Btu/lb	
Fuel Heat Value:	0.13	MMBtu/gal	
Heat Input:	4.89	MMBtu/hr	

Emission Calculations

Uncontrolled (maximum operating hours 8,760 hours/year)

NOx	CO	VOC	SO_2	PM[1]		
0.024	0.0055	0.00071	0.00001	0.0007	lb/hp-hr	AP-42 Table 3.4-1
18.24	4.18	0.54	0.01	0.53	lb/hr	Hourly Emission Rate
79.89	18.31	2.35	0.04	2.33	tpy	Annual emission rate

Notes:

[1] PM = TSP = PM-10 = PM-2.5 (conservative assumption)

SO_2 = ((0.00809 lb/hp-hr) x S); where S is the sulfur content in the diesel fuel. Low Sulfur diesel = 15 ppmw = 0.0015% S.

Example calculation for NOx, CO, VOC, PM (lb/hr) = (g/hp-hr)*(hp)*(0.002205 lb/g)

Controlled (maximum operating hours 200 hours/year)

NOx	CO	VOC	SO_2	PM*	
18.24	**4.18**	**0.54**	**0.009**	**0.53**	**lb/hr**
1.82	**0.42**	**0.05**	**0.001**	**0.05**	**tpy**

CO_2	
881.60	**lb/hr**
88.16	**tpy**

AP-42 Table 3.4-1
For informational purposes only

HAP Emission Calculations

Benzene	Toluene	Xylenes	Formaldehyde	Acetaldehyde	Acrolein	Naphthalene	Total HAPs		
0.00078	0.00028	0.00019	0.000079	0.000025	0.0000079	0.00013	0.0015	lb/MMBtu	AP 42 Table 3.4-3 & 4
3.80E-03	**1.37E-03**	**9.44E-04**	**3.86E-04**	**1.23E-04**	**3.86E-05**	**6.36E-04**	**7.30E-03**	Hourly emission rate (lb/hr)	
1.66E-02	**6.02E-03**	**4.14E-03**	**1.69E-03**	**5.40E-04**	**1.69E-04**	**2.79E-03**	**3.20E-02**	Uncontrolled annual emission rate (tpy)	
3.80E-04	**1.37E-04**	**9.44E-05**	**3.86E-05**	**1.23E-05**	**3.86E-06**	**6.36E-05**	**7.30E-04**	Controlled annual emission rate (tpy)	

Water Authority - Southside Water Reclamation Plant

Primary Pumphouses 1 & 2 Emergency Generator 1MW

Emission unit number(s):	39	
Source description:	Diesel Engine	
Manufacturer:	Cummins	
Model:	QST30-G5 NR2	Manufacture Date: 07/2015
Serial No.:	37265962	
Horse Power:	1490	hp
Annual Hours of Operation:	200	hours
Maximum Fuel Consumption:	72.2	gal/hr
Fuel Density:	7.0	lb/gal
Fuel Heat Value:	18390	Btu/lb
Fuel Heat Value:	0.13	MMBtu/gal
Heat Input:	9.30	MMBtu/hr

Emission Calculations

Uncontrolled (maximum operating hours 8,760 hours/year)

NOx[1]	CO	VOC[1]	SO_2[1]	PM[2]		
3.95	0.66	0.07	0.11	0.11	g/hp-hr	Manufacturer Data
12.98	2.17	0.23	0.36	0.36	lb/hr	Hourly Emission Rate
56.84	9.50	1.01	1.58	1.58	tpy	Annual emission rate

Notes:

[1] Cummins manufacturer data.

[2] PM = TSP = PM-10 = PM-2.5 (conservative assumption)

Example calculation for NOx, CO, VOC, PM (lb/hr) = (g/hp-hr)*(hp)*(0.002205 lb/g)

Controlled (maximum operating hours 200 hours/year)

NOx	CO	VOC	SO_2	PM*	
12.98	**2.17**	**0.23**	**0.361**	**0.36**	**lb/hr**
1.30	**0.22**	**0.02**	**0.036**	**0.04**	**tpy**

CO_2	
1728.40	**lb/hr**
172.84	**tpy**

AP-42 Table 3.4-1
For informational purposes only

HAP Emission Calculations

Benzene	Toluene	Xylenes	Formaldehyde	Acetaldehyde	Acrolein	Naphthalene	Total HAPs		
0.00078	0.00028	0.00019	0.000079	0.000025	0.0000079	0.00013	0.0015	lb/MMBtu	AP 42 Table 3.4-3 & 4
7.21E-03	**2.61E-03**	**1.79E-03**	**7.33E-04**	**2.34E-04**	**7.32E-05**	**1.21E-03**	**1.39E-02**	Hourly emission rate (lb/hr)	
3.16E-02	**1.14E-02**	**7.86E-03**	**3.21E-03**	**1.03E-03**	**3.21E-04**	**5.29E-03**	**6.07E-02**	Uncontrolled annual emission rate (tpy)	
7.21E-04	**2.61E-04**	**1.79E-04**	**7.33E-05**	**2.34E-05**	**7.32E-06**	**1.21E-04**	**1.39E-03**	Controlled annual emission rate (tpy)	

Water Authority - Southside Water Reclamation Plant

South Activated Pump Station (SAPS) Emergency Generator 2MW

Emission unit number(s):	40		
Source description:	Diesel Engine		
Manufacturer:	Cummins		
Model:	QSK60-G6		Manufacture Date: 01/23/2015
Serial No.:	33203628		
Horse Power:	2682	hp	
Annual Hours of Operation:	200	hours	
Maximum Fuel Consumption:	141.0	gal/hr	
Fuel Density:	7.0	lb/gal	
Fuel Heat Value:	18390	Btu/lb	
Fuel Heat Value:	0.13	MMBtu/gal	
Heat Input:	18.15	MMBtu/hr	

Emission Calculations

Uncontrolled (maximum operating hours 8,760 hours/year)

NOx[1]	CO	VOC[1]	SO_2[1]	PM[2]		
5.30	0.32	0.08	0.01	0.03	g/hp-hr	Manufacturer Data
31.34	1.89	0.47	0.06	0.18	lb/hr	Hourly Emission Rate
137.29	8.29	2.07	0.26	0.78	tpy	Annual emission rate

Notes:

[1] Cummins manufacturer data.

[2] PM = TSP = PM-10 = PM-2.5 (conservative assumption)

Example calculation for NOx, CO, VOC, PM (lb/hr) = (g/hp-hr)*(hp)*(0.002205 lb/g)

Controlled (maximum operating hours 200 hours/year)

NOx	CO	VOC	SO_2	PM*	
31.34	**1.89**	**0.47**	**0.059**	**0.18**	**lb/hr**
3.13	**0.19**	**0.05**	**0.006**	**0.02**	**tpy**

CO_2	
3111.17	**lb/hr**
311.12	**tpy**

AP-42 Table 3.4-1
For informational purposes only

HAP Emission Calculations

Benzene	Toluene	Xylenes	Formaldehyde	Acetaldehyde	Acrolein	Naphthalene	Total HAPs		
0.00078	0.00028	0.00019	0.000079	0.000025	0.0000079	0.00013	0.0015	lb/MMBtu	AP 42 Table 3.4-3 & 4
1.41E-02	**5.10E-03**	**3.50E-03**	**1.43E-03**	**4.57E-04**	**1.43E-04**	**2.36E-03**	**2.71E-02**	Hourly emission rate (lb/hr)	
6.17E-02	**2.23E-02**	**1.53E-02**	**6.27E-03**	**2.00E-03**	**6.27E-04**	**1.03E-02**	**1.19E-01**	Uncontrolled annual emission rate (tpy)	
1.41E-03	**5.10E-04**	**3.50E-04**	**1.43E-04**	**4.57E-05**	**1.43E-05**	**2.36E-04**	**2.71E-03**	Controlled annual emission rate (tpy)	

Water Authority - Southside Water Reclamation Plant

Blower Building Emergency Generator 3MW

Emission unit number(s):	41		
Source description:	Diesel Engine		
Manufacturer:	Cummins		
Model:	C3000 D6e		Manufacture Date: TBD
Serial No.:	TBD		
Horse Power:	4307	hp	
Annual Hours of Operation:	200	hours	
Maximum Fuel Consumption:	208.0	gal/hr	
Fuel Density:	7.0	lb/gal	
Fuel Heat Value:	18390	Btu/lb	
Fuel Heat Value:	0.13	MMBtu/gal	
Heat Input:	26.78	MMBtu/hr	

Emission Calculations

Uncontrolled (maximum operating hours 8,760 hours/year)

NOx[1]	CO	VOC[1]	SO_2[1]	PM[2]		
5.20	0.2	0.07	0.005	0.04	g/hp-hr	Manufacturer Data
49.38	1.90	0.66	0.05	0.38	lb/hr	Hourly Emission Rate
216.30	8.32	2.91	0.21	1.66	tpy	Annual emission rate

Notes:

[1] Cummins manufacturer data.

[2] PM = TSP = PM-10 = PM-2.5 (conservative assumption)

Example calculation for NOx, CO, VOC, PM (lb/hr) = (g/hp-hr)*(hp)*(0.002205 lb/g)

Controlled (maximum operating hours 200 hours/year)

NOx	CO	VOC	SO_2	PM*	
49.38	**1.90**	**0.66**	**0.047**	**0.38**	**lb/hr**
4.94	**0.19**	**0.07**	**0.005**	**0.04**	**tpy**

CO_2	
4996.12	**lb/hr**
499.61	**tpy**

AP-42 Table 3.4-1

For informational purposes only

HAP Emission Calculations

Benzene	Toluene	Xylenes	Formaldehyde	Acetaldehyde	Acrolein	Naphthalene	Total HAPs		
0.00078	0.00028	0.00019	0.000079	0.000025	0.0000079	0.00013	0.0015	lb/MMBtu	AP 42 Table 3.4-3 & 4
2.08E-02	**7.53E-03**	**5.17E-03**	**2.11E-03**	**6.75E-04**	**2.11E-04**	**3.48E-03**	**4.00E-02**	Hourly emission rate (lb/hr)	
9.10E-02	**3.30E-02**	**2.26E-02**	**9.25E-03**	**2.96E-03**	**9.24E-04**	**1.52E-02**	**1.75E-01**	Uncontrolled annual emission rate (tpy)	
2.08E-03	**7.53E-04**	**5.17E-04**	**2.11E-04**	**6.75E-05**	**2.11E-05**	**3.48E-04**	**4.00E-03**	Controlled annual emission rate (tpy)	

Water Authority - Southside Water Reclamation Plant

North Blower Bldg. Emergency Generator 0.75 MW

Emission unit number(s):	42		
Source description:	Diesel Engine		
Manufacturer:	Caterpillar		
Model:	3412C		Manufacture Date: 1996
Serial No.:	2WJ00732		
Horse Power:	1109	hp	
Annual Hours of Operation:	200	hours	
Maximum Fuel Consumption:	53.8	gal/hr	
Fuel Density:	7.0	lb/gal	
Fuel Heat Value:	18390	Btu/lb	
Fuel Heat Value:	0.13	MMBtu/gal	
Heat Input:	6.93	MMBtu/hr	

Emission Calculations

Uncontrolled (maximum operating hours 8,760 hours/year)

NOx[1]	CO	VOC[1]	SO_2[2]	PM[3]		
--	--	--	0.00001	--	lb/hp-hr	AP-42 Table 3.4-1
17.61	3.22	0.60	0.01	0.52	lb/hr	Hourly Emission Rate (Manufacturer Data)
77.13	14.10	2.63	0.06	2.28	tpy	Annual emission rate

Notes:

[1] Caterpillar manufacturer data. Total Hydro Carbon (HC) asssumed to be total VOC.

[2] SO_2 = ((0.00809 lb/hp-hr) x S); where S is the sulfur content in the diesel fuel. Low Sulfur diesel = 15 ppmw = 0.0015% S.

[3] PM = TSP = PM-10 = PM-2.5 (conservative assumption)

Example calculation for NOx, CO, VOC, PM (lb/hr) = (g/hp-hr)*(hp)*(0.002205 lb/g)

Controlled (maximum operating hours 200 hours/year)

NOx	CO	VOC	SO_2	PM*	
17.61	**3.22**	**0.60**	**0.013**	**0.52**	**lb/hr**
1.76	**0.32**	**0.06**	**0.001**	**0.05**	**tpy**

CO_2	
1212.00	**lb/hr**
121.20	**tpy**

Manufacturer Data
For informational purposes only

HAP Emission Calculations

Benzene	Toluene	Xylenes	Formaldehyde	Acetaldehyde	Acrolein	Naphthalene	Total HAPs		
0.00078	0.00028	0.00019	0.000079	0.000025	0.0000079	0.00013	0.0015	lb/MMBtu	AP 42 Table 3.4-3 & 4
5.38E-03	**1.95E-03**	**1.34E-03**	**5.47E-04**	**1.75E-04**	**5.46E-05**	**9.00E-04**	**1.03E-02**	Hourly emission rate (lb/hr)	
2.35E-02	**8.53E-03**	**5.86E-03**	**2.39E-03**	**7.65E-04**	**2.39E-04**	**3.94E-03**	**4.53E-02**	Uncontrolled annual emission rate (tpy)	
5.38E-04	**1.95E-04**	**1.34E-04**	**5.47E-05**	**1.75E-05**	**5.46E-06**	**9.00E-05**	**1.03E-03**	Controlled annual emission rate (tpy)	

Water Authority – Southside Water Reclamation Plant

Dewatering Bldg. "HOTSY" and DAF/RDT Building "HOTSY" (high pressure hot water cleaning units)

Emission unit number(s):	43 and 44	
Source description:	Natural gas fired space heaters / water heaters / boilers	
Manufacturer:	Varies	
Model:	Varies	
Fuel heat content:	1020	Btu/scf

Unit Description	Location	MMBtu/hr
DEWATERING HOTSY (high pressure hot water cleaning unit)	Dewatering Bldg	0.720
DAF/RTD HOTSY (high pressure hot water cleaning unit)	DAF/RDT Building	0.720
	Total	**1.44**

Dewatering "HOTSY": Controlled and Uncontrolled Emission Rates (Based on 8760 hours per year)

NOx	CO	VOC	SO_2	TSP[1]	PM-10[1]	PM-2.5[1]	HCHO[2]	HAPs[2]		
100	84	5.5	0.6	7.6	7.6	7.6			lb/MMscf	AP-42 Table 1.4-2 (7/98)
0.07	**0.06**	**0.004**	**0.0004**	**0.01**	**0.01**	**0.01**	**0.0001**	**0.001**	lb/hr	Hourly emission rate
0.31	**0.26**	**0.02**	**0.002**	**0.02**	**0.02**	**0.02**	**0.0002**	**0.01**	tpy	Annual emission rate (8760 hrs/yr)

DAF/RDT "HOTSY": Controlled and Uncontrolled Emission Rates (Based on 8760 hours per year)

NOx	CO	VOC	SO_2	TSP[1]	PM-10[1]	PM-2.5[1]	HCHO[2]	HAPs[2]		
100	84	5.5	0.6	7.6	7.6	7.6			lb/MMscf	AP-42 Table 1.4-2 (7/98)
0.07	**0.06**	**0.004**	**0.0004**	**0.01**	**0.01**	**0.01**	**0.0001**	**0.001**	lb/hr	Hourly emission rate
0.31	**0.26**	**0.02**	**0.002**	**0.02**	**0.02**	**0.02**	**0.0002**	**0.01**	tpy	Annual emission rate (8760 hrs/yr)

[1] Assumes PM (Total) = TSP = PM-10 = PM-2.5

[2] HAPs emissions estimated using AP-42 factors.

HAP Emissions:

Pollutant	Emission Factor	Potential Emission Rates	
	(lb/MMscf)	(lb/hr)	(tons/yr)
HAPs:			
2-Methylnaphthalene	2.40E-05	1.70E-08	7.42E-08
3-Methylchloranthrene	1.80E-06	1.27E-09	5.57E-09
7,12-Dimethylbenz(a)anthracene	1.60E-05	1.13E-08	4.95E-08
Acenaphthene	1.80E-06	1.27E-09	5.57E-09
Acenaphthylene	1.80E-06	1.27E-09	5.57E-09
Anthracene	2.40E-06	1.70E-09	7.42E-09
Benz(a)anthracene	1.80E-06	1.27E-09	5.57E-09
Benzene	2.10E-03	1.48E-06	6.50E-06
Benzo(a)pyrene	1.20E-06	8.48E-10	3.71E-09
Benzo(b)fluoranthene	1.80E-06	1.27E-09	5.57E-09
Benzo(g,h,i)perylene	1.20E-06	8.48E-10	3.71E-09
Benzo(k)fluoranthene	1.80E-06	1.27E-09	5.57E-09
Chrysene	1.80E-06	1.27E-09	5.57E-09
Dibenzo(a,h)anthracene	1.20E-06	8.48E-10	3.71E-09
Dichlorobenzene	1.20E-03	8.48E-07	3.71E-06
Fluoranthene	3.00E-06	2.12E-09	9.28E-09
Fluorene	2.80E-06	1.98E-09	8.66E-09
Formaldehyde	7.50E-02	**5.30E-05**	**2.32E-04**
Indeno(1,2,3-c,d)pyrene	1.80E-06	1.27E-09	5.57E-09
n-Hexane	1.80E+00	1.27E-03	5.57E-03
Naphthalene	6.10E-04	4.31E-07	1.89E-06
Phenanthrene	1.70E-05	1.20E-08	5.26E-08
Pyrene	5.00E-06	3.53E-09	1.55E-08
Toluene	3.40E-03	2.40E-06	1.05E-05
Arsenic	2.00E-04	1.41E-07	6.19E-07
Beryllium	1.20E-05	8.48E-09	3.71E-08
Cadmium	1.10E-03	7.77E-07	3.40E-06
Chromium	1.40E-03	9.89E-07	4.33E-06
Cobalt	8.40E-05	5.93E-08	2.60E-07
Manganese	3.80E-04	2.68E-07	1.18E-06
Mercury	2.60E-04	1.84E-07	8.04E-07
Nickel	2.10E-03	1.48E-06	6.50E-06
Selenium	2.40E-05	1.70E-08	7.42E-08
Total HAP		**1.33E-03**	**5.84E-03**

Emission Factors from AP-42 Table 1.4-3 and Table 1.4-4 (7/98) .

CO_2	CH_4	$CO2_e$	For informational purposes only
84.76	84.76	2203.73	**lb/hr**
371.24	371.24	**9652.33**	**tpy**

AP-42 Table 1.4-2

One ton of CH_4 = 25 tons CO_2e

Water Authority - Southside Water Reclamation Plant

Wang Server Room Emergency Generator 0.15 MW

Emission unit number(s):	50	
Source description:	Diesel Engine	
Manufacturer:	Daimler/Mercedes-Benz	
Model:	12V OM924LA	Manufacture Date: TBD
Serial No.:	92400M571	
Horse Power:	197	hp
Annual Hours of Operation:	200	hours
Maximum Fuel Consumption:	7.6	gal/hr
Fuel Density:	7.0	lb/gal
Fuel Heat Value:	18390	Btu/lb
Fuel Heat Value:	0.13	MMBtu/gal
Heat Input:	0.98	MMBtu/hr

Emission Calculations

Uncontrolled (maximum operating hours 8,760 hours/year)

NOx[1]	CO	VOC[1]	SO_2[2]	PM[3]		
4.8	1.9	0.04		0.139	g/kW-hr	Manufacturer Data
0.01	0.0031	0.0001		0.0002	lb/hp-hr	Manufacturer Data
			0.00205		lb/hp-hr	AP-42 Table 3.3-1
1.55	0.61	0.01	0.40	0.04	lb/hr	Hourly Emission Rate (Manufacturer Data)
6.81	2.67	0.06	1.77	0.20	tpy	Annual emission rate

Notes:

[1] Daimler / Mercedes-Benz manufacturer data. Total Hydro Carbon (HC) asssumed to be total VOC.

[2] SO_2 = ((0.00809 lb/hp-hr) x S); where S is the sulfur content in the diesel fuel. Low Sulfur diesel = 15 ppmw = 0.0015% S.

[3] PM = TSP = PM-10 = PM-2.5 (conservative assumption)

Example calculation for NOx, CO, VOC, PM (lb/hr) = (g/hp-hr)*(hp)*(0.002205 lb/g)

Controlled (maximum operating hours 200 hours/year)

NOx	CO	VOC	SO_2	PM*	
1.55	**0.61**	**0.01**	**0.404**	**0.04**	**lb/hr**
0.16	**0.06**	**0.001**	**0.040**	**0.004**	**tpy**

CO_2	
205.65	**lb/hr**
20.57	**tpy**

Manufacturer Data (645 g/kW-hr)
For informational purposes only

HAP Emission Calculations

Hazardous Air Pollutants (HAP)	Emission Factor	lb/hr	Uncontrolled 8760 hours tpy	Controlled to Max of 200 hrs tpy
Acetaldehyde	7.67E-04 lbs/MMBtu	**0.001**	**0.0033**	**0.000075**
Acrolein	9.25E-05 lbs/MMBtu	**0.0001**	**0.0004**	**0.000009**
Benzene	9.33E-04 lbs/MMBtu	**0.001**	**0.0040**	**0.000091**
1,3-Butadiene	3.91E-05 lbs/MMBtu	**0.00004**	**0.0002**	**0.000004**
Formaldehyde	1.18E-03 lbs/MMBtu	**0.001**	**0.0051**	**0.000115**
Toluene	4.09E-04 lbs/MMBtu	**0.0004**	**0.0018**	**0.000040**
Naphthalene	8.48E-05 lbs/MMBtu	**0.0001**	**0.0004**	**0.000008**
Xylenes	2.85E-04 lbs/MMBtu	**0.0003**	**0.0012**	**0.000028**
	HAP TOTALS	**0.004**	**0.02**	**0.0004**

NOTES:

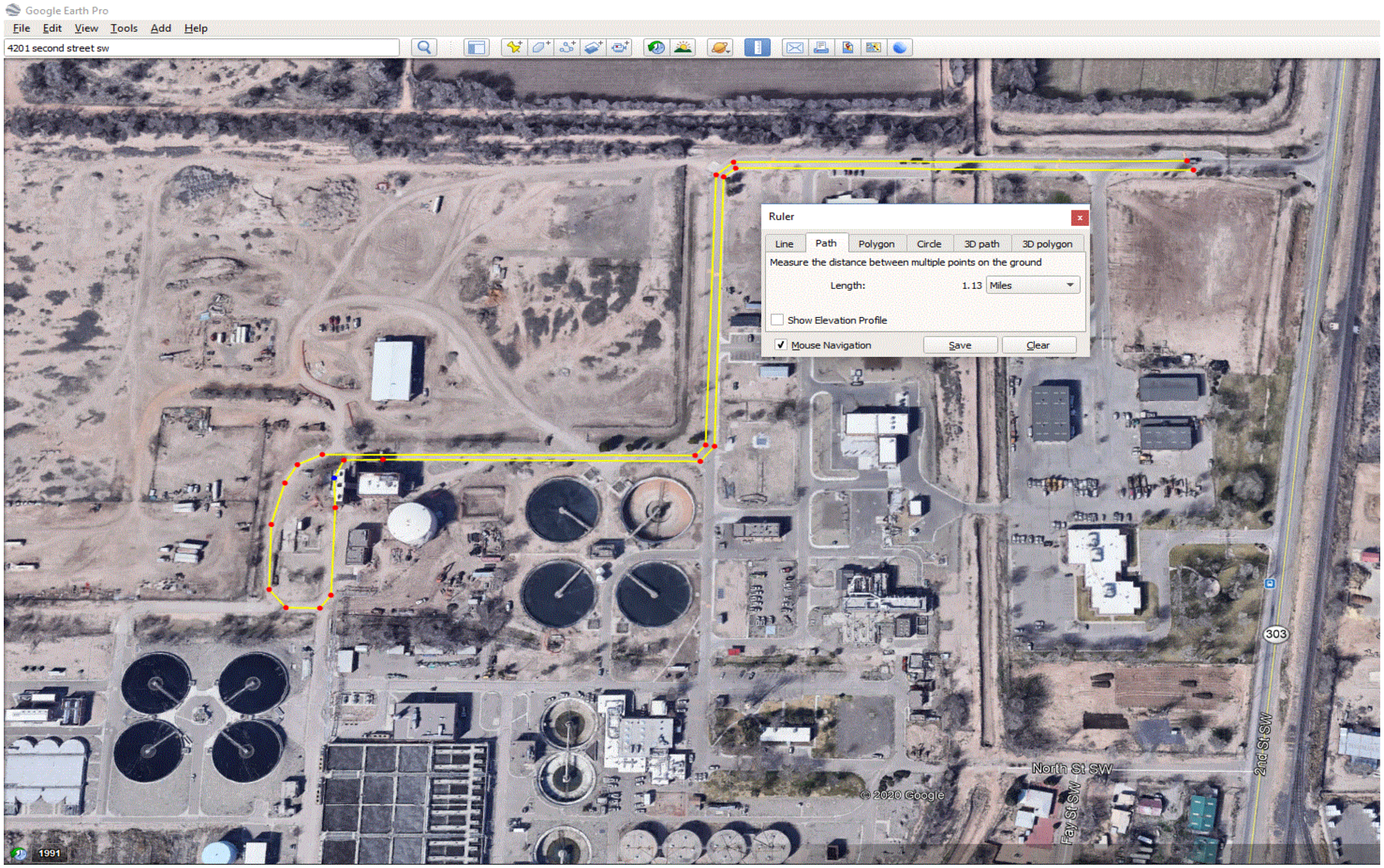
Emission Factors from EPA AP-42, Table 3.3-2 Specified Organic Compound Emission Factors for Uncontrolled Diesel Engines (October, 1996) for HAPs.

Emission Unit No. 51

TOTAL HAUL ROAD EMISSIONS			
Process	**Pollutant**	**Potential Emissions (lb/hr)**	**Potential Emissions (tons/year)**
Haul Road	PM_{10}	**0.05**	**0.07**
Haul Road	$PM_{2.5}$	**0.01**	**0.02**

Route #	Description	Paved Road Distance / Truck Load	Actual CY2018 # of trucks / year	Maximum # of trucks / year	Average Total Miles /Year	Max Total Miles /Year	Truck Weight Empty (lbs/truck)	Truck Weight Full Load (lbs/truck)	Payload (Lbs/load)
1	Dewatering	1.13	2078	3195	2348.1	3610.35	36000	73000	37000
2	PTF	0.6	325	325	195	195	32000	40000	8000
3	Course Screening	0.29	156	156	45.24	45.24	36000	36650	650
			Total Miles/Year		**2588.4**	**3850.6**			

Route #1, Dewatering



Ruler

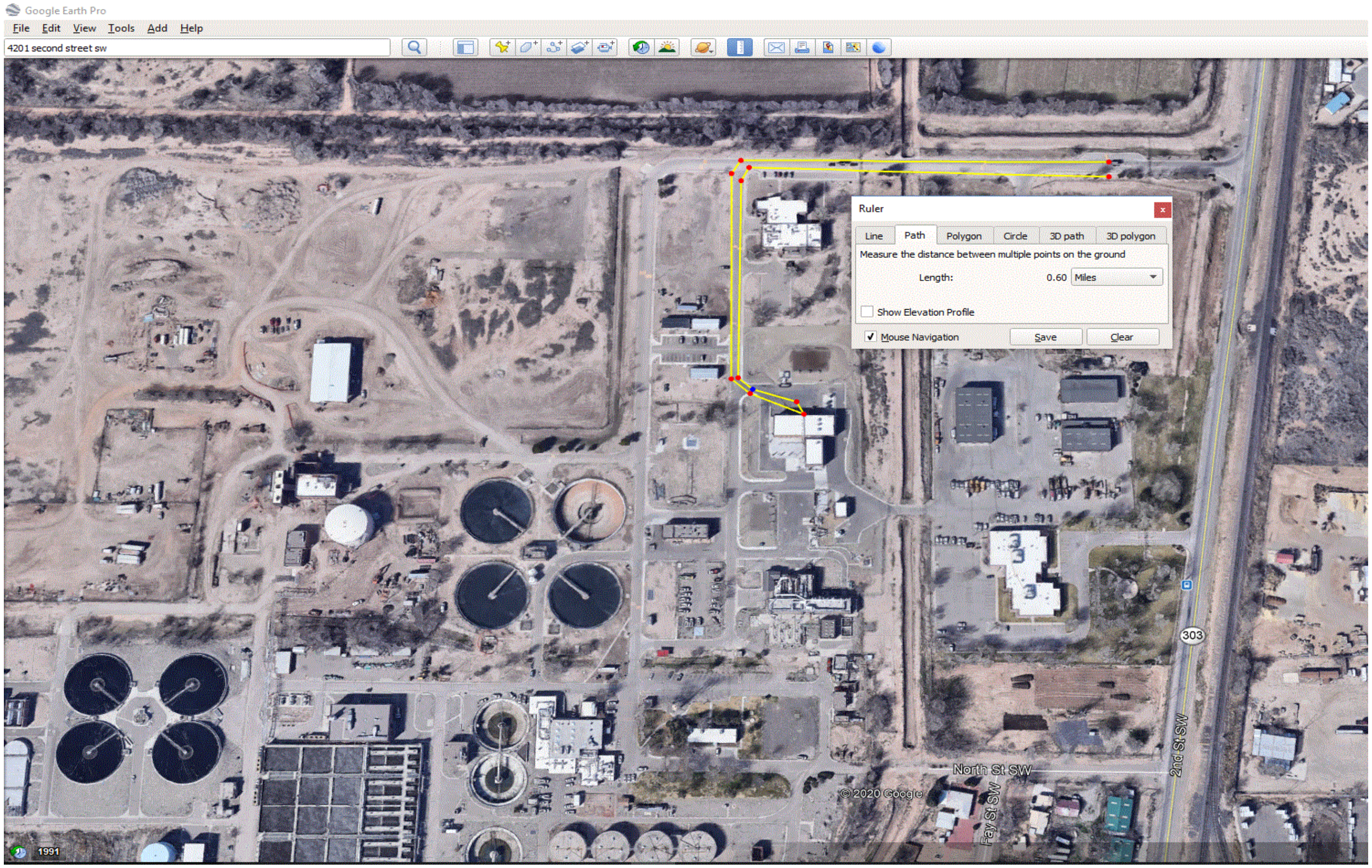
Measure the distance between multiple points on the ground

Length: 1.13 Miles

☐ Show Elevation Profile

☑ Mouse Navigation

Route #2, PTF



4201 second street sw

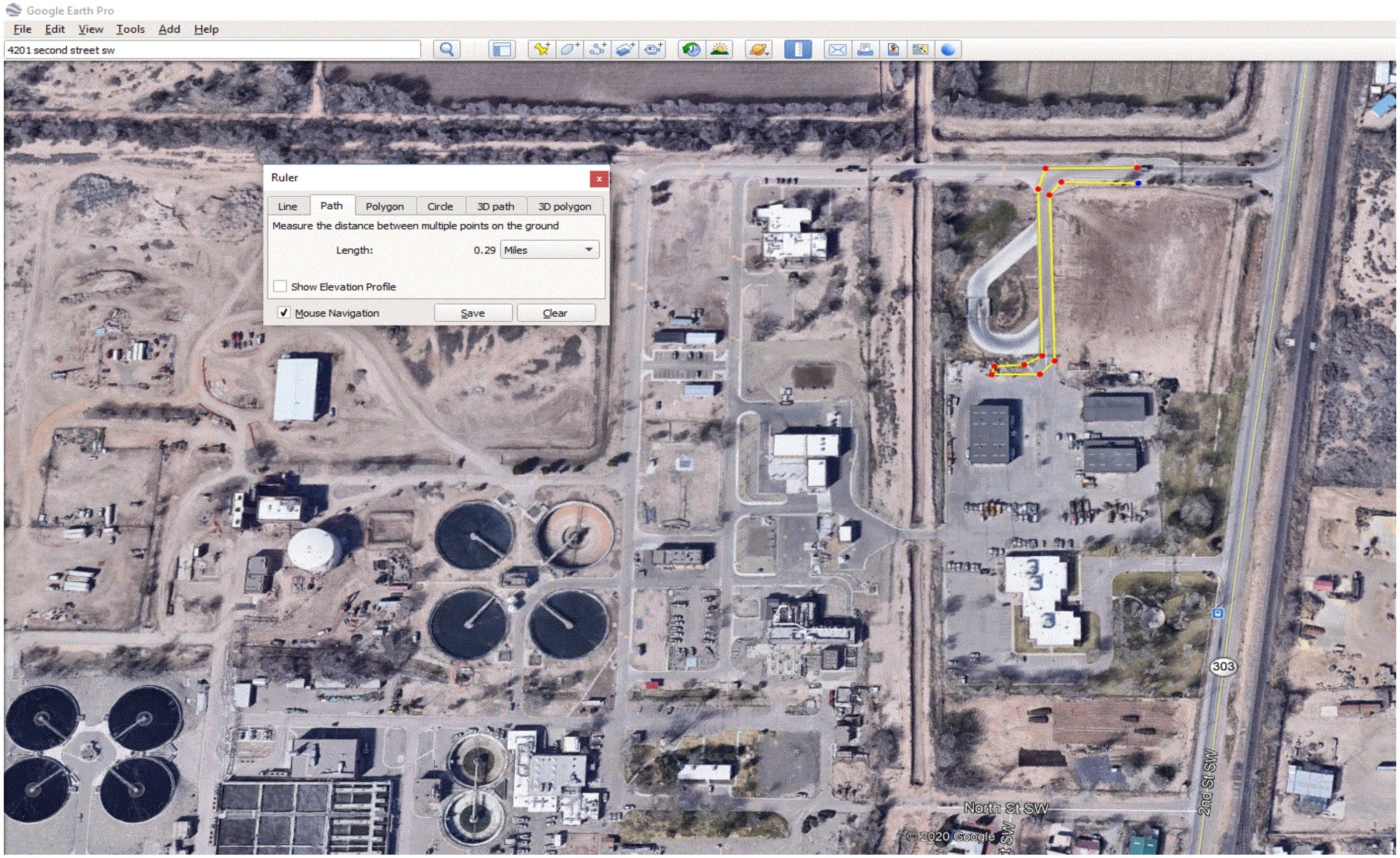
Measure the distance between multiple points on the ground

Length: 0.60 Miles

☐ Show Elevation Profile

☑ Mouse Navigation

Route #3, Course Screening



4201 second street sw

Ruler

Measure the distance between multiple points on the ground

Length: 0.29 Miles

☐ Show Elevation Profile

☑ Mouse Navigation

PAVED HAUL ROAD ROUTE 1

Average Weight of Empty Vehicles (tons):	18	Enter the average weight (in tons) of all unloaded vehicles traveling on the road.
Average Weight of Full Vehicles (tons):	36.5	Enter the average weight (in tons) of all loaded vehicles traveling on the road.
Percent of Miles that the Vehicles Travel While	50%	Enter the %. If vehicles travel the same distance empty and full, this number is should be
Annual Operating Hours	8760	
Average Vehicle Weight **(W)** (tons):	27.25	Average weight of vehicles based on the distance traveled on site.
Average Load Weight (tons):	18.5	Average weight of full vehicle minus average weight of empty vehicle.
Length of Haul Road (miles):	1.13	Enter the length of the haul road round trip.
Trip Frequecy (max hourly)	1	Enter the maximum trips per hour.
Trip Frequecy (annual)	3,195	Enter the maximum total annual trips.
Road Surface Silt Loading (g/m^2):	0.6	Road surface silt loading (g/m2) AP-42 Table 13.2.1-2 "Ubiquitous Baseline <500 ADT.
Wet days	70	Default allowed by NMED without additional justification.

SOURCE OF EMISSION	EQUATION	VALUES
The emission factor is taken from Equation 1 in AP-42, 13.2.1, Paved Roads.	***Annual*** **EF = [k x [s*L* ^0.91] x [W^1.02]]x((1- (P/4N)) lb/VMT** ***Hourly*** **EF = [k x [sL^0.91] x [W^1.02]]x((1- (1.2P/N)) lb/VMT**	**k = constant = 0.0022 for PM-10 and 0.00054 for PM-2.5** from AP-42 Table 13.2.1-1 sL = road surface silt loading = 0.4 from AP-42 Table 13.2.1-2 W = Average Vehicle Weight (tons) P= The number of days that had at least 0.01 inches of precipitation. N=number of days in averaging period (e.g., **365 for annual**, 91 for seasonal, 30 for monthly)

EMISSIONS CALCULATIONS

Process	Pollutant	Annual Emission Factor	Hourly Emission Factor	Emission Factor Units	Source of Emission Factor	Potential Emissions (lb/hr)	Potential Emissions (tons/year)
Haul Road	PM_{10}	0.0383	0.0310	lb/vmt	AP-42	**0.04**	**0.07**
Haul Road	$PM_{2.5}$	0.0094	0.0076	lb/vmt	AP-42	**0.01**	**0.02**

PAVED HAUL ROAD ROUTE 2

Average Weight of Empty Vehicles (tons):	16	Enter the average weight (in tons) of all unloaded vehicles traveling on the road.
Average Wieght of Full Vehicles (tons):	20	Enter the average weight (in tons) of all loaded vehicles traveling on the road.
Percent of Miles that the Vehicles Travel While	50%	Enter the %. If vehicles travel the same distance empty and full, this number is should be
Annual Operating Hours	8760	
Average Vehicle Weight **(W)** (tons):	18	Average weight of vehicles based on the distance traveled on site.
Average Load Weight (tons):	4	Average weight of full vehicle minus average weight of empty vehicle.
Length of Haul Road (miles):	0.6	Enter the length of the haul road round trip.
Trip Frequcy (max hourly)	1	Enter the maximum trips per hour.
Trip Frequcy (annual)	325	Enter the maximum total annual trips.
Road Surface Silt Loading (g/m^2):	0.6	Road surface silt loading (g/m2) AP-42 Table 13.2.1-2 "Ubiquitous Baseline <500 ADT.
Wet days	70	Default allowed by NMED without additional justification.

SOURCE OF EMISSION	EQUATION	VALUES
The emission factor is taken from Equation 1 in AP-42, 13.2.1, Paved Roads.	***Annual*** **EF = [k x [s*L* ^0.91] x [W^1.02]]x((1- (P/4N)) lb/VMT** ***Hourly*** **EF = [k x [sL^0.91] x [W^1.02]]x((1- (1.2P/N)) lb/VMT**	**k = constant = 0.0022 for PM-10 and 0.00054 for PM-2.5** from AP-42 Table 13.2.1-1 sL = road surface silt loading = 0.4 from AP-42 Table 13.2.1-2 W = Average Vehicle Weight (tons) P= The number of days that had at least 0.01 inches of precipitation. N=number of days in averaging period (e.g., **365 for annual**, 91 for seasonal, 30 for monthly)

EMISSIONS CALCULATIONS

Process	**Pollutant**	**Annual Emission Factor**	**Hourly Emission Factor**	**Emission Factor Units**	**Source of Emission Factor**	**Potential Emissions (lb/hr)**	**Potential Emissions (tons/year)**
Haul Road	PM_{10}	0.0251	0.0203	lb/vmt	AP-42	**0.01**	**0.002**
Haul Road	$PM_{2.5}$	0.0062	0.0050	lb/vmt	AP-42	**0.003**	**0.001**

PAVED HAUL ROAD ROUTE 3

Average Weight of Empty Vehicles (tons):	18	Enter the average weight (in tons) of all unloaded vehicles traveling on the road.
Average Wieght of Full Vehicles (tons):	18.325	Enter the average weight (in tons) of all loaded vehicles traveling on the road.
Percent of Miles that the Vehicles Travel While	50%	Enter the %. If vehicles travel the same distance empty and full, this number is should be
Annual Operating Hours	8760	
Average Vehicle Weight **(W)** (tons):	18.16	Average weight of vehicles based on the distance traveled on site.
Average Load Weight (tons):	0.32	Average weight of full vehicle minus average weight of empty vehicle.
Length of Haul Road (miles):	0.29	Enter the length of the haul road round trip.
Trip Frequecy (max hourly)	1	Enter the maximum trips per hour.
Trip Frequecy (annual)	156	Enter the maximum total annual trips.
Road Surface Silt Loading (g/m^2):	0.6	Road surface silt loading (g/m2) AP-42 Table 13.2.1-2 "Ubiquitous Baseline <500 ADT.
Wet days	70	Default allowed by NMED without additional justification.

SOURCE OF EMISSION	EQUATION	VALUES
The emission factor is taken from Equation 1 in AP-42, 13.2.1, Paved Roads.	***Annual*** **EF = [k x [s*L* ^0.91] x [W^1.02]]x((1- (P/4N)) lb/VMT** ***Hourly*** **EF = [k x [sL^0.91] x [W^1.02]]x((1- (1.2P/N)) lb/VMT**	**k = constant = 0.0022 for PM-10 and 0.00054 for PM-2.5** from AP-42 Table 13.2.1-1 sL = road surface silt loading = 0.4 from AP-42 Table 13.2.1-2 W = Average Vehicle Weight (tons) P= The number of days that had at least 0.01 inches of precipitation. N=number of days in averaging period (e.g., **365 for annual**, 91 for seasonal, 30 for monthly)

EMISSIONS CALCULATIONS							
Process	**Pollutant**	**Annual Emission Factor**	**Hourly Emission Factor**	**Emission Factor Units**	**Source of Emission Factor**	**Potential Emissions (lb/hr)**	**Potential Emissions (tons/year)**
Haul Road	PM_{10}	0.0253	0.0205	lb/vmt	AP-42	**0.01**	**0.001**
Haul Road	$PM_{2.5}$	0.0062	0.0050	lb/vmt	AP-42	**0.001**	**0.0001**

Water Authority – Southside Water Reclamation Plant
PSD APPLICABILITY ANALYSIS

PSD Summary Table Existing Units

Air Pollutant	Past Actuals (All Units Combined, tpy)	Proposed Project (All Units Combined, tpy)	PSD Analysis All Units Combined		
			Project Increase (tpy)	PSD Significance Level (tpy)	Is PSD Significance Level Exceeded?
NOx	117.42	66.46	(50.95)	40	No
CO	195.05	96.82	(98.23)	100	No
VOC	79.01	34.72	(44.29)	40	No
SO2	100.60	11.93	(88.67)	40	No
PM	10.85	4.74	(6.11)	10	No
H2S	0.09	0.12	0.02	10	No

Notes:
HAPs are not to be considered for PSD applicability analyses as they are not considered "Regulated NSR Pollutants" as stated under 20.11.61.7.WW(5) NMAC.
Actual emission rates are from the annual emission inventory for the corresponding year, as reported in the City of Albuquerque's SLEIS Inventory System.
Values in parenthesis ( ) indicate a project decrease.

PSD Summary Table New Units (no baseline for proposed emergency generators, Unit Nos. 83-86)

Air Pollutant	Past Actuals (All Units Combined, tpy)	Proposed Project (All Units Combined, tpy)	PSD Analysis All Units Combined		
			Project Increase (tpy)	PSD Significance Level (tpy)	Is PSD Significance Level Exceeded?
NOx	0.00	11.19	11.19	40	No
CO	0.00	1.01	1.01	100	No
VOC	0.00	0.19	0.19	40	No
SO2	0.00	0.05	0.05	40	No
PM	0.00	0.15	0.15	10	No
H2S	0.00	0.00	0.00	10	No

2-Year Averages:

Air Pollutant	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017	Maximum Baseline Actuals	Baseline Years
NOx	64.71	117.42	85.59	46.66	55.37	64.56	117.42	2012-2013
CO	162.02	195.05	192.95	151.08	142.78	149.00	195.05	2012-2013
VOC	45.38	79.01	52.63	27.35	40.57	45.68	79.01	2012-2013
SO_2	41.16	84.03	100.60	56.60	5.02	2.91	100.60	2013-2014
PM	10.85	3.84	4.38	4.34	4.59	5.36	10.85	2011-2012
H2S	0.09	0.01	0.00	0.00	0.06	0.06	0.09	2011-2012
Formaldehyde	6.17	14.38	15.85	14.75	15.13	16.07	16.07	2016-2017
HAPs	9.47	21.24	24.23	24.29	25.06	26.43	26.43	2016-2017

Note:
Per Albuquerque-Bernalillo County Air Quality Control Board regulation 20.11.61 Prevention of Significant Deterioration, Paragraph 7(I)(2): For an existing emissions unit (other than an electric utility steam generating unit), baseline actual emissions means the average rate, in tons per year, at which the emissions unit actually emitted the pollutant during any consecutive 24-month period selected by the owner or operator within the ten (10) year period immediately preceding either the date the owner or operator begins actual construction of the project, or the date a complete permit application is received by the department for a permit required either under 20.11.61 NMAC or under a plan approved by the administrator, whichever is earlier, except that the 10 year period shall not include any period earlier than November 15, 1990.
20.11.61.7(I)(2)(d): A different consecutive 24-month period can be used for each regulated NSR pollutant.
20.11.61.7()(3): For new emissions units, the baseline actual emissions for purposes of determining the emissions increase that will result from the initial construction and operation shall equal to zero.

Past Actuals per Unit

2017 Actuals (tpy):

EU	Name	NOx	CO	VOC	SO2	PM	H2S	Formaldehyde	HAPs
CSF-Valley	Coarse Screening Facility at Valley Interceptor	-	-	-	-	-	-	-	-
1	Preliminary Treatment (Grit Removal)	-	-	0.15	-	-	0.0005	-	-
3-10	Primary Clarifiers #1-8	-	-	0.06	-	-	0.004	-	-
11a-14b	Activated Sludge #1-14	-	-	0.70	-	-	-	-	-
15-26	Final Clarifier #1-12	-	-	0.005	-	-	-	-	-
27	Cogeneration Engine #1	16.23	37.43	22.04	0.12	1.50	-	5.03	6.90
28	Cogeneration Engine #2	10.28	50.62	12.24	0.08	1.42	-	4.78	6.57
29	Cogeneration Engine #3	17.57	23.05	3.45	0.40	1.24	-	3.16	6.49
30	Cogeneration Engine #4	21.43	30.53	7.10	0.19	1.22	-	3.12	6.41
31	Cogeneration Boiler	0.01	0.01	0.001	0.0001	0.001	-	-	0.0002
62	Dissolved Air Filtration (DAF)	-	-	0.35	-	-	-	-	-
67	Unleaded Fuel Tank	-	-	0.61	-	-	-	-	-
70-72	Gas Flare #1, #2, #3	0.0002	0.001	0.001	0.0001	0.00001	0.000001	0.000001	0.000001
75	UV Facility EG	0.033	0.019	0.002	0.007	0.001	-	-	0.00003
77	External Combustion	3.5	3	0.19	0.02	0.27	-	0.003	0.07
	Totals	**69.05**	**144.66**	**46.90**	**0.82**	**5.65**	**0.005**	**16.09**	**26.44**

2016 Actuals (tpy):

EU	Name	NOx	CO	VOC	SO2	PM	H2S	Formaldehyde	HAPs
CSF-Valley	Coarse Screening Facility at Valley Interceptor	-	-	-	-	-	-	-	-
1	Preliminary Treatment (Grit Removal)	-	-	0.15	-	-	0.00005	-	-
3-10	Primary Clarifiers #1-8	-	-	0.06	-	-	0.005	-	-
11a-14b	Activated Sludge #1-14	-	-	0.76	-	-	0.11	-	-
15-26	Final Clarifier #1-12	-	-	0.005	-	-	-	-	-
27	Cogeneration Engine #1	17.77	53.61	18.58	0.50	1.44	-	4.63	6.38
28	Cogeneration Engine #2	10.64	47.25	8.99	0.71	1.63	-	5.31	7.35
29	Cogeneration Engine #3	8.5	22.00	4.03	3.50	0.67	-	2.88	5.98
30	Cogeneration Engine #4	19.40	27.40	10.50	0.26	1.05	-	3.20	6.60
31	Cogeneration Boiler	0.41	0.35	0.023	0.003	0.031	-	-	0.011
62	Dissolved Air Filtration (DAF)	-	-	0.35	-	-	-	-	-
67	Unleaded Fuel Tank	-	-	0.83	-	-	-	-	-
70-72	Gas Flare #1, #2, #3	0.00002	0.0001	0.00004	0.000009	0.0000009	0.00000009	0	0.00000009
75	UV Facility EG	0.06	0.033	0.003	0.01	0.002	-	-	0.009
77	External Combustion	3.30	2.70	0.18	0.02	0.25	-	0.025	0.087
	Totals	**60.08**	**153.34**	**44.46**	**5.00**	**5.08**	**0.112**	**16.05**	**26.42**

2015 Actuals (tpy):

EU	Name	NOx	CO	VOC	SO2	PM	H2S	Formaldehyde	HAPs
CSF-Valley	Coarse Screening Facility at Valley Interceptor	-	-	-	-	-	-	-	-
1	Preliminary Treatment (Grit Removal)	-	-	0.15	-	-	0.000045	-	-
3-10	Primary Clarifiers #1-8	-	-	0.06	-	-	0.004	-	-
11a-14b	Activated Sludge #1-14	-	-	0.78	-	-	-	-	-
15-26	Final Clarifier #1-12	-	-	0.0046	-	-	-	-	-
27	Cogeneration Engine #1	15.40	46.60	16.40	0.44	1.20	-	4.10	5.60
28	Cogeneration Engine #2	7.90	35.21	6.60	0.53	1.20	-	4.00	5.50
29	Cogeneration Engine #3	8.41	23.79	4.28	3.80	0.698	-	3.095	6.39
30	Cogeneration Engine #4	15.60	23.80	6.98	0.24	0.76	-	2.99	6.10
31	Cogeneration Boiler	0.021	0.017	0.0011	0.000	0.0016	-	-	0.0005
62	Dissolved Air Filtration (DAF)	-	-	0.35	-	-	-	-	-
67	Unleaded Fuel Tank	-	-	0.87	-	-	-	-	-
70-72	Gas Flare #1, #2, #3	0.008	0.0434	0.0164	0.0011	0.00035	-	0.000036	0.000036
75	UV Facility EG	0.028	0.049	0.0002	0.001	0.00028	-	-	0.013
77	External Combustion	3.30	2.70	0.18	0.02	0.25	-	0.025	0.087
	Totals	**50.67**	**132.21**	**36.67**	**5.03**	**4.11**	**0.004**	**14.21**	**23.69**

2014 Actuals (tpy):

EU	Name	NOx	CO	VOC	SO2	PM	H2S	Formaldehyde	HAPs
CSF-Valley	Coarse Screening Facility at Valley Interceptor	-	-	-	-	-	-	-	-
1	Preliminary Treatment (Grit Removal)	-	-	0.1495	-	-	0.000045	-	-
3-10	Primary Clarifiers #1-8	-	-	0.06	-	-	0.004	-	-
11a-14b	Activated Sludge #1-14	-	-	0.78	-	-	-	-	-
15-26	Final Clarifier #1-12	-	-	0.005	-	-	-	-	-
27	Cogeneration Engine #1	7.95	65.05	1.35	45.25	1.44	-	4.80	6.59
28	Cogeneration Engine #2	2.84	55.65	9.54	45.33	1.44	-	4.81	6.60
29	Cogeneration Engine #3	15.35	22.02	2.43	9.65	0.7602	-	3.1046	6.3771
30	Cogeneration Engine #4	13.22	24.44	2.32	7.91	0.68	-	2.54	5.23
31	Cogeneration Boiler	0.0114	0.0095	0.0006	0.0001	0.0009	-	-	0.0003
62	Dissolved Air Filtration (DAF)	-	-	0.3504	-	-	-	-	-
67	Unleaded Fuel Tank	-	-	0.8691	-	-	-	-	-
70-72	Gas Flare #1, #2, #3	0.0007	0.0036	0.0014	0.0001	0	-	0	0
75	UV Facility EG	0.01	0.0222	0.0001	0.0005	0.0001	-	-	0.006
77	External Combustion	3.27	2.75	0.1797	0.0196	0.2484	-	0.025	0.0867
	Totals	**42.65**	**169.95**	**18.03**	**108.16**	**4.57**	**0.004**	**15.29**	**24.89**

2013 Actuals (tpy):

EU	Name	NOx	CO	VOC	SO2	PM	H2S	Formaldehyde	HAPs
CSF-Valley	Coarse Screening Facility at Valley Interceptor	-	-	-	-	-	-	-	-
1	Preliminary Treatment (Grit Removal)	-	-	0.15	-	-	0.000045	-	-
3-10	Primary Clarifiers #1-8	-	-	0.06	-	-	0.005	-	-
11a-14b	Activated Sludge #1-14	-	-	0.83	-	-	-	-	-
15-26	Final Clarifier #1-12	-	-	0.005	-	-	-	-	-
27	Cogeneration Engine #1	21.80	68.10	30.07	37.67	1.21	-	4.00	5.49
28	Cogeneration Engine #2	21.11	65.89	29.11	36.46	1.17	-	3.87	5.31
29	Cogeneration Engine #3	29.42	38.89	12.56	9.26	0.75	-	5.44	6.17
30	Cogeneration Engine #4	52.76	40.20	12.98	9.63	0.81	-	3.10	6.36
31	Cogeneration Boiler	0.1	0.086	0.0056	0.0006	0.0078	-	-	0.14
62	Dissolved Air Filtration (DAF)	-	-	0.3504	-	-	-	-	-
67	Unleaded Fuel Tank	-	-	0.909	-	-	-	-	-
70-72	Gas Flare #1, #2, #3	0.0114	0.0618	0.0234	0.0015	0.0005	-	0.0001	0.0001
75	UV Facility EG	0.02	0.043	0.0002	0.00088	0.00025	-	-	0.012
77	External Combustion	3.30	2.70	0.18	0.02	0.25	-	0.0025	0.0867
	Totals	**128.52**	**215.96**	**87.23**	**93.05**	**4.19**	**0.005**	**16.41**	**23.57**

2012 Actuals (tpy):

EU	Name	NOx	CO	VOC	SO2	PM	H2S	Formaldehyde	HAPs
CSF-Valley	Coarse Screening Facility at Valley Interceptor	-	-	-	-	-	-	-	-
1	Preliminary Treatment (Grit Removal)	-	-	0.14948	-	-	0.00005	-	-
3-10	Primary Clarifiers #1-8	-	-	0.09	-	-	0.007	-	-
11a-14b	Activated Sludge #1-14	-	-	0.97	-	-	-	-	-
15-26	Final Clarifier #1-12	-	-	0.007	-	-	-	-	-
27	Cogeneration Engine #1	11.24	35.07	15.49	19.41	0.62	-	2.06	2.83
28	Cogeneration Engine #2	23.52	73.41	32.43	40.62	1.30	-	4.31	5.92
29	Cogeneration Engine #3	19.15	25.27	8.16	6.05	0.52	-	3.10	4.00
30	Cogeneration Engine #4	48.76	37.15	12.00	8.90	0.77	-	2.86	5.88
31	Cogeneration Boiler	0.239	0.201	0.013	0.001	0.018	-	-	0.143
62	Dissolved Air Filtration (DAF)	-	-	0.3504	-	-	-	-	-
67	Unleaded Fuel Tank	-	-	0.95	-	-	-	-	-
70-72	Gas Flare #1, #2, #3	0.0093	0.0506	0.00192	0.00027	0.00037	-	0.00004	0.00004
75	UV Facility EG	0.14	0.24	0.001	0.00495	0.0014	-	-	0.065
77	External Combustion	3.27	2.75	0.180	0.020	0.248	-	0.0025	0.0867
	Totals	**106.32**	**174.13**	**70.79**	**75.01**	**3.48**	**0.007**	**12.34**	**18.92**

2011 Actuals (tpy):

EU	Name	NOx	CO	VOC	SO2	PM	H2S	Formaldehyde	HAPs
CSF-Valley	Coarse Screening Facility at Valley Interceptor	-	-	-	-	-	-	-	-
1	Preliminary Treatment (Grit Removal)	-	-	0.008322	-	-	0.00233	-	-
2	Inlet Works	-	-	0.008322	-	-	0.00233	-	-
3-10	Primary Clarifiers #1-8	-	-	0.26	-	-	0.001	-	-
11a-14b	Activated Sludge #1-14	-	-	0.53	-	-	0.18	-	-
15-26	Final Clarifier #1-12	-	-	0.005	-	-	0.001752	-	-
27	Cogeneration Engine #1	14.38	62.69	3.15	3.15	7.35	-	-	-
28	Cogeneration Engine #2	1.90	62.68	8.66	2.68	6.93	-	-	-
29	Cogeneration Engine #3	0	0	0	0	0	-	-	-
30	Cogeneration Engine #4	2.77	15.08	6.52	1.42	3.89	-	-	-
31	Cogeneration Boiler	3.966	3.5694	0.027	0.040	0.033711	-	-	0.011
62	Dissolved Air Filtration (DAF)	-	-	0.165	-	-	-	-	-
67	Unleaded Fuel Tank	-	-	-	-	-	-	-	-
70-72	Gas Flare #1, #2, #3	0.084	5.877	0.630	0.010	0.024	-	-	-
75	UV Facility EG	-	-	-	-	-	-	-	-
77	External Combustion	-	-	-	-	-	-	-	-
	Totals	**23.10**	**149.90**	**19.97**	**7.30**	**18.22**	**0.182**	**0.00**	**0.01**

Annual Totals:

Air Pollutant	**All Units Combined (tpy)**						
	2011	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
NOx	23.10	106.32	128.52	42.65	50.67	60.08	69.05
CO	149.90	174.13	215.96	169.95	132.21	153.34	144.66
VOC	19.97	70.79	87.23	18.03	36.67	44.46	46.90
SO_2	7.30	75.01	93.05	108.16	5.03	5.00	0.82
PM	18.22	3.48	4.19	4.57	4.11	5.08	5.65
H2S	0.182	0.007	0.005	0.004	0.004	0.112	0.005
Formaldehyde	0.00	12.34	16.41	15.29	14.21	16.05	16.09
HAPs	0.01	18.92	23.57	24.89	23.69	26.42	26.44

Cogeneration Engine Test Results

Engine Emission Test Results

In the tables below, NG refers to tests performed using 100% natural gas fuel. DG for Emission Units 27 & 28 means a blended fuel consisting of 70% natural gas / 30% digester gas whereas DG for Emission Units 29 & 30 means the fuel input was 100% digester gas

Unit	NOx (lb/hr)	CO (lb/hr)	VOC (lb/hr)	SO_2 (lb/hr)
27DG Average	3.6	11.1	2.4	0.19
27DG Maximum	5.2	14.0	5.5	0.80
27NG Average	3.2	11.4	3.1	0.17
27NG Maximum	4.6	16.4	5.3	0.80
28DG Average	2.2	11.4	1.9	0.07
28DG Maximum	3.2	13.7	3.1	0.16
28NG Average	2.2	11.2	2.0	0.06
28NG Maximum	3.9	14.0	3.1	0.16
29DG Average	3.1	5.9	0.7	0.28
29DG Maximum	5.5	7.3	1.0	0.90
29NG Average	3.9	6.5	1.2	0.20
29NG Maximum	5.5	8.1	2.3	0.80
30DG Average	2.6	5.7	0.7	0.10
30DG Maximum	3.6	7.0	1.4	0.25
30NG Average	3.3	7.3	1.5	0.03
30NG Maximum	6.4	8.1	3.1	0.07

*Average and maximum values taken from engine test data from 2014-2020.

2020 Results

Unit	NOx (lb/hr)	CO (lb/hr)	VOC (lb/hr)	SO_2 (lb/hr)
27DG	2.4	6.9	2.1	0.032
27NG	1.8	7.1	2.7	0.008
28DG	2.0	8.2	2.6	0.024
28NG	1.9	7.7	3.1	0.005
29DG	1.4	6.5	0.36	0.082
29NG	1.7	8.00	2.3	0.003
30DG	2.0	5.3	0.29	0.091
30NG	1.3	8.1	2.3	0.002

See Appendix J to this Application for a copy of the engine testing conducted in January 2020 by Alliance Source Testing. Their report was re-issued on 8/28/2020 to reflect recent field measurements of exhaust stack diameters

2019 Results

Unit	NOx (lb/hr)	CO (lb/hr)	VOC (lb/hr)	SO_2 (lb/hr)
27DG	3.5	9.3	1.0	0.006
27NG	3.0	10.8	1.0	0.014
28DG	2.5	10.9	1.0	0.03
28NG	3.2	10.6	1.1	0.02
29DG	1.6	5.8	0.8	0.006
29NG	1.9	6.9	0.8	0.01
30DG	3.3	5.2	0.84	0.01
30NG	2.3	7.7	0.9	0.01

2018 Results

Unit	NOx (lb/hr)	CO (lb/hr)	VOC (lb/hr)	SO_2 (lb/hr)
27DG	2.8	10.5	2.0	0.15
27NG	3.4	10.2	2.0	0.043
28DG	3.2	10.0	1.7	0.11
28NG	3.9	10.1	2.2	0.07
29DG	3.7	7.3	0.67	0.30
29NG	4.5	8.1	1.7	0.09
30DG	2.2	4.9	0.84	0.25
30NG	2.4	5.95	1.12	0.07

2017 Results

Unit	NOx (lb/hr)	CO (lb/hr)	VOC (lb/hr)	SO_2 (lb/hr)
27DG	4.3	9.0	4.0	0.03
27NG	3.9	9.0	5.3	0.03
28DG	2.4	13.1	2.6	0.02
28NG	2.6	12.8	3.1	0.02
29DG	4.1	5.4	0.8	0.1
29NG	4.3	5.4	0.9	0.02
30DG	3.2	6.3	0.8	0.1
30NG	6.4	7.9	2.3	0.01

2016 Results

Unit	NOx (lb/hr)	CO (lb/hr)	VOC (lb/hr)	SO_2 (lb/hr)
27DG	5.2	13.7	1.6	0.11
27NG	4.6	13.9	4.9	0.13
28DG	2.6	10.3	3.1	0.16
28NG	2.4	10.7	2.0	0.16
29DG	1.9	5.6	1.0	0.9
29NG	4.8	6.2	1.4	0.8
30DG	3.6	5.7	1.4	0.06
30NG	5.0	6.7	3.1	0.06

2015 Results

Unit	NOx (lb/hr)	CO (lb/hr)	VOC (lb/hr)	SO_2 (lb/hr)
27DG	4.4	14.00	5.5	0.8
27NG	3.6	12.5	5.3	0.8
28DG	1.3	13.7	0.218	-
28NG	0.9	12.6	0.193	-
29DG	5.5	5.6	0.3	0.3
29NG	5.5	5.1	1.3	0.3
30DG	0.5	5.2	0.032	-
30NG	1.4	7.1	0.163	-

2014 Results

Unit	NOx (lb/hr)	CO (lb/hr)	VOC (lb/hr)	SO_2 (lb/hr)
27DG	2.5	14.0	0.29	-
27NG	2.0	16.4	0.34	-
28DG	1.6	13.7	2.39	-
28NG	0.7	14.0	2.4	-
29DG	3.5	5.2	0.67	-
29NG	4.5	5.5	0.1	-
30DG	3.6	7.0	0.71	-
30NG	4.5	7.4	0.58	-

Albuquerque Bernalillo County Water Utility Authority
Southside Water Reclamation Plant
ATC #786-M3 / Title V Operating Permit #1418-M2
Data for digester gas quality tested in accordance with Protocol DIGGAS

COLLECTION DATE	SAMPLE_TYPE	BTU (BTU/CUFT)	CH4 (VOLUME %)	CO2 (VOLUME %)	H2S (PPMV)	N2 (VOLUME %)	O2 (VOLUME %)
3-Jan-19	TP DIGGAS	643	64	34	18	18	0.56
4-Feb-19	TP DIGGAS	650	64	33	18	2.3	0.72
4-Mar-19	TP DIGGAS	652	65	32	15	2.4	0.72
1-Apr-19	TP DIGGAS	660	65	32	28	1.8	0.55
6-May-19	TP DIGGAS	640	63	33	89	2.3	0.79
3-Jun-19	TP DIGGAS	650	64	31	48	4.1	1.2
1-Jul-19	TP DIGGAS	649	64	34	50	1.5	<0.50
5-Aug-19	TP DIGGAS	649	64	32	59	2.9	0.87
9-Sep-19	TP DIGGAS	638	63	30	16	5.6	1.6
14-Oct-19	TP DIGGAS	617	61	30	27	7.1	2
4-Nov-19	TP DIGGAS	639	63	33	27	3.0	0.91
9-Dec-19	TP DIGGAS	633	not available	33	24	3.0	0.95
Averages		**643.33**	**63.64**	**32.25**	**34.92**	**4.50**	**0.99**

Data provided Patrick McLee.

COLLECTION DATE	SAMPLE_TYPE	BTU (BTU/CUFT)	CH4 (VOLUME %)	CO2 (VOLUME %)	H2S (PPMV)	N2 (VOLUME %)	O2 (VOLUME %)
3-Jan-18	TP DIGGAS	639	63	36	88	<1	<0.50
7-Feb-18	TP DIGGAS	628	62	36	92	1.4	<0.50
7-Mar-18	TP DIGGAS	629	62	36	96	1.2	<0.50
9-Apr-18	TP DIGGAS	644	64	34	45	1.8	0.6
2-May-18	TP DIGGAS	663	66	31	22	2.3	0.73
6-Jun-18	TP DIGGAS	655	65	33	40	1.5	0.62
2-Jul-18	TP DIGGAS	655	65	33	68	1.3	<0.50
8-Aug-18	TP DIGGAS	650	64	34	61	1.5	<0.50
10-Sep-18	TP DIGGAS	635	63	32	73	3	1.5
1-Oct-18	TP DIGGAS	665	66	33	68	1.1	3.5
6-Nov-18	TP DIGGAS	606	60	31	50	6.8	<0.50
12-Dec-18	TP DIGGAS	630	62	31	35	3.4	<0.50
Averages		**641.58**	**63.50**	**33.33**	**61.50**	**2.30**	**1.39**

Data provided Patrick McLee.

COLLECTION DATE	SAMPLE_TYPE	BTU (BTU/CUFT)	CH4 (VOLUME %)	CO2 (VOLUME %)	H2S (PPMV)	N2 (VOLUME %)	O2 (VOLUME %)
31-Jan-17	TP DIGGAS	611	60	38	97	1.4	<0.50
21-Feb-17	TP DIGGAS	607	60	37	82	1.6	<0.50
1-Mar-17	TP DIGGAS	612	60	37	110	1.4	<0.50
5-Apr-17	TP DIGGAS	614	61	37	110	2.0	0.6
3-May-17	TP DIGGAS	619	61	36	110	2.3	0.73
5-Jun-17	TP DIGGAS	639	63	34	130	1.8	0.62
5-Jul-17	TP DIGGAS	645	64	35	91	1.1	<0.50
2-Aug-17	TP DIGGAS	640	63	35	120	1.6	<0.50
6-Sep-17	TP DIGGAS	594	59	35	86	4.9	1.5
4-Oct-17	TP DIGGAS	549	54	30	82	12	3.5
1-Nov-17	TP DIGGAS	626	62	36	90	1.2	<0.50
13-Dec-17	TP DIGGAS	622	62	37	87	1.5	<0.50
Averages		**614.83**	**60.75**	**35.58**	**99.58**	**2.73**	**1.39**

Data provided Patrick McLee.

COLLECTION DATE	SAMPLE_TYPE	BTU (BTU/CUFT)	CH4 (VOLUME %)	CO2 (VOLUME %)	H2S (PPMV)	N2 (VOLUME %)	O2 (VOLUME %)
Jan-16	TP DIGGAS 02	549	60	39	140	0	0
Feb-16	TP DIGGAS 02	557	61	38	130	<1.00	<0.50
Mar-16	TP DIGGAS 02	555	61	37	94	1.3	<0.50
Apr-16	TP DIGGAS 02	550	60	36	80	2.6	0.76
May-16	TP DIGGAS 02	568	62	36	79	1.1	<0.50
Jun-16	TP DIGGAS 02	571	63	36	87	1.1	<0.50
Jul-16	TP DIGGAS 02	588	65	33	38	2	0.61
Aug-16	TP DIGGAS 02	598	65	33	110	<1.00	<0.50
Sep-16	TP DIGGAS 02	599	66	32	130	1.4	<0.50
Oct-16	TP DIGGAS 02	579	64	35	130	1.2	<0.50
Nov-16	TP DIGGAS 03	571	63	35	110	1.8	0.55
Dec-16	TP DIGGAS 03	547	64	38	82	1.4	<0.50
Averages		**569.33**	**62.83**	**35.67**	**100.83**	**1.39**	**0.48**

Data provided by Yuniesky Perez February 25, 2016.

COLLECTION DATE	SAMPLE_TYPE	BTU (BTU/CUFT)	CH4 (VOLUME %)	CO2 (VOLUME %)	H2S (PPMV)	N2 (VOLUME %)	O2 (VOLUME %)
Jan-15	TP DIGGAS 04	555	61	37	110	1.1	<0.50
Feb-15	TP DIGGAS 04	561	62	37	80	<1.00	<0.50
Mar-15	TP DIGGAS 04	558	61	37	110	<1.00	<0.50
Apr-15	TP DIGGAS 04	554	61	38	100	1.2	<0.50
May-15	TP DIGGAS 04	621	61	37	180	<1.00	<0.50
Jun-15	TP DIGGAS 04	628	62	37	110	<1.00	<0.50
Jul-15	TP DIGGAS 04	555	61	38	170	<1.00	<0.50
Aug-15	TP DIGGAS 04	636	63	35	170	1.1	<0.50
Sep-15	TP DIGGAS 04	624	62	37	150	1.1	<0.50
Oct-15	TP DIGGAS 04	611	60	38	110	1.2	<0.50
Nov-15	TP DIGGAS 04	560	62	37	140	<1.00	<0.50
Dec-15	TP DIGGAS 04	553	61	37	150	1.4	<0.50
Averages		**584.67**	**61.42**	**37.08**	**131.67**	**1.18**	**<0.50**

Data provided by Charles S. Leder January 29, 2015.

COLLECTION DATE	SAMPLE_TYPE	BTU (BTU/CUFT)	CH4 (VOLUME %)	CO2 (VOLUME %)	H2S (PPMV)	N2 (VOLUME %)	O2 (VOLUME %)
Jan-14	TP DIGGAS 04	530	58	37	47	3.8	1.1
Feb-14	TP DIGGAS 04	550	61	38	120	ND	ND
Mar-14	TP DIGGAS 04	540	59	39	120	1	ND
Apr-14	TP DIGGAS 04	550	61	38	120	ND	ND
May-14	TP DIGGAS 04	570	63	36	62	<1.0	<0.5
Jun-14	TP DIGGAS 04	580	63	34	55	2.4	0.78
Jul-14	TP DIGGAS 04	599	66	33	54	1.1	<0.5
Aug-14	TP DIGGAS 04	574	63	35	81	1.2	<0.5
Sep-14	TP DIGGAS 04	567	62	37	87	<1.0	<0.5
Oct-14	TP DIGGAS 04	581	64	35	84	<1.0	<0.5
Nov-14	TP DIGGAS 04	571	63	35	89	1.2	<0.5
Dec-14	TP DIGGAS 04	565	62	36	89	1.3	<0.5
Averages		**564.75**	**62.08**	**36.08**	**84.00**	**1.71**	**0.94**

Data provided by Charles S. Leder January 29, 2015.

COLLECTION DATE	SAMPLE_TYPE	BTU (BTU/CUFT)	CH4 (VOLUME %)	CO2 (VOLUME %)	H2S (PPMV)	N2 (VOLUME %)	O2 (VOLUME %)
Jan-13	TP DIGGAS 02	559	61	35	53	3.7	ND
Feb-13	TP DIGGAS 02	570	63	34	62	3.9	0.72
Mar-13	TP DIGGAS 02	600	66	28	60	5.3	1.8
Apr-13	TP DIGGAS 02	570	62	33	68	3.7	1.1
May-13	TP DIGGAS 02	580	64	34	68	1.1	ND
Jun-13	TP DIGGAS 02	580	64	33	62	2.8	0.88
Jul-13	TP DIGGAS 02	597	66	34	76	ND	ND
Aug-13	TP DIGGAS 02	540	60	30	53	8.4	2.3
Sep-13	TP DIGGAS 02	651	67	31	64	1.4	0.54
Oct-13	TP DIGGAS 02	586	66	32	70	2.1	0.61
Nov-13	TP DIGGAS 03	528	58	33	89	6.1	1.8
Dec-13	TP DIGGAS 04	495	54	32	56	10.0	2.85
Averages		**571.33**	**62.58**	**32.42**	**65.08**	**4.41**	**1.40**

Data provided by Yuniesky Perez January 23, 2014.

	BTU (BTU/CUFT)	CH4 (VOLUME %)	CO2 (VOLUME %)	H2S (PPMV)	N2 (VOLUME %)	O2 (VOLUME %)
7-Year Average	**598.55**	**62.40**	**34.63**	**82.51**	**2.60**	**1.10**
7-Year Maximum	**643.33**	**63.64**	**37.08**	**131.67**	**4.50**	**1.40**

MIRATECH Cogeneration Engines Control System Specifications

7/23/2020

Russell Shoats
TLC Plumbing & Utility
5000 Edith Blvd, NE
Albuquerque, NM 87107

Phone: 505-362-2544
E-Mail: rshoats@tlcplumbing.com

Commercial Submittal Revision: 1
Project Reference: SWRP Emissions Upgrade
MIRATECH Proposal Number: TJ-20-000941 & TJ-20-000952
MIRATECH Sales Order Number: 28358
Customer Purchase Order Number: 2920.00405

Dear Russell,

Thank you for your order. This document will summarize the material MIRATECH will supply to TLC Plumbing & Utility for the above referenced project. The order will be based on the MIRATECH terms and conditions that are attached to this submittal.

Material (Quantity) to be provided:

- (1) – SP-CBL36-20040073, stainless steel door right SCR reactor housing with 0.6 meters of SCR catalyst and (1) layer of oxidation catalyst
- (1) – SP-CBL36-20050020, stainless steel door left SCR reactor housing with 0.6 meters of SCR catalyst and (1) layer of oxidation catalyst
- (1) – SP-CBL81-20040072, stainless steel door right SCR reactor housing with 0.6 meters of SCR catalyst and (1) layer of oxidation catalyst
- (1) – SP-CBL81-20050019, stainless steel door left SCR reactor housing with 0.6 meters of SCR catalyst and (1) layer of oxidation catalyst
- (2) – SP-MS2-20-3-20050021 stainless steel pre-fabricated mixing section containing 1 flow dresser, 1 injector flange, 1 dosing mixer and 1 static mixer
- (2) – SP-MS2-30-3-20050022 stainless steel pre-fabricated mixing section containing 1 flow dresser, 1 injector flange, 1 dosing mixer and 1 static mixer
- (8) – 2” thick removable fiberglass blankets with exterior silicone cloth and stainless steel wire mesh encapsulation, secured with lacing hooks – for CBL housings and mixing sections (shipped loose, installation by others)
- (4) – ACIS-3 open loop injection control system and components
- (2) – TLI, ultrasonic tank level indication system
- (2) – SP-GAT-20070054, MODBUS gateway enclosure
- (3) – SP-SKID-20050080, pre-wired mounting skid for SCR controller, air compressor, and VPN reactant pump
- (1) – SP-SKID-20070025, pre-wired mounting skid for SCR controller, air compressor, and SPS reactant pump
- (2) – ACIS-3 maintenance pack
- (2) – ACIS-3 recommended spare parts
- Commissioning & Startup, including two (2) trips which each include one (1) service technician; two (2) days of travel; and four (4) days of onsite commissioning, startup, use of portable analyzer, and operator training

Required material to be provided by others:

- Inlet and outlet exhaust piping
- Expansion joints
- Inlet and outlet pipe bolts, nuts, and gasket
- Urea Tanks
- Support Structure
- Attachment to support structure (bolts, nuts, levels, etc.)
- Power supply (230VAC +/- 10%, 60 Hz, single phase / 120 VAC, 60 Hz, single phase)
- Component installation including external tubing and wiring
- Isolated engine load signal to MIRATECH equipment (4-20 mA)
- Dry contact (N.O.) for engine run signal to MIRATECH equipment
- Heat tracing of reactant lines (if exposed to ambient temperatures below 40 degrees F)

Equipment Delivery

All equipment and materials will be available to ship 10-14 weeks after the first progress payment and the signed submittal has been received by MIRATECH. Any delay in the receipt of the first progress payment or the approved submittal will delay our ability to serve you in accordance with your desires.

Shipping

All equipment is Best Way, prepaid and added to invoice.

Invoice Milestone / Payment Terms

Total sales price for the material noted above is $644,338.50. The order will be based on the MIRATECH terms and conditions included with this submittal. We have agreed to the following payment schedule:

- 30% of the order value totaling $193,301.55, due upon receipt of invoice (accompanying this submittal)
- 65% of the order value totaling $418,820.03, due 30 days from invoice date of MIRATECH's notice to TLC Plumbing & Utility of equipment shipment availability
- 5% of the order value totaling $32,216.92, due upon completion of startup or 90 days from notice of shipment availability, whichever is sooner.

Spare Parts:

Spare parts and maintenance packs are included in this order per the scope of supply attached to the associated technical submittals.

Training

At commissioning, MIRATECH will provide product introduction and system operating training – typically 2 – 3 hours. If additional detailed training including troubleshooting is desired, MIRATECH can provide this at an additional fee.

Service Contract:

No service contract is included in the order. MIRATECH will provide a separate quotation to TLC Plumbing & Utility for a service contract upon request. MIRATECH highly recommends that TLC Plumbing & Utility train its staff and that of its customer (as necessary) on the proper operation and maintenance of this equipment.

Summary of Revisions

- Revision 0 – [*5/22/2020*]: Original Release
- Revision 1 – [*7/23/2020*]:
  - Removed reactant tanks
  - Remove (2) TLI-Lites, changed TLI quantity from (1) to (2)
  - Added SP-GAT-20070054 to scope
  - Replaced (1) SP-SKID-20050080 with (1) SP-SKID-20070025
  - Updated Bid Specification Exceptions, Deviations, and Clarifications

Thank you for the opportunity to serve your project needs. We are committed to this project's success for both companies. If you have any questions, please do not hesitate to contact Gerrit Simpson at our office, (918)-370-6185 or email at gsimpson@miratechcorp.com

Gerrit Simpson, Project Manager
MIRATECH

Russell Shoats Date
TLC Plumbing & Utility
Has reviewed drawings and documents in Group A as submitted.

Cc: John Sartain, VP – Engineering / MIRATECH
Sarah Ring, Inside Sales Representative / MIRATECH
Thomas Jones, Strategic Account Manager - Gas Compression / MIRATECH

Attached: Application and Performance Warranty Datasheets (4 Sheets)
Bid Specification Exceptions, Deviations, and Clarifications (3 Sheets)
General Terms and Conditions of Sale (6 Sheets)
Domestic Onshore Technical Service Rate Schedule

GS:gp

Application & Performance Warranty Data

Project Information

Site Location: NM
Project Name: SWRP Emissions Upgrade South Building
Application: Prime Power
Number Of Engines: 2
Operating Hours per Year: 8750

Engine Specifications

Engine Manufacturer: Superior
Model Number: 12 GTL
Rated Speed: 1200 RPM
Type of Fuel: Bio-Fuel / Natural Gas
Type of Lube Oil: 0.6 wt% sulfated ash or less
Lube Oil Consumption: 0.1 % Fuel Consumption

Engine Cycle Data

Load	**Speed**	**Power**	**Exhaust Flow**	**Exhaust Temp.**	**Fuel Cons.**	**NO_x**	**CO**	**NMHC**	**NMNEHC**	**CH_2O**	**PM_{10}**	**O_2**	**H_2O**
%		*bhp*	*lb/hr*	*F*	*btu/bhp-hr*	*g/bhp-hr*	*g/bhp-hr*	*g/bhp-hr*	*ppmvd*	*g/bhp-hr*	*g/kW-hr*	*%*	*%*
90	Rated	1,466	17,550	680	6,620	1.2	2.5	0.9	94	0.2	0.8	11.4	9.6

Emission Data (100% Load)

Emission	**Raw Engine Emissions**						**Target Outlet Emissions**						**Calculated Reduction**
	g/bhp-hr	*tons/yr*	*ppmvd @ 15% O_2*	*ppmvd*	*g/kW-hr*	*lb/MW-hr*	*g/bhp-hr*	*tons/yr*	*ppmvd @ 15% O_2*	*ppmvd*	*g/kW-hr*	*lb/MW-hr*	
NO_x*	1.2	16.97	96	154	1.609	3.55	0.25	3.53	20	32	0.335	0.74	79.2%
CO	2.5	35.35	328	528	3.353	7.39	0.25	3.53	33	53	0.335	0.74	90%
NMNEHC**	0.26	3.61	58	94	0.342	0.75							
CH_2O	0.2	2.83	24	39	0.268	0.59	0.08	1.13	10	16	0.107	0.24	60%
PM_{10}	0.6	8.44	183	294	0.8	1.76							

---

* MW referenced as NO_2

** MW referenced as CH_4. Propane in the exhaust shall not exceed 15% by volume of the NMNEHC compounds in the exhaust, excluding aldehydes. The 15% (vol.) shall be established on a wet basis, reported on a methane molecular weight basis. The measurement of exhaust NMNEHC composition shall be based upon EPA method 320 (FTIR), and shall exclude formaldehyde.

System Specifications

SCR/Oxidation System Specifications (SP-CBL36-20040073 / 20050020, ACIS-3, TLI, Commissioning & Startup, SP-MS2-20-3-20050021)

Design Exhaust Flow Rate:	17,550 lb/hr
Design Exhaust Temperature[1]:	680°F
Housing Model Number:	SP-CBL36-20040073 / 20050020
Element Model Number:	SCRC-084-150-300
SCR Catalyst Volume:	18 cubic feet
System Pressure Loss:	6.0 inches of WC (Clean) (14.9 mBar)
Sound Attenuation:	25-30 dBA insertion loss
Exhaust Temperature Limits:	572 – 977°F (300 – 525°C)
Reactant:	Urea
Percent Concentration:	32.5%
System Dosing Capacity:	6 L/hr
Estimated Reactant Consumption:	0.7 gal/hr (2.8 L/hr) / Per Engine

Special Notes & Conditions

1. For housings and exhaust components that are insulated, internally or externally, please refer to Section 7.1 of the General Terms and Conditions of Sale to prevent voiding MIRATECH product warranty.
   - Carbon steel is suitable for temperatures up to 900° F / 482° C continuously, when covered with external insulation or a heat shield. For continuous operation above 900° F / 482° C, where the equipment is externally insulated or has a heat shield, stainless steel should be used.

- A packed silencer installed upstream of the MIRATECH catalyst system will void MIRATECH's limited warranty.
- Any sound attenuation listed in this proposal is based on housing with catalyst elements installed.
- Any emission reductions listed in this proposal are based on housing with catalyst elements installed.
- Temperature and Emission data are taken from the project specification. Exhaust flow rate is the project specification value multiplied by 0.9 (based on 90% maximum load operation).

Application & Performance Warranty Data

Project Information

Site Location:	NM
Project Name:	SWRP Emissions Upgrade North Building
Application:	Prime Power
Number Of Engines:	2
Operating Hours per Year:	8750

Engine Specifications

Engine Manufacturer:	Caterpillar
Model Number:	G 3612 LE TA
Rated Speed:	900 RPM
Type of Fuel:	Bio-Fuel / Natural Gas
Type of Lube Oil:	0.6 wt% sulfated ash or less
Lube Oil Consumption:	0.1 % Fuel Consumption
Number of Exhaust Manifolds:	2

Engine Cycle Data

Load	**Speed**	**Power**	**Exhaust Flow**	**Exhaust Temp.**	**Fuel Cons.**	**NO_x**	**CO**	**NMHC**	**NMNEHC**	**CH_2O**	**PM_{10}**	**O_2**	**H_2O**
%		*bhp*	*lb/hr*	*F*	*btu/bhp-hr*	*g/bhp-hr*	*g/bhp-hr*	*g/bhp-hr*	*g/bhp-hr*	*g/bhp-hr*	*g/kW-hr*	*%*	*%*
90	Rated	2,703	35,550	895	6,620	0.7	2.9	0.9	0.6	0.2	0.8	11.7	10.9

Emission Data (100% Load)

Emission	**Raw Engine Emissions**						**Target Outlet Emissions**						**Calculated Reduction**
	g/bhp-hr	*tons/yr*	*ppmvd @ 15% O_2*	*ppmvd*	*g/kW-hr*	*lb/MW-hr*	*g/bhp-hr*	*tons/yr*	*ppmvd @ 15% O_2*	*ppmvd*	*g/kW-hr*	*lb/MW-hr*	
NO_x*	0.7	18.25	53	83	0.939	2.07	0.25	6.52	19	30	0.335	0.74	64.3%
CO	2.9	75.61	363	565	3.889	8.57	0.2	5.21	25	39	0.268	0.59	93.1%
NMNEHC**	0.6	15.64	131	204	0.805	1.77							
CH_2O	0.2	5.21	23	36	0.268	0.59	0.08	2.09	9	15	0.107	0.24	60%
PM_{10}	0.6	15.55	174	271	0.8	1.76							

* MW referenced as NO_2

** MW referenced as CH_4. Propane in the exhaust shall not exceed 15% by volume of the NMNEHC compounds in the exhaust, excluding aldehydes. The 15% (vol.) shall be established on a wet basis, reported on a methane molecular weight basis. The measurement of exhaust NMNEHC composition shall be based upon EPA method 320 (FTIR), and shall exclude formaldehyde.

System Specifications

SCR/Oxidation System Specifications (SP-CBL81-20040072 / 20050019, ACIS-3, TLI, Commissioning & Startup, SP-MS2-30-3-20050022)

Design Exhaust Flow Rate:	35,550 lb/hr
Design Exhaust Temperature[1]:	895°F
Housing Model Number:	SP-CBL81-20040072 / 20050019
Element Model Number:	SCRC-084-075-300
SCR Catalyst Volume:	39 cubic feet
System Pressure Loss:	6.0 inches of WC (Clean) (14.9 mBar)
Sound Attenuation:	25-30 dBA insertion loss
Exhaust Temperature Limits:	572 – 977°F (300 – 525°C)
Reactant:	Urea
Percent Concentration:	32.5%
System Dosing Capacity:	6 L/hr
Estimated Reactant Consumption:	0.7 gal/hr (2.8 L/hr) / Per Engine

Special Notes & Conditions

1. For housings and exhaust components that are insulated, internally or externally, please refer to Section 7.1 of the General Terms and Conditions of Sale to prevent voiding MIRATECH product warranty.
   - Carbon steel is suitable for temperatures up to 900° F / 482° C continuously, when covered with external insulation or a heat shield. For continuous operation above 900° F / 482° C, where the equipment is externally insulated or has a heat shield, stainless steel should be used.

- A packed silencer installed upstream of the MIRATECH catalyst system will void MIRATECH's limited warranty.
- Any sound attenuation listed in this proposal is based on housing with catalyst elements installed.
- Any emission reductions listed in this proposal are based on housing with catalyst elements installed.
- Temperature and Emission data are taken from the project specification. Exhaust flow rate is the project specification value multiplied by 0.9 (based on 90% maximum load operation).

May 20, 2020

Charles Lee, P. E.
Electrical Engineer
Albuquerque Bernalillo County Water Utility Authority
4201 2nd Street SW | Albuquerque NM | 87105

RE: SWRP Emissions Reduction Project

Dear Charles,

The intent of this letter is to address the anticipated destruction of Non-Methane Non-Ethane Hydrocarbons (NMNEHC/VOCs), Acetyl Aldehyde, Acrolein, and Ethylene Dibromide in addition to the specified emission requirements of the project.

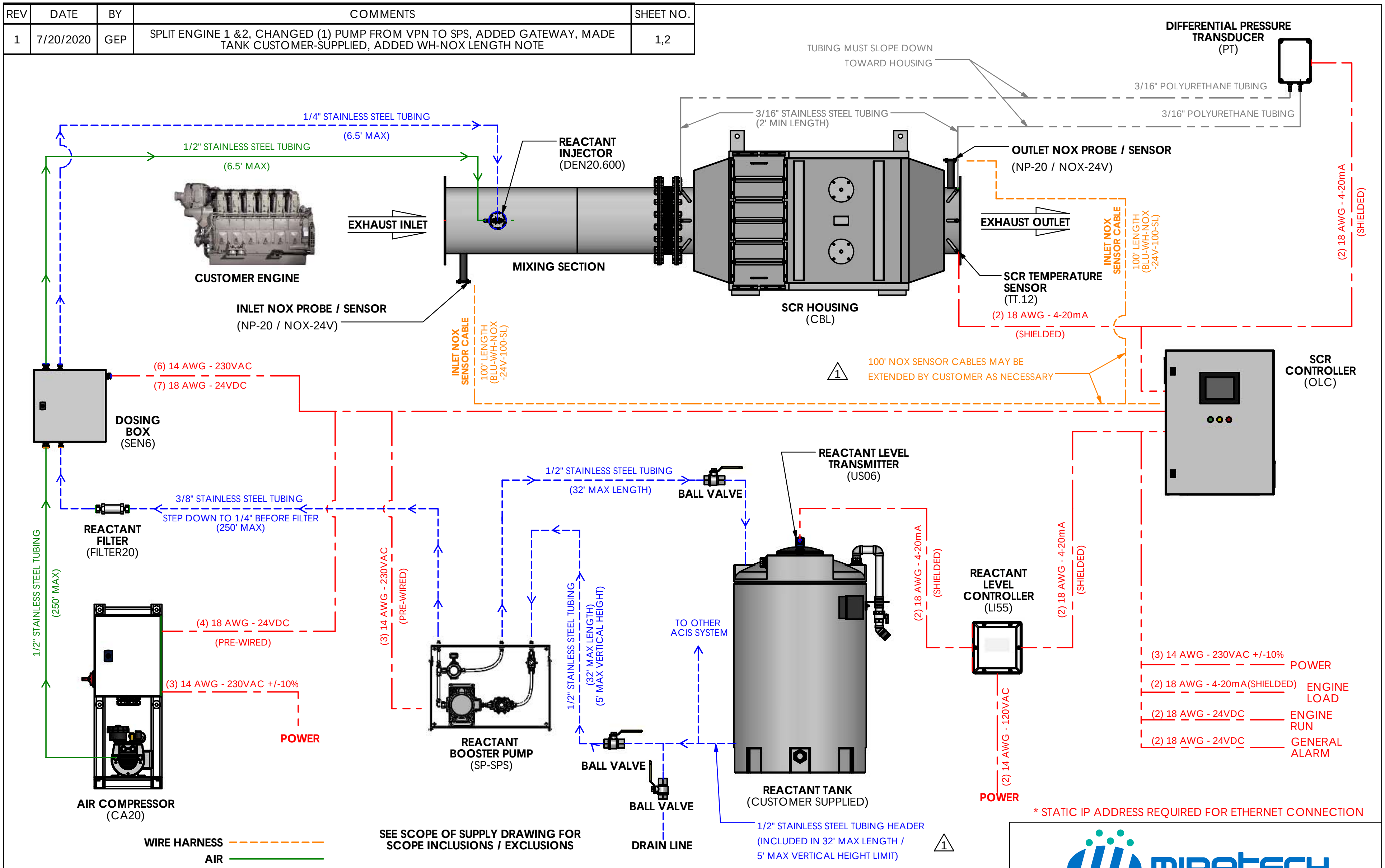
Based on the proposed solutions quoted on TJ-20-000941 Rev (1) (3612 North Cogeneration Building) and TJ-20-000952 Rev (1) (12 GTL South Cogeneration Building) the oxidation catalyst included will effectively reduce VOC emissions. Given the volume of oxidation catalyst included, MIRATECH estimates a minimum of 60% reduction of Non-Methane Non-Ethane Hydrocarbons (NMNEHC/VOCs). We also expect the reduction of Acetyl Aldehyde, Acrolein, and Ethylene Dibromide to be comparable as well, with a minimum reduction of 60%.

Regards,

Tommy

THOMAS JONES *Strategic Account Manager, Gas Compression*
M: +1.918.606.3935 **O**: +1.918.794.0343 **F**: +1.918.933.6243
A: 420 S 145TH EAST AVE, STE A, TULSA, OK 74108-1305 USA **W**: miratechcorp.com

REV	DATE	BY	COMMENTS	SHEET NO.
1	7/20/2020	GEP	SPLIT ENGINE 1 &2, CHANGED (1) PUMP FROM VPN TO SPS, ADDED GATEWAY, MADE TANK CUSTOMER-SUPPLIED, ADDED WH-NOX LENGTH NOTE	1,2



WIRE HARNESS ---------
AIR ———
WIRE — — —
EXHAUST SAMPLE TUBING — — —
REACTANT - - - - -

SEE SCOPE OF SUPPLY DRAWING FOR SCOPE INCLUSIONS / EXCLUSIONS

COMPONENT MODELS

- AIR COMPRESSOR - *(CA20)*
- REACTANT BOOSTER PUMP - *(VPN20U)*
- DOSING BOX - *(SEN6)*
- REACTANT INJECTOR - *(DEN20.600)*

PROJECT NAME
SWRP Emissions Upgrade North Building

PROPOSAL NUMBER
TJ-20-000941

SALES ORDER NO.
28358

CUSTOMER P.O.
2920.00405

PROPRIETARY AND CONFIDENTIAL

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DIMENSIONS ARE APPROXIMATE IN INCHES UNLESS OTHERWISE SPECIFIED

DO NOT SCALE DRAWING

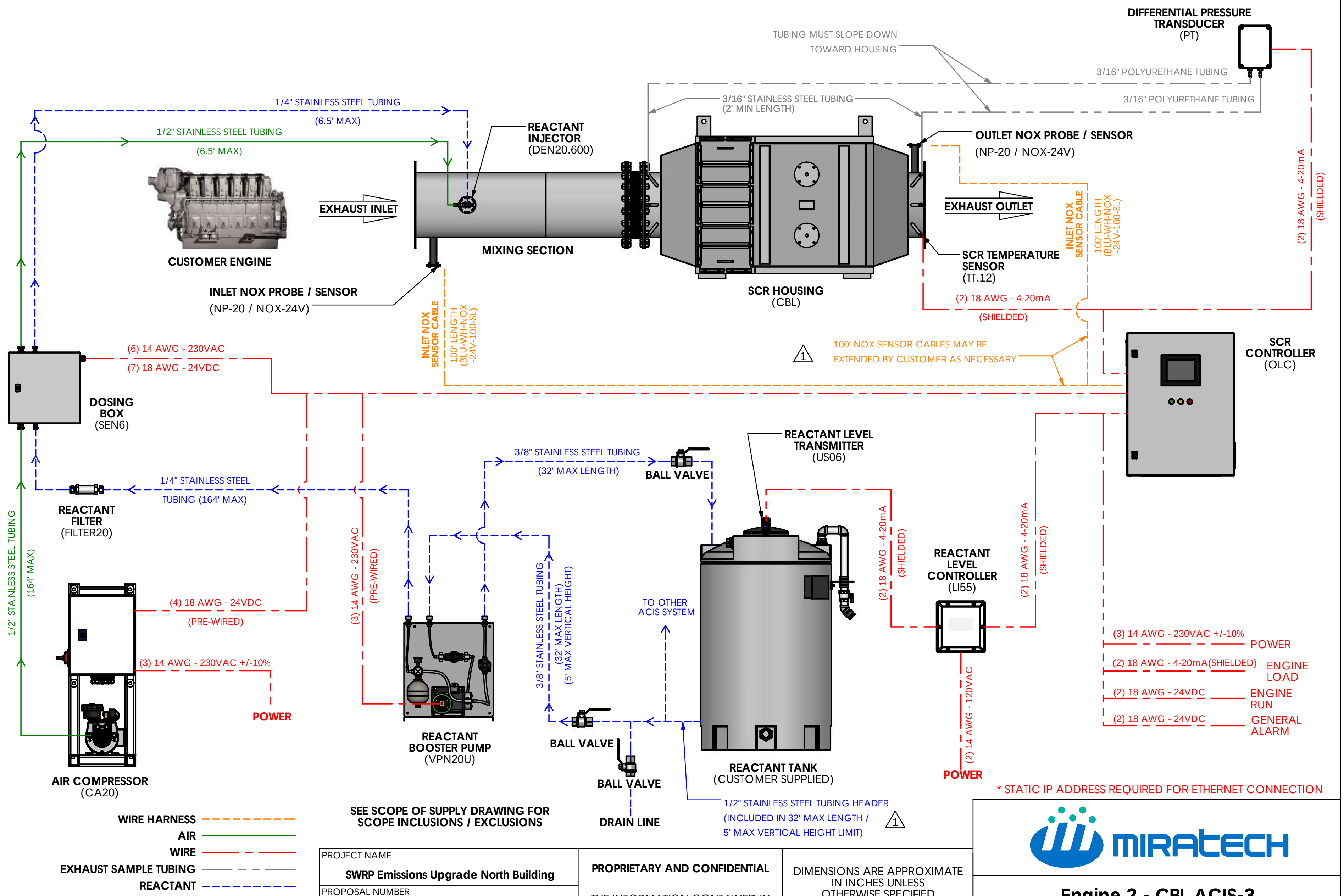
DRAWN	DATE
GEP	5/20/2020
REVIEWED BY	DATE
AJM	5/20/2020

MIRATECH

Engine 1 - CBL ACIS-3 System Interconnect

DRAWING	REV
SWRP Emissions Upgrade North Building - CBL-ACIS-3 SI	1

SIZE		
A	NOT TO SCALE	SHEET 1 OF 3



* STATIC IP ADDRESS REQUIRED FOR ETHERNET CONNECTION

SEE SCOPE OF SUPPLY DRAWING FOR SCOPE INCLUSIONS / EXCLUSIONS

COMPONENT MODELS

- AIR COMPRESSOR - *(CA20)*
- REACTANT BOOSTER PUMP - *(VPN20U)*
- DOSING BOX - *(SEN6)*
- REACTANT INJECTOR - *(DEN20.600)*

PROJECT NAME
SWRP Emissions Upgrade North Building

PROPOSAL NUMBER
TJ-20-000941

SALES ORDER NO.
28358

CUSTOMER P.O.
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DO NOT SCALE DRAWING

DRAWN	DATE
GEP	5/20/2020
REVIEWED BY	DATE
AJM	5/20/2020

MIRATECH

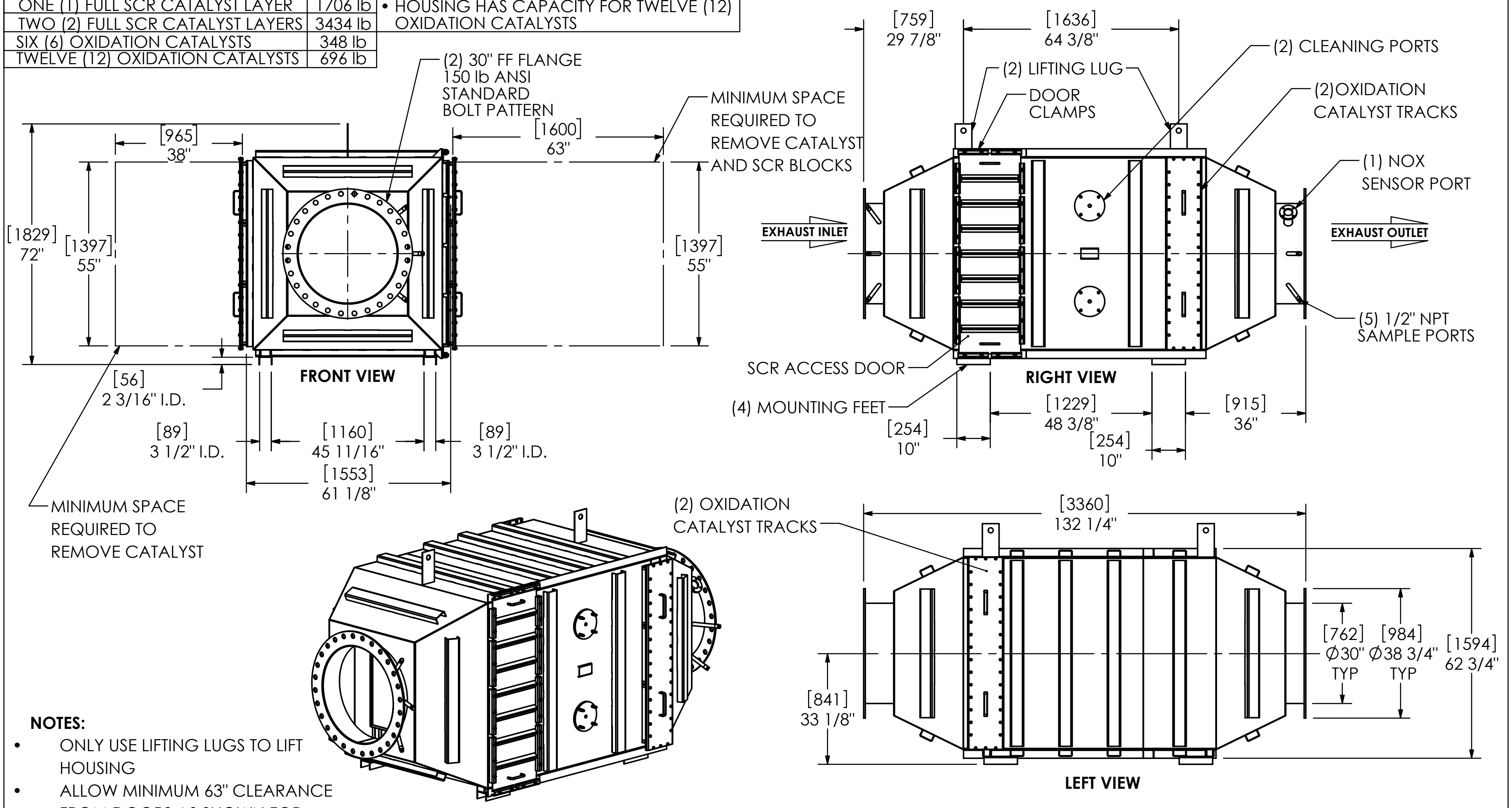
Engine 2 - CBL ACIS-3 System Interconnect

DRAWING	REV
SWRP Emissions Upgrade North Building - CBL-ACIS-3 SI	1

SIZE		
A	NOT TO SCALE	SHEET 2 OF 3

WEIGHTS (APPROXIMATE)	
EMPTY HOUSING	2702 lb
ONE (1) FULL SCR CATALYST LAYER	1706 lb
TWO (2) FULL SCR CATALYST LAYERS	3434 lb
SIX (6) OXIDATION CATALYSTS	348 lb
TWELVE (12) OXIDATION CATALYSTS	696 lb

- HOUSING HAS CAPACITY FOR TWO (2) FULL SCR CATALYST LAYERS
- HOUSING HAS CAPACITY FOR TWELVE (12) OXIDATION CATALYSTS



NOTES:

- ONLY USE LIFTING LUGS TO LIFT HOUSING
- ALLOW MINIMUM 63" CLEARANCE FROM DOORS AS SHOWN FOR LOADING AND MAINTENANCE
- NO FORCES OR MOMENTS MAY BE APPLIED TO THE FLANGES
- MUST BE MOUNTED HORIZONTALLY (CUSTOM HOUSING REQUIRED TO MOUNT VERTICALLY)

MATERIAL CONSTRUCTION:

- 304 STAINLESS STEEL

PAINT:

- NONE (MIRATECH COATING SYSTEM 4)

REV	DATE	BY	COMMENTS	SHEET NO.
1	7/15/2020	CSF	ADD SECOND OXIDATION TRACK	-

PROJECT NAME
SWRP EMISSIONS UPGRADE NORTH BUILDING

PROPOSAL NUMBER
TJ-20-000941

SALES ORDER NO.
28358

CUSTOMER P.O.
2920.00405

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DIMENSIONS ARE APPROXIMATE IN INCHES UNLESS OTHERWISE SPECIFIED

DIMENSIONAL TOLERANCES UNLESS OTHERWISE SPECIFIED
ANGLES
MACH: ±2°
BEND: ±3°
INCHES: ±1/8
MILLIMETERS: ±3

DO NOT SCALE DRAWING

DRAWN	DATE
CSF	04/17/2020
REVIEWED BY	DATE
MLC	04/17/2020

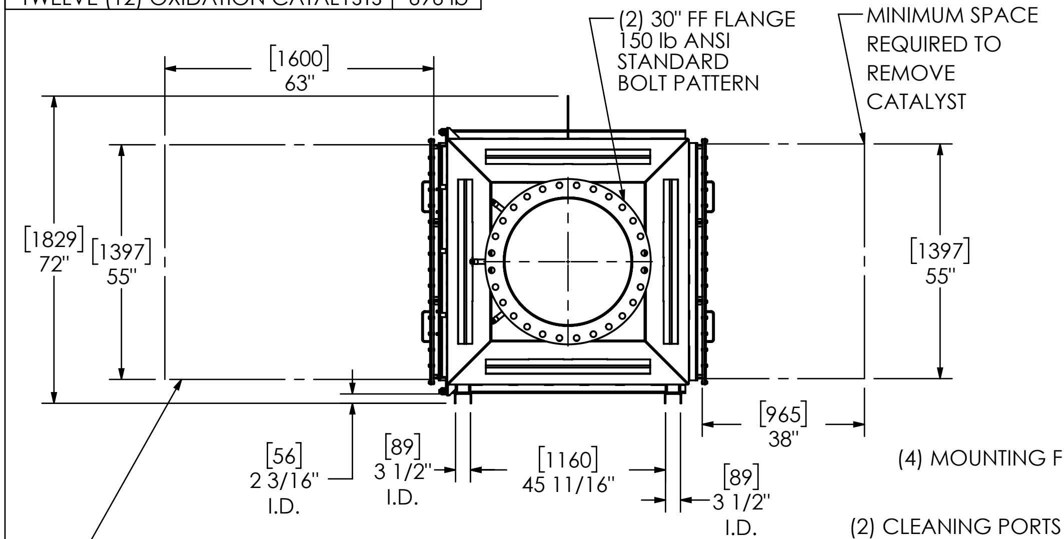
MIRATECH

SP-CBL81-20040072
Submittal Drawing

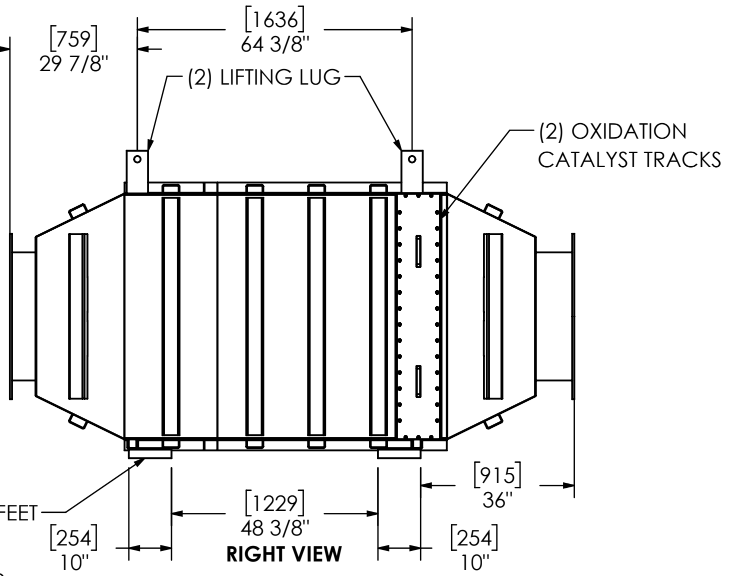
DRAWING SP-CBL81-20040072 SD
REV 1
SIZE A
SCALE 1:45
SHEET 1 OF 1

WEIGHTS (APPROXIMATE)	
EMPTY HOUSING	2702 lb
ONE (1) FULL SCR CATALYST LAYER	1706 lb
TWO (2) FULL SCR CATALYST LAYERS	3434 lb
SIX (6) OXIDATION CATALYSTS	348 lb
TWELVE (12) OXIDATION CATALYSTS	696 lb

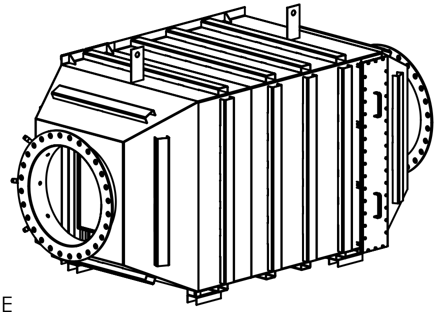
- HOUSING HAS CAPACITY FOR TWO (2) FULL SCR CATALYST LAYERS
- HOUSING HAS CAPACITY FOR TWELVE (12) OXIDATION CATALYSTS

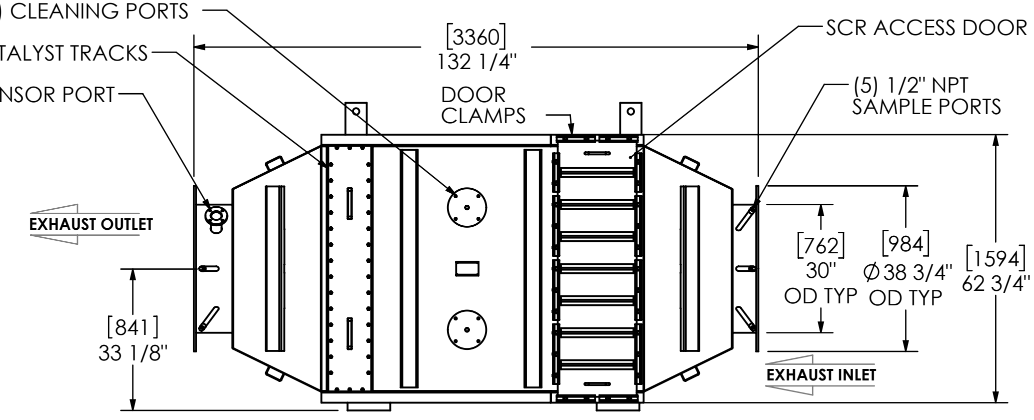


FRONT VIEW



RIGHT VIEW





LEFT VIEW

NOTES:

- ONLY USE LIFTING LUGS TO LIFT HOUSING
- ALLOW MINIMUM 63" CLEARANCE FROM DOORS AS SHOWN FOR LOADING AND MAINTENANCE
- NO FORCES OR MOMENTS MAY BE APPLIED TO THE FLANGES
- MUST BE MOUNTED HORIZONTALLY (CUSTOM HOUSING REQUIRED TO MOUNT VERTICALLY)

MATERIAL CONSTRUCTION:

- 304 STAINLESS STEEL

PAINT:

- NONE (MIRATECH COATING SYSTEM 4)

REV	DATE	BY	COMMENTS	SHEET NO.
1	7/15/2020	CSF	ADD SECOND OXIDATION TRACK	-

PROJECT NAME
SWRP EMISSIONS UPGRADE NORTH BUILDING

PROPOSAL NUMBER
TJ-20-000941

SALES ORDER NO.
28358

CUSTOMER P.O.
2920.00405

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DIMENSIONS ARE APPROXIMATE IN INCHES UNLESS OTHERWISE SPECIFIED

DIMENSIONAL TOLERANCES UNLESS OTHERWISE SPECIFIED

ANGLES			
MACH:	±2°	INCHES:	±1/8
BEND:	±3°	MILLIMETERS:	±3

DO NOT SCALE DRAWING

DRAWN	DATE
CSF	05/12/2020
REVIEWED BY	DATE
MLC	05/12/2020

SP-CBL81-20050019
Submittal Drawing

DRAWING	REV
SP-CBL81-20050019 SD	1

SIZE	SCALE	SHEET
A	SCALE 1:45	SHEET 1 OF 1

From: Eric Pedersen [mailto:epedersen@carollocom]
Sent: Thursday, July 16, 2020 4:00 PM
To: Leder, Charles S. <cleder@abcwua.org>
Cc: Tom Mossinger <TMossinger@carollo.com>; Lee, Charles <clee@abcwua.org>
Subject: ABCWUA Emission Reduction Project

[CAUTION: This email was received from an EXTERNAL source]

Hey Charlie,
You sent Tom a message about urea efficiency and we got a response back from Miratech.

"Engineering got back to us in your question below. Urea is converted to ammonia during the hydrolysis process which is considered a pollutant. Engineering estimated that the ammonia slip would be 10 ppmvd @15% O2. Please note that this is an estimate only and not included in our performance guarantee."

Let me know if you need anything else.

Thank you,

Eric Pedersen, PE
Senior Mechanical Engineer
4600 E Washington Street, Suite 500 | Phoenix, AZ 85034
P 602-474-4153 | **F** 602-265-1422
carollo.com

Emergency Generator Specifications and Emission Factors Used

EU: 37

Power Generation

Exhaust Emission Data Sheet
450DFEJ
60 Hz Diesel Generator Set
EPA Emissions: Tier 2

Serial # for this engine is 79422244; The model & serial #s for the combined genset is Model DFEJ-4141205 & Serial # D100110854

Engine Information:
Model: Cummins Inc. QSX15-G9 Nonroad 2
Nameplate BHP @ 1800 RPM: 755
Type: 4 Cycle, In-Line, 6 Cylinder Diesel
Aspiration: Turbo-charged with air-to-air charge air cooling
Compression Ratio: 17:1
Emission Control Device: Turbocharged with Charge Air Cooled

Bore: 5.39 in. (137 mm)
Stroke: 6.65 in. (169 mm)
Displacement: 912 cu. in. (14.9 liters)

	1/4	1/2	3/4	Full	Full
PERFORMANCE DATA	**Standby**	**Standby**	**Standby**	**Standby**	~~**Prime**~~
Engine HP @ Stated Load (1800 RPM)	185	344	502	661	605
Fuel Consumption (gal/hr)	10.6	17.4	23.6	30.3	28.0
Exhaust Gas Flow (CFM)	1360	2000	2605	3110	2920
Exhaust Temperature (°F)	735	820	810	865	825
EXHAUST EMISSION DATA					
HC (Total Unburned Hydrocarbons)	0.20	0.08	0.06	0.08	0.07
NOx (Oxides of Nitrogen as NO2)	2.75	2.95	4.25	5.15	4.95
CO (Carbon Monoxide)	0.50	0.36	0.31	0.42	0.45
PM (particular Matter)	0.08	0.05	0.05	0.03	0.05
Smoke (Pierburg)	0.52	0.56	0.52	0.40	0.45
All values are Grams per HP-Hour					

TEST METHODS AND CONDITIONS

Test Methods:
Steady-State emissions recorded per ISO8178-1 during operation at rated engine speed (+/-2%) and stated constant load (+/-2%) with engine temperatures, pressures and emission rated stabilized.

Fuel Specification: 40-48 Cetane Number, 0.05 Wt.% max. Sulfur; Reference ISO8178-5, 40CFR86.1313-98 Type 2-D and ASTM D975 No. 2-D.

Reference Conditions:
25 °C (77 °F) Air Inlet Temperature, 40 °C (104 °F) Fuel Inlet Temperature, 100 kPa (29.53 in Hg) Barometric Pressure; 10.7 g/kg (75 grains H_2O/lb) of dry air Humidity (required for NOx correction); Intake Restriction set to maximum allowable limit for clean filter; Exhaust Back pressure set to maximum allowable limit.

Data was taken from a single engine test according to the test methods, fuel specification and reference conditions stated above and is subjected to instrumentation and engine-to-engine variability. Tests conducted with alternate test methods, instrumentation, fuel or reference conditions can yield different results.

Data Subject to Change Without Notice.

Emergency Generator Specifications and Emission Factors Used

EU: 38

Engine No. 37107092

S.O. No.

Model VTA1710G1

Ref. No.

Engine Cert Ident

Conf. No. -

Date of mfg. 7/83

Warranty start

Manufactured by Cummins Engine Co., Inc., U.S.A

1

/83

S.O. No. 58565

E.C.S.

Ref. No.

Injectio

Engine Cert Ident	C.I.D.	Family	CPL
		NONE	0405

Injector

Injector

Warranty start date 4-23-84

Valve lash

mmins Engine Co., Inc., U.S.A. 3029432

Fuelrate a

E.C.S.

Cummins

Injection timing code U

ily | CPL

Injector torque 50 Inch-Lbs.

ONE 0405

Injector travel .000 Inch

23-84

Valve lash cold .014 Int. .027 Exh.

3029432

Fuel rate at advertised HP mm^3/stroke

A

Ac

Idl

WA

if fue

mum

U

ch-Lbs.

00 Inch

Int. .027 Exh.

mm^3/stroke

Cummins

Advertised HP 675 at 1500

Advertised HP 760 at 1800 RPM

Idle Speed. - RPM

WARNING: Injury may result and wa[illegible]
if fuel rate, RPM or altitudes exceed [illegible]
mum values for this model and [illegible]

E.C.S.

Injection timing code U

Family CPL

NONE 0405

Injector torque 50 Inch-Lbs.

Injector travel .000 Inch

23-84

Valve lash cold .014 Int. .027 Exh.

3029432

Fuel rate at advertised HP mm^3/stroke

Cummins

Advertised HP

Advertised HP

Idle Speed.

Emergency Generator Specifications and Emission Factors Used

EU: 39

Rocky Mountain

Power Generation Division
1921 Broadway Blvd NE
Albuquerque, NM 87102

ABQ Southside Water
Albuquerque Water Utility Authority
August 2015

~~1000kW Portable Generator~~

Account Manager: Garrett Eldridge
Phone #: 915-791-6605
Email: garrett.eldridge@cummins.com

Our energy working for you.™

Power
Generation

Exhaust Emission Data Sheet
1000DQFAD
60 Hz Diesel Generator Set

Engine Information:

Model:	Cummins Inc. QST30-G5 NR2	Bore:	5.51 in. (139 mm)
Type:	4 Cycle, 50°V, 12 Cylinder Diesel	Stroke:	6.5 in. (165 mm)
Aspiration:	Turbocharged and Low Temperature aftercooled	Displacement:	1860 cu. in. (30.4 liters)
Compression Ratio:	14.7:1		
Emission Control Device:	Aftercooled (Air-to-Air)		

	1/4	**1/2**	**3/4**	**Full**	~~**Full**~~	
PERFORMANCE DATA	**Standby**	**Standby**	**Standby**	**Standby**	~~**Prime**~~	
BHP @ 1800 RPM (60 Hz)	371	741	1112	1482	~~1322~~	
Fuel Consumption (gal/Hr)	19.1	35.8	54.1	72.2	~~63.9~~	
Exhaust Gas Flow (CFM)	2780	4500	6370	7540	~~6950~~	
Exhaust Gas Temperature (°F)	620	760	814	890	~~873~~	
EXHAUST EMISSION DATA						
HC (Total Unburned Hydrocarbons)	0.12	0.10	0.08	0.07	~~0.08~~	
NOx (Oxides of Nitrogen as NO2)	4.17	5.20	3.87	3.95	~~4.00~~	
CO (carbon Monoxide)	0.66	0.36	0.48	0.66	~~0.58~~	
PM (Particular Matter)	0.19	0.15	0.12	0.11	~~0.11~~	
SO2 (Sulfur Dioxide)	0.11	0.10	0.10	0.11	~~0.10~~	
Smoke (Bosch)	0.88	0.80	0.79	0.73	~~0.75~~	
All Values are Grams/HP-Hour, Smoke is Bosch #						

TEST CONDITIONS

Data was recorded during steady-state rated engine speed (± 25 RPM) with full load (±2%). Pressures, temperatures, and emission rates were stabilized.

Fuel Specification:	46.5 Cetane Number, 0.035 Wt.% Sulfur; Reference ISO8178-5, 40CFR86.1313-98 Type 2-D and ASTM D975 No. 2-D.
Fuel Temperature:	99 ± 9 °F (at fuel pump inlet)
Intake Air Temperature:	77 ± 9 °F
Barometric Pressure:	29.6 ± 1 in. Hg
Humidity:	NOx measurement corrected to 75 grains H2O/lb dry air
Reference Standard:	ISO 8178

The NOx, HC, CO and PM emission data tabulated here were taken from a single engine under the test conditions shown above. Data for the other components are estimated. These data are subjected to instrumentation and engine-to-engine variability. Field emission test data are not guaranteed to these levels. Actual field test results may vary due to test site conditions, installation, fuel specification, test procedures and instrumentation. Engine operation with excessive air intake or exhaust restriction beyond published maximum limits, or with improper maintenance, may results in elevated emission levels.

EPA Tier 2 Exhaust Emission Compliance Statement
C1000D6RG
60 Hz Diesel Generator Set

Compliance Information:

The engine used in this generator set meets U.S. EPA emission standards under 40 CFR 1039.625 and California Emission requirements under 13 CCR 2423(D). Selling or installing this engine for any purpose other than for the equipment flexibility provisions cited may be a violation of Federal or California law subject to civil penalty. This engine is certified to operate on diesel fuel only. Constant speed only.

Engine Manufacturer:	Cummins Inc
Effective Date:	01/01/2011
EPA Diesel Engine Family:	ACEXL060.AAD
CARB Executive Order:	U-R-002-0523-1

Engine Information:

Model:	Cummins Inc QST30-G5 NR2	Bore:	5.51 in. (140 mm)
Engine Nameplate HP:	1490		
Type:	4 Cycle, 50°V, 12 Cylinder Diesel	Stroke:	6.5 in. (165 mm)
Aspiration:	Turbocharged and Low Temperature Aftercooled (Air-to-Air)	Displacement:	1860 cu. in. (30.5 liters)
Compression Ratio:	14.7:1		
Emission Control Device:	Turbocharged and Low Temperature Aftercooled(Air-to-Air)		

U.S. Environmental Protection Agency NSPS Stationary Emergency Tier 2 Limits

COMPONENT	(All values are Grams per HP-Hour)
NOx + HC (Oxides of Nitrogen as NO2 + Non Methane Hydrocarbons)	4.77
CO (Carbon Monoxide)	2.61
PM (Particulate Matter)	0.15

Engine operation with excessive air intake or exhaust restriction beyond published maximum limits, or with improper maintenance, may result in elevated emission levels.

Emergency Generator Specifications and Emission Factors Used

EU: 40

Rocky Mountain

Power Generation Division
1921 Broadway Blvd NE
Albuquerque, NM 87102

ABQ Southside Water
Albuquerque Water Utility Authority
August 2015

2000kW Portable Generator

Account Manager: Garrett Eldridge
Phone #: 915-791-6605
Email: garrett.eldridge@cummins.com

Our energy working for you.™

Power Generation

EPA Tier 2 Exhaust Emission Compliance Statement
C2000D6RG
60 Hz Diesel Generator Set

Compliance Information:

The engine used in this generator set meets U.S. EPA emission standards under 40 CFR 1039.625 and California Emission requirements under 13 CCR 2423(d). Selling or installing this engine for any purpose other than for the equipment flexibility provisions cited may be a violation of Federal or California law subject to civil penalty. This engine is certified to operate on diesel fuel only. Constant speed only.

Engine Manufacturer:	Cummins Inc
Effective Date:	01/01/2011
EPA Nonroad Diesel Engine Family:	ACEXL060.AAD
CARB Executive Order:	U-R-002-0523-1

Engine Information:

Model:	Cummins Inc QST30-G5	Bore:	5.51 in. (140 mm)
Engine Nameplate HP:	1490		
Type:	4-Cycle, 50° Vee, 12-Cylinder Diesel	Stroke:	6.50in. (165 mm)
Aspiration:	Turbocharged and Low Temperature Aftercooled	Displacement:	1860 cu. in. (30.48 liters)
Compression Ratio:	14.0:1		
Emission Control Device:	Turbocharged and Low Temperature Aftercooled		

U.S. Environmental Protection Agency NSPS Stationary Emergency Tier 2 Limits

COMPONENT	(All values are Grams per HP-Hour)
NOx + HC (Oxides of Nitrogen as NO2 + Non Methane Hydrocarbons)	4.77
CO (Carbon Monoxide)	2.61
PM (Particulate Matter)	0.15

Engine operation with excessive air intake or exhaust restriction beyond published maximum limits, or with improper maintenance, may result in elevated emission levels.

Exhaust Emission Data Sheet
2000DQKAB*
60 Hz Diesel Generator Set

Engine Information:

Model:	Cummins Inc QSK60-G6 NR2	Bore:	6.25 in. (158 mm)
Type:	4 Cycle, 60°V, 16 Cylinder Diesel	Stroke:	7.48 in. (189 mm)
Aspiration:	Turbocharged and Low Temperature Air Aftercooled	Displacement:	3673 cu. In. (60.1 liters)

Compression Ratio: 14.5:1

Emission Control Device: Turbocharged and Low Temperature Aftercooled

	1/4	**1/2**	**3/4**	**Full**	~~**Full**~~
PERFORMANCE DATA	**Standby**	**Standby**	**Standby**	**Standby**	~~**Prime**~~
BHP @ 1800 RPM (60 Hz)	732	1462	2191	2922	~~2649~~
Fuel Consumption (gal/Hr)	46	78	106	141	~~126~~
Exhaust Gas Flow (CFM)	6205	9685	12216	15515	~~13667~~
Exhaust Gas Temperature (°F)	756	828	882	897	~~877~~
EXHAUST EMISSION DATA					
HC (Total Unburned Hydrocarbons)	0.32	0.16	0.09	0.08	~~0.09~~
NOx (Oxides of Nitrogen as NO2)	2.87	3.28	4.9	5.3	~~5.4~~
CO (carbon Monoxide)	0.94	0.46	0.24	0.32	~~0.26~~
PM (Particular Matter)	0.2	0.1	0.03	0.03	~~0.01~~
SO2 (Sulfur Dioxide)	0.01	0.01	0.01	0.01	~~0.004~~
Smoke (Bosch)	0.64	0.45	0.17	0.17	~~0.09~~

All values are Grams per HP-Hour, Smoke is Bosch#

TEST CONDITIONS

Data is representative of steady-state engine speed (± 25 RPM) at designated genset loads. Pressures, temperatures, and emission rates were stabilized.

Fuel Specification:	ASTM D975 No. 2-D diesel fuel with ULSD, and 40-48 cetane number
Fuel Temperature:	99 ± 9 °F (at fuel pump inlet)
Intake Air Temperature:	77 ± 9 °F
Barometric Pressure:	29.6 ± 1 in. Hg
Humidity:	NOx measurement corrected to 75 grains H2O/lb dry air
Reference Standard:	ISO 8178

The NOx, HC, CO and PM emission data tabulated here are representative of test data taken from a single engine under the test conditions shown above. Data for the other components are estimated. These data are subjected to instrumentation and engine-to-engine variability. Field emission test data are not guaranteed to these levels. Actual field test results may vary due to test site conditions, installation, fuel specification, test procedures and instrumentation. Engine operation with excessive air intake or exhaust restriction beyond published maximum limits, or with improper maintenance, may results in elevated emission levels.

Emergency Generator Specifications and Emission Factors Used

EU: 41

Model:	**C3000 D6e**
Frequency:	**60 Hz**
Fuel type:	**Diesel**
kW rating:	**3000 Standby** **2750 Prime** **2500 Continuous**
Emissions level:	**EPA NSPS Stationary emergency Tier 2**

Fuel consumption

	Standby				**Prime**				**Continuous**			
	kW (kVA)				**kW (kVA)**				**kW (kVA)**			
Ratings	3000 (3750)				2750 (3438)				2500 (3125)			
Ratings without fan[1]	3075 (3844)				2826 (3532)				2576 (3220)			
Load	**1/4**	**1/2**	**3/4**	**Full**	**1/4**	**1/2**	**3/4**	**Full**	**1/4**	**1/2**	**3/4**	**Full**
US gph	67	113	158	202	63	104	145	187	59	97	134	172
L/hr	254	428	598	769	238	394	549	708	223	367	507	651

[1] Ratings for reference with the optional remote radiator cooling configuration. See note 1 under “Alternator data” section.

Engine

	Standby rating	**Prime rating**	**Continuous rating**
Engine model	QSK95-G9		
Configuration	Cast iron, Vee, 16 cylinder		
Aspiration	Turbocharged and after-cooled		
Gross engine power output, kWm (bhp)	3213 (4307)	2923 (3918)	2665 (3572)
BMEP at set rated load, kPa (psi)	2248 (326)	2041 (296)	1862 (270)
Bore, mm (in.)	190.0 (7.48)		
Stroke, mm (in.)	210.1 (8.27)		
Rated speed, rpm	1800		
Piston speed, m/s (ft/min)	12.6 (2480)		
Compression ratio	15.1:1		
Lube oil capacity, L (qt)	647 (684)		
Overspeed limit, rpm	2070		
Regenerative power, kW	321		

Fuel flow

Maximum fuel flow, L/hr (US gph)	1601.1 (423)
Maximum fuel inlet restriction with clean filter, kPa (in Hg)	13.5 (4)
Maximum fuel return line restriction, kPa (in Hg)	34 (10)
Maximum fuel inlet temperature, °C (°F)	71.1 (160)
Maximum fuel outlet temperature, °C (°F)	92.2 (198)

Air

	Standby rating	Prime rating	Continuous rating
Combustion air, m^3/min (scfm)	270 (9550)	265 (9350)	260 (9170)
Maximum air cleaner restriction with clean filter, mm H_2O (in H_2O)	457 (18)		
Alternator cooling air, m^3/min (scfm)	255 (9005)		

Exhaust

Exhaust flow at set rated load, m^3/min (scfm)	641 (22630)	605 (21370)	573 (20250)
Exhaust temperature at set rated load, °C (°F)	441 (825)	414 (778)	392 (737)
Maximum back pressure, kPa (in H_2O)	7 (28)		

Standard set-mounted radiator cooling

Ambient design, °C (°F)	48 118
Fan load, kWm (HP)	78 (105)
Coolant capacity (with radiator), L (US gal)	1120 (296)
Cooling system air flow, m^3/min (scfm)	3135 (110700)
Maximum cooling air flow static restriction, kPa (in H_2O)	0.12 (0.5)

Optional set-mounted radiator cooling

Ambient design, °C (°F)	50 (122)
Fan load, kWm (HP)	78 (105)
Coolant capacity (with radiator), L (US gal)	1120 (296)
Cooling system air flow, m^3/min (scfm)	3135 (110700)
Maximum cooling air flow static restriction, kPa (in H_2O)	0.12 (0.5)

Optional remote radiator cooling

Engine coolant capacity, L (US gal)	379 (100)		
Max flow rate at max friction head, jacket water circuit, L/min (US gal/min)	3081 (814)		
Max flow rate at max friction head, after-cooler circuit, L/min (US gal/min)	651 (172)		
Heat rejected, jacket water circuit, MJ/min (Btu/min)	90 (85280)	81.60 (77310)	74.10 (70230)
Heat rejected, after-cooler circuit, MJ/min (Btu/min)	21.30 (20190)	20.20 (19110)	19.10 (18150)
Heat rejected, fuel circuit, MJ/min (Btu/min)	0.26 (248)	0.23 (222)	0.21 (199)
Total heat radiated to room, MJ/min (Btu/min)	24.70 (23380)	22.60 (21390)	20.60 (19570)
Maximum friction head, jacket water circuit, kPa (psi)	83 (12)		
Maximum friction head, after-cooler circuit, kPa (psi)	83 (12)		
Maximum static head above engine crank centerline, jacket water circuit, m (ft)	18 (60)		
Maximum static head above engine crank centerline, after-cooler circuit, m (ft)	18 (60)		
Maximum jacket water outlet temp, °C (°F)	140.4 (220)	100 (212)	100 (212)
Maximum after-cooler inlet temp, °C (°F)	71.1 (160)	68 (155)	68 (155)
Maximum after-cooler inlet temp at 25 °C (77 °F) ambient, °C (°F)	46.1 (115)		

Note: For non-standard remote installations contact your local Cummins representative.

Weights

Unit dry weight kg (lb)	29500 (65092)
Unit wet weight kg (lb)	31200 (68771)

Note: Weights represent a set with standard features and alternator frame P80X. See outline drawing for weights of other configurations.

Derating factors

Standby	Full genset power available up to 1312 m (4304 ft) at ambient temperatures up to 40 °C (104 °F) and 962 m (3156 ft) at ambient temperatures up to 50 °C (122 °F). Above these conditions, derate at 6.3% per 305 m (1000 ft) and 8% per 10 °C (18 °F).
Prime	Full genset power available up to 1641 m (5384 ft) at ambient temperatures up to 40 °C (104 °F) and 1205 m (3953 ft) at ambient temperatures up to 50 °C (122 °F). Above these conditions, derate at 5.1% per 305 m (1000 ft) and 10% per 10 °C (18 °F).
Continuous	Full genset power available up to 1350 m (4429 ft) at ambient temperatures up to 40 °C (104 °F) and 961 m (3153 ft) at ambient temperatures up to 50 °C (122 °F). Above these conditions, derate at 5.9 % per 305 m (1000 ft) and 10% per 10 °C (18 °F).

Ratings definitions

Emergency Standby Power (ESP):	**Limited-Time Running Power (LTP):**	**Prime Power (PRP):**	**Base Load (Continuous) Power (COP):**
Applicable for supplying power to varying electrical load for the duration of power interruption of a reliable utility source. Emergency Standby Power (ESP) is in accordance with ISO 8528. Fuel stop power in accordance with ISO 3046, AS 2789, DIN 6271 and BS 5514.	Applicable for supplying power to a constant electrical load for limited hours. Limited-Time Running Power (LTP) is in accordance with ISO 8528.	Applicable for supplying power to varying electrical load for unlimited hours. Prime Power (PRP) is in accordance with ISO 8528. Ten percent overload capability is available in accordance with ISO 3046, AS 2789, DIN 6271 and BS 5514.	Applicable for supplying power continuously to a constant electrical load for unlimited hours. Continuous Power (COP) is in accordance with ISO 8528, ISO 3046, AS 2789, DIN 6271 and BS 5514.

Alternator data[1]

Voltage	Connection	Temp rise degrees C	Duty[2]	Max surge kVA[3]	Winding number	Alternator data sheet	Feature code
380	Wye, 3-phase	125	S	N/A	13	ADS-531	BB05-2
380	Wye, 3-phase	150	S	N/A	13	ADS-531	B814-2
380	Wye, 3-phase	105	P	N/A	13	ADS-531	B840-2
380	Wye, 3-phase	125	P	N/A	13	ADS-531	B815-2
380	Wye, 3-phase	105	C	N/A	13	ADS-531	B597-2
416	Wye, 3-phase	125	S	15093	12	ADS-532	BB76-2
416	Wye, 3-phase	150	S	13283	12	ADS-531	BA53-2
416	Wye, 3-phase	105	P	15093	12	ADS-532	BB75-2
416	Wye, 3-phase	125	P	13283	12	ADS-531	B982-2
416	Wye, 3-phase	80	C	15093	12	ADS-532	BB06-2
416	Wye, 3-phase	105	C	13283	12	ADS-531	BA54-2

Notes:

[1] Alternator data is configured for a set with ratings including engine cooling fan losses and standard features at 40 °C ambient temperature. For non-standard configurations, including remote radiator applications, check appropriate alternator data sheets or contact your local Cummins representative.

[2] Standby (S), Prime (P) and Continuous ratings (C).

[3] Maximum rated starting kVA that results in a minimum of 90% of rated sustained voltage during starting.

Alternator data[1] (Continued)

Voltage	Connection	Temp rise degrees C	Duty[2]	Max surge kVA[3]	Winding number	Alternator data sheet	Feature code
440	Wye, 3-phase	105	S	14781	12	ADS-532	B665-2
440	Wye, 3-phase	125	S	13024	12	ADS-531	B535-2
440	Wye, 3-phase	150/125/105	S/P/C	13024	12	ADS-531	B813-2
440	Wye, 3-phase	105	P	13024	12	ADS-531	B981-2
440	Wye, 3-phase	80	C	14781	12	ADS-532	BA55-2
480	Wye, 3-phase	105	S	13024	12	ADS-531	B280-2
480	Wye, 3-phase	125/105/80	S/P/C	13024	12	ADS-531	B801-2
480	Wye, 3-phase	80	P	14781	12	ADS-532	B694-2
600	Wye, 3-phase	105	S	12426	7	ADS-531	BB07-2
600	Wye, 3-phase	125/105/80	S/P/C	12426	7	ADS-531	B465-2
600	Wye, 3-phase	150/125/105	S/P/C	12426	7	ADS-531	B451-2
600	Wye, 3-phase	80	S	N/A	7	ADS-532	B695-2
4160	Wye, 3-phase	80	S	15662	51	ADS-587	B935-2
4160	Wye, 3-phase	105/80	S/P	9481	51	ADS-545	B937-2
4160	Wye, 3-phase	125/105/80	S/P/C	8752	51	ADS-520	B467-2
4160	Wye, 3-phase	150/125/105	S/P/C	7295	51	ADS-519	B938-2
12.47k	Wye, 3-phase	80	S	N/A	8030	ADS-590	B607-2
12.47k	Wye, 3-phase	105	S	13438	91	ADS-534	B568-2
12.47k	Wye, 3-phase	125/105/80	S/P/C	13438	91	ADS-534	B609-2
12.47k	Wye, 3-phase	80	P	15883	8029	ADS-589	B812-2
12.47k	Wye, 3-phase	105	C	11213	91	ADS-533	B569-2
13.2k	Wye, 3-phase	80	S	N/A	8030	ADS-590	B807-2
13.2k	Wye, 3-phase	105	S	13438	91	ADS-534	B501-2
13.2-13.8k	Wye, 3-phase	125/105	S/P	11213	91	ADS-533	B803-2
13.2k	Wye, 3-phase	80	P	13438	91	ADS-534	B566-2
13.2-13.8k	Wye, 3-phase	105	C	13438	91	ADS-534	B657-2
13.2k	Wye, 3-phase	80	C	13438	91	ADS-534	B808-2
13.8k	Wye, 3-phase	80	S	16688	8029	ADS-589	B610-2
13.8k	Wye, 3-phase	105	S	13438	91	ADS-534	B895-2
13.8k	Wye, 3-phase	80	P	13438	91	ADS-534	B809-2
13.8k	Wye, 3-phase	80	C	11213	91	ADS-533	B565-2

Notes:

[1] Alternator data is configured for a set with ratings including engine cooling fan losses and standard features at 40 °C ambient temperature. For non-standard configurations, including remote radiator applications, check appropriate alternator data sheets or contact your local Cummins representative.

[2] Standby (S), Prime (P) and Continuous ratings (C).

[3] Maximum rated starting kVA that results in a minimum of 90% of rated sustained voltage during starting.

Warning: Back feed to a utility system can cause electrocution and/or property damage. Do not connect to any building's electrical system except through an approved device or after building main switch is open.

For more information contact your local Cummins distributor or visit power.cummins.com

Our energy working for you.™

Exhaust emission data sheet
C3000 D6e
60 Hz Diesel generator set
EPA Tier 2

Engine Information:

Model:	Cummins Inc. QSK95-G9	Bore:	7.48 in. (190 mm)
Type:	4 Cycle, VEE, 16 cylinder diesel	Stroke:	8.27 in. (210 mm)
Aspiration:	Turbocharged and Aftercooled	Displacement:	5816 cu. in. (95.3 liters)
Compression Ratio:	15.5:1		
Emission Control Device:	Turbocharged and Aftercooled		
Emission Level:	Stationary Emergency		

Performance Data	**1/4 Standby**	**1/2 Standby**	**3/4 Standby**	**Full Standby**	**Full Prime**	**Full Continuous**
BHP @ 1800 RPM (60 Hz)	1145	2185	3225	4308	3919	3572
Fuel Consumption L/Hr (US Gal/Hr)	254 (67)	443 (117)	602 (159)	787 (208)	719 (190)	659 (174)
Exhaust Gas Flow m³/min (CFM)	282 (9963)	45 (15921)	55 (19592)	662 (23369)	623 (21997)	588 (20776)
Exhaust Gas Temperature °C (°F)	331 (628)	354 (670)	377 (711)	443 (830)	417 (783)	396 (745)
Exhaust Emission Data						
HC (Total Unburned Hydrocarbons)	0.3 (114)	0.18 (76)	0.1 (48)	0.07 (33)	0.08 (37)	0.09 (42)
NOx (Oxides of Nitrogen as NO_2)	3.4 (1290)	3.3 (1350)	4.2 (1900)	5.2 (2440)	4.9 (2250)	4.5 (2080)
CO (Carbon Monoxide)	0.5 (170)	0.2 (90)	0.1 (60)	0.2 (100)	0.2 (80)	0.2 (70)
PM (Particulate Matter)	0.21 (69)	0.1 (37)	0.06 (23)	0.04 (18)	0.05 (19)	0.05 (21)
SO_2 (Sulfur Dioxide)	0.006 (1.8)	0.005 (1.8)	0.005 (1.8)	0.005 (1.8)	0.005 (1.8)	0.005 (1.8)
Smoke (FSN)	0.92	0.62	0.46	0.44	0.44	0.45

All values (except smoke) are cited: g/BHP-hr (mg/Nm³ @ 5% O_2)

Test Conditions

Steady-state emissions recorded per ISO8178-1 during operation at rated engine speed (+/-2%) and stated constant load (+/-2%) with engine temperatures, pressures and emission rates stabilized.

Fuel Specification:	40-48 Cetane Number, 0.0015 Wt.% Sulfur; Reference ISO8178-5, 40 CFR 86, 1313—98 Type 2-D and ASTM D975 No. 2-D. Fuel Density at 0.85 Kg/L (7.1 lbs/US Gal)
Air Inlet Temperature	25 °C (77 °F)
Fuel Inlet Temperature:	40 °C (104 °F)
Barometric Pressure:	100 kPa (29.53 in Hg)
Humidity:	NOx measurement corrected to 10.7 g/kg (75 grains H_2O/lb) of dry air
Intake Restriction:	Set to 20 in of H_2O as measured from compressor inlet
Exhaust Back Pressure:	Set to 1.5 in Hg
Note:	mg/m³ values are measured dry, corrected to 5% O_2 and normalized to standard temperature and pressure (0°C, 101.325 kPa)

The NOx, HC, CO and PM emission data tabulated here are representative of test data taken from a single engine under the test conditions shown above. Data for the other components are estimated. These data are subjected to instrumentation and engine-to-engine variability. Field emission test data are not guaranteed to these levels. Actual field test results may vary due to test site conditions, installation, fuel specification, test procedures and instrumentation. Engine operation with excessive air intake or exhaust restriction beyond published maximum limits, or with improper maintenance, may results in elevated emission levels.

2019 EPA Tier 2 Exhaust Emission Compliance Statement C3000 D6e Stationary Emergency

60 Hz Diesel Generator Set

Compliance Information:

The engine used in this generator set complies with Tier 2 emissions limit of U.S. EPA New Source Performance Standards for stationary emergency engines under the provisions of 40 CFR 60 Subpart IIII when tested per ISO8178 D2.

Engine Manufacturer:	Cummins Inc.
EPA Certificate Number:	KCEXL95.0AAA-015
Effective Date:	10/01/2018
Date Issued:	10/01/2018
EPA Engine Family (Cummins Emissions Family):	KCEXL95.0AAA

Engine Information:

Model:	QSK95-G9	Bore:	7.48 in. (190 mm)
Engine Nameplate HP:	5051	Stroke:	8.27 in. (210 mm)
Type:	4 cycle, Vee, 16 Cylinder Diesel	Displacement:	5816 cu. in. (95.3 liters)
Aspiration:	Turbocharged and Aftercooled	Compression Ratio:	15.5:1
Emission Control Device:	Turbocharged and Aftercooled	Exhaust Stack Diameter:	14 in.

Diesel Fuel Emissions Limits

D2 Cycle Exhaust Emissions

	Grams per BHP-hr			Grams per kW$_m$-hr		
	NO_X + NMHC	CO	PM	NO_X + NMHC	CO	PM
Test Results	4.6	0.5	0.11	6.2	0.7	0.15
EPA Emissions Limit	4.8	2.6	0.15	6.4	3.5	0.20

Test methods: EPA nonroad emissions recorded per 40CFR89 (ref. ISO8178-1) and weighted at load points prescribed in Subpart E, Appendix A for constant speed engines (ref. ISO8178-4, D2)

Diesel fuel specifications: Cetane number: 40-48. Reference: ASTM D975 No. 2-D, <15 ppm Sulfur

Reference conditions: Air inlet temperature: 25°C (77°F), Fuel inlet temperature: 40°C (104°F). Barometric pressure: 100 kPa (29.53 in Hg), Humidity: 10.7 g/kg (75 grains H2O/lb) of dry air; required for NOx correction, Restrictions: Intake restriction set to a maximum allowable limit for clean filter; Exhaust back pressure set to a maximum allowable limit.

Tests conducted using alternate test methods, instrumentation, fuel or reference conditions can yield different results.

Engine operation with excessive air intake or exhaust restriction beyond published maximum limits, or with improper maintenance, may result in elevated emission levels.

Emergency Generator Specifications and Emission Factors Used

EU: 42

PERFORMANCE DATA [2WJ00732]

OCTOBER 09, 2020

For Help Desk Phone Numbers Click here

Perf No: DM0635 **Change Level:** 05

General Heat Rejection Emissions Regulatory Altitude Derate Cross Reference Perf Param Ref

View PDF

SALES MODEL:	3412C	**COMBUSTION:**	DIRECT INJECTION
BRAND:	CAT	**ENGINE SPEED (RPM):**	1,800
ENGINE POWER (BHP):	1,109	**HERTZ:**	60
GEN POWER WITH FAN (EKW):	750.0	**FAN POWER (HP):**	51.0
COMPRESSION RATIO:	13	**ASPIRATION:**	TA
RATING LEVEL:	STANDBY	**AFTERCOOLER TYPE:**	JWAC
PUMP QUANTITY:	1	**AFTERCOOLER CIRCUIT TYPE:**	JW+OC+AC
FUEL TYPE:	DIESEL	**AFTERCOOLER TEMP (F):**	196
MANIFOLD TYPE:	DRY	**JACKET WATER TEMP (F):**	210.2
GOVERNOR TYPE:	PEEC	**TURBO CONFIGURATION:**	SERIES
IGNITION TYPE:	CI	**TURBO QUANTITY:**	4
REF EXH STACK DIAMETER (IN):	8	**TURBOCHARGER MODEL:**	TV9215-48T-2.00
MAX OPERATING ALTITUDE (FT):	7,546	**COMBUSTION STRATEGY:**	LOW BSFC
		PISTON SPD @ RATED ENG SPD (FT/MIN):	1,800.0

INDUSTRY	SUB INDUSTRY	APPLICATION
ELECTRIC POWER	STANDARD	PACKAGED GENSET
OIL AND GAS	LAND PRODUCTION	PACKAGED GENSET

General Performance Data Top

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	BRAKE MEAN EFF PRES (BMEP)	BRAKE SPEC FUEL CONSUMPTN (BSFC)	VOL FUEL CONSUMPTN (VFC)	INLET MFLD PRES	INLET MFLD TEMP	EXH MFLD TEMP	ENGINE OUTLET TEMP
EKW	%	BHP	PSI	LB/BHP-HR	GAL/HR	IN-HG	DEG F	DEG F	DEG F
750.0	100	1,109	296	0.344	53.8	71.0	207.0	1,258.9	957.0
675.0	90	1,001	267	0.342	48.3	60.1	200.5	1,225.6	946.2
600.0	80	895	239	0.342	43.2	50.3	194.7	1,193.2	935.4
562.5	75	842	225	0.342	40.7	45.7	192.4	1,176.5	929.0
525.0	70	790	211	0.343	38.1	41.4	190.2	1,159.2	921.6
450.0	60	685	183	0.344	33.2	33.3	186.1	1,121.7	902.8
375.0	50	581	155	0.350	28.6	26.1	182.5	1,078.9	878.2
300.0	40	478	128	0.359	24.2	19.7	179.1	1,024.9	842.7
225.0	30	375	100	0.372	19.6	14.0	176.0	952.6	790.3
187.5	25	323	86	0.379	17.3	11.3	174.5	904.4	753.7
150.0	20	270	72	0.390	14.9	8.8	173.0	847.8	709.4
75.0	10	162	43	0.446	10.2	4.6	171.9	701.7	591.0

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	COMPRESSOR OUTLET PRES	COMPRESSOR OUTLET TEMP	WET INLET AIR VOL FLOW RATE	ENGINE OUTLET WET EXH GAS VOL FLOW RATE	WET INLET AIR MASS FLOW RATE	WET EXH GAS MASS FLOW RATE	WET EXH VOL FLOW RATE (32 DEG F AND 29.98 IN HG)	DRY EXH VOL FLOW RATE (32 DEG F AND 29.98 IN HG)
EKW	%	BHP	IN-HG	DEG F	CFM	CFM	LB/HR	LB/HR	FT3/MIN	FT3/MIN
750.0	100	1,109	73	397.6	2,302.4	6,423.4	10,223.2	10,604.8	2,229.3	1,998.4
675.0	90	1,001	61	368.6	2,076.4	5,741.9	9,064.5	9,407.4	2,008.1	1,800.1
600.0	80	895	51	337.1	1,853.9	5,095.6	7,978.0	8,284.4	1,795.8	1,609.8
562.5	75	842	46	321.6	1,752.6	4,794.9	7,471.2	7,759.7	1,697.7	1,521.9
525.0	70	790	42	306.2	1,656.1	4,505.8	6,982.2	7,252.8	1,603.9	1,437.8
450.0	60	685	34	275.6	1,476.1	3,962.1	6,055.5	6,291.1	1,429.7	1,281.6
375.0	50	581	27	246.0	1,313.5	3,453.1	5,180.4	5,383.6	1,269.1	1,137.6
300.0	40	478	21	217.1	1,158.0	2,965.9	4,327.0	4,498.5	1,119.7	1,003.7
225.0	30	375	15	187.9	1,009.1	2,479.6	3,472.8	3,612.2	975.3	874.3
187.5	25	323	12	173.0	937.6	2,234.4	3,039.9	3,162.5	905.4	811.7
150.0	20	270	9	157.8	869.3	1,986.7	2,601.4	2,706.8	835.5	749.0
75.0	10	162	4	132.4	759.8	1,549.1	1,824.6	1,896.9	724.9	649.8

Heat Rejection Data Top

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	REJECTION TO JACKET WATER	REJECTION TO ATMOSPHERE	REJECTION TO EXH	EXHAUST RECOVERY TO 350F	FROM OIL COOLER	FROM AFTERCOOLER	WORK ENERGY	LOW HEAT VALUE ENERGY	HIGH HEAT VALUE ENERGY
EKW	%	BHP	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN
750.0	100	1,109	26,957	6,483	45,157	26,106	3,361	7,394	47,010	117,881	125,573
675.0	90	1,001	24,285	5,858	40,209	23,034	3,162	5,915	42,461	105,924	112,836
600.0	80	895	21,782	5,516	35,545	20,246	2,952	4,437	37,962	94,658	100,835
562.5	75	842	20,529	5,299	33,354	18,899	2,850	3,814	35,727	89,089	94,902
525.0	70	790	19,280	5,062	31,223	17,630	2,747	3,242	33,492	83,553	89,004
450.0	60	685	16,834	4,550	27,128	15,128	2,531	2,218	29,050	72,822	77,574
375.0	50	581	14,557	4,379	23,314	12,794	2,309	1,421	24,633	62,775	66,871
300.0	40	478	12,359	4,272	19,557	10,484	2,086	768	20,276	53,007	56,465
225.0	30	375	10,109	4,092	15,787	8,119	1,852	225	15,899	43,078	45,889
187.5	25	323	8,903	3,896	13,801	6,865	1,701	-16	13,688	37,856	40,326
150.0	20	270	7,688	3,698	11,846	5,585	1,543	-226	11,451	32,613	34,741
75.0	10	162	5,303	3,414	8,210	3,199	1,213	-511	6,875	22,324	23,781

Emissions Data Top

Units Filter All Units

RATED SPEED POTENTIAL SITE VARIATION: 1800 RPM

GENSET POWER WITH FAN ENGINE POWER		EKW BHP	750.0 1,109	562.5 842	375.0 581	187.5 323	75.0 162
PERCENT LOAD		%	100	75	50	25	10
TOTAL NOX (AS NO2)		G/HR	7,989	6,093	3,973	1,969	1,137
TOTAL CO		G/HR	1,462	993	724	759	828
TOTAL HC		G/HR	272	153	134	176	396
PART MATTER		G/HR	235.0	184.1	168.5	130.8	81.0
TOTAL NOX (AS NO2)	(CORR 5% O2)	MG/NM3	3,421.1	3,451.8	3,136.2	2,621.7	2,451.9
TOTAL CO	(CORR 5% O2)	MG/NM3	625.0	559.7	570.6	1,022.9	2,545.3
TOTAL HC	(CORR 5% O2)	MG/NM3	106.8	78.6	98.9	223.2	1,434.0
PART MATTER	(CORR 5% O2)	MG/NM3	82.7	86.4	112.9	148.8	130.6
TOTAL NOX (AS NO2)	(CORR 5% O2)	PPM	1,571	1,578	1,429	1,175	1,159
TOTAL CO	(CORR 5% O2)	PPM	496	441	469	810	1,487
TOTAL HC	(CORR 5% O2)	PPM	187	138	174	382	1,455
TOTAL NOX (AS NO2)		G/HP-HR	7.21	7.23	6.84	6.10	7.01
TOTAL CO		G/HP-HR	1.32	1.18	1.25	2.35	5.11
TOTAL HC		G/HP-HR	0.25	0.18	0.23	0.54	2.44
PART MATTER		G/HP-HR	0.21	0.22	0.29	0.41	0.50
TOTAL NOX (AS NO2)		LB/HR	17.61	13.43	8.76	4.34	2.51
TOTAL CO		LB/HR	3.22	2.19	1.60	1.67	1.83
TOTAL HC		LB/HR	0.60	0.34	0.30	0.39	0.87
PART MATTER		LB/HR	0.52	0.41	0.37	0.29	0.18

RATED SPEED NOMINAL DATA: 1800 RPM

GENSET POWER WITH FAN ENGINE POWER		EKW BHP	750.0 1,109	562.5 842	375.0 581	187.5 323	75.0 162
PERCENT LOAD		%	100	75	50	25	10
TOTAL NOX (AS NO2)		G/HR	6,602	5,035	3,284	1,627	939
TOTAL CO		G/HR	782	531	387	406	443
TOTAL HC		G/HR	144	81	71	93	209
TOTAL CO2		KG/HR	550	411	290	173	102
PART MATTER		G/HR	120.5	94.4	86.4	67.1	41.5
TOTAL NOX (AS NO2)	(CORR 5% O2)	MG/NM3	2,827.4	2,852.7	2,591.9	2,166.7	2,026.4
TOTAL CO	(CORR 5% O2)	MG/NM3	334.2	299.3	305.1	547.0	1,361.1
TOTAL HC	(CORR 5% O2)	MG/NM3	56.5	41.6	52.3	118.1	758.7
PART MATTER	(CORR 5% O2)	MG/NM3	42.4	44.3	57.9	76.3	67.0
TOTAL NOX (AS NO2)	(CORR 5% O2)	PPM	1,298	1,304	1,181	971	958
TOTAL CO	(CORR 5% O2)	PPM	265	236	251	433	795
TOTAL HC	(CORR 5% O2)	PPM	99	73	92	202	770
TOTAL NOX (AS NO2)		G/HP-HR	5.96	5.98	5.65	5.04	5.79
TOTAL CO		G/HP-HR	0.71	0.63	0.67	1.26	2.73

GENSET POWER WITH FAN **ENGINE POWER**		**EKW** **BHP**	**750.0** **1,109**	**562.5** **842**	**375.0** **581**	**187.5** **323**	**75.0** **162**
PERCENT LOAD		**%**	**100**	**75**	**50**	**25**	**10**
TOTAL HC		G/HP-HR	0.13	0.10	0.12	0.29	1.29
PART MATTER		G/HP-HR	0.11	0.11	0.15	0.21	0.26
TOTAL NOX (AS NO2)		LB/HR	14.56	11.10	7.24	3.59	2.07
TOTAL CO		LB/HR	1.72	1.17	0.85	0.90	0.98
TOTAL HC		LB/HR	0.32	0.18	0.16	0.21	0.46
TOTAL CO2		LB/HR	1,212	906	639	382	224
PART MATTER		LB/HR	0.27	0.21	0.19	0.15	0.09
OXYGEN IN EXH		%	9.8	9.9	10.6	12.3	14.7

Regulatory Information Top

NON-CERTIFIED	**1970 - 2100**
THIS ENGINE RATING IS NOT EMISSIONS CERTIFIED BY ANY DOMESTIC OR FOREIGN AGENCY.	

Altitude Derate Data Top

ALTITUDE CORRECTED POWER CAPABILITY (BHP)

AMBIENT OPERATING TEMP (F)	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**	**110**	**120**	**130**	**140**	**NORMAL**
ALTITUDE (FT)													
0	1,109	1,109	1,109	1,109	1,109	1,109	1,109	1,109	1,109	1,109	1,109	1,109	1,109
1,000	1,109	1,109	1,109	1,109	1,109	1,109	1,109	1,109	1,109	1,109	1,109	1,109	1,109
2,000	1,109	1,109	1,109	1,109	1,109	1,109	1,109	1,109	1,109	1,109	1,109	1,109	1,109
3,000	1,109	1,109	1,109	1,109	1,109	1,109	1,109	1,109	1,109	1,109	1,087	1,031	1,109
4,000	1,109	1,109	1,109	1,109	1,109	1,109	1,109	1,109	1,109	1,065	1,009	954	1,109
5,000	1,109	1,109	1,109	1,109	1,109	1,109	1,109	1,087	1,042	976	920	865	1,109
6,000	1,109	1,109	1,109	1,109	1,109	1,109	1,076	1,009	954	898	832	787	1,109
7,000	1,109	1,109	1,109	1,109	1,087	1,042	987	932	865	810	754	710	1,109
8,000	1,109	1,109	1,109	1,076	1,020	954	898	843	787	732	688	643	1,087
9,000	1,109	1,091	1,054	987	932	876	821	765	710	665	621	577	1,020
10,000	1,071	1,020	965	909	843	787	743	688	643	599	566	521	954
11,000	998	932	876	821	765	721	665	621	577	543	510	477	887
12,000	909	854	798	743	699	643	599	566	532	499	466	433	832
13,000	821	776	721	676	621	588	543	510	477	444	421	399	765
14,000	754	699	654	610	566	532	499	466	433	410	388	366	710
15,000	676	632	588	555	510	477	455	421	399	377	355	333	665

Cross Reference Top

Test Spec	**Setting**	**Engine Arrangement**	**Engineering Model**	**Engineering Model Version**	**Start Effective Serial Number**	**End Effective Serial Number**
2T9786	PP4109	1483596	GS014	-	1EZ00001	
2T9786	PP4109	1668587	GS014	-	1EZ00001	

Performance Parameter Reference Top

Parameters Reference: DM9600 - 12

PERFORMANCE DEFINITIONS

PERFORMANCE DEFINITIONS DM9600

APPLICATION: Engine performance tolerance values below are representative of a typical production engine tested in a calibrated dynamometer test cell at SAE J1995 standard reference conditions. Caterpillar maintains ISO9001:2000 certified quality management systems for engine test Facilities to assure accurate calibration of test equipment. Engine test data is corrected in accordance with SAE J1995. Additional reference material SAE J1228, J1349, ISO 8665, 3046-1:2002E, 3046-3:1989, 1585, 2534, 2288, and 9249 may apply in part or are similar to SAE J1995. Special engine rating request (SERR) test data shall be noted.

PERFORMANCE PARAMETER TOLERANCE FACTORS: Power +/- 3% Torque +/- 3% Exhaust stack temperature +/- 8% Inlet airflow +/- 5% Intake manifold pressure-gage +/- 10% Exhaust flow +/- 6% Specific fuel consumption +/- 3% Fuel rate +/- 5% Specific DEF consumption +/- 3% DEF rate +/- 5% Heat rejection +/- 5% Heat rejection exhaust only +/- 10% Heat rejection CEM only +/- 10%
Heat Rejection values based on using treated water.
Torque is included for truck and industrial applications, do not use for Gen Set or steady state applications.
On C7 - C18 engines, at speeds of 1100 RPM and under these values are provided for reference only, and may not meet the tolerance listed.
These values do not apply to C280/3600. For these models, see the tolerances listed below.

C280/3600 HEAT REJECTION TOLERANCE FACTORS: Heat rejection +/- 10% Heat rejection to Atmosphere +/- 50% Heat rejection to Lube Oil +/- 20% Heat rejection to Aftercooler +/- 5%

TEST CELL TRANSDUCER TOLERANCE FACTORS: Torque +/- 0.5% Speed +/- 0.2% Fuel flow +/- 1.0% Temperature +/- 2.0 C degrees Intake manifold pressure +/- 0.1 kPa
OBSERVED ENGINE PERFORMANCE IS CORRECTED TO SAE J1995 REFERENCE AIR AND FUEL CONDITIONS.

REFERENCE ATMOSPHERIC INLET AIR FOR 3500 ENGINES AND SMALLER SAE J1228 AUG2002 for marine engines, and J1995 JAN2014 for other engines, reference atmospheric pressure is 100 KPA (29.61 in hg), and standard temperature is 25deg C (77 deg F) at 30% relative humidity at the stated aftercooler water temp, or inlet manifold temp.
FOR 3600 ENGINES Engine rating obtained and presented in accordance with ISO 3046/1 and SAE J1995 JANJAN2014 reference atmospheric pressure is 100 KPA (29.61 in hg), and standard temperature is 25deg C (77 deg F) at 30% relative humidity and 150M altitude at the stated aftercooler water temperature.

MEASUREMENT LOCATION FOR INLET AIR TEMPERATURE Location for air temperature measurement air cleaner inlet at stabilized operating conditions.

REFERENCE EXHAUST STACK DIAMETER The Reference Exhaust Stack Diameter published with this dataset is only used for the calculation of Smoke Opacity values displayed in this dataset. This value does not necessarily represent the actual stack diameter of the engine due to the variety of exhaust stack adapter options available. Consult the price list, engine order or general dimension drawings for the actual stack diameter size ordered or options available.

REFERENCE FUEL DIESEL Reference fuel is #2 distillate diesel with a 35API gravity; A lower heating value is 42,780 KJ/KG (18,390 BTU/LB) when used at 15 deg C (59 deg F), where the density is 850 G/Liter (7.0936 Lbs/Gal).
GAS Reference natural gas fuel has a lower heating value of 33.74 KJ/L (905 BTU/CU Ft). Low BTU ratings are based on 18.64 KJ/L (500 BTU/CU FT) lower heating value gas. Propane ratings are based on 87.56 KJ/L (2350 BTU/CU Ft) lower heating value gas.

ENGINE POWER (NET) IS THE CORRECTED FLYWHEEL POWER (GROSS) LESS EXTERNAL AUXILIARY LOAD Engine corrected gross output includes the power required to drive standard equipment; lube oil, scavenge lube oil, fuel transfer, common rail fuel, separate circuit aftercooler and jacket water pumps. Engine net power available for the external (flywheel) load is calculated by subtracting the sum of auxiliary load from the corrected gross flywheel out put power. Typical auxiliary loads are radiator cooling fans, hydraulic pumps, air compressors and battery charging alternators. For Tier 4 ratings additional Parasitic losses would also include Intake, and Exhaust Restrictions.

ALTITUDE CAPABILITY Altitude capability is the maximum altitude above sea level at standard temperature and standard pressure at which the engine could develop full rated output power on the current performance data set.
Standard temperature values versus altitude could be seen on TM2001.
When viewing the altitude capability chart the ambient temperature is the inlet air temp at the compressor inlet.
Engines with ADEM MEUI and HEUI fuel systems operating at conditions above the defined altitude capability derate for atmospheric pressure and temperature conditions outside the values defined, see TM2001.
Mechanical governor controlled unit injector engines require a setting change for operation at conditions above the altitude defined on the engine performance sheet. See your Caterpillar technical representative for non standard ratings.

REGULATIONS AND PRODUCT COMPLIANCE TMI Emissions information is presented at 'nominal' and 'Potential Site Variation' values for standard ratings. No tolerances are applied to the emissions data. These values are subject to change at any time. The controlling federal and local emission requirements need to be verified by your Caterpillar technical representative.
Customer's may have special emission site requirements that need to be verified by the Caterpillar Product Group engineer.

EMISSION CYCLE LIMITS: Cycle emissions Max Limits apply to cycle-weighted averages only. Emissions at individual load points may exceed the cycle-weighted limit.

EMISSIONS DEFINITIONS: Emissions : DM1176

EMISSION CYCLE DEFINITIONS
1. For constant-speed marine engines for ship main propulsion, including,diesel-electric drive, test cycle E2 shall be applied, for controllable-pitch propeller sets test cycle E2 shall be applied.
2. For propeller-law-operated main and propeller-law-operated auxiliary engines the test cycle E3 shall be applied.
3. For constant-speed auxiliary engines test cycle D2 shall be applied.
4. For variable-speed, variable-load auxiliary engines, not included above, test cycle C1 shall be applied.

HEAT REJECTION DEFINITIONS: Diesel Circuit Type and HHV Balance : DM9500

HIGH DISPLACEMENT (HD) DEFINITIONS: 3500: EM1500

RATING DEFINITIONS: Agriculture : TM6008
Fire Pump : TM6009
Generator Set : TM6035
Generator (Gas) : TM6041
Industrial Diesel : TM6010
Industrial (Gas) : TM6040
Irrigation : TM5749
Locomotive : TM6037
Marine Auxiliary : TM6036
Marine Prop (Except 3600) : TM5747
Marine Prop (3600 only) : TM5748
MSHA : TM6042
Oil Field (Petroleum) : TM6011
Off-Highway Truck : TM6039
On-Highway Truck : TM6038

SOUND DEFINITIONS: Sound Power : DM8702
Sound Pressure : TM7080

Date Released : 07/10/19

Emergency Generator Specifications and Emission Factors Used

EU: 50

DIESEL GENERATOR SET
MTU 4R0120 DS125

125 kWe / 60 Hz / Standby
208 - 600V

Reference MTU 4R0120 DS125 (111 kWe) for Prime Rating Technical Data

SYSTEM RATINGS

Standby

Voltage (L-L)	240V	240V	208V	240V	380V	480V	600V
Phase	1	1	3	3	3	3	3
PF	1	1	0.8	0.8	0.8	0.8	0.8
Hz	60	60	60	60	60	60	60
kW	125	125	125	125	125	125	125
kVA	125	125	156	156	156	156	156
Amps	521	521	434	376	237	188	150
skVA@30% Voltage Dip	184	196	323	323	191	430	334
Generator Model	431PSL6208	431PSL6224	363CSL1607	363CSL1607	431CSL6202	363CSL1607	363PSL1658
Temp Rise	130 °C/40 °C	130 °C/40 °C	130 °C/40 °C	130 °C/40 °C	130 °C/40 °C	130 °C/40 °C	130 °C/40 °C
Connection	12 LEAD DOUBLE DELTA	4 LEAD	12 LEAD WYE	12 LEAD DELTA	12 LEAD WYE	12 LEAD WYE	4 LEAD WYE

CERTIFICATIONS AND STANDARDS

// **Emissions –** EPA Tier 3 Certified

// **Generator set is designed and manufactured in facilities certified to standards ISO 9001:2008 and ISO 14001:2004**

// **Seismic Certification – Optional**
– IBC Certification
– OSHPD Pre-Approval

// **Power Rating**
- Accepts Rated Load in One Step Per NFPA 110

// **UL 2200 / CSA – Optional**
– UL 2200 Listed
– CSA Certified
– CE Marking Provided

// **Performance Assurance Certification (PAC)**
- Generator Set Tested to ISO 8528-5 for Transient Response
- Verified product design, quality and performance integrity
- All engine systems are prototype and factory tested

STANDARD FEATURES*

- // MTU Onsite Energy is a single source supplier
- // Global Product Support
- // 2 Year Standard Warranty
- // OM924LA Diesel Engine
    - - 4.8 Liter Displacement
    - - 4-Cycle
- // Engine-generator resilient mounted
- // Complete Range of Accessories
- // Generator
    - - Brushless, Rotating Field Generator
    - - 2/3 Pitch Windings
    - - 300% Short Circuit Capability with Optional Permanent Magnet Generator (PMG)
- // Digital Control Panel(s)
    - - UL Recognized, CSA Certified, NFPA 110
    - - Complete System Metering
    - - LCD Display
- // Cooling System
    - - Integral Set-Mounted
    - - Engine-Driven Fan

STANDARD EQUIPMENT*

// Engine

- Air Cleaners
- Oil Pump
- Oil Drain Extension and S/O Valve
- Full Flow Oil Filter
- Fuel Filter with Water Separator
- Jacket Water Pump
- Thermostat
- Blower Fan and Fan Drive
- Radiator - Unit Mounted
- Electric Starting Motor - 12V
- Governor – Electronic Isochronous
- Base - Formed Steel
- SAE Flywheel and Bell Housing
- Charging Alternator - 12V
- Battery Box and Cables
- Flexible Fuel Connectors
- Flexible Exhaust Connection
- EPA Certified Engine

// Generator

- NEMA MG1, IEEE and ANSI standards compliance for temperature rise and motor starting
- Self-Ventilated and Drip-Proof
- Superior Voltage Waveform
- Solid State, Volts-per-Hertz Regulator
- ±1% Voltage Regulation No Load to Full Load
- Brushless Alternator with Brushless Pilot Exciter
- 4 Pole, Rotating Field
- 130 °C Max. Standby Temperature Rise
- 1 Bearing, Sealed
- Flexible Coupling
- Full Amortisseur Windings
- 125% Rotor Balancing
- 3-Phase Voltage Sensing
- 100% of Rated Load - One Step
- 5% Max. Total Harmonic Distortion

// Digital Control Panel(s)

- Digital Metering
- Engine Parameters
- Generator Protection Functions
- Engine Protection
- SAE J1939 Engine ECU Communications
- Windows®-Based Software
- Multilingual Capability
- Remote Communications to RDP-110 Remote Annunciator
- Programmable Input and Output Contacts
- UL Recognized, CSA Certified, CE Approved
- Event Recording
- IP 54 Front Panel Rating with Integrated Gasket
- NFPA110 Compatible

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* Represents standard product only. Consult Factory/MTU Onsite Energy Distributor for additional configurations.

APPLICATION DATA

// Engine

Manufacturer	Mercedes-Benz
Model	OM924LA
Type	4-Cycle
Arrangement	4-Inline
Displacement: L (in^3)	4.8 (293)
Bore: cm (in)	10.6 (4.17)
Stroke: cm (in)	13.6 (5.35)
Compression Ratio	17.5:1
Rated RPM	1,800
Engine Governor	MR2 / ADM3
Max. Power: kWm (bhp)	147 (197)
Speed Regulation	±0.25%
Air Cleaner	Dry

// Liquid Capacity (Lubrication)

Total Oil System: L (gal)	15.8 (4.2)
Engine Jacket Water Capacity: L (gal)	7 (1.8)
System Coolant Capacity: L (gal)	20.8 (5.5)

// Electrical

Electric Volts DC	12
Cold Cranking Amps Under -17.8 °C (0 °F)	950

// Fuel System

Fuel Supply Connection Size	-6 JIC
Fuel Supply Hose Size	3/8" ID
Fuel Return Connection Size	-6 JIC
Fuel Return Hose Size	3/8" ID
Max. Fuel Lift: m (ft)	2.7 (9)
Recommended Fuel	Diesel #2
Total Fuel Flow: L/hr (gal/hr)	328.2 (86.7)

// Fuel Consumption *

At 100% of Power Rating: L/hr (gal/hr)	28.8 (7.6)
At 75% of Power Rating: L/hr (gal/hr)	21.6 (5.7)
At 50% of Power Rating: L/hr (gal/hr)	14.8 (3.8)

* Based on 363CSL1607 480 Volt generator set

// Cooling - Radiator System

Ambient Capacity of Radiator: °C (°F)	50 (122)
Max. Restriction of Cooling Air: Intake and Discharge Side of Rad.: kPa (in. H_20)	0.12 (0.5)
Water Pump Capacity: L/min (gpm)	143 (37)
Heat Rejection to Coolant: kW (BTUM)	54 (3,071)
Heat Rejection to Air to Air: kW (BTUM)	28.5 (1,621)
Heat Radiated to Ambient: kW (BTUM)	29.3 (1,666)
Fan Power: kW (hp)	3.3 (4.4)

// Air Requirements

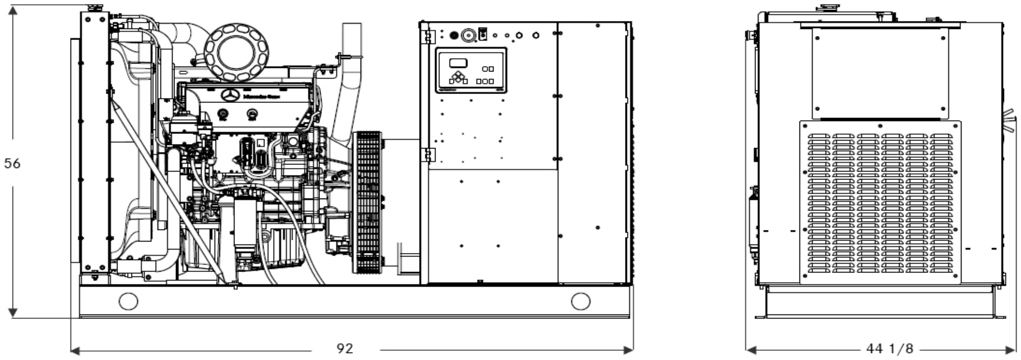
Aspirating: *m^3/min (SCFM)	9.3 (328)
Air Flow Required for Rad. Cooled Unit: *m^3/min (SCFM)	209 (7,381)
Remote Cooled Applications; Air Flow Required for Dissipation of Radiated Generator Set Heat for a Max. of 25 °F Rise: *m^3/min (SCFM)	107 (3,779)

* Air density = 1.184 kg/m^3 (0.0739 lbm/ft^3)

// Exhaust System

Gas Temp. (Stack): °C (°F)	470 (877)
Gas Volume at Stack Temp: m^3/min (CFM)	26.3 (929)
Max. Allowable Back Pressure: kPa (in. H_20)	6.5 (26)

WEIGHTS AND DIMENSIONS



Drawing above for illustration purposes only, based on standard open power 480 volt generator set. Lengths may vary with other voltages. Do not use for installation design. See website for unit specific template drawings.

System	Dimensions (L x W x H)	Weight (less tank)
Open Power Unit (OPU)	2,336 x 1,121 x 1,422 mm (92 x 44.13 x 56 in)	1,216-1,830 kg (2,682-4,034 lb)

Weights and dimensions are based on open power units and are estimates only. Consult the factory for accurate weights and dimensions for your specific generator set.

SOUND DATA

Unit Type	Standby Full Load
Level 0: Open Power Unit dB(A)	83.1

Sound data is provided at 7 m (23 ft). Generator set tested in accordance with ISO 8528-10 and with infinite exhaust.

EMISSIONS DATA

NO_x + NMHC	CO	PM
3.61	1.42	0.08

All units are in g/hp-hr and shown at 100% load (not comparable to EPA weighted cycle values). Emission levels of the engine may vary with ambient temperature, barometric pressure, humidity, fuel type and quality, installation parameters, measuring instrumentation, etc. The data was obtained in compliance with US EPA regulations. The weighted cycle value (not shown) from each engine is guaranteed to be within the US EPA Standards.

RATING DEFINITIONS AND CONDITIONS

// Standby ratings apply to installations served by a reliable utility source. The standby rating is applicable to varying loads for the duration of a power outage. No overload capability for this rating. Ratings are in accordance with ISO 3046-1, BS 5514, and AS 2789. Average load factor: ≤ 85%.

// Deration Factor:
Altitude: Consult your local MTU Onsite Energy Power Generation Distributor for altitude derations.
Temperature: Consult your local MTU Onsite Energy Power Generation Distributor for temperature derations.

C/F = Consult Factory/MTU Onsite Energy Distributor
N/A = Not Available

Engine Data

	Genset	Marine	O & G	Rail	C & I
Application	x				
Engine Model	12V OM924LA				
Engine Power	IFN 147kW - 1800min-1				
Emission Stage	EPA Tier 3				
Optimisation					
Application Group	3D - Diesel Engines for Standby Power				
Test Date	15.07.2015 11:37:12				
Fuel Type	Diesel BS10				

Engine Number	92400M571
Test Sheet Number	493
Drawn by	dasant2
Last Updated	7/29/2015

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Engine Raw Emissions*

Cycle Point	Power (P/PN)	Power	Speed (n/nN)	Speed	Exhaust Temperature after Turbine	Exhaust Mass Flow	Exhaust Back Pressure	NOx		CO		HC		O_2		PM Measured**		PM Calculated		Smoke	CO_2	
[-]	[-]	[kW]	[-]	[rpm]	[°C]	[kg/h]	[mbar]	[ppm]	[g/kW.h]	[ppm]	[g/kW.h]	[ppm]	[g/kW.h]	[%]	[g/kW.h]	[g/kW.h]	[g/kW.h]	[mg]	[g/kW.h]	$[m^{-1}]$	[%]	[g/kW.h]
n1	1.00	147.1	1.00	1800	533	712	83	623	4.8	449	1.9	6	0.04	7.5	358	0.102	0.139	-	-	0.15	9.6	635
n2	0.75	110.3	1.00	1800	449	694	68	389	3.9	120	0.7	3	0.03	10.1	642	0.090		-	-	0.09	7.7	674
n3	0.50	73.5	1.00	1800	324	655	49	251	3.6	70	0.6	3	0.04	13.0	1195	0.114		-	-	0.09	5.6	708
n4	0.25	36.8	1.00	1800	246	475	24	185	3.8	93	1.1	6	0.12	15.1	2028	0.277		-	-	0.11	4.1	763
n5	0.10	14.7	1.00	1800	198	364	15	108	4.3	138	3.2	13	0.45	16.7	4376	0.596		-	-	0.14	2.9	1055
n6																						
n7																						
n8																						

* Emission data measurement procedures are consistent with the respective emission evaluation process. Non certified engines are measured to sales data (TVU/TEN) standard conditions. These boundary conditions might not be representative for detailed dimensioning of exhaust gas aftertreatment, in this case it is recommended to contact the responsible department for more information. Measurements are subject to variation. The nominal emission data shown is subject to instrumentation, measurement, facility, and engine-to-engine variations.
All data applies to an engine in new condition. Over extended operating time deterioration may occur which might have an impact on emission. Exhaust temperature depends on engine ambient conditions.

**The first columm indicates the specific particulate matter emission for each mode. The second columm indicates the specific particulate matter emission considering the weighting factors according to 40 CFR Part 89 Appendix B Tabel 2 - 5 Mode Test Cycle for Constant Speed Engines and calculation procedure according to 40 CFR Part 89 paragraph §89.424.

AP-42 Emission Factors Used:

- **AP-42 Chapter 1.4 Natural Gas Combustion**
- **AP-42 Chapter 3.2 Natural Gas-fired Reciprocating Engines**
- **AP-42 Chapter 3.3 for Gasoline and Diesel Industrial Engines**
- **AP-42 Chapter 3.4 for Large Diesel Engines (>600 hp)**
- **AP-42 Chapter 13.2.1 Paved Roads**
- **AP-42 Chapter 13.5 Industrial Flares**

1.4 Natural Gas Combustion

1.4.1 General[1-2]

Natural gas is one of the major combustion fuels used throughout the country. It is mainly used to generate industrial and utility electric power, produce industrial process steam and heat, and heat residential and commercial space. Natural gas consists of a high percentage of methane (generally above 85 percent) and varying amounts of ethane, propane, butane, and inerts (typically nitrogen, carbon dioxide, and helium). The average gross heating value of natural gas is approximately 1,020 British thermal units per standard cubic foot (Btu/scf), usually varying from 950 to 1,050 Btu/scf.

1.4.2 Firing Practices[3-5]

There are three major types of boilers used for natural gas combustion in commercial, industrial, and utility applications: watertube, firetube, and cast iron. Watertube boilers are designed to pass water through the inside of heat transfer tubes while the outside of the tubes is heated by direct contact with the hot combustion gases and through radiant heat transfer. The watertube design is the most common in utility and large industrial boilers. Watertube boilers are used for a variety of applications, ranging from providing large amounts of process steam, to providing hot water or steam for space heating, to generating high-temperature, high-pressure steam for producing electricity. Furthermore, watertube boilers can be distinguished either as field erected units or packaged units.

Field erected boilers are boilers that are constructed on site and comprise the larger sized watertube boilers. Generally, boilers with heat input levels greater than 100 MMBtu/hr, are field erected. Field erected units usually have multiple burners and, given the customized nature of their construction, also have greater operational flexibility and NO_x control options. Field erected units can also be further categorized as wall-fired or tangential-fired. Wall-fired units are characterized by multiple individual burners located on a single wall or on opposing walls of the furnace while tangential units have several rows of air and fuel nozzles located in each of the four corners of the boiler.

Package units are constructed off-site and shipped to the location where they are needed. While the heat input levels of packaged units may range up to 250 MMBtu/hr, the physical size of these units are constrained by shipping considerations and generally have heat input levels less than 100 MMBtu/hr. Packaged units are always wall-fired units with one or more individual burners. Given the size limitations imposed on packaged boilers, they have limited operational flexibility and cannot feasibly incorporate some NO_x control options.

Firetube boilers are designed such that the hot combustion gases flow through tubes, which heat the water circulating outside of the tubes. These boilers are used primarily for space heating systems, industrial process steam, and portable power boilers. Firetube boilers are almost exclusively packaged units. The two major types of firetube units are Scotch Marine boilers and the older firebox boilers. In cast iron boilers, as in firetube boilers, the hot gases are contained inside the tubes and the water being heated circulates outside the tubes. However, the units are constructed of cast iron rather than steel. Virtually all cast iron boilers are constructed as package boilers. These boilers are used to produce either low-pressure steam or hot water, and are most commonly used in small commercial applications.

Natural gas is also combusted in residential boilers and furnaces. Residential boilers and furnaces generally resemble firetube boilers with flue gas traveling through several channels or tubes with water or air circulated outside the channels or tubes.

1.4.3 Emissions[3-4]

The emissions from natural gas-fired boilers and furnaces include nitrogen oxides (NO_x), carbon monoxide (CO), and carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), volatile organic compounds (VOCs), trace amounts of sulfur dioxide (SO_2), and particulate matter (PM).

Nitrogen Oxides -

Nitrogen oxides formation occurs by three fundamentally different mechanisms. The principal mechanism of NO_x formation in natural gas combustion is thermal NO_x. The thermal NO_x mechanism occurs through the thermal dissociation and subsequent reaction of nitrogen (N_2) and oxygen (O_2) molecules in the combustion air. Most NO_x formed through the thermal NO_x mechanism occurs in the high temperature flame zone near the burners. The formation of thermal NO_x is affected by three furnace-zone factors: (1) oxygen concentration, (2) peak temperature, and (3) time of exposure at peak temperature. As these three factors increase, NO_x emission levels increase. The emission trends due to changes in these factors are fairly consistent for all types of natural gas-fired boilers and furnaces. Emission levels vary considerably with the type and size of combustor and with operating conditions (e.g., combustion air temperature, volumetric heat release rate, load, and excess oxygen level).

The second mechanism of NO_x formation, called prompt NO_x, occurs through early reactions of nitrogen molecules in the combustion air and hydrocarbon radicals from the fuel. Prompt NO_x reactions occur within the flame and are usually negligible when compared to the amount of NO_x formed through the thermal NO_x mechanism. However, prompt NO_x levels may become significant with ultra-low-NO_x burners.

The third mechanism of NO_x formation, called fuel NO_x, stems from the evolution and reaction of fuel-bound nitrogen compounds with oxygen. Due to the characteristically low fuel nitrogen content of natural gas, NO_x formation through the fuel NO_x mechanism is insignificant.

Carbon Monoxide -

The rate of CO emissions from boilers depends on the efficiency of natural gas combustion. Improperly tuned boilers and boilers operating at off-design levels decrease combustion efficiency resulting in increased CO emissions. In some cases, the addition of NO_x control systems such as low NO_x burners and flue gas recirculation (FGR) may also reduce combustion efficiency, resulting in higher CO emissions relative to uncontrolled boilers.

Volatile Organic Compounds -

The rate of VOC emissions from boilers and furnaces also depends on combustion efficiency. VOC emissions are minimized by combustion practices that promote high combustion temperatures, long residence times at those temperatures, and turbulent mixing of fuel and combustion air. Trace amounts of VOC species in the natural gas fuel (e.g., formaldehyde and benzene) may also contribute to VOC emissions if they are not completely combusted in the boiler.

Sulfur Oxides -

Emissions of SO_2 from natural gas-fired boilers are low because pipeline quality natural gas typically has sulfur levels of 2,000 grains per million cubic feet. However, sulfur-containing odorants are added to natural gas for detecting leaks, leading to small amounts of SO_2 emissions. Boilers combusting unprocessed natural gas may have higher SO_2 emissions due to higher levels of sulfur in the natural gas. For these units, a sulfur mass balance should be used to determine SO_2 emissions.

Particulate Matter -

Because natural gas is a gaseous fuel, filterable PM emissions are typically low. Particulate matter from natural gas combustion has been estimated to be less than 1 micrometer in size and has filterable and condensable fractions. Particulate matter in natural gas combustion are usually larger molecular weight hydrocarbons that are not fully combusted. Increased PM emissions may result from poor air/fuel mixing or maintenance problems.

Greenhouse Gases -[6-9]

CO_2, CH_4, and N_2O emissions are all produced during natural gas combustion. In properly tuned boilers, nearly all of the fuel carbon (99.9 percent) in natural gas is converted to CO_2 during the combustion process. This conversion is relatively independent of boiler or combustor type. Fuel carbon not converted to CO_2 results in CH_4, CO, and/or VOC emissions and is due to incomplete combustion. Even in boilers operating with poor combustion efficiency, the amount of CH_4, CO, and VOC produced is insignificant compared to CO_2 levels.

Formation of N_2O during the combustion process is affected by two furnace-zone factors. N_2O emissions are minimized when combustion temperatures are kept high (above 1475°F) and excess oxygen is kept to a minimum (less than 1 percent).

Methane emissions are highest during low-temperature combustion or incomplete combustion, such as the start-up or shut-down cycle for boilers. Typically, conditions that favor formation of N_2O also favor emissions of methane.

1.4.4 Controls[4,10]

NO_x Controls -

Currently, the two most prevalent combustion control techniques used to reduce NO_x emissions from natural gas-fired boilers are flue gas recirculation (FGR) and low NO_x burners. In an FGR system, a portion of the flue gas is recycled from the stack to the burner windbox. Upon entering the windbox, the recirculated gas is mixed with combustion air prior to being fed to the burner. The recycled flue gas consists of combustion products which act as inerts during combustion of the fuel/air mixture. The FGR system reduces NO_x emissions by two mechanisms. Primarily, the recirculated gas acts as a dilutent to reduce combustion temperatures, thus suppressing the thermal NO_x mechanism. To a lesser extent, FGR also reduces NO_x formation by lowering the oxygen concentration in the primary flame zone. The amount of recirculated flue gas is a key operating parameter influencing NO_x emission rates for these systems. An FGR system is normally used in combination with specially designed low NO_x burners capable of sustaining a stable flame with the increased inert gas flow resulting from the use of FGR. When low NO_x burners and FGR are used in combination, these techniques are capable of reducing NO_x emissions by 60 to 90 percent.

Low NO_x burners reduce NO_x by accomplishing the combustion process in stages. Staging partially delays the combustion process, resulting in a cooler flame which suppresses thermal NO_x formation. The two most common types of low NO_x burners being applied to natural gas-fired boilers are staged air burners and staged fuel burners. NO_x emission reductions of 40 to 85 percent (relative to uncontrolled emission levels) have been observed with low NO_x burners.

Other combustion control techniques used to reduce NO_x emissions include staged combustion and gas reburning. In staged combustion (e.g., burners-out-of-service and overfire air), the degree of staging is a key operating parameter influencing NO_x emission rates. Gas reburning is similar to the use of overfire in the use of combustion staging. However, gas reburning injects additional amounts of natural gas in the upper furnace, just before the overfire air ports, to provide increased reduction of NO_x to NO_2.

Two postcombustion technologies that may be applied to natural gas-fired boilers to reduce NO_x emissions are selective noncatalytic reduction (SNCR) and selective catalytic reduction (SCR). The SNCR system injects ammonia (NH_3) or urea into combustion flue gases (in a specific temperature zone) to reduce NO_x emission. The Alternative Control Techniques (ACT) document for NO_x emissions from utility boilers, maximum SNCR performance was estimated to range from 25 to 40 percent for natural gas-fired boilers.[12] Performance data available from several natural gas fired utility boilers with SNCR show a 24 percent reduction in NO_x for applications on wall-fired boilers and a 13 percent reduction in NO_x for applications on tangential-fired boilers.[11] In many situations, a boiler may have an SNCR system installed to trim NO_x emissions to meet permitted levels. In these cases, the SNCR system may not be operated to achieve maximum NO_x reduction. The SCR system involves injecting NH_3 into the flue gas in the presence of a catalyst to reduce NO_x emissions. No data were available on SCR performance on natural gas fired boilers at the time of this publication. However, the ACT Document for utility boilers estimates NO_x reduction efficiencies for SCR control ranging from 80 to 90 percent.[12]

Emission factors for natural gas combustion in boilers and furnaces are presented in Tables 1.4-1, 1.4-2, 1.4-3, and 1.4-4.[11] Tables in this section present emission factors on a volume basis (lb/10^6 scf). To convert to an energy basis (lb/MMBtu), divide by a heating value of 1,020 MMBtu/10^6 scf. For the purposes of developing emission factors, natural gas combustors have been organized into three general categories: large wall-fired boilers with greater than 100 MMBtu/hr of heat input, boilers and residential furnaces with less than 100 MMBtu/hr of heat input, and tangential-fired boilers. Boilers within these categories share the same general design and operating characteristics and hence have similar emission characteristics when combusting natural gas.

Emission factors are rated from A to E to provide the user with an indication of how “good” the factor is, with “A” being excellent and “E” being poor. The criteria that are used to determine a rating for an emission factor can be found in the Emission Factor Documentation for AP-42 Section 1.4 and in the introduction to the AP-42 document.

1.4.5 Updates Since the Fifth Edition

The Fifth Edition was released in January 1995. Revisions to this section are summarized below. For further detail, consult the Emission Factor Documentation for this section. These and other documents can be found on the Emission Factor and Inventory Group (EFIG) home page (http://www.epa.gov/ttn/chief).

Supplement D, March 1998

- Text was revised concerning Firing Practices, Emissions, and Controls.
- All emission factors were updated based on 482 data points taken from 151 source tests. Many new emission factors have been added for speciated organic compounds, including hazardous air pollutants.

July 1998 - minor changes

- Footnote D was added to table 1.4-3 to explain why the sum of individual HAP may exceed VOC or TOC, the web address was updated, and the references were reordered.

Table 1.4-1. EMISSION FACTORS FOR NITROGEN OXIDES (NO_x) AND CARBON MONOXIDE (CO) FROM NATURAL GAS COMBUSTION[a]

Combustor Type (MMBtu/hr Heat Input) [SCC]	NO_x[b]		CO	
	Emission Factor (lb/10^6 scf)	Emission Factor Rating	Emission Factor (lb/10^6 scf)	Emission Factor Rating
Large Wall-Fired Boilers (>100) [1-01-006-01, 1-02-006-01, 1-03-006-01]				
Uncontrolled (Pre-NSPS)[c]	280	A	84	B
Uncontrolled (Post-NSPS)[c]	190	A	84	B
Controlled - Low NO_x burners	140	A	84	B
Controlled - Flue gas recirculation	100	D	84	B
Small Boilers (<100) [1-01-006-02, 1-02-006-02, 1-03-006-02, 1-03-006-03]				
Uncontrolled	100	B	84	B
Controlled - Low NO_x burners	50	D	84	B
Controlled - Low NO_x burners/Flue gas recirculation	32	C	84	B
Tangential-Fired Boilers (All Sizes) [1-01-006-04]				
Uncontrolled	170	A	24	C
Controlled - Flue gas recirculation	76	D	98	D
Residential Furnaces (<0.3) [No SCC]				
Uncontrolled	94	B	40	B

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[a] Reference 11. Units are in pounds of pollutant per million standard cubic feet of natural gas fired. To convert from lb/10^6 scf to kg/10^6 m^3, multiply by 16. Emission factors are based on an average natural gas higher heating value of 1,020 Btu/scf. To convert from 1b/10^6 scf to lb/MMBtu, divide by 1,020. The emission factors in this table may be converted to other natural gas heating values by multiplying the given emission factor by the ratio of the specified heating value to this average heating value. SCC = Source Classification Code. ND = no data. NA = not applicable.

[b] Expressed as NO_2. For large and small wall fired boilers with SNCR control, apply a 24 percent reduction to the appropriate NO_X emission factor. For tangential-fired boilers with SNCR control, apply a 13 percent reduction to the appropriate NO_X emission factor.

[c] NSPS=New Source Performance Standard as defined in 40 CFR 60 Subparts D and Db. Post-NSPS units are boilers with greater than 250 MMBtu/hr of heat input that commenced construction modification, or reconstruction after August 17, 1971, and units with heat input capacities between 100 and 250 MMBtu/hr that commenced construction modification, or reconstruction after June 19, 1984.

TABLE 1.4-2. EMISSION FACTORS FOR CRITERIA POLLUTANTS AND GREENHOUSE GASES FROM NATURAL GAS COMBUSTION[a]

Pollutant	Emission Factor ($lb/10^6$ scf)	Emission Factor Rating
CO_2[b]	120,000	A
Lead	0.0005	D
N_2O (Uncontrolled)	2.2	E
N_2O (Controlled-low-NO_X burner)	0.64	E
PM (Total)[c]	7.6	D
PM (Condensable)[c]	5.7	D
PM (Filterable)[c]	1.9	B
SO_2[d]	0.6	A
TOC	11	B
Methane	2.3	B
VOC	5.5	C

[a] Reference 11. Units are in pounds of pollutant per million standard cubic feet of natural gas fired. Data are for all natural gas combustion sources. To convert from $lb/10^6$ scf to $kg/10^6$ m^3, multiply by 16. To convert from $lb/10^6$ scf to 1b/MMBtu, divide by 1,020. The emission factors in this table may be converted to other natural gas heating values by multiplying the given emission factor by the ratio of the specified heating value to this average heating value. TOC = Total Organic Compounds. VOC = Volatile Organic Compounds.

[b] Based on approximately 100% conversion of fuel carbon to CO_2. $CO_2[lb/10^6 \text{ scf}] = (3.67)$ (CON) (C)(D), where CON = fractional conversion of fuel carbon to CO_2, C = carbon content of fuel by weight (0.76), and D = density of fuel, $4.2x10^4$ $lb/10^6$ scf.

[c] All PM (total, condensible, and filterable) is assumed to be less than 1.0 micrometer in diameter. Therefore, the PM emission factors presented here may be used to estimate PM_{10}, $PM_{2.5}$ or PM_1 emissions. Total PM is the sum of the filterable PM and condensible PM. Condensible PM is the particulate matter collected using EPA Method 202 (or equivalent). Filterable PM is the particulate matter collected on, or prior to, the filter of an EPA Method 5 (or equivalent) sampling train.

[d] Based on 100% conversion of fuel sulfur to SO_2.
Assumes sulfur content is natural gas of 2,000 grains/10^6 scf. The SO_2 emission factor in this table can be converted to other natural gas sulfur contents by multiplying the SO_2 emission factor by the ratio of the site-specific sulfur content (grains/10^6 scf) to 2,000 grains/10^6 scf.

TABLE 1.4-3. EMISSION FACTORS FOR SPECIATED ORGANIC COMPOUNDS FROM NATURAL GAS COMBUSTION[a]

CAS No.	Pollutant	Emission Factor ($lb/10^6$ scf)	Emission Factor Rating
91-57-6	2-Methylnaphthalene[b, c]	2.4E-05	D
56-49-5	3-Methylcholanthrene[b, c]	<1.8E-06	E
	7,12-Dimethylbenz(a)anthracene[b,c]	<1.6E-05	E
83-32-9	Acenaphthene[b,c]	<1.8E-06	E
203-96-8	Acenaphthylene[b,c]	<1.8E-06	E
120-12-7	Anthracene[b,c]	<2.4E-06	E
56-55-3	Benz(a)anthracene[b,c]	<1.8E-06	E
71-43-2	Benzene[b]	2.1E-03	B
50-32-8	Benzo(a)pyrene[b,c]	<1.2E-06	E
205-99-2	Benzo(b)fluoranthene[b,c]	<1.8E-06	E
191-24-2	Benzo(g,h,i)perylene[b,c]	<1.2E-06	E
207-08-9	Benzo(k)fluoranthene[b,c]	<1.8E-06	E
106-97-8	Butane	2.1E+00	E
218-01-9	Chrysene[b,c]	<1.8E-06	E
53-70-3	Dibenzo(a,h)anthracene[b,c]	<1.2E-06	E
25321-22-6	Dichlorobenzene[b]	1.2E-03	E
74-84-0	Ethane	3.1E+00	E
206-44-0	Fluoranthene[b,c]	3.0E-06	E
86-73-7	Fluorene[b,c]	2.8E-06	E
50-00-0	Formaldehyde[b]	7.5E-02	B
110-54-3	Hexane[b]	1.8E+00	E
193-39-5	Indeno(1,2,3-cd)pyrene[b,c]	<1.8E-06	E
91-20-3	Naphthalene[b]	6.1E-04	E
109-66-0	Pentane	2.6E+00	E
85-01-8	Phenanathrene[b,c]	1.7E-05	D
74-98-6	Propane	1.6E+00	E

TABLE 1.4-3. EMISSION FACTORS FOR SPECIATED ORGANIC COMPOUNDS FROM NATURAL GAS COMBUSTION (Continued)

CAS No.	Pollutant	Emission Factor ($lb/10^6$ scf)	Emission Factor Rating
129-00-0	Pyrene[b, c]	5.0E-06	E
108-88-3	Toluene[b]	3.4E-03	C

[a] Reference 11. Units are in pounds of pollutant per million standard cubic feet of natural gas fired. Data are for all natural gas combustion sources. To convert from $lb/10^6$ scf to $kg/10^6$ m^3, multiply by 16. To convert from $1b/10^6$ scf to lb/MMBtu, divide by 1,020. Emission Factors preceeded with a less-than symbol are based on method detection limits.

[b] Hazardous Air Pollutant (HAP) as defined by Section 112(b) of the Clean Air Act.

[c] HAP because it is Polycyclic Organic Matter (POM). POM is a HAP as defined by Section 112(b) of the Clean Air Act.

[d] The sum of individual organic compounds may exceed the VOC and TOC emission factors due to differences in test methods and the availability of test data for each pollutant.

TABLE 1.4-4. EMISSION FACTORS FOR METALS FROM NATURAL GAS COMBUSTION[a]

CAS No.	Pollutant	Emission Factor ($lb/10^6$ scf)	Emission Factor Rating
7440-38-2	Arsenic[b]	2.0E-04	E
7440-39-3	Barium	4.4E-03	D
7440-41-7	Beryllium[b]	<1.2E-05	E
7440-43-9	Cadmium[b]	1.1E-03	D
7440-47-3	Chromium[b]	1.4E-03	D
7440-48-4	Cobalt[b]	8.4E-05	D
7440-50-8	Copper	8.5E-04	C
7439-96-5	Manganese[b]	3.8E-04	D
7439-97-6	Mercury[b]	2.6E-04	D
7439-98-7	Molybdenum	1.1E-03	D
7440-02-0	Nickel[b]	2.1E-03	C
7782-49-2	Selenium[b]	<2.4E-05	E
7440-62-2	Vanadium	2.3E-03	D
7440-66-6	Zinc	2.9E-02	E

[a] Reference 11. Units are in pounds of pollutant per million standard cubic feet of natural gas fired. Data are for all natural gas combustion sources. Emission factors preceeded by a less-than symbol are based on method detection limits. To convert from $lb/10^6$ scf to $kg/10^6$ m^3, multiply by l6. To convert from $lb/10^6$ scf to 1b/MMBtu, divide by 1,020.

[b] Hazardous Air Pollutant as defined by Section 112(b) of the Clean Air Act.

References For Section 1.4

1. *Exhaust Gases From Combustion And Industrial Processes*, EPA Contract No. EHSD 71-36, Engineering Science, Inc., Washington, DC, October 1971.

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3. *Background Information Document For Industrial Boilers*, EPA-450/3-82-006a, U. S. Environmental Protection Agency, Research Triangle Park, NC, March 1982.

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3.2 Natural Gas-fired Reciprocating Engines

3.2.1 General[1-3]

Most natural gas-fired reciprocating engines are used in the natural gas industry at pipeline compressor and storage stations and at gas processing plants. These engines are used to provide mechanical shaft power for compressors and pumps. At pipeline compressor stations, engines are used to help move natural gas from station to station. At storage facilities, they are used to help inject the natural gas into high pressure natural gas storage fields. At processing plants, these engines are used to transmit fuel within a facility and for process compression needs (e.g., refrigeration cycles). The size of these engines ranges from 50 brake horsepower (bhp) to 11,000 bhp. In addition, some engines in service are 50 - 60 years old and consequently have significant differences in design compared to newer engines, resulting in differences in emissions and the ability to be retrofitted with new parts or controls.

At pipeline compressor stations, reciprocating engines are used to power reciprocating compressors that move compressed natural gas (500 - 2000 psig) in a pipeline. These stations are spaced approximately 50 to 100 miles apart along a pipeline that stretches from a gas supply area to the market area. The reciprocating compressors raise the discharge pressure of the gas in the pipeline to overcome the effect of frictional losses in the pipeline upstream of the station, in order to maintain the required suction pressure at the next station downstream or at various downstream delivery points. The volume of gas flowing and the amount of subsequent frictional losses in a pipeline are heavily dependent on the market conditions that vary with weather and industrial activity, causing wide pressure variations. The number of engines operating at a station, the speed of an individual engine, and the amount of individual engine horsepower (load) needed to compress the natural gas is dependent on the pressure of the compressed gas received by the station, the desired discharge pressure of the gas, and the amount of gas flowing in the pipeline. Reciprocating compressors have a wider operating bandwidth than centrifugal compressors, providing increased flexibility in varying flow conditions. Centrifugal compressors powered by natural gas turbines are also used in some stations and are discussed in another section of this document.

A compressor in storage service pumps gas from a low-pressure storage field (500 - 800 psig) to a higher pressure transmission pipeline (700 - 1000 psig) and/or pumps gas from a low-pressure transmission line (500 - 800 psig) to a higher pressure storage field (800 - 2000 psig).

Storage reciprocating compressors must be flexible enough to allow operation across a wide band of suction and discharge pressures and volume variations. The compressor must be able to compress at high compression ratios with low volumes and compress at low compression ratios with high volumes. These conditions require varying speeds and load (horsepower) conditions for the reciprocating engine powering the reciprocating compressor.

Reciprocating compressors are used at processing plants for process compression needs (e.g. refrigeration cycles). The volume of gas compressed varies, but the pressure needed for the process is more constant than the other two cases mentioned above.

3.2.2 Process Description[1-3]

Natural gas-fired reciprocating engines are separated into three design classes: 2-cycle (stroke) lean-burn, 4-stroke lean-burn, and 4-stroke rich-burn. Two-stroke engines complete the power cycle in a single crankshaft revolution as compared to the two crankshaft revolutions required for 4-stroke engines. All engines in these categories are spark-ignited.

In a 2-stroke engine, the air-to-fuel charge is injected with the piston near the bottom of the power stroke. The intake ports are then covered or closed, and the piston moves to the top of the cylinder, compressing the charge. Following ignition and combustion, the power stroke starts with the downward movement of the piston. As the piston reaches the bottom of the power stroke, exhaust ports or valves are opened to exhaust, or scavenge, the combustion products, and a new air-to-fuel charge is injected. Two-stroke engines may be turbocharged using an exhaust-powered turbine to pressurize the charge for injection into the cylinder and to increase cylinder scavenging. Non-turbocharged engines may be either blower scavenged or piston scavenged to improve removal of combustion products. Historically, 2-stroke designs have been widely used in pipeline applications. However, current industry practices reflect a decline in the usage of new 2-stroke engines for stationary applications.

Four-stroke engines use a separate engine revolution for the intake/compression cycle and the power/exhaust cycle. These engines may be either naturally aspirated, using the suction from the piston to entrain the air charge, or turbocharged, using an exhaust-driven turbine to pressurize the charge. Turbocharged units produce a higher power output for a given engine displacement, whereas naturally aspirated units have lower initial costs and require less maintenance.

Rich-burn engines operate near the stoichiometric air-to-fuel ratio (16:1) with exhaust excess oxygen levels less than 4 percent (typically closer to 1 percent). Additionally, it is likely that the emissions profile will be considerably different for a rich-burn engine at 4 percent oxygen than when operated closer to stoichiometric conditions. Considerations such as these can impact the quantitative value of the emission factor presented. It is also important to note that while rich-burn engines may operate, by definition, with exhaust oxygen levels as high as 4 percent, in reality, most will operate within plus or minus 1 air-to-fuel ratio of stoichiometry. Even across this narrow range, emissions will vary considerably, sometimes by more than an order of magnitude. Air-to-fuel ratios were not provided in the gathered emissions data used to develop the presented factors.

Lean-burn engines may operate up to the lean flame extinction limit, with exhaust oxygen levels of 12 percent or greater. The air to fuel ratios of lean-burn engines range from 20:1 to 50:1 and are typically higher than 24:1. The exhaust excess oxygen levels of lean-burn engines are typically around 8 percent, ranging from 4 to 17 percent. Some lean-burn engines are characterized as clean-burn engines. The term “clean-burn” technology is a registered trademark of Cooper Energy Systems and refers to engines designed to reduce NO_X by operating at high air-to-fuel ratios. Engines operating at high air-to-fuel ratios (greater than 30:1) may require combustion modification to promote stable combustion with the high excess air. These modifications may include a turbo charger or a precombustion chamber (PCC). A turbo charger is used to force more air into the combustion chamber, and a PCC is used to ignite a fuel-rich mixture that propagates into the main cylinder and ignites the very lean combustion charge. Lean-burn engines typically have lower oxides of nitrogen (NO_X) emissions than rich-burn engines.

3.2.3 Emissions

The primary criteria pollutants from natural gas-fired reciprocating engines are oxides of nitrogen (NO_X), carbon monoxide (CO), and volatile organic compounds (VOC). The formation of nitrogen oxides is exponentially related to combustion temperature in the engine cylinder. The other pollutants, CO and VOC species, are primarily the result of incomplete combustion. Particulate matter (PM) emissions include trace amounts of metals, non-combustible inorganic material, and condensible, semi-volatile organics which result from volatized lubricating oil, engine wear, or from products of incomplete combustion. Sulfur oxides are very low since sulfur compounds are removed from natural gas at processing plants. However, trace amounts of sulfur containing odorant are added to natural gas at city gates prior to distribution for the purpose of leak detection.

It should be emphasized that the actual emissions may vary considerably from the published emission factors due to variations in the engine operating conditions. This variation is due to engines operating at different conditions, including air-to-fuel ratio, ignition timing, torque, speed, ambient temperature, humidity, and other factors. It is not unusual to test emissions from two identical engines in the same plant, operated by the same personnel, using the same fuel, and have the test results show significantly different emissions. This variability in the test data is evidenced in the high relative standard deviation reported in the data set.

3.2.3.1 Nitrogen Oxides -

Nitrogen oxides are formed through three fundamentally different mechanisms. The principal mechanism of NO_x formation with gas-fired engines is thermal NO_x. The thermal NO_x mechanism occurs through the thermal dissociation and subsequent reaction of nitrogen (N_2) and oxygen (O_2) molecules in the combustion air. Most NO_x formed through the thermal NO_x mechanism occurs in high-temperature regions in the cylinder where combustion air has mixed sufficiently with the fuel to produce the peak temperature fuel/air interface. The second mechanism, called prompt NO_x, occurs through early reactions of nitrogen molecules in the combustion air and hydrocarbon radicals from the fuel. Prompt NO_x reactions occur within the flame and are usually negligible compared to the level of NO_x formed through the thermal NO_x mechanism. The third mechanism, fuel NO_x, stems from the evolution and reaction of fuel-bound nitrogen compounds with oxygen. Natural gas has negligible chemically bound fuel nitrogen (although some molecular nitrogen is present).

Essentially all NO_x formed in natural gas-fired reciprocating engines occurs through the thermal NO_x mechanism. The formation of NO_x through the prompt NO_x mechanism may be significant only under highly controlled situations in rich-burn engines when the thermal NO_x mechanism is suppressed. The rate of NO_x formation through the thermal NO_x mechanism is highly dependent upon the stoichiometric ratio, combustion temperature, and residence time at the combustion temperature. Maximum NO_x formation occurs through the thermal NO_x mechanism near the stoichiometric air-to-fuel mixture ratio since combustion temperatures are greatest at this air-to-fuel ratio.

3.2.3.2 Carbon Monoxide and Volatile Organic Compounds -

CO and VOC emissions are both products of incomplete combustion. CO results when there is insufficient residence time at high temperature to complete the final step in hydrocarbon oxidation. In reciprocating engines, CO emissions may indicate early quenching of combustion gases on cylinder walls or valve surfaces. The oxidation of CO to carbon dioxide (CO_2) is a slow reaction compared to most hydrocarbon oxidation reactions.

The pollutants commonly classified as VOC can encompass a wide spectrum of volatile organic compounds that are photoreactive in the atmosphere. VOC occur when some of the gas remains unburned or is only partially burned during the combustion process. With natural gas, some organics are carryover, unreacted, trace constituents of the gas, while others may be pyrolysis products of the heavier hydrocarbon constituents. Partially burned hydrocarbons result from poor air-to-fuel mixing prior to, or during, combustion, or incorrect air-to-fuel ratios in the cylinder during combustion due to maladjustment of the engine fuel system. Also, low cylinder temperature may yield partially burned hydrocarbons due to excessive cooling through the walls, or early cooling of the gases by expansion of the combustion volume caused by piston motion before combustion is completed.

3.2.3.3 Particulate Matter[4] -

PM emissions result from carryover of noncombustible trace constituents in the fuel and lubricating oil and from products of incomplete combustion. Emission of PM from natural gas-fired reciprocating engines are generally minimal and comprise fine filterable and condensible PM. Increased PM emissions may result from poor air-to-fuel mixing or maintenance problems.

3.2.3.4 Carbon Dioxide, Methane, and Nitrous Oxide[5] -

Carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) are referred to as greenhouse gases. Such gases are largely transparent to incoming solar radiation; however, they absorb infrared radiation re-emitted by the Earth. Where available, emission factors for these pollutants are presented in the emission factors tables of this section.

3.2.4 Control Technologies

Three generic control techniques have been developed for reciprocating engines: parametric controls (timing and operating at a leaner air-to-fuel ratio); combustion modifications such as advanced engine design for new sources or major modification to existing sources (clean-burn cylinder head designs and prestratified charge combustion for rich-burn engines); and postcombustion catalytic controls installed on the engine exhaust system. Post-combustion catalytic technologies include selective catalytic reduction (SCR) for lean-burn engines, nonselective catalytic reduction (NSCR) for rich-burn engines, and CO oxidation catalysts for lean-burn engines.

3.2.4.1 Control Techniques for 4-Cycle Rich-burn Engines[4,6] -

Nonselective Catalytic Reduction (NSCR) -

This technique uses the residual hydrocarbons and CO in the rich-burn engine exhaust as a reducing agent for NO_x. In an NSCR, hydrocarbons and CO are oxidized by O_2 and NO_x. The excess hydrocarbons, CO, and NO_x pass over a catalyst (usually a noble metal such as platinum, rhodium, or palladium) that oxidizes the excess hydrocarbons and CO to H_2O and CO_2, while reducing NO_x to N_2. NO_x reduction efficiencies are usually greater than 90 percent, while CO reduction efficiencies are approximately 90 percent.

The NSCR technique is effectively limited to engines with normal exhaust oxygen levels of 4 percent or less. This includes 4-stroke rich-burn naturally aspirated engines and some 4-stroke rich-burn turbocharged engines. Engines operating with NSCR require tight air-to-fuel control to maintain high reduction effectiveness without high hydrocarbon emissions. To achieve effective NO_x reduction performance, the engine may need to be run with a richer fuel adjustment than normal. This exhaust excess oxygen level would probably be closer to 1 percent. Lean-burn engines could not be retrofitted with NSCR control because of the reduced exhaust temperatures.

Prestratified Charge -

Prestratified charge combustion is a retrofit system that is limited to 4-stroke carbureted natural gas engines. In this system, controlled amounts of air are introduced into the intake manifold in a specified sequence and quantity to create a fuel-rich and fuel-lean zone. This stratification provides both a fuel-rich ignition zone and rapid flame cooling in the fuel-lean zone, resulting in reduced formation of NO_x. A prestratified charge kit generally contains new intake manifolds, air hoses, filters, control valves, and a control system.

3.2.4.2 Control Techniques for Lean-burn Reciprocating Engines[4,6] -

Selective Catalytic Reduction[4,6] -

Selective catalytic reduction is a postcombustion technology that has been shown to be effective in reducing NO_x in exhaust from lean-burn engines. An SCR system consists of an ammonia storage, feed, and injection system, and a catalyst and catalyst housing. Selective catalytic reduction systems selectively reduce NO_x emissions by injecting ammonia (either in the form of liquid anhydrous ammonia or aqueous ammonium hydroxide) into the exhaust gas stream upstream of the catalyst. Nitrogen oxides, NH_3, and O_2 react on the surface of the catalyst to form N_2 and H_2O. For the SCR system to operate properly, the exhaust gas must be within a particular temperature range (typically between 450 and 850°F). The temperature range is dictated by the catalyst (typically made from noble metals, base metal oxides such as vanadium and titanium, and zeolite-based material). Exhaust gas temperatures greater than the upper limit (850°F) will pass the NO_x and ammonia unreacted through the catalyst. Ammonia emissions, called NH_3 slip, are a key consideration when specifying a SCR system. SCR is most suitable for lean-burn engines operated at constant loads, and can achieve efficiencies as high as 90 percent. For engines which typically operate at variable loads, such as engines on gas transmission pipelines, an SCR system may not function effectively, causing either periods of ammonia slip or insufficient ammonia to gain the reductions needed.

Catalytic Oxidation -

Catalytic oxidation is a postcombustion technology that has been applied, in limited cases, to oxidize CO in engine exhaust, typically from lean-burn engines. As previously mentioned, lean-burn technologies may cause increased CO emissions. The application of catalytic oxidation has been shown to be effective in reducing CO emissions from lean-burn engines. In a catalytic oxidation system, CO passes over a catalyst, usually a noble metal, which oxidizes the CO to CO_2 at efficiencies of approximately 70 percent for 2SLB engines and 90 percent for 4SLB engines.

3.2.5 Updates Since the Fifth Edition

The Fifth Edition was released in January 1995. Revisions to this section since that date are summarized below. For further detail, consult the memoranda describing each supplement or the background report for this section. These and other documents can be found on the Clearinghouse for Inventories/Emission Factors (CHIEF) electronic bulletin board (919-541-5742), or on the new Emission Factor and Inventory Group (EFIG) home page (http://www.epa.gov/ttn/chief).

Supplement A, February 1996

- In the table for uncontrolled natural gas prime movers, the Source Classification Code (SCC) for 4-cycle lean-burn was changed from 2-01-002-53 to 2-02-002-54. The SCC for 4-cycle rich-burn was changed from 2-02-002-54 to 2-02-02-002-53.

- An SCC (2-02-002-53) was provided for 4-cycle rich-burn engines, and the "less than" symbol (<) was restored to the appropriate factors.

Supplement B, October 1996

- The introduction section was revised.

- Text was added concerning process description of turbines.

- Text concerning emissions and controls was revised.
- References in various tables were editorially corrected.
- The inconsistency between a CO_2 factor in the table and an equation in the footnote was corrected.

Supplement F, July 2000

- Turbines used for natural gas compression were removed from this section and combined with utility turbines in Section 3.1. Section 3.2 now only contains information on natural gas-fired reciprocating engines.
- All emission factors were updated based on emissions data points taken from 70 emission reports containing over 400 source tests. Many new emission factors have been incorporated in this section for speciated organic compounds, including hazardous air pollutants.

TABLE 3.2-1 UNCONTROLLED EMISSION FACTORS FOR 2-STROKE LEAN-BURN ENGINES[a]
(SCC 2-02-002-52)

Pollutant	Emission Factor (lb/MMBtu)[b] (fuel input)	Emission Factor Rating
Criteria Pollutants and Greenhouse Gases		
NO_x[c] 90 - 105% Load	3.17 E+00	A
NO_x[c] <90% Load	1.94 E+00	A
CO[c] 90 - 105% Load	3.86 E-01	A
CO[c] <90% Load	3.53 E-01	A
CO_2[d]	1.10 E+02	A
SO_2[e]	5.88 E-04	A
TOC[f]	1.64 E+00	A
Methane[g]	1.45 E+00	C
VOC[h]	1.20 E-01	C
PM10 (filterable)[i]	3.84 E-02	C
PM2.5 (filterable)[i]	3.84 E-02	C
PM Condensable[j]	9.91 E-03	E
Trace Organic Compounds		
1,1,2,2-Tetrachloroethane[k]	6.63 E-05	C
1,1,2-Trichloroethane[k]	5.27 E-05	C
1,1-Dichloroethane	3.91 E-05	C
1,2,3-Trimethylbenzene	3.54 E-05	D
1,2,4-Trimethylbenzene	1.11 E-04	C
1,2-Dichloroethane	4.22 E-05	D
1,2-Dichloropropane	4.46 E-05	C
1,3,5-Trimethylbenzene	1.80 E-05	D
1,3-Butadiene[k]	8.20 E-04	D
1,3-Dichloropropene[k]	4.38 E-05	C
2,2,4-Trimethylpentane[k]	8.46 E-04	B
2-Methylnaphthalene[k]	2.14 E-05	C
Acenaphthene[k]	1.33 E-06	C

Table 3.2-1. UNCONTROLLED EMISSION FACTORS FOR 2-STROKE LEAN-BURN ENGINES

(Continued)

Pollutant	Emission Factor (lb/MMBtu)[b] (fuel input)	Emission Factor Rating
Acenaphthylene[k]	3.17 E-06	C
Acetaldehyde[k,l]	7.76 E-03	A
Acrolein[k,l]	7.78 E-03	A
Anthracene[k]	7.18 E-07	C
Benz(a)anthracene[k]	3.36 E-07	C
Benzene[k]	1.94 E-03	A
Benzo(a)pyrene[k]	5.68 E-09	D
Benzo(b)fluoranthene[k]	8.51 E-09	D
Benzo(e)pyrene[k]	2.34 E-08	D
Benzo(g,h,i)perylene[k]	2.48 E-08	D
Benzo(k)fluoranthene[k]	4.26 E-09	D
Biphenyl[k]	3.95 E-06	C
Butane	4.75 E-03	C
Butyr/Isobutyraldehyde	4.37 E-04	C
Carbon Tetrachloride[k]	6.07 E-05	C
Chlorobenzene[k]	4.44 E-05	C
Chloroform[k]	4.71 E-05	C
Chrysene[k]	6.72 E-07	C
Cyclohexane	3.08 E-04	C
Cyclopentane	9.47 E-05	C
Ethane	7.09 E-02	A
Ethylbenzene[k]	1.08 E-04	B
Ethylene Dibromide[k]	7.34 E-05	C
Fluoranthene[k]	3.61 E-07	C
Fluorene[k]	1.69 E-06	C
Formaldehyde[k,l]	5.52 E-02	A

Table 3.2-1. UNCONTROLLED EMISSION FACTORS FOR 2-STROKE LEAN-BURN ENGINES
(Concluded)

Pollutant	Emission Factor (lb/MMBtu)[b] (fuel input)	Emission Factor Rating
Indeno(1,2,3-c,d)pyrene[k]	9.93 E-09	D
Isobutane	3.75 E-03	C
Methanol[k]	2.48 E-03	A
Methylcyclohexane	3.38 E-04	C
Methylene Chloride[k]	1.47 E-04	C
n-Hexane[k]	4.45 E-04	C
n-Nonane	3.08 E-05	C
n-Octane	7.44 E-05	C
n-Pentane	1.53 E-03	C
Naphthalene[k]	9.63 E-05	C
PAH[k]	1.34 E-04	D
Perylene[k]	4.97 E-09	D
Phenanthrene[k]	3.53 E-06	C
Phenol[k]	4.21 E-05	C
Propane	2.87 E-02	C
Pyrene[k]	5.84 E-07	C
Styrene[k]	5.48 E-05	A
Toluene[k]	9.63 E-04	A
Vinyl Chloride[k]	2.47 E-05	C
Xylene[k]	2.68 E-04	A

[a] Reference 7. Factors represent uncontrolled levels. For NO_x, CO, and PM10, “uncontrolled” means no combustion or add-on controls; however, the factor may include turbocharged units. For all other pollutants, “uncontrolled” means no oxidation control; the data set may include units with control techniques used for NOx control, such as PCC and SCR for lean burn engines, and PSC for rich burn engines. Factors are based on large population of engines. Factors are for engines at all loads, except as indicated. SCC = Source Classification Code. TOC = Total Organic Compounds. PM10 = Particulate Matter ≤ 10 microns (μm) aerodynamic diameter. A “<“ sign in front of a factor means that the corresponding emission factor is based on one-half of the method detection limit.

[b] Emission factors were calculated in units of (lb/MMBtu) based on procedures in EPA

Method 19. To convert from (lb/MMBtu) to (lb/10^6 scf), multiply by the heat content of the fuel. If the heat content is not available, use 1020 Btu/scf. To convert from (lb/MMBtu) to (lb/hp-hr) use the following equation:

$$\text{lb/hp-hr} = (\text{lb/MMBtu})\,(\text{heat input, MMBtu/hr})\,(\text{1/operating HP, 1/hp})$$

[c] Emission tests with unreported load conditions were not included in the data set.

[d] Based on 99.5% conversion of the fuel carbon to CO_2. CO_2 [lb/MMBtu] = (3.67)(%CON)(C)(D)(1/h), where %CON = percent conversion of fuel carbon to CO_2, C = carbon content of fuel by weight (0.75), D = density of fuel, 4.1 E+04 lb/10^6 scf, and h = heating value of natural gas (assume 1020 Btu/scf at 60°F).

[e] Based on 100% conversion of fuel sulfur to SO_2. Assumes sulfur content in natural gas of 2,000 gr/10^6 scf.

[f] Emission factor for TOC is based on measured emission levels of 43 tests.

[g] Emission factor for methane is determined by subtracting the VOC and ethane emission factors from the TOC emission factor. Measured emission factor for methane compares well with the calculated emission factor, 1.48 lb/MMBtu vs. 1.45 lb/MMBtu, respectively.

[h] VOC emission factor is based on the sum of the emission factors for all speciated organic compounds less ethane and methane.

[i] Considered $\leq 1\ \mu$m in aerodynamic diameter. Therefore, for filterable PM emissions, PM10(filterable) = PM2.5(filterable).

[j] No data were available for condensable PM emissions. The presented emission factor reflects emissions from 4SLB engines.

[k] Hazardous Air Pollutant as defined by Section 112(b) of the Clean Air Act.

[l] For lean burn engines, aldehyde emissions quantification using CARB 430 may reflect interference with the sampling compounds due to the nitrogen concentration in the stack. The presented emission factor is based on FTIR measurements. Emissions data based on CARB 430 are available in the background report.

Table 3.2-2. UNCONTROLLED EMISSION FACTORS FOR 4-STROKE LEAN-BURN ENGINES[a]
(SCC 2-02-002-54)

Pollutant	Emission Factor (lb/MMBtu)[b] (fuel input)	Emission Factor Rating
Criteria Pollutants and Greenhouse Gases		
NO_x[c] 90 - 105% Load	4.08 E+00	B
NO_x[c] <90% Load	8.47 E-01	B
CO[c] 90 - 105% Load	3.17 E-01	C
CO[c] <90% Load	5.57 E-01	B
CO_2[d]	1.10 E+02	A
SO_2[e]	5.88 E-04	A
TOC[f]	1.47 E+00	A
Methane[g]	1.25 E+00	C
VOC[h]	1.18 E-01	C
PM10 (filterable)[i]	7.71 E-05	D
PM2.5 (filterable)[i]	7.71 E-05	D
PM Condensable[j]	9.91 E-03	D
Trace Organic Compounds		
1,1,2,2-Tetrachloroethane[k]	<4.00 E-05	E
1,1,2-Trichloroethane[k]	<3.18 E-05	E
1,1-Dichloroethane	<2.36 E-05	E
1,2,3-Trimethylbenzene	2.30 E-05	D
1,2,4-Trimethylbenzene	1.43 E-05	C
1,2-Dichloroethane	<2.36 E-05	E
1,2-Dichloropropane	<2.69 E-05	E
1,3,5-Trimethylbenzene	3.38 E-05	D
1,3-Butadiene[k]	2.67E-04	D
1,3-Dichloropropene[k]	<2.64 E-05	E
2-Methylnaphthalene[k]	3.32 E-05	C
2,2,4-Trimethylpentane[k]	2.50 E-04	C
Acenaphthene[k]	1.25 E-06	C

Table 3.2-2. UNCONTROLLED EMISSION FACTORS FOR 4-STROKE LEAN-BURN ENGINES (Continued)

Pollutant	Emission Factor (lb/MMBtu)[b] (fuel input)	Emission Factor Rating
Acenaphthylene[k]	5.53 E-06	C
Acetaldehyde[k,l]	8.36 E-03	A
Acrolein[k,l]	5.14 E-03	A
Benzene[k]	4.40 E-04	A
Benzo(b)fluoranthene[k]	1.66 E-07	D
Benzo(e)pyrene[k]	4.15 E-07	D
Benzo(g,h,i)perylene[k]	4.14 E-07	D
Biphenyl[k]	2.12 E-04	D
Butane	5.41 E-04	D
Butyr/Isobutyraldehyde	1.01 E-04	C
Carbon Tetrachloride[k]	<3.67 E-05	E
Chlorobenzene[k]	<3.04 E-05	E
Chloroethane	1.87 E-06	D
Chloroform[k]	<2.85 E-05	E
Chrysene[k]	6.93 E-07	C
Cyclopentane	2.27 E-04	C
Ethane	1.05 E-01	C
Ethylbenzene[k]	3.97 E-05	B
Ethylene Dibromide[k]	<4.43 E-05	E
Fluoranthene[k]	1.11 E-06	C
Fluorene[k]	5.67 E-06	C
Formaldehyde[k,l]	5.28 E-02	A
Methanol[k]	2.50 E-03	B
Methylcyclohexane	1.23 E-03	C
Methylene Chloride[k]	2.00 E-05	C
n-Hexane[k]	1.11 E-03	C
n-Nonane	1.10 E-04	C

Table 3.2-2. UNCONTROLLED EMISSION FACTORS FOR 4-STROKE LEAN-BURN ENGINES (Continued)

Pollutant	Emission Factor (lb/MMBtu)[b] (fuel input)	Emission Factor Rating
n-Octane	3.51 E-04	C
n-Pentane	2.60 E-03	C
Naphthalene[k]	7.44 E-05	C
PAH[k]	2.69 E-05	D
Phenanthrene[k]	1.04 E-05	D
Phenol[k]	2.40 E-05	D
Propane	4.19 E-02	C
Pyrene[k]	1.36 E-06	C
Styrene[k]	<2.36 E-05	E
Tetrachloroethane[k]	2.48 E-06	D
Toluene[k]	4.08 E-04	B
Vinyl Chloride[k]	1.49 E-05	C
Xylene[k]	1.84 E-04	B

[a] Reference 7. Factors represent uncontrolled levels. For NO_x, CO, and PM10, "uncontrolled" means no combustion or add-on controls; however, the factor may include turbocharged units. For all other pollutants, "uncontrolled" means no oxidation control; the data set may include units with control techniques used for NOx control, such as PCC and SCR for lean burn engines, and PSC for rich burn engines. Factors are based on large population of engines. Factors are for engines at all loads, except as indicated. SCC = Source Classification Code. TOC = Total Organic Compounds. PM-10 = Particulate Matter ≤ 10 microns (μm) aerodynamic diameter. A "<" sign in front of a factor means that the corresponding emission factor is based on one-half of the method detection limit.

[b] Emission factors were calculated in units of (lb/MMBtu) based on procedures in EPA Method 19. To convert from (lb/MMBtu) to (lb/10^6 scf), multiply by the heat content of the fuel. If the heat content is not available, use 1020 Btu/scf. To convert from (lb/MMBtu) to (lb/hp-hr) use the following equation:

$$\text{lb/hp-hr} = (\text{lb/MMBtu})\,(\text{heat input, MMBtu/hr})\,(\text{1/operating HP, 1/hp})$$

[c] Emission tests with unreported load conditions were not included in the data set.

[d] Based on 99.5% conversion of the fuel carbon to CO_2. CO_2 [lb/MMBtu] = (3.67)(%CON)(C)(D)(1/h), where %CON = percent conversion of fuel carbon to CO_2, C = carbon content of fuel by weight (0.75), D = density of fuel, 4.1 E+04 lb/10^6 scf, and

h = heating value of natural gas (assume 1020 Btu/scf at 60°F).

[e] Based on 100% conversion of fuel sulfur to SO_2. Assumes sulfur content in natural gas of 2,000 gr/10^6scf.

[f] Emission factor for TOC is based on measured emission levels from 22 source tests.

[g] Emission factor for methane is determined by subtracting the VOC and ethane emission factors from the TOC emission factor. Measured emission factor for methane compares well with the calculated emission factor, 1.31 lb/MMBtu vs. 1.25 lb/MMBtu, respectively.

[h] VOC emission factor is based on the sum of the emission factors for all speciated organic compounds less ethane and methane.

[i] Considered ≤ 1 μm in aerodynamic diameter. Therefore, for filterable PM emissions, PM10(filterable) = PM2.5(filterable).

[j] PM Condensable = PM Condensable Inorganic + PM-Condensable Organic

[k] Hazardous Air Pollutant as defined by Section 112(b) of the Clean Air Act.

[l] For lean burn engines, aldehyde emissions quantification using CARB 430 may reflect interference with the sampling compounds due to the nitrogen concentration in the stack. The presented emission factor is based on FTIR measurements. Emissions data based on CARB 430 are available in the background report.

Table 3.2-3. UNCONTROLLED EMISSION FACTORS FOR 4-STROKE RICH-BURN ENGINES[a]
(SCC 2-02-002-53)

Pollutant	Emission Factor (lb/MMBtu)[b] (fuel input)	Emission Factor Rating
Criteria Pollutants and Greenhouse Gases		
NO_x[c] 90 - 105% Load	2.21 E+00	A
NO_x[c] <90% Load	2.27 E+00	C
CO[c] 90 - 105% Load	3.72 E+00	A
CO[c] <90% Load	3.51 E+00	C
CO_2[d]	1.10 E+02	A
SO_2[e]	5.88 E-04	A
TOC[f]	3.58 E-01	C
Methane[g]	2.30 E-01	C
VOC[h]	2.96 E-02	C
PM10 (filterable)[i,j]	9.50 E-03	E
PM2.5 (filterable)[j]	9.50 E-03	E
PM Condensable[k]	9.91 E-03	E
Trace Organic Compounds		
1,1,2,2-Tetrachloroethane[l]	2.53 E-05	C
1,1,2-Trichloroethane[l]	<1.53 E-05	E
1,1-Dichloroethane	<1.13 E-05	E
1,2-Dichloroethane	<1.13 E-05	E
1,2-Dichloropropane	<1.30 E-05	E
1,3-Butadiene[l]	6.63 E-04	D
1,3-Dichloropropene[l]	<1.27 E-05	E
Acetaldehyde[l,m]	2.79 E-03	C
Acrolein[l,m]	2.63 E-03	C
Benzene[l]	1.58 E-03	B
Butyr/isobutyraldehyde	4.86 E-05	D
Carbon Tetrachloride[l]	<1.77 E-05	E

Table 3.2-3. UNCONTROLLED EMISSION FACTORS FOR 4-STROKE RICH-BURN ENGINES (Concluded)

Pollutant	Emission Factor (lb/MMBtu)[b] (fuel input)	Emission Factor Rating
Chlorobenzene[l]	<1.29 E-05	E
Chloroform[l]	<1.37 E-05	E
Ethane[n]	7.04 E-02	C
Ethylbenzene[l]	<2.48 E-05	E
Ethylene Dibromide[l]	<2.13 E-05	E
Formaldehyde[l,m]	2.05 E-02	A
Methanol[l]	3.06 E-03	D
Methylene Chloride[l]	4.12 E-05	C
Naphthalene[l]	<9.71 E-05	E
PAH[l]	1.41 E-04	D
Styrene[l]	<1.19 E-05	E
Toluene[l]	5.58 E-04	A
Vinyl Chloride[l]	<7.18 E-06	E
Xylene[l]	1.95 E-04	A

[a] Reference 7. Factors represent uncontrolled levels. For NO_x, CO, and PM-10, “uncontrolled” means no combustion or add-on controls; however, the factor may include turbocharged units. For all other pollutants, “uncontrolled” means no oxidation control; the data set may include units with control techniques used for NOx control, such as PCC and SCR for lean burn engines, and PSC for rich burn engines. Factors are based on large population of engines. Factors are for engines at all loads, except as indicated. SCC = Source Classification Code. TOC = Total Organic Compounds. PM10 = Particulate Matter $\leq$ 10 microns (μm) aerodynamic diameter. A “<“ sign in front of a factor means that the corresponding emission factor is based on one-half of the method detection limit.

[b] Emission factors were calculated in units of (lb/MMBtu) based on procedures in EPA Method 19. To convert from (lb/MMBtu) to (lb/10^6 scf), multiply by the heat content of the fuel. If the heat content is not available, use 1020 Btu/scf. To convert from (lb/MMBtu) to (lb/hp-hr) use the following equation:

$$\text{lb/hp-hr} = (\text{lb/MMBtu})(\text{heat input, MMBtu/hr})(\text{1/operating HP, 1/hp})$$

[c] Emission tests with unreported load conditions were not included in the data set.

[d] Based on 99.5% conversion of the fuel carbon to CO_2. CO_2 [lb/MMBtu] = (3.67)(%CON)(C)(D)(1/h), where %CON = percent conversion of fuel carbon to CO_2,

C = carbon content of fuel by weight (0.75), D = density of fuel, 4.1 E+04 lb/10^6 scf, and h = heating value of natural gas (assume 1020 Btu/scf at 60°F).

[e] Based on 100% conversion of fuel sulfur to SO_2. Assumes sulfur content in natural gas of 2,000 gr/10^6scf.

[f] Emission factor for TOC is based on measured emission levels from 6 source tests.

[g] Emission factor for methane is determined by subtracting the VOC and ethane emission factors from the TOC emission factor.

[h] VOC emission factor is based on the sum of the emission factors for all speciated organic compounds. Methane and ethane emissions were not measured for this engine category.

[i] No data were available for uncontrolled engines. PM10 emissions are for engines equipped with a PCC.

[j] Considered $\leq$ 1 μm in aerodynamic diameter. Therefore, for filterable PM emissions, PM10(filterable) = PM2.5(filterable).

[k] No data were available for condensable emissions. The presented emission factor reflects emissions from 4SLB engines.

[l] Hazardous Air Pollutant as defined by Section 112(b) of the Clean Air Act.

[m] For rich-burn engines, no interference is suspected in quantifying aldehyde emissions. The presented emission factors are based on FTIR and CARB 430 emissions data measurements.

[n] Ethane emission factor is determined by subtracting the VOC emission factor from the NMHC emission factor.

References For Section 3.2

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3.3 Gasoline And Diesel Industrial Engines

3.3.1 General

The engine category addressed by this section covers a wide variety of industrial applications of both gasoline and diesel internal combustion (IC) engines such as aerial lifts, fork lifts, mobile refrigeration units, generators, pumps, industrial sweepers/scrubbers, material handling equipment (such as conveyors), and portable well-drilling equipment. The three primary fuels for reciprocating IC engines are gasoline, diesel fuel oil (No.2), and natural gas. Gasoline is used primarily for mobile and portable engines. Diesel fuel oil is the most versatile fuel and is used in IC engines of all sizes. The rated power of these engines covers a rather substantial range, up to 250 horsepower (hp) for gasoline engines and up to 600 hp for diesel engines. (Diesel engines greater than 600 hp are covered in Section 3.4, "Large Stationary Diesel And All Stationary Dual-fuel Engines".) Understandably, substantial differences in engine duty cycles exist. It was necessary, therefore, to make reasonable assumptions concerning usage in order to formulate some of the emission factors.

3.3.2 Process Description

All reciprocating IC engines operate by the same basic process. A combustible mixture is first compressed in a small volume between the head of a piston and its surrounding cylinder. The mixture is then ignited, and the resulting high-pressure products of combustion push the piston through the cylinder. This movement is converted from linear to rotary motion by a crankshaft. The piston returns, pushing out exhaust gases, and the cycle is repeated.

There are 2 methods used for stationary reciprocating IC engines: compression ignition (CI) and spark ignition (SI). This section deals with both types of reciprocating IC engines. All diesel-fueled engines are compression ignited, and all gasoline-fueled engines are spark ignited.

In CI engines, combustion air is first compression heated in the cylinder, and diesel fuel oil is then injected into the hot air. Ignition is spontaneous because the air temperature is above the autoignition temperature of the fuel. SI engines initiate combustion by the spark of an electrical discharge. Usually the fuel is mixed with the air in a carburetor (for gasoline) or at the intake valve (for natural gas), but occasionally the fuel is injected into the compressed air in the cylinder.

CI engines usually operate at a higher compression ratio (ratio of cylinder volume when the piston is at the bottom of its stroke to the volume when it is at the top) than SI engines because fuel is not present during compression; hence there is no danger of premature autoignition. Since engine thermal efficiency rises with increasing pressure ratio (and pressure ratio varies directly with compression ratio), CI engines are more efficient than SI engines. This increased efficiency is gained at the expense of poorer response to load changes and a heavier structure to withstand the higher pressures.[1]

3.3.3 Emissions

Most of the pollutants from IC engines are emitted through the exhaust. However, some total organic compounds (TOC) escape from the crankcase as a result of blowby (gases that are vented from the oil pan after they have escaped from the cylinder past the piston rings) and from the fuel tank and carburetor because of evaporation. Nearly all of the TOCs from diesel CI engines enter the atmosphere from the exhaust. Evaporative losses are insignificant in diesel engines due to the low volatility of diesel fuels.

The primary pollutants from internal combustion engines are oxides of nitrogen (NO_x), total organic compounds (TOC), carbon monoxide (CO), and particulates, which include both visible (smoke) and nonvisible emissions. Nitrogen oxide formation is directly related to high pressures and temperatures during the combustion process and to the nitrogen content, if any, of the fuel. The other pollutants, HC, CO, and smoke, are primarily the result of incomplete combustion. Ash and metallic additives in the fuel also contribute to the particulate content of the exhaust. Sulfur oxides (SO_x) also appear in the exhaust from IC engines. The sulfur compounds, mainly sulfur dioxide (SO_2), are directly related to the sulfur content of the fuel.[2]

3.3.3.1 Nitrogen Oxides -

Nitrogen oxide formation occurs by two fundamentally different mechanisms. The predominant mechanism with internal combustion engines is thermal NO_x which arises from the thermal dissociation and subsequent reaction of nitrogen (N_2) and oxygen (O_2) molecules in the combustion air. Most thermal NO_x is formed in the high-temperature region of the flame from dissociated molecular nitrogen in the combustion air. Some NO_x, called prompt NO_x, is formed in the early part of the flame from reaction of nitrogen intermediary species, and HC radicals in the flame. The second mechanism, fuel NO_x, stems from the evolution and reaction of fuel-bound nitrogen compounds with oxygen. Gasoline, and most distillate oils have no chemically-bound fuel N_2 and essentially all NO_x formed is thermal NO_x.

3.3.3.2 Total Organic Compounds -

The pollutants commonly classified as hydrocarbons are composed of a wide variety of organic compounds and are discharged into the atmosphere when some of the fuel remains unburned or is only partially burned during the combustion process. Most unburned hydrocarbon emissions result from fuel droplets that were transported or injected into the quench layer during combustion. This is the region immediately adjacent to the combustion chamber surfaces, where heat transfer outward through the cylinder walls causes the mixture temperatures to be too low to support combustion.

Partially burned hydrocarbons can occur because of poor air and fuel homogeneity due to incomplete mixing, before or during combustion; incorrect air/fuel ratios in the cylinder during combustion due to maladjustment of the engine fuel system; excessively large fuel droplets (diesel engines); and low cylinder temperature due to excessive cooling (quenching) through the walls or early cooling of the gases by expansion of the combustion volume caused by piston motion before combustion is completed.[2]

3.3.3.3 Carbon Monoxide -

Carbon monoxide is a colorless, odorless, relatively inert gas formed as an intermediate combustion product that appears in the exhaust when the reaction of CO to CO_2 cannot proceed to completion. This situation occurs if there is a lack of available oxygen near the hydrocarbon (fuel) molecule during combustion, if the gas temperature is too low, or if the residence time in the cylinder is too short. The oxidation rate of CO is limited by reaction kinetics and, as a consequence, can be accelerated only to a certain extent by improvements in air and fuel mixing during the combustion process.[2-3]

3.3.3.4 Smoke and Particulate Matter -

White, blue, and black smoke may be emitted from IC engines. Liquid particulates appear as white smoke in the exhaust during an engine cold start, idling, or low load operation. These are formed in the quench layer adjacent to the cylinder walls, where the temperature is not high enough to ignite the fuel. Blue smoke is emitted when lubricating oil leaks, often past worn piston rings, into the combustion chamber and is partially burned. Proper maintenance is the most effective method of preventing blue smoke emissions from all types of IC engines. The primary constituent of black smoke is agglomerated carbon particles (soot) formed in regions of the combustion mixtures that are oxygen deficient.[2]

3.3.3.5 Sulfur Oxides -

Sulfur oxides emissions are a function of only the sulfur content in the fuel rather than any combustion variables. In fact, during the combustion process, essentially all the sulfur in the fuel is oxidized to SO_2. The oxidation of SO_2 gives sulfur trioxide (SO_3), which reacts with water to give sulfuric acid (H_2SO_4), a contributor to acid precipitation. Sulfuric acid reacts with basic substances to give sulfates, which are fine particulates that contribute to PM-10 and visibility reduction. Sulfur oxide emissions also contribute to corrosion of the engine parts.[2-3]

3.3.4 Control Technologies

Control measures to date are primarily directed at limiting NO_x and CO emissions since they are the primary pollutants from these engines. From a NO_x control viewpoint, the most important distinction between different engine models and types of reciprocating engines is whether they are rich-burn or lean-burn. Rich-burn engines have an air-to-fuel ratio operating range that is near stoichiometric or fuel-rich of stoichiometric and as a result the exhaust gas has little or no excess oxygen. A lean-burn engine has an air-to-fuel operating range that is fuel-lean of stoichiometric; therefore, the exhaust from these engines is characterized by medium to high levels of O_2. The most common NO_x control technique for diesel and dual-fuel engines focuses on modifying the combustion process. However, selective catalytic reduction (SCR) and nonselective catalytic reduction (NSCR) which are post-combustion techniques are becoming available. Controls for CO have been partly adapted from mobile sources.[4]

Combustion modifications include injection timing retard (ITR), preignition chamber combustion (PCC), air-to-fuel ratio adjustments, and derating. Injection of fuel into the cylinder of a CI engine initiates the combustion process. Retarding the timing of the diesel fuel injection causes the combustion process to occur later in the power stroke when the piston is in the downward motion and combustion chamber volume is increasing. By increasing the volume, the combustion temperature and pressure are lowered, thereby lowering NO_x formation. ITR reduces NO_x from all diesel engines; however, the effectiveness is specific to each engine model. The amount of NO_x reduction with ITR diminishes with increasing levels of retard.[4]

Improved swirl patterns promote thorough air and fuel mixing and may include a precombustion chamber (PCC). A PCC is an antechamber that ignites a fuel-rich mixture that propagates to the main combustion chamber. The high exit velocity from the PCC results in improved mixing and complete combustion of the lean air/fuel mixture which lowers combustion temperature, thereby reducing NO_x emissions.[4]

The air-to-fuel ratio for each cylinder can be adjusted by controlling the amount of fuel that enters each cylinder. At air-to-fuel ratios less than stoichiometric (fuel-rich), combustion occurs under conditions of insufficient oxygen which causes NO_x to decrease because of lower oxygen and lower temperatures. Derating involves restricting the engine operation to lower than normal levels of power production for the given application. Derating reduces cylinder pressures and temperatures, thereby lowering NO_x formation rates.[4]

SCR is an add-on NO_x control placed in the exhaust stream following the engine and involves injecting ammonia (NH_3) into the flue gas. The NH_3 reacts with NO_x in the presence of a catalyst to form water and nitrogen. The effectiveness of SCR depends on fuel quality and engine duty cycle (load fluctuations). Contaminants in the fuel may poison or mask the catalyst surface causing a reduction or termination in catalyst activity. Load fluctuations can cause variations in exhaust temperature and NO_x concentration which can create problems with the effectiveness of the SCR system.[4]

NSCR is often referred to as a three-way conversion catalyst system because the catalyst reactor simultaneously reduces NO_x, CO, and HC and involves placing a catalyst in the exhaust stream of the engine. The reaction requires that the O_2 levels be kept low and that the engine be operated at fuel-rich air-to-fuel ratios.[4]

The most accurate method for calculating such emissions is on the basis of "brake-specific" emission factors (pounds per horsepower-hour [lb/hp-hr]). Emissions are the product of the brake-specific emission factor, the usage in hours, the rated power available, and the load factor (the power actually used divided by the power available). However, for emission inventory purposes, it is often easier to assess this activity on the basis of fuel used.

Once reasonable usage and duty cycles for this category were ascertained, emission values were aggregated to arrive at the factors for criteria and organic pollutants presented. Factors in Table 3.3-1 are in pounds per million British thermal unit (lb/MMBtu). Emission data for a specific design type were weighted according to estimated material share for industrial engines. The emission factors in these tables, because of their aggregate nature, are most appropriately applied to a population of industrial engines rather than to an individual power plant. Table 3.3-2 shows unweighted speciated organic compound and air toxic emission factors based upon only 2 engines. Their inclusion in this section is intended for rough order-of-magnitude estimates only.

Table 3.3-3 summarizes whether the various diesel emission reduction technologies (some of which may be applicable to gasoline engines) will generally increase or decrease the selected parameter. These technologies are categorized into fuel modifications, engine modifications, and exhaust after-treatments. Current data are insufficient to quantify the results of the modifications. Table 3.3-3 provides general information on the trends of changes on selected parameters.

3.3.5 Updates Since the Fifth Edition

The Fifth Edition was released in January 1995. Revisions to this section since that date are summarized below. For further detail, consult the memoranda describing each supplement or the background report for this section.

Supplement A, February 1996

No changes.

Supplement B, October 1996

- Text was revised concerning emissions and controls.
- The CO_2 emission factor was adjusted to reflect 98.5 percent conversion efficiency.

Table 3.3-1. EMISSION FACTORS FOR UNCONTROLLED GASOLINE AND DIESEL INDUSTRIAL ENGINES[a]

	Gasoline Fuel (SCC 2-02-003-01, 2-03-003-01)		Diesel Fuel (SCC 2-02-001-02, 2-03-001-01)		
Pollutant	Emission Factor (lb/hp-hr) (power output)	Emission Factor (lb/MMBtu) (fuel input)	Emission Factor (lb/hp-hr) (power output)	Emission Factor (lb/MMBtu) (fuel input)	EMISSION FACTOR RATING
NO_x	0.011	1.63	0.031	4.41	D
CO	6.96 E-03[d]	0.99[d]	6.68 E-03	0.95	D
SO_x	5.91 E-04	0.084	2.05 E-03	0.29	D
PM-10[b]	7.21 E-04	0.10	2.20 E-03	0.31	D
CO_2[c]	1.08	154	1.15	164	B
Aldehydes	4.85 E-04	0.07	4.63 E-04	0.07	D
TOC					
Exhaust	0.015	2.10	2.47 E-03	0.35	D
Evaporative	6.61 E-04	0.09	0.00	0.00	E
Crankcase	4.85 E-03	0.69	4.41 E-05	0.01	E
Refueling	1.08 E-03	0.15	0.00	0.00	E

[a] References 2,5-6,9-14. When necessary, an average brake-specific fuel consumption (BSFC) of 7,000 Btu/hp-hr was used to convert from lb/MMBtu to lb/hp-hr. To convert from lb/hp-hr to kg/kw-hr, multiply by 0.608. To convert from lb/MMBtu to ng/J, multiply by 430. SCC = Source Classification Code. TOC = total organic compounds.

[b] PM-10 = particulate matter less than or equal to 10 µm aerodynamic diameter. All particulate is assumed to be ≤ 1 µm in size.

[c] Assumes 99% conversion of carbon in fuel to CO_2 with 87 weight % carbon in diesel, 86 weight % carbon in gasoline, average BSFC of 7,000 Btu/hp-hr, diesel heating value of 19,300 Btu/lb, and gasoline heating value of 20,300 Btu/lb.

[d] Instead of 0.439 lb/hp-hr (power output) and 62.7 lb/mmBtu (fuel input), the correct emissions factors values are 6.96 E-03 lb/hp-hr (power output) and 0.99 lb/mmBtu (fuel input), respectively. This is an editorial correction. March 24, 2009

Table 3.3-2. SPECIATED ORGANIC COMPOUND EMISSION FACTORS FOR UNCONTROLLED DIESEL ENGINES[a]

EMISSION FACTOR RATING: E

Pollutant	Emission Factor (Fuel Input) (lb/MMBtu)
Benzene[b]	9.33 E-04
Toluene[b]	4.09 E-04
Xylenes[b]	2.85 E-04
Propylene	2.58 E-03
1,3-Butadiene[b,c]	<3.91 E-05
Formaldehyde[b]	1.18 E-03
Acetaldehyde[b]	7.67 E-04
Acrolein[b]	<9.25 E-05
Polycyclic aromatic hydrocarbons (PAH)	
Naphthalene[b]	8.48 E-05
Acenaphthylene	<5.06 E-06
Acenaphthene	<1.42 E-06
Fluorene	2.92 E-05
Phenanthrene	2.94 E-05
Anthracene	1.87 E-06
Fluoranthene	7.61 E-06
Pyrene	4.78 E-06
Benzo(a)anthracene	1.68 E-06
Chrysene	3.53 E-07
Benzo(b)fluoranthene	<9.91 E-08
Benzo(k)fluoranthene	<1.55 E-07
Benzo(a)pyrene	<1.88 E-07
Indeno(1,2,3-cd)pyrene	<3.75 E-07
Dibenz(a,h)anthracene	<5.83 E-07
Benzo(g,h,l)perylene	<4.89 E-07
TOTAL PAH	1.68 E-04

[a] Based on the uncontrolled levels of 2 diesel engines from References 6-7. Source Classification Codes 2-02-001-02, 2-03-001-01. To convert from lb/MMBtu to ng/J, multiply by 430.

[b] Hazardous air pollutant listed in the *Clean Air Act*.

[c] Based on data from 1 engine.

Table 3.3-3. EFFECT OF VARIOUS EMISSION CONTROL TECHNOLOGIES ON DIESEL ENGINES[a]

	Affected Parameter	
Technology	Increase	Decrease
Fuel modifications		
Sulfur content increase	PM, wear	
Aromatic content increase	PM, NO_x	
Cetane number		PM, NO_x
10% and 90% boiling point		PM
Fuel additives		PM, NO_x
Water/Fuel emulsions		NO_x
Engine modifications		
Injection timing retard	PM, BSFC	NO_x, power
Fuel injection pressure	PM, NO_x	
Injection rate control		NO_x, PM
Rapid spill nozzles		PM
Electronic timing & metering		NO_x, PM
Injector nozzle geometry		PM
Combustion chamber modifications		NO_x, PM
Turbocharging	PM, power	NO_x
Charge cooling		NO_x
Exhaust gas recirculation	PM, power, wear	NO_x
Oil consumption control		PM, wear
Exhaust after-treatment		
Particulate traps		PM
Selective catalytic reduction		NO_x
Oxidation catalysts		TOC, CO, PM

[a] Reference 8. PM = particulate matter. BSFC = brake-specific fuel consumption.

References For Section 3.3

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3.4 Large Stationary Diesel And All Stationary Dual-fuel Engines

3.4.1 General

The primary domestic use of large stationary diesel engines (greater than 600 horsepower [hp]) is in oil and gas exploration and production. These engines, in groups of 3 to 5, supply mechanical power to operate drilling (rotary table), mud pumping, and hoisting equipment, and may also operate pumps or auxiliary power generators. Another frequent application of large stationary diesels is electricity generation for both base and standby service. Smaller uses include irrigation, hoisting, and nuclear power plant emergency cooling water pump operation.

Dual-fuel engines were developed to obtain compression ignition performance and the economy of natural gas, using a minimum of 5 to 6 percent diesel fuel to ignite the natural gas. Large dual-fuel engines have been used almost exclusively for prime electric power generation. This section includes all dual-fuel engines.

3.4.2 Process Description

All reciprocating internal combustion (IC) engines operate by the same basic process. A combustible mixture is first compressed in a small volume between the head of a piston and its surrounding cylinder. The mixture is then ignited, and the resulting high-pressure products of combustion push the piston through the cylinder. This movement is converted from linear to rotary motion by a crankshaft. The piston returns, pushing out exhaust gases, and the cycle is repeated.

There are 2 ignition methods used in stationary reciprocating IC engines, compression ignition (CI) and spark ignition (SI). In CI engines, combustion air is first compression heated in the cylinder, and diesel fuel oil is then injected into the hot air. Ignition is spontaneous because the air temperature is above the autoignition temperature of the fuel. SI engines initiate combustion by the spark of an electrical discharge. Usually the fuel is mixed with the air in a carburetor (for gasoline) or at the intake valve (for natural gas), but occasionally the fuel is injected into the compressed air in the cylinder. Although all diesel- fueled engines are compression ignited and all gasoline- and gas-fueled engines are spark ignited, gas can be used in a CI engine if a small amount of diesel fuel is injected into the compressed gas/air mixture to burn any mixture ratio of gas and diesel oil (hence the name dual fuel), from 6 to 100 percent diesel oil.

CI engines usually operate at a higher compression ratio (ratio of cylinder volume when the piston is at the bottom of its stroke to the volume when it is at the top) than SI engines because fuel is not present during compression; hence there is no danger of premature autoignition. Since engine thermal efficiency rises with increasing pressure ratio (and pressure ratio varies directly with compression ratio), CI engines are more efficient than SI engines. This increased efficiency is gained at the expense of poorer response to load changes and a heavier structure to withstand the higher pressures.[1]

3.4.3 Emissions And Controls

Most of the pollutants from IC engines are emitted through the exhaust. However, some total organic compounds (TOC) escape from the crankcase as a result of blowby (gases that are vented from the oil pan after they have escaped from the cylinder past the piston rings) and from the fuel tank and carburetor because of evaporation. Nearly all of the TOCs from diesel CI engines enter the atmosphere from the exhaust. Crankcase blowby is minor because TOCs are not present during compression of the charge. Evaporative losses are insignificant in diesel engines due to the low volatility of diesel fuels. In general, evaporative losses are also negligible in engines using gaseous fuels because these engines receive their fuel continuously from a pipe rather than via a fuel storage tank and fuel pump.

The primary pollutants from internal combustion engines are oxides of nitrogen (NO_x), hydrocarbons and other organic compounds, carbon monoxide (CO), and particulates, which include both visible (smoke) and nonvisible emissions. Nitrogen oxide formation is directly related to high pressures and temperatures during the combustion process and to the nitrogen content, if any, of the fuel. The other pollutants, HC, CO, and smoke, are primarily the result of incomplete combustion. Ash and metallic additives in the fuel also contribute to the particulate content of the exhaust. Sulfur oxides also appear in the exhaust from IC engines. The sulfur compounds, mainly sulfur dioxide (SO_2), are directly related to the sulfur content of the fuel.[2]

3.4.3.1 Nitrogen Oxides -

Nitrogen oxide formation occurs by two fundamentally different mechanisms. The predominant mechanism with internal combustion engines is thermal NO_x which arises from the thermal dissociation and subsequent reaction of nitrogen (N_2) and oxygen (O_2) molecules in the combustion air. Most thermal NO_x is formed in the high-temperature region of the flame from dissociated molecular nitrogen in the combustion air. Some NO_x, called prompt NO_x, is formed in the early part of the flame from reaction of nitrogen intermediary species, and HC radicals in the flame. The second mechanism, fuel NO_x, stems from the evolution and reaction of fuel-bound nitrogen compounds with oxygen. Gasoline, and most distillate oils, have no chemically-bound fuel N_2 and essentially all NO_x formed is thermal NO_x.

3.4.3.2 Total Organic Compounds -

The pollutants commonly classified as hydrocarbons are composed of a wide variety of organic compounds and are discharged into the atmosphere when some of the fuel remains unburned or is only partially burned during the combustion process. Most unburned hydrocarbon emissions result from fuel droplets that were transported or injected into the quench layer during combustion. This is the region immediately adjacent to the combustion chamber surfaces, where heat transfer outward through the cylinder walls causes the mixture temperatures to be too low to support combustion.

Partially burned hydrocarbons can occur because of poor air and fuel homogeneity due to incomplete mixing, before or during combustion; incorrect air/fuel ratios in the cylinder during combustion due to maladjustment of the engine fuel system; excessively large fuel droplets (diesel engines); and low cylinder temperature due to excessive cooling (quenching) through the walls or early cooling of the gases by expansion of the combustion volume caused by piston motion before combustion is completed.[2]

3.4.3.3 Carbon Monoxide -

Carbon monoxide is a colorless, odorless, relatively inert gas formed as an intermediate combustion product that appears in the exhaust when the reaction of CO to CO_2 cannot proceed to completion. This situation occurs if there is a lack of available oxygen near the hydrocarbon (fuel) molecule during combustion, if the gas temperature is too low, or if the residence time in the cylinder is too short. The oxidation rate of CO is limited by reaction kinetics and, as a consequence, can be accelerated only to a certain extent by improvements in air and fuel mixing during the combustion process.[2-3]

3.4.3.4 Smoke, Particulate Matter, and PM-10 -

White, blue, and black smoke may be emitted from IC engines. Liquid particulates appear as white smoke in the exhaust during an engine cold start, idling, or low load operation. These are formed in the quench layer adjacent to the cylinder walls, where the temperature is not high enough to ignite the fuel. Blue smoke is emitted when lubricating oil leaks, often past worn piston rings, into the combustion chamber and is partially burned. Proper maintenance is the most effective method of preventing blue smoke emissions from all types of IC engines. The primary constituent of black smoke is agglomerated carbon particles (soot).[2]

3.4.3.5 Sulfur Oxides -

Sulfur oxide emissions are a function of only the sulfur content in the fuel rather than any combustion variables. In fact, during the combustion process, essentially all the sulfur in the fuel is oxidized to SO_2. The oxidation of SO_2 gives sulfur trioxide (SO_3), which reacts with water to give sulfuric acid (H_2SO_4), a contributor to acid precipitation. Sulfuric acid reacts with basic substances to give sulfates, which are fine particulates that contribute to PM-10 and visibility reduction. Sulfur oxide emissions also contribute to corrosion of the engine parts.[2,3]

Table 3.4-1 contains gaseous emission factors for the pollutants discussed above, expressed in units of pounds per horsepower-hour (lb/hp-hr), and pounds per million British thermal unit (lb/MMBtu). Table 3.4-2 shows the particulate and particle-sizing emission factors. Table 3.4-3 shows the speciated organic compound emission factors and Table 3.4-4 shows the emission factors for polycyclic aromatic hydrocarbons (PAH). These tables do not provide a complete speciated organic compound and PAH listing because they are based only on a single engine test; they are to be used only for rough order of magnitude comparisons.

Table 3.4-5 shows the NO_x reduction and fuel consumption penalties for diesel and dual-fueled engines based on some of the available control techniques. The emission reductions shown are those that have been demonstrated. The effectiveness of controls on a particular engine will depend on the specific design of each engine, and the effectiveness of each technique could vary considerably. Other NO_x control techniques exist but are not included in Table 3.4-5. These techniques include internal/external exhaust gas recirculation, combustion chamber modification, manifold air cooling, and turbocharging.

3.4.4 Control Technologies

Control measures to date are primarily directed at limiting NO_x and CO emissions since they are the primary pollutants from these engines. From a NO_x control viewpoint, the most important distinction between different engine models and types of reciprocating engines is whether they are rich-burn or lean-burn. Rich-burn engines have an air-to-fuel ratio operating range that is near stoichiometric or fuel-rich of stoichiometric and as a result the exhaust gas has little or no excess oxygen. A lean-burn engine has an air-to-fuel operating range that is fuel-lean of stoichiometric; therefore, the exhaust from these engines is characterized by medium to high levels of O_2. The most common NO_x control technique for diesel and dual fuel engines focuses on modifying the combustion process. However, selective catalytic reduction (SCR) and nonselective catalytic reduction (NSCR) which are post-combustion techniques are becoming available. Control for CO have been partly adapted from mobile sources.[5]

Combustion modifications include injection timing retard (ITR), preignition chamber combustion (PCC), air-to-fuel ratio, and derating. Injection of fuel into the cylinder of a CI engine initiates the combustion process. Retarding the timing of the diesel fuel injection causes the combustion process to occur later in the power stroke when the piston is in the downward motion and combustion chamber volume is increasing. By increasing the volume, the combustion temperature and pressure are lowered, thereby lowering NO_x formation. ITR reduces NO_x from all diesel engines; however, the effectiveness is specific to each engine model. The amount of NO_x reduction with ITR diminishes with increasing levels of retard.[5]

Improved swirl patterns promote thorough air and fuel mixing and may include a precombustion chamber (PCC). A PCC is an antechamber that ignites a fuel-rich mixture that propagates to the main combustion chamber. The high exit velocity from the PCC results in improved mixing and complete combustion of the lean air/fuel mixture which lowers combustion temperature, thereby reducing NO_x emissions.[5]

The air-to-fuel ratio for each cylinder can be adjusted by controlling the amount of fuel that enters each cylinder. At air-to-fuel ratios less than stoichiometric (fuel-rich), combustion occurs under conditions of insufficient oxygen which causes NO_x to decrease because of lower oxygen and lower temperatures. Derating involves restricting engine operation to lower than normal levels of power production for the given application. Derating reduces cylinder pressures and temperatures thereby lowering NO_x formation rates.[5]

SCR is an add-on NO_x control placed in the exhaust stream following the engine and involves injecting ammonia (NH_3) into the flue gas. The NH_3 reacts with the NO_x in the presence of a catalyst to form water and nitrogen. The effectiveness of SCR depends on fuel quality and engine duty cycle (load fluctuations). Contaminants in the fuel may poison or mask the catalyst surface causing a reduction or termination in catalyst activity. Load fluctuations can cause variations in exhaust temperature and NO_x concentration which can create problems with the effectiveness of the SCR system.[5]

NSCR is often referred to as a three-way conversion catalyst system because the catalyst reactor simultaneously reduces NO_x, CO, and HC and involves placing a catalyst in the exhaust stream of the engine. The reaction requires that the O_2 levels be kept low and that the engine be operated at fuel-rich air-to-fuel ratios.[5]

3.4.5 Updates Since the Fifth Edition

The Fifth Edition was released in January 1995. Revisions to this section since that date are summarized below. For further detail, consult the memoranda describing each supplement or the background report for this section.

Supplement A, February 1996

No changes.

Supplement B, October 1996

- The general text was updated.
- Controlled NO_x factors and PM factors were added for diesel units.
- Math errors were corrected in factors for CO from diesel units and for uncontrolled NO_x from dual fueled units.

Table 3.4-1. GASEOUS EMISSION FACTORS FOR LARGE STATIONARY DIESEL AND ALL STATIONARY DUAL-FUEL ENGINES[a]

	Diesel Fuel (SCC 2-02-004-01)			Dual Fuel[b] (SCC 2-02-004-02)		
Pollutant	Emission Factor (lb/hp-hr) (power output)	Emission Factor (lb/MMBtu) (fuel input)	EMISSION FACTOR RATING	Emission Factor (lb/hp-hr) (power output)	Emission Factor (lb/MMBtu) (fuel input)	EMISSION FACTOR RATING
NO_x						
Uncontrolled	0.024	3.2	B	0.018	2.7	D
Controlled	0.013[c]	1.9[c]	B	ND	ND	NA
CO	5.5 E-03	0.85	C	7.5 E-03	1.16	D
SO_x[d]	8.09 E-03S_1	1.01S_1	B	4.06 E-04S_1 + 9.57 E-03S_2	0.05S_1 + 0.895S_2	B
CO_2[e]	1.16	165	B	0.772	110	B
PM	0.0007[c]	0.1[c]	B	ND	ND	NA
TOC (as CH_4)	7.05 E-04	0.09	C	5.29 E-03	0.8	D
Methane	f	f	E	3.97 E-03	0.6	E
Nonmethane	f	f	E	1.32 E-03	0.2[g]	E

[a] Based on uncontrolled levels for each fuel, from References 2,6-7. When necessary, the average heating value of diesel was assumed to be 19,300 Btu/lb with a density of 7.1 lb/gallon. The power output and fuel input values were averaged independently from each other, because of the use of actual brake-specific fuel consumption (BSFC) values for each data point and of the use of data possibly sufficient to calculate only 1 of the 2 emission factors (e. g., enough information to calculate lb/MMBtu, but not lb/hp-hr). Factors are based on averages across all manufacturers and duty cycles. The actual emissions from a particular engine or manufacturer could vary considerably from these levels. To convert from lb/hp-hr to kg/kw-hr, multiply by 0.608. To convert from lb/MMBtu to ng/J, multiply by 430. SCC = Source Classification Code.

[b] Dual fuel assumes 95% natural gas and 5% diesel fuel.

[c] References 8-26. Controlled NO_x is by ignition timing retard.

[d] Assumes that all sulfur in the fuel is converted to SO_2. S_1 = % sulfur in fuel oil; S_2 = % sulfur in natural gas. For example, if sulfer content is 1.5%, then S = 1.5.

[e] Assumes 100% conversion of carbon in fuel to CO_2 with 87 weight % carbon in diesel, 70 weight % carbon in natural gas, dual-fuel mixture of 5% diesel with 95% natural gas, average BSFC of 7,000 Btu/hp-hr, diesel heating value of 19,300 Btu/lb, and natural gas heating value of 1050 Btu/scf.

[f] Based on data from 1 engine, TOC is by weight 9% methane and 91% nonmethane.

[g] Assumes that nonmethane organic compounds are 25% of TOC emissions from dual-fuel engines. Molecular weight of nonmethane gas stream is assumed to be that of methane.

Table 3.4-2. PARTICULATE AND PARTICLE-SIZING EMISSION FACTORS FOR LARGE UNCONTROLLED STATIONARY DIESEL ENGINES[a]

EMISSION FACTOR RATING: E

Pollutant	Emission Factor (lb/MMBtu) (fuel input)
Filterable particulate[b]	
< 1 µm	0.0478
< 3 µm	0.0479
< 10 µm	0.0496
Total filterable particulate	0.0620
Condensable particulate	0.0077
Total PM-10[c]	0.0573
Total particulate[d]	0.0697

[a] Based on 1 uncontrolled diesel engine from Reference 6. Source Classification Code 2-02-004-01. The data for the particulate emissions were collected using Method 5, and the particle size distributions were collected using a Source Assessment Sampling System. To convert from lb/MMBtu to ng/J, multiply by 430. PM-10 = particulate matter ≤ 10 micrometers (µm) aerometric diameter.

[b] Particle size is expressed as aerodynamic diameter.

[c] Total PM-10 is the sum of filterable particulate less than 10 µm aerodynamic diameter and condensable particulate.

[d] Total particulate is the sum of the total filterable particulate and condensable particulate.

Table 3.4-3. SPECIATED ORGANIC COMPOUND EMISSION FACTORS FOR LARGE UNCONTROLLED STATIONARY DIESEL ENGINES[a]

EMISSION FACTOR RATING: E

Pollutant	Emission Factor (lb/MMBtu) (fuel input)
Benzene[b]	7.76 E-04
Toluene[b]	2.81 E-04
Xylenes[b]	1.93 E-04
Propylene	2.79 E-03
Formaldehyde[b]	7.89 E-05
Acetaldehyde[b]	2.52 E-05
Acrolein[b]	7.88 E-06

[a] Based on 1 uncontrolled diesel engine from Reference 7. Source Classification Code 2-02-004-01. Not enough information to calculate the output-specific emission factors of lb/hp-hr. To convert from lb/MMBtu to ng/J, multiply by 430.

[b] Hazardous air pollutant listed in the *Clean Air Act*.

Table 3.4-4. PAH EMISSION FACTORS FOR LARGE UNCONTROLLED STATIONARY DIESEL ENGINES[a]

EMISSION FACTOR RATING: E

PAH	Emission Factor (lb/MMBtu) (fuel input)
Naphthalene[b]	1.30 E-04
Acenaphthylene	9.23 E-06
Acenaphthene	4.68 E-06
Fluorene	1.28 E-05
Phenanthrene	4.08 E-05
Anthracene	1.23 E-06
Fluoranthene	4.03 E-06
Pyrene	3.71 E-06
Benz(a)anthracene	6.22 E-07
Chrysene	1.53 E-06
Benzo(b)fluoranthene	1.11 E-06
Benzo(k)fluoranthene	<2.18 E-07
Benzo(a)pyrene	<2.57 E-07
Indeno(1,2,3-cd)pyrene	<4.14 E-07
Dibenz(a,h)anthracene	<3.46 E-07
Benzo(g,h,l)perylene	<5.56 E-07
TOTAL PAH	<2.12 E-04

[a] Based on 1 uncontrolled diesel engine from Reference 7. Source Classification Code 2-02-004-01. Not enough information to calculate the output-specific emission factors of lb/hp-hr. To convert from lb/MMBtu to ng/J, multiply by 430.

[b] Hazardous air pollutant listed in the *Clean Air Act*.

Table 3.4-5. NO_x REDUCTION AND FUEL CONSUMPTION PENALTIES FOR LARGE STATIONARY DIESEL AND DUAL-FUEL ENGINES[a]

Control Approach		Diesel (SCC 2-02-004-01)		Dual Fuel (SCC 2-02-004-02)	
		NO_x Reduction (%)	ΔBSFC[b] (%)	NO_x Reduction (%)	ΔBSFC (%)
Derate	10%	ND	ND	<20	4
	20%	<20	4	ND	ND
	25%	5 - 23	1 - 5	1 - 33	1 - 7
Retard	2°	<20	4	<20	3
	4°	<40	4	<40	1
	8°	28 - 45	2 - 8	50 - 73	3 - 5
Air-to-fuel	3%	ND	ND	<20	0
	±10%	7 - 8	3	25 - 40	1 - 3
Water injection (H_2O/fuel ratio)	50%	25 - 35	2 - 4	ND	ND
SCR		80 - 95	0	80 - 95	0

[a] References 1,27-28. The reductions shown are typical and will vary depending on the engine and duty cycle. SCC = Source Classification Code. ΔBSFC = change in brake-specific fuel consumption. ND = no data.

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13.2.1 Paved Roads

13.2.1.1 General

Particulate emissions occur whenever vehicles travel over a paved surface such as a road or parking lot. Particulate emissions from paved roads are due to direct emissions from vehicles in the form of exhaust, brake wear and tire wear emissions and resuspension of loose material on the road surface. In general terms, resuspended particulate emissions from paved roads originate from, and result in the depletion of, the loose material present on the surface (i.e., the surface loading). In turn, that surface loading is continuously replenished by other sources. At industrial sites, surface loading is replenished by spillage of material and trackout from unpaved roads and staging areas. Figure 13.2.1-1 illustrates several transfer processes occurring on public streets.

Various field studies have found that public streets and highways, as well as roadways at industrial facilities, can be major sources of the atmospheric particulate matter within an area.[1-9] Of particular interest in many parts of the United States are the increased levels of emissions from public paved roads when the equilibrium between deposition and removal processes is upset. This situation can occur for various reasons, including application of granular materials for snow and ice control, mud/dirt carryout from construction activities in the area, and deposition from wind and/or water erosion of surrounding unstabilized areas. In the absence of continuous addition of fresh material (through localized track out or application of antiskid material), paved road surface loading should reach an equilibrium value in which the amount of material resuspended matches the amount replenished. The equilibrium surface loading value depends upon numerous factors. It is believed that the most important factors are: mean speed of vehicles traveling the road; the average daily traffic (ADT); the number of lanes and ADT per lane; the fraction of heavy vehicles (buses and trucks); and the presence/absence of curbs, storm sewers and parking lanes.[10]

The particulate emission factors presented in a previous version of this section of AP-42, dated October 2002, implicitly included the emissions from vehicles in the form of exhaust, brake wear, and tire wear as well as resuspended road surface material. EPA included these sources in the emission factor equation for paved roads since the field testing data used to develop the equation included both the direct emissions from vehicles and emissions from resuspension of road dust.

This version of the paved road emission factor equation only estimates particulate emissions from resuspended road surface material[28]. The particulate emissions from vehicle exhaust, brake wear, and tire wear are now estimated separately using EPA's MOVES[29] model. This approach eliminates the possibility of double counting emissions. Double counting results when employing the previous version of the emission factor equation in this section and MOVES to estimate particulate emissions from vehicle traffic on paved roads. It also incorporates the decrease in exhaust emissions that has occurred since the paved road emission factor equation was developed. Earlier versions of the paved road emission factor equation includes estimates of emissions from exhaust, brake wear, and tire wear based on emission rates for vehicles in the 1980 calendar year fleet. The amount of PM released from vehicle exhaust has decreased since 1980 due to lower new vehicle emission standards and changes in fuel characteristics.

13.2.1.2 Emissions And Correction Parameters

Dust emissions from paved roads have been found to vary with what is termed the "silt loading" present on the road surface. In addition, the average weight and speed of vehicles traveling the road influence road dust emissions. The term silt loading (sL) refers to the mass of silt-size material (equal to or less than 75 micrometers [µm] in physical diameter) per unit area of the travel surface. The total road surface dust loading consists of loose material that can be collected by broom sweeping and vacuuming of the traveled portion of the paved road. The silt fraction is determined by measuring the proportion of the loose dry surface dust that passes through a 200-mesh screen, using the ASTM-C-136 method. Silt loading is the product of the silt fraction and the total loading, and is abbreviated "sL". Additional details on the sampling and analysis of such material are provided in AP-42 Appendices C.1 and C.2.

The surface sL provides a reasonable means of characterizing seasonal variability in a paved road emission inventory. In many areas of the country, road surface loadings [11-21] are heaviest during the late winter and early spring months when the residual loading from snow/ice controls is greatest. As noted earlier, once replenishment of fresh material is eliminated, the road surface loading can be expected to reach an equilibrium value, which is substantially lower than the late winter/early spring values.

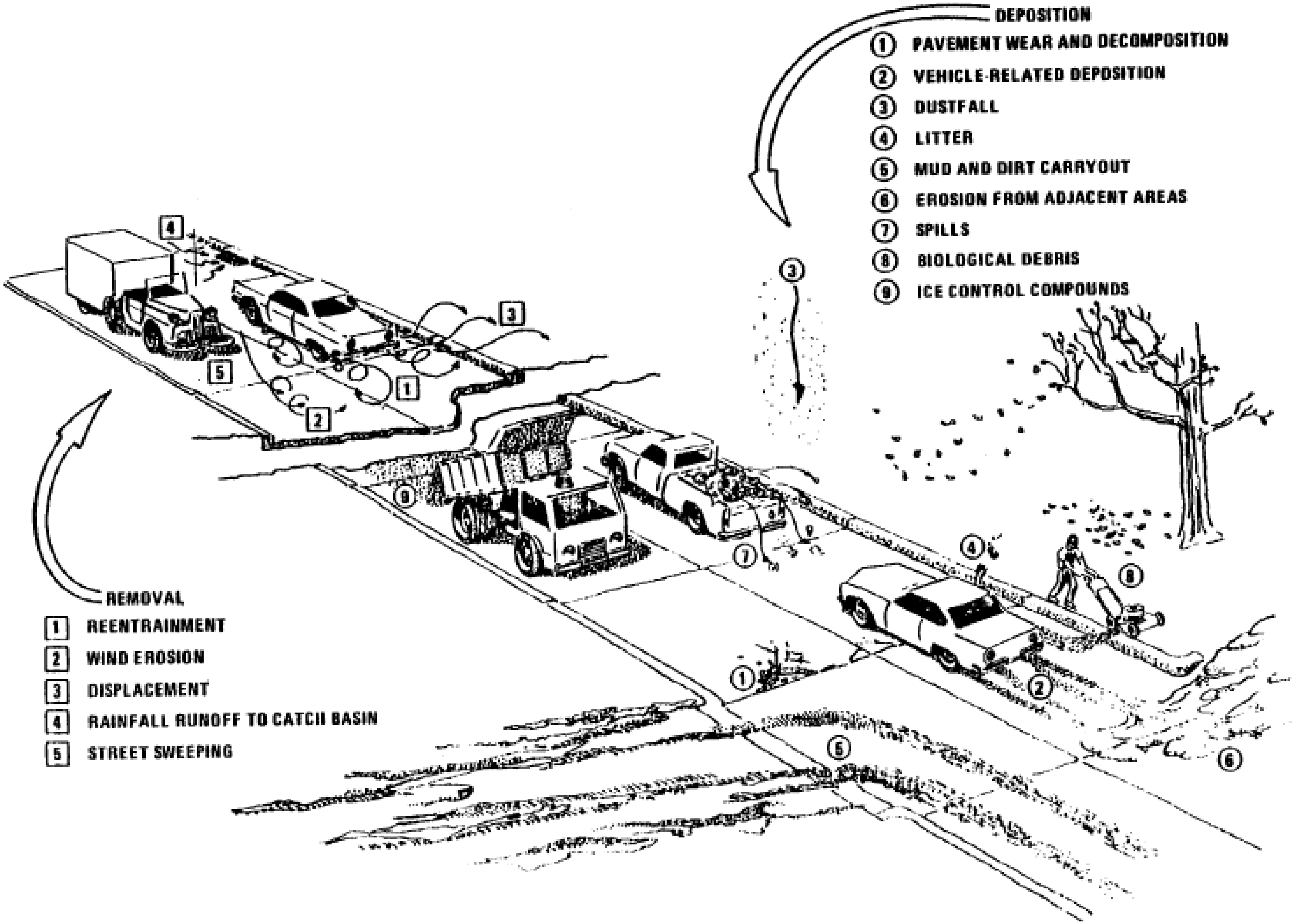

Figure 13.2.1-1. Deposition and removal processes.

13.2.1.3 Predictive Emission Factor Equations[10,29]

The quantity of particulate emissions from resuspension of loose material on the road surface due to vehicle travel on a dry paved road may be estimated using the following empirical expression:

$$E = k\ (sL)^{0.91} \times (W)^{1.02} \qquad (1)$$

where: E = particulate emission factor (having units matching the units of k),

k = particle size multiplier for particle size range and units of interest (see below),

sL = road surface silt loading (grams per square meter) (g/m^2), and

W = average weight (tons) of the vehicles traveling the road.

It is important to note that Equation 1 calls for the average weight of all vehicles traveling the road. For example, if 99 percent of traffic on the road are 2 ton cars/trucks while the remaining 1 percent consists of 20 ton trucks, then the mean weight "W" is 2.2 tons. More specifically, Equation 1 is *not* intended to be used to calculate a separate emission factor for each vehicle weight class. Instead, only one emission factor should be calculated to represent the "fleet" average weight of all vehicles traveling the road.

The particle size multiplier (k) above varies with aerodynamic size range as shown in Table 13.2.1-1. To determine particulate emissions for a specific particle size range, use the appropriate value of k shown in Table 13.2.1-1.

To obtain the total emissions factor, the emissions factors for the exhaust, brake wear and tire wear obtained from either EPA's MOBILE6.2 [27] or most recent MOVES [29] software model should be added to the emissions factor calculated from the empirical equation.

Table 13.2.1-1. PARTICLE SIZE MULTIPLIERS FOR PAVED ROAD EQUATION

Size range[a]	Particle Size Multiplier k[b]		
	g/VKT	g/VMT	lb/VMT
PM-2.5[c]	0.15	0.25	0.00054
PM-10	0.62	1.00	0.0022
PM-15	0.77	1.23	0.0027
PM-30[d]	3.23	5.24	0.011

[a] Refers to airborne particulate matter (PM-x) with an aerodynamic diameter equal to or less than x micrometers.

[b] Units shown are grams per vehicle kilometer traveled (g/VKT), grams per vehicle mile traveled (g/VMT), and pounds per vehicle mile traveled (lb/VMT). The multiplier k includes unit conversions to produce emission factors in the units shown for the indicated size range from the mixed units required in Equation 1.

[c] The k-factors for $PM_{2.5}$ were based on the average $PM_{2.5}$:PM_{10} ratio of test runs in Reference 30.

[d] PM-30 is sometimes termed "suspendable particulate" (SP) and is often used as a surrogate for TSP.

Equation 1 is based on a regression analysis of 83 tests for PM-10.[3, 5-6, 8, 27-29, 31-36] Sources tested include public paved roads, as well as controlled and uncontrolled industrial paved roads. The majority of tests involved freely flowing vehicles traveling at constant speed on relatively level roads. However, 22 tests of slow moving or "stop-and-go" traffic or vehicles under load were available for inclusion in the data base.[32-36] Engine exhaust, tire wear and break wear were subtracted from the emissions measured in the test programs prior to stepwise regression to determine Equation 1.[37, 39] The equations retain the quality rating of A (D for PM-2.5), if applied within the range of source conditions that were tested in developing the equation as follows:

Silt loading:	0.03 - 400 g/m^2 0.04 - 570 grains/square foot (ft^2)
Mean vehicle weight:	1.8 - 38 megagrams (Mg) 2.0 - 42 tons
Mean vehicle speed:	1 - 88 kilometers per hour (kph) 1 - 55 miles per hour (mph)

The upper and lower 95% confidence levels of equation 1 for PM_{10} is best described with equations using an exponents of 1.14 and 0.677 for silt loading and an exponents of 1.19 and 0.85 for weight. Users are cautioned that application of equation 1 outside of the range of variables and operating conditions specified above, e.g., application to roadways or road networks with speeds above 55 mph and average vehicle weights of 42 tons, will result in emission estimates with a higher level of uncertainty. In these situations, users are encouraged to consider an assessment of the impacts of the influence of extrapolation to the overall emissions and alternative methods that are equally or more plausible in light of local emissions data and/or ambient concentration or compositional data.

To retain the quality rating for the emission factor equation when it is applied to a specific paved road, it is necessary that reliable correction parameter values for the specific road in question be determined. With the exception of limited access roadways, which are difficult to sample, the collection and use of site-specific silt loading (sL) data for public paved road emission inventories are strongly recommended. The field and laboratory procedures for determining surface material silt content and surface dust loading are summarized in Appendices C.1 and C.2. In the event that site-specific values cannot be obtained, an appropriate value for a paved public road may be selected from the values in Table 13.2.1-2, but the quality rating of the equation should be reduced by 2 levels.

Equation 1 may be extrapolated to average uncontrolled conditions (but including natural mitigation) under the simplifying assumption that annual (or other long-term) average emissions are inversely proportional to the frequency of measurable (> 0.254 mm [0.01 inch]) precipitation by application of a precipitation correction term. The precipitation correction term can be applied on a daily or an hourly basis [26, 38].

For the daily basis, Equation 1 becomes:

$$E_{ext} = [\ k\ (sL)^{0.91} \times (W)^{1.02}\ ]\ (1 - P/4N) \qquad (2)$$

where k, sL, W, and S are as defined in Equation 1 and

E_{ext} = annual or other long-term average emission factor in the same units as k,

P = number of "wet" days with at least 0.254 mm (0.01 in) of precipitation during the averaging period, and

N = number of days in the averaging period (e.g., 365 for annual, 91 for seasonal, 30 for monthly).

Note that the assumption leading to Equation 2 is based on analogy with the approach used to develop long-term average unpaved road emission factors in Section 13.2.2. However, Equation 2 above incorporates an additional factor of "4" in the denominator to account for the fact that paved roads dry more quickly than unpaved roads and that the precipitation may not occur over the complete 24-hour day.

For the hourly basis, equation 1 becomes:

$$E_{ext} = [\ k\ (sL)^{0.91} \times (W)^{1.02}\ ]\ (1 - 1.2P/N) \qquad (3)$$

where k, sL, W, and S are as defined in Equation 1 and

E_{ext} = annual or other long-term average emission factor in the same units as k,

P = number of hours with at least 0.254 mm (0.01 in) of precipitation during the averaging period, and

N = number of hours in the averaging period (e.g., 8760 for annual, 2124 for season 720 for monthly)

Note: In the hourly moisture correction term (1-1.2P/N) for equation 3, the 1.2 multiplier is applied to account for the residual mitigative effect of moisture. For most applications, this equation will produce satisfactory results. Users should select a time interval to include sufficient "dry" hours such that a reasonable emissions averaging period is evaluated. For the special case where this equation is used to calculate emissions on an hour by hour basis, such as would be done in some emissions modeling situations, the moisture correction term should be modified so that the moisture correction "credit" is applied to the first hours following cessation of precipitation. In this special case, it is suggested that this 20% "credit" be applied on a basis of one hour credit for each hour of precipitation up to a maximum of 12 hours.

Note that the assumption leading to Equation 3 is based on analogy with the approach used to develop long-term average unpaved road emission factors in Section 13.2.2.

Figure 13.2.1-2 presents the geographical distribution of "wet" days on an annual basis for the United States. Maps showing this information on a monthly basis are available in the *Climatic Atlas of the United States*[23] . Alternative sources include other Department of Commerce publications (such as local climatological data summaries). The National Climatic Data Center (NCDC) offers several products that provide hourly precipitation data. In particular, NCDC offers *Solar and Meteorological Surface Observation Network 1961-1990* (SAMSON) CD-ROM, which contains 30 years worth of hourly meteorological data for first-order National Weather Service locations. Whatever meteorological data are used, the source of that data and the averaging period should be clearly specified.

It is emphasized that the simple assumption underlying Equations 2 and 3 has not been verified in any rigorous manner. For that reason, the quality ratings for Equations 2 and 3 should be downgraded one letter from the rating that would be applied to Equation 1.

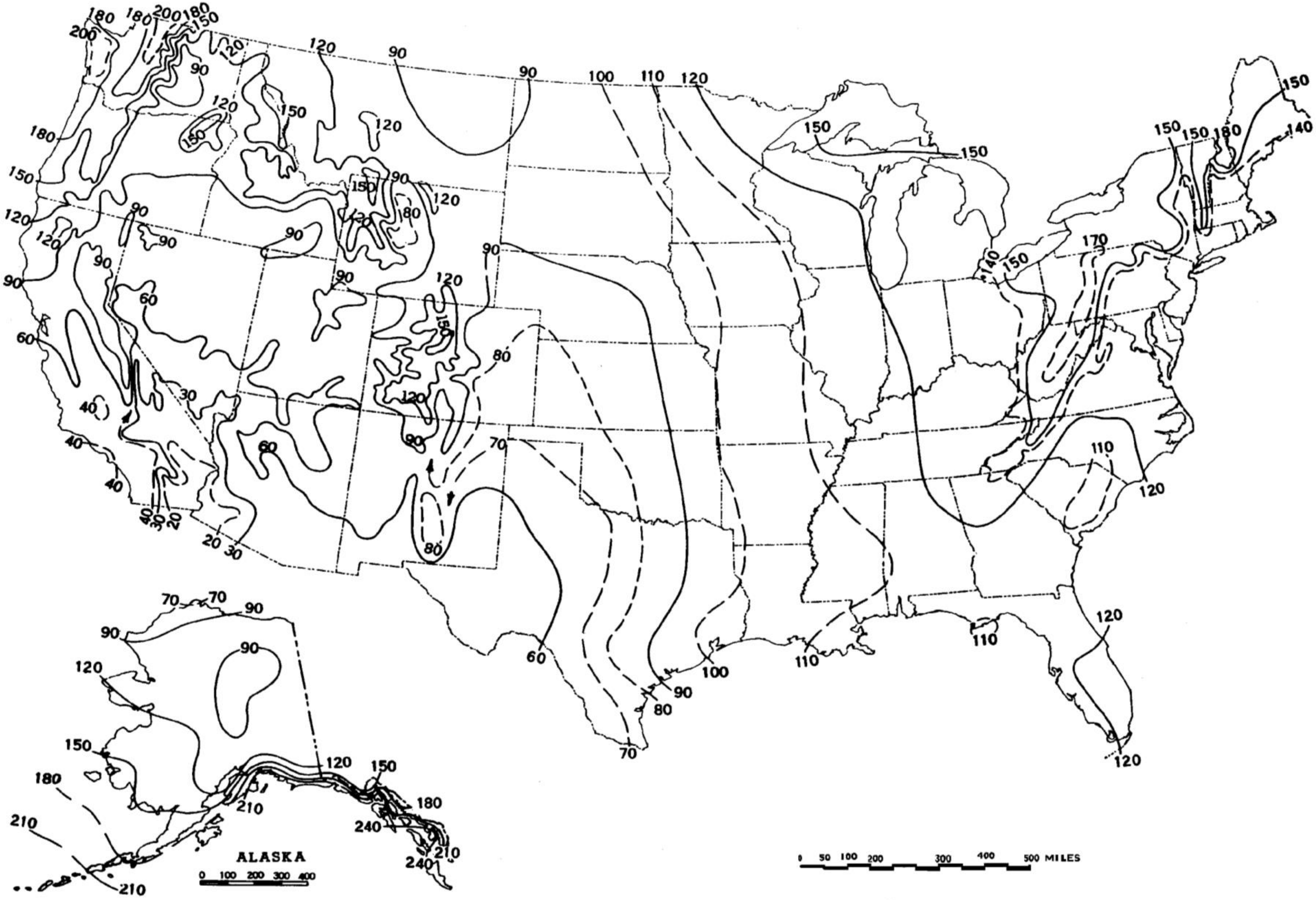

Figure 13.2.1-2. Mean number of days with 0.01 inch or more of precipitation in the United States.

Table 13.2.1-2 presents recommended default silt loadings for normal baseline conditions and for wintertime baseline conditions in areas that experience frozen precipitation with periodic application of antiskid material[24]. The winter baseline is represented as a multiple of the non-winter baseline, depending on the ADT value for the road in question. As shown, a multiplier of 4 is applied for low volume roads (< 500 ADT) to obtain a wintertime baseline silt loading of 4 X 0.6 = 2.4 g/m^2.

Table 13.2.1-2. Ubiquitous Silt Loading Default Values with Hot Spot Contributions from Anti-Skid Abrasives (g/m^2)

ADT Category	< 500	500-5,000	5,000-10,000	> 10,000
Ubiquitous Baseline g/m^2	0.6	0.2	0.06	0.03 0.015 limited access
Ubiquitous Winter Baseline Multiplier during months with frozen precipitation	X4	X3	X2	X1
Initial peak additive contribution from application of antiskid abrasive (g/m^2)	2	2	2	2
Days to return to baseline conditions (assume linear decay)	7	3	1	0.5

It is suggested that an additional (but temporary) silt loading contribution of 2 g/m^2 occurs with each application of antiskid abrasive for snow/ice control. This was determined based on a typical application rate of 500 lb per lane mile and an initial silt content of 1 % silt content. Ordinary rock salt and other chemical deicers add little to the silt loading, because most of the chemical dissolves during the snow/ice melting process.

To adjust the baseline silt loadings for mud/dirt trackout, the number of trackout points is required. It is recommended that in calculating PM$_{10}$ emissions, six additional miles of road be added for each active trackout point from an active construction site, to the paved road mileage of the specified category within the county. In calculating PM$_{2.5}$ emissions, it is recommended that three additional miles of road be added for each trackout point from an active construction site.

It is suggested the number of trackout points for activities other than road and building construction areas be related to land use. For example, in rural farming areas, each mile of paved road would have a specified number of trackout points at intersections with unpaved roads. This value could be estimated from the unpaved road density (mi/sq. mi.).

The use of a default value from Table 13.2.1-2 should be expected to yield only an order-of-magnitude estimate of the emission factor. Public paved road silt loadings are dependent upon: traffic characteristics (speed, ADT, and fraction of heavy vehicles); road characteristics (curbs, number of lanes, parking lanes); local land use (agriculture, new residential construction) and regional/seasonal factors (snow/ice controls, wind blown dust). As a result, the collection and use of site-specific silt loading data is highly recommended. In the event that default silt loading values are used, the quality ratings for the equation should be downgraded 2 levels.

Limited access roadways pose severe logistical difficulties in terms of surface sampling, and few silt loading data are available for such roads. Nevertheless, the available data do not suggest great variation in silt loading for limited access roadways from one part of the country to another. For annual conditions, a default value of 0.015 g/m^2 is recommended for limited access roadways.[9,22] Even fewer of the available data correspond to worst-case situations, and elevated loadings are observed to be quickly depleted because of high traffic speeds and high ADT rates. A default value of 0.2 g/m^2 is recommended for short periods of time following application of snow/ice controls to limited access roads.[22]

The limited data on silt loading values for industrial roads have shown as much variability as public roads. Because of the variations of traffic conditions and the use of preventive mitigative controls, the data probably do not reflect the full extent of the potential variation in silt loading on industrial roads. However, the collection of site specific silt loading data from industrial roads is easier and safer than for public roads. Therefore, the collection and use of site-specific silt loading data is preferred and is highly recommended. In the event that site-specific values cannot be obtained, an appropriate value for an industrial road may be selected from the mean values given in Table 13.2.1-3, but the quality rating of the equation should be reduced by 2 levels.

The predictive accuracy of Equation 1 requires thorough on-site characterization of road silt loading. Road surface sampling is time-consuming and potentially hazardous because of the need to block traffic lanes. In addition, large number of samples is required to represent spatial and temporal variations across roadway networks. Mobile monitoring is a new alternative silt loading or road dust emission characterization method for either paved or unpaved roads. It utilizes a test vehicle that generates and monitors its own dust plume concentration (mass basis) at a fixed sampling probe location. A calibration factor is needed for each mobile monitoring configuration (test vehicle and sampling system), to convert the relative dust emission intensity to an equivalent silt loading or emission factor. Typically, portable continuous particle concentration monitors do not comply with Federal Reference Method (FRM) standards. Therefore, a controlled study must be performed to correlate the portable monitor response to the road silt loading or size specific particle concentration measured with an approved FRM sampling system. In the calibration tests, multiple test conditions should be performed to provide an average correlation with known precision and to accommodate variations in road silt loading, vehicle speed, road dust characteristics and other road conditions that may influence mobile monitoring measurements or emissions characteristics. Because the paved road dust emissions are also dependent on the average vehicle weight for the road segment, it is important that the weight of the test vehicle correspond closely to the average vehicle weight for the road segment or be adjusted using the average vehicle weight relationship in Equation 1. In summary, it is believed that the Mobile Monitoring Method will provide improved capabilities to provide reliable temporally and spatially resolved silt loading or emissions factors with increased coverage, improved safety, reduced traffic interference and decreased cost.[40, 41, 42]

Table 13.2.1-3 (Metric And English Units). TYPICAL SILT CONTENT AND LOADING VALUES FOR PAVED ROADS AT INDUSTRIAL FACILITIES [a]

Industry	No. of Sites	No. Of Samples	Silt Content (%)		No. of Travel Lanes	Total Loading x 10^{-3}			Silt Loading (g/m^2)	
			Range	Mean		Range	Mean	Units[b]	Range	Mean
Copper smelting	1	3	15.4-21.7	19.0	2	12.9 - 19.5 45.8 - 69.2	15.9 55.4	kg/km lb/mi	188-400	292
Iron and steel production	9	48	1.1-35.7	12.5	2	0.006 - 4.77 0.020 -16.9	0.495 1.75	kg/km lb/mi	0.09-79	9.7
Asphalt batching	1	3	2.6 - 4.6	3.3	1	12.1 - 18.0 43.0 - 64.0	14.9 52.8	kg/km lb/mi	76-193	120
Concrete batching	1	3	5.2 - 6.0	5.5	2	1.4 - 1.8 5.0 - 6.4	1.7 5.9	kg/km lb/mi	11-12	12
Sand and gravel processing	1	3	6.4 - 7.9	7.1	1	2.8 - 5.5 9.9 - 19.4	3.8 13.3	kg/km lb/mi	53-95	70
Municipal solid waste landfill	2	7		-	2	-			1.1-32.0	7.4
Quarry	1	6		-	2	-			2.4-14	8.2
Corn wet mills	3	15		-	2	-			0.05 – 2.9	1.1

[a] References 1-2,5-6,11-13. Values represent samples collected from *industrial* roads. Public road silt loading values are presented in Table-13.2.1-2. Dashes indicate information not available. [b] Multiply entries by 1000 to obtain stated units; kilograms per kilometer (kg/km) and pounds per mile (lb/mi).

13.2.1.4 Controls[6,25]

Because of the importance of the silt loading, control techniques for paved roads attempt either to prevent material from being deposited onto the surface (preventive controls) or to remove from the travel lanes any material that has been deposited (mitigative controls). Covering of loads in trucks, and the paving of access areas to unpaved lots or construction sites, are examples of preventive measures. Examples of mitigative controls include vacuum sweeping, water flushing, and broom sweeping and flushing. Actual control efficiencies for any - of these techniques can be highly variable. Locally measured silt loadings before and after the application of controls is the preferred method to evaluate controls. It is particularly important to note that street sweeping of gutters and curb areas may actually increase the silt loading on the traveled portion of the road. Redistribution of loose material onto the travel lanes will actually produce a short-term increase in the emissions.

In general, preventive controls are usually more cost effective than mitigative controls. The cost-effectiveness of mitigative controls falls off dramatically as the size of an area to be treated increases. The cost-effectiveness of mitigative measures is also unfavorable if only a short period of time is required for the road to return to equilibrium silt loading condition. That is to say, the number and length of public roads within most areas of interest preclude any widespread and routine use of mitigative controls. On the other hand, because of the more limited scope of roads at an industrial site, mitigative measures may be used quite successfully (especially in situations where truck spillage occurs). Note, however, that public agencies could make effective use of mitigative controls to remove sand/salt from roads after the winter ends.

Because available controls will affect the silt loading, controlled emission factors may be obtained by substituting controlled silt loading values into the equation. (Emission factors from controlled industrial roads were used in the development of the equation.) The collection of surface loading samples from treated, as well as baseline (untreated), roads provides a means to track effectiveness of the controls over time. The use of Mobile Monitoring Methodologies provide an improved means to track progress in controlling silt loading values.

13.2.1.5 Changes since Fifth Edition

The following changes were made since the publication of the Fifth Edition of AP-42:

October 2002

1) The particle size multiplier for $PM_{2.5}$ was revised to 25% of PM_{10}. The approximately 55% reduction was a result of emission testing using FRM monitors. The monitoring was specifically intended to evaluate the PM-2.5 component of the emissions.

2) Default silt loading values were included in Table 13.2.1-2 replacing the Tables and Figures containing silt loading statistical information.

3) Editorial changes within the text were made indicating the possible causes of variations in the silt loading between roads within and among different locations. The uncertainty of using the default silt loading value was discussed.

4) Section 13.2.1.1 was revised to clarify the role of dust loading in resuspension. Additional minor text changes were made.

5) Equations 2 and 3, Figure 13.2.1-2, and text were added to incorporate natural mitigation into annual or other long-term average emission factors.

December 2003

1) The emission factor equation was adjusted to remove the component of particulate emissions- from exhaust, brake wear, and tire wear. A parameter C representing these emissions was included in the predictive equation. The parameter C varied with aerodynamic size range of the particulate matter. Table 13.2.1-2 was added to present the new coefficients.

2) The default silt loading values in Table 13.2.1-3 were revised to incorporate the results from a recent analysis of silt loading data.

November 2006

1) The $PM_{2.5}$ particle size multiplier was revised to 15% of PM_{10} as the result of wind tunnel studies of a variety of dust emitting surface materials.

2) References were rearranged and renumbered.

January 2011

1) The empirical predictive equation was revised. The revision is based upon stepwise regression of 83 profile emissions tests and an adjustment of individual test data for the exhaust; break wear and tire wear emissions prior to regression of the data.

2) The C term is removed from the empirical predictive equation and Table 13.2.1-2 with the C term values is removed since the exhaust; break wear and tire wear emissions were no longer part of the regressed data.

3) The $PM_{2.5}$ particle size multiplier was revised to 25% of PM_{10} since the PM_{10} test data used to develop the equation did not meet the necessary PM_{10} concentrations for a ratio of 15%.

4) The lower speed of the vehicle speed range supported by the empirical predictive equation was revised to 1 mph.

5) Information was added on an improved methodology to develop spatially and temporally resolved silt loadings or emissions factors by Mobile Monitoring Methodologies.

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13.5 Industrial Flares

13.5.1 General

Flaring is a high-temperature oxidation process used to burn combustible components, mostly hydrocarbons, of waste gases from industrial operations. Natural gas, propane, ethylene, propylene, butadiene and butane constitute over 95 percent of the waste gases flared. In combustion, gaseous hydrocarbons react with atmospheric oxygen to form carbon dioxide (CO_2) and water. In some waste gases, carbon monoxide (CO) is the major combustible component. Presented below, as an example, is the combustion reaction of propane.

$$C_3H_8 + 5\ O_2 \rightarrow 3\ CO_2 + 4\ H_2O$$

During a combustion reaction, several intermediate products are formed, and eventually, most are converted to CO_2 and water. Some quantities of stable intermediate products such as carbon monoxide, hydrogen, and hydrocarbons will escape as emissions.

Flares are used extensively to dispose of (1) purged and wasted products from refineries, (2) unrecoverable gases emerging with oil from oil wells, (3) vented gases from blast furnaces, (4) unused gases from coke ovens, and (5) gaseous wastes from chemical industries. Gases flared from refineries, petroleum production, chemical industries, and to some extent, from coke ovens, are composed largely of low molecular weight hydrocarbons with high heating value. Blast furnace flare gases are largely of inert species and CO, with low heating value. Flares are also used for burning waste gases generated by sewage digesters, coal gasification, rocket engine testing, nuclear power plants with sodium/water heat exchangers, heavy water plants, and ammonia fertilizer plants.

There are two types of flares, elevated and ground flares. Elevated flares, the more common type, have larger capacities than ground flares. In elevated flares, a waste gas stream is fed through a stack anywhere from 10 to over 100 meters tall and is combusted at the tip of the stack. The flame is exposed to atmospheric disturbances such as wind and precipitation. In ground flares, combustion takes place at ground level and is almost always unassisted. Ground flares vary in complexity, and they may consist either of conventional flare burners with no enclosures or of multiple burners in refractory-lined steel enclosures. Ground flares may also be known as shielded flares.[a] Ground flares should not be mistaken for thermal oxidizers or incinerators. Ground flares operate under the same principals as elevated flares and combustion is achieved through the natural draft of combustion air. Thermal oxidizers and incinerators have combustion air blowers and can be tuned to control combustion chamber temperature, thereby allowing for more effective combustion control.

The typical flare system consists of (1) a gas collection header and piping for collecting gases from processing units, (2) a knockout drum (disentrainment drum) to remove and store condensables and entrained liquids, (3) a proprietary seal, water seal, or purge gas supply to prevent flash-back, (4) a single- or multiple-burner unit and a flare stack, (5) gas pilots and an ignitor to ignite the mixture of waste gas and air, and, if required, (6) a provision for external momentum force (steam injection or forced air) for

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[a] For the purposes of 40 CFR part 60 subparts OOOO and OOOOa and 40 CFR part 63 subparts HH and HHH, these units are not considered flares. The definition of flare in these subparts specifically exclude these units. In these subparts, a flare is defined as a thermal oxidation system using an open flame (without enclosure). Under these subparts, these units are considered combustion devices that must be field-tested. Alternatively, a unit tested by a manufacturer may be installed.

smokeless flaring. Natural gas, fuel gas, inert gas, or nitrogen can be used as purge gas. Figure 13.5-1 is a diagram of a typical steam-assisted elevated smokeless flare system.

Combustion requires three ingredients: fuel, an oxidizing agent (typically oxygen in air), and heat (or ignition source). Flares typically operate with pilot flames to provide the ignition source, and they use ambient air as the oxidizing agent. The waste gases to be flared typically provide the fuel necessary for combustion. Combustible gases generally have an upper and lower flammability limit. The upper flammability limit (UFL) is the highest concentration of a gas in air that is capable of burning. Above this flammability limit, the fuel is too rich to burn. The lower flammability limit (LFL) is the lowest concentration of the gas in air that is capable of burning. Below the LFL, the fuel is too lean to burn. Between the upper and lower flammability limits, combustion can occur. Flare waste gases with concentrations above the UFL will become more dilute as the waste gas mixes with ambient air above the flare tip. As this dilution occurs, the air-waste gas mixture will pass through the flammability region, and combustion will occur. However, if flare waste gas concentrations are near the LFL prior to mixing with air, the air-waste gas mixture can fall below the flammability region, and reduced combustion efficiencies can occur. If steam is added to the flare waste gas at or prior to the flare tip (i.e., prior to the "combustion zone" where the mixing with air occurs), the steam will act to dilute the waste gas. Thus, even if there are adequate concentrations of combustibles in the waste gas, if too much steam is added to the waste gas so that the combustibles concentration becomes diluted to near the LFL as the steam-waste gas mixture enters the combustion zone, reduced combustion efficiencies will result. Consequently, critical considerations of flare combustion include the net heating value and the combustibles concentration in the flare gas and in the combustion zone (e.g., accounting for the amount of dilution by steam or other assist gas that occurs to the waste gas prior to the combustion zone).

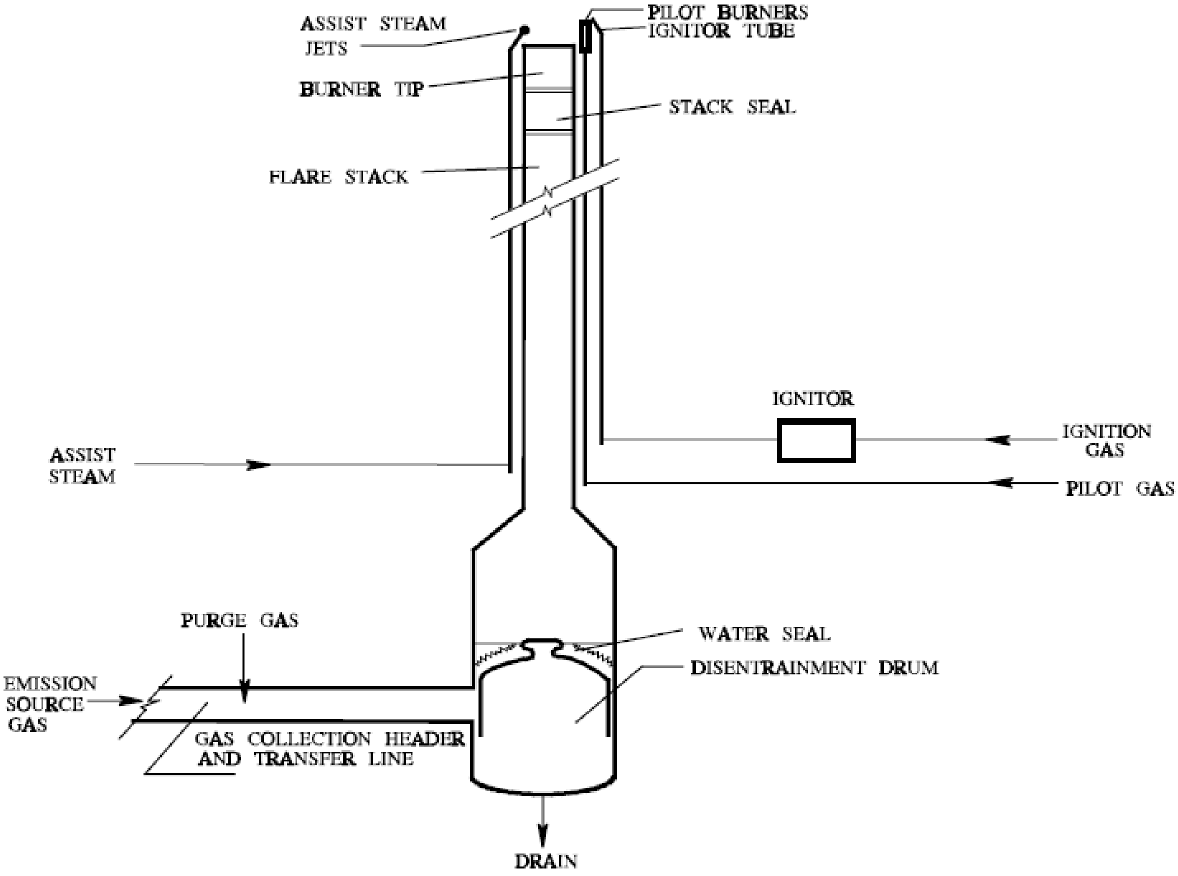

Figure 13.5-1. Diagram of a typical steam-assisted smokeless elevated flare.

Combustion efficiency is the percentage of hydrocarbon in the flare vent gas that is completely converted to CO_2 and water vapor. Destruction efficiency is the percentage of a specific pollutant in the flare vent gas that is converted to a different compound (such as CO_2, CO or other hydrocarbon intermediate). The destruction efficiency of a flare will always be greater than the combustion efficiency of a flare. It is generally estimated that a combustion efficiency of 96.5 percent is equivalent to a destruction efficiency of 98 percent.[10]

Smoking may result from combustion, depending upon waste gas components and the quantity and distribution of combustion air. Waste gases containing methane, hydrogen, CO, and ammonia usually burn without smoke. Waste gases containing heavy hydrocarbons such as paraffins above methane, olefins, and aromatics, have a higher tendency to smoke. An external momentum force, such as steam injection or blowing air, is used for efficient air/waste gas mixing and turbulence, which promotes smokeless flaring of heavy hydrocarbon waste gas. Other external forces may be used for this purpose, including water spray, high velocity vortex action, or natural gas. External momentum force is rarely required in ground flares.

Steam injection is accomplished either by nozzles on an external ring around the top of the flare tip or by a single nozzle located concentrically within the tip. At installations where waste gas flow varies, both are used. The internal nozzle provides steam at low waste gas flow rates, and the external jets are used with large waste gas flow rates. Several other special-purpose flare tips are commercially available, one of which is for injecting both steam and air.

Flares are generally designed to handle large quantities of waste gases that may be intermittently generated during plant emergencies, although they may also be used routinely to dispose of low-volume continuous or intermittent emissions from various sources at the plant. Flare gas volumes can vary from a few cubic meters per hour during regular operations up to several thousand cubic meters per hour during major upsets. Flow rates at a refinery could be 45 to 90 kilograms per hour (kg/hr) (100 - 200 pounds per hour [lb/hr]) during regular operation but could reach a full plant emergency rate of 700 megagrams per hour (Mg/hr) (750 tons/hr). Normal process blowdowns may release 450 to 900 kg/hr (1000 - 2000 lb/hr), and unit maintenance or minor failures may release 25 to 35 Mg/hr (27 - 39 tons/hr). Thus, the required flare turndown ratio can be over 15,000 to 1.

Many plants have 2 or more flares, in parallel or in series. In the former, 1 flare can be shut down for maintenance while the other serves the system. In systems of flares in series, 1 flare is intended to handle regular gas volumes and the other flare is generally intended to handle excess gas flows from emergencies.

13.5.2 Emissions

Noise, heat, and visible flame and/or smoke are the most apparent undesirable effects of flare operation. Flares are usually located away from populated areas or are sufficiently isolated, thus minimizing their effects on populations. Because the flame in a ground flare is generally not visible, and they reduce noise and thermal radiation to the surrounding area, these flares are common in populated areas. Emissions from flaring may include carbon particles (soot), unburned hydrocarbons, CO, and partially burned and altered hydrocarbons. Also emitted are nitrogen oxides (NO_x) and, if sulfur-containing material such as hydrogen sulfide or mercaptans is flared, sulfur dioxide (SO_2). The quantities of hydrocarbon emissions generated relate to the degree of combustion. The degree of combustion depends largely on the rate and extent of fuel-air mixing and on the flame temperatures achieved and maintained. Properly operated flares achieve at least 98 percent destruction efficiency in the flare plume, meaning that hydrocarbon emissions amount to less than 2 percent of the hydrocarbons in the gas stream.

The tendency of a fuel to smoke or make soot is influenced by fuel characteristics and by the amount and distribution of oxygen in the combustion zone. For complete combustion, at least the stoichiometric amount of oxygen must be provided in the combustion zone. The theoretical amount of oxygen required increases with the molecular weight of the gas burned. The oxygen supplied as air ranges from 9.6 units of air per unit of methane to 38.3 units of air per unit of pentane, by volume. Air is supplied to the flame as primary air and secondary air. Primary air is mixed with the gas before combustion, whereas secondary air is drawn into the flame. For smokeless combustion, sufficient primary air must be supplied, this varying from about 20 percent of stoichiometric air for a paraffin to about 30 percent for an olefin. If the amount of primary air is insufficient, the gases entering the base of the flame are preheated by the combustion zone, and larger hydrocarbon molecules crack to form hydrogen, unsaturated hydrocarbons, and carbon. The carbon particles may escape further combustion and cool down to form soot or smoke. Olefins and other unsaturated hydrocarbons may polymerize to form larger molecules which crack, in turn forming more carbon.

The fuel characteristics influencing soot formation include the carbon-to-hydrogen (C-to-H) ratio and the molecular structure of the gases to be burned. All hydrocarbons above methane, i. e., those with a C-to-H ratio of greater than 0.33, tend to soot. Branched chain paraffins smoke more readily than corresponding normal isomers. The more highly branched the paraffin, the greater the tendency to smoke. Unsaturated hydrocarbons tend more toward soot formation than do saturated ones. Soot is eliminated by adding steam or air; hence, most industrial flares are steam-assisted and some are air-assisted. Flare gas composition is a critical factor in determining the amount of steam necessary.

Since elevated flares do not lend themselves to conventional emission testing techniques, until recently only a few attempts have been made to characterize elevated flare emissions. Early EPA tests using propylene as flare gas indicated that efficiencies of 98 percent can be achieved when burning an offgas with at least 11,200 kJ/m^3 (300 Btu/ft^3).[1] However, recent studies on flare performance using passive Fourier Transform Infrared (pFTIR) spectroscopy have been performed on a number of different flares. [4-8] The studies cover a number of flares at refineries, chemical plants and flare test facilities with varying waste gas compositions. The pFTIR studies support the conclusion that the combustion zone properties of the steam-waste gas mixture are predictive of proper flare combustion.[10] There have also been recent studies on sources, including flares, using differential infrared absorption LIDAR [light detection and ranging] (DIAL). To date, many of these studies do not provide the data necessary to isolate the emissions from a particular flare. But enough data existed in one study that the emissions measured by DIAL could be attributed to the flare.[9] For flares operated at petroleum refineries, EPA has determined that the net heating value of the gas in the combustion zone of the flare should be greater than or equal to 270 Btu/ft^3 to obtain a destruction efficiency of at least 98%.[b]

Table 13.5-1 presents flare emissions factors from the EPA tests[1]; Table 13.5-2 presents flare emissions factors from pFTIR and DIAL studies.[4-9] Crude propylene was used as flare gas during the early EPA tests. Methane was a major fraction of hydrocarbons in the flare emissions, and acetylene was the dominant intermediate hydrocarbon species. Many other reports on flares indicate that acetylene is always formed as a stable intermediate product. The acetylene formed in the combustion reactions may react further with hydrocarbon radicals to form polyacetylenes followed by polycyclic hydrocarbons.[2] Typical refinery waste gas feeds were used as flare gas during the pFTIR and DIAL studies.

In flaring waste gases containing no nitrogen compounds, NO is formed either by the fixation of atmospheric nitrogen (N) with oxygen (O) or by the reaction between the hydrocarbon radicals present in

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[b] See Petroleum Refinery Sector Risk and Technology Review and New Source Performance Standards Final Rule, December 1, 2015 (80 FR 75183). Net heating value of the combustion zone is determined on a 15-minute average, and refinery owners and operators may use a corrected heat content for hydrogen when determining the combustion zone heat value.

the combustion products and atmospheric nitrogen, by way of the intermediate stages, HCN, CN, and OCN.[2] Sulfur compounds contained in a flare gas stream are converted to SO_2 when burned. The amount of SO_2 emitted depends directly on the quantity of sulfur in the flared gases.

With the promulgation of the New Source Performance Standards for Crude Oil and Natural Gas Production, Transmission, and Distribution, EPA developed a manufacturer testing program for combustion control devices. These units are generally equivalent to enclosed ground flares, although they are explicitly excluded from the definition of flare in those subpart (see footnote a to this section). The manufacturer testing program requires performance testing be conducted using pure propylene under four different test conditions. Emissions data from these manufacturer tests have been used to develop emissions factors for enclosed ground flares. Because the factors are representative of enclosed ground flares burning propylene, the factors are included in Table 13.5-1, which are the flare factors developed from the EPA testing of elevated flares using crude propylene. Two factors are representative of enclosed ground flares operating at a low percent load, and two factors are representative of enclosed ground flares operating at a normal to high percent load.[c]

Additionally, the Oil and Gas sector rules, as well as some state programs, are requiring more testing for these types of units in the field. As a result, emissions data are available from enclosed ground flares burning field gas. Table 13.5-3 presents two enclosed ground flare emissions factors for total hydrocarbons (THC) applicable to natural gas production.

Table 13.5-4 presents the description of the source classification codes (SCCs) to which the emissions factors in Tables 13.5-1 through 13.5-3 are applicable.

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[c] Because it is possible to test enclosed ground flares, the EPA recommends testing sources and using site-specific data in lieu of emissions factors whenever possible.

Table 13.5-1 (English Units). THC, NOx AND SOOT EMISSIONS FACTORS FOR FLARE OPERATIONS FOR CERTAIN CHEMICAL MANUFACTURING PROCESSES[a]

Pollutant	SCC[e]	Emissions Factor Value	Emissions Factor Units	Grade or Representativeness
THC, elevated flares[c]	30190099; 30119701; 30119705; 30119709; 30119741	0.14[b,f]	lb/10^6 Btu	B
THC, enclosed ground flares[g,h] Low Percent Load[i]		8.37[j] or 3.88e-3[f]	lb/10^6 scf gas burned lb/10^6 Btu heat input	Moderately
THC, enclosed ground flares[g,h] Normal to High Percent Load[i]		2.56[j] or 1.20e-3[f]	lb/10^6 scf gas burned lb/10^6 Btu heat input	Moderately
Nitrogen oxides, elevated flares[d]		0.068[b,k]	lb/10^6 Btu	B
Soot, elevated flares[d]		0 – 274[b]	µg/L	B

[a] All of the emissions factors in this table represent the emissions exiting the flare. Since the flare is not the originating source of the THC emissions, but rather the device controlling these pollutants routed from a process at the facility, the emissions factors are representative of controlled emissions rates for THC. These values are not representative of the uncontrolled THC routed to the flare from the associated process, and as such, they may not be appropriate for estimating the uncontrolled THC emissions or potential to emit from the associated process.

[b] Reference 1. Based on tests using crude propylene containing 80% propylene and 20% propane.

[c] Measured as methane equivalent. The THC emissions factor may not be appropriate for reporting volatile organic compounds (VOC) emissions when a VOC emissions factor exists.

[d] Soot in concentration values: nonsmoking flares, 0 micrograms per liter (µg/L); lightly smoking flares, 40 µg/L; average smoking flares, 177 µg/L; and heavily smoking flares, 274 µg/L.

[e] See Table 13.5-4 for a description of these SCCs.

[f] Factor developed using the lower (net) heating value of the vent gas.

[g] THC measured as propane by US EPA Method 25A.

[h] These factors apply to well operated ground flares achieving at least 98% destruction efficiency and operating in compliance with the current General Provisions requirements of 40 CFR Part 60, i.e. >200 btu/scf net heating value in the vent gas and less than the specified maximum exit velocity. The emissions factor data set had an average destruction efficiency of 99.99%. Based on tests using pure propylene fuel. References 12 through 33 and 39 through 45.

[i] The dataset for these tests were broken into four different test conditions: ramping back and forth between 0 and 30% of load; ramping back and forth between 30% and 70% of load; ramping back and forth between 70% and 100% of load; and a fixed rate maximum load condition. Analyses determined that only the first condition was statistically different. Low percent load is represented by a unit operating at approximately less than 30% of maximum load.

[j] Heat input is an appropriate basis for combustion emissions factor. However, based on available data, heat input data is not always known, but gas flowrate is generally available. Therefore, the emissions factor is presented in two different forms.

[k] Factor developed using the higher (gross) heating value of the vent gas.

Table 13.5-2 (English Units). VOC and CO EMISSIONS FACTORS FOR ELEVATED FLARE OPERATIONS FOR CERTAIN REFINERY AND CHEMICAL MANUFACTURING PROCESSES[a,b]

Pollutant	SCC[e]	Emissions Factor (lb/10^6 Btu)[f]	Representativeness
Volatile organic compounds[c]	30190099; 30600904; 30119701; 30119705; 30119709; 30119741; 30119799; 30130115; 30600201; 30600401; 30600508; 30600903; 30600999; 30601701; 30601801; 30688801; 40600240	0.66	Poorly
Carbon monoxide[d]		0.31	Poorly

[a] The emissions factors in this table represent the emissions exiting the flare. Since the flare is not the originating source of the VOC emissions, but rather the device controlling these pollutants routed from a process at the facility, the emissions factor is representative of controlled emissions rates for VOC. This values is not representative of the uncontrolled VOC routed to the flare from the associated process, and as such, it may not be appropriate for estimating the uncontrolled VOC emissions or potential to emit from the associated process.

[b] These factors apply to well operated flares achieving at least 98% destruction efficiency and operating in compliance with the current General Provisions requirements of 40 CFR Part 60, i.e. >300 btu/scf net heating value in the vent gas and less than the specified maximum flare tip velocity. The VOC emissions factor data set had an average destruction efficiency of 98.9%, and the CO emissions factor data set had an average destruction efficiency of 99.1% (based on test reports where destruction efficiency was provided). These factors are based on steam-assisted and air-assisted flares burning a variety of vent gases.

[c] References 4 through 9 and 11.

[d] References 1, 4 through 8, and 11.

[e] See Table 13.5-4 for a description of these SCCs.

[f] Factor developed using the lower (net) heating value of the vent gas.

Table 13.5-3 (English Units). THC EMISSIONS FACTOR FOR ENCLOSED GROUND FLARES AT NATURAL GAS PRODUCTION SITES[a]

Pollutant	SCC[e]	Emissions Factor[f]	Representativeness
THC[b,c,d]	31000205 31000212 31000227	332 lb/10^6 scf gas burned or 0.335 lb/10^6 Btu heat input[g]	Poorly

[a] The emissions factor in this table represents the emissions exiting the flare. Since the flare is not the originating source of the THC emissions, but rather the device controlling these pollutants routed from a process at the facility, the emissions factor is representative of controlled emissions rates for THC. This value is not representative of the uncontrolled THC routed to the flare from the associated process, and as such, it may not be appropriate for estimating the uncontrolled THC emissions or potential to emit from the associated process.

[b] THC measured as propane by US EPA Method 25A.

[c] These factors apply to well operated flares achieving at least 95% destruction efficiency, as required by the Oil and Gas sector rules in 40 CFR parts 60 and 63. Although the Oil and Gas sector rules in parts 60 and 63 do not require ground flares to operate in compliance with the current General Provisions requirements of 40 CFR Part 60 or 63, i.e. >200 btu/scf net heating value in the vent gas and less than the specified maximum exit velocity, the reference flares do meet these requirements. The emissions factor data set had an average destruction efficiency of 99.33% for the gas volume basis and an average destruction efficiency of 99.23% for the heat input basis. Based on tests using natural gas production field gas, e.g. tank vents, dehydrator vents. References 32 through 38.

[d] For enclosed ground flares with the SCCs specified in this table, the EPA recommends the use of this THC emissions factor instead of the VOC emissions factor in WebFIRE, as background documentation for this new emissions factor is available and the factor is based on field data from similar units.

[e] See Table 13.5-4 for a description of these SCCs. For the purposes of 40 CFR part 60 subparts OOOO and OOOOa and 40 CFR part 63 subparts HH and HHH, these units are not considered flares. The definition of flare in these subparts specifically exclude these units. In these subparts, a flare is defined as a thermal oxidation system using an open flame (without enclosure).

[f] Heat input is an appropriate basis for combustion emissions factor. However, based on available data, heat input data is not always known, but gas flowrate is generally available. Additionally, based on the available reports, there was a more robust dataset to develop an emissions factor on a gas volume basis. Therefore, the emissions factor is presented in two different forms.

[g] Factor developed using the lower (net) heating value of the vent gas.

Table 13.5-4. SCC Descriptions

SCC	Level 1 Description	Level 2 Description	Level 3 Description	Level 4 Description
30600903	Industrial Processes	Petroleum Industry	Flares	Natural Gas
30600904	Industrial Processes	Petroleum Industry	Flares	Process Gas
30190099	Industrial Processes	Chemical Manufacturing	Fuel Fired Equipment	User Specified
30600999	Industrial Processes	Petroleum Industry	Flares	Not Classified
30600201	Industrial Processes	Petroleum Industry	Catalytic Cracking Units	Fluid Catalytic Cracking Unit
30130115	Industrial Processes	Chemical Manufacturing	Chlorobenzene	Atmospheric Distillation Vents
30688801	Industrial Processes	Petroleum Industry	Fugitive Emissions	User Specified
30600401	Industrial Processes	Petroleum Industry	Blowdown Systems	Blowdown System with Vapor Recovery System with Flaring
30601801	Industrial Processes	Petroleum Industry	Hydrogen Generation Unit	General
30601701	Industrial Processes	Petroleum Industry	Catalytic Hydrotreating Unit	General
30600508	Industrial Processes	Petroleum Industry	Wastewater Treatment	Oil/Water Separator
40600240	Petroleum and Solvent Evaporation	Transportation and Marketing of Petroleum Products	Marine Vessels	Gasoline: Barge Loading - Average Tank Condition
30119701	Industrial Processes	Chemical Manufacturing	Butylene, Ethylene, Propylene, Olefin Production	Ethylene: General
30119741	Industrial Processes	Chemical Manufacturing	Butylene, Ethylene, Propylene, Olefin Production	Ethylene: Flue Gas Vent
30119705	Industrial Processes	Chemical Manufacturing	Butylene, Ethylene, Propylene, Olefin Production	Propylene: General
30119709	Industrial Processes	Chemical Manufacturing	Butylene, Ethylene, Propylene, Olefin Production	Propylene: Fugitive Emissions
30119799	Industrial Processes	Chemical Manufacturing	Butylene, Ethylene, Propylene, Olefin Production	Other Not Classified
31000205	Industrial Processes	Oil and Gas Production	Natural Gas Production	Flares
31000212	Industrial Processes	Oil and Gas Production	Natural Gas Production	Condensate Storage Tank
31000227	Industrial Processes	Oil and Gas Production	Natural Gas Production	Glycol Dehydrator Reboiler Still Stack

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Flares Specifications

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FY 2003 MISCELLANEOUS PLANT IMPROVEMENTS

ALBUQUERQUE, NM

INSTALLATION, OPERATION AND MAINTENANCE MANUAL

REFERENCE	
SUBMITTAL DATE:	August 14, 2009
ESTIMATED DELIVERY:	14 – 16 weeks after receipt of approved drawings

CONTRACTOR:	Bradbury Stamm Construction, Inc. PO# 0905-13484-M Project 0905
MANUFACTURER:	Varec Biogas
VAREC BIOGAS REFERENCE NO.:	16675

LOCAL SALES REPRESENTATIVE:	Columbine Controls Company.
ADDRESS:	7390 South Fraser Street, Unit D Centennial, CO 80112
TELEPHONE NO.:	303-680-0775
FAX NO:	303-680-0797
CONTACT:	Ron Daggett

Varec
BIOGAS

VAREC BIOGAS

244W Series

244WS Option
Waste Gas Burner With Automatic Pilot Ignition System

INSTRUCTION, OPERATION AND MAINTENANCE MANUAL

TABLE OF CONTENTS

1.6 SPECIFICATION

1.6.1 Burner

The burner assembly mounts on a mating flange (supplied by others) and is self-supporting. The assembly includes:

a. Burner
b. Continuous pilot nozzle complete with thermowell and thermocouple
c. Flame retention nozzle
d. Burner shroud.

Refer to the 244WS Waste Gas Burner Stack Assembly drawing provided in Section 9 of this manual.

1.6.2 Burning Capacity

For gas having specific gravity 0.8 with 0.5" W.C. pressure drop between inlet flange and burner tip.

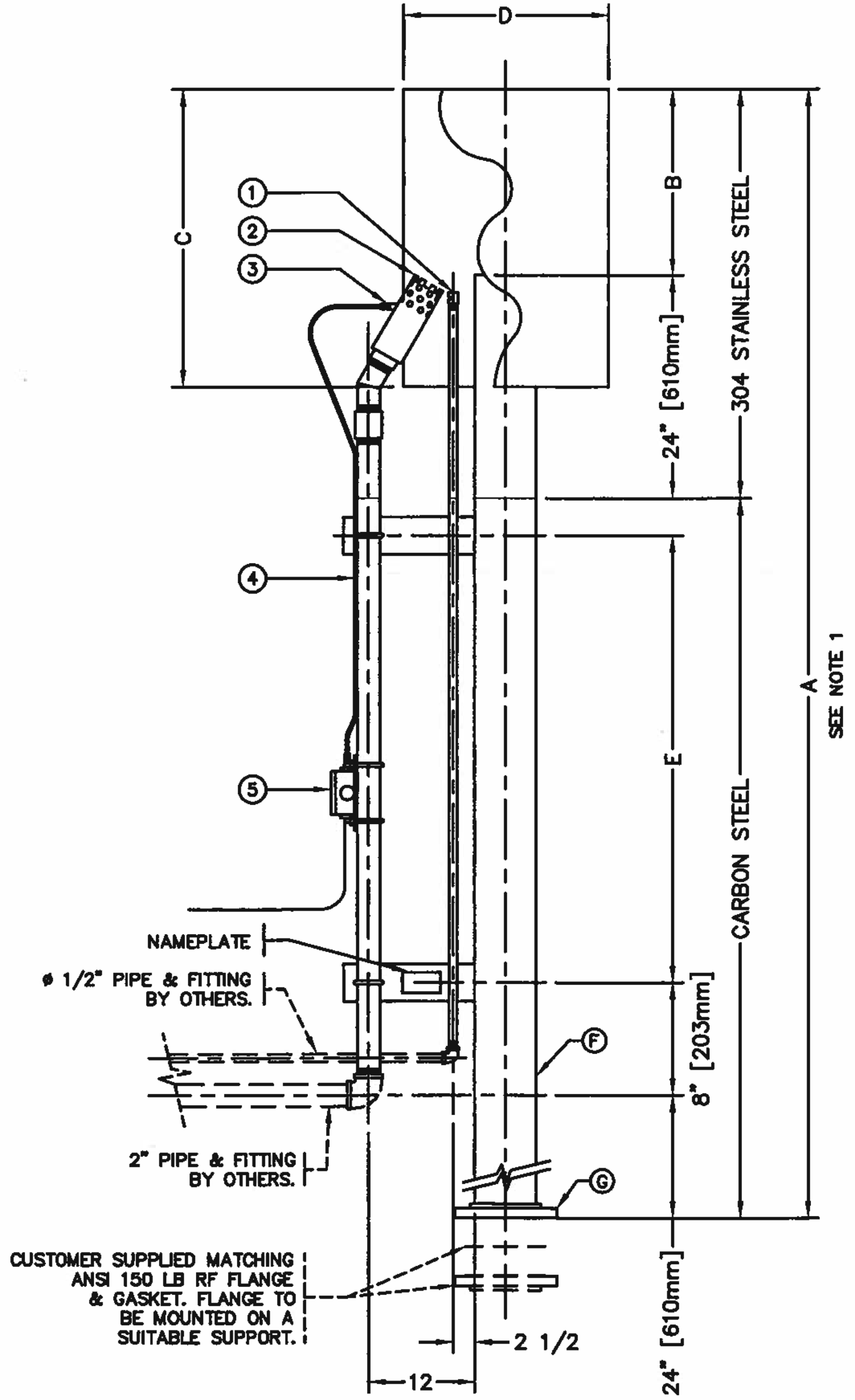
BURNER SIZE	FT^3/HR. MAXIMUM FLOWS	M^3/HR. MAXIMUM FLOWS
2”	3,850	109
3”	11,600	328
4”	22,250	630
▶ 6”	51,300	1,453
8”	88,150	2,496
10”	150,000	4,245
12”	250,000	7,075

1.6.3 Combusted Gas

Biogas, primarily methane of low BTU content. Minimum inlet pressure 0.5" W.C. (12 mm).

1.6.4 Pilot Gas

VENTURI	~~BLOWER~~
Propane Natural Gas Minimum pressure of 10 PSIG (70 kPa) Maximum pressure of 35 PSIG (245 kPa)	~~Natural Gas~~ ~~Minimum pressure of 6” W.C. (150mm WC)~~ ~~Maximum pressure of 10 PSIG (70 kPa)~~



STACK DIMENSIONS

NOMINAL SIZE	WEIGHT	A	B	C	D	E	F	G	CAPACITIES (0.75 SPGR GAS)
2"	140 LBS. (64 KG.)	88" (2235)	12" (305)	20" (508)	18" (457)	16" (406)	2 3/8" (60)	6" (152)*	3850 CU.FT./HR. (109 CU. METERS/HR.)
3"	170 LBS. (77 KG.)	92" (2337)	16" (406)	24" (610)	18" (457)	16" (406)	3 1/2" (89)	7 1/2" (190)*	11,600 CU.FT./HR. (328 CU. METERS/HR.)
4"	200 LBS. (91 KG.)	92" (2237)	16" (406)	24" (610)	20" (508)	16" (406)	4 1/2" (114)	9" (229)*	22,250 CU.FT./HR. (630 CU.METERS/HR.)
6"	285 LBS. (130 KG.)	128" (3251)	20" (508)	32" (813)	22" (559)	48" (1219)	6 5/8" (168)	11" (279)*	51,300 CU.FT./HR. (1453 CU. METERS/HR.)
8"	415 LBS. (189 KG.)	144" (3658)	36" (914)	48" (1219)	24" (610)	48" (1219)	8 5/8" (219)	13 1/2" (343)*	88,150 CU.FT/HR. (2496 CU. METERS/HR.)
10"	750 LBS. (341 KG.)	176" (4470)	32" (813)	48" (1219)	30" (762)	84" (2134)	10 3/4" (273)	16" (406)*	150,000 CU.FT./HR. (4248 CU. METERS/HR.)
12"	950 LBS. (432 KG.)	188" (4775)	44" (1118)	60" (1524)	36" (914)	84" (2134)	12 3/4" (324)	19" (483)*	250,000 CU.FT./HR. (7079 CU. METERS/HR.)

* METRIC DIMENSIONS SPECIFIED ARE FOR REFERENCE ONLY
(DIMENSIONS IN PARENTHESES ARE MILLIMETER EQUIVALENTS)

NOTES:

1. OVERALL HEIGHT SHOWN IS MANUFACTURERS STANDARD. CONSULT FACTORY FOR RECOMMENDED SAFE OPERATING HEIGHT.
2. MAXIMUM ALLOWABLE STRESSES SHALL NOT EXCEED THE LIMITING STRESSES SET FORTH IN THE AISC SPECIFICATIONS FOR STRUCTURAL STEEL WITH A 36,000 PSI YEILD POINT (SA-36).

BILL OF MATERIALS

ITEM	QTY	DESCRIPTON
1	1	FLAME RETENTION NOZZLE: 316SS
2	1	CONTINUOUS FLAME NOZZLE: 316SS
3	1	THERMOWELL: INCONEL
4	1	THERMOCOUPLE ASSEMBLY: INCONEL & 316SS
5	1	THERMOCOUPLE JUNCTION BOX, NEMA 7: AL

REFERENCE DRAWING: S-500-00-BOM

REPLACES 20-07832

REV.	DATE	DESCRIPTION	BY	CHK.	APP.
4	10/02/16	DRIP LEG CHANGED	CHF		
3	95/04/12	RE-ISSUED FOR CONSTRUCTION	DWE		

SYSTEM MANUFACTURED UNDER PATENT PROTECTION NUMBERS.
CANADIAN #1054506
UNITED STATES #4025281

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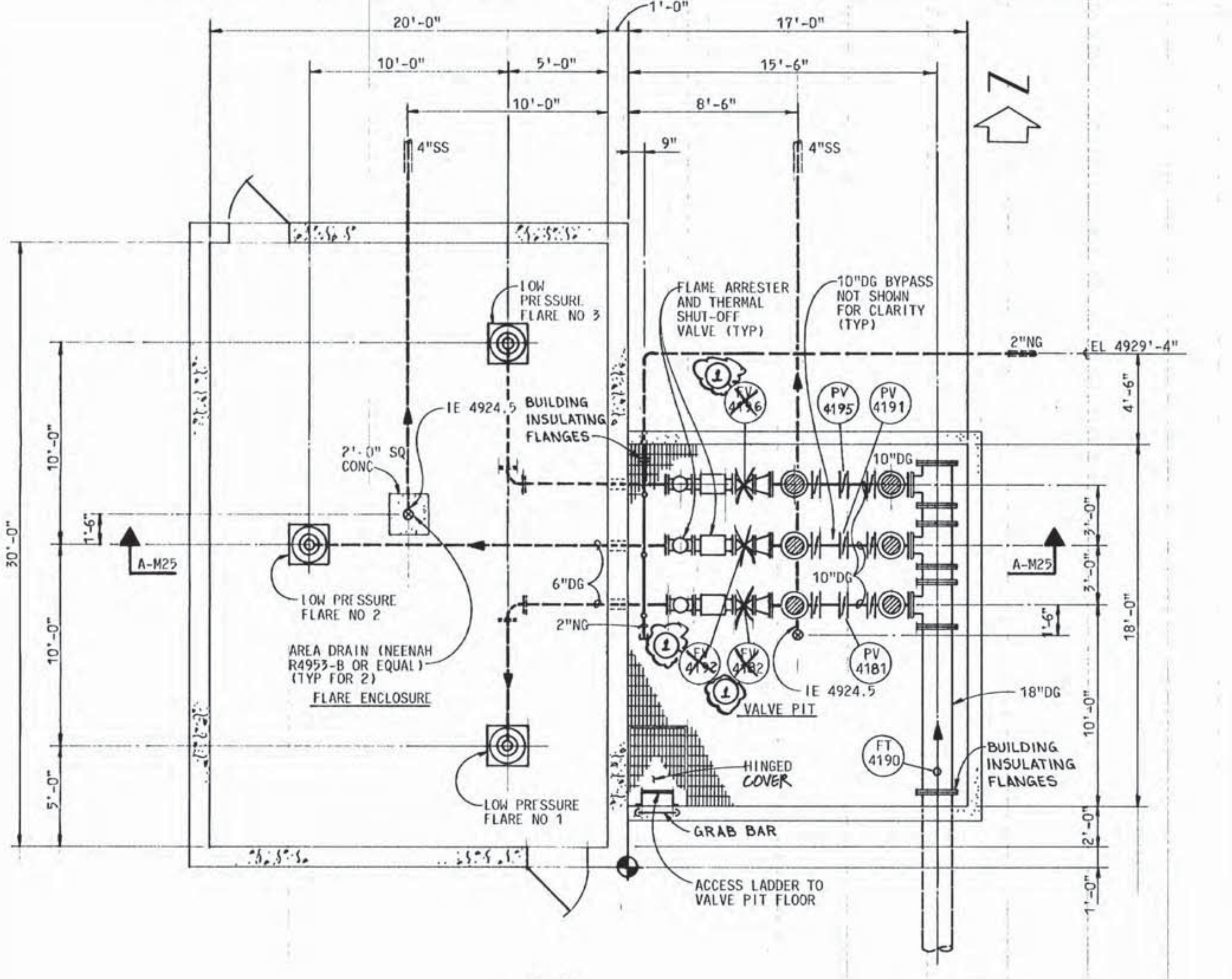
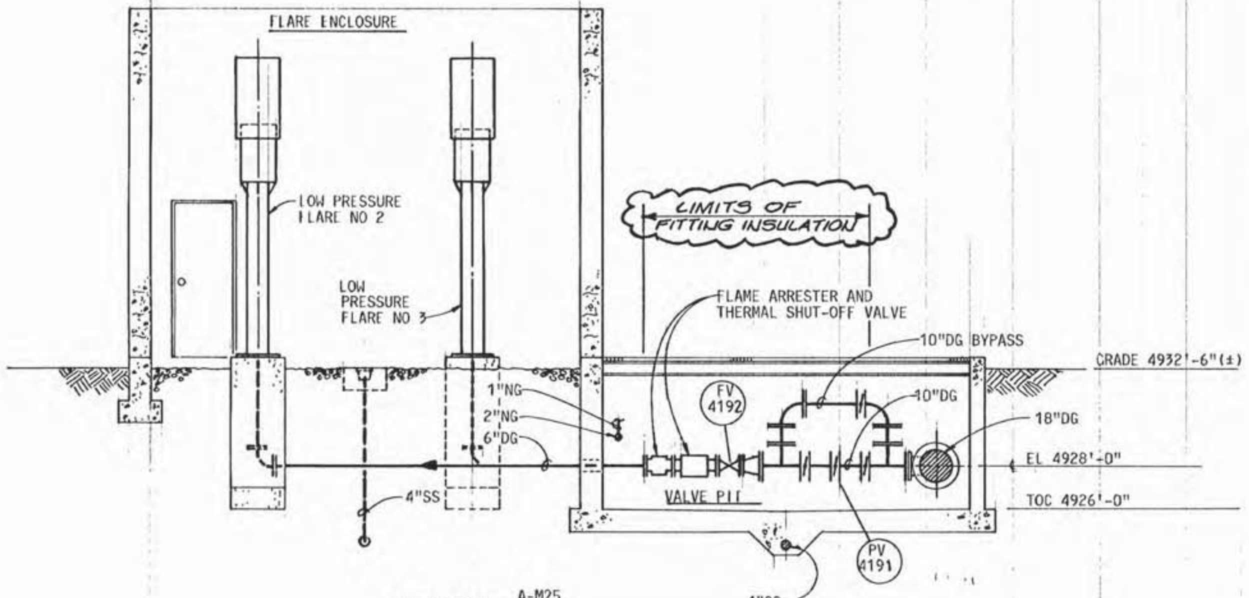
CLIENT: XXX
JOB # XXX
TITLE: 244WS WASTE GAS BURNER STACK -ASSEMBLY
CLIENT # XXX
DWG.# S-500-00
REV.# 4

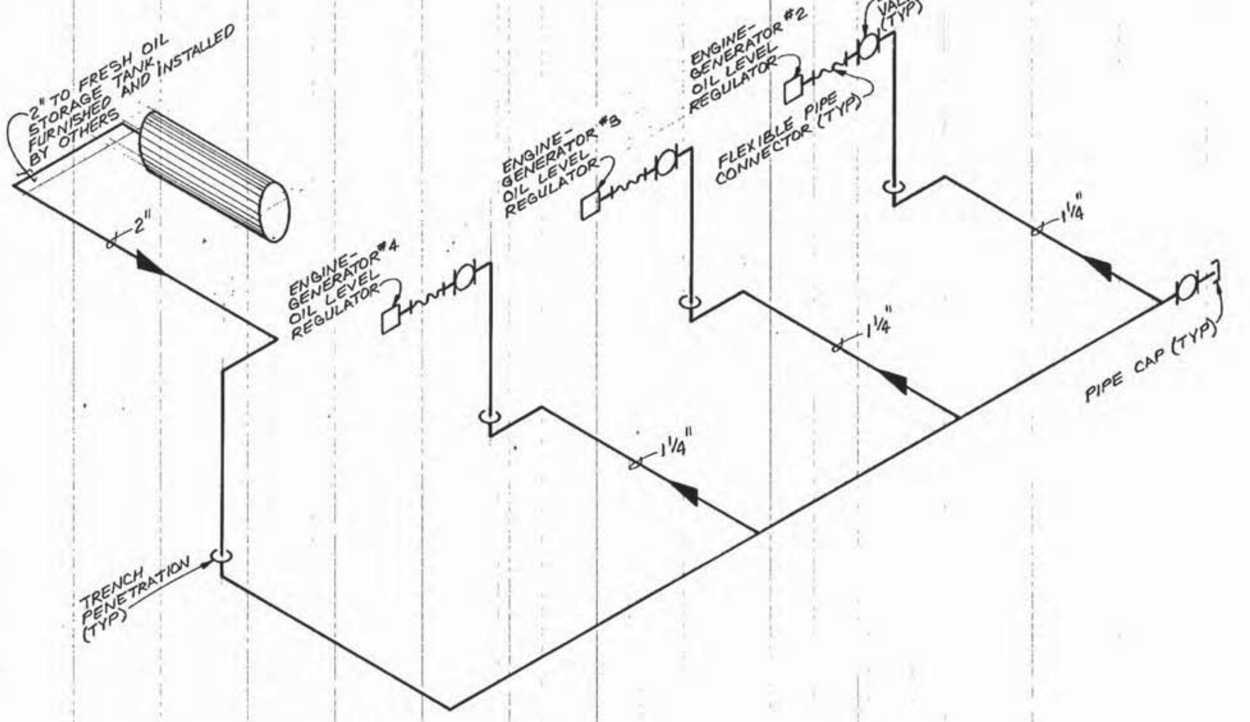


PLAN

① INSTALLED 6" SCH. 80, TYPE 304 STN. STL. SPOOL W/150# TYPE 304 STN. STL. FLANGES



SECTION A-M25



ENGINE FRESH OIL PIPING SCHEMATIC

FOR LOCATION SEE DRAWING 8387-M10

3

REFERENCE DRAWINGS:

LEGEND SHEET	8387-G3
SITE PLAN - SHEET 5	8387-M21
PLANS AND DETAILS	8387-S12

NOTES:

1. FOR CONTINUATION OF PIPES OUTSIDE OF STRUCTURE SEE SITE PLAN DRAWING 8387-M21.

W CLARK HOLLEY

AT FULL SIZE 0 1 2 3 IN / 0 1 2 3 4 5 6 7 8 cm

20 35 8 5487

NO.	REVISIONS	DRAWN	APPROVED	APPROVED	DATE
5	REVISED RECORD DWG	JLB		R.A. Urban	10-20-89
4	RECORD DRAWING	DWRIGHT	RCS	R.B. Dean	2-1-88
3	ADDED FRESH OIL PIPING SCHEMATIC	DWRIGHT	RCS	R.B. Dean	2-26-85
2	ENCLOSE DRAIN W/ CONC	MLM	RCS	R.B. Dean	5-24-84
1	ADD FLARE PIPING	RMSMITH	RCS	W.C.H.	1-16-84

DESIGNED C. Shark R.E. Carroll
DRAWN J.W. O'CONNELL R.E. Carroll
CHECKED C. Shark
APPROVED
APPROVED
DATE AUG 31, 1983

MOLZEN-CORBIN
STANLEY CONSULTANTS
A JOINT VENTURE

CITY OF ALBUQUERQUE, NEW MEXICO
SOLIDS HANDLING FACILITIES
PHASE II B1.1

POWER GENERATION-WWTP NO 2
FLARE ENCLOSURE AND VALVE PIT
PLAN AND SECTION

SCALE 1/4" = 1'-0"
NO. 8387-M13
REV. 4
SHT 52 OF 144

TANKS 4.09d Output for EU 33

(Unleaded Gas Fuel Tank)

TANKS 4.0.9d
Emissions Report - Summary Format
Tank Indentification and Physical Characteristics

Identification

User Identification:	ABCWUA Unit 67
City:	
State:	
Company:	
Type of Tank:	Horizontal Tank
Description:	Unleaded Gasoline Tank

Tank Dimensions

Shell Length (ft):	11.30
Diameter (ft):	7.50
Volume (gallons):	2,000.00
Turnovers:	25.00
Net Throughput(gal/yr):	50,000.00
Is Tank Heated (y/n):	N
Is Tank Underground (y/n):	N

Paint Characteristics

Shell Color/Shade:	White/White
Shell Condition	Good

Breather Vent Settings

Vacuum Settings (psig):	-0.03
Pressure Settings (psig)	0.03

Meterological Data used in Emissions Calculations: Albuquerque, New Mexico (Avg Atmospheric Pressure = 12.15 psia)

TANKS 4.0.9d
Emissions Report - Summary Format
Liquid Contents of Storage Tank

ABCWUA Unit 67 - Horizontal Tank

		Daily Liquid Surf. Temperature (deg F)			Liquid Bulk Temp	Vapor Pressure (psia)			Vapor Mol.	Liquid Mass	Vapor Mass	Mol.	Basis for Vapor Pressure
Mixture/Component	Month	Avg.	Min.	Max.	(deg F)	Avg.	Min.	Max.	Weight.	Fract.	Fract.	Weight	Calculations
Gasoline (RVP 13)	All	58.54	51.41	65.66	56.17	6.7593	5.9014	7.7134	62.0000			92.00	Option 4: RVP=13, ASTM Slope=3

TANKS 4.0.9d
Emissions Report - Summary Format
Individual Tank Emission Totals

Emissions Report for: Annual

ABCWUA Unit 67 - Horizontal Tank

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Gasoline (RVP 13)	498.90	1,418.16	1,917.06

PTF Roll Off Dumpster H_2S Study

Albuquerque Bernalillo County
Water Utility Authority

P.O. Box 568
Albuquerque, NM 87103-0568

Memo

To: Charles Leder

From: Patrick McLee

CC: Jeff Romanowski, Scott Salvas

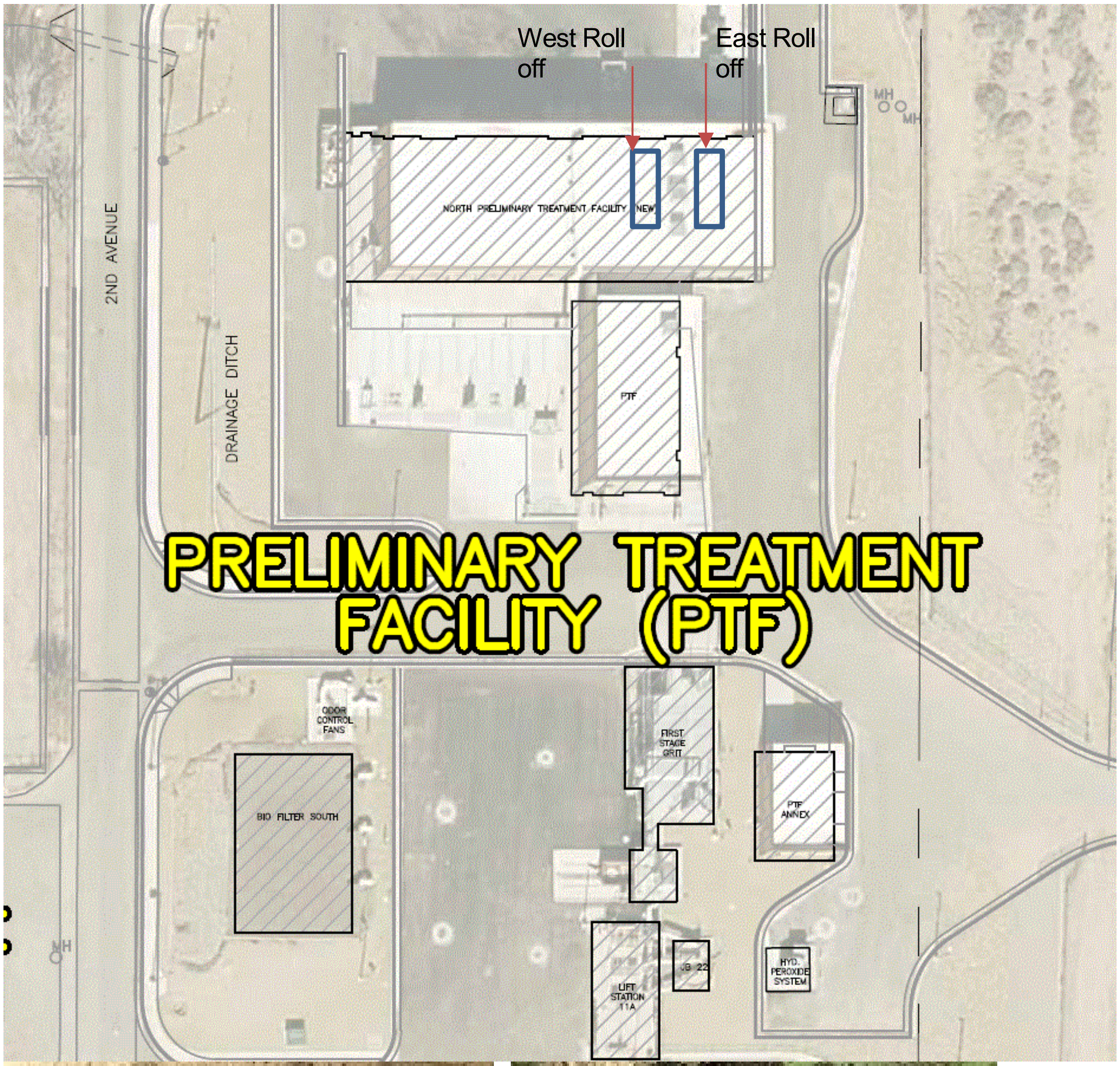
Date: 5/7/2020

Re: PTF screenings and grit roll off dumpster H_2S report

The water authority uses various instruments to measure H2S throughout collections and SWRP. The table below summarizes these devices, there measuring range, and accuracy.

Device	Detection Range	Measurement Frequency	Accuracy
Jerome 631-X	0.003 to 50 ppm	Instantaneous	±0.003 ppm at 0.05 ppm, ±0.03 ppm at 0.5 ppm, ±0.3 ppm at 5 ppm, ±2 ppm at 25 ppm
Acrulog PPM	0 to 1000 ppm	Continues Monitoring (Every 4 Minutes)	± 2 ppm at 20ppm
Acrulog PPB	0 to 2000 ppb	Continues Monitoring (Every 10 Minutes)	< ± 10% of reading over range at NTP Calibrated on 500ppb

On 3/25/2020 at approximately 9:50 AM, we took duplicate H_2S readings with the Jerome meter at a roll off dumpster (west roll off dumpster) that receives grit from head cells/classifiers and rags from the barscreens/washer compactors. Each reading was taken approximately 1 foot from the grit pile or the washed screenings pile. See map and photos below for roll off dumpster location and measurement location detail.


West Roll off
East Roll off
NORTH PRELIMINARY TREATMENT FACILITY
NEW
2ND AVENUE
DRAINAGE DITCH
PTF
MH
MH
PRELIMINARY TREATMENT FACILITY (PTF)
ODOR CONTROL FANS
FIRST STAGE GRIT
PTF ANNEX
BIO FILTER SOUTH
MH
LIFT STATION 11A
JB 22
HYD. PEROXIDE SYSTEM

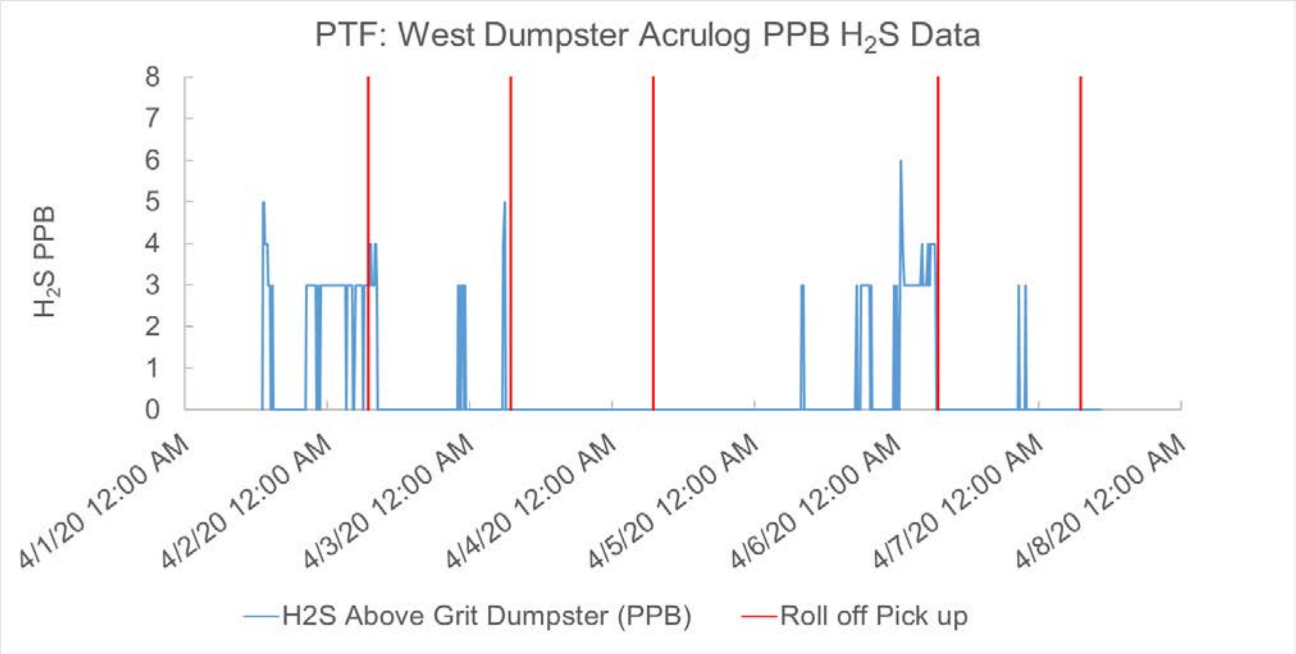
The following table summarizes results for H2S measurements taken by the Jerome meter at these locations.

Jerome Meter H2S Readings (ppm)		
Location: PTF West Dumpster		
	Grit Pile	**Washed Screenings Pile**
Reading 1	0.002	0.012
Reading 2	0.002	0.017
Average	0.002	0.015

Additionally, we hung an Acrulog PPM (ppm H2S) at the aforementioned location (PTF, West Roll off dumpster) shown in the photo below.

The distance from the Acrulog PPM to the grit piles changed as the size of the grit pile changed. At the time this photo was taken the distance from the Acrulog PPM to the grit pile was approximately 2.5 ft. The Acrulog PPM took measurements every 4 minutes from 3/25/2020 at 10am to 3/27/2020 at 10am. During this time, **all measurements taken by the Acrulog PPM at this location returned 0 ppm readings.**

To follow up on this non detect result, a more sensitive device called an Acrulog PPB (ppb H_2S) was placed at the exact same location. The Acrulog PPB took measurements every ten minutes from 4/1/2020 to 4/2/2020. The results of the Acrulog PPB study, and dates/times of roll off dumpster pick ups are shown in the chart and summary table below.



Acrulog PPB H2S Readings (ppb) Daily Summary		
Location: PTF West Dumpster		
	Daily Average	**Daily Max**
4/1/2020	1.3	5
4/2/2020	1.1	4
4/3/2020	0.1	5
4/4/2020	0.0	0
4/5/2020	0.3	3
4/6/2020	0.9	6
4/7/2020	0.0	0

As shown in the chart and summary table above, H_2S readings by the Acrulog PPB are very low with daily average H_2S ranging from 0 to 1.3 ppb and daily max H_2S ranging from 0 to 5 ppb. In general, relatively higher H_2S readings occurred in the moments before roll off dumpster pick up, and returned to 0 ppm shortly after.

Technical Memo: TOXCHEM Emission Calculations for WW Processes

SEH

Building a Better World
for All of Us®

MEMORANDUM

TO: Charles Leder, PE

FROM: Thomas Henning, PE*, CHMM (*Licensed in AR, HI, IA, MN, NE, NM, PA, WI)

DATE: August 27, 2020

RE: Emission Calculations for Wastewater Processes
Southside Water Reclamation Plant

The purpose of this technical memorandum is to document the methodology used to calculate potential uncontrolled and controlled emissions of volatile organic compounds (VOC), organic hazardous air pollutants (HAP) and hydrogen sulfide (H_2S) from wastewater treatment processes at the Southside Water Reclamation Plant located in Albuquerque, New Mexico.

BACKGROUND

The Albuquerque Bernalillo County Water Authority (the "Water Authority") operates the Southside Water Reclamation Plant (Plant) located at 4201 2nd Street SW, Albuquerque, New Mexico. For the purposes of regulatory compliance with Clean Air Act regulations issued under 40 CFR Part 63 Subpart VVV, the Plant is considered to be a reconstructed Publicly Owned Treatment Works (POTW). The Water Authority is preparing an Authority To Construct (ATC) Permit application for the Plant to cover proposed improvements at the Plant. For that application, the Water Authority needs estimates of regulated pollutant emissions from the wastewater treatment processes at the Plant.

The Water Authority has installed covers over the processes in the Preliminary Treatment portion of the Plant and captured emissions are vented through biofilters and activated carbon filters. These filters were designed to control odors (primarily H_2S), but the biofilters and carbon filters also control VOCs, some of which are HAPs.

The Water Authority retained Short Elliott Hendrickson, Inc. ("SEH") to calculate potential controlled and uncontrolled emissions of VOC, HAP and H_2S from the wastewater treatment processes at the Plant.

CALCULATION APPROACH

SEH used the TOXCHEM emission model to estimate potential emissions from the wastewater treatment process. The TOXCHEM model incorporates a number of fate mechanisms for toxic compounds to calculate process specific mass balance calculations. TOXCHEM calculates the volatilization of compounds through air-water interfaces such as water surfaces, air stripping, and at weirs, sewer reaches, drops, and process drains. TOXCHEM uses a database with chemical parameter assumptions for each compound to calculate mass transfer across the air-water interfaces.

The Water Authority submitted to the City of Albuquerque Environmental Health Department Air Quality Program (the "City") a TOXCHEM Modeling Protocol (the "Protocol") for the use of the TOXCHEM model to demonstrate compliance with the requirements of 40 CFR 63 Subpart VVV. This Protocol was used to estimate emissions from the pretreatment portion of the plant. The City approved the Protocol in an email dated January 17, 2020 to the Water Authority.

To calculate the potential emissions for the ATC Permit Application, SEH used a methodology similar to the Protocol with the following exceptions:

Processes included in the emission calculations: In order to estimate facility-wide emissions, SEH calculated emissions from the following processes:

PRIMARY TREATMENT SOURCES SUBJECT to SUBPART VVV

- Preliminary Treatment (with covers)
- Primary Clarifiers 1 and 3 (uncovered)
- Primary Clarifiers 2 and 4 (with launder covers)
- Primary Clarifiers 5 through 8 (with covers)

ADDITIONAL SOURCES FOR FACILITY-WIDE CALCULATIONS

- Coarse Screening Facility[1]
- Activated Sludge
- Final Clarifiers
- Sludge Thickening (DAF/RDT)

Wastewater Flow Rate: To estimate potential emissions, the TOXCHEM modeling was conducted using the plant's design capacity, 76 million gallons per day, for 365 days per year. The wastewater flow through the Coarse Screening Facility was modeled at 20 million gallons per day (for 365 days per year) since this facility only handles flow from the Valley Interceptor, which is one of four (4) tributary sewer interceptors feeding the Plant.

Influent Concentrations: The Water Authority conducted influent VOC and HAP monitoring in September and November of 2019. To estimate potential emissions, the TOXCHEM modeling used the highest measured VOC and HAP concentrations from these sampling events multiplied by 150%. The Water Authority conducted influent monitoring for dissolved sulfide (a surrogate for H_2S) in December 2019. The measured concentration multiplied by 150% was used in the TOXCHEM modeling to estimate H_2S emissions.

Control Efficiencies: For controlled emission rates, a control efficiency of 98% was used for H_2S emissions captured and controlled by the biofilters and activated carbon filters. No control efficiencies were used for VOC and HAP emissions.

tah/PAS/JTL/TAH

p:\ae\a\abwua\152334\title v emission calculations - plant wide\tech memo - atc emission calcs for ww processes 27aug2020.docx

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[1] The Coarse Screening Facility is located upstream of the point at which all wastewater flows into the Plant converge and is thus considered to be a point in the collection system upstream of the Plant.

APPENDIX B

Construction Permit Application Forms and Checklists

Albuquerque Environmental Health Department - Air Quality Program
Please mail this application to **P.O. Box 1293, Albuquerque, NM 87103**
or hand deliver between 8:00am - 5:00pm Monday - Friday to:
3rd Floor, Suite 3023 - One Civic Plaza NW, Albuquerque, New Mexico 87103
(505) 768 – 1972 aqd@cabq.gov (505) 768 - 1977 (Fax)

Application for Air Pollutant Sources in Bernalillo County
Source Registration (20.11.40 NMAC) and Construction Permits (20.11.41 NMAC)

Clearly handwrite or type **Corporate Information** **Submittal Date:** **10/30/2020**

1. Company Name Albuquerque Bernalillo County Water Utility Authority
2. Street Address One Civic Plaza NW, Room 5027, P.O. Box 5027 Zip 87103
3. Company City Albuquerque 4. Company State NM 5. Company Phone (505) 842-9287 6. Company Fax (505) 289-3062
7. Company Mailing Address: One Civic Plaza NW, P.O. Box 5027, Albuquerque, NM Zip 87103
8. Company Contact and Title Charles Leder – Manager for Plant Operations Division 9. Phone (505) 289-3401
10. E-mail cleder@abcwua.org

Stationary Source (Facility) Information: **[Provide a plot plan (legal description/drawing of facility property) with overlay sketch of facility processes; Location of emission points; Pollutant type and distances to property boundaries]**

1. Facility Name Southside Water Reclamation Plant 2. Street Address 4201 2nd Street SW
3. City Albuquerque 4. State NM 5. Facility Phone (505) 289-3401 6. Facility Fax (505) 289-3062
7. Facility Mailing Address (Local) Albuquerque Bernalillo County Water Utility Authority, P.O. Box 568, Albuquerque, NM Zip 87103
8. Latitude - Longitude or UTM Coordinates of Facility UTM Zone 13, 347765 m E, 3876319 m N
9. Facility Contact and Title Charles Leder – Manager for Plant Operations Division 10. Phone (505) 289-3401
11. E-mail cleder@abcwua.org

General Operation Information (if any further information request does not pertain to your facility, write N/A on the line or in the box)

1. Facility Type (description of your facility operations) The Southside Water Reclamation Plant processes wastewater from the collection system of Albuquerque for final discharge into the Rio Grande river.
2. Standard Industrial Classification (SIC 4 digit #) 4952
3. North American Industry Classification System (NAICS Code #) 221320
4. Is facility currently operating in Bernalillo County. Yes If yes, date of original construction 1960s
   If no, planned startup is ___/___/_______
5. Is facility permanent Yes If no, give dates for requested temporary operation - from ____/____/______ through ____/____/______
6. Is facility process equipment new No If no, give actual or estimated manufacture or installation dates in the Process Equipment Table.
7. Is application for a modification, expansion, or reconstruction (altering process, or adding, or replacing process equipment, etc.) to an existing facility which will result in a change in emissions Yes . If yes, give the manufacture date of modified, added, or replacement equipment in the Process Equipment Table modification date column, or the operation changes to existing process/equipment which cause an emission increase.

8. Is facility operation (circle one) [[✓ Continuous] Intermittent Batch]

9. Estimated % of production Jan-Mar 25 Apr-Jun 25 Jul-Sep 25 Oct-Dec 25

10. Current or requested operating times of facility 24 hrs/day 7 days/wk 4 wks/mo 12 mos/yr

11. Business hrs 8 am to 5 pm

12. Will there be special or seasonal operating times other than shown above No If yes, explain N/A

13. Raw materials processed Sanitary sewage, wastewater

14. Saleable item(s) produced: Treated wastewater for reuse by customers located off-site (portion of treated flow that isn't discharged to the Rio Grande); biosolids generated by wastewater treatment operations are processed into compost at a remote facility located approximately 25 road miles from the Southside Water Reclamation Plant (SWRP). Power generated at SWRP in excess of what is required to support treatment operations is sold to Public Service Company of NM.

15. Permitting Action Being Requested

☐ New Permit ☑ Permit Modification ☐ Technical Permit Revision ☐ Administrative Permit Revision

Current Permit #: 786-M3-RV1 Current Permit #: __________ Current Permit #: __________

PROCESS EQUIPMENT TABLE

(Generator-Crusher-Screen-Conveyor-Boiler-Mixer-Spray Guns-Saws-Sander-Oven-Dryer-Furnace-Incinerator, etc.) Match the Process Equipment Units listed on this Table to the same numbered line if also listed on Emissions & Stack Table (page 6).

Process Equipment Unit	Manufacturer	Model #	Serial #	Manufacture Date	Installation Date	Modification Date	Size or Process Rate (Hp;kW;Btu;ft^3;lbs; tons;yd^3;etc.)	Fuel Type
Example 1. Generator	Unigen	B-2500	A56732195C-222	7/96	7/97	N/A	250 Hp - HR. ~~YR.~~	Diesel
Example 2. Spray Gun	HVLP Systems	Spra –N- Stay 1100	k26-56-95	01/97	11/97	N/A	0.25 gal. - HR. ~~YR.~~	Electric Compressor
1. Coarse Screening Facility at Valley Interceptor w/ Carbon System	N/A (site built)	N/A	N/A	2020	2020	N/A	20 MMgal/day	N/A
2. North Prelim Trt Facility (Screenings & Grit Removal) with Carbon System, North and South Bohn Biofilter	N/A (site built)	N/A	N/A	1962	1962	2015	76 MMgal/day	N/A
3. Primary Clarifier Holding Tank #1	N/A (site built)	N/A	N/A	1962	1962	1985	76 MMgal/day	N/A
4. Primary Clarifier Holding Tank #3	N/A (site built)	N/A	N/A	1962	1962	1985	76 MMgal/day	N/A
5. Primary Clarifier #2 with Carbon System	N/A (site built)	N/A	N/A	1962	1962	1985	76 MMgal/day	N/A
6. Primary Clarifier #4 with Carbon System	N/A (site built)	N/A	N/A	1962	1962	1985	76 MMgal/day	N/A
7. Primary Clarifiers #5 with Bohn Biofilter	N/A (site built)	N/A	N/A	1985	1985	2020	76 MMgal/day	N/A
8. Primary Clarifiers #6 with Bohn Biofilter	N/A (site built)	N/A	N/A	1985	1985	2020	76 MMgal/day	N/A
9. Primary Clarifiers #7 with Bohn Biofilter	N/A (site built)	N/A	N/A	1985	1985	2020	76 MMgal/day	N/A
10. Primary Clarifiers #8 with Bohn Biofilter	N/A (site built)	N/A	N/A	1985	1985	2020	76 MMgal/day	N/A
11a. Activated Sludge Group #11a	N/A (site built)	N/A	N/A	1974	1974	1996	76 MMgal/day	N/A
11b. Activated Sludge Group #11b	N/A (site built)	N/A	N/A	1974	1974	1996	76 MMgal/day	N/A
11c. Activated Sludge Group #11c	N/A (site built)	N/A	N/A	1974	1974	1996	76 MMgal/day	N/A
11d. Activated Sludge Group #11d	N/A (site built)	N/A	N/A	1985	1986	1996	76 MMgal/day	N/A
11e. Activated Sludge Group #11e	N/A (site built)	N/A	N/A	1990	1990	1996	76 MMgal/day	N/A
11f. Activated Sludge Group #11f	N/A (site built)	N/A	N/A	1990	1990	1996	76 MMgal/day	N/A
12a. Activated Sludge Group #12a	N/A (site built)	N/A	N/A	1996	1996	N/A	76 MMgal/day	N/A
12b. Activated Sludge Group #12b	N/A (site built)	N/A	N/A	1996	1996	N/A	76 MMgal/day	N/A
12c. Activated Sludge Group #12c	N/A (site built)	N/A	N/A	1996	1996	N/A	76 MMgal/day	N/A
12d. Activated Sludge Group #12d	N/A (site built)	N/A	N/A	1996	1996	N/A	76 MMgal/day	N/A

13a. Activated Sludge Group #13a	N/A (site built)	N/A	N/A	1996	1996	N/A	76 MMgal/day	N/A
13b. Activated Sludge Group #13b	N/A (site built)	N/A	N/A	1996	1996	N/A	76 MMgal/day	N/A
14a. Activated Sludge Group #14a	N/A (site built)	N/A	N/A	1996	1996	N/A	76 MMgal/day	N/A
14b. Activated Sludge Group #14b	N/A (site built)	N/A	N/A	1996	1996	N/A	76 MMgal/day	N/A
15. Final Clarifier #1	N/A (site built)	N/A	N/A	1974	1974	2012	76 MMgal/day	N/A
16. Final Clarifier #2	N/A (site built)	N/A	N/A	1974	1974	2012	76 MMgal/day	N/A
17. Final Clarifier #3	N/A (site built)	N/A	N/A	1974	1974	2012	76 MMgal/day	N/A
18. Final Clarifier #4	N/A (site built)	N/A	N/A	1974	1974	2012	76 MMgal/day	N/A
19. Final Clarifier #5	N/A (site built)	N/A	N/A	1990	1990	2012	76 MMgal/day	N/A
20. Final Clarifier #6	N/A (site built)	N/A	N/A	1990	1990	2012	76 MMgal/day	N/A
21. Final Clarifier #7	N/A (site built)	N/A	N/A	1992	1992	2012	76 MMgal/day	N/A
22. Final Clarifier #8	N/A (site built)	N/A	N/A	1992	1992	2012	76 MMgal/day	N/A
23. Final Clarifier #9	N/A (site built)	N/A	N/A	1996	1996	2012	76 MMgal/day	N/A
24. Final Clarifier #10	N/A (site built)	N/A	N/A	1996	1996	2012	76 MMgal/day	N/A
25. Final Clarifier #11	N/A (site built)	N/A	N/A	1996	1996	2012	76 MMgal/day	N/A
26. Final Clarifier #12	N/A (site built)	N/A	N/A	1996	1996	2012	76 MMgal/day	N/A
27. Cogeneration Engine #1	Caterpillar	G3612	1YG00188	2002	2002	N/A	3,192-hp	Natural Gas and Digester Gas
28. Cogeneration Engine #2	Caterpillar	G3612	1YG00190	2002	2002	N/A	3,192-hp	Natural Gas and Digester Gas
29. Cogeneration Engine #3	Cooper Superior	12-GTLA	311069	2011	2012	N/A	1,650-hp	Natural Gas and Digester Gas
30. Cogeneration Engine #4	Cooper Superior	12-GTLA	305029	1985	1985	N/A	1,650-hp	Natural Gas and Digester Gas
31. Cogeneration Boiler	Sellers Engineering	S300 W Model 15 Senior	103600	2002	2002	N/A	12.553 MMBtu/hr	Natural Gas
32. Secondary Sludge Thickening (DAF/RDT)	N/A	N/A	N/A	1981, 1987	1981, 1987	2003-2008	N/A	N/A
33. Unleaded Fuel Tank	ConVault	UL List #2085	N/A	1990	1990	N/A	50,000 gal/yr	N/A
34. Gas Flare #1	Varec	WG244WS6 192100	51403-SP150376	1985	1985	2010	35.3 MMBtu/hr	Digester Gas
35. Gas Flare #2	Varec	WG244WS6 192100	N/A	1985	1985	2010	35.3 MMBtu/hr	Digester Gas
36. Gas Flare #3	Varec	WG244WS6 192100	166755-SPV11333B	1985	1985	2010	35.3 MMBtu/hr	Digester Gas
37. UV Facility Emergency Generator	Cummins	QSX15-G9 Nonroad 2	79422244	March 2010	2011	N/A	661-hp	Diesel
38. North PTF Emergency Generator 0.5 MW	Cummins	VTA1710G1	37107032	July 1983	2021	N/A	760-hp	Diesel

39. PPH1 & 2 Emergency Generator 1 MW	Cummins	QST30-G5 NR2	37265926	July 2015	2021	N/A	1490-hp	Diesel
40. SAPS Emergency Generator 2 MW	Cummins	QSK60-G6	33203628	January 2015	2021	N/A	2682-hp	Diesel
41. Blower Bldg. Emergency Generator 3 MW	Cummins	C3000 D6e	TBD	TBD	2021	N/A	4307-hp	Diesel
42. North Blower Bldg. Emergency Generator 750 kW	Caterpillar	G3412	2WJ00732	1996	TBD	N/A	1109-hp	Diesel
43. Dewatering Bldg. "HOTSY"	HOTSY	5735SS	11096560-100225	2015	2015	N/A	0.72 MMBtu/hr	Natural Gas
44. DAF/RDT Bldg. "HOTSY"	HOTSY	5735SS	11096560-100246	2014	2014	N/A	0.72 MMBtu/hr	Natural Gas
45. Tijeras Canyon Interceptor and Carbon System	TetraSOLV	VF-360	N/A	2018	2018	N/A	N/A	N/A
46. South Blower Building Carbon System	TetraSOLV	VF-180	N/A	2017	2017	N/A	N/A	N/A
47. South Activated Sludge Pump Station and Carbon System	Purafil	DBS 914	N/A	1992	1992	N/A	N/A	N/A
48. Sludge Blending Tank and Carbon System	N/A (site built)	N/A	N/A	2004	2004	N/A	Tank capacity = 190,000 gal	N/A
49. Sludge Dewatering Facility Bohn Biofilter	N/A (site built)	N/A	N/A	2018	2018	N/A	N/A	N/A
50. Wang Server Room Emergency Generator 150 kW	Mercedes Benz	12V OM924LA	TBD	TBD	TBD	N/A	197-hp	Diesel
51. Paved Haul; Roads	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
52. Digester #1	N/A	N/A	N/A	1962	1962	N/A	N/A	N/A
53. Digester #2	N/A	N/A	N/A	1962	1962	N/A	N/A	N/A
54. Digester #3	N/A	N/A	N/A	1967	1967	N/A	N/A	N/A
55. Digester #4	N/A	N/A	N/A	1967	1967	N/A	N/A	N/A
56. Digester #5	N/A	N/A	N/A	1967	1967	N/A	N/A	N/A
57. Digester #6	N/A	N/A	N/A	1967	1967	N/A	N/A	N/A
58. Digester #7	N/A	N/A	N/A	1967	1967	N/A	N/A	N/A
59. Digester #8	N/A	N/A	N/A	1967	1967	N/A	N/A	N/A
60. Digester #9	N/A	N/A	N/A	1977	1977	N/A	N/A	N/A
61. Digester #10	N/A	N/A	N/A	1977	1977	N/A	N/A	N/A
62. Digester #11	N/A	N/A	N/A	1987	1987	N/A	N/A	N/A
63. Digester #12	N/A	N/A	N/A	1987	1987	N/A	N/A	N/A
64. Digester #13	N/A	N/A	N/A	1987	1987	N/A	N/A	N/A
65. Digester #14	N/A	N/A	N/A	1987	1987	N/A	N/A	N/A

66. Diesel Tank	N/A	N/A	N/A	Unknown	1989	N/A	10,000 gal	N/A
67. East Gas Holder	N/A site built	N/A	N/A	Unknown	1985	N/A	53,000 cf	N/A
68. West Gas Holder	N/A site built	N/A	N/A	Unknown	1985	N/A	53,000 cf	N/A
69. Sludge Storage Tank	N/A site built	N/A	N/A	Unknown	2017	N/A	2 MG	N/A
70. High Pressure Digester Gas Storage Sphere	N/A site built	N/A	N/A	Unknown	1985	N/A	11,400 cf	N/A
71. Digester Gas Treatment System (H_2S, moisture and siloxane removal)	Unison Systems	N/A	N/A	2020	2021	N/A	N/A	N/A
72. Compressor (Rotary Screw)	UE Compression	N/A	N/A	2011	2012	N/A	200 hp	Electric
73. Compressor (Rotary Screw)	UE Compression	N/A	N/A	2011	2012	N/A	200 hp	Electric
74. Compressor (Rotary Screw)	UE Compression	N/A	N/A	2011	2012	N/A	200 hp	Electric

1. Basis for Equipment Size or Process Rate (Manufacturers data, Field Observation/Test, etc.) Manufacturer data and observation
Submit information for each unit as an attachment

NOTE: Process Equipment No. 52 through 74 do not emit any emissions.

TABLE EXEMPTED SOURCES AND EXEMPTED ACTIVITIES

(Generator-Crusher-Screen-Conveyor-Boiler-Mixer-Spray Guns-Saws-Sander-Oven-Dryer-Furnace-Incinerator, etc.) Match the Process Equipment Units listed on this Table to the same numbered line if also listed on Emissions & Stack Table (page 6).

Process Equipment Unit	Manufacturer	Model #	Serial #	Manufacture Date	Installation Date	Modification Date	Size or Process Rate (Hp;kW;Btu;ft^3;lbs; tons;yd^3;etc.)	Fuel Type
Example 1. Generator	Unigen	B-2500	A56732195C-222	7/96	7/97	N/A	250 Hp - HR. ~~YR.~~	Diesel
Example 2. Spray Gun	HVLP Systems	Spra –N-Stay 1100	k26-56-95	01/97	11/97	N/A	0.25 gal. - HR. ~~YR.~~	Electric Compressor
1. Comfort Heater	Ambirad	SC38-S60-D	A4783-C3215	1990	1990	N/A	0.13 MMBtu/HR. ~~YR.~~	Natural Gas
2. Comfort Heater	Ambirad	SC38-S60-D	A4783-C3216	1990	1990	N/A	0.13 MMBtu/HR. ~~YR.~~	Natural Gas
3. Comfort Heater	Ambirad	SC38-S50-D	A4783-C3213	1990	1990	N/A	0.13 MMBtu/HR. ~~YR.~~	Natural Gas
4. Comfort Heater	Ambirad	SC38-S50-D	A4783-C3214	1990	1990	N/A	0.13 MMBtu/HR. ~~YR.~~	Natural Gas
5. Comfort Heater	Ambirad	SC/ER/GX3 8DA	100916935502	1990	1990	N/A	0.10 MMBtu/HR. ~~YR.~~	Natural Gas
6. Comfort Heater	Ambirad	SC/ER/GX3 8DA	100916935506	1990	1990	N/A	0.10 MMBtu/HR. ~~YR.~~	Natural Gas
7. Comfort Heater	Ambirad	SC29-S40	A4783-C3259	1990	1990	N/A	0.10 MMBtu/HR. ~~YR.~~	Natural Gas
8. Comfort Heater	Reznor	HCRPB125-S2J	EATB66H5N0 9006/TE	1989	1989	N/A	0.125 MMBtu/HR. ~~YR.~~	Natural Gas
9. Comfort Heater	Reznor	CRPB125-S2J	EATB66H5N0 9006/TE	1989	1989	N/A	0.125 MMBtu/HR. ~~YR.~~	Natural Gas
10. Comfort Heater	Reznor	RDH100	EBHE83Y2N0 2628TE	1989	1989	N/A	0.088MMBtu/HR. ~~YR.~~	Natural Gas
11. Comfort Heater	Reznor	RDH100	EBHE83Y2N0 2629TE	1989	1989	N/A	0.088MMBtu/HR. ~~YR.~~	Natural Gas
12. Comfort Heater	McQuay Heating	RWS800BA	3VE00033 14	1989	1989	N/A	0.788 MMBtu/HR. ~~YR.~~	Natural Gas
13. Comfort Heater	Reznor	HCRPB125-S2J	EATB66H5N0 9007/TE	1989	1989	N/A	0.125 MMBtu/HR. ~~YR.~~	Natural Gas
14. Comfort Heater	Reznor	CRPB125-S2J	EATB66H5N0 9005/TE	1989	1989	N/A	0.125 MMBtu/HR. ~~YR.~~	Natural Gas
15. Comfort Heater	Reznor	CRPB125-S2J	EATB66H5N0 9004/TE	1989	1989	N/A	0.125 MMBtu/HR. ~~YR.~~	Natural Gas
16. Comfort Heater	Unknown	600NCSS-SC2GK2F	792516-15	1991	1991	N/A	0.30 MMBtu/HR. ~~YR.~~	Natural Gas
17. Comfort Heater	Unknown	600NCSS-SC2GK2F	792516-15	1991	1991	N/A	0.30 MMBtu/HR. ~~YR.~~	Natural Gas
18. Comfort Heater	Unknown	48TCEA06 A2A3A0A0 A0	4111C59941	Unknown	Unknown	N/A	0.115 MMBtu/HR. ~~YR.~~	Natural Gas
19. Comfort Heater	Unknown	48TCEA06 A2A3A0A0 A0	4211C79380	Unknown	Unknown	N/A	0.115 MMBtu/HR. ~~YR.~~	Natural Gas

1. Basis for Equipment Size or Process Rate (Manufacturers data, Field Observation/Test, etc.) Manufacturer Data
Submit information for each unit as an attachment

NOTE: Copy this table if additional space is needed (begin numbering with 16., 17., etc.)

TABLE EXEMPTED SOURCES AND EXEMPTED ACTIVITIES (continued)

(Generator-Crusher-Screen-Conveyor-Boiler-Mixer-Spray Guns-Saws-Sander-Oven-Dryer-Furnace-Incinerator, etc.) Match the Process Equipment Units listed on this Table to the same numbered line if also listed on Emissions & Stack Table (page 6).

Process Equipment Unit	Manufacturer	Model #	Serial #	Manufacture Date	Installation Date	Modification Date	Size or Process Rate (Hp;kW;Btu;ft^3;lbs; tons;yd^3;etc.)	Fuel Type
20. Comfort Heater	Unknown	48TCEA06 A2A3A0A0 A1	3810G40200	Unknown	Unknown	N/A	0.115 MMBtu/HR. ~~YR.~~	Natural Gas
21. Hot Water Heater	Unknown	MI504S6EN 10	TB4843208	Unknown	Unknown	N/A	0.05 MMBtu/HR. ~~YR.~~	Natural Gas
22. Comfort Heater	Unknown	G100-200	URNG0508G0 0773	1991	1991	N/A	0.20 MMBtu/HR. ~~YR.~~	Natural Gas
23. Hot Water Heater	Unknown	3WA54	VGLN0306111 976	2019	2019	N/A	0.07 MMBtu/HR. ~~YR.~~	Natural Gas
24. Hot Water Heater	Unknown	SBD-100-199NE 118	170510478699 7	2017	2017	N/A	0.199 MMBtu/HR. ~~YR.~~	Natural Gas
25. Comfort Heater	Weil-McLane	LG8-8	No Serial No.	1988	1988	N/A	0.91 MMBtu/HR. ~~YR.~~	Natural Gas
26. Comfort Heater	Unknown	MI504S6EN 10	TB4843208	2015	2015	N/A	2.0 MMBtu/HR. ~~YR.~~	Natural Gas

Application for Air Pollutant Sources in Bernalillo County
Source Registration (20.11.40 NMAC) and Construction Permits (20.11.41 NMAC)
UNCONTROLLED EMISSIONS OF INDIVIDUAL AND COMBINED PROCESSES

(Process potential under physical/operational limitations during a 24 hr/day and 365 day/year = 8,760 hrs)

Process Equipment Unit*	Carbon Monoxide (CO)	Oxides of Nitrogen (NOx)	Nonmethane Hydrocarbons NMHC (VOCs)	Oxides of Sulfur (SOx)	Total Suspended Particulate Matter (TSP)	Method(s) used for Determination of Emissions (AP-42, Material balance, field tests, manufacturers data, etc.)
Example **1. Generator**	**1. 9.1 lbs/hr**	**27.7 lbs/hr**	**1.3 lbs/hr**	**0.5 lbs/hr**	**2.0 lbs/hr**	**AP-42**
	1a. 39.9 tons/yr	**121.3 tons/yr**	**5.7 tons/yr**	**2.2 tons/yr**	**8.8 tons/yr**	
1. Coarse Screening Facility at Valley Interceptor	**1. -- lbs/hr**	**-- lbs/hr**	**0.00005 lbs/hr**	**-- lbs/hr**	**-- lbs/hr**	TOXCHEM Model
	1a. -- tons/yr	**-- tons/yr**	**0.0002 tons/yr**	**-- tons/yr**	**-- tons/yr**	
2. North Prelim Trt Facility (Screenings & Grit Removal)	**2. -- lbs/hr**	**-- lbs/hr**	**0.0008 lbs/hr**	**-- lbs/hr**	**-- lbs/hr**	TOXCHEM Model
	2a. -- tons/yr	**-- tons/yr**	**0.0035 tons/yr**	**-- tons/yr**	**-- tons/yr**	
3 to 4. Primary Clarifier Holding Tanks #1 and #3	**3-4. -- lbs/hr**	**-- lbs/hr**	**0.0086 lbs/hr**	**-- lbs/hr**	**-- lbs/hr**	TOXCHEM Model
	3a-4a. -- tons/yr	**-- tons/yr**	**0.0379 tons/yr**	**-- tons/yr**	**-- tons/yr**	
5 to 6. Primary Clarifiers #2 and #4	**5-6 -- lbs/hr**	**-- lbs/hr**	**0.0148 lbs/hr**	**-- lbs/hr**	**-- lbs/hr**	TOXCHEM Model
	5a-6a. -- tons/yr	**-- tons/yr**	**0.0647 tons/yr**	**-- tons/yr**	**-- tons/yr**	
7 to 10. Primary Clarifiers #5-8	**7-10. -- lbs/hr**	**-- lbs/hr**	**0.0667 lbs/hr**	**-- lbs/hr**	**-- lbs/hr**	TOXCHEM Model
	7a-10a. -- tons/yr	**-- tons/yr**	**0.2922 tons/yr**	**-- tons/yr**	**-- tons/yr**	
11a to 14b. Activated Sludge Group #11a-11f, 12a-12d, 13a-13b, 14a-14b	**11-14. -- lbs/hr**	**-- lbs/hr**	**0.0221 lbs/hr**	**-- lbs/hr**	**-- lbs/hr**	TOXCHEM Model
	11a-14a. -- tons/yr	**-- tons/yr**	**0.0966 tons/yr**	**-- tons/yr**	**-- tons/yr**	
15 to 26. Final Clarifier #1-12	**15-26 -- lbs/hr**	**-- lbs/hr**	**0.0063 lbs/hr**	**-- lbs/hr**	**-- lbs/hr**	TOXCHEM Model
	15a-26a. -- tons/yr	**-- tons/yr**	**0.0276 tons/yr**	**-- tons/yr**	**-- tons/yr**	
27. Cogeneration Engine #1	**27. 16.4000 lbs/hr**	**5.2000 lbs/hr**	**5.5000 lbs/hr**	**0.8000 lbs/hr**	**0.2018 lbs/hr**	Stack Test Data, AP-42
	27a. 71.8320 tons/yr	**22.7760 tons/yr**	**24.0900 tons/yr**	**3.5040 tons/yr**	**0.8840 tons/yr**	
28. Cogeneration Engine #2	**28. 14.0000 lbs/hr**	**3.9000 lbs/hr**	**3.1000 lbs/hr**	**0.1600 lbs/hr**	**0.2018 lbs/hr**	Stack Test Data, AP-42
	28a. 61.3200 tons/yr	**17.0820 tons/yr**	**13.5780 tons/yr**	**0.7008 tons/yr**	**0.8840 tons/yr**	
29. Cogeneration Engine #3	**29. 14.5530 lbs/hr**	**7.2765 lbs/hr**	**2.3000 lbs/hr**	**0.9000 lbs/hr**	**0.1235 lbs/hr**	Stack Test Data, AP-42
	29a. 63.7421 tons/yr	**31.8711 tons/yr**	**10.0740 tons/yr**	**3.9420 tons/yr**	**0.5408 tons/yr**	
30. Cogeneration Engine #4	**30. 8.1000 lbs/hr**	**6.4000 lbs/hr**	**3.1000 lbs/hr**	**0.2500 lbs/hr**	**0.1430 lbs/hr**	Stack Test Data, AP-42
	30a. 35.4780 tons/yr	**28.0320 tons/yr**	**13.5780 tons/yr**	**1.0950 tons/yr**	**0.6264 tons/yr**	
31. Cogeneration Boiler	**31. 1.0338 lbs/hr**	**1.2307 lbs/hr**	**0.0677 lbs/hr**	**0.0074 lbs/hr**	**0.0935 lbs/hr**	AP-42
	31a. 4.5279 tons/yr	**5.3904 tons/yr**	**0.2965 tons/yr**	**0.0323 tons/yr**	**0.4097 tons/yr**	

*** If any one (1) of these process units, <u>or</u> combination of units, has an uncontrolled emission greater than (>) 10 lbs/hr or 25 tons/yr for any of the above pollutants (based on 8760 hrs of operation), then a permit will be required. Complete this application along with additional checklist information requested on accompanying instruction sheet. <u>Copy this Table if additional space is needed (begin numbering with 11., 12., etc.).</u> Note: pounds per hour = lb/hr; tons per year = tons/yr = tpy**

*** If all of these process units, individually <u>and</u> in combination, have an uncontrolled emission less than or equal to ($\leq$) 10 lbs/hr or 25 tons/yr for all of the above pollutants (based on 8760 hrs of operation), but > 1 ton/yr for any of the above pollutants - then a source registration is required.**

<u>If your facility does not require a registration or permit, based on above emissions, complete the remainder of this application to determine if a registration or permit would be required for Toxic or Hazardous air pollutants used at your facility.</u>

UNCONTROLLED EMISSIONS OF INDIVIDUAL AND COMBINED PROCESSES (continued)

(Process potential under physical/operational limitations during a 24 hr/day and 365 day/year = 8,760 hrs)

Process Equipment Unit*	Carbon Monoxide (CO)	Oxides of Nitrogen (NOx)	Nonmethane Hydrocarbons NMHC (VOCs)	Oxides of Sulfur (SOx)	Total Suspended Particulate Matter (TSP)	Method(s) used for Determination of Emissions (AP-42, Material balance, field tests, manufacturers data, etc.)
32. Secondary Sludge Thickening (DAF/RDT)	**32. -- lbs/hr**	**-- lbs/hr**	**0.0046 lbs/hr**	**-- lbs/hr**	**-- lbs/hr**	TOXCHEM Model
	32a. -- tons/yr	**-- tons/yr**	**0.0202 tons/yr**	**-- tons/yr**	**-- tons/yr**	
33. Unleaded Fuel Tank	**33. -- lbs/hr**	**-- lbs/hr**	**0.2188 lbs/hr**	**-- lbs/hr**	**-- lbs/hr**	TANKS 4.0.9d
	33a. -- tons/yr	**-- tons/yr**	**0.9585 tons/yr**	**-- tons/yr**	**-- tons/yr**	
34-36. Gas Flare #1, #2, #3	**34-36. 32.8395 lbs/hr**	**7.2035 lbs/hr**	**0.8465 lbs/hr**	**2.4167 lbs/hr**	**1.1696 lbs/hr**	AP-42 and Digester Gas Data
	34a-36a. 143.8371 tpy	**31.5514 tpy**	**3.7075 tons/yr**	**10.5851 tons/yr**	**5.1230 tons/yr**	
37. UV Facility Emergency Generator	**37. 0.6122 lbs/hr**	**7.5062 lbs/hr**	**0.1166 lbs/hr**	**0.0064 lbs/hr**	**0.0437 lbs/hr**	EPA Tier 2 Emission Standards
	37a. 2.6812 tons/yr	**32.8769 tpy**	**0.5107 tons/yr**	**0.0279 tons/yr**	**0.1915 tons/yr**	
38. North PTF Emergency Generator 0.5 MW	**38. 4.1800 lbs/hr**	**18.2400 lbs/hr**	**0.5358 lbs/hr**	**0.0092 lbs/hr**	**0.5320 lbs/hr**	AP-42
	38a. 18.3084 tons/yr	**79.8912 tpy**	**2.3468 tons/yr**	**0.0404 tons/yr**	**2.3302 tons/yr**	
39. PPH1 & 2 Emergency Generator 1 MW	**39. 2.1684 lbs/hr**	**12.9775 lbs/hr**	**0.2300 lbs/hr**	**0.3614 lbs/hr**	**0.3614 lbs/hr**	Manufacturer Data
	39a. 9.4976 tons/yr	**56.8416 tpy**	**1.0073 tons/yr**	**1.5829 tons/yr**	**1.5829 tons/yr**	
40. SAPS Emergency Generator 2 MW	**40. 1.8925 lbs/hr**	**31.3437 lbs/hr**	**0.4731 lbs/hr**	**0.0591 lbs/hr**	**0.1771 lbs/hr**	Manufacturer Data
	40a. 8.2889 tons/yr	**137.2854 tpy**	**2.0722 tons/yr**	**0.2590 tons/yr**	**0.7771 tons/yr**	
41. Blower Bldg. Emergency Generator 3 MW	**41. 1.8994 lbs/hr**	**49.3841 lbs/hr**	**0.6648 lbs/hr**	**0.0475 lbs/hr**	**0.3799 lbs/hr**	Manufacturer Data
	41a. 8.3193 tons/yr	**216.3022 tpy**	**2.9118 tons/yr**	**0.2080 tons/yr**	**1.6639 tons/yr**	
42. North Blower Bldg. Emergency Generator 750 kW	**42. 3.2200 lbs/hr**	**17.6100 lbs/hr**	**0.60000 lbs/hr**	**0.0135 lbs/hr**	**0.5200 lbs/hr**	Manufacturer Data
	42a. 14.1036 tons/yr	**77.1318 tpy**	**2.6280 tons/yr**	**0.0589 tons/yr**	**2.2776 tons/yr**	
43. Dewatering Bldg. "HOTSY"	**43. 0.0593 lbs/hr**	**0.0706 lbs/hr**	**0.0039 lbs/hr**	**0.0004 lbs/hr**	**0.0054 lbs/hr**	AP-42
	43a. 0.2599 tons/yr	**0.3094 tons/yr**	**0.0170 tons/yr**	**0.0019 tons/yr**	**0.0235 tons/yr**	
44. DAF/RDT Bldg. "HOTSY"	**44. 0.0593 lbs/hr**	**0.0706 lbs/hr**	**0.0039 lbs/hr**	**0.0004 lbs/hr**	**0.0054 lbs/hr**	AP-42
	44a. 0.2599 tons/yr	**0.3094 tons/yr**	**0.0170 tons/yr**	**0.0019 tons/yr**	**0.0235 tons/yr**	
45. Tijeras Canyon Interceptor Carbon System	**45. -- lbs/hr**	**-- lbs/hr**	**-- lbs/hr**	**-- lbs/hr**	**-- lbs/hr**	H2S Emissions / TOXCHEM
	45a. -- tons/yr	**-- tons/yr**	**-- tons/yr**	**-- tons/yr**	**-- tons/yr**	
46. South Blower Building Carbon System	**46. -- lbs/hr**	**-- lbs/hr**	**-- lbs/hr**	**-- lbs/hr**	**-- lbs/hr**	H2S Emissions / TOXCHEM
	46a. -- tons/yr	**-- tons/yr**	**-- tons/yr**	**-- tons/yr**	**-- tons/yr**	
47. South Activated Sludge Pump Station Carbon System	**47. -- lbs/hr**	**-- lbs/hr**	**-- lbs/hr**	**-- lbs/hr**	**-- lbs/hr**	H2S Emissions / TOXCHEM
	47a. -- tons/yr	**-- tons/yr**	**-- tons/yr**	**-- tons/yr**	**-- tons/yr**	
48. Sludge Blending Tank Carbon System	**48. -- lbs/hr**	**-- lbs/hr**	**-- lbs/hr**	**-- lbs/hr**	**-- lbs/hr**	H2S Emissions / TOXCHEM
	48a. -- tons/yr	**-- tons/yr**	**-- tons/yr**	**-- tons/yr**	**-- tons/yr**	
49. Sludge Dewatering Facility Bohn Biofilter	**49. -- lbs/hr**	**-- lbs/hr**	**-- lbs/hr**	**-- lbs/hr**	**-- lbs/hr**	H2S Emissions / TOXCHEM
	49a. -- tons/yr	**-- tons/yr**	**-- tons/yr**	**-- tons/yr**	**-- tons/yr**	
50. Wang Server Room Emergency Generator 150 kW	**50. 0.6107 lbs/hr**	**1.5543 lbs/hr**	**0.0130 lbs/hr**	**0.4039 lbs/hr**	**0.0449 lbs/hr**	Manufacturer Data
	50a. 2.6749 tons/yr	**6.8080 tons/yr**	**0.0569 tons/yr**	**1.7689 tons/yr**	**0.1967 tons/yr**	
51. Paved Haul Roads	**51. -- lbs/hr**	**-- lbs/hr**	**-- lbs/hr**	**-- lbs/hr**	**0.0531 lbs/hr**	AP-42
	51a. -- tons/yr	**-- tons/yr**	**-- tons/yr**	**-- tons/yr**	**0.0722 tons/yr**	

Totals of Uncontrolled Emissions	**101.63 lbs/hr**	**169.97 lbs/hr**	**17.90 lbs/hr**	**5.44 lbs/hr**	**4.06 lbs/hr**
	445.13 tons/yr	**744.46 tons/yr**	**78.39 tons/yr**	**23.81 tons/yr**	**17.61 tons/yr**

Application for Air Pollutant Sources in Bernalillo County
Source Registration (20.11.40 NMAC) and Construction Permits (20.11.41 NMAC)

CONTROLLED EMISSIONS OF INDIVIDUAL AND COMBINED PROCESSES

(Based on current operations with emission controls OR requested operations with emission controls)

Process Equipment Units listed on this Table should match up to the same numbered line and Unit as listed on Uncontrolled Table (pg. 3)

Process Equipment Unit	Carbon Monoxide (CO)	Oxides of Nitrogen (NOx)	Nonmethane Hydrocarbons NMHC (VOCs)	Oxides of Sulfur (SOx)	Total Suspended Particulate Matter (TSP)	Control Method	% Efficiency
Example 1. Generator	**1. 9.1 lbs/hr**	**27.7 lbs/hr**	**1.3 lbs/hr**	**0.5 lbs/hr**	**2.0 lbs/hr**	**Operating Hours**	**N/A**
	1a. 18.2 tons/yr	**55.4 tons/yr**	**2.6 tons/yr**	**1.0 tons/yr**	**4.0 tons/yr**		
1. Coarse Screening Facility at Valley Interceptor	**1. -- lbs/hr**	**-- lbs/hr**	**0.00005 lbs/hr**	**-- lbs/hr**	**-- lbs/hr**	Activated Carbon Filter	H2S – 98%
	1a. -- tons/yr	**-- tons/yr**	**0.0002 tons/yr**	**-- tons/yr**	**-- tons/yr**		
2. North Prelim Treatment Facility (Screenings & Grit Removal)	**2. -- lbs/hr**	**-- lbs/hr**	**0.0008 lbs/hr**	**-- lbs/hr**	**-- lbs/hr**	Activated Carbon Filter	H2S – 98%
	2a. -- tons/yr	**-- tons/yr**	**0.0035 tons/yr**	**-- tons/yr**	**-- tons/yr**		
3 to 4. Primary Clarifier Holding Tanks #1 and #3	**3-4. -- lbs/hr**	**-- lbs/hr**	**0.0086 lbs/hr**	**-- lbs/hr**	**-- lbs/hr**	Bohn Biofilter	H2S – 98%
	3a-4a. -- tons/yr	**-- tons/yr**	**0.0379 tons/yr**	**-- tons/yr**	**-- tons/yr**		
5 to 6. Primary Clarifiers #2 and #4	**5-6. -- lbs/hr**	**-- lbs/hr**	**0.0148 lbs/hr**	**-- lbs/hr**	**-- lbs/hr**	Activated Carbon Filter or Bio Tower	H2S – 98%
	5a-6a. -- tons/yr	**-- tons/yr**	**0.0647 tons/yr**	**-- tons/yr**	**-- tons/yr**		
7 to 10. Primary Clarifiers #5-8	**7-10. -- lbs/hr**	**-- lbs/hr**	**0.0667 lbs/hr**	**-- lbs/hr**	**-- lbs/hr**	Bohn Biofilter	H2S – 98%
	7a-10a. -- tons/yr	**-- tons/yr**	**0.2922 tons/yr**	**-- tons/yr**	**-- tons/yr**		
11a to 14b. Activated Sludge Group #11a-11f, 12a-12d, 13a-13b, 14a-14b	**11-14. -- lbs/hr**	**-- lbs/hr**	**0.0221 lbs/hr**	**-- lbs/hr**	**-- lbs/hr**	N/A	N/A
	11a-14a. -- tons/yr	**-- tons/yr**	**0.0966 tons/yr**	**-- tons/yr**	**-- tons/yr**		
15 to 26. Final Clarifiers #1-12	**15-26. -- lbs/hr**	**-- lbs/hr**	**0.0063 lbs/hr**	**-- lbs/hr**	**-- lbs/hr**	N/A	N/A
	15a-26a. -- tons/yr	**-- tons/yr**	**0.0276 tons/yr**	**-- tons/yr**	**-- tons/yr**		
27. Cogeneration Engine #1	**27. 3.9360 lbs/hr**	**2.5480 lbs/hr**	**2.8600 lbs/hr**	**0.8000 lbs/hr**	**0.2018 lbs/hr**	SCR and Oxidative Catalyst	NOx: 51% CO: 76% VOC: 48% HCHO: 48% Tot. HAP: 44%
	27a. 17.2397 tons/yr	**11.1602 tpy**	**12.5268 tons/yr**	**3.5040 tons/yr**	**0.8840 tons/yr**		
28. Cogeneration Engine #2	**28. 3.3600 lbs/hr**	**1.9110 lbs/hr**	**1.6120 lbs/hr**	**0.1600 lbs/hr**	**0.2018 lbs/hr**	SCR and Oxidative Catalyst	NOx: 51% CO: 76% VOC: 48% HCHO: 48% Tot. HAP: 44%
	28a. 14.7168 tons/yr	**8.3702 tons/yr**	**7.0606 tons/yr**	**0.7008 tons/yr**	**0.8840 tons/yr**		
29. Cogeneration Engine #3	**29. 3.4927 lbs/hr**	**3.5655 lbs/hr**	**1.1960 lbs/hr**	**0.9000 lbs/hr**	**0.1235 lbs/hr**	SCR and Oxidative Catalyst	NOx: 51% CO: 76% VOC: 48% HCHO: 48% Tot. HAP: 44%
	29a. 15.2981 tons/yr	**15.6168 tpy**	**5.2385 tons/yr**	**3.9420 tons/yr**	**0.5408 tons/yr**		
30. Cogeneration Engine #4	**30. 1.9440 lbs/hr**	**3.1360 lbs/hr**	**1.6120 lbs/hr**	**0.2500 lbs/hr**	**0.1430 lbs/hr**	SCR and Oxidative Catalyst	NOx: 51% CO: 76% VOC: 48% HCHO: 48% Tot. HAP: 44%
	30a. 8.5157 tons/yr	**13.7357 tpy**	**7.0606 tons/yr**	**1.0950 tons/yr**	**0.6264 tons/yr**		
31. Cogeneration Boiler	**31. 1.0338 lbs/hr**	**1.2307 lbs/hr**	**0.0677 lbs/hr**	**0.0074 lbs/hr**	**0.0935 lbs/hr**	N/A	N/A
	31a. 4.5279 tons/yr	**5.3904 tons/yr**	**0.2965 tons/yr**	**0.0323 tons/yr**	**0.4097 tons/yr**		
32. Secondary Sludge Thickening (DAF/RDT)	**32. -- lbs/hr**	**-- lbs/hr**	**0.0046 lbs/hr**	**-- lbs/hr**	**-- lbs/hr**	N/A	N/A
	32a. -- tons/yr	**-- tons/yr**	**0.0202 tons/yr**	**-- tons/yr**	**-- tons/yr**		

CONTROLLED EMISSIONS OF INDIVIDUAL AND COMBINED PROCESSES (continued)

(Based on current operations with emission controls OR requested operations with emission controls)

Process Equipment Units listed on this Table should match up to the same numbered line and Unit as listed on Uncontrolled Table (pg. 3)

Process Equipment Unit	Carbon Monoxide (CO)	Oxides of Nitrogen (NOx)	Nonmethane Hydrocarbons NMHC (VOCs)	Oxides of Sulfur (SOx)	Total Suspended Particulate Matter (TSP)	Control Method	% Efficiency
33. Unleaded Fuel Tank	**33. -- lbs/hr**	**-- lbs/hr**	**0.2188 lbs/hr**	**-- lbs/hr**	**-- lbs/hr**	N/A	N/A
	33a. -- tons/yr	**-- tons/yr**	**0.9585 tons/yr**	**-- tons/yr**	**-- tons/yr**		
34-36. Gas Flare #1, #2, #3	**34-36. 32.8395 lbs/hr**	**7.2035 lbs/hr**	**0.8465 lbs/hr**	**2.4167 lbs/hr**	**1.1696 lbs/hr**	Operating Hours	N/A
	34a-36a. 35.4667 tpy	**7.7798 tons/yr**	**0.9142 tons/yr**	**2.6100 tons/yr**	**1.2632 tons/yr**		
37. UV Facility Emergency Generator	**37. 0.6122 lbs/hr**	**7.5062 lbs/hr**	**0.1166 lbs/hr**	**0.0064 lbs/hr**	**0.0437 lbs/hr**	Operating Hours	N/A
	37a. 0.1530 tons/yr	**1.8765 tons/yr**	**0.0292 tons/yr**	**0.0016 tons/yr**	**0.0109 tons/yr**		
38. North PTF Emergency Generator 0.5 MW	**38. 4.1800 lbs/hr**	**18.2400 lbs/hr**	**0.5358 lbs/hr**	**0.0092 lbs/hr**	**0.5320 lbs/hr**	Operating Hours	N/A
	38a. 0.4180 tons/yr	**1.8240 tons/yr**	**0.0536 tons/yr**	**0.0009 tons/yr**	**0.0532 tons/yr**		
39. PPH1 & 2 Emergency Generator 1 MW	**39. 2.1684 lbs/hr**	**12.9775 lbs/hr**	**0.2300 lbs/hr**	**0.3614 lbs/hr**	**0.3614 lbs/hr**	Operating Hours	N/A
	39a. 0.2168 tons/yr	**1.2978 tons/yr**	**0.0230 tons/yr**	**0.0361 tons/yr**	**0.0361 tons/yr**		
40. SAPS Emergency Generator 2 MW	**40. 1.8925 lbs/hr**	**31.3437 lbs/hr**	**0.4731 lbs/hr**	**0.0591 lbs/hr**	**0.1774 lbs/hr**	Operating Hours	N/A
	40a. 0.1892 tons/yr	**3.1344 tons/yr**	**0.0473 tons/yr**	**0.0059 tons/yr**	**0.0177 tons/yr**		
41. Blower Bldg. Emergency Generator 3 MW	**41. 1.8994 lbs/hr**	**49.3841 lbs/hr**	**0.6648 lbs/hr**	**0.0475 lbs/hr**	**0.3799 lbs/hr**	Operating Hours	N/A
	41a. 0.1899 tons/yr	**4.9384 tons/yr**	**0.0665 tons/yr**	**0.0047 tons/yr**	**0.0380 tons/yr**		
42. North Blower Bldg. Emergency Generator 750 kW	**42. 3.2200 lbs/hr**	**17.6100 lbs/hr**	**0.6000 lbs/hr**	**0.0135 lbs/hr**	**0.5200 lbs/hr**	Operating Hours	N/A
	42a. 0.3220 tons/yr	**1.7610 tons/yr**	**0.0600 tons/yr**	**0.0013 tons/yr**	**0.0520 tons/yr**		
43. Dewatering Bldg. “HOTSY”	**43. 0.0593 lbs/hr**	**0.0706 lbs/hr**	**0.0039 lbs/hr**	**0.0004 lbs/hr**	**0.0054 lbs/hr**	N/A	N/A
	43a. 0.2599 tons/yr	**0.3094 tons/yr**	**0.0170 tons/yr**	**0.0019 tons/yr**	**0.0235 tons/yr**		
44. DAF/RDT Bldg. “HOTSY”	**44. 0.0593 lbs/hr**	**0.0706 lbs/hr**	**0.0039 lbs/hr**	**0.0004 lbs/hr**	**0.0054 lbs/hr**	N/A	N/A
	44a. 0.2599 tons/yr	**0.3094 tons/yr**	**0.0170 tons/yr**	**0.0019 tons/yr**	**0.0235 tons/yr**		
45. Tijeras Canyon Interceptor Carbon System	**45. -- lbs/hr**	**-- lbs/hr**	**-- lbs/hr**	**-- lbs/hr**	**-- lbs/hr**	Activated Carbon Filter	H2S – 98%
	45a. -- tons/yr	**-- tons/yr**	**-- tons/yr**	**-- tons/yr**	**-- tons/yr**		
46. South Blower Building Carbon System	**46. -- lbs/hr**	**-- lbs/hr**	**-- lbs/hr**	**-- lbs/hr**	**-- lbs/hr**	Activated Carbon Filter	H2S – 98%
	46a. -- tons/yr	**-- tons/yr**	**-- tons/yr**	**-- tons/yr**	**-- tons/yr**		
47. South Activated Sludge Pump Station Carbon System	**47. -- lbs/hr**	**-- lbs/hr**	**-- lbs/hr**	**-- lbs/hr**	**-- lbs/hr**	Activated Carbon Filter	H2S – 98%
	47a. -- tons/yr	**-- tons/yr**	**-- tons/yr**	**-- tons/yr**	**-- tons/yr**		
48. Sludge Blending Tank Carbon System	**48. -- lbs/hr**	**-- lbs/hr**	**-- lbs/hr**	**-- lbs/hr**	**-- lbs/hr**	Activated Carbon Filter	H2S – 98%
	48a. -- tons/yr	**-- tons/yr**	**-- tons/yr**	**-- tons/yr**	**-- tons/yr**		
49. Sludge Dewatering Facility Bohn Biofilter	**49. -- lbs/hr**	**-- lbs/hr**	**-- lbs/hr**	**-- lbs/hr**	**-- lbs/hr**	Bohn Biofilter	H2S – 98%
	49a. -- tons/yr	**-- tons/yr**	**-- tons/yr**	**-- tons/yr**	**-- tons/yr**		
50. Wang Server Room Emergency Generator 150 kW	**50. 0.6107 lbs/hr**	**1.5543 lbs/hr**	**0.013 lbs/hr**	**0.4039 lbs/hr**	**0.0449 lbs/hr**	Operating Hours	N/A
	50a. 0.0611 tons/yr	**0.1554 tons/yr**	**0.0013 tons/yr**	**0.0404 tons/yr**	**0.0045 tons/yr**		
51. Paved Haul Roads	**51. -- lbs/hr**	**-- lbs/hr**	**-- lbs/hr**	**-- lbs/hr**	**0.0531 lbs/hr**	Paved Roads	N/A
	51a. -- tons/yr	**-- tons/yr**	**-- tons/yr**	**-- tons/yr**	**0.0722 tons/yr**		

Totals of Controlled Emissions	**61.31 lbs/hr**	**158.35 lbs/hr**	**11.18 lbs/hr**	**5.44 lbs/hr**	**4.06 lbs/hr**	[redacted]
	97.83 tons/yr	**77.66 tons/yr**	**34.91 tons/yr**	**11.98 tons/yr**	**4.94 tons/yr**	[redacted]

1. Basis for Control Equipment % Efficiency (Manufacturers data, Field Observation/Test, AP-42, etc.)_Manufacturer data, observation, and engineering judgment. ______________________________________
   Submit information for each unit as an attachment
2. Explain and give estimated amounts of any Fugitive Emission associated with facility processes _N/A - all emissions sources are listed in the table above._______

Please note: Changes to one emergency generator and the addition of one 0.15MW emergency generator have been included in this application compared to the previous applications that the Air Quality Program deemed administratively incomplete.

Application for Air Pollutant Sources in Bernalillo County
Source Registration (20.11.40 NMAC) and Construction Permits (20.11.41 NMAC)

**TOXIC EMISSIONS

VOLATILE, HAZARDOUS, & VOLATILE HAZARDOUS AIR POLLUTANT EMISSION TABLE

Product Categories (Coatings, Solvents, Thinners, etc.)	Volatile Organic Compound (VOC), Hazardous Air Pollutant (HAP), or Volatile Hazardous Air Pollutant (VHAP) Primary To The Representative As Purchased Product	Chemical Abstract Service Number (CAS) Of VOC, HAP, Or VHAP From Representative As Purchased Product	VOC, HAP, Or VHAP Concentration Of Representative As Purchased Product (pounds/gallon, or %)	1. How were Concentrations Determined (CPDS, MSDS, etc.)	Total Product Purchases For Category	(-)	Quantity Of Product Recovered & Disposed For Category	(=)	Total Product Usage For Category
EXAMPLE 1. Surface Coatings	XYLENE	1330207	4.0 LBS./GAL	MSDS	lbs/yr	(-)	lbs/yr	(=)	lbs/yr
					100 gal/yr		- 0 - gal/yr		100 gal/yr
EXAMPLE 2. Cleaning Solvents	TOLUENE	108883	70%	PRODUCT LABEL	lbs/yr	(-)	lbs/yr	(=)	lbs/yr
					200 gal/yr		50 gal/yr		150 gal/yr
N/A – no volatile, hazardous, or volatile hazardous air pollutants are purchased for facility operations.									
I.					lbs/yr	(-)	lbs/yr	(=)	lbs/yr
					gal/yr		gal/yr		gal/yr
II.					lbs/yr	(-)	lbs/yr	(=)	lbs/yr
					gal/yr		gal/yr		gal/yr
III.					lbs/yr	(-)	lbs/yr	(=)	lbs/yr
					gal/yr		gal/yr		gal/yr
IV.					lbs/yr	(-)	lbs/yr	(=)	lbs/yr
					gal/yr		gal/yr		gal/yr
V.					lbs/yr	(-)	lbs/yr	(=)	lbs/yr
					gal/yr		gal/yr		gal/yr
TOTAL >>>>>>>					lbs/yr	(-)	lbs/yr	(=)	lbs/yr
					gal/yr		gal/yr		gal/yr

1. Basis for percent (%) determinations (Certified Product Data Sheets, Material Safety Data Sheets, etc.). Submit, as an attachment, information on one (1) product from each Category listed above which best represents the average of all the products purchased in that Category. Copy this Table if additional space is needed (begin numbering with XI., XII., etc.)

****NOTE: A REGISTRATION IS REQUIRED, AT MINIMUM, FOR ANY AMOUNT OF HAP OR VHAP EMISSION.**
A PERMIT MAY BE REQUIRED FOR THESE EMISSIONS, DETERMINED ON A CASE-BY-CASE EVALUATION.

Application for Air Pollutant Sources in Bernalillo County
Source Registration (20.11.40 NMAC) and Construction Permits (20.11.41 NMAC)

MATERIAL AND FUEL STORAGE TABLE

(Tanks, barrels, silos, stockpiles, etc.) Copy this table if additional space is needed (begin numbering with 6., 7., etc.)

Storage Equipment	Product Stored	Capacity (bbls - tons gal - acres,etc)	Above or Below Ground	Construction (welded, riveted) & Color	Install Date	Loading Rate	Offloading Rate	True Vapor Pressure	Control Equipment	Seal Type	% Eff.
Example 1. Tank	diesel fuel	5,000 gal.	Below	welded/ brown	3/93	3000gal HR. ~~YR.~~	500 gal. - HR. ~~YR.~~	N/A Psia	N/A	N/A	N/A
Example 2. Barrels	Solvent	55 gal Drum	Above - in storage room	welded - green	N/A	N/A HR. YR.	N/A HR. YR.	N/A Psia	N/A	N/A	N/A
33. Unleaded Fuel Tank	Unleaded Gasoline (RVP 13)	2,000 gallons	Above Ground	Concrete encased steel AST, white	1990	50,000 gal/yr	50,000 gal/yr	6.8 psia	N/A	N/A	N/A
66. Diesel Tank	Diesel fuel	10,000 gallons	Below Ground	Fiberglass	1989	varies	varies	>0.01 psia	N/A	N/A	N/A
67. East Gas Holder	Digester Gas Holder	53,000 ft^3	Above Ground	Welded steel	1985	varies	varies	N/A	N/A	N/A	N/A
68. West Gas Holder	Digester Gas Holder	53,000 ft^3	Above Ground	Welded steel	1985	varies	varies	N/A	N/A	N/A	N/A
69. sludge Storage Tank	Digested Sludge	2 MG	Above Ground	Concrete	2017	varies	varies	N/A	N/A	N/A	N/A
70. High Pressure Digester Gas Sphere	Digester Gas	11,400 ft^3	Above Ground	Welded steel, white	1985	varies	varies	N/A	N/A	N/A	N/A

1. Basis for Loading/Offloading Rate (Manufacturers data, Field Observation/Test, etc.) Submit information for each unit as an attachment
Field Observation

2. Basis for Control Equipment % Efficiency (Manufacturers data, Field Observation/Test, AP-42, etc.) Submit information for each unit as an attachment
N/A

STACK AND EMISSION MEASUREMENT TABLE

If any equipment from the Process Equipment Table (Page 2) is also listed in this Stack Table, use the same numbered line for the Process Equipment unit on both Tables to show the association between the Process Equipment and its Stack. Copy this table if additional space is needed (begin numbering with 6., 7., etc.).

Process Equipment	Pollutant (CO,NOx,TSP, Toluene,etc)	Control Equipment	Control Efficiency	Stack Height & Diameter in feet	Stack Temp.	Stack Velocity & Exit Direction	Emission Measurement Equipment Type	Range-Sensitivity-Accuracy-
Example 1. Generator	CO, NOx, TSP, SO_2, NMHC	N/A	N/A	18 ft. - H 0.8 ft. - D	225 ^{0}F	6,000 ft^3/min - V Exit - upward	N/A	N/A
Example 2. Spray Gun	TSP, xylene, toluene, MIBK	Paint Booth	99% for TSP	9 ft. - H 0.5 ft. -D	ambient	10,000 ft^3/min - V Exit - horizontal	N/A	N/A
1. Coarse Screening Facility at Valley Interceptor	VOC, HAPs, H2S	Activated Carbon Filter (2 Stacks)	H2S – 98%	Activated Carbon Unit 1N: 9.1 ft. – H 2.0 ft – D 1S: 9.1 ft. – H 2.0 ft – D	Ambient (for both 1N and 1S)	35 ft/s- V Exit – upward for both 1N and 1S	N/A	N/A
2. North Prelim Treatment Facility (Screenings & Grit Removal)	VOC, HAPs, H2S	Activated Carbon Filter	H2S – 98%	Activated Carbon Unit 9.4 ft. – H 1.0 ft - D	Ambient	47.2 fts/- V Exit – upward	N/A	N/A
2. North Prelim Trt Facility (Screenings & Grit Removal)	VOC, HAPs, H2S	North Bohn Biofilter	H2S – 98%	Biofilter 2.5 ft. – Release Height 80 ft – L 56 ft. – W	Ambient	N/A	N/A	N/A
2. North Prelim Trt Facility (Screenings & Grit Removal)	VOC, HAPs, H2S	South Bohn Biofilter	H2S – 98%	Biofilter 2.5 ft. – Release Height 65 ft – L 46 ft. – W	Ambient	N/A	N/A	N/A
3 to 4. Primary Clarifier Holding Tanks #1 and #3.	VOC, HAPs, H2S	N/A	N/A	Radius: 60 ft Release Height: 0 ft	Ambient	N/A	N/A	N/A
5 to 6. Primary Clarifiers #2 and #4	VOC, HAPs, H2S	Activated Carbon Filter or Bio Tower	H2S – 98%	Activated Carbon Unit 9.1 ft. – H 2.0 ft - D	Ambient	35 ft/s- V Exit – upward	N/A	N/A
7 to 10. Primary Clarifiers #5-8	VOC, HAPs, H2S	Bohn Biofilter	H2S – 98%	Biofilter 2.5 ft. – Release Height 87 ft – L 62 ft. – W	Ambient	N/A	N/A	N/A
11a to 14b. Activated Sludge Group #11a-11f, 12a-12d, 13a-13b, 14a-14b	VOC, HAPs	N/A	N/A	N/A	Ambient	N/A	N/A	N/A
15 to 26. Final Clarifier #1-12	VOC, HAPs	N/A	N/A	Radius: 60 ft	Ambient	N/A	N/A	N/A

27. Cogeneration Engine #1	NOx, CO, VOC, PM, SO2, HAPs	SCR and Oxidation Catalyst	NOx: 51% CO: 74% VOC: 48% HCHO, acrolein, acetaldehyde, ethylene dibromide: 48% Tot. HAP: 44%	40 ft. – H 2.08 ft. – D	656 F	68.5 ft/s – V Exit – upward	N/A	N/A
28. Cogeneration Engine #2	NOx, CO, VOC, PM, SO2, HAPs	SCR and Oxidation Catalyst	NOx: 51% CO: 74% VOC: 48% HCHO, acrolein, acetaldehyde, ethylene dibromide: 48% Tot. HAP: 44%	40 ft. – H 2.08 ft. – D	509 F	65.8 ft/s – V Exit – upward	N/A	N/A
29. Cogeneration Engine #3	NOx, CO, VOC, PM, SO2, HAPs	SCR and Oxidation Catalyst	NOx: 51% CO: 76% VOC: 48% HCHO, acrolein, acetaldehyde, ethylene dibromide: 48% Tot. HAP: 44%	44 ft. – H 1.08 ft. – D	695 F	180.8 ft/s – V Exit – upward	N/A	N/A
30. Cogeneration Engine #4	NOx, CO, VOC, PM, SO2, HAPs	SCR and Oxidation Catalyst	NOx: 51% CO: 74% VOC: 48% HCHO, acrolein, acetaldehyde, ethylene dibromide: 48% Tot. HAP: 44%	44 ft. – H 1.08 ft. – D	682 F	183.3 ft/s – V Exit – upward	N/A	N/A
31. Cogeneration Boiler	NOx, CO, VOC, PM, SO2, HAP	N/A	N/A	29.67 ft. – H 1.67 ft. – D	250 F	40 ft/s – V Exit – upward	N/A	N/A
32. Secondary Sludge Thickening (DAF/RDT)	VOC, HAPs	N/A	N/A	N/A	Ambient	N/A	N/A	N/A
33. Unleaded Fuel Tank	VOC	N/A	N/A	11.3 ft – Tank H 7.5 ft Tank dia.	Ambient	N/A	N/A	N/A
34-36. Gas Flare #1, #2, #3	NOx, CO, VOC, PM, SO2, HAPs, H2S	N/A	N/A	11 ft. – H 4.64 ft. – effective Diameter	1,832 F	65.6 ft/s – V Exit – upward	N/A	N/A
37. UV Facility Emergency Generator	NOx, CO, VOC, PM, SO2, HAPs	N/A	N/A	10 ft. – H 0.25 ft. – D	865 F	150 ft/s – V Exit – upward	N/A	N/A
38. North PTF Emergency Generator 0.5 MW	NOx, CO, VOC, PM, SO2, HAPs	N/A	N/A	10 ft. – H 0.4 ft. – D	950 F	99 ft/s – V Exit – upward	N/A	N/A
39. PPH1 & 2 Emergency Generator 1 MW	NOx, CO, VOC, PM, SO2, HAPs	N/A	N/A	12.8 ft. – H 1.15 ft. – equiv. D	890 F	120 ft/s – V Exit – upward	N/A	N/A
40. SAPS Emergency Generator 2 MW	NOx, CO, VOC, PM, SO2, HAPs	N/A	N/A	12.3 ft. – H 1.38 ft. – equiv. D	897 F	172 ft/s – V Exit – upward	N/A	N/A
41. Blower Bldg. Emergency Generator 3 MW	NOx, CO, VOC, PM, SO2, HAPs	N/A	N/A	TBD	TBD	V-TBD Exit - upward	N/A	N/A

42. North Blower Bldg. Emergency Generator 750 kW	NOx, CO, VOC, PM, SO2, HAPs	N/A	N/A	20 ft. – H 0.67 ft. – D	957 F	77 ft/s – V Exit – upward	N/A	N/A
43. Dewatering Bldg. "HOTSY"	NOx, CO, VOC, PM, SO2, HAPs	N/A	N/A	43 ft. – H 1.0 ft. – D	460 F	13.3 ft/s – V Exit – upward	N/A	N/A
44. DAF/RDT Bldg. "HOTSY"	NOx, CO, VOC, PM, SO2, HAPs	N/A	N/A	28.75 ft. – H 1.4 ft. – D	460 F	2.1 ft/s – V Exit – upward	N/A	N/A
45. Tijeras Canyon Interceptor Carbon System North and South Stacks	VOC, HAPs, H2S	Activated Carbon Filter	H2S – 98%	Activated Carbon Unit 9.1 ft. – H 2.0 ft - D	Ambient	35 ft/s- V Exit – upward	N/A	N/A
46. South Blower Building Carbon System	VOC, HAPs, H2S	Activated Carbon Filter	H2S – 98%	Activated Carbon Unit 8.83 ft. – H 0.83 ft - D	Ambient	46.2 ft/s- V Exit – upward	N/A	N/A
47. South Activated Sludge Pump Station Carbon System	VOC, HAPs, H2S	Activated Carbon Filter	H2S – 98%	Activated Carbon Unit 9 ft. – H 14 ft – W (Effective Diameter = 12.7 ft) Stack Height = 0 (stack is a 9 ft x 14 ft duct on the ground) Release Height = (9 ft)/2 = 4.5 ft	Ambient	1.9 ft/s- H Exit – horizontally	N/A	N/A
48. Sludge Blending Tank Carbon System	VOC, HAPs, H2S	Activated Carbon Filter	H2S – 98%	Activated Carbon Unit 14.0 ft. – H 1.5 ft - D	Ambient	14.2 ft/s- V Exit – upward	N/A	N/A
49. Sludge Dewatering Facility Bohn Biofilter	VOC, HAPs, H2S	Bohn Biofilter	H2S – 98%	Biofilter 2.5 ft. – Release Height 77 ft – L 62 ft. – W	Ambient	N/A	N/A	N/A
50. Wang Server Rm Emergency Generator 150 kW	NOx, CO, VOC, PM, SO2, HAPs	N/A	N/A	TBD	TBD	V-TBD Exit - upward	N/A	N/A

1. Basis for Control Equipment % Efficiency (Manufacturers data, Field Observation/Test, AP-42, etc.) Submit information for each unit as an attachment __Manufacturer data, observation, and engineering judgment. ________________

<u>NOTE:</u> Stack parameters (height and diameter) listed in the table above have been measured in the field and were confirmed by Water Utility Authority personnel, in the field, on October 13, 2020.

The cogeneration engine stack velocities and temperatures (Unit Nos. 27, 28, 29, 30) are the average values of the average measured values for natural gas and digester gas per the revised Alliance Source Testing report dated August 28, 2020 (stack test data from January 2020).

I, the undersigned, a responsible officer of the applicant company, certify that to the best of my knowledge, the information stated on this application, together with associated drawings, specifications, and other data, give a true and complete representation of the existing, modified existing, or planned new stationary source with respect to air pollution sources and control equipment. I also understand that any significant omissions, errors, or misrepresentations in these data will be cause for revocation of part or all of the resulting registration or permit.

Signed this ______ day of October, 2020

Stan Allred
Print Name

Chief Financial Officer
Print Title

____
Signature

City of Albuquerque

Environmental Health Department
Air Quality Program

Permit Application Checklist

Any person seeking a permit under 20.11.41 NMAC, Authority-to-Construct Permits, shall do so by filing a written application with the Department. Prior to ruling a submitted application complete each application submitted shall contain the required items listed below. **This checklist must be returned with the application.**

Applications that are ruled incomplete because of missing information will delay any determination or the issuance of the permit. The Department reserves the right to request additional relevant information prior to ruling the application complete in accordance with 20.11.41 NMAC.

All applicants shall:

1. ☑ Fill out and submit the *Pre-permit Application Meeting Request* form
    a. ☑ Attach a copy to this application

2. ☑ Attend the pre-permit application meeting
    a. ☑ Attach a copy of the completed *Pre-permit Application Meeting Checklist* to this application

3. ☑ Provide public notice to the appropriate parties
    a. ☑ Attach a copy of the completed *Notice of Intent to Construct* form to this form
        i. Neighborhood Association(s): South Valley Coalition of Neighborhood Associations, Southwest Alliance of Neighbors, Mountain View Community Action, Mountain View Neighborhood Association, and Southside Farmers Community Association. See the attached memo of Neighborhood Associations and Coalitions provided by the City of Albuquerque.

        ii. Coalition(s): South Valley Coalition of NAs. See the attached memo of Neighborhood Associations provided by the City of Albuquerque.

    b. ☑ Attach a copy of the completed *Public Sign Notice Guideline* form

4. Fill out and submit the *Permit Application*. All applications shall:

    A. ☑ be made on a form provided by the Department. Additional text, tables, calculations or clarifying information may also be attached to the form.

    B. ☑ at the time of application, include documentary proof that all applicable permit application review fees have been paid as required by 20 NMAC 11.02. Please refer to the attached permit application worksheet.

    C. ☑ contain the applicant's name, address, and the names and addresses of all other owners or operators of the emission sources.

D. ☑ contain the name, address, and phone number of a person to contact regarding questions about the facility.

E. ☑ indicate the date the application was completed and submitted

F. ☑ contain the company name, which identifies this particular site.

G. ☑ contain a written description of the facility and/or modification including all operations affecting air emissions.

H. ☑ contain the maximum and standard operating schedules for the source after completion of construction or modification in terms of hours per day, days per week, and weeks per year.

I. ☑ provide sufficient information to describe the quantities and nature of any regulated air contaminant (including any amount of a hazardous air pollutant) that the source will emit during:

  - ➢ Normal operation
  - ➢ Maximum operation
  - ➢ Abnormal emissions from malfunction, start-up and shutdown

J. ☑ include anticipated operational needs to allow for reasonable operational scenarios to avoid delays from needing additional permitting in the future.

K. ☑ contain a map, such as a 7.5-minute USGS topographic quadrangle, showing the exact location of the source; and include physical address of the proposed source.

L. ☑ contain an aerial photograph showing the proposed location of each process equipment unit involved in the proposed construction, modification, relocation, or technical revision of the source except for federal agencies or departments involved in national defense or national security as confirmed and agreed to by the department in writing.

M. ☑ contain the UTM zone and UTM coordinates.

N. ☑ include the four digit Standard Industrialized Code (SIC) and the North American Industrial Classification System (NAICS).

O. ☑ contain the types and **potential emission rate** amounts of any regulated air contaminants the new source or modification will emit. Complete appropriate sections of the application; attachments can be used to supplement the application, but not replace it.

P. ☑ contain the types and **controlled** amounts of any regulated air contaminants the new source or modification will emit. Complete appropriate sections of the application; attachments can be used to supplement the application, but not replace it.

Q. ☑ contain the basis or source for each emission rate (include the manufacturer's specification sheets, AP-42 Section sheets, test data, or other data when used as the source).

R. ☑ contain all calculations used to estimate **potential emission rate** and **controlled** emissions.

S. ☑ contain the basis for the estimated control efficiencies and sufficient engineering data for verification of the control equipment operation, including if necessary, design drawings, test reports, and factors which affect the normal operation (e.g. limits to normal operation).

T. ☑ contain fuel data for each existing and/or proposed piece of fuel burning equipment.

U. ☑ contain the anticipated maximum production capacity of the entire facility and the requested production capacity after construction and/or modification.

V. ☑ contain the stack and exhaust gas parameters for all existing and proposed emission stacks.

W. ☑ provide an ambient impact analysis using a atmospheric dispersion model approved by the US Environmental Protection Agency (EPA), and the Department to demonstrate compliance with the ambient air quality standards for the City of Albuquerque and Bernalillo County (See 20.11.01 NMAC). If you are modifying an existing source, the modeling must include the emissions of the entire source to demonstrate the impact the new or modified source(s) will have on existing plant emissions.

X. ☑ contain a preliminary operational plan defining the measures to be taken to mitigate source emissions during malfunction, startup, or shutdown.

Y. ☑ contain a process flow sheet, including a material balance, of all components of the facility that would be involved in routine operations. Indicate all emission points, including fugitive points.

Z. ☑ contain a full description, including all calculations and the basis for all control efficiencies presented, of the equipment to be used for air pollution control. This shall include a process flow sheet or, if the Department so requires, layout and assembly drawings, design plans, test reports and factors which affect the normal equipment operation, including control and/or process equipment operating limitations.

AA. ☑ contain description of the equipment or methods proposed by the applicant to be used for emission measurement.

BB. ☑ be signed under oath or affirmation by a corporate officer, authorized to bind the company into legal agreements, certifying to the best of his or her knowledge the truth of all information submitted.

Pre-Permit Application Meeting Request Form

Air Quality Program- Environmental Health Department

Please complete appropriate boxes and email to aqd@cabq.gov or mail to:

Environmental Health Department
Air Quality Program
P.O. Box 1293
Room 3047
Albuquerque, NM 87103

Name:	**Mr. Charles Leder, P.E.**
Company/Organization:	**Albuquerque Bernalillo County Water Utility Authority**
Point of Contact: **(phone number and email):** **Preferred form of contact (circle one):** Phone E-mail	**Phone: 505-331-6021** **Email: cleder@abcwua.org**
Preferred meeting date/times:	**October 16th, 2020 at 10:00AM**
Description of Project:	The permit modification application will include proposed emissions control equipment to be installed and operated on the existing four cogeneration engines to substantially reduce combustion emissions (NO2, CO, VOC, and HAP) and updated emission calculations based on correct equipment parameters and associated emission factors as well as proposed controls to be installed.

From: Tavarez, Isreal L.
To: leder S. Charles; Lutz, Jon
Cc: McLee, Patrick; Auh, Peter; Martin R. Schluep (mschluep@alliantenv.com); Burstein, Mara E.; Munoz-Dyer, Carina G.; Stonesifer, Jeff W.; Tumpane, Kyle; Puckett, Paul S.; Young, Joel
Subject: RE: Air Quality Permitting; Request for Pre-application meeting
Date: Thursday, October 8, 2020 10:24:24 AM
Attachments: image005.png
image001.png
image002.png
FINALprepermitapplicationmeetingrequestform (3).doc

Mr. Leder:

Thank you for submittal of your pre-application meeting request.

I have scheduled the requested meeting for Friday, October 16, 2020 from 10 to 11 am.

I have included you, Mr. McLee and Mr. Schluep on the meeting invitation.

Please find attached the request for pre-application meeting form for you to complete to document your pre-application meeting request.

Respectfully,

ONE ALBUQUERQUE environmental health

Isreal L. Tavarez, P.E.
manager | environmental health department
o 505.768.1965
m 505.228.9754
cabq.gov/environmentalhealth/

From: Leder, Charles S. <cleder@abcwua.org>
Sent: Tuesday, October 6, 2020 3:42 PM
To: Tavarez, Isreal L. <ITavarez@cabq.gov>; Lutz, Jon <tlutz@cabq.gov>
Cc: McLee, Patrick <pmclee@abcwua.org>; Auh, Peter <pauh@abcwua.org>; Martin R. Schluep (mschluep@alliantenv.com) <mschluep@alliantenv.com>
Subject: Air Quality Permitting; Request for Pre-application meeting

External

Isreal at COA-Air Quality Programs:

The Water Authority is developing a new Application to modify ATC 786-M3 that covers facilities located at the Southside Water Reclamation Plant. In accordance with your Air Quality Programs policies, we are requesting a pre-application meeting to go over various items which we hope will speed the City's review of our application. Some of these items we wish to discuss include how to best address the issues on our previous submittal which was determined to be administratively incomplete. This meeting would be accomplished by GoToMeeting which has worked well in the past.

Dates & times on which we are available include:

Times next week (week of 10/12/20):
- Wednesday 10/14/20; anytime
- Thursday 10/15/2020; AM anytime or after 2:30 PM
- Friday 10/16/2020; 10 AM – 12 Noon or after 3 PM
-

Times the following week (week of 10/19/20):
- Monday 10/19/20; PM anytime after 2:30 PM
- Tuesday 10/20/2020; PM anytime
- Thursday 10/22/2020; AM anytime

Please discuss with your team members and advise which of these time slots work best for the City. Thx.

Charles S. Leder, P.E.
Manager – Plant Operations Division
Albuquerque Bernalillo County Water Utility Authority
PO Box 568 | Albuquerque NM | 87103
cleder@abcwua.org
505-289-3401 (office) | 505-331-6021 (cell)
www.abcwua.org

City of Albuquerque

Environmental Health Department
Air Quality Program

Pre-Permit Application Meeting Checklist

Any person seeking a permit under 20.11.41 NMAC, Authority-to-Construct Permits, shall do so by filing a written application with the Department. Prior to submitting an application, the applicant shall contact the department in writing and request a pre-application meeting for information regarding the contents of the application and the application process. This checklist is provided to aid the applicant and **a copy must be submitted with the application.**

Applications that are ruled incomplete because of missing information will delay any determination or the issuance of the permit. The Department reserves the right to request additional relevant information prior to ruling the application complete in accordance with 20.11.41 NMAC.

Name: Albuquerque Bernalillo County Water Utility Authority
Contact: Charles Leder – Manager for Plant Operations Division
Company/Business: Southside Water Reclamation Plant

☑ Fill out and submit a Pre-Permit Application Meeting Request form
  ⇒ Available online at http://www.cabq.gov/airquality

☑ Emission Factors and Control Efficiencies

Notes: Stack test data was used for NOx, CO, VOC, and SO_2 for the cogeneration engines. H_2S controls and control efficiencies were discussed during the collaborative meetings between the Air Quality Program and the Water Utility Authority. Detailed documentation is included in the application.

☑ Air Dispersion modeling guidelines and protocol

Notes: Several iterations of the air dispersion modeling ptotocol were submitted to the Air Quality Program and subsequently discussed during the collaborative meetings between the Air Quality Program and the Water Utility Authority.

☑ Department Policies

☑ Air quality permit fees

Notes: The fee previously paid to the Air Quality Program is applicable to this permit revision application.

☑ Public notice requirements
- Replacement Part 41 Implementation
  - *20.11.41.*13 B. Applicant's public notice requirements
    - ☑ Providing public notice to neighborhood association/coalitions

- Neighborhood association: Southwest Alliance of Neighbors, Mountain View Community Action, Mountain View NA, Southside Farmers Community Association.
- Coalition: South Valley Coalition of NAs.

Notes: The City of Albuquerque Air Quality Program supplied a list of neighborhood associations and coalitions within 0.5 mile of the SWRP on 12/7/2018 (see attached memo). A Notice of Intent to Construct was sent to each of the neighborhood associations and coalitions.

- ☑ Posting and maintaining a weather-proof sign

Notes: The City of Albuquerque Air Quality Program supplied a weather-proof sign to be used for this requirement. The required information was entered on the sign and it was posted near the SWRP entrance gate, which is accessible to the public.

A copy of the emails/letters sent to the neighborhood associations and coalitions and pictures of the sign postings can be seen in Appendix C.

☑ Regulatory timelines

- 30 days to rule application complete
- 90 days to issue completed permit
- Additional time allotted if there is significant public interest and/or a significant air quality issue
  - Public Information Hearing
  - Complex permitting action

Notes: All Air Quality Program forms and information required under 20.11.41 NMAC (Construction Permits) and 20.11.42 NMAC (Operating Permits) are included in this application.

The Water Authority requests that a draft permit be available for review prior to final issuance of the permits by the Air Quality Program.

Modifications to ATC 786-M3: Pre-Permit Application Meeting

October 16, 2020 at 10 AM; Meeting via GoToMeeting

Issues the Water Authority would like to cover:

1. Statement of overall project goal: Provide significant reductions in criteria air pollutants and HAPs compared to what's currently permitted for SWRP;

Air Contaminant	As currently permitted; tons/year	Proposed Permit, tons/year	% reduction
CO	328.7	97.6	70%
NOx	166.8	77.6	53%
VOC	130.2	34.8	73%
SO2	130.1	12.1	91%
PM10	6.9	5.0	27%
PM2.5	6.9	5.0	28%
Hazardous Air Pollutants (HAP)	28.6	12.8	55%

2. Goal of Water Authority's next application submittal: Get it right the first time; Avoid LATHER-RINSE-REPEAT Shampoo Loop!

3. Appendix A from previous application had product data for proposed SCR/Oxidative Catalyst treatment system for cogeneration engine exhaust emissions. Any comments from review of data by Air Quality Programs staff?

4. Appendix D from previous application had O&M Strategy for Engines and Hot Water Heating Boilers Any comments from review of document by Air Quality Programs staff?

5. Appendix G from previous application described odor control strategy for SWRP including design criteria and O&M strategy for odor control devices. Any comments from review of document by Air Quality Programs staff?

6. Previous modeling results for 1-hour NO2 modeling. Any comments from review of modeling results and interpretation of results by Air Quality Programs staff? Any issues of note that need correcting?

7. Upcoming Application; Can we use the modeling protocol from the last application or do you need to first review a new one? (Water Authority was under the impression that issues on previous modeling protocol had all been resolved as of July 2020 meeting)

8. Carryover issues from AQP letter dated 9/30/2020
    a. Item 5 – changes in emission rates for EUs 31, 43, and 44
    b. Item 9
        i. Impacts of recent stack diameter measurements & revisions submitted to AQP staff for January 2020 test data; Cautions on comparisons to test data from previous years
        ii. Expected variability in engine performance even though the same model
    c. Item 10 - Proposed handling of model settings for special processing
    d. Item 11 – handling of factor sets for cumulative models

9. Emission data for surrounding sources; Is data previously provided by Air Quality Programs staff still valid?

10. Notification of the public and Neighborhood Associations; Any changes to the address list provided on August 27, 2020?

From: mschluep@alliantenv.com
To: "ITavarez@cabq.gov"; "cmunoz-dyer@cabq.gov"; "Tumpane, Kyle"; "Stonesifer, Jeff W."
Cc: "Leder, Charles S."; "McLee, Patrick"; "Auh, Peter"
Subject: Modifications to Air Quality Construction Permit No. 0786-M3: Pre-Permit Application Meeting October 16, 2020 at 10 AM; Meeting via GoToMeeting
Date: Friday, October 16, 2020 12:34:00 PM

Dear Air Quality Program:

Thank you for meeting with the Water Utility Authority today via GoToMeeting to discuss issues raised in your letter of incompleteness from September 30, 2020 and the path forward in this permit modification application process for the Southside Water Reclamation Plant.

Pre-application Meeting Summary:
During the pre-application meeting held on October 16, 2020, the Water Utility Authority (WUA) stated the intent of the permit modification application, specifically that proposed emission controls on the four currently permitted cogeneration engines will reduce a total of 537 tpy of combustion emissions (NO2, CO, VOCs, and HAPs).

The following summarizes our understanding on items discussed during this meeting regarding the next permit modification application to be submitted to the Air Quality Program (AQP):

- The WUA does not need to prepare and submit a new Air Dispersion Modeling Protocol since the last version of the application submitted on August 31, 2020 included items addressed in the previously submitted modeling protocols as discussed during a collaborative meeting between the WUA and the AQP held on July 10, 2020

- The background data from nearby monitoring sites and the meteorological data that was previously provided by the AQP is still applicable

- Surrounding source data from nearby sources that was previously provided by the AQP is still applicable

- The AQP will provide an updated list of nearby home owner associations and coalitions within 0.5 miles of the Southside Water Reclamation Plant to be notified of the proposed permit modification application the week of October 19, 2020.

- The WUA will include as an appendix to its application an updated stack gas testing report produced by Alliance Source Testing, Inc for tests they performed in January 2020 that reflect corrected exhaust gas flows based on measurements of stack diameter recently performed by the WUA

The anticipated date of submittal of the permit modification application is October 30, 2020.

Thank you,

Martin R. Schluep
Alliant Environmental, LLC
7804 Pan American Fwy. NE, Suite 5
Albuquerque, NM 87109

505.205.4819
www.alliantenv.com

City of Albuquerque

Environmental Health Department
Air Quality Program

Permit Application Review Fee Instructions

All source registration, authority-to-construct, and operating permit applications for stationary or portable sources shall be charged an application review fee according to the fee schedule in 20.11.2 NMAC. These filing fees are required for both new construction, reconstruction, and permit modifications applications. Qualified small businesses as defined in 20.11.2 NMAC may be eligible to pay one-half of the application review fees and 100% of all applicable federal program review fees.

Please fill out the permit application review fee checklist and submit with a check or money order payable to the "City of Albuquerque Fund 242" and either:

1. be delivered in person to the Albuquerque Environmental Health Department, 3rd floor, Suite 3023 or Suite 3027, Albuquerque-Bernalillo County Government Center, south building, One Civic Plaza NW, Albuquerque, NM or,

2. mailed to Attn: Air Quality Program, Albuquerque Environmental Health Department, P.O. Box 1293, Albuquerque, NM 87103.

The department will provide a receipt of payment to the applicant. The person delivering or filing a submittal shall attach a copy of the receipt of payment to the submittal as proof of payment Application review fees shall not be refunded without the written approval of the manager. If a refund is requested, a reasonable professional service fee to cover the costs of staff time involved in processing such requests shall be assessed. Please refer to 20.11.2 NMAC (effective January 10, 2011) for more detail concerning the "Fees" regulation as this checklist does not relieve the applicant from any applicable requirement of the regulation.

City of Albuquerque

Environmental Health Department
Air Quality Program

Permit Application Review Fee Checklist

Please completely fill out the information in each section. Incompleteness of this checklist may result in the Albuquerque Environmental Health Department not accepting the application review fees. If you should have any questions concerning this checklist, please call 768-1972.

I. COMPANY INFORMATION:

Company Name	Albuquerque Bernalillo County Water Utility Authority	
Company Address	4201 2nd Street, Albuquerque, NM 87105	
Facility Name	Southside Water Reclamation Plant	
Facility Address	4201 2nd Street, Albuquerque, NM 87105	
Contact Person	Charles S. Leder, P.E.	
Contact Person Phone Number	(505) 289-3401	
Are these application review fees for an existing permitted source located within the City of Albuquerque or Bernalillo County?	**X Yes**	**No**
If yes, what is the permit number associated with this modification?	**Permit #0786-M3-RV1**	
Is this application review fee for a Qualified Small Business as defined in 20.11.2 NMAC? (See Definition of Qualified Small Business on Page 4)	**Yes**	**X No**

II. STATIONARY SOURCE APPLICATION REVIEW FEES:

If the application is for a new stationary source facility, please check all that apply. If this application is for a modification to an existing permit please see Section III.

Check All That Apply	Stationary Sources	Review Fee	Program Element
	Air Quality Notifications		
	AQN New Application	$573.00	2801
	AQN Technical Amendment	$313.00	2802
	AQN Transfer of a Prior Authorization	$313.00	2803
X	*Not Applicable*	*See Sections Below*	
	Stationary Source Review Fees (Not Based on Proposed Allowable Emission Rate)		
	Source Registration required by 20.11.40 NMAC	$ 584.00	2401
	A Stationary Source that requires a permit pursuant to 20.11.41 NMAC or other board regulations and are not subject to the below proposed allowable emission rates	$ 1,168.00	2301
X	*Not Applicable*	*See Sections Below*	
	Stationary Source Review Fees (Based on the Proposed Allowable Emission Rate for the single highest fee pollutant)		
	Proposed Allowable Emission Rate Equal to or greater than 1 tpy and less than 5 tpy	$876	2302
	Proposed Allowable Emission Rate Equal to or greater than 5 tpy and less than 25 tpy	$1,752	2303
	Proposed Allowable Emission Rate Equal to or greater than 25 tpy and less than 50 tpy	$3,503	2304
	Proposed Allowable Emission Rate Equal to or greater than 50 tpy and less than 75 tpy	$5,255	2305
	Proposed Allowable Emission Rate Equal to or greater than 75 tpy and less than 100 tpy	$7,006	2306
	Proposed Allowable Emission Rate Equal to or greater than 100 tpy	$8,758	2307
X	*Not Applicable*	*See Section Above*	

Federal Program Review Fees (In addition to the Stationary Source Application Review Fees above)			
	40 CFR 60 - "New Source Performance Standards" (NSPS)	$1,168	2308
	40 CFR 61 - "Emission Standards for Hazardous Air Pollutants (NESHAPs)	$1,168	2309
	40 CFR 63 - (NESHAPs) Promulgated Standards	$1,168	2310
	40 CFR 63 - (NESHAPs) Case-by-Case MACT Review	$11,677	2311
	20.11.61 NMAC, Prevention of Significant Deterioration (PSD) Permit	$5,838	2312
	20.11.60 NMAC, Non-Attainment Area Permit	$5,838	2313
X	*Not Applicable*	*Not Applicable*	

III. MODIFICATION TO EXISTING PERMIT APPLICATION REVIEW FEES:

If the permit application is for a modification to an existing permit, please check all that apply. If this application is for a new stationary source facility, please see Section II.

Check All That Apply	**Modifications**	**Review Fee**	**Program Element**
Modification Application Review Fees (Not Based on Proposed Allowable Emission Rate)			
	Proposed modification to an existing stationary source that requires a permit pursuant to 20.11.41 NMAC or other board regulations and are not subject to the below proposed allowable emission rates	$ 1,168.00	2321
X	*Not Applicable*	*See Sections Below*	
Modification Application Review Fees (Based on the Proposed Allowable Emission Rate for the single highest fee pollutant)			
	Proposed Allowable Emission Rate Equal to or greater than 1 tpy and less than 5 tpy	$876	2322
	Proposed Allowable Emission Rate Equal to or greater than 5 tpy and less than 25 tpy	$1,752	2323
	Proposed Allowable Emission Rate Equal to or greater than 25 tpy and less than 50 tpy	$3,503	2324
	Proposed Allowable Emission Rate Equal to or greater than 50 tpy and less than 75 tpy	$5,255	2325
X	Proposed Allowable Emission Rate Equal to or greater than 75 tpy and less than 100 tpy	$7,006	2326
	Proposed Allowable Emission Rate Equal to or greater than 100 tpy	$8,758	2327
	Not Applicable	*See Section Above*	
Major Modifications Review Fees (In addition to the Modification Application Review Fees above)			
	20.11.60 NMAC, Permitting in Non-Attainment Areas	$5,838	2333
	20.11.61 NMAC, Prevention of Significant Deterioration	$5,838	2334
X	*Not Applicable*	*Not Applicable*	
Federal Program Review Fees (This section applies only if a Federal Program Review is triggered by the proposed modification) (These fees are in addition to the Modification and Major Modification Application Review Fees above)			
X	40 CFR 60 - "New Source Performance Standards" (NSPS)	$1,168	2328
	40 CFR 61 - "Emission Standards for Hazardous Air Pollutants (NESHAPs)	$1,168	2329
X	40 CFR 63 - (NESHAPs) Promulgated Standards	$1,168	2330
	40 CFR 63 - (NESHAPs) Case-by-Case MACT Review	$11,677	2331
	20.11.61 NMAC, Prevention of Significant Deterioration (PSD) Permit	$5,838	2332
	20.11.60 NMAC, Non-Attainment Area Permit	$5,838	2333
	Not Applicable	*Not Applicable*	

IV. ADMINISTRATIVE AND TECHNICAL REVISION APPLICATION REVIEW FEES:

If the permit application is for an administrative or technical revision of an existing permit issued pursuant to 20.11.41 NMAC, please check one that applies.

Check One	Revision Type	Review Fee	Program Element
	Administrative Revisions	$ 250.00	2340
	Technical Revisions	$ 500.00	2341
X	*Not Applicable*	*See Sections II, III or V*	

V. PORTABLE STATIONARY SOURCE RELOCATION FEES:

If the permit application is for a portable stationary source relocation of an existing permit, please check one that applies.

Check One	Portable Stationary Source Relocation Type	Review Fee	Program Element
	No New Air Dispersion Modeling Required	$ 500.00	2501
	New Air Dispersion Modeling Required	$ 750.00	2502
X	*Not Applicable*	*See Sections II, III or V*	

VI. Please submit a check or money order in the amount shown for the total application review fee.

Section Totals	Review Fee Amount
Section II Total	$0.00
Section III Total	$9,342.00
Section IV Total	$0.00
Section V Total	$0.00
Total Application Review Fee	**$9,342.00**

I, the undersigned, a responsible official of the applicant company, certify that to the best of my knowledge, the information stated on this checklist, give a true and complete representation of the permit application review fees which are being submitted. I also understand that an incorrect submittal of permit application reviews may cause an incompleteness determination of the submitted permit application and that the balance of the appropriate permit application review fees shall be paid in full prior to further processing of the application.

Signed this__19th__ day of __October _ 2020__

__Stan Allred_____________
Print Name

_Chief Financial Officer______
Print Title

____
Signature

Definition of Qualified Small Business as defined in 20.11.2 NMAC:

"Qualified small business" means a business that meets all of the following requirements:

(1) a business that has 100 or fewer employees;
(2) a small business concern as defined by the federal Small Business Act;
(3) a source that emits less than 50 tons per year of any individual regulated air pollutant, or less than 75 tons per year of all regulated air pollutants combined; and
(4) a source that is not a major source or major stationary source.

Note: Beginning January 1, 2011, and every January 1 thereafter, an increase based on the consumer price index shall be added to the application review fees. The application review fees established in Subsection A through D of 20.11.2.18 NMAC shall be adjusted by an amount equal to the increase in the consumer price index for the immediately-preceding year. Application review fee adjustments equal to or greater than fifty cents ($0.50) shall be rounded up to the next highest whole dollar. Application review fee adjustments totaling less than fifty cents ($0.50) shall be rounded down to the next lowest whole dollar. The department shall post the application review fees on the city of Albuquerque environmental health department air quality program website.

APPENDIX C

Proof of Public Notice

1706

Tim Keller,
Mayor

Public Participation

List of Neighborhood Associations
and Neighborhood Coalitions
MEMORANDUM

To: Permit File
From: Noel Begay
Program Specialist
Subject: Determination of Neighborhood Associations and Coalitions within 0.5 miles of 4201 Second Street SW, Albuquerque registered with the Air Quality Program
Date: October 16, 2020

DETERMINATION:

On October 16, 2020 I used the City of Albuquerque Zoning Advanced Map Viewer (http://sharepoint.cabq.gov/gis) to review which City of Albuquerque (COA) Neighborhood Associations (NAs) and Neighborhood Coalitions (NCs) and which Bernalillo County (BC) NAs and NCs are located within 0.5 miles of 4201 Second Street SW, Albuquerque in Bernalillo County, NM.

I then used the City of Albuquerque Office of Neighborhood Coordination's Monthly Master NA List dated October 2020 and the Bernalillo County Monthly Neighborhood Association October 2020 Excel file to determine the contact information for each NA and NC located within 0.5 miles of 4201 Second Street SW, Albuquerque in Bernalillo County, NM.

The table below contains the contact information, which will be used in the Notice to Construct by the Applicant

City of Albuquerque and/or BC Association or Coalition	Name	Email or Mailing Address
South Valley Coalition of Neighborhood Associations	Roberto Roibal Marcia Fernandez	rroibal@comcast.net mbfernandez1@gmail.com
Southwest Alliance of Neighbors	Luis Hernandez Jr. Jerry Gallegos	luis@wccdg.org jgallegoswccdg@gmail.com
Mountain View Community Action	Marla Painter Josie Lopez	marladesk@gmail.com josiemlopez@gmail.com
Mountain View Neighborhood Association	Nora Garcia Julian Vargas	norag3862@gmail.com javargasconst@gmail.com
South Side Farmers Community Association	Jan Conrad David Lopez	avonjan@Q.com davelopez007@gmail.com

From: mschluep@alliantenv.com
To: "rroibal@comcast.net"; "mbfernandez1@gmail.com"; "luis@wccdg.org"; "jgallegoswccdg@gmail.com"; "marladesk@gmail.com"; "josiemlopez@gmail.com"; "norag3862@gmail.com"; "javargasconst@gmail.com"; "avonjan@Q.com"; "davelopez007@gmail.com"
Cc: "Tavarez, Isreal L."; "Munoz-Dyer, Carina G."; "leder S. Charles"; "mschluep@alliantenv.com"
Bcc: "pmclee@abcwua.org"; "Melissa Fetman"
Subject: Albuquerque Bernalillo County Water Utility Authority Public Notice
Date: Monday, October 26, 2020 2:22:00 PM
Attachments: Applicant Public Notice Cover Letter_SWRP.pdf
Notice of Intent_SWRP_10-26-2020.pdf
ABCWUA NAs&NCs 10162020.pdf

Dear Neighborhood Association/Coalition Representative,

The Water Authority is updating equipment and emissions associated with the operation of their existing Southside Water Reclamation Plant (in operation since 1962) and the proposed installation and operation of **control equipment** on the existing four cogeneration engines. This permit revision will result in **significant reductions** of nitrogen dioxide (NO2), sulfur dioxide (SO2), carbon monoxide (CO), volatile organic compounds (VOCs) and hazardous air pollutants (HAPs) emissions (more than **550 tons per year in total reductions** for the sum of all criteria pollutants and HAPs being reduced). In addition, the Water Authority will be installing a new coarse screening facility onsite. Odorous emissions from the new screening facility will be controlled with an activated carbon filter. An initial application, submitted on August 31, 2020 by the Water Authority to the Air Quality Program to reduce emissions, was denied by the City of Albuquerque Environmental Health Department Air Quality Program.

The City of Albuquerque Environmental Health Department Air Quality Program requires that all registered representatives of neighborhood associations and coalitions within one-half mile of a facility submitting an air quality permit application be notified prior to the submittal, under regulation 20.11.41.13 New Mexico Administrative Code (NMAC). Alliant Environmental is sending you this notification on behalf of the Albuquerque Bernalillo County Water Utility Authority (Water Authority), regarding the Water Authority's Southside Water Reclamation Plant proposed revision application to Construction Permit #0786-M3-RV1. This facility is located at 4201 2nd Street SW, Albuquerque, NM 87103.

Please see the attached Public Notice Cover Letter and Notice of Intent to Construct form for more information.

Respectfully,

Martin R. Schluep
Alliant Environmental, LLC
7804 Pan American Fwy. NE, Suite 5
Albuquerque, NM 87109
505.205.4819
www.alliantenv.com

SUBJECT: Public Notice of Proposed Air Quality Construction Permit Application

Dear Neighborhood Association/Coalition Representative(s),

Why did I receive this public notice?

You are receiving this notice in accordance with New Mexico Administrative Code (NMAC) 20.11.41.13.B(1) which requires any applicant seeking an Air Quality Construction Permit pursuant to 20.11.41 NMAC to provide public notice by certified mail or electronic mail to the designated representative(s) of the recognized neighborhood associations and recognized coalitions that are within one-half mile of the exterior boundaries of the property on which the source is or is proposed to be located.

What is the Air Quality Permit application review process?

The City of Albuquerque, Environmental Health Department, Air Quality Program (Program) is responsible for the review and issuance of Air Quality Permits for any stationary source of air contaminants within Bernalillo County. Once the application is received, the Program reviews each application and rules it either complete or incomplete. Complete applications will then go through a 30-day public comment period. Within 90 days after the Program has ruled the application complete, the Program shall issue the permit, issue the permit subject to conditions, or deny the requested permit or permit modification. The Program shall hold a Public Information Hearing pursuant to 20.11.41.15 NMAC if the Director determines there is significant public interest and a significant air quality issue is involved.

What do I need to know about this proposed application?

Applicant Name	**Albuquerque Bernalillo County Water Utility Authority (Water Authority)**
Site or Facility Name	**Southside Water Reclamation Plant**
Site or Facility Address	**4201 2nd Street SW, Albuquerque, NM 87105**
New or Existing Source	**EXISTING (Since 1962)**
Anticipated Date of Application Submittal	**October 30, 2020**
Summary of Proposed Source to Be Permitted	The Water Authority is updating emissions associated with the operation of their existing Southside Water Reclamation Plant and the proposed installation and operation of control equipment on the existing four cogeneration engines. This permit revision will result in significant reductions of nitrogen dioxide (NO2), sulfur dioxide (SO2), carbon monoxide (CO), volatile organic compounds (VOCs) and hazardous air pollutants (HAPs) emissions (more than 550 tons per year in total reductions for the sum of all criteria pollutants and HAPs being reduced). In addition, the Water Authority will be installing a new coarse screening facility onsite. Emissions from the new screening facility will be controlled with an activated carbon filter. Please

	see the attached Notice of Intent to Construct form for more details. An initial application submitted on August 31, 2020 by the Water Authority to the Air Quality Program to reduce emissions was denied by the City of Albuquerque Environmental Health Department Air Quality Program.

What emission limits and operating schedule are being requested?
The Southside Water Reclamation Plant (wastewater treatment plant) operated 24 hours per day, 7 days per week and 52 weeks per year. The requested emission limits are listed on the attached Notice of Intent to Construct form.

How do I get additional information regarding this proposed application?
For inquiries regarding the proposed source, contact:

- Charles Leder – Manager for Plant Operations Division
- Email: cleder@abcwua.org
- Phone: (505) 289-3401

For inquiries regarding the air quality permitting process, contact:

- City of Albuquerque Environmental Health Department Air Quality Program
- aqd@cabq.gov
- (505) 768-1972

Notice of Intent to Construct

Under 20.11.41.13B NMAC, the owner/operator is required to provide public notice by certified mail or electronic mail to the designated representative(s) of the recognized neighborhood associations and recognized coalitions that are within one-half-mile of the exterior boundaries of the property on which the source is or is proposed to be located if they propose to construct or establish a new facility or make modifications to an existing facility that is subject to 20.11.41 NMAC – Construction Permits. **A copy of this form must be included with the application.**

Applicant's name and address:
Nombre y domicilio del solicitante: Albuquerque Bernalillo County Water Utility Authority (Water Authority), One Civic Plaza NW, Room 5027, Albuquerque, NM 87103

Owner or operator's name and address:
Nombre y domicilio del propietario u operador: Albuquerque Bernalillo County Water Utility Authority (Water Authority), One Civic Plaza NW, Room 5027, Albuquerque, NM 87103

Actual or estimated date the application will be submitted to the department:
Fecha actual o estimada en que se entregará la solicitud al departamento: October 30, 2020

Description of the source:
Descripción de la fuente: Wastewater publicly owned treatment works (POTW)

Exact location of the source or proposed source:
Ubicación exacta de la fuente o fuente propuesta: Albuquerque Southside Water Reclamation Plant (SWRP), 4201 2nd St. SW, Albuquerque, NM 87105

Nature of business:
Tipo de negocio: Wastewater treatment and reuse water production

Process or change for which the permit is requested:
Proceso or cambio para el cuál de solicita el permiso:

- Update all Emission Unit (EU) numbers associated with the SWRP;
- Update all water treatment process equipment emissions (clarifiers, activated sludge, final clarifiers, etc.) using TOXCHEM as approved by the Air Quality Program to estimate emissions for VOCs, HAPs, and H2S;
- Update emissions associated with the cogeneration engines (EU: 27, 28, 29, and 30). The revised uncontrolled emissions are based on updated Caterpillar engines (EU: 27 and 28) horsepower ratings; changes to all four engines' brake specific fuel consumption; the use of 7-year average stack test data; NOx, CO, and VOC emission factors from 40 CFR Part 60, Subpart JJJJ for EU: 29; updated PM emission factors to match PM10 and PM2.5 factors; and updated HAP emission estimates for formaldehyde and total HAPs from all combustion equipment. The cogeneration units will be equipped with Selective Catalytic Reduction (SCR) and oxidation catalyst to control and considerably reduce NOx, CO, VOC, and HAPs; Prior to being used as an engine fuel source, the digester gas will be treated to remove H2S, moisture, and siloxanes to help preserve the life of catalyst media in the engine emission treatment systems;

- Permit VOC, HAP and H2S emissions for a new coarse screening facility (EU: 1) which will be routed to an activated carbon filter to control H2S emissions;
- Clarifiers #1 and #3 will be re-purposed as holding tanks to store waste water in case of emergencies or for maintenance purposes on Clarifiers #5 through #8.;
- Clarifiers #2 and #4 weirs were covered and are only used as back-up for emergencies or for maintenance on Clarifiers #5 through #8;
- Clarifiers #5 through #8 have been covered and emissions will now be treated by one Bohn biofilter;
- Update NOx, CO, and VOC emission factors for the flares to use factors more representative of wastewater treatment digester gas and site-specific data;
- Update the VOC emissions for the unleaded gasoline fuel storage tank to account for the worst-case scenario of gasoline (RVP 13) storage throughout the year;
- For the UV Facility Emergency Generator, the SO2 emission rate calculation was modified to account for the permit requirement for the use of ultra-low sulfur diesel fuel as per 40 CFR 80.510(b);
- Update information and number of proposed on-site emergency generators;
- Revise H2S control efficiencies from all activated carbon filters and biofilters to 98%;
- Update Miscellaneous External Combustion Sources sources and emissions based on process specific fuel-burning equipment.
- The North Preliminary Treatment Facility (PTF) was commissioned in August of 2015 and replaced facilities formerly used for this purpose that are located immediately south and referred to as "the old PTF". With this permit revision application, the Water Authority requests approval of the construction and operation of the new North PTF commissioned in August of 2015, including emissions for VOC, HAP, and H2S which will be routed to a combination of two bohn biofilters and an activated carbon unit to control H2S

Preliminary estimate of the maximum quantities of each regulated air contaminant the source will emit:
Estimación preliminar de las cantidades máximas de cada contaminante de aire regulado que la fuente va a emitir:

Air Contaminant *Contaminante de aire*	**Proposed Construction Permit** *Permiso de Construcción Propuesto*		**Net Changes (for permit modification or technical revision)** *Cambio Neto de Emisiones (para modificación de permiso o revisión técnica)*	
	pounds per hour *libras por hora*	tons per year *toneladas por año*	pounds per hour *libras por hora*	tons per year *toneladas por año*
CO	61.31	97.83	-23.19	-230.87
NOx	158.35	77.66	107.65 (incl. emergency generators)	-89.14
VOC	11.18	34.91	-19.62	-95.29
SO2	5.44	11.98	-24.36	-118.12
PM10	4.06	4.94	2.16	-1.96
PM2.5	4.02	4.89	2.12	-2.01
HAP	3.26	12.83	-3.24	-15.77

Maximum operating schedule:
Horario máximo de operaciones: 24 hours/day, 7 days/week, 52 weeks/year
Normal operating schedule:
Horario normal de operaciones: 24 hours/day, 7 days/week, 52 weeks/year

Current contact information for comments and inquires:
Datos actuales para comentarios y preguntas:
Name *(Nombre):* Charles S. Leder, P.E.
Address *(Domicilio):* P.O. Box 568, Albuquerque, NM 87103
Phone Number *(Número Telefónico)*: (505) 289-3401
E-mail Address *(Correo Electrónico)*: cleder@abcwua.org

If you have any comments about the construction or operation of the above facility, and you want your comments to be made part of the permit review process, you must submit your comments in writing to the address below:

Environmental Health Manager
Permitting Division
Albuquerque Environmental Health Department
Air Quality Program
P.O. Box 1293
Albuquerque, New Mexico 87103
(505) 768-1972

Other comments and questions may be submitted verbally.

Please refer to the company name and facility name, as used in this notice or send a copy of this notice along with your comments, since the Department may not have received the permit application at the time of this notice. Please include a legible mailing address with your comments. Once the Department has performed a preliminary review of the application and its air quality impacts, if required, the Department's notice will be published on the City of Albuquerque's website, https://www.cabq.gov/airquality/air-quality-permits and sent to neighborhood associations and neighborhood coalitions near the facility location or near the facility proposed location.

City of Albuquerque

Environmental Health Department
Air Quality Program

Public Notice Sign Guidelines

Any person seeking a permit under 20.11.41 NMAC, Authority-to-Construct Permits, shall do so by filing a written application with the Department. *Prior to submitting an application, the applicant shall post and maintain a weather-proof sign provided by the department. The applicant shall keep the sign posted until the department takes final action on the permit application; if an applicant can establish to the department's satisfaction that the applicant is prohibited by law from posting, at either location required, the department may waive the posting requirement and may impose different notification requirements.* **A copy of this form must be submitted with your application.**

Applications that are ruled incomplete because of missing information will delay any determination or the issuance of the permit. The Department reserves the right to request additional relevant information prior to ruling the application complete in accordance with 20.11.41 NMAC.

Name: Albuquerque Bernalillo County Water Utility Authority
Contact: Charles Leder – Manager for Plant Operations Division
Company/Business: Southside Water Reclamation Plant

☑ The sign must be posted at the more visible of either the proposed or existing facility entrance (or, if approved in advance and in writing by the department, at another location on the property that is accessible to the public)

  ☑ The sign shall be installed and maintained in a condition such that members of the public can easily view, access, and read the sign at all times.

  ☑ The lower edge of the sign board should be mounted a minimum of 2' above the existing ground surface to facilitate ease of viewing

☑ Attach a picture of the completed, properly posted sign to this document

☐ **Check here if the department has waived the sign posting requirement.**
Alternative public notice details: N/A


Albuquerque Bernalillo County
Water Utility Authority
SOUTHSIDE WATER
RECLAMATION PLANT
4201 SECOND STREET S.W.

Proposed Air Quality Construction Permit

Permiso de Construcción de Calidad del Aire Propuesto

Posting date: October 26, 2020

1. **Applicant's Name:** *Nombre del solicitante:* Albuquerque Bernalillo County Water Utility Authority

Owner or Operator's Name: *Nombre del Propietario u Operador:* Albuquerque Bernalillo County Water Utility Authority

2. **Actual or Estimated Date the Application will be Submitted to the Department:** *Fecha Actual o Estimada en que se Entragará la Solicitud al Departamento:* October 30, 2020

3. **Exact Location of the Source or Proposed Source:** *Ubicación Excata de la Fuente o Fuente Propuesta:* Albuquerque Southside Reclamation Plant 4201 2nd Street SW, Albuquerque, NM 87105

4. **Description of the Source:** *Descripción del Fuente:* Wastewater publicly owned treatment works (POTW)

Nature of Business: *Tipo de Negocio:* Wastewater treatment and reuse water production

Process or change for which a permit is requested: *Proceso o cambio para el cuál se solicita el permiso:* Installation and operation of controls on all cogeneration engines, permit and operational revisions

Preliminary estimate of the maximum quantities of each regulated air contaminant the source will emit:
Estimación preliminar de las cantidades máximas de cada contaminante de aire regulado que la fuente va a emitir:

Air Contaminant *Contaminante de Aire*	**Proposed Construction Permit** *Permiso de Construcción Propuesto*		**Net Change Emissions (for permit modification or technical revision)** *Cambio Neto de Emisiones (para modificación de permiso o revisión técnica)*	
	Pounds per hour *libras por hora*	Tons per year *toneladas por año*	Pounds per hour *libras por hora*	Tons per year *toneladas por año*
CO	61.31	97.83	-23.19	-230.87
NOX	158.35	77.66	107.65 (incl. emerg. generators)	-89.14
SO2	5.44	11.98	-24.36	-118.12
PM10	4.06	4.94	2.16	-1.96
PM2.5	4.02	4.89	2.12	-2.01
HAP	3.26	12.83	-3.24	-15.77
VOC	11.18	34.91	-19.62	-95.29

5. **Maximum Operating Schedule:** *Horario Máximo de Operaciones:* 24 hours per day, 7 days per week, 52 weeks per year

Normal Operation Schedule: *Horario Normal de Operaciones:* 24 hours per day, 7 days per week, 52 weeks per year

6. **Current Contact Information for Comments and Inquiries**
Datos actuales para Comentarios y Preguntas

Name *(Nombre)*: Mr. Charles Leder, P.E., Manager Plant Operations Division
Address *(Domicilio)*: P.O. Box 568, Albuquerque, NM 87103
Phone Number *(Número Telefónico)*: (505) 289-3401
Email Address *(Correo Electrónico)*: cleder@abcwua.org

Call 311 for additional information concerning this project, the Air Quality Program, or to file a complaint.
Llame al 311 para obtener información adicional sobre este proyecto, del Programa de Calidad del Aire, o para presenter una queja.
Gọi 311 để biết thêm thông tin hoặc để khiếu nại về dự án này, Chương Trình Chất Lượng Không Khí

City of Albuquerque, Environmental Health Department, Air Quality Program – Stationary Source Permitting
Ciudad de Albuquerque, Departamento de Salud Ambiental, Programa de Calidad del Aire - Permisos para Fuentes Inmóviles
(505) 768-1972, aqd@cabq.gov

THIS SIGN SHALL REMAIN POSTED UNTIL THE DEPARTMENT TAKES FINAL ACTION ON THE PERMIT APPLICATION
ESTE AVISO DEBERÁ DE MANTENERSE PUESTO HASTA QUE EL DEPARTAMENTO TOME UNA DECISIÓN SOBRE LA SOLICITUD DE PERMISO

APPENDIX D

OM Strategy – Engines and Boiler

Albuquerque Bernalillo County Water Utility Authority
Southside Water Reclamation Facility

Operational and Maintenance Strategy for Cogeneration Engines and Hot Water Heating Boilers

PURPOSE

The Albuquerque Bernalillo County Water Utility Authority ("Water Authority") operates the Southside Water Reclamation Facility (the "Plant") located at 4201 2nd Street SW, Albuquerque, New Mexico. At the Plant, the Water Authority operates four gas-fueled, reciprocating cogeneration engines, one gas-fueled hot water heating boiler associated with anaerobic digester operations, and two gas-fueled hot water heating boilers that supply high pressure hot water for periodic equipment cleaning at the DAF Bldg and SDF Bldg. All of these units are permanent, stationary combustion sources whose main characteristics are summarized in the table below. For the Reader's convenience, the Unit numbers assigned are the same as those in ATC 786-M3-RV1. This table excludes diesel fueled emergency generator units the Water Authority plans to install or has installed at five (5) locations to provide standby power for different treatment process areas at the Plant.

Unit No.	Unit Description	Manufacturer	Capacity
27	Cogen Engine #1	Caterpillar	3,192 Hp
28	Cogen Engine #2	Caterpillar	3,192 Hp
29	Cogen Engine #3	Cooper	1,650 Hp
30	Cogen Engine #4	Copper	1,650 Hp
31	Cogen Boiler	Sellers Engineering	12.5 MMBTU/hr
43	SDF hot water cleaning unit	Hotsy	0.72 MMBTU/hr
44	Secondary Sludge Thickening Bldg (DAF/RDT) hot water cleaning unit	Hotsy	0.72 MMBTU/hr

Under 20.11.41.13(E)(5) NMAC, the Water Authority has prepared this Operational and Maintenance Strategy. As required by this rule, the Operational and Maintenance Strategy documents the following:

1. The steps the Water Authority will take if a malfunction occurs that may cause emission of a regulated air contaminant to exceed a limit that is included in the permit;
2. The nature of emissions during routine startup or shutdown of the source and the source's air pollution control equipment; and
3. The steps the applicant will take to minimize emissions during routine startup or shutdown;

This Operational and Maintenance Strategy is organized to demonstrate compliance with rule requirements. The narrative below covers each section of the Strategy as required by the rule.

1. Steps to take if a malfunction occurs that may cause emissions to exceed a limit

Each of the devices listed in the table above have been installed and are maintained in accordance with their respective manufacturer's specifications. The Water Authority's Enterprise Asset Management System (EAMS) uses MAXIMO™ software to automatically schedule recommended preventive maintenance as well as track corrective maintenance on these devices when required. These procedures help minimize the likelihood of a malfunction event.

In the event of a malfunction that might cause an exceedance of a permitted emission rate, the Water Authority will shut down the malfunctioning unit and repair the unit prior to restarting. All of the devices listed in the table above have inherent "safety" features included in their design that cause automatic shutdown of the device during a malfunction. These "safety" features range from relatively simple controls built into the control panels for Units 31, 43, and 44 to sophisticated SCADA logic programming for Units 27-30, similar to what would be found at a commercial power plant.

In the case of the four cogeneration engines, Operations staff routinely monitor engine generator output via the Plant SCADA system whenever an engine unit is in service to verify that stable power output and operation is being achieved. The Plant's SCADA system is staffed 24 hours a day, seven days a week. SWRP Operations staff are trained to reduce the load applied to an engine in 5% increments if stable performance is not being maintained. This "unloading" procedure includes taking an engine off-line if conditions so require. The steps for "unloading" or "loading" an engine are further described in the Plant's Standard Operating Procedures (SOPs) for Units 27-30.

2. Nature of emissions during routine startup or shutdown of the source and the source's air pollution control equipment

Units 31, 43, and 44

Permitted emissions from Units 31, 43, and 44 are derived from EPA's emission factors provided in AP-42 Tables 1.4-1 and 1.4-2 for small, uncontrolled hot water boilers. There are no air pollution control devices installed on these units. The combustion sources in these units cycle on and off as needed to maintain the desired water temperature. It should be noted that Unit 31 only operates when the cogeneration engines (Units 27-30) do not produce enough heat to keep the Plant's digester hot water heating loop in the desired temperature range of 160-180°F. Similarly, Units 43 and 44 only operate when equipment cleaning operations are underway at the Secondary Sludge Thickening or SDF facilities. As noted earlier, the key to limiting emissions from these units when they are initially energized is maintaining the units in good working order using the Water Authority's EAMS. Once the desired water temperature has been reached, shutdown of the combustion sources for these units is instantaneous.

Units 27 - 30

Units 27-30 are each being equipped with a combined Oxidative Catalyst (OC) / Selective Catalytic Reduction (SCR) treatment system to reduce CO, NOx, non-methane hydrocarbons, and HAP emissions in engine exhaust. The table at right summarizes the reductions expected to be achieved for each type of air pollutant:

Pollutant type	% reduction
NOx	51%
CO	76%
Non-methane HCs (VOCs)	48%
Formaldehyde	48%
Total HAPs	44%

These new treatment systems are currently scheduled to be commissioned sometime after January 2021. The manufacturer of these systems advised that they reach specified levels for pollutant removal performance once the engine exhaust temperature has reached 500°F. In specific, the SCR portion of the treatment system needs for exhaust gas temperatures to be at 500°F before injection of the liquid urea reducing agent starts and NOx removal begins. Operations staff can observe real time data for exhaust gas temperature on each engine through the Plant SCADA system.

The treatment system for each engine has been designed without a by-pass capability. If there is a condition sensed in its control system that prevents a treatment system from being ready for service, the corresponding engine is automatically disabled from starting. Similarly, a malfunction detected in a treatment system will cause its engine to automatically shut down.

The SOP for engine shutdown calls for the engine loading to first be gradually reduced to just 5% of maximum recommended load. Once operation at the 5% load point has been achieved, the engine fuel supply is cut and engine shutdown is completed within 30 seconds. Based on observations by Operations staff, the engine exhaust temperature remains above 500°F throughout the shutdown sequence. Accordingly, there should be no diminished performance by the exhaust treatment systems during routine engine shutdown.

3. The steps to take to minimize emissions during routine startup or shutdown

Units 31, 43, and 44

As noted earlier in Section 2, combustion systems in these units cycle on and off as needed to maintain hot water at the desired temperature. Other than using the Water Authority's EAMS to perform routine maintenance as needed to keep the units in good working order, there are no other specific steps taken to minimize emissions during routine start-up or shutdown.

Units 27 - 30

Each engine is equipped with a jacket water circulation system that maintains engine block temperature at 200°F even when an engine is stopped for several hours to perform periodic maintenance. This feature reduces the time needed for the engine exhaust gas temperature to reach 500°F during engine re-start to a nominal 20 minutes for the smaller Cooper engines (Units 29 & 30) and 45 minutes for the larger Caterpillar engines (Units 27 & 28). The engine start-up SOP also calls for minimizing engine idle time to 5 minutes before a load is applied. The engine is gradually loaded in 5% increments of the maximum recommended load until the applied load reaches 70%. Historically, the Plant's cogeneration engines are not operated above the 70% load point as a way to reduce long-term engine wear. The Water Authority is currently investigating the practicality and business case for increasing the routine upper limit for engine loading beyond the 70% limit now being observed.

As noted earlier in Section 2, exhaust gas temperatures stay above 500°F throughout the engine shutdown sequence. As such, there should be no diminished performance by the exhaust treatment systems during routine engine shutdown.

APPENDIX E

TOXCHEM Modeling Protocol

Leder, Charles S.

From: Tavarez, Isreal L. <ITavarez@cabq.gov>
Sent: Friday, January 17, 2020 2:46 PM
To: Leder, Charles S.
Cc: Slowen, Jolene; Parker, Carol M.; Auh, Peter; PE CHMM Tom Henning (thenning@sehinc.com); Munoz-Dyer, Carina G.; Puckett, Paul S.; Eyerman, Regan V.; Reyes, Damon R.; Maldonado, Angelique; McKinstry, Michael W.; Paul Buellesbach; mike.pring@erg.com
Subject: FW: Water Authority; Draft HAP modeling protocol
Attachments: TOXCHEM Modeling Protocol_2019.10.25.pdf

Mr. Leder:

This email is to confirm the City of Albuquerque Environmental Health Department Air Quality Program has approved the attached TOXCHEM Modeling Protocol.

Please feel free to call me at (505) 228-9754 if you have any questions.

Thank you.

Respectfully,

Isreal L. Tavarez, P.E.
manager | environmental health department
o 505.768.1965
m 505.228.9754
cabq.gov/environmentalhealth/

From: Parker, Carol M. <cparker@cabq.gov>
Sent: Monday, October 28, 2019 10:42 AM
To: Tavarez, Isreal L. <ITavarez@cabq.gov>; Munoz-Dyer, Carina G. <cmunoz-dyer@cabq.gov>; Puckett, Paul S. <ppuckett@cabq.gov>; Eyerman, Regan V. <reyerman@cabq.gov>; Reyes, Damon R. <dreyes@cabq.gov>; Maldonado, Angelique <admaldonado@cabq.gov>; McKinstry, Michael W. <mmckinstry@cabq.gov>; Paul Buellesbach <Paul.Buellesbach@erg.com>; mike.pring@erg.com
Cc: Slowen, Jolene <jslowen@cabq.gov>
Subject: FW: Water Authority; Draft HAP modeling protocol

All - Here is the complete packet for the Water Authority's Modeling Protocol for wastewater HAP. Thanks - Carol

---

From: leder S. Charles
Sent: Monday, October 28, 2019 9:52 AM

To: Parker, Carol M. <cparker@cabq.gov>
Cc: Auh, Peter <pauh@abcwua.org>
Subject: Water Authority; Draft HAP modeling protocol

Here is an electronic copy of the document we distributed at the 10/25/19 meeting complete with all attachments.

Charles S. Leder, P.E.
Manager – Plant Operations Division
Albuquerque Bernalillo County Water Utility Authority
PO Box 568 | Albuquerque NM | 87103
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TOXCHEM Modeling Protocol
Albuquerque Bernalillo County Water Utility Authority
Southside Water Reclamation Facility

BACKGROUND

The Albuquerque Bernalillo County Water Utility Authority (“Water Authority”) operates the Southside Water Reclamation Facility (the “Plant”) located at 4201 2nd Street SW, Albuquerque, New Mexico. The Water Authority was issued a Title V Operation Permit (Permit #1418-M2) that regulates the air emission equipment and processes at the Plant. This Permit became effective December 24, 2014. The Plant is a Title V major source of several criteria pollutants and hazardous air pollutants (HAP).

The Plant is subject to the National Emission Standards for Hazardous Air Pollutants: Publicly Owned Treatment Works found in 40 CFR 63 Subpart VVV (“Sub VVV”). The Plant has been deemed as “reconstructed” under Sub VVV and is regulated as a “New Group 2 POTW”. One of the compliance options for a New Group 2 POTW is to demonstrate that the ratio of HAP emissions for all emission points up to but not including, the secondary influent pumping station, to the total mass of HAPs in the Plant influent is less than 0.014.

The TOXCHEM model is proposed to be used to estimate HAP emissions from the portions of the Plant regulated by Sub VVV. The TOXCHEM model incorporates a number of fate mechanisms for toxic compounds to calculate process specific mass balance calculations. TOXCHEM calculates the volatilization of HAPs through air-water interfaces such as water surfaces, air stripping, and at weirs, sewer reaches, drops, and process drains. TOXCHEM uses a database with chemical parameter assumptions for each HAP compound to calculate mass transfer across the air-water interfaces.

EMISSION POINTS

Sub VVV regulates HAP emissions up to the beginning of the secondary treatment system. For the Plant, this includes the preliminary treatment portion of the plant and includes these specific emission points:

Emission Point	Emission Point Name	Wastewater Processes	Exhaust Flow Rate (cfm)
EP01	Carbon System	JB 22, 1st Grit Chamber, Sewer Reach: 1st Grit to Bar Screens, Bar Screens	1,428
EP02	South Bohn Biofilter	JB 22, 1st Grit Chamber, Sewer Reach: 1st Grit to Bar Screens	3,400
EP03	North Bohn Biofilter	Bar Screens, Sewer Reach: Bar Screens to Conical Tray Vortex Separators, Conical Tray Vortex Separators	5,650
EP04	PC1/2 Compost Media Biofilter	Clarifier 1 and Clarifier 2	Not Included
EP05	PC3/4 Compost Media Biofilter	Clarifier 3 and Clarifier 4	Not Included
EP06	PC5/8 Bohn Biofilter	Clarifier 5, Clarifier 6, Clarifier 7, and Clarifier 8	18,920

HAZARDOUS AIR POLLUTANTS

Water Authority staff contacted multiple contract laboratories to identify laboratories and analytical methods that could be used to quantify influent concentrations of the 96 HAPs listed on Table 2 in 40 CFR part 63 Subpart DD (“Sub DD Table 2”) as well as formaldehyde. The request for analysis included all 96 HAP compounds, and between the four laboratories that responded, analytical methods for 81 HAP compounds were identified. In order to complete this request, multiple sets of samples were collected in the field to cover seven different analytical methods. For two primary methods of analysis, 8260 and 8270, sample containers were collected in duplicate and triplicate to maximize coverage of parameters listed in respected methods. The following table represents the labs, sample methods and sample containers required to conduct the analyses.

Laboratory	Method	Description	Sample Kit	Sample Type
Anatek Labs	EPA 515.4	Chloramben	Two (2) 500 mL Amber Bottles	Composite
	EPA 8260C	Epichorohydrin	Four (4) 40 mL vial w/ HCl	Grab
Eurofins/TestAmerica Houston	EPA 8270C	N,N-Dimethylaniline	Two (2) 1 Liter Amber Glass	Composite
	EPA 8015B	Methanol	Two (2) 40 mL vial w/ HCl	Grab
	EPA 8260B	5 HAPs	Three (3) 40 mL vial w/ HCl	Grab
Eurofins/TestAmerica Irvine	EPA 8315A	Acetaldehyde and Formaldehyde	Two (2) 500 mL Amber Bottles	Composite
Eurofins/TestAmerica Denver	EPA 8081B	Lindane	Two (2) 1 Liter Amber Glass	Composite
	EPA 8151A	2,4-D	Two (2) 1 Liter Amber Glass	Composite
	EPA 8270C	17 HAPs	Two (2) 1 Liter Amber Glass	Composite
	EPA 8260B	4 HAPs	Three (3) 40 mL vial unpreserved	Grab
	EPA 8260B	48 HAPs	Three (3) 40 mL vial w/ HCl	Grab
Amended: Hall Environmental Laboratory	EPA 8081B	Lindane	Two (2) 1 Liter Amber Glass	Composite

For the remaining 15 HAP compounds on Sub DD Table 2, the Water Authority conducted an evaluation of the discharges in their collection system and determined that none of the 15 compounds are reasonably anticipated to be present the Plant’s influent (see Attachment 1).

Compounds that are measured in the wastewater at reportable quantities will be used in the TOXCHEM modeling.

WASTEWATER SAMPLING AND FLOW RATE

The wastewater sampling will occur at JB22 (Junction Box 22). JB22 is the first point that all influent streams to the plant converge prior to any plant processes. Therefore, this location ensures the sample represents wastewater that has not been treated. A sample port was installed at this location.

The TOXCHEM model will be run using the wastewater treatment plant daily flow rate measured on the day that the HAP emission testing was conducted. The model will calculate total mass HAP emissions per day. The results of the wastewater analysis and the actual flow rate will be used to calculate the loading to the plant.

TOXCHEM INPUTS

The model is set up with each process included in the pretreatment portion of the Plant (see Attachment 2). The air flow rates from each of the SWRP foul air treatment systems are included in the model so that the air “sweep” across each process is represented. The TOXCHEM model will be run using:

- HAP influent concentrations measured in the wastewater influent to be at or greater than the laboratories’ detection limits
- The average wastewater influent flow rate on the date(s) influent sampling occurred.
- Design air flow rates from the foul air treatment systems installed on the Plant’s pretreatment processes.

TOXCHEM OUTPUT and SUB VVV CALCULATIONS

TOXCHEM outputs the total mass of HAPs from each emission point and the mass of each individual HAP.

One of the compliance options for a New Group 2 POTW is to demonstrate that the ratio of HAP emissions for all emission points up to but not including, the secondary influent pumping station, to the total mass of HAPs in the Plant influent is less than 0.014. That is, the emissions from the pretreatment portion of the plant estimated using TOXCHEM will be divided by the mass of HAPs in the plant influent. The resulting ratio will be compared to 0.014. The calculations are as follows.

HAPs Emitted, HAP_E: A sum of the TOXCHEM output of daily emission rates for each HAP detected in the Plant’s influent, pounds per day.

Influent HAPs, HAP_{INF}: The sum of each flow weighted mass loading of detected HAPs, pounds per day.

Ratio: HAP_E/HAP_{INF} = compliance ratio to be compared with 0.014

Attachments
1. October 23, 2019 Memorandum regarding NPDES/Pretreatment Investigation of 15 Non-Analyzable HAPS
2. Diagram of Equipment Layout in TOXCHEM

Memorandum

To: Mark Kelly, PE Compliance Division Manager

From: Alan J Barney, Pollution Prevention Specialist

CC: Merat Zarreii, NPDES Program Manager
Travis Peacock, Industrial Pretreatment Engineer

Date: 10/23/2019

Re: NPDES/Pretreatment Investigation of 15 Non-Analyzable HAPS

During the most recent HAPs sampling event conducted in September 2019, there were 15 HAP compounds for which the Compliance Division could not find a laboratory capable of analysis. The National Pollutant Discharge Elimination System (NPDES)/Industrial Pretreatment Program (Pretreatment) conducted research utilizing:

- Environmental Protection Agency's (EPA) list of National Emission Standards for Hazardous Air Pollutants (NESHAP) sources,
- North American Industry Classification System (NAICS) to Standard Industrial Classification (SIC) conversion tool, and
- Pretreatment's database of permitted industries (LINKO)

This was done to determine if there was a probability these HAPs could be present in Pretreatment's known permitted industries' discharge; and, therefore, the influent for the Southside Water Reclamation Plant (SWRP).

Below are the sources used for this research:

https://www.epa.gov/stationary-sources-air-pollution/national-emission-standards-hazardous-air-pollutants-neshap-9

https://www.naics.com/naics-to-sic-crosswalk-2/

It was found that only one (1) of these analytes (carbonyl sulfide) was specifically identified as being potentially emitted by any of the industry types identified by the EPA. This finding required Pretreatment to consult the EPA Hazard Summaries for each individual chemical compound and identify their potential industry uses and how they react chemically in the environment.

Using the SIC code database, Pretreatment compiled a list of all the SIC codes that are potentially associated with each analyte. This list was cross referenced with all the SIC codes in our Pretreatment database (LINKO) and found 3 industries with SIC codes and processes that coincide with the industry uses identified in the EPA hazard summaries. These industries were 2028A- ABB Installation Products, 2055A- Albany Molecular Research Institute (AMRI) and 2032A- Formulab.

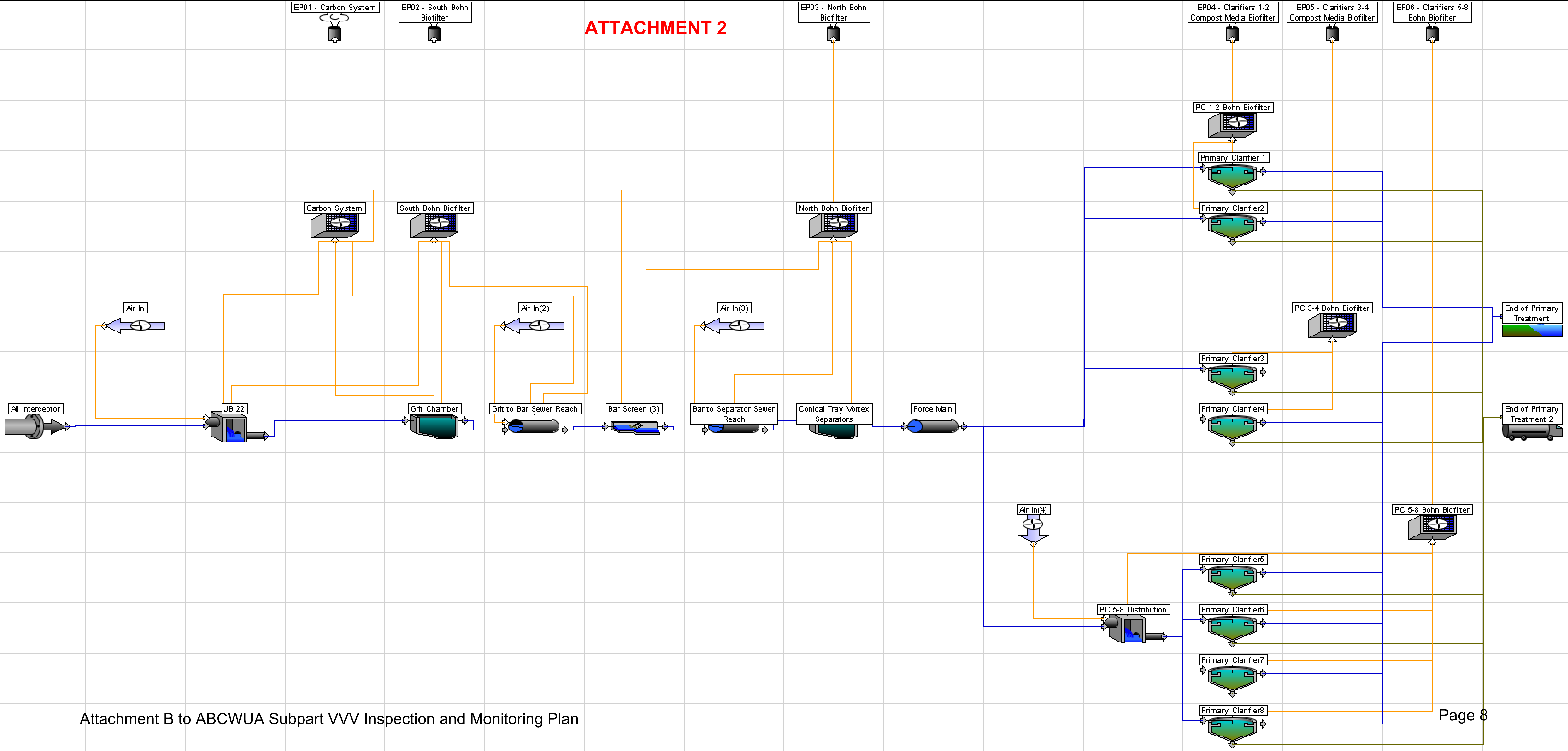
Based on the common role these analytes play in industrial use, Pretreatment determined the most effective way to identify if any of these analytes are present in our industries are to target chemical, pharmaceutical and raw material synthesizers and producers for survey. Pretreatment sent out surveys to each of these three industries requesting they review their chemical inventory, and wastewater discharges and report back as a permit requirement. Attached are the completed surveys.

The three permitted industries indicated the 15 HAP compounds were either known absent or suspected absent in their chemical inventory, manufacture process, and therefore wastewater discharge.

Pretreatment additionally checked the Tier II Hazardous Waste Chemical inventory provided by the Local Emergency Planning Committee (LEPC) to determine if any Tier II industries in Bernalillo county are reporting they have these 15 HAPs. None of the 15 HAP compounds were on the Tier II listing.

Based on the research conducted, surveys received from our permitted industries, and the Tier II check, Pretreatment is confident the data is sufficient and indicates the compounds are not confirmed to be present in the wastewater entering the SWRP.

ATTACHMENT 2



APPENDIX F

Subpart VVV Inspection and Monitoring Plan

Inspection and Monitoring Plan
Compliance Document for the National Emission Standards for Hazardous Air Pollutants: Publicly Owned Treatment Works

Albuquerque Bernalillo County Water Utility Authority
Southside Water Reclamation Plant

PURPOSE

The purpose of this Inspection and Monitoring Plan is to describe how the Albuquerque-Bernalillo County Water Authority (the Water Authority") will inspect and monitor the primary treatment portion of its wastewater treatment plant to assure that emissions of hazardous air pollutants from the primary treatment of its wastewater are adequately controlled.

BACKGROUND

Terminology

The Water Authority operates the Southside Water Reclamation Plant (the "Plant"), a publicly owned treatment works ("POTW") located at 4201 2nd Street SW, Albuquerque, New Mexico. The Plant has been deemed a "reconstructed" POTW under definitions provided in 40 CFR 63 and is subject to the National Emission Standards for Hazardous Air Pollutants: Publicly Owned Treatment Works found in 40 CFR 63 Subpart VVV ("Subpart VVV"). The rule regulates hazardous air pollutant ("HAP") emissions from the wastewater as it flows from the beginning of treatment through the primary treatment portion of the Plant ("Primary Treatment Plant"). For the purposes of this Inspection and Monitoring Plan, a schematic identifying the Primary Treatment Plant and its equipment, emission points, the sampling point JB22, and the electromagnetic flow meter (FT7106) where wastewater influent flow is measured are identified in Attachment A.

The Plant is not the only source of HAP on the Water Authority's property. The Water Authority operates four large internal combustion engines ("Co-generation Engines") which burn natural gas and digester gas generated from sewage sludge. The Co-generation Engines supply electricity to operate the Plant and its ancillary operations. The Water Authority also sells electricity back to Public Service Company of New Mexico. The Co-generation Engines are a major source of HAP.

In addition to the Co-generation Engines, the Water Authority also operates various ancillary facilities on the property to support the Plant. For clarity, all of the air quality regulated equipment and ancillary facilities owned or operated by the Water Authority at 4201 2nd Street SW will collectively be referred to below as the "Facility" to distinguish it from the Plant or the Primary Treatment Plant, as appropriate.

The Applicability of Part 63, Subpart VVV to the Primary Treatment Portion of the Plant

Subpart VVV applies to treatment plants at certain POTWs known as Group 1 or Group 2 POTWs. Where pertinent, portions of the text of Subpart VVV regulations are shown in this document with *italics*. Under Subpart VVV, the Water Authority is regulated as a "Group 2 POTW" because the Water Authority does not meet the definition of "Group 1 POTW." Below is the Group 1 POTW definition from 40 CFR § 63.1595:

> **Group 1 POTW** *means a POTW that accepts a waste stream regulated by another NESHAP and provides treatment and controls as an agent for the industrial user. The industrial user complies with its NESHAP by using the treatment and controls located at the POTW. For example, an industry discharges its benzene-containing waste stream to the POTW for treatment to comply with 40 CFR part 61, subpart FF—National Emission Standard for Benzene Waste Operations. This definition does not include POTW treating waste streams not*

specifically regulated under another NESHAP.

The Water Authority Plant is a Group 2 POTW because its Plant does not accept a waste stream regulated by another NESHAP and does not provide treatment and controls as an agent for the industrial user. To the contrary, the Water Authority has a pretreatment program that regulates and limits the kinds of wastewater that industrial sources may discharge for treatment at the Plant to reduce the quantity of HAP that will be in the Plant's influent.

Subpart VVV applies to Group 2 POTW's that are located at a major source of HAP, The Plant itself is not a major source of HAP emissions but the Facility is. The Co-generation Engines emit 18 tons per year of formaldehyde and 28 tons per year of all HAP combined, making the Co-generation Engines a major source of HAP. Because the Plant is located at a Facility that is a major source of HAP, it is required to comply with Subpart VVV.

Subpart VVV

The Water Authority plans to comply with Subpart VVV by meeting the HAP fraction emitted standard ("Standard") found in 40 CFR § 63.1586(c). Among other things, this Standard requires the Water Authority to prepare an Inspection and Monitoring Plan (a "Plan") in accordance with 40 CFR § 63.1588(c). In general, the Plan documents the methods used to determine (1) the HAP that might reasonably be anticipated to be present in the Plant's wastewater influent; (2) the Plant's monthly and annual influent HAP mass loadings; (3) the Primary Treatment Plant's annual HAP emissions; and, finally, the compliance measures that the Water Authority will meet to assure its ongoing compliance with the Standard. Each of these components are discussed in the sections below.

The Water Authority previously submitted a TOXCHEM modeling protocol that outlines an overall approach to be used to evaluate whether HAP controls would be necessary in the Primary Treatment Plant to meet the Standard. A copy of this protocol is provided as Attachment B. The Water Authority has installed covers and emission devices which serve to control odors and reduce H_2S at the Plant. These controls are not required to meet the Standard but they are briefly described below for clarity.

The Water Authority's Primary Treatment Plant includes eight clarifiers: Primary Clarifiers #1-4 which are each 120-foot in diameter and Primary Clarifiers #5-8 which are each 150-foot in diameter. Primary Clarifiers #5-8 and most other wastewater equipment at the Primary Treatment Plant are covered and have air beneath the covers ducted to various control devices to treat just odor and H_2S but not treat HAP. Primary Clarifiers 1 through 4 are not completely covered but have air collection systems along the outlet weirs of each basin which are also ducted to control devices treating odor and H2S only.

The Water Authority expects to demonstrate compliance with the Standard Subpart VVV without HAP emission reductions from the control devices.

APPROACH

In this Section, the Water Authority describes a 5-step approach it will use for its Inspection and Monitoring Plan to assure that emissions of HAP compounds from primary treatment of its wastewater are adequately controlled.

STEP 1: WHAT ARE THE HAP THAT MIGHT REASONABLY BE ANTICIPATED TO BE PRESENT IN THE WASTEWATER INFLUENT ARRIVING AT THE PLANT?

Subpart VVV requires meeting the Standard for those HAPs in Table 1 of Subpart DD which are "reasonably anticipated" to be present in the wastewater influent. See 40 CFR § 63.1588(c)(3)(ii).

The process of identifying HAPs reasonably anticipated to be present in the influent followed these general steps:

A. Identify which HAPs in Table 1 to Subpart DD had an approved EPA method that could be used with wastewater; for those HAPs with an approved method, test the wastewater to see what concentrations were present in the influent;

B. For Table 1 Subpart DD HAPs for which there were not EPA approved methods for testing wastewater, identify whether the industrial dischargers that the Water Authority serves might be sources of those remaining HAPs;

C. For Table 1 Subpart DD HAPs for which no method existed and for which the WUA has no known possible industrial sources, these HAPs will be excluded from further consideration.

For Step A, the Water Authority contacted several analytical laboratories to identify those that could conduct the required analysis. Based on the results of these contacts, it was determined that 82 of the 97 compounds listed in Table 1 to Subpart DD could be analyzed. Table 1 in Attachment C summarizes the results of this determination. Of the 82 compounds for which commercial lab test services are available, only 13 compounds have thus far been detected in the Water Authority's influent wastewater based on sampling events conducted in September 2019 and November 2019. Results from these two rounds of sampling are provided in Attachment D. Each month, samples of influent wastewater at JB22 will be collected and sent for analysis.

The Water Authority will also monitor pH and temperature of the influent wastewater collected at JB22 during each sampling event using techniques prescribed in Standard Methods.[1] The values determined at the time of sample collection will be used in the monthly TOXCHEM modeling described in STEP 3 below.

Steps B&C in the process of determining which HAP compounds might reasonably be present focused on the 15 compounds for which analytical lab services were not commercially available. The Water Authority reviewed its database of industrial dischargers to determine which ones might be a source of one of these 15 HAP compounds. If they were a possible discharger, the Water Authority sent them a survey asking whether they used that material in their process. A copy of the blank questionnaire along with the completed surveys are included with the TOXCHEM modeling protocol provided as Attachment B. If the answer was NO, the Water Authority concluded that the HAP compound was not reasonably anticipated to be present.

Identification of the HAP compounds reasonably anticipated to be present in the wastewater influent is intended to evolve as sampling is conducted and results are obtained. For any HAP which is not detected after six consecutive months of sampling, the Water Authority will reduce sampling for that HAP to once every three months. After one year of quarterly sampling for such HAPs, for any HAP which continues to be undetected for four consecutive quarters, the Water Authority will reduce sampling for that HAP to annually. If a previously undetected HAP appears in the sampling results for any month, that HAP will return to being sampled and monitored for six consecutive months again as stated above.

Similarly, if the Water Authority receives any information which suggests that a HAP which was previously found not to be reasonably anticipated to be present in its wastewater influent is now reasonably anticipated to be present, the Water Authority will add that HAP to the next round of monthly sampling and monitoring, Information which suggests that a HAP might be reasonably anticipated to be present in the wastewater influent would include an unusual HAP detected in Priority Pollutant Sampling, a new industrial discharger that discharges a new HAP in its wastewater discharge, or other appropriate information that may come to the Water Authority's attention.

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[1] Baird, R.B, et.al; Standard Methods for the Examination of Water and Wastewater, 23rd edition

STEP 2: DETERMINE INFLUENT HAP MASS LOADING TO THE PLANT

Rule Requirement from 40 CFR § 63.1588(c)(1):

> *A method to determine the influent HAP mass loading, i.e., the annual mass quantity for each HAP entering the wastewater treatment plant.*

Influent HAP Concentrations

The Water Authority will conduct its sampling as described in STEP 1 during one of the first five business days of the month. During one 24-hour period each calendar month, the Water Authority will collect a 24-hour composite and three grab samples at approximately 7 am, 3 pm and 7 pm. These grab sample times generally coincide with the Plant's low flow, peak flow and intermediate flow periods, respectively. The Plant's average diurnal influent wastewater flow is shown in Figure 1 on the next page based on flow data for Calendar Year 2018.

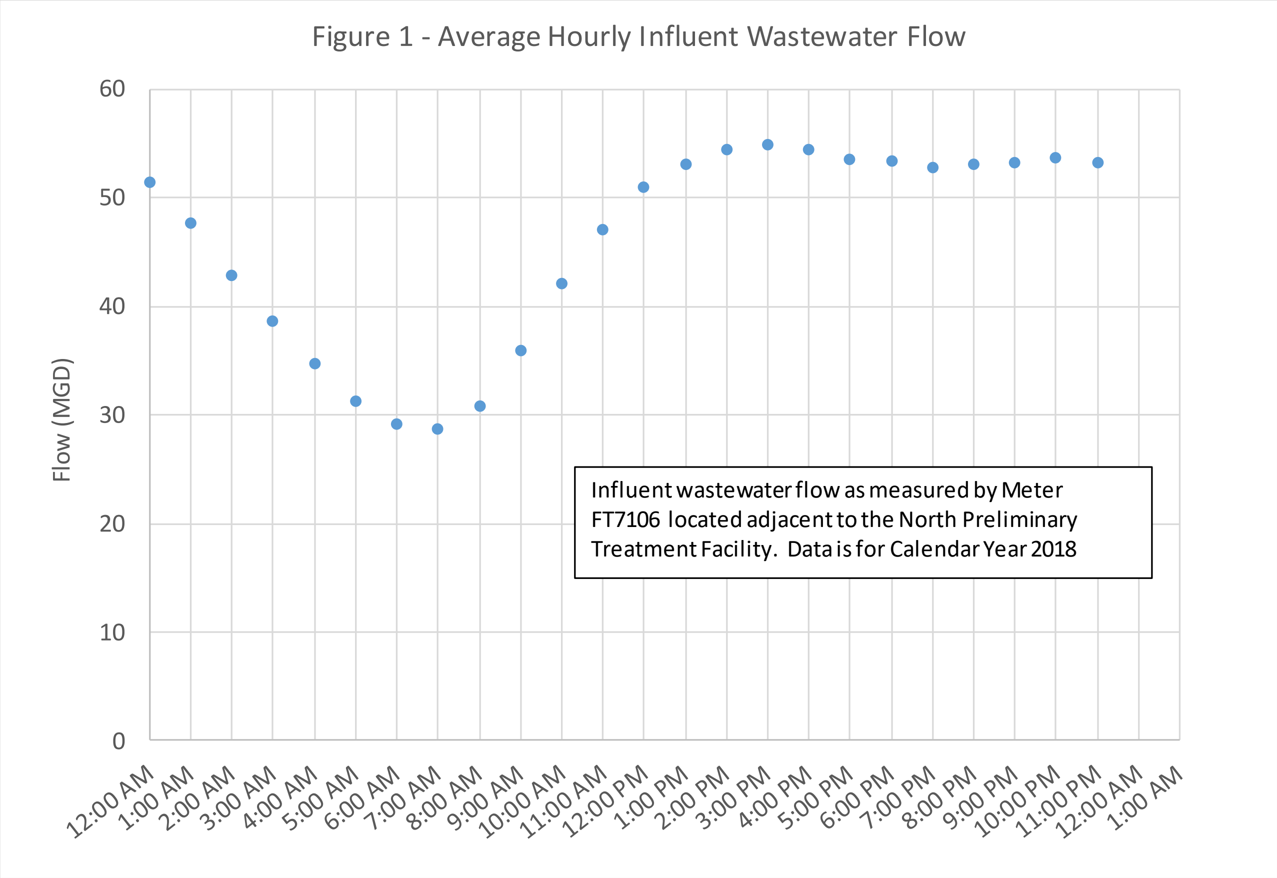

Figure 1 - Average Hourly Influent Wastewater Flow

Influent wastewater flow as measured by Meter FT7106 located adjacent to the North Preliminary Treatment Facility. Data is for Calendar Year 2018

As shown in the schematic in Attachment A, the sampling location will be at Junction Box 22 (JB22) which is the first point at the Plant where all the incoming flows converge prior to any Plant treatment processes. This sampling point represents the most accurate location for sampling raw, untreated influent wastewater.[2] The composite sampler collects 24-hour flow weighted samples. Note that this influent sampling location is upstream from where the Water Authority collects influent samples for Clean Water Act ("CWA") compliance. The CWA sampling point is after the influent flow has been treated to remove grit and screenings but before the primary clarifiers.

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[2] Although certain collection system lines into the Plant have coarse screening facilities, the point of screening is upstream of the point at which all flows converge at the Plant and for purposes of Subpart VVV, treatment begins.

Wastewater Influent Flow Rate

The volume of influent wastewater will be continuously measured using an electromagnetic flow meter (FT7106) located downstream of the North Preliminary Treatment Facility (PTF). This meter will be calibrated once every six months using the verification process recommended by the meter manufacturer. This method and location will accurately estimate the untreated wastewater influent to the Plant's primary treatment system. The measured flow will be averaged to calculate a daily average flow in million gallons per day (MGD) for each month. The Water Authority will maintain records of the daily average flow and the calibration records for the electromagnetic flow meter FT7106.

Influent HAP Mass Loading Rate

The results of each monthly HAP sampling and flow measurements will be used to calculate monthly HAP loading to the plant. The monthly HAP mass loading rates will be calculated using the average concentration of each HAP compound measured at or above the Method's detection level during each monthly sampling event and the measured flow rate for that month. Non-detected compounds are assumed not to be present. The sum of the individual HAP mass loading rates will be used to estimate the total monthly influent HAP mass loading rate.

Annual mass loading rates will be calculated by summing the last 12 consecutive monthly HAP mass loading rates. Each month, a new 12-month rolling mass loading rate will be calculated.

STEP 3: DETERMINE ANNUAL HAP EMISSIONS FROM PRIMARY TREATMENT PROCESSES

Rule Requirement from 40 CFR § 63.1588(c)(2):

> *A method to determine your POTW treatment plant's annual HAP emissions for all units up to, but not including, the secondary influent pumping station or the secondary treatment units*

The Water Authority will use TOXCHEM software to model and estimate HAP emissions from the portions of the Plant regulated by Subpart VVV. The TOXCHEM model incorporates a number of fate mechanisms for toxic compounds to calculate process specific mass balance calculations. TOXCHEM calculates the volatilization of HAPs through air-water interfaces such as water surfaces, air stripping, and at weirs, sewer reaches, drops, and process drains. TOXCHEM uses a database with chemical parameter assumptions for each HAP compound to calculate mass transfer across the air-water interfaces.

The Water Authority has installed covers over each process in the pretreatment portion of the Plant and on its primary clarification process, except for Clarifiers 1 through 4, which are not completely covered, but have air collection systems along the outlet weirs of each basin. With the completion of major renovations to Primary Clarifiers 5 through 8, Clarifiers 1 through 4 will rarely be used to provide any primary treatment at SWRP. They will however be included in the TOXCHEM modeling each month that they are placed in service to provide primary treatment.

Each of the process covers for the pretreatment system or the primary clarifiers has a powered exhaust that pulls air across the process and vents it to a biofilter or carbon unit. Table 1 on the next page summarizes emission points, facilities that are covered, and the air flow rates being pulled from facilities having covers. The air flow rate for each ventilation system is used in the TOXCHEM modeling. For example, the air flow rate for the EP01 Carbon System has a design exhaust flow are of 1,430 cubic feet per minute (cfm). In the TOXCHEM model, this condition is simulated by including in the modeling an air flow rate of 1,430 cfm across the process units connected to the EP01 Carbon Filter system. As noted earlier, for the purposes of this Inspection and Monitoring Plan, these air flows are being treated for odors and H_2S but not for HAPs.

TABLE 1. Emission Points of Covers on Primary Treatment Processes

Emission Point	Emission Point Name	Primary Treatment Processes /Flow Conveyance Structures with Covers	Exhaust Flow Rate, (cfm)
EP01	Carbon System	JB 22, 1st Stage Grit Chamber, & Sewer Reach: 1st Stage Grit to Bar	1,430
EP02	South Bohn Biofilter	JB 22, 1st Stage Grit Chamber, & Sewer Reach: 1st Grit to Bar Screens	3,400
EP03	North Bohn Biofilter	Bar Screens, Sewer Reach: Bar Screens to Conical Tray Vortex Separators, & Conical Tray Vortex	5,650
EP04*	PC1/2 Compost Media Biofilter	Outlet weirs for Primary Clarifiers 1 and 2 (remainder of each primary clarifier is uncovered)	2,100
EP05 *	PC3/4 Compost Media Biofilter	Outlet weirs for Primary Clarifiers 3 and 4 (remainder of each primary clarifier is uncovered)	2,100
EP06	PC5/8 Bohn Biofilter	Primary Clarifiers 5, 6, 7, and 8	18,900

* Clarifiers 5 through 8 normally provide all of the required primary treatment at SWRP for its permitted flow capacity of 76 MGD (NPDES Permit #NM0022250). Clarifiers 1 through 4 are not typically used.

Each month, a daily average emission rate of each HAP will be calculated using the TOXCHEM model with the monthly average daily wastewater flow rate and the HAP influent concentrations measured for that month. In these calculations, it is assumed that the value measured on the day of sample collection is representative of influent HAP concentrations throughout the month. The monthly emission rate will be calculated by multiplying the daily average emission rate by the number of days per month. This approach accounts for several factors that might influence HAP emissions as listed in Table 2 below:

TABLE 2. Factors Influencing Emissions from the Pretreatment Processes

Factor	Response
Emissions from Wastewater Units	Emissions will be calculated from each emission unit in the Primary Treatment Plant that is operated each month thus accounting for all treatment units in service.
Emissions resulting from inspection, maintenance and repair	Emission modeling will account for inspection, maintenance and repair activities. For example, if a cover needs to be removed from a process for three days for a maintenance activity, emissions from that process will be modeled as uncovered for three days. Similarly, if any of the fans pulling the air from the covered treatment processes listed in Table 1 were not available for service, then emissions will be modeled based on no “sweep air” under the covers. It should be noted that those treatment processes in Table 1 which use Bohn bio-filter systems have redundant fans which makes it unlikely that no fan will be available for service.
Fluctuations (i.e. daily, monthly, annual, seasonal) in the influent HAP concentrations	The proposed sampling program will collect samples that will account for the diurnal flow pattern typical for the Plant. Samples will be collected monthly to represent annual variability. The Plant’s collection system does not include any known discharges with monthly, annual or seasonal discharges that would impact influent HAP concentrations.
Annual industrial loads	Industrial wastewater discharges are expected to be similar throughout the year with no significant seasonal variation. The monthly sampling approach is expected to capture any seasonal variability for industrial loads.

Factor	Response
Performance of Control Devices	The Plant operates carbon and biomass filters on each of the processes in the Pretreatment Plant. These devices may provide some HAP emission control but any emission control that is provided is not used to demonstrate compliance with Subpart VVV.

If a sample is lost by a laboratory and cannot be analyzed the average of up to 12 previous monthly monitored concentrations will be used to replace the missing data and calculate the influent mass loading and the HAP emission rate. For example, if a sample is lost during the fifth month of monitoring, the average concentrations from Months 1 through 4 will be used for the Month 5 evaluation. If the 14th month's sample is lost, the average concentration from Months 2 through 13 will be used for the Month 14 evaluation.

STEP 4: DEMONSTRATE COMPLIANCE WITH HAP FRACTION EMITTED STANDARD

Rule Requirement from 40 CFR § 63.1588(c)(3):

> *A method to demonstrate that your POTW treatment plant meets the HAP fraction emitted standard specified in §63.1586(c)*

Within 90 days following the end of each month, the HAP fraction emitted will be calculated and compared with the 0.014 allowable standard. The calculation steps include the following:

> *(i) Determine the average daily flow in million gallons per day (MGD) of the wastewater entering your POTW treatment plant for the month;*
>
> This step is described in **STEP 2. Determine Influent HAP Mass Loading**.
>
> *(ii) Determine the flow-weighted monthly concentration of each HAP listed in Table 1 to subpart DD of this part that is reasonably anticipated to be present in your influent;*
>
> This step is described in **STEP 2. Determine Influent HAP Mass Loading**.
>
> *(iii) Using the information in paragraphs (c)(3)(i) and (ii) of this section, determine a total annual flow-weighted loading in pounds per day (lbs/day) of each HAP entering your POTW treatment plant;*
>
> This step is described in **STEP 2. Determine Influent HAP Mass Loading**.
>
> *(iv) Sum up the values for each individual HAP loading in paragraph (c)(3)(iii) of this section and determine a total annual flow-weighted loading value (lbs/day) for all HAP entering your POTW treatment plant for the current month;*
>
> This step is described in **STEP 2. Determine Influent HAP Mass Loading**.
>
> *(v) Based on the current month's information in paragraph (c)(3)(iii) of this section along with source testing and emission modeling, for each HAP, determine the annual emissions (lbs/day) from all wastewater units up to, but not including, secondary treatment units;*
>
> This step is described in **STEP 3**. **Determine Annual HAP Emissions from Primary Treatment Processes** using the TOXCHEM model to calculate the daily average emission rate of each HAP compound.
>
> *(vi) Sum up the values in paragraph (c)(3)(v) of this section and calculate the total annual emissions value for the month for all HAP from all wastewater treatment units up to, but not including, secondary treatment units;*

This step is described in **STEP 3. Determine Annual HAP Emissions from Primary Treatment Processes** using the TOXCHEM model to calculate the daily average emission rate of each HAP compound.

(vii) *Calculate the HAP fraction emitted value for the month, using Equation 1 of this section as follows*:

$$f_{e\ monthly} = \sum E / \sum L \qquad \text{Equation 1}$$

Where:

$f_{e\ monthly}$ = HAP fraction emitted for the previous month

$\sum E$ = Total monthly HAP emissions
$\sum L$ = Total monthly loading

(viii) Average the HAP fraction emitted value for the current month with the values determined for the previous 11 months, to calculate an annual rolling average of the HAP fraction emitted.

Each month a new 12-month rolling average HAP fraction emitted will be calculated by averaging the current HAP fraction emitted for the current month with the 11 previous HAP fractions emitted for the previous months.

If a sample is lost by a laboratory and cannot be analyzed the average of up to 12 previous monthly monitored concentrations will be used to replace the missing data and calculate the influent mass loading and the HAP emission rate. For example, if a sample is lost during the fifth month of monitoring, the average concentrations from Months 1 through 4 will be used for the Month 5 evaluation. If the 14th month's sample is lost, the average concentration from Months 2 through 13 will be used for the Month 14 evaluation.

STEP 5: DEMONSTRATE CONTINUOUS COMPLIANCE

Rule Requirement from 40 CFR § 63.1588(c)(4):

> *A method to demonstrate, to the satisfaction of the Administrator, that your POTW treatment plant is in continuous compliance with the requirements of § 63.1586(c).*

The Water Authority will do the following to demonstrate continuous compliance:

1) Continue influent HAP sampling, concentration, pH and temperature monitoring as described in **STEP 1** of this Plan.

2) Continue influent wastewater flow monitoring as described in **STEP 2** of this Plan and conduct the flow meter calibration required by this Plan.

3) Continue using TOXCHEM each month to calculate the fraction emitted as described in **STEP 4** of this Plan.

4) Continue calculating the rolling 12-month HAP fraction emitted as described in **STEP 4** of this Plan.

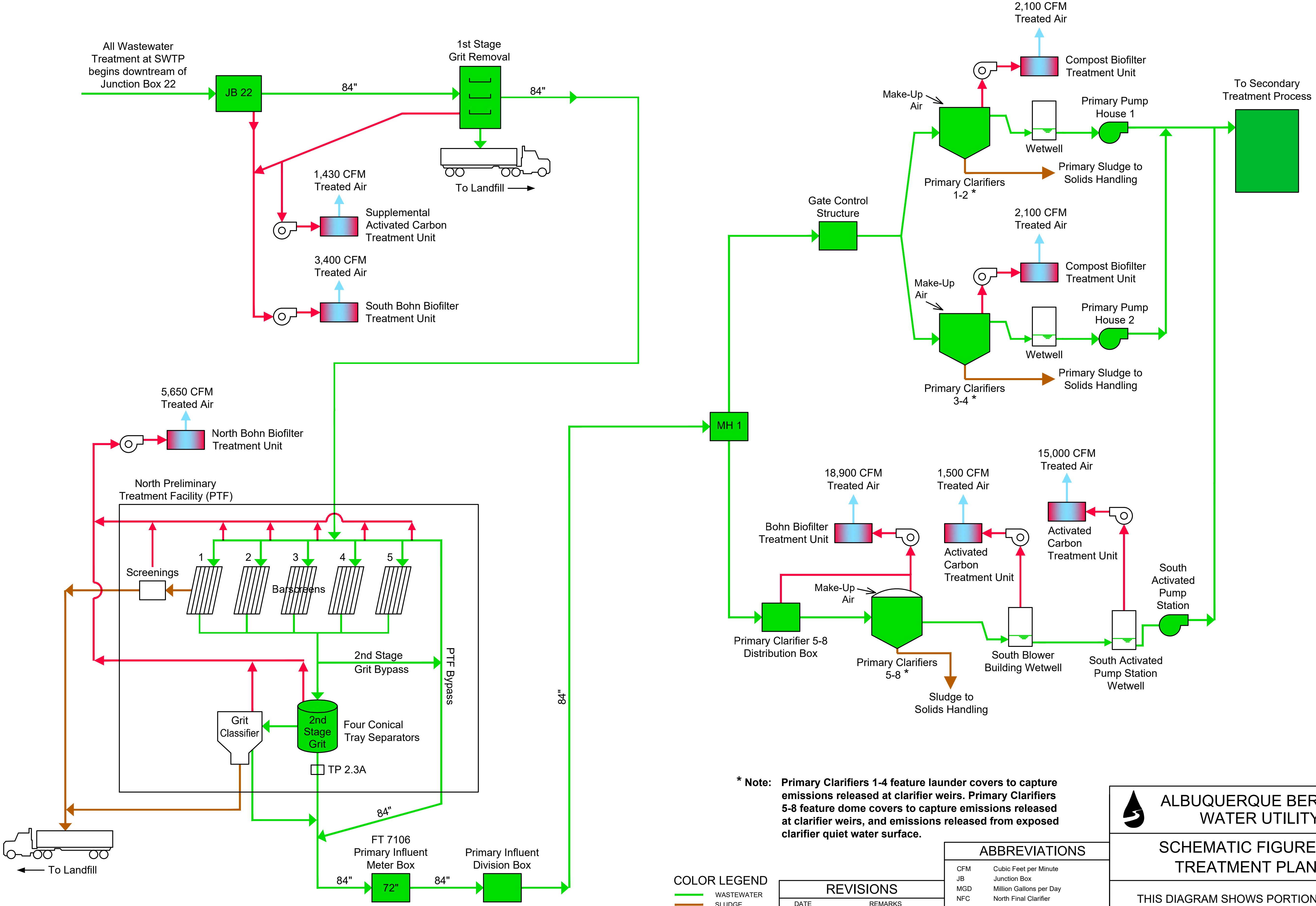
5) Provide a summary report annually to EHD based on the influent sampling results and describing the monthly HAP fraction emitted for the previous 12 months. Each annual report will include the HAP fraction emitted for the current month and the previous 11 months, and the 12-month rolling average HAP fractions emitted for the current month and the previous 11-months. A copy of available Priority Pollutant testing results for the previous 12 months will be submitted with the annual summary report.

6) Review applications from any new industrial dischargers prior to issuing their industrial waste permit to ascertain whether the new industrial discharger would change the Water Authority's assessment of which HAP compounds are reasonably anticipated to be present in the Plant's influent. Annually survey existing industrial dischargers to ascertain any changes that may have occurred that would modify which HAP compounds are reasonably anticipated to be present in the Plant's influent. If an industrial discharger indicates that they use a HAP that is not able to be tested commercially, the Water Authority will re-evaluate the discharge permit.

7) A copy of the Pretreatment Annual Report will be sent to the City of Albuquerque.

ATTACHMENT A

Southside Water Reclamation Plant
Schematic Figure of Primary Treatment Plant and Adjacent Facilities



*** Note:** **Primary Clarifiers 1-4 feature launder covers to capture emissions released at clarifier weirs. Primary Clarifiers 5-8 feature dome covers to capture emissions released at clarifier weirs, and emissions released from exposed clarifier quiet water surface.**

COLOR LEGEND

🟩	WASTEWATER
🟫	SLUDGE
🟦	AIR
🟥	ODOROUS AIR
🟦	TREATED AIR

REVISIONS

DATE	REMARKS
JULY 2019	DRAWING CREATED

ABBREVIATIONS

CFM	Cubic Feet per Minute
JB	Junction Box
MGD	Million Gallons per Day
NFC	North Final Clarifier
RAS	Return Activated Sludge
SFC	South Final Clarifier
SWRP	Southside Water Reclamation Plant
WAS	Waste Activated Sludge

ALBUQUERQUE BERNALILLO COUNTY
WATER UTILITY AUTHORITY

SCHEMATIC FIGURE OF PRIMARY TREATMENT PLANT AT SWRP

THIS DIAGRAM SHOWS PORTIONS OF THE TREATMENT PLANT THAT ARE SUBJECT TO 40 CFR PART 63, SUBPART VVV.

ATTACHMENT B

TOXCHEM Modeling Protocol

Leder, Charles S.

From:	Tavarez, Isreal L. <ITavarez@cabq.gov>
Sent:	Friday, January 17, 2020 2:46 PM
To:	Leder, Charles S.
Cc:	Slowen, Jolene; Parker, Carol M.; Auh, Peter; PE CHMM Tom Henning (thenning@sehinc.com); Munoz-Dyer, Carina G.; Puckett, Paul S.; Eyerman, Regan V.; Reyes, Damon R.; Maldonado, Angelique; McKinstry, Michael W.; Paul Buellesbach; mike.pring@erg.com
Subject:	FW: Water Authority; Draft HAP modeling protocol
Attachments:	TOXCHEM Modeling Protocol_2019.10.25.pdf

Mr. Leder:

This email is to confirm the City of Albuquerque Environmental Health Department Air Quality Program has approved the attached TOXCHEM Modeling Protocol.

Please feel free to call me at (505) 228-9754 if you have any questions.

Thank you.

Respectfully,

ONE
ALBUQUE
RQUE
environmental
health

Isreal L. Tavarez, P.E.
manager | environmental health department
o 505.768.1965
m 505.228.9754
cabq.gov/environmentalhealth/

From: Parker, Carol M. <cparker@cabq.gov>
Sent: Monday, October 28, 2019 10:42 AM
To: Tavarez, Isreal L. <ITavarez@cabq.gov>; Munoz-Dyer, Carina G. <cmunoz-dyer@cabq.gov>; Puckett, Paul S. <ppuckett@cabq.gov>; Eyerman, Regan V. <reyerman@cabq.gov>; Reyes, Damon R. <dreyes@cabq.gov>; Maldonado, Angelique <admaldonado@cabq.gov>; McKinstry, Michael W. <mmckinstry@cabq.gov>; Paul Buellesbach <Paul.Buellesbach@erg.com>; mike.pring@erg.com
Cc: Slowen, Jolene <jslowen@cabq.gov>
Subject: FW: Water Authority; Draft HAP modeling protocol

All - Here is the complete packet for the Water Authority's Modeling Protocol for wastewater HAP. Thanks - Carol

---

From: leder S. Charles
Sent: Monday, October 28, 2019 9:52 AM

To: Parker, Carol M. <cparker@cabq.gov>
Cc: Auh, Peter <pauh@abcwua.org>
Subject: Water Authority; Draft HAP modeling protocol

Here is an electronic copy of the document we distributed at the 10/25/19 meeting complete with all attachments.

Charles S. Leder, P.E.
Manager – Plant Operations Division
Albuquerque Bernalillo County Water Utility Authority
PO Box 568 | Albuquerque NM | 87103
cleder@abcwua.org
505-289-3401 (office) | 505-331-6021 (cell)
www.abcwua.org

TOXCHEM Modeling Protocol
Albuquerque Bernalillo County Water Utility Authority
Southside Water Reclamation Facility

BACKGROUND

The Albuquerque Bernalillo County Water Utility Authority ("Water Authority") operates the Southside Water Reclamation Facility (the "Plant") located at 4201 2nd Street SW, Albuquerque, New Mexico. The Water Authority was issued a Title V Operation Permit (Permit #1418-M2) that regulates the air emission equipment and processes at the Plant. This Permit became effective December 24, 2014. The Plant is a Title V major source of several criteria pollutants and hazardous air pollutants (HAP).

The Plant is subject to the National Emission Standards for Hazardous Air Pollutants: Publicly Owned Treatment Works found in 40 CFR 63 Subpart VVV ("Sub VVV"). The Plant has been deemed as "reconstructed" under Sub VVV and is regulated as a "New Group 2 POTW". One of the compliance options for a New Group 2 POTW is to demonstrate that the ratio of HAP emissions for all emission points up to but not including, the secondary influent pumping station, to the total mass of HAPs in the Plant influent is less than 0.014.

The TOXCHEM model is proposed to be used to estimate HAP emissions from the portions of the Plant regulated by Sub VVV. The TOXCHEM model incorporates a number of fate mechanisms for toxic compounds to calculate process specific mass balance calculations. TOXCHEM calculates the volatilization of HAPs through air-water interfaces such as water surfaces, air stripping, and at weirs, sewer reachs, drops, and process drains. TOXCHEM uses a database with chemical parameter assumptions for each HAP compound to calculate mass transfer across the air-water interfaces.

EMISSION POINTS

Sub VVV regulates HAP emissions up to the beginning of the secondary treatment system. For the Plant, this includes the preliminary treatment portion of the plant and includes these specific emission points:

Emission Point	Emission Point Name	Wastewater Processes	Exhaust Flow Rate (cfm)
EP01	Carbon System	JB 22, 1st Grit Chamber, Sewer Reach: 1st Grit to Bar Screens, Bar Screens	1,428
EP02	South Bohn Biofilter	JB 22, 1st Grit Chamber, Sewer Reach: 1st Grit to Bar Screens	3,400
EP03	North Bohn Biofilter	Bar Screens, Sewer Reach: Bar Screens to Conical Tray Vortex Separators, Conical Tray Vortex Separators	5,650
EP04	PC1/2 Compost Media Biofilter	Clarifier 1 and Clarifier 2	Not Included
EP05	PC3/4 Compost Media Biofilter	Clarifier 3 and Clarifier 4	Not Included
EP06	PC5/8 Bohn Biofilter	Clarifier 5, Clarifier 6, Clarifier 7, and Clarifier 8	18,920

HAZARDOUS AIR POLLUTANTS

Water Authority staff contacted multiple contract laboratories to identify laboratories and analytical methods that could be used to quantify influent concentrations of the 96 HAPs listed on Table 2 in 40 CFR part 63 Subpart DD ("Sub DD Table 2") as well as formaldehyde. The request for analysis included all 96 HAP compounds, and between the four laboratories that responded, analytical methods for 81 HAP compounds were identified. In order to complete this request, multiple sets of samples were collected in the field to cover seven different analytical methods. For two primary methods of analysis, 8260 and 8270, sample containers were collected in duplicate and triplicate to maximize coverage of parameters listed in respected methods. The following table represents the labs, sample methods and sample containers required to conduct the analyses.

Laboratory	Method	Description	Sample Kit	Sample Type
Anatek Labs	EPA 515.4	Chloramben	Two (2) 500 mL Amber Bottles	Composite
	EPA 8260C	Epichorohydrin	Four (4) 40 mL vial w/ HCl	Grab
Eurofins/TestAmerica Houston	EPA 8270C	N,N-Dimethylaniline	Two (2) 1 Liter Amber Glass	Composite
	EPA 8015B	Methanol	Two (2) 40 mL vial w/ HCl	Grab
	EPA 8260B	5 HAPs	Three (3) 40 mL vial w/ HCl	Grab
Eurofins/TestAmerica Irvine	EPA 8315A	Acetaldehyde and Formaldehyde	Two (2) 500 mL Amber Bottles	Composite
Eurofins/TestAmerica Denver	EPA 8081B	Lindane	Two (2) 1 Liter Amber Glass	Composite
	EPA 8151A	2,4-D	Two (2) 1 Liter Amber Glass	Composite
	EPA 8270C	17 HAPs	Two (2) 1 Liter Amber Glass	Composite
	EPA 8260B	4 HAPs	Three (3) 40 mL vial unpreserved	Grab
	EPA 8260B	48 HAPs	Three (3) 40 mL vial w/ HCl	Grab
Amended: Hall Environmental Laboratory	EPA 8081B	Lindane	Two (2) 1 Liter Amber Glass	Composite

For the remaining 15 HAP compounds on Sub DD Table 2, the Water Authority conducted an evaluation of the discharges in their collection system and determined that none of the 15 compounds are reasonably anticipated to be present the Plant’s influent (see Attachment 1).

Compounds that are measured in the wastewater at reportable quantities will be used in the TOXCHEM modeling.

WASTEWATER SAMPLING AND FLOW RATE

The wastewater sampling will occur at JB22 (Junction Box 22). JB22 is the first point that all influent streams to the plant converge prior to any plant processes. Therefore, this location ensures the sample represents wastewater that has not been treated. A sample port was installed at this location.

The TOXCHEM model will be run using the wastewater treatment plant daily flow rate measured on the day that the HAP emission testing was conducted. The model will calculate total mass HAP emissions per day. The results of the wastewater analysis and the actual flow rate will be used to calculate the loading to the plant.

TOXCHEM INPUTS

The model is set up with each process included in the pretreatment portion of the Plant (see Attachment 2). The air flow rates from each of the SWRP foul air treatment systems are included in the model so that the air "sweep" across each process is represented. The TOXCHEM model will be run using:

- HAP influent concentrations measured in the wastewater influent to be at or greater than the laboratories' detection limits
- The average wastewater influent flow rate on the date(s) influent sampling occurred.
- Design air flow rates from the foul air treatment systems installed on the Plant's pretreatment processes.

TOXCHEM OUTPUT and SUB VVV CALCULATIONS

TOXCHEM outputs the total mass of HAPs from each emission point and the mass of each individual HAP.

One of the compliance options for a New Group 2 POTW is to demonstrate that the ratio of HAP emissions for all emission points up to but not including, the secondary influent pumping station, to the total mass of HAPs in the Plant influent is less than 0.014. That is, the emissions from the pretreatment portion of the plant estimated using TOXCHEM will be divided by the mass of HAPs in the plant influent. The resulting ratio will be compared to 0.014. The calculations are as follows.

HAPs Emitted, HAP_E: A sum of the TOXCHEM output of daily emission rates for each HAP detected in the Plant's influent, pounds per day.

Influent HAPs, HAP_{INF}: The sum of each flow weighted mass loading of detected HAPs, pounds per day.

Ratio: HAP_E/HAP_{INF} = compliance ratio to be compared with 0.014

Attachments
1. October 23, 2019 Memorandum regarding NPDES/Pretreatment Investigation of 15 Non-Analyzable HAPS
2. Diagram of Equipment Layout in TOXCHEM

ATTACHMENT 1

Memorandum

To: Mark Kelly, PE Compliance Division Manager

From: Alan J Barney, Pollution Prevention Specialist

CC: Merat Zarreii, NPDES Program Manager
Travis Peacock, Industrial Pretreatment Engineer

Date: 10/23/2019

Re: NPDES/Pretreatment Investigation of 15 Non-Analyzable HAPS

During the most recent HAPs sampling event conducted in September 2019, there were 15 HAP compounds for which the Compliance Division could not find a laboratory capable of analysis. The National Pollutant Discharge Elimination System (NPDES)/Industrial Pretreatment Program (Pretreatment) conducted research utilizing:

- Environmental Protection Agency's (EPA) list of National Emission Standards for Hazardous Air Pollutants (NESHAP) sources,
- North American Industry Classification System (NAICS) to Standard Industrial Classification (SIC) conversion tool, and
- Pretreatment's database of permitted industries (LINKO)

This was done to determine if there was a probability these HAPs could be present in Pretreatment's known permitted industries' discharge; and, therefore, the influent for the Southside Water Reclamation Plant (SWRP).

Below are the sources used for this research:

https://www.epa.gov/stationary-sources-air-pollution/national-emission-standards-hazardous-air-pollutants-neshap-9

https://www.naics.com/naics-to-sic-crosswalk-2/

It was found that only one (1) of these analytes (carbonyl sulfide) was specifically identified as being potentially emitted by any of the industry types identified by the EPA. This finding required Pretreatment to consult the EPA Hazard Summaries for each individual chemical compound and identify their potential industry uses and how they react chemically in the environment.

Using the SIC code database, Pretreatment compiled a list of all the SIC codes that are potentially associated with each analyte. This list was cross referenced with all the SIC codes in our Pretreatment database (LINKO) and found 3 industries with SIC codes and processes that coincide with the industry uses identified in the EPA hazard summaries. These industries were 2028A- ABB Installation Products, 2055A- Albany Molecular Research Institute (AMRI) and 2032A- Formulab.

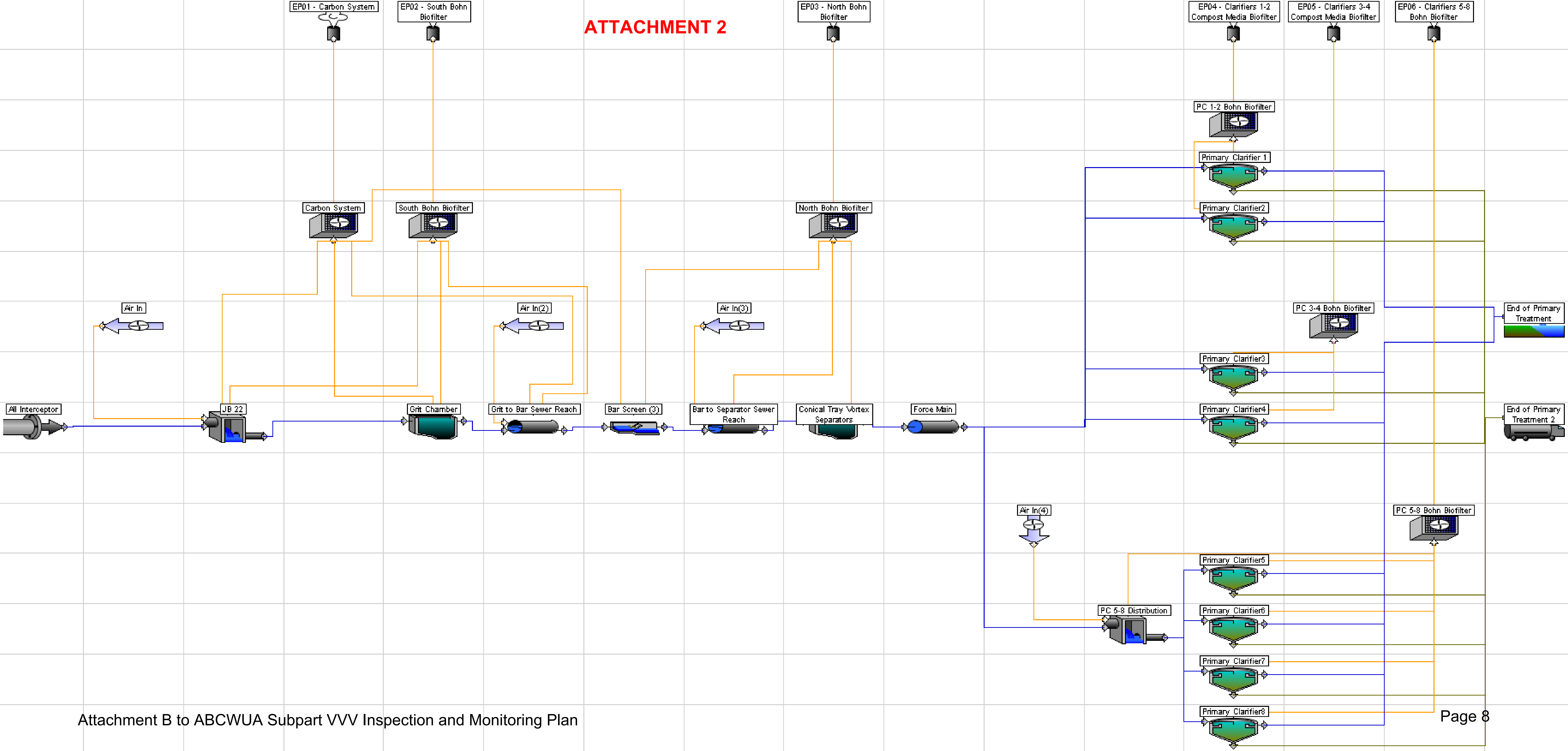
Based on the common role these analytes play in industrial use, Pretreatment determined the most effective way to identify if any of these analytes are present in our industries are to target chemical, pharmaceutical and raw material synthesizers and producers for survey. Pretreatment sent out surveys to each of these three industries requesting they review their chemical inventory, and wastewater discharges and report back as a permit requirement. Attached are the completed surveys.

The three permitted industries indicated the 15 HAP compounds were either known absent or suspected absent in their chemical inventory, manufacture process, and therefore wastewater discharge.

Pretreatment additionally checked the Tier II Hazardous Waste Chemical inventory provided by the Local Emergency Planning Committee (LEPC) to determine if any Tier II industries in Bernalillo county are reporting they have these 15 HAPs. None of the 15 HAP compounds were on the Tier II listing.

Based on the research conducted, surveys received from our permitted industries, and the Tier II check, Pretreatment is confident the data is sufficient and indicates the compounds are not confirmed to be present in the wastewater entering the SWRP.

ATTACHMENT 2



HAZARDOUS AIR POLLUTANT INDUSTRY SURVEY

Please indicate by placing an "X" in the appropriate box by each listed chemical whether it is "Known to be Absent", "Suspected to be Absent", "Suspected to be Present", or "Known to be Present" in your current chemical inventory, manufacturing or service activity or generated as a by-product. If Known or Suspected Present, please list the chemical or process that it is known or suspected to be in.

	Hazardous Air Pollutant	CAS #	Known Absent	Suspected Absent	Suspected Present	Known Present	Known or Suspected Process or Chemical
1	Benzotrichloride (isomers and mixture)	98-07-7	☐	☒	☐	☐	
2	Bis(chloromethyl)ether	542-88-1	☐	☒	☐	☐	
3	Carbonyl sulfide	43-58-1	☐	☒	☐	☐	
4	Chloromethyl methyl ether	107-30-2	☐	☒	☐	☐	
5	Diazomethane	334-88-3	☐	☒	☐	☐	
6	Diethyl sulfate	64-67-5	☐	☒	☐	☐	
7	Dimethyl carbamoyl chloride	79-44-7	☐	☒	☐	☐	
8	Dimethyl sulfate	77-78-1	☐	☒	☐	☐	
9	1,2-Epoxybutane	106-88-7	☐	☒	☐	☐	
10	Ethylene imine (Aziridine)	151-56-4	☐	☒	☐	☐	
11	Methyl isocyanate	624-83-9	☐	☒	☐	☐	
12	Phosgene	75-44-5	☐	☒	☐	☐	
*13	1,2-Propylenimine (2-Methyl aziridine)	75-55-8	☐	☒	☐	☐	
14	Styrene oxide	96-09-3	☐	☒	☐	☐	
*15	Vinyl bromide	593-60-2	☐	☒	☐	☐	

*SIC/NESHAP indicates you may use this compound in your manufacturing process and are required to report on these.

Note: The paints and solvents, rubbers, lead-free solder and other raw material used at this facility do not have any of the above listed HAPs present. Potential presence in "by-products" is highly unlikely since the manufacture process at this facility is injection molding of raw rubber and minor spray painting. The waste water permit at this facility is associated with a sulfuric acid bath process.

Authorized Representative
David Jaramillo, Plant Manager, ABB

10/4/19
Date

Please sign and return to the Industrial Pretreatment Program within 21 days.

From:	Peacock, Travis A.
To:	Dalin, Tracey A.
Subject:	FW: Hazardous Air Pollutants Survey Request
Date:	Wednesday, October 16, 2019 10:43:33 AM
Attachments:	image001.png image002.png image005.png image007.png

---

Can you please print this for me.

Thanks,

Travis A. Peacock
Industrial Pretreatment Engineer
Albuquerque Bernalillo County Water Utility Authority
PO Box 568 | Albuquerque NM | 87103
505-289-3439 (ofc) | 505-274-1820 (cell)
www.abcwua.org

From: Peacock, Travis A.
Sent: Friday, October 04, 2019 12:45 PM
To: David Jaramillo <david.jaramillo@us.abb.com>
Cc: Zarreii, Merat <mzarreii@abcwua.org>; Zimmerman, Benjamin <bzimmerman@abcwua.org>; mschluep@alliantenv.com
Subject: RE: Hazardous Air Pollutants Survey Request

David,
Thank you for returning the requested HAPs survey.

Thanks,

Travis A. Peacock
Industrial Pretreatment Engineer
Albuquerque Bernalillo County Water Utility Authority
PO Box 568 | Albuquerque NM | 87103
505-289-3439 (ofc) | 505-274-1820 (cell)
www.abcwua.org

From: David Jaramillo <david.jaramillo@us.abb.com>
Sent: Friday, October 04, 2019 8:32 AM
To: Peacock, Travis A. <tpeacock@abcwua.org>
Cc: Zarreii, Merat <mzarreii@abcwua.org>; Zimmerman, Benjamin <bzimmerman@abcwua.org>; mschluep@alliantenv.com
Subject: RE: Hazardous Air Pollutants Survey Request

[CAUTION: This email was received from an EXTERNAL source]

Travis,

Attached is the completed survey, let me know if you have any additional questions.

Thank you,

From: Peacock, Travis A. <tpeacock@abcwua.org>
Sent: Tuesday, October 1, 2019 4:05 PM
To: David Jaramillo <david.jaramillo@us.abb.com>
Cc: Zarreii, Merat <mzarreii@abcwua.org>; Zimmerman, Benjamin <bzimmerman@abcwua.org>
Subject: Hazardous Air Pollutants Survey Request

CAUTION: This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

David,

The Water Authority NPDES/Pretreatment Program (Program) has been conducting wastewater scans for Hazardous Air Pollutants (HAP) and cannot analyze for 15 compounds. Based on your industry type and SIC code, EPA NESHAP indicates that you may use some of these HAP compounds in your manufacturing processes.

We just sent you a letter explaining this along with a survey that we are requiring you send back within 21 days. Ignore the "RE: RETURN TO COMPLIANCE" this was a typo. This survey lists all 15 compounds that we were not able to analyze, but according to our SIC/NESHAP research only two are possible compounds found in you manufacturing processes. Please review your chemical inventory for at a minimum the two compounds indicated with an asterisk and we would appreciate if you would review your inventory for all 15 compounds.

I've attached this survey to assist with speeding up the return process. Please email the filled out survey back within 21 days along with the process or chemical(s) that the compounds are found in.

Thanks,

Travis A. Peacock
Industrial Pretreatment Engineer
Albuquerque Bernalillo County Water Utility Authority
PO Box 568 | Albuquerque NM | 87103
505-289-3439 (ofc) | 505-274-1820 (cell)
www.abcwua.org

Albuquerque Bernalillo County
Water Utility Authority

PO Box 568
Albuquerque, NM 87103
www.abcwua.org

7017 3040 0000 7358 1008

October 1, 2019

ABB Installation Productions, Inc.
6625 Bluewater Rd. NW
Albuquerque, NM 87121
ATTN: David Jaramillo, Plant Manager

RE: RETURN TO COMPLIANCE
PERMIT NO: 2028A
FACILITY LOCATION: 6625 Bluewater Rd. NW, Albuquerque, NM 87121

Dear Mr. Jaramillo:

The Water Authority NPDES/Pretreatment Program (Program) has been conducting wastewater scans for Hazardous Air Pollutants (HAP) and cannot analyze for 15 compounds. Based on your industry type and SIC code, EPA NESHAP indicates that you may use some of these HAP compounds in your manufacturing processes.

The Program is requiring that you, as a Permitted Industrial User, evaluate your chemical inventory and report back any Known/Suspected Absence or Known/Suspected Presence of these HAP compounds. Attached is a survey form to be filled out and returned within 21 days of receipt of this letter. The Program considers this a permit requirement per Section 3-2-5 "Wastewater Analysis" of the Sewer Use and Wastewater Control Ordinance and as such must provide "information about the nature and characteristics of its wastewater discharge".

Please email your response if possible. Your response is urgent. Use Pretreatment Engineer's email below.

If you have any questions or need assistance regarding this matter, please contact Travis Peacock, Industrial Pretreatment Engineer, at 505-289-3439 or tpeacock@abcwua.org.

Your prompt attention is appreciated.

Sincerely,

Merat Zarreii
NPDES Program Manager

HAZARDOUS AIR POLLUTANT INDUSTRY SURVEY

Please indicate by placing an "X" in the appropriate box by each listed chemical whether it is "Known to be Absent", "Suspected to be Absent", "Suspected to be Present", or "Known to be Present" in your current chemical inventory, manufacturing or service activity or generated as a by-product. If Known or Suspected Present, please list the chemical or process that it is known or suspected to be in.

	Hazardous Air Pollutant	CAS #	Known Absent	Suspected Absent	Suspected Present	Known Present	Known or Suspected Process or Chemical
1	Benzotrichloride (isomers and mixture)	98-07-7	☐	☐	☐	☐	
2	Bis(chloromethyl)ether	542-88-1	☐	☐	☐	☐	
3	Carbonyl sulfide	43-58-1	☐	☐	☐	☐	
4	Chloromethyl methyl ether	107-30-2	☐	☐	☐	☐	
5	Diazomethane	334-88-3	☐	☐	☐	☐	
6	Diethyl sulfate	64-67-5	☐	☐	☐	☐	
7	Dimethyl carbamoyl chloride	79-44-7	☐	☐	☐	☐	
8	Dimethyl sulfate	77-78-1	☐	☐	☐	☐	
9	1,2-Epoxybutane	106-88-7	☐	☐	☐	☐	
10	Ethylene imine (Aziridine)	151-56-4	☐	☐	☐	☐	
11	Methyl isocyanate	624-83-9	☐	☐	☐	☐	
12	Phosgene	75-44-5	☐	☐	☐	☐	
*13	1,2-Propylenimine (2-Methyl aziridine)	75-55-8	☐	☐	☐	☐	
14	Styrene oxide	96-09-3	☐	☐	☐	☐	
*15	Vinyl bromide	593-60-2	☐	☐	☐	☐	

*SIC/NESHAP indicates you may use this compound in your manufacturing process and are required to report on these.

Please sign and return to the Industrial Pretreatment Program within 21 days.

Authorized Representative
David Jaramillo, Plant Manager, ABB

Date

HAZARDOUS AIR POLLUTANT INDUSTRY SURVEY

Please indicate by placing an "X" in the appropriate box by each listed chemical whether it is "Known to be Absent", "Suspected to be Absent", "Suspected to be Present", or "Known to be Present" in your current chemical inventory, manufacturing or service activity or generated as a by-product. If Known or Suspected Present, please list the chemical or process that it is known or suspected to be in.

	Hazardous Air Pollutant	CAS #	Known Absent	Suspected Absent	Suspected Present	Known Present	Known or Suspected Process or Chemical
1	Benzotrichloride (isomers and mixture)	98-07-7	☒	☐	☐	☐	
2	Bis(chloromethyl)ether	542-88-1	☒	☐	☐	☐	
3	Carbonyl sulfide	43-58-1	☒	☐	☐	☐	
4	Chloromethyl methyl ether	107-30-2	☒	☐	☐	☐	
5	Diazomethane	334-88-3	☒	☐	☐	☐	
6	Diethyl sulfate	64-67-5	☒	☐	☐	☐	
*7	Dimethyl carbamoyl chloride	79-44-7	☒	☐	☐	☐	
8	Dimethyl sulfate	77-78-1	☒	☐	☐	☐	
9	1,2-Epoxybutane	106-88-7	☒	☐	☐	☐	
10	Ethylene imine (Aziridine)	151-56-4	☒	☐	☐	☐	
11	Methyl isocyanate	624-83-9	☒	☐	☐	☐	
*12	Phosgene	75-44-5	☒	☐	☐	☐	
*13	1,2-Propylenimine (2-Methyl aziridine)	75-55-8	☒	☐	☐	☐	
14	Styrene oxide	96-09-3	☒	☐	☐	☐	
15	Vinyl bromide	593-60-2	☒	☐	☐	☐	

*SIC/NESHAP indicates you may use this compound in your manufacturing process and are required to report on these.

Please sign and return to the Industrial Pretreatment Program within 21 days.

Authorized Representative
Mary Circe, Senior EHS Manager, AMRI

07 October 2019
Date

From: Peacock, Travis A.
To: Dalin, Tracey A.
Subject: FW: ABCWUA HAP Survey
Date: Wednesday, October 16, 2019 10:44:31 AM
Attachments: image002.png
image005.png
image001.png
image003.png
image008.png

Can you please print this for me.

Thanks,

Travis A. Peacock
Industrial Pretreatment Engineer
Albuquerque Bernalillo County Water Utility Authority
PO Box 568 | Albuquerque NM | 87103
505-289-3439 (ofc) | 505-274-1820 (cell)
www.abcwua.org

From: Peacock, Travis A.
Sent: Friday, October 11, 2019 10:43 AM
To: Circe, Mary <Mary.Circe@amriglobal.com>
Cc: Miller, Shannon <Shannon.Miller@amriglobal.com>
Subject: RE: ABCWUA HAP Survey

Fantastic,
Thank you again.

Travis A. Peacock
Industrial Pretreatment Engineer
Albuquerque Bernalillo County Water Utility Authority
PO Box 568 | Albuquerque NM | 87103
505-289-3439 (ofc) | 505-274-1820 (cell)
www.abcwua.org

From: Circe, Mary <Mary.Circe@amriglobal.com>
Sent: Friday, October 11, 2019 9:50 AM
To: Peacock, Travis A. <tpeacock@abcwua.org>
Cc: Miller, Shannon <Shannon.Miller@amriglobal.com>
Subject: RE: ABCWUA HAP Survey

[CAUTION: This email was received from an EXTERNAL source]

Travis,

This was determined based on a review of our chemical inventory and the pollutant emissions listed in the reports to the City of ABQ Air Quality Division.
We do not use the 15 hazardous air pollutants (HAPs) in the AMRI manufacturing process or quality laboratories at this time.

Thank you.

Mary

Mary G. Circe (Sir-See)
Senior Manager, EH&S
Mobile: (505) 340-5436
Office: (505) 923-1500 ext. 34637
e-mail: mary.circe@amriglobal.com
Albuquerque, New Mexico

From: Peacock, Travis A. [mailto:tpeacock@abcwua.org]
Sent: Friday, October 11, 2019 8:54 AM
To: Circe, Mary <Mary.Circe@amriglobal.com>
Cc: Miller, Shannon <Shannon.Miller@amriglobal.com>
Subject: RE: ABCWUA HAP Survey

Mary,
Thank you for providing this survey back. How did you determine that the 15 compounds are "known absent"?

Thanks,

Travis A. Peacock
Industrial Pretreatment Engineer
Albuquerque Bernalillo County Water Utility Authority
PO Box 568 | Albuquerque NM | 87103
505-289-3439 (ofc) | 505-274-1820 (cell)
www.abcwua.org

From: Circe, Mary <Mary.Circe@amriglobal.com>
Sent: Friday, October 11, 2019 8:50 AM
To: Peacock, Travis A. <tpeacock@abcwua.org>
Cc: Miller, Shannon <Shannon.Miller@amriglobal.com>
Subject: ABCWUA HAP Survey

[CAUTION: This email was received from an EXTERNAL source]

Travis, please find a scanned copy of the ABCWUA HAP Survey. I am also sending the original via Certified mail today.

Thank you.

Mary

Mary G. Circe (Sir-See)
Senior Manager, EH&S
Mobile: (505) 340-5436
Office: (505) 923-1500 ext. 34637
e-mail: mary.circe@amriglobal.com
Albuquerque, New Mexico

Albuquerque Bernalillo County
Water Utility Authority

PO Box 568
Albuquerque, NM 87103
www.abcwua.org

7017 3040 0000 7358 0988

October 1, 2019

Albany Molecular Research, Inc.
4401 Alexander Blvd. NE
Albuquerque, NM 87107
ATTN: Mary Circe, Senior EHS Manager

RE: RETURN TO COMPLIANCE
PERMIT NO: 2055A
FACILITY LOCATION: 4272 Balloon Park Rd. NE, Albuquerque, NM 87107

Dear Ms. Circe:

The Water Authority NPDES/Pretreatment Program (Program) has been conducting wastewater scans for Hazardous Air Pollutants (HAP) and cannot analyze for 15 compounds. Based on your industry type and SIC code, EPA NESHAP indicates that you may use some of these HAP compounds in your manufacturing processes.

The Program is requiring that you, as a Permitted Industrial User, evaluate your chemical inventory and report back any Known/Suspected Absence or Known/Suspected Presence of these HAP compounds. Attached is a survey form to be filled out and returned within 21 days of receipt of this letter. The Program considers this a permit requirement per Section 3-2-5 "Wastewater Analysis" of the Sewer Use and Wastewater Control Ordinance and as such must provide "information about the nature and characteristics of its wastewater discharge".

Please email your response if possible. Your response is urgent. Use Pretreatment Engineer's email below.

If you have any questions or need assistance regarding this matter, please contact Travis Peacock, Industrial Pretreatment Engineer, at 505-289-3439 or tpeacock@abcwua.org.

Your prompt attention is appreciated.

Sincerely,

Merat Zarreii
NPDES Program Manager

HAZARDOUS AIR POLLUTANT INDUSTRY SURVEY

Please indicate by placing an "X" in the appropriate box by each listed chemical whether it is "Known to be Absent", "Suspected to be Absent", "Suspected to be Present", or "Known to be Present" in your current chemical inventory, manufacturing or service activity or generated as a by-product. If Known or Suspected Present, please list the chemical or process that it is known or suspected to be in.

	Hazardous Air Pollutant	CAS #	Known Absent	Suspected Absent	Suspected Present	Known Present	Known or Suspected Process or Chemical
1	Benzotrichloride (isomers and mixture)	98-07-7	☐	☐	☐	☐	
2	Bis(chloromethyl)ether	542-88-1	☐	☐	☐	☐	
3	Carbonyl sulfide	43-58-1	☐	☐	☐	☐	
4	Chloromethyl methyl ether	107-30-2	☐	☐	☐	☐	
5	Diazomethane	334-88-3	☐	☐	☐	☐	
6	Diethyl sulfate	64-67-5	☐	☐	☐	☐	
*7	Dimethyl carbamoyl chloride	79-44-7	☐	☐	☐	☐	
8	Dimethyl sulfate	77-78-1	☐	☐	☐	☐	
9	1,2-Epoxybutane	106-88-7	☐	☐	☐	☐	
10	Ethylene imine (Aziridine)	151-56-4	☐	☐	☐	☐	
11	Methyl isocyanate	624-83-9	☐	☐	☐	☐	
*12	Phosgene	75-44-5	☐	☐	☐	☐	
*13	1,2-Propylenimine (2-Methyl aziridine)	75-55-8	☐	☐	☐	☐	
14	Styrene oxide	96-09-3	☐	☐	☐	☐	
15	Vinyl bromide	593-60-2	☐	☐	☐	☐	

*SIC/NESHAP indicates you may use this compound in your manufacturing process and are required to report on these.

Please sign and return to the Industrial Pretreatment Program within 21 days.

Authorized Representative
Mary Circe, Senior EHS Manager, AMRI

Date

HAZARDOUS AIR POLLUTANT INDUSTRY SURVEY

Please indicate by placing an "X" in the appropriate box by each listed chemical whether it is "Known to be Absent", "Suspected to be Absent", "Suspected to be Present", or "Known to be Present" in your current chemical inventory, manufacturing or service activity or generated as a by-product. If Known or Suspected Present, please list the chemical or process that it is known or suspected to be in.

	Hazardous Air Pollutant	CAS #	Known Absent	Suspected Absent	Suspected Present	Known Present	Known or Suspected Process or Chemical
1	Benzotrichloride (isomers and mixture)	98-07-7	☒	☐	☐	☐	
2	Bis(chloromethyl)ether	542-88-1	☒	☐	☐	☐	
3	Carbonyl sulfide	43-58-1	☒	☐	☐	☐	
4	Chloromethyl methyl ether	107-30-2	☒	☐	☐	☐	
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6	Diethyl sulfate	64-67-5	☒	☐	☐	☐	
7	Dimethyl carbamoyl chloride	79-44-7	☒	☐	☐	☐	
*8	Dimethyl sulfate	77-78-1	☒	☐	☐	☐	
9	1,2-Epoxybutane	106-88-7	☒	☐	☐	☐	
10	Ethylene imine (Aziridine)	151-56-4	☒	☐	☐	☐	
11	Methyl isocyanate	624-83-9	☒	☐	☐	☐	
12	Phosgene	75-44-5	☒	☐	☐	☐	
13	1,2-Propylenimine (2-Methyl aziridine)	75-55-8	☒	☐	☐	☐	
*14	Styrene oxide	96-09-3	☒	☐	☐	☐	
15	Vinyl bromide	593-60-2	☒	☐	☐	☐	

*SIC/NESHAP indicates you may use this compound in your manufacturing process and are required to report on these.

Please sign and return to the Industrial Pretreatment Program within 21 days.

Authorized Representative
Aurelio Falconi, General Manager, Formulab

10/14/19
Date

From: Peacock, Travis A.
To: Dalin, Tracey A.
Subject: FW: Water Authority (HAP)
Date: Wednesday, October 16, 2019 10:43:51 AM
Attachments: image001.png
image003.png

Can you please print this for me.

Thanks,

Travis A. Peacock
Industrial Pretreatment Engineer
Albuquerque Bernalillo County Water Utility Authority
PO Box 568 | Albuquerque NM | 87103
505-289-3439 (ofc) | 505-274-1820 (cell)
www.abcwua.org

From: Aurelio <aureliof@formulab.com>
Sent: Friday, October 04, 2019 2:31 PM
To: Peacock, Travis A. <tpeacock@abcwua.org>
Cc: Zimmerman, Benjamin <bzimmerman@abcwua.org>
Subject: RE: Water Authority (HAP)

Of course. My pleasure.

From: Peacock, Travis A. [mailto:tpeacock@abcwua.org]
Sent: Friday, October 04, 2019 2:21 PM
To: Aurelio
Cc: Zimmerman, Benjamin
Subject: Re: Water Authority (HAP)

Great, thank you for clarifying this. Is it possible that they could be inactive ingredients?

Sent from my iPhone

On Oct 4, 2019, at 1:39 PM, Aurelio <aureliof@formulab.com> wrote:

> Hello Travis,
>
> Sorry. There was not test conducted, she misunderstood me, our lab chemist just checked our active ingredients list and assure none of those ingredients are used in our current products.
>
> Best regards,

Aurelio Falconi
General Manager

<image004.png>

740 Rankin Rd NE
Albuquerque, NM 87107
Office: 505.831.6162 Ext 7
Formulab.com

From: Peacock, Travis A. [mailto:tpeacock@abcwua.org]
Sent: Friday, October 04, 2019 12:48 PM
To: Teralyn Dayzie
Cc: aureliof@formulab.com; Zimmerman, Benjamin
Subject: RE: Water Authority (HAP)

Teralyn,
Thank you for returning the requested HAPs survey. You indicate a test was conducted, can you elaborate on this?

Thanks,

<image003.png>**Travis A. Peacock**
Industrial Pretreatment Engineer
Albuquerque Bernalillo County Water Utility Authority
PO Box 568 | Albuquerque NM | 87103
505-289-3439 (ofc) | 505-274-1820 (cell)
www.abcwua.org

From: Teralyn Dayzie <teralyn@formulab.com>
Sent: Friday, October 04, 2019 9:23 AM
To: Peacock, Travis A. <tpeacock@abcwua.org>
Subject: Water Authority (HAP)

[CAUTION: This email was received from an EXTERNAL source]

Hello Travis,
Attached it the HAP form filled out in response to your Hazardous Air Pollutants email to Aurelio Falconi. He asks that I send this back.
The test was conducted and verified by our chemist Karen Olsen?

Please let me know if you have any questions. I can be reached by the number below.

Thanks.

Teralyn Dayzie
505.610.6664

Albuquerque Bernalillo County
Water Utility Authority

PO Box 568
Albuquerque, NM 87103
www.abcwua.org

7017 3040 0000 7358 0995

October 1, 2019

Formulab . . .Naturally!
740 Rankin Rd. NE
Allbuquerque, NM 87107
ATTN: Aurelio Falconi, General Manager

RE: RETURN TO COMPLIANCE
PERMIT NO: 2232A
FACILITY LOCATION: 740 Rankin Rd. NE, Allbuquerque, NM 87107

Dear Mr. Falconi:

The Water Authority NPDES/Pretreatment Program (Program) has been conducting wastewater scans for Hazardous Air Pollutants (HAP) and cannot analyze for 15 compounds. Based on your industry type and SIC code, EPA NESHAP indicates that you may use some of these HAP compounds in your manufacturing processes.

The Program is requiring that you, as a Permitted Industrial User, evaluate your chemical inventory and report back any Known/Suspected Absence or Known/Suspected Presence of these HAP compounds. Attached is a survey form to be filled out and returned within 21 days of receipt of this letter. The Program considers this a permit requirement per Section 3-2-5 "Wastewater Analysis" of the Sewer Use and Wastewater Control Ordinance and as such must provide "information about the nature and characteristics of its wastewater discharge".

Please email your response if possible. Your response is urgent. Use Pretreatment Engineer's email below.

If you have any questions or need assistance regarding this matter, please contact Travis Peacock, Industrial Pretreatment Engineer, at 505-289-3439 or tpeacock@abcwua.org.

Your prompt attention is appreciated.

Sincerely,

Merat Zarreii
NPDES Program Manager

HAZARDOUS AIR POLLUTANT INDUSTRY SURVEY

Please indicate by placing an "X" in the appropriate box by each listed chemical whether it is "Known to be Absent", "Suspected to be Absent", "Suspected to be Present", or "Known to be Present" in your current chemical inventory, manufacturing or service activity or generated as a by-product. If Known or Suspected Present, please list the chemical or process that it is known or suspected to be in.

	Hazardous Air Pollutant	CAS #	Known Absent	Suspected Absent	Suspected Present	Known Present	Known or Suspected Process or Chemical
1	Benzotrichloride (isomers and mixture)	98-07-7	☐	☐	☐	☐	
2	Bis(chloromethyl)ether	542-88-1	☐	☐	☐	☐	
3	Carbonyl sulfide	43-58-1	☐	☐	☐	☐	
4	Chloromethyl methyl ether	107-30-2	☐	☐	☐	☐	
5	Diazomethane	334-88-3	☐	☐	☐	☐	
6	Diethyl sulfate	64-67-5	☐	☐	☐	☐	
7	Dimethyl carbamoyl chloride	79-44-7	☐	☐	☐	☐	
*8	Dimethyl sulfate	77-78-1	☐	☐	☐	☐	
9	1,2-Epoxybutane	106-88-7	☐	☐	☐	☐	
10	Ethylene imine (Aziridine)	151-56-4	☐	☐	☐	☐	
11	Methyl isocyanate	624-83-9	☐	☐	☐	☐	
12	Phosgene	75-44-5	☐	☐	☐	☐	
13	1,2-Propylenimine (2-Methyl aziridine)	75-55-8	☐	☐	☐	☐	
*14	Styrene oxide	96-09-3	☐	☐	☐	☐	
15	Vinyl bromide	593-60-2	☐	☐	☐	☐	

*SIC/NESHAP indicates you may use this compound in your manufacturing process and are required to report on these.

Please sign and return to the Industrial Pretreatment Program within 21 days.

Authorized Representative
Aurelio Falconi, General Manager, Formulab

Date

ATTACHMENT C

Table 1 – HAP Compounds listed in Table 1 to Subpart DD of 40 CFR Part 63 and screening for whether compound is Reasonably Expected to be Present

TABLE 1
HAP Compounds listed in Table 1 to Subpart DD of 40 CFR, Part 63 and screening for whether Compound is Reasonably Expected to be Present

Determination of whether a HAP compound is reasonably expected to be present is based on data from September 2019 and November 2019 sampling even
See data presented in Attachment D to this Plan

Chemical Abstract System (CAS) #	Chemical name	EPA test Method	Sample Type	Reasonably anticipated to be present in influent?	Notes
75-07-0	Acetaldehyde	8315A	Composite	Yes	Detected 9/10/19
75-05-8	Acetonitrile	8260B	Grab	No	Not detected in influent sampling
98-86-2	Acetophenone	8270C	Composite	No	Not detected in influent sampling
107-02-8	Acrolein	8260B	Grab	No	Not detected in influent sampling
107-13-1	Acrylonitrile	8260B	Grab	No	Not detected in influent sampling
107-05-1	Allyl chloride	8260B	Grab	No	Not detected in influent sampling
71-43-2	Benzene (includes benzene in gasoline)	8260B	Grab	No	Not detected in influent sampling
98-07-7	Benzotrichloride (isomers and mixture)	N/A		No	No commercial lab available to test for compound. Not associated with any industrial user SIC code.
100-44-7	Benzyl chloride	8260B	Grab	No	Not detected in influent sampling
92-52-4	Biphenyl	8270C	Composite	No	Not detected in influent sampling
542-88-1	Bis(chloromethyl)ether	N/A	N/A	No	No commercial lab available to test for compound. Not associated with any industrial user SIC code. No longer commercially used in the US. Rapidly degrades in the environment
75-25-2	Bromoform	8260B	Grab	No	Not detected in influent sampling
106-99-0	1,3-Butadiene	8260B	Grab	No	Not detected in influent sampling
75-15-0	Carbon disulfide	8260B	Grab	Yes	Detected 11/25/19 12pm 6pm 11:59 pm and 11/26/19 at 6am
56-23-5	Carbon tetrachloride	8260B	Grab	No	Not detected in influent sampling
43-58-1	Carbonyl sulfide	N/A	N/A	No	No commercial lab available to test for compound. Not associated with any industrial user SIC code.
133-90-4	Chloramben	515.4	Composite	No	Not detected in influent sampling
108-90-7	Chlorobenzene	8260B	Grab	No	Not detected in influent sampling
67-66-3	Chloroform	8260B	Grab	Yes	Detected 9/10/19, 11/25/19 12pm 6pm 11:59 pm and 11/26/19 at 6am
107-30-2	Chloromethyl methyl ether	N/A	N/A	No	No commercial lab available to test for this compound. Not associated with any industrial user SIC code. Decomposes in water.
126-99-8	Chloroprene	8260B	Grab	No	Not detected in influent sampling
98-82-8	Cumene	8260B	Grab	No	Not detected in influent sampling. AKA Isopropylbenzene
94-75-7	2,4-D, salts and esters	8151A	Composite	No	Not detected in influent sampling
334-88-3	Diazomethane	N/A	N/A	No	No commercial lab available to test for compound. Not associated with any industrial user SIC code.
132-64-9	Dibenzofurans	8270C	Composite	No	Not detected in influent sampling
96-12-8	1,2-Dibromo-3-chloropropane	8260B	Grab	No	Not detected in influent sampling
106-46-7	1,4-Dichlorobenzene(p)	8260B	Grab	Yes	Detected 9/10/19, 11/25/19 12pm 6pm 11:59 pm and 11/26/19 at 6am
107-06-2	Dichloroethane (Ethylene dichloride)	8260B	Grab	No	Not detected in influent sampling. *AKA* 1,2-Dichloroethane
111-44-4	Dichloroethyl ether (Bis(2-chloroethyl ether))	8270C	Composite	No	Not detected in influent sampling
542-75-6	1,3-Dichloropropene	8260B	Grab	No	Not detected in influent sampling
79-44-7	Dimethyl carbamoyl chloride	N/A	N/A	No	No commercial lab available to test for compound. Associated with one industrial user SIC code (AMRI). AMRI stated that compound is not present in their chemical inventory.
64-67-5	Diethyl sulfate	N/A	N/A	No	No commercial lab available to test for compound. Not associated with any industrial user SIC code.
77-78-1	Dimethyl sulfate	N/A	N/A	No	No commercial lab available to test for compound. Only associated with one industrial user SIC code (Formulab). Formulab stated that compound is known to be absent from their chemical inventory.
121-69-7	N,N-Dimethylaniline	8270C	Composite	No	Not detected in influent sampling
51-28-5	2,4-Dinitrophenol	8270C	Composite	No	Not detected in influent sampling
121-14-2	2,4-Dinitrotoluene	8270C	Composite	No	Not detected in influent sampling
123-91-1	1,4-Dioxane (1,4-Diethyleneoxide)	8260B	Grab	No	Not detected in influent sampling
106-89-8	Epichlorohydrin (1-Chloro-2,3-epoxypropane)	8260C	Grab	No	Not detected in influent sampling
106-88-7	1,2-Epoxybutane	N/A	N/A	No	No commercial lab available to test for compound. Not associated with any industrial user SIC code.
140-88-5	Ethyl acrylate	8260B	Grab	No	Not detected in influent sampling
100-41-4	Ethyl benzene	8260B	Grab	No	Not detected in influent sampling
75-00-3	Ethyl chloride (Chloroethane)	8260B	Grab	No	Not detected in influent sampling
106-93-4	Ethylene dibromide (Dibromoethane)	8260B	Grab	No	Not detected in influent sampling. Also known as (*AKA*) 1,2-Dibromoethane

TABLE 1

HAP Compounds listed in Table 1 to Subpart DD of 40 CFR, Part 63 and screening for whether Compound is Reasonably Expected to be Present

Determination of whether a HAP compound is reasonably expected to be present is based on data from September 2019 and November 2019 sampling even
See data presented in Attachment D to this Plan

Chemical Abstract System (CAS) #	Chemical name	EPA test Method	Sample Type	Reasonably anticipated to be present in influent?	Notes
107-06-2	Ethylene dichloride (1,2-Dichloroethane)	8260B	Grab	No	Not detected in influent sampling
151-56-4	Ethylene imine (Aziridine)	N/A	N/A	No	No commercial lab available to test for compound. Not associated with any industrial user SIC code.
75-21-8	Ethylene oxide	8260B	Grab	No	Not detected in influent sampling
75-34-3	Ethylidene dichloride (1,1-Dichloroethane)	8260B	Grab	No	Not detected in influent sampling
118-74-1	Hexachlorobenzene	8270C	Composite	No	Not detected in influent sampling
87-68-3	Hexachlorobutadiene	8270C	Composite	No	Not detected in influent sampling
67-72-1	Hexachloroethane	8270C	Composite	No	Not detected in influent sampling
110-54-3	Hexane	8260B	Grab	No	Not detected in influent sampling
78-59-1	Isophorone	8270C	Composite	No	Not detected in influent sampling
58-89-9	Lindane (all isomers)	8081B	Composite	No	Not detected in influent sampling
67-56-1	Methanol	8015B	Grab	No	Not detected in influent sampling
74-83-9	Methyl bromide (Bromomethane)	8260B	Grab	No	Not detected in influent sampling
74-87-3	Methyl chloride (Chloromethane)	8260B	Grab	No	Not detected in influent sampling
71-55-6	Methyl chloroform (1,1,1-Trichloroethane)	8260B	Grab	No	Not detected in influent sampling
78-93-3	Methyl ethyl ketone (2-Butanone)	8260B	Grab	Yes	Detected 9/10/19, 11/25/19 12pm 6pm 11:59 pm and 11/26/19 at 6am
74-88-4	Methyl iodide (Iodomethane)	8260B	Grab	No	Not detected in influent sampling
108-10-1	Methyl isobutyl ketone (Hexone)	8260B	Grab	No	Not detected in influent sampling
624-83-9	Methyl isocyanate	N/A	N/A	No	No commercial lab available to test for compound. Not associated with any industrial user SIC code.
80-62-6	Methyl methacrylate	8260B	Grab	No	Not detected in influent sampling
1634-04-4	Methyl tert butyl ether	8260B	Grab	No	Not detected in influent sampling
75-09-2	Methylene chloride (Dichloromethane)	8260B	Grab	Yes	Detected 9/10/19
91-20-3	Naphthalene	8260B	Grab	No	Not detected in influent sampling
98-95-3	Nitrobenzene	8270C	Composite	No	Not detected in influent sampling
79-46-9	2-Nitropropane	8260B	Grab	No	Not detected in influent sampling
82-68-8	Pentachloronitrobenzene (Quintobenzene)	8270C	Composite	No	Not detected in influent sampling
87-86-5	Pentachlorophenol	8270C	Composite	No	Not detected in influent sampling
75-44-5	Phosgene	N/A	N/A	No	No commercial lab available to test for compound. Associated with one industrial user SIC code (AMRI). AMRI stated that compound is known to be absent from their chemical inventory.
123-38-6	Propionaldehyde	8260B	Grab	Yes	Detected 9/10/19
78-87-5	Propylene dichloride (1,2-Dichloropropane)	8260B	Grab	Yes	Detected 9/10/19
75-56-9	Propylene oxide	8260B	Grab	No	Not detected in influent sampling. *AKA* Propene oxide.
75-55-8	1,2-Propylenimine (2-Methyl aziridine)	N/A	N/A	No	No commercial lab available to test for compound. Associated with two industrial user SIC codes (AMRI, ABB). AMRI stated that compound is known to be absent from their chemical inventory. ABB stated that it is suspected to be absent.
100-42-5	Styrene	8260B	Grab	No	Not detected in influent sampling
96-09-3	Styrene oxide	N/A	N/A	No	No commercial lab available to test for compound. Associated with one industrial user SIC code (Formulab). Formulab stated that compound is known to be absent from their chemical inventory.
79-34-5	1,1,2,2-Tetrachloroethane	8260B	Grab	No	Not detected in influent sampling
127-18-4	Tetrachloroethylene (Perchloroethylene)	8260B	Grab	Yes	Detected 9/10/19, 11/25/19 6pm
108-88-3	Toluene	8260B	Grab	Yes	Detected 9/10/19, 11/25/19 12pm 6pm 11:59 pm and 11/26/19 at 6am
95-53-4	o-Toluidine	8270C	Composite	No	Not detected in influent sampling
120-82-1	1,2,4-Trichlorobenzene	8260B	Grab	No	Not detected in influent sampling
71-55-6	1,1,1-Trichloroethane (Methyl chloroform)	8260B	Grab	No	Not detected in influent sampling
79-00-5	1,1,2-Trichloroethane (Vinyl trichloride)	8260B	Grab	No	Not detected in influent sampling
79-01-6	Trichloroethylene	8260B	Grab	No	Not detected in influent sampling
95-95-4	2,4,5-Trichlorophenol	8270C	Composite	No	Not detected in influent sampling
88-06-2	2,4,6-Trichlorophenol	8270C	Composite	No	Not detected in influent sampling
121-44-8	Triethylamine	8270C	Composite	No	Not detected in influent sampling
540-84-1	2,2,4-Trimethylpentane	8260B	Grab	No	Not detected in influent sampling. *AKA* Isooctane
108-05-4	Vinyl acetate	8260B	Grab	No	Not detected in influent sampling

TABLE 1

HAP Compounds listed in Table 1 to Subpart DD of 40 CFR, Part 63 and screening for whether Compound is Reasonably Expected to be Present

Determination of whether a HAP compound is reasonably expected to be present is based on data from September 2019 and November 2019 sampling even
See data presented in Attachment D to this Plan

Chemical Abstract System (CAS) #	Chemical name	EPA test Method	Sample Type	Reasonably anticipated to be present in influent?	Notes
593-60-2	Vinyl bromide	N/A	N/A	No	No commercial lab available to test for compound. Associated with one industrial user SIC code (ABB). ABB stated that compound is suspected to be absent from their chemical inventory.
75-01-4	Vinyl chloride	8260B	Grab	No	Not detected in influent sampling
75-35-4	Vinylidene chloride (1,1-Dichloroethylene)	N/A	N/A	No	Not detected in influent sampling, also known as 1,1-Dichloroethene
1330-20-7	Xylenes (isomers and mixture)	8260B	Grab	Yes	Detected 11/25/19 6pm and 11/26/19 at 6am
95-47-6	o-Xylenes	8260B	Grab	No	Not detected in influent sampling
108-38-3	m-Xylenes	8260B	Grab	Yes	Detected 9/10/19, 11/25/19 6pm and 11/26/19 at 6am
106-42-3	p-Xylenes	8260B	Grab	Yes	Detected 9/10/19, 11/25/19 6pm and 11/26/19 at 6am
50-0-0	Formaldehyde	8315A	Composite	Yes	Not in Table 1 Subpart DD but detected 9/10/19

ATTACHMENT D

Results from September 2019 and November 2019 Sampling Events for HAP Compounds

Albuquerque Bernalillo County Water Utility Authority - Southside Water Reclamation Plant
Initial matrix of HAP compound concentrations to use for inputs to TOXCHEM model based on data from Spetember 2019 and November 2019 sampling events
All compounds as detected in samples collected at JB22

	Method	CAS #	Parameter	Units	Largest value detected; all samples	S-20190910-099: September 10, 2019 12:30PM	S-20191125-067: November 25, 2019 at 12:00PM	S-20191125-106: November 25, 2019 at 6:00PM	S-20191125-105: November 25, 2019 at 11:59PM	S-20191125-107: November 26, 2019 at 6:00AM
Analytes detected through collection of grab samples	E8260B	78-87-5	1,2-Dichloropropane	ug/L	0.41	0.41	ND	ND	ND	ND
	E8260B	106-46-7	1,4-Dichlorobenzene	ug/L	1.3	1.3	0.95	0.58	0.94	0.72
	E8260B	78-93-3	2-Butanone	ug/L	22	5.2	9.9	22	10	14
	E8260B	75-15-0	Carbon disulfide	ug/L	1.1	ND	0.59	0.92	1.1	0.85
	E8260B	67-66-3	Chloroform	ug/L	2.7	1.7	1.6	2.7	2.1	2.2
	E8260B	75-09-2	Methylene Chloride	ug/L	1.9	1.9	ND	ND	ND	ND
	E8260B	108-38-3	mp-Xylenes	ug/L	0.49	0.15	ND	0.26	ND	0.49
	E8260B	123-38-6	Propionaldehyde	ug/L	160	160	ND	ND	ND	ND
	E8260B	127-18-4	Tetrachloroethene (PCE)	ug/L	0.84	0.25	ND	0.84	ND	ND
	E8260B	108-88-3	Toluene	ug/L	2.9	0.88	0.78	2.9	1.0	1.7
	E8260B	1330-20-7	Xylenes, Total	ug/L	0.49	ND	ND	0.26	ND	0.49
Composite sampling	8315A	75-07-0	Acetaldehyde	ug/L	21					
	8315A	50-00-0	Formaldehyde	ug/L	27					
Average hourly Q at sample time, MGD as reported in Hach WIMS Report "Effluent Q-HOURLY"						**52.3**	**47.5**	**56.3**	**55.7**	**36.7**

🟧 = Result was less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

Acetaldehyde and Formaldehyde were detected in a 24-hour flow-weighted composite sample collected on 9/10-11/19

No other compounds were detected in the composite sample collected at this time when analyzed using Methods 8015B, 8315A, 8081B, or 8270C

APPENDIX G

Odor Control Strategy at the Southside Water Reclamation Plant

Odor Control Strategy at the Southside Water Reclamation Plant

Introduction

The Albuquerque Bernalillo County Water Utility Authority ("Water Authority") has a pro-active strategy for controlling odors associated with wastewater treatment at its Southside Water Reclamation Plant (SWRP). These odors are attributed to hydrogen sulfide (H_2S), various mercaptans, and related organic sulfide compounds in the raw wastewater. By far, the most significant of these compounds is H_2S since it has such a low odor detection threshold.

The Water Authority's odor control strategy includes two main elements designed to reduce release of these compounds to the environment which are:

- Aqueous phase controls to change the equilibrium concentration of H_2S in raw wastewater by chemical addition. This control method reduces the potential for H_2S off-gassing from the wastewater. This is accomplished by adding:
    - iron salts to precipitate dissolved sulfides
    - nitrate salts that prevent microbial conversion of raw wastewater sulfates to sulfides
    - hydrogen peroxide to regenerate the iron and make it available to react with additional sulfides
    - calcium hydroxide and magnesium hydroxide to raise the wastewater pH which lowers the equilibrium concentration of dissolved H_2S that could otherwise off-gas and be released to the environment

  The Water Authority has an extensive and sophisticated chemical addition program in place to control aqueous phase H_2S concentrations in its collection system and in raw wastewater at the SWRP. It should be noted that the program to reduce odors in the collection system reduces the magnitude of odors that then have to be managed at SWRP.

- Vapor phase controls consisting of facilities to collect moist, odorous air pulled from strategic locations in the collection system or from wastewater treatment process at SWRP and remove odor-causing compounds from the airstreams to prevent their release to the environment. At the SWRP, these locations for odorous air collection include the North Preliminary Treatment Facility at which grit and screenings are removed from raw wastewater, the primary clarification process, and miscellaneous facilities including covered channels and flow control structures that convey raw wastewater to / from these steps in the treatment process. The combination of covers on these facilities and adjacent air handling systems that maintain a vacuum in the headspace above free water surfaces are effective in trapping fugitive emissions of odorous air that can then be routed to a treatment system.

The Water Authority currently uses two different treatment technologies to remove H_2S and other odor-causing compounds from moist air streams which are activated carbon absorption and biological oxidation. The text which follows explains design criteria used to size these systems and the operation and maintenance programs in place used to keep the systems working efficiently. Figures 1A and 1B at the end of this section shows where these systems have been deployed at the SWRP.

Activated Carbon Absorption

This vapor phase control method uses beds of activated carbon specifically designed to efficiently absorb H_2S and sulfide odors from the air stream. Carbon beds are sized based on expected H_2S concentrations in the air stream and designed to provide sufficient absorptive capacity so that a bed will last for a specified period e.g., 9 months before a carbon bed needs changing. The activated carbon currently in use can remove as much as 99.9% of influent H_2S[1]. The complete carbon absorption system includes a blower that pushes odorous air through the carbon bed for treatment before the airstream is released to the environment and miscellaneous instruments to measure backpressure on the blower which is an indication of carbon bed fouling.

Table 1 at the end of this section lists specific tasks Water Authority staff perform to keep its activated carbon absorption systems at SWRP in good working order. Of particular note in this list of tasks are:

- Periodic measurements of air flow through the carbon bed
- Measurements of H_2S levels at different depths in the bed to predict when carbon needs replacement
- Removal and replacement of carbon media once its absorptive capacity is exhausted

The Water Authority uses a third party testing service to monitor the actual H_2S removal efficiency achieved by its activated carbon absorption systems. These tests are nominally performed every three months. A copy of the testing agency's last report for work performed in May 2020 is provided at the end of this section. The agency's test report shows that an H_2S removal efficiency of at least 99% is being obtained by the Water Authority's activated carbon absorption systems.

Biological Oxidation

This vapor phase odor control method uses microorganisms to biologically oxidize H_2S and organic sulfides. The microorganisms develop on a media bed and are self-sustaining given a sufficient supply of H_2S, oxygen, and moisture. This method of odor control has been adopted by wastewater utilities nationwide since the late 1980's who were looking for a reliable, cost-effective alternative to odor control by chemical oxidation scrubbers or activated carbon absorption. Biological oxidation is effective in applications where there is a steady, uninterruptable supply of odorous compounds for the microorganisms to metabolize.

As biological oxidation technology has evolved and been refined, various criteria have been established on which their design is based. Key criteria that impact odor removal using this technology are:

- media bed contact time
- media bed porosity
- efficiency of moisture distribution over the media surface
- evenness of air distribution over the media bed area

Media beds for biological oxidation systems have evolved over the past 30 years, beginning with simple bark / compost beds and transitioning to inorganic granular sand / gravel beds. The latter media bed

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[1] Roy Clackum, Cabot Carbon Corporation, Personal Communication, February 4, 2020

type provides more uniformity compared to bark / compost media beds which, with proper installation and media selection, promote even distribution of odorous air over the entire media bed area and good removal of H_2S for up to 20 years without needing media replacement. One vendor of such systems, the Bohn Biofilter Corporation, has developed a proprietary blend of fine gravel, sand, and soil for use in media beds.

The Water Authority has deployed biological oxidation using Bohn Biofilter Corporation's proprietary media at four SWRP locations including 2 different locations at its North Pretreatment Facility, one that serves Primary Clarifiers 5-8, and a fourth at its Solids Dewatering Facility (SDF). The first three locations handle H_2S and organic sulfide compounds in the airstreams being treated. The airstream treated by the SDF Bohn biofilter contains little H_2S (based on 3rd party testing) but rather ammonia-based odors originating from anaerobically digested sludge. Table 2 at the end of this section lists design criteria used to construct these four biofilter systems. With proper installation and maintenance, these systems are able to remove 99% of influent H_2S.[2]

Table 3 at the end of this section lists specific tasks Water Authority staff undertake to keep its four (4) Bohn biofilter systems at SWRP in good working order. Of particular note in this list of tasks are:

- Periodic measurements of air flow discharged into each media bed zone
- Measurements of H_2S levels at the exposed media surface
- Maintenance of inlet air filters for grease and misting removal to control media fouling
- Adjustment of media irrigation cycle times in response to seasonal temperature changes

The Water Authority uses the same third party testing service that monitors activated carbon absorber performance to monitor the actual H_2S removal efficiency achieved by its Bohn biofilters. The agency's test report for May 2020 shows that an H_2S removal efficiency of at least 99% or better is being obtained by the Water Authority's Bohn biofilters that process H_2S and organic sulfide odors at the North Preliminary Treatment Facility and at Primary Clarifiers 5-8.

Summary

The Water Authority has a robust and extensive program for odor control at the SWRP and in its upstream collection system that combines both aqueous phase and vapor phase controls. At the SWRP, both activated carbon absorption and biological oxidation (Bohn biofilter) treatment systems have been deployed to remove H_2S and other organic sulfides and eliminate release of these compounds to the environment and the odors attributed to them. Third party testing of SWRP vapor-phase odor control systems shows that they routinely remove > 99% of H_2S. This same testing program also demonstrates that H_2S concentrations measured at the SWRP property line do not exceed 10 ppbv in accordance with the New Mexico Ambient Air Quality Standard for H_2S.

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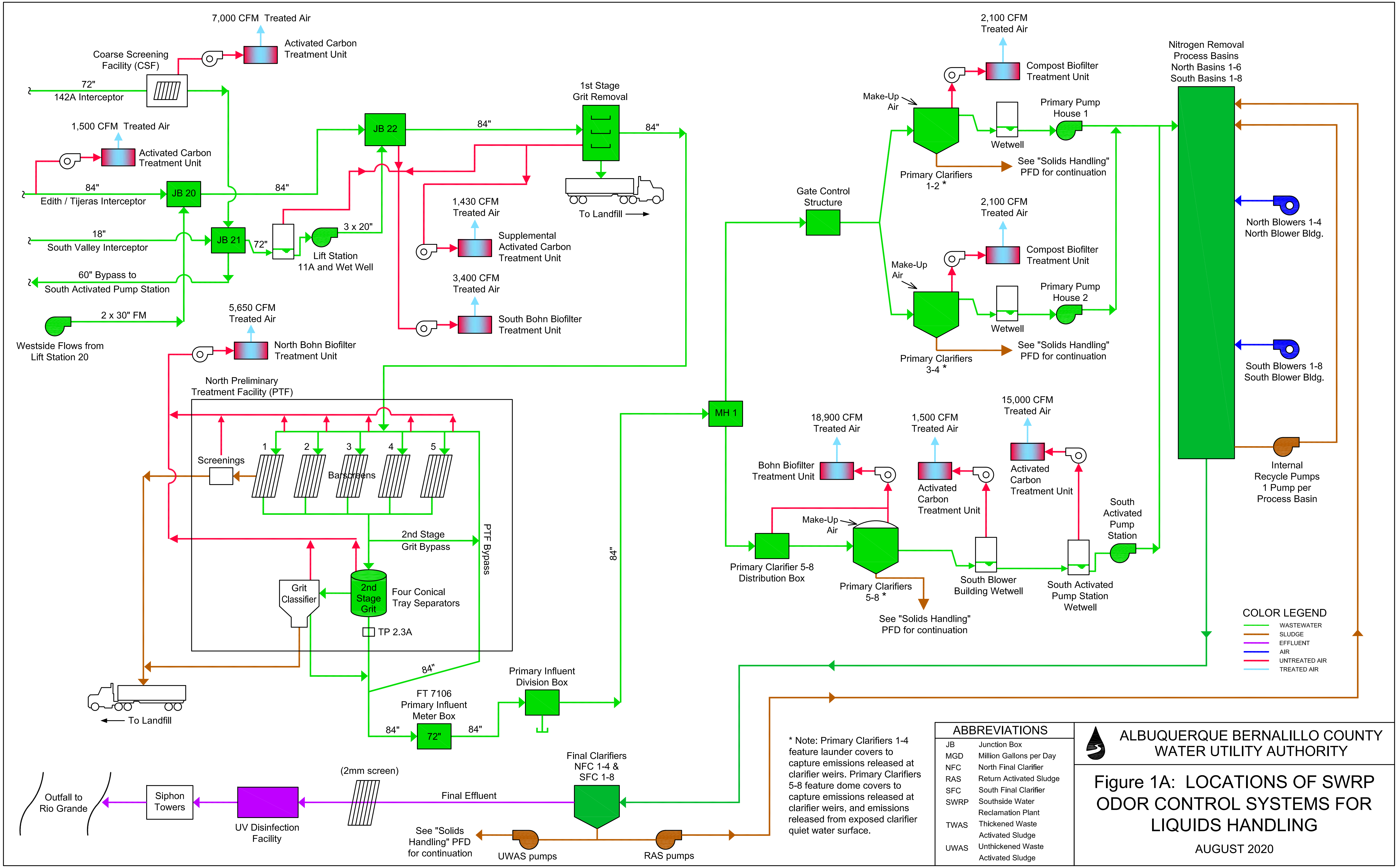
[2] Bohn Biofilter Corporation, "Biofilter Odor Control System Operating & Maintenance Manual", page 14



* Note: Primary Clarifiers 1-4 feature launder covers to capture emissions released at clarifier weirs. Primary Clarifiers 5-8 feature dome covers to capture emissions released at clarifier weirs, and emissions released from exposed clarifier quiet water surface.

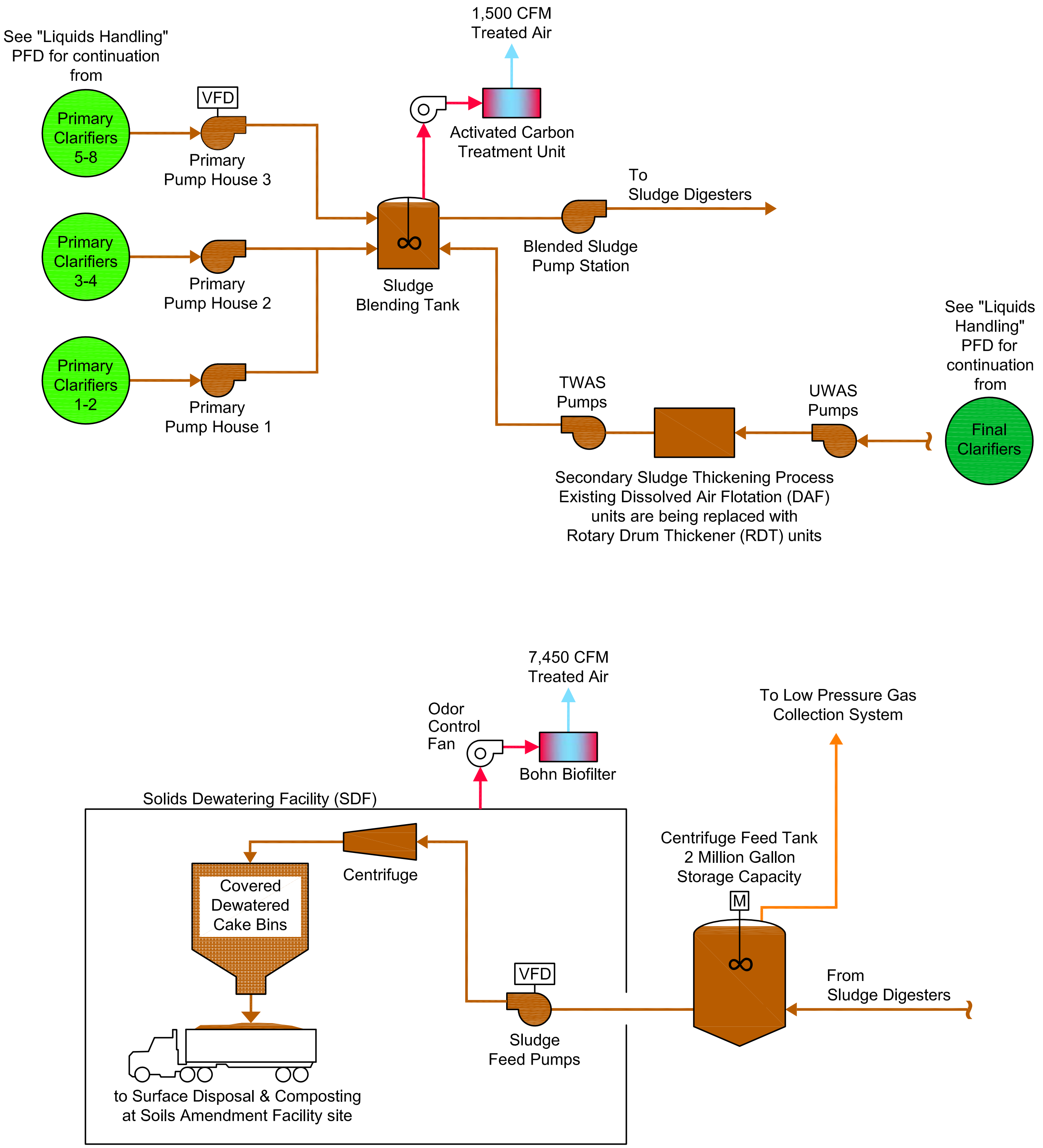
ABBREVIATIONS

JB	Junction Box
MGD	Million Gallons per Day
NFC	North Final Clarifier
RAS	Return Activated Sludge
SFC	South Final Clarifier
SWRP	Southside Water Reclamation Plant
TWAS	Thickened Waste Activated Sludge
UWAS	Unthickened Waste Activated Sludge

ALBUQUERQUE BERNALILLO COUNTY
WATER UTILITY AUTHORITY

Figure 1A: LOCATIONS OF SWRP ODOR CONTROL SYSTEMS FOR LIQUIDS HANDLING

AUGUST 2020



ALBUQUERQUE BERNALILLO COUNTY WATER UTILITY AUTHORITY

Figure 1B: LOCATIONS OF SWRP ODOR CONTROL SYSTEMS FOR SOLIDS HANDLING

AUGUST 2020

ABBREVIATIONS

MW	Megawatt
MMBTU/hr	One Million BTU per hour
RAS	Return Activated Sludge
SCF/hr	Standard Cubic Feet per hour
SWRP	Southside Water Reclamation Plant
TWAS	Thickened Waste Activated Sludge
UWAS	Unthickened Waste Activated Sludge
VFD	Variable Frequency Drive

COLOR LEGEND

—	SLUDGE
—	GAS
—	UNTREATED AIR
—	TREATED AIR

Table 1 - SWRP Carbon Filter Maintenance Schedule Responsibility Matrix

Activity	**Maximo PM**		**Responsibility**		**Rounds?**		**Frequency**				
	Yes	**No**	**Collection Section**	**SWRP**	**Yes**	**No**	**Each Shift**	**2/wk**	**Weekly**	**Monthly**	**Quarterly**
Measure air flow from each fan through carbon filter	X		X			X				X	
Check & clean filters. Check demisters.	X		X			X				X	
Measure H2S through filter to anticipate breakthrough		X	X			X				X	
Create W.O. for bigger issues		X	Whoever sees first. Or at least alert others								
Carbon replacement		X	X			X	As indicated by H2S measurements				
Fix bigger issues with W.O.		X		X							
Verify fan running/Check magnehelic		X		X	X		X				
Be aware of fan being off and resetting		X	Whoever sees first.								
Fan PM	X			X							X

	Comments:
1	The carbon filters at the SWRP are a shared system between the Collection Section and the SWRP.
2	Both groups are impacted if the carbon filters are underperforming.
3	Both groups have opportunities to catch problems and to assure that issues are addressed quickly and effectively.
4	Both groups should act on these opportunities.
5	For example, if power is lost and the fan needs to be reset, this should be caught and addressed by the next operator of either group, that has rounds in the area.
6	Similarly for other fan type losses of service, etc. Immediately fix or at least alert your supervisor.
7	Collection Section is responsible for assuring the creation of PMs.
8	Collection Section is responsible for ordering & coordinating the replacement of carbon media.

Table 2 - Summary of Project Design Specifications for Bohn Bio-filters In Use at Southside Water Reclamation Plant

PCs 5-8 (Emission Unit #s 7-10) Bohn Biofilter Design Criteria

Criteria	value	units
Air Flow Rate	18,920	cfm
Empty Bed Residence Time	2	minutes
Depth of Soil Media	5	ft
Inside Dimension	87 x 87	ft x ft
Outside Dimension	103.5 x 103.5	ft x ft
Side Slopes	4:1	ratio
Maximum Hydrogen Sulfide Concentration Inlet	600	ppmv
Maximum Ammonia Concentration Inlet	<2	ppmv
Hydrogen Sulfide Removal Efficiency	99	%
Site Altitude	4,929	ft
Maximum Air Inlet Temperature	130	deg F
Humidification Water Flow for Each Humidifier	0.35	gpm
Sprinkler Irrigation Water Flow	9	gpm
Moist Biofilter Media	Constant	
Maximum allowable pressure drop through media	2	in of WC per ft depth

This biofilter is designed to treat 18,920 cfm of continously ventilated air and eliminate odorous compounds including: hydrogen sulfide, mercaptans, reduced sulfur compounds, and volatile organic compounds typical of this application

Design Criteria for Solids Dewatering Facility (SDF) Bohn Biofilter (Emission Unit #49)

Criteria	value	units
Air Flow Rate	8,700	cfm
Empty Bed Residence Time	1.2	minutes
Depth of Soil Media	4	ft
Inside Dimension	58 x 45	ft x ft
Outside Dimension	74.5 x 61.5	ft x ft
Side Slopes	1:1	ratio
Maximum Hydrogen Sulfide Concentration Inlet	200	ppmv
Maximum Ammonia Concentration Inlet	<2	ppmv
Hydrogen Sulfide Removal Efficiency	99	%
Site Altitude	4,950	ft
Maximum influent air temperature	130	deg F
Humidification Water Flow for Each Humidifier	0.33	gpm
Sprinkler Irrigation Water Flow	9	gpm
Moist Biofilter Media	Constant	
Maximum allowable pressure drop through media	2	in of WC per ft depth

This biofilter has been designed to treat 8,700 cfm of continously ventilated air and eliminate odorous compounds including: hydrogen sulfide, mercaptans, reduced sulfur compounds, ammonia, and volatile organic compounds typical of this application

Table 2 - Summary of Project Design Specifications for Bohn Bio-filters In Use at Southside Water Reclamation Plant

North Preliminary Treatment Facility (Emission Unit #2) Bohn Biofilter Design Criteria	**North Bohn**	**South Bohn**	
Criteria	**Value**	**Value**	**Units**
Air Flow Rate	5,650	3,400	cfm
Minimum Empty Bed Residence Time	72	72	seconds
Depth of Soil Media	5	5	ft
Inside Dimension	56 x 32	44 x 23	ft x ft
Outside Dimension	73 x 49	61 x 40	ft x ft
Side Slopes	1:1	1:1	ratio
Maximum Hydrogen Sulfide Concentration Inlet	200	200	ppmv
Organic reduced sulfur compounds as analyzed by ASTM Method D-5504	2	-	ppmv
Hydrogen Sulfide Removal Efficiency*	99	99	%
Total non H2S reduced sulfur compounds and amines removal efficiency**	99	99	%
Outlet Odor Concentration	< 500	< 500	D/T (dilutions to threshold)
Site Altitude	4,930	4,930	ft
Maximum Air Inlet Temperature	130	130	deg F
Humidification Water Flow	0.28	0.13	gpm
Moist Biofilter Media	Constant	Constant	
Maximum allowable pressure drop through media	2	2	inches of WC per ft depth
*If inlet concentration is less than 10 ppm, the outlet concentration shall not exceed 0.1 ppmv			

The South Bohn Biofilter treates air collected from the North Preliminary Treatment Facility's (PTF) 1st stage Grit Removal process and air collected from adjacent yard piping structures whereas the North Bohn Biofilter treats air collected from the Screen Room, 2nd Stage Grit Removal, and Grit / Screenings Handling Room of the North PTF.

Table 3 - Bohn Filter Maintenance Schedule Responsibility Matrix

Activity	Maximo PM		Responsibility		Rounds?		Frequency				
	Yes	No	Collection Section	SWRP	Yes	No	Each Shift	2/wk	Weekly	Monthly	Quarterly
Pull Weeds		X	GSW						X		
Spray weeds on Bohn beds		X	X						X		
Measure air flow from each fan and to each zone	X		X			X				X	
Check & clean filters. Check misters.	X		X			X				X	
Check H2S treatment each zone	X		X			X					X
Check: sprinklers working & providing good spray		X	X		X			X			
Fix broken sprinkler heads		X	X		Typically						
Create W.O. for bigger issues		X	Whoever sees first. Or at least alert others.								
Fix bigger issues with W.O.		X		X							
Verify fan running / Check magnehelic		X		X	X		X				
Be aware of fan being off & resetting		X	Whoever sees first.								
Fan PM	X			X							X

	Comments:
1	The Bohn Filters at the SWRP are a shared system between the Collection Section and the SWRP.
2	Both groups are impacted if the Bohn filters are underperforming.
3	Both groups have opportunities to catch problems and to assure that issues are addressed quickly and effectively.
4	Both groups should act on these opportunities.
5	For example, if power is lost and the fan needs to be reset, this should be caught and addressed by the next operator of either group, that has rounds in the area.
6	Similarly for other fan type losses of service, broken sprinkler heads, etc. Immediately fix or at least alert your supervisor.
7	Collection Section is responsible for creating PMs.

LAMBTECH, INC.
Odor and Hydrogen Sulfide Monitoring Specialists

SOUTHSIDE WASTEWATER RECLAMATION FACILITY

2nd QUARTER 2020 REPORT

AIRBORNE HYDROGEN SULFIDE AMBIENT MONITORING AND ODOR REMOVAL SYSTEMS EVALUATION

ALBUQUERQUE-BERNALILLO COUNTY WATER UTILITY AUTHORITY
ALBUQUERQUE, NEW MEXICO

Prepared by:
LambTech, Inc.

Prepared for:
Albuquerque-Bernalillo County Water Utility Authority

May 14, 2020

Introduction

At the request of the Albuquerque-Bernalillo County Water Utility Authority, *LambTech, Inc.* personnel conducted airborne hydrogen sulfide (H_2S) testing at the Southside Wastewater Reclamation Facility located in Albuquerque, New Mexico. Sampling occurred at the facility fenceline and at the various in-ground organic and inorganic media biofilters and carbon adsorbers. All *LambTech, Inc.* on-site sampling occurred from May 11, 2020 to May 14, 2020.

Executive Summary

- All of the odor control systems had low to moderate inlet concentrations, with the exception of the North PTF South *Bohn* Biofilter which had inlet concentrations with a peak of 100 PPM and an average of 35 PPM, and the North PTF Influent Carbon Adsorber which had inlet concentrations with a peak of 122 PPM and an average of 16 PPM. All of the odor control systems recorded average outlet concentrations that were less than 0.100 PPM, and almost all odor control systems recorded an average outlet concentration of 0.000 PPM. All odor control systems exhibited removal rates of >99.99% with the exception of the Solids Handling Facility *Bohn* Biofilter, which averaged removal rates of 72.00%. However, the Solids Handling Facility inlet concentrations were very low and averaged 0.02 PPM, and removal rates below 99.00% are to be expected with inlet loading rates below 1.0 PPM. No other issues were witnessed with any of the odor control systems during the evaluation.

- All fenceline readings were below the AQMD fenceline standard of 0.010 PPM.

Results

Wastewater Reclamation Facility Ambient Analysis

Ambient H_2S concentrations observed at the wastewater treatment facility averaged 0.0028 PPM (2.8 PPB). Individual concentrations were low and ranged between 0.002 PPM and 0.006 PPM. The average, maximum and minimum H_2S concentrations for each segment of the facility are listed in Table 1 (below). Figure 1 (page 5) depicts H_2S concentrations in relation to time and temperature. Figure 2 (page 6) depicts temperature and wind direction in relation to a 2010 aerial photograph of the Albuquerque Southside Wastewater Treatment Facility.

Table 1. Wastewater Treatment Facility Ambient Hydrogen Sulfide Concentrations

Facility Segment	North	West	South	East
Average	0.0024	0.0025	0.0030	0.0031
Maximum	0.004	0.004	0.006	0.006
Minimum	0.002	0.002	0.002	0.002

Wastewater Reclamation Facility Continuous Carbon Adsorber and Biofilter Monitoring Analysis

Standard 0-200 PPM, 0-1000 PPM *L2 Odalogs* or 0-1000 PPM *Acrulogs* were used as the inlet monitors and 0.00-2.01 PPM *Type IV Odalog* or 0.000 PPM - 2.001 PPM *Acrulog* outlet hydrogen sulfide monitors were used to test all of the odor control equipment at the facility. All inlet sampling was collected from the odor control equipment ductwork. The biofilter outlet concentrations were collected using a chimney apparatus, which was placed near the middle of the biofilter bed to eliminate ambient influences on the outlet due to wind and dilution.

See Table 2 (page 2) for details of the inlet and outlet H_2S monitoring and removal percentages on all of the operating odor control systems at the facility.

Table 2. Wastewater Reclamation Facility Odor Control Equipment - Carbon Adsorbers and Biofilters
Average Continuous Inlet and Outlet Hydrogen Sulfide Concentrations and Average Removal Rates

Biofilter	Inlet H2S (PPM)	Outlet H2S (PPM)	Percent Removal (%)
Primary Clarifier #1 & #2 Biofilter	Not in Service	Not in Service	Not in Service
Primary Clarifier #3 & #4 Biofilter	Not in Service	Not in Service	Not in Service
Primary Clarifier Biofilter #5 & #7	2	0.000	>99.99
Primary Clarifier Biofilter #6 & #8	16	0.004	>99.99
North PTF - North *Bohn* Biofilter	2	0.00	>99.99
North PTF - South *Bohn* Biofilter	35	0.00	>99.99
Solids Handling Facility *Bohn* Biofilter	0.02	0.0056	72.00
Sludge Blending Tank Carbon Adsorber	5.3	0.00	>99.99
Temporary Screw Lift Carbon Adsorber	0.5	0.00	>99.99
Temporary North PTF Influent Channel Carbon Adsorber	16	0.00	>99.99
Purafil Carbon Adsorber	Not in Service	Not in Service	Not in Service

Primary Clarifiers #1 & #2 - Pump House #1 Biofilter

Not in service.

Primary Clarifiers #3 & #4 – Pump House #2 Biofilter

Not in service.

Primary Clarifier #5 & #7 Biofilter

Inlet H_2S concentrations on the Primary Clarifier #5 and #7 *Bohn* biofilter were low and ranged from 1 PPM to 3 PPM and averaged 2 PPM. Outlet H_2S concentrations on the Primary Clarifier #5 and #7 *Bohn* biofilter ranged from 0.000 PPM to 0.003 PPM and averaged 0.000 PPM. This translates to an excellent removal rate of >99.99%. See pages 7 and 8 for graphical detail on the inlet and outlet H_2S monitoring of the Primary Clarifier #5 and #7 *Bohn* biofilter.

Primary Clarifier #6 & #8 Biofilter

Inlet H_2S concentrations on the Primary Clarifier #6 and #8 *Bohn* biofilter were moderate and ranged from 7 PPM to 27 PPM and averaged 16 PPM. Outlet H_2S concentrations on the Primary Clarifier #6 and #8 *Bohn* biofilter ranged from 0.000 PPM to 0.004 PPM and averaged 0.000 PPM. This translates to an excellent removal rate of >99.99%. See pages 9 and 10 for graphical detail on the inlet and outlet H_2S monitoring of the Primary Clarifier #6 and #8 *Bohn* biofilter.

North PTF Facility - North *Bohn* Biofilter

Inlet H_2S concentrations on the north PTF facility's North *Bohn* biofilter were low to moderate and ranged from 0 PPM to 14 PPM and averaged 2 PPM. Outlet H_2S concentrations on the North *Bohn* biofilter ranged from 0.00 PPM to 0.01 PPM and averaged 0.00 PPM. This translates to an excellent removal rate of >99.99%. See pages 11 and 12 for graphical detail on the inlet and outlet H_2S monitoring of the north PTF North *Bohn* biofilter.

North PTF Facility - South *Bohn* Biofilter

Inlet H_2S concentrations on the PTF facility's South *Bohn* biofilter were moderate to high and ranged from 2 PPM to 100 PPM and averaged 35 PPM. Outlet H_2S concentrations on the South *Bohn* biofilter ranged from 0.00 PPM to 0.01 PPM and averaged 0.00 PPM. This translates to an excellent removal rate of >99.99%. See pages 13 and 14 for graphical detail of the inlet and outlet H_2S monitoring of the north PTF South *Bohn* biofilter.

Solids Handling Facility *Bohn* Biofilter

Inlet H_2S concentrations at the Solids Handling Facility *Bohn* biofilter were very low and ranged from 0.000 PPM to 0.70 PPM and averaged 0.02 PPM. Outlet concentrations on the Solids Handling Facility *Bohn* biofilter ranged from 0.000 PPM to 0.065 PPM and averaged 0.0056 PPM. This translates to a poor removal rate of 72.00%. However, removal rates under 99.00% are to be expected with inlet concentrations well below 1.0 PPM. See pages 15 and 16 for graphical detail of the inlet and outlet H_2S monitoring of the Solids Handling Facility *Bohn* biofilter.

Sludge Blending Tank Carbon Adsorber

Inlet H_2S concentrations at the Sludge Blending Tank's carbon adsorber were moderately low and ranged from 0.1 PPM to 6.6 PPM and averaged 5.3 PPM. Outlet concentrations on the Sludge Blending Tank's carbon adsorber ranged from 0.00 PPM to 0.02 PPM and averaged 0.00 PPM. This translates to an excellent removal rate of >99.99%. See pages 17 and 18 for graphical detail of the inlet and outlet H_2S monitoring of the Sludge Blending Tank's carbon adsorber.

Temporary Screw Lift Influent Carbon Adsorber

Inlet H_2S concentrations at the Temporary Screw Lift carbon adsorber were low and ranged from 0 PPM to 1.3 PPM and averaged 0.5 PPM. Outlet concentrations on the Temporary Screw Lift carbon adsorber ranged from 0.00 PPM to 0.03 PPM and averaged 0.00 PPM. This translates to an excellent removal rate of >99.99%. See pages 19 and 20 for graphical detail of the inlet and outlet H_2S monitoring of the Temporary Screw Lift carbon adsorber H_2S concentrations.

Temporary North PTF Influent Carbon Adsorber

Inlet H_2S concentrations at the temporary North PTF influent carbon adsorber ranged from 0 PPM to 122 PPM and averaged 16 PPM. Outlet concentrations on the temporary North PTF influent carbon adsorber outlet ranged from 0.00 PPM to 0.01 PPM and averaged 0.00 PPM. This translates to an excellent removal rate of >99.99%. See pages 21 and 22 for graphical detail of the inlet and outlet H_2S monitoring of the temporary North PTF influent carbon adsorber.

Purafil Carbon Adsorber

Not in service.

Continuous Monitoring Summary

Inlet H_2S Concentrations

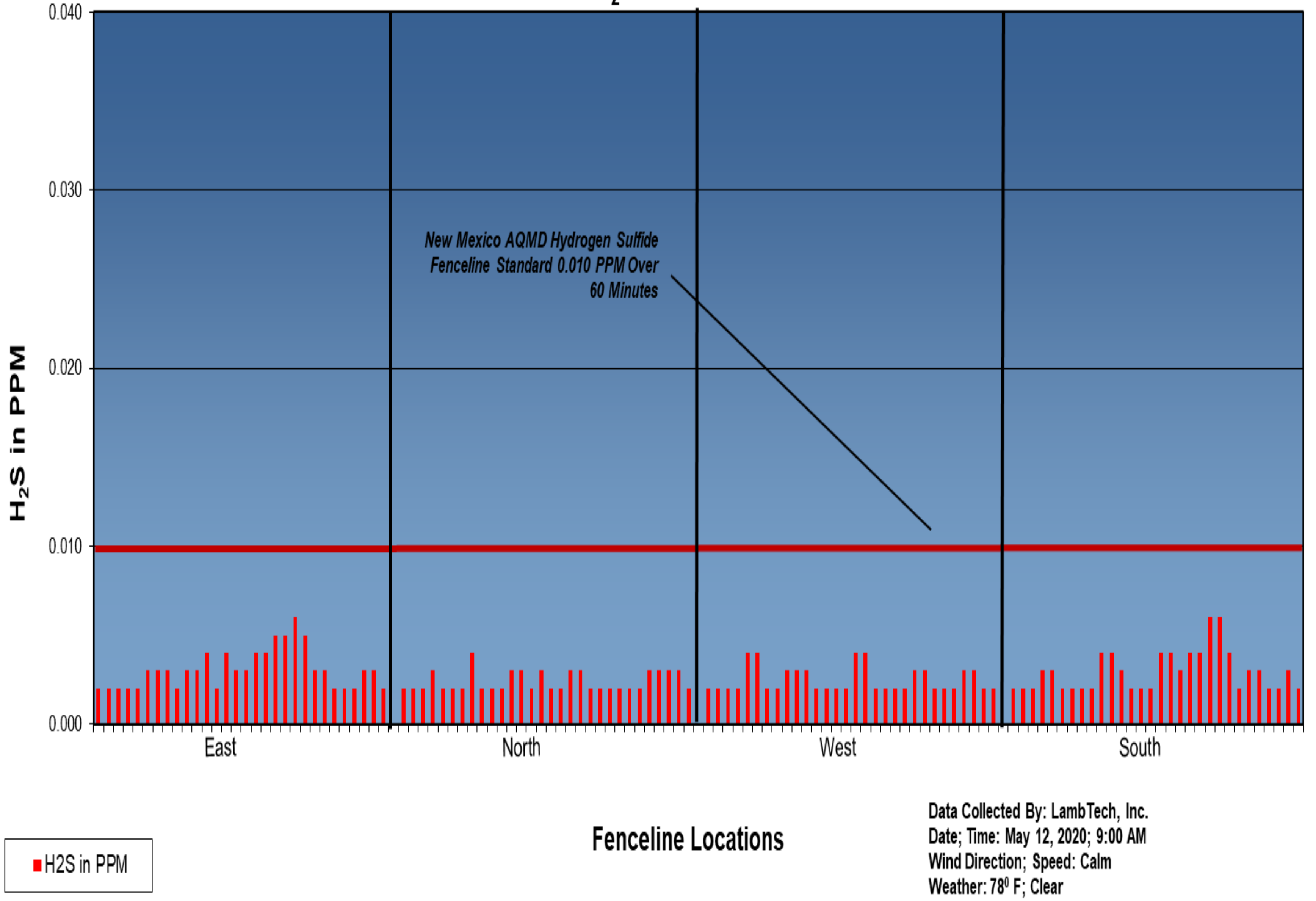
All of the odor control systems had low to moderate hydrogen sulfide inlet concentrations except for the North PTF South *Bohn* biofilter, which recorded a peak of 100 PPM, and the North PTF Influent carbon adsorber, which recorded a peak of 122 PPM. The Temporary Screw Lift carbon adsorber and the Solids Handling Facility biofilter had average inlet hydrogen sulfide concentrations that were under 1 PPM.

Outlet H_2S Concentrations & H_2S Removal Efficiencies

All of the odor control systems had very low outlet H_2S concentrations that averaged less than 0.100 PPM. All of the odor control systems had H_2S outlet concentrations averaging 0.000 PPM, with the exception of the Primary Clarifier #6 and #8 biofilter which averaged 0.004 PPM (4 PPB) and the Solids Handling Facility biofilter which averaged 0.0056 PPM (5.6 PPB).

All of the odor control equipment had excellent removal rates that were >99.99%, with the exception of the Solids Handling Facility *Bohn* biofilter. However, removal rates under 99.00% are typical when inlet loading concentrations are well below 1.0 PPM, and the Solids Handling Facility exhibited average inlet concentrations of 0.02 PPM. For details on H_2S concentrations please refer to the odor control systems' inlet and outlet hydrogen sulfide monitoring graphs (pages 7 through 22).

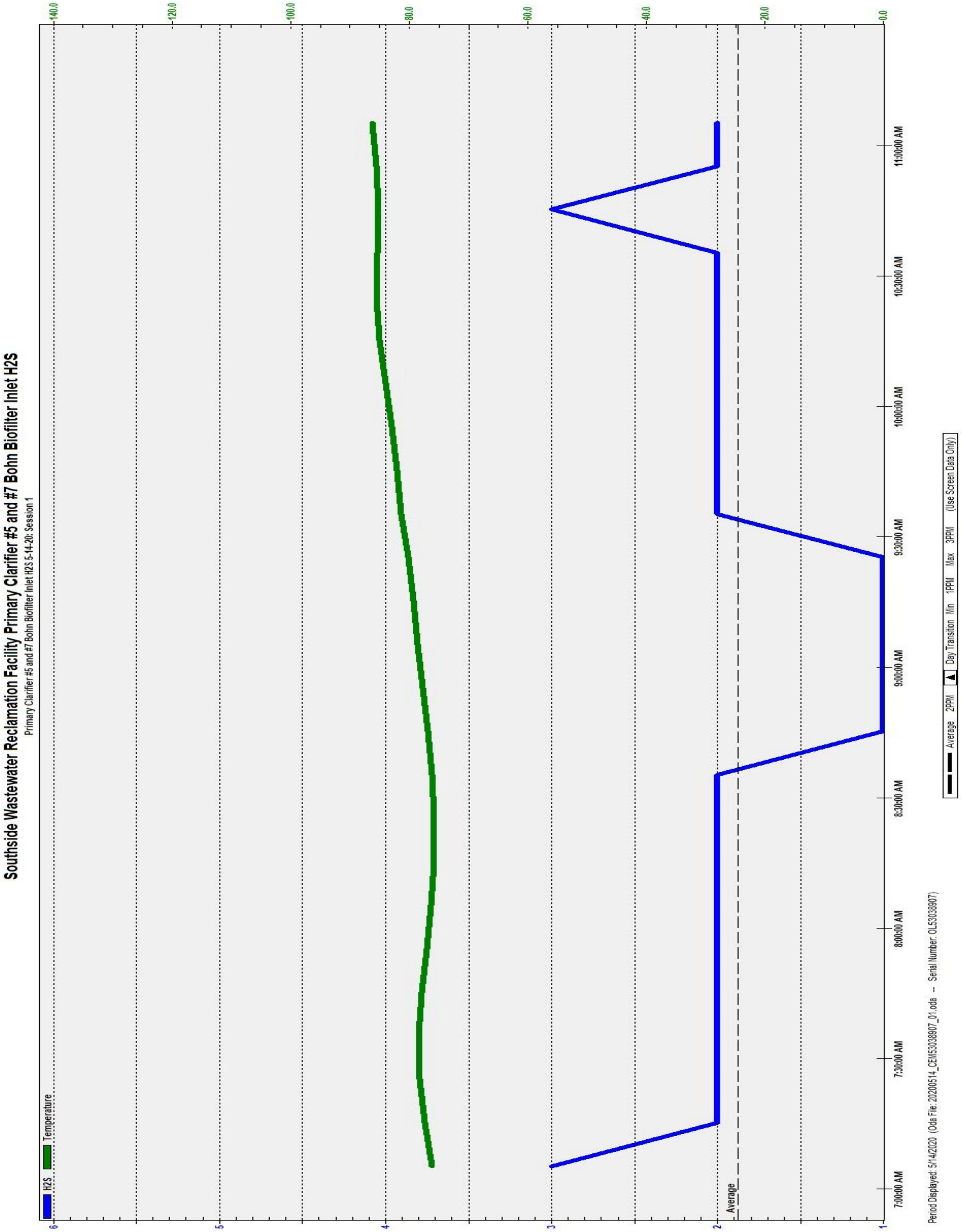
Figure 1. Southside Wastewater Reclamation Facility, Albuquerque, NM
Hydrogen Sulfide Fenceline Evaluation
PPM H_2S Versus Fenceline



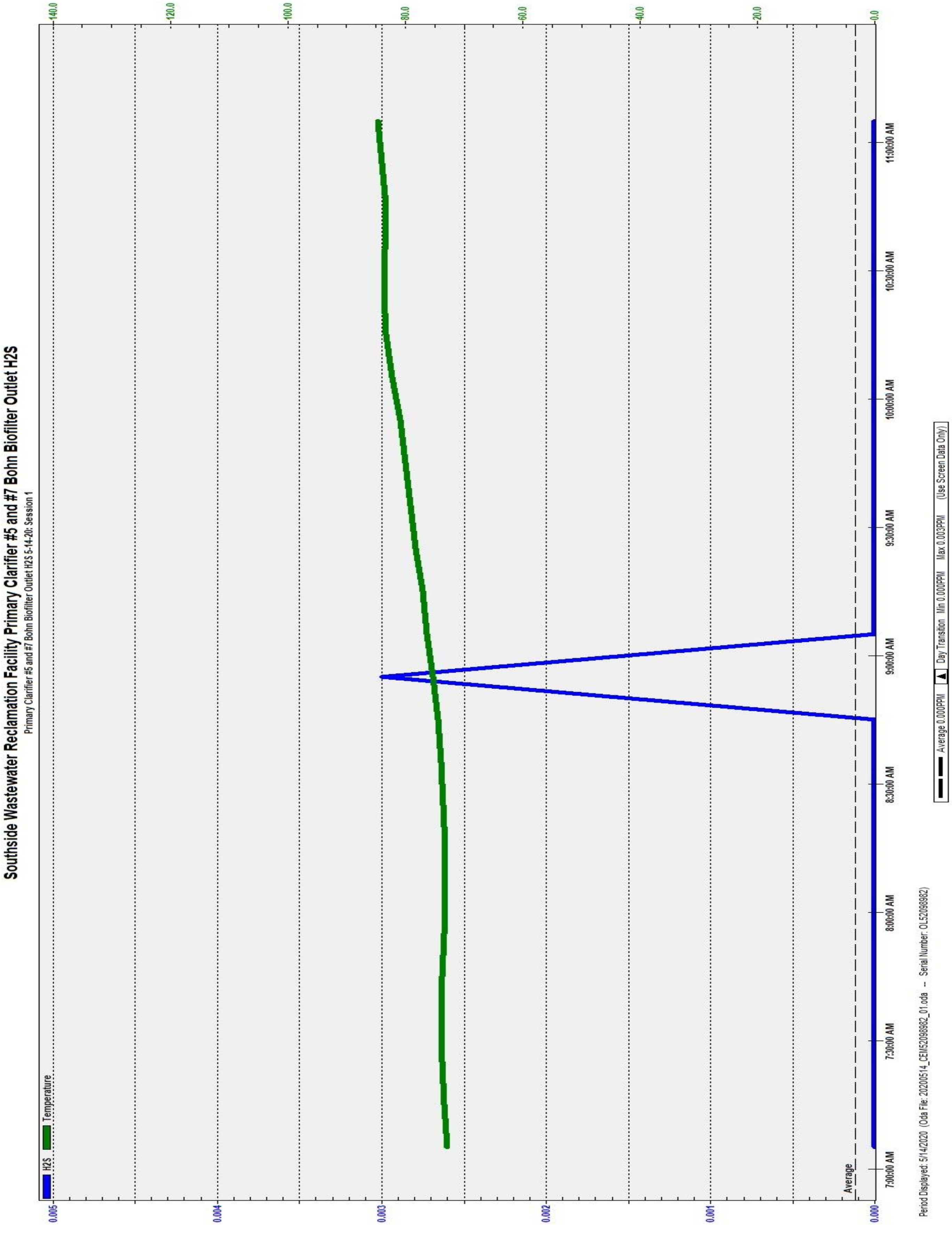
Data Collected By: LambTech, Inc.
Date; Time: May 12, 2020; 9:00 AM
Wind Direction; Speed: Calm
Weather: 78⁰ F; Clear

Figure 2. Aerial Photograph of the Southside Wastewater Reclamation Facility

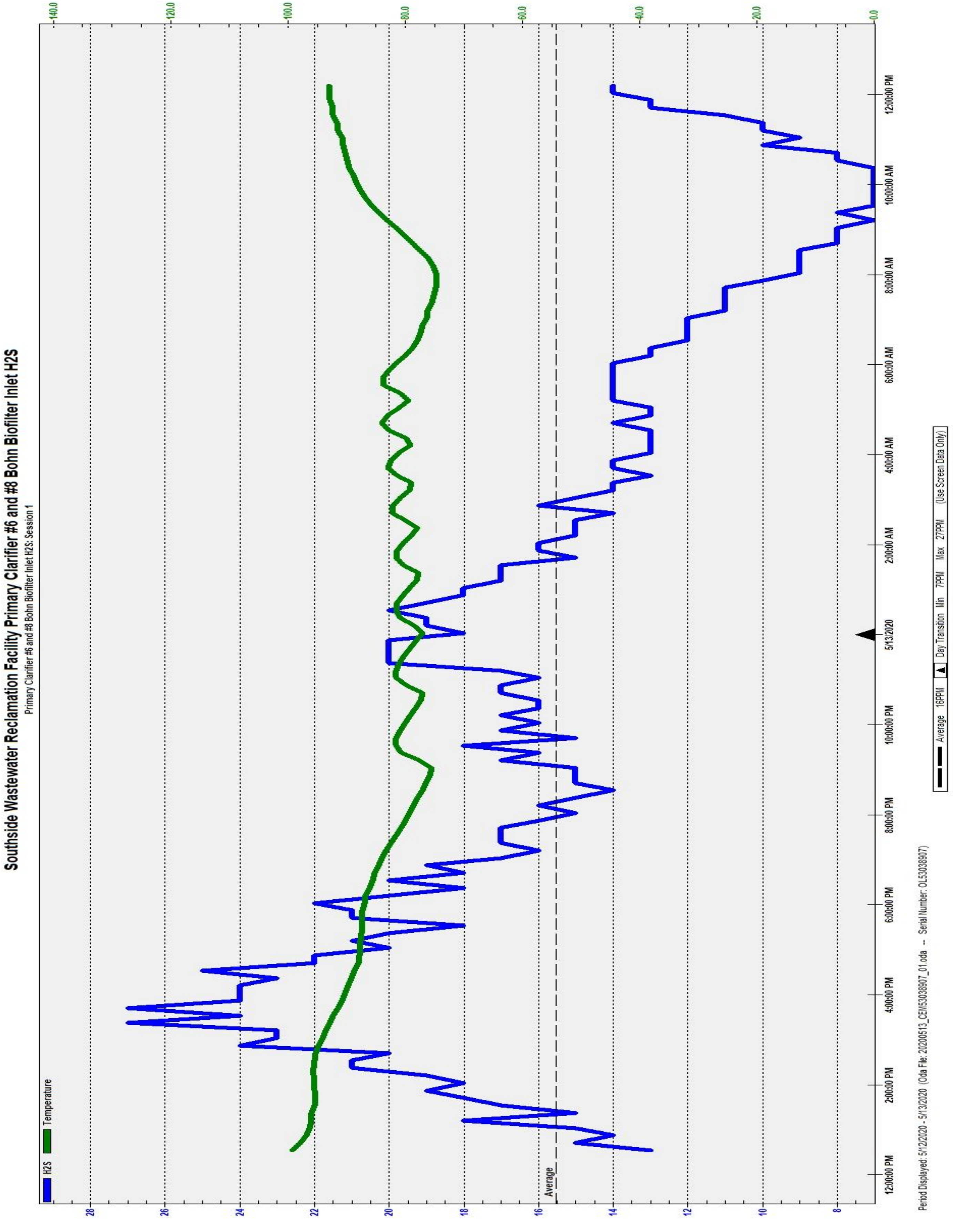
Primary Clarifiers #5 & #7 Biofilter Inlet



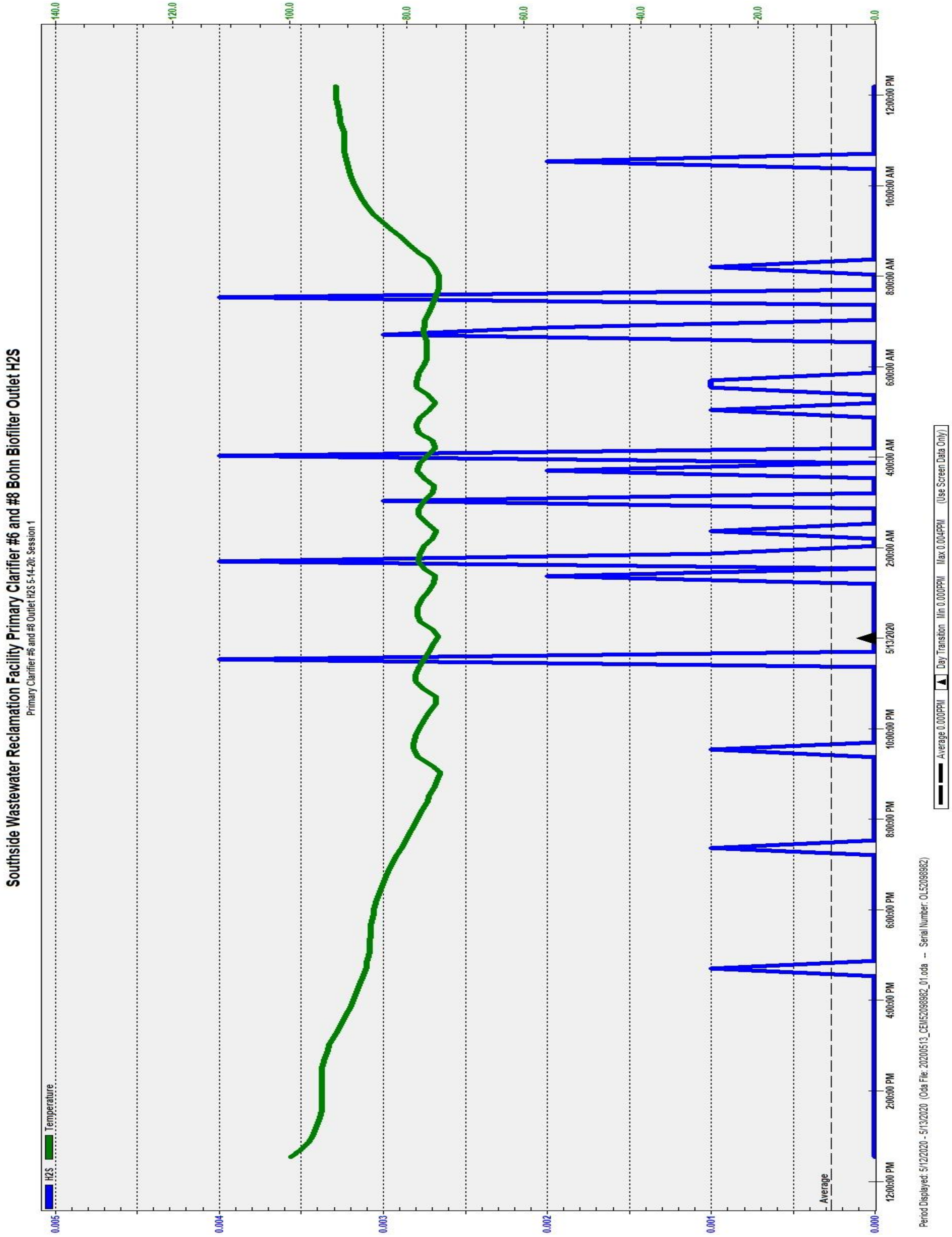
Primary Clarifiers #5 and #7 Biofilter Outlet



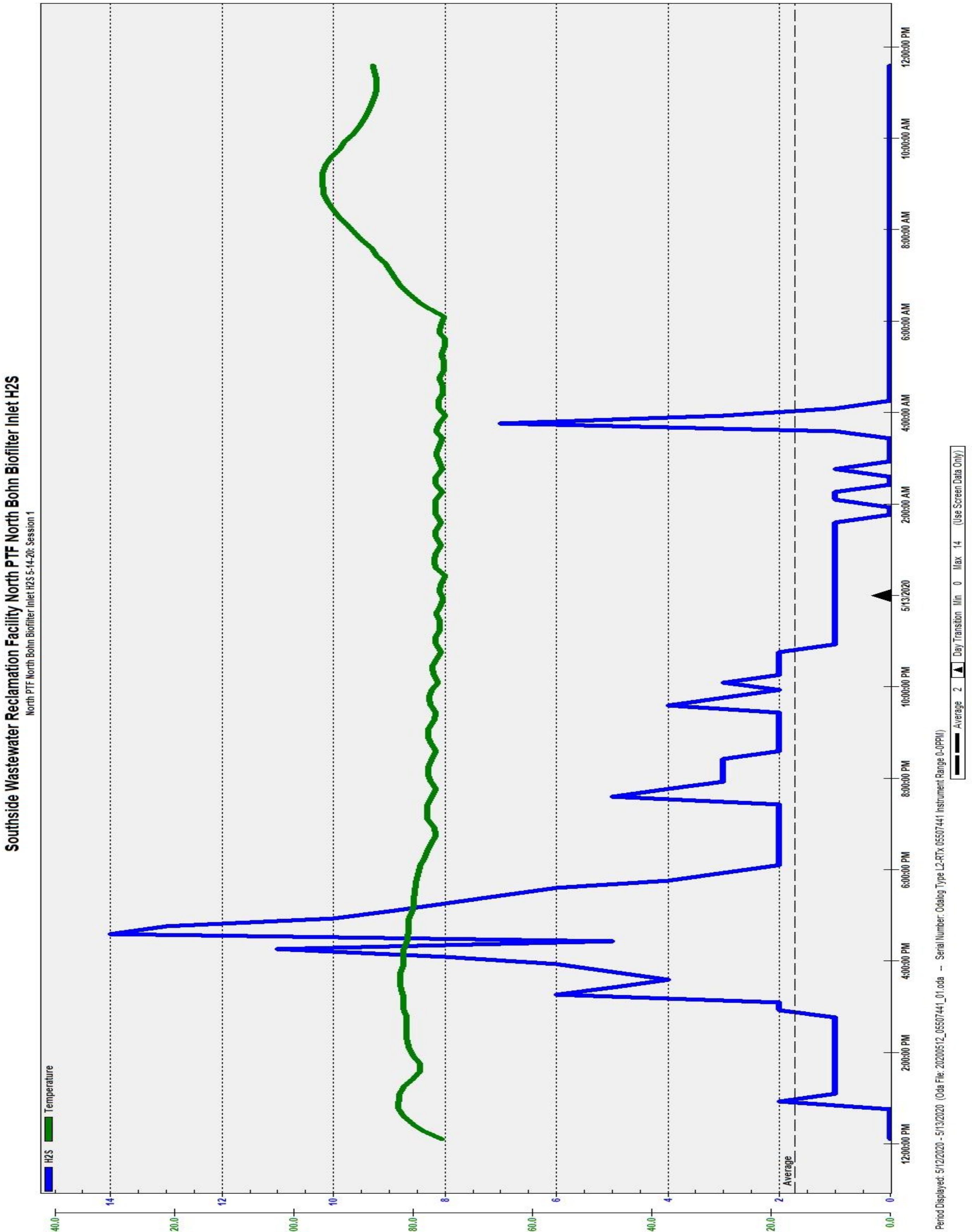
Primary Clarifiers #6 & #8 Biofilter Inlet



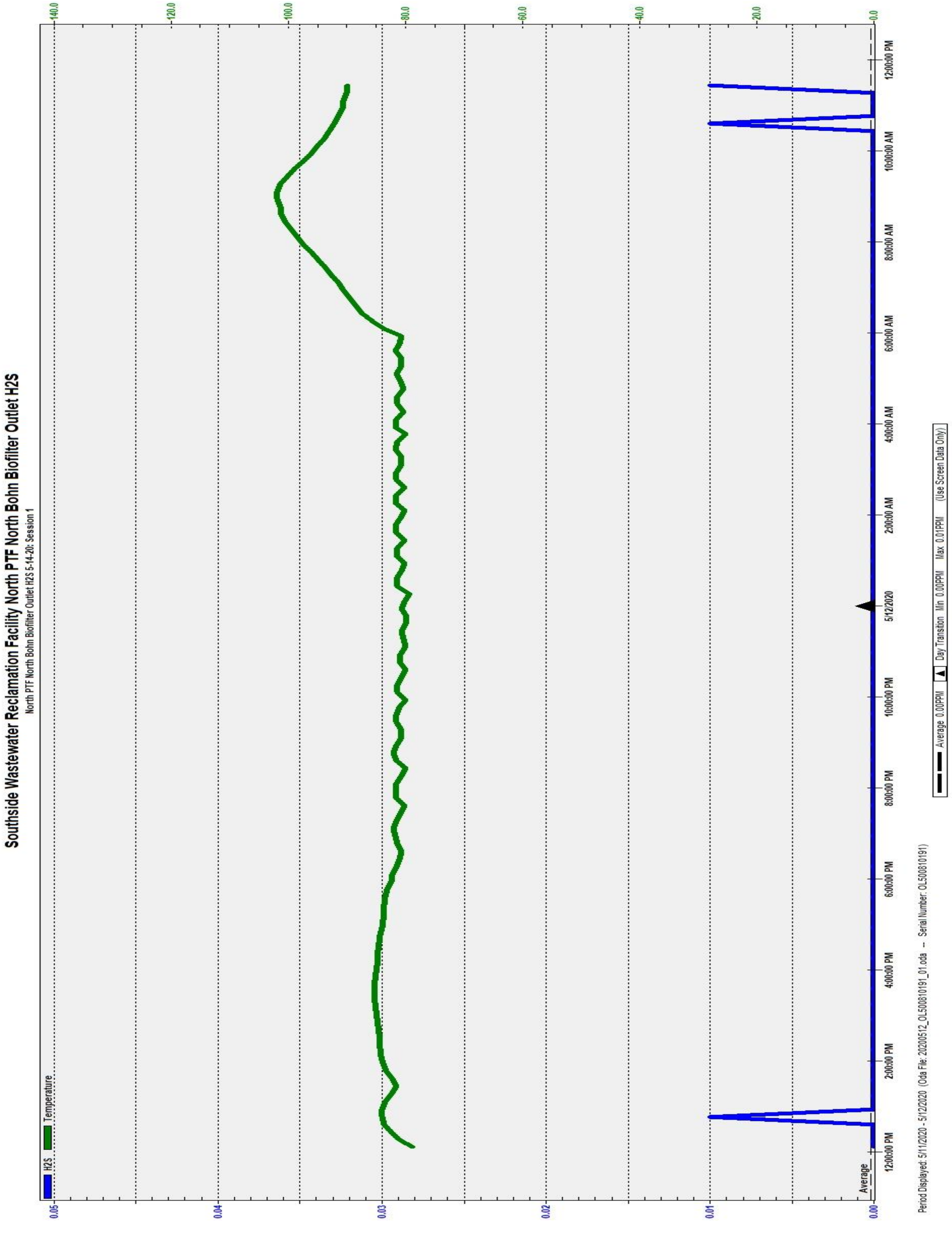
Primary Clarifiers #6 and #8 Biofilter Outlet



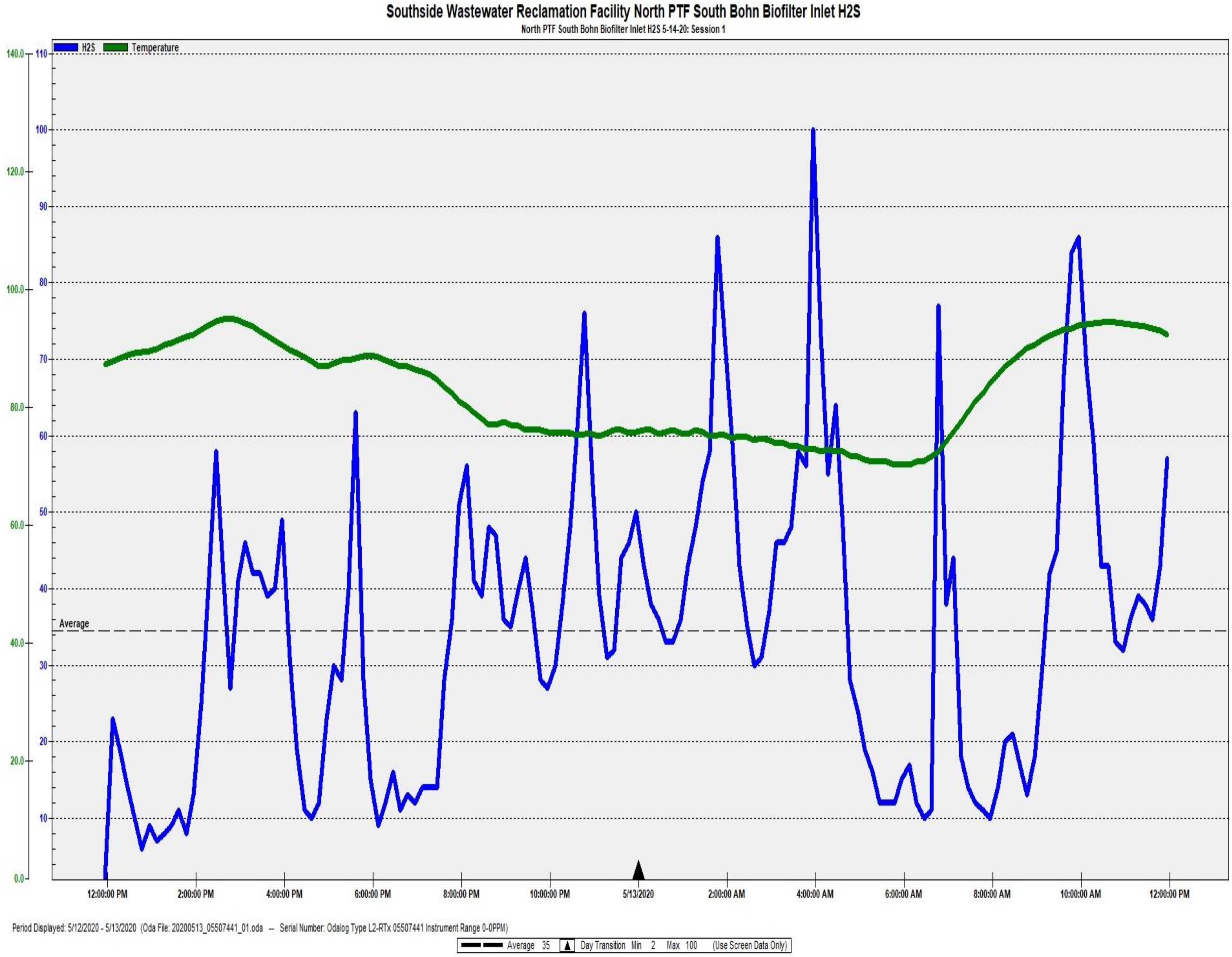
North PTF - North *Bohn* Biofilter Inlet



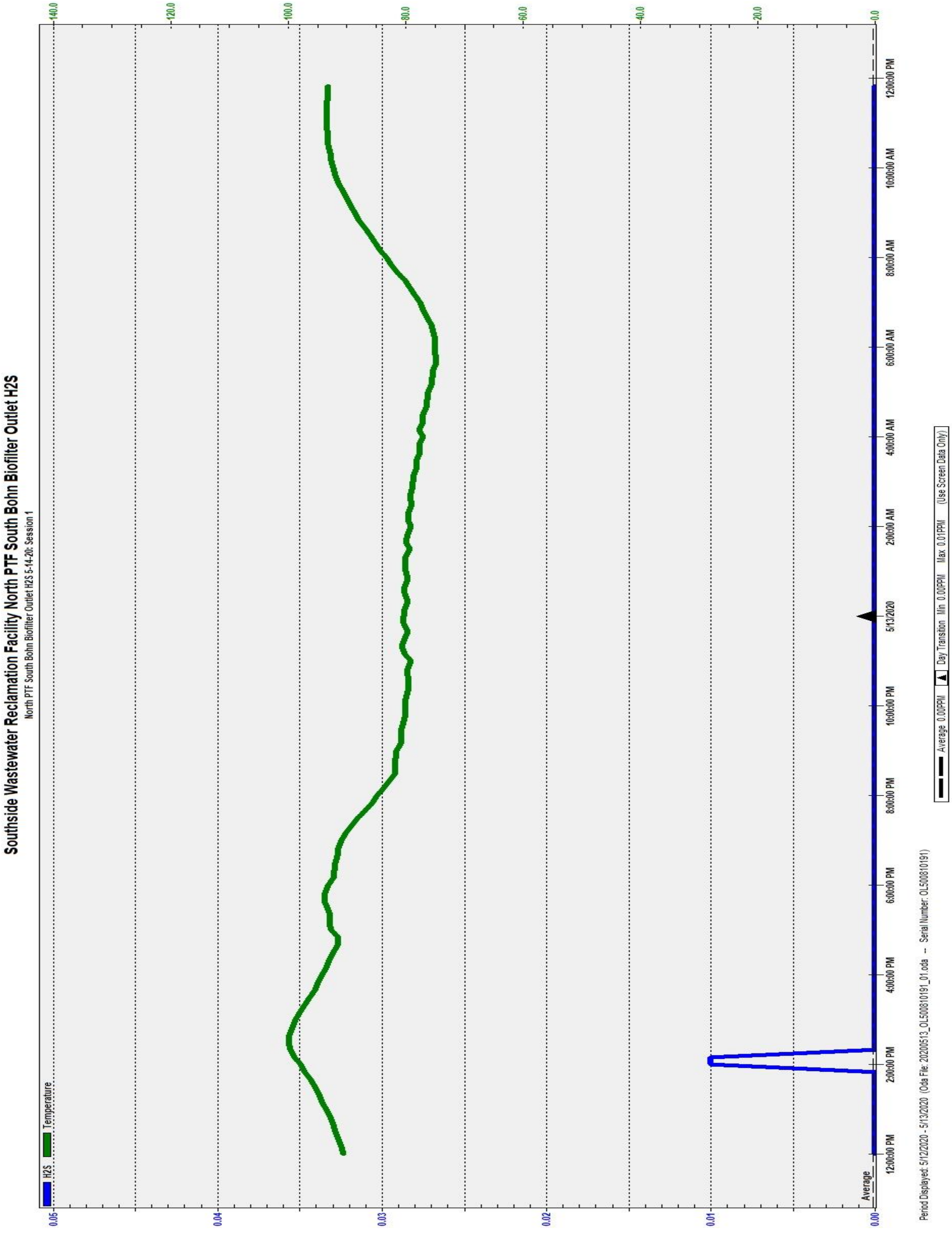
North PTF - North *Bohn* Biofilter Outlet



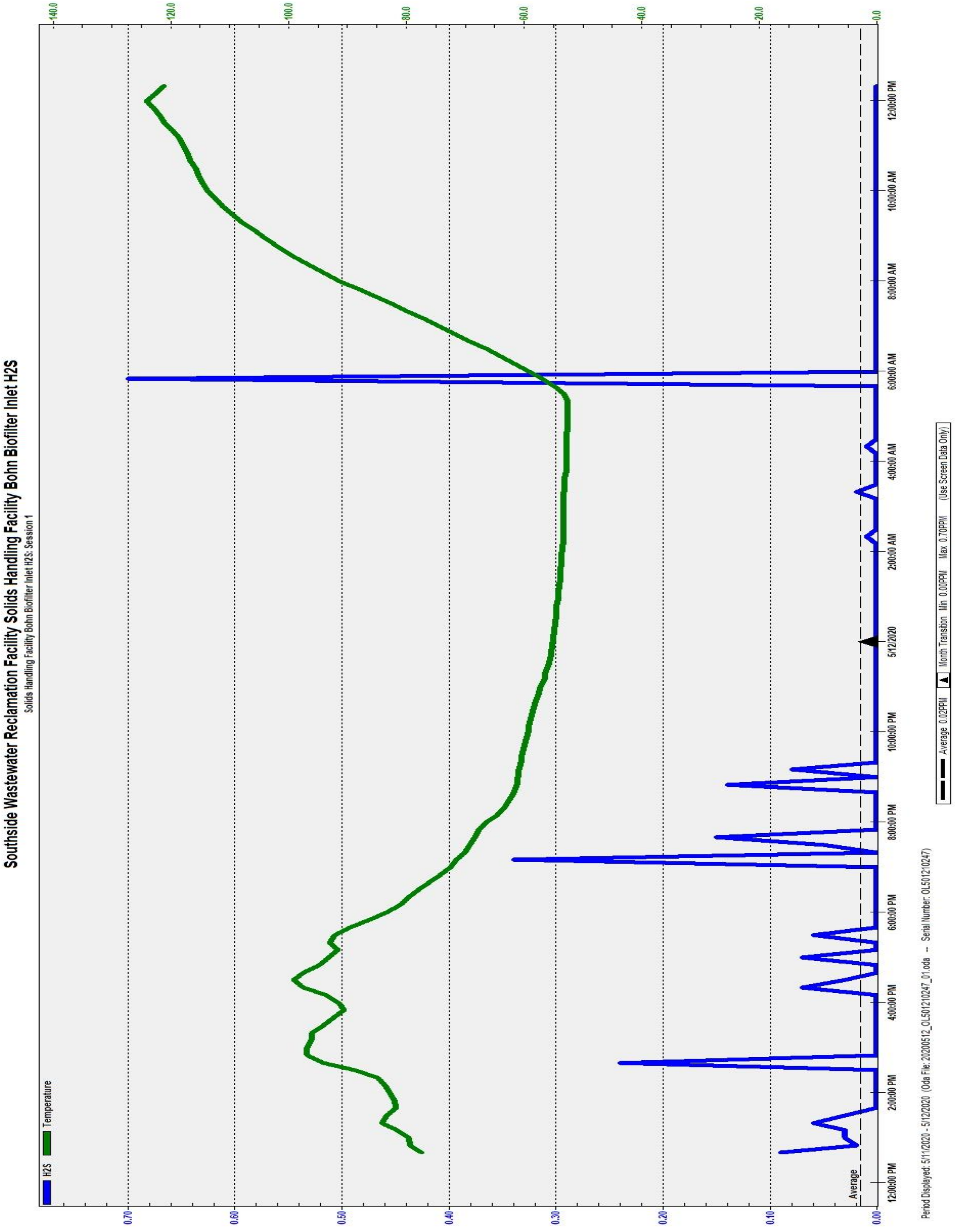
North PTF - South *Bohn* Biofilter Inlet



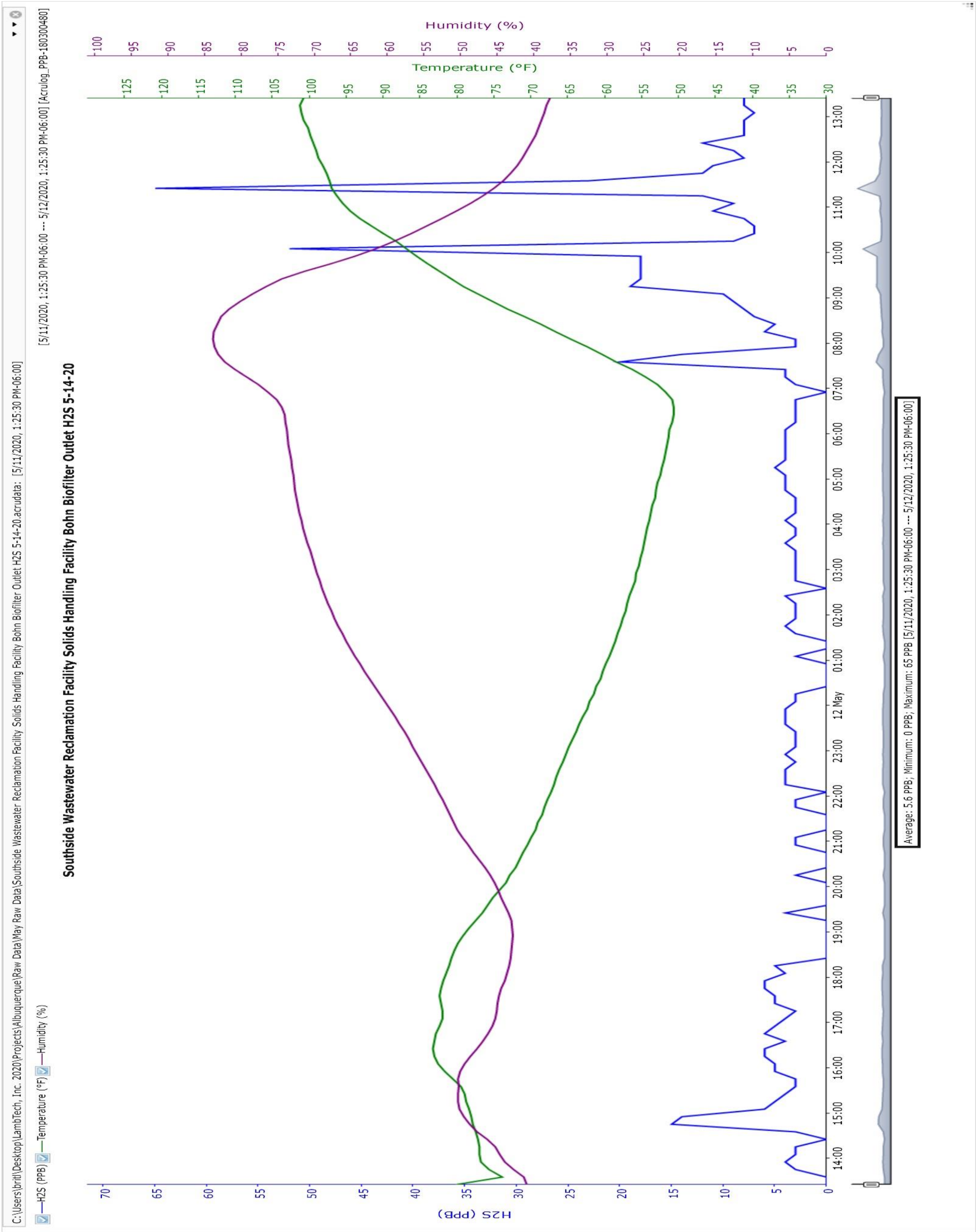
North PTF - South Bohn Biofilter Outlet



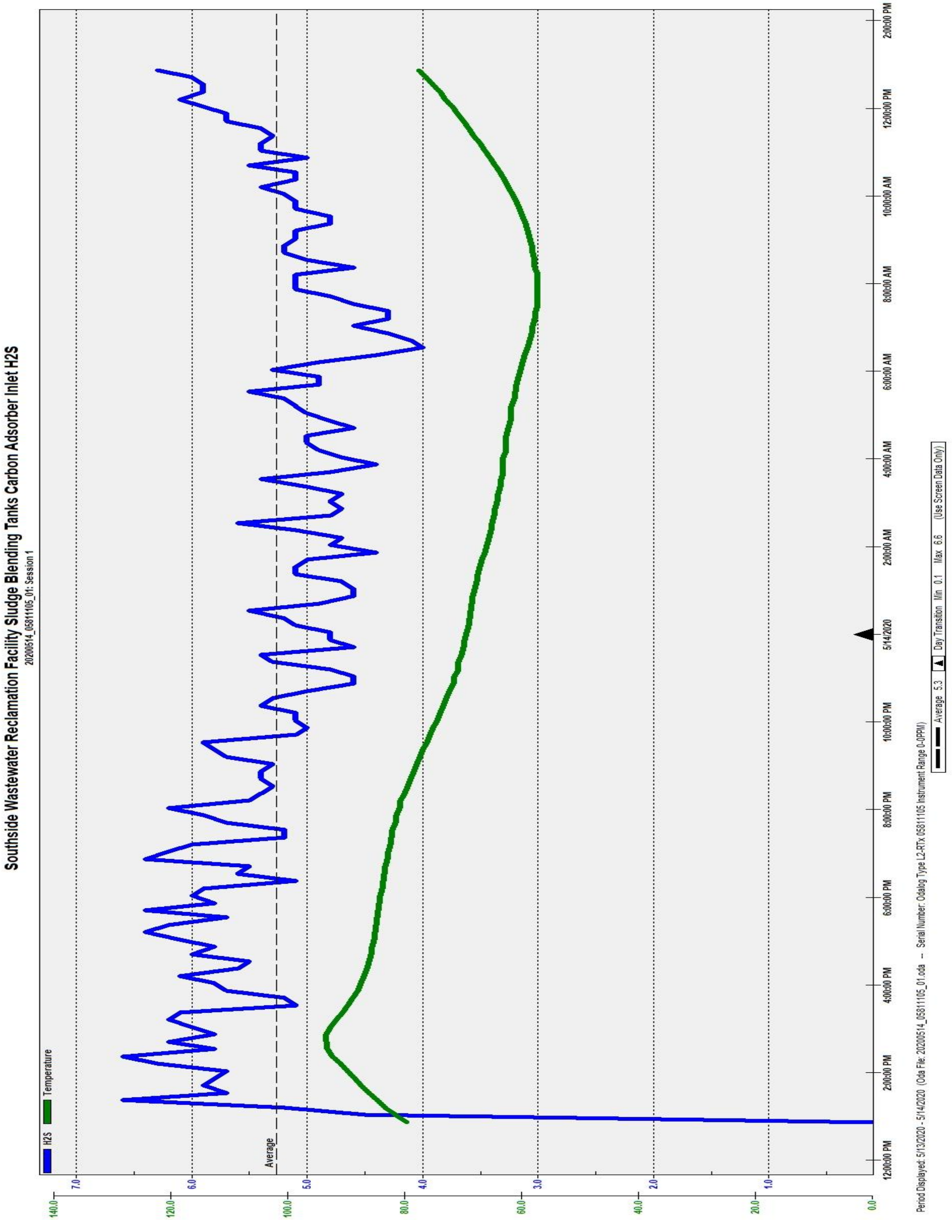
Solids Handling Facility - Bohn Biofilter Inlet



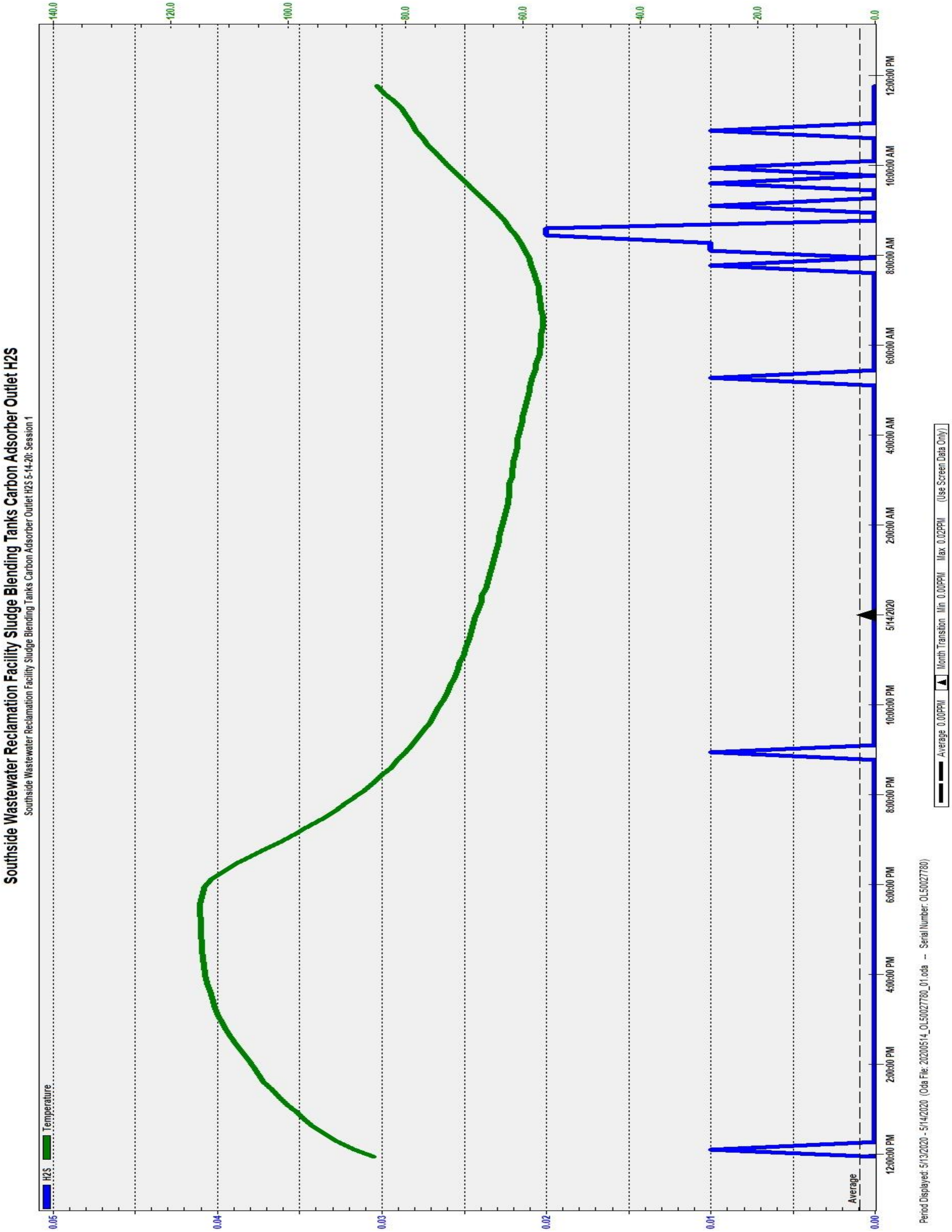
Solids Handling Facility - Bohn Biofilter Outlet



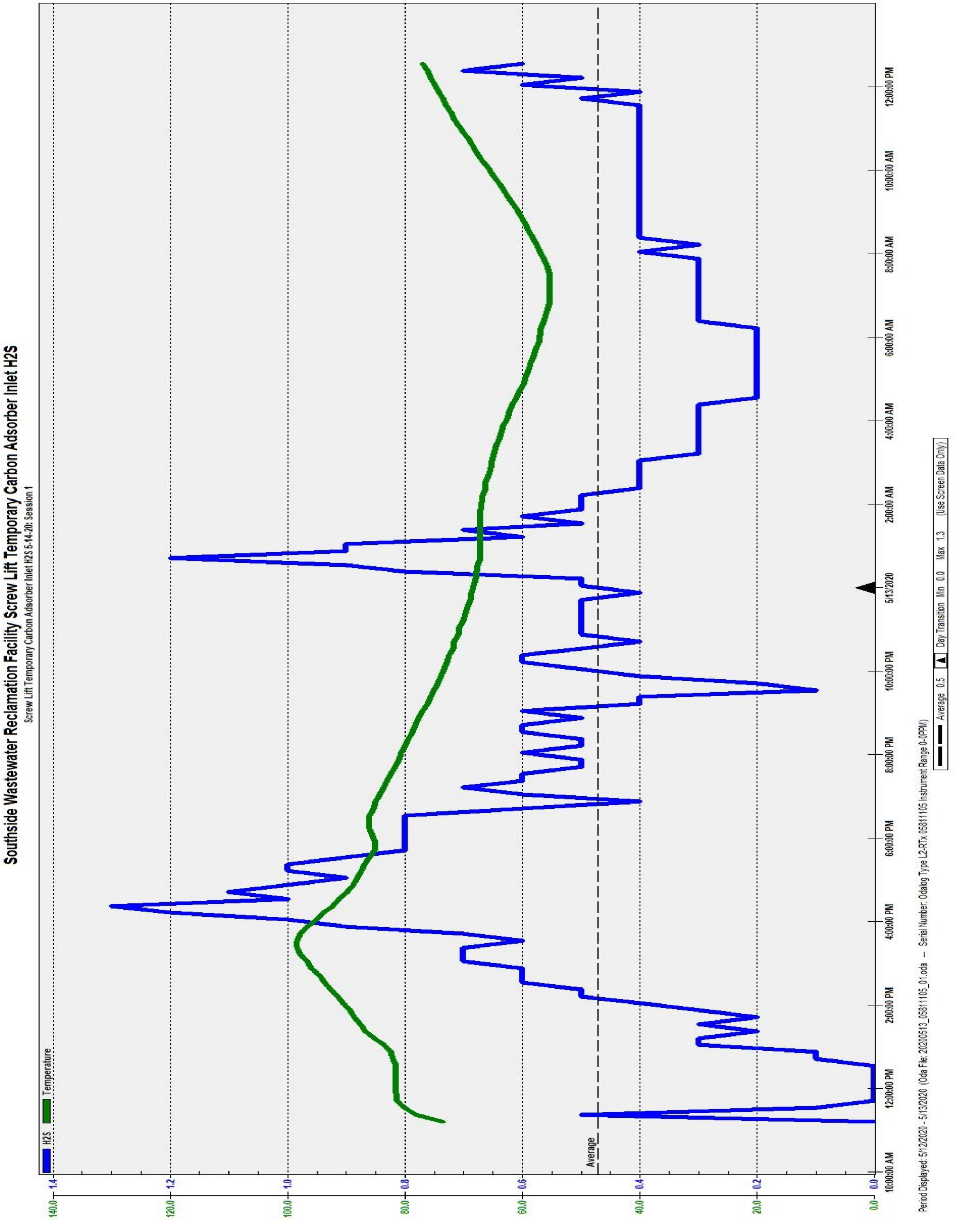
Sludge Blending Tanks - Carbon Adsorber Inlet



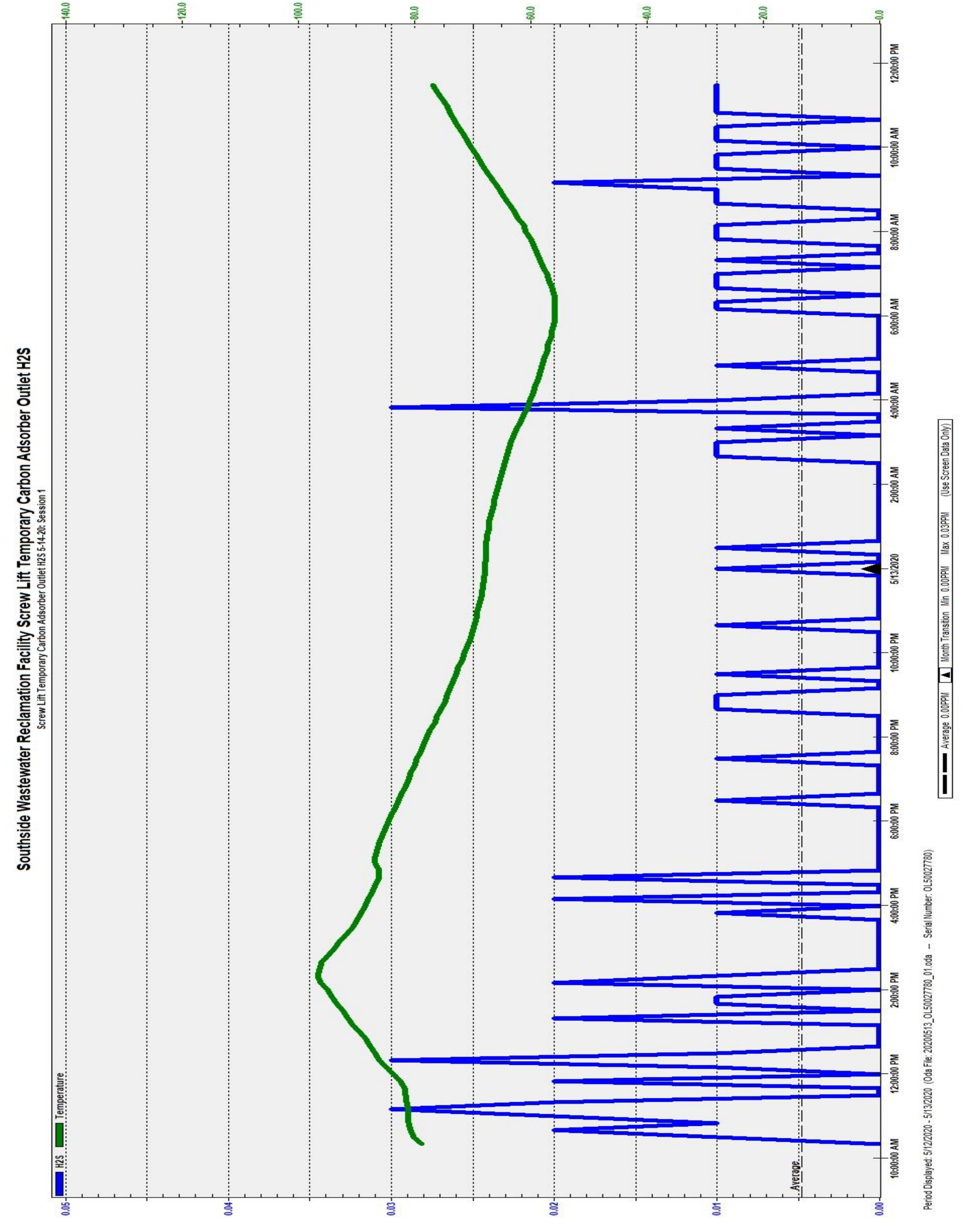
Sludge Blending Tanks - Carbon Adsorber Outlet



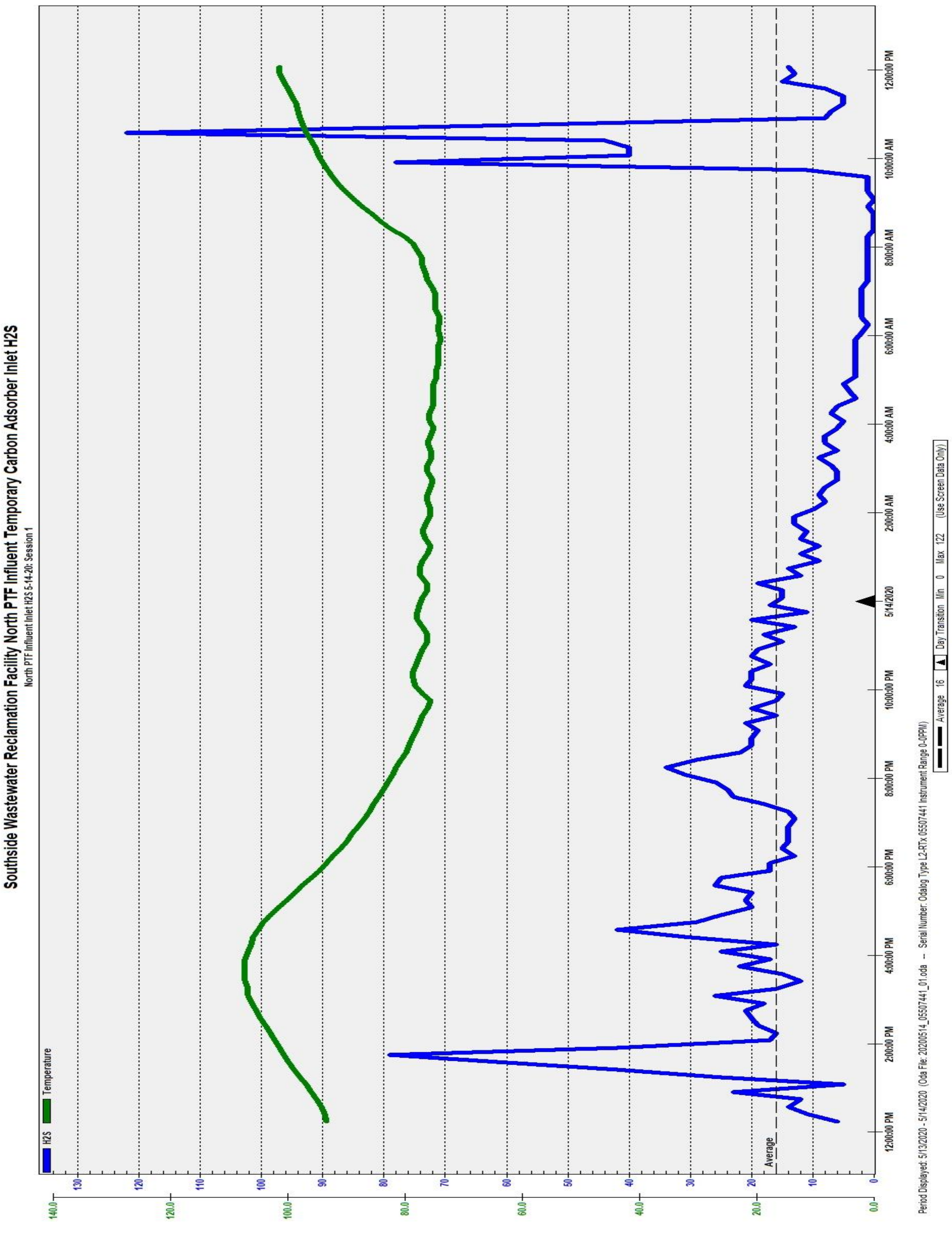
Screw Lift Influent Temporary Carbon Adsorber Inlet



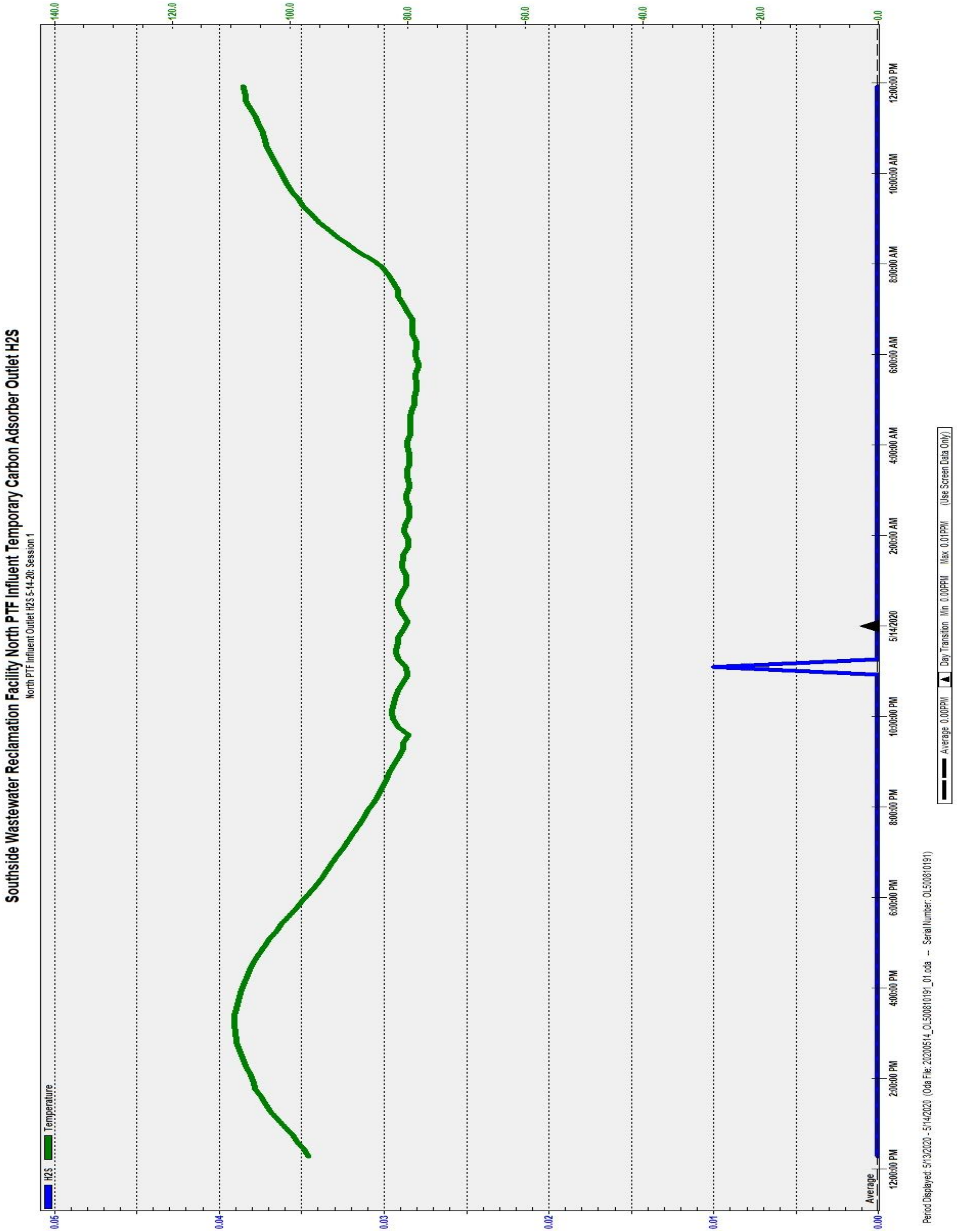
Screw Lift Influent Temporary Carbon Adsorber Outlet H_2S



North PTF Influent Temporary Carbon Adsorber Inlet H_2S



North PTF Influent Temporary Carbon Adsorber Outlet H_2S



Field Test–Jerome 631X Serial Number 1722

Ten PPM Certified Hydrogen Sulfide Gas Source
Lot #: 1247878

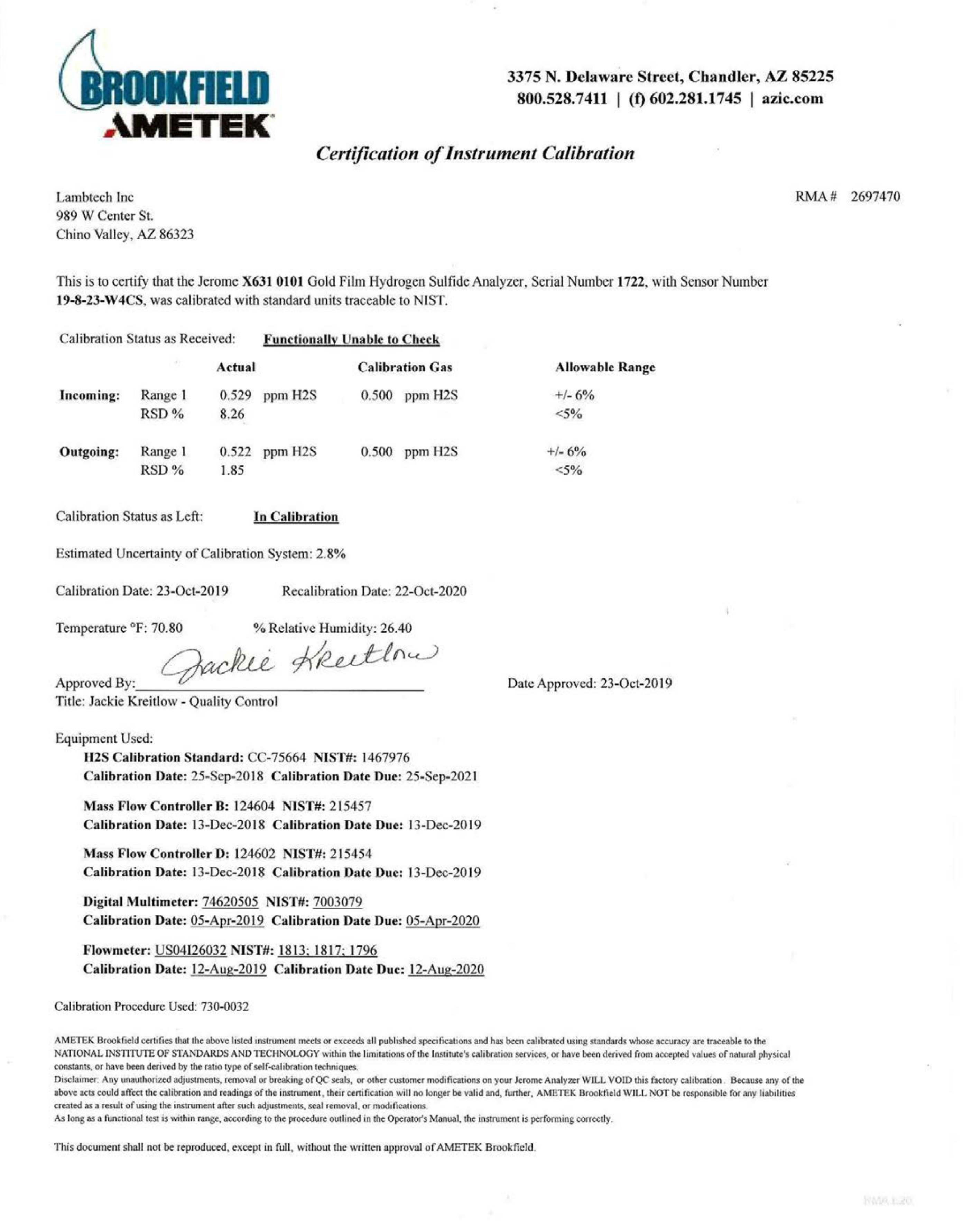
April 23, 2020

10.9 PPM
11.0 PPM
11.1 PPM
10.9 PPM
10.9 PPM
Average 10.96 PPM

Ten PPM Certified Hydrogen Sulfide Gas Source
Lot #: 1247878

May 13, 2020

9.9 PPM
10.5 PPM
10.9 PPM
10.6 PPM
10.9 PPM
Average 10.56 PPM



BROOKFIELD
AMETEK

3375 N. Delaware Street, Chandler, AZ 85225
800.528.7411 | (f) 602.281.1745 | azic.com

Certification of Instrument Calibration

Lambtech Inc
989 W Center St.
Chino Valley, AZ 86323

RMA # 2697470

This is to certify that the Jerome **X631 0101** Gold Film Hydrogen Sulfide Analyzer, Serial Number **1722**, with Sensor Number **19-8-23-W4CS**, was calibrated with standard units traceable to NIST.

Calibration Status as Received: **Functionally Unable to Check**

		Actual	**Calibration Gas**	**Allowable Range**
Incoming:	Range 1	0.529 ppm H2S	0.500 ppm H2S	+/- 6%
	RSD %	8.26		<5%
Outgoing:	Range 1	0.522 ppm H2S	0.500 ppm H2S	+/- 6%
	RSD %	1.85		<5%

Calibration Status as Left: **In Calibration**

Estimated Uncertainty of Calibration System: 2.8%

Calibration Date: 23-Oct-2019 Recalibration Date: 22-Oct-2020

Temperature °F: 70.80 % Relative Humidity: 26.40

Approved By: Jackie Kreitlow Date Approved: 23-Oct-2019
Title: Jackie Kreitlow - Quality Control

Equipment Used:

H2S Calibration Standard: CC-75664 **NIST#:** 1467976
Calibration Date: 25-Sep-2018 **Calibration Date Due:** 25-Sep-2021

Mass Flow Controller B: 124604 **NIST#:** 215457
Calibration Date: 13-Dec-2018 **Calibration Date Due:** 13-Dec-2019

Mass Flow Controller D: 124602 **NIST#:** 215454
Calibration Date: 13-Dec-2018 **Calibration Date Due:** 13-Dec-2019

Digital Multimeter: 74620505 **NIST#:** 7003079
Calibration Date: 05-Apr-2019 **Calibration Date Due:** 05-Apr-2020

Flowmeter: US04I26032 **NIST#:** 1813; 1817; 1796
Calibration Date: 12-Aug-2019 **Calibration Date Due:** 12-Aug-2020

Calibration Procedure Used: 730-0032

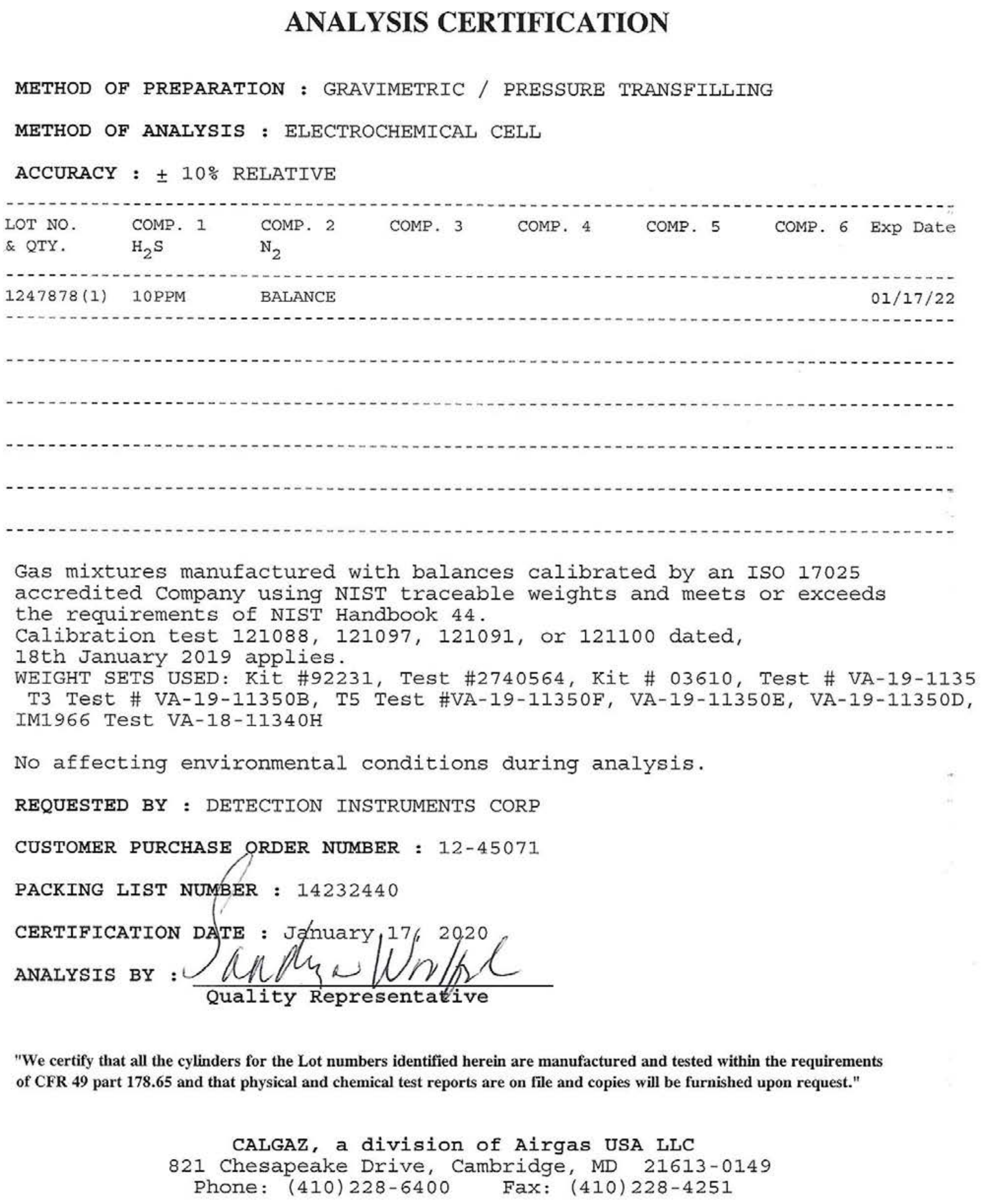
AMETEK Brookfield certifies that the above listed instrument meets or exceeds all published specifications and has been calibrated using standards whose accuracy are traceable to the NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY within the limitations of the Institute's calibration services, or have been derived from accepted values of natural physical constants, or have been derived by the ratio type of self-calibration techniques.

Disclaimer: Any unauthorized adjustments, removal or breaking of QC seals, or other customer modifications on your Jerome Analyzer WILL VOID this factory calibration. Because any of the above acts could affect the calibration and readings of the instrument, their certification will no longer be valid and, further, AMETEK Brookfield WILL NOT be responsible for any liabilities created as a result of using the instrument after such adjustments, seal removal, or modifications.

As long as a functional test is within range, according to the procedure outlined in the Operator's Manual, the instrument is performing correctly.

This document shall not be reproduced, except in full, without the written approval of AMETEK Brookfield.

RMA 1.20



ANALYSIS CERTIFICATION

METHOD OF PREPARATION : GRAVIMETRIC / PRESSURE TRANSFILLING

METHOD OF ANALYSIS : ELECTROCHEMICAL CELL

ACCURACY : ± 10% RELATIVE

LOT NO. & QTY.	COMP. 1 H_2S	COMP. 2 N_2	COMP. 3	COMP. 4	COMP. 5	COMP. 6	Exp Date
1247878(1)	10PPM	BALANCE					01/17/22

Gas mixtures manufactured with balances calibrated by an ISO 17025 accredited Company using NIST traceable weights and meets or exceeds the requirements of NIST Handbook 44.
Calibration test 121088, 121097, 121091, or 121100 dated, 18th January 2019 applies.
WEIGHT SETS USED: Kit #92231, Test #2740564, Kit # 03610, Test # VA-19-1135 T3 Test # VA-19-11350B, T5 Test #VA-19-11350F, VA-19-11350E, VA-19-11350D, IM1966 Test VA-18-11340H

No affecting environmental conditions during analysis.

REQUESTED BY : DETECTION INSTRUMENTS CORP

CUSTOMER PURCHASE ORDER NUMBER : 12-45071

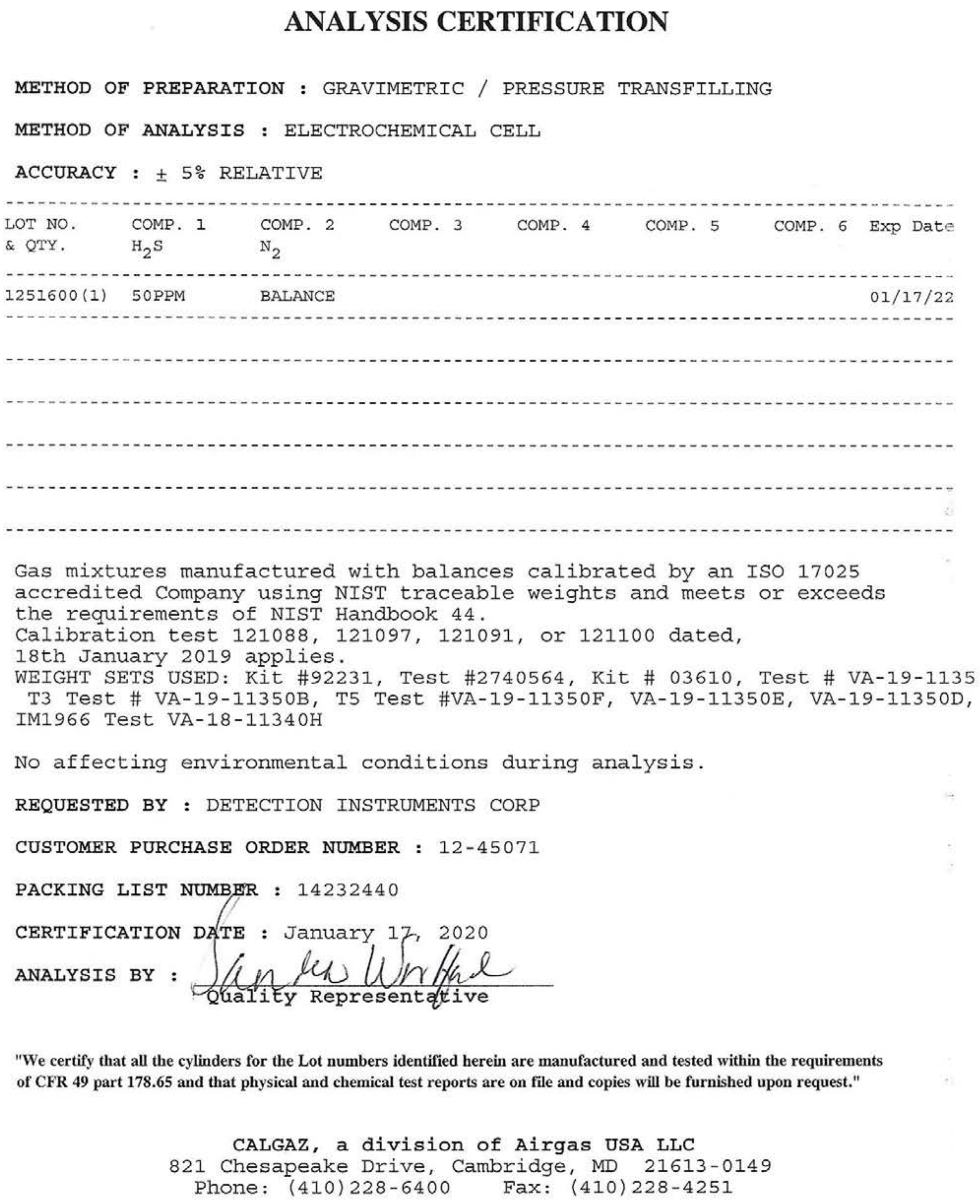
PACKING LIST NUMBER : 14232440

CERTIFICATION DATE : January 17, 2020

ANALYSIS BY :
Quality Representative

"We certify that all the cylinders for the Lot numbers identified herein are manufactured and tested within the requirements of CFR 49 part 178.65 and that physical and chemical test reports are on file and copies will be furnished upon request."

CALGAZ, a division of Airgas USA LLC
821 Chesapeake Drive, Cambridge, MD 21613-0149
Phone: (410)228-6400 Fax: (410)228-4251



ANALYSIS CERTIFICATION

METHOD OF PREPARATION : GRAVIMETRIC / PRESSURE TRANSFILLING

METHOD OF ANALYSIS : ELECTROCHEMICAL CELL

ACCURACY : ± 5% RELATIVE

LOT NO. & QTY.	COMP. 1 H_2S	COMP. 2 N_2	COMP. 3	COMP. 4	COMP. 5	COMP. 6	Exp Date
1251600(1)	50PPM	BALANCE					01/17/22

Gas mixtures manufactured with balances calibrated by an ISO 17025 accredited Company using NIST traceable weights and meets or exceeds the requirements of NIST Handbook 44.
Calibration test 121088, 121097, 121091, or 121100 dated, 18th January 2019 applies.
WEIGHT SETS USED: Kit #92231, Test #2740564, Kit # 03610, Test # VA-19-1135 T3 Test # VA-19-11350B, T5 Test #VA-19-11350F, VA-19-11350E, VA-19-11350D, IM1966 Test VA-18-11340H

No affecting environmental conditions during analysis.

REQUESTED BY : DETECTION INSTRUMENTS CORP

CUSTOMER PURCHASE ORDER NUMBER : 12-45071

PACKING LIST NUMBER : 14232440

CERTIFICATION DATE : January 17, 2020

ANALYSIS BY :
Quality Representative

"We certify that all the cylinders for the Lot numbers identified herein are manufactured and tested within the requirements of CFR 49 part 178.65 and that physical and chemical test reports are on file and copies will be furnished upon request."

CALGAZ, a division of Airgas USA LLC
821 Chesapeake Drive, Cambridge, MD 21613-0149
Phone: (410)228-6400 Fax: (410)228-4251

APPENDIX H

Air Quality Impacts Analysis

Albuquerque Bernalillo County Water Utility Authority

Southside Water Reclamation Plant Air Dispersion Modeling Report

Modification to Permit No. 0786-M3-RV1

October 30, 2020

Prepared for:

Albuquerque Bernalillo County Water Utility Authority
4201 Second St. SW
Albuquerque, NM 87105

Prepared by:

Alliant Environmental, LLC
7804 Pan American Fwy. NE
Albuquerque, NM 87109

TABLE OF CONTENTS

1.0 INTRODUCTION

1.1 Purpose of Modeling / Project Summary

The Albuquerque Bernalillo County Water Utility Authority (Water Authority) is submitting a revision application for the existing and current Permit No. 0786-M3-RV1, which authorizes the operation of the Albuquerque Southside Water Reclamation Plant (SWRP). All criteria pollutants and averaging times were modeled for this permit revision application for the proposed controlled and uncontrolled emissions rates. With this permit revision, the Water Authority proposes to install control technologies on all four cogeneration engines to reduce nitrogen dioxide (NO_2), carbon monoxide (CO), volatile organic compounds (VOC) and hazardous air pollutant (HAP) emissions significantly.

The modeling was performed for uncontrolled emissions specific to the cogeneration engines as these will be controlled; however, the construction timeline until all engines are controlled requires a phase-in period of each engine's control. During Phase 1 of the construction, three cogeneration engines (Emission Units (EU) #28, #29, and #30) may operate uncontrolled while EU #27 is either out of commission during the installation process of the controls, or in operation with controls. This is the worst-case scenario for the uncontrolled models. The Water Authority will be installing pollution control equipment on all four cogeneration engines, which are fueled by natural gas and digester gas.

The following pollutants and averaging times will be modeled and evaluated against their respective National/New Mexico Ambient Air Quality Standards (N/NMAAQS):

- 1-Hour and Annual NO_2
- 1-, 3-, 24-Hour and Annual SO_2 (Note: if the model passes the 1-hr SO_2 N/NMAAQS, the 3-hr, 24-hr and annual standards are automatically met as well)
- 1-Hour and 8-Hour CO
- 24-Hour and Annual $PM_{2.5}$
- 24-Hour PM_{10}
- 1-Hour H_2S

The SWRP is located in an area that is classified by the United States Environmental Protection Agency (US EPA) as in attainment with the NAAQS for all regulated pollutants.

Applicant Information:

Applicant: Albuquerque Bernalillo County Water Utility Authority
Mr. Charles Leder, P.E.
P.O Box 568
Albuquerque, NM 87103
(505) 289-3401
cleder@abcwua.org

Air Dispersion Modeling Report Preparer Contact Information:

Alliant Environmental, LLC
Mr. Martin R. Schluep, Principal
7804 Pan American Fwy. NE, Suite 5
Albuquerque, NM 87109
Phone: (505) 205-4819
E-mail : mschluep@alliantenv.com

2.0 FACILITY DESCRIPTION

2.1 Facility Identification and Location

The SWRP is located on 4201 Second St., SW, Albuquerque, NM 87105.

UTM Coordinates (UTM Zone 13) with NAD83 Datum and an Elevation of 4,933 feet above mean sea level:

UTME: 347,765
UTMN: 3,876,319

2.2 Brief Process Description

The Water Authority owns and operates the Southside Water Reclamation Plant. The facility is a publicly owned treatment works (POTW) and has the capacity to treat up to 76 million gallons per day of wastewater collected in Albuquerque and Bernalillo County. The treated water is discharged into the Rio Grande River. Waste solids produced from wastewater treatment are thickened and processed in anaerobic digesters that produce a methane-rich gas. This gas is combusted in cogeneration engines, which drive electrical generators to produce electricity. Ninety seven percent (97%) of all power produced is used on-site with the remainder sold to Public Service Company of New Mexico. Heat from the engines is recovered and used to keep anaerobic digesters that produce digester gas at the optimal temperature for digestion. The facility operates under Standard Industrial Classification (SIC) 4952, Sewerage Systems, or North American Industrial Classification System Code 221320, Sewage Treatment Facilities. The SWRP operates 24 hours per day, 7 days per week, 52 weeks per year.

ALLIANT ENVIRONMENTAL, LLC

Area Map

Albuquerque Bernalillo County Water Utility Authority

Scale: 1:20,000

Drawn by: MDF

Date: 8/20/2020

Chk'd by:

Date:

Southside Water Reclamation Plant
N 35° 1' 1.7" Latitude
W 106° 39' 57.7" Longitude

Project No.: 082-002

File Name: **SWRP Area Map**

Figure: 2-1

3.0 MODELING REPOPRT

3.1 Model Input Options

The latest version of AERMOD was used for the air dispersion modeling for this analysis. The AERMOD was executed using the regulatory default options (stack-tip downwash, buoyancy induced dispersion, final plume rise), default wind speed profile categories, default potential temperature gradients, no pollutant decay, and no flagpole option. The complex terrain option was selected in this model.

Based on the facility design, buildings and/or structures cause potential influences on normal atmospheric flow in the immediate vicinity of the emission sources. There are buildings and tank structures at this site; therefore, building downwash was addressed and the PRIME algorithms and the latest version of the Building Profile Input Program (BPIP) to evaluate Good Engineering Practice (GEP) stack heights and projected building dimensions is included in the model. Figure 3-1 shows a map/plot plan of all buildings, the main fenceline, and air emissions sources within SWRP property. Note that the solar panel area is also fenced in, but that fenceline is not shown in Figure 3-1.

The selection of the appropriate dispersion coefficients used in the modeling analysis was based on the classification method defined by Auer (1978). This method considers the dispersion coefficients to be rural or urban depending on the land use within three kilometers (km) of the facility if greater than 50% meets certain land use or zoning classifications. Based on the site location (area map), the rural dispersion was used.

The Elevated Terrain mode was used and receptor elevations were entered based on elevations obtained from 7.5 minute United States Geological Survey (USGS) National Elevation Data (NED) or digital elevation model (DEM) files for the applicable region, provided by the Air Quality Program.

The facility-wide air dispersion modeling was performed using BEE-line Software's latest version of BEEST for Windows AERMOD model. Source Group models will be set up as follows:

- **Source alone group** – all sources at the facility used to compare with significance levels for the pollutant and averaging period being modeled. This group determines if the facility is above significant impact levels (SIL).

- **Cumulative sources group** – all allowable emissions of the source and surrounding sources and added current background data. This group is used to determine compliance with N/NMAAQS for all pollutants and averaging periods that exceed the SILs.

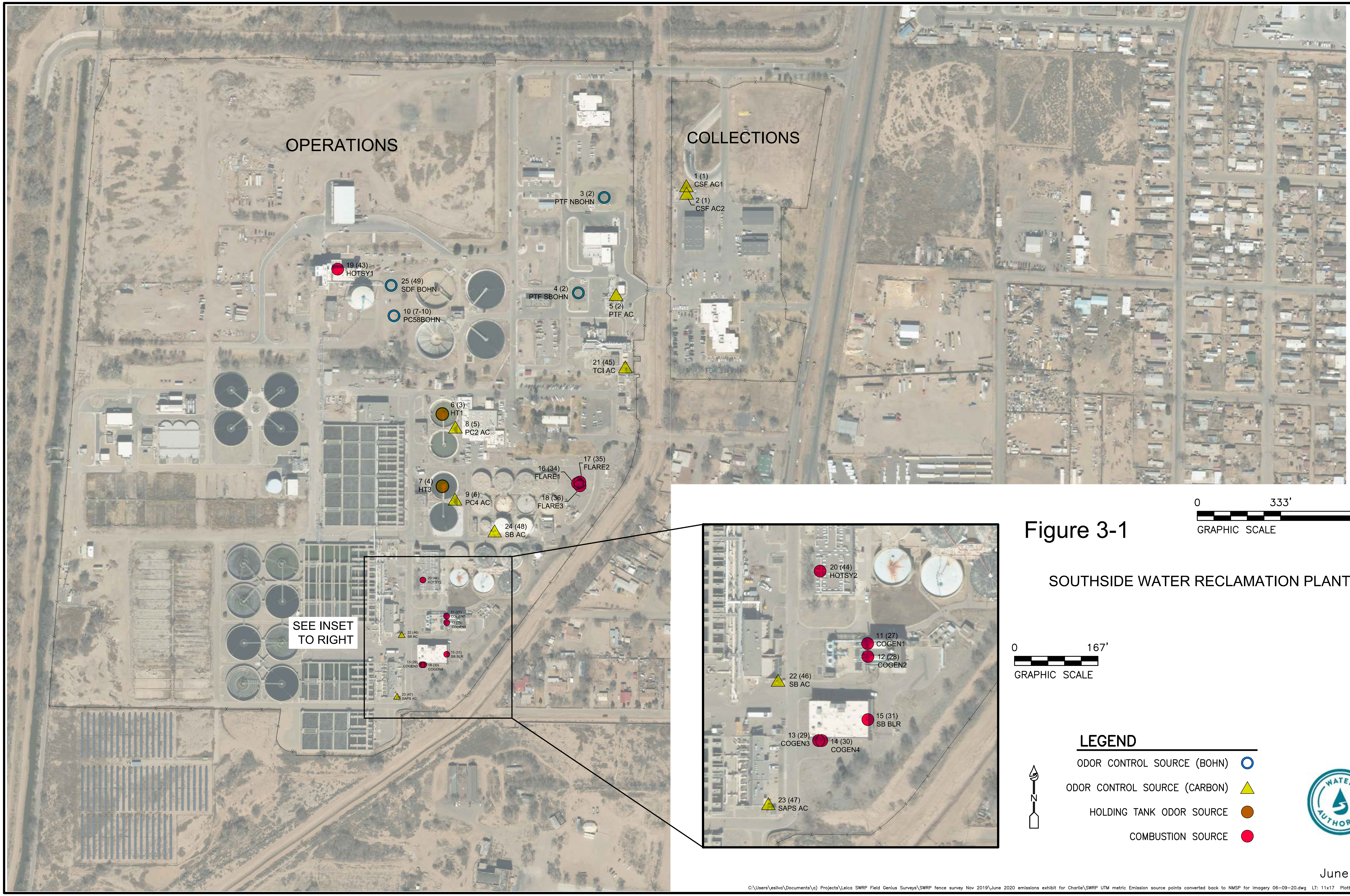


Figure 3-1

SOUTHSIDE WATER RECLAMATION PLANT

June 2020

C:\Users\esilva\Documents\a) Projects\Leica SWRP Field Genius Surveys\SWRP fence survey Nov 2019\June 2020 emissions exhibit for Charlie\SWRP UTM metric Emission source points converted back to NMSP for imagery 06-09-20.dwg LT: 11x17 Plotted: June 9, 2020

3.2 Affected Sources and Source Characterization

Attachment A includes tables showing all SWRP modeled sources (point, volume, circular area) and their specific parameters as well as emission rates used in the modeling analysis. The following paragraphs discuss each EU in detail:

Coarse Screening Facility (EU 1):

H_2S emissions at the Coarse Screening Facility (CSF), EU 1, are controlled with an activated carbon filter. This includes foul air collected from the head space of covered flow channels in the building and all ventilation air exhausted from the building. The CSF is enclosed within a building; therefore, under normal operating conditions, it assumed that 100% of the fugitive emissions are captured. There are no combustion pollutants associated with this process. The flow from the carbon system is divided into two equal flow streams emitting H_2S emissions from two stacks (1N and 1S). The H_2S emission rate is equally divided by two and each stack was modeled as an independent point source. Please note that this is a newly constructed facility that is not yet visible on the most current Google Earth image taken in 2018.

Figure 1: Emission Unit 1 Carbon System Stacks

All carbon filter systems emit at ambient temperature. AERMOD sets the temperature to ambient temperature if the stack exit temperature is set to zero (0) degrees Kelvin (K). This follows the NMED modeling guidelines, Section 5.2.2 page 62 of 83. This is applicable throughout this document and all models for point sources with ambient temperatures.

Preliminary Treatment Facility (Screening and Grit Removal) (EU 2):
This process included screening of the influent stream to collect any large solids such as rags, boards, rocks, and other debris. The flow stream is then sent to grit removal facilities to extract the fine grit and dirt in the flow stream. The effluent is then sent to the primary clarifiers. The PTF, EU 2, H_2S emissions are emitted through an activated carbon system and two (2) Bohn Biofilters. The Bohn Biofilters will be modeled as a volume sources with the following parameters:

North Bohn Biofilter:
Length = 80 feet
Width = 56 feet
Release Height = 2.5 feet

South Bohn Biofilter:
Length = 65 feet
Width = 46 feet
Release Height = 2.5 feet

The calculated H_2S emission rate for the Preliminary Treatment (Bohn Biofilters) is modeled proportionally to the area of each biofilter. The initial horizontal and vertical dimensions are calculated per the New Mexico Environmental Department Air Dispersion Modeling Guidelines, revised February 7, 2019, Section 5.3.2 Fugitive Equipment Sources, page 64 of 83 as follows:

The release height (H) is the distance from the center of the volume to the surface of the ground. For a single volume source, the initial horizontal dimension equals to the length (L) of the volume source divided by 4.3. Per AQP's guidance, the length means the shorter of the two dimensions of the rectangle to calculate a square based volume source. The initial vertical dimension equals to depth of volume source divided by 2.15. The depth (5 ft) of the volume source (Bohn Biofilter) is the design and constructed depth of the biofilter.

North Bohn Biofilter:	Initial horizontal dimension = L/4.3 = 56 ft / 4.3 = 13.02 ft Initial vertical dimension = depth/2.15 = 5 ft / 2.15 = 2.33 ft
South Bohn Biofilter:	Initial horizontal dimension = L/4.3 = 46 ft / 4.3 = 10.70 ft Initial vertical dimension = depth/2.15 = 5 ft / 2.15 = 2.33 ft

There are no combustion pollutants associated with this process.

Figure 2: Picture of a Bohn Biofilter

The activated carbon system was modeled as a point source at ambient temperature. Detailed stack parameters are included in Attachment A.

Primary Clarifier Holding Tanks #1 and #3 (EU 3-4):

The circular primary clarifiers #1 and #3 will be used as inground, un-covered holding tanks only. These two former primary clarifiers have been re-purposed as holding tanks that will be used during emergency conditions or maintenance situations when flow to the secondary treatment process needs to be temporarily halted. H_2S emissions from these tanks will be modeled as circular area sources. The radius of each of the holding tanks is 60 feet. The release heights for both holding tanks is zero (ground level).

Primary Clarifiers #2 and #4 (EU 5-6):

Primary Clarifiers #2 and #4 will be covered with dome covers similar to those on Primary Clarifiers #5 through #8; therefore, a 100% capture efficiency is assumed. Control for H_2S in air collected from beneath the covers will be achieved by using an activated carbon filter, one per clarifier. The clarifier dome covers and stacks for each carbon filter ae in the process of being designed by the Water Authority with construction planned during calendar year 2021.

Primary Clarifiers #5 through #8 (EU 7-10):

Primary Clarifiers #5, #6, #7, and #8 are covered; therefore a 100% capture efficiency is assumed. H_2S in air collected from beneath the covers is controlled using a Bohn Biofilter. For the biofilter, the initial horizontal and vertical dimensions are calculated per the New Mexico Environmental

Department Air Dispersion Modeling Guidelines, revised February 7, 2019, Section 5.3.2 Fugitive Equipment Sources, page 64 of 83 as follows:
The release height (H) is the distance from the center of the volume to the surface of the ground. For a single volume source, the initial horizontal dimension equals to the shortest length (L) of the volume source divided by 4.3. The initial vertical dimension equals to depth of volume source (design and constructed depth of the biofilter) divided by 2.15.

Bohn Biofilter:
Length = 87 feet
Width = 62 feet
Release Height = 2.5 feet

EU7_10_BIO_5_8: Initial horizontal dimension = L/4.3 = 62 ft / 4.3 = 14.42 ft
Initial vertical dimension = depth/2.15 = 5 ft / 2.15 = 2.33 ft

The following sources are additional odor control units (EU 45-49) installed at the SWRP which control H_2S emissions using either an activated carbon system or a Bohn Biofilter:

Tijeras Canyon Interceptor (EU 45)
H_2S emissions are controlled using an activated carbon filter.

South Blower Building (EU 46)
H_2S emissions are controlled using an activated carbon filter.

South Activated Sludge Pump Station (EU 47)
H_2S emissions are controlled using an activated carbon filter. This carbon filter unit has a horizontal stack with the following parameters:

Table 1: South Activated Sludge Pump Station Point Source Stack Parameters

Emission Unit No.	Description	Rectangular Horizontal Stack (ft)
47	Carbon Filter (**Horizontal** Stack)	108 in High x 168 in Wide = 18,144 in^2 = 126 ft^2 = 11.71 m^2 = area Area = r^2 x Pi; therefore 11.72 m^2 / Pi = r^2 = 3.7274 m^2 r = 1.93 m diameter = 2 x r = 3.86 m The effective/equivalent **diameter = 3.86 m (12.7 ft)** The stack is a rectangular duct on the ground; therefore, the **stack height is zero**. The **release height** is half the height of the stack = 9 ft / 2 = **4.5 ft**

Figure 3: EU No. 47 Stack

Sludge Blending Tank (EU 48)

H_2S emissions are controlled using an activated carbon filter.

Sludge Dewatering Facility (EU 49)

H_2S in air collected from Sludge Dewatering Facility is controlled using a Bohn Biofilter. For the biofilter, the initial horizontal and vertical dimensions are calculated per the New Mexico Environmental Department Air Dispersion Modeling Guidelines, revised February 7, 2019, Section 5.3.2 Fugitive Equipment Sources, page 64 of 83 as follows:

The release height (H) is the distance from the center of the volume to the surface of the ground. For a single volume source, the initial horizontal dimension equals to the shortest length (L) of the volume source divided by 4.3. The initial vertical dimension equals to depth of volume source (design and constructed depth of the biofilter) divided by 2.15.

Bohn Biofilter:
Length = 77 feet
Width = 62 feet
Release Height = 2.5 feet

EU 49: Initial horizontal dimension = L/4.3 = 62 ft / 4.3 = 14.42 ft
Initial vertical dimension = depth/2.15 = 5 ft / 2.15 = 2.33 ft

Gas Flares #1, #2, and #3 (EU 34-36):

The three flares are all identical and will be modeled as "Pseudo Point Sources" with the following stack parameters:

- Stack height = 11 ft
- Temperature = 1,832 deg. F
- Velocity = 65.62 fps (20 m/s)
- Effective Stack Diameter = 4.64 ft (see below for effective stack diameter calculation)

Flare Effective Stack Diameter:

The diameter for a flare is the effective diameter calculated based on the following equations:

D = SQRT(q_n x 10^{-6})

q_n = q x (1 - 0.048 x SQRT($MW_{\text{flared compound or mixture}}$)

Where:

D = effective diameter flare (meter)

q = gross heat release in cal/sec

qn = net heat release (cal/sec)

MW = molecular weight of compound being flared

FL-1, FL-2, FL-3 (Units 34, 35 and 36)

q (cal/sec)	MW (methane)	q (MMBtu/hr)
2,471,000	16	35.3

q_n = 1,996,568.0

D (meter) = 1.41

D (feet) = 4.64

The heat release of the flares was calculated using the flare's gas flow (scf/hr). Each flare's design capacity is 51,300 scf/hr (flare design and Operation & Maintenance manual documentation is provided in the permit revision application in Appendix A). The digester gas heating value is 688 Btu/scf. Therefore, the flare heat release is:

(51,300 scf/hr) x (688 Btu/scf) = 35.3 MMBtu/hr.

The remaining emission sources at the SWRP include combustion pollutants associated with the four cogeneration engines, the cogeneration boiler, and the two high pressure hot water heating units (HOTSY units). Detailed stack parameters and emission rates modeled are included in Attachment A.

Figure 4: EU No. 27 and 28 Cogen Stacks

Figure 5: EU No. 29 and 30 Cogen Stacks

Figure 6: Dewatering Building HOTSY Stack Location

Figure 7: DAF/RDT Building HOTSY Stack

Figure 8: Field Measurements Taken to Confirm Cogenerator Stack Parameters

Figure 9: EU: 27 Stack Diameter Measurement

Figure 10: EU: 28 Stack Diameter Measurement

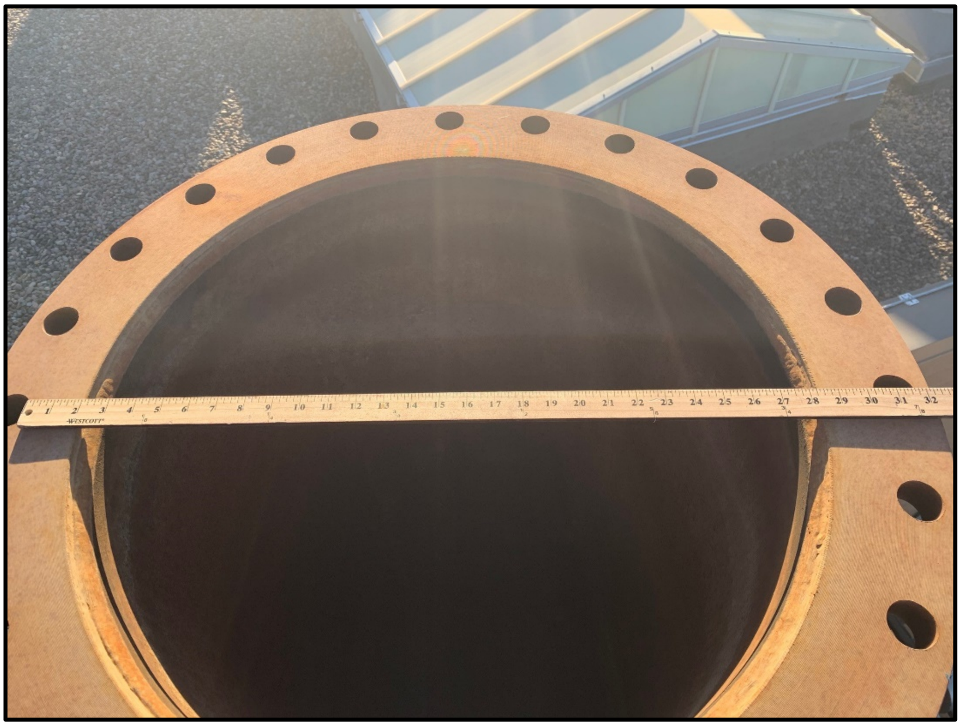


Figure 11: EU: 29 Stack Diameter Measurement

Figure 12: EU: 30 Stack Diameter Measurement

Note: Stack parameters (height, diameter, flow rates/exhaust velocities and temperatures) were verified for this modeling analysis by conducting field measurements and using average values from the January 2020 stack tests performed by Alliance Source Testing. The summary pages of the stack parameters are provided in Attachment A and a full copy of the engine stack test report is provided on CD. EU #29 and #30 (cogeneration engines) stacks will be increased by four (4) feet each for a stack height of 44 feet. This measure will be taken to assure that the 1-hour NO_2 N/NMAAQS is met during the construction phase of the engine control equipment. All measurements were re-confirmed by Water Utility Authority personnel in the field on October 13, 2020.

3.3 Receptor Grid Description

For each pollutant, the radius of impact (ROI) around the facility was established using a Cartesian grid. The following grid resolutions were entered to sufficiently demonstrate that areas of maximum impact of the source remain below the applicable standards:

- Fenceline receptors were placed along the facility boundary at least every 50-meters in linear fenceline distance. **Note:** The fenceline position as shown in the model is based on a GPS survey from which UTM metric coordinates were entered into the model. This GPS survey has a horizontal accuracy of +/- 2 centimeters (cm).

- A rectangular fine grid receptor array was placed at 100- by 100-meter spacing from the fenceline outward to 1,000 meters in all directions.

- A medium receptor grid was placed at 500- by 500-meter spacing from the fine grid to areas beyond 1,000 meters if the radius of impact exceeds 10,000 meters.

The elevations of facility sources and receptors were determined using the elevations obtained from 7.5 minute USGS DEM files. The AERMAP processor was used to apply elevations to the receptors. The USGS DEM data file for this project was downloaded from the Air Quality Program's modeling website.

3.4 Meteorological Data

The five-year ABQMET_2014-2018_DETSURF meteorological data set, as provided by the Air Quality Program on their modeling website, was used.

3.5 Radius of Impact Analysis and Cumulative Impact Analysis

A significant impact analysis for all modeled pollutants was performed for the facility's emission sources. For air pollutants discharged by the facility that resulted in an ambient impact greater than the significant impact levels (SILs), the maximum extent of the significant impact area was determined (measured from the center of the facility to the furthest extent of the significant impact).

The maximum extent of the significant area is the Radius of Impact (ROI). The area within the ROI then became the modeling domain for the Cumulative Impacts Analysis (CIA). The CIA was analyzed including combined impacts from the facility sources, surrounding sources, and appropriate background concentrations, as applicable. For an ROI of zero; i.e., the source alone group of the facility is less than the SIL, no further analysis is required and all standards are met.

3.6 N/NMAAQS Design Values

Initial model runs were performed and the modeled concentrations were compared against the averaging period for the specific SIL. For any SIL that was exceeded, refined site wide modeling was be performed and the following modeled values were used to compare to the N/NMAAQS for each pollutant's design values. All SIL's are compared against the site's modeled High 1st High impact for any pollutant. For the CIA, the following modeled concentrations were evaluated according to EPA's modeling guidelines (based on daily 5 year averages):

1-Hour NO_2: High 8th High which is representative of 98th percentile per EPA's guidance.
Annual NO_2: High 1st High
PM_{10} 24-Hour: The High 2nd High
$PM_{2.5}$ 24-Hour: The High 8th High
$PM_{2.5}$ Annual: High 1st High
SO_2 1-Hour: High 4th High
SO_2 3-Hour and 24-Hour: High 1st High (if required)
SO_2 Annual: High 1st High (if required)
CO 1-Hour and 8-Hour: High 1st High
H_2S 1-Hour: High 1st High

Background concentrations (see Table 2 below) as applicable or required and available for all required averaging periods and pollutants were applied for pollutants exceeding the SILs.

Table 2: New Mexico/National Ambient Air Quality Standards

Criteria Pollutant	Averaging Period	NAAQS ug/m³	NMAAQS ug/m³	Background Concentration ug/m³	Monitoring Station
NO_2	Annual	99.66	94.02	30.0	Del Norte HS
	1-hour	188.03	188	84.6	Del Norte HS
$PM_{2.5}$	Annual	12	---	7.8	South Valley Monitor
	24-hour	35	---	20	South Valley Monitor
PM_{10}	24-hour	150	150	35	South Valley Monitor
SO_2	Annual	80	52.4	0	N/A
	24-hour	365	261.9	0	N/A
	3-hour	1,309.3	---	0	N/A
	1-hour	196.4	---	13.1	Del Norte HS
CO	8-hour	10,303.6	9,960.1	1,450	South Valley Monitor
	1-hour	40,069.6	14,997.5	2,366	South Valley Monitor
H_2S	1-Hour	---	13.9	---	NA, the City of Albuquerque has no H_2S monitors

1-Hour and Annual NO_2 Modeling:

The Tier 2 approach using the Ambient Ratio Method 2 (ARM2) with default in-stack ratios (minimum 0.5 and maximum 0.9) for the site combustion sources plus background concentrations provided by the Air Quality Program, were used to convert total NO_x to NO_2.

Seasonal background concentrations for the 1-Hour NO_2 standard were included in the AERMOD model instead of adding the 1-Hour NO_2 background concentration. The seasonal 1-Hour NO_2 background data was provided by the Air Quality Program and is shown in Table 3 below.

Table 3: Seasonal 1-Hour NO_2 Background Concentrations (ug/m^3)

Hour	Winter	Spring	Summer	Fall
1	72.1	47.6	29.3	65.6
2	67.8	48.3	27.7	59.7
3	67.7	46	26.4	57.9
4	68.4	48.9	26.6	58.9
5	69.1	51.7	32.7	58
6	69.7	63.9	39.3	57.8
7	72.8	70.7	46.4	63.5
8	77.6	71.8	48.5	64.5
9	80	61.1	34.2	65.9
10	71.4	48	27.3	55
11	62	28.6	24.3	47.3
12	48.1	18.9	19.9	35.4
13	36.9	17.6	17	28.2
14	35.1	15.7	15.9	25.3
15	33.6	14.8	17.4	24.2
16	37.2	15.3	19.4	28
17	48.4	17.1	20.4	38
18	73	19.4	19.3	69.6
19	79.3	38.5	21.7	79.1
20	78.1	53.2	30.9	77.1
21	77.3	48	34.1	73.4
22	76.5	56.3	30.8	70.4
23	75	58.8	34.9	69.7
24	72.4	57.9	33.6	70.9

3.7 Surrounding Source Data

The following nearby neighboring sources with NO_x and SO_2 emissions were be included per the Air Quality Program's guidance. The source parameters and emission rates were provided by the Air Quality Program:

Table 4: Surrounding Sources to be included in the Model

Facility and Permit Number
Kinney Brick, Permit No. 0747-M1-RV1
PNM Rio Bravo Generating Station, Permit No. 0694-M2
Mountain States (AAI), Permit No. 3291-R1
Coronado Permit No. 1761 and 1515
Blackrock HMA Permit No. 1694-M3
PG Enterprises, Permit No. 1246-M1-RV1

Note: Kinney Brick facility data was modeled without hourly restriction even though they are only allowed to operate 8 hours per day, because the Kinney Brick permit allows them to operate during any hour of the day. The PNM Rio Bravo Generating Station (RBGS) is permitted to operate 7,320 hours per year when operated with natural gas and 1,440 hours per year when operated with fuel oil. The Water Authority modeled the PNM RBGS per its highest permitted hourly emission rates. RBGS can only operate with one fuel type at a time; therefore, the highest emission rate from either the natural gas or the fuel oil was chosen to be the modeled emission rate per pollutant.

No nearby sources are needed for particulate modeling due to particulate monitoring in the South Valley. For SO_2 modeling, only RBGS and Albuquerque Asphalt's Hot Mix Asphalt plant were included, per Air Quality Program's guidance.

Per NMED's air dispersion modeling guidance and per the AQP's latest guidance, surrounding source building parameters are not required to be included in modeling analyses and will therefore not be added to the model.

3.8 Decommissioned Facility

The South PTF, including the tall stack for its odor control system, located to the west of the administration building, has been decommissioned and is no longer in use. The Air Quality Program Enforcement Section (Mr. Mike McKinstry) issued a City of Albuquerque Environmental Health Department internal memo: "South PFT Decommission Determination". No emissions are emitted from these former sources.

3.9 Secondary Formation of $PM_{2.5}$

$PM_{2.5}$ secondary formation concentrations were estimated using the "Guidance on Development of Modeled Emission Rates for Precursors (MERPS) as a Tier 1 Demonstration Tool for Ozone and $PM_{2.5}$ under the PSD Permitting Program" by Richard a. Wayland, EPA, December 2, 2016, and as described in NMED's modeling guidance in Section 2.6.6 on page 25 of 83. The estimated concentrations (ug/m^3) were added to the modeled concentrations. Total NO_2 and SO_2 tpy will not include emergency generator annual emissions.

Method:

$PM_{2.5}$ Annual = ((NO_x emission rate (tpy)/3184) + (SO_2 emission rate (tpy) 2289)) x 0.2 ug/m^3

$PM_{2.5}$ 24-hr = ((NO_x emission rate (tpy)/1155) + (SO_2 emission rate (tpy)/225) x 1.2 ug/m^3

Uncontrolled Emissions:

$PM_{2.5}$ Annual = ((137.32 tpy NO_2/3184) + (19.86 tpy SO_2/2289)) x 0.2 ug/m^3 = 0.01 ug/m^3

$PM_{2.5}$ 24-hr = ((137.32 tpy NO_2/1155) + (19.86 tpy SO_2/225)) x 1.2 ug/m^3 = 0.25 ug/m^3

Controlled Emissions:

$PM_{2.5}$ Annual = ((62.67 tpy NO_2/3184) + (11.89 tpy SO_2/2289)) x 0.2 ug/m^3 = 0.005 ug/m^3

$PM_{2.5}$ 24-hr = ((62.67 tpy NO_2/1155) + (11.89 tpy SO_2/225)) x 1.2 ug/m^3 = 0.13 ug/m^3

3.10 Haul Road Emissions

Biosolids and screenings/grit are trucked off site six days a week. All haul roads are paved and total PM emissions are negligible. There are three truck routes with varying haul distances. Route 1 is 1.13 miles long, route 2 is 0.6 miles long and route 3 is 0.3 miles long.

Total estimated PM_{10} emission rates from haul roads: 0.05 lb/hr and 0.07 tpy
Total estimated $PM_{2.5}$ emission rates from haul roads: 0.01 lb/hr and 0.02 tpy

Spreading these rates out among the required number of volume sources results in individual emission rates that are less than 1/100th of a percent of the site's total PM emissions. Per the Air Quality Program's guidance, these negligible rates were not modeled as they would not impact the total site's PM modeling.

4.0 MODELING RESULTS

4.1 Modeling Results Discussion

This modeling analysis demonstrates that operation of the facility described in this report neither causes nor contributes to any exceedances of N/MNAAQS. This air quality analysis demonstrates compliance with applicable regulatory requirements. Tables 5 and 6 show a detailed summary of the modeled results compared to the applicable standards after the cogeneration engine emission controls are installed and operational. Tables 7 and 8 show a detailed summary of the modeled results compared to the applicable standards using Phase 1 of the engine control installation process which represents the worst-case uncontrolled scenario. During Phase 1, EU #27 will be taken completely off-line until the engine controls are in place and operational. Therefore, for this phase 1 model scenario, the emissions for EU #27 are the controlled emissions.

For both scenarios, the 1-hour NO_2 high 8th high modeled impact is mainly contributed by PG Enterprises. MAXDCONT Viewer and specific Source Groups within AERMOD were used to investigate potential modeled 1-hour NO_2 exceedances that show each source's contribution. These analyses show that the Water Utility Authority facility will not make a significant contribution to the modeled maximum ground level concentrations (GLC_{max}) or any potential exceedances inside PG Enterprises' property. Any potential exceedances in the 1-hour NO_2 model would not occur in ambient air. In other words, any exceedances inside the PG Enterprises property do not occur when PG Enterprises' own impacts are removed. The impacts of PG Enterprises' emissions cannot be held against anyone when those exceedances occur inside PG Enterprises' property. The same principle is true for Kinney Bricks' and Coronado's facilities.

4.2 Modeling File Names and Descriptions

The following is a list AERMOD model file names and descriptions for each:

1. **WUA_SWRP_Controlled_ROIs**
   This file includes the SWRP site specific controlled emission sources and all pollutants, except H_2S, without any background data and based on the short-term emission rates (lb/hr). Annual impacts were modeled in a separate model since the flares only operate 2160 hours per year. This model determined the ROI for each pollutants and averaging period.

2. **WUA_SWRP_Controlled_ROIs_LT**
   This file includes the controlled annual impacts for the SWRP sources only and the respective annual ROIs. Note that only the flares specific annual emission rate varies due to the annual operating hours restriction of 2160 hours. For all other sources, the controlled short-term emission rate (lb/hr) was modeled for the annual impacts.

3. **WUA_SWRP_Controlled_PM2.5_LT**
   This file includes the controlled annual $PM_{2.5}$ impacts for the SWRP sources. The flares annual emission rates are based on 2160 hours per year of operation. All other sources were

modeled based on the maximum short-term (lb/hr) emission rates. Background concentrations and secondary $PM_{2.5}$ formation concentrations were added to the modeled impacts for comparison against the N/NMAAQS. (Note that the model shows that all annual impacts are below any annual standard even if the maximum lb/hr for the flares are used for the annual impacts).

4. **WUA_SWRP_Controlled_PM2.5_ST**
   This file includes the controlled 24-hour $PM_{2.5}$ impacts for the SWRP sources. Background concentrations and secondary $PM_{2.5}$ formation concentrations were added to the modeled impacts for comparison against the N/NMAAQS.

5. **WUA_SWRP_Controlled_Surr_NO2_LT**
   This file includes the controlled annual NO_2 impacts for the SWRP and surrounding sources. The flares annual emission rates are based on 2160 hours per year of operation. All other sources were modeled based on the maximum short-term (lb/hr) emission rates. The annual NO_2 background concentration was added to the modeled impacts for comparison against the N/NMAAQS. (Note that the model shows that all annual impacts are below any annual standard even if the maximum lb/hr for the flares are used for the annual impacts).

6. **WUA_SWRP_Controlled_Surr_NO2_ST**
   This file includes the controlled 1-hour NO_2 impacts for the SWRP and surrounding sources. The seasonal 1-hour NO_2 background concentrations were added to the AERMOD model.

7. **WUA_SWRP_Controlled_Surr_SO2_ST**
   This file includes the controlled short term SO_2 impacts evaluation for the SWRP and surrounding sources. Background concentrations, where applicable, were added to each modeled averaging time for comparison against the N/NMAAQS.

8. **WUA_SWRP_H2S**
   This file includes the short-term hydrogen sulfide (H_2S) impacts evaluation for the SWRP sources.

9. **WUA_SWRP_Uncontrolled_ROIs**
   The same description applies as above with the exception that Phase 1 uncontrolled emission rates were used, including uncontrolled flare emissions for annual ROIs.

10. **WUA_SWRP_Uncontrolled_Phase 1_PM2.5_LT**
    The same description applies as above with the exception that Phase 1 uncontrolled emission rates were used.

11. **WUA_SWRP_Uncontrolled_Phase 1_PM2.5_ST**
    The same description applies as above with the exception that Phase 1 uncontrolled emission rates were used.

12. **WUA_SWRP_Uncontrolled_Phase 1_Surr_NO2_LT**
    The same description applies as above with the exception that Phase 1 uncontrolled emission rates were used.

13. **WUA_SWRP_Uncontrolled_Phase1_Surr_NO2_ST**
    The same description applies as above with the exception that Phase 1 uncontrolled emission rates were used.

14. **WUA_SWRP_Uncontrolled_Phase 1_Surr_SO2_ST**
    The same description applies as above with the exception that Phase 1 uncontrolled emission rates were used.

15. **WUA_SWRP_PG Enterprises_NO2_ST**
    This file includes a 1-hour NO_2 modeling analysis of PG Enterprises permitted NO2 emissions sources, showing that PG Enterprise's 1-hour NO2 impact within their property/fenceline exceeds the 1-hour NO2 standard. It shows that the impacts on PG Enterprise's property for other nearby sources, including the SWRP, are minimal. Therefore, air within the PG Enterprises' property line is not considered ambient air.

Table 5. Significant Impacts Level Analyses and ROI's - Controlled Emissions

Units	Criteria Pollutant	Averaging Period	Significance Level (ug/m^3)	NM/NAAQS (ug/m^3)	GLC$_{max}$ (ug/m^3)	GLC$_{max}$ < Significance Level? If Yes, NAAQS is met (ug/m^3)	ROI (m)
Site-wide	NO_2	1-hour	7.5	188	103.57	**No**	13,801
Site-wide	NO_2	Annual	1.0	94	5.88	**No**	796
Site-wide	$PM_{2.5}$	24-hour	1.2	35	4.56	**No**	484
Site-wide	$PM_{2.5}$	Annual	0.3	12	0.48	**No**	300
Site-wide	PM_{10}	24-hour	5.0	150	4.56	**Yes, no further analysis required**	0
Site-wide	CO	1-hour	2000	14,992	525.93	**Yes, no further analysis required**	0
Site-wide	CO	8-hour	500	9,957	134.87	**Yes, no further analysis required**	0
Site-wide	SO_2	1-hour	7.8	196.4	38.71	**No**	3,592
Site-wide	SO_2	3-hour	25.0	1,309	21.13	**Yes, no further analysis required**	0
Site-wide	SO_2	24-hour	5.0	261.9	5.70	**No**	300
Site-wide	SO_2	Annual	1.0	52.4	0.59	**Yes, no further analysis required**	0
Site-wide	H_2S	1-hour	1.0	13.9	9.17	**No**	642

Table 6. NM/NAAQS Analyses - Controlled Emissions

Units	Criteria Pollutant	Averaging Period	NM/NAAQS (ug/m^3)	GLC$_{max}$ (ug/m^3)	Background Concentration (ug/m^3)	Secondary Formation of PM$_{2.5}$ (ug/m^3)	GLC$_{max}$ incl. Background conc. (ug/m^3)	GLC$_{max}$ incl. Background conc. < NAAQS?	ROI (m)	Percent of Standard (%)	Location of GLC$_{max}$ UTM Coordinates (m)
Site-wide	NO_2	1-hour	188	185.64	Seasonal	--	185.64	**Yes**	13,801	98.7	349242 E, 3875428 N
Site-wide	NO_2	Annual	94	14.47	30.0	--	44.47	**Yes**	796	47.3	348542 E, 3875627 N
Site-wide	$PM_{2.5}$	24-hour	35	2.10	20.0	0.13	22.23	**Yes**	484	63.5	348145 E, 3875998 N
Site-wide	$PM_{2.5}$	Annual	12	0.48	7.80	0.005	8.29	**Yes**	300	69.1	348145 E, 3875998 N
Site-wide	SO_2	1-hour	196.4	87.86	13.10	--	100.96	**Yes**	3,592	51.4	349542 E, 3874928 N
Site-wide	SO_2	24-hour	261.9	49.21	--	--	49.21	**Yes**	300	18.8	349542 E, 3874928 N
Site-wide	H_2S	1-hour	13.9	9.17	--	--	9.17	**Yes**	642	65.9	348356 E, 3876406 N

Background Concentrations:

1-hour NO_2: Seasonal NO_2 background concentrations added to the model.

Annual NO_2: Monitored background concentrations added to the model (location: Del Norte High School).

24-hour and annual $PM_{2.5}$ background concentration added from the South Valley monitor.

1-Hour SO_2 background concentration added from Del Norte High School monitor.

Background concentrations provided by Mr. Jeff Stonesifer, Air Quality Program.

Note:

The 1-hour NO_2 high 8th high modeled impact of 185.64 ug/m^3 is mainly contributed by PG Enterprises with 184.91 ug/m^3 (including background) leaving 0.73 ug/m^3 contributed from surrounding sources, including the Water Utility Authority. A stand-alone model for the PG Enterprises site was created to make this determination. In addition, MAXDCONT Viewer was used to investigate potential modeled 1-hour NO_2 exceedances as well as specific Source Groups created in the model that show each source's contribution. These analyses show that the Water Utility Authority facility will not make a significant contribution to the modeled GLC$_{max}$ or any potential exceedances inside PG Enterprises property.

Any potential exceedances in the 1-hour NO_2 model would not occur in ambient air. In other words, any exceedances inside the PG Enterprises' property do not occur when PG Enterprises' own impacts are removed. The impacts of PG Enterprises' emissions cannot be held against anyone when those exceedances occur inside PG Enterprises' property. The same principle is true for Kinney Bricks' and Coronado's facilities.

Maximum Ground Level Concentration (GLC$_{max}$) modeled:

1-Hour NO_2: High 8th High which is representative of 98th percentile per EPA’s guidance (daily average over 5 years).

Annual NO_2: High 1st High average over 5 years

$PM_{2.5}$ 24-Hour: The High 8th High daily average over 5 years

$PM_{2.5}$ Annual: High 1st High average over 5 years

SO_2 1-Hour: High 4th High daily average over 5 years

SO_2 24-hour: High 1st High daily average over 5 years

H_2S 1-hour: High 1st High daily average over 5 years

Table 7. Significant Impacts Level Analyses and ROI's - Uncontrolled Emissions Phase 1

Phase 1 represents the worst case scenario during construction/installation of the engine controls, starting with controlling EU #27

Units	Criteria Pollutant	Averaging Period	Significance Level (ug/m^3)	NM/NAAQS (ug/m^3)	GLC$_{max}$ (ug/m^3)	GLC$_{max}$ < Significance Level? If Yes, NAAQS is met (ug/m^3)	ROI (m)
Site-wide Phase 1	NO_2	1-hour	7.5	188	129.80	**No**	16,633
Site-wide Phase 1	NO_2	Annual	1.0	94	8.36	**No**	1,291
Site-wide Phase 1	$PM_{2.5}$	24-hour	1.2	35	4.56	**No**	484
Site-wide Phase 1	$PM_{2.5}$	Annual	0.3	12	0.49	**No**	300
Site-wide Phase 1	PM_{10}	24-hour	5.0	150	4.56	**Yes, no further analysis required**	0
Site-wide Phase 1	CO	1-hour	2000	14,992	526.19	**Yes, no further analysis required**	0
Site-wide Phase 1	CO	8-hour	500	9,957	227.17	**Yes, no further analysis required**	0
Site-wide Phase 1	SO_2	1-hour	7.8	196.4	38.71	**No**	3,592
Site-wide Phase 1	SO_2	3-hour	25.0	1,309	21.13	**Yes, no further analysis required**	0
Site-wide Phase 1	SO_2	24-hour	5.0	261.9	5.70	**No**	300
Site-wide Phase 1	SO_2	Annual	1.0	52.4	0.61	**Yes, no further analysis required**	0

Note:

EU #27 is either out of service (during installation of controls) or conrolled.

Table 8. NM/NAAQS Analyses - Uncontrolled Emissions Phase 1: EU #27 (Caterpillar Engine #1 Controlled, EU #28, 29, and 30 Uncontrolled)

Phase 1 represents the worst case scenario during construction/installation of the engine controls, starting with controlling EU #27.

Units	Criteria Pollutant	Averaging Period	NM/NAAQS (ug/m^3)	GLC_{max} (ug/m^3)	Background Concentration (ug/m^3)	Secondary Formation of $PM_{2.5}$ (ug/m^3)	GLC_{max} incl. Background conc. (ug/m^3)	GLC_{max} incl. Background conc. < NAAQS?	ROI (m)	Percent of Standard (%)	Location of GLC_{max} UTM Coordinates (m)
Site-wide Phase 1	NO_2	1-hour	188	186.07	Seasonal	--	186.07	**Yes**	13,801	99.0	349242 E, 3875428 N
Site-wide Phase 1	NO_2	Annual	94	14.76	30.0	--	44.76	**Yes**	796	47.6	348489 E, 3875654 N
Site-wide Phase 1	$PM_{2.5}$	24-hour	35	2.10	20.0	0.25	22.35	**Yes**	484	63.8	348145 E, 3875998 N
Site-wide Phase 1	$PM_{2.5}$	Annual	12	0.49	7.80	0.01	8.30	**Yes**	300	69.2	348145 E, 3875998 N
Site-wide Phase 1	SO_2	1-hour	196.4	87.86	13.10	--	100.96	**Yes**	3,592	51.4	349542 E, 3874928 N
Site-wide Phase 1	SO_2	24-hour	261.9	49.21	--	--	49.21	**Yes**	300	18.8	349542 E, 3874928 N

Background Concentrations:

1-hour NO_2: Seasonal NO_2 background concentrations added to the model.

Annual NO_2: Monitored background concentrations added to the model (location: Del Norte High School).

24-hour and annual $PM_{2.5}$ background concentration added from the South Valley monitor.

1-Hour SO_2 background concentration added from Del Norte High School monitor.

Background concentrations provided by Mr. Jeff Stonesifer, Air Quality Program.

Notes:

The 1-hour NO_2 high 8th high modeled impact of 186.06 ug/m^3 is mainly contributed by PG Enterprises with 184.91 ug/m^3 (including backgroud) leaving 1.15 ug/m3 contributed from surrounding sources, including the Water Utility Authority.

Only three of the four cogen engines will be operated until controls are installed and operable.

MAXDCONT Viewer was used to investigate potential 1-hour NO_2 exceedances as well as specific Source Groups created in the model that show each source's contribution. These analyses show that the Water Utility Authority facility will not make a significant contribution to the modeled GLC_{max} or any potential exceedances inside PG Enterprises property.

Any potential exceedances in the 1-hour NO_2 model would not occur in ambient air. In other words, any exceedances inside the PG Enterprises property do not occur when PG Enterprises' own impacts are removed. The impacts of PG Enterprises' emissions cannot be held against anyone when those exceedances occur inside PG Enterprises' property. The same principle is true for Kinney Bricks' and Coronado's facilities.

Maximum Ground Level Concentration (GLC_{max}) modeled:

1-Hour NO_2: High 8th High which is representative of 98th percentile per EPA's guidance (daily average over 5 years).

Annual NO_2: High 1st High average over 5 years

$PM_{2.5}$ 24-Hour: The High 8th High daily average over 5 years

$PM_{2.5}$ Annual: High 1st High average over 5 years

SO_2 1-Hour: High 4th High daily average over 5 years

SO_2 24-hour: High 1st High daily average over 5 years

Attachment A

SWRP and Surrounding Source Parameters and Emission Rates Modeled

AERMOD Modeling Parameters

SWRP Point Sources and Controlled Emission Rates

EU No.	Stack Type	Source Description	UTM E	UTM N	Stack Height	Temperature	Exit Velocity	Stack Diameter	NO_2	NO_2	CO	SO_2	SO_2	$PM_{10}/PM_{2.5}$	$PM_{10}/PM_{2.5}$	H_2S
			(m)	(m)	(ft)	(F)	(fps)	(ft)	(lb/hr)	(tpy)	(lb/hr)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)
34	DEFAULT	Flare 1	348287.10	3876257.90	11.00	1832	65.6	4.64	2.4012	2.5900	10.9465	0.8056	0.8700	0.3899	0.3900	0.0087
35	DEFAULT	Flare 2	348290.01	3876259.39	11.00	1832	65.6	4.64	2.4012	2.5900	10.9465	0.8056	0.8700	0.3899	0.3900	0.0087
36	DEFAULT	Flare 3	348289.96	3876254.88	11.00	1832	65.6	4.64	2.4012	2.5900	10.9465	0.8056	0.8700	0.3899	0.3900	0.0087
27	DEFAULT	Cogen Engine 1	348125.50	3876097.99	40.00	656	68.5	2.08	2.5480	11.1600	3.9360	0.8000	3.5000	0.2018	0.8800	--
28	DEFAULT	Cogen Engine 2	348125.56	3876090.09	40.00	509	65.8	2.08	1.9110	8.3700	3.3600	0.1600	0.7000	0.2018	0.8800	--
29	DEFAULT	Cogen Engine 3	348094.85	3876039.20	44.00	695	180.8	1.08	3.5655	15.6200	3.4927	0.9000	3.9400	0.1235	0.5400	--
30	DEFAULT	Cogen Engine 4	348096.84	3876039.20	44.00	682	183.3	1.08	3.1360	13.7400	1.9440	0.2500	1.1000	0.1430	0.6300	--
31	RAINCAP	Cogen Boiler	348125.14	3876051.59	29.67	250	40.0	1.67	1.2307	5.3874	1.0338	0.0074	0.0300	0.0935	0.4100	--
43	RAINCAP	HOTSY (SDF)	347998.14	3876522.73	43.00	460	13.3	1.00	0.0706	0.3066	0.0593	0.0004	0.0020	0.0054	0.0200	--
44	RAINCAP	HOTSY (DAF/RDT)	348097.10	3876142.52	28.75	460	2.1	1.40	0.0706	0.3066	0.0593	0.0004	0.0020	0.0054	0.0200	--
5	DEFAULT	Primary Clarifier #2	348139.00	3876325.91	9.10	ambient (0 K)	35.0	2.00	--	--	--	--	--	--	--	8.0000E-04
2	DEFAULT	Preliminary Treatment	348337.19	3876485.01	9.40	ambient (0 K)	47.2	1.00	--	--	--	--	--	--	--	2.0000E-06
1N	DEFAULT	North Stack EU 1	348424.30	3876615.39	9.10	ambient (0 K)	35.0	2.00	--	--	--	--	--	--	--	1.5000E-06
45	DEFAULT	Tijeras Canyon Interceptor	348347.03	3876396.73	9.10	ambient (0 K)	35.0	2.00	--	--	--	--	--	--	--	3.9000E-03
46	DEFAULT	South Blower Building	348071.06	3876075.08	8.83	ambient (0 K)	46.2	0.83	--	--	--	--	--	--	--	5.8000E-03
47	HORIZONTAL	South Activated Sludge Pump Station	348067.31	3875997.03	4.50	ambient (0 K)	1.9	12.70	--	--	--	--	--	--	--	1.9000E-04
48	DEFAULT	Sludge Blending Tank	348185.29	3876198.82	14.00	ambient (0 K)	14.2	1.50	--	--	--	--	--	--	--	6.0000E-04
1S	DEFAULT	South Stack EU 1	348424.33	3876606.05	9.10	ambient (0 K)	35.0	2.00	--	--	--	--	--	--	--	1.5000E-06
6	DEFAULT	Primary Clarifier #4	348137.37	3876238.08	9.10	ambient (0 K)	35.0	2.00	--	--	--	--	--	--	--	8.0000E-04

SWRP Point Sources and Unontrolled Phase I Project Emission Rates

EU No.	Stack Type	Source Description	UTM E	UTM N	Stack Height	Temperature	Exit Velocity	Stack Diameter	NO_2	NO_2	CO	SO_2	SO_2	$PM_{10}/PM_{2.5}$	$PM_{10}/PM_{2.5}$
			(m)	(m)	(ft)	(F)	(fps)	(ft)	(lb/hr)	(tpy)	(lb/hr)	(lb/hr)	(tpy)	(lb/hr)	(tpy)
34	DEFAULT	Flare 1	348287.10	3876257.90	11.00	1832	65.62	4.64	2.4012	2.5900	10.9500	0.8100	3.5478	0.3900	0.4200
35	DEFAULT	Flare 2	348290.01	3876259.39	11.00	1832	65.62	4.64	2.4012	2.5900	10.9500	0.8100	3.5478	0.3900	0.4200
36	DEFAULT	Flare 3	348289.96	3876254.88	11.00	1832	65.62	4.64	2.4012	2.5900	10.9500	0.8100	3.5478	0.3900	0.4200
27	DEFAULT	Cogen Engine 1	348125.50	3876097.99	40.00	656	68.50	2.08	2.5480	11.1690	3.9400	0.8000	3.5040	0.2000	0.8760
28	DEFAULT	Cogen Engine 2	348125.56	3876090.09	40.00	509	65.80	2.08	3.9000	17.0800	14.0000	0.1600	0.7008	0.2000	0.8760
29	DEFAULT	Cogen Engine 3	348094.85	3876039.20	44.00	695	180.80	1.08	7.2800	31.8700	14.5500	0.9000	3.9420	0.1200	0.5400
30	DEFAULT	Cogen Engine 4	348096.84	3876039.20	44.00	682	183.30	1.08	6.4000	28.0300	8.1000	0.2500	1.0950	0.1400	0.6300
31	RAINCAP	Cogen Boiler	348125.14	3876051.59	29.67	250	40.00	1.67	1.2300	5.3874	1.0300	0.0100	0.3200	0.0900	0.4100
43	RAINCAP	HOTSY (SDF)	347998.14	3876522.73	43.00	460	13.30	1.00	0.0700	0.3066	0.0600	0.0004	0.0020	0.0100	0.0200
44	RAINCAP	HOTSY (DAF/RDT)	348097.10	3876142.52	28.75	460	2.12	1.40	0.0700	0.3066	0.0600	0.0004	0.0020	0.0100	0.0200

SWRP Volume Sources and Controlled Emission Rates

EU No.	Source Type	Source Description	UTM E	UTM N	Release Height	Initial Horizontal Dimension	Initial Vertical Dimension	H_2S
			(m)	(m)	(ft)	(ft)	(ft)	(lb/hr)
2	Volume	North Bohn Biofilter	348324.00	3876606.00	2.5	13.02	2.33	1.00E-05
2	Volume	South Bohn Biofilter	348291.00	3876490.00	2.5	10.70	2.33	3.00E-06
7-10	Volume	Primary Clarifiers 5-8 Bohn Biofilter	348066.00	3876465.00	2.5	14.42	2.33	8.00E-03
49	Volume	Sludge Dewatering Facility - Bohn Biofilter	348063.00	3876502.00	2.5	14.42	2.33	2.00E-05
3	Circular Area	Holding Tank #1	348123.39	3876344.53	0	Radius = 60 ft	--	1.00E-06
4	Circular Area	Holding Tank #3	348122.38	3876256.50	0	Radius = 60 ft	--	1.00E-06

Change in Emissions due to this Permit Revision Application (Not including Emergency Generators and Paved Haul Roads)

Proposed Controlled Emissions														
EU	Former EU#	Name	NOx		CO		SO2		PM10		PM2.5		H2S	
			lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
1	-	Coarse Screening Facility at Valley Interceptor	--	--	--	--	--	--	--	--	--	--	3.34E-06	1.46E-05
2	1	North Prelim Trt Facility (Screenings & Grit Removal)	--	--	--	--	--	--	--	--	--	--	1.18E-05	5.16E-05
3-4	3, 5	Primary Clarifier Holding Tanks #1 and #3	--	--	--	--	--	--	--	--	--	--	2.15E-06	9.41E-06
5-6	4, 6	Primary Clarifiers #2 and #4	--	--	--	--	--	--	--	--	--	--	1.56E-03	6.84E-03
7-10	7-10	Primary Clarifiers #5-8	--	--	--	--	--	--	--	--	--	--	8.28E-03	3.63E-02
11a-14b	11a-14b	Activated Sludge Group#11a-11f12a-12d13a-13b12a-14b	--	--	--	--	--	--	--	--	--	--	--	--
15-26	15-26	Final Clarifiers #1-12	--	--	--	--	--	--	--	--	--	--	--	--
27	27	Cogeneration Engine #1	2.55	11.16	3.94	17.24	0.80	3.50	0.20	0.88	0.20	0.88	--	--
28	28	Cogeneration Engine #2	1.91	8.37	3.36	14.72	0.16	0.70	0.20	0.88	0.20	0.88	--	--
29	29	Cogeneration Engine #3	3.57	15.62	3.49	15.30	0.90	3.94	0.12	0.54	0.12	0.54	--	--
30	30	Cogeneration Engine #4	3.14	13.74	1.90	8.30	0.25	1.10	0.14	0.63	0.14	0.63	--	--
31	31	Cogeneration Boiler	1.23	5.39	1.03	4.53	0.01	0.03	0.09	0.41	0.09	0.41	--	--
32	62	Secondary Sludge Thickening (DAF/RDT)	--	--	--	--	--	--	--	--	--	--	--	--
33	67	Unleaded Gas Fuel Tank	--	--	--	--	--	--	--	--	--	--	--	--
34-36	70-72	Gas Flare #1, #2, #3	7.21	7.78	32.85	35.47	2.42	2.61	1.17	1.26	1.17	1.26	0.03	0.03
43	-	Dewatering Bldg. "HOTSY"	0.07	0.31	0.06	0.26	0.00	0.00	0.01	0.02	0.01	0.02	--	--
44	-	DAF/RDT Bldg. "HOTSY"	0.07	0.31	0.06	0.26	0.00	0.00	0.01	0.02	0.01	0.02	--	--
45	-	Tijeras Canyon Interceptor Carbon System	--	--	--	--	--	--	--	--	--	--	0.004	0.02
46	-	South Blower Building Carbon System	--	--	--	--	--	--	--	--	--	--	0.01	0.03
47	-	South Activated Sludge Pump Station Carbon System	--	--	--	--	--	--	--	--	--	--	0.0002	0.001
48	-	Sludge Blending Tank Carbon System	--	--	--	--	--	--	--	--	--	--	0.001	0.003
49	-	Sludge Dewatering Facility Bohn Biofilter	--	--	--	--	--	--	--	--	--	--	0.00002	0.0001

Former EU# refers to the numbering listed in ATC 786-M3

Currently Permitted Emissions														
EU	Former EU#	Name	NOx		CO		SO2		PM10		PM2.5		H2S	
			lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
1	-	Coarse Screening Facility at Valley Interceptor	--	--	--	--	--	--	--	--	--	--	0.00	0.00
2	1	North Prelim Trt Facility (Screenings & Grit Removal)	--	--	--	--	--	--	--	--	--	--	1.00E-04	4.50E-04
3-4	3, 5	Primary Clarifier Holding Tanks #1 and #3	--	--	--	--	--	--	--	--	--	--	5.33E-04	2.33E-03
5-6	4, 6	Primary Clarifiers #2 and #4	--	--	--	--	--	--	--	--	--	--	5.33E-04	2.33E-03
7-10	7-10	Primary Clarifiers #5-8	--	--	--	--	--	--	--	--	--	--	5.33E-04	2.33E-03
11a-14b	11a-14b	Activated Sludge Group#11a-11f12a-12d13a-13b12a-14b	--	--	--	--	--	--	--	--	--	--	--	--
15-26	15-26	Final Clarifiers #1-12	--	--	--	--	--	--	--	--	--	--	--	--
27	27	Cogeneration Engine #1	6.60	28.90	20.60	90.20	11.40	49.90	0.36	1.60	0.36	1.60	--	--
28	28	Cogeneration Engine #2	6.60	28.90	20.60	90.20	11.40	49.90	0.36	1.60	0.36	1.60	--	--
29	29	Cogeneration Engine #3	7.28	31.90	9.60	42.10	2.30	10.10	0.29	1.29	0.29	1.29	--	--
30	30	Cogeneration Engine #4	12.60	55.20	9.60	42.10	2.30	10.10	0.29	1.29	0.29	1.29	--	--
31	31	Cogeneration Boiler	1.23	5.37	1.03	4.50	0.01	0.03	0.09	0.41	0.09	0.41	--	--
32	62	Secondary Sludge Thickening (DAF/RDT)	--	--	--	--	--	--	--	--	--	--	--	--
33	67	Unleaded Gas Fuel Tank	--	--	--	--	--	--	--	--	--	--	--	--
34-36	70-72	Gas Flare #1, #2, #3	2.28	9.90	12.30	54.30	0.90	3.90	0.39	0.09	0.39	0.09	0.01	0.04
43	-	Dewatering Bldg. "HOTSY"	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	--
44	-	DAF/RDT Bldg. "HOTSY"	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	--
45	-	Tijeras Canyon Interceptor Carbon System	--	--	--	--	--	--	--	--	--	--	0.00	0.00
46	-	South Blower Building Carbon System	--	--	--	--	--	--	--	--	--	--	0.00	0.00
47	-	South Activated Sludge Pump Station Carbon System	--	--	--	--	--	--	--	--	--	--	0.00	0.00
48	-	Sludge Blending Tank Carbon System	--	--	--	--	--	--	--	--	--	--	0.00	0.00
49	-	Sludge Dewatering Facility Bohn Biofilter	--	--	--	--	--	--	--	--	--	--	0.00	0.00

Former EU# refers to the numbering listed in ATC 786-M3

Proposed Change in Emissions														
EU	Former EU#	Name	NOx		CO		SO2		PM10		PM2.5		H2S	
			lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
1	-	Coarse Screening Facility at Valley Interceptor	--	--	--	--	--	--	--	--	--	--	3.34E-06	1.46E-05
2	1	North Prelim Trt Facility (Screenings & Grit Removal)	--	--	--	--	--	--	--	--	--	--	-8.82E-05	-3.98E-04
3-4	3, 5	Primary Clarifier Holding Tanks #1 and #3	--	--	--	--	--	--	--	--	--	--	-5.31E-04	-2.32E-03
5-6	4, 6	Primary Clarifiers #2 and #4	--	--	--	--	--	--	--	--	--	--	1.03E-03	4.51E-03
7-10	7-10	Primary Clarifiers #5-8	--	--	--	--	--	--	--	--	--	--	7.75E-03	3.39E-02
11a-14b	11a-14b	Activated Sludge Group#11a-11f12a-12d13a-13b12a-14b	--	--	--	--	--	--	--	--	--	--	--	--
15-26	15-26	Final Clarifiers #1-12	--	--	--	--	--	--	--	--	--	--	--	--
27	27	Cogeneration Engine #1	-4.05	-17.74	-16.66	-72.96	-10.60	-46.40	-0.16	-0.72	-0.16	-0.72	--	--
28	28	Cogeneration Engine #2	-4.69	-20.53	-17.24	-75.48	-11.24	-49.20	-0.16	-0.72	-0.16	-0.72	--	--
29	29	Cogeneration Engine #3	-3.71	-16.28	-6.11	-26.80	-1.40	-6.16	-0.17	-0.75	-0.17	-0.75	--	--
30	30	Cogeneration Engine #4	-9.46	-41.46	-7.70	-33.80	-2.05	-9.01	-0.15	-0.66	-0.15	-0.66	--	--
31	31	Cogeneration Boiler	0.00	0.02	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	--	--
32	62	Secondary Sludge Thickening (DAF/RDT)	--	--	--	--	--	--	--	--	--	--	--	--
33	67	Unleaded Gas Fuel Tank	--	--	--	--	--	--	--	--	--	--	--	--
34-36	70-72	Gas Flare #1, #2, #3	4.93	-2.12	20.55	-18.83	1.52	-1.29	0.78	1.17	0.78	1.17	0.017	-0.014
43	-	Dewatering Bldg. "HOTSY"	0.07	0.31	0.06	0.26	0.00	0.00	0.01	0.02	0.01	0.02	--	--
44	-	DAF/RDT Bldg. "HOTSY"	0.07	0.31	0.06	0.26	0.00	0.00	0.01	0.02	0.01	0.02	--	--
45	-	Tijeras Canyon Interceptor Carbon System	--	--	--	--	--	--	--	--	--	--	0.004	0.017
46	-	South Blower Building Carbon System	--	--	--	--	--	--	--	--	--	--	0.006	0.025
47	-	South Activated Sludge Pump Station Carbon System	--	--	--	--	--	--	--	--	--	--	0.0002	0.001
48	-	Sludge Blending Tank Carbon System	--	--	--	--	--	--	--	--	--	--	0.001	0.003
49	-	Sludge Dewatering Facility Bohn Biofilter	--	--	--	--	--	--	--	--	--	--	0.00002	0.0001
		TOTAL	-16.85	-97.50	-27.05	-227.32	-23.77	-112.04	0.16	-1.62	0.16	-1.62	0.04	6.8E-02

Former EU# refers to the numbering listed in ATC 786-M3

AERMOD Surrounding Sources Modeling Parameters

EU No.	Stack Type	Source Description	UTM E	UTM N	Stack Height	Temperature	Exit Velocity	Stack Diameter	NO_2	NO_2	SO_2	SO_2
			(m)	(m)	(ft)	(F)	(fps)	(ft)	(lb/hr)	(tpy)	(lb/hr)	(tpy)
KIN1	HORIZONTAL	Kinney Brick, Permit #0747-M1-RV1	348500.76	3875689.57	2.23	165	1.00	4.47	0.46	2.01	--	--
KIN2	DEFAULT		348545.35	3875652.01	11.00	600	3.00	5.00	0.87	3.81	--	--
KIN3	DEFAULT		348562.00	3875710.00	30.00	600	3.00	4.50	1.50	6.57	--	--
RBGS	DEFAULT	PNM Rio Bravo Generating Station Permit #0694-M2	350169.64	3877287.72	50.00	1081	98.30	17.00	288.10	1261.88	84.80	371.42
HMASTK	DEFAULT	Albuquerque Asphalt, Permit #3291-R1	349735.30	3874957.00	30.00	200	82.50	4.23	22.00	96.36	23.20	101.62
HMAHEAT1	RAINCAP		349745.00	3874940.60	14.00	600	20.70	1.00	0.39	1.71	0.14	0.61
GEN	DEFAULT		349668.80	3875016.90	15.00	892	220.90	0.67	13.71	60.05	0.26	1.14
BPBM	DEFAULT	Blackrock HMA, Permit #1694-M3	348589.50	3874438.60	27.00	250	64.25	3.40	5.00	21.90	--	--
BRAH	DEFAULT		348608.10	3874451.70	8.00	250	50.00	0.83	0.29	1.27	--	--
PGSCRENG	DEFAULT	PG Enterprises, Permit #1246-M1	349124.00	3875449.00	12.00	1004	318.60	0.33	6.45	28.24	--	--
PGCRHENG	DEFAULT		349115.00	3875456.00	12.00	968	417.70	0.33	9.02	39.51	--	--
AGGGEN	HORIZONTAL	Coronado, Permit #1761 and #1515	350088.80	3876136.70	13.00	697	105.00	0.50	14.00	61.32	--	--
GEN1	DEFAULT		350250.00	3876105.00	18.00	983	289.00	0.25	3.12	13.67	--	--
GEN2	DEFAULT		350265.00	3876103.00	13.50	750	100.00	0.42	9.30	40.73	--	--

Note:

Surrounding Source Data provided by Albuquerque Air Quality Program, Mr. Jeff Stonesifer (7/14/2020 and confirmed accurate on October 16, 2020)

No nearby sources are needed for particulate modeling due to particulate monitoring in the South Valley.

For SO_2 modeling, only RBGS and Albuquerque Asphalt’s Hot Mix Asphalt plant will be included, per Air Quality Program’s most recent guidance.

From: Tumpane, Kyle
To: mschluep@alliantenv.com; leder S. Charles; Stonesifer, Jeff W.
Subject: RE: SWRP odor control devices; Bohn Biofilters
Date: Tuesday, July 14, 2020 10:50:19 AM
Attachments: image001.png
image002.png
image003.png
nearby srcs with updated Kinney Brick.xlsx

Martin,
As a follow-up to our phone conversation, here is the information you need to start modeling.

A release height of 2.5 ft for all four biofilters.
An initial vertical dimension of 2.33 ft for all four biofilters based on 5 ft of elevation above surrounding grade (5/2.15).
You confirmed that the measurements of the gravel area for each biofilter are based on site measurements, confirmed with Google Earth for the two that exist in the available imagery.

I have also attached the updated version of the surrounding sources document with stack parameters and locations based on information provided by Kinney Brick. I confirmed with Jeff that we are going to go with the location provided by Kinney for the existing Kiln stack.

Let us know if you have any questions. We will look for the modeling and application submittal.

Thank you,
Kyle

ONE ALBUQUERQUE environmental health

KYLE TUMPANE
environmental health scientist | environmental health department
o 505.768.2872
cabq.gov/environmentalhealth/

From: mschluep@alliantenv.com <mschluep@alliantenv.com>
Sent: Monday, July 13, 2020 8:15 AM
To: leder S. Charles <cleder@abcwua.org>; Stonesifer, Jeff W. <JStonesifer@cabq.gov>; Tumpane, Kyle <ktumpane@cabq.gov>
Subject: RE: SWRP odor control devices; Bohn Biofilters

Jeff/Kyle,

Please let me know what release height and initial vertical dimension you would like me to use for the biofilter volume sources.

When you get a chance, please send me the revised stack locations/coordinates for the Kinney Brick facility.

Field Data
Method 2 Data

Location ABCWUA

Source Unit 27

Project No. 2020-0005

Run No.	**1**		**2**		**3**	
Date	1/11/20		1/11/20		1/11/20	
Status	VALID		VALID		VALID	
Start Time	9:42		10:45		12:10	
Stop Time	9:52		10:55		12:18	
Leak Check	Pass		Pass		Pass	
Traverse Point	**Δ P (in. WC)**	**Ts (°F)**	**Δ P (in. WC)**	**Ts (°F)**	**Δ P (in. WC)**	**Ts (°F)**
A-1	0.59	647	0.61	647	0.59	648
2	0.61	648	0.64	647	0.61	649
3	0.62	649	0.65	648	0.62	648
4	0.63	648	0.62	646	0.64	647
5	0.64	648	0.63	646	0.64	647
6	0.63	649	0.63	648	0.65	647
7	0.61	649	0.65	647	0.63	648
8	0.58	649	0.65	647	0.61	648
B-1	0.63	648	0.64	644	0.60	648
2	0.64	648	0.61	645	0.59	647
3	0.62	649	0.62	645	0.62	647
4	0.63	648	0.65	646	0.63	647
5	0.62	647	0.66	648	0.64	647
6	0.61	648	0.62	647	0.60	648
7	0.60	648	0.60	647	0.58	648
8	0.57	648	0.59	645	0.57	647

					Average
Square Root of ΔP, (in. WC)$^{1/2}$	**$(\Delta P)^{1/2}$**	0.78	0.79	0.78	0.79
Average ΔP, in. WC	**(ΔP)**	0.61	0.63	0.61	0.62
Pitot Tube Coefficient	**(Cp)**	0.81	0.81	0.81	0.81
Barometric Pressure, in. Hg	**(Pb)**	25.2	25.2	25.2	25.2
Static Pressure, in. WC	**(Pg)**	0.59	0.59	0.59	0.59
Stack Pressure, in. Hg	**(Ps)**	25.3	25.3	25.3	25.3
Average Temperature, °F	**(Ts)**	648.2	646.4	647.6	647.4
Average Temperature, °R	**(Ts)**	1108.2	1106.4	1107.6	1107.4
Measured Moisture Fraction	**(BWSmsd)**	0.095	0.095	0.095	0.095
Moisture Fraction @ Saturation	**(BWSsat)**	150.2	148.6	149.6	149.5
Moisture Fraction	**(BWS)**	0.095	0.095	0.095	0.095
O2 Concentration, %	**(O2)**	11.6	11.7	11.7	11.7
CO2 Concentration, %	**(CO2)**	5.3	5.3	5.3	5.3
Molecuar Weight, lb/lb-mole (dry)	**(Md)**	29.3	29.3	29.3	29.3
Molecuar Weight, lb/lb-mole (wet)	**(Ms)**	28.2	28.2	28.2	28.2
Velocity, ft/sec	**(Vs)**	68.0	68.7	67.9	68.2
VFR at stack conditions, acfm	**(Qa)**	13,902	14,060	13,890	13,951
VFR at standard conditions, scfh	**(Qsw)**	335,567	339,920	335,463	336,983
VFR at standard conditions, scfm	**(Qsw)**	5,593	5,665	5,591	5,616
VFR at standard conditions, dscfm	**(Qsd)**	5,063	5,126	5,061	5,083

Field Data
Method 2 Data

Location ABCWUA - Southside Water Reclamation Plant

Source Unit 27 (digestor)

Project No. 2020-0005

Run No.	**1**		**2**		**3**	
Date	1/11/20		1/11/20		1/11/20	
Status	VALID		VALID		VALID	
Start Time	14:02		15:30		16:35	
Stop Time	14:15		15:38		16:43	
Leak Check	Pass		Pass		Pass	
Traverse Point	**Δ P (in. WC)**	**Ts (°F)**	**Δ P (in. WC)**	**Ts (°F)**	**Δ P (in. WC)**	**Ts (°F)**
A-1	0.61	662	0.64	663	0.62	664
2	0.62	665	0.62	662	0.63	664
3	0.64	665	0.62	665	0.63	664
4	0.63	666	0.63	665	0.61	665
5	0.65	664	0.64	666	0.61	666
6	0.62	664	0.66	666	0.62	665
7	0.60	662	0.65	667	0.59	665
8	0.58	665	0.62	665	0.60	662
B-1	0.59	664	0.60	664	0.63	663
2	0.61	662	0.61	664	0.65	664
3	0.62	662	0.59	664	0.65	665
4	0.63	665	0.63	663	0.62	662
5	0.64	663	0.61	663	0.62	662
6	0.65	663	0.61	662	0.61	665
7	0.62	663	0.62	663	0.61	665
8	0.61	662	0.62	663	0.60	663

			.		**Average**
Square Root of ΔP, (in. WC)$^{1/2}$	**$(\Delta P)^{1/2}$**	0.79	0.79	0.79	0.79
Average ΔP, in. WC	**(ΔP)**	0.62	0.62	0.62	0.62
Pitot Tube Coefficient	**(Cp)**	0.81	0.81	0.81	0.81
Barometric Pressure, in. Hg	**(Pb)**	25	25	25	25
Static Pressure, in. WC	**(Pg)**	0.58	0.58	0.58	0.58
Stack Pressure, in. Hg	**(Ps)**	25.3	25.3	25.3	25.3
Average Temperature, °F	**(Ts)**	663.6	664.1	664.0	663.9
Average Temperature, °R	**(Ts)**	1123.6	1124.1	1124.0	1123.9
Measured Moisture Fraction	**(BWSmsd)**	0.098	0.096	0.102	0.099
Moisture Fraction @ Saturation	**(BWSsat)**	165.4	165.9	165.8	165.7
Moisture Fraction	**(BWS)**	0.098	0.096	0.10	0.099
O2 Concentration, %	**(O2)**	11.2	11.2	11.2	11.2
CO2 Concentration, %	**(CO2)**	6.3	6.3	6.3	6.3
Molecuar Weight, lb/lb-mole (dry)	**(Md)**	29.5	29.5	29.5	29.5
Molecuar Weight, lb/lb-mole (wet)	**(Ms)**	28.3	28.4	28.3	28.3
Velocity, ft/sec	**(Vs)**	68.6	68.8	68.6	68.7
VFR at stack conditions, acfm	**(Qa)**	14,039	14,073	14,041	14,051
VFR at standard conditions, scfh	**(Qsw)**	334,214	334,889	334,132	334,412
VFR at standard conditions, scfm	**(Qsw)**	5,570	5,581	5,569	5,574
VFR at standard conditions, dscfm	**(Qsd)**	5,026	5,045	5,000	5,024

Field Data
Method 2 Data

Location Albuquerque Bernalillo County Water Utility - Southside Water Reclamation Plant
Source Unit 28
Project No. 2020-0005

Run No.	**1**		**2**		**3**	
Date	1/10/20		1/10/20		1/10/20	
Status	VALID		VALID		VALID	
Start Time	10:00		11:15		12:30	
Stop Time	10:11		11:23		12:15	
Leak Check	Pass		Pass		Pass	
Traverse Point	**Δ P (in. WC)**	**Ts (°F)**	**Δ P (in. WC)**	**Ts (°F)**	**Δ P (in. WC)**	**Ts (°F)**
A-1	0.63	515	0.61	512	0.61	512
2	0.61	515	0.61	512	0.66	513
3	0.62	513	0.62	513	0.67	513
4	0.65	513	0.66	513	0.64	513
5	0.62	516	0.65	514	0.66	514
6	0.62	516	0.65	516	0.68	514
7	0.63	514	0.63	516	0.65	514
8	0.63	512	0.62	514	0.64	515
B-1	0.65	513	0.63	514	0.63	516
2	0.62	513	0.63	512	0.64	516
3	0.62	516	0.61	511	0.67	514
4	0.60	516	0.64	512	0.68	514
5	0.62	515	0.64	513	0.65	514
6	0.63	515	0.62	513	0.64	514
7	0.62	512	0.62	514	0.63	513
8	0.62	513	0.63	514	0.60	512

					Average
Square Root of ΔP, (in. WC)$^{1/2}$	**(ΔP)$^{1/2}$**	0.79	0.79	0.80	0.80
Average ΔP, in. WC	**(ΔP)**	0.62	0.63	0.65	0.63
Pitot Tube Coefficient	**(Cp)**	0.81	0.81	0.81	0.81
Barometric Pressure, in. Hg	**(Pb)**	25	25	25	25
Static Pressure, in. WC	**(Pg)**	0.50	0.50	0.50	0.50
Stack Pressure, in. Hg	**(Ps)**	25.1	25.1	25.1	25.1
Average Temperature, °F	**(Ts)**	514.2	513.3	513.8	513.8
Average Temperature, °R	**(Ts)**	974.2	973.3	973.8	973.8
Measured Moisture Fraction	**(BWSmsd)**	0.116	0.141	0.110	0.122
Moisture Fraction @ Saturation	**(BWSsat)**	56.9	56.5	56.7	56.7
Moisture Fraction	**(BWS)**	0.116	0.141	0.110	0.122
O2 Concentration, %	**(O2)**	11.6	11.6	11.6	11.6
CO2 Concentration, %	**(CO2)**	5.4	5.4	5.4	5.4
Molecuar Weight, lb/lb-mole (dry)	**(Md)**	29.3	29.3	29.3	29.3
Molecuar Weight, lb/lb-mole (wet)	**(Ms)**	28.0	27.7	28.1	27.9
Velocity, ft/sec	**(Vs)**	64.8	65.3	65.8	65.3
VFR at stack conditions, acfm	**(Qa)**	13,247	13,362	13,464	13,358
VFR at standard conditions, scfh	**(Qsw)**	360,773	364,215	366,824	363,938
VFR at standard conditions, scfm	**(Qsw)**	6,013	6,070	6,114	6,066
VFR at standard conditions, dscfm	**(Qsd)**	5,318	5,217	5,443	5,326

Field Data
Method 2 Data

Location Albuquerque Bernalillo County Water Utility - Southside Water Reclamation Plant

Source Unit 28 (digester)

Project No. 2020-0005

Run No.	**1**		**2**		**3**	
Date	1/10/20		1/10/20		1/10/20	
Status	VALID		VALID		VALID	
Start Time	14:00		15:10		16:30	
Stop Time	14:12		15:20		16:42	
Leak Check	Pass		Pass		Pass	
Traverse Point	**Δ P (in. WC)**	**Ts (°F)**	**Δ P (in. WC)**	**Ts (°F)**	**Δ P (in. WC)**	**Ts (°F)**
A-1	0.66	518	0.67	515	0.65	512
2	0.65	517	0.68	514	0.65	16
3	0.68	518	0.69	514	0.68	516
4	0.69	517	0.70	512	0.67	518
5	0.69	517	0.72	513	0.63	517
6	0.67	518	0.68	516	0.66	515
7	0.68	518	0.67	515	0.65	514
8	0.70	518	0.66	518	0.65	512
B-1	0.64	517	0.64	518	0.63	512
2	0.65	519	0.67	514	0.67	514
3	0.68	518	0.69	515	0.68	516
4	0.69	518	0.68	515	0.64	515
5	0.70	517	0.67	512	0.68	515
6	0.72	517	0.66	512	0.65	517
7	0.64	517	0.64	513	0.66	513
8	0.63	516	0.65	513	0.66	513

					Average
Square Root of ΔP, (in. WC)$^{1/2}$	**(ΔP)$^{1/2}$**	0.82	0.82	0.81	0.82
Average ΔP, in. WC	**(ΔP)**	0.67	0.67	0.66	0.67
Pitot Tube Coefficient	**(Cp)**	0.81	0.81	0.81	0.81
Barometric Pressure, in. Hg	**(Pb)**	25.0	25.0	25.0	25.0
Static Pressure, in. WC	**(Pg)**	0.57	0.57	0.57	0.57
Stack Pressure, in. Hg	**(Ps)**	25.1	25.1	25.1	25.1
Average Temperature, °F	**(Ts)**	517.5	514.3	483.4	505.1
Average Temperature, °R	**(Ts)**	977.5	974.3	943.4	965.1
Measured Moisture Fraction	**(BWSmsd)**	0.098	0.10	0.098	0.098
Moisture Fraction @ Saturation	**(BWSsat)**	58.5	56.9	43.5	52.9
Moisture Fraction	**(BWS)**	0.098	0.10	0.098	0.098
O2 Concentration, %	**(O2)**	11.3	11.3	11.3	11.3
CO2 Concentration, %	**(CO2)**	6.2	6.2	6.2	6.2
Molecuar Weight, lb/lb-mole (dry)	**(Md)**	29.4	29.4	29.4	29.4
Molecuar Weight, lb/lb-mole (wet)	**(Ms)**	28.3	28.3	28.3	28.3
Velocity, ft/sec	**(Vs)**	67.0	66.9	65.0	66.3
VFR at stack conditions, acfm	**(Qa)**	13,701	13,684	13,297	13,561
VFR at standard conditions, scfh	**(Qsw)**	371,931	372,703	374,004	372,879
VFR at standard conditions, scfm	**(Qsw)**	6,199	6,212	6,233	6,215
VFR at standard conditions, dscfm	**(Qsd)**	5,592	5,592	5,625	5,603

Location Albuquerque Bernalillo County Water Utility - Southside Water Reclamation Plant
Source Unit 29
Project No. 2020-0005

Run No.	**1**	**2**	**3**
Date	1/13/20	1/13/20	1/13/20
Status	VALID	VALID	VALID
Start Time	9:30	10:48	11:55
Stop Time	9:42	10:58	12:05
Leak Check	Pass	Pass	Pass

Traverse Point	**Δ P (in. WC)**	**Ts (°F)**	**Δ P (in. WC)**	**Ts (°F)**	**Δ P (in. WC)**	**Ts (°F)**
A-1	4.60	676	4.60	676	4.50	674
2	4.50	674	4.50	675	4.50	674
3	4.50	676	4.50	675	4.20	674
4	4.40	675	4.20	676	4.10	675
5	4.30	675	4.20	674	4.20	675
6	4.20	675	4.20	674	4.30	675
7	4.10	674	4.00	674	4.00	675
8	3.80	674	4.10	675	4.10	676
B-1	4.60	675	4.30	675	4.50	674
2	4.40	675	4.50	675	4.20	672
3	4.30	676	4.10	676	4.10	671
4	4.20	676	4.30	675	4.10	671
5	4.10	675	4.30	674	4.00	675
6	4.00	675	4.00	674	4.10	673
7	3.80	674	4.10	675	3.80	674
8	3.70	674	4.10	675	4.00	675

					Average
Square Root of ΔP, (in. WC)$^{1/2}$	**(ΔP)$^{1/2}$**	2.1	2.1	2.0	2.1
Average ΔP, in. WC	**(ΔP)**	4.2	4.3	4.2	4.2
Pitot Tube Coefficient	**(Cp)**	0.81	0.81	0.81	0.81
Barometric Pressure, in. Hg	**(Pb)**	25	25	25	25
Static Pressure, in. WC	**(Pg)**	4.2	4.2	4.2	4.2
Stack Pressure, in. Hg	**(Ps)**	25.4	25.4	25.4	25.4
Average Temperature, °F	**(Ts)**	674.9	674.9	673.9	674.6
Average Temperature, °R	**(Ts)**	1134.9	1134.9	1133.9	1134.6
Measured Moisture Fraction	**(BWSmsd)**	0.094	0.097	0.096	0.096
Moisture Fraction @ Saturation	**(BWSsat)**	176.2	176.1	175.1	175.8
Moisture Fraction	**(BWS)**	0.094	0.097	0.096	0.096
O2 Concentration, %	**(O2)**	11.5	11.4	11.4	11.4
CO2 Concentration, %	**(CO2)**	5.4	5.4	5.5	5.4
Molecuar Weight, lb/lb-mole (dry)	**(Md)**	29.3	29.3	29.3	29.3
Molecuar Weight, lb/lb-mole (wet)	**(Ms)**	28.3	28.2	28.2	28.2
Velocity, ft/sec	**(Vs)**	179.6	180.4	178.5	179.5
VFR at stack conditions, acfm	**(Qa)**	9,931	9,977	9,872	9,927
VFR at standard conditions, scfh	**(Qsw)**	235,508	236,612	234,316	235,479
VFR at standard conditions, scfm	**(Qsw)**	3,925	3,944	3,905	3,925
VFR at standard conditions, dscfm	**(Qsd)**	3,556	3,561	3,531	3,549

Field Data
Method 2 Data

Location Albuquerque Bernalillo County Water Utility - Southside Water Reclamation Plant
Source Unit 29 (digester)
Project No. 2020-0005

Run No.	**1**		**2**		**3**	
Date	1/13/20		1/13/20		1/13/20	
Status	VALID		VALID		VALID	
Start Time	13:20		14:45		15:40	
Stop Time	13:30		14:55		15:50	
Leak Check	Pass		Pass		Pass	
Traverse Point	**Δ P (in. WC)**	**Ts (°F)**	**Δ P (in. WC)**	**Ts (°F)**	**Δ P (in. WC)**	**Ts (°F)**
A-1	4.30	715	4.50	718	4.40	716
2	4.20	716	4.50	716	4.60	718
3	4.20	718	4.50	716	4.50	718
4	4.50	718	4.20	716	4.20	718
5	4.60	715	4.30	715	4.20	715
6	4.60	715	4.10	714	4.10	715
7	4.20	714	4.10	714	4.00	716
8	4.30	714	4.20	714	4.40	715
B-1	4.30	715	4.50	715	4.60	718
2	4.00	715	4.50	715	4.00	714
3	4.10	712	4.20	715	4.10	715
4	4.20	715	4.30	713	4.20	716
5	4.20	714	4.30	713	4.30	714
6	4.20	714	4.20	715	4.30	714
7	4.10	716	4.10	714	4.00	715
8	4.00	714	4.00	712	3.80	715

					Average
Square Root of ΔP, (in. WC)$^{1/2}$	**(ΔP)$^{1/2}$**	2.1	2.1	2.1	2.1
Average ΔP, in. WC	**(ΔP)**	4.3	4.3	4.2	4.3
Pitot Tube Coefficient	**(Cp)**	0.81	0.81	0.81	0.81
Barometric Pressure, in. Hg	**(Pb)**	25	25	25	25
Static Pressure, in. WC	**(Pg)**	4.2	4.2	4.2	4.2
Stack Pressure, in. Hg	**(Ps)**	25.4	25.4	25.4	25.4
Average Temperature, °F	**(Ts)**	715.0	714.7	715.8	715.1
Average Temperature, °R	**(Ts)**	1175.0	1174.7	1175.8	1175.1
Measured Moisture Fraction	**(BWSmsd)**	0.098	0.099	0.098	0.098
Moisture Fraction @ Saturation	**(BWSsat)**	222.2	221.8	223.1	222.4
Moisture Fraction	**(BWS)**	0.098	0.099	0.098	0.098
O2 Concentration, %	**(O2)**	9.9	9.9	9.9	9.9
CO2 Concentration, %	**(CO2)**	9.5	9.4	9.5	9.5
Molecuar Weight, lb/lb-mole (dry)	**(Md)**	29.9	29.9	29.9	29.9
Molecuar Weight, lb/lb-mole (wet)	**(Ms)**	28.7	28.7	28.7	28.7
Velocity, ft/sec	**(Vs)**	181.9	182.6	181.5	182.0
VFR at stack conditions, acfm	**(Qa)**	10,059	10,099	10,039	10,066
VFR at standard conditions, scfh	**(Qsw)**	230,416	231,378	229,794	230,529
VFR at standard conditions, scfm	**(Qsw)**	3,840	3,856	3,830	3,842
VFR at standard conditions, dscfm	**(Qsd)**	3,463	3,475	3,454	3,464

Field Data
Method 2 Data

Location Albuquerque Bernalillo County Water Utility - Southside Water Reclamation Plant
Source Unit 30
Project No. 2020-0005

Run No.	1	2	3
Date	1/12/20	1/12/20	1/12/20
Status	VALID	VALID	VALID
Start Time	9:55	11:00	12:20
Stop Time	10:05	11:10	12:32
Leak Check	Pass	Pass	Pass

Traverse Point	**Δ P (in. WC)**	**Ts (°F)**	**Δ P (in. WC)**	**Ts (°F)**	**Δ P (in. WC)**	**Ts (°F)**
A-1	4.90	684	4.92	686	4.60	688
2	4.80	685	4.90	686	4.60	687
3	4.80	685	4.90	684	4.40	687
4	4.70	686	4.80	685	4.80	684
5	4.50	687	4.50	685	4.70	684
6	4.40	688	4.20	685	4.70	682
7	4.30	687	4.70	686	4.60	682
8	4.00	688	4.60	682	4.20	686
B-1	4.80	688	4.50	685	4.30	685
2	4.70	687	4.30	685	4.50	685
3	4.60	687	4.50	684	4.50	684
4	4.50	687	4.60	687	4.20	686
5	4.30	686	4.30	688	4.20	686
6	4.20	687	4.30	685	4.00	682
7	4.20	687	4.20	684	4.30	683
8	4.00	688	4.00	683	4.30	680

					Average
Square Root of ΔP, (in. WC)$^{1/2}$	**(ΔP)$^{1/2}$**	2.1	2.1	2.1	2.1
Average ΔP, in. WC	**(ΔP)**	4.5	4.5	4.4	4.5
Pitot Tube Coefficient	**(Cp)**	0.81	0.81	0.81	0.81
Barometric Pressure, in. Hg	**(Pb)**	25.1	25.1	25.1	25.1
Static Pressure, in. WC	**(Pg)**	4.1	4.1	4.1	4.1
Stack Pressure, in. Hg	**(Ps)**	25.4	25.4	25.4	25.4
Average Temperature, °F	**(Ts)**	686.7	685.0	684.4	685.4
Average Temperature, °R	**(Ts)**	1146.7	1145.0	1144.4	1145.4
Measured Moisture Fraction	**(BWSmsd)**	0.092	0.097	0.098	0.096
Moisture Fraction @ Saturation	**(BWSsat)**	188.7	186.9	186.3	187.3
Moisture Fraction	**(BWS)**	0.092	0.097	0.098	0.096
O2 Concentration, %	**(O2)**	11.5	11.4	11.2	11.4
CO2 Concentration, %	**(CO2)**	5.4	5.5	5.4	5.4
Molecuar Weight, lb/lb-mole (dry)	**(Md)**	29.3	29.3	29.3	29.3
Molecuar Weight, lb/lb-mole (wet)	**(Ms)**	28.3	28.2	28.2	28.2
Velocity, ft/sec	**(Vs)**	185.9	186.6	184.9	185.8
VFR at stack conditions, acfm	**(Qa)**	10,678	10,720	10,625	10,674
VFR at standard conditions, scfh	**(Qsw)**	250,845	252,196	250,092	251,044
VFR at standard conditions, scfm	**(Qsw)**	4,181	4,203	4,168	4,184
VFR at standard conditions, dscfm	**(Qsd)**	3,798	3,794	3,761	3,784

Field Data
Method 2 Data

Location Albuquerque Bernalillo County Water Utility - Southside Water Reclamation Plant

Source Unit 30 (Digester)

Project No. 2020-0005

Run No.	**1**		**2**		**3**	
Date	1/12/20		1/12/20		1/12/20	
Status	VALID		VALID		VALID	
Start Time	14:00		15:30		16:25	
Stop Time	14:10		15:40		16:37	
Leak Check	Pass		Pass		Pass	
Traverse Point	**Δ P (in. WC)**	**Ts (°F)**	**Δ P (in. WC)**	**Ts (°F)**	**Δ P (in. WC)**	**Ts (°F)**
A-1	4.70	675	4.60	679	4.80	682
2	4.60	676	4.50	680	4.70	681
3	4.50	674	4.50	681	4.50	681
4	4.60	674	4.50	681	4.30	680
5	4.50	675	4.40	680	4.20	680
6	4.40	675	4.30	680	4.10	680
7	4.10	675	4.20	681	4.00	681
8	3.80	674	3.90	680	3.90	681
B-1	4.80	674	4.70	680	4.80	681
2	4.60	674	4.60	680	4.70	681
3	4.50	676	4.50	680	4.50	682
4	4.40	675	4.50	680	4.40	682
5	4.20	674	4.30	680	4.20	683
6	4.10	675	4.20	680	4.10	683
7	4.00	674	4.00	681	4.00	682
8	3.70	673	3.60	680	3.70	682

					Average
Square Root of ΔP, (in. WC)$^{1/2}$	**(ΔP)$^{1/2}$**	2.1	2.1	2.1	2.1
Average ΔP, in. WC	**(ΔP)**	4.3	4.3	4.3	4.3
Pitot Tube Coefficient	**(Cp)**	0.81	0.81	0.81	0.81
Barometric Pressure, in. Hg	**(Pb)**	25.1	25.1	25.1	25.1
Static Pressure, in. WC	**(Pg)**	4.2	4.3	4.2	4.2
Stack Pressure, in. Hg	**(Ps)**	25.4	25.5	25.4	25.5
Average Temperature, °F	**(Ts)**	674.6	680.2	681.4	678.7
Average Temperature, °R	**(Ts)**	1134.6	1140.2	1141.4	1138.7
Measured Moisture Fraction	**(BWSmsd)**	0.104	0.111	0.110	0.108
Moisture Fraction @ Saturation	**(BWSsat)**	175.5	181.5	182.9	180.0
Moisture Fraction	**(BWS)**	0.104	0.111	0.110	0.108
O2 Concentration, %	**(O2)**	9.3	9.3	9.2	9.3
CO2 Concentration, %	**(CO2)**	9.9	10.0	10.0	10.0
Molecuar Weight, lb/lb-mole (dry)	**(Md)**	30.0	30.0	30.0	30.0
Molecuar Weight, lb/lb-mole (wet)	**(Ms)**	28.7	28.6	28.7	28.7
Velocity, ft/sec	**(Vs)**	180.6	181.0	180.5	180.7
VFR at stack conditions, acfm	**(Qa)**	10,377	10,399	10,373	10,383
VFR at standard conditions, scfh	**(Qsw)**	246,455	245,831	244,880	245,722
VFR at standard conditions, scfm	**(Qsw)**	4,108	4,097	4,081	4,095
VFR at standard conditions, dscfm	**(Qsd)**	3,679	3,642	3,632	3,651

APPENDIX I

Letter From AQP "Decommissioning Old PTF"

City of Albuquerque

Decommission Determination
of Old Preliminary Treatment Facility (PTF)
at the Albuquerque Bernalillo County Water Utility Authority

In 2016, an enforcement action was brought against The Albuquerque Bernalillo County Water Utility Authority (WUA) for submitting a late Annual Compliance Certification (ACC). Upon a thorough review of the ACC, it was determined that there was a deviation in permit 1418-M2, condition 2.1 concerning the process equipment authorized in the permit in the Process Equipment Table. It was stated that the Preliminary Treatment Facility (PTF) had a "Date of Manufacture Equipment" of 1962, however, during an EPA Grant inspection of the facility it was discovered that a new PTF had been built and the old PTF still existed. Over the course of many discussions and a final Stipulated Order and Settlement agreement and a new cooperative agreement, it has be decided that for the WUA to move forward on the renewing their Title V Permit a determination needed to be made by the City of Albuquerque (COA) to consider the Old PTF to be decommissioned/Abandoned. The determination will be decided from the Record Drawings, photos and observations from the physical inspection conducted.

On July 25, 2019 at 9:00 am, Angelique Maldonado, EH Supervisor and myself were given a tour of the Old PTF with Mr. Charles Leder, P.E. Plant Operations Manager, Mr. Jeffrey Romanowski, Chief Engineer, and Mr. Kenneth Lipe, Superintendent. During our inspection, WUA Personnel explained to us that there are five "interceptors" that bring in raw sewage from the city, they are: 1ea. 72" pipe titled the 142A (Valley), 1ea. 84" pipe titled the Tijeras, 2e. 30" pipes titled the Twin Thirties, and 1ea. 18" pipe titled the Mountain View. The 72" 142A interceptor comes from North to the South which brings in all the raw sewage from Downtown and west of the Rio Grande. The 84" Tijeras interceptor brings in all the raw sewage from the Eastside of the city. The two 30" Twin Thirties come from the West to the East and conveys raw sewage from the Westside of the city. Finally, the 18" Mountain View comes from the Southeast to the Northwest and brings in the raw sewage from the Mountain View area.

During the inspection WUA personnel explained to us the changes that were made when the new PTF went on-line. However, when all the work that was done the whole site had been excavated and then all the earth was put back and repaved, so there was no way of seeing if the changes have been done. After examining how the interceptors were re-routed, we were taken inside the old PTF building.

We started by inspecting where the bins for removing the large screenings (i.e. debris, shoes, rags, boards, etc.), used to be loaded. That area is now being used as storage of plant equipment (see picture 7/25/2019 9:33:05 AM). On the inside where the screening process happens you can see (from the pictures), that the building has not been used in quite some time. There are cobwebs everywhere, screens are dry, and conveyor belts are dry.

There is one breaker box room inside the old PTF that WUA personnel keep electricity for. This room containing the process is the power control equipment room that links to the Supervisory Control and Data Acquisition (SCADA) system. The system still has electricity connected to it, Mr. Leder stated that the equipment was very expensive and they are trying to preserve it by temperature controlling the room.

Also inside the old PTF, in the room to the South, houses all the course grit cyclones. Upon inspection, this additional equipment has been abandoned in place. There are cobwebs on all the equipment, all the conveyor belts are dried out, and it is noticeable that this equipment has not been used in quite some time. In the same room, you can see the Lock-Out Tag-Out tags for the Grit Escalator, Grit Pump, and Grit Mix, dated September 5, 2016 (see photograph dated 7/25/2019 9:38 AM).

To the South of the old PTF, I observed and documented that some of the piping that is above ground in the aerated grit basins, are rusted out and of no use (see picture dated 7/25/2019 9:41:02 AM). Also, to the South of the old PTF it was observed that the two bio filters for the old PTF exhaust were either emptied or dried out and both were no longer in use (see pictures dated 7/25/2019 9:41:43 AM and 7/25/2018 9:42:41 AM). After observing the area above the aerated grit chamber, I was shown into the “Blower Room”. As can be seen in pictures dated 7/25/2018 9:47:26 AM through 7/25/2019 9:48:02 AM, it was observed that blowers, piping to supply air, and electrical motors were either disconnected or were locked-out/tagged-out and were no longer in use. I also observed the vents used for directing the air to the old PTF were locked-out/tagged-out (see pictures dated 7/25/2019 9:48:02 AM).

Record Drawing Definition

Revised set of drawing submitted by a contractor upon completion of a project or a particular job. They reflect all changes made in the specifications and working drawings during the construction process, and show the exact dimensions, geometry, and location of all elements of the work completed under the contract. These can also be called “as-built drawings” or just “as-builts” (http://www.businessdictionary.com/definition/record-drawings.html).

All the raw sewage that comes into the Southside Water Reclamation Plant is conveyed by:

- The Valley (142A) interceptor – 72”
- The Tijeras interceptor – 84”
- The two (2) twin interceptors - 30”
- Mountain View – 18”

1. The Valley (142A) interceptor is a 72” line that brings all the raw sewage from downtown Albuquerque and everything west of the Rio Grande. In record drawing C-200-011 it is shown that the Valley interceptor is no longer connected to the old PTF and is now routed into Junction Box (JB) 21. JB21 now takes the flow from 142A to Lift Station 11A and lifts it to coarse grit removal.

2. Man Hole (MH) #8 was the connection between the 84” Tijeras interceptor and the old PTF. MH #8 has now been demolished according to record drawing D-200-001.

3. The Tijeras interceptor is an 84” line that brings all the raw sewage form the East side of Albuquerque. In record drawing C-200-011 it is shown that where MH #8 and the 84” Tijeras interceptor was connected, has been demolished and the 84” Tijeras interceptor now connected to JB20. With MH#8 now demolished and Tijeras connected to JB20, the Tijeras interceptor can no longer convey sewage to the old PTF.

4. The two twin 30” interceptors bring all the raw sewage from the Westside of Albuquerque. The twin 30’s run from west to east and used to take a ninety degree angle into the old PTF. The twin 30” interceptors are now piped into JB20 as seen on record drawing C-200-011.

5. The 18” Mountain View pipe brings raw sewage from Southeast to Northwest. The 18” Mountain View is no longer piped into the Old PTF. The 18” Mountain View is now piped into JB21 as can be confirmed on record drawing C-200-011.

6. On record drawing C-200-010 and D-200-000 it is confirmed that there are two 60” Reinforced Concrete Pipes (RCPs), that were used to deliver the preliminary treated wastewater from the old PTF to the Primary Clarifiers. According to the record drawings, both the 60” RCPs have had plugs installed and have been abandoned in place.

Recommendation

Based on my inspection of the old PTF, I observed equipment that appeared to not have been used for years. The equipment appeared to not have any raw sewage running through it, the conveyor belts were dry because they have not transported any course screenings, the interior of the building and equipment have a heavy buildup of cobwebs and dust on them from non-use. It appears that some of the equipment is disassembled and lock-out/tag-out tags could be observed on the buildings electrical boxes and air supply vents. From my review of the record drawings, it appears that all the interceptor pipes that conveyed the raw sewage from the City into the old PTF have been reconfigured to convey the flow to the new PTF. Also, the two 60” RCPs that deliver the pretreated sewage from the old PTF to the primary clarifiers have been plugged and abandoned in place. By using my observations from physical inspection of the old PTF and the record drawings documentation, I have found no areas of concern in making a determination of a confirmed decommissioning/abandonment of the old PTF facility. Furthermore, I would also recommend that the permitting division add a condition to the WUA Title V, stating that if the old PTF is found to be useable in the future, the WUA shall be in non-compliance.

Michael W. McKinstry

Michael W. McKinstry
Environmental Health Scientist

APPENDIX J

Alliance Source Testing, Inc. Stack Gas Test Report for January 2020, Rev 1 as Issued on August 28, 2020

TEST REPORT SUMMARY

Client Information / Test Location

ABCWUA
Southside Water Reclamation Plant
4201 Second Street SW
Albuquerque, NM

Source Information

Engine/Unit ID:	Unit 27 (Natural Gas)
Engine Make/Model:	Caterpillar G3612
Engine Serial Number:	1YG00188
Engine Type:	4SLB
Engine Year of Manufacture:	2002
Engine Rating:	3,192 bhp

Regulatory Applicability

A/BCAQCB Title V Permit No. 1418-M2
Authority-to-Construct No. 0786-M3

AST Project No.

2020-0005

Run No.	**Run 1**	**Run 2**	**Run 3**	**Average**
Date	**1/11/20**	**1/11/20**	**1/11/20**	**--**
Engine Load, % *	90	90	90	90
Nitrogen Oxides Data				
Emission Rate, lb/hr	1.9	1.9	1.8	1.8
Permit Limit, lb/hr	--	--	--	6.60
Percent of Limit, %	--	--	--	**28**
Carbon Monoxide Data				
Emission Rate, lb/hr	6.9	7.2	7.2	7.1
Permit Limit, lb/hr	--	--	--	20.60
Percent of Limit, %	--	--	--	**34**
Non-Methane Ethane Hydrocarbons Data				
Emission Rate, lb/hr	2.7	2.8	2.7	2.7
Permit Limit, lb/hr	--	--	--	9.10
Percent of Limit, %	--	--	--	**30**
Sulfur Dioxide Data				
Emission Rate, lb/hr	0.007	0.008	0.008	0.008
Permit Limit, lb/hr	--	--	--	11.40
Percent of Limit, %	--	--	--	**<1**

* Performance testing was conducted while the engine was operating at the highest achievable load at current site conditions.

TEST REPORT SUMMARY

Client Information / Test Location

ABCWUA

Southside Water Reclamation Plant
4201 Second Street SW
Albuquerque, NM

Source Information

Engine/Unit ID:	Unit 27 (Natural Gas (70%) / Digester Gas (30% blend)
Engine Make/Model:	Caterpillar G3612
Engine Serial Number:	1YG00188
Engine Type:	4SLB
Engine Year of Manufacture:	2002
Engine Rating:	3,192 bhp

Regulatory Applicability

A/BCAQCB Title V Permit No. 1418-M2
Authority-to-Construct No. 0786-M3

AST Project No.

2020-0005

Run No.	**Run 1**	**Run 2**	**Run 3**	**Average**
Date	**1/11/20**	**1/11/20**	**1/11/20**	**--**
Engine Load, % *	90	90	90	90
Nitrogen Oxides Data				
Emission Rate, lb/hr	2.3	2.5	2.5	2.4
Permit Limit, lb/hr	--	--	--	6.60
Percent of Limit, %	--	--	--	**36**
Carbon Monoxide Data				
Emission Rate, lb/hr	7.1	6.9	6.8	6.9
Permit Limit, lb/hr	--	--	--	20.60
Percent of Limit, %	--	--	--	**34**
Non-Methane Ethane Hydrocarbons Data				
Emission Rate, lb/hr	2.2	2.1	2.1	2.1
Permit Limit, lb/hr	--	--	--	9.10
Percent of Limit, %	--	--	--	**24**
Sulfur Dioxide Data				
Emission Rate, lb/hr	0.033	0.033	0.031	0.032
Permit Limit, lb/hr	--	--	--	11.40
Percent of Limit, %	--	--	--	**<1**

* Performance testing was conducted while the engine was operating at the highest achievable load at current site conditions.

TEST REPORT SUMMARY

Client Information / Test Location

ABCWUA
Southside Water Reclamation Plant
4201 Second Street SW
Albuquerque, NM

Source Information

Engine/Unit ID:	Unit 28 (Natural Gas)
Engine Make/Model:	Caterpillar G3612
Engine Serial Number:	1YG00190
Engine Type:	4SLB
Engine Year of Manufacture:	2002
Engine Rating:	3,192 bhp

Regulatory Applicability

A/BCAQCB Title V Permit No. 1418-M2
Authority-to-Construct No. 0786-M3

AST Project No.

2020-0005

Run No.	Run 1	Run 2	Run 3	Average
Date	**1/10/20**	**1/10/20**	**1/10/20**	**--**
Engine Load, % *	90	90	90	90
Nitrogen Oxides Data				
Emission Rate, lb/hr	1.9	1.9	2.0	1.9
Permit Limit, lb/hr	--	--	--	6.60
Percent of Limit, %	--	--	--	**29**
Carbon Monoxide Data				
Emission Rate, lb/hr	7.7	7.6	8.0	7.7
Permit Limit, lb/hr	--	--	--	20.60
Percent of Limit, %	--	--	--	**38**
Non-Methane Ethane Hydrocarbons Data				
Emission Rate, lb/hr	3.1	3.2	3.1	3.1
Permit Limit, lb/hr	--	--	--	9.10
Percent of Limit, %	--	--	--	**35**
Sulfur Dioxide Data				
Emission Rate, lb/hr	0.00	0.00	0.0060	0.0050
Permit Limit, lb/hr	--	--	--	11.40
Percent of Limit, %	--	--	--	**<1**

* Performance testing was conducted while the engine was operating at the highest achievable load at current site conditions.

TEST REPORT SUMMARY

Client Information / Test Location

ABCWUA

Southside Water Reclamation Plant
4201 Second Street SW
Albuquerque, NM

Source Information

Engine/Unit ID:	Unit 28 (Natural Gas (70%) / Digester Gas (30% blend)
Engine Make/Model:	Caterpillar G3612
Engine Serial Number:	1YG00190
Engine Type:	4SLB
Engine Year of Manufacture:	2002
Engine Rating:	3,192 bhp

Regulatory Applicability

A/BCAQCB Title V Permit No. 1418-M2
Authority-to-Construct No. 0786-M3

AST Project No.

2020-0005

Run No.	**Run 1**	**Run 2**	**Run 3**	**Average**
Date	**1/10/20**	**1/10/20**	**1/10/20**	**--**
Engine Load, % *	90	90	90	90
Nitrogen Oxides Data				
Emission Rate, lb/hr	2.0	2.0	2.0	2.0
Permit Limit, lb/hr	--	--	--	6.60
Percent of Limit, %	--	--	--	**30**
Carbon Monoxide Data				
Emission Rate, lb/hr	8.1	8.2	8.3	8.2
Permit Limit, lb/hr	--	--	--	20.60
Percent of Limit, %	--	--	--	**40**
Non-Methane Ethane Hydrocarbons Data				
Emission Rate, lb/hr	2.5	2.5	2.6	2.6
Permit Limit, lb/hr	--	--	--	9.10
Percent of Limit, %	--	--	--	**28**
Sulfur Dioxide Data				
Emission Rate, lb/hr	0.025	0.024	0.024	0.024
Permit Limit, lb/hr	--	--	--	11.40
Percent of Limit, %	--	--	--	**<1**

* Performance testing was conducted while the engine was operating at the highest achievable load at current site conditions.

Alliance
SOURCE TESTING

TEST REPORT SUMMARY

Client Information / Test Location

ABCWUA
Southside Water Reclamation Plant
4201 Second Street SW
Albuquerque, NM

Source Information

Engine/Unit ID:	Unit 29 (Natural Gas)
Engine Make/Model:	Cooper 12-GTLA
Engine Serial Number:	311069
Engine Type:	4SLB
Engine Year of Manufacture:	2011
Engine Rating:	1,650 bhp

Regulatory Applicability

40 CFR 60, Subpart JJJJ
A/BCAQCB Title V Permit No. 1418-M2
Authority-to-Construct No. 0786-M3

AST Project No.

2020-0005

Run No.	**Run 1**	**Run 2**	**Run 3**	**Average**
Date	**1/13/20**	**1/13/20**	**1/13/20**	**--**
Engine Load, % *	90	90	90	90
Nitrogen Oxides Data				
Emission Factor, g/hp-hr	0.58	0.58	0.60	0.59
NSPS JJJJ Limit, lb/hr	--	--	--	2.0
Percent of Limit, %	--	--	--	**29**
Emission Rate, lb/hr	1.6	1.7	1.7	1.7
Permit Limit, lb/hr	--	--	--	7.28
Percent of Limit, %	--	--	--	**23**
Carbon Monoxide Data				
Emission Factor, g/hp-hr	2.9	2.8	2.7	2.8
NSPS JJJJ Limit, g/hp-hr	--	--	--	4.0
Percent of Limit, %	--	--	--	**70**
Emission Rate, lb/hr	8.2	7.9	7.8	8.0
Permit Limit, lb/hr	--	--	--	9.60
Percent of Limit, %	--	--	--	**83**
Non-Methane Ethane Hydrocarbons Data				
Emission Factor, g/hp-hr	0.82	0.80	0.79	0.80
NSPS JJJJ Limit, g/hp-hr	--	--	--	1.0
Percent of Limit, %	--	--	--	**80**
Emission Rate, lb/hr	2.3	2.3	2.3	2.3
Permit Limit, lb/hr	--	--	--	3.10
Percent of Limit, %	--	--	--	**74**
Sulfur Dioxide Data				
Emission Rate, lb/hr	0.002	0.004	0.003	0.003
Permit Limit, lb/hr	--	--	--	2.30
Percent of Limit, %	--	--	--	**<1**

* Performance testing was conducted while the engine was operating at the highest achievable load at current site conditions.

Alliance
SOURCE TESTING

TEST REPORT SUMMARY

Client Information / Test Location

ABCWUA
Southside Water Reclamation Plant
4201 Second Street SW
Albuquerque, NM

Source Information

Engine/Unit ID:	Unit 29 (Digestor Gas)
Engine Make/Model:	Cooper 12-GTLA
Engine Serial Number:	311069
Engine Type:	4SLB
Engine Year of Manufacture:	2011
Engine Rating:	1,650 bhp

Regulatory Applicability
40 CFR 60, Subpart JJJJ
A/BCAQCB Title V Permit No. 1418-M2
Authority-to-Construct No. 0786-M3

AST Project No.
2020-0005

Run No.	**Run 1**	**Run 2**	**Run 3**	**Average**
Date	**1/13/20**	**1/13/20**	**1/13/20**	**--**
Engine Load, % *	90	90	90	90
Nitrogen Oxides Data				
Emission Factor, g/hp-hr	0.50	0.48	0.50	0.49
NSPS JJJJ Limit, g/hp-hr	--	--	--	2.0
Percent of Limit, %	--	--	--	**24**
Emission Rate, lb/hr	1.4	1.4	1.4	1.4
Permit Limit, lb/hr	--	--	--	7.28
Percent of Limit, %	--	--	--	**19**
Carbon Monoxide Data				
Emission Factor, g/hp-hr	2.3	2.3	2.3	2.3
NSPS JJJJ Limit, g/hp-hr	--	--	--	4.0
Percent of Limit, %	--	--	--	**57**
Emission Rate, lb/hr	6.5	6.5	6.5	6.5
Permit Limit, lb/hr	--	--	--	9.60
Percent of Limit, %	--	--	--	**68**
Non-Methane Ethane Hydrocarbons Data				
Emission Factor, g/hp-hr	0.13	0.13	0.12	0.13
NSPS JJJJ Limit, g/hp-hr	--	--	--	1.0
Percent of Limit, %	--	--	--	**13**
Emission Rate, lb/hr	0.36	0.37	0.35	0.36
Permit Limit, lb/hr	--	--	--	3.10
Percent of Limit, %	--	--	--	**12**
Sulfur Dioxide Data				
Emission Rate, lb/hr	0.081	0.081	0.083	0.082
Permit Limit, lb/hr	--	--	--	2.30
Percent of Limit, %	--	--	--	**4**

* Performance testing was conducted while the engine was operating at the highest achievable load at current site conditions.

TEST REPORT SUMMARY

Client Information / Test Location

ABCWUA
Southside Water Reclamation Plant
4201 Second Street SW
Albuquerque, NM

Source Information

Engine/Unit ID:	Unit 30 (Natural Gas)
Engine Make/Model:	Cooper 12-GTLA
Engine Serial Number:	305029
Engine Type:	4SLB
Engine Year of Manufacture:	1985
Engine Rating:	1,650 bhp

Regulatory Applicability

40 CFR 60, Subpart JJJJ
A/BCAQCB Title V Permit No. 1418-M2
Authority-to-Construct No. 0786-M3

AST Project No.

2020-0005

Run No.	Run 1	Run 2	Run 3	Average
Date	**1/12/20**	**1/12/20**	**1/12/20**	**--**
Engine Load, % *	90	90	90	90
Nitrogen Oxides Data				
Emission Factor, g/hp-hr	0.41	0.38	0.42	0.40
NSPS JJJJ Limit, g/hp-hr	--	--	--	2.0
Percent of Limit, %	--	--	--	**20**
Emission Rate, lb/hr	1.2	1.3	1.3	1.3
Permit Limit, lb/hr	--	--	--	7.28
Percent of Limit, %	--	--	--	**18**
Carbon Monoxide Data				
Emission Factor, g/hp-hr	2.3	2.3	3.0	2.5
NSPS JJJJ Limit, g/hp-hr	--	--	--	4.0
Percent of Limit, %	--	--	--	**63**
Emission Rate, lb/hr	6.9	8.0	9.5	8.1
Permit Limit, lb/hr	--	--	--	9.60
Percent of Limit, %	--	--	--	**85**
Non-Methane Ethane Hydrocarbons Data				
Emission Factor, g/hp-hr	0.79	0.67	0.70	0.72
NSPS JJJJ Limit, g/hp-hr	--	--	--	1.0
Percent of Limit, %	--	--	--	**72**
Emission Rate, lb/hr	2.4	2.3	2.2	2.3
Permit Limit, lb/hr	--	--	--	3.10
Percent of Limit, %	--	--	--	**74**
Sulfur Dioxide Data				
Emission Rate, lb/hr	0.002	0.002	0.002	0.002
Permit Limit, lb/hr	--	--	--	2.30
Percent of Limit, %	--	--	--	**<1**

* Performance testing was conducted while the engine was operating at the highest achievable load at current site conditions.

Alliance
SOURCE TESTING

TEST REPORT SUMMARY

Client Information / Test Location

ABCWUA
Southside Water Reclamation Plant
4201 Second Street SW
Albuquerque, NM

Source Information

Engine/Unit ID:	Unit 30 (Digester Gas)
Engine Make/Model:	Cooper 12-GTLA
Engine Serial Number:	305029
Engine Type:	4SLB
Engine Year of Manufacture:	1985
Engine Rating:	1,650 bhp

Regulatory Applicability

40 CFR 60, Subpart JJJJ
A/BCAQCB Title V Permit No. 1418-M2
Authority-to-Construct No. 0786-M3

AST Project No.

2020-0005

Run No.	**Run 1**	**Run 2**	**Run 3**	**Average**
Date	**1/12/20**	**1/12/20**	**1/12/20**	**--**
Engine Load, % *	90	90	90	90
Nitrogen Oxides Data				
Emission Factor, g/hp-hr	0.60	0.64	0.71	0.65
NSPS JJJJ Limit, g/hp-hr	--	--	--	2.0
Percent of Limit, %	--	--	--	**32**
Emission Rate, lb/hr	1.9	2.0	2.2	2.0
Permit Limit, lb/hr	--	--	--	7.28
Percent of Limit, %	--	--	--	**27**
Carbon Monoxide Data				
Emission Factor, g/hp-hr	1.6	1.7	1.8	1.7
NSPS JJJJ Limit, g/hp-hr	--	--	--	4.0
Percent of Limit, %	--	--	--	**43**
Emission Rate, lb/hr	5.1	5.3	5.4	5.3
Permit Limit, lb/hr	--	--	--	9.60
Percent of Limit, %	--	--	--	**55**
Non-Methane Ethane Hydrocarbons Data				
Emission Factor, g/hp-hr	0.085	0.096	0.11	0.096
NSPS JJJJ Limit, g/hp-hr	--	--	--	1.0
Percent of Limit, %	--	--	--	**10**
Emission Rate, lb/hr	0.26	0.29	0.33	0.29
Permit Limit, lb/hr	--	--	--	3.10
Percent of Limit, %	--	--	--	**9**
Sulfur Dioxide Data				
Emission Rate, lb/hr	0.090	0.092	0.092	0.091
Permit Limit, lb/hr	--	--	--	2.30
Percent of Limit, %	--	--	--	**4**

* Performance testing was conducted while the engine was operating at the highest achievable load at current site conditions.

TEST REPORT SUMMARY

Client Information / Test Location

ABCWUA
Lift Station #24
4800 West Bank Road
Albuquerque, NM

Source Information

Engine/Unit ID:	Unit 80
Engine Make/Model:	Cummins KTA50-G2
Engine Serial Number:	33156661
Engine Type:	Compression Ignition
Engine Year of Manufacture:	2004
Engine Rating:	1,620 bhp

Regulatory Applicability

A/BCAQCB Title V Permit No. 1418-M2
Authority-to-Construct No. 1660-M1

AST Project No.

2020-0005

Run No.	**Run 1**	**Run 2**	**Run 3**	**Average**
Date	**1/9/20**	**1/9/20**	**1/9/20**	**--**
Engine Load, % *	100	100	100	100
Nitrogen Oxides Data				
Emission Rate, lb/hr	4.1	4.0	4.0	4.0
Permit Limit, lb/hr	--	--	--	40.40
Percent of Limit, %	--	--	--	**10**
Carbon Monoxide Data				
Emission Rate, lb/hr	0.87	0.89	0.90	0.88
Permit Limit, lb/hr	--	--	--	17.80
Percent of Limit, %	--	--	--	**5**
Non-Methane Ethane Hydrocarbons Data				
Emission Rate, lb/hr	0.21	0.20	0.20	0.20
Permit Limit, lb/hr	--	--	--	1.10
Percent of Limit, %	--	--	--	**18**
Sulfur Dioxide Data				
Emission Rate, lb/hr	0.014	0.014	0.014	0.014
Permit Limit, lb/hr	--	--	--	13.10
Percent of Limit, %	--	--	--	**<1**

* Performance testing was conducted while the engine was operating at the highest achievable load at current site conditions.

TEST REPORT SUMMARY

Client Information / Test Location

ABCWUA
Corrales Well No. 4
7251 Paradise Blvd NW
Albuquerque, NM

Source Information

Engine/Unit ID:	Corrales Well #4
Engine Make/Model:	Waukesha P-48GL
Engine Serial Number:	C-18414/1
Engine Type:	4SLB
Engine Year of Manufacture:	2008
Engine Rating:	1,065 bhp

Regulatory Applicability

Authority-to-Construct No. 398-M1

AST Project No.

2020-0005

Run No.	Run 1	Run 2	Run 3	Average
Date	**1/8/20**	**1/8/20**	**1/8/20**	**--**
Engine Load, % *	100	100	100	100
Nitrogen Oxides Data				
Emission Rate, lb/hr	1.3	1.4	1.4	1.4
Permit Limit, lb/hr	--	--	--	4.70
Percent of Limit, %	--	--	--	**29**
Carbon Monoxide Data				
Emission Rate, lb/hr	0.90	0.92	0.94	0.92
Permit Limit, lb/hr	--	--	--	4.11
Percent of Limit, %	--	--	--	**22**
Non-Methane Ethane Hydrocarbons Data				
Emission Rate, lb/hr	0.21	0.21	0.22	0.21
Permit Limit, lb/hr	--	--	--	1.80
Percent of Limit, %	--	--	--	**12**
Sulfur Dioxide Data				
Emission Rate, lb/hr	0.00	0.00	0.00	0.00
Permit Limit, lb/hr	--	--	--	0.11
Percent of Limit, %	--	--	--	**4**

* Performance testing was conducted while the engine was operating at the highest achievable load at current site conditions.

Engine Test Report

Albuquerque Bernalillo County Water Utility Authority
4201 2nd Street SW
Albuquerque, NM 87105

Sources Tested: SWRP - (2) Caterpillar G3612 Engines (Units 27 & 28)
SWRP - (2) Cooper 12-GTLA Engines (Units 29 & 30)
Lift Station #24 – (1) Cummins KTA50-G2 Engine (Unit 80)
Corrales Well #4 – (1) Waukesha P-48GL Engine

Test Dates: January 8-13, 2020

AST Project No. 2020-0005R1

Prepared By
Alliance Source Testing, LLC
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Arvada, CO 80002

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Pittsburgh, PA
Roanoke, VA
Salt Lake City, UT

Source Information

Source Names	*Source IDs*	*Target Parameters*
(2) Caterpillar G3612 Engines	Units 27 & 28	SO_2, NOx, CO, VOC
(2) Cooper 12-GTLA Engines	Units 29 & 30	SO_2, NOx, CO, VOC
(1) Cummins KTA50-G2 Engine	Unit 80	SO_2, NOx, CO, VOC
(1) Waukesha P-48GL Engine	Corrales Well #4	SO_2, NOx, CO, VOC

Contact Information

Test Location

Southside Water Reclamation Plant
4201 Second Street SW
Albuquerque, NM

Lift Station #24
4800 West Bank Road
Albuquerque, NM

Corrales Well No. 4
7251 Paradise Blvd NW
Albuquerque, NM

Albuquerque Bernalillo County Water Utility Authority

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Alliance Source Testing, LLC (AST) has completed the source testing as described in this report. Results apply only to the source(s) tested and operating condition(s) for the specific test date(s) and time(s) identified within this report. All results are intended to be considered in their entirety, and AST is not responsible for use of less than the complete test report without written consent. This report shall not be reproduced in full or in part without written approval from the customer.

To the best of my knowledge and abilities, all information, facts and test data are correct. Data presented in this report has been checked for completeness and is accurate, error-free and legible. Onsite testing was conducted in accordance with approved internal Standard Operating Procedures. Any deviations or test program notes are detailed in the relevant sections on the test report.

This report is only considered valid once an authorized representative of AST has signed in the space provided below; any other version is considered draft. This document was prepared in portable document format (.pdf) and contains pages as identified in the bottom footer of this document.

8/28/2020 (R1)

David Maiers, QSTI
Project Manager
Alliance Source Testing, LLC

Date

8/28/2020 (R1)

Kenneth Moody
Field Team Leader
Alliance Source Testing, LLC

Date

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APPENDICES

Introduction

1.0 Introduction

Alliance Source Testing, LLC (AST) was retained by Albuquerque Bernalillo County Water Utility (ABCWUA) to conduct compliance emissions testing Southside Water Reclamation Plant (SWRP), Lift Station #24 and Corrales Well #4 located in Albuquerque, New Mexico. Portions of the facility are subject to provisions of A/BCAQCB Title V Permit No. 1418-M2 & Authority-to-Construct Nos. 0786-M3, 1660-M1 and 398-M1 as well as 40 CFR Part 60, Subpart JJJJ. Compliance testing was conducted to determine the emission rates of sulfur dioxide (SO_2), nitrogen oxides (NO_X), carbon monoxide (CO) and volatile organic compounds (VOC) as well as the opacity of visible emission (OVE) from two (2) Caterpillar G3612 Engines (Units 27 & 28) and two (2) Cooper 12-GTLA Engines (Units 29 & 30) at the SWRP; one (1) Cummins KTA50-G2 Engine (Unit 80) at Lift Station #24; and one (1) Waukesha P-48GL Engine at Corrales Well #4. OVE's were conducted by A/BCAQCB personnel.

Testing consisted of three (3) 60-minute test runs for the source. Performance testing was conducted while the engines were operating at the highest achievable load at current site conditions. The Test Report Summary (TRS) provides the results from the compliance testing, including the three (3) run average, with comparisons to the applicable limits. Any difference between the summary results listed in the TRS and the detailed results contained in the appendices is due to rounding for presentation.

1.1 Facility and Process Description

The SWRP is located at 4201 Second Street SW. Two (2) Caterpillar G3612 Engines (Units 27 & 28) and two (2) Cooper 12-GTLA Engines (Units 29 & 30) are in service at the SWRP to generate electricity for the facility. Units 27 and 28 are site rated at 3,192 brake horsepower (bhp) and can be fired on natural gas or a blend of 70% natural gas / 30% digester gas (blend by volume). Units 29 and 30 are site rated at 1,650 bhp and can be fired on natural gas, digester gas or a blend of natural gas and digester gas. Fuel meters are installed on each engine to measure the consumption of natural gas and digester gas.

The Lift Station #24 is located at 4800 West Bank Road. One (1) Cummins KTA50-G2 Engine (Unit 80) is in service to provide emergency power. Unit 80 is site rated at 1,620 bhp, fired on diesel fuel and limited to 200 hours of operation per year (hr/yr).

The Corrales Well #4 is located at 7251 Paradise Blvd NW. One (1) Waukesha P-48GL Engine powers a vertical turbine pump. The Waukesha P-48GL Engine is site rated at 1,065 bhp and is fired on natural gas. In order to comply with federal Safe Drinking Water Act regulations for arsenic, the Water Authority restricts the discharge from this well to 1,200 gallons per minute (gpm) and blend the product water with other sources. This reduction to 1,200-gpm output for Well #4 is accomplished by throttling the engine speed from 1,800 revolutions per minute (RPM) to 1,200 RPM.

1.2 Project Team

Personnel involved in this project are identified in the following table.

Table 1-1
Project Team

AST Personnel	Kenneth Moody Amin Kalantarifard

1.3 Instrument Information

The instruments used to conduct the compliance testing are summarized in the following table.

Table 1-2
Instrument Information

Pollutant	Manufacturer	Model	Serial Number
O_2	Servomex	1440	1420C/2767
CO_2			1415C/2767
NOx	Thermo	42i-HL	1129850114
CO		48C	48C-64905-345
SO_2		43C-3	43C-70673-366
THC		55i-3	1209052113

1.4 Test Protocol and Notification

Testing was conducted in accordance with the test protocol submitted to Albuquerque Environmental Health Department Air Quality Program by AST on December 20, 2019.

1.5 Report Revision

The report has been revised to reflect updates to the stack diameters for Units 27, 29 and 30. ABCWUA recently measured the stacks and found the following discrepancies in the stack diameters used in the original stack testcalculations
Unit 27 – 25 inch diameter vs 29 inch diameter
Unit 29 – 13 inch diameter vs 12.75 inch diameter
Unit 30 – 13 inch diameter vs 12.75 inch diameter

The volumetric flow rate calculations were updated with the new diameters and the updated flow rates were used to amend the emission calculations provided in the Test Report Summary pages and Appendix B.

Testing Methodology

2.0 Testing Methodology

The emissions testing program was conducted in accordance with the U.S. EPA Reference Test Methods listed in Table 2-1. Method descriptions are provided below while quality assurance/quality control data is provided in Appendix C.

Table 2-1
Source Testing Methodology

Parameter	U.S. EPA Reference Test Methods	Notes/Remarks
Volumetric Flow Rate	1 & 2	Full Velocity Traverses
Oxygen/Carbon Dioxide	3A	Instrumental Analysis
Moisture Content	4	Volumetric / Gravimetric Analysis
Sulfur Dioxide	6C	Instrumental Analysis
Nitrogen Oxides	7E	Instrumental Analysis
Visible Emissions	9	Certified Observer (ABCWUA)
Carbon Monoxide	10	Instrumental Analysis
Methane, Ethane	18	Bag Samples / Gas Chromatography
Non-Methane / Ethane Hydrocarbons	25A	Instrumental Analysis

2.1 U.S. EPA Reference Test Methods 1 and 2 – Sampling/Traverse Points and Volumetric Flow Rate

The sampling location and number of traverse (sampling) points were selected in accordance with U.S. EPA Reference Test Method 1. To determine the minimum number of traverse points, the upstream and downstream distances were equated into equivalent diameters and compared to Figure 1-1 (for isokinetic sampling) and/or Figure 1-2 (measuring velocity alone) in U.S. EPA Reference Test Method 1.

Full velocity traverses were conducted in accordance with U.S. EPA Reference Test Method 2 to determine the average stack gas velocity pressure, static pressure and temperature. The velocity and static pressure measurement system consisted of a pitot tube and inclined manometer. The stack gas temperature was measured with a K-type thermocouple and pyrometer.

2.2 U.S. EPA Reference Test Method 3A – Oxygen/Carbon Dioxide

The oxygen (O_2) and carbon dioxide (CO_2) testing was conducted in accordance with U.S. EPA Reference Test Method 3A. Data was collected online and reported in one-minute averages. The sampling system consisted of a stainless-steel probe, Teflon sample line(s), gas conditioning system and the identified gas analyzer. The gas conditioning system was a non-contact condenser used to remove moisture from the stack gas. If an unheated Teflon sample line was used, then a portable non-contact condenser was placed in the system directly after the probe. Otherwise, a heated Teflon sample line was used. The quality control measures are described in Section 2.8.

2.3 U.S. EPA Reference Test Method 4 – Moisture Content

The stack gas moisture content was determined in accordance with U.S. EPA Reference Test Method 4. The gas conditioning train consisted of a series of chilled impingers. Prior to testing, each impinger was filled with a known quantity of water or silica gel. Each impinger was analyzed gravimetrically before and after each test run on the same balance to determine the amount of moisture condensed.

2.4 U.S. EPA Reference Test Method 6C – Sulfur Dioxide

The sulfur dioxide (SO_2) testing was conducted in accordance with U.S. EPA Reference Test Method 6C. Data was collected online and reported in one-minute averages. The sampling system consisted of a heated stainless-steel probe, Teflon sample line(s), gas conditioning system and the identified analyzer. The gas conditioning system was a non-contact condenser used to remove moisture from the source gas. If an unheated Teflon sample line was used, then a portable non-contact condenser was placed in the system directly after the probe. Otherwise, a heated Teflon sample line was used. The quality control measures are described in Section 2.8.

2.5 U.S. EPA Reference Test Method 7E – Nitrogen Oxides

The nitrogen oxides (NOx) testing was conducted in accordance with U.S. EPA Reference Test Method 7E. Data was collected online and reported in one-minute averages. The sampling system consisted of a stainless-steel probe, Teflon sample line(s), gas conditioning system and the identified gas analyzer. The gas conditioning system was a non-contact condenser used to remove moisture from the stack gas. If an unheated Teflon sample line was used, then a portable non-contact condenser was placed in the system directly after the probe. Otherwise, a heated Teflon sample line was used. The quality control measures are described in Section 2.8.

2.6 U.S. EPA Reference Test Method 10 – Carbon Monoxide

The carbon monoxide (CO) testing was conducted in accordance with U.S. EPA Reference Test Method 10. Data was collected online and reported in one-minute averages. The sampling system consisted of a stainless-steel probe, Teflon sample line(s), gas conditioning system, and the identified gas analyzer. The gas conditioning system was a non-contact condenser used to remove moisture from the gas. If an unheated Teflon sample line was used, then a portable non-contact condenser was placed in the system directly after the probe. Otherwise, a heated Teflon sample line was used. The quality control measures are described in Section 2.8.

2.7 U.S. EPA Reference Test Methods 25A and 18 – Non-Methane Ethane Hydrocarbons

The NMEHC testing was conducted in accordance with U.S. EPA Reference Test Methods 25A and 18. The sampling system consisted of a stainless-steel probe, heated Teflon sample line(s) and the identified gas analyzer. Total hydrocarbon data was collected online and reported in one-minute averages. The quality control measures are described in Section 2.9.

Methane concentration was determined by integrated Tedlar bag sampling and offsite lab analysis using U.S. EPA Reference Test Method 18. The average methane concentration was subtracted from the average total hydrocarbon concentration to provide a non-methane VOC concentration.

2.8 Quality Assurance/Quality Control – U.S. EPA Reference Test Methods 3A, 6C, 7E and 10

Cylinder calibration gases used met EPA Protocol 1 (+/- 2%) standards. Copies of all calibration gas certificates can be found in the Quality Assurance/Quality Control Appendix.

Low Level gas was introduced directly to the analyzer. After adjusting the analyzer to the Low-Level gas concentration and once the analyzer reading was stable, the analyzer value was recorded. This process was repeated for the High-Level gas. For the Calibration Error Test, Low, Mid, and High-Level calibration gases were sequentially introduced directly to the analyzer. All values were within 2.0 percent of the Calibration Span or 0.5 ppmv absolute difference.

High or Mid-Level gas (whichever was closer to the stack gas concentration) was introduced at the probe and the time required for the analyzer reading to reach 95 percent or 0.5 ppm (whichever was less restrictive) of the gas concentration was recorded. The analyzer reading was observed until it reached a stable value, and this value was recorded. Next, Low Level gas was introduced at the probe and the time required for the analyzer reading to decrease to a value within 5.0 percent or 0.5 ppm (whichever was less restrictive) was recorded. If the Low-Level gas was zero gas, the response was 0.5 ppm or 5.0 percent of the upscale gas concentration (whichever was less restrictive). The analyzer reading was observed until it reached a stable value and this value was recorded. The measurement system response time and initial system bias were determined from these data. The System Bias was within 5.0 percent of the Calibration Span or 0.5 ppmv absolute difference.

High or Mid-Level gas (whichever was closer to the stack gas concentration) was introduced at the probe. After the analyzer response was stable, the value was recorded. Next, Low Level gas was introduced at the probe, and the analyzer value recorded once it reached a stable response. The System Bias was within 5.0 percent of the Calibration Span or 0.5 ppmv absolute difference or the data was invalidated, and the Calibration Error Test and System Bias were repeated.

Drift between pre- and post-run System Bias was within 3% of the Calibration Span or 0.5 ppmv absolute difference. If the drift exceeded 3% or 0.5 ppmv, the Calibration Error Test and System Bias were repeated.

To determine the number of sampling points, a gas stratification check was conducted prior to initiating testing. The pollutant concentrations were measured at three points (16.7, 50.0 and 83.3 percent of the measurement line). Each traverse point was sampled for a minimum of twice the system response time.

If the pollutant concentration at each traverse point did not differ more than 5% or 0.5 ppm (whichever was less restrictive) of the average pollutant concentration, then single point sampling was conducted during the test runs. If the pollutant concentration did not meet these specifications but differed less than 10% or 1.0 ppm from the average concentration, then three (3) point sampling was conducted (stacks less than 7.8 feet in diameter - 16.7, 50.0 and 83.3 percent of the measurement line; stacks greater than 7.8 feet in diameter – 0.4, 1.0, and 2.0 meters from the stack wall). If the pollutant concentration differed by more than 10% or 1.0 ppm from the average concentration, then sampling was conducted at a minimum of twelve (12) traverse points. Copies of stratification check data can be found in the Quality Assurance/Quality Control Appendix.

An NO_2 – NO converter check was performed on the analyzer prior to initiating testing. Mid-level nitrogen oxide protocol 1 calibration gas was mixed at a 1:1 ratio with span level protocol 1 oxygen calibration gas in a Tedlar sample bag to form NO_2 gas. The NO_2 gas was delivered to the nitrogen oxides analyzer directly from a Tedlar sample bag. The response of the analyzer was stable for the 30-minute duration of the test with the variation less than 2.0% at the end of the test from the maximum value of the test.

A Data Acquisition System with battery backup was used to record the instrument response in one (1) minute averages. The data was continuously stored as a *.CSV file in Excel format on the hard drive of a computer. At the completion of testing, the data was also saved to the AST server. All data was reviewed by the Field Team Leader before leaving the facility. Once arriving at AST's office, all written and electronic data was relinquished to the report coordinator and then a final review was performed by the Project Manager.

2.9 Quality Assurance/Quality Control – U.S. EPA Reference Test Method 25A

Cylinder calibration gases used met EPA Protocol 1 (+/- 2%) standards. Copies of all calibration gas certificates can be found in the Quality Assurance/Quality Control Appendix.

Within two (2) hours prior to testing, zero gas was introduced through the sampling system to the analyzer. After adjusting the analyzer to the Zero gas concentration and once the analyzer reading was stable, the analyzer value was recorded. This process was repeated for the High-Level gas, and the time required for the analyzer reading to reach 95 percent of the gas concentration was recorded to determine the response time. Next, Low and Mid-Level gases were introduced through the sampling system to the analyzer, and the response was recorded when it was stable. All values were less than +/- 5 percent of the calibration gas concentrations.

Mid-Level gas was introduced through the sampling system. After the analyzer response was stable, the value was recorded. Next, zero gas was introduced through the sampling system, and the analyzer value recorded once it reached a stable response. The Analyzer Drift was less than +/- 3 percent of the span value.

A Data Acquisition System with battery backup was used to record the instrument response in one (1) minute averages. The data was continuously stored as a *.CSV file in Excel format on the hard drive of a computer. At the completion of testing, the data was also saved to the AST server. All data was reviewed by the Field Team Leader before leaving the facility. Once arriving at AST's office, all written and electronic data was relinquished to the report coordinator and then a final review was performed by the Project Manager.

Appendix A

Location ABCWUA
Source Unit 27
Project No. 2020-0005
Run No. 1
Parameter(s) VFR

Meter Pressure (Pm), in. Hg

$$Pm = Pb + \frac{\Delta H}{13.6}$$

where,

Pb 25 = barometric pressure, in. Hg
ΔH 1.0 = pressure differential of orifice, in H_2O
Pm 25.3 = in. Hg

Absolute Stack Gas Pressure (Ps), in. Hg

$$Ps = Pb + \frac{Pg}{13.6}$$

where,

Pb 25 = barometric pressure, in. Hg
Pg 0.59 = static pressure, in. H_2O
Ps 25.3 = in. Hg

Standard Meter Volume (Vmstd), dscf

$$Vmstd = \frac{17.647 \times Vm \times Pm}{Tm}$$

where,

Y 1.0 = meter correction factor
Vm 37.9 = meter volume, cf
Pm 25.3 = absolute meter pressure, in. Hg
Tm 508.2 = absolute meter temperature, ^{o}R
Vmstd 33.3 = dscf

Standard Wet Volume (Vwstd), scf

$$Vwstd = 0.04707 \times Vlc$$

where,

Vlc 73.8 = volume of H2O collected, ml
Vwstd 3.5 = scf

Moisture Fraction (BWSsat), dimensionless (theoretical at saturated conditions)

$$BWSsat = \frac{10^{6.37 - \left(\frac{2,827}{Ts + 365}\right)}}{Ps}$$

where,

Ts 648.2 = stack temperature, °F
Ps 25.3 = absolute stack gas pressure, in. Hg
BWSsat 150.2 = dimensionless

Moisture Fraction (BWS), dimensionless

$$BWS = \frac{Vwstd}{(Vwstd + Vmstd)}$$

where,

Vwstd 3.5 = standard wet volume, scf
Vmstd 33.3 = standard meter volume, dscf
BWS 0.095 = dimensionless

Moisture Fraction (BWS), dimensionless

$$BWS = BWSmsd \text{ unless } BWSsat < BWSmsd$$

where,

BWSsat 150.2 = moisture fraction (theoretical at saturated conditions)
BWSmsd 0.095 = moisture fraction (measured)
BWS 0.095

Location ABCWUA
Source Unit 27
Project No. 2020-0005
Run No. 1
Parameter(s) VFR

Molecular Weight (DRY) (Md), lb/lb-mole

$$Md = (0.44 \times \% \ CO_2) + (0.32 \times \% \ O_2) + (0.28 \ (100 - \% \ CO_2 - \% \ O_2))$$

where,

CO2 5.3 = carbon dioxide concentration, %
O2 11.6 = oxygen concentration, %
Md 29.3 = lb/lb mol

Molecular Weight (WET) (Ms), lb/lb-mole

$$Ms = Md \ (1 - BWS) + 18 \ (BWS)$$

where,

Md 29.3 = molecular weight (DRY), lb/lb mol
BWS 0.095 = moisture fraction, dimensionless
Ms 28.2 = lb/lb mol

Average Velocity (Vs), ft/sec

$$Vs = 85.49 \times Cp \times (\Delta P^{1/2}) \, avg \times \sqrt{\frac{Ts}{Ps \ x \ Ms}}$$

where,

Cp 0.81 = pitot tube coefficient
$\Delta P^{1/2}$ 0.78 = average pre/post test velocity head of stack gas, (in. H2O)$^{1/2}$
Ts 1108.2 = average pre/post test absolute stack temperature, °R
Ps 25.3 = absolute stack gas pressure, in. Hg
Ms 28.2 = molecular weight of stack gas, lb/lb mol
Vs 68.0 = ft/sec

Average Stack Gas Flow at Stack Conditions (Qa), acfm

$$Qa = 60 \times Vs \times As$$

where,

Vs 68.0 = stack gas velocity, ft/sec
As 3.4 = cross-sectional area of stack, ft^2
Qa 13,902 = acfm

Average Stack Gas Flow at Standard Conditions (Qs), dscfm

$$Qsd = 17.647 \times Qa \times (1 - BWS) \times \frac{Ps}{Ts}$$

where,

Qa 13,902 = average stack gas flow at stack conditions, acfm
BWS 0.095 = moisture fraction, dimensionless
Ps 25.3 = absolute stack gas pressure, in. Hg
Ts 1108.2 = average pre/post test absolute stack temperature, °R
Qs 5,063 = dscfm

Location ABCWUA
Source Unit 27
Project No. 2020-0005
Run No. 1
Parameter(s) VFR

Dry Gas Meter Calibration Check (Yqa), dimensionless

$$Yqa = \frac{Y - \left(\frac{\Theta}{Vm} \sqrt{\frac{0.0319 \times Tm \times 29}{\Delta H @ \times \left(Pb + \frac{\Delta H\ avg.}{13.6} \right) \times Md}} \sqrt{\Delta H}\ avg. \right)}{Y} \times 100$$

where,

Y	1	= meter correction factor, dimensionless
Θ	60	= run time, min.
Vm	37.879	= total meter volume, dcf
Tm	508.2	= absolute meter temperature, °R
ΔH@	1.6	= orifice meter calibration coefficient, in. H_2O
Pb	25.2	= barometric pressure, in. Hg
ΔH avg	1.0	= average pressure differential of orifice, in H_2O
Md	29.3	= molecular weight (DRY), lb/lb mol
$(\Delta H)^{1/2}$	1.0	= average squareroot pressure differential of orifice, (in. $H_2O)^{1/2}$
Yqa	-0.67	= dimensionless

Location: ABCWUA - Southside Water Reclamation Plant
Source: Unit 27
Project No.: 2020-0005
Run No./Method Run 1 Outlet/ Method 6C

Sulfur Dioxide Concentration (C_{SO2}), ppmvd

$$C_{SO2} = (C_{obs} - C_o) \times \left(\frac{C_{MA}}{(C_M - C_o)} \right)$$

where,

C_{obs} 52.2 = average analyzer value during test, ppmvd
C_o 0.70 = average of pretest & posttest zero responses, ppmvd
C_{MA} 487.4 = actual concentration of calibration gas, ppmvd
C_M 489.3 = average of pretest & posttest calibration responses, ppmvd
C_{SO2} 0.14 = SO_2 concentration, ppmvd

Sulfur Dioxide Concentration @ 15% Oxygen (C_{SO2c15}), ppmvd @ 15% O2

$$C_{SO215} = C_{SO2} \times \frac{20.9 - 15}{20.9 - C_{O2}}$$

where,

C_{SO2} 0.14 = SO_2 concentration, ppmvd
C_{O2} 11.6 = O_2 concentration, %
C_{SO2c15} 0.090 = ppmvd @ 15% O_2

Sulfur Dioxide Emission Rate (ER_{SO2}), lb/hr

$$ER_{SO2} = \frac{C_{SO2} \times MW \times Qs \times 60 \times 28.32}{24.04 \times 1.0E + 06 \times 454}$$

where,

C_{SO2} 0.14 = SO_2 concentration, ppmvd
MW 64.1 = SO_2 molecular weight, g/g-mole
Qs 5,063 = stack gas volumetric flow rate at standard conditions, dscfm
ER_{SO2} 0.007 = lb/hr

Sulfur Dioxide Emission Rate (ER_{SO2TPY}), ton/yr

$$ER_{SO2TPY} = ER_{SO2} \times \frac{8,760}{2.0E + 03}$$

where,

ER_{SO2} 0.007 = SO_2 emission rate, lb/hr
ER_{SO2TPY} 0.031 = ton/yr

Sulfur Dioxide Emission Factor (EF_{SO2}), g/hp-hr

$$EF_{SO2} = \frac{ER_{SO2} \times 454}{EBW}$$

where,

ER_{SO2} 0.007 = SO_2 emission rate, lb/hr
EBW 2,701 = engine brake work, HP
EF_{SO2} 0.0012 = g/HP-hr

Location: ABCWUA - Southside Water Reclamation Plant
Source: Unit 27
Project No.: 2020-0005
Run No./Method Run 1 Outlet/ Method 7E

Nitrogen Oxides Concentration (C_{NOx}), ppmvd

$$\mathrm{C_{NOx}} = (\mathrm{C_{obs}} - \mathrm{C_o}) \times \left(\frac{\mathrm{C_{MA}}}{(\mathrm{C_M} - \mathrm{C_o})}\right)$$

where,

C_{obs} 52.2 = average analyzer value during test, ppmvd
C_o 0.70 = average of pretest & posttest zero responses, ppmvd
C_{MA} 487.4 = actual concentration of calibration gas, ppmvd
C_M 489.3 = average of pretest & posttest calibration responses, ppmvd
C_{NOx} 51.4 = NOx concentration, ppmvd

Nitrogen Oxides Concentration @ 15% Oxygen (C_{NOxc15}), ppmvd @ 15% O_2

$$C_{NOxc15} = C_{NOx} \times \frac{20.9 - 15}{20.9 - C_{O2}}$$

where,

C_{NOx} 51.4 = NO_x concentration, ppmvd
C_{O2} 11.6 = O_2 concentration, %
C_{NOxc15} 32.7 = ppmvd @ 15% O_2

Nitrogen Oxides Emission Rate (ER_{NOx}), lb/hr

$$ER_{NOx} = \frac{C_{NOx}\ x\ MW\ x\ Qs\ x\ 60\frac{min}{h}\ \ x\ 28.32\frac{L}{ft^3}}{24.04\frac{L}{mol}\ x\ 1.0E+06\ x\ 454\frac{g}{lb}}$$

where,

C_{NOx} 51.4 = NOx concentration, ppmvd
MW 46.0 = NOx (as NO2) molecular weight, g/g-mole
Qs 5,063 = stack gas volumetric flow rate at standard conditions, dscfm
ER_{NOx} 1.9 = lb/hr

Nitrogen Oxides Emission Rate (ER_{NOxTPY}), ton/yr

$$ER_{NOxTPY} = ER_{NOx} \times \frac{8{,}760}{2.0E+03}$$

where,

ER_{NOx} 1.9 = NOx emission rate, lb/hr
ER_{NOxTPY} 8.2 = ton/yr

Nitrogen Oxides Emission Factor (EF_{NOx}), g/hp-hr

$$EF_{NOx} = \frac{ER_{NOx} \times 454\frac{g}{lb}}{EBW}$$

where,

ER_{NOX} 1.9 = NOx emission rate, lb/hr
EBW 2,701 = engine brake work, HP
EF_{NOX} 0.31 = g/HP-hr

Location: ABCWUA - Southside Water Reclamation Plant
Source: Unit 27
Project No.: 2020-0005
Run No./Method Run 1 Outlet/ Method 10

Carbon Monoxide Concentration (C_{CO}), ppmvd

$$C_{CO} = (C_{obs} - C_o) \times \left(\frac{C_{MA}}{(C_M - C_o)} \right)$$

where,

C_{obs} 311.8 = average analyzer value during test, ppmvd
C_o 0.25 = average of pretest & posttest zero responses, ppmvd
C_{MA} 440.2 = actual concentration of calibration gas, ppmvd
C_M 439.8 = average of pretest & posttest calibration responses, ppmvd
C_{CO} 312.0 = CO concentration, ppmvd

Carbon Monoxide Concentration @ 15% Oxygen (C_{COc15}), ppmvd @ 15% O2

$$C_{COc\,15} = C_{CO} \times \frac{20.9 - 15}{20.9 - C_{O2}}$$

where,

C_{CO} 312.0 = CO concentration, ppmvd
C_{O2} 11.6 = O_2 concentration, %
C_{COc15} 198.6 = ppmvd @ 15% O_2

Carbon Monoxide Emission Rate (ER_{CO}), lb/hr

$$ER_{CO} = \frac{C_{CO} \times MW \times Qs \times 60 \times 28.32}{24.04 \times 1.0E + 06 \times 454}$$

where,

C_{CO} 312.0 = CO concentration, ppmvd
MW 28.0 = CO molecular weight, g/g-mole
Qs 5,063 = stack gas volumetric flow rate at standard conditions, dscfm
ER_{CO} 6.9 = lb/hr

Carbon Monoxide Emission Rate (ER_{COTPY}), ton/yr

$$ER_{COTPY} = ER_{CO} \times \frac{8,760}{2.0E + 03}$$

where,

ER_{CO} 6.9 = CO emission rate, lb/hr
ER_{COTPY} 30.2 = ton/yr

Carbon Monoxide Emission Factor (EF_{CO}), g/hp-hr

$$EF_{CO} = \frac{ER_{CO} \times 454}{EBW}$$

where,

ER_{CO} 6.9 = CO emission rate, lb/hr
EBW 2,701 = engine brake work, HP
EF_{CO} 1.2 = g/HP-hr

Location: ABCWUA - Southside Water Reclamation Plant
Source: Unit 27
Project No.: 2020-0005
Run No./Method Run 1 Outlet / Methods 25A-18

Total Hydrocarbons Concentration (C_{THC}) (as C3H8), ppmvd

$$C_{THC} = \frac{C_{THCw}}{1 - BWS}$$

where,

C_{THCw} 71.1 = THC concentration (as C3H8), ppmvw
BWS 0.095 = moisture fraction, unitless
C_{THC} 78.6 = ppmvd

NMEVOC Concentration (C_{NMEVOC}) (as C3H8), ppmvd

$$C_{NMEVOC} = C_{VOC} - C_{CH4} - C_{C2H6}$$

where,

C_{VOCd} 78.6 = VOC concentration (as C3H8), ppmvd
C_{CH4} 0.00 = CH4 concentration (as C3H8), ppmvd
C_{C2H6} 0.00 = C2H6 concentration (as C3H8), ppmvd
C_{NMEVOC} 78.6 = ppmvd

NMEVOC Concentration @ 15% Oxygen ($C_{NMEVOCc15}$) (as C3H8), ppmvd @ 15% O2

$$C_{NMEVOCc15} = C_{NMEVOC} \times \frac{20.9 - 15}{20.9 - C_{O2}}$$

where,

C_{NMEVOC} 78.6 = NMEVOC concentration (as C3H8), ppmvd
C_{O2} 11.6 = O_2 concentration, %
$C_{NMEVOCc15}$ 50.0 = ppmvd @ 15% O_2

NMEVOC Compounds Rate (ER_{NMEVOC}) (as C3H8), lb/hr

$$ER_{NMEVOC} = \frac{C_{NMEVOC} \times MW \times Qs \times 60 \times 28.32}{24.04 \times 1.0E+06 \times 454}$$

where,

C_{NMEVOC} 78.6 = NMEVOC concentration (C3H8), ppmvd
MW 44.1 = molecular weight, g/g-mole
Qs 5,063 = stack gas volumetric flow rate at standard conditions, dscfm
ER_{NMEVOC} 2.7 = lb/hr

NMEVOC Emission Rate ($ER_{NMEVOCTPY}$) (as C3H8), ton/yr

$$ER_{NMEVOCTPY} = ER_{NMEVOC} \times \frac{8,760}{2.0E+03}$$

where,

ER_{NMEVOC} 2.7 = NMEVOC emission rate (C3H8), lb/hr
$ER_{NMEVOCTPY}$ 12.0 = ton/yr

NMEVOC Emission Factor (EF_{NMEVOC}) (as C3H8), g/HP-Hr

$$EF_{NMEVOC} = \frac{ER_{NMEVOC} \times 454}{EBW}$$

where,

ER_{NMEVOC} 2.7 = NMEVOC emission rate (as C3H8), lb/hr
EBW 2,701 = engine brake work, HP
EF_{NMEVOC} 0.46 = g/HP-hr

Appendix B

Unit 27

Location ABCWUA - Southside Water Reclamation Plant
Source Unit 27
Project No. 2020-0005

Run Number		Run 1	Run 2	Run 3	Average
Date		1/11/20	1/11/20	1/11/20	--
Start Time		9:23	10:36	11:50	--
Stop Time		10:23	11:36	12:50	--
Engine Data					
Engine Manufacturer		Caterpillar			
Engine Model		G3612			
Engine Serial Number		1YG00188			
Engine Type		Spark Ignition - 4SLB			
Engine Year of Manufacture	DOM	2002			
Engine Speed, RPM	ES	900	900	900	900
Engine Brake Work, HP	EBW	2,701	2,697	2,694	2,697
Maximum Engine Brake Work, HP	MaxEBW	3,161	3,161	3,161	3,161
Engine Load, %	EL	90	90	90	90
Fuel Heating Value, Btu/scf	F_{HV}	1,040	1,040	1,040	1,040
Fuel Factor, dscf/MMBtu	F_{Factor}	8,710	8,710	8,710	8,710
Fuel Rate, scfh	F_R	421	421	423	422
Input Data - Outlet					
Moisture Fraction, dimensionless	BWS	0.095	0.095	0.095	0.095
Volumetric Flow Rate (M1-4), dscfm	Qs	5,063	5,126	5,061	5,083
Calculated Data - Outlet					
O2 Concentration, % dry	C_{O2}	11.6	11.7	11.7	11.7
CO2 Concentration, % dry	C_{CO2}	5.3	5.3	5.3	5.3
NOx Concentration, ppmvd	C_{NOx}	51.4	50.8	50.2	50.8
NOx Concentration, ppmvd @ 15% O2	C_{NOxc15}	32.7	32.6	32.1	32.5
NOx Emission Factor, g/HP-hr	EF_{NOx}	0.31	0.31	0.31	0.31
NOx Emission Rate, lb/hr	ER_{NOx}	1.9	1.9	1.8	1.8
NOx Emission Rate, ton/yr	ER_{NOxTPY}	8.2	8.2	8.0	8.1
CO Concentration, ppmvd	C_{CO}	312.0	321.0	324.7	319.2
CO Concentration, ppmvd @ 15% O2	C_{COc15}	198.6	206.4	207.6	204.2
CO Emission Factor, g/HP-hr	EF_{CO}	1.2	1.2	1.2	1.2
CO Emission Rate, lb/hr	ER_{CO}	6.9	7.2	7.2	7.1
CO Emission Rate, ton/yr	ER_{COTPY}	30.2	31.4	31.4	31.0
THC Concentration as propane, ppmvw	C_{THCw}	71.1	71.1	71.5	71.2
THC Concentration as propane, ppmvd	C_{THCd}	78.6	78.5	79.0	78.7
CH4 Concentration, ppmvd	C_{CH4}	0.00	0.00	0.00	0.00
CH4 Concentration (as C3H8), ppmvd	$C_{CH4\ as\ propane}$	0.00	0.00	0.00	0.00
C2H6 Concentration, ppmvd	C_{C2H6}	0.00	0.00	0.00	0.00
C2H6 Concentration (as C3H8), ppmvd	$C_{C2H6\ as\ propane}$	0.00	0.00	0.00	0.00
NMEHC Concentration (as C3H8), ppmvd	C_{NMEHC}	78.6	78.5	79.0	78.7
NMEHC Concentration (as C3H8), ppmvd @ 15% O2	$C_{NMEHCc15}$	50.0	50.5	50.5	50.3
NMEHC Emission Factor (as C3H8), g/HP-hr	EF_{NMEHC}	0.46	0.47	0.46	0.46
NMEHC Emission Rate (as C3H8), lb/hr	ER_{NMEHC}	2.7	2.8	2.7	2.7
NMEHC Emission Rate (as C3H8), ton/yr	$ER_{NMEHCTPY}$	12.0	12.1	12.0	12.0
SO_2 Concentration, ppmvd	C_{SO2}	0.14	0.15	0.15	0.15
SO_2 Concentration, ppmvd @ 15% O2	C_{SO2c15}	0.090	0.10	0.10	0.10
SO_2 Emission Factor, g/HP-hr	EF_{SO2}	0.00	0.00	0.00	0.00
SO_2 Emission Rate, lb/hr	ER_{SO2}	0.007	0.008	0.008	0.008
SO_2 Emission Rate, ton/yr	ER_{SO2TPY}	0.031	0.034	0.034	0.033

Run 1 - CEMS Data

Location: ABCWUA - Southside Water Reclamation Plant
Source: Unit 27
Project No.: 2020-0005
Date: 1/11/20

Time **Unit** **Status**	**O_2 - Outlet** **% dry** Valid	**CO_2 - Outlet** **% dry** Valid	**CO - Outlet** **ppmvd** Valid	**NOx - Outlet** **ppmvd** Valid	**THC - Outlet** **ppmvw** Valid	**SO_2 - Outlet** **ppmvd** Valid
9:23	11.6	5.3	313.5	53.5	70.9	0.1
9:24	11.6	5.3	314.7	52.8	72.3	0.1
9:25	11.6	5.3	312.1	53.6	72.8	0.1
9:26	11.6	5.3	312.7	52.2	72.3	0.1
9:27	11.6	5.3	315.0	52.3	69.6	0.1
9:28	11.6	5.3	310.8	52.4	70.9	0.1
9:29	11.6	5.3	311.4	53.7	71.2	0.1
9:30	11.6	5.3	312.2	52.5	75.3	0.1
9:31	11.5	5.3	308.4	52.4	72.9	0.1
9:32	11.6	5.3	312.2	52.8	71.9	0.1
9:33	11.6	5.3	304.7	52.0	71.0	0.1
9:34	11.6	5.3	310.8	52.2	70.2	0.1
9:35	11.6	5.3	312.5	50.7	70.0	0.1
9:36	11.6	5.3	311.1	51.8	71.0	0.1
9:37	11.6	5.3	308.4	53.3	72.2	0.1
9:38	11.6	5.3	313.1	53.5	72.4	0.1
9:39	11.6	5.3	319.6	51.3	72.3	0.1
9:40	11.6	5.3	313.6	52.3	70.9	0.1
9:41	11.6	5.3	312.5	53.0	68.9	0.1
9:42	11.6	5.3	321.3	51.8	70.0	0.1
9:43	11.6	5.3	309.3	54.1	68.8	0.1
9:44	11.6	5.3	314.7	51.2	67.6	0.1
9:45	11.6	5.3	316.7	51.5	74.9	0.1
9:46	11.6	5.3	317.1	52.4	71.5	0.1
9:47	11.6	5.3	313.4	52.5	68.2	0.1
9:48	11.6	5.3	306.6	53.8	71.2	0.1
9:49	11.6	5.3	309.4	53.0	72.0	0.1
9:50	11.6	5.3	312.3	53.1	77.3	0.1
9:51	11.6	5.3	316.6	52.8	73.8	0.1
9:52	11.6	5.3	316.5	52.2	68.9	0.1
9:53	11.6	5.3	310.9	52.1	70.9	0.1
9:54	11.6	5.3	308.6	50.8	71.2	0.1
9:55	11.6	5.3	310.6	53.0	69.2	0.1
9:56	11.6	5.3	316.9	52.3	68.5	0.1
9:57	11.6	5.3	317.7	53.7	70.3	0.1
9:58	11.6	5.3	313.9	52.3	71.2	0.1
9:59	11.6	5.3	307.4	52.3	70.0	0.1
10:00	11.6	5.3	314.3	52.0	70.3	0.1
10:01	11.6	5.3	311.2	51.3	71.0	0.1
10:02	11.6	5.3	310.1	49.8	70.4	0.1
10:03	11.6	5.3	312.3	52.0	70.0	0.1
10:04	11.6	5.3	309.0	53.7	68.5	0.1
10:05	11.6	5.3	314.1	50.0	69.0	0.1
10:06	11.6	5.3	311.0	51.7	69.1	0.1
10:07	11.6	5.3	312.3	52.3	70.7	0.1
10:08	11.6	5.3	310.4	52.3	71.8	0.2
10:09	11.6	5.3	306.3	52.8	72.6	0.1
10:10	11.6	5.3	307.3	53.6	69.0	0.1
10:11	11.6	5.3	303.7	53.3	70.2	0.1
10:12	11.6	5.3	307.6	53.3	72.2	0.1
10:13	11.6	5.3	307.2	51.6	74.9	0.1
10:14	11.6	5.3	314.8	50.8	74.0	0.1
10:15	11.6	5.3	308.7	50.6	71.6	0.1
10:16	11.7	5.3	313.1	52.2	69.7	0.1
10:17	11.6	5.3	310.9	50.7	72.4	0.1
10:18	11.6	5.3	313.7	52.6	72.3	0.1
10:19	11.7	5.3	306.9	52.1	70.2	0.1
10:20	11.7	5.3	309.9	49.5	71.6	0.2
10:21	11.6	5.3	313.0	50.9	71.6	0.1
10:22	11.7	5.3	309.2	50.5	70.9	0.1

Parameter	**O_2 - Outlet**	**CO_2 - Outlet**	**CO - Outlet**	**NOx - Outlet**	**THC - Outlet**	**SO2 - Outlet**
Uncorrected Run Average (C_{obs})	11.6	5.3	311.8	52.2	71.1	0.14
Cal Gas Concentration (C_{MA})	10.9	10.9	440.2	487.4	45.7	19.1
Pretest System Zero Response	0.00	0.00	0.00	0.70	0.00	0.00
Posttest System Zero Response	0.10	0.00	0.50	0.70	0.00	0.00
Average Zero Response (Co)	0.050	0.00	0.25	0.70	0.00	0.00
Pretest System Cal Response	10.9	10.7	437.0	486.4	46.0	19.1
Posttest System Cal Response	10.9	10.7	442.5	492.1	46.5	18.9
Average Cal Response (C_M)	10.9	10.7	439.8	489.3	46.3	19.0
Corrected Run Average (Corr)	11.6	5.3	312.0	51.4	NA	0.14

Run 2 - CEMS Data

Location: ABCWUA - Southside Water Reclamation Plant
Source: Unit 27
Project No.: 2020-0005
Date: 1/11/20

Time	O_2 - Outlet	CO_2 - Outlet	CO - Outlet	NOx - Outlet	THC - Outlet	SO2 - Outlet
Unit	% dry	% dry	ppmvd	ppmvd	ppmvw	ppmvd
Status	Valid	Valid	Valid	Valid	Valid	Valid
10:36	11.7	5.3	316.6	54.0	72.8	0.3
10:37	11.7	5.3	317.1	53.1	70.6	0.2
10:38	11.7	5.3	317.6	51.4	70.9	0.2
10:39	11.7	5.3	317.2	52.9	71.4	0.1
10:40	11.7	5.3	321.0	51.6	72.5	0.1
10:41	11.7	5.3	313.2	49.5	73.6	0.1
10:42	11.7	5.3	318.8	52.1	74.3	0.1
10:43	11.7	5.3	316.9	51.5	74.4	0.1
10:44	11.7	5.3	318.8	50.7	70.2	0.2
10:45	11.7	5.3	313.2	53.2	70.7	0.2
10:46	11.7	5.3	323.8	52.6	70.9	0.1
10:47	11.7	5.3	319.4	52.4	71.2	0.2
10:48	11.7	5.3	313.2	50.1	80.5	0.1
10:49	11.7	5.3	322.9	51.7	72.9	0.2
10:50	11.7	5.3	316.7	51.7	75.9	0.2
10:51	11.7	5.3	312.6	50.5	70.5	0.2
10:52	11.7	5.3	315.7	51.3	70.8	0.2
10:53	11.7	5.3	315.0	52.3	69.8	0.2
10:54	11.7	5.3	318.1	52.9	71.4	0.2
10:55	11.7	5.3	313.3	52.5	71.4	0.2
10:56	11.7	5.3	318.5	51.7	68.9	0.2
10:57	11.7	5.3	314.0	51.3	68.7	0.1
10:58	11.8	5.3	318.1	50.0	71.2	0.2
10:59	11.8	5.3	315.2	51.6	70.6	0.2
11:00	11.8	5.3	317.4	52.0	69.2	0.1
11:01	12.0	5.3	320.5	52.8	70.2	0.2
11:02	12.0	5.3	320.0	52.9	71.2	0.1
11:03	12.2	5.3	317.6	52.7	72.8	0.2
11:04	11.8	5.3	320.5	54.1	73.5	0.2
11:05	11.8	5.3	316.9	53.3	70.4	0.1
11:06	11.8	5.3	321.8	50.9	69.5	0.2
11:07	11.8	5.3	309.2	50.4	68.6	0.2
11:08	11.8	5.3	313.3	53.5	71.8	0.2
11:09	11.8	5.3	320.9	52.2	79.4	0.2
11:10	11.8	5.3	320.5	50.9	69.8	0.2
11:11	11.7	5.3	318.4	52.2	72.0	0.2
11:12	11.7	5.3	313.5	52.9	70.8	0.2
11:13	11.7	5.3	316.6	50.0	73.2	0.2
11:14	11.7	5.3	314.7	50.3	70.6	0.2
11:15	11.7	5.3	314.0	50.6	71.9	0.2
11:16	11.7	5.3	316.9	51.9	70.0	0.2
11:17	11.7	5.3	311.7	51.5	68.4	0.2
11:18	11.7	5.3	319.5	50.2	69.1	0.2
11:19	11.8	5.3	315.1	51.7	69.1	0.2
11:20	11.7	5.3	324.7	49.6	70.7	0.2
11:21	11.7	5.3	311.0	50.6	72.8	0.1
11:22	11.7	5.3	305.5	53.0	72.0	0.2
11:23	11.7	5.3	306.6	54.2	70.3	0.2
11:24	11.7	5.3	316.4	55.0	69.1	0.2
11:25	11.7	5.3	321.9	52.5	67.7	0.2
11:26	11.7	5.3	312.2	53.6	68.4	0.2
11:27	11.7	5.3	319.0	52.3	69.6	0.2
11:28	11.7	5.3	310.0	51.8	69.2	0.2
11:29	11.7	5.3	315.4	52.1	68.1	0.2
11:30	11.7	5.3	310.2	52.6	69.0	0.2
11:31	11.7	5.3	317.6	52.1	68.9	0.2
11:32	11.7	5.3	309.3	53.2	70.0	0.2
11:33	11.7	5.3	316.1	52.2	70.8	0.2
11:34	11.7	5.3	310.2	52.5	69.1	0.2
11:35	11.7	5.3	313.9	52.1	70.0	0.2

Parameter	O_2 - Outlet	CO_2 - Outlet	CO - Outlet	NOx - Outlet	THC - Outlet	SO2 - Outlet
Uncorrected Run Average (C_{obs})	11.7	5.3	316.1	52.0	71.1	0.15
Cal Gas Concentration (C_{MA})	10.9	10.9	440.2	487.4	45.7	19.1
Pretest System Zero Response	0.10	0.00	0.50	0.70	0.00	0.00
Posttest System Zero Response	0.10	0.00	0.00	0.70	0.00	0.00
Average Zero Response (Co)	0.10	0.00	0.25	0.70	0.00	0.00
Pretest System Cal Response	10.9	10.7	442.5	492.1	46.5	18.9
Posttest System Cal Response	11.0	10.7	424.4	493.7	46.4	18.9
Average Cal Response (C_M)	11.0	10.7	433.5	492.9	46.5	18.9
Corrected Run Average (Corr)	11.7	5.3	321.0	50.8	NA	0.15

Alliance
SOURCE TESTING

Run 3 - CEMS Data

Location: ABCWUA - Southside Water Reclamation Plant
Source: Unit 27
Project No.: 2020-0005
Date: 1/11/20

Time	**O_2 - Outlet**	**CO_2 - Outlet**	**CO - Outlet**	**NOx - Outlet**	**THC - Outlet**	**SO2 - Outlet**
Unit	**% dry**	**% dry**	**ppmvd**	**ppmvd**	**ppmvw**	**ppmvd**
Status	Valid	Valid	Valid	Valid	Valid	Valid
11:50	11.8	5.2	316.2	51.3	69.1	0.3
11:51	11.7	5.3	312.9	52.2	71.7	0.2
11:52	11.7	5.2	315.1	51.6	67.2	0.2
11:53	11.7	5.3	315.0	52.7	73.8	0.2
11:54	11.7	5.3	317.9	50.8	69.9	0.2
11:55	11.7	5.3	310.2	54.0	70.6	0.2
11:56	11.7	5.2	312.3	52.1	71.8	0.2
11:57	11.8	5.3	309.2	50.9	71.5	0.2
11:58	11.7	5.3	313.0	51.7	69.5	0.2
11:59	11.7	5.3	311.7	52.5	69.1	0.2
12:00	11.7	5.3	310.6	51.1	69.5	0.2
12:01	11.8	5.3	314.6	51.9	71.5	0.2
12:02	11.7	5.3	310.1	50.2	71.7	0.2
12:03	11.8	5.3	323.4	52.0	76.0	0.2
12:04	11.8	5.3	316.3	52.1	76.1	0.2
12:05	11.7	5.3	311.5	51.2	70.3	0.2
12:06	11.8	5.3	313.6	51.1	71.7	0.2
12:07	11.7	5.3	310.8	51.6	72.2	0.2
12:08	11.7	5.3	310.5	53.0	70.2	0.2
12:09	11.8	5.2	314.3	51.9	70.9	0.2
12:10	11.8	5.3	314.5	49.2	71.2	0.2
12:11	11.7	5.3	315.1	52.2	70.2	0.2
12:12	11.7	5.3	307.9	52.8	68.5	0.2
12:13	11.8	5.3	312.5	51.8	71.0	0.2
12:14	11.8	5.2	313.9	51.2	71.0	0.2
12:15	11.7	5.3	309.7	49.6	69.8	0.2
12:16	11.8	5.2	308.3	50.8	72.5	0.2
12:17	11.8	5.2	317.1	49.6	72.7	0.2
12:18	11.8	5.2	320.6	49.1	72.9	0.1
12:19	11.7	5.3	309.8	50.1	72.6	0.2
12:20	11.8	5.2	310.2	50.0	72.8	0.2
12:21	11.7	5.3	304.9	51.5	71.1	0.2
12:22	11.7	5.3	316.1	50.5	70.6	0.2
12:23	11.8	5.3	314.2	51.4	72.0	0.2
12:24	11.7	5.3	310.2	51.9	71.7	0.2
12:25	11.8	5.3	316.9	50.1	71.2	0.2
12:26	11.8	5.3	316.7	50.3	70.7	0.2
12:27	11.8	5.3	319.2	51.1	70.3	0.2
12:28	11.7	5.3	311.9	52.2	72.8	0.2
12:29	11.7	5.3	319.0	52.0	72.4	0.2
12:30	11.8	5.3	319.2	50.9	73.2	0.2
12:31	11.7	5.3	312.5	50.9	73.2	0.2
12:32	11.7	5.3	315.6	53.6	71.5	0.2
12:33	11.7	5.3	310.9	52.5	70.6	0.2
12:34	11.8	5.3	315.9	51.6	70.6	0.2
12:35	11.7	5.3	315.7	52.4	78.0	0.2
12:36	11.8	5.2	314.6	50.9	73.5	0.2
12:37	11.8	5.3	315.6	51.2	72.4	0.2
12:38	11.8	5.3	312.9	51.1	70.2	0.2
12:39	11.7	5.3	311.0	53.8	71.5	0.2
12:40	11.8	5.2	309.4	50.8	70.9	0.2
12:41	11.7	5.2	311.2	53.5	70.9	0.2
12:42	11.7	5.2	320.4	51.2	71.5	0.2
12:43	11.8	5.3	312.7	53.2	71.9	0.2
12:44	11.7	5.3	311.5	51.1	72.0	0.2
12:45	11.7	5.3	317.2	51.3	72.3	0.2
12:46	11.7	5.3	314.2	51.4	71.9	0.1
12:47	11.8	5.3	309.0	50.9	70.8	0.2
12:48	11.7	5.3	313.0	52.4	70.4	0.2
12:49	11.7	5.2	313.5	51.9	70.1	0.2

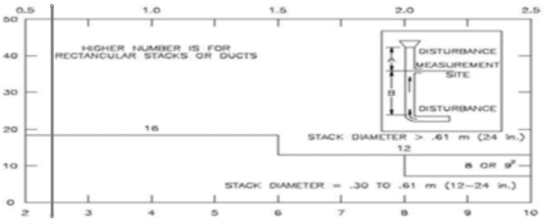
Parameter	**O_2 - Outlet**	**CO_2 - Outlet**	**CO - Outlet**	**NOx - Outlet**	**THC - Outlet**	**SO2 - Outlet**
Uncorrected Run Average (C_{obs})	11.7	5.3	313.6	51.5	71.5	0.15
Cal Gas Concentration (C_{MA})	10.9	10.9	440.2	487.4	45.7	19.1
Pretest System Zero Response	0.10	0.00	0.00	0.70	0.00	0.00
Posttest System Zero Response	0.20	0.040	0.00	0.68	0.016	0.00
Average Zero Response (Co)	0.15	0.020	0.00	0.69	0.0080	0.00
Pretest System Cal Response	11.0	10.7	424.4	493.7	46.4	18.9
Posttest System Cal Response	11.0	10.7	425.8	493.4	46.0	18.9
Average Cal Response (C_M)	11.0	10.7	425.1	493.6	46.2	18.9
Corrected Run Average (Corr)	11.7	5.3	324.7	50.2	NA	0.15

Method 1 Data

Location ABCWUA
Source Unit 27
Project No. 2020-0005
Date: 01/11/20

Stack Parameters

Duct Orientation: Horizontal
Duct Design: Circular
Depth of Duct: 25.00 in
Cross Sectional Area of Duct: 3.41 ft^2
No. of Test Ports: 2
Distance A: 7.5 ft
Distance A Duct Diameters: 3.6 (must be > 0.5)
Distance B: 5.0 ft
Distance B Duct Diameters: 2.4 (must be > 2)
Minimum Number of Traverse Points: 16
Actual Number of Traverse Points: 16



CIRCULAR DUCT

LOCATION OF TRAVERSE POINTS

Number of traverse points on a diameter

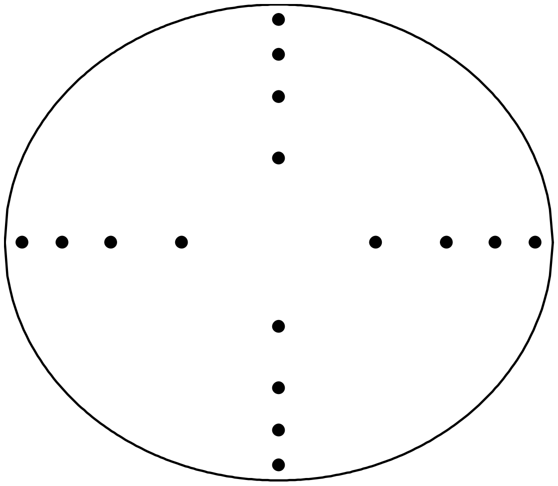
	2	3	4	5	6	7	8	9	10	11	12
1	14.6	--	6.7	--	4.4	--	3.2	--	2.6	--	2.1
2	85.4	--	25.0	--	14.6	--	10.5	--	8.2	--	6.7
3	--	--	75.0	--	29.6	--	19.4	--	14.6	--	11.8
4	--	--	93.3	--	70.4	--	32.3	--	22.6	--	17.7
5	--	--	--	--	85.4	--	67.7	--	34.2	--	25.0
6	--	--	--	--	95.6	--	80.6	--	65.8	--	35.6
7	--	--	--	--	--	--	89.5	--	77.4	--	64.4
8	--	--	--	--	--	--	96.8	--	85.4	--	75.0
9	--	--	--	--	--	--	--	--	91.8	--	82.3
10	--	--	--	--	--	--	--	--	97.4	--	88.2
11	--	--	--	--	--	--	--	--	--	--	93.3
12	--	--	--	--	--	--	--	--	--	--	97.9

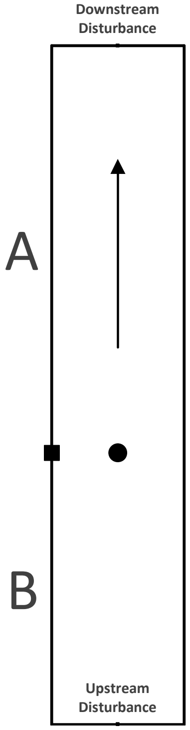
**Percent of stack diameter from inside wall to traverse point.*

Traverse Point	% of Diameter	Distance from inside wall	Distance from outside of port
1	3.2	1.00	5.50
2	10.5	2.63	7.13
3	19.4	4.85	9.35
4	32.3	8.08	12.58
5	67.7	16.93	21.43
6	80.6	20.15	24.65
7	89.5	22.38	26.88
8	96.8	24.00	28.50
9	--	--	--
10	--	--	--
11	--	--	--
12	--	--	--

Stack Diagram
A = 7.5 ft.
B = 5 ft.
Depth of Duct = 25 in.

Cross Sectional Area





Cyclonic Flow Check

Location ABCWUA
Source Unit 27
Project No. 2020-0005
Date 1/11/20

Sample Point	Angle (ΔP=0)
1	2
2	3
3	3
4	6
5	4
6	2
7	2
8	1
9	0
10	3
11	4
12	2
13	1
14	1
15	3
16	1
Average	2.4

Alliance
SOURCE TESTING

Field Data
Method 2 Data

Location ABCWUA
Source Unit 27
Project No. 2020-0005

Run No.	**1**		**2**		**3**	
Date	1/11/20		1/11/20		1/11/20	
Status	VALID		VALID		VALID	
Start Time	9:42		10:45		12:10	
Stop Time	9:52		10:55		12:18	
Leak Check	Pass		Pass		Pass	
Traverse Point	**Δ P (in. WC)**	**Ts (°F)**	**Δ P (in. WC)**	**Ts (°F)**	**Δ P (in. WC)**	**Ts (°F)**
A-1	0.59	647	0.61	647	0.59	648
2	0.61	648	0.64	647	0.61	649
3	0.62	649	0.65	648	0.62	648
4	0.63	648	0.62	646	0.64	647
5	0.64	648	0.63	646	0.64	647
6	0.63	649	0.63	648	0.65	647
7	0.61	649	0.65	647	0.63	648
8	0.58	649	0.65	647	0.61	648
B-1	0.63	648	0.64	644	0.60	648
2	0.64	648	0.61	645	0.59	647
3	0.62	649	0.62	645	0.62	647
4	0.63	648	0.65	646	0.63	647
5	0.62	647	0.66	648	0.64	647
6	0.61	648	0.62	647	0.60	648
7	0.60	648	0.60	647	0.58	648
8	0.57	648	0.59	645	0.57	647

					Average
Square Root of ΔP, (in. WC)$^{1/2}$	**(ΔP)$^{1/2}$**	0.78	0.79	0.78	0.79
Average ΔP, in. WC	**(ΔP)**	0.61	0.63	0.61	0.62
Pitot Tube Coefficient	**(Cp)**	0.81	0.81	0.81	0.81
Barometric Pressure, in. Hg	**(Pb)**	25.2	25.2	25.2	25.2
Static Pressure, in. WC	**(Pg)**	0.59	0.59	0.59	0.59
Stack Pressure, in. Hg	**(Ps)**	25.3	25.3	25.3	25.3
Average Temperature, °F	**(Ts)**	648.2	646.4	647.6	647.4
Average Temperature, °R	**(Ts)**	1108.2	1106.4	1107.6	1107.4
Measured Moisture Fraction	**(BWSmsd)**	0.095	0.095	0.095	0.095
Moisture Fraction @ Saturation	**(BWSsat)**	150.2	148.6	149.6	149.5
Moisture Fraction	**(BWS)**	0.095	0.095	0.095	0.095
O2 Concentration, %	**(O2)**	11.6	11.7	11.7	11.7
CO2 Concentration, %	**(CO2)**	5.3	5.3	5.3	5.3
Molecuar Weight, lb/lb-mole (dry)	**(Md)**	29.3	29.3	29.3	29.3
Molecuar Weight, lb/lb-mole (wet)	**(Ms)**	28.2	28.2	28.2	28.2
Velocity, ft/sec	**(Vs)**	68.0	68.7	67.9	68.2
VFR at stack conditions, acfm	**(Qa)**	13,902	14,060	13,890	13,951
VFR at standard conditions, scfh	**(Qsw)**	335,567	339,920	335,463	336,983
VFR at standard conditions, scfm	**(Qsw)**	5,593	5,665	5,591	5,616
VFR at standard conditions, dscfm	**(Qsd)**	5,063	5,126	5,061	5,083

Location ABCWUA
Source Unit 27
Project No. 2020-0005
Parameter(s): VFR
Console Type Meter Box

Run No.		1					2					3				
Date		1/11/20					1/11/20					1/11/20				
Status		VALID					VALID					VALID				
Start Time		9:23					10:36					11:50				
End Time		10:23					11:36					12:50				
Run Time, min	**(θ)**	60					60					60				
Meter ID		M5-17					M5-17					M5-17				
Meter Correction Factor	**(Y)**	1.000					1.000					1.000				
Orifice Calibration Value	**(ΔH @)**	1.570					1.570					1.570				
Max Vacuum, in. Hg		3					3					3				
Post Leak Check, ft3/min (at max vac.)		0.000					0.000					0.000				
Meter Volume, ft3																
0		338.895					376.925					416.844				
5		342.000					380.200					420.100				
10		345.300					383.600					423.400				
15		348.600					386.700					426.800				
20		351.200					389.700					429.800				
25		354.600					393.200					433.100				
30		357.800					396.800					436.700				
35		360.600					399.400					440.100				
40		363.500					402.800					443.200				
45		366.700					405.400					446.500				
50		370.100					408.900					449.900				
55		373.800					412.600					452.700				
60		376.774					416.320					456.514				
Total Meter Volume, ft3	**(Vm)**	37.879					39.395					39.670				
Temperature, °F		**Meter**	**Probe**	**Filter**	**Vacuum**	**Imp. Exit**	**Meter**	**Probe**	**Filter**	**Vacuum**	**Imp. Exit**	**Meter**	**Probe**	**Filter**	**Vacuum**	**Imp. Exit**
0		45	N/A	N/A	3	54	57	N/A	N/A	3	52	64	N/A	N/A	3	55
5		45	N/A	N/A	3	55	57	N/A	N/A	3	52	64	N/A	N/A	3	55
10		46	N/A	N/A	3	55	57	N/A	N/A	3	52	64	N/A	N/A	3	55
15		46	N/A	N/A	3	56	58	N/A	N/A	3	53	5	N/A	N/A	3	56
20		46	N/A	N/A	3	56	58	N/A	N/A	3	53	65	N/A	N/A	3	56
25		48	N/A	N/A	3	56	59	N/A	N/A	3	54	65	N/A	N/A	3	56
30		48	N/A	N/A	3	54	59	N/A	N/A	3	54	66	N/A	N/A	3	56
35		49	N/A	N/A	3	53	59	N/A	N/A	3	54	66	N/A	N/A	3	56
40		50	N/A	N/A	3	52	60	N/A	N/A	3	54	67	N/A	N/A	3	57
45		51	N/A	N/A	3	52	60	N/A	N/A	3	55	67	N/A	N/A	3	58
50		51	N/A	N/A	3	51	60	N/A	N/A	3	56	68	N/A	N/A	3	58
55		52	N/A	N/A	3	51	62	N/A	N/A	3	56	68	N/A	N/A	3	58
60		54	N/A	N/A	3	51	62	N/A	N/A	3	56	68	N/A	N/A	3	58
Average Temperature, °F	**(Tm)**	49	--	--	--	--	59	--	--	--	--	61	--	--	--	--
Average Temperature, °R	**(Tm)**	508	--	--	--	--	519	--	--	--	--	521	--	--	--	--
Minimum Temperature, °F		45	--	--	--	--	57	--	--	--	--	5	--	--	--	--
Maximum Temperature, °F		54	--	--	--	56	62	--	--	--	56	68	--	--	--	58
Barometeric Pressure, in. Hg	**(Pb)**	25.22					25.22					25.22				
Meter Orifice Pressure , in. WC	**(ΔH)**	1.000					1.000					1.000				
Meter Pressure, in. Hg	**(Pm)**	25.29					25.29					25.29				
Standard Meter Volume, ft3	**(Vmstd)**	33.267					33.895					33.986				
Analysis Type		Gravimetric					Gravimetric					Gravimetric				
Impinger 1, Pre/Post Test, mL		H2O		507.8	550.6	42.8	H2O		475.1	523.1	48.0	H2O		523.1	528.5	5.4
Impinger 2, Pre/Post Test, mL		H2O		464.3	483.1	18.8	H2O		483.1	490.5	7.4	H2O		490.5	547.9	57.4
Impinger 3, Pre/Post Test, mL		Empty		301.2	305.1	3.9	Empty		302.2	314.9	12.7	Empty		301.3	306.6	5.3
Impinger 4, Pre/Post Test, g		Silica		560.8	569.1	8.3	Silica		569.1	576.6	7.5	Silica		576.6	584.0	7.4
Volume Water Collected, mL	**(Vlc)**	73.8					75.6					75.5				
Standard Water Volume, ft^3	**(Vwstd)**	3.480					3.565					3.560				
Moisture Fraction Measured	**(BWS)**	0.095					0.095					0.095				
Gas Molecular Weight, lb/lb-mole (dry)	**(Md)**	29.31					29.32					29.32				
DGM Calibration Check Value	**(Yqa)**	-0.7					2.2					2.7				

Unit 27 Digester

Emissions Calculations

Location ABCWUA- Southside Water Reclamation Plant
Source Unit 27 (digestor)
Project No. 2020-0005

Run Number		**Run 1**	**Run 2**	**Run 3**	**Average**
Date		1/11/20	1/11/20	1/11/20	--
Start Time		13:47	15:04	16:22	--
Stop Time		14:47	16:04	17:22	--
Engine Data					
Engine Manufacturer		Caterpillar			
Engine Model		G3612			
Engine Serial Number		1YG00188			
Engine Type		Spark Ignition - 4SLB			
Engine Year of Manufacture	DOM	2002			
Engine Speed, RPM	ES	900	900	900	900
Engine Brake Work, HP	EBW	2,709	2,730	2,669	2,703
Maximum Engine Brake Work, HP	MaxEBW	3,161	3,161	3,161	3,161
Engine Load, %	EL	90	90	90	90
Fuel Heating Value, Btu/scf	F_{HV}	1,040	1,040	1,040	1,040
Fuel Factor, dscf/MMBtu	F_{Factor}	8,710	8,710	8,710	8,710
Fuel Rate, scfh	F_R	504	462	460	475
Input Data - Outlet					
Moisture Fraction, dimensionless	BWS	0.098	0.096	0.102	0.099
Volumetric Flow Rate (M1-4), dscfm	Qs	5,026	5,045	5,000	5,024
Calculated Data - Outlet					
O2 Concentration, % dry	C_{O2}	11.2	11.2	11.2	11.2
CO2 Concentration, % dry	C_{CO2}	6.3	6.3	6.3	6.3
NOx Concentration, ppmvd	C_{NOx}	63.0	67.8	68.7	66.5
NOx Concentration, ppmvd @ 15% O2	C_{NOxc15}	38.3	41.4	42.0	40.6
NOx Emission Factor, g/HP-hr	EF_{NOx}	0.38	0.41	0.42	0.40
NOx Emission Rate, lb/hr	ER_{NOx}	2.3	2.5	2.5	2.4
NOx Emission Rate, ton/yr	ER_{NOxTPY}	9.9	10.7	10.8	10.5
CO Concentration, ppmvd	C_{CO}	322.8	314.2	311.1	316.0
CO Concentration, ppmvd @ 15% O2	C_{COc15}	196.2	191.8	190.1	192.7
CO Emission Factor, g/HP-hr	EF_{CO}	1.2	1.1	1.2	1.2
CO Emission Rate, lb/hr	ER_{CO}	7.1	6.9	6.8	6.9
CO Emission Rate, ton/yr	ER_{COTPY}	31.0	30.3	29.7	30.3
THC Concentration as propane, ppmvw	C_{THCw}	57.4	55.9	54.9	56.1
THC Concentration as propane, ppmvd	C_{THCd}	63.7	61.9	61.1	62.2
CH4 Concentration, ppmvd	C_{CH4}	0.00	0.00	0.00	0.00
CH4 Concentration (as C3H8), ppmvd	$C_{CH4\ as\ propane}$	0.00	0.00	0.00	0.00
C2H6 Concentration, ppmvd	C_{C2H6}	0.00	0.00	0.00	0.00
C2H6 Concentration (as C3H8), ppmvd	$C_{C2H6\ as\ propane}$	0.00	0.00	0.00	0.00
NMEHC Concentration (as C3H8), ppmvd	C_{NMEHC}	63.7	61.9	61.1	62.2
NMEHC Concentration (as C3H8), ppmvd @ 15% O2	$C_{NMEHCc15}$	38.7	37.8	37.3	37.9
NMEHC Emission Factor (as C3H8), g/HP-hr	EF_{NMEHC}	0.37	0.36	0.36	0.36
NMEHC Emission Rate (as C3H8), lb/hr	ER_{NMEHC}	2.2	2.1	2.1	2.1
NMEHC Emission Rate (as C3H8), ton/yr	$ER_{NMEHCTPY}$	9.6	9.4	9.2	9.4
SO_2 Concentration, ppmvd	C_{SO2}	0.66	0.65	0.62	0.64
SO_2 Concentration, ppmvd @ 15% O2	C_{SO2c15}	0.40	0.40	0.38	0.39
SO_2 Emission Factor, g/HP-hr	EF_{SO2}	0.0055	0.0054	0.0053	0.0054
SO_2 Emission Rate, lb/hr	ER_{SO2}	0.033	0.033	0.031	0.032
SO_2 Emission Rate, ton/yr	ER_{SO2TPY}	0.14	0.14	0.14	0.14

Run 1 - CEMS Data

Location: ABCWUA- Southside Water Reclamation Plant
Source: Unit 27 (digester)
Project No.: 2020-0005
Date: 1/11/20

Time	O_2 - Outlet	CO_2 - Outlet	CO - Outlet	NOx - Outlet	THC - Outlet	SO_2 - Outlet
Unit	**% dry**	**% dry**	**ppmvd**	**ppmvd**	**ppmvw**	**ppmvd**
Status	Valid	Valid	Valid	Valid	Valid	Valid
13:47	11.2	6.2	314.5	66.9	61.1	0.8
13:48	11.2	6.2	315.5	68.2	60.3	0.8
13:49	11.2	6.2	312.7	69.1	56.0	0.7
13:50	11.2	6.2	314.7	68.4	60.1	0.7
13:51	11.2	6.2	318.5	67.2	62.0	0.7
13:52	11.3	6.2	312.1	64.5	53.4	0.7
13:53	11.3	6.2	318.2	65.8	55.9	0.7
13:54	11.3	6.2	320.5	63.3	58.6	0.7
13:55	11.2	6.2	321.8	63.1	56.1	0.7
13:56	11.2	6.2	317.0	62.8	55.5	0.7
13:57	11.2	6.2	319.7	65.7	53.8	0.7
13:58	11.2	6.2	310.0	67.1	53.6	0.7
13:59	11.2	6.2	314.0	67.2	62.5	0.7
14:00	11.3	6.2	317.9	64.2	54.1	0.7
14:01	11.3	6.2	314.3	62.2	55.2	0.7
14:02	11.2	6.2	316.4	63.2	56.0	0.7
14:03	11.3	6.2	311.3	64.3	54.6	0.7
14:04	11.3	6.2	311.0	65.4	53.8	0.7
14:05	11.3	6.2	315.9	65.5	53.9	0.7
14:06	11.3	6.2	313.1	65.8	55.2	0.6
14:07	11.3	6.2	319.5	62.3	60.3	0.6
14:08	11.3	6.2	315.2	63.2	59.6	0.6
14:09	11.3	6.2	316.3	62.7	57.5	0.6
14:10	11.3	6.2	313.7	63.7	56.9	0.6
14:11	11.3	6.2	322.3	62.5	55.0	0.7
14:12	11.3	6.2	316.8	65.8	56.3	0.7
14:13	11.3	6.2	321.2	64.6	56.9	0.6
14:14	11.3	6.2	320.9	63.6	57.7	0.7
14:15	11.3	6.2	313.8	64.0	54.7	0.6
14:16	11.3	6.2	313.6	62.7	55.5	0.6
14:17	11.3	6.2	317.8	65.1	62.9	0.7
14:18	11.3	6.2	319.8	64.7	59.1	0.6
14:19	11.3	6.2	314.3	65.1	60.0	0.7
14:20	11.3	6.2	313.9	64.4	57.2	0.6
14:21	11.3	6.2	314.3	63.7	54.7	0.6
14:22	11.3	6.2	312.1	61.5	58.7	0.6
14:23	11.3	6.2	318.3	60.5	59.3	0.6
14:24	11.3	6.2	311.8	66.4	55.8	0.7
14:25	11.3	6.2	311.2	65.2	54.6	0.7
14:26	11.3	6.2	316.7	64.5	57.1	0.7
14:27	11.3	6.2	309.4	62.9	56.3	0.7
14:28	11.3	6.2	316.6	66.3	60.3	0.7
14:29	11.3	6.2	319.2	68.2	59.4	0.7
14:30	11.3	6.2	309.6	67.0	59.3	0.7
14:31	11.3	6.2	317.1	63.2	63.7	0.7
14:32	11.3	6.2	309.6	65.0	61.0	0.7
14:33	11.3	6.2	311.8	64.3	55.4	0.6
14:34	11.3	6.2	314.5	61.6	54.0	0.6
14:35	11.3	6.2	318.7	61.9	55.8	0.6
14:36	11.3	6.2	314.2	61.9	57.0	0.7
14:37	11.3	6.2	311.1	65.7	56.4	0.7
14:38	11.2	6.2	309.2	62.1	63.1	0.7
14:39	11.3	6.2	306.2	60.5	63.1	0.7
14:40	11.2	6.2	309.4	62.8	63.1	0.7
14:41	11.3	6.2	313.2	65.8	55.4	0.7
14:42	11.3	6.2	305.6	63.0	52.5	0.6
14:43	11.3	6.2	312.4	62.6	61.9	0.6
14:44	11.3	6.2	316.8	66.3	56.4	0.7
14:45	11.3	6.2	318.4	64.2	55.2	0.7
14:46	11.3	6.2	317.3	63.1	55.7	0.6

Parameter	O_2 - Outlet	CO_2 - Outlet	CO - Outlet	NOx - Outlet	THC - Outlet	SO2 - Outlet
Uncorrected Run Average (C_{obs})	11.3	6.2	314.9	64.4	57.4	0.65
Cal Gas Concentration (C_{MA})	10.9	10.9	440.2	487.4	45.7	19.1
Pretest System Zero Response	0.20	0.040	0.00	0.68	0.016	0.00
Posttest System Zero Response	0.20	0.020	0.070	1.2	0.040	0.00
Average Zero Response (Co)	0.20	0.030	0.035	0.93	0.028	0.00
Pretest System Cal Response	11.0	10.7	425.8	493.4	46.0	18.9
Posttest System Cal Response	11.0	10.7	433.0	490.2	46.0	18.8
Average Cal Response (C_M)	11.0	10.7	429.4	491.8	46.0	18.9
Corrected Run Average (Corr)	11.2	6.3	322.8	63.0	NA	0.66

Alliance SOURCE TESTING

Run 2 - CEMS Data

Location: ABCWUA- Southside Water Reclamation Plant
Source: Unit 27 (digester)
Project No.: 2020-0005
Date: 1/11/20

Time	**O_2 - Outlet**	**CO_2 - Outlet**	**CO - Outlet**	**NOx - Outlet**	**THC - Outlet**	**SO2 - Outlet**
Unit	**% dry**	**% dry**	**ppmvd**	**ppmvd**	**ppmvw**	**ppmvd**
Status	Valid	Valid	Valid	Valid	Valid	Valid
15:04	11.3	6.2	311.3	63.1	55.7	0.7
15:05	11.3	6.2	313.7	64.7	66.0	0.7
15:06	11.3	6.2	312.9	65.6	57.6	0.7
15:07	11.3	6.2	307.0	64.8	57.7	0.7
15:08	11.3	6.1	314.8	63.5	56.9	0.6
15:09	11.3	6.2	312.7	63.6	60.4	0.6
15:10	11.3	6.2	308.2	64.0	64.0	0.6
15:11	11.3	6.2	314.5	62.7	59.8	0.7
15:12	11.3	6.1	314.9	61.9	55.8	0.6
15:13	11.3	6.2	311.8	63.9	55.1	0.6
15:14	11.3	6.2	308.6	66.8	53.2	0.7
15:15	11.3	6.2	312.7	68.4	53.1	0.6
15:16	11.3	6.2	309.0	70.7	53.8	0.7
15:17	11.3	6.2	306.9	68.4	53.0	0.7
15:18	11.3	6.2	312.6	69.7	52.6	0.7
15:19	11.3	6.2	318.3	70.8	52.9	0.7
15:20	11.2	6.2	312.8	73.4	53.1	0.7
15:21	11.3	6.2	315.9	71.1	57.5	0.6
15:22	11.2	6.2	317.2	72.3	51.4	0.6
15:23	11.2	6.2	307.5	72.7	60.1	0.6
15:24	11.2	6.2	311.3	71.1	57.1	0.7
15:25	11.2	6.2	308.2	72.0	57.6	0.7
15:26	11.2	6.2	311.8	70.5	56.1	0.7
15:27	11.2	6.2	310.5	70.8	53.3	0.7
15:28	11.2	6.2	316.9	72.0	52.2	0.6
15:29	11.2	6.2	313.5	71.7	56.1	0.7
15:30	11.2	6.2	309.2	74.0	55.9	0.7
15:31	11.2	6.2	308.5	73.3	57.7	0.7
15:32	11.2	6.2	313.0	71.8	56.4	0.6
15:33	11.2	6.2	314.0	71.9	52.8	0.6
15:34	11.3	6.2	309.4	71.9	53.6	0.7
15:35	11.3	6.2	311.5	72.3	54.9	0.7
15:36	11.2	6.2	313.6	71.7	53.2	0.7
15:37	11.2	6.2	311.7	71.6	51.9	0.6
15:38	11.2	6.2	310.7	69.3	54.1	0.6
15:39	11.3	6.2	309.2	67.9	60.2	0.6
15:40	11.3	6.2	308.4	68.1	59.7	0.6
15:41	11.3	6.2	317.2	66.9	55.6	0.6
15:42	11.3	6.2	310.4	70.0	63.3	0.7
15:43	11.3	6.2	310.1	68.9	53.3	0.6
15:44	11.3	6.2	307.8	67.9	52.7	0.6
15:45	11.3	6.2	309.7	68.5	53.0	0.6
15:46	11.3	6.2	307.4	68.8	55.4	0.7
15:47	11.2	6.2	313.4	69.6	54.5	0.6
15:48	11.3	6.2	309.9	69.3	52.4	0.6
15:49	11.3	6.2	302.1	70.1	55.6	0.6
15:50	11.3	6.2	307.7	70.9	58.2	0.6
15:51	11.3	6.2	317.1	70.3	56.4	0.6
15:52	11.3	6.2	305.0	70.5	53.6	0.6
15:53	11.3	6.2	304.2	67.8	60.1	0.6
15:54	11.3	6.2	311.3	72.4	61.0	0.6
15:55	11.2	6.2	308.3	70.4	55.0	0.7
15:56	11.3	6.2	304.8	71.6	54.5	0.6
15:57	11.2	6.2	306.2	70.5	55.2	0.6
15:58	11.3	6.2	310.1	70.1	57.6	0.7
15:59	11.3	6.2	308.4	71.3	55.0	0.6
16:00	11.3	6.2	317.4	70.4	53.0	0.6
16:01	11.3	6.2	307.3	71.3	53.7	0.6
16:02	11.3	6.2	313.8	71.2	56.1	0.6
16:03	11.3	6.2	307.0	69.7	59.2	0.7

Parameter	**O_2 - Outlet**	**CO_2 - Outlet**	**CO - Outlet**	**NOx - Outlet**	**THC - Outlet**	**SO2 - Outlet**
Uncorrected Run Average (C_{obs})	11.3	6.2	310.8	69.4	55.9	0.64
Cal Gas Concentration (C_{MA})	10.9	10.9	440.2	487.4	45.7	19.1
Pretest System Zero Response	0.20	0.020	0.070	1.2	0.040	0.00
Posttest System Zero Response	0.22	0.00	0.030	1.9	0.00	0.00
Average Zero Response (Co)	0.21	0.010	0.050	1.5	0.020	0.00
Pretest System Cal Response	11.0	10.7	433.0	490.2	46.0	18.8
Posttest System Cal Response	10.9	10.6	438.1	488.0	45.6	18.9
Average Cal Response (C_M)	11.0	10.6	435.6	489.1	45.8	18.8
Corrected Run Average (Corr)	11.2	6.3	314.2	67.8	NA	0.65

Run 3 - CEMS Data

Location: ABCWUA- Southside Water Reclamation Plant
Source: Unit 27 (digester)
Project No.: 2020-0005
Date: 1/11/20

Time	O_2 - Outlet	CO_2 - Outlet	CO - Outlet	NOx - Outlet	THC - Outlet	SO2 - Outlet
Unit	% dry	% dry	ppmvd	ppmvd	ppmvw	ppmvd
Status	Valid	Valid	Valid	Valid	Valid	Valid
16:22	11.3	6.2	311.8	70.2	51.9	0.7
16:23	11.3	6.2	306.4	70.9	52.1	0.7
16:24	11.3	6.2	306.7	69.4	52.8	0.7
16:25	11.3	6.2	315.3	67.9	52.5	0.7
16:26	11.3	6.2	305.4	70.2	54.6	0.7
16:27	11.3	6.2	309.0	71.1	54.0	0.7
16:28	11.3	6.2	306.8	68.6	54.2	0.7
16:29	11.3	6.2	311.7	70.1	57.5	0.6
16:30	11.3	6.2	312.6	68.0	59.8	0.6
16:31	11.3	6.2	313.4	69.3	56.8	0.6
16:32	11.3	6.2	310.4	68.0	59.4	0.6
16:33	11.3	6.2	304.0	70.3	55.0	0.6
16:34	11.3	6.2	298.4	70.9	50.9	0.6
16:35	11.3	6.2	309.7	71.5	52.9	0.6
16:36	11.3	6.2	309.9	71.0	53.2	0.6
16:37	11.3	6.2	306.8	70.7	51.6	0.6
16:38	11.3	6.2	309.5	69.7	54.2	0.6
16:39	11.3	6.2	309.3	69.5	57.3	0.6
16:40	11.3	6.2	310.0	69.5	55.6	0.6
16:41	11.3	6.2	306.0	70.5	53.5	0.6
16:42	11.3	6.2	308.7	70.5	53.7	0.6
16:43	11.3	6.2	309.7	67.3	55.5	0.6
16:44	11.3	6.2	305.9	71.0	52.5	0.6
16:45	11.3	6.2	305.1	70.2	54.0	0.6
16:46	11.3	6.2	306.9	71.4	61.7	0.6
16:47	11.3	6.2	306.2	70.6	53.1	0.6
16:48	11.3	6.2	307.4	71.7	57.8	0.6
16:49	11.3	6.2	314.9	71.9	57.0	0.6
16:50	11.3	6.2	312.6	71.2	60.2	0.6
16:51	11.2	6.2	313.1	72.5	54.1	0.6
16:52	11.3	6.2	309.9	70.3	51.7	0.6
16:53	11.3	6.2	310.5	72.2	51.1	0.6
16:54	11.3	6.2	309.6	71.7	51.2	0.6
16:55	11.2	6.2	304.8	71.9	55.8	0.6
16:56	11.3	6.2	314.0	70.6	56.7	0.6
16:57	11.3	6.2	315.6	69.0	54.3	0.6
16:58	11.3	6.2	312.1	68.2	54.0	0.6
16:59	11.3	6.2	312.0	65.9	54.1	0.6
17:00	11.3	6.2	310.2	70.1	55.4	0.6
17:01	11.3	6.2	314.7	68.9	57.3	0.6
17:02	11.3	6.2	310.9	69.3	55.4	0.6
17:03	11.3	6.2	304.5	68.8	53.7	0.6
17:04	11.3	6.2	304.0	67.8	52.5	0.6
17:05	11.3	6.2	312.5	69.2	60.6	0.6
17:06	11.3	6.2	313.4	68.0	57.8	0.6
17:07	11.3	6.2	311.7	69.3	52.7	0.6
17:08	11.3	6.2	313.4	67.9	60.5	0.6
17:09	11.2	6.2	316.7	71.7	55.0	0.6
17:10	11.3	6.2	306.7	69.2	56.0	0.6
17:11	11.3	6.2	307.7	68.5	51.7	0.6
17:12	11.3	6.2	315.2	70.4	56.5	0.6
17:13	11.3	6.2	308.8	69.6	53.2	0.6
17:14	11.2	6.2	310.9	71.0	50.3	0.6
17:15	11.3	6.2	307.8	69.5	51.7	0.6
17:16	11.3	6.2	308.1	68.0	59.3	0.6
17:17	11.2	6.2	307.9	68.3	58.0	0.6
17:18	11.2	6.2	309.5	71.0	51.9	0.6
17:19	11.2	6.2	310.8	70.8	54.3	0.6
17:20	11.3	6.2	309.4	70.4	56.2	0.6
17:21	11.3	6.2	307.0	68.0	53.4	0.6

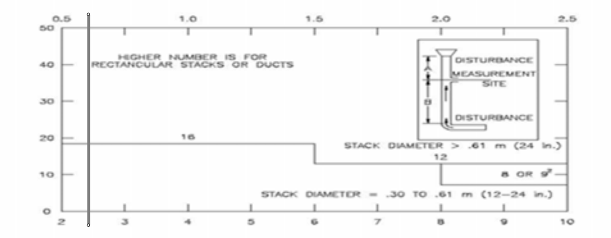
Parameter	O_2 - Outlet	CO_2 - Outlet	CO - Outlet	NOx - Outlet	THC - Outlet	SO2 - Outlet
Uncorrected Run Average (C_{obs})	11.3	6.2	309.6	69.8	54.9	0.62
Cal Gas Concentration (C_{MA})	10.9	10.9	440.2	487.4	45.7	19.1
Pretest System Zero Response	0.22	0.00	0.030	1.9	0.00	0.00
Posttest System Zero Response	0.26	0.010	0.020	0.18	0.62	0.00
Average Zero Response (Co)	0.24	0.0050	0.025	1.0	0.31	0.00
Pretest System Cal Response	10.9	10.6	438.1	488.0	45.6	18.9
Posttest System Cal Response	11.0	10.6	437.8	490.4	45.8	18.9
Average Cal Response (C_M)	11.0	10.6	438.0	489.2	45.7	18.9
Corrected Run Average (Corr)	11.2	6.3	311.1	68.7	NA	0.62

Method 1 Data

Location **ABCWUA - Southside Water Reclamation Plant**
Source **Unit 27 (digestor)**
Project No. **2020-0005**
Date: **01/11/20**

Stack Parameters

Duct Orientation: Horizontal
Duct Design: Circular
Depth of Duct: 25.00 **in**
Cross Sectional Area of Duct: 3.41 **ft^2**
No. of Test Ports: 2
Distance A: 7.5 **ft**
Distance A Duct Diameters: 3.6 **(must be > 0.5)**
Distance B: 5.0 **ft**
Distance B Duct Diameters: 2.4 **(must be > 2)**
Minimum Number of Traverse Points: 16
Actual Number of Traverse Points: 16



CIRCULAR DUCT

LOCATION OF TRAVERSE POINTS

Number of traverse points on a diameter

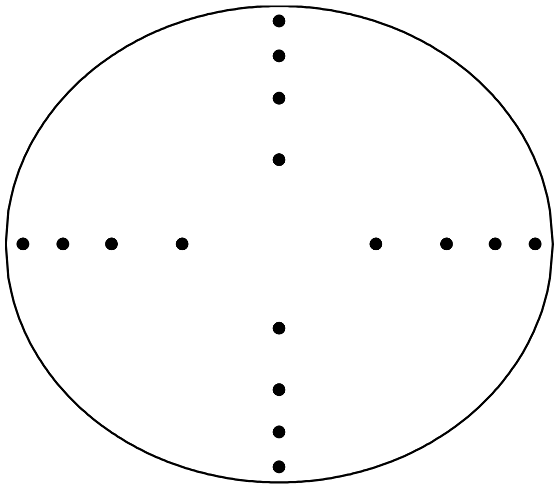
	2	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
1	14.6	--	6.7	--	4.4	--	3.2	--	2.6	--	2.1
2	85.4	--	25.0	--	14.6	--	10.5	--	8.2	--	6.7
3	--	--	75.0	--	29.6	--	19.4	--	14.6	--	11.8
4	--	--	93.3	--	70.4	--	32.3	--	22.6	--	17.7
5	--	--	--	--	85.4	--	67.7	--	34.2	--	25.0
6	--	--	--	--	95.6	--	80.6	--	65.8	--	35.6
7	--	--	--	--	--	--	89.5	--	77.4	--	64.4
8	--	--	--	--	--	--	96.8	--	85.4	--	75.0
9	--	--	--	--	--	--	--	--	91.8	--	82.3
10	--	--	--	--	--	--	--	--	97.4	--	88.2
11	--	--	--	--	--	--	--	--	--	--	93.3
12	--	--	--	--	--	--	--	--	--	--	97.9

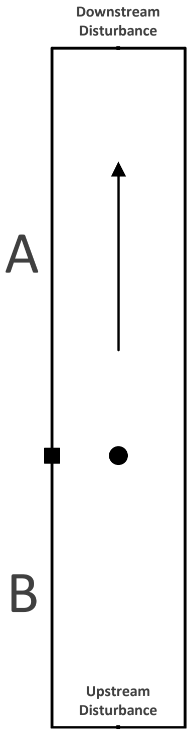
**Percent of stack diameter from inside wall to traverse point.*

Traverse Point	**% of Diameter**	**Distance from inside wall**	**Distance from outside of port**
1	3.2	1.00	5.50
2	10.5	2.63	7.13
3	19.4	4.85	9.35
4	32.3	8.08	12.58
5	67.7	16.93	21.43
6	80.6	20.15	24.65
7	89.5	22.38	26.88
8	96.8	24.00	28.50
9	--	--	--
10	--	--	--
11	--	--	--
12	--	--	--

Stack Diagram
A = 7.5 ft.
B = 5 ft.
Depth of Duct = 25 in.

Cross Sectional Area





Cyclonic Flow Check

Location ABCWUA - Southside Water Reclamation Plant
Source Unit 27 (digester)
Project No. 2020-0005
Date 1/11/20

Sample Point	Angle (ΔP=0)
1	3
2	1
3	3
4	2
5	5
6	4
7	1
8	2
9	3
10	6
11	0
12	2
13	1
14	4
15	3
16	2
Average	2.6

Location ABCWUA - Southside Water Reclamation Plant
Source Unit 27 (digestor)
Project No. 2020-0005

Run No.	**1**	**2**	**3**
Date	1/11/20	1/11/20	1/11/20
Status	VALID	VALID	VALID
Start Time	14:02	15:30	16:35
Stop Time	14:15	15:38	16:43
Leak Check	Pass	Pass	Pass

Traverse Point	**Δ P (in. WC)**	**Ts (°F)**	**Δ P (in. WC)**	**Ts (°F)**	**Δ P (in. WC)**	**Ts (°F)**
A-1	0.61	662	0.64	663	0.62	664
2	0.62	665	0.62	662	0.63	664
3	0.64	665	0.62	665	0.63	664
4	0.63	666	0.63	665	0.61	665
5	0.65	664	0.64	666	0.61	666
6	0.62	664	0.66	666	0.62	665
7	0.60	662	0.65	667	0.59	665
8	0.58	665	0.62	665	0.60	662
B-1	0.59	664	0.60	664	0.63	663
2	0.61	662	0.61	664	0.65	664
3	0.62	662	0.59	664	0.65	665
4	0.63	665	0.63	663	0.62	662
5	0.64	663	0.61	663	0.62	662
6	0.65	663	0.61	662	0.61	665
7	0.62	663	0.62	663	0.61	665
8	0.61	662	0.62	663	0.60	663

					Average
Square Root of ΔP, (in. WC)$^{1/2}$	**(ΔP)$^{1/2}$**	0.79	0.79	0.79	0.79
Average ΔP, in. WC	**(ΔP)**	0.62	0.62	0.62	0.62
Pitot Tube Coefficient	**(Cp)**	0.81	0.81	0.81	0.81
Barometric Pressure, in. Hg	**(Pb)**	25	25	25	25
Static Pressure, in. WC	**(Pg)**	0.58	0.58	0.58	0.58
Stack Pressure, in. Hg	**(Ps)**	25.3	25.3	25.3	25.3
Average Temperature, °F	**(Ts)**	663.6	664.1	664.0	663.9
Average Temperature, °R	**(Ts)**	1123.6	1124.1	1124.0	1123.9
Measured Moisture Fraction	**(BWSmsd)**	0.098	0.096	0.102	0.099
Moisture Fraction @ Saturation	**(BWSsat)**	165.4	165.9	165.8	165.7
Moisture Fraction	**(BWS)**	0.098	0.096	0.10	0.099
O2 Concentration, %	**(O2)**	11.2	11.2	11.2	11.2
CO2 Concentration, %	**(CO2)**	6.3	6.3	6.3	6.3
Molecuar Weight, lb/lb-mole (dry)	**(Md)**	29.5	29.5	29.5	29.5
Molecuar Weight, lb/lb-mole (wet)	**(Ms)**	28.3	28.4	28.3	28.3
Velocity, ft/sec	**(Vs)**	68.6	68.8	68.6	68.7
VFR at stack conditions, acfm	**(Qa)**	14,039	14,073	14,041	14,051
VFR at standard conditions, scfh	**(Qsw)**	334,214	334,889	334,132	334,412
VFR at standard conditions, scfm	**(Qsw)**	5,570	5,581	5,569	5,574
VFR at standard conditions, dscfm	**(Qsd)**	5,026	5,045	5,000	5,024

Location ABCWUA - Southside Water Reclamation Plan
Source Unit 27 (digester)
Project No. 2020-0005
Parameter(s): VFR
Console Type Meter Box

Run No.		1					2					3				
Date		1/11/20					1/11/20					1/11/20				
Status		VALID					VALID					VALID				
Start Time		13:47					15:04					16:22				
End Time		14:47					16:04					17:22				
Run Time, min	**(θ)**	60					60					60				
Meter ID		M5-17					M5-17					M5-17				
Meter Correction Factor	**(Y)**	1.000					1.000					1.000				
Orifice Calibration Value	**(ΔH @)**	1.570					1.570					1.570				
Max Vacuum, in. Hg		3					4					3				
Post Leak Check, ft3/min (at max vac.)		0.000					0.000					0.000				
Meter Volume, ft3																
0		456.854					494.326					532.521				
5		460.000					497.500					535.600				
10		463.300					500.800					538.600				
15		466.200					503.900					541.600				
20		469.500					506.900					544.800				
25		472.300					510.300					547.900				
30		475.400					513.300					551.000				
35		478.800					516.400					553.800				
40		481.200					519.800					557.100				
45		484.600					522.700					560.300				
50		487.900					525.600					563.400				
55		490.600					528.800					566.700				
60		494.198					532.215					569.360				
Total Meter Volume, ft3	**(Vm)**	37.344					37.889					36.839				
Temperature, °F		**Meter**	**Probe**	**Filter**	**Vacuum**	**Imp. Exit**	**Meter**	**Probe**	**Filter**	**Vacuum**	**Imp. Exit**	**Meter**	**Probe**	**Filter**	**Vacuum**	**Imp. Exit**
0		67	N/A	N/A	3	57	71	N/A	N/A	4	55	74	N/A	N/A	3	52
5		68	N/A	N/A	3	58	71	N/A	N/A	4	55	74	N/A	N/A	3	52
10		68	N/A	N/A	3	58	71	N/A	N/A	4	55	74	N/A	N/A	3	53
15		69	N/A	N/A	3	58	72	N/A	N/A	4	56	74	N/A	N/A	3	53
20		69	N/A	N/A	3	60	72	N/A	N/A	4	56	74	N/A	N/A	3	53
25		69	N/A	N/A	3	60	72	N/A	N/A	4	57	74	N/A	N/A	3	53
30		70	N/A	N/A	3	61	72	N/A	N/A	4	57	75	N/A	N/A	3	55
35		70	N/A	N/A	3	61	72	N/A	N/A	4	57	75	N/A	N/A	3	55
40		70	N/A	N/A	3	61	72	N/A	N/A	4	57	75	N/A	N/A	3	56
45		70	N/A	N/A	3	61	72	N/A	N/A	4	58	75	N/A	N/A	3	58
50		71	N/A	N/A	3	62	72	N/A	N/A	4	58	75	N/A	N/A	3	58
55		71	N/A	N/A	3	63	73	N/A	N/A	4	58	75	N/A	N/A	3	60
60		71	N/A	N/A	3	63	73	N/A	N/A	4	58	75	N/A	N/A	3	60
Average Temperature, °F	**(Tm)**	69	--	--	--	--	72	--	--	--	--	75	--	--	--	--
Average Temperature, °R	**(Tm)**	529	--	--	--	--	532	--	--	--	--	534	--	--	--	--
Minimum Temperature, °F		67	--	--	--	--	71	--	--	--	--	74	--	--	--	--
Maximum Temperature, °F		71	--	--	--	63	73	--	--	--	58	75	--	--	--	60
Barometeric Pressure, in. Hg	**(Pb)**	25.22					25.22					25.22				
Meter Orifice Pressure , in. WC	**(ΔH)**	1.000					1.000					0.950				
Meter Pressure, in. Hg	**(Pm)**	25.29					25.29					25.29				
Standard Meter Volume, ft3	**(Vmstd)**	31.500					31.812					30.774				
Analysis Type		Gravimetric					Gravimetric					Gravimetric				
Impinger 1, Pre/Post Test, mL		H2O		449.5	467.2	17.7	H2O		467.2	455.7	-11.5	H2O		455.1	449.3	-5.8
Impinger 2, Pre/Post Test, mL		H2O		483.9	523.9	40.0	H2O		523.9	594.8	70.9	H2O		453.5	521.9	68.4
Impinger 3, Pre/Post Test, mL		Empty		301.1	308.3	7.2	Empty		300.4	305.8	5.4	Empty		300.7	305.3	4.6
Impinger 4, Pre/Post Test, g		Silica		584.0	591.4	7.4	Silica		591.4	598.4	7.0	Silica		597.7	604.8	7.1
Volume Water Collected, mL	**(Vlc)**	72.3					71.8					74.3				
Standard Water Volume, ft^3	**(Vwstd)**	3.409					3.385					3.503				
Moisture Fraction Measured	**(BWS)**	0.098					0.096					0.102				
Gas Molecular Weight, lb/lb-mole (dry)	**(Md)**	29.46					29.46					29.46				
DGM Calibration Check Value	**(Yqa)**	-3.9					-2.7					-3.2				

Unit 28

Emissions Calculations

Location ABCWUA - Southside Water Reclamation Plant
Source Unit 28
Project No. 2020-0005

Run Number		**Run 1**	**Run 2**	**Run 3**	**Average**
Date		1/10/20	1/10/20	1/10/20	--
Start Time		9:45	11:02	12:17	--
Stop Time		10:45	12:02	13:17	--
Engine Data					
Engine Manufacturer		Caterpillar			
Engine Model		G3612			
Engine Serial Number		1YG00190			
Engine Type		Spark Ignition - 4SLB			
Engine Year of Manufacture	DOM	2002			
Engine Speed, RPM	ES	900	900	900	900
Engine Brake Work, HP	EBW	2,474	2,509	2,484	2,489
Maximum Engine Brake Work, HP	MaxEBW	3,161	3,161	3,161	3,161
Engine Load, %	EL	90	90	90	90
Fuel Heating Value, Btu/scf	F_{HV}	1,040	1,040	1,040	1,040
Fuel Factor, dscf/MMBtu	F_{Factor}	8,710	8,710	8,710	8,710
Fuel Rate, scfh	F_R	373	380	373	375
Input Data - Outlet					
Moisture Fraction, dimensionless	BWS	0.116	0.141	0.110	0.122
Volumetric Flow Rate (M1-4), dscfm	Qs	5,318	5,217	5,443	5,326
Calculated Data - Outlet					
O2 Concentration, % dry	C_{O2}	11.6	11.6	11.6	11.6
CO2 Concentration, % dry	C_{CO2}	5.4	5.4	5.4	5.4
NOx Concentration, ppmvd	C_{NOx}	49.4	50.5	50.0	50.0
NOx Concentration, ppmvd @ 15% O2	C_{NOxc15}	31.4	32.0	31.8	31.7
NOx Emission Factor, g/HP-hr	EF_{NOx}	0.35	0.34	0.36	0.35
NOx Emission Rate, lb/hr	ER_{NOx}	1.9	1.9	2.0	1.9
NOx Emission Rate, ton/yr	ER_{NOxTPY}	8.2	8.3	8.5	8.4
CO Concentration, ppmvd	C_{CO}	332.2	332.8	335.0	333.3
CO Concentration, ppmvd @ 15% O2	C_{COc15}	210.9	211.1	213.1	211.7
CO Emission Factor, g/HP-hr	EF_{CO}	1.4	1.4	1.5	1.4
CO Emission Rate, lb/hr	ER_{CO}	7.7	7.6	8.0	7.7
CO Emission Rate, ton/yr	ER_{COTPY}	33.7	33.2	34.8	33.9
THC Concentration as propane, ppmvw	C_{THCw}	75.7	75.8	74.8	75.4
THC Concentration as propane, ppmvd	C_{THCd}	85.7	88.3	84.0	86.0
CH4 Concentration, ppmvd	C_{CH4}	0.00	0.00	0.00	0.00
CH4 Concentration (as C3H8), ppmvd	$C_{CH4\ as\ propane}$	0.00	0.00	0.00	0.00
C2H6 Concentration, ppmvd	C_{C2H6}	0.00	0.00	0.00	0.00
C2H6 Concentration (as C3H8), ppmvd	$C_{C2H6\ as\ propane}$	0.00	0.00	0.00	0.00
NMEHC Concentration (as C3H8), ppmvd	C_{NMEHC}	85.7	88.3	84.0	86.0
NMEHC Concentration (as C3H8), ppmvd @ 15% O2	$C_{NMEHCc15}$	54.4	56.0	53.4	54.6
NMEHC Emission Factor (as C3H8), g/HP-hr	EF_{NMEHC}	0.57	0.57	0.57	0.57
NMEHC Emission Rate (as C3H8), lb/hr	ER_{NMEHC}	3.1	3.2	3.1	3.1
NMEHC Emission Rate (as C3H8), ton/yr	$ER_{NMEHCTPY}$	13.7	13.8	13.8	13.8
SO_2 Concentration, ppmvd	C_{SO2}	0.081	0.093	0.11	0.095
SO_2 Concentration, ppmvd @ 15% O2	C_{SO2c15}	0.052	0.059	0.070	0.060
SO_2 Emission Factor, g/HP-hr	EF_{SO2}	0.00	0.00	0.00	0.00
SO_2 Emission Rate, lb/hr	ER_{SO2}	0.00	0.00	0.0060	0.0050
SO_2 Emission Rate, ton/yr	ER_{SO2TPY}	0.019	0.021	0.026	0.022

Run 1 - CEMS Data

Location: ABCWUA - Southside Water Reclamation Plant
Source: Unit 28
Project No.: 2020-0005
Date: 1/10/20

Time	**O_2 - Outlet**	**CO_2 - Outlet**	**CO - Outlet**	**NOx - Outlet**	**THC - Outlet**	**SO_2 - Outlet**
Unit	**% dry**	**% dry**	**ppmvd**	**ppmvd**	**ppmvw**	**ppmvd**
Status	Valid	Valid	Valid	Valid	Valid	Valid
9:45	11.6	5.4	341.3	48.0	77.1	0.0
9:46	11.6	5.4	341.8	47.5	75.9	0.0
9:47	11.6	5.4	331.0	48.2	75.9	0.1
9:48	11.6	5.4	340.1	50.3	73.9	0.1
9:49	11.6	5.4	333.9	48.9	72.5	0.1
9:50	11.6	5.4	331.6	48.8	73.4	0.1
9:51	11.6	5.4	337.0	48.4	73.4	0.1
9:52	11.6	5.4	332.7	49.0	77.4	0.1
9:53	11.6	5.4	334.7	47.3	77.4	0.1
9:54	11.6	5.4	327.3	47.8	76.1	0.1
9:55	11.6	5.4	331.6	47.8	75.1	0.1
9:56	11.6	5.4	331.2	47.9	75.5	0.1
9:57	11.6	5.4	338.8	49.2	77.6	0.1
9:58	11.6	5.4	328.9	48.8	78.4	0.1
9:59	11.6	5.4	330.1	49.1	77.2	0.1
10:00	11.6	5.4	332.1	48.6	76.1	0.1
10:01	11.6	5.4	331.7	50.0	74.1	0.1
10:02	11.6	5.4	330.1	49.5	73.0	0.1
10:03	11.6	5.4	334.1	48.9	73.5	0.1
10:04	11.6	5.4	333.8	48.5	74.1	0.1
10:05	11.6	5.4	331.6	49.6	74.6	0.1
10:06	11.6	5.4	333.5	49.1	74.9	0.1
10:07	11.6	5.4	334.0	50.2	76.0	0.1
10:08	11.6	5.4	333.3	48.4	75.2	0.1
10:09	11.6	5.4	336.7	48.9	77.0	0.1
10:10	11.6	5.4	331.3	49.0	75.9	0.1
10:11	11.7	5.4	333.3	48.3	75.6	0.1
10:12	11.7	5.4	332.5	48.4	76.7	0.1
10:13	11.7	5.4	334.8	47.6	76.9	0.1
10:14	11.6	5.4	327.6	49.5	81.0	0.1
10:15	11.6	5.4	334.9	47.7	75.5	0.1
10:16	11.7	5.4	337.3	48.7	77.2	0.1
10:17	11.7	5.4	335.6	48.8	74.2	0.1
10:18	11.6	5.4	334.1	48.7	74.2	0.1
10:19	11.6	5.4	331.0	50.8	76.2	0.1
10:20	11.6	5.4	329.8	49.4	76.7	0.1
10:21	11.6	5.4	332.5	48.8	76.0	0.1
10:22	11.6	5.4	333.6	48.9	76.0	0.1
10:23	11.7	5.4	330.5	48.9	75.6	0.1
10:24	11.7	5.4	333.0	48.2	75.3	0.1
10:25	11.6	5.4	326.2	49.2	77.5	0.1
10:26	11.7	5.4	325.7	48.7	79.3	0.1
10:27	11.6	5.4	336.7	49.2	77.0	0.1
10:28	11.7	5.4	330.6	48.8	74.3	0.1
10:29	11.6	5.4	331.5	47.9	74.9	0.1
10:30	11.6	5.4	331.5	49.0	76.2	0.1
10:31	11.6	5.4	331.8	48.7	75.5	0.1
10:32	11.7	5.4	333.0	49.8	75.0	0.1
10:33	11.6	5.4	336.9	48.7	76.2	0.1
10:34	11.6	5.4	330.7	49.8	73.4	0.1
10:35	11.6	5.4	331.2	49.1	75.0	0.1
10:36	11.6	5.4	326.0	48.9	75.0	0.1
10:37	11.7	5.4	327.6	49.5	76.9	0.1
10:38	11.7	5.4	329.3	48.5	75.8	0.1
10:39	11.6	5.4	326.1	49.0	76.2	0.1
10:40	11.6	5.4	334.1	48.4	76.3	0.1
10:41	11.6	5.4	327.1	49.3	75.2	0.1
10:42	11.7	5.4	333.3	48.9	74.5	0.1
10:43	11.7	5.4	336.9	49.1	75.5	0.1
10:44	11.7	5.4	335.6	49.2	76.3	0.1

Parameter	**O_2 - Outlet**	**CO_2 - Outlet**	**CO - Outlet**	**NOx - Outlet**	**THC - Outlet**	**SO2 - Outlet**
Uncorrected Run Average (C_{obs})	11.6	5.4	332.6	48.8	75.7	0.081
Cal Gas Concentration (C_{MA})	10.9	10.9	440.2	487.4	45.7	19.1
Pretest System Zero Response	0.00	0.00	0.00	0.70	0.70	0.00
Posttest System Zero Response	0.00	0.00	0.00	1.1	0.70	0.00
Average Zero Response (Co)	0.00	0.00	0.00	0.90	0.70	0.00
Pretest System Cal Response	10.9	10.7	441.3	470.8	46.3	19.0
Posttest System Cal Response	11.0	10.8	440.1	476.3	46.1	19.0
Average Cal Response (C_M)	11.0	10.8	440.7	473.6	46.2	19.0
Corrected Run Average (Corr)	11.6	5.4	332.2	49.4	NA	0.081

Run 2 - CEMS Data

Location: ABCWUA - Southside Water Reclamation Plant
Source: Unit 28
Project No.: 2020-0005
Date: 1/10/20

Time	O_2 - Outlet	CO_2 - Outlet	CO - Outlet	NOx - Outlet	THC - Outlet	SO2 - Outlet
Unit	% dry	% dry	ppmvd	ppmvd	ppmvw	ppmvd
Status	Valid	Valid	Valid	Valid	Valid	Valid
11:02	11.7	5.4	333.7	49.1	79.1	0.1
11:03	11.7	5.4	329.7	49.8	77.9	0.1
11:04	11.7	5.4	330.7	49.7	75.9	0.1
11:05	11.7	5.4	335.7	50.4	75.4	0.1
11:06	11.7	5.4	331.2	49.0	75.5	0.1
11:07	11.7	5.4	330.0	49.4	76.4	0.1
11:08	11.7	5.4	327.2	48.2	77.9	0.1
11:09	11.7	5.4	332.3	49.9	76.3	0.1
11:10	11.7	5.4	332.3	48.7	74.8	0.1
11:11	11.7	5.4	332.1	49.0	73.2	0.1
11:12	11.7	5.4	332.9	50.3	75.4	0.1
11:13	11.7	5.4	330.4	49.8	73.9	0.1
11:14	11.7	5.4	324.2	50.1	76.1	0.1
11:15	11.7	5.4	326.3	49.5	76.7	0.1
11:16	11.7	5.4	333.6	52.0	76.2	0.1
11:17	11.7	5.4	332.9	50.5	73.9	0.1
11:18	11.7	5.4	333.7	50.4	74.8	0.1
11:19	11.7	5.4	333.8	51.3	77.0	0.1
11:20	11.7	5.4	330.5	49.6	75.9	0.1
11:21	11.7	5.4	325.8	49.9	74.9	0.1
11:22	11.7	5.4	329.0	50.7	74.8	0.1
11:23	11.7	5.4	328.8	50.3	76.1	0.1
11:24	11.7	5.4	327.1	50.0	76.1	0.1
11:25	11.7	5.4	331.2	49.8	76.6	0.1
11:26	11.7	5.4	330.5	51.5	75.7	0.1
11:27	11.7	5.4	329.1	51.1	75.0	0.1
11:28	11.7	5.4	337.1	51.3	75.4	0.1
11:29	11.7	5.4	329.3	51.4	75.6	0.1
11:30	11.7	5.4	333.2	51.3	77.5	0.1
11:31	11.7	5.4	336.3	50.8	76.0	0.1
11:32	11.7	5.4	332.3	51.2	76.6	0.1
11:33	11.7	5.4	335.2	50.4	77.1	0.1
11:34	11.7	5.4	336.5	50.6	75.0	0.1
11:35	11.7	5.4	332.2	50.8	77.1	0.1
11:36	11.7	5.4	326.6	49.7	74.9	0.1
11:37	11.7	5.4	329.8	50.7	76.3	0.1
11:38	11.7	5.4	337.3	50.8	75.3	0.1
11:39	11.7	5.4	324.2	50.2	74.1	0.1
11:40	11.7	5.4	329.4	49.7	75.0	0.1
11:41	11.7	5.4	324.6	49.6	76.5	0.1
11:42	11.7	5.4	333.8	50.4	77.7	0.1
11:43	11.7	5.4	326.6	51.0	77.8	0.1
11:44	11.7	5.4	327.5	50.8	75.6	0.1
11:45	11.7	5.4	324.6	51.1	75.3	0.1
11:46	11.7	5.4	332.7	50.9	75.2	0.1
11:47	11.7	5.4	328.7	51.3	74.8	0.1
11:48	11.7	5.4	321.6	52.0	75.0	0.1
11:49	11.7	5.4	321.0	50.3	76.1	0.1
11:50	11.7	5.4	328.5	51.1	76.3	0.1
11:51	11.7	5.4	331.5	51.8	74.8	0.1
11:52	11.7	5.4	333.3	50.8	76.6	0.1
11:53	11.7	5.4	325.4	51.6	74.6	0.1
11:54	11.7	5.4	329.6	52.0	76.0	0.1
11:55	11.7	5.4	334.1	51.3	78.0	0.1
11:56	11.7	5.4	330.4	52.7	74.0	0.1
11:57	11.7	5.4	328.9	51.2	74.9	0.1
11:58	11.7	5.3	332.3	50.5	75.2	0.1
11:59	11.7	5.4	331.5	49.9	76.0	0.1
12:00	11.7	5.3	330.3	51.0	76.9	0.1
12:01	11.7	5.4	323.4	50.8	74.0	0.1

Parameter	O_2 - Outlet	CO_2 - Outlet	CO - Outlet	NOx - Outlet	THC - Outlet	SO2 - Outlet
Uncorrected Run Average (C_{obs})	11.7	5.4	330.2	50.5	75.8	0.092
Cal Gas Concentration (C_{MA})	10.9	10.9	440.2	487.4	45.7	19.1
Pretest System Zero Response	0.00	0.00	0.00	1.1	0.70	0.00
Posttest System Zero Response	0.00	0.00	0.00	1.2	0.60	0.00
Average Zero Response (Co)	0.00	0.00	0.00	1.2	0.65	0.00
Pretest System Cal Response	11.0	10.8	440.1	476.3	46.1	19.0
Posttest System Cal Response	11.0	10.8	433.6	478.4	45.5	18.9
Average Cal Response (C_M)	11.0	10.8	436.8	477.4	45.8	19.0
Corrected Run Average (Corr)	11.6	5.4	332.8	50.5	NA	0.093

Run 3 - CEMS Data

Location: ABCWUA - Southside Water Reclamation Plant
Source: Unit 28
Project No.: 2020-0005
Date: 1/10/20

Time **Unit** **Status**	**O_2 - Outlet** **% dry** Valid	**CO_2 - Outlet** **% dry** Valid	**CO - Outlet** **ppmvd** Valid	**NOx - Outlet** **ppmvd** Valid	**THC - Outlet** **ppmvw** Valid	**SO2 - Outlet** **ppmvd** Valid
12:17	11.6	5.4	335.4	48.2	79.1	0.5
12:18	11.7	5.3	327.7	49.9	75.0	0.3
12:19	11.7	5.4	331.4	49.9	77.0	0.2
12:20	11.7	5.4	327.2	50.7	76.6	0.1
12:21	11.7	5.3	329.3	49.9	75.2	0.1
12:22	11.6	5.4	333.3	50.1	73.8	0.1
12:23	11.7	5.3	335.8	49.8	74.8	0.1
12:24	11.7	5.3	324.5	49.4	74.5	0.1
12:25	11.7	5.4	324.8	49.1	75.1	0.1
12:26	11.7	5.3	329.1	51.4	74.8	0.1
12:27	11.7	5.4	331.1	49.9	75.5	0.1
12:28	11.7	5.3	332.0	50.6	74.0	0.1
12:29	11.7	5.4	336.0	49.2	74.2	0.1
12:30	11.7	5.4	326.2	50.6	75.2	0.1
12:31	11.7	5.4	333.0	50.8	74.9	0.1
12:32	11.7	5.4	333.4	50.4	75.2	0.1
12:33	11.7	5.4	336.5	50.7	74.1	0.1
12:34	11.7	5.4	334.2	50.1	75.3	0.1
12:35	11.7	5.4	336.4	50.9	75.2	0.1
12:36	11.7	5.4	339.4	51.0	75.5	0.1
12:37	11.7	5.4	335.4	50.3	76.3	0.1
12:38	11.7	5.4	336.1	50.6	72.6	0.1
12:39	11.7	5.4	329.4	50.2	76.3	0.1
12:40	11.7	5.4	321.3	50.9	74.9	0.1
12:41	11.7	5.4	332.9	50.3	74.7	0.1
12:42	11.7	5.4	329.9	51.6	74.6	0.1
12:43	11.7	5.4	332.4	50.4	73.9	0.1
12:44	11.7	5.4	332.3	51.9	75.2	0.1
12:45	11.7	5.4	333.5	49.1	73.4	0.1
12:46	11.7	5.4	329.9	49.1	75.3	0.1
12:47	11.7	5.4	331.9	49.7	74.6	0.1
12:48	11.7	5.4	331.6	50.4	73.9	0.1
12:49	11.7	5.4	329.1	51.8	73.9	0.1
12:50	11.7	5.4	332.9	50.9	74.8	0.1
12:51	11.7	5.4	335.9	51.2	74.5	0.1
12:52	11.7	5.4	323.8	51.3	74.1	0.1
12:53	11.7	5.4	330.1	51.2	75.4	0.1
12:54	11.7	5.3	331.9	49.9	73.9	0.1
12:55	11.7	5.4	332.2	51.2	74.8	0.1
12:56	11.7	5.4	329.7	48.9	75.3	0.1
12:57	11.7	5.4	334.7	50.6	73.5	0.1
12:58	11.7	5.4	328.5	50.0	75.0	0.1
12:59	11.7	5.4	330.1	50.5	74.5	0.1
13:00	11.7	5.4	330.1	48.9	75.8	0.1
13:01	11.7	5.4	325.6	50.7	75.6	0.1
13:02	11.7	5.4	328.8	50.3	74.6	0.1
13:03	11.7	5.4	333.1	50.3	73.3	0.1
13:04	11.7	5.4	327.4	50.5	74.7	0.1
13:05	11.7	5.4	324.3	51.3	75.5	0.1
13:06	11.7	5.4	329.6	49.3	74.8	0.1
13:07	11.7	5.4	334.4	50.4	75.2	0.1
13:08	11.7	5.4	334.9	49.4	74.4	0.1
13:09	11.7	5.4	333.3	50.1	74.5	0.1
13:10	11.7	5.4	335.7	51.0	74.7	0.1
13:11	11.7	5.4	333.2	50.3	73.8	0.1
13:12	11.7	5.4	331.3	49.6	74.1	0.1
13:13	11.7	5.4	331.2	49.3	73.6	0.1
13:14	11.8	5.4	326.7	49.8	72.2	0.1
13:15	11.8	5.4	330.8	49.6	74.0	0.1
13:16	12.1	5.4	327.0	49.2	74.6	0.1

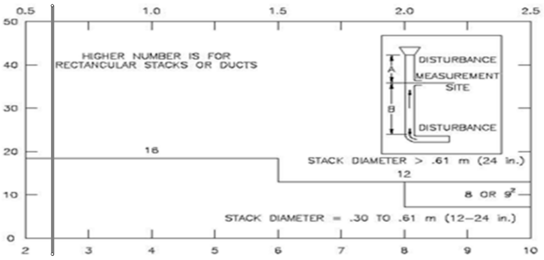
Parameter	**O_2 - Outlet**	**CO_2 - Outlet**	**CO - Outlet**	**NOx - Outlet**	**THC - Outlet**	**SO2 - Outlet**
Uncorrected Run Average (C_{obs})	11.7	5.4	331.1	50.2	74.8	0.11
Cal Gas Concentration (C_{MA})	10.9	10.9	440.2	487.4	45.7	19.1
Pretest System Zero Response	0.00	0.00	0.00	1.2	0.60	0.00
Posttest System Zero Response	0.050	0.010	0.00	1.7	0.50	0.00
Average Zero Response (Co)	0.025	0.0050	0.00	1.4	0.55	0.00
Pretest System Cal Response	11.0	10.8	433.6	478.4	45.5	18.9
Posttest System Cal Response	11.0	10.8	436.6	475.5	45.4	19.3
Average Cal Response (C_M)	11.0	10.8	435.1	477.0	45.4	19.1
Corrected Run Average (Corr)	11.6	5.4	335.0	50.0	NA	0.11

Method 1 Data

Location Albuquerque Bernalillo County Water Utility - Southside Water Reclamation Plant
Source Unit 28
Project No. 2020-0005
Date: 01/10/20

Stack Parameters

Duct Orientation: Horizontal
Duct Design: Circular
Distance from Far Wall to Outside of Port: 32.00 in
Nipple Length: 7.00 in
Depth of Duct: 25.00 in
Cross Sectional Area of Duct: 3.41 ft^2
No. of Test Ports: 2
Distance A: 7.5 ft
Distance A Duct Diameters: 3.6 (must be > 0.5)
Distance B: 5.0 ft
Distance B Duct Diameters: 2.4 (must be > 2)
Minimum Number of Traverse Points: 16
Actual Number of Traverse Points: 16



CIRCULAR DUCT

LOCATION OF TRAVERSE POINTS

Number of traverse points on a diameter

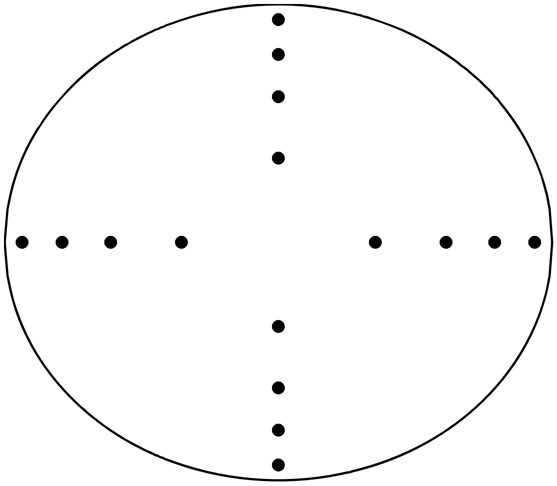
	2	3	4	5	6	7	8	9	10	11	12
1	14.6	--	6.7	--	4.4	--	3.2	--	2.6	--	2.1
2	85.4	--	25.0	--	14.6	--	10.5	--	8.2	--	6.7
3	--	--	75.0	--	29.6	--	19.4	--	14.6	--	11.8
4	--	--	93.3	--	70.4	--	32.3	--	22.6	--	17.7
5	--	--	--	--	85.4	--	67.7	--	34.2	--	25.0
6	--	--	--	--	95.6	--	80.6	--	65.8	--	35.6
7	--	--	--	--	--	--	89.5	--	77.4	--	64.4
8	--	--	--	--	--	--	96.8	--	85.4	--	75.0
9	--	--	--	--	--	--	--	--	91.8	--	82.3
10	--	--	--	--	--	--	--	--	97.4	--	88.2
11	--	--	--	--	--	--	--	--	--	--	93.3
12	--	--	--	--	--	--	--	--	--	--	97.9

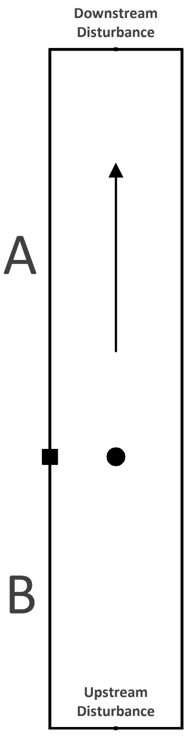
**Percent of stack diameter from inside wall to traverse point.*

Traverse Point	% of Diameter	Distance from inside wall	Distance from outside of port
1	3.2	1.00	8.00
2	10.5	2.63	9.63
3	19.4	4.85	11.85
4	32.3	8.08	15.08
5	67.7	16.93	23.93
6	80.6	20.15	27.15
7	89.5	22.38	29.38
8	96.8	24.00	31.00
9	--	--	--
10	--	--	--
11	--	--	--
12	--	--	--

Stack Diagram
A = 7.5 ft.
B = 5 ft.
Depth of Duct = 25 in.

Cross Sectional Area





Cyclonic Flow Check

Location Albuquerque Bernalillo County Water Utility - Southside Water Reclamation Plant
Source Unit 28
Project No. 2020-0005
Date 1/10/20

Sample Point	Angle (ΔP=0)
1	3
2	1
3	1
4	2
5	4
6	0
7	4
8	3
9	1
10	2
11	2
12	5
13	2
14	1
15	1
16	1
Average	2.1

Field Data
Method 2 Data

Location Albuquerque Bernalillo County Water Utility - Southside Water Reclamation Plant
Source Unit 28
Project No. 2020-0005

Run No.	**1**		**2**		**3**	
Date	1/10/20		1/10/20		1/10/20	
Status	VALID		VALID		VALID	
Start Time	10:00		11:15		12:30	
Stop Time	10:11		11:23		12:15	
Leak Check	Pass		Pass		Pass	
Traverse Point	**Δ P (in. WC)**	**Ts (°F)**	**Δ P (in. WC)**	**Ts (°F)**	**Δ P (in. WC)**	**Ts (°F)**
A-1	0.63	515	0.61	512	0.61	512
2	0.61	515	0.61	512	0.66	513
3	0.62	513	0.62	513	0.67	513
4	0.65	513	0.66	513	0.64	513
5	0.62	516	0.65	514	0.66	514
6	0.62	516	0.65	516	0.68	514
7	0.63	514	0.63	516	0.65	514
8	0.63	512	0.62	514	0.64	515
B-1	0.65	513	0.63	514	0.63	516
2	0.62	513	0.63	512	0.64	516
3	0.62	516	0.61	511	0.67	514
4	0.60	516	0.64	512	0.68	514
5	0.62	515	0.64	513	0.65	514
6	0.63	515	0.62	513	0.64	514
7	0.62	512	0.62	514	0.63	513
8	0.62	513	0.63	514	0.60	512

					Average
Square Root of ΔP, (in. WC)$^{1/2}$	**$(\Delta P)^{1/2}$**	0.79	0.79	0.80	0.80
Average ΔP, in. WC	**(ΔP)**	0.62	0.63	0.65	0.63
Pitot Tube Coefficient	**(Cp)**	0.81	0.81	0.81	0.81
Barometric Pressure, in. Hg	**(Pb)**	25	25	25	25
Static Pressure, in. WC	**(Pg)**	0.50	0.50	0.50	0.50
Stack Pressure, in. Hg	**(Ps)**	25.1	25.1	25.1	25.1
Average Temperature, °F	**(Ts)**	514.2	513.3	513.8	513.8
Average Temperature, °R	**(Ts)**	974.2	973.3	973.8	973.8
Measured Moisture Fraction	**(BWSmsd)**	0.116	0.141	0.110	0.122
Moisture Fraction @ Saturation	**(BWSsat)**	56.9	56.5	56.7	56.7
Moisture Fraction	**(BWS)**	0.116	0.141	0.110	0.122
O2 Concentration, %	**(O2)**	11.6	11.6	11.6	11.6
CO2 Concentration, %	**(CO2)**	5.4	5.4	5.4	5.4
Molecuar Weight, lb/lb-mole (dry)	**(Md)**	29.3	29.3	29.3	29.3
Molecuar Weight, lb/lb-mole (wet)	**(Ms)**	28.0	27.7	28.1	27.9
Velocity, ft/sec	**(Vs)**	64.8	65.3	65.8	65.3
VFR at stack conditions, acfm	**(Qa)**	13,247	13,362	13,464	13,358
VFR at standard conditions, scfh	**(Qsw)**	360,773	364,215	366,824	363,938
VFR at standard conditions, scfm	**(Qsw)**	6,013	6,070	6,114	6,066
VFR at standard conditions, dscfm	**(Qsd)**	5,318	5,217	5,443	5,326

Location Albuquerque Bernalillo County Water Utility - Southside Water Reclamation Pla
Source Unit 28
Project No. 2020-0005
Parameter(s): VFR
Console Type Meter Box

Run No.		1					2					3				
Date		1/10/20					1/10/20					1/10/20				
Status		VALID					VALID					VALID				
Start Time		9:45					11:02					12:17				
End Time		10:45					12:02					13:17				
Run Time, min	**(θ)**	60					60					60				
Meter ID		M5-17					M5-17					M5-17				
Meter Correction Factor	**(Y)**	1.000					1.000					1.000				
Orifice Calibration Value	**(ΔH @)**	1.570					1.570					1.570				
Max Vacuum, in. Hg		3					3					3				
Post Leak Check, ft3/min (at max vac.)		0.000					0.000					0.000				
Meter Volume, ft3																
0		112.104					150.124					187.261				
5		115.300					153.200					190.400				
10		118.500					156.400					193.600				
15		121.500					159.400					196.800				
20		124.800					162.400					199.700				
25		127.900					165.700					202.800				
30		130.600					168.500					206.100				
35		133.800					171.300					209.500				
40		137.500					174.700					212.400				
45		140.600					177.400					215.700				
50		143.600					180.300					219.200				
55		146.500					183.600					221.800				
60		149.845					187.021					224.975				
Total Meter Volume, ft3	**(Vm)**	37.741					36.897					37.714				
Temperature, °F		**Meter**	**Probe**	**Filter**	**Vacuum**	**Imp. Exit**	**Meter**	**Probe**	**Filter**	**Vacuum**	**Imp. Exit**	**Meter**	**Probe**	**Filter**	**Vacuum**	**Imp. Exit**
0		46	N/A	N/A	3	38	52	N/A	N/A	3	41	58	N/A	N/A	3	46
5		46	N/A	N/A	3	38	52	N/A	N/A	3	41	58	N/A	N/A	3	46
10		46	N/A	N/A	3	38	52	N/A	N/A	3	41	58	N/A	N/A	3	46
15		478	N/A	N/A	3	40	53	N/A	N/A	3	42	58	N/A	N/A	3	46
20		47	N/A	N/A	3	40	53	N/A	N/A	3	42	60	N/A	N/A	3	47
25		48	N/A	N/A	3	40	53	N/A	N/A	3	42	60	N/A	N/A	3	47
30		48	N/A	N/A	3	40	54	N/A	N/A	3	42	60	N/A	N/A	3	47
35		50	N/A	N/A	3	40	54	N/A	N/A	3	43	60	N/A	N/A	3	48
40		50	N/A	N/A	3	41	54	N/A	N/A	3	43	60	N/A	N/A	3	48
45		51	N/A	N/A	3	41	55	N/A	N/A	3	43	61	N/A	N/A	3	49
50		51	N/A	N/A	3	42	56	N/A	N/A	3	44	61	N/A	N/A	3	49
55		51	N/A	N/A	3	42	56	N/A	N/A	3	45	61	N/A	N/A	3	50
60		51	N/A	N/A	3	42	57	N/A	N/A	3	45	61	N/A	N/A	3	50
Average Temperature, °F	**(Tm)**	82	--	--	--	--	54	--	--	--	--	60	--	--	--	--
Average Temperature, °R	**(Tm)**	541	--	--	--	--	514	--	--	--	--	519	--	--	--	--
Minimum Temperature, °F		46	--	--	--	--	52	--	--	--	--	58	--	--	--	--
Maximum Temperature, °F		478	--	--	--	42	57	--	--	--	45	61	--	--	--	50
Barometeric Pressure, in. Hg	**(Pb)**	25.02					25.02					25.02				
Meter Orifice Pressure , in. WC	**(ΔH)**	1.000					1.000					1.000				
Meter Pressure, in. Hg	**(Pm)**	25.09					25.09					25.09				
Standard Meter Volume, ft3	**(Vmstd)**	30.865					31.811					32.154				
Analysis Type		Gravimetric					Gravimetric					Gravimetric				
Impinger 1, Pre/Post Test, mL		H2O		475.9	517.6	41.7	H2O		475.9	514.6	38.7	H2O		514.6	514.8	0.2
Impinger 2, Pre/Post Test, mL		H2O		500.6	512.0	11.4	H2O		500.6	555.0	54.4	H2O		555.0	612.2	57.2
Impinger 3, Pre/Post Test, mL		Empty		301.2	324.8	23.6	Empty		300.5	301.8	1.3	Empty		300.2	320.7	20.5
Impinger 4, Pre/Post Test, g		Silica		584.1	592.9	8.8	Silica		584.1	600.0	15.9	Silica		600.1	606.3	6.2
Volume Water Collected, mL	**(Vlc)**	85.5					110.3					84.1				
Standard Water Volume, ft^3	**(Vwstd)**	4.031					5.201					3.965				
Moisture Fraction Measured	**(BWS)**	0.116					0.141					0.110				
Gas Molecular Weight, lb/lb-mole (dry)	**(Md)**	29.33					29.33					29.33				
DGM Calibration Check Value	**(Yqa)**	-4.7					-4.3					-2.6				

Unit 28 Digester

Location ABCWUA - Southside Water Reclamation Plant
Source Unit 28 (Digester)
Project No. 2020-0005

Run Number		Run 1	Run 2	Run 3	Average
Date		1/10/20	1/10/20	1/10/20	--
Start Time		13:40	14:56	16:14	--
Stop Time		14:40	15:56	17:14	--
Engine Data					
Engine Manufacturer		Caterpillar			
Engine Model		G3612			
Engine Serial Number		1YG00190			
Engine Type		Spark Ignition - 4SLB			
Engine Year of Manufacture	DOM	2002			
Engine Speed, RPM	ES	900	900	900	900
Engine Brake Work, HP	EBW	2,502	2,492	2,501	1,249
Maximum Engine Brake Work, HP	MaxEBW	3,161	3,161	3,161	3,161
Engine Load, %	EL	90	90	90	90
Fuel Heating Value, Btu/scf	F_{HV}	1,040	1,040	1,040	1,040
Fuel Factor, dscf/MMBtu	F_{Factor}	8,710	8,710	8,710	8,710
Fuel Rate, scfh	F_R	417	419	422	419
Input Data - Outlet					
Moisture Fraction, dimensionless	BWS	0.098	0.100	0.098	0.099
Volumetric Flow Rate (M1-4), dscfm	Qs	5,592	5,592	5,625	5,603
Calculated Data - Outlet					
O2 Concentration, % dry	C_{O2}	11.4	11.4	11.4	11.4
CO2 Concentration, % dry	C_{CO2}	6.2	6.2	6.2	6.2
NOx Concentration, ppmvd	C_{NOx}	50.1	49.8	50.0	50.0
NOx Concentration, ppmvd @ 15% O2	C_{NOxc15}	31.0	30.8	31.0	30.9
NOx Emission Factor, g/HP-hr	EF_{NOx}	0.36	0.36	0.37	0.36
NOx Emission Rate, lb/hr	ER_{NOx}	2.0	2.0	2.0	2.0
NOx Emission Rate, ton/yr	ER_{NOxTPY}	8.8	8.7	8.8	8.8
CO Concentration, ppmvd	C_{CO}	334.1	335.0	338.5	335.9
CO Concentration, ppmvd @ 15% O2	C_{COc15}	206.8	207.4	209.6	207.9
CO Emission Factor, g/HP-hr	EF_{CO}	1.5	1.5	1.5	1.5
CO Emission Rate, lb/hr	ER_{CO}	8.1	8.2	8.3	8.2
CO Emission Rate, ton/yr	ER_{COTPY}	35.7	35.8	36.4	35.9
THC Concentration as propane, ppmvw	C_{THCw}	59.1	59.7	60.8	59.9
THC Concentration as propane, ppmvd	C_{THCd}	65.5	66.4	67.5	66.4
CH4 Concentration, ppmvd	C_{CH4}	0.00	0.00	0.00	0.00
CH4 Concentration (as C3H8), ppmvd	$C_{CH4\ as\ propane}$	0.00	0.00	0.00	0.00
C2H6 Concentration, ppmvd	C_{C2H6}	0.00	0.00	0.00	0.00
C2H6 Concentration (as C3H8), ppmvd	$C_{C2H6\ as\ propane}$	0.00	0.00	0.00	0.00
NMEHC Concentration (as C3H8), ppmvd	C_{NMEHC}	65.5	66.4	67.5	66.4
NMEHC Concentration (as C3H8), ppmvd @ 15% O2	$C_{NMEHCc15}$	40.5	41.1	41.8	41.1
NMEHC Emission Factor (as C3H8), g/HP-hr	EF_{NMEHC}	0.46	0.46	0.47	0.46
NMEHC Emission Rate (as C3H8), lb/hr	ER_{NMEHC}	2.5	2.5	2.6	2.6
NMEHC Emission Rate (as C3H8), ton/yr	$ER_{NMEHCTPY}$	11.0	11.2	11.4	11.2
SO_2 Concentration, ppmvd	C_{SO2}	0.44	0.44	0.44	0.44
SO_2 Concentration, ppmvd @ 15% O2	C_{SO2c15}	0.27	0.27	0.27	0.27
SO_2 Emission Factor, g/HP-hr	EF_{SO2}	0.00	0.00	0.00	0.00
SO_2 Emission Rate, lb/hr	ER_{SO2}	0.025	0.024	0.024	0.024
SO_2 Emission Rate, ton/yr	ER_{SO2TPY}	0.11	0.11	0.11	0.11

Run 1 - CEMS Data

Location: ABCWUA - Southside Water Reclamation Plant
Source: Unit 28 (Digester)
Project No.: 2020-0005
Date: 1/10/20

Time	**O_2 - Outlet**	**CO_2 - Outlet**	**CO - Outlet**	**NOx - Outlet**	**THC - Outlet**	**SO_2 - Outlet**
Unit	**% dry**	**% dry**	**ppmvd**	**ppmvd**	**ppmvw**	**ppmvd**
Status	Valid	Valid	Valid	Valid	Valid	Valid
13:40	11.3	6.2	329.4	63.2	55.3	0.5
13:41	11.4	6.2	326.3	54.8	57.7	0.4
13:42	11.4	6.2	328.2	51.8	58.7	0.4
13:43	11.4	6.1	328.7	50.3	60.7	0.4
13:44	11.4	6.1	330.2	50.9	61.1	0.4
13:45	11.4	6.1	325.1	50.7	59.9	0.4
13:46	11.4	6.2	327.5	49.7	60.3	0.4
13:47	11.4	6.1	329.9	50.7	60.0	0.4
13:48	11.4	6.2	333.8	51.9	60.6	0.5
13:49	11.4	6.2	327.9	53.7	59.4	0.5
13:50	11.4	6.2	333.1	51.8	60.7	0.4
13:51	11.4	6.2	334.4	53.5	60.4	0.5
13:52	11.4	6.2	332.3	50.1	60.2	0.5
13:53	11.4	6.2	317.2	52.7	59.4	0.5
13:54	11.4	6.2	320.1	51.4	58.6	0.4
13:55	11.4	6.1	326.2	51.2	59.6	0.4
13:56	11.4	6.1	335.2	50.9	59.3	0.5
13:57	11.4	6.2	325.6	50.6	59.2	0.5
13:58	11.4	6.2	326.8	51.3	59.0	0.5
13:59	11.4	6.2	330.6	51.9	58.1	0.5
14:00	11.5	6.2	335.2	50.3	57.4	0.5
14:01	11.4	6.2	332.2	50.3	59.6	0.5
14:02	11.5	6.1	326.9	50.0	57.3	0.5
14:03	11.5	6.2	326.6	50.3	58.7	0.5
14:04	11.5	6.2	332.3	50.1	58.5	0.5
14:05	11.5	6.1	332.9	49.3	59.2	0.5
14:06	11.5	6.2	331.9	50.3	59.5	0.5
14:07	11.4	6.2	322.5	50.7	60.9	0.5
14:08	11.4	6.2	327.8	50.4	57.7	0.5
14:09	11.4	6.2	327.1	49.9	58.2	0.5
14:10	11.5	6.2	338.7	50.7	59.9	0.4
14:11	11.5	6.2	329.4	49.6	58.1	0.5
14:12	11.5	6.2	332.9	50.0	56.4	0.5
14:13	11.5	6.2	331.7	49.5	56.4	0.5
14:14	11.5	6.1	333.2	49.4	57.1	0.5
14:15	11.4	6.2	319.5	48.7	58.6	0.5
14:16	11.5	6.2	333.4	48.6	59.4	0.5
14:17	11.5	6.1	332.0	48.3	59.0	0.5
14:18	11.5	6.1	335.3	49.3	60.0	0.4
14:19	11.5	6.1	324.7	48.5	59.9	0.5
14:20	11.5	6.1	335.1	48.3	59.2	0.5
14:21	11.5	6.1	331.9	47.7	58.4	0.5
14:22	11.5	6.1	336.7	47.4	57.8	0.5
14:23	11.5	6.1	338.6	48.9	58.2	0.5
14:24	11.5	6.1	331.3	48.5	58.2	0.5
14:25	11.5	6.1	337.1	49.7	58.6	0.5
14:26	11.5	6.2	332.0	49.5	60.9	0.5
14:27	11.5	6.1	325.3	48.8	60.1	0.5
14:28	11.5	6.1	331.8	48.5	59.6	0.5
14:29	11.5	6.1	328.9	48.7	58.9	0.5
14:30	11.5	6.2	330.4	48.6	58.3	0.5
14:31	11.5	6.1	331.9	49.5	58.5	0.5
14:32	11.5	6.1	327.8	48.7	59.4	0.5
14:33	11.5	6.1	327.5	49.2	59.0	0.4
14:34	11.5	6.2	327.5	49.2	59.1	0.5
14:35	11.4	6.2	331.8	50.4	60.1	0.5
14:36	11.5	6.2	331.3	50.3	59.9	0.5
14:37	11.5	6.2	327.0	49.9	59.6	0.5
14:38	11.5	6.2	332.2	50.3	60.5	0.5
14:39	11.5	6.2	330.1	50.1	60.3	0.5

Parameter	**O_2 - Outlet**	**CO_2 - Outlet**	**CO - Outlet**	**NOx - Outlet**	**THC - Outlet**	**SO2 - Outlet**
Uncorrected Run Average (C_{obs})	11.4	6.1	330.0	50.3	59.1	0.44
Cal Gas Concentration (C_{MA})	10.9	10.9	440.2	487.4	45.7	19.1
Pretest System Zero Response	0.050	0.010	0.00	1.7	0.50	0.00
Posttest System Zero Response	0.10	0.030	0.010	1.2	0.010	0.010
Average Zero Response (Co)	0.075	0.020	0.0050	1.4	0.26	0.0050
Pretest System Cal Response	11.0	10.8	436.6	475.5	45.4	19.3
Posttest System Cal Response	11.0	10.8	433.0	477.8	45.6	18.8
Average Cal Response (C_M)	11.0	10.8	434.8	476.7	45.5	19.1
Corrected Run Average (Corr)	11.4	6.2	334.1	50.1	NA	0.44

Run 2 - CEMS Data

Location: ABCWUA - Southside Water Reclamation Plant
Source: Unit 28 (Digester)
Project No.: 2020-0005
Date: 1/10/20

Time	O_2 - Outlet	CO_2 - Outlet	CO - Outlet	NOx - Outlet	THC - Outlet	SO2 - Outlet
Unit	**% dry**	**% dry**	**ppmvd**	**ppmvd**	**ppmvw**	**ppmvd**
Status	Valid	Valid	Valid	Valid	Valid	Valid
14:56	11.5	6.2	330.4	50.5	59.9	0.4
14:57	11.5	6.2	337.8	49.0	58.2	0.4
14:58	11.5	6.2	333.9	49.9	59.6	0.4
14:59	11.5	6.2	337.0	48.6	60.2	0.4
15:00	11.5	6.2	334.4	48.5	60.5	0.4
15:01	11.5	6.2	323.5	50.1	61.8	0.4
15:02	11.5	6.2	334.5	49.3	61.8	0.4
15:03	11.5	6.2	332.4	50.0	60.2	0.4
15:04	11.4	6.2	325.6	50.1	61.0	0.4
15:05	11.4	6.2	318.8	51.1	61.8	0.4
15:06	11.4	6.2	328.2	52.0	59.3	0.4
15:07	11.5	6.2	327.8	51.0	59.3	0.4
15:08	11.5	6.2	328.9	50.4	58.7	0.5
15:09	11.4	6.2	333.0	50.7	59.9	0.5
15:10	11.4	6.2	334.7	50.7	59.0	0.5
15:11	11.4	6.2	332.8	51.3	59.6	0.5
15:12	11.4	6.2	335.5	50.7	59.9	0.5
15:13	11.5	6.2	328.1	50.9	59.9	0.5
15:14	11.5	6.2	336.8	50.1	60.5	0.5
15:15	11.4	6.2	331.2	50.4	60.4	0.5
15:16	11.5	6.2	331.7	50.5	59.4	0.5
15:17	11.5	6.2	330.4	50.4	59.9	0.5
15:18	11.5	6.2	331.1	50.4	60.4	0.5
15:19	11.5	6.2	336.1	50.6	58.9	0.5
15:20	11.5	6.2	325.8	51.2	58.4	0.5
15:21	11.5	6.2	330.9	49.9	58.6	0.5
15:22	11.4	6.2	326.4	50.8	58.5	0.5
15:23	11.5	6.2	332.5	50.7	59.4	0.5
15:24	11.5	6.2	328.8	50.4	59.7	0.5
15:25	11.5	6.2	319.9	50.1	59.4	0.5
15:26	11.5	6.2	330.8	50.9	58.8	0.5
15:27	11.5	6.2	331.5	49.7	58.8	0.5
15:28	11.5	6.2	333.7	49.9	60.5	0.5
15:29	11.5	6.2	329.2	50.0	59.9	0.4
15:30	11.5	6.2	330.9	50.0	60.1	0.5
15:31	11.5	6.2	328.9	49.1	58.6	0.5
15:32	11.5	6.2	330.3	49.4	59.5	0.4
15:33	11.5	6.2	328.4	50.1	59.8	0.4
15:34	11.5	6.2	338.1	48.4	60.6	0.4
15:35	11.5	6.1	343.2	48.6	59.8	0.4
15:36	11.5	6.2	335.3	47.8	59.9	0.4
15:37	11.5	6.2	332.7	48.7	59.8	0.4
15:38	11.5	6.2	337.5	48.3	59.0	0.4
15:39	11.5	6.2	329.0	48.5	58.8	0.4
15:40	11.5	6.2	334.0	48.6	58.8	0.4
15:41	11.5	6.2	332.4	47.5	59.5	0.5
15:42	11.5	6.2	330.4	48.9	60.6	0.4
15:43	11.5	6.2	324.5	50.4	60.4	0.4
15:44	11.5	6.2	336.2	51.0	59.8	0.4
15:45	11.5	6.2	337.3	50.1	60.1	0.5
15:46	11.5	6.2	329.0	49.6	60.7	0.4
15:47	11.5	6.2	325.4	48.7	60.5	0.4
15:48	11.5	6.2	324.9	49.0	59.0	0.4
15:49	11.5	6.2	326.6	49.5	58.3	0.4
15:50	11.5	6.2	327.4	49.4	59.4	0.4
15:51	11.5	6.2	334.8	48.6	60.2	0.5
15:52	11.5	6.2	325.5	48.9	62.7	0.5
15:53	11.5	6.1	329.3	48.7	59.3	0.4
15:54	11.5	6.2	330.3	48.7	58.4	0.4
15:55	11.5	6.2	331.5	48.2	58.3	0.5

Parameter	O_2 - Outlet	CO_2 - Outlet	CO - Outlet	NOx - Outlet	THC - Outlet	SO2 - Outlet
Uncorrected Run Average (C_{obs})	11.5	6.2	331.0	49.7	59.7	0.43
Cal Gas Concentration (C_{MA})	10.9	10.9	440.2	487.4	45.7	19.1
Pretest System Zero Response	0.10	0.030	0.010	1.2	0.010	0.010
Posttest System Zero Response	0.12	0.050	0.61	1.2	0.24	0.00
Average Zero Response (Co)	0.11	0.040	0.31	1.2	0.13	0.0050
Pretest System Cal Response	11.0	10.8	433.0	477.8	45.6	18.8
Posttest System Cal Response	11.0	10.8	436.7	475.7	45.2	18.8
Average Cal Response (C_M)	11.0	10.8	434.9	476.8	45.4	18.8
Corrected Run Average (Corr)	11.4	6.2	335.0	49.8	NA	0.44

Run 3 - CEMS Data

Location: ABCWUA - Southside Water Reclamation Plant
Source: Unit 28 (Digester)
Project No.: 2020-0005
Date: 1/10/20

Time	O_2 - Outlet	CO_2 - Outlet	CO - Outlet	NOx - Outlet	THC - Outlet	SO2 - Outlet
Unit	% dry	% dry	ppmvd	ppmvd	ppmvw	ppmvd
Status	Valid	Valid	Valid	Valid	Valid	Valid
16:14	11.8	6.1	329.9	48.7	57.9	0.4
16:15	11.5	6.2	332.9	48.7	57.1	0.4
16:16	11.5	6.2	339.7	48.4	56.3	0.4
16:17	11.5	6.2	335.3	49.0	56.9	0.4
16:18	11.5	6.2	331.2	48.8	57.5	0.4
16:19	11.5	6.2	337.6	48.8	56.8	0.4
16:20	11.5	6.2	341.1	49.1	56.8	0.4
16:21	11.5	6.2	338.2	49.8	57.1	0.4
16:22	11.5	6.2	345.8	49.2	57.2	0.4
16:23	11.5	6.2	340.2	49.0	58.5	0.4
16:24	11.5	6.2	330.3	49.3	59.1	0.4
16:25	11.5	6.2	337.1	49.0	58.7	0.4
16:26	11.5	6.2	338.0	50.5	58.0	0.4
16:27	11.5	6.2	337.2	50.5	58.2	0.4
16:28	11.5	6.2	334.9	51.6	59.3	0.5
16:29	11.5	6.2	338.0	51.6	58.2	0.5
16:30	11.5	6.2	335.8	52.1	59.2	0.5
16:31	11.5	6.2	334.1	50.2	58.7	0.5
16:32	11.4	6.2	340.8	51.1	60.3	0.5
16:33	11.5	6.2	330.9	52.1	58.4	0.5
16:34	11.5	6.2	335.5	51.3	58.1	0.5
16:35	11.5	6.2	337.2	50.7	59.1	0.5
16:36	11.5	6.2	334.9	50.6	59.2	0.5
16:37	11.6	6.2	331.3	51.1	60.3	0.5
16:38	11.6	6.2	336.1	52.2	61.6	0.5
16:39	11.5	6.2	339.0	50.7	63.3	0.5
16:40	11.5	6.2	342.7	50.5	61.9	0.5
16:41	11.6	6.2	329.0	50.5	61.1	0.4
16:42	11.5	6.2	326.8	50.7	61.9	0.4
16:43	11.5	6.2	335.6	51.1	61.2	0.5
16:44	11.5	6.2	334.4	50.6	60.8	0.5
16:45	11.5	6.2	338.9	51.3	61.9	0.5
16:46	11.5	6.2	328.8	50.9	63.0	0.5
16:47	11.5	6.2	339.1	50.6	62.1	0.5
16:48	11.5	6.2	335.9	50.8	62.5	0.5
16:49	11.4	6.2	333.2	50.8	62.6	0.5
16:50	11.5	6.2	331.1	51.6	61.5	0.5
16:51	11.5	6.2	342.5	51.2	63.3	0.5
16:52	11.5	6.2	336.9	52.5	62.5	0.5
16:53	11.5	6.2	333.9	51.1	62.2	0.5
16:54	11.5	6.2	336.9	51.8	61.7	0.5
16:55	11.5	6.2	341.2	52.0	62.0	0.5
16:56	11.5	6.2	333.0	51.9	61.6	0.4
16:57	11.7	6.2	331.8	51.9	63.0	0.5
16:58	11.6	6.2	340.9	49.0	62.8	0.4
16:59	11.6	6.2	335.8	49.6	61.8	0.4
17:00	11.6	6.2	348.2	49.0	62.7	0.4
17:01	11.5	6.2	339.2	48.1	63.1	0.4
17:02	11.5	6.2	340.2	49.2	62.8	0.4
17:03	11.5	6.2	342.1	48.1	64.0	0.4
17:04	11.5	6.2	338.1	47.9	65.3	0.4
17:05	11.5	6.2	338.3	47.4	65.2	0.4
17:06	11.5	6.2	349.5	47.4	65.2	0.4
17:07	11.5	6.2	338.0	47.9	64.4	0.4
17:08	11.5	6.2	344.1	47.0	62.6	0.4
17:09	11.5	6.2	339.1	47.0	61.5	0.4
17:10	11.5	6.2	350.4	47.0	62.4	0.4
17:11	11.5	6.2	342.5	45.9	64.4	0.4
17:12	11.5	6.2	342.6	46.5	62.4	0.4
17:13	11.5	6.2	343.7	46.7	61.8	0.4

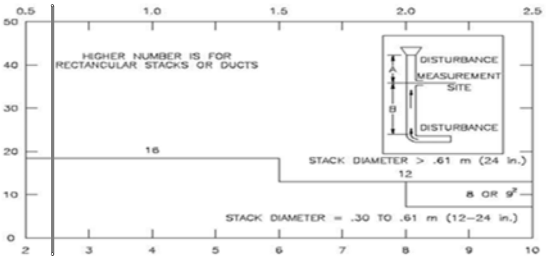
Parameter	O_2 - Outlet	CO_2 - Outlet	CO - Outlet	NOx - Outlet	THC - Outlet	SO2 - Outlet
Uncorrected Run Average (C_{obs})	11.5	6.2	337.4	49.8	60.8	0.43
Cal Gas Concentration (C_{MA})	10.9	10.9	440.2	487.4	45.7	19.1
Pretest System Zero Response	0.12	0.050	0.61	1.2	0.24	0.00
Posttest System Zero Response	0.090	0.030	0.020	1.2	0.020	0.00
Average Zero Response (Co)	0.11	0.040	0.32	1.2	0.13	0.00
Pretest System Cal Response	11.0	10.8	436.7	475.7	45.2	18.8
Posttest System Cal Response	11.1	10.9	440.7	475.0	45.6	18.7
Average Cal Response (C_M)	11.0	10.8	438.7	475.4	45.4	18.8
Corrected Run Average (Corr)	11.4	6.2	338.5	50.0	NA	0.44

Method 1 Data

Location **Albuquerque Bernalillo County Water Utility - Southside Water Reclamation Plant**
Source **Unit 28 (digester)**
Project No. **2020-0005**
Date: **01/10/20**

Stack Parameters

Duct Orientation: Horizontal
Duct Design: Circular
Distance from Far Wall to Outside of Port: 32.00 **in**
Nipple Length: 7.00 **in**
Depth of Duct: 25.00 **in**
Cross Sectional Area of Duct: 3.41 **ft^2**
No. of Test Ports: 2
Distance A: 7.5 **ft**
Distance A Duct Diameters: 3.6 **(must be > 0.5)**
Distance B: 5.0 **ft**
Distance B Duct Diameters: 2.4 **(must be > 2)**
Minimum Number of Traverse Points: 16
Actual Number of Traverse Points: 16



CIRCULAR DUCT

LOCATION OF TRAVERSE POINTS

Number of traverse points on a diameter

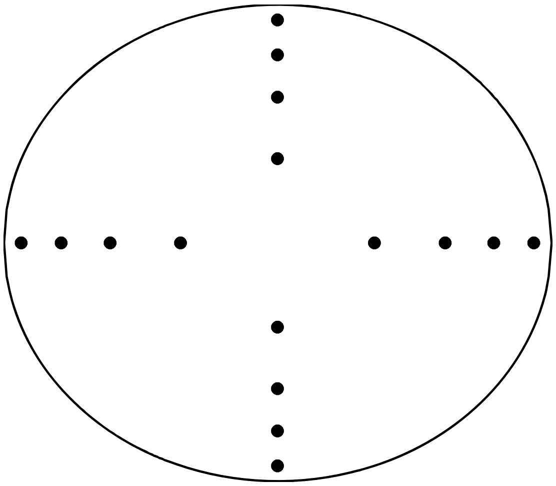
	2	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
1	14.6	--	6.7	--	4.4	--	3.2	--	2.6	--	2.1
2	85.4	--	25.0	--	14.6	--	10.5	--	8.2	--	6.7
3	--	--	75.0	--	29.6	--	19.4	--	14.6	--	11.8
4	--	--	93.3	--	70.4	--	32.3	--	22.6	--	17.7
5	--	--	--	--	85.4	--	67.7	--	34.2	--	25.0
6	--	--	--	--	95.6	--	80.6	--	65.8	--	35.6
7	--	--	--	--	--	--	89.5	--	77.4	--	64.4
8	--	--	--	--	--	--	96.8	--	85.4	--	75.0
9	--	--	--	--	--	--	--	--	91.8	--	82.3
10	--	--	--	--	--	--	--	--	97.4	--	88.2
11	--	--	--	--	--	--	--	--	--	--	93.3
12	--	--	--	--	--	--	--	--	--	--	97.9

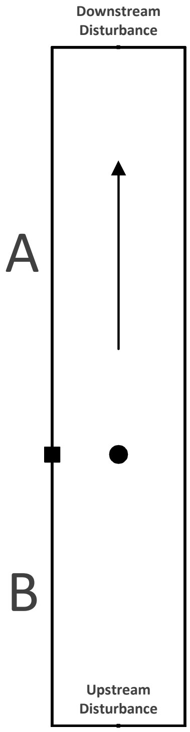
**Percent of stack diameter from inside wall to traverse point.*

Traverse Point	**% of Diameter**	**Distance from inside wall**	**Distance from outside of port**
1	3.2	1.00	8.00
2	10.5	2.63	9.63
3	19.4	4.85	11.85
4	32.3	8.08	15.08
5	67.7	16.93	23.93
6	80.6	20.15	27.15
7	89.5	22.38	29.38
8	96.8	24.00	31.00
9	--	--	--
10	--	--	--
11	--	--	--
12	--	--	--

Stack Diagram
A = 7.5 ft.
B = 5 ft.
Depth of Duct = 25 in.

Cross Sectional Area





Cyclonic Flow Check

Location Albuquerque Bernalillo County Water Utility - Southside Water Reclamation Plant
Source Unit 28 (digester)
Project No. 2020-0005
Date 1/10/20

Sample Point	Angle (ΔP=0)
1	4
2	3
3	2
4	2
5	0
6	3
7	2
8	3
9	1
10	0
11	4
12	1
13	2
14	1
15	3
16	4
Average	2.2

Field Data
Method 2 Data

Location Albuquerque Bernalillo County Water Utility - Southside Water Reclamation Plant
Source Unit 28 (digester)
Project No. 2020-0005

Run No.	**1**		**2**		**3**	
Date	1/10/20		1/10/20		1/10/20	
Status	VALID		VALID		VALID	
Start Time	14:00		15:10		16:30	
Stop Time	14:12		15:20		16:42	
Leak Check	Pass		Pass		Pass	
Traverse Point	**Δ P (in. WC)**	**Ts (°F)**	**Δ P (in. WC)**	**Ts (°F)**	**Δ P (in. WC)**	**Ts (°F)**
A-1	0.66	518	0.67	515	0.65	512
2	0.65	517	0.68	514	0.65	16
3	0.68	518	0.69	514	0.68	516
4	0.69	517	0.70	512	0.67	518
5	0.69	517	0.72	513	0.63	517
6	0.67	518	0.68	516	0.66	515
7	0.68	518	0.67	515	0.65	514
8	0.70	518	0.66	518	0.65	512
B-1	0.64	517	0.64	518	0.63	512
2	0.65	519	0.67	514	0.67	514
3	0.68	518	0.69	515	0.68	516
4	0.69	518	0.68	515	0.64	515
5	0.70	517	0.67	512	0.68	515
6	0.72	517	0.66	512	0.65	517
7	0.64	517	0.64	513	0.66	513
8	0.63	516	0.65	513	0.66	513

					Average
Square Root of ΔP, (in. WC)$^{1/2}$	**(ΔP)$^{1/2}$**	0.82	0.82	0.81	0.82
Average ΔP, in. WC	**(ΔP)**	0.67	0.67	0.66	0.67
Pitot Tube Coefficient	**(Cp)**	0.81	0.81	0.81	0.81
Barometric Pressure, in. Hg	**(Pb)**	25.0	25.0	25.0	25.0
Static Pressure, in. WC	**(Pg)**	0.57	0.57	0.57	0.57
Stack Pressure, in. Hg	**(Ps)**	25.1	25.1	25.1	25.1
Average Temperature, °F	**(Ts)**	517.5	514.3	483.4	505.1
Average Temperature, °R	**(Ts)**	977.5	974.3	943.4	965.1
Measured Moisture Fraction	**(BWSmsd)**	0.098	0.10	0.098	0.098
Moisture Fraction @ Saturation	**(BWSsat)**	58.5	56.9	43.5	52.9
Moisture Fraction	**(BWS)**	0.098	0.10	0.098	0.098
O2 Concentration, %	**(O2)**	11.3	11.3	11.3	11.3
CO2 Concentration, %	**(CO2)**	6.2	6.2	6.2	6.2
Molecuar Weight, lb/lb-mole (dry)	**(Md)**	29.4	29.4	29.4	29.4
Molecuar Weight, lb/lb-mole (wet)	**(Ms)**	28.3	28.3	28.3	28.3
Velocity, ft/sec	**(Vs)**	67.0	66.9	65.0	66.3
VFR at stack conditions, acfm	**(Qa)**	13,701	13,684	13,297	13,561
VFR at standard conditions, scfh	**(Qsw)**	371,931	372,703	374,004	372,879
VFR at standard conditions, scfm	**(Qsw)**	6,199	6,212	6,233	6,215
VFR at standard conditions, dscfm	**(Qsd)**	5,592	5,592	5,625	5,603

Location Albuquerque Bernalillo County Water Utility - Southside Water Reclamation Pla
Source Unit 28 (digester)
Project No. 2020-0005
Parameter(s): VFR
Console Type Meter Box

Run No.		1					2					3				
Date		1/10/20					1/10/20					1/10/20				
Status		VALID					VALID					VALID				
Start Time		13:40					14:56					16:14				
End Time		14:40					15:56					17:14				
Run Time, min	**(θ)**	60					60					60				
Meter ID		M5-17					M5-17					M5-17				
Meter Correction Factor	**(Y)**	1.000					1.000					1.000				
Orifice Calibration Value	**(ΔH @)**	1.570					1.570					1.570				
Max Vacuum, in. Hg		3					3					3				
Post Leak Check, ft3/min (at max vac.)		0.000					0.000					0.000				
Meter Volume, ft3																
0		225.146					263.203					301.127				
5		228.300					266.400					304.200				
10		231.400					269.400					307.300				
15		234.600					272.600					310.500				
20		237.700					275.800					313.600				
25		240.900					278.500					316.800				
30		243.800					282.300					319.700				
35		247.600					285.600					322.900				
40		250.100					288.800					325.700				
45		253.600					291.700					329.200				
50		256.400					294.500					332.600				
55		259.300					297.900					335.900				
60		262.898					300.825					338.774				
Total Meter Volume, ft3	**(Vm)**	37.752					37.622					37.647				
Temperature, °F		**Meter**	**Probe**	**Filter**	**Vacuum**	**Imp. Exit**	**Meter**	**Probe**	**Filter**	**Vacuum**	**Imp. Exit**	**Meter**	**Probe**	**Filter**	**Vacuum**	**Imp. Exit**
0		64	N/A	N/A	3	50	70	N/A	N/A	3	48	68	N/A	N/A	3	48
5		64	N/A	N/A	3	50	70	N/A	N/A	3	48	68	N/A	N/A	3	48
10		65	N/A	N/A	3	50	70	N/A	N/A	3	48	68	N/A	N/A	3	48
15		65	N/A	N/A	3	51	70	N/A	N/A	3	48	68	N/A	N/A	3	48
20		65	N/A	N/A	3	51	70	N/A	N/A	3	50	68	N/A	N/A	3	48
25		66	N/A	N/A	3	51	71	N/A	N/A	3	51	69	N/A	N/A	3	47
30		68	N/A	N/A	3	52	71	N/A	N/A	3	51	69	N/A	N/A	3	47
35		68	N/A	N/A	3	52	71	N/A	N/A	3	52	69	N/A	N/A	3	47
40		68	N/A	N/A	3	52	70	N/A	N/A	3	52	68	N/A	N/A	3	47
45		69	N/A	N/A	3	51	70	N/A	N/A	3	50	68	N/A	N/A	3	47
50		69	N/A	N/A	3	50	69	N/A	N/A	3	49	68	N/A	N/A	3	47
55		70	N/A	N/A	3	50	69	N/A	N/A	3	49	68	N/A	N/A	3	47
60		70	N/A	N/A	3	49	69	N/A	N/A	3	49	68	N/A	N/A	3	47
Average Temperature, °F	**(Tm)**	67	--	--	--	--	70	--	--	--	--	68	--	--	--	--
Average Temperature, °R	**(Tm)**	527	--	--	--	--	530	--	--	--	--	528	--	--	--	--
Minimum Temperature, °F		64	--	--	--	--	69	--	--	--	--	68	--	--	--	--
Maximum Temperature, °F		70	--	--	--	52	71	--	--	--	52	69	--	--	--	48
Barometeric Pressure, in. Hg	**(Pb)**	25.02					25.02					25.02				
Meter Orifice Pressure , in. WC	**(ΔH)**	1.000					1.000					1.000				
Meter Pressure, in. Hg	**(Pm)**	25.09					25.09					25.09				
Standard Meter Volume, ft3	**(Vmstd)**	31.740					31.452					31.578				
Analysis Type		Gravimetric					Gravimetric					Gravimetric				
Impinger 1, Pre/Post Test, mL		H2O		466.6	511.3	44.7	H2O		511.3	517.3	6.0	H2O		517.3	509.1	-8.2
Impinger 2, Pre/Post Test, mL		H2O		431.8	453.6	21.8	H2O		453.6	510.1	56.5	H2O		510.1	557.2	47.1
Impinger 3, Pre/Post Test, mL		Empty		301.0	302.3	1.3	Empty		300.8	307.1	6.3	Empty		302.0	330.4	28.4
Impinger 4, Pre/Post Test, g		Silica		606.3	611.5	5.2	Silica		611.5	616.6	5.1	Silica		616.6	621.7	5.1
Volume Water Collected, mL	**(Vlc)**	73.0					73.9					72.4				
Standard Water Volume, ft^3	**(Vwstd)**	3.442					3.484					3.414				
Moisture Fraction Measured	**(BWS)**	0.098					0.100					0.098				
Gas Molecular Weight, lb/lb-mole (dry)	**(Md)**	29.44					29.44					29.44				
DGM Calibration Check Value	**(Yqa)**	-3.0					-3.7					-3.4				

Unit 29

Location ABCWUA - Southside Water Reclamation Plant
Source Unit 29
Project No. 2020-0005

Run Number		Run 1	Run 2	Run 3	Average
Date		1/13/20	1/13/20	1/13/20	--
Start Time		9:17	10:33	11:44	--
Stop Time		10:17	11:33	12:44	--
Engine Data					
Engine Manufacturer		Cooper			
Engine Model		12-GTLA			
Engine Serial Number		311069			
Engine Type		Spark Ignition - 4SLB			
Engine Year of Manufacture	DOM	2011			
Engine Speed, RPM	ES	900	900	900	900
Engine Brake Work, HP	EBW	1,285	1,297	1,301	1,294
Maximum Engine Brake Work, HP	MaxEBW	1,650	1,650	1,650	1,650
Engine Load, %	EL	90	90	90	90
Fuel Heating Value, Btu/scf	F_{HV}	1,040	1,040	1,040	1,040
Fuel Factor, dscf/MMBtu	F_{Factor}	8,710	8,710	8,710	8,710
Fuel Rate, scfh	F_R	182	184	184	183
Input Data - Outlet					
Moisture Fraction, dimensionless	BWS	0.094	0.097	0.097	0.096
Volumetric Flow Rate (M1-4), dscfm	Qs	3,556	3,561	3,531	3,549
Calculated Data - Outlet					
O2 Concentration, % dry	C_{O2}	11.5	11.4	11.4	11.4
CO2 Concentration, % dry	C_{CO2}	5.4	5.4	5.5	5.4
NOx Concentration, ppmvd	C_{NOx}	64.1	65.3	67.6	65.6
NOx Concentration, ppmvd @ 15% O2	C_{NOxc15}	40.0	40.6	41.8	40.8
NOx Emission Factor, g/HP-hr	EF_{NOx}	0.58	0.58	0.60	0.59
NOx Emission Rate, lb/hr	ER_{NOx}	1.6	1.7	1.7	1.7
NOx Emission Rate, ton/yr	ER_{NOxTPY}	7.1	7.3	7.5	7.3
CO Concentration, ppmvd	C_{CO}	527.2	508.2	506.9	514.1
CO Concentration, ppmvd @ 15% O2	C_{COc15}	329.2	315.8	313.2	319.4
CO Emission Factor, g/HP-hr	EF_{CO}	2.9	2.8	2.7	2.8
CO Emission Rate, lb/hr	ER_{CO}	8.2	7.9	7.8	8.0
CO Emission Rate, ton/yr	ER_{COTPY}	35.8	34.6	34.2	34.9
THC Concentration as propane, ppmvw	C_{THCw}	86.1	84.3	84.5	85.0
THC Concentration as propane, ppmvd	C_{THCd}	95.1	93.3	93.6	94.0
CH4 Concentration, ppmvd	C_{CH4}	0.00	0.00	0.00	0.00
CH4 Concentration (as C3H8), ppmvd	$C_{CH4\ as\ propane}$	0.00	0.00	0.00	0.00
C2H6 Concentration, ppmvd	C_{C2H6}	0.00	0.00	0.00	0.00
C2H6 Concentration (as C3H8), ppmvd	$C_{C2H6\ as\ propane}$	0.00	0.00	0.00	0.00
NMEHC Concentration (as C3H8), ppmvd	C_{NMEHC}	95.1	93.3	93.6	94.0
NMEHC Concentration (as C3H8), ppmvd @ 15% O2	$C_{NMEHCc15}$	59.4	58.0	57.8	58.4
NMEHC Emission Factor (as C3H8), g/HP-hr	EF_{NMEHC}	0.82	0.80	0.79	0.80
NMEHC Emission Rate (as C3H8), lb/hr	ER_{NMEHC}	2.3	2.3	2.3	2.3
NMEHC Emission Rate (as C3H8), ton/yr	$ER_{NMEHCTPY}$	10.2	10.0	9.9	10.0
SO_2 Concentration, ppmvd	C_{SO2}	0.063	0.12	0.082	0.089
SO_2 Concentration, ppmvd @ 15% O2	C_{SO2c15}	0.039	0.076	0.051	0.055
SO_2 Emission Factor, g/HP-hr	EF_{SO2}	0.001	0.002	0.001	0.001
SO_2 Emission Rate, lb/hr	ER_{SO2}	0.002	0.004	0.003	0.003
SO_2 Emission Rate, ton/yr	ER_{SO2TPY}	0.0098	0.019	0.013	0.014

Run 1 - CEMS Data

Location: ABCWUA - Southside Water Reclamation Plant
Source: Unit 29
Project No.: 2020-0005
Date: 1/13/20

Time	O_2 - Outlet	CO_2 - Outlet	CO - Outlet	NOx - Outlet	THC - Outlet	SO_2 - Outlet
Unit	% dry	% dry	ppmvd	ppmvd	ppmvw	ppmvd
Status	Valid	Valid	Valid	Valid	Valid	Valid
9:17	10.8	5.7	488.6	123.8	20.1	0.2
9:18	10.7	5.7	479.0	127.6	37.1	0.3
9:19	10.8	5.7	481.6	131.6	23.9	0.3
9:20	11.0	5.6	501.9	105.4	29.0	0.2
9:21	11.1	5.5	495.2	94.2	55.2	0.2
9:22	11.2	5.5	511.6	78.4	46.7	0.1
9:23	11.3	5.4	500.1	76.9	77.5	0.1
9:24	11.3	5.4	525.9	67.4	71.9	0.1
9:25	11.3	5.4	549.2	69.0	81.3	0.1
9:26	11.3	5.4	508.5	71.4	75.5	0.1
9:27	11.5	5.3	540.1	64.4	77.9	0.1
9:28	11.5	5.3	544.1	55.8	87.5	0.0
9:29	11.5	5.3	548.5	58.6	93.1	0.0
9:30	11.5	5.3	544.0	58.0	94.3	0.0
9:31	11.5	5.3	537.6	58.0	93.1	0.0
9:32	11.5	5.3	563.8	56.9	92.8	0.0
9:33	11.5	5.3	569.6	57.3	94.5	0.0
9:34	11.5	5.3	545.4	56.6	94.4	0.0
9:35	11.5	5.3	525.0	57.5	95.0	0.0
9:36	11.5	5.3	532.6	57.8	94.5	0.0
9:37	11.5	5.3	533.2	58.3	91.4	0.0
9:38	11.5	5.3	515.2	55.8	93.2	0.0
9:39	11.5	5.3	511.0	56.8	98.0	0.0
9:40	11.5	5.3	511.2	59.5	95.2	0.0
9:41	11.5	5.3	513.5	56.8	99.5	0.0
9:42	11.5	5.3	529.1	57.0	96.9	0.1
9:43	11.5	5.3	521.0	56.3	89.1	0.0
9:44	11.5	5.3	524.5	56.1	92.5	0.0
9:45	11.5	5.3	533.5	57.9	96.2	0.0
9:46	11.5	5.3	512.5	56.9	99.2	0.0
9:47	11.5	5.3	514.0	56.1	99.4	0.0
9:48	11.5	5.3	533.2	56.8	92.6	0.0
9:49	11.5	5.3	536.1	56.3	92.4	0.0
9:50	11.5	5.3	536.1	56.2	93.9	0.0
9:51	11.5	5.3	522.1	56.8	95.6	0.1
9:52	11.5	5.3	508.8	56.6	94.5	0.0
9:53	11.5	5.3	517.7	56.7	91.8	0.0
9:54	11.5	5.3	533.4	56.1	94.0	0.0
9:55	11.5	5.3	515.9	55.8	94.8	0.1
9:56	11.5	5.3	527.0	56.0	92.3	0.0
9:57	11.5	5.3	536.1	56.1	94.2	0.0
9:58	11.5	5.3	538.5	56.2	93.3	0.0
9:59	11.5	5.3	532.2	56.2	89.7	0.0
10:00	11.5	5.3	518.6	58.0	97.4	0.0
10:01	11.5	5.3	505.1	57.1	91.8	0.1
10:02	11.5	5.3	526.9	57.8	87.7	0.1
10:03	11.5	5.3	509.8	57.4	85.0	0.0
10:04	11.5	5.3	523.1	56.7	83.6	0.0
10:05	11.5	5.3	529.6	57.4	97.1	0.1
10:06	11.5	5.3	531.0	57.5	98.9	0.1
10:07	11.5	5.3	519.8	57.9	94.9	0.0
10:08	11.5	5.3	518.2	57.2	87.1	0.1
10:09	11.5	5.3	531.4	56.7	96.2	0.0
10:10	11.5	5.3	516.2	58.1	91.6	0.1
10:11	11.5	5.3	515.5	57.9	92.0	0.1
10:12	11.5	5.3	504.3	58.8	93.6	0.1
10:13	11.5	5.3	506.4	58.9	89.5	0.1
10:14	11.5	5.3	539.0	59.2	93.1	0.1
10:15	11.5	5.3	502.2	59.5	95.5	0.0
10:16	11.4	5.4	497.5	60.9	88.1	0.0

Parameter	O_2 - Outlet	CO_2 - Outlet	CO - Outlet	NOx - Outlet	THC - Outlet	SO2 - Outlet
Uncorrected Run Average (C_{obs})	11.4	5.3	522.4	63.6	86.1	0.062
Cal Gas Concentration (C_{MA})	10.9	10.9	440.2	487.4	45.7	19.1
Pretest System Zero Response	0.00	0.00	0.00	0.70	0.00	0.00
Posttest System Zero Response	0.10	0.00	0.00	1.2	0.00	0.00
Average Zero Response (Co)	0.050	0.00	0.00	1.0	0.00	0.00
Pretest System Cal Response	10.9	10.7	440.1	479.9	45.4	18.9
Posttest System Cal Response	10.9	10.7	432.3	475.3	45.5	18.9
Average Cal Response (C_M)	10.9	10.7	436.2	477.6	45.5	18.9
Corrected Run Average (Corr)	11.5	5.4	527.2	64.1	NA	0.063

Run 2 - CEMS Data

Location: ABCWUA - Southside Water Reclamation Plant
Source: Unit 29
Project No.: 2020-0005
Date: 1/13/20

Time	**O_2 - Outlet**	**CO_2 - Outlet**	**CO - Outlet**	**NOx - Outlet**	**THC - Outlet**	**SO2 - Outlet**
Unit	**% dry**	**% dry**	**ppmvd**	**ppmvd**	**ppmvw**	**ppmvd**
Status	Valid	Valid	Valid	Valid	Valid	Valid
10:33	11.5	5.3	486.9	59.1	84.3	2.1
10:34	11.5	5.3	509.4	60.8	90.2	0.2
10:35	11.5	5.3	515.1	61.9	85.3	0.1
10:36	11.5	5.3	497.8	61.3	82.7	0.1
10:37	11.5	5.3	514.8	60.4	86.5	0.1
10:38	11.5	5.3	513.1	61.2	89.2	0.1
10:39	11.5	5.3	506.2	61.0	87.5	0.1
10:40	11.5	5.3	520.1	62.0	86.4	0.1
10:41	11.4	5.3	517.6	60.8	86.4	0.1
10:42	11.5	5.3	500.7	62.0	85.6	0.1
10:43	11.5	5.3	493.2	61.0	93.4	0.1
10:44	11.4	5.4	500.5	61.8	78.5	0.1
10:45	11.4	5.4	502.1	62.7	79.5	0.1
10:46	11.4	5.4	518.2	62.3	80.7	0.1
10:47	11.5	5.3	496.3	62.4	98.6	0.1
10:48	11.4	5.4	499.8	62.1	95.8	0.1
10:49	11.4	5.4	508.5	61.8	87.1	0.1
10:50	11.5	5.3	507.8	62.2	84.4	0.1
10:51	11.5	5.3	498.8	61.1	87.3	0.1
10:52	11.4	5.4	512.0	61.8	87.7	0.1
10:53	11.4	5.3	515.0	62.5	85.9	0.1
10:54	11.5	5.3	512.8	61.6	82.8	0.1
10:55	11.5	5.3	480.4	61.5	83.6	0.1
10:56	11.5	5.3	508.1	61.8	91.6	0.1
10:57	11.5	5.3	498.2	61.9	95.8	0.1
10:58	11.5	5.3	509.6	61.0	89.5	0.1
10:59	11.4	5.3	503.3	61.7	85.0	0.1
11:00	11.5	5.4	499.5	63.7	85.5	0.1
11:01	11.6	5.4	516.7	63.7	85.6	0.1
11:02	11.4	5.4	484.5	69.0	81.4	0.1
11:03	11.4	5.4	472.5	72.2	76.6	0.1
11:04	11.4	5.4	494.8	70.8	74.1	0.1
11:05	11.4	5.4	485.8	70.7	71.2	0.1
11:06	11.4	5.4	498.3	69.4	73.5	0.1
11:07	11.4	5.4	474.8	70.4	76.4	0.1
11:08	11.4	5.4	475.7	68.8	78.2	0.1
11:09	11.4	5.4	492.5	70.0	76.8	0.1
11:10	11.4	5.4	480.7	69.4	75.5	0.1
11:11	11.4	5.4	486.5	67.6	74.0	0.1
11:12	11.4	5.4	491.8	68.1	74.8	0.1
11:13	11.4	5.4	491.4	66.3	78.8	0.1
11:14	11.4	5.4	487.4	66.9	77.0	0.1
11:15	11.4	5.4	499.7	64.8	79.9	0.1
11:16	11.4	5.4	493.3	65.7	81.8	0.1
11:17	11.4	5.4	484.1	67.5	80.1	0.1
11:18	11.4	5.4	491.3	68.4	81.1	0.1
11:19	11.4	5.4	499.3	68.1	87.3	0.1
11:20	11.4	5.4	489.8	67.1	98.1	0.1
11:21	11.4	5.4	487.7	66.8	79.8	0.1
11:22	11.4	5.4	490.0	66.6	82.8	0.1
11:23	11.4	5.4	505.5	66.0	81.3	0.1
11:24	11.4	5.4	506.7	65.6	80.4	0.1
11:25	11.4	5.4	496.4	63.8	96.5	0.1
11:26	11.4	5.4	502.9	65.0	86.6	0.1
11:27	11.4	5.4	516.8	64.6	90.9	0.1
11:28	11.4	5.4	478.3	65.5	89.2	0.1
11:29	11.4	5.4	475.7	65.3	94.6	0.1
11:30	11.4	5.4	500.7	64.7	88.6	0.1
11:31	11.4	5.4	498.2	65.4	84.8	0.1
11:32	11.4	5.4	491.0	67.4	83.8	0.1

Parameter	**O_2 - Outlet**	**CO_2 - Outlet**	**CO - Outlet**	**NOx - Outlet**	**THC - Outlet**	**SO2 - Outlet**
Uncorrected Run Average (C_{obs})	11.4	5.4	498.1	64.6	84.3	0.12
Cal Gas Concentration (C_{MA})	10.9	10.9	440.2	487.4	45.7	19.1
Pretest System Zero Response	0.10	0.00	0.00	1.2	0.00	0.00
Posttest System Zero Response	0.10	0.00	-1.0	1.2	0.00	0.00
Average Zero Response (Co)	0.10	0.00	-0.50	1.2	0.00	0.00
Pretest System Cal Response	10.9	10.7	432.3	475.3	45.5	18.9
Posttest System Cal Response	11.0	10.7	430.4	473.8	45.9	18.9
Average Cal Response (C_M)	11.0	10.7	431.4	474.6	45.7	18.9
Corrected Run Average (Corr)	11.4	5.4	508.2	65.3	NA	0.12

Run 3 - CEMS Data

Location: ABCWUA - Southside Water Reclamation Plant
Source: Unit 29
Project No.: 2020-0005
Date: 1/13/20

Time	O_2 - Outlet	CO_2 - Outlet	CO - Outlet	NOx - Outlet	THC - Outlet	SO2 - Outlet
Unit	**% dry**	**% dry**	**ppmvd**	**ppmvd**	**ppmvw**	**ppmvd**
Status	Valid	Valid	Valid	Valid	Valid	Valid
11:44	11.4	5.4	505.3	66.0	91.6	0.4
11:45	11.4	5.4	505.5	63.6	88.5	0.1
11:46	11.4	5.4	486.6	65.7	91.2	0.1
11:47	11.4	5.4	500.3	66.6	83.3	0.1
11:48	11.4	5.4	494.4	67.3	86.1	0.1
11:49	11.4	5.4	499.5	66.0	79.9	0.1
11:50	11.4	5.4	489.6	66.4	86.7	0.1
11:51	11.4	5.4	502.3	66.2	81.9	0.1
11:52	11.4	5.4	496.6	66.2	83.3	0.1
11:53	11.4	5.4	498.2	65.4	87.8	0.1
11:54	11.4	5.4	498.9	64.1	88.2	0.1
11:55	11.4	5.4	487.0	64.5	86.0	0.1
11:56	11.4	5.4	478.6	65.3	88.4	0.1
11:57	11.4	5.4	490.2	67.4	84.7	0.1
11:58	11.4	5.4	487.1	66.2	82.3	0.1
11:59	11.4	5.4	494.1	66.8	85.0	0.1
12:00	11.4	5.4	481.6	66.5	83.0	0.1
12:01	11.4	5.4	491.6	67.5	83.3	0.1
12:02	11.4	5.4	492.2	68.2	84.1	0.1
12:03	11.4	5.4	488.7	66.9	83.7	0.1
12:04	11.4	5.4	484.7	66.7	86.1	0.1
12:05	11.4	5.4	495.9	66.4	86.4	0.1
12:06	11.3	5.4	476.4	67.4	83.4	0.1
12:07	11.4	5.4	486.4	68.2	76.9	0.1
12:08	11.4	5.4	491.4	66.8	87.8	0.1
12:09	11.4	5.4	489.1	67.5	87.3	0.1
12:10	11.4	5.4	497.5	68.3	81.6	0.1
12:11	11.4	5.4	485.2	67.2	79.5	0.1
12:12	11.4	5.4	496.2	67.4	82.0	0.1
12:13	11.4	5.4	509.9	67.7	84.0	0.1
12:14	11.4	5.4	495.2	66.3	84.8	0.1
12:15	11.4	5.4	509.0	65.4	83.1	0.1
12:16	11.4	5.4	490.0	65.9	86.6	0.1
12:17	11.4	5.4	503.9	66.3	89.0	0.1
12:18	11.4	5.4	482.6	65.1	86.8	0.1
12:19	11.4	5.4	493.5	66.4	83.2	0.1
12:20	11.4	5.4	490.1	66.1	80.0	0.1
12:21	11.4	5.4	486.5	66.1	83.5	0.1
12:22	11.4	5.4	491.0	66.4	90.1	0.1
12:23	11.4	5.4	479.5	67.2	85.4	0.1
12:24	11.4	5.4	468.4	67.8	83.0	0.1
12:25	11.4	5.4	509.6	67.6	82.3	0.1
12:26	11.4	5.4	488.3	66.6	81.9	0.1
12:27	11.4	5.4	497.8	66.8	88.5	0.1
12:28	11.4	5.4	509.3	67.1	88.6	0.1
12:29	11.4	5.4	502.0	65.5	79.6	0.1
12:30	11.4	5.4	513.9	64.6	85.5	0.1
12:31	11.4	5.4	490.8	65.9	85.3	0.1
12:32	11.4	5.4	510.2	66.0	84.5	0.1
12:33	11.4	5.4	497.1	66.3	86.7	0.1
12:34	11.4	5.4	489.1	66.0	84.9	0.1
12:35	11.4	5.4	497.3	66.0	86.8	0.1
12:36	11.3	5.4	490.3	66.7	84.4	0.1
12:37	11.3	5.4	482.1	68.3	80.9	0.1
12:38	11.3	5.4	503.7	67.5	80.4	0.1
12:39	11.4	5.4	502.8	66.8	80.5	0.1
12:40	11.4	5.4	484.9	67.2	81.4	0.1
12:41	11.4	5.4	501.3	67.1	82.7	0.1
12:42	11.4	5.4	486.3	66.5	82.2	0.1
12:43	11.4	5.4	485.7	66.2	83.0	0.1

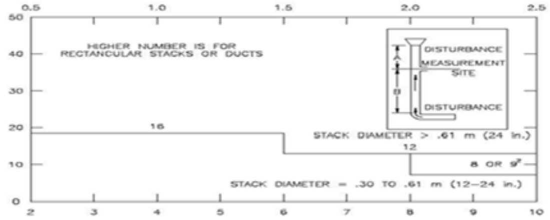
Parameter	O_2 - Outlet	CO_2 - Outlet	CO - Outlet	NOx - Outlet	THC - Outlet	SO2 - Outlet
Uncorrected Run Average (C_{obs})	11.4	5.4	493.5	66.5	84.5	0.081
Cal Gas Concentration (C_{MA})	10.9	10.9	440.2	487.4	45.7	19.1
Pretest System Zero Response	0.10	0.00	-1.0	1.2	0.00	0.00
Posttest System Zero Response	0.20	0.00	0.00	1.2	0.00	0.00
Average Zero Response (Co)	0.15	0.00	-0.50	1.2	0.00	0.00
Pretest System Cal Response	11.0	10.7	430.4	473.8	45.9	18.9
Posttest System Cal Response	10.9	10.7	426.7	470.7	45.4	19.0
Average Cal Response (C_M)	11.0	10.7	428.6	472.3	45.7	19.0
Corrected Run Average (Corr)	11.4	5.5	506.9	67.6	NA	0.082

Method 1 Data

Location Albuquerque Bernalillo County Water Utility - Southside Water Reclamation Plant
Source Unit 29
Project No. 2020-0005
Date: 01/13/20

Stack Parameters

Duct Orientation: Vertical
Duct Design: Circular
Depth of Duct: 13.00 in
Cross Sectional Area of Duct: 0.92 ft^2
No. of Test Ports: 2
Distance A: 9.4 ft
Distance A Duct Diameters: 8.7 (must be > 0.5)
Distance B: 12.2 ft
Distance B Duct Diameters: 11.3 (must be > 2)
Minimum Number of Traverse Points: 8
Actual Number of Traverse Points: 16



CIRCULAR DUCT

LOCATION OF TRAVERSE POINTS

Number of traverse points on a diameter

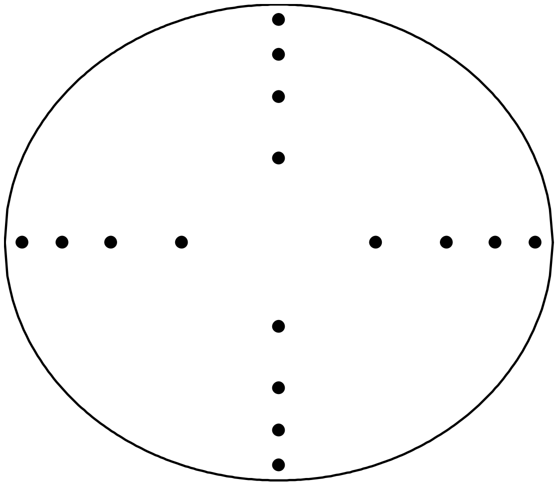
	2	3	4	5	6	7	8	9	10	11	12
1	14.6	--	6.7	--	4.4	--	3.2	--	2.6	--	2.1
2	85.4	--	25.0	--	14.6	--	10.5	--	8.2	--	6.7
3	--	--	75.0	--	29.6	--	19.4	--	14.6	--	11.8
4	--	--	93.3	--	70.4	--	32.3	--	22.6	--	17.7
5	--	--	--	--	85.4	--	67.7	--	34.2	--	25.0
6	--	--	--	--	95.6	--	80.6	--	65.8	--	35.6
7	--	--	--	--	--	--	89.5	--	77.4	--	64.4
8	--	--	--	--	--	--	96.8	--	85.4	--	75.0
9	--	--	--	--	--	--	--	--	91.8	--	82.3
10	--	--	--	--	--	--	--	--	97.4	--	88.2
11	--	--	--	--	--	--	--	--	--	--	93.3
12	--	--	--	--	--	--	--	--	--	--	97.9

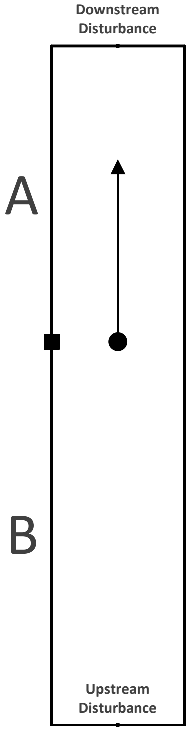
**Percent of stack diameter from inside wall to traverse point.*

Traverse Point	% of Diameter	Distance from inside wall	Distance from outside of port
1	3.2	0.50	4.00
2	10.5	1.37	4.87
3	19.4	2.52	6.02
4	32.3	4.20	7.70
5	67.7	8.80	12.30
6	80.6	10.48	13.98
7	89.5	11.64	15.14
8	96.8	12.50	16.00
9	--	--	--
10	--	--	--
11	--	--	--
12	--	--	--

Stack Diagram
A = 9.4 ft.
B = 12.2 ft.
Depth of Duct = 13 in.

Cross Sectional Area





Cyclonic Flow Check

Location Albuquerque Bernalillo County Water Utility - Southside Water Reclamation Plant
Source Unit 29
Project No. 2020-0005
Date 1/13/20

Sample Point	Angle (ΔP=0)
1	2
2	5
3	1
4	4
5	1
6	1
7	3
8	4
9	2
10	2
11	3
12	5
13	6
14	1
15	1
16	3
Average	2.8

Field Data
Method 2 Data

Location Albuquerque Bernalillo County Water Utility - Southside Water Reclamation Plant
Source Unit 29
Project No. 2020-0005

Run No.	**1**		**2**		**3**	
Date	1/13/20		1/13/20		1/13/20	
Status	VALID		VALID		VALID	
Start Time	9:30		10:48		11:55	
Stop Time	9:42		10:58		12:05	
Leak Check	Pass		Pass		Pass	
Traverse Point	**Δ P (in. WC)**	**Ts (°F)**	**Δ P (in. WC)**	**Ts (°F)**	**Δ P (in. WC)**	**Ts (°F)**
A-1	4.60	676	4.60	676	4.50	674
2	4.50	674	4.50	675	4.50	674
3	4.50	676	4.50	675	4.20	674
4	4.40	675	4.20	676	4.10	675
5	4.30	675	4.20	674	4.20	675
6	4.20	675	4.20	674	4.30	675
7	4.10	674	4.00	674	4.00	675
8	3.80	674	4.10	675	4.10	676
B-1	4.60	675	4.30	675	4.50	674
2	4.40	675	4.50	675	4.20	672
3	4.30	676	4.10	676	4.10	671
4	4.20	676	4.30	675	4.10	671
5	4.10	675	4.30	674	4.00	675
6	4.00	675	4.00	674	4.10	673
7	3.80	674	4.10	675	3.80	674
8	3.70	674	4.10	675	4.00	675

					Average
Square Root of ΔP, (in. WC)$^{1/2}$	**(ΔP)$^{1/2}$**	2.1	2.1	2.0	2.1
Average ΔP, in. WC	**(ΔP)**	4.2	4.3	4.2	4.2
Pitot Tube Coefficient	**(Cp)**	0.81	0.81	0.81	0.81
Barometric Pressure, in. Hg	**(Pb)**	25	25	25	25
Static Pressure, in. WC	**(Pg)**	4.2	4.2	4.2	4.2
Stack Pressure, in. Hg	**(Ps)**	25.4	25.4	25.4	25.4
Average Temperature, °F	**(Ts)**	674.9	674.9	673.9	674.6
Average Temperature, °R	**(Ts)**	1134.9	1134.9	1133.9	1134.6
Measured Moisture Fraction	**(BWSmsd)**	0.094	0.097	0.096	0.096
Moisture Fraction @ Saturation	**(BWSsat)**	176.2	176.1	175.1	175.8
Moisture Fraction	**(BWS)**	0.094	0.097	0.096	0.096
O2 Concentration, %	**(O2)**	11.5	11.4	11.4	11.4
CO2 Concentration, %	**(CO2)**	5.4	5.4	5.5	5.4
olecuar Weight, lb/lb-mole (dry)	**(Md)**	29.3	29.3	29.3	29.3
olecuar Weight, lb/lb-mole (wet)	**(Ms)**	28.3	28.2	28.2	28.2
Velocity, ft/sec	**(Vs)**	179.6	180.4	178.5	179.5
VFR at stack conditions, acfm	**(Qa)**	9,931	9,977	9,872	9,927
VFR at standard conditions, scfh	**(Qsw)**	235,508	236,612	234,316	235,479
VFR at standard conditions, scfm	**(Qsw)**	3,925	3,944	3,905	3,925
FR at standard conditions, dscfm	**(Qsd)**	3,556	3,561	3,531	3,549

Location Albuquerque Bernalillo County Water Utility - Southside Water Reclamation Pla
Source Unit 29
Project No. 2020-0005
Parameter(s): VFR
Console Type Meter Box

Run No.		1					2					3				
Date		1/12/20					1/12/20					1/12/20				
Status		VALID					VALID					VALID				
Start Time		9:17					10:33					11:44				
End Time		10:17					11:33					12:44				
Run Time, min	**(θ)**	60					60					60				
Meter ID		M5-17					M5-17					M5-17				
Meter Correction Factor	**(Y)**	1.000					1.000					1.000				
Orifice Calibration Value	**(ΔH @)**	1.570					1.570					1.570				
Max Vacuum, in. Hg		3					3					3				
Post Leak Check, ft3/min (at max vac.)		0.000					0.000					0.000				
Meter Volume, ft3																
0		803.304					840.511					878.637				
5		806.400					843.600					881.800				
10		809.600					846.800					884.700				
15		812.200					849.900					887.900				
20		815.400					852.600					890.800				
25		818.600					855.700					894.100				
30		821.700					858.900					897.600				
35		824.900					862.300					900.200				
40		827.800					865.700					903.600				
45		830.400					868.900					906.400				
50		833.700					872.100					909.400				
55		836.900					875.600					912.200				
60		840.233					878.467					915.158				
Total Meter Volume, ft3	**(Vm)**	36.929					37.956					36.521				
Temperature, °F		**Meter**	**Probe**	**Filter**	**Vacuum**	**Imp. Exit**	**Meter**	**Probe**	**Filter**	**Vacuum**	**Imp. Exit**	**Meter**	**Probe**	**Filter**	**Vacuum**	**Imp. Exit**
0		40	N/A	N/A	3	38	52	N/A	N/A	3	47	58	N/A	N/A	3	51
5		41	N/A	N/A	3	38	53	N/A	N/A	3	47	59	N/A	N/A	3	52
10		41	N/A	N/A	3	38	53	N/A	N/A	3	47	59	N/A	N/A	3	52
15		42	N/A	N/A	3	40	53	N/A	N/A	3	48	59	N/A	N/A	3	52
20		42	N/A	N/A	3	40	54	N/A	N/A	3	48	59	N/A	N/A	3	53
25		45	N/A	N/A	3	41	54	N/A	N/A	3	49	59	N/A	N/A	3	53
30		45	N/A	N/A	3	41	56	N/A	N/A	3	49	59	N/A	N/A	3	53
35		47	N/A	N/A	3	41	56	N/A	N/A	3	49	60	N/A	N/A	3	53
40		48	N/A	N/A	3	42	57	N/A	N/A	3	50	61	N/A	N/A	3	54
45		50	N/A	N/A	3	42	58	N/A	N/A	3	50	61	N/A	N/A	3	54
50		50	N/A	N/A	3	42	59	N/A	N/A	3	50	61	N/A	N/A	3	54
55		51	N/A	N/A	3	43	60	N/A	N/A	3	50	62	N/A	N/A	3	54
60		51	N/A	N/A	3	43	61	N/A	N/A	3	50	62	N/A	N/A	3	54
Average Temperature, °F	**(Tm)**	46	--	--	--	--	56	--	--	--	--	60	--	--	--	--
Average Temperature, °R	**(Tm)**	505	--	--	--	--	516	--	--	--	--	520	--	--	--	--
Minimum Temperature, °F		40	--	--	--	--	52	--	--	--	--	58	--	--	--	--
Maximum Temperature, °F		51	--	--	--	43	61	--	--	--	50	62	--	--	--	54
Barometeric Pressure, in. Hg	**(Pb)**	25.11					25.11					25.11				
Meter Orifice Pressure , in. WC	**(ΔH)**	1.000					1.000					0.950				
Meter Pressure, in. Hg	**(Pm)**	25.18					25.18					25.18				
Standard Meter Volume, ft3	**(Vmstd)**	32.478					32.719					31.230				
Analysis Type		Gravimetric					Gravimetric					Gravimetric				
Impinger 1, Pre/Post Test, mL		H2O		457.6	503.3	45.7	H2O		503.3	496.7	-6.6	H2O		496.7	526.6	29.9
Impinger 2, Pre/Post Test, mL		H2O		438.0	457.9	19.9	H2O		457.9	530.7	72.8	H2O		530.7	564.0	33.3
Impinger 3, Pre/Post Test, mL		Empty		300.2	301.2	1.0	Empty		300.1	303.7	3.6	Empty		300.2	302.3	2.1
Impinger 4, Pre/Post Test, g		Silica		612.3	617.3	5.0	Silica		617.3	622.1	4.8	Silica		622.1	627.1	5.0
Volume Water Collected, mL	**(Vlc)**	71.6					74.6					70.3				
Standard Water Volume, ft^3	**(Vwstd)**	3.376					3.517					3.315				
Moisture Fraction Measured	**(BWS)**	0.094					0.097					0.096				
Gas Molecular Weight, lb/lb-mole (dry)	**(Md)**	29.32					29.32					29.34				
DGM Calibration Check Value	**(Yqa)**	-3.2					-1.4					-3.1				

Unit 29 Digester

Location ABCQUA - Southside Water Reclamation Plant
Source Unit 29 (Digestor)
Project No. 2020-0005

Run Number		**Run 1**	**Run 2**	**Run 3**	**Average**
Date		1/13/20	1/13/20	1/13/20	--
Start Time		13:02	14:18	3:29	--
Stop Time		14:02	15:18	4:29	--
Engine Data					
Engine Manufacturer		Cooper			
Engine Model		12-GTLA			
Engine Serial Number		311069			
Engine Type		Spark Ignition - 4SLB			
Engine Year of Manufacture	DOM	2011			
Engine Speed, RPM	ES	900	900	900	900
Engine Brake Work, HP	EBW	1,301	1,297	1,297	1,298
Maximum Engine Brake Work, HP	MaxEBW	1,650	1,650	1,650	1,650
Engine Load, %	EL	90	90	90	90
Fuel Heating Value, Btu/scf	F_{HV}	1,040	1,040	1,040	1,040
Fuel Factor, dscf/MMBtu	F_{Factor}	8,710	8,710	8,710	8,710
Fuel Rate, scfh	F_R	321	322	322	322
Input Data - Outlet					
Moisture Fraction, dimensionless	BWS	0.098	0.099	0.098	0.098
Volumetric Flow Rate (M1-4), dscfm	Qs	3,463	3,475	3,454	3,464
Calculated Data - Outlet					
O2 Concentration, % dry	C_{O2}	9.9	9.9	9.9	9.9
CO2 Concentration, % dry	C_{CO2}	9.5	9.4	9.5	9.5
NOx Concentration, ppmvd	C_{NOx}	57.5	54.6	57.3	56.5
NOx Concentration, ppmvd @ 15% O2	C_{NOxc15}	30.9	29.4	30.7	30.3
NOx Emission Factor, g/HP-hr	EF_{NOx}	0.50	0.48	0.50	0.49
NOx Emission Rate, lb/hr	ER_{NOx}	1.4	1.4	1.4	1.4
NOx Emission Rate, ton/yr	ER_{NOxTPY}	6.2	6.0	6.2	6.1
CO Concentration, ppmvd	C_{CO}	430.7	428.5	432.2	430.4
CO Concentration, ppmvd @ 15% O2	C_{COc15}	231.8	230.6	231.7	231.4
CO Emission Factor, g/HP-hr	EF_{CO}	2.3	2.3	2.3	2.3
CO Emission Rate, lb/hr	ER_{CO}	6.5	6.5	6.5	6.5
CO Emission Rate, ton/yr	ER_{COTPY}	28.5	28.4	28.5	28.5
THC Concentration as propane, ppmvw	C_{THCw}	13.8	13.9	13.3	13.7
THC Concentration as propane, ppmvd	C_{THCd}	15.3	15.4	14.7	15.2
CH4 Concentration, ppmvd	C_{CH4}	0.00	0.00	0.00	0.00
CH4 Concentration (as C3H8), ppmvd	$C_{CH4\ as\ propane}$	0.00	0.00	0.00	0.00
C2H6 Concentration, ppmvd	C_{C2H6}	0.00	0.00	0.00	0.00
C2H6 Concentration (as C3H8), ppmvd	$C_{C2H6\ as\ propane}$	0.00	0.00	0.00	0.00
NMEHC Concentration (as C3H8), ppmvd	C_{NMEHC}	15.3	15.4	14.7	15.2
NMEHC Concentration (as C3H8), ppmvd @ 15% O2	$C_{NMEHCc15}$	8.2	8.3	7.9	8.1
NMEHC Emission Factor (as C3H8), g/HP-hr	EF_{NMEHC}	0.13	0.13	0.12	0.13
NMEHC Emission Rate (as C3H8), lb/hr	ER_{NMEHC}	0.36	0.37	0.35	0.36
NMEHC Emission Rate (as C3H8), ton/yr	$ER_{NMEHCTPY}$	1.6	1.6	1.5	1.6
SO_2 Concentration, ppmvd	C_{SO2}	2.3	2.3	2.4	2.4
SO_2 Concentration, ppmvd @ 15% O2	C_{SO2c15}	1.3	1.3	1.3	1.3
SO_2 Emission Factor, g/HP-hr	EF_{SO2}	0.028	0.028	0.029	0.029
SO_2 Emission Rate, lb/hr	ER_{SO2}	0.081	0.081	0.083	0.082
SO_2 Emission Rate, ton/yr	ER_{SO2TPY}	0.35	0.36	0.37	0.36

Run 1 - CEMS Data

Location: ABCQUA - Southside Water Reclamation Plant
Source: Unit 29 (Digester)
Project No.: 2020-0005
Date: 1/13/20

Time Unit Status	O_2 - Outlet % dry Valid	CO_2 - Outlet % dry Valid	CO - Outlet ppmvd Valid	NOx - Outlet ppmvd Valid	THC - Outlet ppmvw Valid	SO_2 - Outlet ppmvd Valid
13:02	9.2	10.0	424.0	143.3	12.4	2.8
13:03	9.7	9.6	430.8	141.1	14.3	2.7
13:04	9.8	9.5	405.5	71.9	13.4	2.5
13:05	10.0	9.4	413.5	66.1	12.0	2.4
13:06	10.0	9.3	445.3	51.2	12.9	2.3
13:07	9.9	9.3	411.7	53.3	14.5	2.3
13:08	10.0	9.3	413.7	52.6	15.4	2.3
13:09	10.0	9.3	411.8	53.9	14.0	2.3
13:10	10.0	9.3	434.0	53.3	13.5	2.3
13:11	10.0	9.3	433.0	52.4	14.3	2.3
13:12	10.0	9.3	423.3	54.4	13.6	2.3
13:13	10.0	9.3	412.9	56.5	13.4	2.3
13:14	10.0	9.3	411.2	55.1	13.1	2.3
13:15	9.9	9.3	432.9	52.2	14.5	2.3
13:16	10.0	9.3	423.8	54.8	14.3	2.3
13:17	9.9	9.4	408.1	56.1	14.2	2.3
13:18	9.9	9.3	416.8	56.9	13.9	2.3
13:19	9.9	9.3	414.0	55.7	13.5	2.3
13:20	9.9	9.4	405.3	55.5	13.5	2.3
13:21	9.9	9.3	418.0	54.2	13.4	2.4
13:22	9.9	9.4	405.5	55.8	13.3	2.3
13:23	9.9	9.4	412.2	56.6	13.2	2.4
13:24	10.0	9.3	428.4	56.5	13.0	2.3
13:25	9.9	9.4	427.6	53.5	13.8	2.3
13:26	9.9	9.3	404.5	53.4	14.3	2.3
13:27	9.9	9.3	423.4	54.1	14.1	2.3
13:28	10.0	9.3	416.9	55.5	13.5	2.3
13:29	10.0	9.3	422.7	53.1	14.1	2.3
13:30	10.0	9.3	424.5	52.1	13.5	2.3
13:31	10.0	9.3	419.2	54.1	13.6	2.3
13:32	9.9	9.4	415.1	52.9	13.2	2.3
13:33	10.0	9.3	417.3	52.8	13.8	2.2
13:34	10.0	9.3	426.8	54.7	13.6	2.3
13:35	10.0	9.3	417.8	53.2	14.0	2.3
13:36	9.9	9.4	430.1	51.6	14.1	2.3
13:37	9.9	9.4	422.2	52.1	13.6	2.4
13:38	10.0	9.3	420.0	53.9	14.0	2.3
13:39	9.9	9.4	413.2	53.0	14.0	2.3
13:40	9.9	9.4	415.4	54.9	14.9	2.3
13:41	9.9	9.3	415.2	57.2	14.4	2.3
13:42	9.9	9.4	407.0	54.7	14.0	2.3
13:43	9.9	9.3	420.3	58.2	14.5	2.3
13:44	9.9	9.3	404.9	55.5	14.2	2.4
13:45	10.0	9.3	413.6	54.3	13.3	2.3
13:46	10.0	9.3	421.9	52.6	13.3	2.3
13:47	10.0	9.3	418.2	51.3	14.4	2.3
13:48	10.0	9.3	411.1	51.2	14.3	2.3
13:49	10.0	9.3	411.3	50.8	13.7	2.3
13:50	10.0	9.3	422.0	49.7	13.5	2.3
13:51	10.0	9.3	420.3	51.1	14.4	2.3
13:52	10.0	9.3	417.1	50.7	15.6	2.3
13:53	10.0	9.3	418.7	51.5	14.0	2.3
13:54	10.0	9.3	420.1	51.9	13.8	2.3
13:55	10.0	9.3	415.8	50.8	12.1	2.3
13:56	10.0	9.3	415.9	49.3	12.7	2.3
13:57	10.0	9.3	428.8	49.7	14.7	2.3
13:58	10.0	9.3	424.2	48.9	15.0	2.3
13:59	10.0	9.3	410.1	49.8	13.9	2.3
14:00	10.0	9.3	420.0	51.8	13.8	2.3
14:01	10.0	9.3	421.9	51.4	13.4	2.3

Parameter	O_2 - Outlet	CO_2 - Outlet	CO - Outlet	NOx - Outlet	THC - Outlet	SO2 - Outlet
Uncorrected Run Average (C_{obs})	9.9	9.3	418.5	56.8	13.8	2.3
Cal Gas Concentration (C_{MA})	10.9	10.9	440.2	487.4	45.7	19.1
Pretest System Zero Response	0.20	0.00	0.00	1.2	0.00	0.00
Posttest System Zero Response	0.20	0.00	0.00	1.2	0.00	0.00
Average Zero Response (Co)	0.20	0.00	0.00	1.2	0.00	0.00
Pretest System Cal Response	10.9	10.7	426.7	470.7	45.4	19.0
Posttest System Cal Response	10.9	10.7	428.8	474.6	44.9	18.9
Average Cal Response (C_M)	10.9	10.7	427.8	472.7	45.2	19.0
Corrected Run Average (Corr)	9.9	9.5	430.7	57.5	NA	2.3

ALLIANCE SOURCE TESTING

Run 2 - CEMS Data

Location: ABCQUA - Southside Water Reclamation Plant
Source: Unit 29 (Digester)
Project No.: 2020-0005
Date: 1/13/20

Time	O_2 - Outlet	CO_2 - Outlet	CO - Outlet	NOx - Outlet	THC - Outlet	SO2 - Outlet
Unit	% dry	% dry	ppmvd	ppmvd	ppmvw	ppmvd
Status	Valid	Valid	Valid	Valid	Valid	Valid
14:18	10.0	9.3	366.5	59.6	21.4	5.4
14:19	10.0	9.3	417.3	55.4	15.9	2.6
14:20	10.0	9.3	409.8	52.3	14.0	2.3
14:21	10.0	9.3	419.7	52.6	13.8	2.2
14:22	10.0	9.3	420.3	52.3	14.1	2.2
14:23	10.0	9.3	418.4	53.2	13.2	2.2
14:24	10.0	9.3	413.6	51.3	13.2	2.2
14:25	10.0	9.3	415.6	52.3	14.1	2.2
14:26	10.0	9.3	410.2	52.4	14.2	2.2
14:27	10.0	9.3	424.7	51.2	14.0	2.2
14:28	10.0	9.3	414.1	51.9	13.9	2.2
14:29	10.0	9.3	419.0	52.0	14.6	2.2
14:30	10.0	9.3	413.1	52.4	14.2	2.2
14:31	9.9	9.3	418.5	53.6	13.8	2.2
14:32	9.9	9.3	412.8	54.2	13.7	2.2
14:33	9.9	9.3	411.4	55.4	13.7	2.2
14:34	9.9	9.3	423.1	54.0	14.4	2.2
14:35	9.9	9.3	421.6	53.9	14.1	2.3
14:36	9.9	9.3	417.6	54.2	14.8	2.3
14:37	9.9	9.3	412.7	57.8	13.1	2.3
14:38	9.9	9.3	413.1	54.6	13.8	2.3
14:39	9.9	9.3	421.3	55.7	12.9	2.3
14:40	9.9	9.3	414.1	55.4	12.9	2.2
14:41	9.9	9.3	408.7	53.2	13.4	2.2
14:42	9.9	9.3	413.5	55.4	13.3	2.3
14:43	9.9	9.3	427.6	59.3	13.4	2.2
14:44	9.9	9.3	414.5	56.2	13.3	2.3
14:45	9.9	9.3	412.3	54.8	13.1	2.3
14:46	9.9	9.4	417.7	57.7	13.6	2.3
14:47	9.9	9.4	428.2	59.8	13.7	2.3
14:48	9.8	9.4	414.4	62.4	12.7	2.3
14:49	9.9	9.4	405.9	60.8	12.6	2.3
14:50	9.9	9.4	411.4	56.9	13.6	2.3
14:51	9.9	9.4	407.2	60.9	13.6	2.4
14:52	9.9	9.4	406.7	59.8	13.4	2.4
14:53	9.9	9.3	421.5	57.6	13.8	2.3
14:54	9.9	9.4	419.2	57.1	13.1	2.3
14:55	9.9	9.4	410.8	59.0	12.6	2.3
14:56	9.9	9.4	412.6	57.1	13.2	2.3
14:57	9.9	9.3	411.1	58.7	12.2	2.3
14:58	9.9	9.3	417.5	54.3	13.6	2.3
14:59	9.9	9.3	436.7	52.2	12.5	2.3
15:00	10.0	9.3	409.6	53.4	13.6	2.3
15:01	10.0	9.3	427.5	51.9	14.0	2.3
15:02	10.0	9.3	416.8	51.7	14.3	2.3
15:03	10.0	9.3	428.3	51.1	13.8	2.3
15:04	10.0	9.3	430.8	52.3	14.0	2.3
15:05	10.0	9.3	427.8	50.6	14.6	2.3
15:06	10.0	9.3	426.1	49.0	14.4	2.3
15:07	10.0	9.3	443.5	47.2	14.3	2.3
15:08	10.0	9.3	426.7	49.9	14.8	2.3
15:09	10.0	9.3	420.2	50.5	14.5	2.3
15:10	10.0	9.3	441.3	48.6	14.0	2.3
15:11	10.0	9.3	419.6	52.1	15.0	2.3
15:12	10.0	9.3	424.0	53.4	15.0	2.3
15:13	9.9	9.3	432.1	53.2	15.0	2.3
15:14	9.9	9.3	415.3	56.4	14.5	2.3
15:15	9.9	9.3	428.6	55.0	14.1	2.3
15:16	9.9	9.3	418.7	55.5	13.5	2.4
15:17	9.8	9.3	426.9	54.7	13.6	2.4

Parameter	O_2 - Outlet	CO_2 - Outlet	CO - Outlet	NOx - Outlet	THC - Outlet	SO2 - Outlet
Uncorrected Run Average (C_{obs})	9.9	9.3	418.2	54.5	13.9	2.3
Cal Gas Concentration (C_{MA})	10.9	10.9	440.2	487.4	45.7	19.1
Pretest System Zero Response	0.20	0.00	0.00	1.2	0.00	0.00
Posttest System Zero Response	0.20	0.00	0.00	1.2	0.00	0.00
Average Zero Response (Co)	0.20	0.00	0.00	1.2	0.00	0.00
Pretest System Cal Response	10.9	10.7	428.8	474.6	44.9	18.9
Posttest System Cal Response	10.9	10.7	430.4	478.8	45.5	19.0
Average Cal Response (C_M)	10.9	10.7	429.6	476.7	45.2	19.0
Corrected Run Average (Corr)	9.9	9.4	428.5	54.6	NA	2.3

Run 3 - CEMS Data

Location: ABCQUA - Southside Water Reclamation Plant
Source: Unit 29 (Digester)
Project No.: 2020-0005
Date: 1/13/20

Time	O_2 - Outlet	CO_2 - Outlet	CO - Outlet	NOx - Outlet	THC - Outlet	SO2 - Outlet
Unit	**% dry**	**% dry**	**ppmvd**	**ppmvd**	**ppmvw**	**ppmvd**
Status	Valid	Valid	Valid	Valid	Valid	Valid
3:29	10.0	9.3	409.7	59.3	15.6	4.1
3:30	9.9	9.3	416.7	55.0	12.9	2.4
3:31	9.9	9.3	409.4	55.3	12.7	2.3
3:32	9.9	9.3	423.6	54.9	12.6	2.3
3:33	9.9	9.3	427.1	55.8	13.7	2.3
3:34	9.9	9.3	427.9	53.3	13.7	2.3
3:35	9.9	9.3	424.8	53.2	14.1	2.3
3:36	9.9	9.3	428.7	51.5	14.1	2.3
3:37	9.9	9.3	415.4	52.6	13.8	2.3
3:38	10.0	9.3	424.9	52.5	13.8	2.3
3:39	9.9	9.3	425.5	54.3	14.4	2.3
3:40	9.9	9.3	420.0	54.4	12.2	2.3
3:41	9.9	9.3	435.4	55.5	12.6	2.3
3:42	9.9	9.3	420.3	54.5	14.1	2.4
3:43	10.0	9.3	416.1	56.3	14.1	2.3
3:44	10.0	9.3	414.0	54.5	14.1	2.3
3:45	9.9	9.3	425.0	55.2	14.3	2.3
3:46	9.9	9.3	412.5	55.2	13.3	2.4
3:47	9.9	9.3	410.9	53.2	13.4	2.3
3:48	9.9	9.3	430.9	56.9	13.8	2.4
3:49	9.9	9.3	426.1	56.2	13.3	2.4
3:50	9.9	9.3	423.7	54.8	12.9	2.4
3:51	9.9	9.3	409.6	56.5	12.8	2.4
3:52	10.0	9.3	419.1	55.7	13.0	2.4
3:53	9.9	9.3	429.3	55.6	13.6	2.4
3:54	9.9	9.3	411.6	57.0	13.7	2.4
3:55	9.9	9.3	428.6	53.8	12.2	2.3
3:56	9.9	9.4	422.2	56.6	14.0	2.4
3:57	9.9	9.4	429.5	58.1	14.2	2.4
3:58	9.9	9.3	423.0	56.2	13.2	2.4
3:59	9.9	9.4	422.9	57.0	13.4	2.4
4:00	9.9	9.4	421.6	57.7	11.5	2.4
4:01	9.9	9.4	423.6	56.0	12.7	2.3
4:02	9.9	9.4	414.2	58.0	13.5	2.4
4:03	9.9	9.4	428.5	56.4	12.8	2.4
4:04	9.9	9.4	413.3	58.3	13.4	2.4
4:05	9.9	9.4	408.2	56.7	14.0	2.3
4:06	9.9	9.4	414.4	58.3	13.4	2.4
4:07	9.8	9.4	416.8	58.4	12.7	2.4
4:08	9.9	9.4	426.7	61.1	13.2	2.4
4:09	9.9	9.4	414.1	61.2	12.9	2.5
4:10	9.9	9.4	399.7	59.2	12.3	2.5
4:11	9.8	9.4	413.9	61.8	12.4	2.5
4:12	9.9	9.4	412.0	60.4	12.0	2.4
4:13	9.8	9.4	412.4	63.2	12.3	2.4
4:14	9.8	9.4	406.7	59.9	12.4	2.4
4:15	9.8	9.4	416.7	59.8	13.4	2.4
4:16	9.9	9.4	411.2	59.5	13.2	2.5
4:17	9.9	9.4	425.5	59.7	13.1	2.5
4:18	9.9	9.4	422.3	59.9	13.1	2.5
4:19	9.9	9.4	420.4	58.4	12.8	2.5
4:20	9.9	9.4	426.2	58.7	14.0	2.4
4:21	9.9	9.4	430.7	56.3	13.6	2.4
4:22	9.8	9.4	414.7	59.9	13.5	2.5
4:23	9.9	9.4	409.7	59.8	12.5	2.4
4:24	9.9	9.4	405.9	61.0	12.4	2.5
4:25	9.9	9.4	418.9	59.6	12.6	2.4
4:26	9.9	9.4	421.0	57.8	14.2	2.4
4:27	9.9	9.4	420.1	57.0	14.3	2.4
4:28	9.9	9.4	407.9	55.1	13.5	2.4

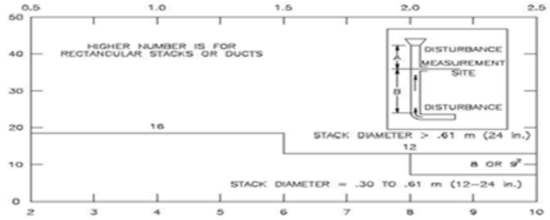
Parameter	O_2 - Outlet	CO_2 - Outlet	CO - Outlet	NOx - Outlet	THC - Outlet	SO2 - Outlet
Uncorrected Run Average (C_{obs})	9.9	9.3	419.0	57.0	13.3	2.4
Cal Gas Concentration (C_{MA})	10.9	10.9	440.2	487.4	45.7	19.1
Pretest System Zero Response	0.20	0.00	0.00	1.2	0.00	0.00
Posttest System Zero Response	0.20	0.00	0.00	1.2	0.00	0.00
Average Zero Response (Co)	0.20	0.00	0.00	1.2	0.00	0.00
Pretest System Cal Response	10.9	10.7	430.4	478.8	45.5	19.0
Posttest System Cal Response	10.9	10.7	423.3	472.6	45.6	19.0
Average Cal Response (C_M)	10.9	10.7	426.8	475.7	45.6	19.0
Corrected Run Average (Corr)	9.9	9.5	432.2	57.3	NA	2.4

Method 1 Data

Location Albuquerque Bernalillo County Water Utility - Southside Water Reclamation Plant
Source Unit 29 (digester)
Project No. 2020-0005
Date: 01/13/20

Stack Parameters

Duct Orientation: Vertical
Duct Design: Circular
Depth of Duct: 13.00 in
Cross Sectional Area of Duct: 0.92 ft^2
No. of Test Ports: 2
Distance A: 9.4 ft
Distance A Duct Diameters: 8.7 (must be > 0.5)
Distance B: 12.2 ft
Distance B Duct Diameters: 11.3 (must be > 2)
Minimum Number of Traverse Points: 8
Actual Number of Traverse Points: 16



CIRCULAR DUCT

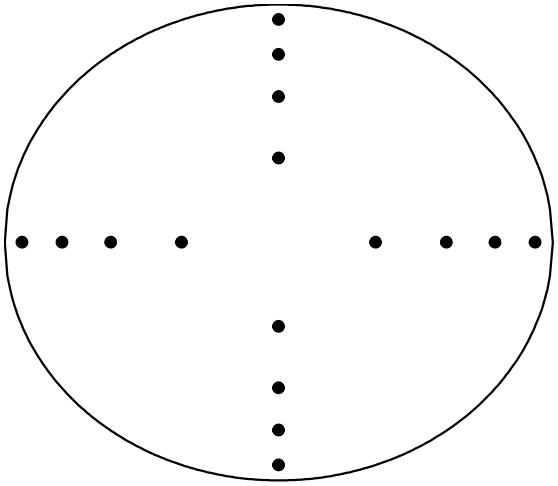
LOCATION OF TRAVERSE POINTS											
	Number of traverse points on a diameter										
	2	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
1	14.6	--	6.7	--	4.4	--	3.2	--	2.6	--	2.1
2	85.4	--	25.0	--	14.6	--	10.5	--	8.2	--	6.7
3	--	--	75.0	--	29.6	--	19.4	--	14.6	--	11.8
4	--	--	93.3	--	70.4	--	32.3	--	22.6	--	17.7
5	--	--	--	--	85.4	--	67.7	--	34.2	--	25.0
6	--	--	--	--	95.6	--	80.6	--	65.8	--	35.6
7	--	--	--	--	--	--	89.5	--	77.4	--	64.4
8	--	--	--	--	--	--	96.8	--	85.4	--	75.0
9	--	--	--	--	--	--	--	--	91.8	--	82.3
10	--	--	--	--	--	--	--	--	97.4	--	88.2
11	--	--	--	--	--	--	--	--	--	--	93.3
12	--	--	--	--	--	--	--	--	--	--	97.9

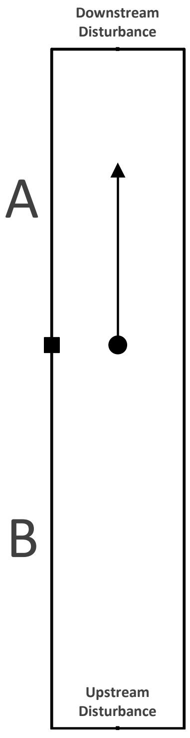
**Percent of stack diameter from inside wall to traverse point.*

Traverse Point	% of Diameter	Distance from inside wall	Distance from outside of port
1	3.2	0.50	4.00
2	10.5	1.37	4.87
3	19.4	2.52	6.02
4	32.3	4.20	7.70
5	67.7	8.80	12.30
6	80.6	10.48	13.98
7	89.5	11.64	15.14
8	96.8	12.50	16.00
9	--	--	--
10	--	--	--
11	--	--	--
12	--	--	--

Stack Diagram
A = 9.4 ft.
B = 12.2 ft.
Depth of Duct = 13 in.

Cross Sectional Area





Cyclonic Flow Check

Location Albuquerque Bernalillo County Water Utility - Southside Water Reclamation Plant
Source Unit 29 (digester)
Project No. 2020-0005
Date 1/13/20

Sample Point	Angle (ΔP=0)
1	2
2	2
3	5
4	5
5	4
6	3
7	2
8	3
9	6
10	4
11	5
12	2
13	2
14	2
15	3
16	4
Average	3.4

Field Data
Method 2 Data

Location Albuquerque Bernalillo County Water Utility - Southside Water Reclamation Plant
Source Unit 29 (digester)
Project No. 2020-0005

Run No.	**1**	**2**	**3**
Date	1/13/20	1/13/20	1/13/20
Status	VALID	VALID	VALID
Start Time	13:20	14:45	15:40
Stop Time	13:30	14:55	15:50
Leak Check	Pass	Pass	Pass

Traverse Point	**Δ P (in. WC)**	**Ts (°F)**	**Δ P (in. WC)**	**Ts (°F)**	**Δ P (in. WC)**	**Ts (°F)**
A-1	4.30	715	4.50	718	4.40	716
2	4.20	716	4.50	716	4.60	718
3	4.20	718	4.50	716	4.50	718
4	4.50	718	4.20	716	4.20	718
5	4.60	715	4.30	715	4.20	715
6	4.60	715	4.10	714	4.10	715
7	4.20	714	4.10	714	4.00	716
8	4.30	714	4.20	714	4.40	715
B-1	4.30	715	4.50	715	4.60	718
2	4.00	715	4.50	715	4.00	714
3	4.10	712	4.20	715	4.10	715
4	4.20	715	4.30	713	4.20	716
5	4.20	714	4.30	713	4.30	714
6	4.20	714	4.20	715	4.30	714
7	4.10	716	4.10	714	4.00	715
8	4.00	714	4.00	712	3.80	715

					Average
Square Root of ΔP, (in. WC)$^{1/2}$	**(ΔP)$^{1/2}$**	2.1	2.1	2.1	2.1
Average ΔP, in. WC	**(ΔP)**	4.3	4.3	4.2	4.3
Pitot Tube Coefficient	**(Cp)**	0.81	0.81	0.81	0.81
Barometric Pressure, in. Hg	**(Pb)**	25	25	25	25
Static Pressure, in. WC	**(Pg)**	4.2	4.2	4.2	4.2
Stack Pressure, in. Hg	**(Ps)**	25.4	25.4	25.4	25.4
Average Temperature, °F	**(Ts)**	715.0	714.7	715.8	715.1
Average Temperature, °R	**(Ts)**	1175.0	1174.7	1175.8	1175.1
Measured Moisture Fraction	**(BWSmsd)**	0.098	0.099	0.098	0.098
Moisture Fraction @ Saturation	**(BWSsat)**	222.2	221.8	223.1	222.4
Moisture Fraction	**(BWS)**	0.098	0.099	0.098	0.098
O2 Concentration, %	**(O2)**	9.9	9.9	9.9	9.9
CO2 Concentration, %	**(CO2)**	9.5	9.4	9.5	9.5
olecuar Weight, lb/lb-mole (dry)	**(Md)**	29.9	29.9	29.9	29.9
olecuar Weight, lb/lb-mole (wet)	**(Ms)**	28.7	28.7	28.7	28.7
Velocity, ft/sec	**(Vs)**	181.9	182.6	181.5	182.0
VFR at stack conditions, acfm	**(Qa)**	10,059	10,099	10,039	10,066
VFR at standard conditions, scfh	**(Qsw)**	230,416	231,378	229,794	230,529
VFR at standard conditions, scfm	**(Qsw)**	3,840	3,856	3,830	3,842
FR at standard conditions, dscfm	**(Qsd)**	3,463	3,475	3,454	3,464

Location Albuquerque Bernalillo County Water Utility - Southside Water Reclamation Pla
Source Unit 29 (digester)
Project No. 2020-0005
Parameter(s): VFR
Console Type Meter Box

Run No.		1					2					3				
Date		1/12/20					1/12/20					1/12/20				
Status		VALID					VALID					VALID				
Start Time		13:02					14:18					15:29				
End Time		14:02					15:18					16:29				
Run Time, min	**(θ)**	60					60					60				
Meter ID		M5-17					M5-17					M5-17				
Meter Correction Factor	**(Y)**	1.000					1.000					1.000				
Orifice Calibration Value	**(ΔH @)**	1.570					1.570					1.570				
Max Vacuum, in. Hg		3					3					3				
Post Leak Check, ft3/min (at max vac.)		0.000					0.000					0.000				
Meter Volume, ft3																
0		915.418					953.472					990.423				
5		918.500					956.600					993.800				
10		921.800					959.700					997.000				
15		924.600					962.600					1000.400				
20		927.800					965.900					1003.500				
25		930.900					969.400					1006.800				
30		934.100					972.300					1009.500				
35		937.600					975.600					1012.500				
40		940.500					978.400					1016.100				
45		943.800					981.600					1019.800				
50		947.700					984.300					1022.600				
55		950.600					987.400					1026.400				
60		953.222					990.188					1030.625				
Total Meter Volume, ft3	**(Vm)**	37.804					36.716					40.202				
Temperature, °F		**Meter**	**Probe**	**Filter**	**Vacuum**	**Imp. Exit**	**Meter**	**Probe**	**Filter**	**Vacuum**	**Imp. Exit**	**Meter**	**Probe**	**Filter**	**Vacuum**	**Imp. Exit**
0		68	N/A	N/A	3	54	74	N/A	N/A	3	58	82	N/A	N/A	3	62
5		68	N/A	N/A	3	54	74	N/A	N/A	3	58	82	N/A	N/A	3	62
10		68	N/A	N/A	3	54	75	N/A	N/A	3	58	82	N/A	N/A	3	63
15		69	N/A	N/A	3	54	75	N/A	N/A	3	58	82	N/A	N/A	3	63
20		69	N/A	N/A	3	55	75	N/A	N/A	3	59	83	N/A	N/A	3	61
25		69	N/A	N/A	3	56	76	N/A	N/A	3	59	83	N/A	N/A	3	61
30		70	N/A	N/A	3	56	77	N/A	N/A	3	59	84	N/A	N/A	3	61
35		70	N/A	N/A	3	56	77	N/A	N/A	3	60	84	N/A	N/A	3	59
40		70	N/A	N/A	3	57	78	N/A	N/A	3	60	85	N/A	N/A	3	59
45		70	N/A	N/A	3	57	78	N/A	N/A	3	60	85	N/A	N/A	3	59
50		72	N/A	N/A	3	58	79	N/A	N/A	3	61	85	N/A	N/A	3	57
55		72	N/A	N/A	3	58	80	N/A	N/A	3	61	85	N/A	N/A	3	57
60		72	N/A	N/A	3	58	81	N/A	N/A	3	61	85	N/A	N/A	3	56
Average Temperature, °F	**(Tm)**	70	--	--	--	--	77	--	--	--	--	84	--	--	--	--
Average Temperature, °R	**(Tm)**	529	--	--	--	--	537	--	--	--	--	543	--	--	--	--
Minimum Temperature, °F		68	--	--	--	--	74	--	--	--	--	82	--	--	--	--
Maximum Temperature, °F		72	--	--	--	58	81	--	--	--	61	85	--	--	--	63
Barometeric Pressure, in. Hg	**(Pb)**	25.11					25.11					25.11				
Meter Orifice Pressure , in. WC	**(ΔH)**	1.000					0.950					1.000				
Meter Pressure, in. Hg	**(Pm)**	25.18					25.18					25.18				
Standard Meter Volume, ft3	**(Vmstd)**	31.731					30.407					32.884				
Analysis Type		Gravimetric					Gravimetric					Gravimetric				
Impinger 1, Pre/Post Test, mL		H2O		526.6	574.2	47.6	H2O		574.2	570.1	-4.1	H2O		570.1	601.9	31.8
Impinger 2, Pre/Post Test, mL		H2O		464.7	478.3	13.6	H2O		478.3	542.3	64.0	H2O		542.3	572.6	30.3
Impinger 3, Pre/Post Test, mL		Empty		300.1	306.2	6.1	Empty		300.4	305.1	4.7	Empty		300.1	306.8	6.7
Impinger 4, Pre/Post Test, g		Silica		627.1	633.2	6.1	Silica		633.2	639.3	6.1	Silica		639.3	646.4	7.1
Volume Water Collected, mL	**(Vlc)**	73.4					70.7					75.9				
Standard Water Volume, ft^{3}	**(Vwstd)**	3.461					3.334					3.579				
Moisture Fraction Measured	**(BWS)**	0.098					0.099					0.098				
Gas Molecular Weight, lb/lb-mole (dry)	**(Md)**	29.92					29.90					29.92				
DGM Calibration Check Value	**(Yqa)**	-2.1					-3.2					2.7				

Unit 30

Emissions Calculations

Location ABCWUA - Southside Water Reclamation Plant
Source Unit 30
Project No. 2020-0005

Run Number		**Run 1**	**Run 2**	**Run 3**	**Average**
Date		1/12/20	1/12/20	1/12/20	--
Start Time		9:30	10:46	12:01	--
Stop Time		10:30	11:46	13:01	--
Engine Data					
Engine Manufacturer		Cooper			
Engine Model		12-GTLA			
Engine Serial Number		305029			
Engine Type		Spark Ignition - 4SLB			
Engine Year of Manufacture	DOM	1985			
Engine Speed, RPM	ES	900	900	900	900
Engine Brake Work, HP	EBW	1,365	1,584	1,448	1,466
Maximum Engine Brake Work, HP	MaxEBW	1,650	1,650	1,650	1,650
Engine Load, %	EL	90	90	90	90
Fuel Heating Value, Btu/scf	F_{HV}	1,040	1,040	1,040	1,040
Fuel Factor, dscf/MMBtu	F_{Factor}	8,710	8,710	8,710	8,710
Fuel Rate, scfh	F_R	208	208	207	208
Input Data - Outlet					
Moisture Fraction, dimensionless	BWS	0.092	0.097	0.098	0.096
Volumetric Flow Rate (M1-4), dscfm	Qs	3,798	3,794	3,761	3,784
Calculated Data - Outlet					
O2 Concentration, % dry	C_{O2}	11.5	11.4	11.2	11.3
CO2 Concentration, % dry	C_{CO2}	5.4	5.5	5.4	5.4
NOx Concentration, ppmvd	C_{NOx}	45.2	48.8	49.5	47.8
NOx Concentration, ppmvd @ 15% O2	C_{NOxc15}	28.3	30.2	30.1	29.5
NOx Emission Factor, g/HP-hr	EF_{NOx}	0.41	0.38	0.42	0.40
NOx Emission Rate, lb/hr	ER_{NOx}	1.2	1.3	1.3	1.3
NOx Emission Rate, ton/yr	ER_{NOxTPY}	5.4	5.8	5.8	5.7
CO Concentration, ppmvd	C_{CO}	416.2	483.6	580.8	493.5
CO Concentration, ppmvd @ 15% O2	C_{COc15}	259.9	299.4	353.6	304.3
CO Emission Factor, g/HP-hr	EF_{CO}	2.3	2.3	3.0	2.5
CO Emission Rate, lb/hr	ER_{CO}	6.9	8.0	9.5	8.1
CO Emission Rate, ton/yr	ER_{COTPY}	30.2	35.0	41.7	35.7
THC Concentration as propane, ppmvw	C_{THCw}	82.5	80.5	77.6	80.2
THC Concentration as propane, ppmvd	C_{THCd}	90.9	89.2	86.1	88.7
CH4 Concentration, ppmvd	C_{CH4}	0.00	0.00	0.00	0.00
CH4 Concentration (as C3H8), ppmvd	$C_{CH4\ as\ propane}$	0.00	0.00	0.00	0.00
C2H6 Concentration, ppmvd	C_{C2H6}	0.00	0.00	0.00	0.00
C2H6 Concentration (as C3H8), ppmvd	$C_{C2H6\ as\ propane}$	0.00	0.00	0.00	0.00
NMEHC Concentration (as C3H8), ppmvd	C_{NMEHC}	90.9	89.2	86.1	88.7
NMEHC Concentration (as C3H8), ppmvd @ 15% O2	$C_{NMEHCc15}$	56.8	55.2	52.4	54.8
NMEHC Emission Factor (as C3H8), g/HP-hr	EF_{NMEHC}	0.79	0.67	0.70	0.72
NMEHC Emission Rate (as C3H8), lb/hr	ER_{NMEHC}	2.4	2.3	2.2	2.3
NMEHC Emission Rate (as C3H8), ton/yr	$ER_{NMEHCTPY}$	10.4	10.2	9.7	10.1
SO_2 Concentration, ppmvd	C_{SO2}	0.042	0.050	0.051	0.047
SO_2 Concentration, ppmvd @ 15% O2	C_{SO2c15}	0.026	0.031	0.031	0.029
SO_2 Emission Factor, g/HP-hr	EF_{SO2}	0.001	0.001	0.001	0.001
SO_2 Emission Rate, lb/hr	ER_{SO2}	0.002	0.002	0.002	0.002
SO_2 Emission Rate, ton/yr	ER_{SO2TPY}	0.0069	0.0082	0.0083	0.0078

Run 1 - CEMS Data

Location: ABCWUA - Southside Water Reclamation Plant
Source: Unit 30
Project No.: 2020-0005
Date: 1/12/20

Time	O_2 - Outlet	CO_2 - Outlet	CO - Outlet	NOx - Outlet	THC - Outlet	SO_2 - Outlet
Unit	% dry	% dry	ppmvd	ppmvd	ppmvw	ppmvd
Status	Valid	Valid	Valid	Valid	Valid	Valid
9:30	11.2	5.3	421.2	42.2	76.3	0.0
9:31	11.2	5.3	417.7	42.9	75.8	0.0
9:32	11.2	5.3	414.1	43.4	78.9	0.0
9:33	11.2	5.3	419.0	42.9	81.3	0.0
9:34	11.2	5.3	421.7	43.1	82.2	0.0
9:35	11.2	5.3	413.9	42.8	80.4	0.0
9:36	11.2	5.3	425.8	42.7	79.8	0.0
9:37	11.2	5.3	421.8	43.4	81.7	0.0
9:38	11.2	5.3	416.3	43.4	94.1	0.0
9:39	11.2	5.3	415.6	43.2	98.5	0.0
9:40	11.2	5.3	421.7	43.9	81.5	0.0
9:41	11.2	5.3	424.9	44.4	83.4	0.1
9:42	11.2	5.3	416.7	43.0	82.1	0.0
9:43	11.2	5.3	425.7	43.4	92.6	0.0
9:44	11.2	5.3	430.4	44.1	83.4	0.0
9:45	11.2	5.3	422.4	44.2	76.4	0.0
9:46	11.2	5.3	408.1	44.8	80.7	0.0
9:47	11.2	5.3	420.0	45.0	79.8	0.0
9:48	11.2	5.3	414.5	45.4	85.5	0.0
9:49	11.2	5.3	419.2	45.2	83.4	0.0
9:50	11.2	5.3	414.6	44.0	80.1	0.0
9:51	11.2	5.4	417.4	44.1	81.5	0.0
9:52	11.2	5.4	405.2	45.5	78.3	0.0
9:53	11.3	5.3	420.2	44.2	76.3	0.0
9:54	11.2	5.4	430.1	44.5	81.6	0.0
9:55	11.2	5.4	410.3	46.2	80.7	0.1
9:56	11.3	5.3	428.5	45.1	76.9	0.0
9:57	11.3	5.3	422.2	43.3	77.6	0.0
9:58	11.4	5.3	424.6	43.6	80.9	0.0
9:59	11.6	5.4	420.7	44.9	96.0	0.0
10:00	12.0	5.4	426.1	45.4	76.8	0.0
10:01	11.9	5.4	399.6	45.4	96.8	0.0
10:02	11.9	5.4	410.7	45.6	84.7	0.0
10:03	11.9	5.4	410.0	46.0	79.1	0.0
10:04	11.9	5.4	407.4	45.7	80.1	0.0
10:05	11.9	5.4	417.0	45.7	77.0	0.1
10:06	11.9	5.4	413.2	45.3	87.1	0.0
10:07	11.8	5.4	408.5	45.1	80.7	0.0
10:08	11.7	5.4	416.2	45.6	91.8	0.0
10:09	11.6	5.4	412.7	45.7	89.8	0.0
10:10	11.5	5.4	409.9	45.8	81.8	0.0
10:11	11.5	5.4	403.6	44.9	79.6	0.1
10:12	11.6	5.4	415.3	45.4	82.8	0.0
10:13	11.7	5.4	403.0	45.7	87.6	0.0
10:14	11.7	5.4	412.7	45.8	86.3	0.0
10:15	11.8	5.4	407.7	46.1	79.5	0.0
10:16	11.6	5.4	422.2	46.8	76.6	0.0
10:17	11.5	5.4	409.2	46.8	80.0	0.0
10:18	11.4	5.4	406.9	46.4	79.7	0.1
10:19	11.4	5.4	406.4	46.4	79.3	0.0
10:20	11.4	5.4	405.3	46.3	84.1	0.0
10:21	11.4	5.4	410.0	46.4	74.5	0.0
10:22	11.4	5.4	413.8	46.7	83.1	0.0
10:23	11.4	5.4	407.4	46.6	77.4	0.0
10:24	11.4	5.4	409.8	46.2	82.0	0.0
10:25	11.5	5.4	406.7	45.0	84.5	0.0
10:26	11.4	5.4	412.5	44.8	85.4	0.0
10:27	11.4	5.4	402.8	46.3	85.2	0.0
10:28	11.4	5.4	402.5	46.0	84.1	0.0
10:29	11.4	5.4	412.3	47.5	87.1	0.0

Parameter	O_2 - Outlet	CO_2 - Outlet	CO - Outlet	NOx - Outlet	THC - Outlet	SO2 - Outlet
Uncorrected Run Average (C_{obs})	11.4	5.4	414.8	44.9	82.5	0.041
Cal Gas Concentration (C_{MA})	10.9	10.9	440.2	487.4	45.7	19.1
Pretest System Zero Response	0.00	0.00	0.00	0.20	0.00	0.00
Posttest System Zero Response	0.14	0.070	0.00	0.66	0.030	0.00
Average Zero Response (Co)	0.070	0.035	0.00	0.43	0.015	0.00
Pretest System Cal Response	10.9	10.7	440.7	477.3	45.2	18.9
Posttest System Cal Response	10.9	10.7	436.7	482.6	45.5	18.9
Average Cal Response (C_M)	10.9	10.7	438.7	480.0	45.3	18.9
Corrected Run Average (Corr)	11.5	5.4	416.2	45.2	NA	0.042

Run 2 - CEMS Data

Location: ABCWUA - Southside Water Reclamation Plant
Source: Unit 30
Project No.: 2020-0005
Date: 1/12/20

Time Unit Status	O_2 - Outlet % dry Valid	CO_2 - Outlet % dry Valid	CO - Outlet ppmvd Valid	NOx - Outlet ppmvd Valid	THC - Outlet ppmvw Valid	SO2 - Outlet ppmvd Valid
10:46	11.4	5.4	483.8	46.6	90.8	0.2
10:47	11.4	5.4	498.9	46.6	86.8	0.1
10:48	11.4	5.4	508.0	45.8	92.9	0.0
10:49	11.4	5.4	484.3	46.9	94.3	0.0
10:50	11.4	5.4	479.4	47.6	78.9	0.0
10:51	11.4	5.4	473.9	48.8	70.2	0.0
10:52	11.4	5.4	492.3	47.9	78.7	0.0
10:53	11.4	5.4	495.2	47.3	85.9	0.0
10:54	11.4	5.4	493.7	46.0	86.5	0.0
10:55	11.4	5.4	473.9	46.9	90.3	0.0
10:56	11.4	5.4	512.1	46.2	90.9	0.1
10:57	11.4	5.4	483.2	46.4	84.6	0.0
10:58	11.4	5.4	494.0	46.7	82.3	0.1
10:59	11.4	5.4	498.8	46.5	81.4	0.0
11:00	11.4	5.4	487.4	48.4	87.4	0.0
11:01	11.4	5.4	488.0	49.6	81.1	0.0
11:02	11.3	5.4	475.0	49.9	78.3	0.0
11:03	11.3	5.4	500.9	50.5	95.3	0.0
11:04	11.3	5.4	475.8	50.8	73.1	0.0
11:05	11.3	5.5	468.8	51.6	79.6	0.1
11:06	11.3	5.5	489.8	51.7	64.6	0.0
11:07	11.3	5.4	471.4	51.5	79.8	0.0
11:08	11.3	5.4	474.0	51.8	73.9	0.1
11:09	11.4	5.4	500.1	50.4	73.2	0.0
11:10	11.4	5.4	491.3	49.6	82.3	0.0
11:11	11.4	5.4	486.2	49.4	84.3	0.0
11:12	11.4	5.4	472.9	49.6	77.4	0.1
11:13	11.4	5.4	475.0	49.9	76.6	0.1
11:14	11.4	5.4	461.6	50.6	79.5	0.1
11:15	11.4	5.4	468.3	50.3	79.1	0.1
11:16	11.4	5.4	479.3	51.1	74.1	0.1
11:17	11.4	5.4	485.9	50.1	74.4	0.1
11:18	11.4	5.4	474.3	51.2	83.9	0.1
11:19	11.4	5.4	476.8	50.0	85.9	0.1
11:20	11.4	5.4	487.5	50.0	81.3	0.1
11:21	11.4	5.4	480.9	48.8	81.6	0.1
11:22	11.4	5.4	486.1	51.0	79.5	0.1
11:23	11.4	5.4	480.9	51.0	78.3	0.1
11:24	11.4	5.4	476.4	50.4	73.1	0.1
11:25	11.3	5.5	466.5	52.0	70.9	0.1
11:26	11.3	5.4	472.9	52.2	67.0	0.1
11:27	11.4	5.4	451.7	52.0	70.9	0.1
11:28	11.4	5.4	462.7	50.6	75.2	0.1
11:29	11.4	5.4	503.9	49.1	74.6	0.1
11:30	11.4	5.4	476.7	49.0	79.0	0.1
11:31	11.4	5.4	487.3	50.5	80.7	0.1
11:32	11.5	5.4	479.7	49.0	79.0	0.1
11:33	11.6	5.4	481.5	49.0	79.5	0.1
11:34	11.5	5.4	481.9	49.4	80.1	0.1
11:35	11.5	5.4	477.7	48.6	82.6	0.1
11:36	11.5	5.4	461.2	48.5	82.3	0.1
11:37	11.5	5.4	484.0	48.9	81.4	0.1
11:38	11.4	5.4	483.6	49.0	81.3	0.1
11:39	11.4	5.4	488.6	49.3	79.8	0.1
11:40	11.4	5.4	476.8	48.8	81.8	0.1
11:41	11.4	5.4	474.8	49.0	79.4	0.1
11:42	11.4	5.4	486.3	49.1	79.5	0.1
11:43	11.4	5.4	486.4	48.2	78.3	0.1
11:44	11.4	5.4	477.1	48.2	79.9	0.1
11:45	11.4	5.4	486.6	48.5	95.7	0.1

Parameter	O_2 - Outlet	CO_2 - Outlet	CO - Outlet	NOx - Outlet	THC - Outlet	SO2 - Outlet
Uncorrected Run Average (C_{obs})	11.4	5.4	482.2	49.2	80.5	0.049
Cal Gas Concentration (C_{MA})	10.9	10.9	440.2	487.4	45.7	19.1
Pretest System Zero Response	0.14	0.070	0.00	0.66	0.030	0.00
Posttest System Zero Response	0.10	0.00	0.00	1.1	0.00	0.00
Average Zero Response (Co)	0.12	0.035	0.00	0.88	0.015	0.00
Pretest System Cal Response	10.9	10.7	436.7	482.6	45.5	18.9
Posttest System Cal Response	11.0	10.8	441.2	484.4	45.1	19.0
Average Cal Response (C_M)	11.0	10.7	439.0	483.5	45.3	18.9
Corrected Run Average (Corr)	11.4	5.5	483.6	48.8	NA	0.050

Run 3 - CEMS Data

Location: ABCWUA - Southside Water Reclamation Plant
Source: Unit 30
Project No.: 2020-0005
Date: 1/12/20

Time	O_2 - Outlet	CO_2 - Outlet	CO - Outlet	NOx - Outlet	THC - Outlet	SO2 - Outlet
Unit	**% dry**	**% dry**	**ppmvd**	**ppmvd**	**ppmvw**	**ppmvd**
Status	Valid	Valid	Valid	Valid	Valid	Valid
12:01	11.4	5.4	656.1	46.3	82.9	0.1
12:02	11.4	5.4	642.3	46.5	82.6	0.1
12:03	11.4	5.4	614.2	47.5	82.6	0.1
12:04	11.4	5.4	616.1	48.3	77.3	0.1
12:05	11.4	5.4	573.7	48.6	85.2	0.1
12:06	11.3	5.5	583.7	49.8	77.7	0.1
12:07	11.3	5.5	583.3	51.0	78.3	0.1
12:08	11.4	5.4	585.5	50.3	83.0	0.1
12:09	11.3	5.4	598.4	50.3	72.9	0.1
12:10	11.3	5.4	583.2	50.7	74.1	0.1
12:11	11.4	5.4	562.4	50.5	75.7	0.1
12:12	11.3	5.4	598.0	49.9	88.8	0.1
12:13	11.4	5.4	566.6	51.7	77.2	0.1
12:14	11.3	5.4	597.8	50.4	71.3	0.1
12:15	11.4	5.4	590.6	50.5	73.4	0.1
12:16	11.4	5.4	581.1	50.3	74.7	0.1
12:17	11.4	5.4	570.4	49.5	75.8	0.1
12:18	11.4	5.4	591.1	50.0	78.0	0.1
12:19	11.3	5.4	586.5	50.5	79.8	0.1
12:20	11.4	5.4	566.8	50.2	77.1	0.1
12:21	11.4	5.4	600.5	49.2	72.9	0.1
12:22	11.4	5.4	583.8	48.3	75.6	0.1
12:23	11.4	5.4	566.8	48.7	81.4	0.1
12:24	11.4	5.4	595.5	48.2	87.4	0.1
12:25	11.4	5.4	566.3	47.5	74.5	0.1
12:26	11.4	5.4	565.8	48.0	79.3	0.1
12:27	11.3	5.5	568.4	49.3	85.2	0.1
12:28	11.4	5.5	560.6	49.6	74.0	0.1
12:29	11.3	5.5	573.5	50.2	77.3	0.1
12:30	11.3	5.5	567.6	52.5	77.6	0.1
12:31	11.4	5.4	582.4	49.3	64.5	0.1
12:32	11.4	5.4	569.1	47.1	75.2	0.1
12:33	11.4	5.4	568.1	49.0	80.5	0.1
12:34	11.3	5.4	573.0	49.9	81.1	0.1
12:35	11.3	5.5	577.6	50.2	78.2	0.1
12:36	11.3	5.5	587.3	51.1	72.7	0.1
12:37	11.3	5.5	566.1	51.4	69.3	0.1
12:38	11.3	5.5	564.1	51.0	66.1	0.1
12:39	11.3	5.5	557.7	52.7	73.7	0.1
12:40	11.3	5.5	557.2	54.1	77.4	0.1
12:41	11.3	5.5	559.6	53.4	72.0	0.1
12:42	11.3	5.5	561.5	53.3	81.5	0.1
12:43	11.3	5.5	563.7	52.7	85.8	0.1
12:44	11.3	5.5	557.5	51.6	72.0	0.1
12:45	11.3	5.5	572.4	51.3	76.6	0.1
12:46	11.4	5.4	590.7	51.2	79.8	0.1
12:47	11.4	5.4	590.1	50.4	75.5	0.1
12:48	11.4	5.4	560.2	50.0	77.3	0.1
12:49	11.4	5.4	591.2	50.4	76.5	0.1
12:50	11.4	5.4	569.7	50.7	71.6	0.1
12:51	11.4	5.4	593.3	49.2	75.2	0.1
12:52	11.4	5.4	599.9	50.4	82.7	0.1
12:53	11.4	5.4	595.9	50.0	82.7	0.1
12:54	11.4	5.4	582.0	49.9	80.1	0.1
12:55	11.4	5.4	588.3	50.1	81.0	0.1
12:56	11.4	5.4	579.2	49.2	74.2	0.1
12:57	11.4	5.4	586.7	48.8	78.2	0.1
12:58	11.4	5.4	581.9	49.8	79.5	0.1
12:59	11.4	5.4	597.1	49.3	81.9	0.1
13:00	7.1	3.5	568.0	50.1	81.1	0.1

Parameter	O_2 - Outlet	CO_2 - Outlet	CO - Outlet	NOx - Outlet	THC - Outlet	SO2 - Outlet
Uncorrected Run Average (C_{obs})	11.3	5.4	581.5	50.0	77.6	0.050
Cal Gas Concentration (C_{MA})	10.9	10.9	440.2	487.4	45.7	19.1
Pretest System Zero Response	0.10	0.00	0.00	1.1	0.00	0.00
Posttest System Zero Response	0.10	0.00	0.00	1.0	0.00	0.00
Average Zero Response (Co)	0.10	0.00	0.00	1.1	0.00	0.00
Pretest System Cal Response	11.0	10.8	441.2	484.4	45.1	19.0
Posttest System Cal Response	11.0	10.8	440.2	482.4	44.9	18.9
Average Cal Response (C_M)	11.0	10.8	440.7	483.4	45.0	19.0
Corrected Run Average (Corr)	11.2	5.4	580.8	49.5	NA	0.051

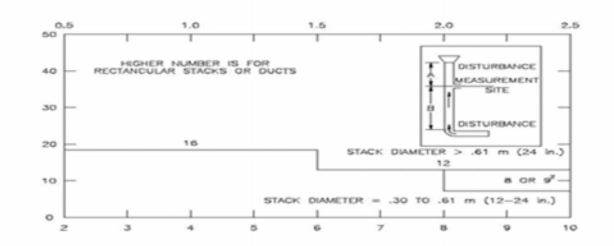
Alliance
SOURCE TESTING

Method 1 Data

Location **Albuquerque Bernalillo County Water Utility - Southside Water Reclamation Plant**
Source **Unit 30**
Project No. **2020-0005**
Date: **01/12/20**

Stack Parameters

Duct Orientation:	Vertical	
Duct Design:	Circular	
Depth of Duct:	13.25	**in**
Cross Sectional Area of Duct:	0.96	**ft^2**
No. of Test Ports:	2	
Distance A:	9.4	**ft**
Distance A Duct Diameters:	8.5	**(must be > 0.5)**
Distance B:	12.2	**ft**
Distance B Duct Diameters:	11.0	**(must be > 2)**
Minimum Number of Traverse Points:	8	
Actual Number of Traverse Points:	16	



CIRCULAR DUCT

LOCATION OF TRAVERSE POINTS

Number of traverse points on a diameter

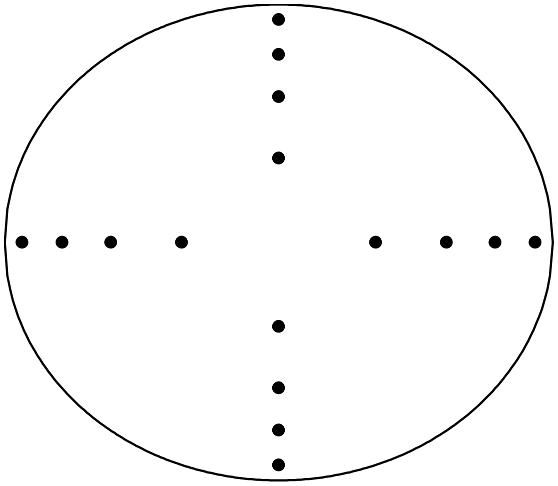
	2	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
1	14.6	--	6.7	--	4.4	--	3.2	--	2.6	--	2.1
2	85.4	--	25.0	--	14.6	--	10.5	--	8.2	--	6.7
3	--	--	75.0	--	29.6	--	19.4	--	14.6	--	11.8
4	--	--	93.3	--	70.4	--	32.3	--	22.6	--	17.7
5	--	--	--	--	85.4	--	67.7	--	34.2	--	25.0
6	--	--	--	--	95.6	--	80.6	--	65.8	--	35.6
7	--	--	--	--	--	--	89.5	--	77.4	--	64.4
8	--	--	--	--	--	--	96.8	--	85.4	--	75.0
9	--	--	--	--	--	--	--	--	91.8	--	82.3
10	--	--	--	--	--	--	--	--	97.4	--	88.2
11	--	--	--	--	--	--	--	--	--	--	93.3
12	--	--	--	--	--	--	--	--	--	--	97.9

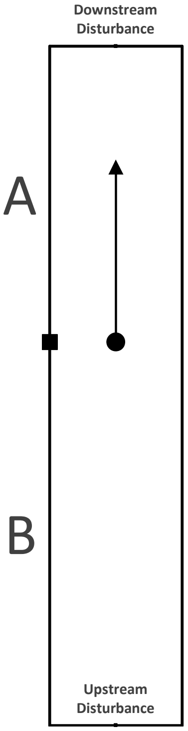
**Percent of stack diameter from inside wall to traverse point.*

Traverse Point	**% of Diameter**	**Distance from inside wall**	**Distance from outside of port**
1	3.2	0.50	4.00
2	10.5	1.39	4.89
3	19.4	2.57	6.07
4	32.3	4.28	7.78
5	67.7	8.97	12.47
6	80.6	10.68	14.18
7	89.5	11.86	15.36
8	96.8	12.75	16.25
9	--	--	--
10	--	--	--
11	--	--	--
12	--	--	--

Stack Diagram
A = 9.4 ft.
B = 12.2 ft.
Depth of Duct = 13.25 in.

Cross Sectional Area





Cyclonic Flow Check

Location Albuquerque Bernalillo County Water Utility - Southside Water Reclamation Plant
Source Unit 30
Project No. 2020-0005
Date 1/12/20

Sample Point	Angle (ΔP=0)
1	3
2	1
3	2
4	3
5	2
6	4
7	6
8	3
9	4
10	1
11	2
12	3
13	0
14	1
15	1
16	3
Average	2.4

Field Data
Method 2 Data

Location Albuquerque Bernalillo County Water Utility - Southside Water Reclamation Plant
Source Unit 30
Project No. 2020-0005

Run No.	**1**		**2**		**3**	
Date	1/12/20		1/12/20		1/12/20	
Status	VALID		VALID		VALID	
Start Time	9:55		11:00		12:20	
Stop Time	10:05		11:10		12:32	
Leak Check	Pass		Pass		Pass	
Traverse Point	**Δ P (in. WC)**	**Ts (°F)**	**Δ P (in. WC)**	**Ts (°F)**	**Δ P (in. WC)**	**Ts (°F)**
A-1	4.90	684	4.92	686	4.60	688
2	4.80	685	4.90	686	4.60	687
3	4.80	685	4.90	684	4.40	687
4	4.70	686	4.80	685	4.80	684
5	4.50	687	4.50	685	4.70	684
6	4.40	688	4.20	685	4.70	682
7	4.30	687	4.70	686	4.60	682
8	4.00	688	4.60	682	4.20	686
B-1	4.80	688	4.50	685	4.30	685
2	4.70	687	4.30	685	4.50	685
3	4.60	687	4.50	684	4.50	684
4	4.50	687	4.60	687	4.20	686
5	4.30	686	4.30	688	4.20	686
6	4.20	687	4.30	685	4.00	682
7	4.20	687	4.20	684	4.30	683
8	4.00	688	4.00	683	4.30	680

					Average
Square Root of ΔP, (in. WC)$^{1/2}$	**(ΔP)$^{1/2}$**	2.1	2.1	2.1	2.1
Average ΔP, in. WC	**(ΔP)**	4.5	4.5	4.4	4.5
Pitot Tube Coefficient	**(Cp)**	0.81	0.81	0.81	0.81
Barometric Pressure, in. Hg	**(Pb)**	25.1	25.1	25.1	25.1
Static Pressure, in. WC	**(Pg)**	4.1	4.1	4.1	4.1
Stack Pressure, in. Hg	**(Ps)**	25.4	25.4	25.4	25.4
Average Temperature, °F	**(Ts)**	686.7	685.0	684.4	685.4
Average Temperature, °R	**(Ts)**	1146.7	1145.0	1144.4	1145.4
Measured Moisture Fraction	**(BWSmsd)**	0.092	0.097	0.098	0.096
Moisture Fraction @ Saturation	**(BWSsat)**	188.7	186.9	186.3	187.3
Moisture Fraction	**(BWS)**	0.092	0.097	0.098	0.096
O2 Concentration, %	**(O2)**	11.5	11.4	11.2	11.4
CO2 Concentration, %	**(CO2)**	5.4	5.5	5.4	5.4
olecuar Weight, lb/lb-mole (dry)	**(Md)**	29.3	29.3	29.3	29.3
olecuar Weight, lb/lb-mole (wet)	**(Ms)**	28.3	28.2	28.2	28.2
Velocity, ft/sec	**(Vs)**	185.9	186.6	184.9	185.8
VFR at stack conditions, acfm	**(Qa)**	10,678	10,720	10,625	10,674
VFR at standard conditions, scfh	**(Qsw)**	250,845	252,196	250,092	251,044
VFR at standard conditions, scfm	**(Qsw)**	4,181	4,203	4,168	4,184
FR at standard conditions, dscfm	**(Qsd)**	3,798	3,794	3,761	3,784

Location Albuquerque Bernalillo County Water Utility - Southside Water Reclamation Pla
Source Unit 30
Project No. 2020-0005
Parameter(s): VFR
Console Type Meter Box

Run No.		**1**					**2**					**3**				
Date		1/12/20					1/12/20					1/12/20				
Status		VALID					VALID					VALID				
Start Time		9:30					10:46					12:01				
End Time		10:30					11:46					13:01				
Run Time, min	**(θ)**	60					60					60				
Meter ID		M5-17					M5-17					M5-17				
Meter Correction Factor	**(Y)**	1.000					1.000					1.000				
Orifice Calibration Value	**(ΔH @)**	1.570					1.570					1.570				
Max Vacuum, in. Hg		3					3					3				
Post Leak Check, ft3/min (at max vac.)		0.000					0.000					0.000				
Meter Volume, ft3																
0		569.219					607.413					645.871				
5		572.300					610.500					649.100				
10		575.400					613.800					652.600				
15		578.500					616.700					655.700				
20		581.600					619.900					658.900				
25		584.400					623.000					661.700				
30		587.900					626.400					665.300				
35		590.300					629.700					668.700				
40		594.100					632.300					671.600				
45		597.700					635.800					674.900				
50		601.100					638.900					678.600				
55		604.500					641.500					681.800				
60		607.058					645.608					685.688				
Total Meter Volume, ft3	**(Vm)**	37.839					38.195					39.817				
Temperature, °F		**Meter**	**Probe**	**Filter**	**Vacuum**	**Imp. Exit**	**Meter**	**Probe**	**Filter**	**Vacuum**	**Imp. Exit**	**Meter**	**Probe**	**Filter**	**Vacuum**	**Imp. Exit**
0		45	N/A	N/A	3	43	54	N/A	N/A	3	47	61	N/A	N/A	3	52
5		45	N/A	N/A	3	43	54	N/A	N/A	3	47	61	N/A	N/A	3	52
10		46	N/A	N/A	3	43	55	N/A	N/A	3	47	61	N/A	N/A	3	53
15		46	N/A	N/A	3	43	55	N/A	N/A	3	48	62	N/A	N/A	3	53
20		46	N/A	N/A	3	44	55	N/A	N/A	3	48	62	N/A	N/A	3	54
25		47	N/A	N/A	3	44	56	N/A	N/A	3	49	62	N/A	N/A	3	54
30		47	N/A	N/A	3	44	56	N/A	N/A	3	49	63	N/A	N/A	3	54
35		47	N/A	N/A	3	45	57	N/A	N/A	3	50	64	N/A	N/A	3	55
40		48	N/A	N/A	3	45	57	N/A	N/A	3	50	66	N/A	N/A	3	56
45		48	N/A	N/A	3	46	59	N/A	N/A	3	50	67	N/A	N/A	3	56
50		49	N/A	N/A	3	46	59	N/A	N/A	3	52	67	N/A	N/A	3	57
55		49	N/A	N/A	3	46	60	N/A	N/A	3	52	68	N/A	N/A	3	58
60		49	N/A	N/A	3	46	60	N/A	N/A	3	54	68	N/A	N/A	3	58
Average Temperature, °F	**(Tm)**	47	--	--	--	--	57	--	--	--	--	64	--	--	--	--
Average Temperature, °R	**(Tm)**	507	--	--	--	--	516	--	--	--	--	524	--	--	--	--
Minimum Temperature, °F		45	--	--	--	--	54	--	--	--	--	61	--	--	--	--
Maximum Temperature, °F		49	--	--	--	46	60	--	--	--	54	68	--	--	--	58
Barometeric Pressure, in. Hg	**(Pb)**	25.14					25.14					25.14				
Meter Orifice Pressure , in. WC	**(ΔH)**	1.000					1.000					1.000				
Meter Pressure, in. Hg	**(Pm)**	25.21					25.21					25.21				
Standard Meter Volume, ft3	**(Vmstd)**	33.222					32.910					33.829				
Analysis Type		Gravimetric					Gravimetric					Gravimetric				
Impinger 1, Pre/Post Test, mL		H2O		500.3	508.2	7.9	H2O		508.2	498.4	-9.8	H2O		498.4	506.1	7.7
Impinger 2, Pre/Post Test, mL		H2O		504.4	559.3	54.9	H2O		559.3	601.5	42.2	H2O		467.9	529.3	61.4
Impinger 3, Pre/Post Test, mL		Empty		300.5	303.3	2.8	Empty		301.2	338.1	36.9	Empty		299.8	302.2	2.4
Impinger 4, Pre/Post Test, g		Silica		603.2	608.6	5.4	Silica		608.6	614.6	6.0	Silica		589.3	595.5	6.2
Volume Water Collected, mL	**(Vlc)**	71.0					75.3					77.7				
Standard Water Volume, ft^3	**(Vwstd)**	3.348					3.550					3.664				
Moisture Fraction Measured	**(BWS)**	0.092					0.097					0.098				
Gas Molecular Weight, lb/lb-mole (dry)	**(Md)**	29.32					29.32					29.10				
DGM Calibration Check Value	**(Yqa)**	-0.8					-0.8					2.3				

Unit 30 Digester

Location ABCWUA - Southside Water Reclamation Plant
Source Unit 30 (Digestor)
Project No. 2020-0005

Run Number		**Run 1**	**Run 2**	**Run 3**	**Average**
Date		1/12/20	1/12/20	1/12/20	--
Start Time		13:51	15:03	16:15	--
Stop Time		14:51	16:03	17:15	--
Engine Data					
Engine Manufacturer		Cooper			
Engine Model		12-GTLA			
Engine Serial Number		305029			
Engine Type		Spark Ignition - 4SLB			
Engine Year of Manufacture	DOM	1985			
Engine Speed, RPM	ES	900	900	900	900
Engine Brake Work, HP	EBW	1,400	1,392	1,396	1,396
Maximum Engine Brake Work, HP	MaxEBW	1,650	1,650	1,650	1,650
Engine Load, %	EL	90	90	90	90
Fuel Heating Value, Btu/scf	F_{HV}	1,040	1,040	1,040	1,040
Fuel Factor, dscf/MMBtu	F_{Factor}	8,710	8,710	8,710	8,710
Fuel Rate, scfh	F_{R}	307	312	305	308
Input Data - Outlet					
Moisture Fraction, dimensionless	BWS	0.104	0.111	0.110	0.108
Volumetric Flow Rate (M1-4), dscfm	Qs	3,679	3,642	3,632	3,651
Calculated Data - Outlet					
O2 Concentration, % dry	C_{O2}	9.3	9.3	9.2	9.3
CO2 Concentration, % dry	C_{CO2}	9.9	10.0	10.0	10.0
NOx Concentration, ppmvd	C_{NOx}	70.4	75.1	83.6	76.4
NOx Concentration, ppmvd @ 15% O2	C_{NOxc15}	35.9	38.1	42.2	38.8
NOx Emission Factor, g/HP-hr	EF_{NOx}	0.60	0.64	0.71	0.65
NOx Emission Rate, lb/hr	ER_{NOx}	1.9	2.0	2.2	2.0
NOx Emission Rate, ton/yr	ER_{NOxTPY}	8.1	8.6	9.5	8.7
CO Concentration, ppmvd	C_{CO}	316.7	334.1	340.4	330.4
CO Concentration, ppmvd @ 15% O2	C_{COc15}	161.6	169.6	171.9	167.7
CO Emission Factor, g/HP-hr	EF_{CO}	1.6	1.7	1.8	1.7
CO Emission Rate, lb/hr	ER_{CO}	5.1	5.3	5.4	5.3
CO Emission Rate, ton/yr	ER_{COTPY}	22.3	23.2	23.6	23.0
THC Concentration as propane, ppmvw	C_{THCw}	9.3	10.4	11.7	10.5
THC Concentration as propane, ppmvd	C_{THCd}	10.4	11.7	13.1	11.7
CH4 Concentration, ppmvd	C_{CH4}	0.00	0.00	0.00	0.00
CH4 Concentration (as C3H8), ppmvd	$C_{CH4\ as\ propane}$	0.00	0.00	0.00	0.00
C2H6 Concentration, ppmvd	C_{C2H6}	0.00	0.00	0.00	0.00
C2H6 Concentration (as C3H8), ppmvd	$C_{C2H6\ as\ propane}$	0.00	0.00	0.00	0.00
NMEHC Concentration (as C3H8), ppmvd	C_{NMEHC}	10.4	11.7	13.1	11.7
NMEHC Concentration (as C3H8), ppmvd @ 15% O2	$C_{NMEHCc15}$	5.3	6.0	6.6	6.0
NMEHC Emission Factor (as C3H8), g/HP-hr	EF_{NMEHC}	0.085	0.096	0.11	0.096
NMEHC Emission Rate (as C3H8), lb/hr	ER_{NMEHC}	0.26	0.29	0.33	0.29
NMEHC Emission Rate (as C3H8), ton/yr	$ER_{NMEHCTPY}$	1.1	1.3	1.4	1.3
SO_2 Concentration, ppmvd	C_{SO2}	2.5	2.5	2.5	2.5
SO_2 Concentration, ppmvd @ 15% O2	C_{SO2c15}	1.3	1.3	1.3	1.3
SO_2 Emission Factor, g/HP-hr	EF_{SO2}	0.029	0.030	0.030	0.030
SO_2 Emission Rate, lb/hr	ER_{SO2}	0.090	0.092	0.092	0.091
SO_2 Emission Rate, ton/yr	ER_{SO2TPY}	0.39	0.40	0.40	0.40

Run 1 - CEMS Data

Location: ABCWUA - Southside Water Reclamation Plant
Source: Unit 30 (Digester)
Project No.: 2020-0005
Date: 1/12/20

Time **Unit** **Status**	**O_2 - Outlet** **% dry** Valid	**CO_2 - Outlet** **% dry** Valid	**CO - Outlet** **ppmvd** Valid	**NOx - Outlet** **ppmvd** Valid	**THC - Outlet** **ppmvw** Valid	**SO_2 - Outlet** **ppmvd** Valid
13:51	9.4	9.9	315.0	69.5	12.0	2.4
13:52	9.5	9.8	316.7	76.0	9.1	2.4
13:53	9.4	9.8	315.3	66.6	12.0	2.4
13:54	9.4	9.9	310.6	70.6	8.5	2.4
13:55	9.4	9.9	315.2	68.9	8.7	2.4
13:56	9.4	9.8	317.4	74.2	8.5	2.5
13:57	9.4	9.9	312.9	70.2	8.7	2.5
13:58	9.4	9.8	316.0	70.5	8.7	2.5
13:59	9.4	9.8	315.8	69.1	8.8	2.5
14:00	9.4	9.8	316.4	69.6	11.0	2.5
14:01	9.4	9.9	323.3	73.4	9.8	2.5
14:02	9.3	9.9	319.6	76.3	8.2	2.5
14:03	9.4	9.8	316.7	72.3	10.0	2.5
14:04	9.4	9.8	309.8	67.1	10.6	2.4
14:05	9.4	9.8	307.6	66.2	8.9	2.4
14:06	9.5	9.8	316.7	65.2	8.8	2.4
14:07	9.5	9.8	311.1	64.2	8.8	2.4
14:08	9.5	9.8	317.8	66.3	8.8	2.4
14:09	9.5	9.8	319.2	66.8	9.1	2.4
14:10	9.5	9.8	320.8	66.1	8.3	2.5
14:11	9.4	9.8	315.7	64.8	8.6	2.4
14:12	9.4	9.8	316.3	70.5	8.9	2.4
14:13	9.4	9.9	320.3	68.6	11.7	2.4
14:14	9.4	9.8	311.8	71.9	9.1	2.5
14:15	9.4	9.9	313.8	72.4	9.1	2.4
14:16	9.4	9.8	313.5	79.5	8.8	2.5
14:17	9.4	9.9	319.4	71.0	9.1	2.4
14:18	9.4	9.9	321.4	71.2	8.6	2.4
14:19	9.4	9.8	315.2	70.0	8.8	2.4
14:20	9.4	9.9	310.0	70.9	8.5	2.4
14:21	9.4	9.8	313.1	74.9	8.5	2.4
14:22	9.4	9.9	315.8	69.7	8.5	2.4
14:23	9.4	9.9	312.1	75.7	8.3	2.4
14:24	9.4	9.9	316.4	81.3	8.3	2.5
14:25	9.4	9.9	304.8	78.4	8.3	2.5
14:26	9.4	9.8	314.1	77.9	8.2	2.5
14:27	9.4	9.8	308.6	70.5	9.5	2.5
14:28	9.4	9.8	311.4	71.2	11.2	2.4
14:29	9.4	9.8	318.5	71.7	8.9	2.4
14:30	9.4	9.8	313.3	71.8	9.0	2.4
14:31	9.4	9.8	309.6	67.4	8.8	2.4
14:32	9.5	9.8	327.0	64.4	8.3	2.4
14:33	9.4	9.8	318.0	70.2	11.9	2.4
14:34	9.5	9.8	323.6	64.0	11.5	2.4
14:35	9.4	9.8	320.0	64.2	9.6	2.4
14:36	9.4	9.8	306.9	72.0	10.2	2.4
14:37	9.4	9.8	306.8	67.3	9.9	2.4
14:38	9.4	9.8	305.1	72.0	9.0	2.4
14:39	9.5	9.8	311.4	69.1	9.0	2.4
14:40	9.5	9.8	317.8	67.3	9.4	2.4
14:41	9.5	9.8	321.0	66.9	9.5	2.4
14:42	9.5	9.8	317.5	66.5	9.0	2.4
14:43	9.4	9.8	321.9	66.2	9.3	2.4
14:44	9.5	9.8	307.8	65.6	9.2	2.4
14:45	9.5	9.8	307.6	64.3	8.6	2.4
14:46	9.5	9.8	310.4	68.5	8.5	2.4
14:47	9.4	9.8	316.4	67.1	8.6	2.4
14:48	9.4	9.8	317.9	68.8	9.8	2.4
14:49	9.5	9.8	317.7	66.8	11.1	2.4
14:50	9.4	9.8	307.8	69.0	9.8	2.3

Parameter	**O_2 - Outlet**	**CO_2 - Outlet**	**CO - Outlet**	**NOx - Outlet**	**THC - Outlet**	**SO2 - Outlet**
Uncorrected Run Average (C_{obs})	9.4	9.8	314.9	69.8	9.3	2.4
Cal Gas Concentration (C_{MA})	10.9	10.9	440.2	487.4	45.7	19.1
Pretest System Zero Response	0.10	0.00	0.00	1.0	0.00	0.00
Posttest System Zero Response	0.20	0.00	0.00	1.2	0.00	0.00
Average Zero Response (Co)	0.15	0.00	0.00	1.1	0.00	0.00
Pretest System Cal Response	11.0	10.8	440.2	482.4	44.9	18.9
Posttest System Cal Response	11.0	10.7	435.1	471.1	45.3	18.9
Average Cal Response (C_M)	11.0	10.8	437.7	476.8	45.1	18.9
Corrected Run Average (Corr)	9.3	9.9	316.7	70.4	NA	2.5

Run 2 - CEMS Data

Location: ABCWUA - Southside Water Reclamation Plant
Source: Unit 30 (Digester)
Project No.: 2020-0005
Date: 1/12/20

Time	**O_2 - Outlet**	**CO_2 - Outlet**	**CO - Outlet**	**NOx - Outlet**	**THC - Outlet**	**SO2 - Outlet**
Unit	**% dry**	**% dry**	**ppmvd**	**ppmvd**	**ppmvw**	**ppmvd**
Status	Valid	Valid	Valid	Valid	Valid	Valid
15:03	9.5	9.8	300.8	70.0	10.4	4.6
15:04	9.5	9.8	334.4	69.7	9.1	2.8
15:05	9.5	9.8	331.2	70.5	8.8	2.4
15:06	9.4	9.8	332.9	69.3	8.7	2.3
15:07	9.4	9.8	328.3	69.8	9.0	2.4
15:08	9.4	9.8	326.0	68.7	10.2	2.5
15:09	9.4	9.8	326.2	71.1	10.8	2.5
15:10	9.4	9.9	330.5	72.8	9.7	2.5
15:11	9.3	9.9	331.5	74.5	11.0	2.4
15:12	9.3	9.9	331.8	76.6	8.6	2.5
15:13	9.4	9.9	328.5	73.4	9.3	2.5
15:14	9.4	9.9	322.6	75.5	12.2	2.5
15:15	9.3	9.9	318.0	81.2	11.9	2.4
15:16	9.3	9.9	330.0	77.3	12.0	2.5
15:17	9.3	9.9	316.3	79.4	8.5	2.5
15:18	9.3	9.9	318.6	77.1	8.8	2.5
15:19	9.4	9.8	332.3	75.5	12.3	2.5
15:20	9.4	9.9	330.5	74.1	11.9	2.5
15:21	9.4	9.8	320.0	73.4	9.6	2.5
15:22	9.4	9.8	337.1	69.2	11.1	2.5
15:23	9.4	9.8	336.0	75.0	12.1	2.5
15:24	9.4	9.8	338.9	74.0	10.3	2.5
15:25	9.4	9.8	329.9	70.9	9.0	2.5
15:26	9.4	9.8	329.1	72.7	8.9	2.5
15:27	9.4	9.8	329.1	71.6	9.0	2.5
15:28	9.4	9.8	331.9	77.5	8.8	2.5
15:29	9.4	9.8	324.7	78.1	9.9	2.5
15:30	9.4	9.9	322.3	76.4	10.9	2.5
15:31	9.3	9.9	331.3	73.0	8.7	2.5
15:32	9.4	9.8	327.2	71.3	9.5	2.5
15:33	9.4	9.8	327.6	72.7	11.4	2.5
15:34	9.4	9.8	323.0	71.3	8.9	2.5
15:35	9.4	9.8	331.7	73.5	9.1	2.5
15:36	9.4	9.8	330.9	68.4	12.1	2.5
15:37	9.4	9.8	324.1	69.3	12.3	2.5
15:38	9.4	9.8	337.8	68.6	11.8	2.5
15:39	9.4	9.8	322.0	72.2	12.2	2.5
15:40	9.4	9.8	325.8	72.1	9.8	2.4
15:41	9.4	9.8	328.4	73.6	9.4	2.5
15:42	9.4	9.8	318.2	74.6	11.6	2.5
15:43	9.4	9.8	337.2	70.6	12.2	2.5
15:44	9.3	9.9	333.9	76.3	12.0	2.4
15:45	9.3	9.9	327.5	77.7	11.9	2.5
15:46	9.4	9.8	329.5	81.0	9.9	2.5
15:47	9.3	9.8	327.5	77.0	10.5	2.5
15:48	9.4	9.8	327.5	75.3	11.9	2.5
15:49	9.4	9.8	324.6	73.6	11.9	2.5
15:50	9.4	9.8	321.8	75.4	11.9	2.5
15:51	9.4	9.8	324.0	72.2	10.9	2.5
15:52	9.4	9.8	326.1	76.3	9.7	2.5
15:53	9.3	9.9	326.1	81.4	11.7	2.5
15:54	9.3	9.9	325.5	81.6	11.4	2.5
15:55	9.3	9.9	340.9	83.0	9.7	2.5
15:56	9.4	9.8	332.4	79.1	12.0	2.5
15:57	9.4	9.8	339.0	74.0	8.8	2.5
15:58	9.3	9.8	327.6	71.4	8.3	2.5
15:59	9.4	9.8	335.2	73.6	11.9	2.5
16:00	9.4	9.8	331.4	68.5	9.2	2.5
16:01	9.4	9.8	332.4	66.8	9.3	2.5
16:02	9.4	9.8	330.5	75.9	11.9	2.5

Parameter	**O_2 - Outlet**	**CO_2 - Outlet**	**CO - Outlet**	**NOx - Outlet**	**THC - Outlet**	**SO2 - Outlet**
Uncorrected Run Average (C_{obs})	9.4	9.8	328.3	73.9	10.4	2.5
Cal Gas Concentration (C_{MA})	10.9	10.9	440.2	487.4	45.7	19.1
Pretest System Zero Response	0.20	0.00	0.00	1.2	0.00	0.00
Posttest System Zero Response	0.20	0.00	0.00	1.2	0.00	0.00
Average Zero Response (Co)	0.20	0.00	0.00	1.2	0.00	0.00
Pretest System Cal Response	11.0	10.7	435.1	471.1	45.3	18.9
Posttest System Cal Response	11.0	10.7	430.0	475.2	45.3	19.0
Average Cal Response (C_M)	11.0	10.7	432.6	473.2	45.3	19.0
Corrected Run Average (Corr)	9.3	10.0	334.1	75.1	NA	2.5

Run 3 - CEMS Data

Location: ABCWUA - Southside Water Reclamation Plant
Source: Unit 30 (Digester)
Project No.: 2020-0005
Date: 1/12/20

Time	**O_2 - Outlet**	**CO_2 - Outlet**	**CO - Outlet**	**NOx - Outlet**	**THC - Outlet**	**SO2 - Outlet**
Unit	**% dry**	**% dry**	**ppmvd**	**ppmvd**	**ppmvw**	**ppmvd**
Status	Valid	Valid	Valid	Valid	Valid	Valid
16:15	9.3	9.8	332.2	83.3	9.0	2.8
16:16	9.3	9.9	352.1	78.7	11.9	2.5
16:17	9.3	9.9	336.4	78.2	11.8	2.4
16:18	9.3	9.9	341.5	78.8	11.8	2.5
16:19	9.3	9.9	329.8	77.1	11.7	2.5
16:20	9.3	9.8	331.9	79.2	12.0	2.5
16:21	9.3	9.9	340.5	78.1	9.0	2.5
16:22	9.3	9.8	334.1	83.3	9.5	2.5
16:23	9.3	9.9	334.4	78.9	11.7	2.5
16:24	9.4	9.8	336.4	79.0	11.8	2.5
16:25	9.3	9.8	339.5	76.1	11.8	2.5
16:26	9.3	9.9	340.9	76.6	12.0	2.5
16:27	9.3	9.9	336.0	79.1	12.1	2.5
16:28	9.3	9.9	325.8	81.5	12.0	2.5
16:29	9.2	9.9	336.8	82.3	11.9	2.5
16:30	9.3	9.9	339.6	91.7	11.7	2.6
16:31	9.2	9.9	335.2	94.9	11.6	2.6
16:32	9.2	9.9	340.9	89.8	11.8	2.6
16:33	9.2	9.9	338.6	86.4	11.8	2.6
16:34	9.2	9.9	334.8	91.0	12.0	2.6
16:35	9.2	9.9	330.8	90.3	12.1	2.6
16:36	9.2	9.9	343.5	87.6	12.1	2.6
16:37	9.3	9.9	334.7	83.5	12.0	2.5
16:38	9.2	9.9	336.0	84.0	11.8	2.6
16:39	9.2	9.9	350.9	87.4	11.8	2.5
16:40	9.3	9.9	334.2	86.8	12.0	2.5
16:41	9.3	9.9	332.3	86.5	11.7	2.5
16:42	9.3	9.9	330.2	83.3	8.9	2.6
16:43	9.3	9.9	341.8	82.9	11.6	2.6
16:44	9.2	9.9	334.7	85.0	11.8	2.6
16:45	9.3	9.9	338.8	84.4	12.1	2.5
16:46	9.3	9.9	346.8	85.6	12.0	2.5
16:47	9.2	9.9	334.2	88.1	11.9	2.5
16:48	9.2	9.9	348.7	80.7	12.3	2.6
16:49	9.2	9.9	337.4	85.0	12.1	2.6
16:50	9.3	9.9	337.0	91.1	11.8	2.5
16:51	9.2	9.9	332.7	86.7	11.9	2.6
16:52	9.2	9.9	342.0	88.8	10.7	2.5
16:53	9.2	9.9	337.5	86.6	10.4	2.6
16:54	9.3	9.9	350.5	88.8	12.1	2.6
16:55	9.2	9.9	347.5	86.2	11.9	2.6
16:56	9.2	9.9	328.4	85.8	11.2	2.5
16:57	9.3	9.9	331.5	87.9	9.3	2.6
16:58	9.2	9.9	332.4	85.7	12.1	2.6
16:59	9.3	9.8	349.4	80.9	11.8	2.5
17:00	9.3	9.8	339.0	76.5	12.5	2.5
17:01	9.3	9.8	352.6	73.5	12.2	2.5
17:02	9.3	9.8	334.1	73.9	9.5	2.5
17:03	9.3	9.8	335.6	71.5	12.5	2.5
17:04	9.3	9.8	336.8	76.4	12.4	2.5
17:05	9.3	9.8	332.6	79.6	12.1	2.5
17:06	9.3	9.8	341.6	72.6	12.2	2.5
17:07	9.3	9.8	333.7	77.6	12.2	2.5
17:08	9.3	9.8	332.2	80.1	12.1	2.5
17:09	9.3	9.9	333.0	84.3	12.5	2.5
17:10	9.3	9.9	334.2	82.6	12.9	2.5
17:11	9.3	9.9	336.4	79.9	12.5	2.5
17:12	9.3	9.9	335.0	82.6	12.1	2.5
17:13	9.3	9.8	339.0	82.4	12.2	2.5
17:14	9.3	9.8	333.0	78.8	12.3	2.5

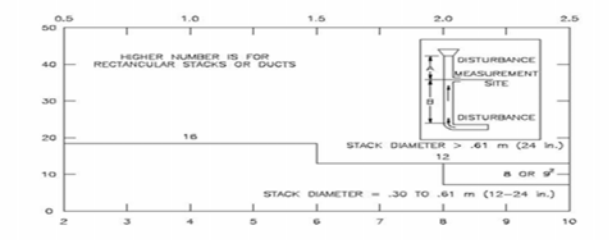
Parameter	**O_2 - Outlet**	**CO_2 - Outlet**	**CO - Outlet**	**NOx - Outlet**	**THC - Outlet**	**SO2 - Outlet**
Uncorrected Run Average (C_{obs})	9.3	9.9	337.5	82.8	11.7	2.5
Cal Gas Concentration (C_{MA})	10.9	10.9	440.2	487.4	45.7	19.1
Pretest System Zero Response	0.20	0.00	0.00	1.2	0.00	0.00
Posttest System Zero Response	0.20	0.00	0.00	1.2	0.00	0.00
Average Zero Response (Co)	0.20	0.00	0.00	1.2	0.00	0.00
Pretest System Cal Response	11.0	10.7	430.0	475.2	45.3	19.0
Posttest System Cal Response	10.9	10.7	442.8	478.2	45.6	19.0
Average Cal Response (C_M)	11.0	10.7	436.4	476.7	45.5	19.0
Corrected Run Average (Corr)	9.2	10.0	340.4	83.6	NA	2.5

Method 1 Data

Location **Albuquerque Bernalillo County Water Utility - Southside Water Reclamation Plant**
Source **Unit 30 (Digester)**
Project No. **2020-0005**
Date: **01/12/20**

Stack Parameters

Duct Orientation: Vertical
Duct Design: Circular
Depth of Duct: 13.25 **in**
Cross Sectional Area of Duct: 0.96 **ft^2**
No. of Test Ports: 2
Distance A: 9.4 **ft**
Distance A Duct Diameters: 8.5 **(must be > 0.5)**
Distance B: 12.2 **ft**
Distance B Duct Diameters: 11.0 **(must be > 2)**
Minimum Number of Traverse Points: 8
Actual Number of Traverse Points: 16



CIRCULAR DUCT

LOCATION OF TRAVERSE POINTS

Number of traverse points on a diameter

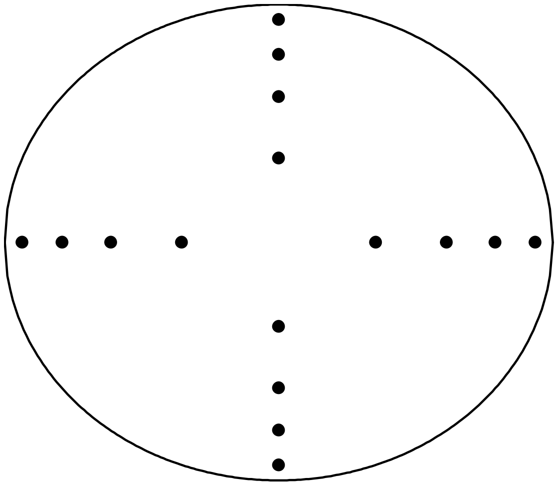
	2	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
1	14.6	--	6.7	--	4.4	--	3.2	--	2.6	--	2.1
2	85.4	--	25.0	--	14.6	--	10.5	--	8.2	--	6.7
3	--	--	75.0	--	29.6	--	19.4	--	14.6	--	11.8
4	--	--	93.3	--	70.4	--	32.3	--	22.6	--	17.7
5	--	--	--	--	85.4	--	67.7	--	34.2	--	25.0
6	--	--	--	--	95.6	--	80.6	--	65.8	--	35.6
7	--	--	--	--	--	--	89.5	--	77.4	--	64.4
8	--	--	--	--	--	--	96.8	--	85.4	--	75.0
9	--	--	--	--	--	--	--	--	91.8	--	82.3
10	--	--	--	--	--	--	--	--	97.4	--	88.2
11	--	--	--	--	--	--	--	--	--	--	93.3
12	--	--	--	--	--	--	--	--	--	--	97.9

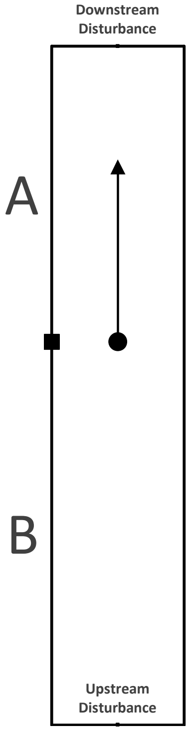
**Percent of stack diameter from inside wall to traverse point.*

Traverse Point	**% of Diameter**	**Distance from inside wall**	**Distance from outside of port**
1	3.2	0.50	4.00
2	10.5	1.39	4.89
3	19.4	2.57	6.07
4	32.3	4.28	7.78
5	67.7	8.97	12.47
6	80.6	10.68	14.18
7	89.5	11.86	15.36
8	96.8	12.75	16.25
9	--	--	--
10	--	--	--
11	--	--	--
12	--	--	--

Stack Diagram
A = 9.4 ft.
B = 12.2 ft.
Depth of Duct = 13.25 in.

Cross Sectional Area





Cyclonic Flow Check

Location Albuquerque Bernalillo County Water Utility - Southside Water Reclamation Plant
Source Unit 30 (Digester)
Project No. 2020-0005
Date 1/12/20

Sample Point	Angle (ΔP=0)
1	2
2	3
3	3
4	4
5	5
6	2
7	1
8	1
9	3
10	2
11	2
12	1
13	4
14	0
15	3
16	1
Average	2.3

Field Data
Method 2 Data

Location Albuquerque Bernalillo County Water Utility - Southside Water Reclamation Plant
Source Unit 30 (Digester)
Project No. 2020-0005

Run No.	**1**	**2**	**3**
Date	1/12/20	1/12/20	1/12/20
Status	VALID	VALID	VALID
Start Time	14:00	15:30	16:25
Stop Time	14:10	15:40	16:37
Leak Check	Pass	Pass	Pass

Traverse Point	**Δ P (in. WC)**	**Ts (°F)**	**Δ P (in. WC)**	**Ts (°F)**	**Δ P (in. WC)**	**Ts (°F)**
A-1	4.70	675	4.60	679	4.80	682
2	4.60	676	4.50	680	4.70	681
3	4.50	674	4.50	681	4.50	681
4	4.60	674	4.50	681	4.30	680
5	4.50	675	4.40	680	4.20	680
6	4.40	675	4.30	680	4.10	680
7	4.10	675	4.20	681	4.00	681
8	3.80	674	3.90	680	3.90	681
B-1	4.80	674	4.70	680	4.80	681
2	4.60	674	4.60	680	4.70	681
3	4.50	676	4.50	680	4.50	682
4	4.40	675	4.50	680	4.40	682
5	4.20	674	4.30	680	4.20	683
6	4.10	675	4.20	680	4.10	683
7	4.00	674	4.00	681	4.00	682
8	3.70	673	3.60	680	3.70	682

					Average
Square Root of ΔP, (in. WC)$^{1/2}$	**(ΔP)$^{1/2}$**	2.1	2.1	2.1	2.1
Average ΔP, in. WC	**(ΔP)**	4.3	4.3	4.3	4.3
Pitot Tube Coefficient	**(Cp)**	0.81	0.81	0.81	0.81
Barometric Pressure, in. Hg	**(Pb)**	25.1	25.1	25.1	25.1
Static Pressure, in. WC	**(Pg)**	4.2	4.3	4.2	4.2
Stack Pressure, in. Hg	**(Ps)**	25.4	25.5	25.4	25.5
Average Temperature, °F	**(Ts)**	674.6	680.2	681.4	678.7
Average Temperature, °R	**(Ts)**	1134.6	1140.2	1141.4	1138.7
Measured Moisture Fraction	**(BWSmsd)**	0.104	0.111	0.110	0.108
Moisture Fraction @ Saturation	**(BWSsat)**	175.5	181.5	182.9	180.0
Moisture Fraction	**(BWS)**	0.104	0.111	0.110	0.108
O2 Concentration, %	**(O2)**	9.3	9.3	9.2	9.3
CO2 Concentration, %	**(CO2)**	9.9	10.0	10.0	10.0
Molecuar Weight, lb/lb-mole (dry)	**(Md)**	30.0	30.0	30.0	30.0
Molecuar Weight, lb/lb-mole (wet)	**(Ms)**	28.7	28.6	28.7	28.7
Velocity, ft/sec	**(Vs)**	180.6	181.0	180.5	180.7
VFR at stack conditions, acfm	**(Qa)**	10,377	10,399	10,373	10,383
VFR at standard conditions, scfh	**(Qsw)**	246,455	245,831	244,880	245,722
VFR at standard conditions, scfm	**(Qsw)**	4,108	4,097	4,081	4,095
VFR at standard conditions, dscfm	**(Qsd)**	3,679	3,642	3,632	3,651

Location Albuquerque Bernalillo County Water Utility - Southside Water Reclamation Pla
Source Unit 30 (Digester)
Project No. 2020-0005
Parameter(s): VFR
Console Type Meter Box

Run No.		1					2					3				
Date		1/12/20					1/12/20					1/12/20				
Status		VALID					VALID					VALID				
Start Time		13:51					15:03					16:15				
End Time		14:51					16:03					17:15				
Run Time, min	**(θ)**	60					60					60				
Meter ID		M5-17					M5-17					M5-17				
Meter Correction Factor	**(Y)**	1.000					1.000					1.000				
Orifice Calibration Value	**(ΔH @)**	1.570					1.570					1.570				
Max Vacuum, in. Hg		3					3					3				
Post Leak Check, ft3/min (at max vac.)		0.000					0.000					0.000				
Meter Volume, ft3																
0		685.945					724.556					764.114				
5		689.100					727.800					767.300				
10		692.300					731.100					770.600				
15		695.500					734.400					773.800				
20		698.700					737.700					777.000				
25		701.900					741.000					780.200				
30		705.000					744.300					783.400				
35		708.200					747.600					786.700				
40		711.400					750.800					789.900				
45		714.600					754.100					793.100				
50		717.800					757.400					796.300				
55		720.900					760.700					799.500				
60		724.128					763.983					802.768				
Total Meter Volume, ft3	**(Vm)**	38.183					39.427					38.654				
Temperature, °F		**Meter**	**Probe**	**Filter**	**Vacuum**	**Imp. Exit**	**Meter**	**Probe**	**Filter**	**Vacuum**	**Imp. Exit**	**Meter**	**Probe**	**Filter**	**Vacuum**	**Imp. Exit**
0		73	N/A	N/A	3	54	82	N/A	N/A	3	62	84	N/A	N/A	3	59
5		74	N/A	N/A	3	54	82	N/A	N/A	3	62	83	N/A	N/A	3	59
10		74	N/A	N/A	3	54	82	N/A	N/A	3	62	83	N/A	N/A	3	59
15		75	N/A	N/A	3	55	83	N/A	N/A	3	62	82	N/A	N/A	3	59
20		75	N/A	N/A	3	55	83	N/A	N/A	3	62	82	N/A	N/A	3	59
25		76	N/A	N/A	3	56	83	N/A	N/A	3	61	81	N/A	N/A	3	59
30		76	N/A	N/A	3	56	83	N/A	N/A	3	61	81	N/A	N/A	3	60
35		77	N/A	N/A	3	56	84	N/A	N/A	3	61	80	N/A	N/A	3	60
40		77	N/A	N/A	3	56	84	N/A	N/A	3	61	79	N/A	N/A	3	60
45		78	N/A	N/A	3	57	84	N/A	N/A	3	60	78	N/A	N/A	3	61
50		78	N/A	N/A	3	58	84	N/A	N/A	3	60	77	N/A	N/A	3	61
55		79	N/A	N/A	3	59	84	N/A	N/A	3	60	76	N/A	N/A	3	61
60		80	N/A	N/A	3	61	84	N/A	N/A	3	60	76	N/A	N/A	3	61
Average Temperature, °F	**(Tm)**	76	--	--	--	--	83	--	--	--	--	80	--	--	--	--
Average Temperature, °R	**(Tm)**	536	--	--	--	--	543	--	--	--	--	540	--	--	--	--
Minimum Temperature, °F		73	--	--	--	--	82	--	--	--	--	76	--	--	--	--
Maximum Temperature, °F		80	--	--	--	61	84	--	--	--	62	84	--	--	--	61
Barometeric Pressure, in. Hg	**(Pb)**	25.14					25.14					25.14				
Meter Orifice Pressure , in. WC	**(ΔH)**	1.000					1.000					1.000				
Meter Pressure, in. Hg	**(Pm)**	25.21					25.21					25.21				
Standard Meter Volume, ft3	**(Vmstd)**	31.696					32.311					31.858				
Analysis Type		Gravimetric					Gravimetric					Gravimetric				
Impinger 1, Pre/Post Test, mL		H2O		506.1	522.3	16.2	H2O		522.3	521.6	-0.7	H2O		521.6	530.1	8.5
Impinger 2, Pre/Post Test, mL		H2O		529.3	583.9	54.6	H2O		472.0	549.6	77.6	H2O		549.6	611.2	61.6
Impinger 3, Pre/Post Test, mL		Empty		302.2	304.2	2.0	Empty		300.1	303.1	3.0	Empty		300.0	308.4	8.4
Impinger 4, Pre/Post Test, g		Silica		595.5	601.1	5.6	Silica		601.1	606.8	5.7	Silica		606.8	611.8	5.0
Volume Water Collected, mL	**(Vlc)**	78.4					85.6					83.5				
Standard Water Volume, ft^{3}	**(Vwstd)**	3.697					4.036					3.937				
Moisture Fraction Measured	**(BWS)**	0.104					0.111					0.110				
Gas Molecular Weight, lb/lb-mole (dry)	**(Md)**	29.96					29.97					30.00				
DGM Calibration Check Value	**(Yqa)**	-1.6					1.0					-0.7				

Unit 80

Emissions Calculations

Location ABCWUA - Southside Water Reclamation Plant
Source Unit 80
Project No. 2020-0005

Run Number		Run 1	Run 2	Run 3	Average
Date		1/9/20	1/9/20	1/9/20	--
Start Time		10:18	11:41	13:01	--
Stop Time		11:19	12:42	14:01	--
Engine Data					
Engine Manufacturer		Cummins			
Engine Model		KTA50-G2			
Engine Serial Number		33156661			
Engine Type		Compression Ignition			
Engine Year of Manufacture	DOM	2004			
Engine Speed, RPM	ES	1,800	1,800	1,800	1,800
Engine Brake Work, HP	EBW	1,620	1,620	1,620	1,620
Maximum Engine Brake Work, HP	MaxEBW	1,620	1,620	1,620	1,620
Engine Load, %	EL	100	100	100	100
Fuel Heating Value, Btu/scf	F_{HV}	1,040	1,040	1,040	1,040
Fuel Factor, dscf/MMBtu	F_{Factor}	8,710	8,710	8,710	8,710
Input Data - Outlet					
Moisture Fraction, dimensionless	BWS	0.069	0.063	0.056	0.063
Volumetric Flow Rate (M1-4), dscfm	Qs	1,677	1,691	1,690	1,686
Calculated Data - Outlet					
O2 Concentration, % dry	C_{O2}	14.6	14.7	14.7	14.6
CO2 Concentration, % dry	C_{CO2}	4.7	4.6	4.7	4.7
NOx Concentration, ppmvd	C_{NOx}	341.0	330.6	332.4	334.7
NOx Concentration, ppmvd @ 15% O2	C_{NOxc15}	317.1	313.5	314.5	315.0
NOx Emission Factor, g/HP-hr	EF_{NOx}	1.1	1.1	1.1	1.1
NOx Emission Rate, lb/hr	ER_{NOx}	4.1	4.0	4.0	4.0
NOx Emission Rate, ton/yr	ER_{NOxTPY}	17.9	17.5	17.6	17.7
CO Concentration, ppmvd	C_{CO}	118.7	120.2	122.0	120.3
CO Concentration, ppmvd @ 15% O2	C_{COc15}	110.3	114.0	115.4	113.2
CO Emission Factor, g/HP-hr	EF_{CO}	0.24	0.25	0.25	0.25
CO Emission Rate, lb/hr	ER_{CO}	0.87	0.89	0.90	0.88
CO Emission Rate, ton/yr	ER_{COTPY}	3.8	3.9	3.9	3.9
THC Concentration as propane, ppmvw	C_{THCw}	16.9	16.0	16.2	16.4
THC Concentration as propane, ppmvd	C_{THCd}	18.1	17.1	17.2	17.5
CH4 Concentration, ppmvd	C_{CH4}	0.00	0.00	0.00	0.00
CH4 Concentration (as C3H8), ppmvd	$C_{CH4\ as\ propane}$	0.00	0.00	0.00	0.00
C2H6 Concentration, ppmvd	C_{C2H6}	0.00	0.00	0.00	0.00
C2H6 Concentration (as C3H8), ppmvd	$C_{C2H6\ as\ propane}$	0.00	0.00	0.00	0.00
NMEHC Concentration (as C3H8), ppmvd	C_{NMEHC}	18.1	17.1	17.2	17.5
NMEHC Concentration (as C3H8), ppmvd @ 15% O2	$C_{NMEHCc15}$	16.9	16.2	16.2	16.4
NMEHC Emission Factor (as C3H8), g/HP-hr	EF_{NMEHC}	0.059	0.056	0.056	0.057
NMEHC Emission Rate (as C3H8), lb/hr	ER_{NMEHC}	0.21	0.20	0.20	0.20
NMEHC Emission Rate (as C3H8), ton/yr	$ER_{NMEHCTPY}$	0.91	0.87	0.87	0.88
SO_2 Concentration, ppmvd	C_{SO2}	0.85	0.82	0.81	0.82
SO_2 Concentration, ppmvd @ 15% O2	C_{SO2c15}	0.79	0.78	0.77	0.78
SO_2 Emission Factor, g/HP-hr	EF_{SO2}	0.00	0.00	0.00	0.00
SO_2 Emission Rate, lb/hr	ER_{SO2}	0.014	0.014	0.014	0.014
SO_2 Emission Rate, ton/yr	ER_{SO2TPY}	0.062	0.060	0.060	0.061

Run 1 - CEMS Data

Location: ABCWUA - Southside Water Reclamation Plant
Source: Unit 80
Project No.: 2020-0005
Date: 1/9/20

Time	O_2 - Outlet	CO_2 - Outlet	CO - Outlet	NOx - Outlet	THC - Outlet	SO_2 - Outlet
Unit	% dry	% dry	ppmvd	ppmvd	ppmvw	ppmvd
Status	Valid	Valid	Valid	Valid	Valid	Valid
10:18	16.4	4.7	105.8	460.4	12.9	1.0
10:19	16.4	3.4	121.9	223.9	16.5	0.6
10:20	16.4	3.4	152.6	151.9	21.1	0.5
10:21	16.6	3.3	142.2	159.1	20.7	0.5
10:22	16.5	3.4	160.7	154.3	22.0	0.5
10:23	16.5	3.4	180.3	148.7	28.3	0.5
10:24	13.5	5.5	154.2	245.1	29.5	0.8
10:25	13.3	5.6	110.8	455.4	25.5	1.1
10:26	13.3	5.7	105.4	447.6	14.1	1.1
10:27	13.4	5.6	104.9	464.7	13.5	1.1
10:28	13.4	5.6	105.0	463.6	13.2	1.1
10:29	13.4	5.6	102.0	455.9	13.1	1.1
10:30	13.5	5.5	103.3	458.0	12.8	1.1
10:31	13.5	5.6	103.0	456.7	12.8	1.1
10:32	13.4	5.6	101.6	448.1	12.6	1.1
10:33	13.6	5.5	103.6	462.3	12.7	1.1
10:34	16.3	3.6	105.2	339.9	12.7	0.8
10:35	16.5	3.4	142.9	153.2	14.9	0.5
10:36	16.6	3.3	145.5	155.6	21.7	0.5
10:37	16.5	3.4	159.3	148.4	24.8	0.5
10:38	16.3	3.5	164.5	150.7	20.8	0.5
10:39	13.4	5.6	152.9	281.1	25.1	0.9
10:40	13.4	5.6	106.5	431.6	20.6	1.1
10:41	13.5	5.5	101.0	439.0	13.5	1.1
10:42	13.5	5.5	101.5	448.2	12.9	1.1
10:43	13.5	5.5	96.7	427.4	12.8	1.1
10:44	13.6	5.5	99.7	443.7	12.6	1.1
10:45	13.5	5.5	98.7	433.3	12.6	1.1
10:46	13.6	5.5	98.0	435.0	12.6	1.1
10:47	16.3	3.6	105.0	342.3	12.4	0.8
10:48	16.5	3.4	140.4	150.0	13.9	0.5
10:49	16.7	3.3	148.6	150.9	23.7	0.5
10:50	16.5	3.4	148.5	150.3	25.0	0.5
10:51	16.7	3.3	165.3	146.6	18.5	0.5
10:52	15.1	4.4	167.8	157.4	26.7	0.5
10:53	13.4	5.6	115.3	364.0	28.3	1.0
10:54	13.5	5.6	100.9	416.8	15.2	1.0
10:55	13.6	5.5	98.0	420.7	13.4	1.0
10:56	13.6	5.5	99.6	425.3	12.9	1.1
10:57	13.6	5.5	98.0	423.1	12.9	1.0
10:58	13.6	5.5	98.7	420.0	12.8	1.0
10:59	13.7	5.4	98.7	426.7	12.8	1.1
11:00	13.6	5.5	97.2	413.3	12.6	1.0
11:01	13.7	5.4	97.6	421.0	12.4	1.0
11:02	13.6	5.5	99.8	430.5	12.4	1.1
11:03	13.6	5.5	98.8	416.5	12.3	1.1
11:04	16.4	3.5	108.8	333.9	12.2	0.8
11:05	16.5	3.4	129.7	155.9	15.6	0.5
11:06	16.5	3.4	148.2	148.1	22.5	0.5
11:07	16.7	3.3	147.8	155.1	23.4	0.5
11:08	16.6	3.3	168.3	144.9	24.2	0.5
11:09	14.0	5.1	157.1	208.6	26.5	0.7
11:10	13.3	5.7	112.8	430.3	25.0	1.1
11:11	13.4	5.6	108.9	459.3	13.6	1.1
11:12	13.3	5.7	106.2	451.9	12.7	1.1
11:13	13.4	5.6	103.9	456.7	12.7	1.1
11:14	13.4	5.6	105.5	466.9	12.2	1.1
11:15	13.4	5.6	103.0	452.0	11.9	1.1
11:16	13.5	5.5	101.6	452.8	11.9	1.1
11:17	16.4	3.6	109.3	345.0	11.9	0.8

Parameter	O_2 - Outlet	CO_2 - Outlet	CO - Outlet	NOx - Outlet	THC - Outlet	SO2 - Outlet
Uncorrected Run Average (C_{obs})	14.6	4.8	120.3	338.0	16.9	0.86
Cal Gas Concentration (C_{MA})	10.9	10.9	440.2	487.4	45.7	19.1
Pretest System Zero Response	0.080	0.060	0.00	0.18	0.040	0.010
Posttest System Zero Response	0.11	0.060	0.10	0.20	1.8	0.020
Average Zero Response (Co)	0.10	0.060	0.050	0.19	0.92	0.015
Pretest System Cal Response	11.0	10.8	446.7	487.3	45.5	19.2
Posttest System Cal Response	11.0	10.8	445.5	478.6	46.4	19.0
Average Cal Response (C_M)	11.0	10.8	446.1	482.9	45.9	19.1
Corrected Run Average (Corr)	14.6	4.7	118.7	341.0	NA	0.85

Run 2 - CEMS Data

Location: ABCWUA - Southside Water Reclamation Plant
Source: Unit 80
Project No.: 2020-0005
Date: 1/9/20

Time	O_2 - Outlet	CO_2 - Outlet	CO - Outlet	NOx - Outlet	THC - Outlet	SO2 - Outlet
Unit	% dry	% dry	ppmvd	ppmvd	ppmvw	ppmvd
Status	Valid	Valid	Valid	Valid	Valid	Valid
11:41	13.4	5.6	100.1	452.0	10.8	1.2
11:42	13.6	5.5	99.8	453.4	11.4	1.2
11:43	15.7	4.1	99.4	407.0	11.3	1.0
11:44	16.8	3.2	138.6	160.6	15.9	0.6
11:45	16.5	3.4	145.0	150.5	22.9	0.6
11:46	16.5	3.4	160.9	145.6	25.6	0.6
11:47	16.6	3.4	146.0	156.2	22.9	0.6
11:48	16.1	3.6	152.8	153.4	20.7	0.6
11:49	13.6	5.5	129.7	262.8	24.1	0.9
11:50	13.5	5.5	104.8	432.4	14.4	1.1
11:51	13.4	5.6	100.4	435.5	12.7	1.1
11:52	13.5	5.5	97.2	432.0	12.7	1.1
11:53	13.6	5.5	98.0	440.5	12.4	1.1
11:54	13.6	5.5	97.6	432.8	12.2	1.1
11:55	13.6	5.5	95.3	422.5	12.2	1.1
11:56	13.7	5.4	94.8	431.0	12.0	1.1
11:57	14.0	5.2	95.8	428.7	11.9	1.1
11:58	16.7	3.3	115.5	264.7	12.0	0.7
11:59	16.7	3.3	149.4	146.5	19.7	0.5
12:00	16.4	3.4	152.7	151.0	23.8	0.5
12:01	16.4	3.5	154.3	153.7	19.3	0.5
12:02	16.5	3.4	149.2	158.1	19.0	0.5
12:03	13.5	5.5	145.4	238.9	24.2	0.8
12:04	13.2	5.7	114.1	447.7	19.8	1.1
12:05	13.4	5.6	108.2	469.8	13.5	1.1
12:06	13.4	5.6	105.7	468.2	12.8	1.1
12:07	13.4	5.6	103.6	452.2	12.3	1.1
12:08	13.5	5.5	104.5	466.6	12.1	1.1
12:09	13.5	5.5	100.4	445.7	12.0	1.1
12:10	13.5	5.5	99.9	445.2	12.0	1.1
12:11	16.8	3.6	104.9	356.9	11.9	0.9
12:12	16.6	3.4	125.0	154.1	13.2	0.5
12:13	16.5	3.4	139.1	152.7	21.2	0.5
12:14	16.6	3.3	138.9	156.0	22.5	0.5
12:15	16.4	3.5	146.3	154.8	22.3	0.5
12:16	15.7	3.9	158.2	151.5	17.5	0.5
12:17	13.3	5.7	142.0	345.9	24.9	1.0
12:18	13.3	5.7	108.8	451.4	14.7	1.1
12:19	13.4	5.6	104.8	460.5	12.8	1.1
12:20	13.4	5.6	106.2	474.9	12.6	1.1
12:21	13.4	5.6	99.9	455.0	12.3	1.1
12:22	13.5	5.5	98.5	448.9	12.1	1.1
12:23	13.6	5.5	98.6	446.1	11.9	1.1
12:24	16.4	3.5	103.5	342.5	11.9	0.8
12:25	16.4	3.4	134.4	152.5	16.5	0.5
12:26	16.6	3.3	141.9	154.5	18.1	0.5
12:27	16.4	3.4	139.4	157.9	19.9	0.5
12:28	16.4	3.4	155.2	149.6	24.9	0.5
12:29	15.9	3.8	154.4	156.4	22.9	0.5
12:30	13.3	5.7	139.2	339.8	17.3	0.9
12:31	13.3	5.7	107.5	444.3	13.8	1.1
12:32	13.5	5.5	103.7	458.1	12.6	1.1
12:33	13.5	5.5	99.1	440.3	12.1	1.1
12:34	13.5	5.5	97.4	435.5	12.2	1.1
12:35	13.4	5.6	99.6	439.7	12.2	1.1
12:36	13.5	5.5	100.0	450.8	12.2	1.1
12:37	13.5	5.5	101.4	457.4	12.2	1.1
12:38	15.9	3.9	102.2	365.9	11.9	0.9
12:39	16.7	3.2	130.4	160.4	18.1	0.5
12:40	16.5	3.4	142.1	153.0	22.7	0.5

Parameter	O_2 - Outlet	CO_2 - Outlet	CO - Outlet	NOx - Outlet	THC - Outlet	SO2 - Outlet
Uncorrected Run Average (C_{obs})	14.7	4.6	119.7	326.2	16.0	0.87
Cal Gas Concentration (C_{MA})	10.9	10.9	440.2	487.4	45.7	19.1
Pretest System Zero Response	0.11	0.060	0.10	0.20	1.8	0.020
Posttest System Zero Response	0.11	0.040	0.13	0.40	0.040	0.080
Average Zero Response (Co)	0.11	0.050	0.12	0.30	0.92	0.050
Pretest System Cal Response	11.0	10.8	445.5	478.6	46.4	19.0
Posttest System Cal Response	11.0	10.8	430.9	483.0	47.4	19.2
Average Cal Response (C_M)	11.0	10.8	438.2	480.8	46.9	19.1
Corrected Run Average (Corr)	14.7	4.6	120.2	330.6	NA	0.82

Run 3 - CEMS Data

Location: ABCWUA - Southside Water Reclamation Plant
Source: Unit 80
Project No.: 2020-0005
Date: 1/9/20

Time Unit Status	O_2 - Outlet % dry Valid	CO_2 - Outlet % dry Valid	CO - Outlet ppmvd Valid	NOx - Outlet ppmvd Valid	THC - Outlet ppmvw Valid	SO2 - Outlet ppmvd Valid
13:01	13.4	5.6	107.8	477.0	12.0	1.2
13:02	13.4	5.7	104.6	468.9	11.6	1.2
13:03	13.4	5.6	99.6	467.0	11.4	1.2
13:04	13.7	5.5	102.4	475.4	11.3	1.2
13:05	16.6	3.4	107.2	321.6	11.3	0.8
13:06	16.7	3.3	137.9	153.8	15.3	0.5
13:07	16.5	3.5	150.3	152.3	21.1	0.5
13:08	16.7	3.4	141.0	163.2	19.8	0.5
13:09	16.2	3.6	148.4	157.0	19.1	0.5
13:10	13.5	5.6	136.1	262.5	23.0	0.9
13:11	13.2	5.7	115.3	468.7	19.4	1.1
13:12	13.3	5.7	106.2	460.3	12.6	1.1
13:13	13.4	5.6	103.5	464.4	12.0	1.1
13:14	13.5	5.5	101.1	448.6	11.9	1.1
13:15	13.5	5.5	99.1	445.1	11.9	1.1
13:16	13.5	5.5	99.1	444.8	12.0	1.1
13:17	15.7	4.0	105.7	402.7	11.8	0.9
13:18	16.7	3.3	124.9	166.0	11.8	0.5
13:19	16.5	3.4	140.2	150.4	21.8	0.5
13:20	16.6	3.3	154.2	151.0	18.2	0.5
13:21	16.5	3.4	150.1	156.6	27.0	0.5
13:22	15.9	3.8	168.6	147.5	25.7	0.5
13:23	13.4	5.6	139.9	325.1	23.2	0.9
13:24	13.3	5.7	110.1	450.9	15.9	1.1
13:25	13.4	5.6	105.4	446.5	13.0	1.1
13:26	13.5	5.6	104.9	462.2	12.9	1.1
13:27	13.5	5.6	100.9	450.4	12.7	1.1
13:28	13.6	5.5	100.6	447.9	12.2	1.1
13:29	13.5	5.5	101.3	452.8	12.0	1.1
13:30	16.4	3.5	104.6	327.2	12.0	0.8
13:31	16.8	3.2	130.8	152.9	15.1	0.5
13:32	16.7	3.2	153.4	141.8	21.4	0.5
13:33	16.5	3.4	158.4	144.3	25.1	0.5
13:34	16.6	3.3	146.1	154.1	24.4	0.5
13:35	16.4	3.5	155.9	147.6	19.3	0.5
13:36	14.1	5.0	135.9	218.0	25.5	0.7
13:37	13.3	5.6	112.3	416.8	23.9	1.0
13:38	13.5	5.5	100.3	430.4	13.4	1.1
13:39	13.6	5.5	99.3	420.5	12.7	1.1
13:40	13.6	5.4	96.0	418.5	12.7	1.1
13:41	13.6	5.4	95.5	413.9	12.6	1.0
13:42	13.6	5.4	96.3	414.2	12.6	1.1
13:43	13.5	5.5	98.1	418.1	12.3	1.1
13:44	13.5	5.5	100.1	443.1	12.4	1.1
13:45	13.8	5.4	97.2	431.1	12.3	1.1
13:46	16.5	3.4	111.9	303.4	12.3	0.7
13:47	16.6	3.3	123.3	159.3	18.5	0.5
13:48	16.4	3.4	143.5	149.5	23.3	0.5
13:49	16.5	3.3	150.3	152.5	21.0	0.5
13:50	16.6	3.3	147.0	155.9	22.2	0.5
13:51	15.0	4.4	160.6	160.6	27.2	0.5
13:52	13.2	5.7	118.0	387.8	22.7	1.0
13:53	13.3	5.7	110.6	453.9	13.9	1.1
13:54	13.4	5.6	104.9	452.4	13.3	1.1
13:55	13.3	5.6	104.0	450.8	12.5	1.1
13:56	13.3	5.6	107.5	476.3	12.4	1.1
13:57	13.3	5.7	103.0	456.0	12.1	1.1
13:58	15.4	4.2	106.7	432.4	11.9	1.0
13:59	16.5	3.4	118.2	177.5	12.0	0.5
14:00	16.5	3.4	152.4	146.6	15.5	0.5

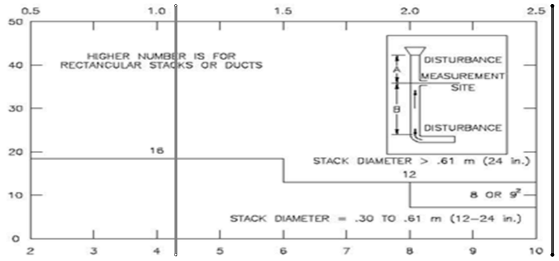
Parameter	O_2 - Outlet	CO_2 - Outlet	CO - Outlet	NOx - Outlet	THC - Outlet	SO2 - Outlet
Uncorrected Run Average (C_{obs})	14.7	4.7	120.1	327.5	16.2	0.85
Cal Gas Concentration (C_{MA})	10.9	10.9	440.2	487.4	45.7	19.1
Pretest System Zero Response	0.11	0.040	0.13	0.40	0.040	0.080
Posttest System Zero Response	0.10	0.00	0.10	0.80	0.00	0.00
Average Zero Response (Co)	0.11	0.020	0.12	0.60	0.020	0.040
Pretest System Cal Response	11.0	10.8	430.9	483.0	47.4	19.2
Posttest System Cal Response	11.0	10.8	435.7	476.8	47.5	19.0
Average Cal Response (C_M)	11.0	10.8	433.3	479.9	47.5	19.1
Corrected Run Average (Corr)	14.7	4.7	122.0	332.4	NA	0.81

Method 1 Data

Location Albuquerque Bernalillo County Water Utility - Southside Water Reclamation Plant
Source Unit 80
Project No. 2020-0005
Date: 01/09/20

Stack Parameters

Duct Orientation: Vertical
Duct Design: Circular
Distance from Far Wall to Outside of Port: 16.00 in
Nipple Length: 2.00 in
Depth of Duct: 14.00 in
Cross Sectional Area of Duct: 1.07 ft^2
No. of Test Ports: 2
Distance A: 3.0 ft
Distance A Duct Diameters: 2.6 (must be > 0.5)
Distance B: 5.0 ft
Distance B Duct Diameters: 4.3 (must be > 2)
Minimum Number of Traverse Points: 16
Actual Number of Traverse Points: 16



CIRCULAR DUCT

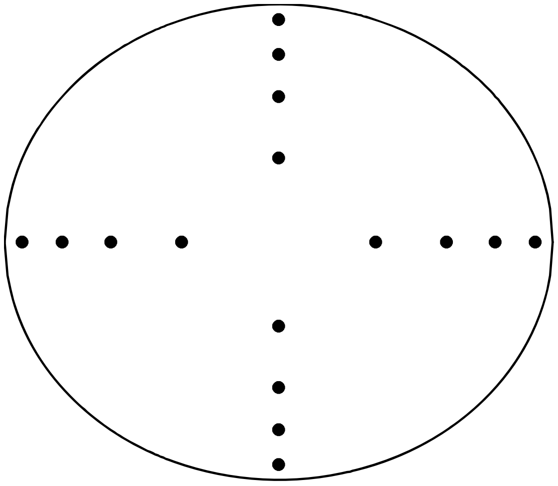
LOCATION OF TRAVERSE POINTS *Number of traverse points on a diameter*											
	2	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
1	14.6	--	6.7	--	4.4	--	3.2	--	2.6	--	2.1
2	85.4	--	25.0	--	14.6	--	10.5	--	8.2	--	6.7
3	--	--	75.0	--	29.6	--	19.4	--	14.6	--	11.8
4	--	--	93.3	--	70.4	--	32.3	--	22.6	--	17.7
5	--	--	--	--	85.4	--	67.7	--	34.2	--	25.0
6	--	--	--	--	95.6	--	80.6	--	65.8	--	35.6
7	--	--	--	--	--	--	89.5	--	77.4	--	64.4
8	--	--	--	--	--	--	96.8	--	85.4	--	75.0
9	--	--	--	--	--	--	--	--	91.8	--	82.3
10	--	--	--	--	--	--	--	--	97.4	--	88.2
11	--	--	--	--	--	--	--	--	--	--	93.3
12	--	--	--	--	--	--	--	--	--	--	97.9

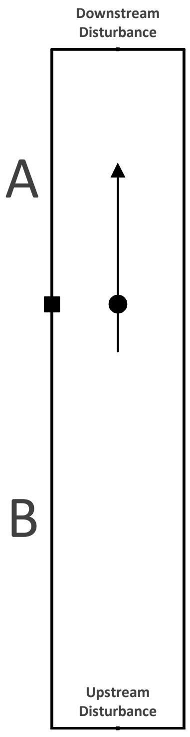
**Percent of stack diameter from inside wall to traverse point.*

Traverse Point	% of Diameter	Distance from inside wall	Distance from outside of port
1	3.2	0.50	2.50
2	10.5	1.47	3.47
3	19.4	2.72	4.72
4	32.3	4.52	6.52
5	67.7	9.48	11.48
6	80.6	11.28	13.28
7	89.5	12.53	14.53
8	96.8	13.50	15.50
9	--	--	--
10	--	--	--
11	--	--	--
12	--	--	--

Stack Diagram
A = 3 ft.
B = 5 ft.
Depth of Duct = 14 in.

Cross Sectional Area





Cyclonic Flow Check

Location Albuquerque Bernalillo County Water Utility - Southside Water Reclamation Plant
Source Unit 80
Project No. 2020-0005
Date 1/9/20

Sample Point	Angle (ΔP=0)
1	3
2	1
3	1
4	2
5	0
6	2
7	2
8	1
9	4
10	3
11	1
12	0
13	4
14	2
15	1
16	1
Average	1.8

Field Data
Method 2 Data

Location Albuquerque Bernalillo County Water Utility - Southside Water Reclamation Plant
Source Unit 80
Project No. 2020-0005

Run No.	**1**		**2**		**3**	
Date	1/9/20		1/9/20		1/9/20	
Status	VALID		VALID		VALID	
Start Time	10:25		11:52		13:20	
Stop Time	10:35		12:05		13:31	
Leak Check	Pass		Pass		Pass	
Traverse Point	**Δ P (in. WC)**	**Ts (°F)**	**Δ P (in. WC)**	**Ts (°F)**	**Δ P (in. WC)**	**Ts (°F)**
A-1	0.63	544	0.64	545	0.62	551
2	0.61	544	0.63	545	0.63	551
3	0.61	542	0.64	546	0.65	551
4	0.63	545	0.62	545	0.64	552
5	0.64	544	0.62	546	0.62	551
6	0.62	544	0.63	546	0.60	551
7	0.62	543	0.63	545	0.63	551
8	0.60	543	0.63	544	0.61	551
B-1	0.61	543	0.64	544	0.67	552
2	0.61	542	0.62	545	0.65	551
3	0.64	542	0.62	543	0.61	552
4	0.64	544	0.62	544	0.60	553
5	0.63	545	0.63	545	0.59	553
6	0.62	545	0.61	545	0.60	553
7	0.62	544	0.62	545	0.61	552
8	0.61	545	0.61	545	0.62	551

					Average
Square Root of ΔP, (in. WC)$^{1/2}$	**(ΔP)$^{1/2}$**	0.79	0.79	0.79	0.79
Average ΔP, in. WC	**(ΔP)**	0.62	0.63	0.62	0.62
Pitot Tube Coefficient	**(Cp)**	0.81	0.81	0.81	0.81
Barometric Pressure, in. Hg	**(Pb)**	24	24	24	24
Static Pressure, in. WC	**(Pg)**	0.40	0.40	0.40	0.40
Stack Pressure, in. Hg	**(Ps)**	24.1	24.1	24.1	24.1
Average Temperature, °F	**(Ts)**	543.7	544.9	551.6	546.7
Average Temperature, °R	**(Ts)**	1003.7	1004.9	1011.6	1006.7
Measured Moisture Fraction	**(BWSmsd)**	0.069	0.063	0.056	0.063
Moisture Fraction @ Saturation	**(BWSsat)**	75.1	75.8	80.0	77.0
Moisture Fraction	**(BWS)**	0.069	0.063	0.056	0.063
O2 Concentration, %	**(O2)**	14.5	14.7	14.7	14.6
CO2 Concentration, %	**(CO2)**	4.7	4.6	4.7	4.7
Molecuar Weight, lb/lb-mole (dry)	**(Md)**	29.3	29.3	29.3	29.3
Molecuar Weight, lb/lb-mole (wet)	**(Ms)**	28.6	28.6	28.7	28.6
Velocity, ft/sec	**(Vs)**	66.2	66.4	66.3	66.3
VFR at stack conditions, acfm	**(Qa)**	4,247	4,260	4,254	4,254
VFR at standard conditions, scfh	**(Qsw)**	108,058	108,273	107,392	107,908
VFR at standard conditions, scfm	**(Qsw)**	1,801	1,805	1,790	1,798
VFR at standard conditions, dscfm	**(Qsd)**	1,677	1,691	1,690	1,686

Location Albuquerque Bernalillo County Water Utility - Southside Water Reclamation Pla
Source Unit 80
Project No. 2020-0005
Parameter(s): VFR
Console Type Meter Box

Run No.		1					2					3				
Date		1/9/20					1/9/20					1/9/20				
Status		VALID					VALID					VALID				
Start Time		10:18					11:41					13:01				
End Time		11:18					12:41					14:01				
Run Time, min	**(θ)**	60					60					60				
Meter ID		M5-17					M5-17					M5-17				
Meter Correction Factor	**(Y)**	1.000					1.000					1.000				
Orifice Calibration Value	**(ΔH @)**	1.570					1.570					1.570				
Max Vacuum, in. Hg		3					3					3				
Post Leak Check, ft3/min (at max vac.)		0.000					0.000					0.000				
Meter Volume, ft3																
0		999.872					38.966					76.833				
5		1003.100					42.200					79.700				
10		1006.300					45.600					82.600				
15		1009.600					48.800					85.600				
20		1012.800					52.100					88.500				
25		1016.200					55.300					91.400				
30		1019.700					58.600					94.300				
35		1022.500					61.600					97.200				
40		1025.700					64.700					100.200				
45		1028.600					68.300					103.100				
50		1032.800					71.900					106.100				
55		1035.400					74.000					108.900				
60		1038.492					76.564					111.904				
Total Meter Volume, ft3	**(Vm)**	38.620					37.598					35.071				
Temperature, °F		**Meter**	**Probe**	**Filter**	**Vacuum**	**Imp. Exit**	**Meter**	**Probe**	**Filter**	**Vacuum**	**Imp. Exit**	**Meter**	**Probe**	**Filter**	**Vacuum**	**Imp. Exit**
0		45	N/A	N/A	3	44	50	N/A	N/A	3	48	58	N/A	N/A	3	44
5		45	N/A	N/A	3	44	51	N/A	N/A	3	48	58	N/A	N/A	3	44
10		45	N/A	N/A	3	44	51	N/A	N/A	3	48	58	N/A	N/A	3	44
15		46	N/A	N/A	3	44	52	N/A	N/A	3	49	58	N/A	N/A	3	45
20		46	N/A	N/A	3	45	52	N/A	N/A	3	50	58	N/A	N/A	3	45
25		48	N/A	N/A	3	45	52	N/A	N/A	3	50	58	N/A	N/A	3	46
30		48	N/A	N/A	3	46	54	N/A	N/A	3	52	59	N/A	N/A	3	46
35		48	N/A	N/A	3	46	54	N/A	N/A	3	52	59	N/A	N/A	3	46
40		49	N/A	N/A	3	46	55	N/A	N/A	3	49	59	N/A	N/A	3	47
45		49	N/A	N/A	3	47	56	N/A	N/A	3	47	59	N/A	N/A	3	47
50		49	N/A	N/A	3	48	56	N/A	N/A	3	47	59	N/A	N/A	3	48
55		50	N/A	N/A	3	48	57	N/A	N/A	3	45	59	N/A	N/A	3	49
60		51	N/A	N/A	3	49	58	N/A	N/A	3	43	59	N/A	N/A	3	49
Average Temperature, °F	**(Tm)**	48	--	--	--	--	54	--	--	--	--	59	--	--	--	--
Average Temperature, °R	**(Tm)**	507	--	--	--	--	513	--	--	--	--	518	--	--	--	--
Minimum Temperature, °F		45	--	--	--	--	50	--	--	--	--	58	--	--	--	--
Maximum Temperature, °F		51	--	--	--	49	58	--	--	--	52	59	--	--	--	49
Barometeric Pressure, in. Hg	**(Pb)**	24.93					24.93					24.93				
Meter Orifice Pressure , in. WC	**(ΔH)**	1.000					1.000					0.900				
Meter Pressure, in. Hg	**(Pm)**	25.00					25.00					25.00				
Standard Meter Volume, ft3	**(Vmstd)**	33.590					32.314					29.851				
Analysis Type		Gravimetric					Gravimetric					Gravimetric				
Impinger 1, Pre/Post Test, mL		H2O		511.9	511.2	-0.7	H2O		511.2	520.8	9.6	H2O		520.8	527.6	6.8
Impinger 2, Pre/Post Test, mL		H2O		481.8	497.7	15.9	H2O		497.7	525.9	28.2	H2O		525.9	541.3	15.4
Impinger 3, Pre/Post Test, mL		Empty		300.5	309.8	9.3	Empty		301.3	302.9	1.6	Empty		300.2	305.7	5.5
Impinger 4, Pre/Post Test, g		Silica		544.6	572.6	28.0	Silica		572.6	579.4	6.8	Silica		579.4	589.2	9.8
Volume Water Collected, mL	**(Vlc)**	52.5					46.2					37.5				
Standard Water Volume, ft^3	**(Vwstd)**	2.475					2.178					1.768				
Moisture Fraction Measured	**(BWS)**	0.069					0.063					0.056				
Gas Molecular Weight, lb/lb-mole (dry)	**(Md)**	29.33					29.32					29.34				
DGM Calibration Check Value	**(Yqa)**	0.8					-2.5					-4.7				

Corrales Well #4

Emissions Calculations

Location ABCWUA - Southside Water Reclamation Plant
Source Corrales Well #4
Project No. 2020-0005

Run Number		Run 1	Run 2	Run 3	Average
Date		1/8/20	1/8/20	1/8/20	--
Start Time		12:52	14:22	15:42	--
Stop Time		13:53	15:22	16:42	--
Engine Data					
Engine Manufacturer		Waukesha			
Engine Model		P-48GL			
Engine Serial Number		C-1841/1			
Engine Type		Spark Ignition - 4SLB			
Engine Year of Manufacture	DOM	2008			
Engine Speed, RPM	ES	1,445	1,445	1,445	1,445
Engine Brake Work, HP	EBW	1,065	1,065	1,065	1,065
Maximum Engine Brake Work, HP	MaxEBW	1,065	1,065	1,065	1,065
Engine Load, %	EL	100	100	100	100
Fuel Heating Value, Btu/scf	F_{HV}	1,040	1,040	1,040	1,040
Fuel Factor, dscf/MMBtu	F_{Factor}	8,710	8,710	8,710	8,710
Input Data - Outlet					
Moisture Fraction, dimensionless	BWS	0.136	0.138	0.138	0.137
Volumetric Flow Rate (M1-4), dscfm	Qs	516	524	528	523
Calculated Data - Outlet					
O2 Concentration, % dry	C_{O2}	6.4	6.4	6.4	6.4
CO2 Concentration, % dry	C_{CO2}	8.3	8.4	8.4	8.4
NOx Concentration, ppmvd	C_{NOx}	347.5	363.5	376.4	362.5
NOx Concentration, ppmvd @ 15% O2	C_{NOxc15}	141.6	148.0	153.0	147.5
NOx Emission Factor, g/HP-hr	EF_{NOx}	0.55	0.58	0.61	0.58
NOx Emission Rate, lb/hr	ER_{NOx}	1.3	1.4	1.4	1.4
NOx Emission Rate, ton/yr	ER_{NOxTPY}	5.6	6.0	6.2	5.9
CO Concentration, ppmvd	C_{CO}	398.8	400.4	409.0	402.7
CO Concentration, ppmvd @ 15% O2	C_{COc15}	162.5	163.0	166.3	163.9
CO Emission Factor, g/HP-hr	EF_{CO}	0.38	0.39	0.40	0.39
CO Emission Rate, lb/hr	ER_{CO}	0.90	0.92	0.94	0.92
CO Emission Rate, ton/yr	ER_{COTPY}	3.9	4.0	4.1	4.0
THC Concentration as propane, ppmvw	C_{THCw}	50.7	51.4	52.9	51.7
THC Concentration as propane, ppmvd	C_{THCd}	58.7	59.6	61.3	59.9
CH4 Concentration, ppmvd	C_{CH4}	0.00	0.00	0.00	0.00
CH4 Concentration (as C3H8), ppmvd	$C_{CH4\ as\ propane}$	0.00	0.00	0.00	0.00
C2H6 Concentration, ppmvd	C_{C2H6}	0.00	0.00	0.00	0.00
C2H6 Concentration (as C3H8), ppmvd	$C_{C2H6\ as\ propane}$	0.00	0.00	0.00	0.00
NMEHC Concentration (as C3H8), ppmvd	C_{NMEHC}	58.7	59.6	61.3	59.9
NMEHC Concentration (as C3H8), ppmvd @ 15% O2	$C_{NMEHCc15}$	23.9	24.3	24.9	24.4
NMEHC Emission Factor (as C3H8), g/HP-hr	EF_{NMEHC}	0.089	0.091	0.095	0.092
NMEHC Emission Rate (as C3H8), lb/hr	ER_{NMEHC}	0.21	0.21	0.22	0.21
NMEHC Emission Rate (as C3H8), ton/yr	$ER_{NMEHCTPY}$	0.91	0.94	0.97	0.94
SO_2 Concentration, ppmvd	C_{SO2}	0.68	0.77	0.84	0.76
SO_2 Concentration, ppmvd @ 15% O2	C_{SO2c15}	0.28	0.31	0.34	0.31
SO_2 Emission Factor, g/HP-hr	EF_{SO2}	0.00	0.00	0.00	0.00
SO_2 Emission Rate, lb/hr	ER_{SO2}	0.00	0.00	0.00	0.00
SO_2 Emission Rate, ton/yr	ER_{SO2TPY}	0.015	0.018	0.019	0.017

Run 1 - CEMS Data

Location: ABCWUA - Southside Water Reclamation Plant
Source: Corrales Well #4
Project No.: 2020-0005
Date: 1/8/20

Time	O_2 - Outlet	CO_2 - Outlet	CO - Outlet	NOx - Outlet	THC - Outlet	SO_2 - Outlet
Unit	% dry	% dry	ppmvd	ppmvd	ppmvw	ppmvd
Status	Valid	Valid	Valid	Valid	Valid	Valid
12:52	6.5	8.2	400.3	326.6	52.8	0.6
12:53	6.5	8.2	396.9	326.2	52.4	0.6
12:54	6.5	8.2	401.5	327.0	51.8	0.6
12:55	6.5	8.2	401.0	331.0	52.3	0.6
12:56	6.5	8.2	397.7	330.4	52.6	0.7
12:57	6.5	8.2	395.6	331.1	51.7	0.7
12:58	6.5	8.2	398.9	328.9	51.9	0.6
12:59	6.5	8.2	397.8	331.7	52.9	0.7
13:00	6.5	8.2	398.4	334.6	52.9	0.7
13:01	6.5	8.2	394.2	330.3	52.3	0.6
13:02	6.5	8.2	395.4	333.6	52.7	0.6
13:03	6.5	8.2	394.5	331.8	52.3	0.6
13:04	6.5	8.2	394.7	330.2	51.5	0.6
13:05	6.5	8.2	398.6	335.4	51.9	0.7
13:06	6.5	8.2	396.6	336.1	51.4	0.6
13:07	6.4	8.3	396.8	340.3	51.4	0.6
13:08	6.4	8.3	400.3	344.9	51.6	0.6
13:09	6.4	8.3	397.5	344.1	51.5	0.7
13:10	6.4	8.3	396.8	348.6	51.1	0.6
13:11	6.4	8.3	394.3	346.3	50.6	0.6
13:12	6.4	8.3	396.1	347.0	50.2	0.7
13:13	6.4	8.3	393.7	348.5	50.0	0.7
13:14	6.4	8.3	396.1	349.7	50.1	0.7
13:15	6.4	8.3	395.4	354.3	50.6	0.7
13:16	6.4	8.3	390.6	356.4	51.1	0.7
13:17	6.4	8.3	391.9	356.9	50.7	0.7
13:18	6.4	8.3	392.9	359.2	50.9	0.7
13:19	6.4	8.3	393.4	359.7	50.5	0.7
13:20	6.4	8.3	393.3	358.1	51.1	0.7
13:21	6.4	8.3	393.9	360.3	51.1	0.7
13:22	6.4	8.3	395.7	359.0	50.7	0.7
13:23	6.4	8.3	392.4	361.8	49.7	0.7
13:24	6.4	8.3	394.4	361.1	49.8	0.7
13:25	6.4	8.3	393.8	360.4	50.3	0.7
13:26	6.4	8.3	392.7	360.1	50.3	0.7
13:27	6.4	8.3	395.1	357.0	50.1	0.7
13:28	6.4	8.3	386.5	360.7	50.9	0.7
13:29	6.4	8.3	391.2	358.3	51.8	0.7
13:30	6.4	8.3	389.8	360.1	51.5	0.7
13:31	6.4	8.3	393.0	355.6	51.2	0.7
13:32	6.4	8.3	394.4	361.1	50.4	0.7
13:33	6.4	8.3	396.4	360.0	49.7	0.7
13:34	6.4	8.3	390.5	361.6	49.6	0.7
13:35	6.4	8.3	395.9	359.3	49.7	0.7
13:36	6.4	8.3	397.2	355.6	49.3	0.7
13:37	6.4	8.3	396.4	355.9	48.9	0.7
13:38	6.4	8.3	395.9	360.5	49.9	0.7
13:39	6.4	8.3	394.2	349.9	49.9	0.7
13:40	6.4	8.3	393.6	354.1	50.1	0.7
13:41	6.4	8.3	389.7	356.7	49.8	0.7
13:42	6.4	8.3	397.7	354.6	49.9	0.7
13:43	6.4	8.3	394.8	352.6	49.3	0.7
13:44	6.4	8.3	393.8	352.8	49.2	0.7
13:45	6.4	8.3	396.2	351.2	49.8	0.7
13:46	6.4	8.3	391.4	349.6	49.3	0.7
13:47	6.4	8.3	390.3	351.7	49.2	0.7
13:48	6.4	8.3	391.6	349.6	49.5	0.7
13:49	6.4	8.3	389.3	352.5	49.6	0.7
13:50	6.4	8.3	391.3	351.5	49.4	0.7
13:51	6.4	8.3	398.9	346.6	49.6	0.7

Parameter	O_2 - Outlet	CO_2 - Outlet	CO - Outlet	NOx - Outlet	THC - Outlet	SO2 - Outlet
Uncorrected Run Average (C_{obs})	6.4	8.3	394.8	348.7	50.7	0.68
Cal Gas Concentration (C_{MA})	11.0	10.9	440.2	487.4	45.7	19.1
Pretest System Zero Response	0.00	0.00	-0.30	0.20	0.00	0.00
Posttest System Zero Response	0.10	0.00	0.00	1.7	0.00	0.00
Average Zero Response (Co)	0.050	0.00	-0.15	1.0	0.00	0.00
Pretest System Cal Response	10.9	10.8	441.8	488.4	45.7	18.9
Posttest System Cal Response	10.9	10.7	429.8	488.8	43.5	18.9
Average Cal Response (C_M)	10.9	10.8	435.8	488.6	44.6	18.9
Corrected Run Average (Corr)	6.4	8.3	398.8	347.5	NA	0.68

Run 2 - CEMS Data

Location: ABCWUA - Southside Water Reclamation Plant
Source: Corrales Well #4
Project No.: 2020-0005
Date: 1/8/20

Time **Unit** **Status**	**O_2 - Outlet** **% dry** Valid	**CO_2 - Outlet** **% dry** Valid	**CO - Outlet** **ppmvd** Valid	**NOx - Outlet** **ppmvd** Valid	**THC - Outlet** **ppmvw** Valid	**SO2 - Outlet** **ppmvd** Valid
14:22	6.4	8.3	387.5	352.9	53.6	0.7
14:23	6.4	8.3	385.8	355.9	53.0	0.7
14:24	6.4	8.3	387.5	356.5	51.8	0.7
14:25	6.4	8.3	386.2	360.8	50.7	0.8
14:26	6.4	8.3	392.8	360.3	51.3	0.7
14:27	6.4	8.3	395.8	355.3	49.5	0.7
14:28	6.4	8.3	394.5	362.5	50.3	0.7
14:29	6.4	8.3	390.7	359.6	50.7	0.7
14:30	6.4	8.3	392.2	356.9	50.6	0.7
14:31	6.4	8.3	395.6	360.5	51.1	0.8
14:32	6.4	8.3	390.3	358.8	51.3	0.8
14:33	6.4	8.3	395.7	360.1	51.3	0.8
14:34	6.4	8.3	391.9	360.1	51.7	0.8
14:35	6.4	8.3	396.8	363.4	51.7	0.8
14:36	6.4	8.3	391.7	357.5	50.2	0.8
14:37	6.4	8.3	392.8	355.7	49.1	0.8
14:38	6.4	8.3	388.6	356.0	49.6	0.8
14:39	6.4	8.3	388.1	358.0	50.2	0.8
14:40	6.4	8.3	388.3	361.6	50.3	0.8
14:41	6.4	8.3	393.4	364.6	50.3	0.8
14:42	6.5	8.3	390.8	359.8	51.1	0.8
14:43	6.4	8.3	391.0	359.3	51.4	0.8
14:44	6.5	8.3	394.0	360.8	51.6	0.8
14:45	6.4	8.3	394.3	361.3	52.0	0.8
14:46	6.4	8.3	394.1	363.6	51.1	0.8
14:47	6.4	8.3	390.7	364.3	51.2	0.8
14:48	6.4	8.3	388.9	365.8	51.9	0.8
14:49	6.4	8.3	391.1	363.5	51.5	0.8
14:50	6.5	8.3	398.6	362.8	51.2	0.8
14:51	6.5	8.3	395.0	360.3	51.8	0.8
14:52	6.5	8.3	391.4	359.6	51.9	0.8
14:53	6.4	8.3	394.8	365.4	51.0	0.8
14:54	6.4	8.3	398.7	362.2	50.7	0.8
14:55	6.4	8.3	397.5	361.3	51.3	0.8
14:56	6.4	8.3	391.3	361.0	50.9	0.8
14:57	6.5	8.3	393.2	362.3	51.1	0.8
14:58	6.5	8.3	391.9	357.3	51.6	0.8
14:59	6.4	8.3	391.1	362.3	51.8	0.8
15:00	6.4	8.3	396.8	363.3	52.3	0.8
15:01	6.4	8.3	392.0	368.6	52.1	0.8
15:02	6.5	8.3	388.9	362.9	51.4	0.8
15:03	6.5	8.3	392.3	364.8	51.3	0.8
15:04	6.4	8.3	389.1	366.5	51.5	0.8
15:05	6.5	8.3	387.5	368.0	51.5	0.8
15:06	6.5	8.3	393.3	362.7	52.3	0.8
15:07	6.4	8.3	388.5	367.3	52.0	0.8
15:08	6.4	8.3	391.5	365.7	52.3	0.8
15:09	6.5	8.3	393.3	362.7	51.9	0.8
15:10	6.5	8.3	392.7	363.2	52.5	0.8
15:11	6.5	8.3	391.4	364.2	52.2	0.8
15:12	6.4	8.3	393.0	362.8	52.6	0.8
15:13	6.5	8.3	395.0	367.1	51.6	0.8
15:14	6.5	8.3	388.7	366.1	51.5	0.8
15:15	6.4	8.3	393.6	366.0	51.7	0.8
15:16	6.4	8.3	395.6	367.5	51.6	0.8
15:17	6.4	8.3	395.7	367.1	51.4	0.8
15:18	6.5	8.3	392.8	367.5	51.2	0.8
15:19	6.5	8.3	388.2	365.2	51.5	0.8
15:20	6.5	8.3	388.2	362.5	52.0	0.8
15:21	6.4	8.3	394.0	364.7	52.1	0.8

Parameter	**O_2 - Outlet**	**CO_2 - Outlet**	**CO - Outlet**	**NOx - Outlet**	**THC - Outlet**	**SO2 - Outlet**
Uncorrected Run Average (C_{obs})	6.4	8.3	392.1	362.1	51.4	0.75
Cal Gas Concentration (C_{MA})	11.0	10.9	440.2	487.4	45.7	19.1
Pretest System Zero Response	0.10	0.00	0.00	1.7	0.00	0.00
Posttest System Zero Response	0.20	0.10	-1.0	1.2	0.00	0.00
Average Zero Response (Co)	0.15	0.050	-0.50	1.5	0.00	0.00
Pretest System Cal Response	10.9	10.7	429.8	488.8	43.5	18.9
Posttest System Cal Response	10.9	10.7	432.4	481.4	43.8	18.6
Average Cal Response (C_M)	10.9	10.7	431.1	485.1	43.7	18.8
Corrected Run Average (Corr)	6.4	8.4	400.4	363.5	NA	0.77

Run 3 - CEMS Data

Location: ABCWUA - Southside Water Reclamation Plant
Source: Corrales Well #4
Project No.: 2020-0005
Date: 1/8/20

Time	O_2 - Outlet	CO_2 - Outlet	CO - Outlet	NOx - Outlet	THC - Outlet	SO2 - Outlet
Unit	% dry	% dry	ppmvd	ppmvd	ppmvw	ppmvd
Status	Valid	Valid	Valid	Valid	Valid	Valid
15:42	6.5	8.3	400.5	366.4	55.9	1.2
15:43	6.4	8.3	399.0	371.0	53.2	0.9
15:44	6.4	8.3	401.2	370.7	51.6	0.8
15:45	6.4	8.3	397.9	368.5	51.1	0.8
15:46	6.5	8.3	399.4	369.2	51.2	0.8
15:47	6.4	8.3	409.2	373.0	51.6	0.8
15:48	6.4	8.3	401.5	371.4	51.9	0.8
15:49	6.4	8.3	402.9	369.6	51.6	0.8
15:50	6.4	8.3	400.4	370.3	52.0	0.8
15:51	6.4	8.3	402.9	371.4	51.8	0.8
15:52	6.5	8.3	399.8	367.6	52.5	0.8
15:53	6.5	8.3	405.5	368.9	52.5	0.8
15:54	6.4	8.3	399.7	370.9	52.3	0.8
15:55	6.5	8.3	404.4	369.3	52.3	0.8
15:56	6.4	8.3	402.1	369.9	52.7	0.8
15:57	6.4	8.3	401.8	371.6	53.3	0.8
15:58	6.5	8.3	401.8	370.7	53.0	0.8
15:59	6.4	8.3	400.4	367.5	52.7	0.8
16:00	6.4	8.3	405.4	371.1	53.2	0.8
16:01	6.4	8.3	399.3	369.4	53.9	0.8
16:02	6.4	8.3	402.1	373.2	53.4	0.8
16:03	6.4	8.3	401.8	373.9	52.5	0.8
16:04	6.4	8.3	401.1	373.1	52.5	0.8
16:05	6.4	8.3	398.3	368.5	52.5	0.8
16:06	6.4	8.3	403.1	373.1	52.2	0.8
16:07	6.4	8.3	400.7	373.9	52.0	0.8
16:08	6.4	8.3	402.0	376.5	51.5	0.9
16:09	6.5	8.3	402.4	371.6	52.1	0.8
16:10	6.4	8.3	399.6	373.7	51.9	0.8
16:11	6.5	8.3	401.9	372.6	52.0	0.8
16:12	6.4	8.3	406.2	372.0	52.8	0.8
16:13	6.5	8.3	401.1	370.8	52.8	0.8
16:14	6.4	8.3	402.7	372.5	52.5	0.8
16:15	6.5	8.3	398.0	367.4	53.0	0.8
16:16	6.4	8.3	407.0	372.9	52.9	0.8
16:17	6.5	8.3	400.6	373.6	52.8	0.8
16:18	6.4	8.3	403.3	370.9	53.1	0.8
16:19	6.4	8.3	401.4	370.1	52.8	0.8
16:20	6.4	8.3	397.0	371.4	52.4	0.8
16:21	6.4	8.3	400.6	370.1	52.6	0.8
16:22	6.4	8.3	399.1	376.5	52.4	0.8
16:23	6.5	8.3	398.9	370.3	52.1	0.8
16:24	6.5	8.3	403.6	364.1	52.3	0.8
16:25	6.5	8.3	403.6	364.7	52.6	0.8
16:26	6.4	8.3	404.5	370.1	53.5	0.8
16:27	6.4	8.3	398.8	369.9	53.3	0.8
16:28	6.4	8.3	398.6	370.2	52.9	0.8
16:29	6.4	8.3	403.6	371.8	52.6	0.8
16:30	6.5	8.3	404.1	364.8	52.8	0.8
16:31	6.4	8.3	407.2	366.4	52.9	0.8
16:32	6.4	8.3	404.5	366.1	53.0	0.8
16:33	6.4	8.3	406.9	373.7	53.7	0.8
16:34	6.4	8.3	402.5	366.9	53.1	0.8
16:35	6.5	8.3	402.2	370.7	53.9	0.8
16:36	6.4	8.3	400.8	364.9	53.6	0.8
16:37	6.5	8.3	406.5	365.9	53.0	0.8
16:38	6.5	8.3	402.4	367.7	53.1	0.8
16:39	6.4	8.3	401.2	374.0	53.3	0.8
16:40	6.4	8.3	401.9	366.5	57.3	0.8
16:41	6.4	8.3	398.6	366.4	60.2	0.8

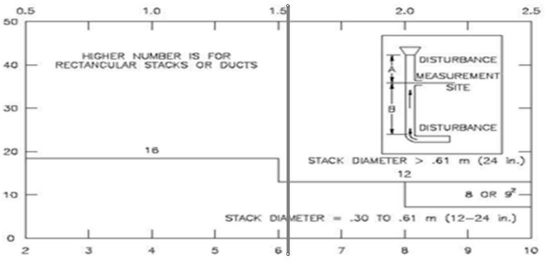
Parameter	O_2 - Outlet	CO_2 - Outlet	CO - Outlet	NOx - Outlet	THC - Outlet	SO2 - Outlet
Uncorrected Run Average (C_{obs})	6.4	8.3	401.9	370.2	52.9	0.82
Cal Gas Concentration (C_{MA})	11.0	10.9	440.2	487.4	45.7	19.1
Pretest System Zero Response	0.20	0.10	-1.0	1.2	0.00	0.00
Posttest System Zero Response	0.20	0.10	-1.0	1.2	0.00	0.00
Average Zero Response (Co)	0.20	0.10	-1.0	1.2	0.00	0.00
Pretest System Cal Response	10.9	10.7	432.4	481.4	43.8	18.6
Posttest System Cal Response	10.9	10.7	433.0	476.7	43.4	18.6
Average Cal Response (C_M)	10.9	10.7	432.7	479.1	43.6	18.6
Corrected Run Average (Corr)	6.4	8.4	409.0	376.4	NA	0.84

Method 1 Data

Location Albuquerque Bernalillo County Water Utility - Southside Water Reclamation Plant
Source Corrales Well 4
Project No. 2020-0005
Date: 01/08/20

Stack Parameters

Duct Orientation: Vertical
Duct Design: Circular
Distance from Far Wall to Outside of Port: 14.50 in
Nipple Length: 4.75 in
Depth of Duct: 9.75 in
Cross Sectional Area of Duct: 0.52 ft^2
No. of Test Ports: 2
Distance A: 5.0 ft
Distance A Duct Diameters: 6.2 (must be > 0.5)
Distance B: 5.0 ft
Distance B Duct Diameters: 6.2 (must be > 2)
Minimum Number of Traverse Points: 12
Actual Number of Traverse Points: 16



CIRCULAR DUCT

LOCATION OF TRAVERSE POINTS

Number of traverse points on a diameter

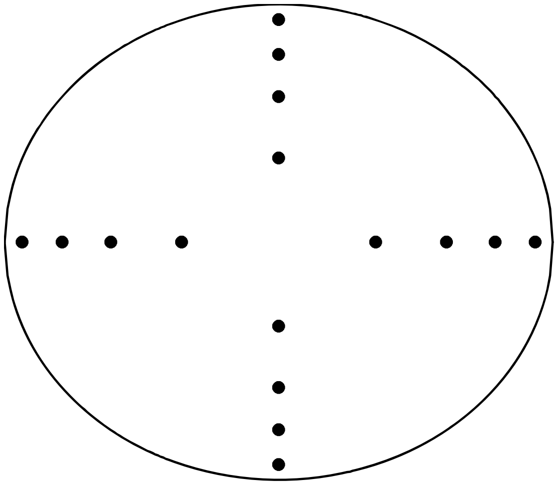
	2	3	4	5	6	7	8	9	10	11	12
1	14.6	--	6.7	--	4.4	--	3.2	--	2.6	--	2.1
2	85.4	--	25.0	--	14.6	--	10.5	--	8.2	--	6.7
3	--	--	75.0	--	29.6	--	19.4	--	14.6	--	11.8
4	--	--	93.3	--	70.4	--	32.3	--	22.6	--	17.7
5	--	--	--	--	85.4	--	67.7	--	34.2	--	25.0
6	--	--	--	--	95.6	--	80.6	--	65.8	--	35.6
7	--	--	--	--	--	--	89.5	--	77.4	--	64.4
8	--	--	--	--	--	--	96.8	--	85.4	--	75.0
9	--	--	--	--	--	--	--	--	91.8	--	82.3
10	--	--	--	--	--	--	--	--	97.4	--	88.2
11	--	--	--	--	--	--	--	--	--	--	93.3
12	--	--	--	--	--	--	--	--	--	--	97.9

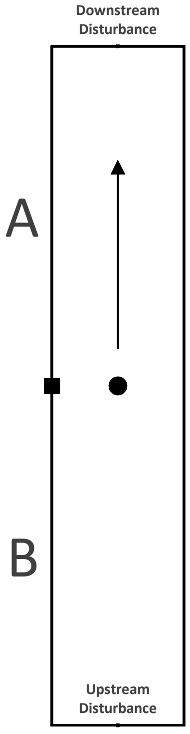
**Percent of stack diameter from inside wall to traverse point.*

Traverse Point	% of Diameter	Distance from inside wall	Distance from outside of port
1	3.2	0.50	5.25
2	10.5	1.02	5.77
3	19.4	1.89	6.64
4	32.3	3.15	7.90
5	67.7	6.60	11.35
6	80.6	7.86	12.61
7	89.5	8.73	13.48
8	96.8	9.25	14.00
9	--	--	--
10	--	--	--
11	--	--	--
12	--	--	--

Stack Diagram
A = 5 ft.
B = 5 ft.
Depth of Duct = 9.75 in.

Cross Sectional Area





Cyclonic Flow Check

Location Albuquerque Bernalillo County Water Utility - Southside Water Reclamation Plant
Source Corrales Well 4
Project No. 2020-0005
Date 1/8/20

Sample Point	Angle ($\Delta P=0$)
1	2
2	0
3	3
4	1
5	1
6	4
7	2
8	3
9	2
10	2
11	1
12	4
13	3
14	0
15	2
16	1
Average	1.9

Location Albuquerque Bernalillo County Water Utility - Southside Water Reclamation Plant
Source Corrales Well 4
Project No. 2020-0005

Run No.	**1**	**2**	**3**
Date	1/8/20	1/8/20	1/8/20
Status	VALID	VALID	VALID
Start Time	12:52	14:30	14:55
Stop Time	13:01	14:44	15:07
Leak Check	Pass	Pass	Pass

Traverse Point	**Δ P (in. WC)**	**Ts (°F)**	**Δ P (in. WC)**	**Ts (°F)**	**Δ P (in. WC)**	**Ts (°F)**
A-1	0.50	655	0.53	656	0.55	648
2	0.53	656	0.54	657	0.56	649
3	0.55	656	0.55	656	0.58	649
4	0.54	657	0.55	655	0.56	648
5	0.52	657	0.56	655	0.55	647
6	0.52	656	0.57	656	0.54	647
7	0.53	656	0.55	655	0.53	648
8	0.50	656	0.53	654	0.56	648
B-1	0.54	657	0.53	654	0.54	649
2	0.54	657	0.56	654	0.57	650
3	0.53	658	0.58	654	0.58	650
4	0.58	658	0.59	653	0.59	650
5	0.59	658	0.60	653	0.61	650
6	0.62	658	0.61	652	0.62	651
7	0.63	659	0.57	652	0.60	650
8	0.60	658	0.58	653	0.58	650

					Average
Square Root of ΔP, (in. WC)$^{1/2}$	**(ΔP)$^{1/2}$**	0.55	0.56	0.56	0.56
Average ΔP, in. WC	**(ΔP)**	0.55	0.56	0.57	0.56
Pitot Tube Coefficient	**(Cp)**	0.81	0.81	0.81	0.81
Barometric Pressure, in. Hg	**(Pb)**	25	25	25	25
Static Pressure, in. WC	**(Pg)**	0.49	0.49	0.49	0.49
Stack Pressure, in. Hg	**(Ps)**	25.0	25.0	25.0	25.0
Average Temperature, °F	**(Ts)**	657.0	654.3	649.0	653.4
Average Temperature, °R	**(Ts)**	1117.0	1114.3	1109.0	1113.4
Measured Moisture Fraction	**(BWSmsd)**	0.136	0.137	0.138	0.137
Moisture Fraction @ Saturation	**(BWSsat)**	160.7	158.1	152.9	157.2
Moisture Fraction	**(BWS)**	0.136	0.137	0.138	0.137
O2 Concentration, %	**(O2)**	6.4	6.4	6.4	6.4
CO2 Concentration, %	**(CO2)**	8.3	8.4	8.4	8.4
Molecuar Weight, lb/lb-mole (dry)	**(Md)**	29.6	29.6	29.6	29.6
Molecuar Weight, lb/lb-mole (wet)	**(Ms)**	28.0	28.0	28.0	28.0
Velocity, ft/sec	**(Vs)**	48.7	49.4	49.5	49.2
VFR at stack conditions, acfm	**(Qa)**	1,515	1,536	1,541	1,530
VFR at standard conditions, scfh	**(Qsw)**	35,832	36,426	36,706	36,321
VFR at standard conditions, scfm	**(Qsw)**	597	607	612	605
VFR at standard conditions, dscfm	**(Qsd)**	516	524	528	522

Location Albuquerque Bernalillo County Water Utility - Southside Water Reclamation Pla
Source Corrales Well 4
Project No. 2020-0005
Parameter(s): VFR
Console Type Meter Box

Run No.		1					2					3				
Date		1/8/20					1/8/20					1/8/20				
Status		VALID					VALID					VALID				
Start Time		12:52					14:22					15:42				
End Time		13:52					15:22					16:42				
Run Time, min	**(θ)**	60					60					60				
Meter ID		M5-17					M5-17					M5-17				
Meter Correction Factor	**(Y)**	1.000					1.000					1.000				
Orifice Calibration Value	**(ΔH @)**	1.570					1.570					1.570				
Max Vacuum, in. Hg		3					3					3				
Post Leak Check, ft3/min (at max vac.)		0.000					0.000					0.000				
Meter Volume, ft3																
0		884.001					922.613					961.683				
5		887.200					925.900					964.900				
10		890.500					929.100					968.000				
15		893.800					932.300					971.200				
20		896.900					935.600					974.400				
25		900.200					938.800					977.600				
30		903.300					942.000					980.700				
35		906.400					945.300					983.900				
40		909.800					948.500					987.100				
45		912.800					951.700					990.300				
50		915.800					955.000					993.400				
55		918.900					958.200					996.600				
60		922.544					961.455					999.792				
Total Meter Volume, ft3	**(Vm)**	38.543					38.842					38.109				
Temperature, °F		**Meter**	**Probe**	**Filter**	**Vacuum**	**Imp. Exit**	**Meter**	**Probe**	**Filter**	**Vacuum**	**Imp. Exit**	**Meter**	**Probe**	**Filter**	**Vacuum**	**Imp. Exit**
0		47	N/A	N/A	3	46	51	N/A	N/A	3	51	54	N/A	N/A	3	51
5		47	N/A	N/A	3	47	51	N/A	N/A	3	51	54	N/A	N/A	3	51
10		48	N/A	N/A	3	47	52	N/A	N/A	3	52	54	N/A	N/A	3	52
15		48	N/A	N/A	3	49	52	N/A	N/A	3	52	54	N/A	N/A	3	52
20		49	N/A	N/A	3	50	52	N/A	N/A	3	52	54	N/A	N/A	3	53
25		50	N/A	N/A	3	51	53	N/A	N/A	3	52	55	N/A	N/A	3	53
30		51	N/A	N/A	3	51	53	N/A	N/A	3	52	55	N/A	N/A	3	53
35		51	N/A	N/A	3	50	53	N/A	N/A	3	53	55	N/A	N/A	3	54
40		52	N/A	N/A	3	48	54	N/A	N/A	3	53	55	N/A	N/A	3	54
45		52	N/A	N/A	3	48	54	N/A	N/A	3	53	55	N/A	N/A	3	55
50		52	N/A	N/A	3	46	54	N/A	N/A	3	53	56	N/A	N/A	3	55
55		53	N/A	N/A	3	45	55	N/A	N/A	3	53	56	N/A	N/A	3	55
60		54	N/A	N/A	3	44	55	N/A	N/A	3	53	56	N/A	N/A	3	55
Average Temperature, °F	**(Tm)**	50	--	--	--	--	53	--	--	--	--	55	--	--	--	--
Average Temperature, °R	**(Tm)**	510	--	--	--	--	513	--	--	--	--	515	--	--	--	--
Minimum Temperature, °F		47	--	--	--	--	51	--	--	--	--	54	--	--	--	--
Maximum Temperature, °F		54	--	--	--	51	55	--	--	--	53	56	--	--	--	55
Barometeric Pressure, in. Hg	**(Pb)**	24.92					24.92					24.92				
Meter Orifice Pressure , in. WC	**(ΔH)**	1.000					1.000					1.000				
Meter Pressure, in. Hg	**(Pm)**	24.99					24.99					24.99				
Standard Meter Volume, ft3	**(Vmstd)**	33.332					33.415					32.666				
Analysis Type		Gravimetric					Gravimetric					Gravimetric				
Impinger 1, Pre/Post Test, mL		H2O		454.9	545.0	90.1	H2O		481.2	525.2	44.0	H2O		525.7	516.4	-9.3
Impinger 2, Pre/Post Test, mL		H2O		479.9	486.4	6.5	H2O		486.4	548.1	61.7	H2O		548.1	551.9	3.8
Impinger 3, Pre/Post Test, mL		Empty		301.1	309.9	8.8	Empty		300.9	302.3	1.4	Empty		300.2	408.1	107.9
Impinger 4, Pre/Post Test, g		Silica		540.2	546.0	5.8	Silica		546.0	551.7	5.7	Silica		551.7	559.8	8.1
Volume Water Collected, mL	**(Vlc)**	111.2					112.8					110.5				
Standard Water Volume, ft^3	**(Vwstd)**	5.243					5.319					5.210				
Moisture Fraction Measured	**(BWS)**	0.136					0.137					0.138				
Gas Molecular Weight, lb/lb-mole (dry)	**(Md)**	29.58					29.60					--				
DGM Calibration Check Value	**(Yqa)**	0.8					1.3					#VALUE!				

Appendix C

Alliance Source Testing, LLC
Lab Services
5530 Marshall St.
Arvada, CO 80002
(720) 457-9504
www.stacktest.com

Analytical Laboratory Report

Albuquerque Bernalillo County Water Utility Authority
4201 2nd Street SW
Albuquerque, New Mexico 87105

Project No. 2019-20-0005

Version No. LT 2018-00_18.1

Certification Statement

Alliance Source Testing, LLC (AST) has completed the analysis as described in this report. Results apply only to the source(s) tested and operating condition(s) for the specific test date(s) and time(s) identified within this report. All results are intended to be considered in their entirety, and AST is not responsible for use of less than the complete test report without written consent. This report shall not be reproduced in full or in part without written approval from the customer.

To the best of my knowledge and abilities, all information, facts and test data are correct. Data presented in this report has been checked for completeness and is accurate, error-free and legible. Any deviations or problems are detailed in the relevant sections on the test report.

This document was prepared in portable document format (.pdf) and contains pages as identified in the bottom footer of this document.

Validation Signature

The analytical data and all QC contained within this report was reviewed and validated by the following individual.

James Davidson

James Davidson
Laboratory Manager

1/23/20
Date

Project Narrative

Analytical Method(s): ASTM D1945 Standard Test Method for Analysis of Natural Gas by Gas Chromatography

Custody: The samples were received by James Davidson on 1/14/20 in Arvada, CO. The samples were received in good condition with proper Chain-of-Custody documentation. No apparent container problems were noted upon receipt. Prior to analysis, the samples were kept secure with access limited to authorized personnel of AST.

Number of Samples: 4

Labeling: Acceptable

Analyst: James Davidson - Laboratory Manager

Equipment: Agilent 7890B GC, SN: CN15533043

QC Notes: The samples met the minimum criteria established by the relevant method.

Reporting Notes: Only primary samples were analyzed for runs that had duplicates.

Alliance SOURCE TESTING

5530 Marshall Street
Arvada, Colorado 80002
Phone: 303-420-5949
Fax: 303-420-5920

Certificate of Analysis
Analysis By Gas Chromatography

Company	Albuquerque Water		
		Study Number..............	20-0005
Unit..................................	**Digestor Gas Unit 27**		
Date Sampled...............	12/12/2012	Date Analyzed	1/21/20 10:39 AM
Sample Name..................	**Digestor Gas Unit 27**		
Sample Location..............	NA		
Sample Pressure..............	NA	Sample Temp..............	NA
Test Method...............	ASTM D1945	Sample Method..........	RGA
Method of Analysis....	GC-TCD/FID	Container....................	N/A
Instrument..................	Agilent 7890 GC		

Components	Normalized Mole%
C6+..	0.0000
Propane..	0.0000
Propylene..	0.0000
Isobutane..	0.0000
Propadiene..	0.0000
n-Butane..	0.0000
1 - Butene..	0.0000
Isobutylene...	0.0000
trans-2-Butene..	0.0000
cis-2-Butene..	0.0000
1,3-Butadiene...	0.0000
Isopentane..	0.0000
n-Pentane..	0.0000
Helium..	0.0000
Hydrogen...	0.0000
Carbon Dioxide...	26.5267
Ethylene..	0.0000
Ethane..	0.0000
Acetylene..	0.0000
Hydrogen Sulfide...	0.0000
Oxygen...	5.9056
Nitrogen..	18.2974
Methane..	49.2703
Carbon Monoxide...	0.0000
Cyclopropane...	0.0000
Methylacetylene..	0.0000
Neopentane..	0.0000
TOTAL	100.0000

Molecular Weight (gm/gm-mol)	26.59
Heat Content (Btu/scf)	497.63
Heat Content (Btu/lb)	7,099
F Factor (dscf/MMBtu)	9,059

5530 Marshall Street
Arvada, Colorado 80002
Phone: 303-420-5949
Fax: 303-420-5920

Certificate of Analysis
Analysis By Gas Chromatography

Company ……………………	Albuquerque Water		
		Study Number…………..	20-0005
Unit…………………………….	**Digestor Gas Unit 27 Duplicate**		
Date Sampled…………….	12/12/2012	Date Analyzed …………..	1/21/20 11:03 AM
Sample Name………………	**Digestor Gas Unit 27 Duplicate**		
Sample Location…………..	NA		
Sample Pressure…………..	NA	Sample Temp…………..	NA
Test Method……………	ASTM D1945	Sample Method……….	RGA
Method of Analysis….	GC-TCD/FID	Container………………..	N/A
Instrument………………	Agilent 7890 GC		

Components	Normalized Mole%
C6+……………………………………………………………………	0.0000
Propane……………………………………………………………	0.0000
Propylene…………………………………………………………	0.0000
Isobutane…………………………………………………………	0.0000
Propadiene………………………………………………………	0.0000
n-Butane……………………………………………………………	0.0000
1 - Butene…………………………………………………………	0.0000
Isobutylene………………………………………………………	0.0000
trans-2-Butene…………………………………………………	0.0000
cis-2-Butene………………………………………………………	0.0000
1,3-Butadiene……………………………………………………	0.0000
Isopentane…………………………………………………………	0.0000
n-Pentane…………………………………………………………	0.0000
Helium………………………………………………………………	0.0000
Hydrogen……………………………………………………………	0.0000
Carbon Dioxide…………………………………………………	26.5829
Ethylene……………………………………………………………	0.0000
Ethane………………………………………………………………	0.0000
Acetylene…………………………………………………………	0.0000
Hydrogen Sulfide………………………………………………	0.0000
Oxygen………………………………………………………………	5.9323
Nitrogen……………………………………………………………	18.3965
Methane……………………………………………………………	49.0883
Carbon Monoxide………………………………………	0.0000
Cyclopropane……………………………………………………	0.0000
Methylacetylene………………………………………………	0.0000
Neopentane………………………………………………………	0.0000
TOTAL	100.0000

Molecular Weight (gm/gm-mol)	26.63
Heat Content (Btu/scf)	495.79
Heat Content (Btu/lb)	7,065
F Factor (dscf/MMBtu)	9,062

Alliance
SOURCE TESTING

5530 Marshall Street
Arvada, Colorado 80002
Phone: 303-420-5949
Fax: 303-420-5920

Certificate of Analysis
Analysis By Gas Chromatography

Company .... Albuquerque Water
Study Number.............. 20-0005

Unit.................................. **Digestor Gas Unit 28**
Date Sampled................ 12/12/2012
Date Analyzed .... 1/21/20 11:46 AM
Sample Name.................. **Digestor Gas Unit 28**

Sample Location.............. NA
Sample Pressure.............. NA
Sample Temp.............. NA
Test Method................ ASTM D1945
Sample Method........... RGA
Method of Analysis.... GC-TCD/FID
Container.................... N/A
Instrument.................. Agilent 7890 GC

Components	Normalized Mole%
C6+..	0.0000
Propane..	0.0000
Propylene..	0.0000
Isobutane..	0.0000
Propadiene..	0.0000
n-Butane..	0.0000
1 - Butene..	0.0000
Isobutylene..	0.0000
trans-2-Butene..	0.0000
cis-2-Butene..	0.0000
1,3-Butadiene..	0.0000
Isopentane..	0.0000
n-Pentane..	0.0000
Helium..	0.0000
Hydrogen...	0.0000
Carbon Dioxide..	27.3875
Ethylene...	0.0000
Ethane..	0.0000
Acetylene...	0.0000
Hydrogen Sulfide...	0.0000
Oxygen...	5.1644
Nitrogen...	15.7477
Methane...	51.7004
Carbon Monoxide...	0.0000
Cyclopropane..	0.0000
Methylacetylene..	0.0000
Neopentane...	0.0000
TOTAL	100.0000

Molecular Weight (gm/gm-mol)	26.41
Heat Content (Btu/scf)	522.17
Heat Content (Btu/lb)	7,501
F Factor (dscf/MMBtu)	9,059

Alliance
SOURCE TESTING

5530 Marshall Street
Arvada, Colorado 80002
Phone: 303-420-5949
Fax: 303-420-5920

Certificate of Analysis
Analysis By Gas Chromatography

Company .... Albuquerque Water

Study Number.............. 20-0005

Unit.................................. **Digestor Gas Unit 30 1/12**
Date Sampled................ 12/12/2012
Sample Name.................. **Digestor Gas Unit 30 1/12**

Date Analyzed .... 1/21/20 1:17 PM

Sample Location.............. NA
Sample Pressure.............. NA
Test Method................ ASTM D1945
Method of Analysis.... GC-TCD/FID
Instrument.................. Agilent 7890 GC

Sample Temp.............. NA
Sample Method.......... RGA
Container.................... N/A

Components	Normalized Mole%
C6+..	0.0000
Propane..	0.0000
Propylene...	0.0000
Isobutane...	0.0000
Propadiene...	0.0000
n-Butane...	0.0000
1 - Butene..	0.0000
Isobutylene..	0.0000
trans-2-Butene...	0.0000
cis-2-Butene...	0.0000
1,3-Butadiene...	0.0000
Isopentane...	0.0000
n-Pentane...	0.0000
Helium..	0.0000
Hydrogen...	0.0000
Carbon Dioxide..	20.8966
Ethylene...	0.0000
Ethane..	0.0000
Acetylene...	0.0000
Hydrogen Sulfide..	0.0000
Oxygen...	9.8837
Nitrogen...	32.9442
Methane...	36.2755
Carbon Monoxide..	0.0000
Cyclopropane..	0.0000
Methylacetylene..	0.0000
Neopentane...	0.0000
TOTAL	100.0000

Molecular Weight (gm/gm-mol)	27.41
Heat Content (Btu/scf)	366.38
Heat Content (Btu/lb)	5,072
F Factor (dscf/MMBtu)	9,058

Alliance
SOURCE TESTING

5530 Marshall Street
Arvada, Colorado 80002
Phone: 303-420-5949
Fax: 303-420-5920

Certificate of Analysis
Analysis By Gas Chromatography

Company .... Albuquerque Water

Study Number.............. 20-0005

Unit.................................. **Digestor Gas Unit 30 1/13**
Date Sampled............... 12/12/2012
Date Analyzed .... 1/21/20 2:28 PM
Sample Name.................. **Digestor Gas Unit 30 1/13**

Sample Location.............. NA
Sample Pressure.............. NA
Sample Temp.............. NA
Test Method............... ASTM D1945
Sample Method.......... RGA
Method of Analysis.... GC-TCD/FID
Container.................... N/A
Instrument.................. Agilent 7890 GC

Components	Normalized Mole%
C6+...	0.0000
Propane..	0.0000
Propylene..	0.0000
Isobutane...	0.0000
Propadiene...	0.0000
n-Butane...	0.0000
1 - Butene...	0.0000
Isobutylene..	0.0000
trans-2-Butene...	0.0000
cis-2-Butene...	0.0000
1,3-Butadiene...	0.0000
Isopentane...	0.0000
n-Pentane...	0.0000
Helium..	0.0000
Hydrogen...	0.0000
Carbon Dioxide..	33.3313
Ethylene...	0.0000
Ethane..	0.0000
Acetylene...	0.0000
Hydrogen Sulfide...	0.0000
Oxygen...	0.7706
Nitrogen...	1.5921
Methane...	64.3060
Carbon Monoxide...	0.0000
Cyclopropane...	0.0000
Methylacetylene..	0.0000
Neopentane...	0.0000
TOTAL	100.0000

Molecular Weight (gm/gm-mol)	25.68
Heat Content (Btu/scf)	649.49
Heat Content (Btu/lb)	9,596
F Factor (dscf/MMBtu)	9,100

Alliance SOURCE TESTING

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Arvada, Colorado 80002
Phone: 303-420-5949
Fax: 303-420-5920

Certificate of Analysis
Analysis By Gas Chromatography

Company .... Albuquerque Water

Study Number.............. 20-0005

Unit.................................. NA
Date Sampled................ 12/12/2012
Date Analyzed .... 1/21/20 3:13 PM
Sample Name.................. **RRD005175**

Sample Location.............. NA
Sample Pressure.............. NA
Sample Temp.............. NA
Test Method................ ASTM D1945
Sample Method.......... RGA
Method of Analysis.... GC-TCD/FID
Container.................... N/A
Instrument.................. Agilent 7890 GC

Components	Normalized Mole%	Certified Mole%
C6+	0.5009	0.500
Propane	6.7496	6.801
Propylene	0.0000	
Isobutane	0.6935	0.6980
Propadiene	0.0000	
n-Butane	2.3027	2.300
1 - Butene	0.0000	
Isobutylene	0.0000	
trans-2-Butene	0.0000	
cis-2-Butene	0.0000	
1,3-Butadiene	0.0000	
Isopentane	0.3972	0.400
n-Pentane	0.6006	0.600
Helium	0.0000	
Hydrogen	0.0724	
Carbon Dioxide	2.5347	2.398
Ethylene	0.0000	
Ethane	9.6807	9.702
Acetylene	0.0000	
Hydrogen Sulfide	0.0000	
Oxygen	0.1100	0.100
Nitrogen	0.4578	0.506
Methane	75.8999	75.995
Carbon Monoxide	0.0000	
Cyclopropane	0.0000	
Methylacetylene	0.0000	
Neopentane	0.0000	
TOTAL	100.0000	

Molecular Weight (gm/gm-mol)	22.24
Heat Content (Btu/scf)	1269.39
Heat Content (Btu/lb)	21,658
F Factor (dscf/MMBtu)	8,730

AGP Cal Gas #2

ACCURATE
GAS
PRODUCTS, L.L.C.

OFFICE (337) 269-1217
FAX (337) 269-1978

CERTIFICATE OF ANALYSIS

ALLIANCE SOURCE TESTING
5530 MARSHALL ST.
ATTN: MIKE PEARSON
ARVADA, CO 80002

DATE: 9/12/19
INVOICE NO: 11989
PO NUMBER: OGLAB082719
QC NUMBER: 091219-4
SHIP VIA: FEDEX

CYL. NO	COMPONENT	REQUESTED MOLE %	ACTUAL MOLE %
RRD005175	NITROGEN	0.50%	0.506%
	OXYGEN	0.10%	0.100%
	METHANE	BALANCE	75.995%
	CARBON DIOXIDE	2.40%	2.398%
	ETHANE	9.70%	9.702%
	PROPANE	6.80%	6.801%
	ISOBUTANE	0.70%	0.698%
	N BUTANE	2.30%	2.300%
	ISOPENTANE	0.40%	0.400%
	N-PENTANE	0.60%	0.600%
	HEXANES+AGPSVI	0.50%	0.500%

74 PSIA CGA-510
1 YEAR SHELF LIFE

Erich

ERICH HOFMEISTER-ANALYST

CHRIS SHADLE-QC MANAGER

THE ABOVE CERTIFIED STANDARD WAS MANUFACTURED USING BALANCES TESTED AND ADJUSTED FOR ACCURACY, PRECISION, AND SENSITIVITY WITH N.I.S.T. TRACEABLE WEIGHTS. THE CALIBRATION PROCEDURE FOLLOWED IS OUTLINED IN PBS REVISION 1 ACCORDING TO MLD STD 5-662A, NIST TEST NUMBER 822/278785-10. TESTED 5/19. THIS STANDARD IS CERTIFIED TO BE WITHIN +/-2 MOLE% OF THE NUMBER REPORTED RELATIVE TO THE COMPONENT, AND WITH A GRAVIMETRIC UNCERTAINTY OF +/- 1%

P.O. BOX 65 BROUSSARD, LA. 70518-0065
116 BOARD ROAD LAFAYETTE, LA. 70508

CHAIN OF CUSTODY RECORD

Temperature on Receipt ________

Alliance Source Testing
5530 MARSHALL ST.
ARVADA, CO 80002
T: (303) 420-5949
F: (303) 420-5920

PROJECT CODE 20-0005D
PROJECT MANAGER KMM
CHAIN OF CUSTODY #
CLIENT NAME Albuquerque Water Authority
TELEPHONE # / FAX #
ADDRESS
DATE 1/14/20
Page ______ **of** ______
CONTRACT/PURCHASE/QUOTE #
STATE
CITY
ZIP CODE
SITE CONTACT
LAB CONTACT
LAB NUMBER
CARRIER / WAYBILL #

SAMPLE I.D.	RUN	FILTER/BEAKER ID	DATE COLLECTED	MATRIX	ANALYSIS	SPECIAL CONDITIONS
Digestor gas unit ~~[illegible]~~ 27					ASTM D1945	
Digestor gas Backup Unit 27						
28						
28						
30 1/12 ~~29~~						
30 1/12 ~~29~~						
1/13 30						
1/13 30						

POSSIBLE HAZARD IDENTIFICATION: (CIRCLE)
NON HAZARD FLAMMABLE SKIN IRRITANT POISON B UNKNOWN

SAMPLE DISPOSAL: (CIRCLE)
RETURN TO CLIENT DISPOSAL BY LAB ARCHIVE FOR ______ MONTHS

TURN AROUND TIME: (CIRCLE)
24HRS 48HRS 7 DAYS 14 DAYS 21DAYS OTHER______

	Date	Time		Date	Time
1. Relinquished By	1/14/20	16:30	1. Received By	1/14	
2. Relinquished By			2. Received By		
3. Relinquished By			3. Received By		

Comments:

Appendix D

QA Data

Location ABCWUA - Southside Water Reclamation Plant
Source Unit 27
Project No. 2020-0005

Parameter	O_2 - Outlet	CO_2 - Outlet	CO - Outlet	NOx - Outlet	THC - Outlet	SO_2 - Outlet
Make	Servomex	Servomex	Thermo	Thermo	Thermo	Thermo
Model	1440	1440	48C	42i-HL	55i-3	43C-3
S/N	1420C/2767	1415C/2767	48C-64905-345	1129850114	1209052113	43C-70673-366
Operating Range	0-25	0-25	0-1000	0-2000	0-100	0-50
Cylinder ID						
Low	NA	NA	NA	NA	ALM058337	NA
Mid	EB0082456	EB0082456	SG9107488BAL	CC496889	SX63171	CC53917
High	SX25695	SX25695	CC142863	ALM044259	CC10068	CC166

Calibration Data

Location: ABCWUA - Southside Water Reclamation Plant
Source: Unit 27
Project No.: 2020-0005
Date: 1/11/20

Parameter	**O_2 - Outlet**	**CO_2 - Outlet**	**CO - Outlet**	**NOx - Outlet**	**THC - Outlet**	**SO_2 - Outlet**
Expected Average Concentration	12.0	7.0	400.0	100.0	50.0	10.0
Span Between						
Low	12.0	7.0	400.0	100.0	75.0	10.0
High	60.0	35.0	2,000.0	500.0	125.0	50.0
Desired Span	23.0	22.6	914.0	1,012.0	100.0	40.4
Low Range Gas						
Low	NA	NA	NA	NA	25.0	NA
High	NA	NA	NA	NA	35.0	NA
Mid Range Gas						
Low	9.2	9.0	365.6	404.8	45.0	16.2
High	13.8	13.6	548.4	607.2	55.0	24.2
High Range Gas						
Low	NA	NA	NA	NA	80.0	NA
High	NA	NA	NA	NA	90.0	NA
Actual Concentration (% or ppm)						
Zero	0.0	0.0	0.0	0.0	0.0	0.0
Low	NA	NA	NA	NA	29.9	NA
Mid	10.9	10.9	440.2	487.4	45.7	19.1
High	23.0	22.6	914.0	1,012.0	85.8	40.4
Response Time (seconds)	25.0	25.0	30.0	35.0	50.0	45.0
Instrument Response (% or ppm)						
Zero	0.0	0.0	0.0	0.2	0.0	0.0
Low	NA	NA	NA	NA	30.1	NA
Mid	10.9	10.7	443.1	486.3	46.0	19.2
High	23.0	22.6	917.2	1,012.8	87.7	40.3
Performance (% of Span or Cal. Gas Conc.)						
Zero	0.0	0.0	0.0	0.0	0.0	0.0
Low	NA	NA	NA	NA	0.7	NA
Mid	0.1	0.7	0.3	0.1	0.6	0.2
High	0.0	0.0	0.4	0.1	2.2	0.2
Status						
Zero	PASS	PASS	PASS	PASS	PASS	PASS
Low	NA	NA	NA	NA	PASS	NA
Mid	PASS	PASS	PASS	PASS	PASS	PASS
High	PASS	PASS	PASS	PASS	PASS	PASS

Bias/Drift Determinations

Location: ABCWUA - Southside Water Reclamation Plant
Source: Unit 27
Project No.: 2020-0005

Parameter	O_2 - Outlet	CO_2 - Outlet	CO - Outlet	NOx - Outlet	THC - Outlet	SO_2 - Outlet
Run 1 Date 1/11/20						
Span Value	23.0	22.6	914.0	1,012.0	100.0	40.4
Instrument Zero Cal Response	0.0	0.0	0.0	0.2	0.0	0.0
Instrument Mid Cal Response	10.9	10.7	443.1	486.3	46.0	19.2
Pretest System Zero Response	0.0	0.0	0.0	0.7	0.0	0.0
Posttest System Zero Response	0.1	0.0	0.5	0.7	0.0	0.0
Pretest System Mid Response	10.9	10.7	437.0	486.4	46.0	19.1
Posttest System Mid Response	10.9	10.7	442.5	492.1	46.5	18.9
Bias (%)						
Pretest Zero	0.0	0.0	0.0	0.0	NA	0.0
Posttest Zero	0.4	0.0	0.1	0.0	NA	0.0
Pretest Span	0.0	0.0	0.7	0.0	NA	0.2
Posttest Span	0.0	0.0	0.1	0.6	NA	0.7
Drift (%)						
Zero	0.4	0.0	0.1	0.0	0.0	0.0
Mid	0.0	0.0	0.6	0.6	0.5	0.5
Run 2 Date 1/11/20						
Span Value	23.0	22.6	914.0	1,012.0	100.0	40.4
Instrument Zero Cal Response	0.0	0.0	0.0	0.2	0.0	0.0
Instrument Mid Cal Response	10.9	10.7	443.1	486.3	46.0	19.2
Pretest System Zero Response	0.1	0.0	0.5	0.7	0.0	0.0
Posttest System Zero Response	0.1	0.0	0.0	0.7	0.0	0.0
Pretest System Mid Response	10.9	10.7	442.5	492.1	46.5	18.9
Posttest System Mid Response	11.0	10.7	424.4	493.7	46.4	18.9
Bias (%)						
Pretest Zero	0.4	0.0	0.1	0.0	NA	0.0
Posttest Zero	0.4	0.0	0.0	0.0	NA	0.0
Pretest Span	0.0	0.0	0.1	0.6	NA	0.7
Posttest Span	0.4	0.0	2.0	0.7	NA	0.7
Drift (%)						
Zero	0.0	0.0	0.1	0.0	0.0	0.0
Mid	0.4	0.0	2.0	0.2	0.1	0.0
Run 3 Date 1/11/20						
Span Value	23.0	22.6	914.0	1,012.0	100.0	40.4
Instrument Zero Cal Response	0.0	0.0	0.0	0.2	0.0	0.0
Instrument Mid Cal Response	10.9	10.7	443.1	486.3	46.0	19.2
Pretest System Zero Response	0.1	0.0	0.0	0.7	0.0	0.0
Posttest System Zero Response	0.2	0.0	0.0	0.7	0.0	0.0
Pretest System Mid Response	11.0	10.7	424.4	493.7	46.4	18.9
Posttest System Mid Response	11.0	10.7	425.8	493.4	46.0	18.9
Bias (%)						
Pretest Zero	0.4	0.0	0.0	0.0	NA	0.0
Posttest Zero	0.9	0.2	0.0	0.0	NA	0.0
Pretest Span	0.4	0.0	2.0	0.7	NA	0.7
Posttest Span	0.4	0.0	1.9	0.7	NA	0.8
Drift (%)						
Zero	0.4	0.2	0.0	0.0	0.0	0.0
Mid	0.0	0.0	0.2	0.0	0.4	0.0

QA Data

Location ABCWUA- Southside Water Reclamation Plant
Source Unit 27 (digestor)
Project No. 2020-0005

Parameter	O_2 - Outlet	CO_2 - Outlet	CO - Outlet	NOx - Outlet	THC - Outlet	SO_2 - Outlet
Make	Servomex	Servomex	Thermo	Thermo	Thermo	Thermo
Model	1440	1440	48C	42i-HL	55i-3	43C-3
S/N	1420C/2767	1415C/2767	48C-64905-345	1129850114	1209052113	43C-70673-366
Operating Range	0-25	0-25	0-1000	0-2000	0-100	0-50
Cylinder ID						
Low	NA	NA	NA	NA	ALM058337	NA
Mid	EB0082456	EB0082456	SG9107488BAL	CC496889	SX63171	CC53917
High	SX25695	SX25695	CC142863	ALM044259	CC10068	CC166

Calibration Data

Location: ABCWUA- Southside Water Reclamation Plant
Source: Unit 27 (digestor)
Project No.: 2020-0005
Date: 1/11/20

Parameter	O_2 - Outlet	CO_2 - Outlet	CO - Outlet	NOx - Outlet	THC - Outlet	SO_2 - Outlet
Expected Average Concentration	12.0	7.0	400.0	100.0	50.0	10.0
Span Between						
Low	12.0	7.0	400.0	100.0	75.0	10.0
High	60.0	35.0	2,000.0	500.0	125.0	50.0
Desired Span	23.0	22.6	914.0	1,012.0	100.0	40.4
Low Range Gas						
Low	NA	NA	NA	NA	25.0	NA
High	NA	NA	NA	NA	35.0	NA
Mid Range Gas						
Low	9.2	9.0	365.6	404.8	45.0	16.2
High	13.8	13.6	548.4	607.2	55.0	24.2
High Range Gas						
Low	NA	NA	NA	NA	80.0	NA
High	NA	NA	NA	NA	90.0	NA
Actual Concentration (% or ppm)						
Zero	0.0	0.0	0.0	0.0	0.0	0.0
Low	NA	NA	NA	NA	29.9	NA
Mid	10.9	10.9	440.2	487.4	45.7	19.1
High	23.0	22.6	914.0	1,012.0	85.8	40.4
Response Time (seconds)	20.0	25.0	30.0	35.0	50.0	45.0
Instrument Response (% or ppm)						
Zero	0.1	0.1	0.0	0.2	0.1	0.0
Low	NA	NA	NA	NA	29.6	NA
Mid	10.9	10.8	444.4	488.0	44.6	19.2
High	23.0	22.5	915.1	1,008.5	86.4	40.1
Performance (% of Span or Cal. Gas Conc.)						
Zero	0.3	0.3	0.0	0.0	0.1	0.0
Low	NA	NA	NA	NA	0.9	NA
Mid	0.1	0.2	0.5	0.1	2.5	0.2
High	0.2	0.6	0.1	0.3	0.6	0.8
Status						
Zero	PASS	PASS	PASS	PASS	PASS	PASS
Low	NA	NA	NA	NA	PASS	NA
Mid	PASS	PASS	PASS	PASS	PASS	PASS
High	PASS	PASS	PASS	PASS	PASS	PASS

Bias/Drift Determinations

Location: ABCWUA- Southside Water Reclamation Plant
Source: Unit 27 (digestor)
Project No.: 2020-0005

Parameter	**O_2 - Outlet**	**CO_2 - Outlet**	**CO - Outlet**	**NOx - Outlet**	**THC - Outlet**	**SO_2 - Outlet**
Run 1 Date 1/11/20						
Span Value	23.0	22.6	914.0	1,012.0	100.0	40.4
Instrument Zero Cal Response	0.1	0.1	0.0	0.2	0.1	0.0
Instrument Mid Cal Response	10.9	10.8	444.4	488.0	44.6	19.2
Pretest System Zero Response	0.2	0.0	0.0	0.7	0.0	0.0
Posttest System Zero Response	0.2	0.0	0.1	1.2	0.0	0.0
Pretest System Mid Response	11.0	10.7	425.8	493.4	46.0	18.9
Posttest System Mid Response	11.0	10.7	433.0	490.2	46.0	18.8
Bias (%)						
Pretest Zero	0.6	0.1	0.0	0.1	NA	0.0
Posttest Zero	0.6	0.2	0.0	0.1	NA	0.0
Pretest Span	0.4	0.4	2.0	0.5	NA	0.7
Posttest Span	0.5	0.5	1.2	0.2	NA	0.9
Drift (%)						
Zero	0.0	0.1	0.0	0.0	0.0	0.0
Mid	0.0	0.0	0.8	0.3	0.0	0.1
Run 2 Date 1/11/20						
Span Value	23.0	22.6	914.0	1,012.0	100.0	40.4
Instrument Zero Cal Response	0.1	0.1	0.0	0.2	0.1	0.0
Instrument Mid Cal Response	10.9	10.8	444.4	488.0	44.6	19.2
Pretest System Zero Response	0.2	0.0	0.1	1.2	0.0	0.0
Posttest System Zero Response	0.2	0.0	0.0	1.9	0.0	0.0
Pretest System Mid Response	11.0	10.7	433.0	490.2	46.0	18.8
Posttest System Mid Response	10.9	10.6	438.1	488.0	45.6	18.9
Bias (%)						
Pretest Zero	0.6	0.2	0.0	0.1	NA	0.0
Posttest Zero	0.7	0.3	0.0	0.2	NA	0.0
Pretest Span	0.5	0.5	1.2	0.2	NA	0.9
Posttest Span	0.0	0.9	0.7	0.0	NA	0.8
Drift (%)						
Zero	0.1	0.1	0.0	0.1	0.0	0.0
Mid	0.5	0.4	0.6	0.2	0.4	0.0
Run 3 Date 1/11/20						
Span Value	23.0	22.6	914.0	1,012.0	100.0	40.4
Instrument Zero Cal Response	0.1	0.1	0.0	0.2	0.1	0.0
Instrument Mid Cal Response	10.9	10.8	444.4	488.0	44.6	19.2
Pretest System Zero Response	0.2	0.0	0.0	1.9	0.0	0.0
Posttest System Zero Response	0.3	0.0	0.0	0.2	0.6	0.0
Pretest System Mid Response	10.9	10.6	438.1	488.0	45.6	18.9
Posttest System Mid Response	11.0	10.6	437.8	490.4	45.8	18.9
Bias (%)						
Pretest Zero	0.7	0.3	0.0	0.2	NA	0.0
Posttest Zero	0.8	0.3	0.0	0.0	NA	0.0
Pretest Span	0.0	0.9	0.7	0.0	NA	0.8
Posttest Span	0.4	0.9	0.7	0.2	NA	0.8
Drift (%)						
Zero	0.2	0.0	0.0	0.2	0.6	0.0
Mid	0.4	0.0	0.0	0.2	0.1	0.0

QA Data

Location ABCWUA - Southside Water Reclamation Plant
Source Unit 28
Project No. 2020-0005

Parameter	O_2 - Outlet	CO_2 - Outlet	CO - Outlet	NOx - Outlet	THC - Outlet	SO_2 - Outlet
Make	Servomex	Servomex	Thermo	Thermo	Thermo	Thermo
Model	1440	1440	48C	42i-HL	55i-3	43C-3
S/N	1420C/2767	1415C/2767	48C-64905-345	1129850114	1209052113	43C-70673-366
Operating Range	0-25	0-25	0-1000	0-2000	0-100	0-50
Cylinder ID						
Low	NA	NA	NA	NA	ALM058337	NA
Mid	EB0082456	EB0082456	SG9107488BAL	CC496889	SX63171	CC53917
High	SX25695	SX25695	CC142863	ALM044259	CC10068	CC166

Calibration Data

Location: ABCWUA - Southside Water Reclamation Plant
Source: Unit 28
Project No.: 2020-0005
Date: 1/10/20

Parameter	O_2 - Outlet	CO_2 - Outlet	CO - Outlet	NOx - Outlet	THC - Outlet	SO_2 - Outlet
Expected Average Concentration	12.0	7.0	400.0	100.0	50.0	10.0
Span Between						
Low	12.0	7.0	400.0	100.0	75.0	10.0
High	60.0	35.0	2,000.0	500.0	125.0	50.0
Desired Span	23.0	22.6	914.0	1,012.0	100.0	40.4
Low Range Gas						
Low	NA	NA	NA	NA	25.0	NA
High	NA	NA	NA	NA	35.0	NA
Mid Range Gas						
Low	9.2	9.0	365.6	404.8	45.0	16.2
High	13.8	13.6	548.4	607.2	55.0	24.2
High Range Gas						
Low	NA	NA	NA	NA	80.0	NA
High	NA	NA	NA	NA	90.0	NA
Actual Concentration (% or ppm)						
Zero	0.0	0.0	0.0	0.0	0.0	0.0
Low	NA	NA	NA	NA	29.9	NA
Mid	10.9	10.9	440.2	487.4	45.7	19.1
High	23.0	22.6	914.0	1,012.0	85.8	40.4
Response Time (seconds)	20.0	25.0	30.0	35.0	50.0	45.0
Instrument Response (% or ppm)						
Zero	0.1	0.1	0.0	0.2	0.1	0.0
Low	NA	NA	NA	NA	29.6	NA
Mid	10.9	10.8	444.4	488.0	44.6	19.2
High	23.0	22.5	915.1	1,008.5	86.4	40.1
Performance (% of Span or Cal. Gas Conc.)						
Zero	0.3	0.3	0.0	0.0	0.1	0.0
Low	NA	NA	NA	NA	1.0	NA
Mid	0.1	0.2	0.5	0.1	2.5	0.2
High	0.2	0.6	0.1	0.3	0.6	0.8
Status						
Zero	PASS	PASS	PASS	PASS	PASS	PASS
Low	NA	NA	NA	NA	PASS	NA
Mid	PASS	PASS	PASS	PASS	PASS	PASS
High	PASS	PASS	PASS	PASS	PASS	PASS

Bias/Drift Determinations

Location: ABCWUA - Southside Water Reclamation Plant
Source: Unit 28
Project No.: 2020-0005

Parameter	O_2 - Outlet	CO_2 - Outlet	CO - Outlet	NOx - Outlet	THC - Outlet	SO_2 - Outlet
Run 1 Date 1/10/20						
Span Value	23.0	22.6	914.0	1,012.0	100.0	40.4
Instrument Zero Cal Response	0.1	0.1	0.0	0.2	0.1	0.0
Instrument Mid Cal Response	10.9	10.8	444.4	488.0	44.6	19.2
Pretest System Zero Response	0.0	0.0	0.0	0.7	0.7	0.0
Posttest System Zero Response	0.0	0.0	0.0	1.1	0.7	0.0
Pretest System Mid Response	10.9	10.7	441.3	470.8	46.3	19.0
Posttest System Mid Response	11.0	10.8	440.1	476.3	46.1	19.0
Bias (%)						
Pretest Zero	0.3	0.3	0.0	0.1	NA	0.0
Posttest Zero	0.3	0.3	0.0	0.1	NA	0.0
Pretest Span	0.0	0.4	0.3	1.7	NA	0.4
Posttest Span	0.4	0.0	0.5	1.2	NA	0.4
Drift (%)						
Zero	0.0	0.0	0.0	0.0	0.0	0.0
Mid	0.4	0.4	0.1	0.5	0.2	0.0
Run 2 Date 1/10/20						
Span Value	23.0	22.6	914.0	1,012.0	100.0	40.4
Instrument Zero Cal Response	0.1	0.1	0.0	0.2	0.1	0.0
Instrument Mid Cal Response	10.9	10.8	444.4	488.0	44.6	19.2
Pretest System Zero Response	0.0	0.0	0.0	1.1	0.7	0.0
Posttest System Zero Response	0.0	0.0	0.0	1.2	0.6	0.0
Pretest System Mid Response	11.0	10.8	440.1	476.3	46.1	19.0
Posttest System Mid Response	11.0	10.8	433.6	478.4	45.5	18.9
Bias (%)						
Pretest Zero	0.3	0.3	0.0	0.1	NA	0.0
Posttest Zero	0.3	0.3	0.0	0.1	NA	0.0
Pretest Span	0.4	0.0	0.5	1.2	NA	0.4
Posttest Span	0.4	0.0	1.2	0.9	NA	0.7
Drift (%)						
Zero	0.0	0.0	0.0	0.0	0.1	0.0
Mid	0.0	0.0	0.7	0.2	0.6	0.2
Run 3 Date 1/10/20						
Span Value	23.0	22.6	914.0	1,012.0	100.0	40.4
Instrument Zero Cal Response	0.1	0.1	0.0	0.2	0.1	0.0
Instrument Mid Cal Response	10.9	10.8	444.4	488.0	44.6	19.2
Pretest System Zero Response	0.0	0.0	0.0	1.2	0.6	0.0
Posttest System Zero Response	0.1	0.0	0.0	1.7	0.5	0.0
Pretest System Mid Response	11.0	10.8	433.6	478.4	45.5	18.9
Posttest System Mid Response	11.0	10.8	436.6	475.5	45.4	19.3
Bias (%)						
Pretest Zero	0.3	0.3	0.0	0.1	NA	0.0
Posttest Zero	0.1	0.3	0.0	0.1	NA	0.0
Pretest Span	0.4	0.0	1.2	0.9	NA	0.7
Posttest Span	0.4	0.0	0.9	1.2	NA	0.3
Drift (%)						
Zero	0.2	0.0	0.0	0.0	0.1	0.0
Mid	0.0	0.0	0.3	0.3	0.1	1.0

QA Data

Location ABCWUA - Southside Water Reclamation Plant
Source Unit 28 (Digestor)
Project No. 2020-0005

Parameter	**O_2 - Outlet**	**CO_2 - Outlet**	**CO - Outlet**	**NOx - Outlet**	**THC - Outlet**	**SO_2 - Outlet**
Make	Servomex	Servomex	Thermo	Thermo	Thermo	Thermo
Model	1440	1440	48C	42i-HL	55i-3	43C-3
S/N	1420C/2767	1415C/2767	48C-64905-345	1129850114	1209052113	43C-70673-366
Operating Range	0-25	0-25	0-1000	0-2000	0-100	0-50
Cylinder ID						
Low	NA	NA	NA	NA	ALM058337	NA
Mid	EB0082456	EB0082456	SG9107488BAL	CC496889	SX63171	CC53917
High	SX25695	SX25695	CC142863	ALM044259	CC10068	CC166

Calibration Data

Location: ABCWUA - Southside Water Reclamation Plant
Source: Unit 28 (Digestor)
Project No.: 2020-0005
Date: 1/10/20

Parameter	O_2 - Outlet	CO_2 - Outlet	CO - Outlet	NOx - Outlet	THC - Outlet	SO_2 - Outlet
Expected Average Concentration	12.0	7.0	400.0	100.0	50.0	10.0
Span Between						
Low	12.0	7.0	400.0	100.0	75.0	10.0
High	60.0	35.0	2,000.0	500.0	125.0	50.0
Desired Span	23.0	22.6	914.0	1,012.0	100.0	40.4
Low Range Gas						
Low	NA	NA	NA	NA	25.0	NA
High	NA	NA	NA	NA	35.0	NA
Mid Range Gas						
Low	9.2	9.0	365.6	404.8	45.0	16.2
High	13.8	13.6	548.4	607.2	55.0	24.2
High Range Gas						
Low	NA	NA	NA	NA	80.0	NA
High	NA	NA	NA	NA	90.0	NA
Actual Concentration (% or ppm)						
Zero	0.0	0.0	0.0	0.0	0.0	0.0
Low	NA	NA	NA	NA	29.9	NA
Mid	10.9	10.9	440.2	487.4	45.7	19.1
High	23.0	22.6	914.0	1,012.0	85.8	40.4
Response Time (seconds)	20.0	25.0	30.0	35.0	50.0	45.0
Instrument Response (% or ppm)						
Zero	0.1	0.1	0.0	0.2	0.1	0.0
Low	NA	NA	NA	NA	29.6	NA
Mid	10.9	10.8	444.4	488.0	44.6	19.2
High	23.0	22.5	915.1	1,008.5	86.4	40.1
Performance (% of Span or Cal. Gas Conc.)						
Zero	0.3	0.3	0.0	0.0	0.1	0.0
Low	NA	NA	NA	NA	1.1	NA
Mid	0.1	0.2	0.5	0.1	2.4	0.2
High	0.0	0.6	0.1	0.3	0.7	0.8
Status						
Zero	PASS	PASS	PASS	PASS	PASS	PASS
Low	NA	NA	NA	NA	PASS	NA
Mid	PASS	PASS	PASS	PASS	PASS	PASS
High	PASS	PASS	PASS	PASS	PASS	PASS

Bias/Drift Determinations

Location: ABCWUA - Southside Water Reclamation Plant
Source: Unit 28 (Digestor)
Project No.: 2020-0005

Parameter	O_2 - Outlet	CO_2 - Outlet	CO - Outlet	NOx - Outlet	THC - Outlet	SO_2 - Outlet
Run 1 Date 1/10/20						
Span Value	23.0	22.6	914.0	1,012.0	100.0	40.4
Instrument Zero Cal Response	0.1	0.1	0.0	0.2	0.1	0.0
Instrument Mid Cal Response	10.9	10.8	444.4	488.0	44.6	19.2
Pretest System Zero Response	0.1	0.0	0.0	1.7	0.5	0.0
Posttest System Zero Response	0.1	0.0	0.0	1.2	0.0	0.0
Pretest System Mid Response	11.0	10.8	436.6	475.5	45.4	19.3
Posttest System Mid Response	11.0	10.8	433.0	477.8	45.6	18.8
Bias (%)						
Pretest Zero	0.1	0.3	0.0	0.1	NA	0.0
Posttest Zero	0.1	0.2	0.0	0.1	NA	0.0
Pretest Span	0.4	0.0	0.9	1.2	NA	0.3
Posttest Span	0.4	0.0	1.2	1.0	NA	0.9
Drift (%)						
Zero	0.2	0.1	0.0	0.0	0.5	0.0
Mid	0.0	0.0	0.4	0.2	0.2	1.2
Run 2 Date 1/10/20						
Span Value	23.0	22.6	914.0	1,012.0	100.0	40.4
Instrument Zero Cal Response	0.1	0.1	0.0	0.2	0.1	0.0
Instrument Mid Cal Response	10.9	10.8	444.4	488.0	44.6	19.2
Pretest System Zero Response	0.1	0.0	0.0	1.2	0.0	0.0
Posttest System Zero Response	0.1	0.1	0.6	1.2	0.2	0.0
Pretest System Mid Response	11.0	10.8	433.0	477.8	45.6	18.8
Posttest System Mid Response	11.0	10.8	436.7	475.7	45.2	18.8
Bias (%)						
Pretest Zero	0.1	0.2	0.0	0.1	NA	0.0
Posttest Zero	0.2	0.1	0.1	0.1	NA	0.0
Pretest Span	0.4	0.0	1.2	1.0	NA	0.9
Posttest Span	0.6	0.0	0.8	1.2	NA	0.9
Drift (%)						
Zero	0.1	0.1	0.1	0.0	0.2	0.0
Mid	0.1	0.0	0.4	0.2	0.4	0.0
Run 3 Date 1/10/20						
Span Value	23.0	22.6	914.0	1,012.0	100.0	40.4
Instrument Zero Cal Response	0.1	0.1	0.0	0.2	0.1	0.0
Instrument Mid Cal Response	10.9	10.8	444.4	488.0	44.6	19.2
Pretest System Zero Response	0.1	0.1	0.6	1.2	0.2	0.0
Posttest System Zero Response	0.1	0.0	0.0	1.2	0.0	0.0
Pretest System Mid Response	11.0	10.8	436.7	475.7	45.2	18.8
Posttest System Mid Response	11.1	10.9	440.7	475.0	45.6	18.7
Bias (%)						
Pretest Zero	0.2	0.1	0.1	0.1	NA	0.0
Posttest Zero	0.1	0.2	0.0	0.1	NA	0.0
Pretest Span	0.6	0.0	0.8	1.2	NA	0.9
Posttest Span	0.7	0.3	0.4	1.3	NA	1.1
Drift (%)						
Zero	0.1	0.1	0.1	0.0	0.2	0.0
Mid	0.1	0.3	0.4	0.1	0.4	0.2

Alliance SOURCE TESTING

QA Data

Location ABCWUA - Southside Water Reclamation Plant
Source Unit 29
Project No. 2020-0005

Parameter	O_2 - Outlet	CO_2 - Outlet	CO - Outlet	NOx - Outlet	THC - Outlet	SO_2 - Outlet
Make	Servomex	Servomex	Thermo	Thermo	Thermo	Thermo
Model	1440	1440	48C	42i-HL	55i-3	43C-3
S/N	1420C/2767	1415C/2767	48C-64905-345	1129850114	1209052113	43C-70673-366
Operating Range	0-25	0-25	0-1000	0-2000	0-100	0-50
Cylinder ID						
Low	NA	NA	NA	NA	ALM058337	NA
Mid	EB0082456	EB0082456	SG9107488BAL	CC496889	SX63171	CC53917
High	SX25695	SX25695	CC142863	ALM044259	CC10068	CC166

Calibration Data

Location: ABCWUA - Southside Water Reclamation Plant
Source: Unit 29
Project No.: 2020-0005
Date: 1/13/20

Parameter	O_2 - Outlet	CO_2 - Outlet	CO - Outlet	NOx - Outlet	THC - Outlet	SO_2 - Outlet
Expected Average Concentration	12.0	7.0	400.0	100.0	50.0	10.0
Span Between						
Low	12.0	7.0	400.0	100.0	75.0	10.0
High	60.0	35.0	2,000.0	500.0	125.0	50.0
Desired Span	23.0	22.6	914.0	1,012.0	100.0	40.4
Low Range Gas						
Low	NA	NA	NA	NA	25.0	NA
High	NA	NA	NA	NA	35.0	NA
Mid Range Gas						
Low	9.2	9.0	365.6	404.8	45.0	16.2
High	13.8	13.6	548.4	607.2	55.0	24.2
High Range Gas						
Low	NA	NA	NA	NA	80.0	NA
High	NA	NA	NA	NA	90.0	NA
Actual Concentration (% or ppm)						
Zero	0.0	0.0	0.0	0.0	0.0	0.0
Low	NA	NA	NA	NA	29.9	NA
Mid	10.9	10.9	440.2	487.4	45.7	19.1
High	23.0	22.6	914.0	1,012.0	85.8	40.4
Response Time (seconds)	25.0	25.0	30.0	35.0	50.0	45.0
Instrument Response (% or ppm)						
Zero	0.0	0.0	0.0	0.2	0.0	0.0
Low	NA	NA	NA	NA	29.9	NA
Mid	10.9	10.7	442.2	485.8	45.5	19.0
High	23.0	22.6	914.6	1,012.5	85.6	40.3
Performance (% of Span or Cal. Gas Conc.)						
Zero	0.0	0.0	0.0	0.0	0.0	0.0
Low	NA	NA	NA	NA	0.0	NA
Mid	0.1	0.7	0.2	0.2	0.5	0.2
High	0.0	0.0	0.1	0.0	0.2	0.2
Status						
Zero	PASS	PASS	PASS	PASS	PASS	PASS
Low	NA	NA	NA	NA	PASS	NA
Mid	PASS	PASS	PASS	PASS	PASS	PASS
High	PASS	PASS	PASS	PASS	PASS	PASS

Bias/Drift Determinations

Location: ABCWUA - Southside Water Reclamation Plant
Source: Unit 29
Project No.: 2020-0005

Parameter	O_2 - Outlet	CO_2 - Outlet	CO - Outlet	NOx - Outlet	THC - Outlet	SO_2 - Outlet
Run 1 Date 1/13/20						
Span Value	23.0	22.6	914.0	1,012.0	100.0	40.4
Instrument Zero Cal Response	0.0	0.0	0.0	0.2	0.0	0.0
Instrument Mid Cal Response	10.9	10.7	442.2	485.8	45.5	19.0
Pretest System Zero Response	0.0	0.0	0.0	0.7	0.0	0.0
Posttest System Zero Response	0.1	0.0	0.0	1.2	0.0	0.0
Pretest System Mid Response	10.9	10.7	440.1	479.9	45.4	18.9
Posttest System Mid Response	10.9	10.7	432.3	475.3	45.5	18.9
Bias (%)						
Pretest Zero	0.0	0.0	0.0	0.0	NA	0.0
Posttest Zero	0.4	0.0	0.0	0.1	NA	0.0
Pretest Span	0.0	0.0	0.2	0.6	NA	0.2
Posttest Span	0.0	0.0	1.1	1.0	NA	0.2
Drift (%)						
Zero	0.4	0.0	0.0	0.0	0.0	0.0
Mid	0.0	0.0	0.9	0.5	0.1	0.0
Run 2 Date 1/13/20						
Span Value	23.0	22.6	914.0	1,012.0	100.0	40.4
Instrument Zero Cal Response	0.0	0.0	0.0	0.2	0.0	0.0
Instrument Mid Cal Response	10.9	10.7	442.2	485.8	45.5	19.0
Pretest System Zero Response	0.1	0.0	0.0	1.2	0.0	0.0
Posttest System Zero Response	0.1	0.0	-1.0	1.2	0.0	0.0
Pretest System Mid Response	10.9	10.7	432.3	475.3	45.5	18.9
Posttest System Mid Response	11.0	10.7	430.4	473.8	45.9	18.9
Bias (%)						
Pretest Zero	0.4	0.0	0.0	0.1	NA	0.0
Posttest Zero	0.4	0.0	0.1	0.1	NA	0.0
Pretest Span	0.0	0.0	1.1	1.0	NA	0.2
Posttest Span	0.4	0.0	1.3	1.2	NA	0.2
Drift (%)						
Zero	0.0	0.0	0.1	0.0	0.0	0.0
Mid	0.4	0.0	0.2	0.1	0.4	0.0
Run 3 Date 1/13/20						
Span Value	23.0	22.6	914.0	1,012.0	100.0	40.4
Instrument Zero Cal Response	0.0	0.0	0.0	0.2	0.0	0.0
Instrument Mid Cal Response	10.9	10.7	442.2	485.8	45.5	19.0
Pretest System Zero Response	0.1	0.0	-1.0	1.2	0.0	0.0
Posttest System Zero Response	0.2	0.0	0.0	1.2	0.0	0.0
Pretest System Mid Response	11.0	10.7	430.4	473.8	45.9	18.9
Posttest System Mid Response	10.9	10.7	426.7	470.7	45.4	19.0
Bias (%)						
Pretest Zero	0.4	0.0	0.1	0.1	NA	0.0
Posttest Zero	0.9	0.0	0.0	0.1	NA	0.0
Pretest Span	0.4	0.0	1.3	1.2	NA	0.2
Posttest Span	0.0	0.0	1.7	1.5	NA	0.0
Drift (%)						
Zero	0.4	0.0	0.1	0.0	0.0	0.0
Mid	0.4	0.0	0.4	0.3	0.5	0.2

QA Data

Location ABCQUA - Southside Water Reclamation Plant
Source Unit 29 (Digestor)
Project No. 2020-0005

Parameter	**O_2 - Outlet**	**CO_2 - Outlet**	**CO - Outlet**	**NOx - Outlet**	**THC - Outlet**	**SO_2 - Outlet**
Make	Servomex	Servomex	Thermo	Thermo	Thermo	Thermo
Model	1440	1440	48C	42i-HL	55i-3	43C-3
S/N	1420C/2767	1415C/2767	48C-64905-345	1129850114	1209052113	43C-70673-366
Operating Range	0-25	0-25	0-1000	0-2000	0-100	0-50
Cylinder ID						
Low	NA	NA	NA	NA	ALM058337	NA
Mid	EB0082456	EB0082456	SG9107488BAL	CC496889	SX63171	CC53917
High	SX25695	SX25695	CC142863	ALM044259	CC10068	CC166

Calibration Data

Location: ABCQUA - Southside Water Reclamation Plant
Source: Unit 29 (Digestor)
Project No.: 2020-0005
Date: 1/13/20

Parameter	O_2 - Outlet	CO_2 - Outlet	CO - Outlet	NOx - Outlet	THC - Outlet	SO_2 - Outlet
Expected Average Concentration	12.0	7.0	400.0	100.0	50.0	10.0
Span Between						
Low	12.0	7.0	400.0	100.0	75.0	10.0
High	60.0	35.0	2,000.0	500.0	125.0	50.0
Desired Span	23.0	22.6	914.0	1,012.0	100.0	40.4
Low Range Gas						
Low	NA	NA	NA	NA	25.0	NA
High	NA	NA	NA	NA	35.0	NA
Mid Range Gas						
Low	9.2	9.0	365.6	404.8	45.0	16.2
High	13.8	13.6	548.4	607.2	55.0	24.2
High Range Gas						
Low	NA	NA	NA	NA	80.0	NA
High	NA	NA	NA	NA	90.0	NA
Actual Concentration (% or ppm)						
Zero	0.0	0.0	0.0	0.0	0.0	0.0
Low	NA	NA	NA	NA	29.9	NA
Mid	10.9	10.9	440.2	487.4	45.7	19.1
High	23.0	22.6	914.0	1,012.0	85.8	40.4
Response Time (seconds)	25.0	25.0	30.0	35.0	50.0	45.0
Instrument Response (% or ppm)						
Zero	0.0	0.0	0.0	0.2	0.0	0.0
Low	NA	NA	NA	NA	29.9	NA
Mid	10.9	10.7	442.2	485.8	45.5	19.0
High	23.0	22.6	914.6	1,012.5	85.6	40.3
Performance (% of Span or Cal. Gas Conc.)						
Zero	0.0	0.0	0.0	0.0	0.0	0.0
Low	NA	NA	NA	NA	0.0	NA
Mid	0.1	0.7	0.2	0.2	0.5	0.2
High	0.0	0.0	0.1	0.0	0.2	0.2
Status						
Zero	PASS	PASS	PASS	PASS	PASS	PASS
Low	NA	NA	NA	NA	PASS	NA
Mid	PASS	PASS	PASS	PASS	PASS	PASS
High	PASS	PASS	PASS	PASS	PASS	PASS

Bias/Drift Determinations

Location: ABCQUA - Southside Water Reclamation Plant
Source: Unit 29 (Digestor)
Project No.: 2020-0005

Parameter	O_2 - Outlet	CO_2 - Outlet	CO - Outlet	NOx - Outlet	THC - Outlet	SO_2 - Outlet
Run 1 Date 1/13/20						
Span Value	23.0	22.6	914.0	1,012.0	100.0	40.4
Instrument Zero Cal Response	0.0	0.0	0.0	0.2	0.0	0.0
Instrument Mid Cal Response	10.9	10.7	442.2	485.8	45.5	19.0
Pretest System Zero Response	0.2	0.0	0.0	1.2	0.0	0.0
Posttest System Zero Response	0.2	0.0	0.0	1.2	0.0	0.0
Pretest System Mid Response	10.9	10.7	426.7	470.7	45.4	19.0
Posttest System Mid Response	10.9	10.7	428.8	474.6	44.9	18.9
Bias (%)						
Pretest Zero	0.9	0.0	0.0	0.1	NA	0.0
Posttest Zero	0.9	0.0	0.0	0.1	NA	0.0
Pretest Span	0.0	0.0	1.7	1.5	NA	0.0
Posttest Span	0.0	0.0	1.5	1.1	NA	0.2
Drift (%)						
Zero	0.0	0.0	0.0	0.0	0.0	0.0
Mid	0.0	0.0	0.2	0.4	0.5	0.2
Run 2 Date 1/13/20						
Span Value	23.0	22.6	914.0	1,012.0	100.0	40.4
Instrument Zero Cal Response	0.0	0.0	0.0	0.2	0.0	0.0
Instrument Mid Cal Response	10.9	10.7	442.2	485.8	45.5	19.0
Pretest System Zero Response	0.2	0.0	0.0	1.2	0.0	0.0
Posttest System Zero Response	0.2	0.0	0.0	1.2	0.0	0.0
Pretest System Mid Response	10.9	10.7	428.8	474.6	44.9	18.9
Posttest System Mid Response	10.9	10.7	430.4	478.8	45.5	19.0
Bias (%)						
Pretest Zero	0.9	0.0	0.0	0.1	NA	0.0
Posttest Zero	0.9	0.0	0.0	0.1	NA	0.0
Pretest Span	0.0	0.0	1.5	1.1	NA	0.2
Posttest Span	0.0	0.0	1.3	0.7	NA	0.0
Drift (%)						
Zero	0.0	0.0	0.0	0.0	0.0	0.0
Mid	0.0	0.0	0.2	0.4	0.6	0.2
Run 3 Date 1/13/20						
Span Value	23.0	22.6	914.0	1,012.0	100.0	40.4
Instrument Zero Cal Response	0.0	0.0	0.0	0.2	0.0	0.0
Instrument Mid Cal Response	10.9	10.7	442.2	485.8	45.5	19.0
Pretest System Zero Response	0.2	0.0	0.0	1.2	0.0	0.0
Posttest System Zero Response	0.2	0.0	0.0	1.2	0.0	0.0
Pretest System Mid Response	10.9	10.7	430.4	478.8	45.5	19.0
Posttest System Mid Response	10.9	10.7	423.3	472.6	45.6	19.0
Bias (%)						
Pretest Zero	0.9	0.0	0.0	0.1	NA	0.0
Posttest Zero	0.9	0.0	0.0	0.1	NA	0.0
Pretest Span	0.0	0.0	1.3	0.7	NA	0.0
Posttest Span	0.0	0.0	2.1	1.3	NA	0.0
Drift (%)						
Zero	0.0	0.0	0.0	0.0	0.0	0.0
Mid	0.0	0.0	0.8	0.6	0.1	0.0

QA Data

Location ABCWUA - Southside Water Reclamation Plant
Source Unit 30
Project No. 2020-0005

Parameter	O_2 - Outlet	CO_2 - Outlet	CO - Outlet	NOx - Outlet	THC - Outlet	SO_2 - Outlet
Make	Servomex	Servomex	Thermo	Thermo	Thermo	Thermo
Model	1440	1440	48C	42i-HL	55i-3	43C-3
S/N	1420C/2767	1415C/2767	48C-64905-345	1129850114	1209052113	43C-70673-366
Operating Range	0-25	0-25	0-1000	0-2000	0-100	0-50
Cylinder ID						
Low	NA	NA	NA	NA	ALM058337	NA
Mid	EB0082456	EB0082456	SG9107488BAL	CC496889	SX63171	CC53917
High	SX25695	SX25695	CC142863	ALM044259	CC10068	CC166

Calibration Data

Location: ABCWUA - Southside Water Reclamation Plant
Source: Unit 30
Project No.: 2020-0005
Date: 1/12/20

Parameter	O_2 - Outlet	CO_2 - Outlet	CO - Outlet	NOx - Outlet	THC - Outlet	SO_2 - Outlet
Expected Average Concentration	12.0	7.0	400.0	100.0	50.0	10.0
Span Between						
Low	12.0	7.0	400.0	100.0	75.0	10.0
High	60.0	35.0	2,000.0	500.0	125.0	50.0
Desired Span	23.0	22.6	914.0	1,012.0	100.0	40.4
Low Range Gas						
Low	NA	NA	NA	NA	25.0	NA
High	NA	NA	NA	NA	35.0	NA
Mid Range Gas						
Low	9.2	9.0	365.6	404.8	45.0	16.2
High	13.8	13.6	548.4	607.2	55.0	24.2
High Range Gas						
Low	NA	NA	NA	NA	80.0	NA
High	NA	NA	NA	NA	90.0	NA
Actual Concentration (% or ppm)						
Zero	0.0	0.0	0.0	0.0	0.0	0.0
Low	NA	NA	NA	NA	29.9	NA
Mid	10.9	10.9	440.2	487.4	45.7	19.1
High	23.0	22.6	914.0	1,012.0	85.8	40.4
Response Time (seconds)	25.0	25.0	30.0	35.0	50.0	45.0
Instrument Response (% or ppm)						
Zero	0.0	0.0	0.0	0.2	0.0	0.0
Low	NA	NA	NA	NA	29.6	NA
Mid	11.0	10.7	441.6	488.4	45.2	19.3
High	23.0	22.6	909.2	1,013.1	85.4	40.3
Performance (% of Span or Cal. Gas Conc.)						
Zero	0.0	0.0	0.0	0.0	0.0	0.0
Low	NA	NA	NA	NA	1.0	NA
Mid	0.3	0.7	0.2	0.1	1.2	0.5
High	0.0	0.0	0.5	0.1	0.5	0.2
Status						
Zero	PASS	PASS	PASS	PASS	PASS	PASS
Low	NA	NA	NA	NA	PASS	NA
Mid	PASS	PASS	PASS	PASS	PASS	PASS
High	PASS	PASS	PASS	PASS	PASS	PASS

Bias/Drift Determinations

Location: ABCWUA - Southside Water Reclamation Plant
Source: Unit 30
Project No.: 2020-0005

Parameter	O_2 - Outlet	CO_2 - Outlet	CO - Outlet	NOx - Outlet	THC - Outlet	SO_2 - Outlet
Run 1 Date 1/12/20						
Span Value	23.0	22.6	914.0	1,012.0	100.0	40.4
Instrument Zero Cal Response	0.0	0.0	0.0	0.2	0.0	0.0
Instrument Mid Cal Response	11.0	10.7	441.6	488.4	45.2	19.3
Pretest System Zero Response	0.0	0.0	0.0	0.2	0.0	0.0
Posttest System Zero Response	0.1	0.1	0.0	0.7	0.0	0.0
Pretest System Mid Response	10.9	10.7	440.7	477.3	45.2	18.9
Posttest System Mid Response	10.9	10.7	436.7	482.6	45.5	18.9
Bias (%)						
Pretest Zero	0.0	0.0	0.0	0.0	NA	0.0
Posttest Zero	0.6	0.3	0.0	0.0	NA	0.0
Pretest Span	0.4	0.0	0.1	1.1	NA	1.0
Posttest Span	0.4	0.1	0.5	0.6	NA	1.0
Drift (%)						
Zero	0.6	0.3	0.0	0.0	0.0	0.0
Mid	0.0	0.1	0.4	0.5	0.3	0.0
Run 2 Date 1/12/20						
Span Value	23.0	22.6	914.0	1,012.0	100.0	40.4
Instrument Zero Cal Response	0.0	0.0	0.0	0.2	0.0	0.0
Instrument Mid Cal Response	11.0	10.7	441.6	488.4	45.2	19.3
Pretest System Zero Response	0.1	0.1	0.0	0.7	0.0	0.0
Posttest System Zero Response	0.1	0.0	0.0	1.1	0.0	0.0
Pretest System Mid Response	10.9	10.7	436.7	482.6	45.5	18.9
Posttest System Mid Response	11.0	10.8	441.2	484.4	45.1	19.0
Bias (%)						
Pretest Zero	0.6	0.3	0.0	0.0	NA	0.0
Posttest Zero	0.4	0.0	0.0	0.1	NA	0.0
Pretest Span	0.4	0.1	0.5	0.6	NA	1.0
Posttest Span	0.0	0.4	0.0	0.4	NA	0.7
Drift (%)						
Zero	0.2	0.3	0.0	0.0	0.0	0.0
Mid	0.4	0.6	0.5	0.2	0.4	0.3
Run 3 Date 1/12/20						
Span Value	23.0	22.6	914.0	1,012.0	100.0	40.4
Instrument Zero Cal Response	0.0	0.0	0.0	0.2	0.0	0.0
Instrument Mid Cal Response	11.0	10.7	441.6	488.4	45.2	19.3
Pretest System Zero Response	0.1	0.0	0.0	1.1	0.0	0.0
Posttest System Zero Response	0.1	0.0	0.0	1.0	0.0	0.0
Pretest System Mid Response	11.0	10.8	441.2	484.4	45.1	19.0
Posttest System Mid Response	11.0	10.8	440.2	482.4	44.9	18.9
Bias (%)						
Pretest Zero	0.4	0.0	0.0	0.1	NA	0.0
Posttest Zero	0.4	0.0	0.0	0.1	NA	0.0
Pretest Span	0.0	0.4	0.0	0.4	NA	0.7
Posttest Span	0.0	0.4	0.2	0.6	NA	1.0
Drift (%)						
Zero	0.0	0.0	0.0	0.0	0.0	0.0
Mid	0.0	0.0	0.1	0.2	0.2	0.2

QA Data

Location ABCWUA - Southside Water Reclamation Plant
Source Unit 30 (Digestor)
Project No. 2020-0005

Parameter	O_2 - Outlet	CO_2 - Outlet	CO - Outlet	NOx - Outlet	THC - Outlet	SO_2 - Outlet
Make	Servomex	Servomex	Thermo	Thermo	Thermo	Thermo
Model	1440	1440	48C	42i-HL	55i-3	43C-3
S/N	1420C/2767	1415C/2767	48C-64905-345	1129850114	1209052113	43C-70673-366
Operating Range	0-25	0-25	0-1000	0-2000	0-100	0-50
Cylinder ID						
Low	NA	NA	NA	NA	ALM058337	NA
Mid	EB0082456	EB0082456	SG9107488BAL	CC496889	SX63171	CC53917
High	SX25695	SX25695	CC142863	ALM044259	CC10068	CC166

Calibration Data

Location: ABCWUA - Southside Water Reclamation Plant
Source: Unit 30 (Digestor)
Project No.: 2020-0005
Date: 1/12/20

Parameter	O_2 - Outlet	CO_2 - Outlet	CO - Outlet	NOx - Outlet	THC - Outlet	SO_2 - Outlet
Expected Average Concentration	12.0	7.0	400.0	100.0	50.0	10.0
Span Between						
Low	12.0	7.0	400.0	100.0	75.0	10.0
High	60.0	35.0	2,000.0	500.0	125.0	50.0
Desired Span	23.0	22.6	914.0	1,012.0	100.0	40.4
Low Range Gas						
Low	NA	NA	NA	NA	25.0	NA
High	NA	NA	NA	NA	35.0	NA
Mid Range Gas						
Low	9.2	9.0	365.6	404.8	45.0	16.2
High	13.8	13.6	548.4	607.2	55.0	24.2
High Range Gas						
Low	NA	NA	NA	NA	80.0	NA
High	NA	NA	NA	NA	90.0	NA
Actual Concentration (% or ppm)						
Zero	0.0	0.0	0.0	0.0	0.0	0.0
Low	NA	NA	NA	NA	29.9	NA
Mid	10.9	10.9	440.2	487.4	45.7	19.1
High	23.0	22.6	914.0	1,012.0	85.8	40.4
Response Time (seconds)	25.0	25.0	30.0	35.0	50.0	45.0
Instrument Response (% or ppm)						
Zero	0.0	0.0	0.0	0.2	0.0	0.0
Low	NA	NA	NA	NA	29.6	NA
Mid	11.0	10.7	441.6	488.4	45.2	19.3
High	23.0	22.6	909.2	1,013.1	85.4	40.3
Performance (% of Span or Cal. Gas Conc.)						
Zero	0.0	0.0	0.0	0.0	0.0	0.0
Low	NA	NA	NA	NA	1.0	NA
Mid	0.3	0.7	0.2	0.1	1.2	0.5
High	0.0	0.0	0.5	0.1	0.5	0.2
Status						
Zero	PASS	PASS	PASS	PASS	PASS	PASS
Low	NA	NA	NA	NA	PASS	NA
Mid	PASS	PASS	PASS	PASS	PASS	PASS
High	PASS	PASS	PASS	PASS	PASS	PASS

Bias/Drift Determinations

Location: ABCWUA - Southside Water Reclamation Plant
Source: Unit 30 (Digestor)
Project No.: 2020-0005

Parameter	**O_2 - Outlet**	**CO_2 - Outlet**	**CO - Outlet**	**NOx - Outlet**	**THC - Outlet**	**SO_2 - Outlet**
Run 1 Date 1/12/20						
Span Value	23.0	22.6	914.0	1,012.0	100.0	40.4
Instrument Zero Cal Response	0.0	0.0	0.0	0.2	0.0	0.0
Instrument Mid Cal Response	11.0	10.7	441.6	488.4	45.2	19.3
Pretest System Zero Response	0.1	0.0	0.0	1.0	0.0	0.0
Posttest System Zero Response	0.2	0.0	0.0	1.2	0.0	0.0
Pretest System Mid Response	11.0	10.8	440.2	482.4	44.9	18.9
Posttest System Mid Response	11.0	10.7	435.1	471.1	45.3	18.9
Bias (%)						
Pretest Zero	0.4	0.0	0.0	0.1	NA	0.0
Posttest Zero	0.9	0.0	0.0	0.1	NA	0.0
Pretest Span	0.0	0.4	0.2	0.6	NA	1.0
Posttest Span	0.0	0.0	0.7	1.7	NA	1.0
Drift (%)						
Zero	0.4	0.0	0.0	0.0	0.0	0.0
Mid	0.0	0.4	0.6	1.1	0.4	0.0
Run 2 Date 1/12/20						
Span Value	23.0	22.6	914.0	1,012.0	100.0	40.4
Instrument Zero Cal Response	0.0	0.0	0.0	0.2	0.0	0.0
Instrument Mid Cal Response	11.0	10.7	441.6	488.4	45.2	19.3
Pretest System Zero Response	0.2	0.0	0.0	1.2	0.0	0.0
Posttest System Zero Response	0.2	0.0	0.0	1.2	0.0	0.0
Pretest System Mid Response	11.0	10.7	435.1	471.1	45.3	18.9
Posttest System Mid Response	11.0	10.7	430.0	475.2	45.3	19.0
Bias (%)						
Pretest Zero	0.9	0.0	0.0	0.1	NA	0.0
Posttest Zero	0.9	0.0	0.0	0.1	NA	0.0
Pretest Span	0.0	0.0	0.7	1.7	NA	1.0
Posttest Span	0.0	0.0	1.3	1.3	NA	0.7
Drift (%)						
Zero	0.0	0.0	0.0	0.0	0.0	0.0
Mid	0.0	0.0	0.6	0.4	0.0	0.2
Run 3 Date 1/12/20						
Span Value	23.0	22.6	914.0	1,012.0	100.0	40.4
Instrument Zero Cal Response	0.0	0.0	0.0	0.2	0.0	0.0
Instrument Mid Cal Response	11.0	10.7	441.6	488.4	45.2	19.3
Pretest System Zero Response	0.2	0.0	0.0	1.2	0.0	0.0
Posttest System Zero Response	0.2	0.0	0.0	1.2	0.0	0.0
Pretest System Mid Response	11.0	10.7	430.0	475.2	45.3	19.0
Posttest System Mid Response	10.9	10.7	442.8	478.2	45.6	19.0
Bias (%)						
Pretest Zero	0.9	0.0	0.0	0.1	NA	0.0
Posttest Zero	0.9	0.0	0.0	0.1	NA	0.0
Pretest Span	0.0	0.0	1.3	1.3	NA	0.7
Posttest Span	0.4	0.0	0.1	1.0	NA	0.7
Drift (%)						
Zero	0.0	0.0	0.0	0.0	0.0	0.0
Mid	0.4	0.0	1.4	0.3	0.3	0.0

QA Data

Location ABCWUA - Southside Water Reclamation Plant
Source Unit 80
Project No. 2020-0005

Parameter	O_2 - Outlet	CO_2 - Outlet	CO - Outlet	NOx - Outlet	THC - Outlet	SO_2 - Outlet
Make	Servomex	Servomex	Thermo	Thermo	Thermo	Thermo
Model	1440	1440	48C	42i-HL	55i-3	43C-3
S/N	1420C/2767	1415C/2767	48C-64905-345	1129850114	1209052113	43C-70673-366
Operating Range	0-25	0-25	0-1000	0-2000	0-100	0-50
Cylinder ID						
Low	NA	NA	NA	NA	ALM058337	NA
Mid	EB0082456	EB0082456	SG9107488BAL	CC496889	SX63171	CC53917
High	SX25695	SX25695	CC142863	ALM044259	CC10068	CC166

Calibration Data

Location: ABCWUA - Southside Water Reclamation Plant
Source: Unit 80
Project No.: 2020-0005
Date: 1/9/20

Parameter	O_2 - Outlet	CO_2 - Outlet	CO - Outlet	NOx - Outlet	THC - Outlet	SO_2 - Outlet
Expected Average Concentration	12.0	7.0	200.0	400.0	50.0	10.0
Span Between						
Low	12.0	7.0	200.0	400.0	75.0	10.0
High	60.0	35.0	1,000.0	2,000.0	125.0	50.0
Desired Span	23.0	22.6	914.0	1,012.0	100.0	40.4
Low Range Gas						
Low	NA	NA	NA	NA	25.0	NA
High	NA	NA	NA	NA	35.0	NA
Mid Range Gas						
Low	9.2	9.0	365.6	404.8	45.0	16.2
High	13.8	13.6	548.4	607.2	55.0	24.2
High Range Gas						
Low	NA	NA	NA	NA	80.0	NA
High	NA	NA	NA	NA	90.0	NA
Actual Concentration (% or ppm)						
Zero	0.0	0.0	0.0	0.0	0.0	0.0
Low	NA	NA	NA	NA	29.9	NA
Mid	10.9	10.9	440.2	487.4	45.7	19.1
High	23.0	22.6	914.0	1,012.0	85.8	40.4
Response Time (seconds)	20.0	25.0	30.0	35.0	50.0	45.0
Instrument Response (% or ppm)						
Zero	0.1	0.1	0.0	0.2	0.0	0.0
Low	NA	NA	NA	NA	29.8	NA
Mid	10.9	10.8	452.3	483.0	45.5	18.7
High	23.0	22.6	909.5	1,011.0	85.8	40.4
Performance (% of Span or Cal. Gas Conc.)						
Zero	0.3	0.3	0.0	0.0	0.0	0.0
Low	NA	NA	NA	NA	0.3	NA
Mid	0.1	0.2	1.3	0.4	0.5	1.0
High	0.1	0.0	0.5	0.1	0.0	0.0
Status						
Zero	PASS	PASS	PASS	PASS	PASS	PASS
Low	NA	NA	NA	NA	PASS	NA
Mid	PASS	PASS	PASS	PASS	PASS	PASS
High	PASS	PASS	PASS	PASS	PASS	PASS

Bias/Drift Determinations

Location: ABCWUA - Southside Water Reclamation Plant
Source: Unit 80
Project No.: 2020-0005

Parameter	O_2 - Outlet	CO_2 - Outlet	CO - Outlet	NOx - Outlet	THC - Outlet	SO_2 - Outlet
Run 1 Date 1/9/20						
Span Value	23.0	22.6	914.0	1,012.0	100.0	40.4
Instrument Zero Cal Response	0.1	0.1	0.0	0.2	0.0	0.0
Instrument Mid Cal Response	10.9	10.8	452.3	483.0	45.5	18.7
Pretest System Zero Response	0.1	0.1	0.0	0.2	0.0	0.0
Posttest System Zero Response	0.1	0.1	0.1	0.2	1.8	0.0
Pretest System Mid Response	11.0	10.8	446.7	487.3	45.5	19.2
Posttest System Mid Response	11.0	10.8	445.5	478.6	46.4	19.0
Bias (%)						
Pretest Zero	0.0	0.0	0.0	0.0	NA	0.0
Posttest Zero	0.1	0.0	0.0	0.0	NA	0.0
Pretest Span	0.4	0.0	0.6	0.4	NA	1.4
Posttest Span	0.4	0.0	0.7	0.4	NA	0.7
Drift (%)						
Zero	0.1	0.0	0.0	0.0	1.8	0.0
Mid	0.0	0.0	0.1	0.9	0.9	0.6
Run 2 Date 1/9/20						
Span Value	23.0	22.6	914.0	1,012.0	100.0	40.4
Instrument Zero Cal Response	0.1	0.1	0.0	0.2	0.0	0.0
Instrument Mid Cal Response	10.9	10.8	452.3	483.0	45.5	18.7
Pretest System Zero Response	0.1	0.1	0.1	0.2	1.8	0.0
Posttest System Zero Response	0.1	0.0	0.1	0.4	0.0	0.1
Pretest System Mid Response	11.0	10.8	445.5	478.6	46.4	19.0
Posttest System Mid Response	11.0	10.8	430.9	483.0	47.4	19.2
Bias (%)						
Pretest Zero	0.1	0.0	0.0	0.0	NA	0.0
Posttest Zero	0.1	0.1	0.0	0.0	NA	0.2
Pretest Span	0.4	0.0	0.7	0.4	NA	0.7
Posttest Span	0.4	0.0	2.3	0.0	NA	1.5
Drift (%)						
Zero	0.0	0.1	0.0	0.0	1.8	0.1
Mid	0.0	0.0	1.6	0.4	1.0	0.7
Run 3 Date 1/9/20						
Span Value	23.0	22.6	914.0	1,012.0	100.0	40.4
Instrument Zero Cal Response	0.1	0.1	0.0	0.2	0.0	0.0
Instrument Mid Cal Response	10.9	10.8	452.3	483.0	45.5	18.7
Pretest System Zero Response	0.1	0.0	0.1	0.4	0.0	0.1
Posttest System Zero Response	0.1	0.0	0.1	0.8	0.0	0.0
Pretest System Mid Response	11.0	10.8	430.9	483.0	47.4	19.2
Posttest System Mid Response	11.0	10.8	435.7	476.8	47.5	19.0
Bias (%)						
Pretest Zero	0.1	0.1	0.0	0.0	NA	0.2
Posttest Zero	0.1	0.3	0.0	0.1	NA	0.0
Pretest Span	0.4	0.0	2.3	0.0	NA	1.5
Posttest Span	0.4	0.0	1.8	0.6	NA	0.9
Drift (%)						
Zero	0.0	0.2	0.0	0.0	0.0	0.2
Mid	0.0	0.0	0.5	0.6	0.1	0.6

QA Data

Location ABCWUA - Southside Water Reclamation Plant
Source Corrales Well #4
Project No. 2020-0005

Parameter	O_2 - Outlet	CO_2 - Outlet	CO - Outlet	NOx - Outlet	THC - Outlet	SO_2 - Outlet
Make	Servomex	Servomex	Thermo	Thermo	Thermo	Thermo
Model	1440	1440	48C	42i-HL	55i-3	43C-3
S/N	1420C/2767	1415C/2767	48C-64905-345	1129850114	1209052113	43C-70673-366
Operating Range	0-25	0-25	0-1000	0-2000	0-100	0-50
Cylinder ID						
Low	NA	NA	NA	NA	ALM058337	NA
Mid	EB0082456	EB0082456	SG9107488BAL	CC496889	SX63171	CC53917
High	SX25695	SX25695	CC142863	ALM044259	CC10068	CC166

Alliance
SOURCE TESTING

Calibration Data

Location: ABCWUA - Southside Water Reclamation Plant
Source: Corrales Well #4
Project No.: 2020-0005
Date: 1/8/20

Parameter	O_2 - Outlet	CO_2 - Outlet	CO - Outlet	NOx - Outlet	THC - Outlet	SO_2 - Outlet
Expected Average Concentration	8.0	8.0	500.0	500.0	50.0	10.0
Span Between						
Low	8.0	8.0	500.0	500.0	75.0	10.0
High	40.0	40.0	2,500.0	2,500.0	125.0	50.0
Desired Span	23.0	22.6	914.0	1,012.0	100.0	40.4
Low Range Gas						
Low	NA	NA	NA	NA	25.0	NA
High	NA	NA	NA	NA	35.0	NA
Mid Range Gas						
Low	9.2	9.0	365.6	404.8	45.0	16.2
High	13.8	13.6	548.4	607.2	55.0	24.2
High Range Gas						
Low	NA	NA	NA	NA	80.0	NA
High	NA	NA	NA	NA	90.0	NA
Actual Concentration (% or ppm)						
Zero	0.0	0.0	0.0	0.0	0.0	0.0
Low	NA	NA	NA	NA	29.9	NA
Mid	11.0	10.9	440.2	487.4	45.7	19.1
High	23.0	22.6	914.0	1,012.0	85.8	40.4
Response Time (seconds)	25.0	30.0	35.0	45.0	50.0	45.0
Instrument Response (% or ppm)						
Zero	0.0	0.0	0.0	0.1	0.0	0.1
Low	NA	NA	NA	NA	30.6	NA
Mid	10.8	10.6	441.6	483.7	45.8	18.9
High	23.0	22.6	911.0	1,012.4	85.8	40.4
Performance (% of Span or Cal. Gas Conc.)						
Zero	0.0	0.1	0.0	0.0	0.0	0.1
Low	NA	NA	NA	NA	2.4	NA
Mid	0.5	1.1	0.2	0.4	0.1	0.3
High	0.1	0.0	0.3	0.0	0.0	0.0
Status						
Zero	PASS	PASS	PASS	PASS	PASS	PASS
Low	NA	NA	NA	NA	PASS	NA
Mid	PASS	PASS	PASS	PASS	PASS	PASS
High	PASS	PASS	PASS	PASS	PASS	PASS

Bias/Drift Determinations

Location: ABCWUA - Southside Water Reclamation Plant
Source: Corrales Well #4
Project No.: 2020-0005

Parameter	O_2 - Outlet	CO_2 - Outlet	CO - Outlet	NOx - Outlet	THC - Outlet	SO_2 - Outlet
Run 1 Date 1/8/20						
Span Value	23.0	22.6	914.0	1,012.0	100.0	40.4
Instrument Zero Cal Response	0.0	0.0	0.0	0.1	0.0	0.1
Instrument Mid Cal Response	10.8	10.6	441.6	483.7	45.8	18.9
Pretest System Zero Response	0.0	0.0	-0.3	0.2	0.0	0.0
Posttest System Zero Response	0.1	0.0	0.0	1.7	0.0	0.0
Pretest System Mid Response	10.9	10.8	441.8	488.4	45.7	18.9
Posttest System Mid Response	10.9	10.7	429.8	488.8	43.5	18.9
Bias (%)						
Pretest Zero	0.0	0.1	0.0	0.0	NA	0.1
Posttest Zero	0.4	0.1	0.0	0.2	NA	0.1
Pretest Span	0.3	0.9	0.0	0.5	NA	0.0
Posttest Span	0.3	0.4	1.3	0.5	NA	0.0
Drift (%)						
Zero	0.4	0.0	0.0	0.1	0.0	0.0
Mid	0.0	0.4	1.3	0.0	2.2	0.0
Run 2 Date 1/8/20						
Span Value	23.0	22.6	914.0	1,012.0	100.0	40.4
Instrument Zero Cal Response	0.0	0.0	0.0	0.1	0.0	0.1
Instrument Mid Cal Response	10.8	10.6	441.6	483.7	45.8	18.9
Pretest System Zero Response	0.1	0.0	0.0	1.7	0.0	0.0
Posttest System Zero Response	0.2	0.1	-1.0	1.2	0.0	0.0
Pretest System Mid Response	10.9	10.7	429.8	488.8	43.5	18.9
Posttest System Mid Response	10.9	10.7	432.4	481.4	43.8	18.6
Bias (%)						
Pretest Zero	0.4	0.1	0.0	0.2	NA	0.1
Posttest Zero	0.9	0.4	0.1	0.1	NA	0.1
Pretest Span	0.3	0.4	1.3	0.5	NA	0.0
Posttest Span	0.3	0.4	1.0	0.2	NA	0.8
Drift (%)						
Zero	0.4	0.4	0.1	0.0	0.0	0.0
Mid	0.0	0.0	0.3	0.7	0.3	0.7
Run 3 Date 1/8/20						
Span Value	23.0	22.6	914.0	1,012.0	100.0	40.4
Instrument Zero Cal Response	0.0	0.0	0.0	0.1	0.0	0.1
Instrument Mid Cal Response	10.8	10.6	441.6	483.7	45.8	18.9
Pretest System Zero Response	0.2	0.1	-1.0	1.2	0.0	0.0
Posttest System Zero Response	0.2	0.1	-1.0	1.2	0.0	0.0
Pretest System Mid Response	10.9	10.7	432.4	481.4	43.8	18.6
Posttest System Mid Response	10.9	10.7	433.0	476.7	43.4	18.6
Bias (%)						
Pretest Zero	0.9	0.4	0.1	0.1	NA	0.1
Posttest Zero	0.9	0.4	0.1	0.1	NA	0.1
Pretest Span	0.3	0.4	1.0	0.2	NA	0.8
Posttest Span	0.3	0.4	0.9	0.7	NA	0.8
Drift (%)						
Zero	0.0	0.0	0.0	0.0	0.0	0.0
Mid	0.0	0.0	0.1	0.5	0.4	0.0

MATHESON

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EPA Protocol
Gas Mixture

Customer: Matheson
CGA: 590
Customer PO#: 2982988
Cylinder #: EB0082456
Part #: G2700346

Reference#: 090219SY-L
Certification Date: 09/16/2019
Expiration Date: 09/16/2027
Pressure, psig: 2000

Method: This standard was analyzed according to EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards, Procedure G1 (May 2012).

Components	Requested Concentration	Certified Concentration	Expanded Uncertainty	Assay Dates
Carbon Dioxide	10.9%	10.91%	0.6%	9/16/19
Oxygen	10.9%	10.92%	0.6%	9/16/19
Nitrogen	Balance	Balance	-	-

Reference Standard	Cylinder #	Concentration	Expanded Uncertainty	Expiration Date
Carbon Dioxide/ GMIS	EB0046334	10.99%	0.4%	04/27/20
Carbon Dioxide/ SRM	CAL016053	15.63%	0.2%	05/01/15
Oxygen/ GMIS	EB0040572	9.96%	0.5%	03/15/22
Oxygen/ SRM	CAL015787	20.72%	0.2%	01/01/16

Instrument/ Model	Serial Number	Last Date Calibrated	Analytical Method
Micro GC/ Agilent	US020002031	9/16/2019	Thermal Conductivity

These mixtures were prepared gravimetrically using a high load high sensitivity electronic scale. Prior to filling the scale is verified for accuracy throughout the target mass range against applicable NIST traceable weights. We certify that the weights are calibrated to ASTM E617-97 Class 1 tolerances.

This report states accurately the results of the investigation made upon the material submitted to the analytical laboratory. Every effort has been made to determine objectively the information requested. However, in connection with this report, Global Calibration Gases LLC shall have no liability in excess of the established charge for this service. Assayed at Global Calibration Gases LLC, Sarasota, Florida.

The calibration results published in this certificate were obtained using equipment and standards capable of producing results that are traceable to National Institute of Standards and Technology (NIST) and through NIST to the International System of Units (SI). The expanded uncertainties, if included on this certificate, use a coverage factor of k=2 to approximate the 95% confidence level of the measurement, unless otherwise noted. If uncertainties are not included on this certificate, they are available upon request. This calibration certificate applies only to the item described and shall not be reproduced other than in full, without written approval from the calibration facility. Calibration certificates without signatures are not valid. This calibration meets the requirements of ISO/IEC 17025:2017. Do not use this standard when cylinder pressure is below 100 psig.

Produced by:
Global Calibration Gases LLC.
1090 Commerce Blvd N.
Sarasota, Florida 34243 USA
PGVP Vendor ID.: N22019

Principal Analyst:
Date: 09/16/2019

Principal Reviewer:
Date: 09/16/2019

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1700 Scepter Rd
Waverly, TN 37185
931-296-3357

Certificate of Analysis - EPA Protocol Mixtures

Customer:
MATHESON LINWELD
4705 NOME ST
ALLIANCE SOURCE TESTING
DENVER, CO 80239

Customer PO#: 20181071-00

Part #: G2698715

Protocol:
G1= O2
G2= CO2

Reference #: 750827-003

Lot#: 9309638860

Cylinder Number: SX25695

Cylinder Pressure: 1900 psig

Last Analysis Date: 6/26/2019

Expiration Date: 6/26/2027

DO NOT USE THIS CYLINDER WHEN THE PRESSURE FALLS BELOW 100 PSIG

				REPLICATE RESPONSES
Component:	Carbon Dioxide			Date: 6/26/2019
				22.60
Certified Conc:	22.60 %	+/- 0.09 %	ABS	22.60
				22.61
Component:	Oxygen			Date: 6/26/2019
				22.97
Certified Conc:	22.97 %	+/- 0.03 %	ABS	22.97
				22.98

BALANCE GAS: Nitrogen

REFERENCE STANDARDS:

Component:	Carbon Dioxide	Component:	Oxygen
Reference Standard:	NTRM	Reference Standard:	SRM
Cylinder #:	AM11350	Cylinder #:	CAL016956
Concentration:	19.405 +/- 0.58 % ABS	Concentration:	9.918 +/- 0.022 % ABS
Exp. Date:	12/9/2022	Exp. Date:	2/3/2024
SRM #:	NTRM	SRM #:	2658a
NIST Sample#	171101	NIST Sample#	72-D-41

CERTIFICATION INSTRUMENTS

Component:	Carbon Dioxide	Component:	Oxygen
Make/Model:	CAI 700	Make/Model:	HORIBA MPA 510
Serial Number:	1805006	Serial Number:	SGU27SC4
Measurement Principle:	NDIR	Measurement Principle:	PARAMAGNETIC
Last Calibration:	6/24/2019	Last Calibration:	6/17/2019

Notes:

The certification was performed according to EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards May 2012, using procedure G1 and/or G2. U.S EPA Vendor ID Number: D62019, PGVP Participation Date: 01/01/19, PGVP Renewal Date: 01/01/20
The expanded uncertainty listed for each component was calculated at a coverage factor of k=2 and at a level of confidence of 95%.

Analyst: Cathy Swaw
Cathy Swaw

Date: 06/27/19

Airgas
an Air Liquide company

Airgas Specialty Gases
Airgas USA, LLC
525 North Industrial Loop Road
Tooele, UT 84074
Airgas.com

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number:	E02NI99E15A1383	Reference Number:	153-401646783-1
Cylinder Number:	SG9107488BAL	Cylinder Volume:	144.3 CF
Laboratory:	124 - Tooele (SAP) - UT	Cylinder Pressure:	2015 PSIG
PGVP Number:	B72019	Valve Outlet:	350
Gas Code:	CO,BALN	Certification Date:	Nov 08, 2019

Expiration Date: Nov 08, 2027

Certification performed in accordance with “EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)” document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a mole/mole basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
CARBON MONOXIDE	440.0 PPM	440.2 PPM	G1	+/- 0.7% NIST Traceable	11/08/2019
NITROGEN	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	15060546	CC453970	491.9 PPM CARBON MONOXIDE/NITROGEN	0.6%	Jan 08, 2021

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet 6700 AHR0801550 CO MCO	FTIR	Oct 23, 2019

Triad Data Available Upon Request

Signature on file

Approved for Release

Airgas Specialty Gases
Airgas USA, LLC
525 North Industrial Loop Road
Tooele, UT 84074
Airgas.com

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number:	E02NI99E15A0Q44	Reference Number:	153-124524724-1
Cylinder Number:	CC142863	Cylinder Volume:	144.4 CF
Laboratory:	124 - Tooele (SAP) - UT	Cylinder Pressure:	2015 PSIG
PGVP Number:	B72015	Valve Outlet:	350
Gas Code:	CO,BALN	Certification Date:	Nov 17, 2015

Expiration Date: Nov 17, 2023

Certification performed in accordance with “EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)” document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
CARBON MONOXIDE	915.0 PPM	914.0 PPM	G1	+/- 1.0% NIST Traceable	11/17/2015
NITROGEN	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	14060124	CC434302	990.9 PPM CARBON MONOXIDE/NITROGEN	0.6	Nov 18, 2019

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet 6700 AHR0801550 CO HCO	FTIR	Nov 04, 2015

Triad Data Available Upon Request

Signature on file

Approved for Release

Airgas
an Air Liquide company

Airgas Specialty Gases
Airgas USA, LLC
525 North Industrial Loop Road
Tooele, UT 84074
Airgas.com

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number:	E02NI99E15A01D1	Reference Number:	153-124597793-1
Cylinder Number:	CC496889	Cylinder Volume:	144.4 CF
Laboratory:	124 - Tooele - UT	Cylinder Pressure:	2015 PSIG
PGVP Number:	B72017	Valve Outlet:	660
Gas Code:	NO,NOX,BALN	Certification Date:	Jan 23, 2017

Expiration Date: Jan 23, 2025

Certification performed in accordance with “EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)” document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	485.0 PPM	487.4 PPM	G1	+/- 1.2% NIST Traceable	01/16/2017, 01/23/2017
NITRIC OXIDE	485.0 PPM	485.5 PPM	G1	+/- 1.1% NIST Traceable	01/16/2017, 01/23/2017
NITROGEN	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	12061002	CC359342	500.7 PPM NITRIC OXIDE/NITROGEN	0.5%	Feb 16, 2018
PRM	12367	APEX1099237	10.00 PPM NITROGEN DIOXIDE/NITROGEN	1.6%	May 29, 2016
NTRM	15060425	CC449859	496.8 PPM NITRIC OXIDE/NITROGEN	0.5	May 04, 2021
GMIS	0315201603	CC502257	4.875 PPM NITROGEN DIOXIDE/NITROGEN	1.6	Mar 15, 2019

The SRM, PRM or RGM noted above is only in reference to the GMIS used in the assay and not part of the analysis.

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet 6700 AHR0801550 NO MNO	FTIR	Dec 28, 2016
Nicolet 6700 AHR0801550 NO2 impurity	FTIR NO2 impurity	Dec 29, 2016

Triad Data Available Upon Request

Signature on file

Approved for Release

Airgas
an Air Liquide company

Airgas Specialty Gases
Airgas USA, LLC
525 North Industrial Loop Road
Tooele, UT 84074
Airgas.com

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number:	E02NI99E15A0100	Reference Number:	153-401646780-1
Cylinder Number:	ALM044259	Cylinder Volume:	144.4 CF
Laboratory:	124 - Tooele (SAP) - UT	Cylinder Pressure:	2015 PSIG
PGVP Number:	B72019	Valve Outlet:	660
Gas Code:	NO,NOX,BALN	Certification Date:	Nov 18, 2019

Expiration Date: Nov 18, 2027

Certification performed in accordance with “EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)” document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a mole/mole basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	1000 PPM	1012 PPM	G1	+/- 0.6% NIST Traceable	11/11/2019, 11/18/2019
NITRIC OXIDE	1000 PPM	1010 PPM	G1	+/- 0.7% NIST Traceable	11/11/2019, 11/18/2019
NITROGEN	Balance			-	

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	15010303	KAL003293	980.7 PPM NITRIC OXIDE/NITROGEN	0.5%	Aug 21, 2021
PRM	12376	D562879	10.01 PPM NITROGEN DIOXIDE/NITROGEN	2.0%	Aug 17, 2018
GMIS	7302017111	CC511391	4.634 PPM NITROGEN DIOXIDE/NITROGEN	2.0%	Aug 15, 2021

The SRM, PRM or RGM noted above is only in reference to the GMIS used in the assay and not part of the analysis.

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet 6700 AHR0801550 NO HNO	FTIR	Nov 06, 2019
Nicolet 6700 AHR0801550 NO2 impurity	FTIR NO2 impurity	Nov 07, 2019

Triad Data Available Upon Request

Signature on file

Approved for Release

Airgas Specialty Gases
Airgas USA, LLC
525 North Industrial Loop Road
Tooele, UT 84074
Airgas.com

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number:	E02NI99E15A0930	Reference Number:	153-401441678-1
Cylinder Number:	ALM058337	Cylinder Volume:	144.4 CF
Laboratory:	124 - Tooele (SAP) - UT	Cylinder Pressure:	2015 PSIG
PGVP Number:	B72019	Valve Outlet:	350
Gas Code:	PPN,BALN	Certification Date:	Mar 08, 2019

Expiration Date: Mar 08, 2027

Certification performed in accordance with “EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)” document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
PROPANE	30.00 PPM	29.88 PPM	G1	+/- 0.7% NIST Traceable	03/08/2019
NITROGEN	Balance			-	

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	17061011	ND61547	49.13 PPM PROPANE/AIR	0.4%	Jul 21, 2023

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet 6700 AMP0900119 C3H8 LC3H8	FTIR	Feb 21, 2019

Triad Data Available Upon Request

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MATHESON
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1700 Scepter Rd
Waverly, TN 37185
931-296-3357

Certificate of Analysis - EPA Protocol Mixtures

Customer: MATHESON LINWELD
4705 NOME ST
ALLIANCE SOURCE TESTING
DENVER, CO 80239

Customer PO#: 20181071-00
Protocol: G1
Reference #: 750827-02
Part # G2700345
Lot#: 9309638856

Cylinder Number: SX63171
Cylinder Pressure: 1900 psig
Last Analysis Date: 6/27/2019
Expiration Date: 6/27/2027

DO NOT USE THIS CYLINDER WHEN THE PRESSURE FALLS BELOW 100 PSIG

REPLICATE RESPONSES
Date: 6/27/2019

Component: Propane
Certified Conc: 45.73 ppm +/- 0.14 ppm ABS

REPLICATE RESPONSES
45.72
45.75
45.71

BALANCE GAS: Nitrogen

REFERENCE STANDARDS:

Component: Propane
Reference Standard: PRM
Cylinder #: 5604695
Concentration: 49.55 ppm +/- 0.15 ppm (abs)
Exp Date: 11/19/2020
SRM #: VSL PRIMARY
NIST Sample# VSL PRIMARY

CERTIFICATION INSTRUMENTS

Component: Propane
Make/Model: Horiba FIA-510
Serial Number: 2LNDTHVT
Measurement Principle: FID
Last Calibration: 6/4/2019

Notes:

The certification was performed according to EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards May 2012, using procedure G1 and/or G2. U.S EPA Vendor ID Number: D62019, PGVP Participation Date: 01/01/19, PGVP Renewal Date: 01/01/20
The expanded uncertainty listed for each component was calculated at a coverage factor of k=2 and at a level of confidence of 95%.

Analyst: Cierra Freed
Cierra Freed

Date: 6/28/2019

Airgas Specialty Gases
Airgas USA, LLC
600 Union Landing Road
Cinnaminson, NJ 08077-0000
Airgas.com

CERTIFICATE OF ANALYSIS
Grade of Product: EPA Protocol

Part Number:	E04NI88E15AC032	Reference Number:	82-124383028-1
Cylinder Number:	CC10068	Cylinder Volume:	150.6 CF
Laboratory:	124 - Riverton (SAP) - NJ	Cylinder Pressure:	2015 PSIG
PGVP Number:	B52013	Valve Outlet:	660
Gas Code:	CO2,NO,NOX,SO2,BALN	Certification Date:	Jul 10, 2013

Expiration Date: Jul 10, 2021

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a mole/mole basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	410.0 PPM	402.1 PPM	G1	+/- 1.0% NIST Traceable	07/02/2013, 07/10/2013
NITRIC OXIDE	410.0 PPM	402.1 PPM	G1	+/- 1.0% NIST Traceable	07/02/2013, 07/10/2013
SULFUR DIOXIDE	1400 PPM	1393 PPM	G1	+/- 1.0% NIST Traceable	07/02/2013, 07/10/2013
CARBON DIOXIDE	11.00 %	10.97 %	G1	+/- 0.7% NIST Traceable	07/02/2013
NITROGEN	Balance			-	

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRMplus	12061015	CC359383	500.7 PPM NITRIC OXIDE/NITROGEN	+/- 0.5%	Feb 16, 2018
NTRMplus	12061015	CC359383-NOX	501.7 PPM NOx/NITROGEN	+/- 0.5%	Feb 16, 2018
NTRMplus	12062629	CC366247	996.8 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.5%	Jun 22, 2018
NTRMplus	12061330	CC360523	11.002 % CARBON DIOXIDE/NITROGEN	+/- 0.6%	Jan 11, 2018

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Thermo 42i-HL-NO-0627218610	Chemiluminescence	Jun 21, 2013
Thermo 42i-HL-NOx-0627218610	Chemiluminescence	Jun 21, 2013
Bovar 721M-SO2-93-721M-7998-3	NDUV	Jun 28, 2013

Triad Data Available Upon Request

Signature on file

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Airgas
an Air Liquide company

Airgas Specialty Gases
Airgas USA, LLC
525 North Industrial Loop Road
Tooele, UT 84074
Airgas.com

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number:	E02NI99E15A1322	Reference Number:	153-401075518-1
Cylinder Number:	CC53917	Cylinder Volume:	144.3 CF
Laboratory:	124 - Tooele (SAP) - UT	Cylinder Pressure:	2015 PSIG
PGVP Number:	B72017	Valve Outlet:	660
Gas Code:	SO2,BALN	Certification Date:	Dec 19, 2017

Expiration Date: Dec 19, 2021

Certification performed in accordance with “EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)” document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
SULFUR DIOXIDE	19.00 PPM	19.06 PPM	G1	+/- 1.1% NIST Traceable	12/12/2017, 12/19/2017
NITROGEN	Balance			-	

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	17060726	CC486277	15.9 PPM SULFUR DIOXIDE/NITROGEN	0.9%	Jul 14, 2019

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet 6700 AHR0801550 SO2 LSO2	FTIR	Nov 22, 2017

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Airgas
an Air Liquide company

Airgas Specialty Gases
Airgas USA, LLC
525 North Industrial Loop Road
Tooele, UT 84074
Airgas.com

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number:	E02NI99E15A0357	Reference Number:	153-124612915-4
Cylinder Number:	CC166	Cylinder Volume:	144.4 CF
Laboratory:	124 - Tooele - UT	Cylinder Pressure:	2015 PSIG
PGVP Number:	B72017	Valve Outlet:	660
Gas Code:	SO2,BALN	Certification Date:	Apr 24, 2017

Expiration Date: **Apr 24, 2021**

Certification performed in accordance with “EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)” document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
SULFUR DIOXIDE	40.00 PPM	40.39 PPM	G1	+/- 0.9% NIST Traceable	04/17/2017, 04/24/2017
NITROGEN	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	16061023	CC473215	49.02 PPM SULFUR DIOXIDE/NITROGEN	0.8%	Jun 17, 2022

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet 6700 AMP0900119 SO2 LSO2	FTIR	Apr 06, 2017

Triad Data Available Upon Request

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QA Data
Stratification Check

Location: ABCWUA - Southside Water Reclamation Plant
Source: Unit 27
Project No.: 2020-0005
Date: 1/11/2019

Traverse Point	**Time**	**NOx** **(ppm)**	**CO** **(ppm)**	**SO_2** **(ppm)**	**O_2** **(%)**	**CO_2** **(%)**
A-1	9:16	53.1	314.1	0.1	11.6	5.3
2	9:18	52.9	312.4	0.1	11.6	5.3
3	9:20	52.4	312.9	0.1	11.6	5.3
Average		52.8	313.1	0.1	11.6	5.3
Status		Single	Single	Single	Single	Single

QA Data
Stratification Check

Location: ABCWUA- Southside Water Reclamation Plant
Source: Unit 27 (digestor)
Project No.: 2020-0005
Date: 1/11/2019

Traverse Point	**Time**	**NOx** **(ppm)**	**CO** **(ppm)**	**SO_2** **(ppm)**	**O_2** **(%)**	**CO_2** **(%)**
A-1	9:16	53.1	314.1	0.1	11.6	5.3
2	9:18	52.9	312.4	0.1	11.6	5.3
3	9:20	52.4	312.9	0.1	11.6	5.3
Average		52.8	313.1	0.1	11.6	5.3
Status		Single	Single	Single	Single	Single

QA Data
Stratification Check

Location: ABCWUA - Southside Water Reclamation Plant
Source: Unit 28
Project No.: 2020-0005
Date: 1/10/2019

Traverse Point	**Time**	**NOx (ppm)**	**CO (ppm)**	**SO_2 (ppm)**	**O_2 (%)**	**CO_2 (%)**
A-1	9:38	47.7	341.6	0.0	11.6	5.4
2	9:40	49.3	335.6	0.1	11.6	5.4
3	9:42	48.9	332.8	0.1	11.6	5.4
Average		48.6	336.6	0.1	11.6	5.4
Status		Single	Single	Single	Single	Single

QA Data
Stratification Check

Location: ABCWUA - Southside Water Reclamation Plant
Source: Unit 28 (Digestor)
Project No.: 2020-0005
Date: 1/10/2020

Traverse Point	**Time**	**NOx (ppm)**	**CO (ppm)**	**SO_2 (ppm)**	**O_2 (%)**	**CO_2 (%)**
A-1	9:38	47.7	341.6	0.0	11.6	5.4
2	9:40	49.3	335.6	0.1	11.6	5.4
3	9:42	48.9	332.8	0.1	11.6	5.4
Average		48.6	336.6	0.1	11.6	5.4
Status		Single	Single	Single	Single	Single

Alliance SOURCE TESTING

QA Data
Stratification Check

Location: ABCWUA - Southside Water Reclamation Plant
Source: Unit 29
Project No.: 2020-0005
Date: 1/13/2019

Traverse Point	Time	O_2 (%)	CO_2 (%)
A-1	9:10	10.8	5.7
2	9:12	10.8	5.7
3	9:14	10.8	5.7
Average		10.8	5.7
Status		Single	Single

QA Data
Stratification Check

Location: ABCQUA - Southside Water Reclamation Plant
Source: Unit 29 (Digestor)
Project No.: 2020-0005
Date: 1/13/2019

Traverse Point	Time	O_2 (%)	CO_2 (%)
A-1	9:10	10.8	5.7
2	9:12	10.8	5.7
3	9:14	10.8	5.7
Average		10.8	5.7
Status		Single	Single

QA Data
Stratification Check

Location: ABCWUA - Southside Water Reclamation Plant
Source: Unit 30
Project No.: 2020-0005
Date: 1/12/2020

Traverse Point	**Time**	**NOx (ppm)**	**CO (ppm)**	**SO_2 (ppm)**	**O_2 (%)**	**CO_2 (%)**
A-1	9:24	42.5	419.5	0.0	11.2	5.3
2	9:26	43.1	416.6	0.0	11.2	5.3
3	9:28	42.9	417.8	0.0	11.2	5.3
Average		42.9	417.9	0.0	11.2	5.3
Status		Single	Single	Single	Single	Single

QA Data
Stratification Check

Location: ABCWUA - Southside Water Reclamation Plant
Source: Unit 30 (Digestor)
Project No.: 2020-0005
Date: 1/12/2020

Traverse Point	Time	NOx (ppm)	CO (ppm)	SO_2 (ppm)	O_2 (%)	CO_2 (%)
A-1	9:24	42.5	419.5	0.0	11.2	5.3
2	9:26	43.1	416.6	0.0	11.2	5.3
3	9:28	42.9	417.8	0.0	11.2	5.3
Average		42.9	417.9	0.0	11.2	5.3
Status		Single	Single	Single	Single	Single

QA Data
Stratification Check

Location: ABCWUA - Southside Water Reclamation Plant
Source: Unit 80
Project No.: 2020-0005
Date: 1/9/2019

Traverse Point	**Time**	**O_2 (%)**	**CO_2 (%)**
A-1	10:12	16.4	4.1
2	10:14	16.5	3.4
3	10:16	16.5	3.4
Average		16.5	3.6
Status		Single	Single

QA Data
Stratification Check

Location: ABCWUA - Southside Water Reclamation Plant
Source: Corrales Well #4
Project No.: 2020-0005
Date: 1/8/2020

Traverse Point	**Time**	**NOx (ppm)**	**CO (ppm)**	**SO_2 (ppm)**	**O_2 (%)**	**CO_2 (%)**
A-1	12:46	309.6	407.9	0.6	6.6	8.1
2	12:48	315.0	406.5	0.6	6.6	8.2
3	12:50	320.0	407.3	0.6	6.6	8.2
Average		314.9	407.2	0.6	6.6	8.1
Status		Single	Single	Single	Single	Single

NOx Converter Efficiency Check

Location: ABCWUA - Southside Water Reclamation Plant
Project No.: 2020-0005

**Required Efficiency is ≥ 90 %.*

40 CFR Part. 60, Appendix A, Method 7E, Section 16.2

16.2 - Alternative NO2 to NO Conversion Efficiency Procedures.

16.2.2 – Add gas from the mid-level NO in N2 calibration gas cylinder to a clean, evacuated, leak-tight Tedlar bag. Dilute this gas approximately 1:1 with 20.9% O2, purified air. Immediately attach the bag outlet to the calibration valve assembly and begin operation of the sampling system. Operate the sampling system, recording the NOX response, for at least 30 minutes. If the NO2 to NO conversion is 100%, the instrument response will be stable at the highest peak value observed. If the response at the end of 30 minutes decreases more than 2.0% of the highest peak value, the system is not acceptable and corrections must be made before repeating the check.

NO$_2$ Converter Check - Outlet					
Analyzer Make	Thermo	**Date**	1/11/20	**Start Time**	8:32
Analyzer Model	42i-HL			**Initial NO Response**	204.3
Serial Number	1129850114			**NOx High Peak Response**	208
Cylinder ID Number	CC496889			**NOx Final Response**	208
Cylinder Exp. Date	1/23/25			**NO Final Reponse**	182
Cylinder Concentration, ppm	487.4			**NOx % Decrease**	0
Span Value	1012			**Status**	Pass

Converter Efficiency Test Data		
Minutes	Time	NOx (ppm)
1	8:32:00 AM	208.03
2	8:33:00 AM	208.11
3	8:34:00 AM	208.17
4	8:35:00 AM	208.19
5	8:36:00 AM	208.19
6	8:37:00 AM	208.19
7	8:38:00 AM	208.19
8	8:39:00 AM	208.19
9	8:40:00 AM	208.17
10	8:41:00 AM	208.15
11	8:42:00 AM	208.14
12	8:43:00 AM	208.15
13	8:44:00 AM	208.14
14	8:45:00 AM	208.15
15	8:46:00 AM	208.15
16	8:47:00 AM	208.12
17	8:48:00 AM	208.11
18	8:49:00 AM	208.08
19	8:50:00 AM	208.1
20	8:51:00 AM	208.1
21	8:52:00 AM	208.12
22	8:53:00 AM	208.11
23	8:54:00 AM	208.1
24	8:55:00 AM	208.08
25	8:56:00 AM	208.06
26	8:57:00 AM	208.06
27	8:58:00 AM	208.06
28	8:59:00 AM	208.07
29	9:00:00 AM	208.07
30	9:01:00 AM	208.04

40 CFR Part. 60, Appendix A, Method 7E, Section 12.9, Equation 7E-9

$$\%Decrease = 100\ x\ \frac{(NOx\ Peak\ -NOx\ Final)}{NOx\ Peak}$$

NOx Converter Efficiency Check

Location: ABCWUA - Southside Water Reclamation Plant
Project No.: 2020-0005

**Required Efficiency is ≥ 90 %.*

40 CFR Part. 60, Appendix A, Method 7E, Section 16.2

16.2 - Alternative NO2 to NO Conversion Efficiency Procedures.

16.2.2 – Add gas from the mid-level NO in N2 calibration gas cylinder to a clean, evacuated, leak-tight Tedlar bag. Dilute this gas approximately 1:1 with 20.9% O2, purified air. Immediately attach the bag outlet to the calibration valve assembly and begin operation of the sampling system. Operate the sampling system, recording the NOX response, for at least 30 minutes. If the NO2 to NO conversion is 100%, the instrument response will be stable at the highest peak value observed. If the response at the end of 30 minutes decreases more than 2.0% of the highest peak value, the system is not acceptable and corrections must be made before repeating the check.

NO$_2$ Converter Check - Outlet					
Analyzer Make	Thermo	**Date**	1/13/20	**Start Time**	8:13
Analyzer Model	42i-HL			**Initial NO Response**	178.4
Serial Number	1129850114			**NOx High Peak Response**	180
Cylinder ID Number	CC496889			**NOx Final Response**	179
Cylinder Exp. Date	1/23/25			**NO Final Reponse**	162
Cylinder Concentration, ppm	487.4			**NOx % Decrease**	1
Span Value	1012			**Status**	Pass

Converter Efficiency Test Data		
Minutes	Time	NOx (ppm)
1	8:13:00 AM	179.6
2	8:14:00 AM	179.61
3	8:15:00 AM	179.64
4	8:16:00 AM	179.69
5	8:17:00 AM	179.68
6	8:18:00 AM	179.67
7	8:19:00 AM	179.67
8	8:20:00 AM	179.66
9	8:21:00 AM	179.59
10	8:22:00 AM	179.59
11	8:23:00 AM	179.58
12	8:24:00 AM	179.54
13	8:25:00 AM	179.55
14	8:26:00 AM	179.52
15	8:27:00 AM	179.49
16	8:28:00 AM	179.44
17	8:29:00 AM	179.44
18	8:30:00 AM	179.43
19	8:31:00 AM	179.39
20	8:32:00 AM	179.38
21	8:33:00 AM	179.24
22	8:34:00 AM	179.21
23	8:35:00 AM	179.07
24	8:36:00 AM	179.02
25	8:37:00 AM	178.93
26	8:38:00 AM	178.94
27	8:39:00 AM	178.84
28	8:40:00 AM	178.87
29	8:41:00 AM	178.79
30	8:42:00 AM	178.72

40 CFR Part. 60, Appendix A, Method 7E, Section 12.9, Equation 7E-9

$$\%Decrease = 100\ x\ \frac{(NOx\ Peak\ - NOx\ Final)}{NOx\ Peak}$$

NOx Converter Efficiency Check

Location: ABCWUA - Southside Water Reclamation Plant
Project No.: 2020-0005

40 CFR Part. 60, Appendix A, Method 7E, Section 16.2

16.2 - Alternative NO2 to NO Conversion Efficiency Procedures.

16.2.2 – Add gas from the mid-level NO in N2 calibration gas cylinder to a clean, evacuated, leak-tight Tedlar bag. Dilute this gas approximately 1:1 with 20.9% O2, purified air. Immediately attach the bag outlet to the calibration valve assembly and begin operation of the sampling system. Operate the sampling system, recording the NOX response, for at least 30 minutes. If the NO2 to NO conversion is 100%, the instrument response will be stable at the highest peak value observed. If the response at the end of 30 minutes decreases more than 2.0% of the highest peak value, the system is not acceptable and corrections must be made before repeating the check.

NO_2 Converter Check - Outlet

Analyzer Make	Thermo	**Date**	1/12/20	**Start Time**	8:48
Analyzer Model	42i-HL			**Initial NO Response**	205.6
Serial Number	1129850114			**NOx High Peak Response**	207
Cylinder ID Number	CC496889			**NOx Final Response**	207
Cylinder Exp. Date	1/23/25			**NO Final Reponse**	189
Cylinder Concentration, ppm	487.4			**NOx % Decrease**	0
Span Value	1012			**Status**	Pass

Converter Efficiency Test Data

Minutes	Time	NOx (ppm)
1	8:48:00 AM	207.01
2	8:49:00 AM	207.09
3	8:50:00 AM	207.15
4	8:51:00 AM	207.17
5	8:52:00 AM	207.17
6	8:53:00 AM	207.17
7	8:54:00 AM	207.17
8	8:55:00 AM	207.17
9	8:56:00 AM	207.15
10	8:57:00 AM	207.13
11	8:58:00 AM	207.12
12	8:59:00 AM	207.13
13	9:00:00 AM	207.12
14	9:01:00 AM	207.13
15	9:02:00 AM	207.13
16	9:03:00 AM	207.1
17	9:04:00 AM	207.09
18	9:05:00 AM	207.08
19	9:06:00 AM	207.08
20	9:07:00 AM	207.08
21	9:08:00 AM	207.1
22	9:09:00 AM	207.09
23	9:10:00 AM	207.08
24	9:11:00 AM	207.06
25	9:12:00 AM	207.04
26	9:13:00 AM	207.04
27	9:14:00 AM	207.04
28	9:15:00 AM	207.05
29	9:16:00 AM	207.05
30	9:17:00 AM	207.02

40 CFR Part. 60, Appendix A, Method 7E, Section 12.9, Equation 7E-9

$$\%Decrease = 100\ x\ \frac{(NOx\ Peak\ - NOx\ Final)}{NOx\ Peak}$$

NOx Converter Efficiency Check

Location: ABCWUA - Southside Water Reclamation Plant
Project No.: 2020-0005

40 CFR Part. 60, Appendix A, Method 7E, Section 16.2

16.2 - Alternative NO2 to NO Conversion Efficiency Procedures.

16.2.2 – Add gas from the mid-level NO in N2 calibration gas cylinder to a clean, evacuated, leak-tight Tedlar bag. Dilute this gas approximately 1:1 with 20.9% O2, purified air. Immediately attach the bag outlet to the calibration valve assembly and begin operation of the sampling system. Operate the sampling system, recording the NOX response, for at least 30 minutes. If the NO2 to NO conversion is 100%, the instrument response will be stable at the highest peak value observed. If the response at the end of 30 minutes decreases more than 2.0% of the highest peak value, the system is not acceptable and corrections must be made before repeating the check.

NO_2 Converter Check - Outlet

Analyzer Make	Thermo	**Date**	1/9/20	**Start Time**	9:33
Analyzer Model	42i-HL			**Initial NO Response**	247.6
Serial Number	1129850114			**NOx High Peak Response**	252
Cylinder ID Number	CC496889			**NOx Final Response**	251
Cylinder Exp. Date	1/23/25			**NO Final Reponse**	222
Cylinder Concentration, ppm	487.4			**NOx % Decrease**	0
Span Value	1012			**Status**	Pass

Converter Efficiency Test Data

Minutes	Time	NOx (ppm)
1	9:33:00 AM	251.72
2	9:34:00 AM	251.75
3	9:35:00 AM	251.72
4	9:36:00 AM	251.72
5	9:37:00 AM	251.64
6	9:38:00 AM	251.62
7	9:39:00 AM	251.63
8	9:40:00 AM	251.63
9	9:41:00 AM	251.59
10	9:42:00 AM	251.61
11	9:43:00 AM	251.6
12	9:44:00 AM	251.58
13	9:45:00 AM	251.57
14	9:46:00 AM	251.53
15	9:47:00 AM	251.55
16	9:48:00 AM	251.57
17	9:49:00 AM	251.54
18	9:50:00 AM	251.49
19	9:51:00 AM	251.5
20	9:52:00 AM	251.47
21	9:53:00 AM	251.44
22	9:54:00 AM	251.41
23	9:55:00 AM	251.42
24	9:56:00 AM	251.37
25	9:57:00 AM	251.34
26	9:58:00 AM	251.31
27	9:59:00 AM	251.29
28	10:00:00 AM	251.24
29	10:01:00 AM	251.21
30	10:02:00 AM	251.14

40 CFR Part. 60, Appendix A, Method 7E, Section 12.9, Equation 7E-9

$$\%Decrease = 100\ x\ \frac{(NOx\ Peak\ \ - NOx\ Final)}{NOx\ Peak}$$

NOx Converter Efficiency Check

Location: ABCWUA - Southside Water Reclamation Plant
Project No.: 2020-0005

**Required Efficiency is ≥ 90 %.*

40 CFR Part. 60, Appendix A, Method 7E, Section 16.2

16.2 - Alternative NO2 to NO Conversion Efficiency Procedures.

16.2.2 – Add gas from the mid-level NO in N2 calibration gas cylinder to a clean, evacuated, leak-tight Tedlar bag. Dilute this gas approximately 1:1 with 20.9% O2, purified air. Immediately attach the bag outlet to the calibration valve assembly and begin operation of the sampling system. Operate the sampling system, recording the NOX response, for at least 30 minutes. If the NO2 to NO conversion is 100%, the instrument response will be stable at the highest peak value observed. If the response at the end of 30 minutes decreases more than 2.0% of the highest peak value, the system is not acceptable and corrections must be made before repeating the check.

NO_2 Converter Check - Outlet					
Analyzer Make	Thermo	**Date**	1/8/20	**Start Time**	10:47
Analyzer Model	42i-HL			**Initial NO Response**	211.1
Serial Number	1129850114			**NOx High Peak Response**	212
Cylinder ID Number	CC496889			**NOx Final Response**	212
Cylinder Exp. Date	1/23/25			**NO Final Reponse**	185
Cylinder Concentration, ppm	487.4			**NOx % Decrease**	0
Span Value	1012			**Status**	Pass

Converter Efficiency Test Data		
Minutes	Time	NOx (ppm)
1	10:47:00 AM	211.65
2	10:48:00 AM	211.73
3	10:49:00 AM	211.79
4	10:50:00 AM	211.81
5	10:51:00 AM	211.81
6	10:52:00 AM	211.81
7	10:53:00 AM	211.81
8	10:54:00 AM	211.81
9	10:55:00 AM	211.79
10	10:56:00 AM	211.77
11	10:57:00 AM	211.76
12	10:58:00 AM	211.77
13	10:59:00 AM	211.76
14	11:00:00 AM	211.77
15	11:01:00 AM	211.77
16	11:02:00 AM	211.74
17	11:03:00 AM	211.73
18	11:04:00 AM	211.72
19	11:05:00 AM	211.72
20	11:06:00 AM	211.72
21	11:07:00 AM	211.74
22	11:08:00 AM	211.73
23	11:09:00 AM	211.72
24	11:10:00 AM	211.7
25	11:11:00 AM	211.68
26	11:12:00 AM	211.68
27	11:13:00 AM	211.68
28	11:14:00 AM	211.69
29	11:15:00 AM	211.69
30	11:16:00 AM	211.66

40 CFR Part. 60, Appendix A, Method 7E, Section 12.9, Equation 7E-9

$$\%Decrease = 100\ x\ \frac{(NOx\ Peak\ - NOx\ Final)}{NOx\ Peak}$$

Location ABCWUA
Source Unit 27
Project No. 2020-0005
Parameter(s): VFR

Date	Pitot ID	Evidence of damage?	Evidence of mis-alignment?	Calibration or Repair required?
1/11/20	P-675	no	no	no

Date	Probe ID	Reference Temp. (°F)	Indicated Temp. (°F)	Difference	Criteria
1/11/20	P-675	647.0	653.0	0.5%	± 1.5 %

Date	Barometric Pressure	Evidence of damage?	Reading Verified	Calibration or Repair required?	Weather Station Location
1/11/20	Weather Station	N/A	N/A	N/A	Albuquerque

Date	Meter Box ID	Positive Pressure Leak Check
1/11/20	M5-17	Pass

Location ABCWUA - Southside Water Reclamation Plant
Source Unit 27 (digestor)
Project No. 2020-0005
Parameter(s): VFR

Date	Pitot ID	Evidence of damage?	Evidence of mis-alignment?	Calibration or Repair required?
1/11/20	P-675	no	no	no

Date	Probe ID	Reference Temp. (°F)	Indicated Temp. (°F)	Difference	Criteria
1/11/20	P-675	647.0	653.0	0.5%	± 1.5 %

Date	Barometric Pressure	Evidence of damage?	Reading Verified	Calibration or Repair required?	Weather Station Location
1/11/20	Weather Station	N/A	N/A	N/A	Albuquerque

Date	Meter Box ID	Positive Pressure Leak Check
1/11/20	M5-17	Pass

Location Albuquerque Bernalillo County Water Utility - Southside Water Reclamation Plant
Source Unit 28
Project No. 2020-0005
Parameter(s): VFR

Date	Pitot ID	Evidence of damage?	Evidence of mis-alignment?	Calibration or Repair required?
1/10/20	P-675	no	no	no

Date	Probe ID	Reference Temp. (°F)	Indicated Temp. (°F)	Difference	Criteria
1/10/20	P-675	510.0	518.0	0.8%	± 1.5 %

Date	Barometric Pressure	Evidence of damage?	Reading Verified	Calibration or Repair required?	Weather Station Location
1/10/20	Weather Station	NA	NA	NA	Albuquerque

Date	Meter Box ID	Positive Pressure Leak Check
1/10/20	M5-17	Pass

Location Albuquerque Bernalillo County Water Utility - Southside Water Reclamation Plant
Source Unit 28 (digestor)
Project No. 2020-0005
Parameter(s): VFR

Date	Pitot ID	Evidence of damage?	Evidence of mis-alignment?	Calibration or Repair required?
1/10/20	P-675	no	no	no

Date	Probe ID	Reference Temp. (°F)	Indicated Temp. (°F)	Difference	Criteria
1/10/20	'P-675	518.0	525.0	0.7%	± 1.5 %

Date	Barometric Pressure	Evidence of damage?	Reading Verified	Calibration or Repair required?	Weather Station Location
1/10/20	Weather Station	NA	NA	NA	Albuquerque

Date	Meter Box ID	Positive Pressure Leak Check
1/10/20	M5-17	Pass

Location Albuquerque Bernalillo County Water Utility - Southside Water Reclamation Plant
Source Unit 29
Project No. 2020-0005
Parameter(s): VFR

Date	Pitot ID	Evidence of damage?	Evidence of mis-alignment?	Calibration or Repair required?
1/12/20	P-675	no	no	no

Date	Probe ID	Reference Temp. (°F)	Indicated Temp. (°F)	Difference	Criteria
1/12/20	P-675	675.0	681.0	0.5%	± 1.5 %

Date	Barometric Pressure	Evidence of damage?	Reading Verified	Calibration or Repair required?	Weather Station Location
1/12/20	Weather Station	NA	NA	NA	Albuquerque

Date	Meter Box ID	Positive Pressure Leak Check
1/12/20	M5-17	Pass

Location Albuquerque Bernalillo County Water Utility - Southside Water Reclamation Plant
Source Unit 29 (digestor)
Project No. 2020-0005
Parameter(s): VFR

Date	Pitot ID	Evidence of damage?	Evidence of mis-alignment?	Calibration or Repair required?
1/12/20	P-675	no	no	no

Date	Probe ID	Reference Temp. (°F)	Indicated Temp. (°F)	Difference	Criteria
1/12/20	P-675	672.0	676.0	0.4%	± 1.5 %

Date	Barometric Pressure	Evidence of damage?	Reading Verified	Calibration or Repair required?	Weather Station Location
1/12/20	Weather Station	NA	NA	NA	Albuquerque

Date	Meter Box ID	Positive Pressure Leak Check
1/12/20	M5-17	Pass

Location Albuquerque Bernalillo County Water Utility - Southside Water Reclamation Plant
Source Unit 30
Project No. 2020-0005
Parameter(s): VFR

Date	Pitot ID	Evidence of damage?	Evidence of mis-alignment?	Calibration or Repair required?
1/12/20	P-675	no	no	no

Date	Probe ID	Reference Temp. (°F)	Indicated Temp. (°F)	Difference	Criteria
1/12/20	P-675	680.0	687.0	0.6%	± 1.5 %

Date	Barometric Pressure	Evidence of damage?	Reading Verified	Calibration or Repair required?	Weather Station Location
1/12/20	Weather Station	NA	NA	NA	Albuquerque

Date	Meter Box ID	Positive Pressure Leak Check
1/12/20	M5-17	Pass

Location Albuquerque Bernalillo County Water Utility - Southside Water Reclamation Plant
Source Unit 30 (Digestor)
Project No. 2020-0005
Parameter(s): VFR

Date	Pitot ID	Evidence of damage?	Evidence of mis-alignment?	Calibration or Repair required?
1/12/20	P-675	no	no	no

Date	Probe ID	Reference Temp. (°F)	Indicated Temp. (°F)	Difference	Criteria
1/12/20	P-675	684.0	687.0	0.3%	± 1.5 %

Date	Barometric Pressure	Evidence of damage?	Reading Verified	Calibration or Repair required?	Weather Station Location
1/12/20	Weather Station	NA	NA	NA	Albuquerque

Date	Meter Box ID	Positive Pressure Leak Check
1/12/20	M5-17	Pass

Location Albuquerque Bernalillo County Water Utility - Southside Water Reclamation Plant
Source Unit 80
Project No. 2020-0005
Parameter(s): VFR

Date	Pitot ID	Evidence of damage?	Evidence of mis-alignment?	Calibration or Repair required?
1/9/20	p-675	no	no	no

Date	Probe ID	Reference Temp. (°F)	Indicated Temp. (°F)	Difference	Criteria
1/9/20	p-675	544.0	543.0	0.1%	± 1.5 %

Date	Barometric Pressure	Evidence of damage?	Reading Verified	Calibration or Repair required?	Weather Station Location
1/9/20	Weather Station	NA	NA	NA	Albuquerque

Date	Meter Box ID	Positive Pressure Leak Check
1/9/20	M5-17	Pass

Location Albuquerque Bernalillo County Water Utility - Southside Water Reclamation Plant
Source Corrales Well 4
Project No. 2020-0005
Parameter(s): VFR

Date	Pitot ID	Evidence of damage?	Evidence of mis-alignment?	Calibration or Repair required?
1/8/20	P-675	no	no	no

Date	Probe ID	Reference Temp. (°F)	Indicated Temp. (°F)	Difference	Criteria
1/8/20	P-675	653.7	654.0	0.0%	± 1.5 %

Date	Barometric Pressure	Evidence of damage?	Reading Verified	Calibration or Repair required?	Weather Station Location
1/8/20	Weather Station	NA	NA	NA	Albuquerque

Date	Meter Box ID	Positive Pressure Leak Check
1/8/20	M5-17	Pass

AIR POLLUTION TESTING, INC.
DENVER, SALT LAKE CITY

METHOD 5 DRY GAS METER CALIBRATION USING CRITICAL ORIFICES

1) Select three critical orifices to calibrate the dry gas meter which bracket the expected operating range.
2) Record barometric pressure before and after calibration procedure.
3) Run at tested vacuum (from Orifice Calibration Report), for a period of time necessary to achieve a minimum volume of 10 cubic feet Vcr (STD). K' factors of~.8025 = 13 minutes, .5011 = 20 minutes, .3433 = 30
4) Record data and information in the **GREEN** cells, YELLOW cells are calculated.

	INITIAL	FINAL	AVG (P_{bar})
BAROMETRIC PRESSURE (mbar):	849	850	849.5
BAROMETRIC PRESSURE (in Hg):	25.07097	25.1005	25.0857

DATE: 11/10/2019
METER PART #: NA

DGM SERIAL NUMBER: 17485098
CRITICAL ORIFICE MFG: Apex
METHOD 5 BOX ID: M5-17

TECHNICIAN/OPERATOR: Phil Brock

ORIFICE #	RUN #	K' FACTOR (AVG)	TESTED VACUUM (in Hg)	DGM READINGS (FT^3) INITIAL	FINAL	NET (V_m)	TEMPERATURES °F AMBIENT	DGM INLET INITIAL	FINAL	DGM OUTLET INITIAL	FINAL	DGM AVG	ELAPSED TIME (MIN) θ	DGM ΔH (in H_2O)	(1) V_m (STD)	(2) V_{cr} (STD)	(3) Y	$\Delta H_@$
48	1	0.3433	20.5	398.286	408.622	10.336	67	73	74	73	74	73.5	23.00	0.45	8.5895	8.6308	1.005	1.49
	2	0.3433	20.5	408.622	418.937	10.315	68	74	74	74	74	74	23.00	0.45	8.5640	8.6226	1.007	1.50
	3	0.3433	20.5	418.937	429.278	10.341	68	74	75	74	76	74.75	23.00	0.45	8.5736	8.6226	1.006	1.49
																AVG =	1.006	
63	1	0.5849	17.5	366.115	376.895	10.780	66	72	73	71	72	72	14.00	1.35	9.0074	8.9592	0.995	1.55
	2	0.5849	17.5	376.895	387.589	10.694	67	73	73	72	72	72.5	14.00	1.35	8.9272	8.9507	1.003	1.55
	3	0.5849	17.5	387.589	398.286	10.697	67	73	73	72	73	72.75	14.00	1.35	8.9255	8.9507	1.003	1.55
																AVG =	1.000	
73	1	0.8025	15.5	322.003	336.715	14.712	64	68	70	66	68	68	14.00	2.70	12.4349	12.3158	0.990	1.66
	2	0.8025	15.0	336.715	351.443	14.728	65	70	72	68	70	70	14.00	2.70	12.4014	12.3041	0.992	1.66
	3	0.8025	15.0	351.443	366.115	14.672	65	72	72	70	71	71.25	14.00	2.70	12.3252	12.3041	0.998	1.65
																AVG =	0.994	

USING THE CRITICAL ORIFICES AS CALIBRATION STANDARDS:
The following equations are used to calculate the standard volumes of air passed through the DGM, V_m (std), and the critical orifice, V_{cr} (std), and the DGM calibration factor, Y. These equations are automatically calculated in the spreadsheet above.

AVERAGE DRY GAS METER CALIBRATION FACTOR, Y = 1.000

AVERAGE $\Delta H_@$ = 1.57

(1) $$Vm_{(std)} = K_1 * Vm * \frac{Pbar + (\Delta H / 13.6)}{Tm}$$

= Net volume of gas sample passed through DGM, corrected to standard conditions

K_1 = 17.64 °R/in. Hg (English), 0.3858 °K/mm Hg (Metric)

T_m = Absolute DGM avg. temperature (°R - English, °K - Metric)

$$\Delta H_@ = \left(\frac{0.75\,\theta}{V_{cr}(std)}\right)^2 \Delta H \left(\frac{V_m(std)}{V_m}\right)$$

(2) $$Vcr_{(std)} = K' * \frac{Pbar * \Theta}{\sqrt{Tamb}}$$

= Volume of gas sample passed through the critical orifice, corrected to standard conditions

T_{amb} = Absolute ambient temperature (°R - English, °K - Metric)

K' = Average K' factor from Critical Orifice Calibration

(3) $$Y = \frac{Vcr_{(std)}}{Vm_{(std)}}$$

= DGM calibration factor

Pyrometer Calibration Data

Calibration Temp. Reading (F)	Pyrometer Reading (F)	ABS (Relative Difference) % R
0	1	0.2
50	49	0.2
100	99	0.2
150	149	0.2
250	251	0.1
500	499	0.1
800	802	0.2
Max Absolute Difference %.......................		0.2

Omega Temp Calibrator ID 1
Omega Temp Calibrator S/N.. T-197197
Calibration Date.................. 8/28/2018
Recert Date........................ 8/28/2019

AIR
POLLUTION
TESTING, INC.
DENVER, SALT LAKE CITY

METER BOX PYROMETER PRE-CALIBRATION DATA

Gas Meter ID.. M5-17
Date... 11/9/2019
Technician... Phil Brock

Calibration Reference Settings	Pyrometer Reading for Each Channel Degrees Farhenheit				
	Channel 1	Channel 2	Channel 3	Channel 4	Channel 5
0	2	2	1	0	0
50.0	50	50	50	48	48
100.0	100	100	100	98	98
150.0	151	151	150	149	149
200.0	202	201	201	200	200
250.0	252	252	252	251	251
300.0	302	302	302	300	301
350.0	352	352	351	350	350
400.0	401	401	400	399	399
450.0	450	450	450	449	448
500.0	500	500	500	499	499
550.0	551	X	X	X	549
600.0	602	X	X	X	600
650.0	652	X	X	X	652
700.0	702	X	X	X	702
750.0	752	X	X	X	751
800.0	802	X	X	X	801
850.0	852	X	X	X	851
900.0	902	X	X	X	902
950.0	952	X	X	X	952
1000.0	1002	X	X	X	1002

Tolerance = +/- 2 Degrees Fahrenheit from Reference Setting

Calibration / Calibrator Information

Calibrator ID	1
Calibrator Serial Number	T-197197
Calibration Date	8/28/2018
Calibration Due Date	8/28/2019

Appendix E

Location ABCWUA - Southside Water Reclamation Plant
Source Unit 27
Project No. 2020-0005

Run Number		Run 1	Run 2	Run 3
Date		1/11/20	1/11/20	1/11/20
Start Time		9:23	10:36	11:50
Stop Time		10:23	11:36	12:50
Engine Operational Data				
Generator Output, kW				
	Time, 0 min	2,014	2,011	2,009
	Time, 15 min	2,014	2,011	2,009
	Time, 30 min	2,014	2,011	2,009
	Time, 45 min	2,014	2,011	2,009
	Time, 60 min	2,014	2,011	2,009
	Average	2,014	2,011	2,009
Engine Speed, RPM (ES)				
	Time, 0 min	900	900	900
	Time, 15 min	900	900	900
	Time, 30 min	900	900	900
	Time, 45 min	900	900	900
	Time, 60 min	900	900	900
	Average	900	900	900
Engine Brake Work, HP (EBW)				
	Time, 0 min	2,701	2,697	2,694
	Time, 15 min	2,701	2,697	2,694
	Time, 30 min	2,701	2,697	2,694
	Time, 45 min	2,701	2,697	2,694
	Time, 60 min	2,701	2,697	2,694
	Average	2,701	2,697	2,694
Engine Load, % (EL)				
	Time, 0 min	90	90	90
	Time, 15 min	90	90	90
	Time, 30 min	90	90	90
	Time, 45 min	90	90	90
	Time, 60 min	90	90	90
	Average	90	90	90
Fuel Rate, scfh (F_R)				
	Time, 0 min	421	421	423
	Time, 15 min	421	421	423
	Time, 30 min	421	421	423
	Time, 45 min	421	421	423
	Time, 60 min	421	421	423
	Average	421	421	423

Location ABCWUA- Southside Water Reclamation Plant
Source Unit 27 (digestor)
Project No. 2020-0005

Run Number	**Run 1**	**Run 2**	**Run 3**
Date	1/11/20	1/11/20	1/11/20
Start Time	13:47	15:04	16:22
Stop Time	14:47	16:04	17:22
Engine Operational Data			
Generator Output, kW			
Time, 0 min	2,020	2,036	1,990
Time, 15 min	2,020	2,036	1,990
Time, 30 min	2,020	2,036	1,990
Time, 45 min	2,020	2,036	1,990
Time, 60 min	2,020	2,036	1,990
Average	2,020	2,036	1,990
Engine Speed, RPM (ES)			
Time, 0 min	900	900	900
Time, 15 min	900	900	900
Time, 30 min	900	900	900
Time, 45 min	900	900	900
Time, 60 min	900	900	900
Average	900	900	900
Engine Brake Work, HP (EBW)			
Time, 0 min	2,709	2,730	2,669
Time, 15 min	2,709	2,730	2,669
Time, 30 min	2,709	2,730	2,669
Time, 45 min	2,709	2,730	2,669
Time, 60 min	2,709	2,730	2,669
Average	2,709	2,730	2,669
Engine Load, % (EL)			
Time, 0 min	90	90	90
Time, 15 min	90	90	90
Time, 30 min	90	90	90
Time, 45 min	90	90	90
Time, 60 min	90	90	90
Average	90	90	90
Fuel Rate, scfh (F_R)			
Time, 0 min	504	462	460
Time, 15 min	504	462	460
Time, 30 min	504	462	460
Time, 45 min	504	462	460
Time, 60 min	504	462	460
Average	504	462	460

Location ABCWUA - Southside Water Reclamation Plant
Source Unit 28
Project No. 2020-0005

Run Number	Run 1	Run 2	Run 3
Date	1/10/20	1/10/20	1/10/20
Start Time	9:45	11:02	12:17
Stop Time	10:45	12:02	13:17
Engine Operational Data			
Generator Output, kW			
Time, 0 min	1,845	1,871	1,852
Time, 15 min	1,845	1,871	1,852
Time, 30 min	1,845	1,871	1,852
Time, 45 min	1,845	1,871	1,852
Time, 60 min	1,845	1,871	1,852
Average	1,845	1,871	1,852
Engine Speed, RPM (ES)			
Time, 0 min	900	900	900
Time, 15 min	900	900	900
Time, 30 min	900	900	900
Time, 45 min	900	900	900
Time, 60 min	900	900	900
Average	900	900	900
Engine Brake Work, HP (EBW)			
Time, 0 min	2,474	2,509	2,484
Time, 15 min	2,474	2,509	2,484
Time, 30 min	2,474	2,509	2,484
Time, 45 min	2,474	2,509	2,484
Time, 60 min	2,474	2,509	2,484
Average	2,474	2,509	2,484
Engine Load, % (EL)			
Time, 0 min	90	90	90
Time, 15 min	90	90	90
Time, 30 min	90	90	90
Time, 45 min	90	90	90
Time, 60 min	90	90	90
Average	90	90	90
Fuel Rate, scfh (F_R)			
Time, 0 min	373	380	373
Time, 15 min	373	380	373
Time, 30 min	373	380	373
Time, 45 min	373	380	373
Time, 60 min	373	380	373
Average	373	380	373

Location ABCWUA - Southside Water Reclamation Plant
Source Unit 28 (Digestor)
Project No. 2020-0005

Run Number	**Run 1**	**Run 2**	**Run 3**
Date	1/10/20	1/10/20	1/10/20
Start Time	13:40	14:56	16:14
Stop Time	14:40	15:56	17:14
Engine Operational Data			
Generator Output, kW			
Time, 0 min	1,866	1,858	1,865
Time, 15 min	1,866	1,858	1,865
Time, 30 min	1,866	1,858	1,865
Time, 45 min	1,866	1,858	1,865
Time, 60 min	1,866	1,858	1,865
Average	1,866	1,858	1,865
Engine Speed, RPM (ES)			
Time, 0 min	900	900	900
Time, 15 min	900	900	900
Time, 30 min	900	900	900
Time, 45 min	900	900	900
Time, 60 min	900	900	900
Average	900	900	900
Engine Brake Work, HP (EBW)			
Time, 0 min	2,502	2,492	2,501
Time, 15 min	2,502	2,492	2,501
Time, 30 min	2,502	2,492	2,501
Time, 45 min	2,502	2,492	2,501
Time, 60 min	2,502	2,492	2,501
Average	2,502	2,492	2,501
Engine Load, % (EL)			
Time, 0 min	90	90	90
Time, 15 min	90	90	90
Time, 30 min	90	90	90
Time, 45 min	90	90	90
Time, 60 min	90	90	90
Average	90	90	90
Fuel Rate, scfh (F_R)			
Time, 0 min	417	419	422
Time, 15 min	417	419	422
Time, 30 min	417	419	422
Time, 45 min	417	419	422
Time, 60 min	417	419	422
Average	417	419	422

Location ABCWUA - Southside Water Reclamation Plant
Source Unit 29
Project No. 2020-0005

Run Number	Run 1	Run 2	Run 3
Date	1/13/20	1/13/20	1/13/20
Start Time	9:17	10:33	11:44
Stop Time	10:17	11:33	12:44
Engine Operational Data			
Generator Output, kW			
Time, 0 min	958	967	970
Time, 15 min	958	967	970
Time, 30 min	958	967	970
Time, 45 min	958	967	970
Time, 60 min	958	967	970
Average	958	967	970
Engine Speed, RPM (ES)			
Time, 0 min	900	900	900
Time, 15 min	900	900	900
Time, 30 min	900	900	900
Time, 45 min	900	900	900
Time, 60 min	900	900	900
Average	900	900	900
Engine Brake Work, HP (EBW)			
Time, 0 min	1,285	1,297	1,301
Time, 15 min	1,285	1,297	1,301
Time, 30 min	1,285	1,297	1,301
Time, 45 min	1,285	1,297	1,301
Time, 60 min	1,285	1,297	1,301
Average	1,285	1,297	1,301
Engine Load, % (EL)			
Time, 0 min	90	90	90
Time, 15 min	90	90	90
Time, 30 min	90	90	90
Time, 45 min	90	90	90
Time, 60 min	90	90	90
Average	90	90	90
Fuel Rate, scfm (F_R)			
Time, 0 min	182	184	184
Time, 15 min	182	184	184
Time, 30 min	182	184	184
Time, 45 min	182	184	184
Time, 60 min	182	184	184
Average	182	184	184

Location ABCQUA - Southside Water Reclamation Plant
Source Unit 29 (Digestor)
Project No. 2020-0005

Run Number	Run 1	Run 2	Run 3
Date	1/13/20	1/13/20	1/13/20
Start Time	13:02	14:18	3:29
Stop Time	14:02	15:18	4:29
Engine Operational Data			
Generator Output, kW			
Time, 0 min	970	967	967
Time, 15 min	970	967	967
Time, 30 min	970	967	967
Time, 45 min	970	967	967
Time, 60 min	970	967	967
Average	970	967	967
Engine Speed, RPM (ES)			
Time, 0 min	900	900	900
Time, 15 min	900	900	900
Time, 30 min	900	900	900
Time, 45 min	900	900	900
Time, 60 min	900	900	900
Average	900	900	900
Engine Brake Work, HP (EBW)			
Time, 0 min	1,301	1,297	1,297
Time, 15 min	1,301	1,297	1,297
Time, 30 min	1,301	1,297	1,297
Time, 45 min	1,301	1,297	1,297
Time, 60 min	1,301	1,297	1,297
Average	1,301	1,297	1,297
Engine Load, % (EL)			
Time, 0 min	90	90	90
Time, 15 min	90	90	90
Time, 30 min	90	90	90
Time, 45 min	90	90	90
Time, 60 min	90	90	90
Average	90	90	90
Fuel Rate, scfh (F_R)			
Time, 0 min	321	322	322
Time, 15 min	321	322	322
Time, 30 min	321	322	322
Time, 45 min	321	322	322
Time, 60 min	321	322	322
Average	321	322	322

Location ABCWUA - Southside Water Reclamation Plant
Source Unit 30
Project No. 2020-0005

Run Number	Run 1	Run 2	Run 3
Date	1/12/20	1/12/20	1/12/20
Start Time	9:30	10:46	12:01
Stop Time	10:30	11:46	13:01
Engine Operational Data			
Generator Output, kW			
Time, 0 min	1,018	1,181	1,080
Time, 15 min	1,018	1,181	1,080
Time, 30 min	1,018	1,181	1,080
Time, 45 min	1,018	1,181	1,080
Time, 60 min	1,018	1,181	1,080
Average	1,018	1,181	1,080
Engine Speed, RPM (ES)			
Time, 0 min	900	900	900
Time, 15 min	900	900	900
Time, 30 min	900	900	900
Time, 45 min	900	900	900
Time, 60 min	900	900	900
Average	900	900	900
Engine Brake Work, HP (EBW)			
Time, 0 min	1,365	1,584	1,448
Time, 15 min	1,365	1,584	1,448
Time, 30 min	1,365	1,584	1,448
Time, 45 min	1,365	1,584	1,448
Time, 60 min	1,365	1,584	1,448
Average	1,365	1,584	1,448
Engine Load, % (EL)			
Time, 0 min	90	90	90
Time, 15 min	90	90	90
Time, 30 min	90	90	90
Time, 45 min	90	90	90
Time, 60 min	90	90	90
Average	90	90	90
Fuel Rate, scfh (F_R)			
Time, 0 min	208	208	207
Time, 15 min	208	208	207
Time, 30 min	208	208	207
Time, 45 min	208	208	207
Time, 60 min	208	208	207
Average	208	208	207

Location ABCWUA - Southside Water Reclamation Plant
Source Unit 30 (Digestor)
Project No. 2020-0005

Run Number	**Run 1**	**Run 2**	**Run 3**
Date	1/12/20	1/12/20	1/12/20
Start Time	13:51	15:03	16:15
Stop Time	14:51	16:03	17:15
Engine Operational Data			
Generator Output, kW			
Time, 0 min	1,044	1,038	1,041
Time, 15 min	1,044	1,038	1,041
Time, 30 min	1,044	1,038	1,041
Time, 45 min	1,044	1,038	1,041
Time, 60 min	1,044	1,038	1,041
Average	1,044	1,038	1,041
Engine Speed, RPM (ES)			
Time, 0 min	900	900	900
Time, 15 min	900	900	900
Time, 30 min	900	900	900
Time, 45 min	900	900	900
Time, 60 min	900	900	900
Average	900	900	900
Engine Brake Work, HP (EBW)			
Time, 0 min	1,400	1,392	1,396
Time, 15 min	1,400	1,392	1,396
Time, 30 min	1,400	1,392	1,396
Time, 45 min	1,400	1,392	1,396
Time, 60 min	1,400	1,392	1,396
Average	1,400	1,392	1,396
Engine Load, % (EL)			
Time, 0 min	90	90	90
Time, 15 min	90	90	90
Time, 30 min	90	90	90
Time, 45 min	90	90	90
Time, 60 min	90	90	90
Average	90	90	90
Fuel Rate, scfh (F_R)			
Time, 0 min	307	312	305
Time, 15 min	307	312	305
Time, 30 min	307	312	305
Time, 45 min	307	312	305
Time, 60 min	307	312	305
Average	307	312	305

Location ABCWUA - Southside Water Reclamation Plant
Source Unit 80
Project No. 2020-0005

Run Number	**Run 1**	**Run 2**	**Run 3**
Date	1/9/20	1/9/20	1/9/20
Start Time	10:18	11:41	13:01
Stop Time	11:19	12:42	14:01
Engine Operational Data			
Generator Output, Kw			
Time, 0 min	315	299	305
Time, 15 min	315	299	305
Time, 30 min	315	299	305
Time, 45 min	315	299	305
Time, 60 min	315	299	305
Average	315	299	305
Engine Speed, RPM (ES)			
Time, 0 min	1,800	1,800	1,800
Time, 15 min	1,800	1,800	1,800
Time, 30 min	1,800	1,800	1,800
Time, 45 min	1,800	1,800	1,800
Time, 60 min	1,800	1,800	1,800
Average	1,800	1,800	1,800
Engine Brake Work, HP (EBW)			
Time, 0 min	1,620	1,620	1,620
Time, 15 min	1,620	1,620	1,620
Time, 30 min	1,620	1,620	1,620
Time, 45 min	1,620	1,620	1,620
Time, 60 min	1,620	1,620	1,620
Average	1,620	1,620	1,620
Engine Load, % (EL)			
Time, 0 min	100	100	100
Time, 15 min	100	100	100
Time, 30 min	100	100	100
Time, 45 min	100	100	100
Time, 60 min	100	100	100
Average	100	100	100

Location ABCWUA - Southside Water Reclamation Plant
Source Corrales Well #4
Project No. 2020-0005

Run Number	Run 1	Run 2	Run 3
Date	1/8/20	1/8/20	1/8/20
Start Time	12:52	14:22	15:42
Stop Time	13:53	15:22	16:42
Engine Operational Data			
Water Flow (gpm)			
Time, 0 min	1,284	1,282	1,284
Time, 15 min	1,284	1,282	1,284
Time, 30 min	1,284	1,282	1,284
Time, 45 min	1,284	1,282	1,284
Time, 60 min	1,284	1,282	1,284
Average	1,284	1,282	1,284
Engine Speed, RPM (ES)			
Time, 0 min	1,445	1,445	1,445
Time, 15 min	1,445	1,445	1,445
Time, 30 min	1,445	1,445	1,445
Time, 45 min	1,445	1,445	1,445
Time, 60 min	1,445	1,445	1,445
Average	1,445	1,445	1,445
Engine Brake Work, HP (EBW)			
Time, 0 min	1,065	1,065	1,065
Time, 15 min	1,065	1,065	1,065
Time, 30 min	1,065	1,065	1,065
Time, 45 min	1,065	1,065	1,065
Time, 60 min	1,065	1,065	1,065
Average	1,065	1,065	1,065
Engine Load, % (EL)			
Time, 0 min	100	100	100
Time, 15 min	100	100	100
Time, 30 min	100	100	100
Time, 45 min	100	100	100
Time, 60 min	100	100	100
Average	100	100	100

Appendix F

Visible Emissions Evaluations

①

RECORD OF VISUAL DETERMINATION OF OPACITY

Albuquerque Bernalillo County
Water Utility Authority

SOURCE: NATURAL GAS / GENERATOR

LOCATION: WELL #4 7429 IRVING BLVD NW

TYPE OF SOURCE: NATURAL GAS

TYPE OF CORRECT EQUIPMENT: NONE

At what point in the Plume at which Opacity was determined? AT STACK EXIT (TOP OF STACK)

DESCRIPTION OF PLUME (Track exit only):
☒ Lofting ☐ Trapping ☐ Looping ☐ Farming ☐ Coning ☐ Fumigation

EMISSION COLOR: CLEAR

PLUME TYPE: ☒ Continuous ☐ Fugitive ☐ Intermittent

Water droplets present? ☒ No ☐ Yes

If yes, droplet plume is: ☐ Attached ☐ Detached

Describe Emission(s) Point (top of stack, etc.): TOP OF STACK

Height above Ground Level 20' **Feet**

Height relative to Observer 14' **Feet**

Distance from Observer 10 **Yards**

Dimensions from Observer

Describe background (i.e., blue skies, trees, etc.): BLUE SKIES

Background Color: BLUE SKIES

Sky Conditions: LITE OVER CAST

Wind Speed: mph

Wind Direction (i.e., North to South) 6MPH S TO N

Ambient Temperature 46 °F

Wet Temperature °F

Relative Humidity 42 %

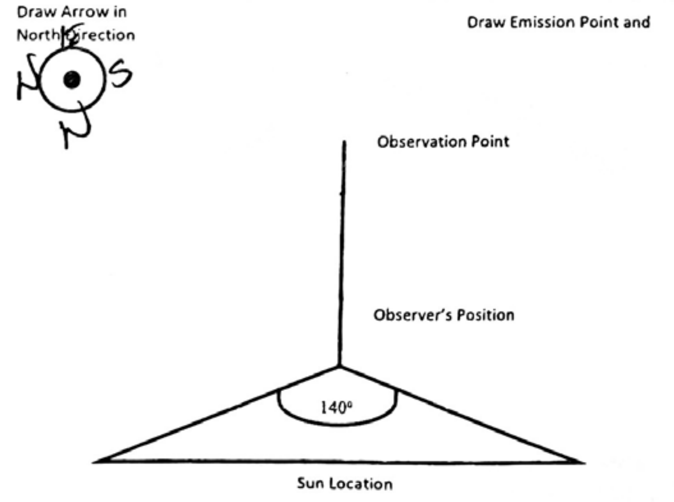
Remarks:

OBSERVATION DATE 01-8-2020

START TIME 1118

STOP TIME 1218

Sec / Min	0	15	30	45
1	0	0	0	0
2				
3				
4				
5				
6	0	0	0	0
7				
8				
9				
10				
11				
12	0	0	0	0
13				



Average Opacity 0

Range of Opacity Readings Min: 0% Max:

OBSERVER (Please print)
NAME: DONALD J HARRISON
SIGNATURE:
ORGANIZATION: ABCWUA

TITLE: STATION OPERATOR
DATE: 1-8-2020
CERTIFICATION

I acknowledge receipt of a copy of these visible emissions observations

Signature: ____________________

Title: ____________________

Date: ____________________

②

RECORD OF VISUAL DETERMINATION OF OPACITY

Albuquerque Bernalillo County
Water Utility Authority

SOURCE: NATURAL GAS / GENERATOR

LOCATION: WELL #4 7429 IRVING BLVD NW

TYPE OF SOURCE: NATURAL GAS

TYPE OF CORRECT EQUIPMENT: NONE

At what point in the Plume at which Opacity was determined? AT STACK EXIT (TOP OF STACK)

DESCRIPTION OF PLUME (Track exit only):
☒ Lofting ☐ Trapping ☐ Looping ☐ Farming ☐ Coning ☐ Fumigation

EMISSION COLOR: CLEAR

PLUME TYPE: ☒ Continuous ☐ Fugitive ☐ Intermittent

Water droplets present? ☒ No ☐ Yes

If yes, droplet plume is: ☐ Attached ☐ Detached

Describe Emission(s) Point (top of stack, etc.): TOP OF STACK

Height above Ground Level 20' Feet

Height relative to Observer 14' Feet

Distance from Observer 10 Yards

Dimensions from Observer

Describe background (i.e., blue skies, trees, etc.): BLUE SKIES

Background Color: BLUE SKIES

Sky Conditions: LITE OVER CAST

Wind Speed: mph

Wind Direction (i.e., North to South) 6MPH S TO N

Ambient Temperature 46 °F

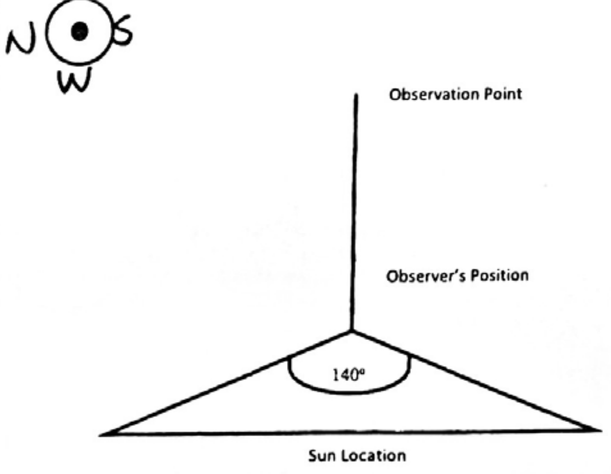
Wet Temperature °F

Relative Humidity 42 %

Remarks:

Draw Arrow in North Direction

Draw Emission Point and



OBSERVATION DATE	START TIME	STOP TIME
01-8-2020	1218	118

Sec / Min	0	15	30	45	
1	0	0	0	0	
2					
3					
4					
5					
6	0	0	0	0	
7					
8					
9					
10					
11					
12	0	0	0	0	
13					

Average Opacity 0

Range of Opacity Readings Min: 6 Max:

OBSERVER (Please print) NAME: DAVID J HARRISON

TITLE: STATION OPERATOR

SIGNATURE:

DATE: 1-8-2020

ORGANIZATION: ABCWUA

CERTIFICATION

I acknowledge receipt of a copy of these visible emissions observations

Signature: ______________________________

Title: ______________________________

Date: ______________________________

RECORD OF VISUAL DETERMINATION OF OPACITY

Albuquerque Bernalillo County
Water Utility Authority

SOURCE: NATURAL GAS / GENERATOR

LOCATION: WELL #4 7429 IRVING BLVD NW

TYPE OF SOURCE: NATURAL GAS

TYPE OF CORRECT EQUIPMENT: NONE

At what point in the Plume at which Opacity was determined? AT STACK EXIT (TOP OF STACK)

DESCRIPTION OF PLUME (Track exit only):
☒ Lofting ☐ Trapping ☐ Looping ☐ Farming ☐ Coning ☐ Fumigation

EMISSION COLOR: CLEAR

PLUME TYPE: ☒ Continuous ☐ Fugitive ☐ Intermittent

Water droplets present? ☒ No ☐ Yes

If yes, droplet plume is: ☐ Attached ☐ Detached

Describe Emission(s) Point (top of stack, etc.): TOP OF STACK

Height above Ground Level 20' **Feet**

Height relative to Observer 14' **Feet**

Distance from Observer 10 **Yards**

Dimensions from Observer

Describe background (i.e., blue skies, trees, etc.): BLUE SKIES

Background Color: BLUE SKIES

Sky Conditions: LIGHT OVER CAST

Wind Speed: **mph**

Wind Direction (i.e., North to South) 6MPH S TO N

Ambient Temperature 46 **°F**

Wet Temperature **°F**

Relative Humidity 42 **%**

Remarks:

OBSERVATION DATE 01-8-2020

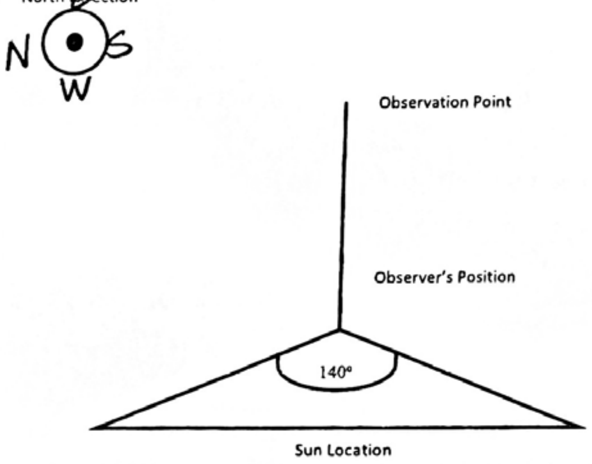
START TIME 118

STOP TIME 218

Min \ Sec	0	15	30	45
1	0	0	0	0
2				
3				
4				
5				
6	0	0	0	0
7				
8				
9				
10				
11				
12	0	0	0	0
13				

Draw Arrow in North Direction

Draw Emission Point and



Average Opacity 0

Range of Opacity Readings Min: 6 Max:

OBSERVER (Please print) NAME: DONALD J HARRISON

TITLE: STATION OPERATOR

SIGNATURE:

DATE: 1-8-2020

ORGANIZATION: ABCWUA

CERTIFICATION

I acknowledge receipt of a copy of these visible emissions observations

Signature: ____________________

Title: ____________________

Date: ____________________

①

RECORD OF VISUAL DETERMINATION OF OPACITY

Albuquerque Bernalillo County
Water Utility Authority

SOURCE: DIESEL GENERATOR

LOCATION: STA 24

TYPE OF SOURCE: DIESEL EXHAUST

TYPE OF CORRECT EQUIPMENT: NONE

At what point in the Plume at which Opacity was determined? AT STACK EXIT

DESCRIPTION OF PLUME (Track exit only):
☒ Lofting ☐ Trapping ☐ Looping ☐ Farming ☐ Coning ☐ Fumigation

EMISSION COLOR: BLACK

PLUME TYPE: ☒ Continuous ☐ Fugitive ☐ Intermittent

Water droplets present? ☒ No ☐ Yes

If yes, droplet plume is: ☐ Attached ☐ Detached

Describe Emission(s) Point (top of stack, etc.): AT STACK EXIT

Height above Ground Level: 20' Feet

Height relative to Observer: 14' Feet

Distance from Observer: 15 Yards

Dimensions from Observer:

Describe background (i.e., blue skies, trees, etc.): TREES

Background Color: ~~[illegible]~~ Brown

Sky Conditions: OVER CAST

Wind Speed: 03 mph

Wind Direction (i.e., North to South): SOUTH TO NORTH

Ambient Temperature: 39 °F

Wet Temperature: °F

Relative Humidity: 34% %

Remarks:

OBSERVATION DATE: 1-9-20

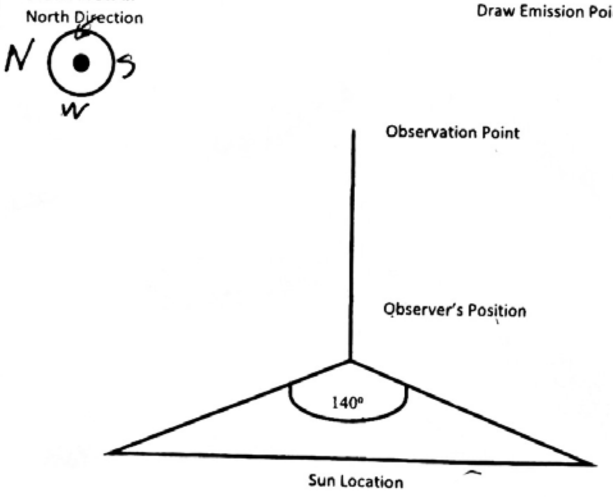
START TIME: 10:18

STOP TIME: 11:18

Min \ Sec	0	15	30	45	
1	5%	5%	5%	5%	
2					
3					
4					
5					
6	5%	5%	5%	5%	
7					
8					
9					
10					
11					
12	5%	5%	5%	5%	
13					

Draw Arrow in North Direction

Draw Emission Point and



Average Opacity

Range of Opacity Readings
Min: 6 Max:

OBSERVER (Please print)
NAME: DONALD J HARRISON
SIGNATURE: Donald J Harrison

TITLE: STATION OPERATOR
DATE: 1-9-2020

ORGANIZATION: ABCWUA

CERTIFICATION

I acknowledge receipt of a copy of these visible emissions observations

Signature: ______________________

Title: ______________________

Date: ______________________

②

RECORD OF VISUAL DETERMINATION OF OPACITY

Albuquerque Bernalillo County
Water Utility Authority

SOURCE: DIESEL GENERATOR

LOCATION: 81A 24

TYPE OF SOURCE: DIESEL EXHAUST

TYPE OF CORRECT EQUIPMENT:

At what point in the Plume at which Opacity was determined? AT STACK EXIT

DESCRIPTION OF PLUME (Track exit only):
[✓ Lofting] ☐ Trapping ☐ Looping ☐ Farming ☐ Coning ☐ Fumigation

EMISSION COLOR: BLACK

PLUME TYPE: [✓ Continuous] ☐ Fugitive ☐ Intermittent

Water droplets present? [✓ No] ☐ Yes

If yes, droplet plume is: ☐ Attached ☐ Detached

Describe Emission(s) Point (top of stack, etc.): AT STACK EXIT

Height above Ground Level 20' Feet

Height relative to Observer 14 Feet

Distance from Observer 15 Yards

Dimensions from Observer

Describe background (i.e., blue skies, trees, etc.): TREES SUN @ my BACK

Background Color: GREEN BROWN

Sky Conditions: OVER CAST

Wind Speed: 03 mph

Wind Direction (i.e., North to South) SOUTH TO NORTH

Ambient Temperature 39 °F

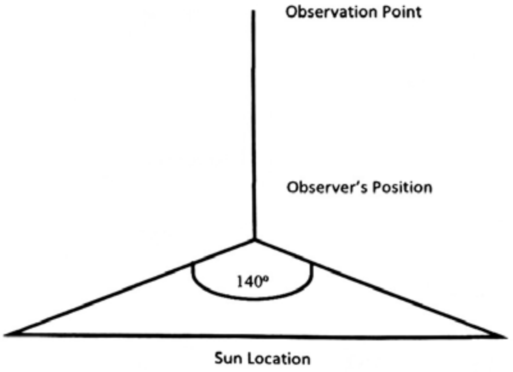
Wet Temperature °F

Relative Humidity 34 %

Remarks:

Draw Arrow in North Direction

Draw Emission Point and



OBSERVATION DATE 1-9-20

START TIME 11:18

STOP TIME 12:18

Min \ Sec	0	15	30	45	
1	5%	5%	5%	5%	
2					
3					
4					
5					
6	5%	5%	5%	5%	
7					
8					
9					
10					
11					
12					
13	5%	5%	5%	5%	

Average Opacity 5%

Range of Opacity Readings
Min: 6 Max:

OBSERVER (Please print)
NAME: DONACO J HARRISON

TITLE: STATION OPERATOR

SIGNATURE: Donal J Harrison

DATE: 1-9-20

ORGANIZATION: ABCWUA

CERTIFICATION

I acknowledge receipt of a copy of these visible emissions observations

Signature: ______________________

Title: ______________________

Date: ______________________

RECORD OF VISUAL DETERMINATION OF OPACITY

Albuquerque Bernalillo County
Water Utility Authority

SOURCE: DIESEL GENERATOR

LOCATION: STA 24

TYPE OF SOURCE: DIESEL EXHAUST

TYPE OF CORRECT EQUIPMENT:

At what point in the Plume at which Opacity was determined? AT STACK EXIT

DESCRIPTION OF PLUME (Track exit only):
☑ Lofting ☐ Trapping ☐ Looping ☐ Farming ☐ Coning ☐ Fumigation

EMISSION COLOR: BLACK

PLUME TYPE: ☑ Continuous ☐ Fugitive ☐ Intermittent

Water droplets present? ☑ No ☐ Yes

If yes, droplet plume is: ☐ Attached ☐ Detached

Describe Emission(s) Point (top of stack, etc.): AT STACK EXIT

Height above Ground Level 20' **Feet**

Height relative to Observer 14' **Feet**

Distance from Observer 15 **Yards**

Dimensions from Observer

Describe background (i.e., blue skies, trees, etc.): TREES SUN @ MY BACK

Background Color: GREEN BROWN

Sky Conditions: OVER CAST

Wind Speed: 03 **mph**

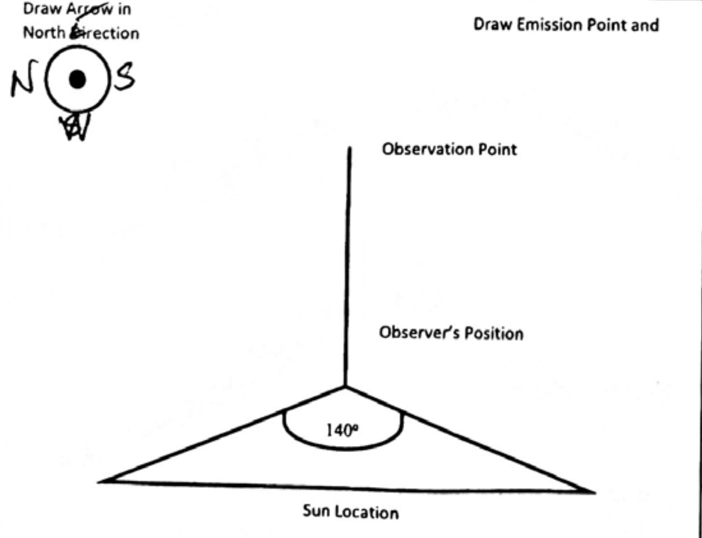
Wind Direction (i.e., North to South) SOUTH TO NORTH

Ambient Temperature 34 **°F**

Wet Temperature **°F**

Relative Humidity 36 **%**

Remarks:



OBSERVATION DATE 1-9-20

START TIME 12:18

STOP TIME 1:18

Sec / Min	0	15	30	45
1	5%	5%	5%	5%
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3				
4				
5				
6	5%	5%	5%	5%
7				
8				
9				
10				
11				
12	5%	5%	5%	5%
13				

Average Opacity

Range of Opacity Readings

Min: **Max:**

OBSERVER (Please print)
NAME: DONALD J HARRISON

TITLE: STATION OPERATOR

SIGNATURE:

DATE: 1-9-20

ORGANIZATION: ABCWUA

CERTIFICATION

I acknowledge receipt of a copy of these visible emissions observations

Signature: ____________________

Title: ____________________

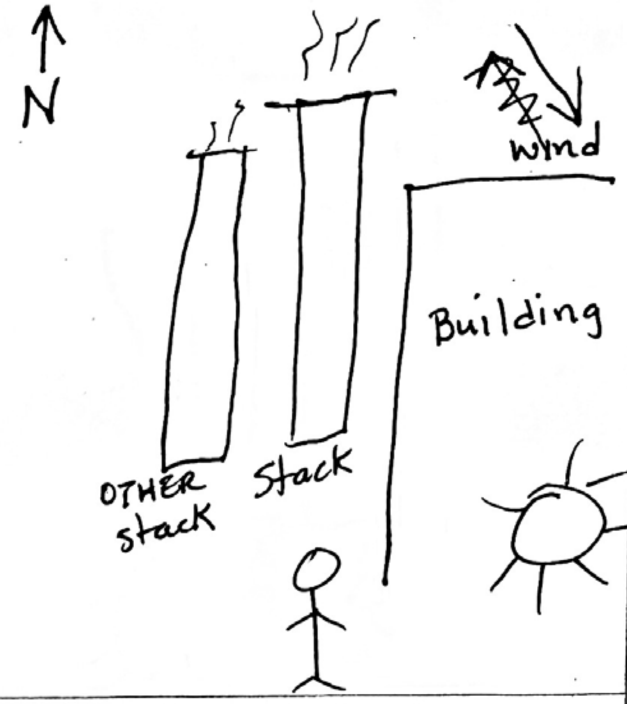
Date: ____________________

AIR POLLUTION TESTING, INC.
VISIBLE EMISSIONS OBSERVATION FORM

Page No.______

Source Name: ABCWUA
Type of Source: Cogeneration
Address: 4201 Second St. SW
City: Albuquerque State: NM. Zip: 87105
Phone (Key Contact): 505-503-3777
Source ID Number: 1YG188
Process Equipment: Catapillar 3612
Operating Mode:
Control Equipment: Generator
Operating Mode:
Describe Emission Point: TOP OF Exhaust stack
Height Above Ground Level / Height Relative To Observer: 33 ft
Inclinometer Reading:
Distance From Observer: 87 ft.
Direction From Observer Start N End N
Describe Emissions & Color Start NONE End NONE
Visible Water Vapor Present? If yes, determine approximate distance from the stack exit to where the Plume was read [✓ No] Yes
Point In Plume at Which Opacity Was Determined: NONE Visable
Describe Plume Background Start Blue sky End Blue sky
Background Color Start Blue End Blue
Sky Conditions: Start Partly Cloudy End Same
Wind Speed: 24 mph
Wind Direction From Start NW End NW
Ambient Temperature: 35°
Wet Bulb Temp: 22°
RH percent: 54%

NOTES: 1 Stack or Point Being Read 2 Wind Direction From 3 Observer Location 4 Sun Location 5 North Arrow 6 Other Stacks



Observation Date: Start Time 11:30 AM End Time 11:37 AM

Min \ Sec	.0	15	30	45	Comments
1	0	0	0	0	Natural Gas
2	0	0	0	0	Run
3	0	0	0	0	
4	0	0	0	0	
5	0	0	0	0	
6	0	0	0	0	
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Range of Opacity
Minimum 0 Maximum 0

Print Observer's Name: Marlon Luna
Observer's Signature: Marlon Luna Date: 01/10/2020
Organization:
Certified By: Date:

I have received a copy of these opacity observations
Print Name:
Signature:
Title Date

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AIR POLLUTION TESTING, INC.
VISIBLE EMISSIONS OBSERVATION FORM

Page No.____

Source Name: ABCWUA

Type of Source: Cogeneration

Address: 4201 second st. SW

City: Albuquergue State: N M Zip: 87105

Phone (Key Contact): 505-503-3777

Source ID Number: 1YG188

Process Equipment: Catepillar 3612

Operating Mode: AUTO

Control Equipment: Generator

Operating Mode: AUTO

Describe Emission Point: TOP of Exhaust stack

Height Above Ground Level / Height Relative To Observer: 33 ft

Inclinometer Reading:

Distance From Observer: 87 ft

Direction From Observer: Start N End N

Describe Emissions & Color: Start NONE End NONE

Visible Water Vapor Present? If yes, determine approximate distance from the stack exit to where the Plume was read [✓ No] Yes

Point In Plume at Which Opacity Was Determined: NONE Visable

Describe Plume Background: Start Blue sky End Blue sky

Background Color: Start Blue End Blue

Sky Conditions: Start Partly Cloudy End Partly cloudy

Wind Speed: 27 mph

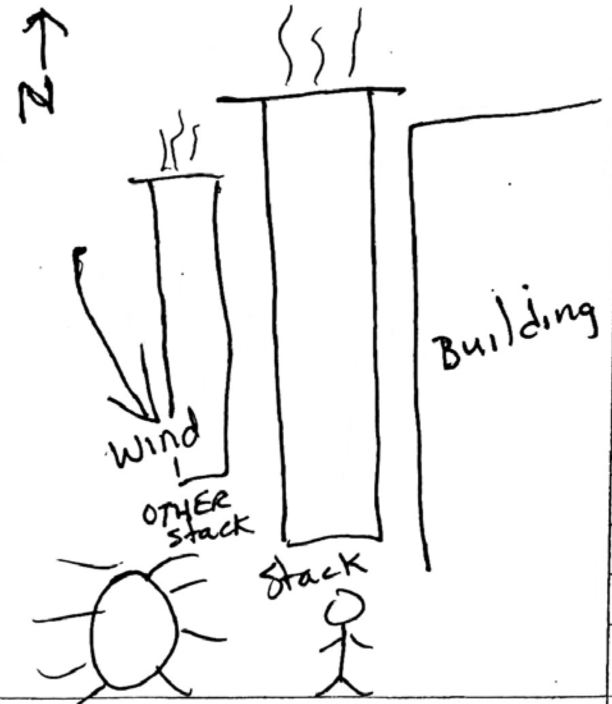
Wind Direction From: Start NW End NW

Ambient Temperature: 38°

Wet Bulb Temp: 24°

RH percent: 42%

NOTES: 1 Stack or Point Being Read 2 Wind Direction From 3 Observer Location 4 Sun Location 5 North Arrow 6 Other Stacks



Observation Date:

Start Time: 1535

End Time: 1542

Min \ Sec	.0	15	30	45	Comments
1	0	0	0	0	Natural & Digester
2	0	0	0	0	Gas Mix Run
3	0	0	0	0	70% Nat.
4	0	0	0	0	30% Dig.
5	0	0	0	0	
6	0	0	0	0	
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Range of Opacity

Minimum 0 Maximum 0

I have received a copy of these opacity observations

Print Name:

Signature:

Title

Date

Print Observer's Name: Marlon Luna

Observer's Signature: Marlon Lun

Date: 01/10/2020

Organization

Certified By:

Date

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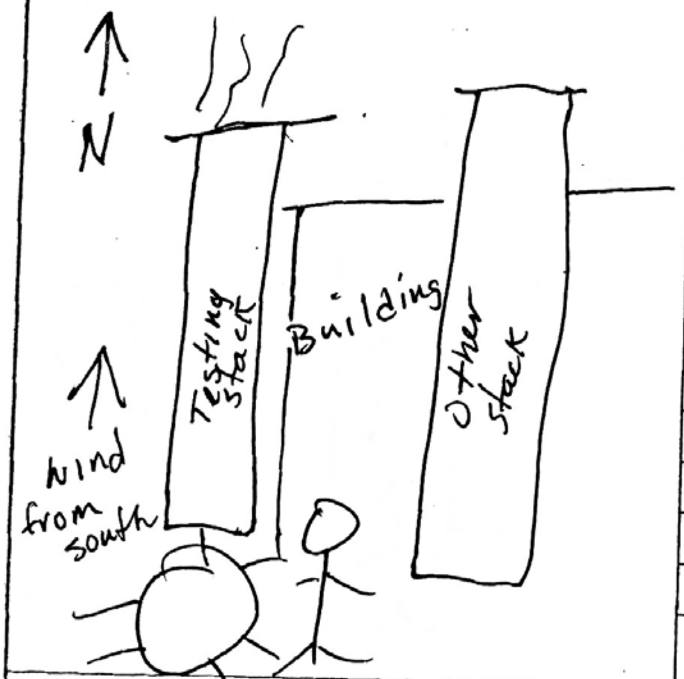
AIR POLLUTION TESTING, INC.
VISIBLE EMISSIONS OBSERVATION FORM

Page No.

Source Name ABCWUA
Type of Source Cogeneration
Address 4201 Second St. SW
City Albuquerque State NM Zip 87105
Phone (Key Contact) 505-503-3777
Source ID Number 1VG199
Process Equipment Catapillar 3912
Operating Mode
Control Equipment Generator
Operating Mode
Describe Emission Point TOP OF stack
Height Above Ground Level / Height Relative To Observer 33 ft
Inclinometer Reading
Distance From Observer 99 ft
Direction From Observer Start NE End NE
Describe Emissions & Color Start NONE End NONE
Visible Water Vapor Present? If yes, determine approximate distance from the stack exit to where the Plume was read [✓ No] Yes
Point In Plume at Which Opacity Was Determined TOP of the Exhaust stack
Describe Plume Background Start Blue End Blue
Background Color Start Blue sky End Blue sky
Sky Conditions: Start Clear End Clear
Wind Speed 6 mph
Wind Direction From Start S End S
Ambient Temperature 35°
Wet Bulb Temp 30°
RH percent 29%

NOTES: 1 Stack or Point Being Read 2 Wind Direction From 3 Observer Location 4 Sun Location 5 North Arrow 6 Other Stacks



Observation Date
Start Time 1215
End Time 1221

Min \ Sec	.0	15	30	45	Comments
1	0	0	0	0	Natural Gas
2	0	0	0	0	Run - Engine#1
3	0	0	0	0	unit 27
4	0	0	0	0	
5	0	0	0	0	
6	0	0	0	0	
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Range of Opacity
Minimum 0 Maximum 0

I have received a copy of these opacity observations
Print Name:
Signature:
Title Date

Print Observer's Name Marlon Luna
Observer's Signature Marlon Luna Date 01/11/2020
Organization
Certified By: Date

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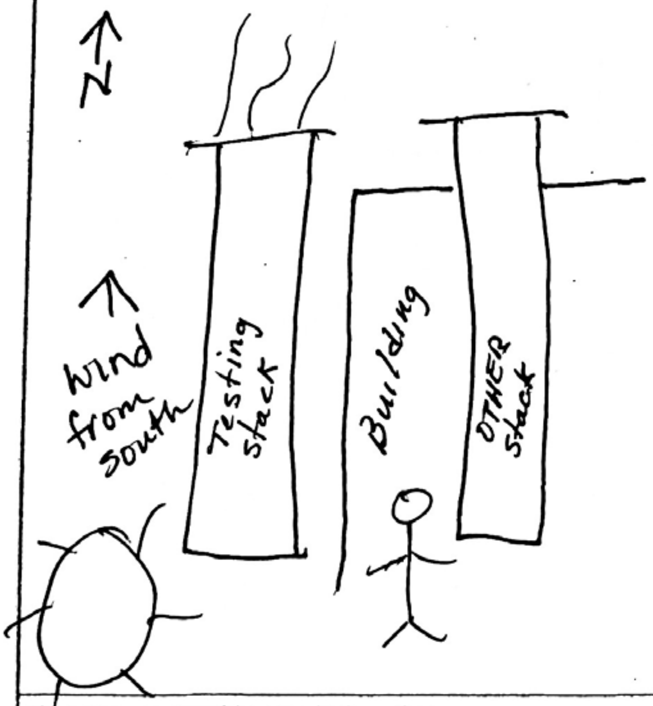
AIR POLLUTION TESTING, INC.
VISIBLE EMISSIONS OBSERVATION FORM

Page No.______

Source Name ABCWUA
Type of Source Cogeneration
Address 4201 Second st. SW
City Albuquerque State NM Zip 87105
Phone (Key Contact) 505-503-3777
Source ID Number 1YG199
Process Equipment Caterpillar 3912
Operating Mode
Control Equipment Generator
Operating Mode
Describe Emission Point TOP OF Stack
Height Above Ground Level
Height Relative To Observer 33 ft
Inclinometer Reading
Distance From Observer 99 ft
Direction From Observer Start NE End NE
Describe Emissions & Color
Start NONE End NONE
Visible Water Vapor Present? If yes, determine approximate distance from the stack exit to where the Plume was read [✓ No] Yes
Point In Plume at Which Opacity Was Determined NONE Visable
Describe Plume Background
Start Blue
End Blue
Background Color
Start BLUE SKY
End BLUE SKY
Sky Conditions: Start Clear
End Clear
Wind Speed 10 mph
Wind Direction From Start S End S
Ambient Temperature 42°
Wet Bulb Temp 36°
RH percent 23%

NOTES: 1 Stack or Point Being Read 2 Wind Direction From
3 Observer Location 4 Sun Location 5 North Arrow 6 Other Stacks



Observation Date
Start Time 1515
End Time 1521

Min \ Sec	.0	15	30	45	Comments
1	0	0	0	0	Natural 70% - Digester
2	0	0	0	0	30% mix Run
3	0	0	0	0	unit27
4	0	0	0	0	
5	0	0	0	0	
6	0	0	0	0	
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Range of Opacity
Minimum 0 Maximum 0

I have received a copy of these opacity observations
Print Name:
Signature:
Title Date

Print Observer's Name Morlon Luna
Observer's Signature Marlon Luna Date 01/11/2020
Organization
Certified By: Date

AIR POLLUTION TESTING, INC.
VISIBLE EMISSIONS OBSERVATION FORM

Page No.______

Source Name: ABCWUA
Type of Source: Cogeneration
Address: 4201 Second St. SW
City: Albuquerque State: NM Zip: 87105
Phone (Key Contact): 505-303-3777
Source ID Number: 305029
Process Equipment: Superior Engine
Operating Mode:
Control Equipment: Generator
Operating Mode:
Describe Emission Point: TOP OF STACK
Height Above Ground Level / Height Relative To Observer: 33 ft
Inclinometer Reading:
Distance From Observer: 114 ft
Direction From Observer: Start NE End NE
Describe Emissions & Color: Start NONE Visable End NONE Visable
Visible Water Vapor Present? If yes, determine approximate distance from the stack exit to where the Plume was read [✓ No] Yes
Point In Plume at Which Opacity Was Determined: NONE
Describe Plume Background: Start Sky Blue End Sky Blue
Background Color: Start Blue End Blue
Sky Conditions: Start Clear End Clear
Wind Speed: 1 mph
Wind Direction From: Start SSW End SSW
Ambient Temperature: ~~48~~° 52°
Wet Bulb Temp: 48°
RH percent: 20%

Observation Date:
Start Time: 1550
End Time: 1554

Min \ Sec	0	15	30	45	Comments
1	0	0	0	0	Digester Test
2	0	0	0	0	run
3	0	0	0	0	
4	0	0	0	0	
5	0	0	0	0	
6	0	0	0	0	
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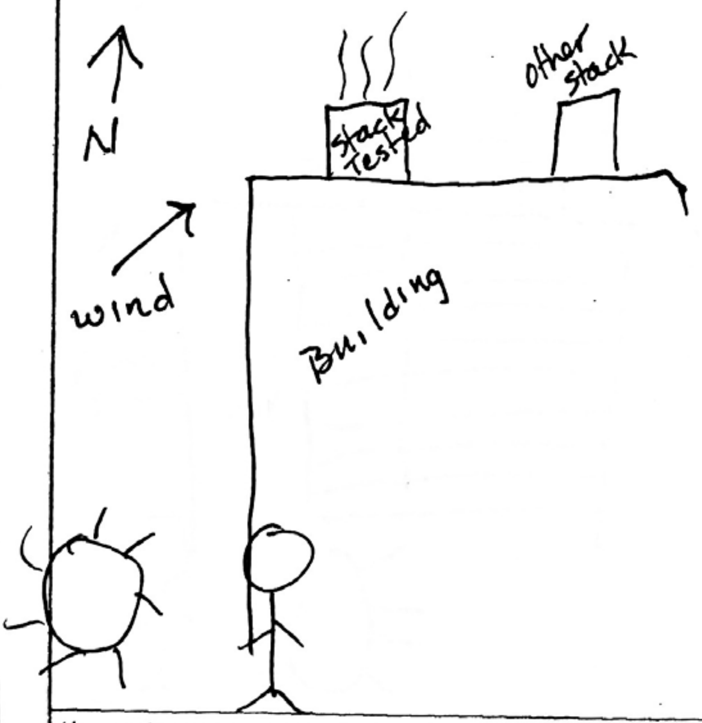
NOTES: 1 Stack or Point Being Read 2 Wind Direction From 3 Observer Location 4 Sun Location 5 North Arrow 6 Other Stacks



Range of Opacity
Minimum 0 Maximum 0

I have received a copy of these opacity observations
Print Name:
Signature:
Title
Date

Print Observer's Name: Marlon Luna
Observer's Signature: Marlon Luna
Date 01/12/2020
Organization
Certified By:
Date

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AIR POLLUTION TESTING, INC.
VISIBLE EMISSIONS OBSERVATION FORM

Page No._____

Source Name: ABCWUA
Type of Source: Cogeneration
Address: 4201 Second St SW
City: Albuquerque State: N.M. Zip: 87105
Phone (Key Contact): 505-503-3777
Source ID Number: 305029
Process Equipment: SUPERIOR Engine
Operating Mode:
Control Equipment: Generator
Operating Mode:
Describe Emission Point: TOP of stack
Height Above Ground Level / Height Relative To Observer: 33 ft
Inclinometer Reading:
Distance From Observer: 114 ft
Direction From Observer: Start NE End NE
Describe Emissions & Color: Start NONE VISable End NONE VISable
Visible Water Vapor Present? If yes, determine approximate distance from the stack exit to where the Plume was read: [✓ No] Yes
Point In Plume at Which Opacity Was Determined: NONE
Describe Plume Background: Start Sky Blue End Sky Blue
Background Color: Start Blue End Blue
Sky Conditions: Start clear End clear
Wind Speed: 8
Wind Direction From: Start S End S
Ambient Temperature: 41°
Wet Bulb Temp: 36°
RH percent: 34%

Observation Date: Start Time 1200 End Time 1206

Min \ Sec	0	15	30	45	Comments
1	0	0	0	0	Natural Gas
2	0	0	0	0	Run
3	0	0	0	0	
4	0	0	0	0	
5	0	0	0	0	
6	0	0	0	0	
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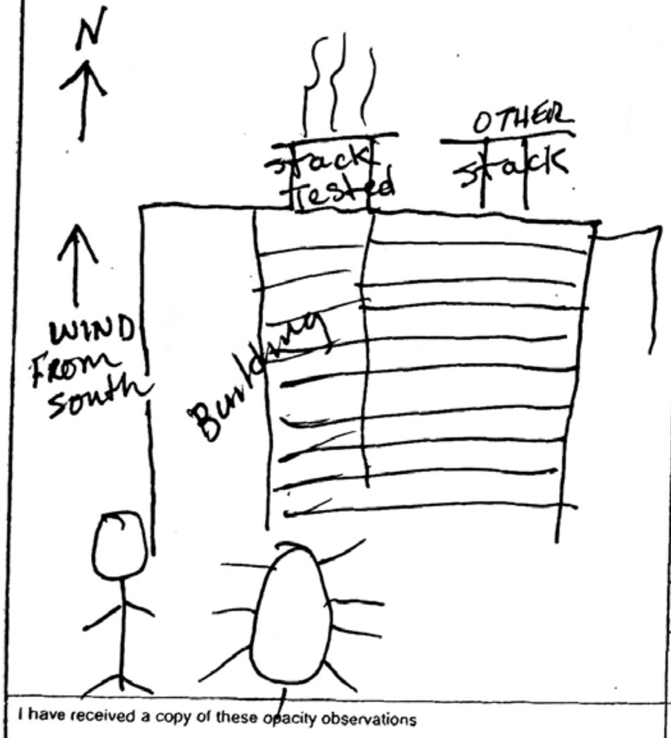
NOTES: 1 Stack or Point Being Read 2 Wind Direction From 3 Observer Location 4 Sun Location 5 North Arrow 6 Other Stacks



Range of Opacity
Minimum 0 Maximum 0

I have received a copy of these opacity observations
Print Name:
Signature:
Title Date

Print Observer's Name: Marlon Luna
Observer's Signature: Marlon Luna Date 01/12/2020
Organization:
Certified By: Date

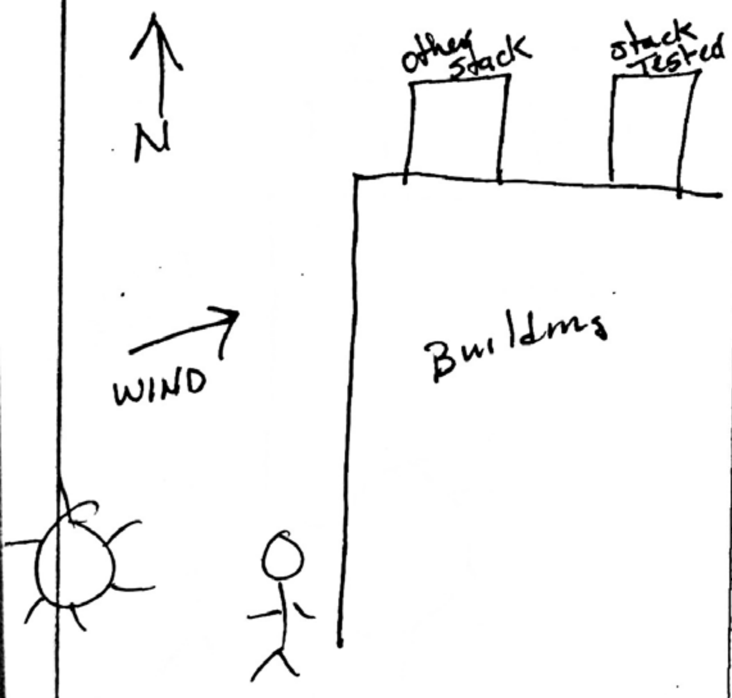
veo-frm 2/14/01

AIR POLLUTION TESTING, INC.
VISIBLE EMISSIONS OBSERVATION FORM

Page No. ______

Source Name: ABCWUA
Type of Source: Cogeneration
Address: 4201 Second St. SW
City: Albuquerque State: N.M. Zip: 87105
Phone (Key Contact): 505-503-3777
Source ID Number: 305019
Process Equipment: Superior Engines
Operating Mode:
Control Equipment: Generator
Operating Mode:
Describe Emission Point: TOP OF Exhaust stack
Height Above Ground Level / Height Relative To Observer: 33 ft
Inclinometer Reading:
Distance From Observer: 108 ft
Direction From Observer: Start NE End NE
Describe Emissions & Color: Start NONE Visable End NONE visable
Visible Water Vapor Present? If yes, determine approximate distance from the stack exit to where the Plume was read: [✓ No] Yes
Point In Plume at Which Opacity Was Determined: NONE Visable
Describe Plume Background: Start SKY Blue End SKY Blue
Background Color: Start BLUE End BLUE
Sky Conditions: Start Clear End Clear
Wind Speed: 16 mph
Wind Direction From: Start WSW End WSW
Ambient Temperature: 52°
Wet Bulb Temp: 47
RH percent: 17%

NOTES: 1 Stack or Point Being Read 2 Wind Direction From 3 Observer Location 4 Sun Location 5 North Arrow 6 Other Stacks



Observation Date: Start Time: 1625 End Time: 1631

Min \ Sec	0	15	30	45	Comments
1	0	0	0	0	Digester Gas
2	0	0	0	0	Test Run
3	0	0	0	0	
4	0	0	0	0	
5	0	0	0	0	
6	0	0	0	0	
7					
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Range of Opacity: Minimum 0 Maximum 0

I have received a copy of these opacity observations
Print Name:
Signature:
Title Date

Print Observer's Name: Marlon Luna
Observer's Signature: Date: 01/13/2020
Organization:
Certified By: Date

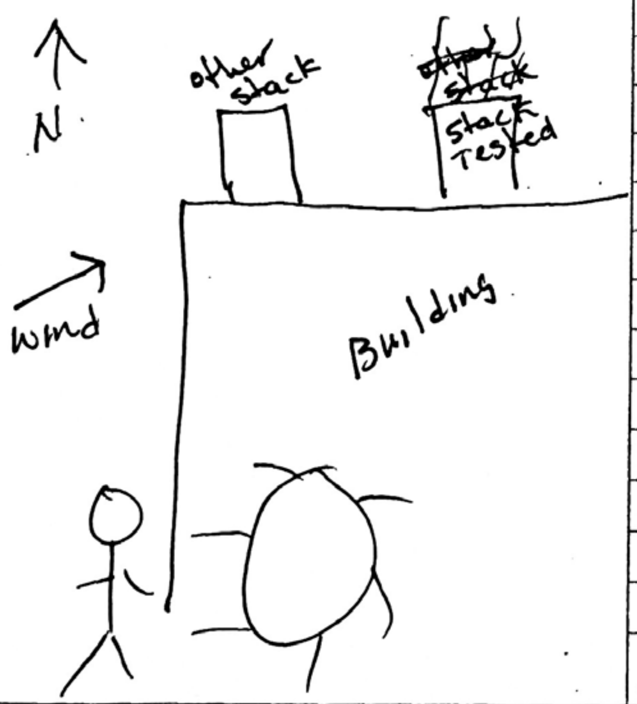
veo-frm 2/14/01

AIR POLLUTION TESTING, INC.
VISIBLE EMISSIONS OBSERVATION FORM

Page No.______

Source Name: ABCWUA
Type of Source: Cogeneration
Address: 4201 Second St SW
City: Albuquerque State: NM Zip: 87105
Phone (Key Contact): 505-503-3777
Source ID Number: 305019
Process Equipment: Superior Engine
Operating Mode:
Control Equipment: Generator
Operating Mode:
Describe Emission Point: Top of Exhaust stack
Height Above Ground Level / Height Relative To Observer: 33 ft
Inclinometer Reading:
Distance From Observer: 108 ft
Direction From Observer: Start NE End NE
Describe Emissions & Color: Start NONE Visable End NONE Visable
Visible Water Vapor Present? If yes, determine approximate distance from the stack exit to where the Plume was read [✓ No] Yes
Point In Plume at Which Opacity Was Determined: NONE Visable
Describe Plume Background: Start Sky Blue End sky Blue
Background Color: Start Blue End Blue
Sky Conditions: Start Clear End Clear
Wind Speed: 18 mph
Wind Direction From: Start WSW End WSW
Ambient Temperature: 50°
Wet Bulb Temp: 44°
RH percent: 23%

NOTES: 1 Stack or Point Being Read 2 Wind Direction From 3 Observer Location 4 Sun Location 5 North Arrow 6 Other Stacks



Observation Date:
Start Time: 1220
End Time: 1226

Min \ Sec	0	15	30	45	Comments
1	0	0	0	0	Natural GAS
2	0	0	0	0	Test Run
3	0	0	0	0	
4	0	0	0	0	
5	0	0	0	0	
6	0	0	0	0	
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Range of Opacity
Minimum 0 Maximum 0

I have received a copy of these opacity observations
Print Name:
Signature:
Title Date

Print Observer's Name: Marlon Luna
Observer's Signature: Marlon Luna Date: 01/13/2020
Organization:
Certified By: Date

veo-frm 2/14/01

AeroMet
Engineering, Inc.
Solutions for a Changing Environment

Certification of Visible Opacity Reading

Marlon Luna

qualified to conduct EPA Method 9 Tests for visible opacity in accordance with the methods established for such qualification in 40 CFR Part 60 Appendix A.

Certification Date: October 10, 2019

Expiration Date: April 10, 2020

Bell

AeroMet Instructor: Jim Bell

[P] 573.636.6393 www.aeromet.org

AEROMET ENGINEERING INC. CERTIFIES THAT

Marlon Luna

has qualified as a CERTIFIED VISIBLE EMISSIONS READER per Title 40 Part 60 Appendix A USEPA Method 9

Issued: 10/10/2019 Expires: 04/10/2020

Questions? Call 573.636.6393

Cut Here

Last Page of Report