ATTACHMENT E CONTAINS CONFIDENTIAL TRADE SECRET INFORMATION NOT SUBJECT TO DISCLOSURE PURSUANT TO OCGA § 50-18-72(34)

8195 Industrial Blvd.
Covington, GA 30014

bd.com

BD

31 October 2019

Eric Cornwell
Georgia Department of Natural Resources
Environmental Protection Division
Air Protection Branch
4244 International Parkway, Suite 120
Atlanta, Georgia 30354-3908

Dear Mr. Cornwell:

RE: SIP Permit Application
BD Covington
Air Quality Permit 3841-211-0021-S-0-04-0

Enclosed is a SIP application for our 8195 Industrial Blvd. Covington GA 30014 location. The application describes the additional voluntary emission controls we plan to install to reduce fugitive emissions of Ethylene Oxide. These emissions are not regulated by Subpart O (40 CFR 63.360).

If you have any questions or comments regarding this information, please contact me at (770) 652-2049.

Sincerely,

John LaMontagne
Process Technology Engineer
Urology and Critical Care Division
Becton, Dickinson and Company

cc: K. Hays, GA EPD
R. Pasdon

With Air Dispersion Modeling files. (USB Flash Drive)

Certified: 70092250000127474828

8195 Industrial Blvd.
Covington, GA 30014

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Without Air Dispersion Modeling files

Certified: 70092250000127474811

State of Georgia
Department of Natural Resources
Environmental Protection Division
Air Protection Branch

Stationary Source Permitting Program
4244 International Parkway, Suite 120
Atlanta, Georgia 30354
404/363-7000
Fax: 404/363-7100

SIP AIR PERMIT APPLICATION

EPD Use Only

Date Received: ______________ Application No. ______________

FORM 1.00: GENERAL INFORMATION

1. Facility Information

Facility Name: BD Covington

AIRS No. (if known): 04-13-217 - 00021

Facility Location: Street: 8195 Industrial Blvd

City: Covington Georgia Zip: 30014 County: Newton

Is this facility a "small business" as defined in the instructions? Yes: ☐ No: ☒

2. Facility Coordinates

Latitude: 85° 36' 42" **NORTH** Longitude: 83° 50' 17" **WEST**

UTM Coordinates: ______ **EAST** ______ **NORTH** **ZONE** ______

3. Facility Owner

Name of Owner: Becton, Dickinson and Company

Owner Address Street: 1 Becton Drive

City: Franklin Lakes State: NJ Zip: 07417

4. Permitting Contact and Mailing Address

Contact Person: John LaMontagne Title: Process Technology Engineer

Telephone No.: 770 784 6186 Ext. ______ Fax No.: 770 788 5519

Email Address: john.lamontagne@BD.com

Mailing Address: Same as: Facility Location: ☒ Owner Address: ☐ Other: ☐

If Other: Street Address: ______

City: ______ State: ______ Zip: ______

5. Authorized Official

Name: Ron Pasdon Title: Sr.Operations Mgr. Covington

Address of Official Street: 8195 Industrial Blvd.

City: Covington State: GA Zip: 30014

This application is submitted in accordance with the provisions of the Georgia Rules for Air Quality Control and, to the best of my knowledge, is complete and correct.

Signature: R Pasdon Date: 31 Oct. 2019

6. **Reason for Application: (Check all that apply)**

☐ New Facility (to be constructed)

☒ Existing Facility (initial or modification application)

☒ Permit to Construct

☒ Permit to Operate

☐ Change of Location

☐ Permit to Modify Existing Equipment: Affected Permit No.: ____________

☐ Revision of Data Submitted in an Earlier Application

Application No.: ____________

Date of Original Submittal: ____________

7. **Permitting Exemption Activities (for permitted facilities only):**

Have any exempt modifications based on emission level per Georgia Rule 391-3-1-.03(6)(i)(3) been performed at the facility that have not been previously incorporated in a permit?

☐ **No** ☐ **Yes, please fill out the SIP Exemption Attachment** (See Instructions for the attachment download)

8. **Has assistance been provided to you for any part of this application?**

☐ **No** ☐ **Yes, SBAP** ☒ **Yes, a consultant has been employed or will be employed.**

If yes, please provide the following information:

Name of Consulting Company: Trinity Consultants

Name of Contact: Justin Fickas

Telephone No.: 678 441-9977 Fax No.: ____________

Email Address: ____________

Mailing Address: Street: 3495 Piedmont Rd

City: Atlanta State: GA Zip: 30305

Describe the Consultant's Involvement:

Air Dispersion Modeling

9. **Submitted Application Forms:** Select only the necessary forms for the facility application that will be submitted.

No. of Forms	Form
1	2.00 Emission Unit List
	2.01 Boilers and Fuel Burning Equipment
	2.02 Storage Tank Physical Data
	2.03 Printing Operations
	2.04 Surface Coating Operations
	2.05 Waste Incinerators (solid/liquid waste destruction)
	2.06 Manufacturing and Operational Data
1	3.00 Air Pollution Control Devices (APCD)
	3.01 Scrubbers
	3.02 Baghouses & Other Filter Collectors
	3.03 Electrostatic Precipitators
1	4.00 Emissions Data
1	5.00 Monitoring Information
	6.00 Fugitive Emission Sources
1	7.00 Air Modeling Information

10. **Construction or Modification Date**

Estimated Start Date: Construction estimated to start in December 2019

11. **If confidential information is being submitted in this application, were the guidelines followed in the "Procedures for Requesting that Submitted Information be treated as Confidential"?**

☐ No ☐ Yes

12. **New Facility Emissions Summary**

Criteria Pollutant	New Facility	
	Potential (tpy)	Actual (tpy)
Carbon monoxide (CO)		
Nitrogen oxides (NOx)		
Particulate Matter (PM) (filterable only)		
PM <10 microns (PM10)		
PM <2.5 microns (PM2.5)		
Sulfur dioxide (SO_2)		
Volatile Organic Compounds (VOC)		
Greenhouse Gases (GHGs) (in CO2e)		
Total Hazardous Air Pollutants (HAPs)		
Individual HAPs Listed Below:		

13. **Existing Facility Emissions Summary**

Criteria Pollutant	Current Facility		After Modification	
	Potential (tpy)	Actual (tpy)	Potential (tpy)	Actual (tpy)
Carbon monoxide (CO)	27.77	2.98	27.77	2.98
Nitrogen oxides (NOx)	54.1	5.69	54.1	5.69
Particulate Matter (PM) (filterable only)	2.76	0.30	2.76	0.30
PM <10 microns (PM10)	2.76	0.30	2.76	0.30
PM <2.5 microns (PM2.5)	2.76	0.30	2.76	0.30
Sulfur dioxide (SO_2)	5.02	0.50	5.02	0.50
Volatile Organic Compounds (VOC)	6.29	0.70	5.81	0.41
Greenhouse Gases (GHGs) (in CO2e)	30956	19734	30956	19734
Total Hazardous Air Pollutants (HAPs)	0.98	0.35	0.50	0.07
Individual HAPs Listed Below:				
Ethylene Oxide	0.5	0.3	0.019	0.014

14. 4-Digit Facility Identification Code:

SIC Code: 3841 SIC Description: Surgical & Medical Instruments & Apparatus

NAICS Code: 339112 NAICS Description: Surgical and Medical Instrument Manufacturing

15. Description of general production process and operation for which a permit is being requested. If necessary, attach additional sheets to give an adequate description. Include layout drawings, as necessary, to describe each process. References should be made to source codes used in the application.

This application is for the addition of Emission Controls for currently non-captured emissions of Ethylene Oxide (EO) at an existing medical device sterilization facility. The existing regulated process which includes the Sterilization Chamber Exhaust Vent, Chamber Vent, and Aeration Exhaust are not being modified. Information for these systems has been included in previous permit applications and will not be repeated here. This application is specific to additional emission controls being installed to capture and treat emissions not captured by current control equipment. No increase in the usage of EO will result from this proposed fugitive emission control project. The new controls will be comprised of two Local Exhaust Ventilation Systems:

System One (SYS1) will capture potential emissions from the five Sterilization Vessel Rooms (VRM1, VRM2, VRM3, VRM4, VRM5), the Vessel to Aeration Transfer Corridor (NCO1), and the EO Dispensing Room (DRM1). Reference Attachment C.

System Two (SYS2) will capture potential emissions from the Work in Progress Area (WIP1) where product is stored after Sterilization and prior to shipment. Reference Attachment D.

The captured emissions will be treated using Advanced Air Technologies Model DR490 "Dry Bed Scrubbers" designed to achieve an estimated 99% destruction efficiency.

16. Additional information provided in attachments as listed below:

Attachment A - Floor Plan

Attachment B - Plot Plan with proposed new stack locations

Attachment C - System 1 Flow Diagram

Attachment D - System 2 Flow Diagram

Attachment E - Mass Balance Calculations.

Attachment F - Monitoring Recommendations

Attachment G - Advanced Air Technologies DR-490 Equipment Information

Attachment H - Air Dispersion Modeling

17. Additional Information: Unless previously submitted, include the following two items:

☒ Plot plan/map of facility location or date of previous submittal: Attachment B

☒ Flow Diagram or date of previous submittal: Attachment C & D

18. Other Environmental Permitting Needs:

Will this facility/modification trigger the need for environmental permits/approvals (other than air) such as Hazardous Waste Generation, Solid Waste Handling, Water withdrawal, water discharge, SWPPP, mining, landfill, etc.?

☒ **No** ☐ **Yes, please list below:**

19. List requested permit limits including synthetic minor (SM) limits.

Proposed Permit Conditions

Permittee shall initially test performance of System1 (SYS1) and System2 (SYS2) to confirm ethylene oxide removal efficiency of at least 99% on a concentration basis within 60 days of commissioning of each system and within 60 days following any replacement of dry bed media.

Removal efficiency across each system (SYS1 and SYS2) shall be demonstrated on a concentration reduction basis using simultaneous samples of inlet and outlet gases by Summa Canisters using EPA Method TO-15 with analysis by GC/MS in the Selective Ion Monitoring (SIM) acquisition mode. During sampling of the inlet and outlet concentrations across each system, the outlet stack airflows will be measured using EPA Methods 1, 2, and 4 for determination of volumetric flow rate and moisture content, and calculation of mass emission rate of ethylene oxide.

Permittee shall sample the outlet from System1 (SYS1) and System2 (SYS2) once each month by Summa Canisters using EPA Method TO-15 with analysis by GC/MS in the Selective Ion Monitoring (SIM) acquisition mode to determine concentration of ethylene oxide in the exhaust airflow stream.
Permittee shall track monthly concentration data versus baseline conditions and, in consultation with the dry bed manufacturer, determine when media replacement is warranted to maintain at least 99% removal efficiency.

20. Effective March 1, 2019, permit application fees will be assessed. The fee amount varies based on type of permit application. Application acknowledgement emails will be sent to the current registered fee contact in the GECO system. If fee contacts have changed, please list that below:

Fee Contact name:
Fee Contact email address:
Fee Contact phone number:

Fee invoices will be created through the GECO system shortly after the application is received. It is the applicant's responsibility to access the facility GECO account, generate the fee invoice, and submit payment within 10 days after notification.

Facility Name: BD Covington **Date of Application:** 31 October 2019

FORM 2.00 – EMISSION UNIT LIST

Emission Unit ID	Name	Manufacturer and Model Number	Description
VRM1	Vessel Room 1	N/A	Dedicated Room for Sterilization Chamber 1
VRM2	Vessel Room 2	N/A	Dedicated Room for Sterilization Chamber 2
VRM3	Vessel Room 3	N/A	Dedicated Room for Sterilization Chamber 3
VRM4	Vessel Room 4	N/A	Dedicated Room for Sterilization Chamber 4
VRM5	Vessel Room 5	N/A	Dedicated Room for Sterilization Chamber 5
NCO1	Vessel to Aeration Transfer	N/A	Common corridor between Vessel Rooms and Aeration Cells
DRM1	EO Dispensing	N/A	Dedicated Room for Dispensing EO from supply drums to each Vessel Room
WIP1	Work in Progress	N/A	Common area where sterilized product is stored prior to shipment

Facility Name: BD Covington **Date of Application:** 31 October 2019

Form 3.00 – AIR POLLUTION CONTROL DEVICES - PART A: GENERAL EQUIPMENT INFORMATION

APCD Unit ID	Emission Unit ID	APCD Type (Baghouse, ESP, Scrubber etc)	Date Installed	Make & Model Number (Attach Mfg. Specifications & Literature)	Unit Modified from Mfg Specifications?	Gas Temp. °F		Inlet Gas Flow Rate (acfm)
						Inlet	Outlet	
SYS1	VRM1	Dry Beds	TBD	Advanced Air Technologies, DR490	No	70	70	4,000-10,000
SYS1	VRM2	Dry Beds	TBD	Advanced Air Technologies, DR490	No	70	70	4,000-10,000
SYS1	VRM3	Dry Beds	TBD	Advanced Air Technologies, DR490	No	70	70	4,000-10,000
SYS1	VRM4	Dry Beds	TBD	Advanced Air Technologies, DR490	No	70	70	4,000-10,000
SYS1	VRM5	Dry Beds	TBD	Advanced Air Technologies, DR490	No	70	70	4,000-10,000
SYS1	NCO1	Dry Beds	TBD	Advanced Air Technologies, DR490	No	70	70	3,000
SYS1	DRM1	Dry Beds	TBD	Advanced Air Technologies, DR490	No	70	70	1,000
SYS2	WIP1	Dry Beds	TBD	Advanced Air Technologies, DR490	No	70	70	64,000

Facility Name: BD Covington **Date of Application:** 31 October 2019

Form 3.00 – AIR POLLUTION CONTROL DEVICES – PART B: EMISSION INFORMATION

APCD Unit ID	Pollutants Controlled	Percent Control Efficiency		Inlet Stream To APCD		Exit Stream From APCD		Pressure Drop Across Unit (Inches of water)
		Design	Actual	lb/hr	Method of Determination	lb/hr	Method of Determination	
SYS1	Ethylene Oxide	99%	TBD	0.013	Mass Balance	0.00013	Mass Balance	7
SYS2	Ethylene Oxide	99%	TBD	0.36	Mass Balance	0.0036*	Mass Balance	7
							*This value was calculated using the facility's maximum sterilization production rate at 8,760 hours per year (i.e., the PTE).	

Facility Name: BD Covington **Date of Application:** 31 October 2019

FORM 4.00 – EMISSION INFORMATION

Emission Unit ID	Air Pollution Control Device ID	Stack ID	Pollutant Emitted	Emission Rates				
				Hourly Actual Emissions (lb/hr)	Hourly Potential Emissions (lb/hr)	Actual Annual Emission (tpy)	Potential Annual Emission (tpy)	Method of Determination
VRM1	SYS1	STK1	Ethylene Oxide	0.000018	0.000018	0.00008	0.00008	Estimate
VRM1	SYS1	STK1	Ethylene Oxide	0.000018	0.000018	0.00008	0.00008	Estimate
VRM1	SYS1	STK1	Ethylene Oxide	0.000018	0.000018	0.00008	0.00008	Estimate
VRM1	SYS1	STK1	Ethylene Oxide	0.000018	0.000018	0.00008	0.00008	Estimate
VRM1	SYS1	STK1	Ethylene Oxide	0.000018	0.000018	0.00008	0.00008	Estimate
NCO1	SYS1	STK1	Ethylene Oxide	0.0000091	0.000013	0.000040	0.000055	Mass Balance
DMR1	SYS1	STK1	Ethylene Oxide	0.000023	0.000023	0.0001	0.0001	Estimate
WIP1	SYS2	STK2	Ethylene Oxide	0.0026	0.0036	0.012	0.016	Mass Balance

Facility Name: BD Covington **Date of Application:** 31 October 2019

FORM 5.00 MONITORING INFORMATION

Emission Unit ID/ APCD ID	Emission Unit/APCD Name	Monitored Parameter		Monitoring Frequency
		Parameter	Units	
VRM1/SYS 1	Vessel Room1/System1	EO Concentration at outlet of SYS1	ppm	Reference Attachment F
VRM2/SYS 1	Vessel Room2/System1	EO Concentration at outlet of SYS1	ppm	Reference Attachment F
VRM3/SYS 1	Vessel Room3/System1	EO Concentration at outlet of SYS1	ppm	Reference Attachment F
VRM4/SYS 1	Vessel Room4/System1	EO Concentration at outlet of SYS1	ppm	Reference Attachment F
VRM5/SYS 1	Vessel Room5/System1	EO Concentration at outlet of SYS1	ppm	Reference Attachment F
NCO1/SYS 1	Vessel to Aeration Transfer/System1	EO Concentration at outlet of SYS1	ppm	Reference Attachment F
DMR1/SYS 1	EO Dispensing/System1	EO Concentration at outlet of SYS1	ppm	Reference Attachment F
WIP1/SYS2	Work in Progress/System2	EO Concentration at outlet of SYS2	ppm	Reference Attachment F

Comments:
Monitoring detail described in attachment F

Facility Name: BD Covington **Date of Application:** 31 October 2019

FORM 7.00 – AIR MODELING INFORMATION: Stack Data

Stack ID	Emission Unit ID(s)	Stack Information			Dimensions of largest Structure Near Stack		Exit Gas Conditions at Maximum Emission Rate			
		Height Above Grade (ft)	Inside Diameter (ft)	Exhaust Direction	Height (ft)	Longest Side (ft)	Velocity (ft/sec)	Temperature (°F)	Flow Rate (acfm)	
									Average	Maximum
STK1	VRM1, VRM2, VRM3, VRM4, VRM5, NCO1, DMR1,	100	3.83	To the Sky	30	50	52	70	21,000	36,000
STK2	WIP1	100	5.17	To the Sky	30	50	50.8	70	64,000	64,000

NOTE: If emissions are not vented through a stack, describe point of discharge below and, if necessary, include an attachment. List the attachment in Form 1.00 *General Information*, Item 16.

n/a

Facility Name: BD Covington **Date of Application:** 31 October 2019

FORM 7.00 AIR MODELING INFORMATION: Chemicals Data

Chemical	Potential Emission Rate (lb/hr)	Toxicity	Reference	MSDS Attached
Ethylene Oxide CAS#: 71-25-8	0.0044	PEL: 1ppm STEL: 5 ppm	OSHA 1910	☐
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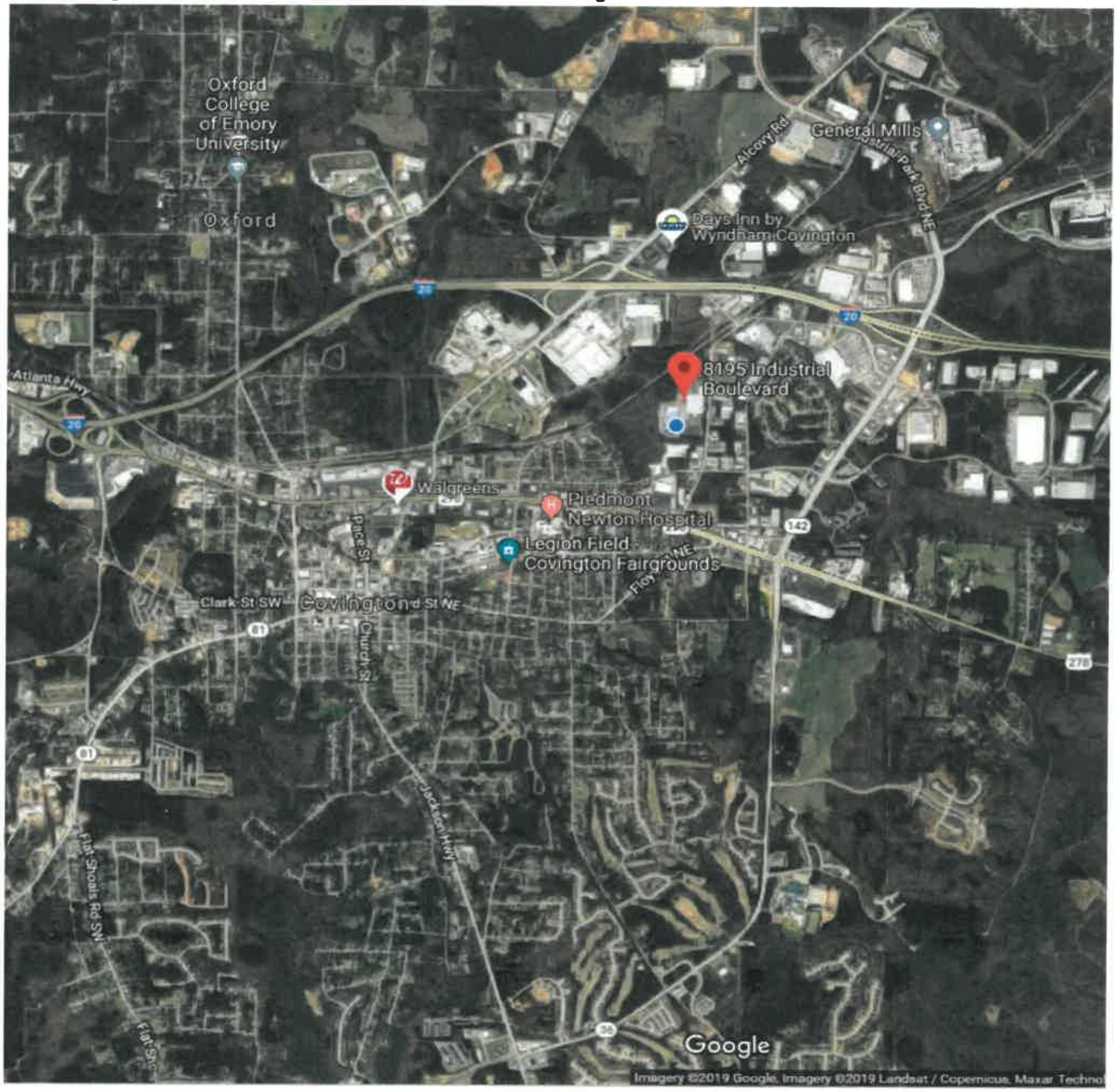
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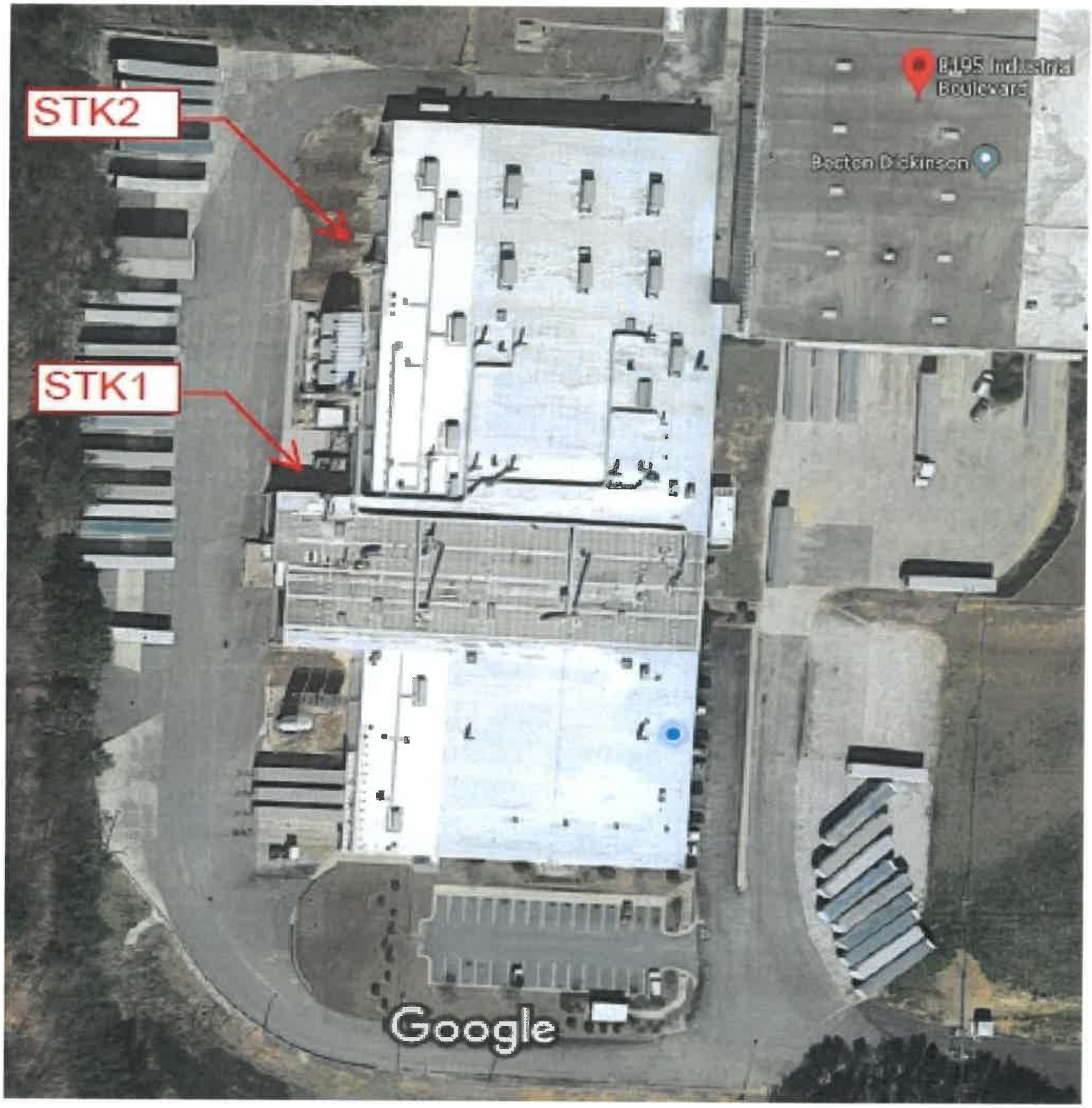
Oxford
General Mills
Alcovy Rd
Days Inn by Wyndham Covington
8195 Industrial Boulevard
Walgreens
Piedmont Newton Hospital
Legion Field - Covington Fairgrounds
Pace St
Clark St SW
Covington
Church St
Jackson Hwy
Flat Shoals Rd SW
Google
Imagery ©2019 Google, Imagery ©2019 Landsat / Copernicus, Maxar Techno


STK2
STK1
Becton Dickinson
Google

Attachment C

BD Covington SIP Application

General Description

The intent of the mechanical systems design upgrade is to capture unregulated, fugitive Ethylene Oxide (EO) emissions inside the facility and reduce the potential for releases of these emissions to atmosphere. An effective means of containing emissions is to capture EO at the source. The capture and treatment systems will utilize pressure differential strategies. Using negatively pressurized spaces, extraction will direct air from the lowest EO concentrations to the highest concentrations in the building and then send this exhaust air through an EO destruction process. Existing exhaust fans (WIP1) will be replaced with a dedicated EO capture and destruction systems. Further, the shipping area will be enclosed. The new systems are designed to reduce captured emissions by 99% at the outlet.

System 1 Description/Flow Diagram

System One (SYS1) will capture potential emissions from the five Sterilization Vessel Rooms (VRM1, VRM2, VRM3, VRM4, VRM5), the Vessel to Aeration Transfer Corridor (NCO1), and the EO Dispensing Room (DRM1). All SYS1 exhaust will be manifolded into a Dry Bed System with variable speed exhaust fan with a maximum capacity of 36,000 cfm. The system will maintain negative pressure, with respect to outside, in the Vessel Rooms, Vessel to Aeration Transfer Corridor, Drum Dispensing and use local ventilation exhaust to capture and destruct EO.

Normal Mode:

Vessel Rooms (VRM1-VRM5) will exhaust 4,000 cfm each, DMR1 will exhaust 1,000 cfm, NC01 hoods will be off. Total cfm = 21,000. The other Vessel rooms, DMR1, and NCO1 can increase cfm, to a total of 36,000 cfm, if monitoring equipment detects elevated EO levels.

Chamber Unloading Mode:

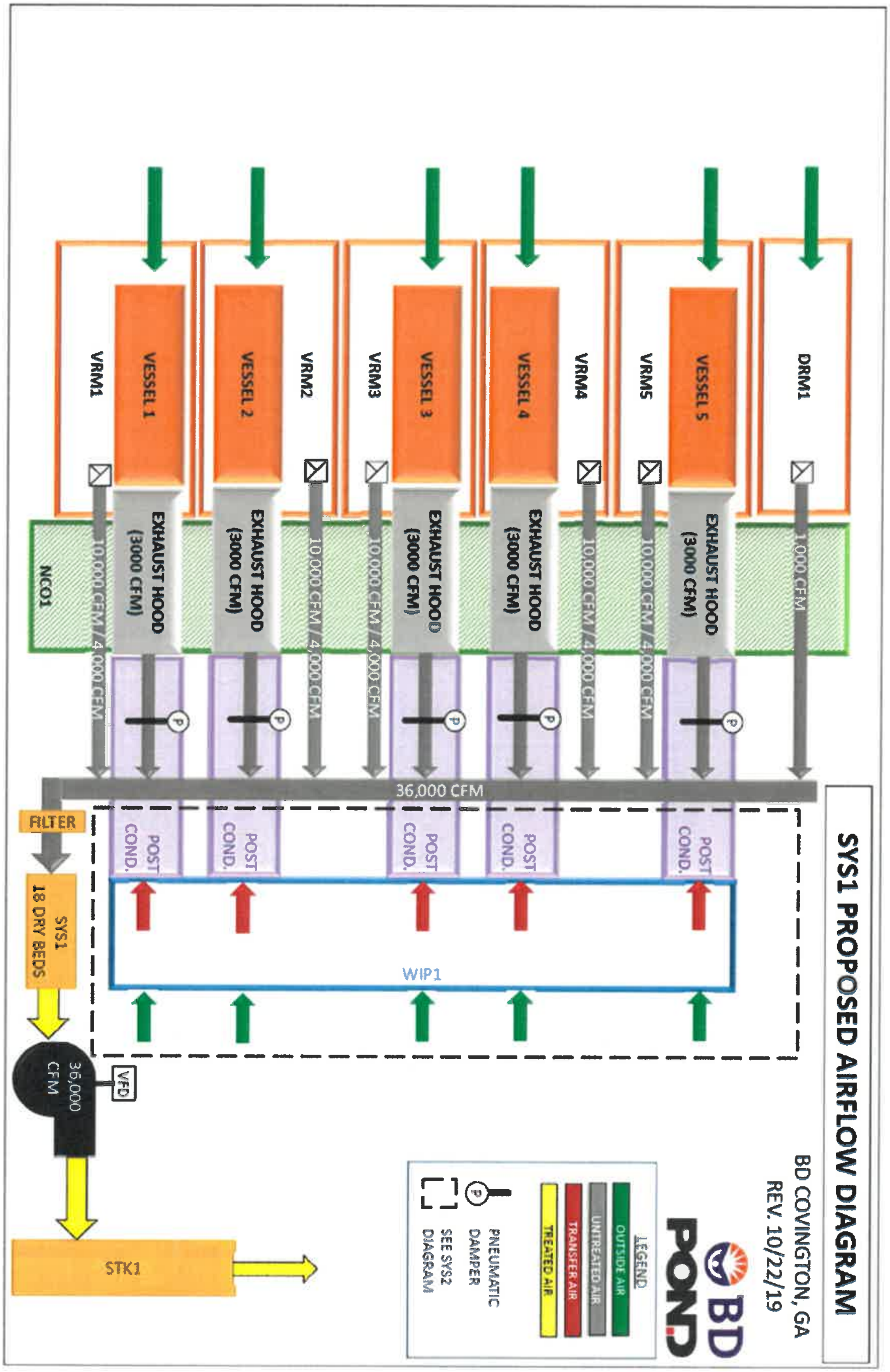
When a chamber is being unloaded the room exhaust will ramp to 10,000 cfm (all other vessel rooms will be at 4,000 cfm) the corresponding NCO1 hood will go to 3,000 cfm exhaust (all other hoods will be off). DMR1 will remain at 1,000 cfm. Total cfm = 30,000. The other Vessel rooms can increase cfm, to a total of 36,000 cfm, if monitoring equipment detects elevated EO levels.

Emergency Mode:

SYS1 will also incorporate a safety feature that will serve to shut down the system in the case of a major EO leak (≥25% of LEL or 7,500ppm). The AAT Dry Beds are designed for a maximum limit of 10,000 ppm and can ignite if overfed leading to potential fire or explosion. An EO sensor will be located in the SYS1 inlet duct and will activate a shutdown sequence based on an internal setpoint. EO emissions will not be captured in this emergency situation. This event will also trigger a sterilization process shutdown. It should be noted that BD has not experienced levels of this magnitude in its twenty-year history and this safety system is being included only to prevent a personnel injury in the event of a catastrophic failure.

Attachment C

BD Covington SIP Application

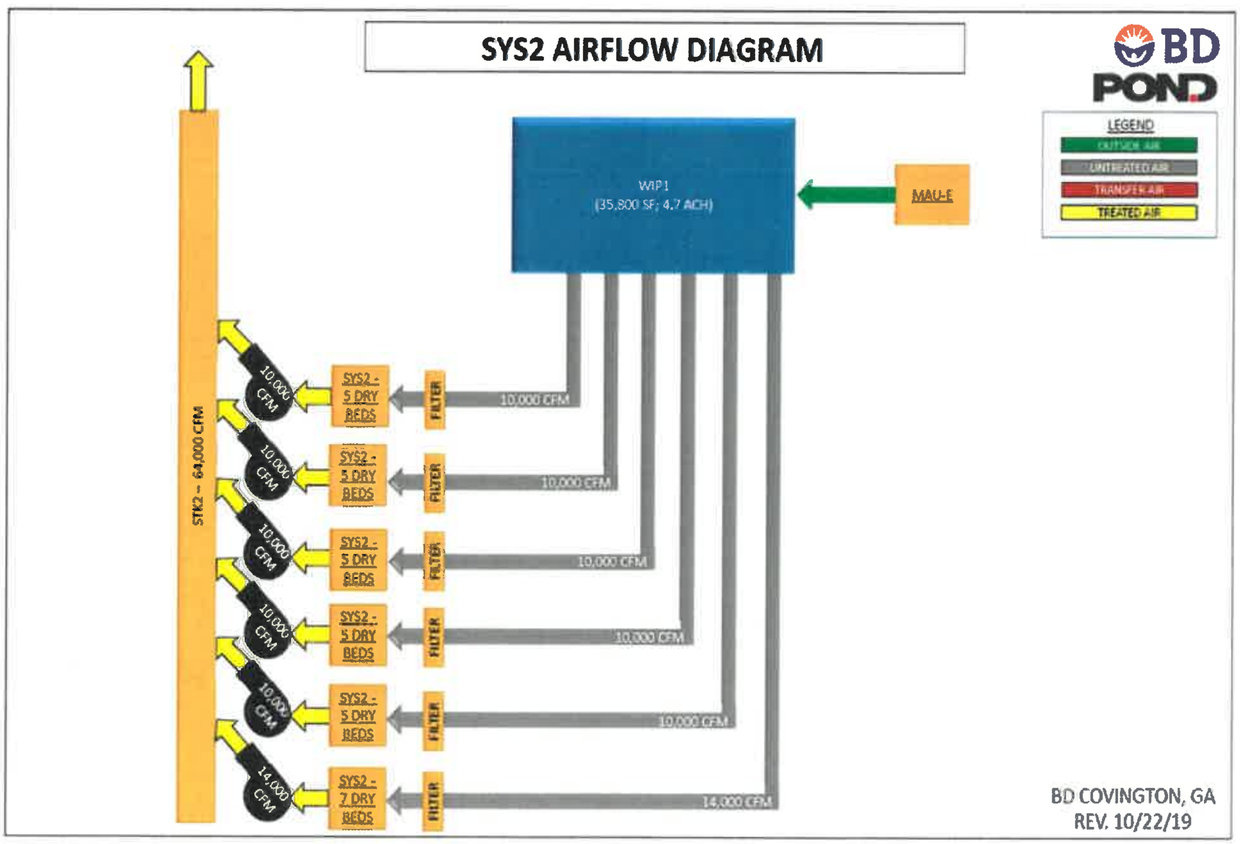


Attachment D

BD Covington SIP Application

System 2 Description/Flow Diagram

System Two (SYS2) will capture potential emissions from the Work in Progress Area (WIP1) where product is stored after Sterilization and prior to shipment. All SYS2 exhaust will be manifolded into a Dry Bed System with multiple variable speed exhaust fans for a maximum capacity of 64,000 cfm. The exhaust fans will be routed to a common Stack (STK2). The system will maintain negative pressure, with respect to outside, in the WIP1 area. The area pressure will be monitored with pressure sensors and fans will modulated to maintain a negative pressure in the space. Administrative controls will be implemented to ensure building integrity is preserved, doorways are managed, and air flows/pressures are maintained per design. The shipping area will be enclosed to aid in containment of emissions.



CONFIDENTIAL TRADE SECRET INFORMATION NOT SUBJECT TO DISCLOSURE PURSUANT TO OCGA § 50-18-72(34)

ATTACHMENT E	Page 1 of 2		
Becton, Dickinson and Company			
Mass Balance Calculations for SIP Application **(PTE)**			
Facility: Covington, GA			
Input data:			
Ethylene oxide usage	[redacted]	lb/yr	Total usage based on Mass Balance
Sterilizer removal efficency[1]	99.9%		Based on partial pressure calculation estimate
RTO efficiency, aeration	99.970%		Based on 2019 Performance Testing
RTO efficiency, vessels	99.999%		Based on 2019 Performance Testing
Product transfer time, sterilizer to aeration	5	min	
Aeration time	16	hr	
Aeration Unload time	10	min	
System 1 removal efficiency	99%		Assume 99% Based on vendor literature
System 2 removal efficiency	99%		Assume 99% Based on vendor literature
System 2 Safety Factor	4.00		Safety factor included to account for variation in future products and product density which may impact EO residuals.
Assumptions:			
Product absorption[2]	[redacted]		
EO degassing rate constant, k[3]	[redacted]	lb/hr	
Miscellaneous fugitive loss[4]	100	lb	captured in system 1
Calculations:			
Sterilizer:			
EO into sterilizers	[redacted]	lb	Total usage based on Mass Balance minus miscellaneous fugitive loss
EO absorbed by product	2,135.6	lb	
EO in sterilizer not absorbed by product	[redacted]	lb	
EO exhausted to RTO from vac/air wash	[redacted]	lb	
EO exhausted to RTO from vent	531.8	lb	
Sterilizer exhaust to RTO	[redacted]	lb	
Sterilizer exhaust removed by RTO	[redacted]	lb	
Sterilizer exhaust to atmosphere after RTO	5.3	lb	
Transfer:			
EO offgas during product transfer to aeration	0.51%		EO will off-gas from products during aeration per equation: $C = C_o e^{(-kt)}$, where C = Final EO concentration, C_o = EO concentration at time 0, k = EO degassing rate constant, and t = degassing time in hrs.
EO offgas during product transfer to aeration	10.9	lb	This will be captured by system one
Aeration:			
EO remaining in product entering aeration	2,124.7	lb	
Offgas during aeration	62.6%		
Offgas during unloading	0.0		
EO offgas during aeration	1,330.6	lb	
To RTO during aeration	1,330.6	lb	
To RTO during aeration unload	8.1	lb	
Total aeration to RTO	1,338.7	lb	
Aeration removed by RTO	1,338.3	lb	
Aeration exhaust to atmosphere after RTO	0.4	lb	
System1:			
Into System 1	110.9	lb	
Removed by System 1	109.8	lb	
System 1 exhaust to atmosphere	1.1		
System2:			
Into System 2	3,144.0	lb	Includes System 2 Safety Factor
Removed by System 2	3,112.6	lb	
System 2 exhaust to atmosphere	31.4		
Exhausted before Modification:			
EO exhausted to atmosphere from RTO	5.7	lb	
EO Exhausted to atmosphere by system 1	110.9	lb	
EO Exhausted by to atmosphere System 2	786.0	lb	Does not include Safety Factor[5]
Total EO exhausted to atmosphere	**902.6**	**lb**	**Before Modifications**
	0.5	Tons	
Exhausted after Modification:			
EO exhausted to atmosphere from RTO	5.7	lb	
EO Exhausted to atmosphere by system 1	1.1	lb	
EO Exhausted by to atmosphere System 2	31.4	lb	Does include Safety Factor
Total EO exhausted to atmosphere	**38.3**	**lb**	
	0.019	Tons	**After Modifications**

Note 1	This estimates how much EO is removed during post exposure vacuum washes but does not include what is in the product at the time it transfers to Aeration
Note 2	Estimates the amount of EO in the product when it starts the transfer to aeration
Note 3	An estimate based on Product EO Residue Testing performed by BD laboratory personnel.
Note 4	An estimate of potential EO emissions from pump/valve packaging, flange losses, EO supply drum changes, and non-routine losses.
Note 5	The Safety Factor is only included in the After Modification calculations as this insures the new System is designed to account for variation in future products and product density which may impact EO residuals.

CONFIDENTIAL TRADE SECRET INFORMATION NOT SUBJECT TO DISCLOSURE PURSUANT TO OCGA § 50-18-72(34)

ATTACHMENT E	Page 2 of 2		
Becton, Dickinson and Company			
Mass Balance Calculations for SIP Application **(Actual)**			
Facility: Covington, GA			
Input data:			
Ethylene oxide usage	[redacted]	lb/yr	Total usage based on Mass Balance (CY 2018)
Sterilizer removal efficency[1]	99.9%		Based on partial pressure calculation estimate
RTO efficiency, aeration	99.970%		Based on 2019 Performance Testing
RTO efficiency, vessels	99.999%		Based on 2019 Performance Testing
Product transfer time, sterilizer to aeration	5	min	
Aeration time	16	hr	
Aeration Unload time	10	min	
System 1 removal efficiency	99%		Assume 99% Based on vendor literature
System 2 removal efficiency	99%		Assume 99% Based on vendor literature
System 2 Safety Factor	4.00		Safety factor included to account for variation in future products and product density which may impact EO residuals.
Assumptions:			
Product absorption[2]	[redacted]		
EO degassing rate constant, k[3]	[redacted]	lb/hr	
Miscellaneous fugitive loss[4]	100	lb	captured in system 1
Calculations:			
Sterilizer:			
EO into sterilizers	[redacted]	lb	Total usage based on Mass Balance minus miscellaneous fugitive loss
EO absorbed by product	1,561.2	lb	
EO in sterilizer not absorbed by product	[redacted]	lb	
EO exhausted to RTO from vac/air wash	[redacted]	lb	
EO exhausted to RTO from vent	388.7	lb	
Sterilizer exhaust to RTO	[redacted]	lb	
Sterilizer exhaust removed by RTO	[redacted]	lb	
Sterilizer exhaust to atmosphere after RTO	3.9	lb	
Transfer:			
EO offgas during product transfer to aeration	0.51%		EO will off-gas from products during aeration per equation: $C = C_o e^{(-kt)}$, where C = Final EO concentration, C_o = EO concentration at time 0, k = EO degassing rate constant, and t = degassing time in hrs.
EO offgas during product transfer to aeration	8.0	lb	This will be captured by system one
Aeration:			
EO remaining in product entering aeration	1,553.2	lb	
Offgas during aeration	62.6%		
Offgas during unloading	1.0%		
EO offgas during aeration	972.7	lb	
To RTO during aeration	972.7	lb	
To RTO during aeration unload	5.9	lb	
Total aeration to RTO	978.6	lb	
Aeration removed by RTO	978.3	lb	
Aeration exhaust to atmosphere after RTO	0.3	lb	
System1:			
Into System 1	108.0	lb	
Removed by System 1	106.9	lb	
System 1 exhaust to atmosphere	1.1		
System2:			
Into System 2	2,298.4	lb	Includes System 2 Safety Factor
Removed by System 2	2,275.4	lb	
System 2 exhaust to atmosphere	23.0		
Exhausted before Modification:			
EO exhausted to atmosphere from RTO	4.2	lb	
EO Exhausted to atmosphere by system 1	108.0	lb	
EO Exhausted by to atmosphere System 2	574.6	lb	Does not Includes System 2 Safety Factor[5]
Total EO exhausted to atmosphere	686.8	lb	Before Modifications
	0.3	Tons	
Exhausted after Modification:			
EO exhausted to atmosphere from RTO	4.2	lb	
EO Exhausted to atmosphere by system 1	1.1	lb	
EO Exhausted by to atmosphere System 2	23.0	lb	Includes System 2 Safety Factor
Total EO exhausted to atmosphere	28.2	lb	
	0.014	Tons	After Modifications

Note 1	This estimates how much EO is removed during post exposure vacuum washes but does not include what is in the product at the time it transfers to Aeration
Note 2	Estimates the amount of EO in the product when it starts the transfer to aeration
Note 3	An estimate based on Product EO Residue Testing performed by BD laboratory personnel.
Note 4	An estimate of potential EO emissions from pump/valve packaging, flange losses, EO supply drum changes, and non-routine losses.
Note 5	The Safety Factor is only included in the After Modification calculations as this insures the new System is designed to account for variation in future products and product density which may impact EO residuals.

[redacted]

Note: Redacted information was inadvertently disclosed and was not part of BD's Application.

Attachment F

BD Covington SIP Application

BD has not identified an US EPA- or GA EPD-approved stack test method that will measure the concentrations of unregulated, fugitive emissions of ethylene oxide (EO), which are expected to be less than 0.2 ppm, that will enter the dry systems' inlets or the resulting, reduced concentrations of EO at the dry bed systems' outlets or the combined stacks.[1] For these reasons, BD proposes to demonstrate the control efficiency of the dry bed systems using the following sample collection and analysis methods, which are based EPA Method TO-15.

Based upon available information, BD anticipates that the ethylene oxide (EO) concentrations at the inlet and outlet of the proposed systems will be relatively low (i.e., typically less than 0.2 ppmv) and essentially not reliably detected by standard EPA stack testing methods (e.g., EPA Method No. 18). To overcome this limitation, the approach described below employs a gas sampling technique capable of achieving lower detection limits.

When the inlet and outlet concentrations are close to the limits of detection of the analytical equipment it becomes mathematically impossible to prove the specified destruction efficiency. We are currently investigating monitoring technologies and methods that would allow practical measurement of the relatively low levels of EO expected at the outlet of the proposed emission systems with the intent to be able to confirm a 99% reduction or an equivalent emission standard. BD welcomes any alternate sample/analysis methods may be that GA EPD may recommend.

BD proposes that the initial compliance tests and subsequent monthly monitoring of System1 and System2 as follows:

Initial Compliance Testing:

- Demonstrate 99% ethylene oxide removal efficiency of the dry bed systems across each control System using simultaneous samples of inlet and outlet gases by Summa Canisters using EPA Method TO-15 with analysis by GC/MS in the Selective Ion Monitoring (SIM) acquisition mode.
- During this sampling of the inlet and outlet concentrations across each system, the outlet stack airflows will be measured using EPA Methods 1, 2, and 4 for determination of volumetric flow rate and moisture content.

[1] Advanced Air Technologies, Inc. (AAT), the manufacturer of the dry bed systems, has claimed that that emissions "of EtO will be 99% or = 1 ppmv, whichever is less stringent, when operated per AAT operations manual and other parameters of project design." BD has based its calculations of the removal of unregulated, fugitive EO emissions on AAT's manufacturer's claims. To its knowledge, BD's installation of the AAT dry bed systems to control EO in the concentrations found in the unregulated, fugitive emissions of the substance at the Covington plant is the first such installation anywhere. BD, nonetheless, believes that the dry bed systems will reduce the unregulated, fugitive emissions of EO by 99%.

- Using the above-measured airflow and concentration data, the mass emission rate from each System will be calculated and reported.

- These data will be used to establish baseline conditions against which subsequent monitoring data (collected as described below) will be considered in determining when media replacement should be initiated.

This compliance testing regime will be repeated after completion of any future media replacement.

Routine Monitoring:

- Sample the outlet from each dry bed system on a monthly basis by Summa Canisters using EPA Method TO-15 with analysis by GC/MS in the Selective Ion Monitoring (SIM) acquisition mode and determine concentration of ethylene oxide in the exhaust airflow stream.

- Monthly concentration data will be tracked and compared with baseline data.

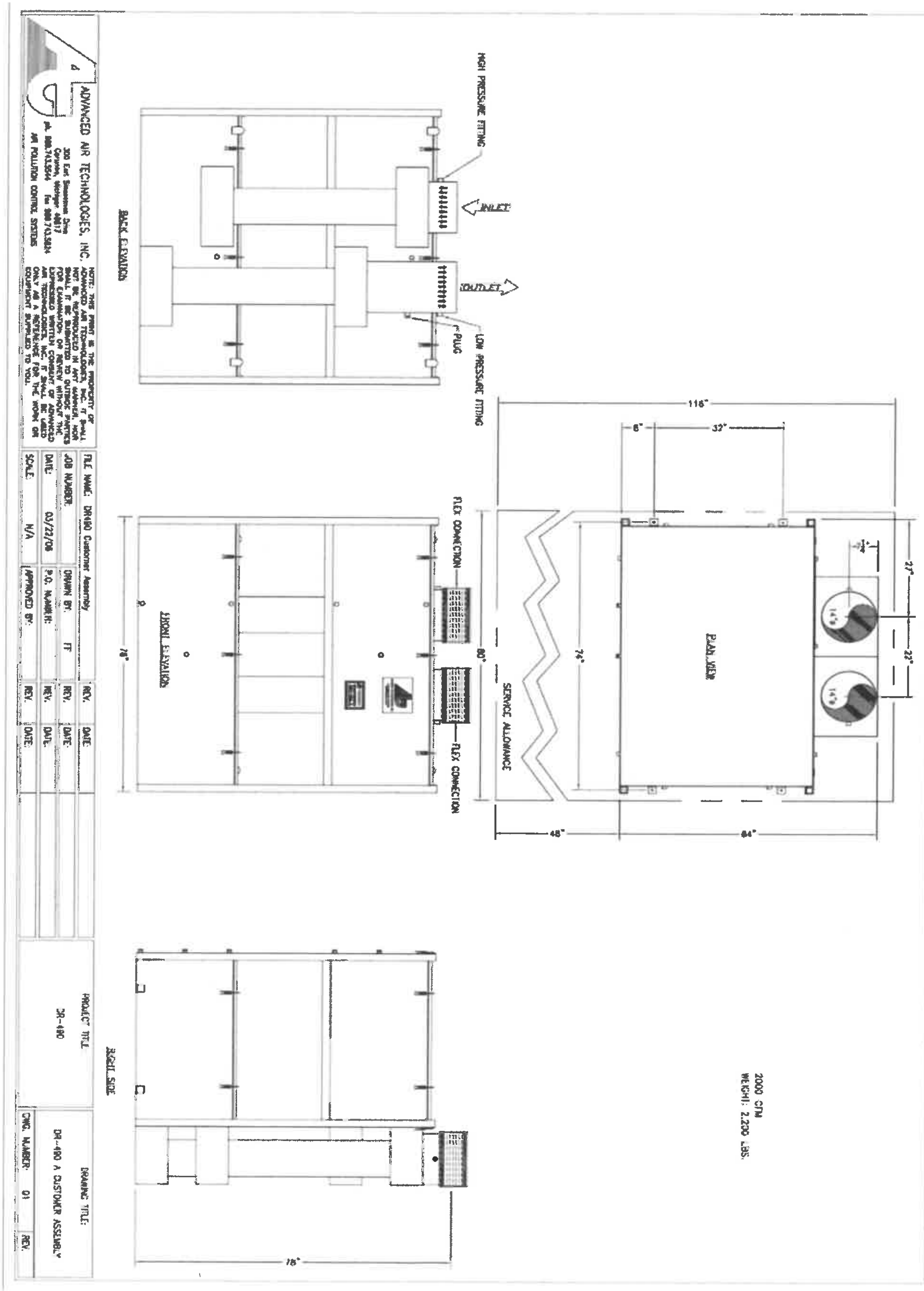
- Trending of the monthly concentration data versus baseline will be used in consultation with the dry bed manufacturer to determine when media replacement is warranted to maintain at least 99% removal efficiency.

The abatement method is chemisorption (adsorption accompanied by chemical reaction) by means of Advanced Air Technology dry beds containing sulfonated polymer of styrene. Once the chemisorption process has occurred, the amount of EO is reduced by at least 99%. See table below:

ISO 9001 : 2008 Certified
ADVANCED AIR TECHNOLOGIES, INC.
www.advairtech.com
300 Earl Sleeseman Drive
Corunna, MI 48817
(Michigan - USA)
Phone: 989-743-5544
Fax: 989-743-5624
Toll Free: 800-295-6583

AAT, INC. DR-490 ETHYLENE OXIDE ABATOR
REMOVAL EFFICIENCY DECAY
(BASED ON 2000 SCFM AIR FLOW RATE)

lb. EtO Treated/lb. Reactant	lb. EtO Previously Treated	EtO % Removal Efficiency
0	0	99.995
0.05	45	99.97
0.10	90	99.95
0.15	135	99.92
0.20	180	99.9
0.25	225	99.5
0.30	270	99
0.35	315	98
0.40	360	97
0.45	405	95
0.50	450	85
0.52	468	0


ADVANCED AIR TECHNOLOGIES, INC.
AIR POLLUTION CONTROL SYSTEMS
BACK ELEVATION
HIGH PRESSURE FITTING
INLET
OUTLET
PLUG
LOW PRESSURE FITTING
FRONT ELEVATION
FLEX CONNECTION
SERVICE ALLOWANCE
PLAN VIEW
RIGHT SIDE
118"
6"
32"
27"
22"
74"
80"
78"
48"
84"
FILE NAME: DR480 Customer Assembly
JOB NUMBER:
DRAWN BY: TF
DATE: 03/22/08
P.O. NUMBER:
SCALE: N/A
APPROVED BY:
REV.
DATE:
PROJECT TITLE:
DR-480
DRAWING TITLE:
DR-480 A CUSTOMER ASSEMBLY
DWG. NUMBER: 01
2000 CFM
WEIGHT: 2,200 LBS.

Attachment H

BD Covington SIP Application

ETHYLENE OXIDE EMISSIONS IMPACT ASSESSMENT

BD > Covington Facility

Prepared By:

TRINITY CONSULTANTS

October 2019

Project 191101.0218

Trinity Consultants

Environmental solutions delivered uncommonly well

1. ETHYLENE OXIDE EMISSIONS IMPACT ASSESSMENT

EPD regulates the emissions of toxic air pollutants (TAPs) through a program approved under the provisions of GRAQC Rule 391-3-1-.02(2)(a)3(ii). A TAP is defined as any substance that may have an adverse effect on public health, excluding any specific substance that is covered by a State or Federal ambient air quality standard. Procedures governing the EPD's review of toxic air pollutant emissions as part of air permit reviews are contained in EPD's *Guideline for Ambient Impact Assessment of Toxic Air Pollutant Emissions* (the *Guideline*).[1]

This assessment included dispersion modeling for ethylene oxide from the facility.

1.1. MODELING ASSESSMENT

Modeling conducted was done with the AERMOD (v19191) dispersion model. Meteorological data utilized for the modeling assessment was obtained from the Georgia EPD website.[2] Meteorological data utilized was processed using AERMET (v18081), AERSURFACE (v13016), and AERMINUTE (v15272) with the adjusted surface friction velocity option (ADJ_U*). Five consecutive years of meteorological data (2014-2018) were utilized in the modeling assessment, with surface meteorological data from the Atlanta Hartsfield Jackson airport and upper air data from Falcon Field in Peachtree City, Georgia. This assessment was performed in accordance with the *Guideline*.

1.1.1. Source Parameters

Ethylene oxide emissions were modeled as point sources from three specific facility stack locations. For point sources, AERMOD requires the stack height (m), inside stack exit diameter (m), temperature (K), and exit gas velocity (m/s) to be specified. Table 1-1 provides a summary of the location and stack parameters used in the dispersion model for the point sources. The modeled emission rates reflect the current DRE for the RTO (incinerator) at the Covington plant, and assume a 99% reduction of all fugitive emissions of EtO from the plant, which reflects the performance of the dry bed filters proposed in the permit application for which this modeling was performed.

[1] *Guideline for Ambient Impact Assessment of Toxic Air Pollutant Emissions*. Georgia Department of Natural Resources, Environmental Protection Division, Air Protection Branch, Revised, May 2017.

[2] https://epd.georgia.gov/air-protection-branch-technical-guidance-0/air-quality-modeling/georgia-aermet-meteorological-data

Table 1-1. Point Source Parameters

Source	Easting (meter)	Northing (meter)	Modeled Emissions (lb/yr)	Modeled Emissions (lb/hr)	Modeled Emissions (g/s)	Stack Height (ft)	Stack Height (m)	Stack Temperature (F)	Stack Temperature (K)	Exit Velocity (ft/s)	Exit Velocity (m/s)	Flow (cfm)	Stack Diameter (in)	Stack Diameter (m)
RTO	236,424.2	3,722,295.0	5.7	6.51E-04	8.21E-05	50	15.24	250	394.26	30.5	9.29	23,000	48	1.219
System 1	236,404.2	3,722,273.3	1.1	1.26E-04	1.59E-05	100	30.48	70	294.26	30.3	9.23	21,000	46	1.167
System 2	236,423.6	3,722,313.7	31.4	3.58E-03	4.52E-04	100	30.48	70	294.26	50.8	15.48	64,000	62	1.575

1.1.2. Land Use Classification

Classification of land use in the immediate area surrounding a facility is important in determining the appropriate dispersion coefficients to select for a particular modeling application. The selection of either rural or urban dispersion coefficients for a specific application should follow one of two procedures. These include a land use classification procedure or a population-based procedure to determine whether the area is primarily urban or rural.[3]

Of the two methods, the land use procedure is considered more definitive. The land use within the total area circumscribed by a 3-kilometer (km) radius circle around the facility was classified using the land use typing scheme proposed by Auer. If land use types I1 (Heavy Industrial), I2 (Light Industrial), C1 (Commercial), R2 (Residential; Small Lot Single Family & Duplex), and R3 (Residential; Multi-Family) account for 50% or more of the circumscribed area, urban dispersion coefficients should be used; otherwise, rural dispersion coefficients are appropriate.

AERSURFACE (v13016) was used for the extraction of the land-use values in the domain. The results of the land use analysis evaluation were as follows.

Each USGS NLCD92 land use class was compared to the most appropriate Auer land use category to quantify the total urban and rural area. Table 1-2 summarizes the results of this land use analysis. As approximately 93.7% of the area can be classified as rural, rural dispersion coefficients were used. The AERSURFACE files are enclosed in Appendix A.

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[3] 40 CFR Part 51, Appendix W, the Guideline on Air Quality Models (January 2017) – Section 7.2.1.1(b)(i)

Table 1-2. Summary of Land Use Analysis

USGS NLCD92		Auer Scheme		Rural/ Urban	Land Area
Land Class	Land Class Description	Land Use Type	Land Use Description		
11	Open Water	A5	Water Surfaces/Rivers/Lakes	Rural	0.8%
12	Perennial Ice/Snow	A5	Water Surfaces/Rivers/Lakes	Rural	0.0%
21	Low Intensity Residential	R1	Common Residential	Rural	7.8%
22	High Intensity Residential	R2 and R3	Compact Residential (Single Family, Multi-Family & Duplex)	Urban	0.9%
23	Commercial/Industrial/ Transportation	I1, I2, and C1	Heavy and Light-Moderate Industrial & Commercial	Urban	5.4%
31	Bare Rock/Sand/Clay	A3	Undeveloped	Rural	0.0%
32	Quarries/Strip Mines/Gravel	A4	Undeveloped Rural	Rural	0.2%
33	Transitional	A3	Undeveloped/Uncultivated	Rural	1.8%
41	Deciduous Forest	A4	Undeveloped Rural	Rural	29.1%
42	Evergreen Forest	A4	Undeveloped Rural	Rural	19.9%
43	Mixed Forest	A4	Undeveloped Rural	Rural	13.2%
51	Shrubland	A3	Undeveloped/Uncultivated	Rural	0.0%
61	Orchards/Vineyard/Other	A2	Agricultural Rural	Rural	0.0%
71	Grasslands/Herbaceous	A3	Undeveloped/Uncultivated	Rural	0.0%
81	Pasture/Hay	A2	Agricultural Rural	Rural	7.0%
82	Row Crops	A2	Agricultural Rural	Rural	3.8%
83	Small Grains	A2	Agricultural Rural	Rural	0.0%
84	Fallow	A2	Agricultural Rural	Rural	0.0%
85	Urban/Recreational Grasses	A1	Metropolitan Natural	Rural	2.5%
91	Woody Wetlands	A4	Undeveloped Rural	Rural	7.6%
92	Emergent Herbaceous Wetlands	A4	Undeveloped Rural	Rural	0.2%

1.1.3. Building Downwash

The effects of building downwash for each of the stack emission points were evaluated in terms of the proximity of the stack to nearby structures. The purpose of this evaluation is to determine if stack discharges might become caught in the turbulent wakes of these structures leading to downwash of the plumes. Wind blowing around a building creates zones of turbulence that are greater than if the building were absent.

For these modeling analyses, the direction-specific building dimensions used as input to the AERMOD model were calculated using the U.S. EPA's BPIP PRIME, version 04274. BPIP PRIME is designed to incorporate the concepts and procedures expressed in the GEP Technical Support document, the Building Downwash Guidance document, and other related documents.[4]

For the BPIP analysis, the structure elevations (buildings and stacks) were estimating using the AERMAP processor (v18081). Terrain elevations from the USGS 1-arc second NED were used for AERMAP processing. In all modeling analysis data files, the location of emission points and structures were represented in the UTM coordinate system, zone 17, NAD 83.

EPA has promulgated stack height regulations that restrict the use of stack heights in excess of "Good Engineering Practice" (GEP) in air dispersion modeling analyses. Under these regulations, that portion of a stack in excess of the GEP height is generally not creditable when modeling to determine source impacts. This essentially prevents the use of excessively tall stacks to reduce ground-level pollutant concentrations.

This equation is limited to stacks located within five times the lesser dimension (5L) of a building structure. Stacks located at a distance greater than 5L from a building structure are not subject to the wake effects of the structure. The wind direction-specific downwash dimensions and the dominant downwash structures used in this analysis are determined using BPIP. In general, the lowest GEP stack height for any source is 65 meters by default.[5] The BPIP evaluation indicates that none of the facility emission unit stacks exceed GEP stack height.

Input and output files from the BPIP downwash analysis are provided in the electronic files included in Appendix A.

1.1.4. Receptor Grid Coordinate System

Modeled concentrations were calculated at ground-level receptors placed along the facility fenceline and on a variable Cartesian receptor grid. Fenceline receptors were spaced no more than 25 meters apart. Beyond the fenceline, receptors were placed with 100 meters spacing on a Cartesian grid extending outward from the facility. An approximately 25 km by 25 km modeling domain with a receptor spacing of 100 meters was created.

Also, five residential receptors, as identified in a modeling memo prepared by the Georgia Environmental Protection Division (EPD) in June 2019, were also placed within the receptor grid system to provide predicted modeled impacts consistent with the results presented by the EPD in their June 2019 memo.[6]

Receptor elevations and hill heights required by AERMOD were determined using the AERMAP terrain preprocessor (v18081). Terrain elevations from the USGS 1-arc second NED were used for AERMAP processing. In all modeling analysis data files, the location of receptors were represented in the UTM coordinate system, zone 17, NAD 83.

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[4] U.S. EPA, Office of Air Quality Planning and Standards, Guidelines for Determination of Good Engineering Practice Stack Height (Technical Support Document for the Stack Height Regulations) (Revised), Research Triangle Park, North Carolina, EPA 450/4-80-023R, June 1985.

[5] 40 CFR 51.100(ii)

[6] https://epd.georgia.gov/bd-becton-dickinson-and-company-covington

1.1.5. Modeling Results

Using the source parameters specified in Table 1-1, and additional model setup as described above, AERMOD was executed for each of the five years of meteorological data to determine the maximum predicted modeled 1-hr and annual concentrations of ethylene oxide at each receptor location. Table 1-3 below summarizes the MGLC for each averaging period. Hourly concentrations were adjusted to a 15-min averaging period based on the *Guideline* (15-min MGLC = 1-hr MGLC * 1.32).

Table 1-3. Maximum Predicted Modeled Impacts

Year	Max Annual Concentration (μg/m³)	Annual AAC (μg/m³)	Max Hourly Concentration (μg/m³)	Max 15-min Concentration (μg/m³)	15-minute AAC (μg/m³)
2014	6.0E-04	3.3E-04	0.29	0.38	900
2015	5.3E-04		0.03	0.04	
2016	5.4E-04		0.03	0.04	
2017	4.6E-04		0.04	0.05	
2018	5.5E-04		0.05	0.06	

While maximum predicted modeled impacts exceed the annual AAC, the locations where the annual AAC are exceeded are limited to locations in much closer proximity to the facility when compared to modeling conducted by the Georgia EPD for their June 7th, 2019 modeling memo. The distance from the facility at which the model predicts exceedances of the annual AAC has been reduced by approximately 95% due to the proposed changes. The magnitude of the predicted modeled annual impacts have been reduced more than 99.5% when compared to modeling conducted by the Georgia EPD for their June 7th, 2019 modeling memo.

Analyses were also conducted to evaluate predicted modeled impacts at each of five identified residential receptors by the Georgia EPD. Table 1-3 below summarizes the annual average maximum predicted modeled impacts at the five residential receptor locations previously identified by the Georgia EPD.

Table 1-4. Maximum Predicted Modeled Impacts at EPD Identified Residential Receptors

Residential Area	Easting (meter)	Northing (meter)	Max Annual Concentration (μg/m³)	Averaging Period	Annual AAC (μg/m³)	Ratio of Result to AAC
R1	236,932.5	3,722,361.2	2.7E-04	Annual	3.3E-04	0.82
R2	236,137.9	3,721,995.0	1.3E-04	Annual	3.3E-04	0.39
R3	236,163.0	3,721,885.6	8.0E-05	Annual	3.3E-04	0.24
R4	237,343.8	3,721,603.8	2.2E-04	Annual	3.3E-04	0.67
R5	235,611.0	3,722,319.2	2.5E-04	Annual	3.3E-04	0.76

All air dispersion modeling files are included in Appendix A.

APPENDIX A. ELECTRONIC TOXICS MODELING FILES