curia

Received via email 7/14/2022

8/19/2022

July 15, 2022

Sent Via Email and Hand Delivered

Ms. Elizabeth Pomo
Air Quality Program
Albuquerque Environmental Health Department
P.O. Box 1293
Albuquerque, NM 87103
Email: epomo@cabq.gov

Subject: Air Permit Modification Application
Construction Permit No. 491-M7-RV1
Curia New Mexico, LLC
4401 Alexander Blvd. NE
Albuquerque, New Mexico 87109

Dear Ms. Pomo:

Curia New Mexico, LLC (Curia) respectfully submits the enclosed permit modification application for the facility located at 4272 Balloon Park Road and 4200 Balloon Park Road Albuquerque, NM 87107 that is currently permitted under Permit No. 491-M7-RV1. This application requests the removal of permit conditions 6.A – 6.f compliance tests, requiring annual stack testing for the emergency generators. The application also provides updated information on permitted equipment. This permit modification application replaces the application that was submitted on June 1, 2022.

A check in the amount of $3,661, made payable to the City of Albuquerque, for the Air Quality Program's permit modification application review fee was submitted to the Air Quality Program on June 1, 2022. A check for $1,220 has been included in this submittal in Attachment 13 for the federal program review fee.

We will be happy to answer any questions or provide additional information in a timely manner. Please do not hesitate to contact me at John.GerbackJr@curiaglobal.com or 505-340-5989.

Sincerely,

John Gerback, Jr.
Senior EHS Manager
Curia New Mexico, LLC

Attachments

Attachment 1 – Air Quality Permit Application
Attachment 2 – Permit Application Checklist
Attachment 3 – Pre-permit Application Meeting Request Form
Attachment 4 – Notice of Intent to Construct Form, Public Sign Notice Guideline Form, List of Neighborhood Associations and Neighborhood Coalitions and Proof of Public Notices
Attachment 5 – Ambient Impact Analysis Dispersion Model Report
Attachment 6 – Basis for each emission rate
Attachment 7 – Emission Calculations
Attachment 8 – Operational and Maintenance Strategy
Attachment 9 – Site Location Map and Aerial Photograph
Attachment 10 – Process Flow Diagram
Attachment 11 – Zoning Certification
Attachment 12 – Regulatory Review
Attachment 13 – Permit Application Review Fees 2022

Attachment 1

Air Quality Permit Application

City of Albuquerque – Environmental Health Department
Air Quality Program

Please mail this application to **P.O. Box 1293, Albuquerque, NM 87103**
or hand deliver between 8:00 am – 5:00 pm Monday – Friday to:
3rd Floor, Suite 3023 – One Civic Plaza NW, Albuquerque, NM 87102
(505) 768-1972 aqd@cabq.gov

Application for Air Pollutant Sources in Bernalillo County
Source Registration (20.11.40 NMAC) and Construction Permits (20.11.41 NMAC)

Submittal Date: July 15, 2022

Owner/Corporate Information ☐ **Check here and leave this section blank if information is exactly the same as Facility Information below.**

Company Name: **Curia New Mexico, LLC**			
Mailing Address: **4401 Alexander Blvd NE**	City: **Albuquerque**	State: **NM**	Zip: **87107**
Company Phone: **505-923-1500**	Company Contact: **John Gerback, Jr.**		
Company Contact Title: **Sr. Manager EH&S**	Phone: **505-340-5989**	E-mail: **John.GerbackJr@curiaglobal.com**	

Stationary Source (Facility) Information: **Provide a plot plan (legal description/drawing of the facility property) with overlay sketch of facility processes, location of emission points, pollutant type, and distances to property boundaries.**

Facility Name: **Curia New Mexico, LLC**			
Facility Physical Address: **4272 Balloon Park Road and 4200 Balloon Park Road**	City: **Albuquerque**	State: **NM**	Zip: **87109**
Facility Mailing Address (if different): **4401 Alexander Blvd NE**	City: **Albuquerque**	State: **NM**	Zip: **87107**
Facility Contact: **John Gerback, Jr.**	Title: **Sr. Manager EH&S**		
Phone: **505-340-5989**	E-mail: **John.GerbackJr@curiaglobal.com**		
Authorized Representative Name[1]: **John Gerback, Jr.**	Authorized Representative Title: **Sr. Manager EH&S**		

Billing Information ☒ **Check here if same contact and mailing address as corporate** ☐ **Check here if same as facility**

Billing Company Name:			
Mailing Address:	City:	State:	Zip:
Billing Contact:	Title:		
Phone:	E-mail:		

Preparer/Consultant(s) Information ☒ **Check here and leave section blank if no Consultant used or Preparer is same as Facility Contact.**

Name:	Title:		
Mailing Address:	City:	State:	Zip:
Phone:	Email:		

1. See 20.11.41.13(E)(13) NMAC.

Application for Air Pollutant Sources in Bernalillo County
Source Registration (20.11.40 NMAC) and Construction Permits (20.11.41 NMAC)

General Operation Information (if any question does not pertain to your facility, type N/A on the line or in the box)

Permitting action being requested (please refer to the definitions in 20.11.40 NMAC or 20.11.41 NMAC):			
☐ New Permit	☒ Permit Modification Current Permit #: **491-M7-RV1**	☐ Technical Permit Revision Current Permit #:	☐ Administrative Permit Revision Current Permit #:
☐ New Registration Certificate	☐ Modification Current Reg. #:	☐ Technical Revision Current Reg. #:	☐ Administrative Revision Current Reg. #:
UTM coordinates of facility (Zone 13, NAD 83): **UTM Zone 13 (NAD27) UTM-E(m) 354,447 UTM-N(m) 3,890,647**			
Facility type (*i.e.*, a description of your facility operations): **Pharmaceutical Manufacturing**			
Standard Industrial Classification (SIC Code #): **2834**		North American Industry Classification System (NAICS Code #): **325412**	
Is this facility currently operating in Bernalillo County? **Yes**		If **YES**, list date of original construction: **1970** If **NO**, list date of planned startup: **N/A**	
Is the facility permanent? **Yes**		If **NO**, list dates for requested temporary operation: From **N/A** Through **N/A**	
Is the facility a portable stationary source? **No**		If **YES**, is the facility address listed above the main permitted location for this source? **N/A**	
Is the application for a physical or operational change, expansion, or reconstruction (*e.g.*, altering process, or adding, or replacing process or control equipment, etc.) to an existing facility? **No**			
Provide a description of the requested changes: **Removal of condition 6.A – 6.f Compliance Tests.**			
What is the facility's operation? ☒ Continuous ☐ Intermittent ☐ Batch			
Estimated percent of production/operation:	Jan-Mar: **25%**	Apr-Jun: **25%**	Jul-Sep: **25%**	Oct-Dec: **25%**
Requested operating times of facility:	**24** hours/day	**7** days/week	**4.345** weeks/month	**12** months/year
Will there be special or seasonal operating times other than shown above? This includes monthly- or seasonally-varying hours. **No**			
If **YES**, please explain: **N/A**			
List raw materials processed: **Active pharmaceutical drug compounds and excipients**			
List saleable item(s) produced: **Sterile, injectable pharmaceutical drug products**			

USE INSTRUCTIONS: For the forms on the following pages, please do not alter or delete the existing footnotes or page breaks. If additional footnotes are needed then add them to the end of the existing footnote list for a given table. Only update the rows and cells within tables as necessary for your project. Unused rows can be deleted from tables. If multiple scenarios will be represented then the Uncontrolled and Controlled Emission Tables, and other tables as needed, can be duplicated and adjusted to indicate the different scenarios.

Regulated Emission Sources Table

(*E.g.*, Generator-Crusher-Screen-Conveyor-Boiler-Mixer-Spray Guns-Saws-Sander-Oven-Dryer-Furnace-Incinerator-Haul Road-Storage Pile, etc.) Match the Units listed on this Table to the same numbered line if also listed on Emissions Tables & Stack Table.

Unit Number and Description[1]		Manufacturer	Model #	Serial #	Manufacture Date	Installation Date	Modification Date[2]	Process Rate or Capacity (Hp, kW, Btu, ft^3, lbs, tons, yd^3, etc.)[3]	Fuel Type
1.	**Emergency Generator at 4200 Balloon Park Road**	**Engine: John Deere, Generator: Allison/GM**	**Engine: RG6466 AF-00 Generator: G0659600**	**Engine: RG6466A3 01506 Generator: J-9557/1**	**1986**	**1986**	**N/A**	**215 HP/HR**	**Diesel**
2.	**Not used**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
3.	**Not used**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
4.	**Not used**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
5.	**Boiler at 4272 Balloon Park Road**	**Superior**	**MSX6-X-1250**	**17115**	**2011**	**2011**	**N/A**	**8,369,000 btu/HR**	**Natural Gas**
6.	**Boiler at 4272 Balloon Park Road**	**Cleaver Brooks**	**CBLE-700-125-150ST**	**T2234-1-1**	**2011**	**2011**	**N/A**	**5,175,000 btu /HR**	**Natural Gas**
7.	**Emergency Generator at 4272 Balloon Park Road**	**Engine: Cummins Generator: Onan**	**Engine: KTA50-G9 Generator: DFLE-4487400**	**Engine: 77931-132 Generator: K000172332**	**09/2000**	**2003**	**N/A**	**2,220 hp/HR**	**Diesel**
8.	**Emergency Generator at 4272 Balloon Park Road**	**Engine: Cummins Generator: Onan**	**Engine: KTA50-G9 Generator: DFLE-4487400**	**Engine: 77931-97 Generator: G000131896**	**09/2000**	**2003**	**N/A**	**2,220 hp/HR**	**Diesel**

NOTE: To add extra rows in Word, click anywhere in the last row. A plus (+) sign should appear on the bottom right corner of the row. Click the plus (+) sign to add a row. Repeat as needed.

1. Unit numbers must correspond to unit numbers in the previous permit unless a complete cross reference table of all units in both permits is provided.
2. To determine whether a unit has been modified, evaluate if changes have been made to the unit that impact emissions or that trigger modification as defined in 20.11.41.7(U) NMAC. If not, put N/A.
3. Basis for Equipment Process Rate or Capacity (*e.g.*, Manufacturer's Data, Field Observation/Test, etc.) Manufacturer's Data
   Submit information for each unit as an attachment.

Emissions Control Equipment Table

Control Equipment Units listed on this Table should either match up to the same Unit number as listed on the Regulated Emission Sources, Controlled Emissions and Stack Parameters Tables (if the control equipment is integrated with the emission unit) or should have a distinct Control Equipment Unit Number and that number should then also be listed on the Stack Parameters Table.

Control Equipment Unit Number and Description		Controlling Emissions for Unit Number(s)	Manufacturer	Model # | Serial #	Date Installed	Controlled Pollutant(s)	% Control Efficiency[1]	Method Used to Estimate Efficiency	Rated Process Rate or Capacity or Flow
N/A	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**

NOTE: To add extra rows in Word, click anywhere in the last row. A plus (+) sign should appear on the bottom right corner of the row. Click the plus (+) sign to add a row. Repeat as needed.

1. Basis for Control Equipment % Efficiency (*e.g.*, Manufacturer's Data, Field Observation/Test, AP-42, etc.). **N/A**
   Submit information for each unit as an attachment.

Exempted Sources and Exempted Activities Table

See 20.11.41 NMAC for exemptions.

Unit Number and Description		Manufacturer	Model #	Serial #	Manufacture Date	Installation Date	Modification Date[1]	Process Rate or Capacity (Hp, kW, Btu, ft^3, lbs, tons, yd^3, etc.)[2]	Fuel Type
1.	**Hot Water Heater at 4200 Balloon Park Rd.**	**LAARS**	**RHCH1600NACF2EXX**	**A13 252762**	**2013**	**Unkown**	**N/A**	**1,376,000 btu /HR**	**Natural Gas**

NOTE: To add extra rows in Word, click anywhere in the last row. A plus (+) sign should appear on the bottom right corner of the row. Click the plus (+) sign to add a row. Repeat as needed.

1. To determine whether a unit has been modified, evaluate if changes have been made to the unit that impact emissions or that trigger modification as defined in 20.11.41.7(U) NMAC. Also, consider if any changes that were made alter the status from exempt to non-exempt. If not, put N/A.
2. Basis for Equipment Process Rate or Capacity (*e.g.*, Manufacturer's Data, Field Observation/Test, etc.) Manufacturer's Data
   Submit information for each unit as an attachment.

Uncontrolled Emissions Table

(Process potential under physical/operational limitations during a 24 hr/day and 365 day/year = 8760 hrs)

Regulated Emission Units listed on this Table should match up to the same numbered line and Unit as listed on the Regulated Emissions and Controlled Tables. List total HAP values per Emission Unit if overall HAP total for the facility is ≥ 1 ton/yr.

Unit Number*	Nitrogen Oxides (NO_X)		Carbon Monoxide (CO)		Nonmethane Hydrocarbons/Volatile Organic Compounds (NMHC/VOCs)		Sulfur Dioxide (SO_2)		Particulate Matter ≤ 10 Microns (PM_{10})		Particulate Matter ≤ 2.5 Microns ($PM_{2.5}$)		Hazardous Air Pollutants (HAPs)		Method(s) used for Determination of Emissions (AP-42, Material Balance, Field Tests, etc.)
	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	
1.	**6.67**	**29.19**	**1.44**	**6.29**	**0.53**	**2.33**	**0.002**	**0.01**	**0.47**	**2.07**	**0.47**	**2.07**	**0.01**	**0.04**	**AP-42**
2.	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
3.	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
4.	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
5.	**0.25**	**1.10**	**0.31**	**1.36**	**0.07**	**0.29**	**0.01**	**0.04**	**0.04**	**0.18**	**0.04**	**0.18**	**0**	**0**	**Manufacturer's data**
6.	**0.36**	**1.58**	**0.19**	**0.83**	**0.02**	**0.08**	**0.003**	**0.01**	**0.04**	**0.17**	**0.04**	**0.17**	**0**	**0**	**Manufacturer's data**
7.	**41.63**	**182.32**	**13.25**	**58.04**	**1.57**	**6.86**	**0.025**	**0.11**	**1.55**	**6.81**	**1.55**	**6.81**	**0.07**	**0.30**	**Field test / AP-42**
8.	**44.00**	**192.72**	**13.25**	**58.04**	**1.57**	**6.86**	**0.025**	**0.11**	**1.55**	**6.81**	**1.55**	**6.81**	**0.07**	**0.30**	**Field test / AP-42**
Miscellaneous Chemical Usage	**0**	**0**	**0**	**0**	**4.57**	**20.0**	**0**	**0**	**0**	**0**	**0**	**0**	**1.39**	**6.1**	**Material Balance**
Totals of Uncontrolled Emissions	**92.9**	**406.9**	**28.4**	**124.6**	**8.3**	**36.4**	**0.1**	**0.3**	**3.7**	**16.0**	**3.7**	**16.0**	**1.5**	**6.7**	

NOTE: To add extra rows in Word, click anywhere in the second-to-last row. A plus (+) sign should appear on the bottom right corner of the row. Click the plus (+) sign to add a row. Repeat as needed.

*A permit is required and this application along with the additional checklist information requested on the Permit Application checklist must be provided if:

(1) any one of these process units or combination of units, has an uncontrolled emission rate greater than or equal to (≥) 10 lbs/hr or 25 tons/yr for any of the above pollutants, excluding HAPs, based on 8,760 hours of operation; or

(2) any one of these process units or combination of units, has an uncontrolled emission rate ≥ 2 tons/yr for any single HAP or ≥ 5 tons/yr for any combination of HAPs based on 8,760 hours of operation; or

(3) any one of these process units or combination of units, has an uncontrolled emission rate ≥ 5 tons/yr for lead (Pb) or any combination of lead and its compounds based on 8,760 hours of operation; or

(4) any one of the process units or combination of units is subject to an Air Board or federal emission limit or standard.

* If all of these process units, individually and in combination, have an uncontrolled emission rate less than (<) 10 lbs/hr or 25 tons/yr for all of the above pollutants (based on 8,760 hours of operation), but > 1 ton/yr for any of the above pollutants, then a source registration is required. A Registration is required, at minimum, for any amount of HAP emissions. Please complete the remainder of this form.

Controlled Emissions Table

(Based on current operations with emission controls OR requested operations with emission controls)

Regulated Emission Units listed on this Table should match up to the same numbered line and Unit as listed on the Regulated Emissions and Uncontrolled Tables. List total HAP values per Emission Unit if overall HAP total for the facility is ≥ 1 ton/yr.

Unit Number	Nitrogen Oxides (NO_X)		Carbon Monoxide (CO)		Nonmethane Hydrocarbons/Volatile Organic Compounds (NMHC/VOCs)		Sulfur Dioxide (SO_2)		Particulate Matter ≤ 10 Microns (PM_{10})		Particulate Matter ≤ 2.5 Microns ($PM_{2.5}$)		Hazardous Air Pollutants (HAPs)		Control Method	% Efficiency[1]
	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr		
1.	**6.67**	**1.67**	**1.44**	**0.36**	**0.53**	**0.13**	**0.002**	**0.001**	**0.47**	**0.12**	**0.47**	**0.12**	**0.01**	**0.003**	**Operating Hours (500 hours)**	**94.3%**
2.	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
3.	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
4.	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
5.	**0.25**	**1.10**	**0.31**	**1.36**	**0.07**	**0.29**	**0.01**	**0.04**	**0.04**	**0.18**	**0.04**	**0.18**	**0**	**0**	**none**	**N/A**
6.	**0.36**	**1.58**	**0.19**	**0.83**	**0.02**	**0.08**	**0.003**	**0.01**	**0.04**	**0.17**	**0.04**	**0.17**	**0**	**0**	**none**	**N/A**
7.	**41.63**	**10.41**	**13.25**	**3.31**	**1.57**	**0.39**	**0.025**	**0.01**	**1.55**	**0.39**	**1.55**	**0.39**	**0.07**	**0.02**	**Operating Hours (500 hours)**	**94.3%**
8.	**44.00**	**11.00**	**13.25**	**3.31**	**1.57**	**0.39**	**0.025**	**0.01**	**1.55**	**0.39**	**1.55**	**0.39**	**0.07**	**0.02**	**Operating Hours (500 hours)**	**94.3%**
Miscellaneous Chemical Usage	**0**	**0**	**0**	**0**	**4.57**	**20.0**	**0**	**0**	**0**	**0**	**0**	**0**	**1.39**	**6.1**	**none**	**N/A**
Totals of Controlled Emissions	**92.9**	**25.7**	**28.4**	**9.2**	**8.3**	**21.3**	**0.1**	**0.1**	**3.7**	**1.2**	**3.7**	**1.2**	**1.5**	**6.1**		

NOTE: To add extra rows in Word, click anywhere in the second-to-last row. A plus (+) sign should appear on the bottom right corner of the row. Click the plus (+) sign to add a row. Repeat as needed.

1. Basis for Control Method % Efficiency (*e.g.*, Manufacturer's Data, Field Observation/Test, AP-42, etc.). Manufacturer's Data, Field Observation/Test, AP-42
   Submit information for each unit as an attachment.

Hazardous Air Pollutants (HAPs) Emissions Table

Report the Potential Emission Rate for each HAP from each source on the Regulated Emission Sources Table that emits a given HAP. Report individual HAPs with ≥ 1 ton/yr total emissions for the facility on this table. Otherwise, report total HAP emissions for each source that emits HAPs and report individual HAPs in the accompanying application package in association with emission calculations. If this application is for a Registration solely due to HAP emissions, report the largest HAP emissions on this table and the rest, if any, in the accompanying application package.

Unit Number	Total HAPs		N/A		N/A		N/A		N/A		N/A		N/A		N/A	
	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr
Unit 1	**0.01**	**0.003**	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Unit Number	Total HAPs		N/A		N/A		N/A		N/A		N/A		N/A		N/A	
	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr
Unit 7	**0.07**	**0.02**	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Unit Number	Total HAPs		N/A		N/A		N/A		N/A		N/A		N/A		N/A	
	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr
Unit 8	**0.07**	**0.02**	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Unit Number	Total HAPs		Acetaldehyde		Acetonitrile		Benzene		Chlorobenzene		Chloroform		Cobaltous chloride		Dichloromethane	
	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr
Miscellaneous Chemical Usage	**1.39**	**6.1**	**0.015**	**0.067**	**0.188**	**0.823**	**0.005**	**0.022**	**0.001**	**0.006**	**0.013**	**0.058**	**0.001**	**0.005**	**0.011**	**0.06**
Unit Number	Ethylene dichloride		Hexane		Hydrochloric Acid		Methanol		Methyl Ethyl Ketone		Toluene		N/A		N/A	
	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr
Misc. Chemical Usage (continued)	**0.001**	**0.006**	**0.060**	**0.264**	**0.863**	**3.78**	**0.227**	**0.992**	**0.001**	**0.006**	**0.001**	**0.003**	**N/A**	**N/A**	**N/A**	**N/A**
Totals of HAPs for all units:	**1.54**	**6.14**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**

NOTE: To add extra rows in Word, click anywhere in the second-to-last row. A plus (+) sign should appear on the bottom right corner of the row. Click the plus (+) sign to add a row. Repeat as needed.

Use Instructions: Copy and paste the HAPs table here if need to list more individual HAPs.

Purchased Hazardous Air Pollutant Table*

Product Categories (Coatings, Solvents, Thinners, etc.)	Hazardous Air Pollutant (HAP), or Volatile Hazardous Air Pollutant (VHAP) Primary To The Representative As Purchased Product	Chemical Abstract Service (CAS) Number of HAP or VHAP from Representative As Purchased Product	HAP or VHAP Concentration of Representative As Purchased Product (pounds/gallon, or %)	Concentration Determination (CPDS, SDS, etc.)[1]	Total Product Purchases For Category	(-)	Quantity of Product Recovered & Disposed For Category	(=)	Total Product Usage For Category
1. Laboratory use	Acetaldehyde	75-07-0	99.5%	SDS	133.9 lb/yr gal/yr	(-)	0 lb/yr gal/yr	(=)	133.9 lb/yr gal/yr
2. Laboratory use	Acetonitrile	75-05-8	100%	SDS	1,647 lb/yr gal/yr	(-)	0 lb/yr gal/yr	(=)	1647 lb/yr gal/yr
3. Laboratory use	Benzene	71-43-2	99.8%	SDS	43.6 lb/yr gal/yr	(-)	0 lb/yr gal/yr	(=)	43.6 lb/yr gal/yr
4. Laboratory use	Chlorobenzene	108-90-7	100%	SDS	111.6 lb/yr gal/yr	(-)	0 lb/yr gal/yr	(=)	11.6 lb/yr gal/yr
5. Laboratory use	Chloroform	67-66-3	98% - 100%	SDS	116 lb/yr gal/yr	(-)	0 lb/yr gal/yr	(=)	116 lb/yr gal/yr
6. Laboratory use	Cobaltous chloride	7646-79-9	100%	SDS	10.0 lb/yr gal/yr	(-)	0 lb/yr gal/yr	(=)	10.0 lb/yr gal/yr
7. Laboratory use	Dichloromethane	75-09-2	99%	SDS	100 lb/yr gal/yr	(-)	0 lb/yr gal/yr	(=)	100 lb/yr gal/yr
8. Laboratory use	Ethylene dichloride	107-06-2	99%	SDS	11.3 lb/yr gal/yr	(-)	0 lb/yr gal/yr	(=)	11.3 lb/yr gal/yr
9. Laboratory use	Hexane	110-54-3	95%	SDS	527.5 lb/yr gal/yr	(-)	0 lb/yr gal/yr	(=)	527.5 lb/yr gal/yr
10 Wastewater neutralization	Hydrochloric Acid	7647-01-0	100%	SDS	7,563 lb/yr gal/yr	(-)	0 lb/yr gal/yr	(=)	7,563 lb/yr gal/yr
11 Laboratory use	Methanol	67-56-1	100%	SDS	1,985 lb/yr gal/yr	(-)	0 lb/yr gal/yr	(=)	1,985 lb/yr gal/yr
12. Laboratory use	Methyl Ethyl Ketone	78-93-3	100%	SDS	11.3 lb/yr gal/yr	(-)	0 lb/yr gal/yr	(=)	11.3 lb/yr gal/yr
13. Laboratory use	Toluene	108-88-3	100%	SDS	6.4 lb/yr gal/yr	(-)	0 lb/yr gal/yr	(=)	6.4 lb/yr gal/yr
TOTALS					**12,167** lb/yr gal/yr	(-)	**0** lb/yr gal/yr	(=)	**12,167** lb/yr gal/yr

NOTE: To add extra rows in Word, click anywhere in the second-to-last row. A plus (+) sign should appear on the bottom right corner of the row. Click the plus (+) sign to add a row. Repeat as needed.

NOTE: Product purchases, recovery/disposal and usage should be converted to the units listed in this table. If units cannot be converted please contact the Air Quality Program prior to making changes to this table.

1. 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. CPDS = Certified Product Data Sheet; SDS = Safety Data Sheet

*** A Registration is required, at minimum, for any amount of HAP or VHAP emission.**
Emissions from purchased HAP usage should be accounted for on previous tables as appropriate.
A permit may be required for these emissions if the source meets the requirements of 20.11.41 NMAC.

Material and Fuel Storage Table

(*E.g.*, Tanks, barrels, silos, stockpiles, etc.)

Storage Equipment		Product Stored	Capacity (bbls, tons, gals, acres, etc.)	Above or Below Ground	Construction (Welded, riveted) & Color	Installation Date	Loading Rate[1]	Offloading Rate[1]	True Vapor Pressure	Control Method	Seal Type	% Eff.[2]
1.	**Unit 1 Tank**	**diesel fuel**	**150 gal**	**above**	**welded / white**	**1986**	**30 gpm**	**11.7 gph**	**N/A**	**N/A**	**N/A**	**N/A**
2.	**Unit 7 Tank**	**diesel fuel**	**2,500**	**above**	**welded / tan**	**7/03**	**30 gpm**	**121 gph**	**N/A**	**N/A**	**N/A**	**N/A**
3.	**Unit 8 Tank**	**diesel fuel**	**3,368**	**above**	**welded / tan**	**12/03**	**30 gpm**	**121 gph**	**N/A**	**N/A**	**N/A**	**N/A**

NOTE: To add extra rows in Word, click anywhere in the last row. A plus (+) sign should appear on the bottom right corner of the row. Click the plus (+) sign to add a row. Repeat as needed.

1. Basis for Loading/Offloading Rate (*e.g.*, Manufacturer's Data, Field Observation/Test, etc.). Manufacturer's Data
   Submit information for each unit as an attachment.
2. Basis for Control Method % Efficiency (*e.g.*, Manufacturer's Data, Field Observation/Test, AP-42, etc.). **N/A**
   Submit information for each unit as an attachment.

Stack Parameters Table

If any equipment from the Regulated Emission Sources Table is also listed in this Stack Table, use the same numbered line for the emission unit on both tables to show the association between the Process Equipment and its stack.

Unit Number and Description		Pollutant (CO, NOx, PM_{10}, etc.)	UTM Easting (m)	UTM Northing (m)	Stack Height (ft)	Stack Exit Temp. (°F)	Stack Velocity (fps)	Stack Flow Rate (acfm)	Stack Inside Diameter (ft)	Stack Type
1	**Emergency Generator**	CO, NOx, PM10, PM2.5, SO2	354488.0	3890588.7	7.00	800.0	250.00	2045	0.42	Vertical
5	**Boiler**	CO, NOx, PM10, PM2.5, SO2	354571.3	3890508.8	40.00	355.0	25.9	3351	1.42	Rain Cap
6	**Boiler**	CO, NOx, PM10, PM2.5, SO2	354571.8	3890508.5	38.20	459.0	28.4	2094	1.25	Rain Cap
7	**Emergency Generator**	CO, NOx, PM10, PM2.5, SO2	354559.1	3890502.5	29.50	900.0	340.0	16040	1.00	Vertical
8	**Emergency Generator**	CO, NOx, PM10, PM2.5, SO2	354567.0	3890498.9	29.50	917.0	338.0	15935	1.00	Vertical

NOTE: To add extra rows in Word, click anywhere in the last row. A plus (+) sign should appear on the bottom right corner of the row. Click the plus (+) sign to add a row. Repeat as needed.

Certification

NOTICE REGARDING SCOPE OF A PERMIT: The Environmental Health Department's issuance of an air quality permit only authorizes the use of the specified equipment pursuant to the air quality control laws, regulations and conditions. Permits relate to air quality control only and are issued for the sole purpose of regulating the emission of air contaminants from said equipment. Air quality permits are not a general authorization for the location, construction and/or operation of a facility, nor does a permit authorize any particular land use or other form of land entitlement. It is the applicant's/permittee's responsibility to obtain all other necessary permits from the appropriate agencies, such as the City of Albuquerque Planning Department or Bernalillo County Department of Planning and Development Services, including but not limited to site plan approvals, building permits, fire department approvals and the like, as may be required by law for the location, construction and/or operation of a facility. For more information, please visit the City of Albuquerque Planning Department website at https://www.cabq.gov/planning and the Bernalillo County Department of Planning and Development Services website at https://www.bernco.gov/planning.

NOTICE REGARDING ACCURACY OF INFORMATION AND DATA SUBMITTED: Any misrepresentation of a material fact in this application and its attachments is cause for denial of a permit or revocation of part or all of the resulting registration or permit, and revocation of a permit for cause may limit the permitee's ability to obtain any subsequent air quality permit for ten (10) years. Any person who knowingly makes any false statement, representation, or certification in any application, record, report, plan or other document filed or required to be maintained under the Air Quality Control Act, NMSA 1978 §§ 74-2-1 to 74-2-17, is guilty of a misdemeanor and shall, upon conviction, be punished by a fine of not more than ten thousand dollars ($10,000) per day per violation or by imprisonment for not more than twelve months, or by both.

I, the undersigned, hereby certify that I have knowledge of the information and data represented and submitted in this application and that the same is true and accurate, including the information and date in any and all attachments, including without limitation associated forms, materials, drawings, specifications, and other data. I also certify that the information represented gives a true and complete portrayal of the existing, modified existing, or planned new stationary source with respect to air pollution sources and control equipment. I understand that there may be significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations. I also understand that the person who has applied for or has been issued an air quality permit by the Department is an obligatory party to a permit appeal filed pursuant to 20.11.81 NMAC. Further, I certify that I am qualified and authorized to file this application, to certify the truth and accuracy of the information herein, and bind the source. Moreover, I covenant and agree to comply with any requests by the Department for additional information necessary for the Department to evaluate or make a final decision regarding the application.

Signed this 13 day of July, 2022

John Gerback
Print Name

Sr. Manager of EHS
Print Title

Signature

Role: ☐ Owner ☐ Operator

☒ Other Authorized Representative

Attachment 2

Permit Application Checklist

City of Albuquerque
Environmental Health Department
Air Quality Program

Construction Permit (20.11.41 NMAC)
Application Checklist

This checklist must be returned with the application

Any person seeking a new air quality permit, a permit modification, or an emergency permit under 20.11.41 NMAC (Construction Permits) shall do so by filing a written application with the Albuquerque-Bernalillo County Joint Air Quality Program, which administers and enforces local air quality laws for the City of Albuquerque ("City") and Bernalillo County ("County"), on behalf of the City Environmental Health Department ("Department").

The Department will rule an application administratively incomplete if it is missing or has incorrect information. The Department may require additional information that is necessary to make a thorough review of an application, including but not limited to technical clarifications, emission calculations, emission factor usage, additional application review fees if any are required by 20.11.2 NMAC, and new or additional air dispersion modeling.

If the Department has ruled an application administratively incomplete three (3) times, the Department will deny the permit application. Any fees submitted for processing an application that has been denied will not be refunded. If the Department denies an application, a person may submit a new application and the fee required for a new application. The applicant has the burden of demonstrating that a permit should be issued.

The following are the minimum elements that shall be included in the permit application before the Department can determine whether an 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.

At all times before the Department has made a final decision regarding the application, an applicant has a duty to promptly supplement and correct information the applicant has submitted in an application to the Department. The applicant's duty to supplement and correct the application includes but is not limited to relevant information acquired after the applicant has submitted the application and additional information the applicant otherwise determines is relevant to the application and the Department's review and decision. While the Department is processing an application, regardless of whether the Department has determined the application is administratively complete, if the Department determines that additional information is necessary to evaluate or make a final decision regarding the application, the Department may request additional information and the applicant shall provide the requested additional information.

NOTICE REGARDING PERMIT APPEALS: A person who has applied for or has been issued an air quality permit by the Department shall be an obligatory party to a permit appeal filed pursuant to 20.11.81 NMAC.

NOTICE REGARDING SCOPE OF A PERMIT: The Department's issuance of an air quality permit only authorizes the use of the specified equipment pursuant to the air quality control laws, regulations and conditions. Permits relate to air quality control only and are issued for the sole purpose of regulating the emission of air contaminants from said equipment. Air quality permits are not a general authorization for the location, construction and/or operation of a facility, nor does a permit authorize any particular land use or other form of land entitlement. It is the applicant's/permittee's responsibility to obtain all other necessary permits from the appropriate agencies, such as the City Planning Department or County Department of Planning and Development Services, including but not limited to site plan approvals, building permits, fire department approvals and the like, as may be required by law for the location, construction and/or operation of a facility. For more information, please visit the City Planning Department website at https://www.cabq.gov/planning and the County Department of Planning and Development Services website at https://www.bernco.gov/planning.

The Applicant shall:

20.11.41.13(A) NMAC – Pre-Application Requirements:

Item	Completed	NA[1]	Waived[2]
(1) Request a pre-application meeting with the Department using the pre-application meeting request form.	☒	☐	☐
(2) Attend the pre-application meeting. Date of Pre-application meeting: October 08, 2022	☒	☐	☐

1. *Not Applicable*
2. *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.*

20.11.41.13(B) NMAC – Applicant's Public Notice Requirements:

Item	Included in Application	NA[1]	Waived[2]
(1) Provide public notice in accordance with the regulation, including by certified mail or electronic copy 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.	☒	☐	☐
• Contact list of representative(s) of neighborhood associations and recognized coalitions cannot be more than three months old from the application submittal date.	☒	☐	☐
• Provide notice using the Notice of Intent to Construct form.	☒	☐	☐
(2) In accordance with the regulation, post and maintain in a visible location a weather proof sign provided by the Department.	☒	☐	☐

1. *Not Applicable; For emergency permits, the public notice requirements in 20.11.41.24 NMAC shall apply instead.*
2. *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:

20.11.41.13(E) NMAC – Application Contents

Item	Included In Application	NA[1]	Waived[2]
(1) A complete permit application on the most recent form provided by the Department.	☒	☐	☐
(2) The application form includes:			
a. The owner's name, street and post office address, and contact information;	☒	☐	☐
b. The facility/ operator's name, street address and mailing address, if different from the owner;	☒	☐	☐
c. The consultant's name, and contact information, if applicable;	☐	☒	☐
d. All information requested on the application form is included (*i.e.*, the form is complete).	☒	☐	☐
(3) Date application is submitted.	☒	☐	☐
(4) Sufficient attachments for the following:			
a. Ambient impact analysis using an atmospheric dispersion model approved by the U.S. Environmental Protection Agency, and the Department to demonstrate compliance with the applicable ambient air quality standards. *See* 20.11.01 NMAC. If you are modifying an existing source, the modeling must include the	☒	☐	☐

Item	Included In Application	NA[1]	Waived[2]
emissions of the entire source to demonstrate the impact the new or modified source(s) will have on existing plant emissions.			
b. The air dispersion model has been executed pursuant to a protocol that was approved in advance by the Department.	☒	☐	☐
c. Air dispersion modeling approved protocol date: April 6, 2022	☒	☐	☐
d. Basis or source for each emission rate (including manufacturer's specification sheet, AP-42 section sheets, test data, or corresponding supporting documentation for any other source used).	☒	☐	☐
e. All calculations used to estimate potential emission rates and controlled/proposed emissions.	☒	☐	☐
f. Basis for the estimated control efficiencies and sufficient engineering data for verification of the control equipment operation, including if necessary, design, drawing, test report and factors which affect the normal operation.	☐	☒	☐
g. Fuel data for each existing and/or proposed piece of fuel burning equipment.	☒	☐	☐
h. Anticipated maximum production capacity of the entire facility and the requested production capacity after construction and/or modification.	☒	☐	☐
i. Stack and exhaust gas parameters for all existing and proposed emission stacks.	☒	☐	☐
(5) An operational and maintenance strategy detailing:	☒	☐	☐
a. 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;	☒	☐	☐
b. the nature of emission during routine startup or shutdown of the source and the source's air pollution control equipment; and	☒	☐	☐
c. the steps the application will take to minimize emissions during routine startup or shutdown.	☒	☐	☐
(6) A map, such as a 7.5'-topographic quadrangle map published by the U.S. Geological Survey or a map of equivalent or greater scale, detail, and precision, including a City or County zone atlas map that shows the proposed location of each process equipment unit involved in the proposed construction, modification, or operation of the source, as applicable.	☒	☐	☐
(7) 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 by the Department in writing.	☒	☐	☐
(8) A complete description of all sources of regulated air contaminants and a process flow diagram depicting the process equipment unit or units at the facility, both existing and proposed, that are proposed to be involved in routine operations and from which regulated air contaminant emissions are expected to be emitted.	☒	☐	☐
(9) A full description of air pollution control equipment, including all calculations and the basis for all control efficiencies presented, manufacturer's specifications sheets, and site layout and assembly drawings; UTM (universal transverse mercator) coordinates shall be used to identify the location of each emission unit.	☒	☐	☐
(10) A description of the equipment or methods proposed by the applicant to be used for emission measurement.	☐	☒	☐
(11) The maximum and normal operating time schedules of the source after completion of construction or modification, as applicable.	☒	☐	☐
(12) Any other relevant information as the Department may reasonably require, including without limitation:	☒	☐	☐
a. Applicants shall provide documentary proof that the proposed air quality permitted use of the facility's subject property is allowed by the zoning designation of the City or County zoning laws, as applicable. Sufficient documentation includes: (i) a zoning certification from the City Planning Department or County Department of Planning and Development Services, as applicable, if the property is subject to City or County zoning jurisdiction; or (ii) a zoning verification from both planning	☒	☐	☐

Item	Included In Application	NA[1]	Waived[2]
departments if the property is not subject to City or County zoning jurisdiction.[3] A zone atlas map shall not be sufficient.			
(13) The signature of the applicant, operator, owner or an authorized representative, certifying to the accuracy of all information as represented in the application and attachments, if any.	☒	☐	☐
(14) A check or money order for the appropriate application fee or fees required by 20.11.2 NMAC (Fees).	☒	☐	☐

1. *Not Applicable*
2. *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.*
3. *For emergency permit applications, applicants are not required to submit documentation for the subject property's zoning designation.*

Attachment 3

Pre-permit Application Meeting Request Form

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:	**John Gerback Jr, Todd Albers, Matt Lane**
Company/Organization:	Curia New Mexico, LLC
Point of Contact: **(phone number and email):** **Preferred form of contact (circle one):** Phone E-mail	Phone: 505-553-8106 Email: todd.albers@curiaglobal.com
Preferred meeting date/times:	October 5th, 2021 11:00am
Description of Project:	permit modification application for 0491-M7-RV1

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:	**John Gerback Jr, Todd Albers, Matt Lane**
Company/Organization:	Curia New Mexico, LLC
Point of Contact: **(phone number and email):** **Preferred form of contact (circle one):** Phone E-mail	Phone: 505-553-8106 Email: todd.albers@curiaglobal.com
Preferred meeting date/times:	October 5th, 2021 11:00am
Description of Project:	permit modification application for 0491-M7-RV1

Albers, Todd

Subject:	Air Quality Program Pre-Application Meeting for Curia New Mexico, LLC
Location:	GoTo Meeting
Start:	Fri 10/8/2021 13:30
End:	Fri 10/8/2021 14:15
Recurrence:	(none)
Meeting Status:	Not yet responded
Organizer:	Pomo, Elizabeth

External: This message originated outside of the organization from epomo@cabq.gov. Do not click links or open attachments unless you recognize the sender or know the content is safe.

Good afternoon Todd,

Can you please send the meeting invitation to Matt Lane? I do not have his email address.

Please see attached agenda and Permits 0491-M7-RV1 and 0491-M7-RV1-EP prior to meeting.

Air Quality Program Pre-Application Meeting with Curia NM, LLC Fri, Oct 8, 2021 1:30 PM - 2:15 PM (MDT)

Please join my meeting from your computer, tablet or smartphone.
https://secure-web.cisco.com/1l3Q0LQP7uJkRG-sNg8cDosKV3PxmcN1_88IaIhSXca_FbdVYhKECKjQpj7Wp-HGS4uZM2hfc4hPtQPplvmF6SQYsafC6C7wl8jz6inGAtyU1C-XJCX-zy3OMCuP4Z9Ita_CyNIaQXdAZlluwiZBi-ETEtpXmNIUy3QXKZS00E6qEIkis6oR32HVI7VkwtcHeTwijXytPN6fuvSVWjXUYzlVHPlpk8lSFFe-HYLRydFEUyGtKQPDI1nkItQ1G3ikoJVXYHe4MdF9G4R8lSUh0kVuD6oTjatrBY31nUXLmhM29j1MwZ3TIXSKRdNiwxjsd/https%3A%2F%2Fglobal.gotomeeting.com%2Fjoin%2F355677525

You can also dial in using your phone.
United States: +1 (571) 317-3112

Access Code: 355-677-525

Join from a video-conferencing room or system.
Dial in or type: 67.217.95.2 or inroomlink.goto.com Meeting ID: 355 677 525 Or dial directly: 355677525@67.217.95.2 or 67.217.95.2##355677525

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Thank you,

Elizabeth M. Pomo, MPH
environmental health scientist | environmental health department o 505.768.2638 m 505.239.7094
cabq.gov/environmentalhealth/

Attachment 4

Notice of Intent to Construct Form, Public Sign Notice Guideline Form, List of Neighborhood Associations and Neighborhood Coalitions and Proof of Public Notices

Timothy M. Keller,
Mayor

Public Participation

List of Neighborhood Associations
and Neighborhood Coalitions
MEMORANDUM

To: Todd Albers, Senior Environmental, Health & Safety Specialist
From: Elizabeth Pomo, Senior Environmental Health Scientist
Subject: Determination of Neighborhood Associations and Coalitions within 0.5 mile of 4200 and 4272 Balloon Park Rd NE in Bernalillo County, NM
Date: April 28, 2022

DETERMINATION:

On April 28, 2022 I used the City of Albuquerque Zoning Advanced Map Viewer (http://coagisweb.cabq.gov/) to verify which City of Albuquerque Neighborhood Associations (NA), Homeowner Associations (HOA) and Neighborhood Coalitions (NC) are located within 0.5 mile of 4200 and 4272 Balloon Park Rd NE in Bernalillo County, NM.

I then used the City of Albuquerque Office (COA) of Neighborhood Coordination's Monthly Master NA List dated April 2022 and the Bernalillo County (BC) Monthly Neighborhood Association April 2022 Excel file to determine the contact information for each NA and NC located within 0.5 mile of 4200 and 4272 Balloon Park Rd NE in Bernalillo County, NM.

The table below contains the contact information, which will be used in the City of Albuquerque Environmental Health Department's public notice. Duplicates have been deleted.

COA/BC Association or Coalition	Name	Email or Mailing Address
Alameda North Valley Association	Steve Wentworth	anvanews@aol.com;
District 4 Coalition	Mildred Griffee Daniel Regan Association Email	mgriffee@noreste.org; dlreganabq@gmail.com; sect.dist4@gmail.com;
North Edith Commercial Corridor Association	Michael Haederle Evelyn Harris	haederle@yahoo.com; grumpyeh46@comcast.net;
North Valley Coalition	Peggy Norton Doyle Kimbrough Association Email	peggynorton@yahoo.com; newmexmba@aol.com; nvcabq@gmail.com;
Vista Del Norte Alliance	Janelle Johnson James Souter Association Email	tuscanylandscape@me.com; jamessouter@msn.com; vistadelnorte@me.com;

Gmail Matthew Lane <theenvironmentallane@gmail.com>

Public Notice of Proposed Air Quality Construction Permit Application

Gerback, Jr., John <John.GerbackJr@curiaglobal.com> Tue, May 17, 2022 at 2:13 PM
To: "anvanews@aol.com" <anvanews@aol.com>, "mgriffee@noreste.org" <mgriffee@noreste.org>, "dlreganabq@gmail.com" <dlreganabq@gmail.com>, "sect.dist4@gmail.com" <sect.dist4@gmail.com>, "haederle@yahoo.com" <haederle@yahoo.com>, "grumpyeh46@comcast.net" <grumpyeh46@comcast.net>, "peggynorton@yahoo.com" <peggynorton@yahoo.com>, "newmexmba@aol.com" <newmexmba@aol.com>, "nvcabq@gmail.com" <nvcabq@gmail.com>, "tuscanylandscape@me.com" <tuscanylandscape@me.com>, "jamessouter@msn.com" <jamessouter@msn.com>, "vistadelnorte@me.com" <vistadelnorte@me.com>
Cc: "epomo@cabq.gov" <epomo@cabq.gov>, Matthew Lane <theenvironmentallane@gmail.com>

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	Curia New Mexico, LLC
Site or Facility Name	Curia New Mexico
Site or Facility Address	4272 Balloon Park Road and 4200 Balloon Park Road Albuquerque, NM 87109

New or Existing Source	Existing
Anticipated Date of Application Submittal	May 31, 2022
Summary of Proposed Source to Be Permitted	The application is to modify existing Construction Permit #491-M7-RV1. The modification includes the removal of permit conditions requiring annual stack testing for emergency generators (due to minimal usage).

What emission limits and operating schedule are being requested?

See attached Notice of Intent to Construct form for this information.

How do I get additional information regarding this proposed application?

For inquiries regarding the proposed source, contact:

- John Gerback.
- 4240 Balloon Park Road, Albuquerque, NM, 87109
- My contact information is listed below.

For inquiries regarding the air quality permitting process, contact:

- City of Albuquerque Environmental Health Department Air Quality Program
- aqd@cabq.gov
- (505) 768-1972

John Gerback, CIH, CSP,

Environmental, Health and Safety

505.340.5989

John.GerbackJr@curiaglobal.com

curia

Gmail Matthew Lane <theenvironmentallane@gmail.com>

RE: Public Notice of Proposed Air Quality Construction Permit Application

Albers, Todd <Todd.Albers@curiaglobal.com> Tue, May 17, 2022 at 3:09 PM
To: "anvanews@aol.com" <anvanews@aol.com>, "mgriffee@noreste.org" <mgriffee@noreste.org>, "dlreganabq@gmail.com" <dlreganabq@gmail.com>, "sect.dist4@gmail.com" <sect.dist4@gmail.com>, "haederle@yahoo.com" <haederle@yahoo.com>, "grumpyeh46@comcast.net" <grumpyeh46@comcast.net>, "peggynorton@yahoo.com" <peggynorton@yahoo.com>, "newmexmba@aol.com" <newmexmba@aol.com>, "nvcabq@gmail.com" <nvcabq@gmail.com>, "tuscanylandscape@me.com" <tuscanylandscape@me.com>, "jamessouter@msn.com" <jamessouter@msn.com>, "vistadelnorte@me.com" <vistadelnorte@me.com>
Cc: "epomo@cabq.gov" <epomo@cabq.gov>, Matthew Lane <theenvironmentallane@gmail.com>, "Gerback, Jr., John" <John.GerbackJr@curiaglobal.com>

See attached document, Notice of Intent.

From: Gerback, Jr., John <John.GerbackJr@curiaglobal.com>
Sent: Tuesday, May 17, 2022 14:14
To: anvanews@aol.com; mgriffee@noreste.org; dlreganabq@gmail.com; sect.dist4@gmail.com; haederle@yahoo.com; grumpyeh46@comcast.net; peggynorton@yahoo.com; newmexmba@aol.com; nvcabq@gmail.com; tuscanylandscape@me.com; jamessouter@msn.com; vistadelnorte@me.com
Cc: epomo@cabq.gov; Matthew Lane <theenvironmentallane@gmail.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	Curia New Mexico, LLC
Site or Facility Name	Curia New Mexico
Site or Facility Address	4272 Balloon Park Road and 4200 Balloon Park Road Albuquerque, NM 87109
New or Existing Source	Existing
Anticipated Date of Application Submittal	May 31, 2022
Summary of Proposed Source to Be Permitted	The application is to modify existing Construction Permit #491-M7-RV1. The modification includes the removal of permit conditions requiring annual stack testing for emergency generators (due to minimal usage).

What emission limits and operating schedule are being requested?

See attached Notice of Intent to Construct form for this information.

How do I get additional information regarding this proposed application?

For inquiries regarding the proposed source, contact:

- John Gerback.
- 4240 Balloon Park Road, Albuquerque, NM, 87109
- My contact information is listed below.

For inquiries regarding the air quality permitting process, contact:

- City of Albuquerque Environmental Health Department Air Quality Program
- aqd@cabq.gov
- (505) 768-1972

John Gerback, CIH, CSP,

Environmental, Health and Safety

505.340.5989

John.GerbackJr@curiaglobal.com

Notice of Intent_Curia_01May2022 (003).pdf
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NOTICE FROM THE APPLICANT

Notice of Intent to Apply for Air Quality Construction Permit

You are receiving this notice because the New Mexico Air Quality Control Act (20.11.41.13B NMAC) requires any owner/operator proposing to construct or modify a facility subject to air quality regulations to provide public notice by certified mail or electronic mail to designated representatives of recognized neighborhood associations and coalitions within 0.5-mile of the property on which the source is or is proposed to be located.

This notice indicates that the owner/operator intends to apply for an Air Quality Construction Permit from the Albuquerque – Bernalillo County Joint Air Quality Program. Currently, no application for this proposed project has been submitted to the Air Quality Program. Applicants are required to include a copy of this form and documentation of mailed notices with their Air Quality Construction Permit Application.

Proposed Project Information

Applicant's name and address:
Nombre y domicilio del solicitante: Curia New Mexico, LLC 4401 Alexander Blvd NE Albuquerque, NM 87107

Owner / operator's name and address:
Nombre y domicilio del propietario u operador: Curia New Mexico, LLC 4401 Alexander Blvd NE Albuquerque, NM 87107

Contact for comments and inquires:
Datos actuales para comentarios y preguntas:

Name *(Nombre)*: John Gerback, Jr.
Address *(Domicilio)*: 4240 Balloon Park Road Albuquerque, NM 87109
Phone Number *(Número Telefónico)*: (505) 923-1500
E-mail Address *(Correo Electrónico)*: John.GerbackJr@curiaglobal.com

Actual or estimated date the application will be submitted to the department:
Fecha actual o estimada en que se entregará la solicitud al departamento: May 31, 2022

Description of the source:
Descripción de la fuente: Two 2,200 HP standby / emergency generators, one 8.4 MMBtu/hr. boiler, and one 5.2 MMBtu/hr. boiler

Exact location of the source or proposed source:
Ubicación exacta de la fuente o fuente propuesta: 4272 Balloon Park Road and 4200 Balloon Park Road Albuquerque, NM 87109

Nature of business:
Tipo de negocio: Curia Albuquerque specializes in delivering sterile injectable liquid, suspension, and biological pharmaceutical products.

Process or change for which the permit is requested:
Proceso o cambio para el cuál de solicita el permiso: Removal of permit conditions requiring annual stack testing for emergency generators.

Maximum operating schedule:
Horario máximo de operaciones: Boilers = 8,760 Hrs./Yr., standby / emergency generators = 500 Hrs./Yr.

Normal operating schedule:
Horario normal de operaciones: Boilers = 8,760 Hrs./Yr., standby / emergency generators = 500 Hrs./Yr.

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	28.4	9.2	(-) 6.3	(-) 4.2
NOx	92.9	25.7	(-) 55.6	(-) 17.0
VOC	8.3	21.3	(-) 1.1	(-) 0.2
SO2	0.1	0.1	(-) 47.2	(-) 11.8
PM10	3.7	1.2	(-) 1.1	(-) 0.4
PM2.5	3.7	1.2	(-) 1.1	(-) 0.4
HAP	1.4	6.1	no change	no change

Questions or comments regarding this Notice of Intent should be directed to the Applicant. Contact information is provided with the Proposed Project Information on the first page of this notice. To check the status of an Air Quality Construction Permit application, call 311 and provide the Applicant's information, or visit www.cabq.gov/airquality/air-quality-permits.

The Air Quality Program will issue a Public Notice announcing a 30-day public comment period on the permit application for the proposed project when the application is deemed complete. The Air Quality Program does not process or issue notices on applications that are deemed incomplete. More information about the air quality permitting process is attached to this notice.

Air Quality Construction Permitting Overview

This is the typical process to obtain an Air Quality Construction Permit for Synthetic Minor and Minor sources of air pollution from the Albuquerque – Bernalillo County Joint Air Quality Program.

Step 1: Pre-application Meeting: The Applicant and their consultant must request a meeting with the Air Quality Program to discuss the proposed action. If air dispersion modeling is required, Air Quality Program staff discuss the modeling protocol with the Applicant to ensure that all proposed emissions are considered.

> **Notice of Intent from the Applicant:** Before submitting their application, the Applicant is required to notify all nearby neighborhood associations and interested parties that they intend to apply for an air quality permit or modify an existing permit. The Applicant is also required to post a notice sign at the facility location.

Step 2: Administrative Completeness Review and Preliminary Technical Review: The Air Quality Program has 30 days from the day the permit is received to review the permit application to be sure that it is administratively complete. This means that all application forms must be signed and filled out properly, and that all relevant technical information needed to evaluate any proposed impacts is included. If the application is not complete, the permit reviewer will return the application and request more information from the Applicant. Applicants have three opportunities to submit an administratively complete application with all relevant technical information.

> **Public Notice from the Department:** When the application is deemed complete, the Department will issue a Public Notice announcing a 30-day public comment period on the permit application. This notice is distributed to the same nearby neighborhood associations and interested parties that the Applicant sent notices to, and published on the Air Quality Program's website.
>
> During this 30-day comment period, individuals have the opportunity to submit written comments expressing their concerns or support for the proposed project, and/or to request a Public Information Hearing. If approved by the Environmental Health Department Director, Public Information Hearings are held after the technical analysis is complete and the permit has been drafted.

Step 3: Technical Analysis and Draft Permit: Air Quality Program staff review all elements of the proposed operation related to air quality, and review outputs from advanced air dispersion modeling software that considers existing emission levels in the area surrounding the proposed project, emission levels from the proposed project, and meteorological data. The total calculated level of emissions is compared to state and federal air quality standards and informs the decision on whether to approve or deny the Applicant's permit.

Draft Permit: The permit will establish emission limits, standards, monitoring, recordkeeping, and reporting requirements. The draft permit undergoes an internal peer review process to determine if the emissions were properly evaluated, permit limits are appropriate and enforceable, and the permit is clear, concise, and consistent.

> **Public Notice from the Department:** When the technical analysis is complete and the permit has been drafted, the Department will issue a second Public Notice announcing a 30-day public comment period on the technical analysis and draft permit. This second Public Notice, along with the technical analysis documentation and draft permit, will be published on the Air Quality Program's website, and the public notice for availability of the technical analysis and draft permit will only be directly sent to those who requested further information during the first comment period.

Air Quality Construction Permitting Overview

During this second 30-day comment period, residents have another opportunity to submit written comments expressing their concerns or support for the proposed project, and/or to request a Public Information Hearing.

Possible Public Information Hearing: The Environmental Health Department Director may decide to hold a Public Information Hearing for a permit application if there is significant public interest and a significant air quality issue. If a Public Information Hearing is held, it will occur after the technical analysis is complete and the permit has been drafted.

Step 4: Public Comment Evaluation and Response: The Air Quality Program evaluates all public comments received during the two 30-day public comment periods and Public Information Hearing, if held, and updates the technical analysis and draft permit as appropriate. The Air Quality Program prepares a response document to address the public comments received, and when a final decision is made on the permit application, the comment response document is published on the Air Quality Program's website and distributed to the individuals who participated in the permit process. If no comments are received, a response document is not prepared.

Step 5: Final Decision on the Application: After public comments are addressed and the final technical review is completed, the Environmental Health Department makes a final decision on the application. If the permit application meets all applicable requirements set forth by the New Mexico Air Quality Control Act and the federal Clean Air Act, the permit is approved. If the permit application does not meet all applicable requirements, it is denied.

Notifications of the final decision on the permit application and the availability of the comment response document is published on the Air Quality Program's website and distributed to the individuals who participated in the permit process.

The Department must approve a permit application if the proposed action will meet all applicable requirements and if it demonstrates that it will not result in an exceedance of ambient air quality standards. Permit writers are very careful to ensure that estimated emissions have been appropriately identified or quantified and that the emission data used are acceptable.

The Department must deny a permit application if it is deemed incomplete three times, if the proposed action will not meet applicable requirements, if estimated emissions have not been appropriately identified or quantified, or if the emission data are not acceptable for technical reasons.

For more information about air quality permitting, visit www.cabq.gov/airquality/air-quality-permits

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: Curia New Mexico
Contact: John Gerback, Jr.
Company/Business: Curia New Mexico, LLC

☐ ☒ 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:

Ver. 11/13


curia
CAUTION
WATCH YOUR STEP
PEDESTRIAN CROSSING

Proposed Air Quality Construction Permit
Permiso de Construcción de Calidad del Aire Propuesto

1. **Applicant's Name:**
   Nombre del solicitante: Curia New Mexico, LLC
   Owner or Operator's Name:
   Nombre del Propietario u Operador: Curia New Mexico, LLC
2. **Actual or Estimated Date the Application will be Submitted to the Department:**
   Fecha Actual o Estimada en que se Entregará la Solicitud al Departamento: July 15, 2022
3. **Exact Location of the Source or Proposed Source:**
   Ubicación Exacta de la Fuente o Fuente Propuesta: 4272 & 4200 Balloon Park Rd Abq. NM 87109
4. **Description of the Source:**
   Descripción de la Fuente: Two 2,200 HP standby/emergency generators one 8.4 MMBTU/hr boiler and one 5.2 MMBTU/hr. Boiler
   Nature of Business:
   Tipo de Negocio: Delivering Steril injectable liquid, suspension, & biological pharmaceutical products.
   Process or change for which a permit is requested:
   Proceso o cambio para el cuál se solicita el permiso: Removal of permit conditions requing annual stack testing for emergency generators

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) *Cambio Neto de Emisiones (para modificación de permiso)*	
	Pounds per hour *libras por hora*	Tons per year *toneladas por año*	Pounds per hour *libras por hora*	Tons per year *toneladas por año*
NO_x	92.9	25.7	(-) 55.6	(-) 17.0
CO	28.4	9.2	(-) 6.3	(-) 4.2
VOC	8.3	21.3	(-) 1.1	(-) 0.2
SO_2	0.1	0.1	(-) 49.2	(-) 11.8
PM_{10}	3.7	1.2	(-) 1.1	(-) 0.4
$PM_{2.5}$	3.7	1.2	(-) 1.1	(-) 0.4
HAP	1.5	6.1	0.15	0.04

5. **Maximum Operating Schedule:**
   Horario Máximo de Operaciones: Boilers = 8760 hrs/yr, standby/emergency generators = 500 hrs/yr.
   Normal Operation Schedule:
   Horario Normal de Operaciones: Boilers = 8760 hrs/yr, standby/emergency generators = 500 hrs/yr.
6. **Current Contact Information for Comments and Inquiries**
   Datos actuales para Comentarios y Preguntas
   Name *(Nombre):* John Gerback, Jr
   Address *(Domicilio):* 4240 Balloon Park Rd. Albuquerque, New Mexico 87109
   Phone Number *(Número Telefónica):* (505) 923-1500
   Email Address *(Correo Electrónico):* John.Gerback.Jr@curiaglobal.com

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 presentar 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


SCOTT'S
FENCING CO., INC.
821-1114
ENTER
ONLY

Attachment 5

Ambient Impact Analysis Dispersion Model Report

DISPERSION MODEL REPORT
FOR CURIA NEW MEXICO, LLC
PERMIT #0491-M7-RV1 REVISION APPICATION

Albuquerque, New Mexico

PREPARED FOR
CURIA NEW MEXICO, LLC

May 2, 2022

Prepared by

Montrose Air Quality Services, LLC

MONTROSE
AIR QUALITY SERVICES

CONTENTS

TABLE OF CONTENTS **PAGE**

TABLES **PAGE**

FIGURES **PAGE**

1.0 INTRODUCTION

This dispersion modeling analysis will be conducted by Montrose Air Quality Service, LLC (Montrose) on behalf of Curia New Mexico, LLC (Curia), to evaluate ambient air quality impacts for Curia's Balloon Park Road facilities using updated information from the manufacturer for permitted, Units 5 and 6, emission sources in the permit modification of Permit #0491-M7-RV1. The approximate UTM coordinates of the Balloon Park Road facilities are; 354,450 meters E, 3,890,650 meters N, Zone 13, NAD 83. The objective of this evaluation is to determine whether ambient air concentrations from the maximum operation of the Balloon Park Road facilities for nitrogen dioxide (NO_2), carbon monoxide (CO), sulfur dioxide (SO_2), and particulate matter; both 10 microns or less (PM_{10}) and 2.5 microns or less ($PM_{2.5}$); are below Class II federal and state ambient air quality standards (NAAQS and NMAAQS) found in 40 CFR Part 50 and the City of Albuquerque/Bernalillo County Health Division (AEHD) air quality regulation 20.11.8 NMAC, respectively.

The dispersion modeling will be conducted using the American Meteorological Society/Environmental Protection Agency Regulatory Model Improvement Committee Dispersion Model (AERMOD), *Version 21112*. This model is recommended by EPA for determining Class II impacts within 50 km of the source being assessed. Additionally, AERMOD was developed to handle complex terrain. Montrose employs the general modeling procedures outlined in "Permit Modeling Guidelines, Albuquerque Environmental Health Department", revised 10/10/2019, "New Mexico Air Pollution Control Bureau, Dispersion Modeling Guidelines", revised 10/26/2020, and the most up to date EPA's *Guideline on Air Quality Models*.

With this permit modification, Curia is requesting removal of all permit conditions requiring annual stack testing for emergency generators, Units 7 and 8. The permit presently includes three (3) steam boilers (Units 2, 5, and 6) and three (3) emergency generators (Units 1, 7, and 8). In addition to removing the permit conditions for stack test, Curia will be updating the Units 5 and 6 boiler emission rates and model stack parameters based on manufacturer data and site measurements. Also, Unit 2 will be moved from a regulated source to an exempt source due to the size of the boiler (< 5 MMBtu) and its function of produce steam for personal heating of air and water. The revised emission rates of Unit 5 and 6 will be included in the permit modification application. Each boiler is presently permitted to operate 8760 hours per year, which will not change with this permit modification. Maximum operation modeled will include both boilers operating at 100% load. Additional modeling will present normal operations with the Superior (Unit 5) at 100% load and the Cleaver-Brooks (Unit 6) operating at 75% load.

For the boilers modeled exhaust parameters, the boiler manufacturers were contacted and the manufacturer provided the following information; expected emission rates, stack exhaust temperature at maximum and exhaust flowrate at maximum (see Attachment A). Stack height and stack diameter were determined by site inspection.

The three (3) emergency generators included in Permit #0491-M7-RV1 will not be included in the dispersion modeling analysis, because these sources are intermittent. Emergency generators, with exception of loss of generating power, are tested monthly. Monthly testing takes less than an hour per engine and stack emission rate testing of Units 7 and 8 takes about 4 hours each annually. The following table summarizes the hours of operation for the emergency generators from 2016 through 2020.

TABLE 1: Emergency Generator Hours of Operation

Unit	2016 (Hours/Year)	2017 (Hours/Year)	2018 (Hours/Year)	2019 (Hours/Year)	2020 (Hours/Year)	Annual Average (Hours/Year)
Unit 1 Emergency Generator	29.0	15.4	31.3	38.5	35.5	30.3
Unit 7 Emergency Generator	14.1	24.5	16.8	10.0	5.8	14.2
Unit 8 Emergency Generator	16.2	25.8	16.7	10.8	6.2	15.1

Figure 1 below shows the Curia Balloon Park Road facilities restricted boundary and location of the existing permitted boiler stacks. Figure 2 shows the location of Curia Balloon Park Road facilities and surrounding area.

Curia modeled additional neighboring sources identified by the Albuquerque Environmental Health Department (AEHD) Air Quality Program (AQP) Modeling Section. Neighbors include; Materion (Permit #1962-M2-1AR), Materion (Permit #0494-M4-2AR), Mega Corp (Permit #1292), Roadrunner CBP (Permit #0271-2AR), Roadrunner CBP (Permit #0505-M1-4AR), Vulcan RAP Plant (Permit #1625-7AR), Vulcan Osuna HMA (Permit #0104-M2), American Gypsum (Permit #0752-M3), and PNM's Reeves Station (Permit #0499-M2-RN1).

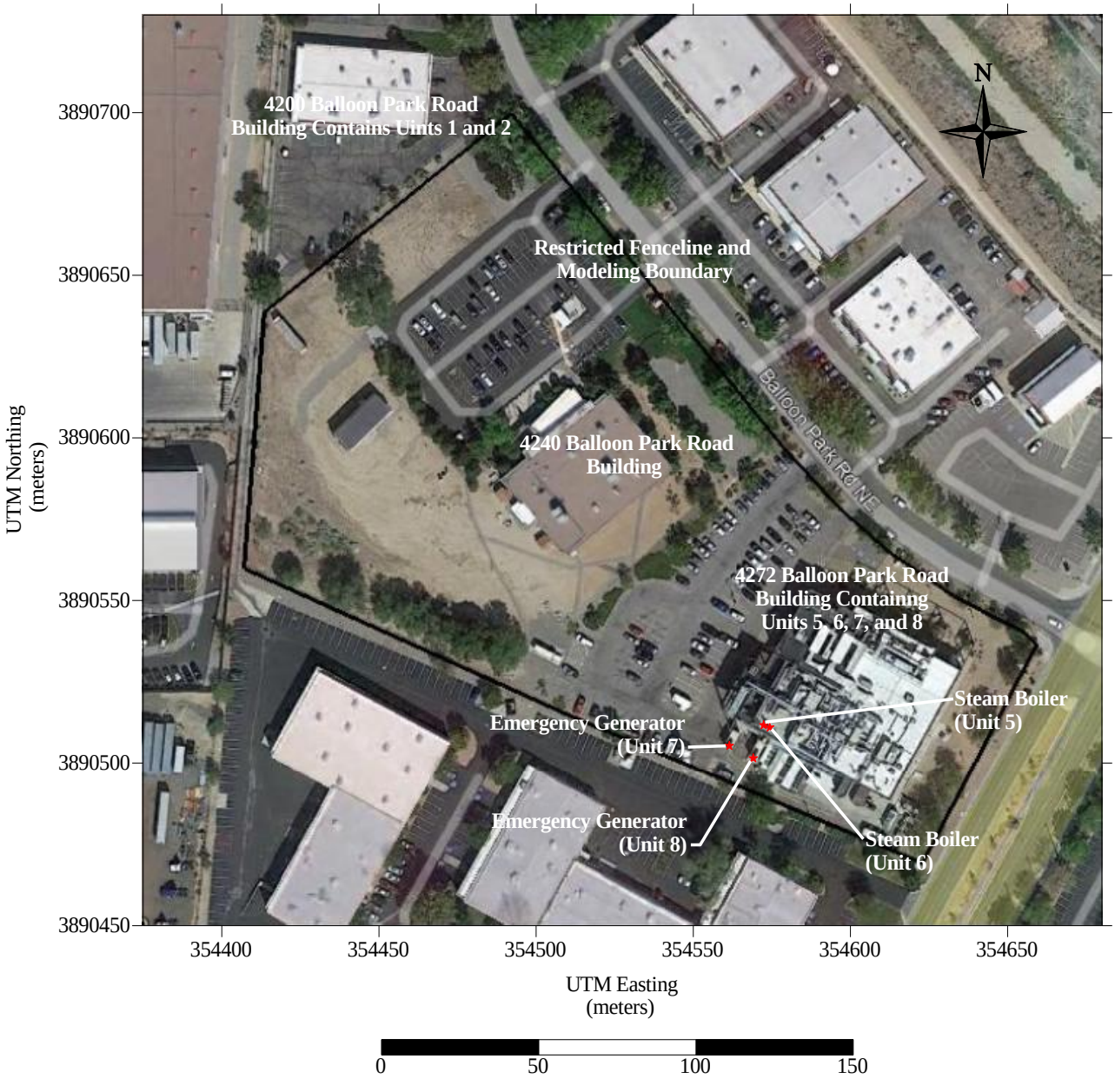

FIGURE 1: Curia Balloon Park Site Equipment Locations

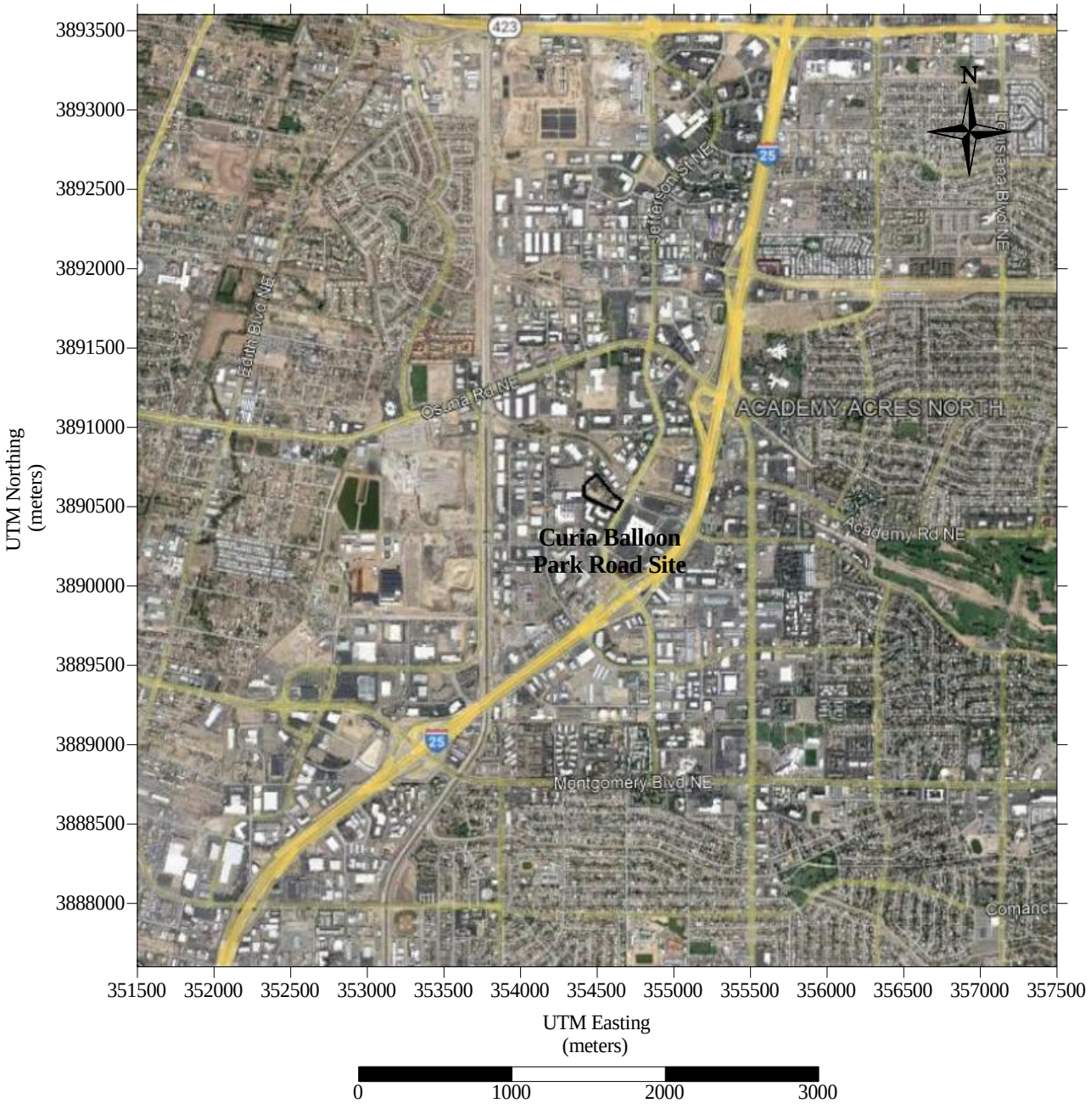

FIGURE 2: Curia Balloon Park Site Location and Surrounding Area

2.0 DISPERSION MODELING PROTOCOL

This section identifies the technical approach and dispersion model inputs that will be used for the Class II federal and State ambient air quality standards for this permit application. AEHD AQP requires that all applicable criteria pollutant emissions be modeled using the most recent versions of US EPA's approved models and the modeled concentrations be compared with National Ambient Air Quality Standards (NAAQS), and New Mexico Ambient Air Quality Standards (NMAAQS). Table 1 shows the NAAQS and NMAAQS that the source's ambient impacts must meet in order to demonstrate compliance. Table 1 also lists the Class II Significant Impact Levels (SILs) which are used to assess whether a source has a significant impact at downwind receptors.

The dispersion modeling analysis will be performed to estimate concentrations resulting from the maximum permitted operation of the Curia's Unit 5 and 6 steam boilers using the maximum permitted emission rates for operation of 8760 hours per year. Additional dispersion modeling analysis will be performed to estimate concentrations resulting from the normal operation of the Curia's Unit 5 and 6 steam boilers using the maximum permitted emission rates for operation of Unit 5 and 75% load for Unit 6. The modeling will determine the maximum off-site concentrations for NO_2, CO, SO_2, PM_{10} and $PM_{2.5}$, for comparison with modeling significance levels, national/New Mexico/Bernalillo County ambient air quality standards (AAQS). For this modeling analysis, particulate emissions from Curia sources assumes PM = PM_{10} = $PM_{2.5}$ are equal. The modeling will follow the guidance and protocols outlined in the "Permit Modeling Guidelines, Albuquerque Environmental Health Department", revised 10/10/2019, "New Mexico Air Pollution Control Bureau, Dispersion Modeling Guidelines", revised 01/01/2019, and the most up to date EPA's *Guideline on Air Quality Models*.

Initial radius of impact (ROI) modeling will be performed for all Curia modeled sources only to determine pollutants and averaging periods that exceed significant impact levels (SILs). If initial modeling for any pollutant and averaging period exceeds SILs, then cumulative modeling will be performed for those pollutants and averaging periods. The cumulative impacts model will include all receptors for which the ROI model indicates that the SILs are exceeded, will include any identified neighboring emission sources, and will incorporate background ambient concentrations. Table 2 lists the SILs, NAAQS and NMAAQS for each pollutant averaging period. Table 3 lists ambient air quality standards for which modeling is not required by NMED AQB, when an approved surrogate standard is modeled.

TABLE 2: National and New Mexico Ambient Air Quality Standard Summary

Pollutant	Avg. Period	Sig. Lev. ($\mu g/m^3$)	Class I Sig. Lev. ($\mu g/m^3$)	NAAQS	NMAAQS	PSD Increment Class I	PSD Increment Class II
CO	8-hour	500		9,000 ppb(1)	8,700 ppb(2)		
	1-hour	2,000		35,000 ppb(1)	13,100 ppb(2)		
NO_2	annual	1.0	0.1	53 ppb(3)	50 ppb(2)	2.5 $\mu g/m^3$	25 $\mu g/m^3$
	24-hour	5.0			100 ppb(2)		
	1-hour	7.52		100 ppb(4)			
$PM_{2.5}$	annual	0.2	0.05	12 $\mu g/m^3$(5)		1 $\mu g/m^3$	4 $\mu g/m^3$
	24-hour	1.2	0.27	35 $\mu g/m^3$(6)		2 $\mu g/m^3$	9 $\mu g/m^3$
PM_{10}	annual	1.0	0.2			4 $\mu g/m^3$	17 $\mu g/m^3$
	24-hour	5.0	0.3	150 $\mu g/m^3$(7)		8 $\mu g/m^3$	30 $\mu g/m^3$
SO_2	annual	1.0	0.1		20 ppb(2)	2 $\mu g/m^3$	20 $\mu g/m^3$
	24-hour	5.0	0.2		100 ppb(2)	5 $\mu g/m^3$	91 $\mu g/m^3$
	3-hour	25.0	1.0	500 ppb(1)		25 $\mu g/m^3$	512 $\mu g/m^3$
	1-hour	7.8		75 ppb(8)			

Standards converted from ppb to $\mu g/m^3$ use a reference temperature of 25° C and a reference pressure of 760 millimeters of mercury.
(1) Not to be exceeded more than once each year.
(2) Not to be exceeded.
(3) Annual mean.
(4) 98th percentile of 1-hour daily maximum concentrations, averaged over 3 years.
(5) Annual mean, averaged over 3 years.
(6) 98th percentile of 24-hour daily maximum concentrations, averaged over 3 years.
(7) Not to be exceeded more than once per year on average over 3 years.
(8) 99th percentile of 1-hour daily maximum concentrations, averaged over 3 years.

TABLE 3: Standards for Which Modeling Is Not Required by NMED AQB

Standard not Modeled	Surrogate that Demonstrates Compliance
CO 8-hour NAAQS	CO 8-hour NMAAQS
CO 1-hour NAAQS	CO 1-hour NMAAQS
NO_2 annual NAAQS	NO_2 annual NMAAQS
NO_2 24-hour NMAAQS	NO_2 1-hour NAAQS
O_3 8-hour	Regional modeling
SO_2 annual NMAAQS	SO_2 1-hour NAAQS
SO_2 24-hour NMAAQS	SO_2 1-hour NAAQS
SO_2 3-hour NAAQS	SO_2 1-hour NAAQS

2.1 DISPERSION MODEL SELECTION

The dispersion modeling will be conducted using the American Meteorological Society/Environmental Protection Agency Regulatory Model Improvement Committee Dispersion Model (AERMOD), *Version 21112*. This model is recommended by EPA for determining Class II impacts within 50 km of the source being assessed. Additionally, AERMOD was developed to handle complex terrain. In this analysis, AERMOD will be used to estimate pollutant ambient air concentrations for NO_2, CO, SO_2, PM_{10} and $PM_{2.5}$, from the Curia Balloon Park facility emission sources.

AERMOD is a Gaussian plume dispersion model that is based on planetary boundary layer principles for characterizing atmospheric stability. The model evaluates the non-Gaussian vertical behavior of plumes during convective conditions with the probability density function and the superposition of several Gaussian plumes. The AERMOD modeling system has three components: AERMAP, AERMET, and AERMOD. AERMAP is the terrain preprocessor program. AERMET is the meteorological data preprocessor. AERMOD includes the dispersion modeling algorithms and was developed to handle simple and complex terrain issues using improved algorithms. AERMOD uses the dividing streamline concept to address plume interactions with elevated terrain. AERMOD will be run using all the regulatory default options.

AERMOD CIA modeling will be run using all the following regulatory default options including use of:

- Gradual Plume Rise
- Stack-tip Downwash
- Buoyancy-induced Dispersion
- Calms and Missing Data Processing Routine
- Upper-bound downwash concentrations for super-squat buildings
- Default wind speed profile exponents
- Calculate Vertical Potential Temperature Gradient
- No use of gradual plume rise
- Rural Dispersion

These regulatory default options are found in the AERMOD User's Manual. The model will incorporate local terrain into the calculations.

2.2 BUILDING WAKE EFFECTS

Buildings are located at the site that could impact plume downwash effects for the Curia Balloon Park sources. These buildings located within 5L (L = lesser dimension, height or projected width, of nearby structure(s)) of near point sources will be included in building downwash calculations. Figure 3 shows proposed Curia buildings location on the Balloon Park Road and other nearby buildings included in the model analysis.

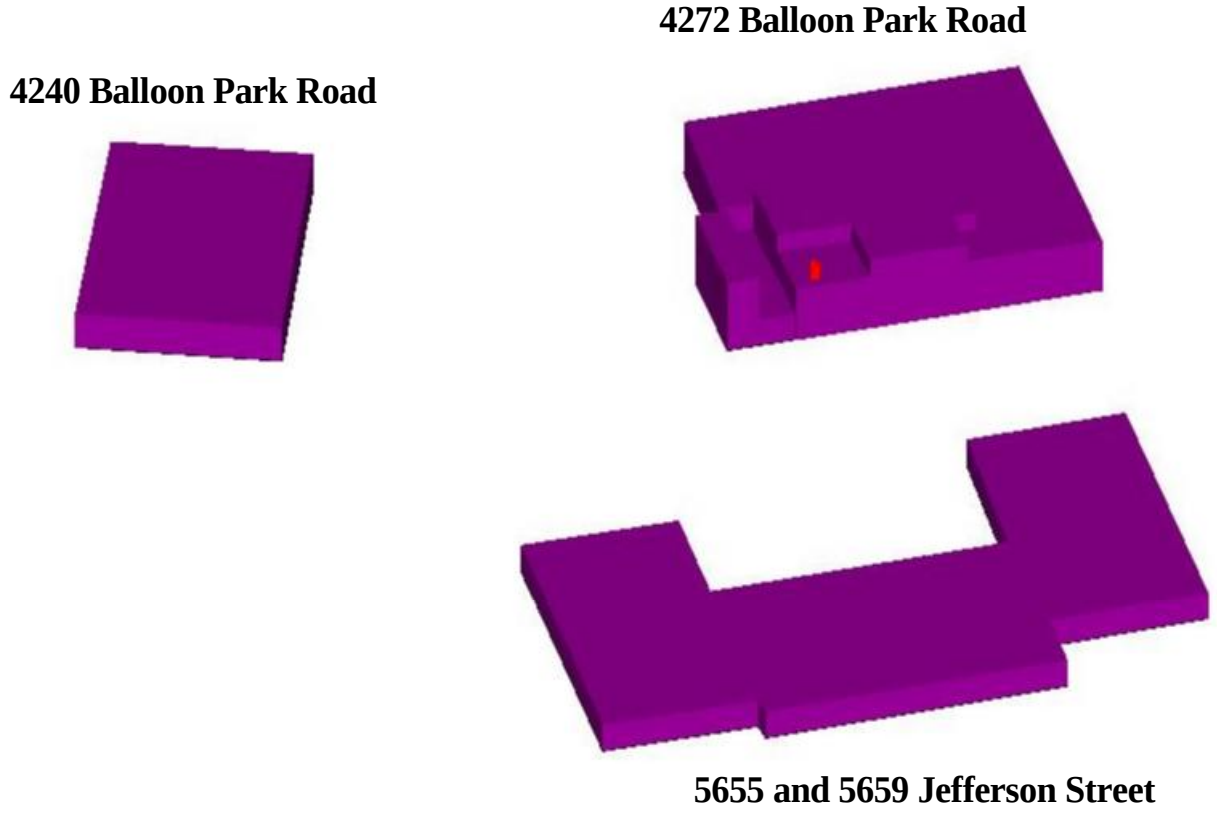

FIGURE 3: Curia and Nearby Buildings Included in the Model Analysis

2.3 METEOROLOGICAL DATA

The meteorological data input file to be used in this dispersion modeling analysis is Albuquerque met data covering years 2014 through 2018 (AERMET *Version 19191* dated 01/31/2020) available from the AEHD AQP.

2.4 RECEPTORS AND TOPOGRAPHY

Modeling will be completed using as many receptor locations as required to ensure that the maximum estimated impacts are identified. ROI modeling will be performed with receptors within 20 kilometers of the model boundary. Because of the nature of the emissions from the site, it is expected the maximum modeled concentrations will be on or near the site's fenceline.

The refined receptor grid will include receptors located at 50-meter spacing from the facility boundary out to 500 meters; 100-meter spacing from 500 meters out to 1,000 meters; 250-meter spacing from 1,000 meters out to 3,000 meters; 500-meter spacing from 3,000 meters out to 5,000 meters; and 1000-meter spacing from 5,000 meters out to 10,000 meters, and 2500-meter spacing from 10,000 meters out to 20,000 meters. Fenceline receptor spacing will be 25 meters.

All model receptors will be preprocessed using the AERMAP software (*Version 18081*) associated with AERMOD. The AERMAP software establishes a base elevation and a height scale for each receptor location. The height scale is a measure of the receptor's location and base elevation and its relation to the terrain feature that has the greatest influence in dispersion for that receptor. AERMAP will be processed using U.S. Geological Survey (USGS) national elevation data (NED). Output from AERMAP will be used as input to the AERMOD runstream file for each model run.

2.5 MODELED EMISSION SOURCES INPUTS

Curia presently operates 2 regulated steam boilers under Permit #0491-M7-RV1. Each boiler is allowed to operate 8760 hours per year. Emissions from exhaust stacks will be modeled as point sources. Model input parameters are based on actual release height, release diameter, and manufacture specification release velocity or exhaust flow rate, and release temperature. Curia Balloon Park boilers modeled stack releases are vertical and include raincaps. Table 4 summarize the model inputs for the Curia Balloon Park emission sources. Table 5 summarize the model inputs for the Curia Balloon Park emission sources with Unit 5 operating at 100% load and Unit 6 operating at 75% load. For information on model inputs for Unit 6 operating at 75% load, the manufacture specifications for the Cleaver-Brooks Boiler, found in Attachment A, was used.

TABLE 4: Model Inputs for Point Sources at the Curia Balloon Park Plant – NO_X, CO, SO_2 and PM – 100% Load Unit 5 and 6

Source Description	Model ID	Stack Height (m)	Stack Temp. (K)	Exit Vel. (m/s)	Stack Dia. (m)	NOx Emission Rate (lb/hr)	CO Emission Rate (lb/hr)	SO2 Emission Rate (lb/hr)	PM Emission Rate (lb/hr)
Curia NG Boiler Unit 5	B5	12.1920	452.5944	7.8943	0.4318	0.25107	0.30965	0.00837	0.04017
Curia NG Boiler Unit 6	B6	11.6434	510.3700	8.6682	0.3810	0.36000	0.19000	0.00300	0.03900

TABLE 5: Model Inputs for Point Sources at the Curia Balloon Park Plant – NO_X, CO, SO_2 and PM – 100% Load Unit 5 and 75% Load Unit 6

Source Description	Model ID	Stack Height (m)	Stack Temp. (K)	Exit Vel. (m/s)	Stack Dia. (m)	NOx Emission Rate (lb/hr)	CO Emission Rate (lb/hr)	SO2 Emission Rate (lb/hr)	PM Emission Rate (lb/hr)
Curia NG Boiler Unit 5	B5	12.1920	452.5944	7.8943	0.4318	0.25107	0.30965	0.00837	0.04017
Curia NG Boiler Unit 6	B6	11.6434	494.8167	6.2631	0.3810	0.27000	0.14000	0.00230	0.02900

2.6 PARTICLE SIZE DISTRIBUTION

No particle size distribution will be included in the particulate modeling for either Curia or neighboring sources.

2.7 NO_2 DISPERSION MODELING ANALYSIS

The AERMOD model predicts ground-level concentrations of any generic pollutant without chemical transformations. Thus, the modeled NO_X emission rate will give ground-level modeled concentrations of NO_X. NAAQS values are presented as NO_2.

EPA has a three-tier approach to modeling NO_2 concentrations.

- Tier I – total conversion, or all NOx = NO_2
- Tier II –Ambient Ratio Method 2 (ARM2)
- Tier III – case-by-case detailed screening methods, such as Ozone Limiting Method (OLM) and Plume Volume Molar Ratio Method (PVMRM) and NO_2/NO_X in-stack ratio

Initial modeling will be performed using the Tier II methodology (ARM2). If these modeling iterations demonstrate that less conservative methods for determining 1-hour and annual NO_2 compliance would be needed for this project, then the ambient impact of 1-hour and annual NOx predicted by the model will use Tier III – OLM or PVMRM.

When using ARM2, two inputs can be selected in the model. For this modeling analysis, EPA default minimum and maximum ambient NO_2/NO_X ratios for the ambient air of 0.50 and 0.90, respectively, will be used. For OLM or PVMRM, three inputs can be selected in the model: the in-stack-ratio (ISR), the NO_2/NO_X equilibrium ratio for the ambient air, and the ambient ozone concentration. The ISR will be determined for each source or group of sources. The NO_2/NO_X equilibrium ratio will be the EPA default of 0.90. Ozone input is determined from monitored ozone data collected from Del Norte city monitoring station matching the modeled met years 2014 – 2018.

To determine the ISR for each source, a search was performed for the Curia boilers. A document prepared by the California Air Pollution Control Officers Association (CAPCOA) released a guidance document named "Modeling Compliance of The Federal 1-Hour NO2 NAAQS", October 27, 2011 summarizes ISR values for various type of sources. In an effort to provide data needed for modeling and to address issues noted in EPA's NO_2 guidance memoranda, the San Joaquin Valley APCD has started gathering data from internal and external resources and has compiled a NO_2/NO_X ratio for a variety of sources. The document's Appendix C is found in Attachment B. Based on this ISR summary, the ISR range for natural gas boilers is 0.00 to 0.1579 with the CAPCOA recommendation of 0.10. Curia proposes an ISR for the 2 natural gas boilers a conservative ISR of 0.20. For neighboring sources, since the ISR has a diminishing impact on ambient NO_2/NO_X ratios as a plume is transported farther downwind due to mixing and reaction towards background ambient NO_2/NO_X ratios, neighboring sources within 1 kilometer of the site

will use an ISR of 0.30 or available source specific ISR data. For neighboring sources extended beyond 1 kilometer a default ISR of 0.20[1] will be used.

Model Ozone Data

For OLM or PVMRM, modeling of the project-generated 1-hour NO_2 concentrations requires use of ambient monitored ozone concentrations. This ozone data was provided by the AEHD AQP from the Del Norte monitoring station for the years 2014 – 2018. The Del Norte monitor best represents the Curia area consisting of mostly vehicle traffic emissions.

2.8 $PM_{2.5}$ SECONDARY EMISSIONS MODELING

Particulate matter includes both "primary" PM, which is directly emitted into the air, and "secondary" PM, which forms in the atmosphere from chemical reactions involving primary gaseous emissions of precursor air contaminants. Primary PM consists of carbon (soot)—emitted from cars, trucks, heavy equipment, forest fires, and burning waste—and crustal material from unpaved roads, stone crushing, construction sites, and metallurgical operations. Secondary PM forms in the atmosphere from gases. Some of these reactions require sunlight and/or water vapor. Secondary PM includes:

- Sulfates formed from SO_2 emissions from power plants and industrial facilities;
- Nitrates formed from NO_X emissions from cars, trucks, industrial facilities, and power plants; and
- Carbon formed from reactive organic gas (ROG or VOC) emissions from cars, trucks, industrial facilities, forest fires, and biogenic sources such as trees.

AERMOD does not account for secondary formation of $PM_{2.5}$ for near-field modeling. Any secondary contribution of the Curia source emissions is not explicitly accounted for in the model results. While representative background monitoring data for $PM_{2.5}$ should adequately account for secondary contribution from existing background sources, the Curia assessment of their potential contribution to cumulative impacts as secondary $PM_{2.5}$ was performed based on guidance from the NMED Modeling Section and using prescribed equations. The permit application for Curia Balloon Park emissions of precursors include:

- NO_X – 25.7 tons per year (below SER)
- SO_2 – 0.1 tons per year (below SER)
- Volatile Organic Compounds (VOC) – 21.3 tons per year (below SER)
- Particulate Matter with an aerodynamic diameter of 2.5 micron or less ($PM_{2.5}$) – 1.2 tons per year (below SER).

The $PM_{2.5}$ secondary emission concentration analysis will follow EPA and NMED AQB guidelines. Following recent EPA guidelines for conversion of NO_X and SO_2 emission rates to secondary $PM_{2.5}$ emissions, Curia emissions are compared to appropriate western MERPs values (NO_X 24-Hr – 1155 tpy; NO_X Annual – 3184 tpy; SO_2 24-Hr – 225 tpy; SO_2 Annual – 2289 tpy).

[1] Technical support document (TSD) for NO2-related AERMOD modifications, EPA- 454/B-15-004, July 2015

The following equation, found in NMED AQB modeling guidance document on MERPs, will be added to determine if secondary emission would cause violation with $PM_{2.5}$ NAAQS.

$PM_{2.5}$ annual = ((NO_X emission rate (tpy)/3184 + (SO_2 emission rate (tpy)/2289)) x 0.2 µg/m^3

$PM_{2.5}$ annual = ((25.7/3184) + (0.1/2289)) x 0.2 µg/m^3 = **0.002 µg/m^3**

$PM_{2.5}$ 24 hour = ((NO_X emission rate (tpy)/1155 + (SO_2 emission rate (tpy)/225)) x 1.2 µg/m^3

$PM_{2.5}$ 24 hour = ((25.7/1155) + (0.1/225)) x 1.2 µg/m^3 = **0.03 µg/m^3**

2.9 AMBIENT MODELING BACKGROUND

Ambient background concentrations, based on the Del Norte Monitoring Station for CO, NO_2, SO_2, and $PM_{2.5}$ will be added to the dispersion modeling results and compared to the NAAQS and NMAAQS. Ambient background concentrations, based on the Jefferson Monitoring Station for PM_{10} will be added to the dispersion modeling results and compared to the NAAQS and NMAAQS. Background concentrations were obtained from the AEHD AQP Modeling Section.

CO 1-hr:	1870 micrograms per cubic meter
CO 8-hr:	1336 micrograms per cubic meter
NO_2 Annual:	19 micrograms per cubic meter
SO_2 1-hr:	13.1 micrograms per cubic meter
PM_{10} 24-hr:	31 micrograms per cubic meter
$PM_{2.5}$ 24-hr:	16 micrograms per cubic meter
$PM_{2.5}$ annual:	5.8 micrograms per cubic meter

NO_2 1-hour Background data

NO_2 1-hour background data was developed by the AEHD AQP based on the Tier 2 procedure found in EPA guidance documents[2] for determining background concentrations.

> *"Based on this guidance, we believe that an appropriate methodology for incorporating background concentrations in the cumulative impact assessment for the 1-hour NO_2 standard would be to use multiyear averages of the 98th-percentile of the available background concentrations by season and hour-of-day, excluding periods when the source in question is expected to impact the monitored concentration (which is only relevant for modified sources). For situations involving a significant mobile source component to the background monitored concentrations, inclusion of a day-of-week component to the temporal variability may also be appropriate. The rank associated with the 98th-percentile of daily maximum 1-hour values should be generally consistent with the number of "samples" within that distribution for each combination based on the temporal resolution but also account for the number of samples "ignored" in specifying the 98th-percentile based on the annual distribution. For example, Table 1 in Section 5 of Appendix S specifies the rank associated with the 98th-percentile value based on the annual number of days with valid data. Since the number of days per season will range from 90 to 92, Table 1 would indicate that the 2nd-highest value from the seasonal distribution should be used to represent the 98th-percentile. On the other hand, use of the 2nd-highest value for each season would effectively "ignore" only 4 values for the year rather than the 7 values "ignored" from the annual distribution. Balancing these considerations, we recommend that background values by season and hour-of-day used in this context should be based on the 3rd-highest value for each season and hour-of-day combination, whereas the 8th-highest value should be used if values vary by hour-of-day only. For more detailed temporal pairing, such as season by hour-of- day and day-of-week or month by hour-of-day, the 1st-highest values from the distribution for each temporal combination should be used."*

The NO_2 background data was provided by the AEHD AQP Modeling Section and is presented below in Table 5.

[2] Memo: "Additional Clarification Regarding Application of Appendix W Modeling Guidance for 1-hour N02 National Ambient Air Quality Standard" Tyler Fox, Leader, Air Quality Modeling Group, C439-01, dated March 1, 2011.

TABLE 6: Monitored Seasonal NO_2 Background – 3rd Highest Hourly µg/m³

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	46.0	26.4	57.9
4	68.4	48.9	26.6	58.9
5	69.1	51.7	32.7	58.0
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	80.0	61.1	34.2	65.9
10	71.4	48.0	27.3	55.0
11	62.0	28.6	24.3	47.3
12	48.1	18.9	19.9	35.4
13	36.9	17.6	17.0	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	28.0
17	48.4	17.1	20.4	38.0
18	73.0	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	48.0	34.1	73.4
22	76.5	56.3	30.8	70.4
23	75.0	58.8	34.9	69.7
24	72.4	57.9	33.6	70.9

3.0 MODEL SUMMARY

This section summarizes the model results, following the technical approach discussed in Section 2 of this report for Class II federal ambient air quality standards for this facility. Model results show for each criteria pollutant and applicable averaging periods for nitrogen dioxide (NO_2), carbon monoxide (CO), sulfur dioxide (SO_2), and particulate matter with aerodynamic diameter less than 10 micrometers (PM_{10}) and particulate matter with aerodynamic diameter less than 2.5 micrometers ($PM_{2.5}$), all model results are below ambient air quality standards. The modeling was used to evaluate ambient air quality impacts for Curia's Balloon Park Road facilities using updated information from the manufacturer for permitted, Units 5 and 6, emission sources in the permit modification of Permit #0491-M7-RV1. The modeling followed the guidance and protocols outlined in the protocol found in Section 2 of this report, the modeling procedures outlined in "Permit Modeling Guidelines, Albuquerque Environmental Health Department", revised 10/10/2019, "New Mexico Air Pollution Control Bureau, Dispersion Modeling Guidelines", revised 10/26/2020, and the most up to date EPA's *Guideline on Air Quality Models*.

With this permit modification, Curia is requesting removal of all permit conditions requiring annual stack testing for emergency generators, Units 7 and 8. The permit presently includes three (3) steam boilers (Units 2, 5, and 6) and three (3) emergency generators (Units 1, 7, and 8). In addition to removing the permit conditions for stack test, Curia will be updating Units 5 and 6 boiler emission rates and model stack parameters based on manufacturer data and site measurements. Also, Unit 2 will be moved from a regulated source to an exempt source due to the size of the boiler (< 5 MMBtu) and its function of produce steam for personal heating of air and water. The revised emission rates of Unit 5 and 6 will be included in the permit modification application. Each boiler is presently permitted to operate 8760 hours per year, which will not change with this permit modification. Maximum operation modeled will include both boilers operating at 100% load. Additional modeling will present normal operations with the Superior Boiler (Unit 5) at 100% load and the Cleaver-Brooks Boiler (Unit 6) operating at 75% load.

For the boilers modeled exhaust parameters, the boiler manufacturers were contacted and the manufacturer provided the following information; expected emission rates, stack exhaust temperature at maximum and exhaust velocity or flowrate at maximum for the Superior Boiler and both expected emission rates, stack exhaust temperature and exhaust flowrate at maximum and 75% load for the Cleaver-Brooks Boiler (see Attachment A). Stack height and stack diameter were determined by site inspection.

The three (3) emergency generators included in Permit #0491-M7-RV1 will not be included in the dispersion modeling analysis, because these sources are intermittent.

Curia modeled additional neighboring sources identified by the Albuquerque Environmental Health Department (AEHD) Air Quality Program (AQP) Modeling Section. Neighbors include; Materion (Permit #1962-M2-1AR), Materion (Permit #0494-M4-2AR), Mega Corp (Permit #1292),

Roadrunner CBP (Permit #0271-2AR), Roadrunner CBP (Permit #0505-M1-4AR), Vulcan RAP Plant (Permit #1625-7AR), Vulcan Osuna HMA (Permit #0104-M2), American Gypsum (Permit #0752-M3), and PNM's Reeves Station (Permit #0499-M2-RN1).

3.1 SIGNIFICANT IMPACT LEVEL (SILs) MODELING ANALYSIS

Significant impact level AERMOD dispersion modeling (ROI) was completed for PM_{10}, $PM_{2.5}$, NO_X, CO, and SO_2. All significant impact models were run in terrain mode and building downwash with Curia emission sources only. Table 7 lists the results of the modeling for pollutant and averaging period that falls below the applicable SILs.

TABLE 7: Summary of Air Dispersion Modeling Results below SILs

Parameter	Maximum Modeled Concentration ($\mu g/m^3$)	Significant Impact Level ($\mu g/m^3$)	% of SIL
CO 1 Hr.	22.5	2000	1.1
CO 8 Hr.	14.8	500	3.0
SO_2 1 Hr.	0.51	7.8	6.5
SO_2 3 Hr.	0.41	25	1.6
SO_2 24 Hr.	0.17	5	3.4
SO_2 Annual	0.038	1	3.8
$PM_{2.5}$ 24 Hr.	1.18	1.2	98.3
PM_{10} 24 Hr.	1.18	5	23.6

For ROI modeling results, the model operating at maximum produced the highest results. CO 1 hour and 8 hour; SO_2 1 hour, 3 hour, 24 hour and annual average; $PM_{2.5}$ 24 hour; and PM_{10} 24 hour were below the SILs.

3.2 CUMULATIVE IMPACT ANALYSIS (CIA) MODEL RESULTS

The model results from either 100% load (Maximum Operation) or 75% load for Unit 6 (Normal Operations), significant neighboring sources, approved ambient background (see Section 2.9), and $PM_{2.5}$ secondary emissions (see Section 2.8) are summarized below in Table 8. Dispersion modeling analysis followed the modeling protocol outline in Section 2 of this report.

TABLE 8: Summary of CIA Modeling Results Including all Applicable Neighboring Sources, Approved Ambient Background, and for $PM_{2.5}$ Secondary Emissions

Parameter	Maximum Curia Modeled Concentration ($\mu g/m^3$)	Significant Impact Level ($\mu g/m^3$)	Maximum Modeled Concentration With Neighbor and Background ($\mu g/m^3$)	Lowest Applicable Standard ($\mu g/m^3$)	% of Standard
NO_2 1 Hr. 8th highest 1-hour daily maximum	7.78	7.54	175.2	188.1	93.1
NO_2 Annual	1.87	1.0	48.3	94.0	51.4
$PM_{2.5}$ Annual	0.27	0.2	6.54	12	54.5

Note: Background concentrations are found in Section 2.9 of the modeling protocol. $PM_{2.5}$ secondary emission concentrations are found in Section 2.8 of the modeling protocol. Dispersion modeling inputs and settings are presented in Section 2.

3.2.1 NO_2 Cumulative Impact Analysis Modeling Results

NO_2 1-hour and annual average modeling was performed with terrain elevations and building downwash for Curia modeled sources. Two models were run, one for maximum operation modeled for both boilers operating at 100% load and additional modeling with the facility operating in normal operating mode with the Superior Boiler (Unit 5) at 100% load and the Cleaver-Brooks Boiler (Unit 6) at 75% load. Additionally, all neighboring sources identified by the city air quality department were included in the cumulative impact analysis.

Dispersion modeling meteorology for this analysis included 5 years of data, 2014–2018 Albuquerque Meteorological data, was obtained from the AEHD AQP.

For NO_2 1-hour modeling, the Tier II ARM2 approach found in Section 2.6 of this report was used for the analysis.

The seasonal NO_2 background – 3rd highest hourly, 1-hour NO_2 background concentrations found in Section 2.9 of this report was added to the modeled results and compared to the lowest applicable ambient standard.

CIA dispersion modeling showed exceedance of the NO_2 8th highest 1-hour daily maximum NAAQS. The exceedance was the result of modeled emissions by neighboring sources. For each of the receptors that showed an exceedance of the NAAQS, it was determine that the contribution from Curia sources were below the NO_2 1-Hour SIL. For model results with Curia sources above the SIL, the 8th highest 1-hour daily maximum occurred on Curia modeled fenceline.

For NO_2 annual modeling, the highest concentrations result where Curia was a significant contributor occurred on Curia modeled fenceline.

Table 9 shows the NO_2 1-Hour 8th highest 1-hour daily maximum and annual model results for and locations where is above the SILs.

TABLE 9: NO_2 CIA MODEL RESULTS

	Curia Modeled Concentration ($\mu g/m^3$)	**Modeled Concentration With Neighbor and Background ($\mu g/m^3$)**	**Location UTMs E/N**	
NO_2 1 Hr. 8th highest 1-hour daily maximum 75% Load	7.78	175.2	354642.1	3890542.3
NO_2 1 Hr. 8th highest 1-hour daily maximum 100% Load	8.48	168.5	354800.0	3890900.0
NO_2 Annual 75% Load	1.70	48.2	354611.0	3890562.4
NO_2 Annual 100% Load	1.87	48.3	354611.0	3890562.4

Figures 4 and 5 shows an aerial map of the NO_2 8th highest 1-hour daily maximum and annual average concentrations and the location of the maximum modeled concentrations which includes background where Curia sources contribute above the NO_2 SIL.

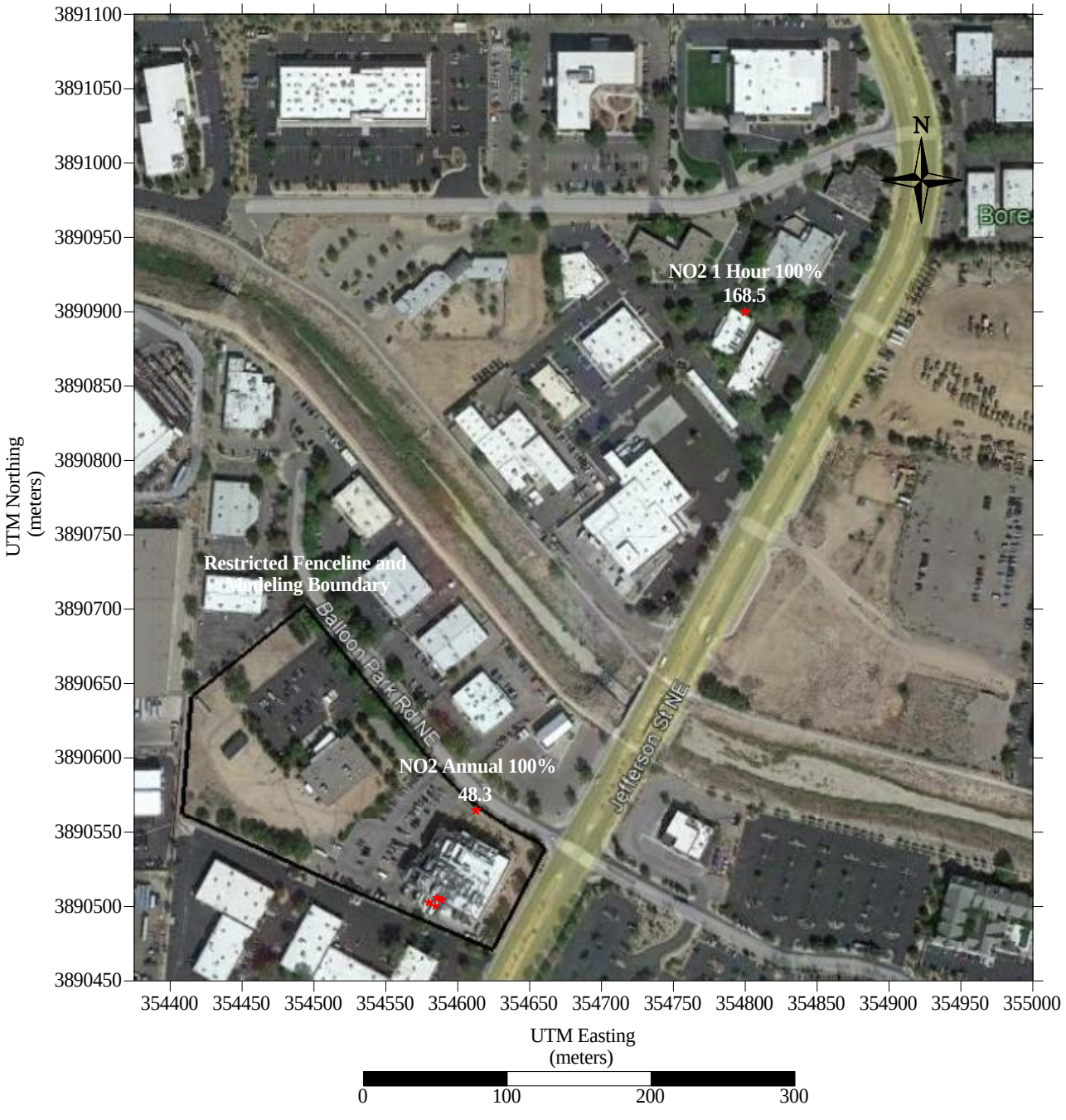

Figure 4: Aerial Map of NO_2 8th Highest 1-Hour Daily Maximum and Annual Average Model Results at Maximum Operations ($\mu g/m^3$)

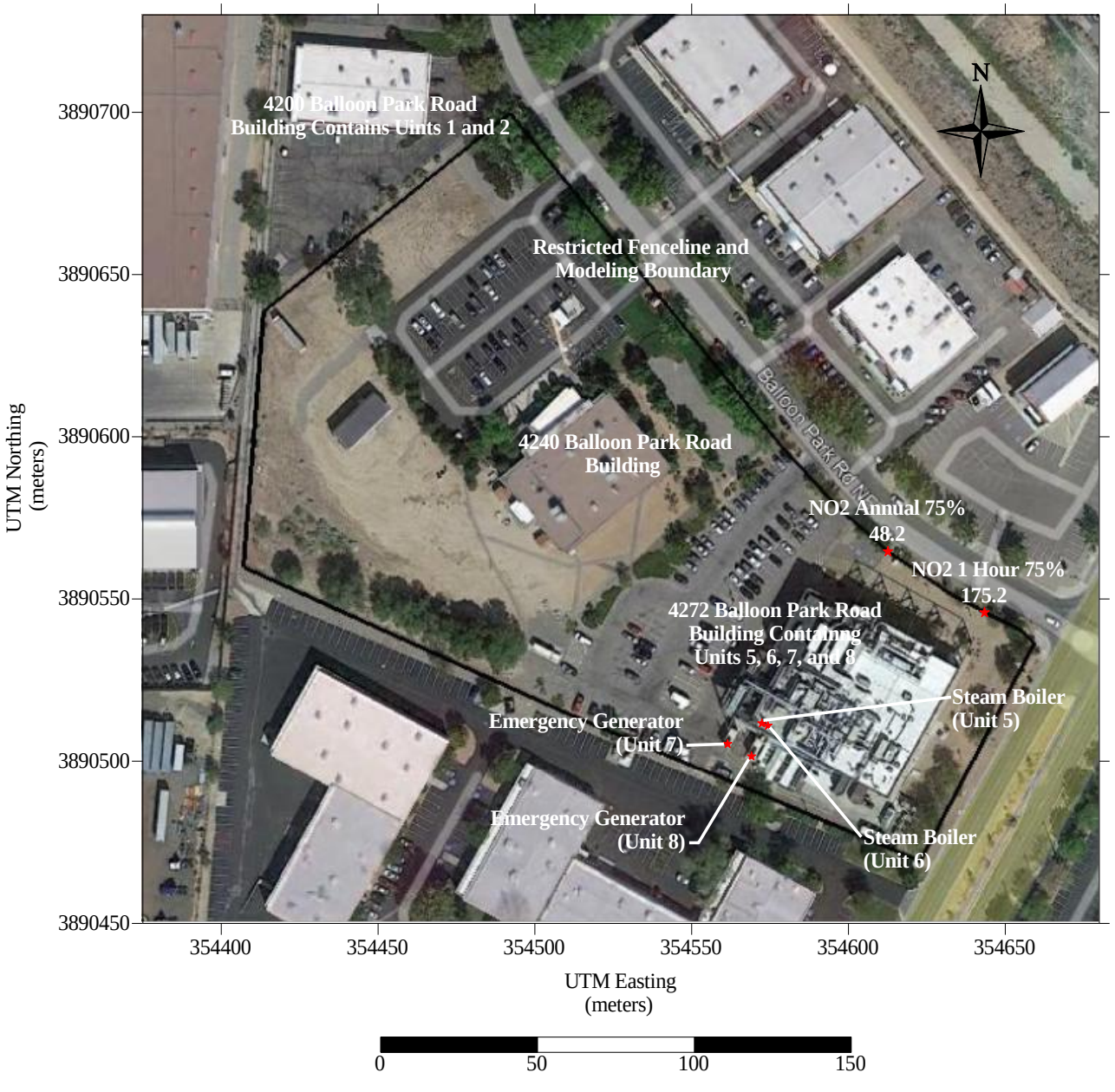

Figure 5: Aerial Map of NO_2 8th Highest 1-Hour Daily Maximum and Annual Average Model Results at Normal Operations
(µg/m³)

3.2.2 $PM_{2.5}$ Direct and Secondary Formation CIA Modeling Results

Particulate matter includes both "primary" PM, which is directly emitted into the air, and "secondary" PM, which forms in the atmosphere from chemical reactions involving primary gaseous emissions of precursor air contaminants. Primary PM consists of carbon (soot)—emitted from cars, trucks, heavy equipment, forest fires, and burning waste—and crustal material from unpaved roads, stone crushing, construction sites, and metallurgical operations. Secondary PM forms in the atmosphere from gases. Some of these reactions require sunlight and/or water vapor. Secondary PM includes:

- Sulfates formed from SO_2 emissions from power plants and industrial facilities;
- Nitrates formed from NO_X emissions from cars, trucks, industrial facilities, and power plants; and
- Carbon formed from reactive organic gas (ROG or VOC) emissions from cars, trucks, industrial facilities, forest fires, and biogenic sources such as trees.

AERMOD does not account for secondary formation of $PM_{2.5}$ for near-field modeling. Any secondary contribution of the Curia source emissions is not explicitly accounted for in the model results. While representative background monitoring data for $PM_{2.5}$ should adequately account for secondary contribution from existing background sources, the Curia assessment of their potential contribution to cumulative impacts as secondary $PM_{2.5}$ was performed based on guidance from the NMED Modeling Section and using prescribed equations. The permit application for Curia Balloon Park emissions of precursors include:

- NO_X – 25.7 tons per year (below SER)
- SO_2 – 0.1 tons per year (below SER)
- Volatile Organic Compounds (VOC) – 21.3 tons per year (below SER)
- Particulate Matter with an aerodynamic diameter of 2.5 micron or less ($PM_{2.5}$) – 1.2 tons per year (below SER).

The $PM_{2.5}$ secondary emission concentration analysis will follow EPA and NMED AQB guidelines. Following recent EPA guidelines for conversion of NO_X and SO_2 emission rates to secondary $PM_{2.5}$ emissions, Curia emissions are compared to appropriate western MERPs values (NO_X 24-Hr – 1155 tpy; NO_X Annual – 3184 tpy; SO_2 24-Hr – 225 tpy; SO_2 Annual – 2289 tpy). The following equation, found in NMED AQB modeling guidance document on MERPs, will be added to determine if secondary emission would cause violation with $PM_{2.5}$ NAAQS.

$PM_{2.5}$ annual = ((NO_X emission rate (tpy)/3184 + (SO_2 emission rate (tpy)/2289)) x 0.2 µg/m^3

$PM_{2.5}$ annual = ((25.7/3184) + (0.1/2289)) x 0.2 µg/m^3 = **0.002 µg/m^3**

$PM_{2.5}$ 24 hour = ((NO_X emission rate (tpy)/1155 + (SO_2 emission rate (tpy)/225)) x 1.2 µg/m^3

$PM_{2.5}$ 24 hour = ((25.7/1155) + (0.1/225)) x 1.2 µg/m^3 = **0.03 µg/m^3**

Results of the secondary formation from the facility were added to the modeled value.

Del Norte monitor representative annual $PM_{2.5}$ background concentrations was added to the modeled results and compared to the lowest applicable ambient standard.

Two models were run, one for maximum operation modeled for both boilers operating at 100% load and additional modeling with the facility operating in normal operating mode with the Superior Boiler (Unit 5) at 100% load and the Cleaver-Brooks Boiler (Unit 6) at 75% load. Additionally, all neighboring sources identified by the city air quality department were included in the cumulative impact analysis.

The annual average results show that significant direct "primary" $PM_{2.5}$ from Curia sources combined with neighboring sources are located on the Curia facility boundary.

The result from direct "primary" $PM_{2.5}$ emissions dispersion modeling, secondary PM emissions, applicable neighboring sources, plus a representative $PM_{2.5}$ background concentrations from Section 2.9 of this report, which includes monitored secondary $PM_{2.5}$ concentrations, were used to show compliance with national $PM_{2.5}$ annual average AAQS. $PM_{2.5}$ model results are summarized in Table 10.

TABLE 10: $PM_{2.5}$ CIA Model Results

	Curia Modeled Concentration with Secondary PM ($\mu g/m^3$)	**Modeled Concentration With Neighboring Sources and Background ($\mu g/m^3$)**	**Location UTMs E/N**	
$PM_{2.5}$ Annual Average 75% Load	0.25	6.53	354611.0	3890562.4
$PM_{2.5}$ Annual Average 100% Load	0.27	6.54	354611.0	3890562.4

Figures 6 and 7 summarize the results of the modeling analysis.

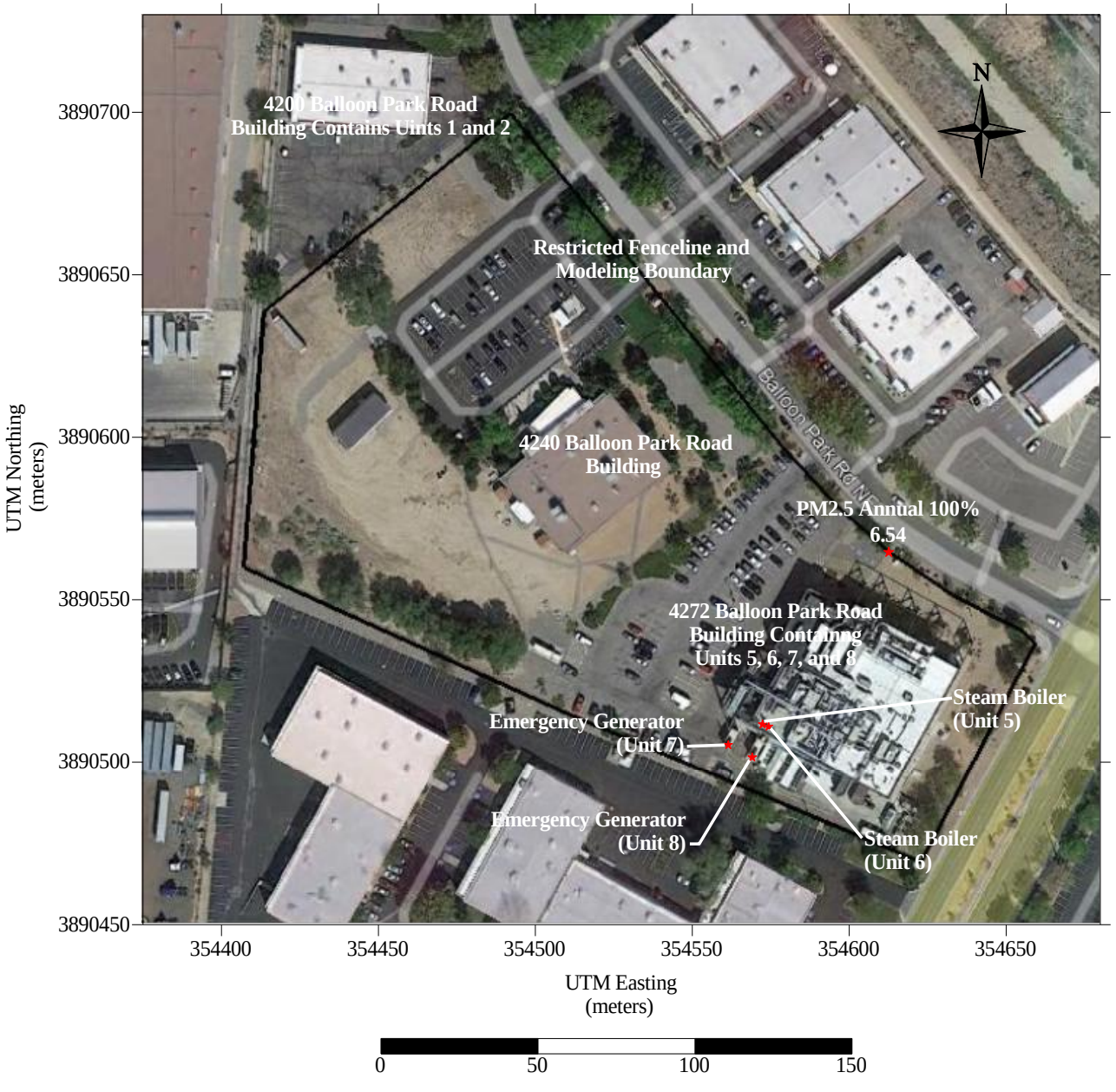

Figure 6: Aerial Map of PM_{25} Annual Average Model Results at Maximum Operations ($\mu g/m^3$)

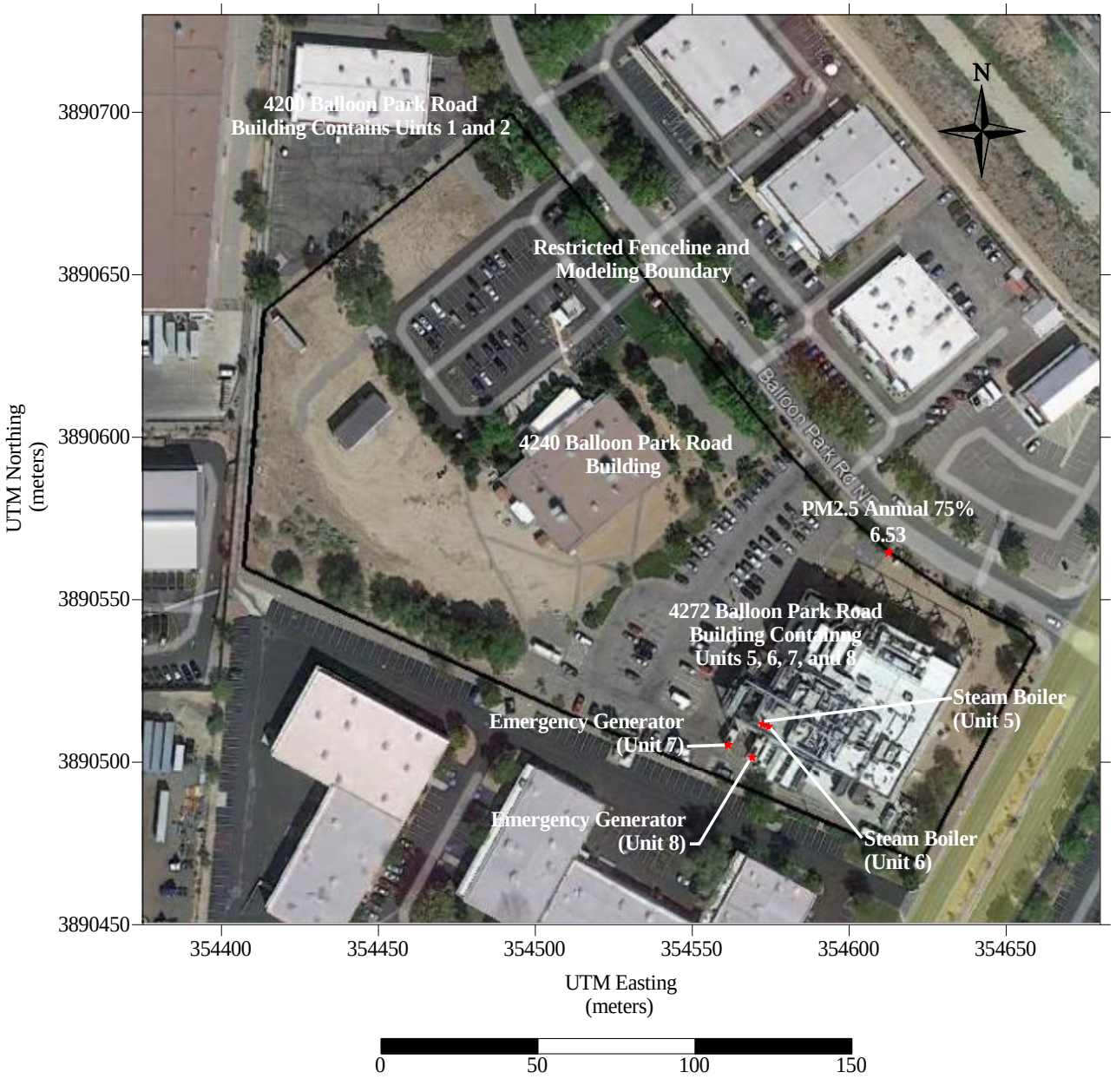

Figure 7: Aerial Map of PM_{25} Annual Average Model Results at Normal Operations ($\mu g/m^3$)

Modeling File List

Model File Name	Description
Curia ROI Model 100	Curia Sources Only ROI modeling – 100% Load (Maximum Operations)
Curia ROI Model 75	Curia Sources Only ROI modeling – 100% Load (Unit 5) 75% Load (Unit 6)

Model File Name	Description
Curia NO2 1 Hour CIA Model 100	Cumulative NO_2 Modeling – 1-Hour – 100% Load (Maximum Operations)
Curia NO2 1 Hour CIA Model 75	Cumulative NO_2 Modeling – 1-Hour – 100% Load (Unit 5) 75% Load (Unit 6)
Curia NO2 Annual CIA Model 100	Cumulative NO_2 Modeling – Annual Average – 100% Load (Maximum Operations)
Curia NO2 Annual CIA Model 75	Cumulative NO_2 Modeling – Annual Average – 100% Load (Unit 5) 75% Load (Unit 6)
Curia PM25 Annual CIA Model 100	Cumulative $PM_{2.5}$ Modeling – Annual Average– 100% Load (Maximum Operations)
Curia PM25 Annual CIA Model 75	Cumulative $PM_{2.5}$ Modeling – Annual Average– 100% Load (Unit 5) 75% Load (Unit 6)

Attachment A

Boiler Manufacturer Data

Superior Boiler
Unit 5

WEBSTER COMBUSTION
A Selas Heat Technology Company

Estimated Emissions -JB and JBX Burners

The following emissions apply to all JB and JBX burners firing the fuels shown.

Estimated Emission Levels Firing Natural Gas			
Pollutant		**Model JB**	**Model JBX**
NOx (B)	ppm lb/mmbtu	80 0.096	25 0.03
CO (A)	ppm lb/mmbtu	50 0.037	50 0.037
SOx (C)	ppm lb/mmbtu	1 0.001	1 0.001
HC / VOC	ppm lb/mmbtu	20 0.008	20 0.008
PM	ppm lb/mmbtu	na 0.0048	na 0.0048

Estimated Emission Levels Firing #2 Oil (D)			
Pollutant		**Model JB**	**Model JBX**
NOx (B)	ppm lb/mmbtu	135 0.176	120 0.157
CO (A)	ppm lb/mmbtu	50 0.04	50 0.04
SOx (C)	ppm lb/mmbtu	278 0.52	278 0.52
HC / VOC	ppm lb/mmbtu	25 0.013	25 0.013
PM	ppm lb/mmbtu	na 0.014	na 0.014

Assumption used for above (Contact Webster if different assumptions required)

A. CO varies with firing rate. Lower levels available, contact sales.
B. The ppm levels are corrected to 3% Oxygen (15% excess air) and dry volume basis.
C. Maximum sulfur in natural gas is 0.0006% wt.
D. ASTM #2 fuel, 0.02% Nitrogen, 0.5% Sulfur and 0.01% Ash (% by weight).
E. All levels are above backround (ambient) conditions.
F. Emission levels are based on a properly maintained and tuned burner.

Gmail Todd.Albers@curiaglobal.com

www.montrose-env.com

Albers, Todd
to me, Matthew

Good morning Paul,

I have the following temps from the boilers:

Cleaver Brooks: 440 degrees F (pictures 4,5,6)

Superior: 355 degrees F (pictures 1,2,3)

I also send these back to Superior to see what further information they can provide. I'll pass anything along once I receive it.

Thank you,

Todd

From: Albers, Todd
Sent: Monday, December 20, 2021 9:11 AM
To: 'Paul Wade' <pwade@montrose-env.com>
Cc: 'Matthew Lane' <theenvironmentallane@gmail.com>

Gmail Todd.Albers@curiaglobal.com

Thanks.

Todd

From: Jason Paxson [mailto:jason@csinm.com]
Sent: Wednesday, December 22, 2021 10:00 AM
To: Albers, Todd <Todd.Albers@curiaglobal.com>
Subject: Re: FW: stack parameter data

External: This message originated outside of the organization from jason@csinm.com. Do not click links or open attachı

Hi Todd,

I got the info back from Webster.

For the Balloon Park Superior boiler the flue gas flow rate is 3351 acfm and the stack flue velocity is 25.9 ft/s.

For the Alexander Superior boiler the flue gas flow rate is 1340 acfm and the stack flue velocity is 16.3 ft/s.

Thanks,

Jason Paxson

Combustion Systems

Cleaver-Brooks Boiler
Unit 6

Cleaver-Brooks Boiler Expected Emission Data

Producing Steam Firing — **Nat Gas**

BACKGROUND INFORMATION

Date	12/01/21	Boiler Model	CB(LE)
Author	Don Betts	Altitude (feet)	5300
Customer	Curia Global	Operating Pressure (psig)	115.00
City & State	Albuquerque, NM	Furnace Volume (cuft)	33.36
		Furnace Heat Release (btu/hr/cu ft)	91,270
		Heating Surface (sqft)	625
		Nox System	60

Nat Gas		Firing Rate			
		25%	**50%**	**75%**	**100%**
Horsepower		31	63	94	125
Input , Btu/hr		1,301,000	2,552,000	3,859,000	5,175,000
CO	ppm	50	50	50	50
	lb/MMBtu	0.0375	0.0375	0.0375	0.0375
	lb/hr	0.05	0.10	0.14	0.19
	tpy	0.214	0.419	0.634	0.850
NOx	ppm	60	60	60	60
	lb/MMBtu	0.0700	0.0700	0.0700	0.0700
	lb/hr	0.09	0.18	0.27	0.36
	tpy	0.399	0.782	1.183	1.587
NO	ppm	51.0	51.0	51.0	51.0
	lb/MMBtu	0.060	0.060	0.060	0.060
	lb/hr	0.08	0.15	0.23	0.31
	tpy	0.32	0.63	0.95	1.27
NO_2	ppm	9.0	9.0	9.0	9.0
	lb/MMBtu	0.011	0.011	0.011	0.011
	lb/hr	0.01	0.03	0.04	0.05
	tpy	0.08	0.16	0.24	0.32
SOx	ppm	0.34	0.34	0.34	0.34
	lb/MMBtu	0.0006	0.0006	0.0006	0.0006
	lb/hr	0.0008	0.0015	0.0023	0.0030
	tpy	0.003	0.007	0.010	0.013
VOCs	ppm	8	8	8	8
(Non-Methane Only)	lb/MMBtu	0.0036	0.0036	0.0036	0.0036
	lb/hr	0.005	0.009	0.014	0.018
	tpy	0.020	0.040	0.060	0.081
VOCs does not include any background VOC emissions.					
PM10 (Filterable)	ppm	N/A	N/A	N/A	N/A
	lb/MMBtu	0.0019	0.0019	0.0019	0.0019
	lb/hr	0.002	0.005	0.007	0.010
	tpy	0.011	0.021	0.031	0.042
PM10 (Condensable)	lb/MMBtu	0.0056	0.0056	0.0056	0.0056
	lb/hr	0.007	0.014	0.022	0.029
	tpy	0.032	0.062	0.094	0.127
PM2.5 (Filterable)	lb/MMBtu	0.0019	0.0019	0.0019	0.0019
	lb/hr	0.002	0.005	0.007	0.010
	tpy	0.011	0.021	0.031	0.042
PM2.5 (Condensable)	lb/MMBtu	0.0056	0.0056	0.0056	0.0056
	lb/hr	0.007	0.014	0.022	0.029
	tpy	0.032	0.062	0.094	0.127
Exhaust Data					
Temperature, F		375	403	431	459
Flow	ACFM	556	969	1,513	2,094
	SCFM (70 Degrees Fah.)	297	501	757	1,015
	DSCFM	268	445	672	901
	lb/hr	1,337	2,253	3,407	4,568
Velocity	ft/sec	6.64	11.57	18.07	25.01
	ft/min	398	694	1,084	1,501

Notes:

1) All ppm levels are corrected to dry at 3% oxygen.
2) Emission data based on actual boiler efficiency.
3) % H2O , by volume in exhaust gas is **17.24** % O2, by volume **2.47**
4) Water vapor in exhaust gas is **98.91** lbs/MMBtu of fuel fired
5) CO2 produced is **116.31** lbs/MMBtu of fuel fired
6) Particulate is exclusive of any particulates in combustion air or other sources of residual particulates from material.
PM level indicated on this form is based on combustion air and fuel being clean and turndown up to 4:1.
7) Heat input is based on high heating value (HHV).
8.) Emission produced in tons per year (tpy) is based on 24 hours per day for 365 days = 8,760 hours per year
9.) Exhaust data is based on a clean and properly sealed boiler.
10.) Emission data is based on a burner turndown of 4 to 1 above 40 hp.

14) Fuel High Heating Value = **1000** Btu/FT^3

Attachment B

ISR Ratio
CAPCOA Guidance Document
October 27, 2011
Appendix C

Appendix C - In-Stack NO_2/NOx Ratios

Recommend In-stack NO2/NOx Ratios				
Refer #	**Fuel**	**Equipment Category (Controls)**	**Range of Ratios (%)**	**Recommended Ratio (%)**
Boilers				
1	**NG**	Default	10	10
2		6.6 MMBtu/Hr (Force Draft)*[L]	0.0 – 2.90	1.58**
2		7.6 MMBtu/Hr (SCR / FGR)*	3.45 – 15.79	9.65**
2		11.4 MMBtu/Hr (Force Draft)*[L]	1.81 – 3.51	2.68**
Compressor IC Engines				
1	**NG**	Default	60	60
2a		225 BHP IGN Timing BTC 17***	11.61 – 11.86	11.76**
2a		350 BHP IGN Timing BTC 18***	4.37 – 4.83	4.66**
2a		550 BHP IGN Timing BTC 20***	0.93 – 2.98	1.96**
2a		625 BHP IGN Timing BTC 10***	10.97 – 11.96	11.6**
2a		773 BHP IGN Timing BTC 9***	58.04 – 58.54	58.3**
2a		773 BHP IGN Timing BTC 20***	72.65 – 73.42	73.12**
2a		880 BHP IGN Timing BTC 8***	9.79 – 14.14	11.93**
2a		880 BHP IGN Timing BTC 15***	0.7 – 8.28	2.52**
2a		1500 BHP IGN Timing BTC 12***	10.32 – 12.03	11.47**
2a		1500 BHP IGN Timing BTC 6.5***	18.42 – 21.33	19.97**
2a		4000 BHP IGN Timing BTC 5***	22.36 – 25.69	23.82**
2a	**Waste Gas (Field Gas)**	880 BHP IGN Timing BTC 20***	1.77 – 6.10	3.86**
2a		1000 BHP***	0.40 – 0.81	0.64**
Dryer				
	NG	20 MMBTU/Hr (Milk -Tower Dryer)*	3.85 – 11.11	6.88**
Glass Furnace				
2	**NG**	**Glass Furnace**	2.45 – 11.59	4.32**
Heaters				
2	**NG / Refinery Gas**	14.1 MMBTU/Hr (John Zink PSMR)*	11.54 – 52.63	32.0**

Recommend In-stack NO2/NOx Ratios						
Refer #	**Fuel**	**Equipment Category (Controls)**	**Range of Ratios (%)**			**Recommended Ratio (%)**
IC Engines						
2	**Biogas**	200 BHP*	0.0 – 1.90			0.37**
1	**Diesel**	Default	20			20
		322 BHP (WP)*	0.0 – 50.0			15.64**
4	**NG**	Default – Lean Burn	5-10			10
2		120 BHP (3-Way Catalyst)*	0.1 – 2.83			0.9**
2		162 BHP (catalytic converter, air/fuel ratio)*	0.0 – 12.5			1.81**
2		165 BHP (3-Way Catalyst)*	0.0 – 17.58			3.16**
2		180 BHP (NSCR)*	1.02 – 3.41			1.82**
2		208 BHP (catalytic converter, air/fuel ratio)*	0.0 – 1.44			0.48**
2		1,070 BHP (LB/WP–Turbocharger/Intercooler)*	20.91 – 39.62			34.41**
2		1,529 BHP (LB - CO Catalyst, SCR)*	2.70 – 4.58			3.59**
2		2,775 BHP (SCR)*	14.53 – 26.33			19.46**
2		4,175 BHP (SCR,CO & VOC Catalysts)*	0.0 – 21.28			1.15**
Transportation Refrigeration Units (TRUs)						
5		CARB= CARB Diesel GTL = Gas To Liquid	Fuel	Eng Speed	Exhaust	NO_2/ NO_x Ratio
			CARB	High	Muffler	15.37
			GTL	High	Muffler	16.17
			CARB	High	pDPF	25.71
			CARB	Low	Muffler	22.66
			GTL	Low	Muffler	25.12
			CARB	Low	pDPF	12.98
Truck / Cars						
6	**Gas/Diesel**	Light / Medium Duty	16-25			25
	Diesel	Heavy Duty	6-11			11
Turbines						
3	**NG**	GE Turbines	8.33 – 9.1			9.1

Recommend In-stack NO2/NOx Ratios				
Refer #	**Fuel**	**Equipment Category (Controls)**	**Range of Ratios (%)**	**Recommended Ratio (%)**
2a		Solar Centaur T-4702 (3.4 MW)***	8.43 – 12.42	10.32**

* Samples taken each minute or several minutes

**Value represents the statistical average of all data points

*** 30 min / 1 hour Source Test

L = Load ratings have been included in average

LB = Lean Burn

WP = Water Pump

References

1. Barrie Lawrence, Environmental Scientist, Government of Newfoundland and Labrador, "Guideline for Plume Dispersion Modeling" 1st Revision: November 20, 2006, Page 14

2. District Database "NO2 -NOx Ratio.mdb" - Data is based on CEMs, source test, and portable analyzer data collected in the San Joaquin Valley

a. District Database "NO2 -NOx Ratio.mdb" - Data is based on source test data collected from out of state (Arkansas Department of Environmental Quality Office of Air Quality)

3. Roointon Pavri and Gerald D. Moore, GE Energy Services Atlanta, GA, "Gas Turbine Emissions and Control" March 2001 Page 63

4. Nigel N. Clark, Center for Alternative Fuels, Engines and Emissions Department of Mechanical and Aerospace Engineering West Virginia University Morgantown, WV 26506, "Selective NOx Recirculation for Stationary Lean-Burn Natural Gas Engines" April 30, 2007 Page 64

5. Robb A. Barnitt, National Renewable Energy Laboratory, "Emissions of Transport Refrigeration Units with CARB Diesel, Gas-to-Liquid Diesel, and Emissions Control Devices", May 1, 2010

6. P G Boulter, I S McCrae, and J Green, Transportation research Laboratory, "Primary NIO2 Emissions From Road Vehicles in the Hatfield and Bell Commons Tunnels", July 2007

Attachment 6

Basis for each emission rate

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]

Pollutant	Gasoline Fuel (SCC 2-02-003-01, 2-03-003-01)		Diesel Fuel (SCC 2-02-001-02, 2-03-001-01)		EMISSION FACTOR RATING
	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)	
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]

Technology	Affected Parameter	
	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.

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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]

Pollutant	Diesel Fuel (SCC 2-02-004-01)			Dual Fuel[b] (SCC 2-02-004-02)		
	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.

References For Section 3.4

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6. C. Castaldini, *Environmental Assessment Of NO_x Control On A Compression Ignition Large Bore Reciprocating Internal Combustion Engine, Volume I: Technical Results*, EPA-600/7-86/001a, U. S. Environmental Protection Agency, Cincinnati, OH, April 1984.

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11. *Compliance Test Report For Particulate Emissions From A Caterpillar Diesel Generator*, St. Mary's Hospital, Waterburg, CT, TRC Environmental Consultants, 1987.

12. *Compliance Measured Particulate Emissions From An Emergency Diesel Generator, Silorsky Aircraft, United Technologies*, Stratford, CT, TRC Environmental Consultants, 1987.

13. *Compliance Test Report For Particulate Emissions From A Cummins Diesel Generator*, Colonial Gold Limited Partnership, Hartford, CT, TRC Environmental Consultants, 1988.

14. *Compliance Test Report For Particulate Emissions From A Cummins Diesel Generator*, CIGNA Insurance Company, Bloomfield, CT, TRC Environmental Consultants, 1988.

15. *Compliance Test Report For Particulate Emission From A Waukesha Diesel Generator*, Bristol Meyers, Wallinsford, CT, TRC Environmental Consultants, 1987.

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17. *Compliance Measured Particulate Emissions From An Emergency Diesel Generator*, Danbury Hospital, Danbury, CT, TRC Environmental Consultants, 1988.

18. *Compliance Test Report For Particulate Emissions From A Caterpillar Diesel Generator*, Colonial Metro Limited Partnership, Hartford, CT, TRC Environmental Consultants, 1988.

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WEBSTER COMBUSTION
A Selas Heat Technology Company

Estimated Emissions -JB and JBX Burners

The following emissions apply to all JB and JBX burners firing the fuels shown.

Estimated Emission Levels Firing Natural Gas			
Pollutant		**Model JB**	**Model JBX**
NOx (B)	ppm lb/mmbtu	80 0.096	25 0.03
CO (A)	ppm lb/mmbtu	50 0.037	50 0.037
SOx (C)	ppm lb/mmbtu	1 0.001	1 0.001
HC / VOC	ppm lb/mmbtu	20 0.008	20 0.008
PM	ppm lb/mmbtu	na 0.0048	na 0.0048

Estimated Emission Levels Firing #2 Oil (D)			
Pollutant		**Model JB**	**Model JBX**
NOx (B)	ppm lb/mmbtu	135 0.176	120 0.157
CO (A)	ppm lb/mmbtu	50 0.04	50 0.04
SOx (C)	ppm lb/mmbtu	278 0.52	278 0.52
HC / VOC	ppm lb/mmbtu	25 0.013	25 0.013
PM	ppm lb/mmbtu	na 0.014	na 0.014

Assumption used for above (Contact Webster if different assumptions required)

A. CO varies with firing rate. Lower levels available, contact sales.
B. The ppm levels are corrected to 3% Oxygen (15% excess air) and dry volume basis.
C. Maximum sulfur in natural gas is 0.0006% wt.
D. ASTM #2 fuel, 0.02% Nitrogen, 0.5% Sulfur and 0.01% Ash (% by weight).
E. All levels are above backround (ambient) conditions.
F. Emission levels are based on a properly maintained and tuned burner.

Gmail Matthew Lane <theenvironmentallane@gmail.com>

FW: stack parameter data

Albers, Todd <Todd.Albers@curiaglobal.com> Wed, Dec 22, 2021 at 10:50 AM
To: Paul Wade <pwade@montrose-env.com>
Cc: Matthew Lane <theenvironmentallane@gmail.com>

Paul,

See below from Combustion Systems.

Thanks.

Todd

From: Jason Paxson [mailto:jason@csinm.com]
Sent: Wednesday, December 22, 2021 10:00 AM
To: Albers, Todd <Todd.Albers@curiaglobal.com>
Subject: Re: FW: stack parameter data

Hi Todd,

I got the info back from Webster.

For the Balloon Park Superior boiler the flue gas flow rate is 3351 acfm and the stack flue velocity is 25.9 ft/s.

For the Alexander Superior boiler the flue gas flow rate is 1340 acfm and the stack flue velocity is 16.3 ft/s.

Thanks,

Jason Paxson

Combustion Systems

Cleaver-Brooks Boiler Expected Emission Data

Producing Steam Firing **Nat Gas**

BACKGROUND INFORMATION

Date	12/01/21	Boiler Model	CB(LE)
Author	Don Betts	Altitude (feet)	5300
Customer	Curia Global	Operating Pressure (psig)	115.00
City & State	Albuquerque, NM	Furnace Volume (cuft)	33.36
		Furnace Heat Release (btu/hr/cu ft)	91,270
		Heating Surface (sqft)	625
		Nox System	60

Nat Gas		Firing Rate			
		25%	**50%**	**75%**	**100%**
Horsepower		31	63	94	125
Input , Btu/hr		1,301,000	2,552,000	3,859,000	5,175,000
CO	ppm	50	50	50	50
	lb/MMBtu	0.0375	0.0375	0.0375	0.0375
	lb/hr	0.05	0.10	0.14	0.19
	tpy	0.214	0.419	0.634	0.850
NOx	ppm	60	60	60	60
	lb/MMBtu	0.0700	0.0700	0.0700	0.0700
	lb/hr	0.09	0.18	0.27	0.36
	tpy	0.399	0.782	1.183	1.587
NO	ppm	51.0	51.0	51.0	51.0
	lb/MMBtu	0.060	0.060	0.060	0.060
	lb/hr	0.08	0.15	0.23	0.31
	tpy	0.32	0.63	0.95	1.27
NO_2	ppm	9.0	9.0	9.0	9.0
	lb/MMBtu	0.011	0.011	0.011	0.011
	lb/hr	0.01	0.03	0.04	0.05
	tpy	0.08	0.16	0.24	0.32
SOx	ppm	0.34	0.34	0.34	0.34
	lb/MMBtu	0.0006	0.0006	0.0006	0.0006
	lb/hr	0.0008	0.0015	0.0023	0.0030
	tpy	0.003	0.007	0.010	0.013
VOCs	ppm	8	8	8	8
(Non-Methane Only)	lb/MMBtu	0.0036	0.0036	0.0036	0.0036
	lb/hr	0.005	0.009	0.014	0.018
VOCs does not include any background VOC emissions.	tpy	0.020	0.040	0.060	0.081
PM10 (Filterable)	ppm	N/A	N/A	N/A	N/A
	lb/MMBtu	0.0019	0.0019	0.0019	0.0019
	lb/hr	0.002	0.005	0.007	0.010
	tpy	0.011	0.021	0.031	0.042
PM10 (Condensable)	lb/MMBtu	0.0056	0.0056	0.0056	0.0056
	lb/hr	0.007	0.014	0.022	0.029
	tpy	0.032	0.062	0.094	0.127
PM2.5 (Filterable)	lb/MMBtu	0.0019	0.0019	0.0019	0.0019
	lb/hr	0.002	0.005	0.007	0.010
	tpy	0.011	0.021	0.031	0.042
PM2.5 (Condensable)	lb/MMBtu	0.0056	0.0056	0.0056	0.0056
	lb/hr	0.007	0.014	0.022	0.029
	tpy	0.032	0.062	0.094	0.127
Exhaust Data					
Temperature, F		375	403	431	459
Flow	ACFM	556	969	1,513	2,094
	SCFM (70 Degrees Fah.)	297	501	757	1,015
	DSCFM	268	445	672	901
	lb/hr	1,337	2,253	3,407	4,568
Velocity	ft/sec	6.64	11.57	18.07	25.01
	ft/min	398	694	1,084	1,501

Notes:

1) All ppm levels are corrected to dry at 3% oxygen.
2) Emission data based on actual boiler efficiency.
3) % H2O , by volume in exhaust gas is **17.24** % O2, by volume **2.47**
4) Water vapor in exhaust gas is **98.91** lbs/MMBtu of fuel fired
5) CO2 produced is **116.31** lbs/MMBtu of fuel fired
6) Particulate is exclusive of any particulates in combustion air or other sources of residual particulates from material.
PM level indicated on this form is based on combustion air and fuel being clean and turndown up to 4:1.
7) Heat input is based on high heating value (HHV).
8.) Emission produced in tons per year (tpy) is based on 24 hours per day for 365 days = 8,760 hours per year
9.) Exhaust data is based on a clean and properly sealed boiler.
10.) Emission data is based on a burner turndown of 4 to 1 above 40 hp.

14) Fuel High Heating Value = **1000** Btu/FT^3

EMISSIONS COMPLIANCE TEST REPORT
Of Two Cummins Diesel Generator Engines

Performed At The
Curia New Mexico LLC
4272 Balloon Park Campus
Albuquerque, NM 87109

Test Date(s)
November 04, 2021

Project No.
TRC Environmental Corporation Project No. 454646.0000.0000

Report No.
TRC Environmental Corporation Report No. 454646.0000.0000

Original Report Submittal Date
November 24, 2021

TRC Environmental Corporation
400 Corporate Circle Suite P
Golden, Colorado 80401
USA

T (281) 979-5801

Report Certification

I certify that to the best of my knowledge:

- Testing data and all corresponding information have been checked for accuracy and completeness.
- Sampling and analysis have been conducted in accordance with the approved protocol and applicable reference methods (as applicable).
- All deviations, method modifications, or sampling and analytical anomalies are summarized in the appropriate report narrative(s).
- This report includes a total of 108 pages *(including cover, table of contents, and certification pages).*

Associate Project Manager

November 24, 2021
Date

TRC was operating in conformance with the requirements of ASTM D7036-04 during this test program.

Bruce Randall
TRC Emission Testing Technical Director

Table of Contents

EMISSIONS COMPLIANCE TEST REPORT

I. INTRODUCTION

I.A Reasons for conducting test

TRC Environmental Corporation (TRC) performed an emissions compliance test program on the Units 7 & 8 at the 4272 Balloon Park Campus of Curia New Mexico LLC (Curia) in Albuquerque, NM on November 4, 2021. The tests were authorized by and performed for Curia.

The purpose of this test program was to determine emissions of the nitrogen oxides (NOx) and carbon monoxide (CO) while operating at a load greater than 90%. The results of the test program will be used to determine compliance with Albuquerque / Bernalillo County Air Quality Program (A/BCAQP) Authority to Construct (ATC) Permit No. 0491-M7-RV1. The test program was conducted according to the TRC Test Protocol 454646.0000.0000 dated August 16, 2021.

I.B Applicable Regulations and Permits

Albuquerque / Bernalillo County Air Pollution Control Board Authority to Construct Permit No. 0491-M7-RV1.

All testing was performed in accordance with the Code of Federal Regulations, Title 40, Part 60, Appendix A, Methods 1-4, 7E, 9, and 10.

I.C Date of Test

The testing was conducted on November 4, 2021.

I.D. Startup Date:

Unit 7 was installed during July 2003.
Unit 8 was installed during December 2003.

Both units are Model Year 2000 generator sets, purchased used and installed at the facility to replace an older Caterpillar generator set.

I.E. Date of Achievement of Maximum Production Rate:

The generator was available for use immediately after installation was completed.

I.F. Description of Plant Process and Sampling Points

These units are used for the emergency generation of electricity. The gaseous sampling took place in the exhaust stacks of each engine. These stacks are

approximately 35 feet tall, and discharge vertically into the atmosphere. Sample ports were located approximately 33 feet off the ground after the silencer. These sample ports are located in a section of duct with adequate upstream and downstream distances to meet the requirements of EPA Method 1.

I.G, H, & I: Project Contact and Facility Information

Participants		
Test Facility	Curia New Mexico LLC 4272 Balloon Park Rd. NE Albuquerque, NM 87109	Todd Albers Environmental Health & Safety (505) 923-1500 x 33151 (phone) Todd.Albers@curiaglobal.com
Air Emissions Testing Body (AETB)	TRC Environmental Corporation 400 Corporate Circle Suite P Golden, Colorado 80401	Caleb Bradley Associate Project Manager (281) 979-5801 (phone) CBradley@trccompanies.com

I.J: List of Test Participants and their Affiliations

TRC Environmental
Caleb Bradley
Panteleimon Statopulos

Mountaintop Services, LLC
Richard Kingsbury

Albuquerque / Bernalillo County Air Quality Program (A/BCAQP)
Not present

I.K Unit Description and Design Capacities

Unit 7: Cummins KTA50-G9 16-cylinder turbocharged, after-cooled, diesel engine. This engine powers a DFLE-4487400 generator. This generator set is utilized for the emergency generation of electricity, which is used at the facility in the event of a grid power failure. The engine burns low-sulfur diesel oil as a fuel source. The engine/generator set is rated for 1500 kilowatts. Engine Serial Number is 77931-132 and generator Serial Number is K000172332.

Unit 8: Cummins KTA50-G9 16-cylinder turbocharged, after-cooled, diesel engine. This engine powers a DFLE-4487400 generator. This generator set is utilized for the emergency generation of electricity. The engine burns low-sulfur diesel oil as a fuel source. The engine/generator set is rated for 1500 kilowatts. Engine Serial Number is 77931-97 and generator Serial Number is G000131896.

I.L CONTROL EQUIPMENT DESCRIPTION

The units tested utilize no pollution control equipment.

II.A-B SUMMARY OF RESULTS

No problems were encountered with the testing equipment during the test program. No changes or problems were encountered that required modification of any procedures presented in the test plan. No adverse test or environmental conditions were encountered during the conduct of this test program. The table of results are on the following pages.

II.A-C. SUMMARY OF RESULTS, RUNS 1 – 3

(Unit #7, Test Summary)

Client: Curia
Plant Name: Curia New Mexico LLC
Sampling Location: Emergency Generator 7
Date: 11/04/2021
Technicians: CRB & PSS

Test Number	***1***	***2***	***3***		
Load Condition	101%	102%	103%		
Date	11/04/21	11/04/21	11/04/21		
Start Time	11:00 AM	12:10 PM	1:29 PM		
Stop Time	12:00 PM	1:10 PM	2:29 PM		
Engine/Generator Operation					
Engine Speed, rpm	1800.0	1800.0	1800.0		
Power (kW)	1444	1444	1444		
Frequency (Hz)	60.0	60.0	60.0		
Voltage (V)	483	483	483		
Current (Amps)	1732	1730	1730		
Calculated on-site rated Hp	1911	1890	1876		
Horsepower (estimated from power)	1936	1936	1936		
Ambient Conditions					
Atmospheric Pressure (in. Hg)	25.12	25.09	25.05		
Temperature (°F dry)	55.0	60.0	63.0		
Measured Emissions (dry) (corrected for instrument drift)				**Averages**	
NOx (ppmv)	1206.9	1224.3	1243.4	**1224.85**	
CO (ppmv)	593.5	643.0	684.6	**640.36**	
O2 (%)	8.33	8.12	7.99	**8.15**	
CO2 (%)	9.26	9.38	9.44	**9.36**	
Exhaust Flow Rates					
via EPA Methods 1-4 (SCFH, dry)	228801.29	226311.68	226928.62	**227347.19**	**Permit Limits**
Mass Emission Rates (Based on Methods 1-4)					
NOx (lbs/hr)	33.0	33.1	33.7	**33.3**	**69.3**
CO (lbs/hr)	9.9	10.6	11.3	**10.6**	**15.9**
NOx (tons/yr) {based on 500 hrs/year}	8.2	8.3	8.4	**8.3**	**17.3**
CO (tons/yr) {based on 500 hrs/year}	2.5	2.6	2.8	**2.6**	**4.0**

II: A-C. Summary of Results, Runs 1-3
(Unit #8, Test Summary)
Operational Data, Concentrations, Exhaust Flow Rates, Mass Emission Rates

Client: Curia
Plant Name: Curia New Mexico LLC
Sampling Location: Emergency Generator 8
Date: 11/04/2021
Technicians: Curia New Mexico LLC

Test Number	***1***	***2***	***3***		
Load Condition	104%	104%	103%		
Date	11/04/21	11/04/21	11/04/21		
Start Time	3:55 PM	5:03 PM	6:13 PM		
Stop Time	4:55 PM	6:03 PM	7:13 PM		
Engine/Generator Operation					
Engine Speed, rpm	1800.0	1800.0	1800.0		
Power (kW)	1449	1444	1444		
Frequency (Hz)	60.0	60.0	60.0		
Voltage (V)	484	484	484		
Current (Amps)	1734	1731	1730		
Calculated on-site rated Hp	1861	1861	1878		
Horsepower (estimated from power)	1943	1936	1936		
Ambient Conditions					
Atmospheric Pressure (in. Hg)	24.99	24.98	24.97		
Temperature (°F dry)	66.0	66.0	61.0		
Measured Emissions (dry) (corrected for instrument drift)				**Averages**	
NOx (ppmv)	1258.1	1262.6	1244.4	**1255.04**	
CO (ppmv)	613.9	628.2	617.1	**619.74**	
O2 (%)	7.96	7.89	7.97	**7.94**	
CO2 (%)	9.54	9.56	9.47	**9.52**	
Exhaust Flow Rates					
via EPA Methods 1-4 (SCFH, dry)	242124.20	237391.14	225139.55	**234884.96**	**Permit Limits**
Mass Emission Rates (Based on Methods 1-4)					
NOx (lbs/hr)	36.4	35.8	33.5	**35.2**	**69.3**
CO (lbs/hr)	10.8	10.8	10.1	**10.6**	**15.9**
NOx (tons/yr) {based on 500 hrs/year}	9.1	9.0	8.4	**8.8**	**17.3**
CO (tons/yr) {based on 500 hrs/year}	2.7	2.7	2.5	**2.6**	**4.0**

II.C Control Equipment Operating Parameters

Not Applicable

II.D Comparison of Measured and Modeled Parameters

Not Applicable

III. TEST PROCEDURES

All testing, sampling, analytical, and calibration procedures used for this test program were performed in accordance with the methods presented in the following sections. Where applicable, the Quality Assurance Handbook for Air Pollution Measurement Systems, Volume III, Stationary Source Specific Methods, USEPA 600/R-94/038c, September 1994 was used to supplement procedures.

TRC integrates our Quality Management System (QMS) into every aspect of our testing service. We follow the procedures specified in current published versions of the test Method(s) referenced in this report. Any modifications or deviations are specifically identified in the body of the report. We routinely participate in independent, third party audits of our activities, and maintain:

- Accreditation from the Stack Testing Accreditation Council (STAC) and the American Association for Laboratory Accreditation (A2LA) that our operations conform with the requirements of ASTM D 7036 as an Air Emission Testing Body (AETB).

These accreditations demonstrate that our systems for training, equipment maintenance and calibration, document control and project management will fully ensure that project objectives are achieved in a timely and efficient manner with a strict commitment to quality.

All calibrations are performed in accordance with the test Method(s) identified in this report. If a Method allows for more than one calibration approach, or if approved alternatives are available, the calibration documentation in the appendices specifies which approach was used. All measurement devices are calibrated or verified at set intervals against standards traceable to the National Institute of Standards and Technology (NIST). NIST traceability information is available upon request.

ASTM D7036-04 specifies that: *"AETBs shall have and shall apply procedures for estimating the uncertainty of measurement. Conformance with this section may be demonstrated by the use of approved test protocols for all tests. When such protocols are used, reference shall be made to published literature, when available, where estimates of*

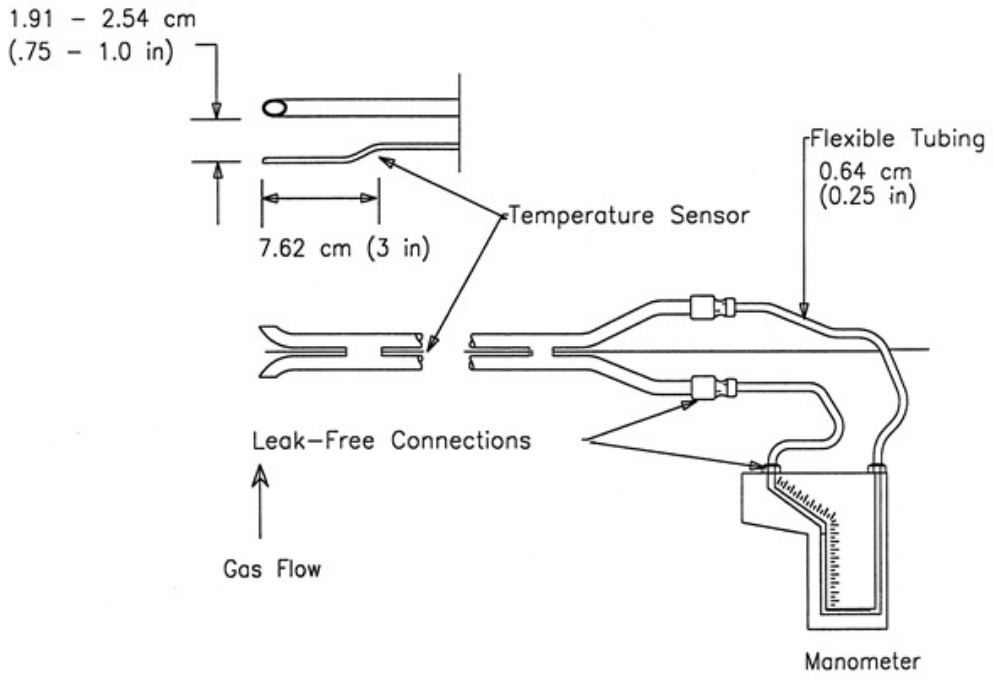
uncertainty for test methods may be found." TRC conforms to this section by using approved test protocols for all tests.

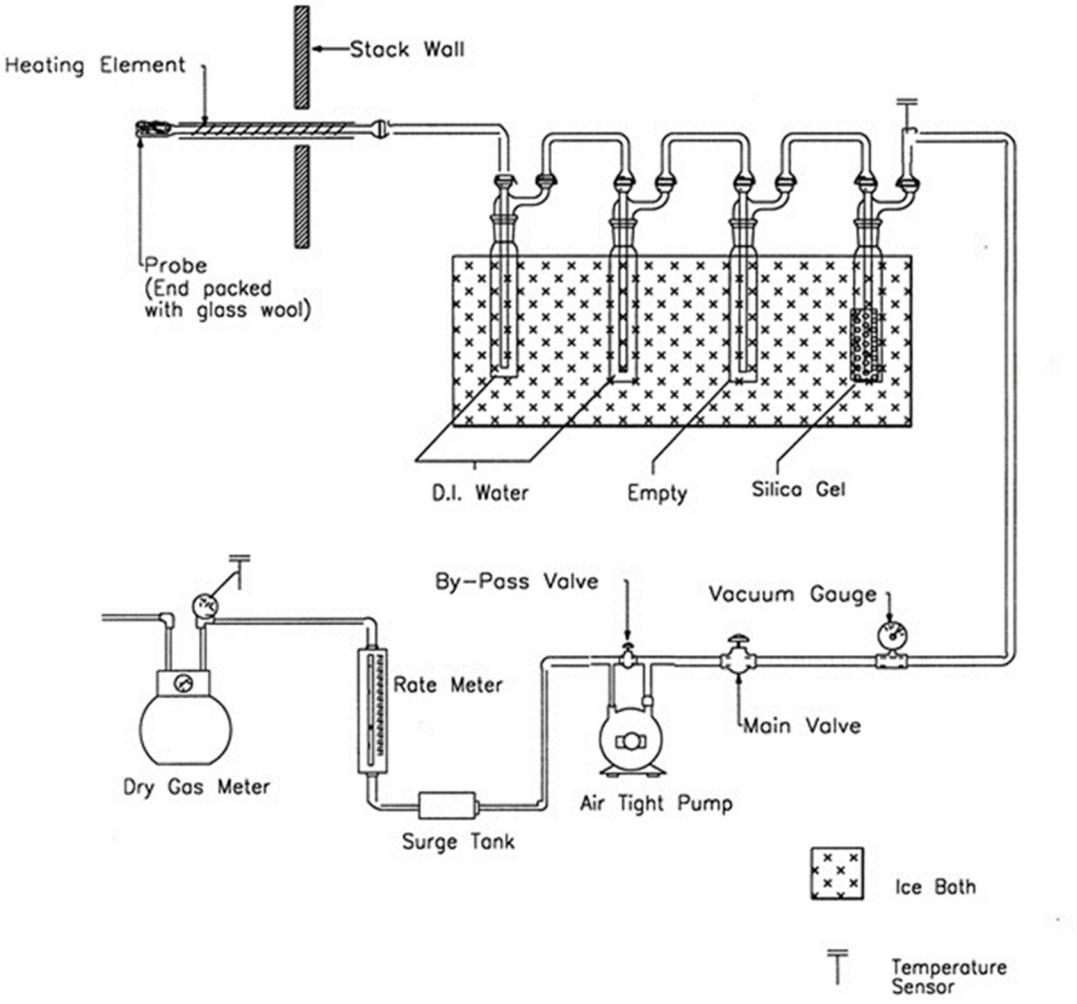
III.A Schematic Drawing of Exhaust Stack

Please see Section IV.A.

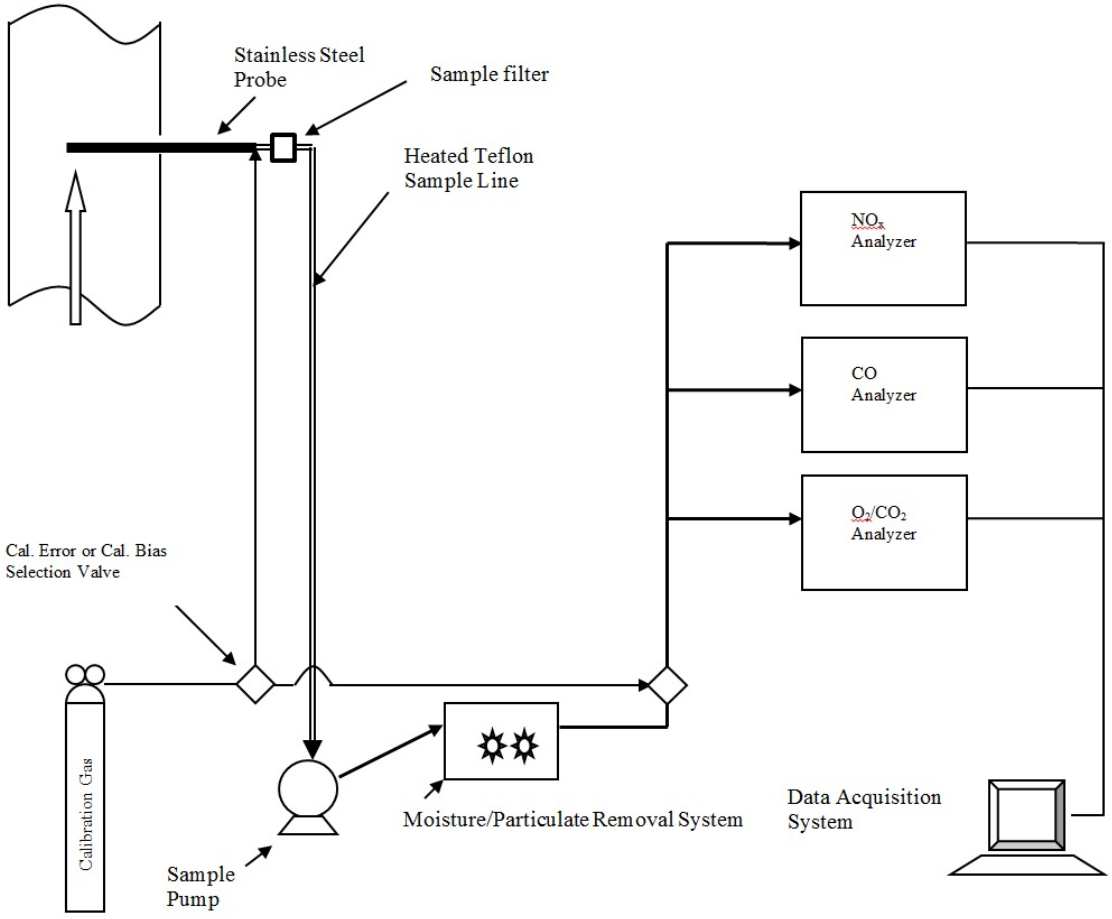
III.B Schematic drawings of sampling devices/trains

USEPA Promulgated Test Method 2




Heating Element
Stack Wall
Probe
(End packed
with glass wool)
D.I. Water
Empty
Silica Gel
By-Pass Valve
Vacuum Gauge
Rate Meter
Main Valve
Dry Gas Meter
Air Tight Pump
Surge Tank
Ice Bath
Temperature
Sensor

Gaseous Test Methods (EPA Methods 3A, 7E, & 10):



III.C Descriptions of EPA Reference Test Methods

III.C.1 Determination of Sample Point Locations by USEPA Method 1

This method is applicable to gas streams flowing in ducts, stacks, and flues and is designed to provide guidance for the selection of sampling ports and traverse points at which sampling for air pollutants will be performed. Sample ports must be located at least two duct diameters downstream and a half a duct diameter upstream from any flow disturbance.

The cross-section of the measurement site was divided into a number of equal areas, and the traverse points were located in the center of each area. The minimum number of points were determined from Figure 1-2 (non-particulate) of the Method.

III.C.2 Volumetric Flow Rate Determination by USEPA Method 2

This method is applicable for the determination of the average velocity and the volumetric flow rate of a gas stream.

The gas velocity head (ΔP) and temperature were measured at traverse points defined by USEPA Method 1. The velocity head was measured with a standard pitot tube and oil-filled manometer; and the gas temperature was measured with a Type K thermocouple. The average gas velocity in the flue was calculated based on: the gas density (as determined by USEPA Methods 3A and 4); the flue gas pressure; the average of the square roots of the velocity heads at each traverse point, and the average flue gas temperature.

III.C.3 Determination of the Concentration of Gaseous Pollutants Using a Multi-Pollutant Sampling System

Concentrations of the pollutants in the following sub-sections were determined using one sampling system. The number of points at which sample was collected was determined in accordance with Method 7E specifications.

A straight-extractive sampling system was used. A data logger continuously recorded pollutant concentrations and generated one-minute averages of those concentrations. All calibrations and system checks were conducted using USEPA Procedure G1 gases. Three-point linearity checks were performed prior to sampling, and in the event of a failing system bias or drift test (and subsequent corrective action). System bias and drift checks were performed using the low-level gas and either the high- or mid-level gas (as specified in the appendices) prior to and following each test run.

III.C.3.A CO_2 Determination by USEPA Method 3A

This method is applicable for the determination of CO_2 concentrations in controlled and uncontrolled emissions from stationary sources only when specified within the regulations. The CO_2 analyzer was equipped with a non-dispersive infrared (IR) detector.

III.C.3.B O_2 Determination by USEPA Method 3A

This method is applicable for the determination of O_2 concentrations in controlled and uncontrolled emissions from stationary sources only when specified within the regulations. The O_2 analyzer was equipped with a paramagnetic-based detector.

III.C.3.D NO_x Determination by USEPA Method 7E

This method is applicable for the determination of NO_x concentrations in controlled and uncontrolled emissions from stationary sources only when specified within the regulations. The NO_x analyzer utilized a photomultiplier tube to measure the linear and proportional luminescence caused by the reaction of nitric oxide and ozone.

III.C.3.E CO Determination by USEPA Method 10

This method is applicable for the determination of CO concentrations in controlled and uncontrolled emissions from stationary sources only when specified within the regulations. The non-dispersive infrared analyzer (NDIR) CO analyzer was equipped with an internal gas correlation filter wheel, which eliminates potential detector interference. As such, use of an interference removal trap was not required.

III.C.4 Moisture Determination by USEPA Method 4

This method is applicable for the determination of the moisture content of stack gas.

A gas sample was extracted at a constant rate from the source. Moisture was removed from the sample stream by a series of pre-weighed impingers immersed in an ice bath. A minimum of 21 dry standard cubic feet of flue gas was collected during each sample run.

III.C.5 Visible Emissions Determination by USEPA Method 9

This method is applicable for the determination of the opacity of emissions from stationary sources pursuant to § 60.11(b) and for visually determining opacity of emissions.

Opacity observations were made by a qualified observer. Observations were made at the point of greatest opacity in the portion of the plume where condensed water vapor was not present. Observations were made at 15-second intervals for a six (6) minute period once during each test run.

III.D Deviations from EPA Reference Test Methods

There were no deviations from published test methods.

III.E Analytical Instrumentation

Parameter	Manufacturer	Model	Serial Number
Nitrogen Oxides (NO_x)	Thermo	42i	1151350002
Carbon Monoxide (CO)	Thermo	48i	1171950007
Oxygen (O_2)	Servomex	1440	01440D1/4115
Carbon Dioxide (CO_2)	Servomex	1440	01440D1/4115

III.F Method(s) for obtaining operational data

Operational data was taken from available instrumentation control panels or gauges by Mountaintop personnel at regular intervals during the test program. Operational parameters obtained during the testing included engine rpm, engine temperature, generator voltage, current, power output, and other data as available.

IV. DATA AND CALCULATIONS

IV.A Raw Emission Test Data

Mountaintop Services, LLC

Richard Kingsbury
Power Generation Systems Specialist
505-559-3426

Load Bank Test Report

Date 11/4/2021 Customer CURIA Site 4272 West Hours 345

Engine Model KTA50-G9 Gen Model DFLE-4487400 S/N K000172332 KW Rating 1500

Voltage 480/277 Phase 3Ø Max AMPS 1804

Time	OUTPUT VOLTAGE AB	BC	CA	HZ	CURRENT A	B	C	KW	O/PRES	W/TEMP	O/TEMP	AMBIENT TEMP
9:00	482	482	483	60.2	854	854	840	712	94	151	113	44
9:15	483	483	483	60.1	1724	1722	1726	1444	77	172	182	45
9:30	483	483	483	60.1	1722	1719	1730	1444	70	173	205	46
10:00	483	483	483	60.2	1723	1720	1731	1444	70	174	207	49
10:30	483	483	483	60.2	1725	1719	1733	1442	70	173	207	51
11:00	483	483	483	60.2	1727	1719	1728	1444	69	174	207	52
11:30	483	483	483	60.2	1723	1721	1733	1445	69	174	209	55
12:00	483	483	483	60.2	1723	1719	1734	1444	69	174	206	56
12:30	483	483	483	60.2	1721	1719	1727	1444	68	174	209	59
1:00	483	483	483	60.2	1720	1718	1734	1444	68	176	208	60
1:30	483	483	483	60.2	1721	1717	1731	1444	67	176	209	61
2:00	483	483	483	60.2	1721	1719	1729	1444	67	177	209	63
2:30	483	483	483	60.2	1719	1719	1728	1444	67	177	208	63

Notes:

TRC

Page 1 of 1

40 CFR 60 Method 1 -- TRAVERSE POINT LOCATIONS

Project No. 454646.0000.0000		Date	11-04-2021
Client Curia New Mexico LLC		Operator Name	P. Stathopulos
Facility Curia New Mexico LLC	Source	Generator, Cumins	

Dimensions

Circular ✓ Rectangular *(inside dimensions)*

Far Wall to Outside of Port (in.)	12.25	Stack Width (in.)	N/A
Port Length (in.)	0.25	Depth (in.)	N/A
Stack Diameter or Depth (in.)	12.0	Equiv. Stack Diameter (in.)	N/A

Point No.	A Internal Dimension (in.)	B Internal Dimension (%)	(A x B) Distance from Inside Wall (in.)	C Port Length (in.)	(A x B) + C Point Location (in.)
1	12.0	6.7	0.8	0.25	1.05
2	12.0	25	3.0	0.25	3.25
3	12.0	75	9.0	0.25	9.25
4	12.0	93.3	11.2	0.25	11.45

Comments:

Stack / Ports Stack Type: ✓ Circular ___ Rectangular

Number and Type of Ports Available 2, drilled

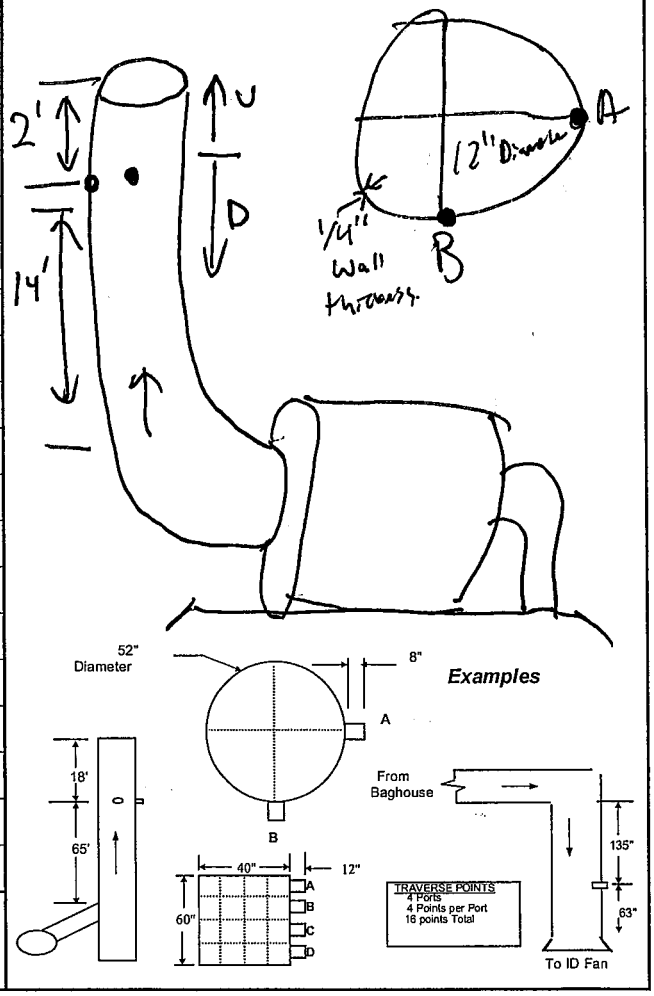
Port Inside Diameter (in.) ~ 3/4"

Distance to Flow Disturb. Reference: ___ Disturbance ✓ Port

	Distance (ft)	Diameters
Upstream (U)	2	2
Downstream (D)	14	14
Number of Traverse Points	Particulates	Velocity
Minimum Required	—	8
Number of Ports Used	—	2
Points per Port	—	4

Test Location Schematic(s)

1. Include distances to disturbances and note what they are.
2. Show and label all ports. Note which was used for each test type.
3. Indicate the air flow direction.



NA = Not Applicable

Checked By: _____ (Project Manager or QA Manager - sign and date) 11/22/2021

TRC

Page 1 of 1

40 CFR 60 Methods 2 and 4 -- VELOCITY and MOISTURE

Project No. 454646	160-24 PSS 11-18-21		Date 11-04-2021
Client Curia New Mexico LLC	Pitot ID ~~2-4~~ CB 11-04-2021		Operator Name P. Stathopulos
Facility Curia New Mexico LLC	PTCF / Cp ~~0.84 1.000~~ 0.84		Gauge Sensitivity 0.01
Source Cummins Desil Generator	Internal Dimensions (in.) 3/8		Thermocouple ID 4706473
Sampling Location Stack	Meter Console ID JC 12012		Meter Console Y 1.00
Condition Load Bank	Meter ID 1204011		Meter Console DH@ 1.850
	Barometer ID 26477226		Barometric Pressure (in. Hg) 25.12

Velocity Traverse Data

Run No. 1

Stack CO_2 (%) | Stack O_2 (%) | P Static (in. H_2O) +4.9

Run Time (24-hr) Start 1117 Stop 1127

Traverse Point No.	Flue Gas Temp. (°F)	DP (in H_2O)
A 1	891	5.01
2	897	~~5.66~~ 5.60
3	895	5.63
4	892	5.12
B 1	892	5.05
2	896	5.64
3	896	5.65
4	891	5.09
AVERAGE		

PSS 11-04-21

545.61 PSS 11-04-21

Moisture Sample Data

Run No. 1

Test Time: Clock (24-hr)	Elapsed (min)	DGM Reading (ft^3)	DGM Temp. (°F): Inlet	Outlet	DH (in. H_2O)	Vacuum (in. Hg)	Imp. Exit Temp. (°F)
1100	0	516.065	74	74	0.85	5.0	67
1105	5	518.63	75	75	0.85	5.0	61
1110	10	521.45	75	75	0.9	5.0	58
1115	15	524.32	76	76	0.9	5.0	58
1120	20	527.26	76	76	0.9	5.0	58
1125	25	530.44	77	77	0.9	5.0	60
1130	30	533.43	78	78	0.9	5.0	63
1135	35	536.44	79	79	0.9	5.0	61
1140	40	539.39	79	79	0.9	5.0	59
1145	45	542.53	79	79	0.93	5.0	59
1150	50	~~545.61~~	79	79	0.95	5.0	59
1155	55	548.79	81	81	0.95	5.0	59
1200	60	551.895					

Moisture Analysis Results

	#1	#2	#3	#4	Silica Gel
Reagent	H_2O	H_2O	MT		57
Final Weight (g)	875.3	743.9	622.7		965.4
Initial Weight (g)	834.1	738.0	621.8		957.0
Net Moisture Weight Gain (g)	41.2	5.9	0.9		8.4
Total Moisture (g)					56.4

Leak Check Data

Meter Console	Pre-Test	Post-Test
Vacuum (in Hg)	5.0	5.0
Rate (cfm)	0.001	0.001
Pitot Tube	Pre-Test ✓	Post-Test ✓

O_2 / CO_2 Data

	Fyrite	Orsat	CEM
O_2 %			✓
CO_2 %			✓

Balance Tracking Information

Field Balance ID	OHAUS 7131470376	
Standard Weight ID	5NL9	
Actual (g):	Measured (g):	Delta:
500.0	499.8	0.2

PSS 11-4-21

Checked By: _____
(Project Manager or QA Manager - sign and date)
11/22/2021

AM-FDS-35 R0

TRC 40 CFR 60 Methods 2 and 4 -- VELOCITY and MOISTURE

Project No. 454646.0000.0000	160-24 PSS 11-18-21		Date 11-04-2021
Client Curia New Mexico LLC	Pitot ID ~~T-1~~ CB 11-04-2021		Operator Name P. Stathopoulos
Facility Curia New Mexico LLC	PTCF / Cp ~~0.840~~ 1.00 0.99		Gauge Sensitivity 0.01
Source Cummins Desil Generator	Internal Dimensions (in.) 3/8		Thermocouple ID 47084473
Sampling Location Stack	Meter Console ID 120-1011		Meter Console Y 1.00
Condition Load Bank	Meter ID JC12012		Meter Console Δ H@ 1.850
Probe Temp °F —	Barometer ID 26477226		Barometric Pressure (in. Hg) 25.09

Velocity Traverse Data

Run No. 2

Stack CO_2 (%)	Stack O_2 (%)	P Static (in. H_2O)
		+4.2

Run Time (24-hr): Start 1226 Stop 1236

552.248 PSS 11-4-21

Traverse Point No.	Flue Gas Temp. (°F)	Δ P (in H_2O)
A1	891	5.01
2	895	5.63
3	897	5.58
4	892	5.09
~~5~~		
~~6~~		
B1	892	5.09
2	896	5.61
3	896	5.59
4	893	5.12
~~5~~		
~~6~~		
AVERAGE		

PSS 11-4

PSS 11-4

Moisture Sample Data

Run No. 2

Test Time: Clock (24-hr)	Elapsed (min)	DGM Reading (ft^3)	DGM Temp. (°F): Inlet	Outlet	Δ H (in. H_2O)	Vacuum (in. Hg)	Imp. Exit Temp. (°F)
1210	0	~~552.245~~	81	81	0.85	6.0	67
1215	5	555.18	81	81	0.85	6.0	61
1220	10	558.13	81	81	0.87	6.0	59
1225	15	561.09	81	81	0.87	6.0	59
1230	20	564.03	81	81	0.87	6.0	59
1235	25	~~566.98~~	82	82	0.87	6.0	61
1240	30	~~569.88~~	82	82	0.9	6.0	61
1245	35	~~572.76~~	83	83	0.85	6.0	62
1250	40	~~575.68~~	83	83	0.85	6.0	62
1255	45	~~578.53~~	83	83	0.85	6.0	63
1300	50	~~581.55~~	83	83	0.85	6.0	63
1305	55	584.37	83	83	0.85	6.0	64
1310	60	587.305					

Moisture Analysis Results

	#1	#2	#3	#4	Silica Gel
Reagent	H_2O	H_2O	MT		SI
Final Weight (g)	871.7	671.0	597.5		847.0
Initial Weight (g)	830.3	663.8	596.6		839.5
Net Moisture Weight Gain (g)	41.4	7.2	0.9		7.5
Total Moisture (g)					57

Leak Check Data

Meter Console	Pre-Test	Post-Test
Vacuum (in Hg)	8.0	8.0
Rate (cfm)	0.061	0.001
Pitot Tube	Pre-Test + ✓ - ✓	Post-Test + ✓ - —

O_2 / CO_2 Data

	Fyrite	Orsat	CEM
O_2 %			✓
CO_2 %			✓

Balance Tracking Information

Field Balance ID		
Standard Weight ID		
Actual (g):	Measured (g):	Delta:

Checked By: _____ 11/22/2021
(Project Manager or QA Manager - sign and date)

NA = Not Applicable

TRC 40 CFR 60 Methods 2 and 4 -- VELOCITY and MOISTURE

Project No. 454646.0000.0000	160-24 PSS 11-18-21		Date 11-04-2021
Client Curia New Mexico LLC	Pitot ID ~~24~~ 0.99 CB 11-4-21		Operator Name R. Stathopoulos
Facility Curia New Mexico LLC	PTCF / Cp ~~0.84~~ ~~0.00~~ PSS 11-4		Gauge Sensitivity 0.01
Source Cumins Desil Generator	Internal Dimensions (in.) 3/8		Thermocouple ID 47084173
Sampling Location Stack	Meter Console ID 12041011		Meter Console Y 1.00
Condition Load Bank	Meter ID JC12012		Meter Console ΔH@ 1.850
Probe Temp °F ~	Barometer ID 26417226		Barometric Pressure (in. Hg) 25.05

Velocity Traverse Data

Run No. 3

Stack CO_2 (%)	Stack O_2 (%)	P Static (in. H_2O)
~	~	4.1

Run Time (24-hr): Start 1400 Stop 1410

Traverse Point No.	Flue Gas Temp. (°F)	ΔP (in H_2O)
A 1	~~842~~	5.02
2	917	5.54
3	916	5.61
4	909	5.12
~	~	~
B 1	911	5.13
2	921	5.67
3	914	5.69
4	908	5.09
AVERAGE		

1410 PSS 11-4-21

1404 1409 PSS 11-4-21

Moisture Sample Data

Run No. 3

Test Time Clock (24-hr)	Test Time Elapsed (min)	DGM Reading (ft^3)	DGM Temp. (°F) Inlet	DGM Temp. (°F) Outlet	ΔH (in. H_2O)	Vacuum (in. Hg)	Imp. Exit Temp. (°F)
1329	0	587.734	82	82	0.85	5.0	66
1334	5	590.65	82	82	0.88	5.0	63
1339	10	593.74	82	82	0.88	5.0	60
1344	15	596.78	82	82	0.88	5.0	59
1349	20	599.63	82	82	0.88	5.0	59
1354	25	602.59	82	82	0.88	5.0	59
1359	30	605.71	82	82	0.88	5.0	59
~~1364~~	35	608.70	82	82	0.88	5.0	59
~~1369~~	40	611.65	82	82	0.88	5.0	58
1414	45	614.63	82	82	0.88	5.0	58
1419	50	617.68	82	82	0.88	5.0	58
1424	55	620.66	82	82	0.88	5.0	58
1429	60	623.646	~	~	~	~	~

Moisture Analysis Results

	#1	#2	#3	#4	Silica Gel
Reagent	H_2O	H_2O	MT		SI
Final Weight (g)	917.7	750.7	624.3		973.3
Initial Weight (g)	875.3	743.9	622.7		965.4
Net Moisture Weight Gain (g)	42.4	6.8	1.6		7.9
Total Moisture (g)					58.7

Leak Check Data

Meter Console	Pre-Test	Post-Test
Vacuum (in Hg)	8.0	8.0
Rate (cfm)	0.001	0.001
Pitot Tube	Pre-Test ✓ + ✓ -	Post-Test ✓ + ✓ -

O_2 / CO_2 Data

	Fyrite	Orsat	CEM
O_2 %			✓
CO_2 %			✓

Balance Tracking Information

Field Balance ID		
Standard Weight ID		
Actual (g):	Measured (g):	Delta:

Checked By: [signature] (Project Manager or QA Manager - sign and date) 11/22/2021

NA = Not Applicable

Mountaintop Services, LLC

Richard Kingsbury
Power Generation Systems Specialist
505-559-3426

Load Bank Test Report

Date 11/4/2021 Customer CURIA Site 4277 EAST Hours 332

Engine Model KTA 50-G9 Gen Model DFLC-4479762 S/N 60001318896 KW Rating 1500

Voltage 480/277 Phase 3Φ Max AMPS 1804

Time	OUTPUT VOLTAGE AB	BC	CA	HZ	CURRENT A	B	C	KW	O/PRES	W/TEMP	O/TEMP	AMBIENT TEMP
2:50	484	484	484	60.1	1724	1715	1734	1447	80	174	170	64
3:20	484	484	484	60.1	1726	1715	1736	1449	78	178	183	65
3:50	484	484	484	60.1	1727	1715	1736	1449	77	179	183	65
4:20	484	484	484	60.1	1719	1713	1731	1444	70	186	215	66
4:50	484	484	484	60.1	1721	1714	1734	1449	70	189	218	67
5:20	484	484	484	60.1	1721	1715	1731	1444	69	189	220	66
5:50	484	484	484	60.2	1724	1719	1736	1444	70	188	216	66
6:20	484	484	484	60.2	1721	1715	1727	1444	70	188	218	64
6:58	484	484	484	60.2	1719	1715	1731	1447	70	185	216	61
7:20	484	484	484	60.2	1720	1717	1732	1447	71	185	218	60

Notes:

40 CFR 60 Method 1 -- TRAVERSE POINT LOCATIONS

Project No. 454646.0000.0000		Date	11-04-2021
Client Curia New Mexico LLC		Operator Name	P. Stathopulos
Facility Curia New Mexico LLC	Source	Generator, Cumins	

Dimensions

Circular ✓ Rectangular *(inside dimensions)*

Far Wall to Outside of Port (in.)	12.25	Stack Width (in.)	N/A
Port Length (in.)	0.25	Depth (in.)	N/A
Stack Diameter or Depth (in.)	12.0	Equiv. Stack Diameter (in.)	N/A

Point No.	A Internal Dimension (in.)	B Internal Dimension (%)	(A x B) Distance from Inside Wall (in.)	C Port Length (in.)	(A x B) + C Point Location (in.)
1	12.0	6.7	0.8	0.25	1.05
2	12.0	25	3.0	0.25	3.25
3	12.0	75	9.0	0.25	9.25
4	12.0	93.3	11.2	0.25	11.45

Comments:

Stack / Ports Stack Type: ✓ Circular ___ Rectangular

Number and Type of Ports Available 2, drilled

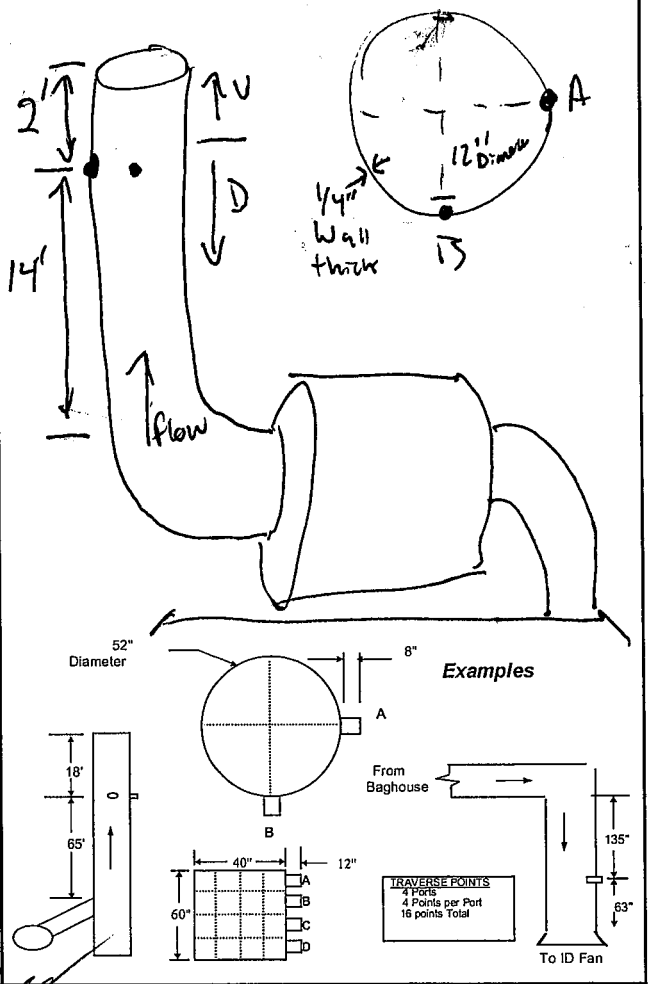
Port Inside Diameter (in.) ~ 3/4 inch

Distance to Flow Disturb. Reference: ___ Disturbance ✓ Port

	Distance (ft)	Diameters
Upstream (U)	2	2
Downstream (D)	14	14
Number of Traverse Points	Particulates	Velocity
Minimum Required	—	8
Number of Ports Used	—	2
Points per Port	—	4

Test Location Schematic(s)

1. Include distances to disturbances and note what they are.
2. Show and label all ports. Note which was used for each test type.
3. Indicate the air flow direction.



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40 CFR 60 Methods 2 and 4 -- VELOCITY and MOISTURE

Project No. 454646.0000.0000			Date 11-04-2021
Client Curia New Mexico LLC	Pitot ID 160-24		Operator Name P. Stathopulos
Facility Curia New Mexico LLC	PTCF / Cp 0.99		Gauge Sensitivity 0.01
Source Curias Diesel Generator	Internal Dimensions (in.) 3/8		Thermocouple ID 97084173
Sampling Location Stack	Meter Console ID 1204011		Meter Console Y 1.00
Condition Load Bank	Meter ID DC12012		Meter Console ΔH@ 1.850
Probe Temp °F	Barometer ID 26477226		Barometric Pressure (in. Hg) 24.99

Velocity Traverse Data

Run No. 1

Stack CO_2 (%)	Stack O_2 (%)	P Static (in. H_2O)
		2.9

Run Time (24-hr): Start 1620 Stop 1630

Traverse Point No.	Flue Gas Temp. (°F)	ΔP (in H_2O)
A1	910	5.02
2	911	5.37
3	916	5.56
4	909	5.22
B1	911	5.11
2	912	5.38
3	911	5.62
4	911	5.25
AVERAGE		

Moisture Sample Data

Run No. 1

Test Time: Clock (24-hr)	Test Time: Elapsed (min)	DGM Reading (ft^3)	DGM Temp. (°F): Inlet	DGM Temp. (°F): Outlet	ΔH (in. H_2O)	Vacuum (in. Hg)	Imp. Exit Temp. (°F)
15 55	0	645.815	83	83	0.88	5.0	67
1600	5	648.63	83	83	0.88	5.0	67
1605	10	651.57	83	83	0.88	5.0	63
1610	15	654.52	82	82	0.88	5.0	59
1615	20	657.50	82	82	0.88	5.0	58
1620	25	660.45	83	83	0.88	5.0	57
1625	30	663.40	83	83	0.88	6.0	56
1630	35	666.37	82	82	0.88	6.0	56
1635	40	669.36	82	82	0.88	6.0	57
1640	45	672.33	82	82	0.88	6.0	57
1645	50	675.32	82	82	0.88	6.0	57
1650	55	678.32	82	82	0.88	6.0	58
1655	60	681.300					

Moisture Analysis Results

	#1	#2	#3	#4	Silica Gel
Reagent	H_2O	H_2O	mt		Si
Final Weight (g)	758.7	679.8	600.0		857.0
Initial Weight (g)	718.3	672.8	598.4		850.2
Net Moisture Weight Gain (g)	40.4	7.0	1.6		6.8
				Total Moisture (g)	55.8

Leak Check Data

Meter Console	Pre-Test	Post-Test
Vacuum (in Hg)	8.0	8.0
Rate (cfm)	0.001	0.001
Pitot Tube	Pre-Test: + ✓ / - ✓	Post-Test: + ✓ / - ✓

O_2 / CO_2 Data

	Fyrite	Orsat	CEM
O_2 %			✓
CO_2 %			

Balance Tracking Information

Field Balance ID	
Standard Weight ID	
Actual (g):	Measured (g): Delta:

Checked By: _____ 11/22/2021
(Project Manager or QA Manager - sign and date)

NA = Not Applicable

TRC 40 CFR 60 Methods 2 and 4 -- VELOCITY and MOISTURE

Project No. 454646.0000.0000			Date 11-04-2021
Client Curtis New Mexico LLC	Pitot ID 160-24		Operator Name P. Stathopulos
Facility Curtis New Mexico LLC	PTCF / Cp 0.99		Gauge Sensitivity 0.01
Source Cumins Diesel Generator	Internal Dimensions (in.) 3/8		Thermocouple ID 47084173
Sampling Location Stack	Meter Console ID 12041011		Meter Console Y 1.00
Condition load Bank	Meter ID JC 12012		Meter Console ΔH@ 1.850
	Probe Temp °F —	Barometer ID 26417226	Barometric Pressure (in. Hg) 24.98

Velocity Traverse Data

Run No. 2

Stack CO_2 (%)	Stack O_2 (%)	P Static (in. H_2O)
		3.2

Run Time (24-hr): Start 1723 Stop 1733

Traverse Point No.	Flue Gas Temp. (°F)	ΔP (in H_2O)
A1	918	5.04
2	921	5.47
3	920	5.38
4	919	5.11
B1	916	5.09
2	919	5.50
3	920	5.49
4	917	5.21
AVERAGE		

Moisture Sample Data

Run No. 2

Test Time: Clock (24-hr)	Elapsed (min)	DGM Reading (ft^3)	DGM Temp. (°F): Inlet	DGM Temp. (°F): Outlet	ΔH (in. H_2O)	Vacuum (in. Hg)	Imp. Exit Temp. (°F)
1703	0	681.840	81	81	0.88	5.0	65
1708	5	684.81	82	82	0.88	5.0	58
1713	10	687.73	82	82	0.88	5.0	55
1718	15	690.71	81	81	0.88	5.0	54
1723	20	693.67	81	81	0.88	5.0	52
1728	25	696.65	81	81	0.88	5.0	52
1733	30	699.62	81	81	0.88	5.0	52
1738	35	702.62	81	81	0.88	5.0	52
1743	40	705.59	81	81	0.88	5.0	52
1748	45	708.55	81	81	0.88	5.0	53
1753	50	711.50	80	80	0.88	5.0	53
1758	55	714.56	80	80	0.88	5.0	53
1803	60	717.571					

Moisture Analysis Results

	#1	#2	#3	#4	Silica Gel
Reagent	H_2O	H_2O	MT		SI
Final Weight (g)	777.6	756.5	626.1		983.1
Initial Weight (g)	735.7	751.2	623.9		973.5
Net Moisture Weight Gain (g)	41.9	5.3	2.2		9.6
Total Moisture (g)				59.0	

Leak Check Data

Meter Console	Pre-Test	Post-Test
Vacuum (in Hg)	8.0	8.0
Rate (cfm)	0.001	0.001

Pitot Tube	Pre-Test	Post-Test
	+ ✓	+ ✓
	- ✓	- ✓

O_2 / CO_2 Data

	Fyrite	Orsat	CEM
O_2 %			✓
CO_2 %			✓

Balance Tracking Information

Field Balance ID		
Standard Weight ID		
Actual (g):	Measured (g):	Delta:

Checked By: Caleb Bradley
(Project Manager or QA Manager - sign and date)
11/22/2021

NA = Not Applicable

TRC 40 CFR 60 Methods 2 and 4 -- VELOCITY and MOISTURE

Project No. 545646.0000.0000			Date 11-04-2021
Client Curia New Mexico LLC	Pitot ID 160-24		Operator Name P. Stathopulos
Facility Curia New Mexico LLC	PTCF / Cp 0.99		Gauge Sensitivity 0.01
Source Cumins Diesel Generator	Internal Dimensions (in.) 3 1/8		Thermocouple ID 47084173
Sampling Location Stack	Meter Console ID 12041011		Meter Console Y 1.00
Condition Load Bank	Meter ID SC12012		Meter Console Δ H@ 1.850
Probe Temp °F —	Barometer ID 26417226		Barometric Pressure (in. Hg) 24.97

Velocity Traverse Data

Run No. 3

Stack CO_2 (%)	Stack O_2 (%)	P Static (in. H_2O)
		3.4

Run Time (24-hr) Start 1822 Stop 1832

Traverse Point No.	Flue Gas Temp. (°F)	Δ P (in H_2O)
A1	920	5.12
2	925	5.41
3	924	5.48
4	921	5.21
B1	922	5.14
2	926	5.46
3	925	5.44
4	921	5.28
AVERAGE		

Moisture Sample Data

Run No. 3

Test Time Clock (24-hr)	Test Time Elapsed (min)	DGM Reading (ft^3)	DGM Temp. (°F) Inlet	DGM Temp. (°F) Outlet	Δ H (in. H_2O)	Vacuum (in. Hg)	Imp. Exit Temp. (°F)
1813	0	717.925	79	79	0.88	5.0	62
1818	5	720.99	79	79	0.88	6.0	59
1823	10	723.86	78	78	0.88	6.0	58
1828	15	726.81	78	78	0.88	6.0	58
1833	20	729.78	78	78	0.88	6.0	58
1838	25	732.77	78	78	0.88	6.0	57
1843	30	735.76	78	78	0.88	6.0	58
1848	35	738.72	78	78	0.88	6.0	57
1853	40	741.70	78	78	0.88	6.0	58
1858	45	744.68	78	78	0.88	6.0	58
1903	50	747.69	78	78	0.88	6.0	57
1908	55	750.66	78	78	0.88	6.0	57
1913	60	953.636					

Moisture Analysis Results

	#1	#2	#3	#4	Silica Gel
Reagent	H_2O	H_2O	MT		SI
Final Weight (g)	799.5	682.4	600.5		863.9
Initial Weight (g)	758.7	679.8	600.0		857.0
Net Moisture Weight Gain (g)	40.8	2.6	0.5		6.9
Total Moisture (g)					50.8

Leak Check Data

Meter Console	Pre-Test	Post-Test
Vacuum (in Hg)	8.0	8.0
Rate (cfm)	0.001	0.001
Pitot Tube	Pre-Test ✓	Post-Test ✓
	+ ——	+ ——
	- ✓	- ✓

O_2 / CO_2 Data

	Fyrite	Orsat	CEM
O_2 %			✓
CO_2 %			✓

Balance Tracking Information

Field Balance ID		
Standard Weight ID		
Actual (g):	Measured (g):	Delta:

Checked By: [signature] 11/22/2021
(Project Manager or QA Manager - sign and date)

NA = Not Applicable

TRC

VELOCITY and MOISTURE Calculation - Run 1

Project No.	454646			Date	11/04/21
Client	Curia New Mexico LLC	Pitot ID	160-24	Operator Name	PSS
Facility	Curia New Mexico LLC	PTCF / Cp	0.99	Measurement Device Sensitivity	±0.01
Source	Emergency Generator #7	Internal Dimensions (in.)	3/8	Thermocouple ID	4708473
Sampling Location	Exhaust	Barometer ID	2647226	Meter Console Y	1
Condition	90% + Load	Meter Console ID	1204011	Meter Console Δ H@	1.85
Moisture Probe Temperature	250° +	Meter ID	JC12012	Barometric Pressure (in. Hg)	25.12

Velocity Traverse Data

Run No. 1

Stack CO2 (%)	Stack O2 (%)	P Static (in. H2O)
9.26	8.33	4.9

Run Time (24-hr)	Start	Stop
	11:17	11:27

Traverse Point No.	Δ P (in H_2O)	Flue Gas Temp. (°F)	√Δ P
1	5.01	891	2.238
2	5.60	897	2.366
3	5.63	895	2.373
4	5.12	892	2.263
5	5.05	892	2.247
6	5.64	896	2.375
7	5.65	896	2.377
8	5.09	891	2.256
AVERAGE	5.349	893.8	2.312

Moisture Sample Data

Run No. 1

Test Time Clock (24-hr)	Elapsed (min)	DGM Reading (ft^3)	DGM Temp. (°F) Inlet	Outlet	Δ H (in. H_2O)	Vacuum (in. Hg)	Imp. Exit Temp. (°F)
11:00	0	516.065	74	74	0.9	5.0	67
11:05	5	518.63	75	75	0.9	5.0	61
11:10	10	521.45	75	75	0.9	5.0	58
11:15	15	524.32	76	76	0.9	5.0	58
11:20	20	527.26	76	76	0.9	5.0	58
11:25	25	530.44	77	77	0.9	5.0	60
11:30	30	533.43	78	78	0.9	5.0	63
11:35	35	536.44	79	79	0.9	5.0	61
11:40	40	539.39	79	79	0.9	5.0	59
11:45	45	542.53	79	79	0.9	5.0	59
11:50	50	545.61	79	79	1.0	5.0	59
11:55	55	548.78	81	81	1.0	5.0	59
12:00	60	551.895					
Totals / Averages		35.830	77.3		0.9	5.0	60.2

Moisture Analysis Results

	#1	#2	#3	#4	Silica Gel
Reagent	H_2O	H_2O	Dry		Silica Gel
Final Weight (g)	875.3	743.9	622.7		965.4
Initial Weight (g)	834.1	738.0	621.8		957.0
Net Moisture Weight Gain (g)	41.2	5.9	0.9		8.4
				Total Moisture (g)	56.4

Moisture Calculation (EPA Method 4)

Sample volume, corrected to STP:	29.56	SCF
Volume of moisture collected on first 3 impingers:	2.263	ft^3
Volume of moisture collected on silica gel impinger:	0.396	ft^3
Stack exhaust moisture content:	8.3%	
Dry gas fraction:	0.9175	
Molecular Weight (M_s):	28.84	lb/lb-mole

Flow Rate Calculation (EPA Method 2)

Sum of square root of ΔP's :	18.495	
Stack Diameter:	12	inches
Stack area:	0.79	ft^2
Stack velocity:	15932.92	ft/min
Stack flow rate:	**2.29E+05**	**SCFH (dry)**

TRC

VELOCITY and MOISTURE Calculation - Run 2

Project No.	454646			Date	11/04/21
Client	Curia New Mexico LLC	Pitot ID	160-24	Operator Name	PSS
Facility	Curia New Mexico LLC	PTCF / Cp	0.99	Measurement Device Sensitivity	±0.01
Source	Emergency Generator #7	Internal Dimensions (in.)	3/8	Thermocouple ID	4708473
Sampling Location	Exhaust	Barometer ID	2647226	Meter Console Y	1
Condition	90% + Load	Meter Console ID	1204011	Meter Console Δ H@	1.85
Moisture Probe Temperature	250° +	Meter ID	JC12012	Barometric Pressure (in. Hg)	24.85

Velocity Traverse Data

Run No. 2

Stack CO2 (%)	Stack O2 (%)	P Static (in. H2O)
9.38	8.12	4.2

Run Time (24-hr): Start 12:26 — Stop 12:36

Traverse Point No.	Δ P (in H_2O)	Flue Gas Temp. (°F)	√Δ P
1	5.01	891	2.238
2	5.63	895	2.373
3	5.58	897	2.362
4	5.09	892	2.256
5	5.09	892	2.256
6	5.61	896	2.369
7	5.59	896	2.364
8	5.12	893	2.263
AVERAGE	5.340	894.0	2.310

Moisture Sample Data

Run No. 2

Test Time: Clock (24-hr)	Elapsed (min)	DGM Reading (ft^3)	DGM Temp. (°F): Inlet	Outlet	Δ H (in. H_2O)	Vacuum (in. Hg)	Imp. Exit Temp. (°F)
12:10	0	552.245	81	81	0.9	6.0	67
12:15	5	555.18	81	81	0.9	6.0	61
12:20	10	558.13	81	81	0.9	6.0	59
12:25	15	561.09	81	81	0.9	6.0	59
12:30	20	564.03	81	81	0.9	6.0	59
12:35	25	566.98	82	82	0.9	6.0	61
12:40	30	569.88	82	82	0.9	6.0	61
12:45	35	572.76	83	83	0.9	6.0	62
12:50	40	575.68	83	83	0.9	6.0	62
12:55	45	578.530	83	83	0.9	6.0	63
13:00	50	581.550	83	83	0.9	6.0	63
13:05	55	584.370	83	83	0.9	6.0	64
13:10	60	587.305					
Totals / Averages		35.060	82.0	82.0	0.9	6.0	61.8

Moisture Analysis Results

	#1	#2	#3	#4	Silica Gel
Reagent	H_2O	H_2O	Dry		Silica Gel
Final Weight (g)	871.7	671.0	597.5		847.0
Initial Weight (g)	830.3	663.8	596.6		839.5
Net Moisture Weight Gain (g)	41.4	7.2	0.9		7.5
Total Moisture (g)					57.0

Moisture Calculation (EPA Method 4)

Sample volume, corrected to STP:	28.37	SCF
Volume of moisture collected on first 3 impingers:	2.334	ft^3
Volume of moisture collected on silica gel impinger:	0.354	ft^3
Stack exhaust moisture content:	8.7%	
Dry gas fraction:	0.9135	
Molecular Weight (M_s):	28.80	lb/lb-mole

Flow Rate Calculation (EPA Method 2)

Sum of square root of ΔP's :	18.481	
Stack Diameter:	12	inches
Stack area:	0.79	ft^2
Stack velocity:	16033.87	ft/min
Stack flow rate:	**2.26E+05**	**SCFH (dry)**

TRC

VELOCITY and MOISTURE Calculation - Run 3

Project No.	454646			Date	11/04/21
Client	Curia New Mexico LLC	Pitot ID	160-24	Operator Name	PSS
Facility	Curia New Mexico LLC	PTCF / Cp	0.99	Measurement Device Sensitivity	±0.01
Source	Emergency Generator #7	Internal Dimensions (in.)	3/8	Thermocouple ID	4708473
Sampling Location	Exhaust	Barometer ID	2647226	Meter Console Y	1
Condition	90% + Load	Meter Console ID	1204011	Meter Console Δ H@	1.85
Moisture Probe Temperature	250° +	Meter ID	JC12012	Barometric Pressure (in. Hg)	24.82

Velocity Traverse Data

Run No.	3	
Stack CO2 (%)	Stack O2 (%)	P Static (in. H2O)
9.44	7.99	4.1
Run Time (24-hr)	Start 14:00	Stop 14:10

Traverse Point No.	Δ P (in H_2O)	Flue Gas Temp. (°F)	√Δ P
1	5.020	910	2.241
2	5.540	917	2.354
3	5.610	916	2.369
4	5.120	909	2.263
5	5.130	911	2.265
6	5.670	921	2.381
7	5.690	914	2.385
8	5.090	908	2.256
AVERAGE	5.359	913.3	2.314

Moisture Sample Data

Test Time		DGM Reading (ft^3)	DGM Temp. (°F)		Run No. 3		
Clock (24-hr)	Elapsed (min)		Inlet	Outlet	Δ H (in. H_2O)	Vacuum (in. Hg)	Imp. Exit Temp. (°F)
13:29	0	587.734	82	82	0.9	5.0	66
13:34	5	590.65	82	82	0.9	5.0	63
13:39	10	593.74	82	82	0.9	5.0	60
13:44	15	596.78	82	82	0.9	5.0	59
13:49	20	599.63	82	82	0.9	5.0	59
13:54	25	602.59	82	82	0.9	5.0	59
13:59	30	605.71	82	82	0.9	5.0	59
14:04	35	608.70	82	82	0.9	5.0	59
14:09	40	611.65	82	82	0.9	5.0	58
14:14	45	614.63	82	82	0.9	5.0	58
14:19	50	617.68	82	82	0.9	5.0	58
14:24	55	620.66	82	82	0.9	5.0	58
14:29	60	623.646					
Totals / Averages		35.912	82.0	82.0	0.9	5.0	59.7

Moisture Analysis Results

	#1	#2	#3	#4	Silica Gel
Reagent	H_2O	H_2O	Dry		Silica Gel
Final Weight (g)	835.1	738.4	622.7		958.3
Initial Weight (g)	794.6	734.3	621.8		952.8
Net Moisture Weight Gain (g)	40.5	4.1	0.9		5.5
				Total Moisture (g)	51.0

Moisture Calculation (EPA Method 4)

Sample volume, corrected to STP:	29.02	SCF
Volume of moisture collected on first 3 impingers:	2.145	ft^3
Volume of moisture collected on silica gel impinger:	0.259	ft^3
Stack exhaust moisture content:	7.7%	
Dry gas fraction:	0.9235	
Molecular Weight (M_s):	28.92	lb/lb-mole

Flow Rate Calculation (EPA Method 2)

Sum of square root of ΔP's :	18.513	
Stack Diameter:	12	inches
Stack area:	0.79	ft^2
Stack velocity:	16153.14	ft/min
Stack flow rate:	**2.27E+05**	**SCFH (dry)**

II: A-C. Summary of Results, Runs 1-3
(Unit #8, Test Summary)
Operational Data, Concentrations, Exhaust Flow Rates,
Mass Emission Rates

TRC

VELOCITY and MOISTURE Calculation - Run 1

Project No.	454646			Date	11/04/21
Client	Curia New Mexico LLC	Pitot ID	160-24	Operator Name	PSS
Facility	Curia New Mexico LLC	PTCF / Cp	0.99	Measurement Device Sensitivity	±0.01
Source	Emergency Generator #8	Internal Dimensions (in.)	3/8	Thermocouple ID	4708473
Sampling Location	Exhaust	Barometer ID	2647226	Meter Console Y	1
Condition	90% + Load	Meter Console ID	1204011	Meter Console Δ H@	1.85
Moisture Probe Temperature	250° +	Meter ID	JC12012	Barometric Pressure (in. Hg)	25.12

Velocity Traverse Data

Run No.	1		
Stack CO2 (%)	Stack O2 (%)	P Static (in. H2O)	
9.54	7.96	2.9	
Run Time (24-hr)	Start 16:20	Stop 16:30	
Traverse Point No.	Δ P (in H_2O)	Flue Gas Temp. (°F)	√Δ P
1	5.02	910	2.241
2	5.37	911	2.317
3	5.56	910	2.358
4	5.22	909	2.285
5	5.11	911	2.261
6	5.38	912	2.319
7	5.62	911	2.371
8	5.25	911	2.291
AVERAGE	5.316	910.6	2.305

Moisture Sample Data

Test Time		DGM Reading (ft^3)	DGM Temp. (°F)		Run No. 1		
Clock (24-hr)	Elapsed (min)		Inlet	Outlet	Δ H (in. H_2O)	Vacuum (in. Hg)	Imp. Exit Temp. (°F)
15:55	0	645.815	83	83	0.9	5.0	67
16:00	5	648.63	83	83	0.9	5.0	67
16:05	10	651.57	83	83	0.9	5.0	63
16:10	15	654.52	82	82	0.9	5.0	59
16:15	20	657.5	82	82	0.9	5.0	58
16:20	25	660.45	83	83	0.9	5.0	57
16:25	30	663.4	83	83	0.9	6.0	56
16:30	35	666.37	82	82	0.9	6.0	56
16:35	40	669.36	82	82	0.9	6.0	57
16:40	45	672.33	82	82	0.9	6.0	57
16:45	50	675.32	82	82	0.9	6.0	57
16:50	55	6278.32	82	82	0.9	6.0	58
16:55	60	681.300					
Totals / Averages		5632.505	82.4		0.9	5.5	59.3

Moisture Analysis Results

	#1	#2	#3	#4	Silica Gel
Reagent	H_2O	H_2O	Dry		Silica Gel
Final Weight (g)	758.7	679.8	600.0		857.0
Initial Weight (g)	718.3	672.8	598.4		850.2
Net Moisture Weight Gain (g)	40.4	7.0	1.6		6.8
Total Moisture (g)					55.8

Moisture Calculation (EPA Method 4)

Sample volume, corrected to STP:	4603.21	SCF
Volume of moisture collected on first 3 impingers:	2.310	ft^3
Volume of moisture collected on silica gel impinger:	0.321	ft^3
Stack exhaust moisture content:	0.1%	
Dry gas fraction:	0.9994	
Molecular Weight (M_s):	29.84	lb/lb-mole

Flow Rate Calculation (EPA Method 2)

Sum of square root of ΔP's :	18.443	
Stack Diameter:	12	inches
Stack area:	0.79	ft^2
Stack velocity:	15761.93	ft/min
Stack flow rate:	**2.42E+05**	**SCFH (dry)**

II: A-C. Summary of Results, Runs 1-3
(Unit #8, Test Summary)
Operational Data, Concentrations, Exhaust Flow Rates, Mass Emission Rates

TRC

VELOCITY and MOISTURE Calculation - Run 2

Project No.	454646			Date	11/04/21
Client	Curia New Mexico LLC	Pitot ID	160-24	Operator Name	PSS
Facility	Curia New Mexico LLC	PTCF / Cp	0.99	Measurement Device Sensitivity	±0.01
Source	Emergency Generator #8	Internal Dimensions (in.)	3/8	Thermocouple ID	4708473
Sampling Location	Exhaust	Barometer ID	2647226	Meter Console Y	1
Condition	90% + Load	Meter Console ID	1204011	Meter Console Δ H@	1.85
Moisture Probe Temperature	250° +	Meter ID	JC12012	Barometric Pressure (in. Hg)	24.85

Velocity Traverse Data

Run No.	2		
Stack CO2 (%)	Stack O2 (%)	P Static (in. H2O)	
9.56	7.89	3.2	
Run Time (24-hr)	Start 17:23	Stop 17:33	
Traverse Point No.	Δ P (in H_2O)	Flue Gas Temp. (°F)	√Δ P
1	5.04	918	2.245
2	5.47	921	2.339
3	5.38	920	2.319
4	5.11	919	2.261
5	5.09	916	2.256
6	5.50	919	2.345
7	5.49	920	2.343
8	5.21	917	2.283
AVERAGE	5.286	918.8	2.299

Moisture Sample Data

Test Time		DGM Reading (ft^3)	DGM Temp. (°F)		Run No. 2		
Clock (24-hr)	Elapsed (min)		Inlet	Outlet	Δ H (in. H_2O)	Vacuum (in. Hg)	Imp. Exit Temp. (°F)
17:03	0	681.840	81	81	0.9	5.0	65
17:08	5	684.81	82	82	0.9	5.0	58
17:13	10	687.73	82	82	0.9	5.0	55
17:18	15	690.71	81	81	0.9	5.0	54
17:23	20	693.67	81	81	0.9	5.0	52
17:28	25	969.65	81	81	0.9	5.0	52
17:33	30	699.62	81	81	0.9	5.0	52
17:38	35	702.62	81	81	0.9	5.0	52
17:43	40	705.59	81	81	0.9	5.0	52
17:48	45	708.550	81	81	0.9	5.0	53
17:53	50	711.500	80	80	0.9	5.0	53
17:58	55	714.560	80	80	0.9	5.0	53
18:03	60	717.571					
Totals / Averages		287.810	81.0	81.0	0.9	5.0	54.3

Moisture Analysis Results

	#1	#2	#3	#4	Silica Gel
Reagent	H_2O	H_2O	Dry		Silica Gel
Final Weight (g)	777.6	756.5	626.1		983.1
Initial Weight (g)	735.7	751.2	623.9		973.5
Net Moisture Weight Gain (g)	41.9	5.3	2.2		9.6
Total Moisture (g)					59.0

Moisture Calculation (EPA Method 4)

Sample volume, corrected to STP:	233.30	SCF
Volume of moisture collected on first 3 impingers:	2.329	ft^3
Volume of moisture collected on silica gel impinger:	0.453	ft^3
Stack exhaust moisture content:	1.2%	
Dry gas fraction:	0.9882	
Molecular Weight (M_s):	29.71	lb/lb-mole

Flow Rate Calculation (EPA Method 2)

Sum of square root of ΔP's :	18.391	
Stack Diameter:	12	inches
Stack area:	0.79	ft^2
Stack velocity:	15877.18	ft/min
Stack flow rate:	**2.37E+05**	**SCFH (dry)**

II: A-C. Summary of Results, Runs 1-3
(Unit #8, Test Summary)
Operational Data, Concentrations, Exhaust Flow Rates, Mass Emission Rates

TRC

VELOCITY and MOISTURE Calculation - Run 3

Project No.	454646			Date	11/04/21
Client	Curia New Mexico LLC	Pitot ID	160-24	Operator Name	PSS
Facility	Curia New Mexico LLC	PTCF / Cp	0.99	Measurement Device Sensitivity	±0.01
Source	Emergency Generator #8	Internal Dimensions (in.)	3/8	Thermocouple ID	4708473
Sampling Location	Exhaust	Barometer ID	2647226	Meter Console Y	1
Condition	90% + Load	Meter Console ID	1204011	Meter Console Δ H@	1.85
Moisture Probe Temperature	250° +	Meter ID	JC12012	Barometric Pressure (in. Hg)	24.82

Velocity Traverse Data

Run No.	3		
Stack CO2 (%)	Stack O2 (%)	P Static (in. H2O)	
9.47	7.97	3.4	
Run Time (24-hr)	Start 18:22	Stop 18:32	
Traverse Point No.	Δ P (in H_2O)	Flue Gas Temp. (°F)	√Δ P
1	5.120	920	2.263
2	5.410	925	2.326
3	5.480	924	2.341
4	5.210	921	2.283
5	5.140	922	2.267
6	5.460	926	2.337
7	5.440	925	2.332
8	5.280	921	2.298
AVERAGE	5.318	923.0	2.306

Moisture Sample Data

Test Time		DGM Reading (ft^3)	DGM Temp. (°F)		Run No. 3		
Clock (24-hr)	Elapsed (min)		Inlet	Outlet	Δ H (in. H_2O)	Vacuum (in. Hg)	Imp. Exit Temp. (°F)
18:13	0	717.925	79	79	0.9	5.0	62
18:18	5	720.99	79	79	0.9	6.0	59
18:23	10	723.86	78	78	0.9	6.0	58
18:28	15	726.81	78	78	0.9	6.0	58
18:33	20	729.78	78	78	0.9	6.0	57
18:38	25	732.77	78	78	0.9	6.0	58
18:43	30	735.76	78	78	0.9	6.0	57
18:48	35	738.72	78	78	0.9	6.0	58
18:53	40	741.70	78	78	0.9	6.0	58
18:58	45	744.68	78	78	0.9	6.0	58
19:03	50	747.69	78	78	0.9	6.0	57
19:08	55	750.66	78	78	0.9	6.0	57
19:13	60	753.636					
Totals / Averages		35.711	78.2	78.2	0.9	5.9	58.1

Moisture Analysis Results

	#1	#2	#3	#4	Silica Gel
Reagent	H_2O	H_2O	Dry		Silica Gel
Final Weight (g)	799.5	682.4	600.5		863.9
Initial Weight (g)	758.7	679.8	600.0		857.0
Net Moisture Weight Gain (g)	40.8	2.6	0.5		6.9
Total Moisture (g)					50.8

Moisture Calculation (EPA Method 4)

Sample volume, corrected to STP:	29.06	SCF
Volume of moisture collected on first 3 impingers:	2.070	ft^3
Volume of moisture collected on silica gel impinger:	0.325	ft^3
Stack exhaust moisture content:	7.6%	
Dry gas fraction:	0.9239	
Molecular Weight (M_s):	28.93	lb/lb-mole

Flow Rate Calculation (EPA Method 2)

Sum of square root of ΔP's :	18.446	
Stack Diameter:	12	inches
Stack area:	0.79	ft^2
Stack velocity:	16166.04	ft/min
Stack flow rate:	**2.25E+05**	**SCFH (dry)**

IV.B LABORATORY DATA

Not Applicable

IV.C Copy of Data Log Records

NO_x, CO, O_2, and CO_2

454645Curia Initial Calibration Error Test

Date/Time: 11/4/2021 8:27:43

Result: PASS

Operator: CRB/PS

Plant: Curia New Mexico LLC

Location: Albuquerque NM

Source ID: Cummins Diesel Generator Engies

Reference Cylinder IDs

	Zero ID:	Low ID:	Mid ID:	High ID:
O2	CC704230		CC84055	CC210288
CO2	CC704230		CC84055	CC210288
NOx	CC704230		CC129528	CC280768
CO	CC704230		EB0067614	CC427696

Calibration Error Results

Channel:	O2	CO2	NOx	CO
Units:	ppm	ppm	ppm	ppm
Span:	22.03	21.69	806.2	200.7
Range:	25	25	1000	500
Method:	EPA 7E	EPA 7E	EPA 7E	EPA 7E
Zero Ref:	0	0	0	0
Zero Cal:	0.097	0.184	0.910	0.377
Zero Error:	0.40%	0.80%	0.10%	0.20%
Low Ref:				
Low Cal:				
Low Error:				
Mid Ref:	10.02	9.936	408.9	102.8
Mid Cal:	10.104	9.972	406.884	101.088
Mid Error:	0.40%	0.20%	-0.30%	-0.90%
High Ref:	22.03	21.69	806.2	200.7
High Cal:	22.086	21.645	807.357	201.256
High Error:	0.30%	-0.20%	0.10%	0.30%
Cal Result:	PASSED	PASSED	PASSED	PASSED

454645Curia Initial NOX CE Test

Date/Time:	11/4/2021	8:29:34
Result:	PASS	

Operator:	CRB/PS
Plant:	Curia New Mexico LLC
Location:	Albuquerque NM
Source ID:	Cummins Diesel Generator Engies

Reference Cylinder IDs

	NOx (NO2) ID
NOx	CC507600

NOx Converter Efficiency Results

Channel:	NOx
Units:	ppm
Span:	806.2
Range:	1000
Method:	EPA 7E

NOx Ref:	50.12
NOx Cal:	49.824
NOx Error:	-0.60%

Cal Result: PASSED

454645Curia Initial System Bias Check

Date/Time:	11/4/2021	8:43:02
Result:	PASS	

Operator:	CRB/PS
Plant:	Curia New Mexico LLC
Location:	Albuquerque NM
Source ID:	Cummins Diesel Generator Engies

Reference Cylinder IDs

	Low ID	Upscale ID	Span ID
O2	CC704230	CC84055	CC210288
CO2	CC704230	CC84055	CC210288
NOx	CC704230	CC129528	CC280768
CO	CC704230	EB0067614	CC427696

System Bias Check Results

Analyte:	O2	CO2	NOx	CO
Units:	ppm	ppm	ppm	ppm
Span:	22.03	21.69	806.2	200.7
Range:	25	25	1000	500
Method:	EPA 7E	EPA 7E	EPA 7E	EPA 7E
Low Cal:	0.097	0.184	0.910	0.377
Low Sys:	0.188	0.202	1.675	0.383
Low Bias:	0.40%	0.10%	0.10%	0.00%
Upscale Cal:	10.104	9.972	406.884	101.088
Upscale Sys:	10.054	9.868	417.503	101.094
Upscale Bias	-0.20%	-0.50%	1.30%	0.00%
Bias Result:	PASSED	PASSED	PASSED	PASSED

454645Curia Response Time
Date/Time: 11/4/2021 8:51:44

Operator: CRB/PS
Plant: Curia New Mexico LLC
Location: Albuquerque NM
Source ID: Cummins Diesel Generator Engies

Response Time Results

Analyte:	O2		CO2		NOx		CO	
Units:	ppm		ppm		ppm		ppm	
Span:	22.03		21.69		806.2		200.7	
Range:	25		25		1000		500	
Method:	EPA 7E		EPA 7E		EPA 7E		EPA 7E	
Upscale Lvl:	9.551		9.368		396.628		96.039	
Dnscale Lvl:	1.102		1.085		40.31		10.035	
Upscale (s):	0:25		0:37		0:59		1:09	
Dnscale (s):	0:31		0:33		0:59		1:10	
	Upscale	Dnscale	Upscale	Dnscale	Upscale	Dnscale	Upscale	Dnscale
	0.159	10.030	0.186	9.827	1.390	416.504	20.333	97.299
	0.153	10.032	0.189	9.838	1.414	416.471	20.341	99.635
	0.153	10.040	0.192	9.828	1.447	416.517	20.329	99.625
	0.160	10.031	0.193	9.836	1.425	416.500	20.338	99.634
	0.154	10.038	0.187	9.835	1.430	416.513	20.335	99.624
	0.151	10.030	0.193	9.839	1.425	416.506	20.338	99.626
	0.158	10.034	0.185	9.836	1.421	416.533	20.320	99.642
	0.157	10.034	0.195	9.833	1.427	416.508	15.104	99.640
	0.147	10.040	0.183	9.842	1.408	416.546	4.686	99.638
	0.157	10.039	0.193	9.838	1.397	416.513	4.706	99.610
	0.158	10.028	0.190	9.846	1.405	416.462	4.695	99.843
	0.154	10.037	0.192	9.847	1.414	416.559	4.690	100.289
	0.156	10.048	0.198	9.841	1.449	416.487	4.694	100.298
	0.152	10.038	0.205	9.850	1.414	416.504	4.702	100.301
	0.155	10.040	0.195	9.850	1.423	416.541	4.698	100.323
	0.149	10.038	0.191	9.856	1.390	416.552	4.688	100.289
	0.162	10.031	0.199	9.860	1.412	416.495	4.687	100.288
	0.150	10.038	0.185	9.852	1.456	416.537	3.646	100.288
	0.160	10.045	0.188	9.854	1.394	416.504	1.528	100.307
	0.160	10.040	0.190	9.858	1.403	416.583	1.544	100.298
	0.167	10.058	0.183	9.853	1.414	416.493	1.546	100.424
	0.387	10.272	0.199	9.861	1.421	416.519	1.541	100.684
	1.840	10.818	0.198	9.829	1.416	416.535	1.552	100.669
	5.217	11.107	0.192	9.609	1.410	416.541	1.554	100.692
	8.635	10.580	0.210	9.167	1.405	416.495	1.544	100.680
	9.823	9.233	0.212	8.721	1.438	416.519	1.526	100.704
		7.148	0.252	8.040	1.443	416.561	1.532	100.691
		4.936	0.387	6.750	1.390	416.574	2.704	100.688
		3.177	0.940	5.121	1.386	416.537	5.060	100.683
		2.027	2.163	3.543	1.403	416.620	5.055	100.677
		1.327	4.009	2.348	1.405	416.852	5.069	97.402
		0.901	5.770	1.531	1.419	416.815	5.067	90.799
			7.114	1.118	1.405	416.800	5.057	90.798
			8.117	0.847	1.386	416.754	5.061	90.785
			8.752		1.419	416.817	5.071	90.791
			9.126		1.412	416.763	5.066	90.806
			9.351		1.408	416.802	5.062	90.813
			9.502		1.408	416.784	13.726	90.801
					13.150	416.784	31.006	90.797
					36.603	406.365	31.017	90.822
					36.630	385.496	31.015	81.314
					36.614	385.498	31.027	62.315
					36.605	385.492	31.013	62.310
					36.621	385.476	30.998	62.310
					36.603	385.487	31.017	62.327
					36.621	385.505	31.022	62.324
					36.621	385.525	31.014	62.330
					36.627	385.505	40.504	62.317
					149.063	385.468	59.445	62.315
					373.969	273.445	59.439	62.341
					373.984	49.285	59.449	53.068
					374.023	49.281	59.437	34.550
					373.997	49.320	59.466	34.547
					374.052	49.305	59.440	34.571
					373.964	49.329	59.449	34.544
					373.944	49.292	59.436	34.544
					373.960	49.305	59.430	34.550
					373.944	49.305	67.466	34.543
					386.815	49.294	83.485	34.547
					412.542	35.164	83.459	34.566
							83.487	27.361
							83.460	13.023
							83.468	13.000
							83.460	13.006
							83.460	13.015
							83.467	13.022
							83.441	12.999
							87.692	13.011
							96.158	13.001
								13.008
								9.865

454645Curia Repeat Calibration Error 1

Date/Time:	11/4/2021	10:50:54
Result:	PASS	

Operator:	CRB/PS
Plant:	Curia New Mexico LLC
Location:	Albuquerque NM
Source ID:	Cummins Diesel Generator Engies

Reference Cylinder IDs

	Zero ID:	Low ID:	Mid ID:	High ID:
NOx	CC704230		CC280768	CC702206
CO	CC704230		CC129528	CC280768

Calibration Error Results

Channel:	NOx	CO
Units:	ppm	ppm
Span:	1641	811.5
Range:	2000	1000
Method:	EPA 7E	EPA 7E
Zero Ref:	0	0
Zero Cal:	4.335	0.233
Zero Error:	0.30%	0.00%
Low Ref:		
Low Cal:		
Low Error:		
Mid Ref:	806.2	404.4
Mid Cal:	812.192	406.98
Mid Error:	0.40%	0.30%
High Ref:	1641	811.5
High Cal:	1641.560	808.291
High Error:	0.00%	-0.40%
Cal Result:	PASSED	PASSED

454645Curia Repeat System Bias 1

Date/Time:	11/4/2021	10:57:04
Result:	PASS	

Operator:	CRB/PS
Plant:	Curia New Mexico LLC
Location:	Albuquerque NM
Source ID:	Cummins Diesel Generator Engies

Reference Cylinder IDs

	Low ID	Upscale ID	Span ID
NOx	CC704230	CC280768	CC702206
CO	CC704230	CC280768	CC280768

System Bias Check Results

Analyte:	NOx	CO
Units:	ppm	ppm
Span:	1641	811.5
Range:	2000	1000
Method:	EPA 7E	EPA 7E
Low Cal:	4.335	0.233
Low Sys:	18.349	0.744
Low Bias:	0.90%	0.10%
Upscale Cal:	812.192	808.291
Upscale Sys:	806.913	804.352
Upscale Bias	-0.30%	-0.50%
Bias Result:	PASSED	PASSED

454645Curia Test Run 1

Start: 11/4/2021 11:00:00
End: 11/4/2021 12:00:00

Operator: CRB/PS
Plant: Curia New Mexico LLC
Location: Albuquerque NM
Source ID: Cummins Diesel Generator Engies

Time	Entry	O2 ppm	CO2 ppm	NOx ppm	CO ppm
11:00:59	1min avg:	8.360	9.161	1179.477	569.284
11:01:59	1min avg:	8.352	9.175	1182.255	570.541
11:02:59	1min avg:	8.362	9.173	1187.711	569.385
11:03:59	1min avg:	8.345	9.190	1189.207	575.489
11:04:59	1min avg:	8.351	9.187	1189.829	581.103
11:05:59	1min avg:	8.360	9.182	1192.921	573.367
11:06:59	1min avg:	8.380	9.170	1193.317	568.147
11:07:59	1min avg:	8.363	9.182	1192.355	571.384
11:08:59	1min avg:	8.371	9.175	1194.849	570.056
11:09:59	1min avg:	8.376	9.178	1193.349	568.963
11:10:59	1min avg:	8.391	9.171	1193.894	565.164
11:11:59	1min avg:	8.500	9.174	1190.397	568.625
11:12:59	1min avg:	8.555	9.176	1190.193	567.095
11:13:59	1min avg:	8.467	9.179	1190.546	566.538
11:14:59	1min avg:	8.456	9.187	1190.347	571.853
11:15:59	1min avg:	8.543	9.191	1190.470	569.265
11:16:59	1min avg:	8.525	9.200	1191.537	573.179
11:17:59	1min avg:	8.498	9.204	1191.270	578.570
11:18:59	1min avg:	8.521	9.198	1191.452	576.074
11:19:59	1min avg:	8.514	9.195	1191.784	571.647
11:20:59	1min avg:	8.422	9.203	1191.117	571.936
11:21:59	1min avg:	8.364	9.204	1189.457	576.289
11:22:59	1min avg:	8.381	9.198	1191.277	569.823
11:23:59	1min avg:	8.363	9.213	1188.844	577.317
11:24:59	1min avg:	8.494	9.212	1188.951	575.972
11:25:59	1min avg:	8.513	9.210	1189.873	577.640
11:26:59	1min avg:	8.373	9.218	1189.301	579.792
11:27:59	1min avg:	8.329	9.217	1190.755	580.930
11:28:59	1min avg:	8.401	9.216	1191.099	577.992
11:29:59	1min avg:	8.449	9.224	1190.510	580.875
11:30:59	1min avg:	8.327	9.218	1191.363	584.127
11:31:59	1min avg:	8.311	9.218	1190.801	579.656
11:32:59	1min avg:	8.331	9.219	1189.014	579.599
11:33:59	1min avg:	8.395	9.219	1189.792	580.906
11:34:59	1min avg:	8.445	9.223	1188.107	584.975
11:35:59	1min avg:	8.412	9.248	1187.957	590.626
11:36:59	1min avg:	8.285	9.243	1188.662	593.049
11:37:59	1min avg:	8.289	9.230	1188.828	586.846
11:38:59	1min avg:	8.281	9.237	1188.901	590.630
11:39:59	1min avg:	8.292	9.234	1189.297	588.077
11:40:59	1min avg:	8.285	9.237	1188.126	581.885
11:41:59	1min avg:	8.316	9.234	1188.546	587.339
11:42:59	1min avg:	8.305	9.232	1187.230	583.956
11:43:59	1min avg:	8.292	9.227	1187.610	584.404
11:44:59	1min avg:	8.277	9.235	1187.753	585.715
11:45:59	1min avg:	8.186	9.294	1184.441	600.097
11:46:59	1min avg:	8.269	9.291	1187.044	617.662
11:47:59	1min avg:	8.228	9.292	1187.245	613.138
11:48:59	1min avg:	8.202	9.294	1186.424	616.983
11:49:59	1min avg:	8.221	9.273	1188.141	611.282
11:50:59	1min avg:	8.254	9.287	1187.186	610.818
11:51:59	1min avg:	8.359	9.280	1186.275	611.047
11:52:59	1min avg:	8.370	9.272	1188.125	605.539
11:53:59	1min avg:	8.354	9.266	1188.352	603.623
11:54:59	1min avg:	8.232	9.270	1187.296	605.153
11:55:59	1min avg:	8.238	9.262	1188.454	600.551
11:56:59	1min avg:	8.185	9.291	1187.024	609.974
11:57:59	1min avg:	8.223	9.268	1188.178	605.201
11:58:59	1min avg:	8.179	9.297	1186.906	611.556
11:59:59	1min avg:	8.169	9.299	1186.923	617.214
12:00:00	Test Avgs:	8.353	9.224	1189.138	585.276

454645Curia Run 1 Final Bias & Drift Check

Date/Time:	11/4/2021 12:08:02
Result:	PASS
Operator:	CRB/PS
Plant:	Curia New Mexico LLC
Location:	Albuquerque NM
Source ID:	Cummins Diesel Generator Engies

Reference Cylinder IDs

	Low ID	Upscale ID	Span ID
O2	CC704230	CC84055	CC210288
CO2	CC704230	CC84055	CC210288
NOx	CC704230	CC280768	CC702206
CO	CC704230	CC280768	CC280768

System Bias Check Results

Analyte:	O2	CO2	NOx	CO
Units:	ppm	ppm	ppm	ppm
Span:	22.03	21.69	1641	811.5
Range:	25	25	2000	1000
Method:	EPA 7E	EPA 7E	EPA 7E	EPA 7E
Low Cal:	0.097	0.184	4.335	0.233
Low Sys:	0.086	0.238	35.687	1.294
Low Bias:	0.00%	0.30%	1.90%	0.10%
Upscale Cal:	10.104	9.972	812.192	808.291
Upscale Sys:	9.989	9.899	799.742	795.449
Upscale Bias	-0.50%	-0.30%	-0.80%	-1.60%
Bias Result:	PASSED	PASSED	PASSED	PASSED

System Bias Drift Results

Low Drift:	-0.50%	0.20%	1.10%	0.10%
Mid Drift:	-0.30%	0.10%	-0.40%	-1.10%
Drift Result:	PASSED	PASSED	PASSED	PASSED
Cal Result:	OK	OK	OK	OK

Test Run 1 Bias Correction Calculations:

	O2	CO2	NOx	CO
Low init:	0.188	0.202	18.349	0.744
Low final:	0.086	0.238	35.687	1.294
Mid Init:	10.054	9.868	806.913	804.352
Mid Final:	9.989	9.899	799.742	795.449
Run Avg:	8.353	9.224	1189.138	585.276
Co:	0.137	0.220	27.018	1.019
Cm:	10.022	9.883	803.328	799.900
Coa:	0.000	0.000	0.000	0.000
Cma:	10.020	9.936	806.200	811.500
Corrected:	8.329	9.258	1206.866	593.485

454645Curia Test Run 2

Start: 11/4/2021 12:10:00
End: 11/4/2021 13:10:00

Operator: CRB/PS
Plant: Curia New Mexico LLC
Location: Albuquerque NM
Source ID: Cummins Diesel Generator Engies

Time	Entry	O2 ppm	CO2 ppm	NOx ppm	CO ppm
12:11:00	1min avg:	8.201	9.259	1149.461	605.784
12:12:00	1min avg:	8.193	9.269	1165.075	603.791
12:13:00	1min avg:	8.195	9.269	1173.044	602.191
12:14:00	1min avg:	8.186	9.279	1175.895	607.180
12:15:00	1min avg:	8.177	9.283	1180.711	608.763
12:16:00	1min avg:	8.160	9.298	1180.475	614.844
12:17:00	1min avg:	8.167	9.295	1183.695	613.620
12:18:00	1min avg:	8.151	9.310	1186.187	616.060
12:19:00	1min avg:	8.112	9.339	1185.211	627.919
12:20:00	1min avg:	8.101	9.346	1187.341	632.865
12:21:00	1min avg:	8.112	9.337	1186.960	634.144
12:22:00	1min avg:	8.138	9.319	1188.808	621.656
12:23:00	1min avg:	8.169	9.297	1189.286	619.094
12:24:00	1min avg:	8.161	9.306	1190.530	611.810
12:25:00	1min avg:	8.167	9.300	1190.489	612.128
12:26:00	1min avg:	8.152	9.298	1191.192	614.118
12:27:00	1min avg:	8.148	9.301	1188.974	615.685
12:28:00	1min avg:	8.160	9.292	1189.705	614.209
12:29:00	1min avg:	8.157	9.296	1189.727	611.998
12:30:00	1min avg:	8.176	9.287	1189.676	604.087
12:31:00	1min avg:	8.077	9.352	1185.035	627.708
12:32:00	1min avg:	8.078	9.354	1189.369	639.925
12:33:00	1min avg:	8.139	9.322	1191.323	623.737
12:34:00	1min avg:	8.136	9.322	1192.131	613.486
12:35:00	1min avg:	8.155	9.310	1190.192	614.866
12:36:00	1min avg:	8.167	9.300	1188.759	604.690
12:37:00	1min avg:	8.090	9.357	1186.517	623.665
12:38:00	1min avg:	8.076	9.379	1187.874	634.343
12:39:00	1min avg:	8.091	9.380	1186.957	626.441
12:40:00	1min avg:	8.064	9.424	1186.961	631.750
12:41:00	1min avg:	8.082	9.403	1187.622	630.101
12:42:00	1min avg:	8.035	9.403	1188.502	634.605
12:43:00	1min avg:	8.021	9.415	1190.103	650.324
12:44:00	1min avg:	8.028	9.624	1191.248	642.649
12:45:00	1min avg:	8.035	9.423	1190.739	642.762
12:46:00	1min avg:	8.075	9.365	1194.074	631.965
12:47:00	1min avg:	8.087	9.358	1191.867	627.839
12:48:00	1min avg:	8.113	9.342	1194.027	614.909
12:49:00	1min avg:	8.114	9.344	1190.388	614.250
12:50:00	1min avg:	8.076	9.399	1186.850	622.252
12:51:00	1min avg:	8.070	9.411	1187.369	625.522
12:52:00	1min avg:	8.005	9.399	1184.650	643.266
12:53:00	1min avg:	8.030	9.386	1188.833	641.994
12:54:00	1min avg:	8.064	9.363	1190.221	633.778
12:55:00	1min avg:	8.083	9.352	1189.083	621.755
12:56:00	1min avg:	8.079	9.355	1190.985	613.399
12:57:00	1min avg:	8.074	9.363	1189.336	624.076
12:58:00	1min avg:	8.040	9.391	1187.165	626.856
12:59:00	1min avg:	7.965	9.451	1188.019	653.899
13:00:00	1min avg:	7.985	9.446	1189.358	648.691
13:01:00	1min avg:	7.964	9.458	1189.086	655.280
13:02:00	1min avg:	8.069	9.384	1192.956	632.447
13:03:00	1min avg:	8.070	9.386	1189.318	619.734
13:04:00	1min avg:	8.071	9.385	1190.252	618.791
13:05:00	1min avg:	8.050	9.399	1188.402	628.459
13:06:00	1min avg:	8.034	9.408	1187.661	622.852
13:07:00	1min avg:	7.976	9.447	1184.704	643.697
13:08:00	1min avg:	7.979	9.446	1187.465	648.708
13:09:00	1min avg:	7.979	9.443	1186.940	639.937
13:10:00	1min avg:	7.978	9.449	1188.512	647.747
13:10:00	Test Avgs:	8.091	9.361	1187.055	625.585

454645Curia Run 2 Final Bias & Drift Check

Date/Time:	11/4/2021	13:22:05
Result:	PASS	

Operator:	CRB/PS
Plant:	Curia New Mexico LLC
Location:	Albuquerque NM
Source ID:	Cummins Diesel Generator Engies

Reference Cylinder IDs

	Low ID	Upscale ID	Span ID
O2	CC704230	CC84055	CC210288
CO2	CC704230	CC84055	CC210288
NOx	CC704230	CC280768	CC702206
CO	CC704230	CC280768	CC280768

System Bias Check Results

Analyte:	O2	CO2	NOx	CO
Units:	ppm	ppm	ppm	ppm
Span:	22.03	21.69	1641	811.5
Range:	25	25	2000	1000
Method:	EPA 7E	EPA 7E	EPA 7E	EPA 7E
Low Cal:	0.097	0.184	4.335	0.233
Low Sys:	0.044	0.227	34.741	0.985
Low Bias:	-0.20%	0.20%	1.90%	0.10%
Upscale Cal:	10.104	9.972	812.192	808.291
Upscale Sys:	9.940	9.910	787.700	783.051
Upscale Bias	-0.70%	-0.30%	-1.50%	-3.10%
Bias Result:	PASSED	PASSED	PASSED	PASSED

System Bias Drift Results

Low Drift:	-0.20%	-0.10%	-0.10%	0.00%
Mid Drift:	-0.20%	0.10%	-0.70%	-1.50%
Drift Result:	PASSED	PASSED	PASSED	PASSED
Cal Result:	OK	OK	OK	OK

Test Run 2 Bias Correction Calculations:

	O2	CO2	NOx	CO
Low init:	0.086	0.238	35.687	1.294
Low final:	0.044	0.227	34.741	0.985
Mid Init:	9.989	9.899	799.742	795.449
Mid Final:	9.940	9.910	787.700	783.051
Run Avg:	8.091	9.361	1187.055	625.585
Co:	0.065	0.233	35.214	1.140
Cm:	9.965	9.904	793.721	789.250
Coa:	0.000	0.000	0.000	0.000
Cma:	10.020	9.936	806.200	811.500
Corrected:	8.124	9.378	1224.266	642.978

454645Curia Test Run 3

Start: 11/4/2021 13:29:00
End: 11/4/2021 14:29:00

Operator: CRB/PS
Plant: Curia New Mexico LLC
Location: Albuquerque NM
Source ID: Cummins Diesel Generator Engies

Time	Entry	O2 ppm	CO2 ppm	NOx ppm	CO ppm
13:30:00	1min avg:	7.916	9.438	1175.063	668.843
13:31:00	1min avg:	7.902	9.441	1181.170	663.987
13:32:00	1min avg:	7.914	9.429	1189.215	664.729
13:33:00	1min avg:	7.987	9.364	1200.899	644.778
13:34:00	1min avg:	7.980	9.369	1196.484	636.519
13:35:00	1min avg:	7.944	9.390	1194.997	643.487
13:36:00	1min avg:	7.939	9.393	1193.446	653.240
13:37:00	1min avg:	7.959	9.376	1195.179	640.451
13:38:00	1min avg:	7.933	9.396	1190.818	649.842
13:39:00	1min avg:	7.971	9.371	1193.157	644.545
13:40:00	1min avg:	7.921	9.401	1190.610	647.660
13:41:00	1min avg:	7.886	9.423	1190.386	666.859
13:42:00	1min avg:	7.957	9.376	1195.553	646.874
13:43:00	1min avg:	7.976	9.358	1194.858	634.034
13:44:00	1min avg:	7.877	9.423	1190.420	657.230
13:45:00	1min avg:	7.876	9.423	1193.171	667.336
13:46:00	1min avg:	7.919	9.394	1193.137	653.851
13:47:00	1min avg:	7.966	9.360	1192.661	641.422
13:48:00	1min avg:	7.988	9.346	1195.174	637.374
13:49:00	1min avg:	7.988	9.341	1198.576	634.623
13:50:00	1min avg:	7.991	9.338	1194.321	633.673
13:51:00	1min avg:	7.942	9.369	1186.415	646.144
13:52:00	1min avg:	7.911	9.387	1187.592	650.047
13:53:00	1min avg:	7.865	9.417	1195.786	666.357
13:54:00	1min avg:	7.854	9.426	1191.784	672.272
13:55:00	1min avg:	7.882	9.406	1197.586	662.096
13:56:00	1min avg:	7.875	9.407	1199.251	658.722
13:57:00	1min avg:	7.913	9.379	1194.842	653.169
13:58:00	1min avg:	7.907	9.383	1196.924	652.852
13:59:00	1min avg:	7.925	9.369	1196.802	645.666
14:00:00	1min avg:	7.917	9.372	1195.772	645.892
14:01:00	1min avg:	7.838	9.425	1192.434	662.156
14:02:00	1min avg:	7.886	9.393	1198.803	656.152
14:03:00	1min avg:	7.891	9.389	1197.913	648.358
14:04:00	1min avg:	7.898	9.382	1199.184	647.479
14:05:00	1min avg:	7.879	9.393	1197.768	657.637
14:06:00	1min avg:	7.904	9.372	1196.813	649.569
14:07:00	1min avg:	7.902	9.367	1198.407	646.735
14:08:00	1min avg:	7.857	9.391	1196.008	651.023
14:09:00	1min avg:	7.770	9.447	1191.968	681.067
14:10:00	1min avg:	7.790	9.439	1193.282	688.956
14:11:00	1min avg:	7.784	9.435	1192.728	682.209
14:12:00	1min avg:	7.856	9.404	1208.369	664.331
14:13:00	1min avg:	7.889	9.377	1211.799	654.631
14:14:00	1min avg:	7.925	9.352	1204.476	642.317
14:15:00	1min avg:	7.919	9.352	1199.699	640.956
14:16:00	1min avg:	7.861	9.386	1197.019	651.542
14:17:00	1min avg:	7.839	9.401	1198.644	661.731
14:18:00	1min avg:	7.839	9.398	1199.679	660.397
14:19:00	1min avg:	7.846	9.392	1199.784	659.824
14:20:00	1min avg:	7.836	9.398	1198.558	668.694
14:21:00	1min avg:	7.858	9.379	1199.379	654.659
14:22:00	1min avg:	7.774	9.435	1192.889	677.027
14:23:00	1min avg:	7.833	9.399	1198.885	668.619
14:24:00	1min avg:	7.877	9.365	1198.474	652.627
14:25:00	1min avg:	7.877	9.366	1196.007	652.562
14:26:00	1min avg:	7.831	9.394	1194.956	659.803
14:27:00	1min avg:	7.774	9.437	1194.052	683.257
14:28:00	1min avg:	7.822	9.404	1197.114	671.534
14:29:00	1min avg:	7.843	9.390	1199.212	666.352
14:29:00	Test Avgs:	7.891	9.392	1195.439	655.780

454645Curia Run 3 Final Bias & Drift Check

Date/Time:	11/4/2021	14:39:36
Result:	PASS	

Operator:	CRB/PS
Plant:	Curia New Mexico LLC
Location:	Albuquerque NM
Source ID:	Cummins Diesel Generator Engies

Reference Cylinder IDs

	Low ID	Upscale ID	Span ID
O2	CC704230	CC84055	CC210288
CO2	CC704230	CC84055	CC210288
NOx	CC704230	CC280768	CC702206
CO	CC704230	CC280768	CC280768

System Bias Check Results

Analyte:	O2	CO2	NOx	CO
Units:	ppm	ppm	ppm	ppm
Span:	22.03	21.69	1641	811.5
Range:	25	25	2000	1000
Method:	EPA 7E	EPA 7E	EPA 7E	EPA 7E
Low Cal:	0.097	0.184	4.335	0.233
Low Sys:	-0.009	0.231	25.647	0.726
Low Bias:	-0.50%	0.20%	1.30%	0.10%
Upscale Cal:	10.104	9.972	812.192	808.291
Upscale Sys:	9.832	9.840	783.713	771.265
Upscale Bias	-1.20%	-0.60%	-1.70%	-4.60%
Bias Result:	PASSED	PASSED	PASSED	PASSED

System Bias Drift Results

Low Drift:	-0.20%	0.00%	-0.60%	0.00%
Mid Drift:	-0.50%	-0.30%	-0.20%	-1.50%
Drift Result:	PASSED	PASSED	PASSED	PASSED
Cal Result:	OK	OK	OK	OK

Test Run 3 Bias Correction Calculations:

	O2	CO2	NOx	CO
Low init:	0.044	0.227	34.741	0.985
Low final:	-0.009	0.231	25.647	0.726
Mid Init:	9.940	9.910	787.700	783.051
Mid Final:	9.832	9.840	783.713	771.265
Run Avg:	7.891	9.392	1195.439	655.780
Co:	0.018	0.229	30.194	0.856
Cm:	9.886	9.875	785.707	777.158
Coa:	0.000	0.000	0.000	0.000
Cma:	10.020	9.936	806.200	811.500
Corrected:	7.995	9.439	1243.422	684.618

454645Curia Repeat Calibration Error 2

Date/Time:	11/4/2021	15:47:25
Result:	PASS	

Operator:	CRB/PS
Plant:	Curia New Mexico LLC
Location:	Albuquerque NM
Source ID:	Cummins Diesel Generator Engies

Reference Cylinder IDs

	Zero ID:	Low ID:	Mid ID:	High ID:
NOx	CC704230		CC280768	CC702206
CO	CC704230		CC129528	CC280768

Calibration Error Results

Channel:	NOx	CO
Units:	ppm	ppm
Span:	1641	811.5
Range:	2000	1000
Method:	EPA 7E	EPA 7E
Zero Ref:	0	0
Zero Cal:	1.935	-0.313
Zero Error:	0.10%	0.00%
Low Ref:		
Low Cal:		
Low Error:		
Mid Ref:	806.2	404.4
Mid Cal:	808.197	411.106
Mid Error:	0.10%	0.80%
High Ref:	1641	811.5
High Cal:	1639.952	805.354
High Error:	-0.10%	-0.80%
Cal Result:	PASSED	PASSED

454645Curia Repeat System Bias 2

Date/Time:	11/4/2021	15:51:53
Result:	PASS	

Operator:	CRB/PS
Plant:	Curia New Mexico LLC
Location:	Albuquerque NM
Source ID:	Cummins Diesel Generator Engies

Reference Cylinder IDs

	Low ID	Upscale ID	Span ID
NOx	CC704230	CC280768	CC702206
CO	CC704230	CC280768	CC280768

System Bias Check Results

Analyte:	NOx	CO
Units:	ppm	ppm
Span:	1641	811.5
Range:	2000	1000
Method:	EPA 7E	EPA 7E
Low Cal:	1.935	-0.313
Low Sys:	3.928	0.209
Low Bias:	0.10%	0.10%
Upscale Cal:	808.197	805.354
Upscale Sys:	797.771	801.940
Upscale Bias	-0.60%	-0.40%
Bias Result:	PASSED	PASSED

454645Curia Test Run 4

Start: 11/4/2021 15:55:00
End: 11/4/2021 16:55:00

Operator: CRB/PS
Plant: Curia New Mexico LLC
Location: Albuquerque NM
Source ID: Cummins Diesel Generator Engies

Time	Entry	O2 ppm	CO2 ppm	NOx ppm	CO ppm
15:56:00	1min avg:	7.796	9.428	1193.513	616.241
15:57:00	1min avg:	7.846	9.402	1204.256	594.502
15:58:00	1min avg:	7.920	9.363	1210.637	576.248
15:59:00	1min avg:	7.943	9.351	1214.899	569.687
16:00:00	1min avg:	7.919	9.371	1217.954	576.132
16:01:00	1min avg:	7.935	9.362	1223.505	571.875
16:02:00	1min avg:	7.882	9.400	1223.737	581.808
16:03:00	1min avg:	7.879	9.403	1231.641	587.143
16:04:00	1min avg:	7.911	9.388	1236.606	573.104
16:05:00	1min avg:	7.898	9.393	1237.249	577.374
16:06:00	1min avg:	7.840	9.434	1234.675	594.087
16:07:00	1min avg:	7.756	9.488	1240.378	611.555
16:08:00	1min avg:	7.712	9.518	1245.176	630.048
16:09:00	1min avg:	7.677	9.543	1249.588	635.102
16:10:00	1min avg:	7.678	9.543	1254.397	632.722
16:11:00	1min avg:	7.673	9.546	1257.639	632.511
16:12:00	1min avg:	7.724	9.520	1260.525	625.208
16:13:00	1min avg:	7.807	9.463	1258.932	600.444
16:14:00	1min avg:	7.777	9.482	1252.698	603.614
16:15:00	1min avg:	7.794	9.475	1249.059	606.753
16:16:00	1min avg:	7.817	9.459	1246.948	598.243
16:17:00	1min avg:	7.849	9.437	1246.359	594.505
16:18:00	1min avg:	7.856	9.432	1243.808	587.659
16:19:00	1min avg:	7.823	9.453	1240.861	597.629
16:20:00	1min avg:	7.787	9.476	1240.773	604.876
16:21:00	1min avg:	7.723	9.522	1248.938	620.972
16:22:00	1min avg:	7.780	9.488	1252.866	609.942
16:23:00	1min avg:	7.808	9.462	1246.253	598.914
16:24:00	1min avg:	7.814	9.464	1244.179	599.474
16:25:00	1min avg:	7.841	9.445	1242.917	597.550
16:26:00	1min avg:	7.820	9.456	1241.216	592.455
16:27:00	1min avg:	7.837	9.449	1242.975	595.012
16:28:00	1min avg:	7.834	9.448	1239.367	596.635
16:29:00	1min avg:	7.810	9.463	1238.295	600.873
16:30:00	1min avg:	7.713	9.526	1243.179	626.134
16:31:00	1min avg:	7.769	9.494	1249.658	612.729
16:32:00	1min avg:	7.750	9.504	1247.403	614.548
16:33:00	1min avg:	7.770	9.490	1246.157	607.387
16:34:00	1min avg:	7.687	9.542	1249.970	627.712
16:35:00	1min avg:	7.700	9.535	1252.019	626.095
16:36:00	1min avg:	7.746	9.506	1253.960	618.390
16:37:00	1min avg:	7.727	9.518	1253.452	618.750
16:38:00	1min avg:	7.748	9.505	1253.890	614.624
16:39:00	1min avg:	7.781	9.486	1257.198	607.084
16:40:00	1min avg:	7.816	9.460	1251.599	598.148
16:41:00	1min avg:	7.821	9.452	1247.719	592.780
16:42:00	1min avg:	7.820	9.454	1242.692	595.159
16:43:00	1min avg:	7.805	9.467	1240.996	594.045
16:44:00	1min avg:	7.827	9.450	1245.808	593.973
16:45:00	1min avg:	7.799	9.468	1242.951	600.371
16:46:00	1min avg:	7.806	9.462	1243.285	593.501
16:47:00	1min avg:	7.773	9.485	1242.694	602.461
16:48:00	1min avg:	7.756	9.498	1244.320	608.685
16:49:00	1min avg:	7.781	9.482	1245.204	601.654
16:50:00	1min avg:	7.797	9.469	1245.503	598.120
16:51:00	1min avg:	7.732	9.512	1243.645	611.089
16:52:00	1min avg:	7.723	9.516	1247.568	611.321
16:53:00	1min avg:	7.681	9.547	1246.656	626.782
16:54:00	1min avg:	7.680	9.546	1252.783	618.804
16:55:00	1min avg:	7.687	9.542	1257.028	621.918
16:55:00	Test Avgs:	7.791	9.471	1242.669	603.886

454645Curia Run 4 Final Bias & Drift Check

Date/Time:	11/4/2021 17:01:11
Result:	PASS
Operator:	CRB/PS
Plant:	Curia New Mexico LLC
Location:	Albuquerque NM
Source ID:	Cummins Diesel Generator Engies

Reference Cylinder IDs

	Low ID	Upscale ID	Span ID
O2	CC704230	CC84055	CC210288
CO2	CC704230	CC84055	CC210288
NOx	CC704230	CC280768	CC702206
CO	CC704230	CC280768	CC280768

System Bias Check Results

Analyte:	O2	CO2	NOx	CO
Units:	ppm	ppm	ppm	ppm
Span:	22.03	21.69	1641	811.5
Range:	25	25	2000	1000
Method:	EPA 7E	EPA 7E	EPA 7E	EPA 7E
Low Cal:	0.097	0.184	1.935	-0.313
Low Sys:	-0.014	0.268	44.785	1.241
Low Bias:	-0.50%	0.40%	2.60%	0.20%
Upscale Cal:	10.104	9.972	808.197	805.354
Upscale Sys:	9.791	9.876	812.354	794.127
Upscale Bias	-1.40%	-0.40%	0.30%	-1.40%
Bias Result:	PASSED	PASSED	PASSED	PASSED

System Bias Drift Results

Low Drift:	0.00%	0.20%	2.50%	0.10%
Mid Drift:	-0.20%	0.20%	0.90%	-1.00%
Drift Result:	PASSED	PASSED	PASSED	PASSED
Cal Result:	OK	OK	OK	OK

Test Run 4 Bias Correction Calculations:

	O2	CO2	NOx	CO
Low init:	-0.009	0.231	3.928	0.209
Low final:	-0.014	0.268	44.785	1.241
Mid Init:	9.832	9.840	797.771	801.940
Mid Final:	9.791	9.876	812.354	794.127
Run Avg:	7.791	9.471	1242.669	603.886
Co:	-0.011	0.249	24.357	0.725
Cm:	9.812	9.858	805.062	798.034
Coa:	0.000	0.000	0.000	0.000
Cma:	10.020	9.936	806.200	811.500
Corrected:	7.959	9.535	1258.097	613.897

454645Curia Test Run 5

Start: 11/4/2021 17:03:00
End: 11/4/2021 18:03:00

Operator: CRB/PS
Plant: Curia New Mexico LLC
Location: Albuquerque NM
Source ID: Cummins Diesel Generator Engies

Time	Entry	O2 ppm	CO2 ppm	NOx ppm	CO ppm
17:04:00	1min avg:	7.683	9.521	1218.563	616.967
17:05:00	1min avg:	7.745	9.488	1231.765	607.948
17:06:00	1min avg:	7.760	9.476	1237.416	598.924
17:07:00	1min avg:	7.675	9.532	1236.446	623.991
17:08:00	1min avg:	7.635	9.559	1247.212	634.531
17:09:00	1min avg:	7.600	9.583	1252.919	637.302
17:10:00	1min avg:	7.598	9.585	1256.799	642.418
17:11:00	1min avg:	7.598	9.585	1262.119	640.585
17:12:00	1min avg:	7.582	9.597	1263.885	640.778
17:13:00	1min avg:	7.607	9.580	1263.645	640.586
17:14:00	1min avg:	7.611	9.575	1262.067	638.561
17:15:00	1min avg:	7.615	9.574	1260.191	634.450
17:16:00	1min avg:	7.601	9.581	1263.054	630.146
17:17:00	1min avg:	7.645	9.554	1260.790	628.328
17:18:00	1min avg:	7.696	9.521	1255.510	618.740
17:19:00	1min avg:	7.619	9.573	1257.258	628.090
17:20:00	1min avg:	7.720	9.505	1260.342	613.730
17:21:00	1min avg:	7.705	9.514	1250.236	612.801
17:22:00	1min avg:	7.708	9.512	1252.155	611.096
17:23:00	1min avg:	7.684	9.527	1251.590	619.223
17:24:00	1min avg:	7.752	9.487	1252.476	603.282
17:25:00	1min avg:	7.757	9.480	1249.207	595.803
17:26:00	1min avg:	7.726	9.504	1242.803	610.148
17:27:00	1min avg:	7.681	9.533	1245.717	618.563
17:28:00	1min avg:	7.721	9.508	1247.341	612.174
17:29:00	1min avg:	7.768	9.476	1246.866	598.120
17:30:00	1min avg:	7.788	9.466	1245.321	594.272
17:31:00	1min avg:	7.778	9.474	1240.714	596.772
17:32:00	1min avg:	7.769	9.482	1240.815	598.508
17:33:00	1min avg:	7.734	9.506	1243.205	605.499
17:34:00	1min avg:	7.709	9.521	1247.959	615.402
17:35:00	1min avg:	7.720	9.515	1252.226	609.801
17:36:00	1min avg:	7.750	9.495	1248.350	603.341
17:37:00	1min avg:	7.747	9.498	1240.434	603.615
17:38:00	1min avg:	7.747	9.496	1240.665	605.918
17:39:00	1min avg:	7.706	9.519	1243.481	612.101
17:40:00	1min avg:	7.770	9.479	1246.257	600.571
17:41:00	1min avg:	7.745	9.494	1242.833	599.513
17:42:00	1min avg:	7.713	9.513	1240.752	608.334
17:43:00	1min avg:	7.726	9.506	1243.447	610.943
17:44:00	1min avg:	7.700	9.518	1244.223	614.903
17:45:00	1min avg:	7.655	9.547	1243.986	622.442
17:46:00	1min avg:	7.689	9.527	1247.086	620.639
17:47:00	1min avg:	7.710	9.515	1247.594	611.556
17:48:00	1min avg:	7.750	9.488	1244.264	602.833
17:49:00	1min avg:	7.733	9.499	1241.217	608.782
17:50:00	1min avg:	7.720	9.508	1240.535	609.332
17:51:00	1min avg:	7.695	9.522	1240.557	617.911
17:52:00	1min avg:	7.720	9.506	1241.393	608.385
17:53:00	1min avg:	7.708	9.516	1239.620	615.044
17:54:00	1min avg:	7.733	9.497	1244.785	606.399
17:55:00	1min avg:	7.716	9.508	1245.435	609.819
17:56:00	1min avg:	7.738	9.493	1244.468	604.339
17:57:00	1min avg:	7.705	9.514	1243.443	610.998
17:58:00	1min avg:	7.678	9.531	1244.742	621.168
17:59:00	1min avg:	7.715	9.503	1243.613	615.457
18:00:00	1min avg:	7.683	9.515	1242.917	616.999
18:01:00	1min avg:	7.697	9.509	1245.436	616.173
18:02:00	1min avg:	7.666	9.527	1243.100	618.363
18:03:00	1min avg:	7.687	9.515	1245.194	619.590
18:03:00	Test Avgs:	7.700	9.519	1246.974	614.883

454645Curia Run 5 Final Bias & Drift Check

Date/Time:	11/4/2021	18:09:54
Result:	PASS	

Operator:	CRB/PS
Plant:	Curia New Mexico LLC
Location:	Albuquerque NM
Source ID:	Cummins Diesel Generator Engies

Reference Cylinder IDs

	Low ID	Upscale ID	Span ID
O2	CC704230	CC84055	CC210288
CO2	CC704230	CC84055	CC210288
NOx	CC704230	CC280768	CC702206
CO	CC704230	CC280768	CC280768

System Bias Check Results

Analyte:	O2	CO2	NOx	CO
Units:	ppm	ppm	ppm	ppm
Span:	22.03	21.69	1641	811.5
Range:	25	25	2000	1000
Method:	EPA 7E	EPA 7E	EPA 7E	EPA 7E
Low Cal:	0.097	0.184	1.935	-0.313
Low Sys:	-0.024	0.270	44.728	0.724
Low Bias:	-0.50%	0.40%	2.60%	0.10%
Upscale Cal:	10.104	9.972	808.197	805.354
Upscale Sys:	9.773	9.880	808.805	793.829
Upscale Bias	-1.50%	-0.40%	0.00%	-1.40%
Bias Result:	PASSED	PASSED	PASSED	PASSED

System Bias Drift Results

Low Drift:	0.00%	0.00%	0.00%	-0.10%
Mid Drift:	-0.10%	0.00%	-0.20%	0.00%
Drift Result:	PASSED	PASSED	PASSED	PASSED
Cal Result:	OK	OK	OK	OK

Test Run 5 Bias Correction Calculations:

	O2	CO2	NOx	CO
Low init:	-0.014	0.268	44.785	1.241
Low final:	-0.024	0.270	44.728	0.724
Mid Init:	9.791	9.876	812.354	794.127
Mid Final:	9.773	9.880	808.805	793.829
Run Avg:	7.700	9.519	1246.974	614.883
Co:	-0.019	0.269	44.757	0.983
Cm:	9.782	9.878	810.580	793.978
Coa:	0.000	0.000	0.000	0.000
Cma:	10.020	9.936	806.200	811.500
Corrected:	7.891	9.565	1265.603	628.226

454645Curia Test Run 6

Start: 11/4/2021 18:13:00
End: 11/4/2021 19:13:00

Operator: CRB/PS
Plant: Curia New Mexico LLC
Location: Albuquerque NM
Source ID: Cummins Diesel Generator Engies

Time	Entry	O2 ppm	CO2 ppm	NOx ppm	CO ppm
18:13:59	1min avg:	7.777	9.442	1201.051	596.331
18:14:59	1min avg:	7.785	9.449	1211.436	600.697
18:15:59	1min avg:	7.803	9.477	1217.917	614.148
18:16:59	1min avg:	7.793	9.488	1226.868	613.791
18:17:59	1min avg:	7.735	9.497	1231.170	619.515
18:18:59	1min avg:	7.744	9.494	1238.205	616.128
18:19:59	1min avg:	7.799	9.492	1239.123	616.256
18:20:59	1min avg:	7.838	9.456	1241.511	602.589
18:21:59	1min avg:	7.783	9.464	1235.615	601.989
18:22:59	1min avg:	7.730	9.502	1229.015	621.340
18:23:59	1min avg:	7.785	9.480	1236.035	611.909
18:24:59	1min avg:	7.720	9.491	1236.044	614.621
18:25:59	1min avg:	7.724	9.490	1236.464	614.507
18:26:59	1min avg:	7.766	9.465	1233.535	609.262
18:27:59	1min avg:	7.833	9.454	1234.761	598.067
18:28:59	1min avg:	7.782	9.473	1231.448	604.978
18:29:59	1min avg:	7.839	9.462	1231.102	609.050
18:30:59	1min avg:	7.869	9.447	1227.370	605.463
18:31:59	1min avg:	7.832	9.451	1228.434	603.235
18:32:59	1min avg:	7.831	9.463	1229.098	610.045
18:33:59	1min avg:	7.821	9.451	1232.613	604.932
18:34:59	1min avg:	7.789	9.464	1230.623	612.486
18:35:59	1min avg:	7.748	9.476	1229.478	617.901
18:36:59	1min avg:	7.770	9.458	1230.967	613.544
18:37:59	1min avg:	7.782	9.451	1233.329	606.363
18:38:59	1min avg:	7.798	9.441	1231.272	604.628
18:39:59	1min avg:	7.810	9.433	1229.234	603.760
18:40:59	1min avg:	7.820	9.428	1227.188	602.672
18:41:59	1min avg:	7.827	9.423	1228.081	599.485
18:42:59	1min avg:	7.820	9.428	1228.568	602.539
18:43:59	1min avg:	7.817	9.430	1223.748	604.156
18:44:59	1min avg:	7.821	9.429	1221.726	603.609
18:45:59	1min avg:	7.808	9.436	1223.689	604.565
18:46:59	1min avg:	7.823	9.431	1224.588	603.398
18:47:59	1min avg:	7.822	9.430	1223.474	607.232
18:48:59	1min avg:	7.832	9.424	1224.034	601.886
18:49:59	1min avg:	7.842	9.417	1227.245	600.651
18:50:59	1min avg:	7.848	9.415	1226.740	596.644
18:51:59	1min avg:	7.817	9.438	1225.827	603.055
18:52:59	1min avg:	7.851	9.422	1229.336	600.270
18:53:59	1min avg:	7.877	9.424	1224.686	599.896
18:54:59	1min avg:	7.919	9.417	1224.667	602.691
18:55:59	1min avg:	7.911	9.422	1220.951	604.538
18:56:59	1min avg:	7.902	9.414	1223.037	601.540
18:57:59	1min avg:	7.877	9.418	1220.558	602.415
18:58:59	1min avg:	7.891	9.404	1219.692	595.672
18:59:59	1min avg:	7.921	9.381	1218.961	587.251
19:00:59	1min avg:	7.900	9.394	1216.639	590.552
19:01:59	1min avg:	7.857	9.422	1209.002	602.170
19:02:59	1min avg:	7.874	9.411	1212.431	601.559
19:03:59	1min avg:	7.826	9.445	1210.518	612.114
19:04:59	1min avg:	7.806	9.462	1210.362	622.169
19:05:59	1min avg:	7.808	9.457	1210.536	621.453
19:06:59	1min avg:	7.804	9.462	1207.962	623.188
19:07:59	1min avg:	7.799	9.465	1215.757	621.453
19:08:59	1min avg:	7.813	9.457	1218.937	619.443
19:09:59	1min avg:	7.804	9.463	1217.471	620.559
19:10:59	1min avg:	7.774	9.483	1222.650	622.467
19:11:59	1min avg:	7.760	9.494	1222.199	628.117
19:12:59	1min avg:	7.772	9.484	1221.232	624.556
19:13:00	Test Avgs:	7.815	9.449	1224.935	608.029

454645Curia Run 6 Final Bias & Drift Check

Date/Time:	11/4/2021 19:23:10
Result:	PASS
Operator:	CRB/PS
Plant:	Curia New Mexico LLC
Location:	Albuquerque NM
Source ID:	Cummins Diesel Generator Engies

Reference Cylinder IDs

	Low ID	Upscale ID	Span ID
O2	CC704230	CC84055	CC210288
CO2	CC704230	CC84055	CC210288
NOx	CC704230	CC280768	CC702206
CO	CC704230	CC280768	CC280768

System Bias Check Results

Analyte:	O2	CO2	NOx	CO
Units:	ppm	ppm	ppm	ppm
Span:	22.03	21.69	1641	811.5
Range:	25	25	2000	1000
Method:	EPA 7E	EPA 7E	EPA 7E	EPA 7E
Low Cal:	0.097	0.184	1.935	-0.313
Low Sys:	0.000	0.277	38.399	0.744
Low Bias:	-0.40%	0.40%	2.20%	0.10%
Upscale Cal:	10.104	9.972	808.197	805.354
Upscale Sys:	9.875	9.921	807.614	804.887
Upscale Bias	-1.00%	-0.20%	0.00%	-0.10%
Bias Result:	PASSED	PASSED	PASSED	PASSED

System Bias Drift Results

Low Drift:	0.10%	0.00%	-0.40%	0.00%
Mid Drift:	0.50%	0.20%	-0.10%	1.40%
Drift Result:	PASSED	PASSED	PASSED	PASSED
Cal Result:	OK	OK	OK	OK

Test Run 6 Bias Correction Calculations:

	O2	CO2	NOx	CO
Low init:	-0.024	0.270	44.728	0.724
Low final:	0.000	0.277	38.399	0.744
Mid Init:	9.773	9.880	808.805	793.829
Mid Final:	9.875	9.921	807.614	804.887
Run Avg:	7.815	9.449	1224.935	608.029
Co:	-0.012	0.273	41.564	0.734
Cm:	9.824	9.900	808.210	799.358
Coa:	0.000	0.000	0.000	0.000
Cma:	10.020	9.936	806.200	811.500
Corrected:	7.974	9.470	1244.425	617.086

IV.D Example Calculations

Drift Corrected Emission Concentrations

Formula

$$C_{GAS} = (Ç - Co) \times \frac{C_{MA}}{C_M - C_O} \quad \textit{(eq. 7e-5)}$$

All Calculations Refer to Test Run 1

$Ç_{NOx}$ =	Raw Concentration of NOx	= 1011.739 ppmv
C_O =	Avg. of Initial and Final Zero Checks	= 4.8 ppmv
C_M =	Avg. of Initial and Final Span Checks	= 812.361 ppmv
C_{MA} =	Certified Concentration of Span Gas	= 818.6 ppmv
C_{NOx} =	**(1011.7 - 4.8) x 818.6 / (812.4 - 4.77)**	**= 1020.7 ppmv**
$Ç_{CO}$ =	Raw Concentration of CO	= 127.962 ppmv
C_O =	Avg. of Initial and Final Zero Checks	= -0.253 ppmv
C_M =	Avg. of Initial and Final Span Checks	= 96.2 ppmv
C_{MA} =	Certified Concentration of Span Gas	= 100.4 ppmv
C_{CO} =	**(128.0 - 0.3) x 100.4 / (96.2 - 0.25)**	**= 133.5 ppmv**
$Ç_{O2}$ =	Raw Concentration of O2	= 8.77 %
C_O =	Avg. of initial and final zero bias checks	= 0.05%
C_M =	Avg. of initial and final span bias checks	= 9.80%
C_{MA} =	Actual concentration of span gas	= 10.02%
C_{O2} =	**(8.77 - 0.05) x 10.02 / (9.80 - 0.05)**	**= 8.96%**
$Ç_{CO2}$ =	Raw Concentration of CO2	= 8.99%
C_O =	Avg. of initial and final zero bias checks	= 0.21%
C_M =	Avg. of initial and final span bias checks	= 10.16%
C_{MA} =	Actual concentration of span gas	= 10.10%
C_{CO2} =	**(8.993 - 0.21) x 10.1 / (10.16 - 0.21)**	**= 8.92%**

Moisture Content Determination

(EPA Method 4; equations 4-1, 4-2, 4-3, and 4-4)

V_1	= initial dry gas meter reading	=	516.07	ft^3	
V_2	= final dry gas meter reading	=	542.53	ft^3	
V_m	= total cubic feet of stack gas metered	=	V_2-V_1		
		=	**26.46**	**ft^3**	
Y	= dry gas meter correction factor	=	1.0000	(Unitless)	
T_m	= average temperature of dry gas meter	=	77.33	1011.739	
P_m	= Barometric Pressure	=	25.12	in Hg	
$V_{m(std)}$	= V_m x Y x (T_{std} / T_m) x (P_m / P_{std}) *Eq. 4-3 (Corrected dry gas volume)*				4.7725
		=	**21.83**		**812.361**
V_i	= initial weight of first three impingers	=	2193.90	grams	
V_f	= final weight of first three impingers	=	2241.90		818.6
W_i	= initial weight of silica impinger	=	957.00	grams	
W_f	= final weight of silica impinger	=	965.40	grams	
K_1	= 0.04706 ft^3 / ml x 1.0018 ml/g (H_2O)	=	0.047145	ft^3 / g	
	Constant for water vapor condensed in first three impingers.				127.962
K_3	= 0.04715 ft^3 / g				
	Constant for water vapor condensed in silica gel.				-0.253
$V_{wc(std)}$	= K_1 (V_f - V_i) *Eq. 4-1(Volume of Water Vapor Condensed)*				
	= 0.04714 x (2241.90 - 2193.90)	=	2.26295		96.176
$V_{wsg(std)}$	= K_3 (W_f - W_i) *Eq. 4-2 (Volume of Water collected in Silica Gel)*				**100.4**
	= 0.04715 x (965.40 - 957.00)	=	0.39606	ft^3	
B_{ws}	= $\frac{V_{wc(std)} + V_{wsg(std)}}{V_{wc(std)} + V_{wsg(std)} + V_{m(std)}}$ *Eq. 4-4 (Moisture Content)*				
	= $\frac{2.262946 + 0.396060}{2.262946 + 0.396060 + 21.83}$	=	0.1086		0.053
		=	**10.86%**		

Any differences between example calculations and data tables are due to rounding and/or truncation. 9.796

Exhaust Flow Rate Calculation

Stack Gas Molecular Weight (Equations 3.1 and 2.5)

Ms	=	wet molecualr weight of stack gas (lb/lb-mol)					
Md	=	dry molecular weight of stack gas (lb/lb-mol)					
B*ws*	=	moisture fraction of stack gas by volume			=	0.0825	
MW H20	=	molecular weight of water			=	18	lb/lb-mol
MW CO2	=	molecular weight of carbon dioxide			=	44	lb/lb-mol
MW O2	=	molecular weight of oxygen		1012	=	32	lb/lb-mol
MW N2	=	molecular weight of nitrogen			=	28	lb/lb-mol
CCO2	=	volume fraction of carbon dioxide (7e-5 corrected)		4.773	=	0.09	
CO2	=	volume fraction of oxygen (7e-5 corrected)			=	0.083	
CN2	=	volume fraction of nitrogen	= 1-(CCO2 + (	812.4	=	0.824	
1-B*ws*	=	dry gas fraction	= 1-(0.0825)		=	0.9175	
				818.6			

Md = wt. of CO2 + wt. of O2 + wt. of N2

= ((MW CO2 x CCO2) + (MW O2 x CO2) + (MW N2 x CN2)

= ((44 x 0.09) + (32 x 0.083) + (28 x 0.824)) = **29.815 lb/lb-mol**

Ms = (18 x B*ws*) + ((1-B*ws*) x Md)

= (18 x 0.0825) + (0.9175 x 29.815) = **28.840 lb/lb-mol**

100.4

Velocity and stack flow rate via Pitot tube (Equations 2-6, 2-8, 2-9, 2-10)

Cp	=	Pitot tube coefficient (dimensionless)		=	0.99	
ΔP	=	pressure difference in stack as measured by Pitot tube	8.765			
$(\sqrt{\Delta P})_{avg}$	=	average of square root of ΔP's (from Pitot readings)		=	2.3119	
ts	=	average stack temperature (measured)	0.053	=	893.75	
Ts	=	absolute stack temperature (°R) = (ts + 460)		=	1353.75	

Kp = Pitot tube constant = 85.49 ft/sec $\sqrt{\left(\frac{lb\ /\ lbmolexin\quad .Hg}{^\circ Rxin\ \ .H_2O}\right)}$ 9.796 / 10.02

= Pitot tube constant =5128.8 ft/min $\sqrt{\left(\frac{lb\ /\ lbmolexin\quad .Hg}{^\circ Rxin\ \ .H_2O}\right)}$ 8.993

Velocity and stack flow rate via Pitot tube (Equations 2-6, 2-8, 2-9, 2-10) (Continued)

Ky = Standard pressure/temperature coefficient

$$= \frac{528\ °R}{29.92"\ Hg} \times \frac{60\ \text{min}\ utes}{hour}$$

10.16

10.1 = 1058.8

Pb = atmospheric pressure (inches Hg) = 25.12

Pg = stack static pressure (inches H2O) = 4.9

Ps = absolute stack pressure (Equation 2.6)

$$= Pb + \frac{Pg}{13.6\ (\text{in H2O/in Hg})} = \mathbf{25.480\ "\ Hg}$$

As = area of stack (ft2)

$$= \frac{\frac{diameter^2}{4} \times \pi}{144\ in^2 / ft^2} = \mathbf{0.7854\ Ft2}$$

Vs = stack velocity (ft/min)

$$= Kp \times Cp \times (\sqrt{\Delta P})avg \times \sqrt{\frac{T_s}{P_s x M_s}}\ (eq\ .2-9)$$

$$= 5129 \times 0.99 \times 2.312 \sqrt{\frac{1353.75}{25.480 \times 28.8397}} = \mathbf{15932.95\ ft/min}$$

Qa = Stack flow rate = Vs x As

$$= 15932.954 \times 0.7854 = \mathbf{12513.71\ ACFM}$$

Qd = Stack flow rate on a dry basis and standard conditions (DSCFH)

$$= Qa \times Ky \times \frac{Ps}{Ts} \times (1-Bws) \quad \text{(Equation 2.10)}$$

$$= 12513.71 \times 1058.8 \times \frac{25.48}{1353.8} \times (1-0.0825) = \mathbf{2.29E+05\ DSCFH}$$

Mass Emissions rates via EPA Methods 1-4 (lbs/hr, tons/year)

CNOx	= Concentration of NOx	=	1206.87	ppmv
CCO	= Concentration of CO	=	593.49	ppmv
Qs	= stack flow rate	=	2.29E+05	DSCFH
MW NOx	= Molecular Weight of NOx	=	46.01	lb/lb-mol
MW CO	= Molecular Weight of CO	=	28.01	lb/lb-mol

$$\text{Ex (lb/hr)} = Cx \times 10^{-6} \times Qs \times \frac{MWx}{385.15}$$

1011.739

$$\text{Ex (TPY)} = \text{Ex (lb/hr)} \times \frac{8760 \text{ hr/yr}}{2000 \text{ lb/ton}}$$

4.7725

812.361

$$\text{Ex (g/bhp-l} = \frac{\text{Ex (lb/hr)}}{\text{hp}} \times \frac{454 \text{ g}}{1 \text{ lb}}$$

818.6

ENOx $= C_{NOx} \times 10^{-6} \times Qs \times \frac{46.01}{385.15}$

127.962

$= 1206.87 \times 10^{-6} \times 2.29E+05 \times \frac{46.01}{385.15} =$ **32.98 lb/hr**

-0.253

$= 32.98 \text{ lb/hr} \times \frac{500 \text{ hrs/yr}}{2000 \text{ lbs/ton}} =$ **8.25** **96.176**

100.4

E CO $= C_{CO} \times 10^{-6} \times Qs \times \frac{28.00}{385.15}$

$= 593.49 \times 10^{-6} \times 2.29E+05 \times \frac{28.00}{385.15} =$ **9.88** **8.765**

0.053

$= 9.88 \text{ lb/hr} \times \frac{500 \text{ hrs/yr}}{2000 \text{ lbs/ton}} =$ **2.47 TPY**

9.796

IV.E Documentation Of Analysis and certification for calibration gases and Calibration of Sampling Equipment

Airgas
an Air Liquide company

Airgas Intermountain region
Airgas USA, LLC
8775 E. 93rd Place
Henderson, CO 80640
Airgas.com

CERTIFICATE OF BATCH ANALYSIS

Grade of Product: ULTRA HIGH PURITY-PURE

Part Number:	NI UHP15A	Reference Number:	71-402236409-1
Cylinder Analyzed:	CC142549	Cylinder Volume:	142.0 CF
Laboratory:	104 - Henderson/Denver Fill Plant (SAP) - CO	Cylinder Pressure:	2000 PSIG
Analysis Date:	Sep 23, 2021	Valve Outlet:	580
Lot Number:	71-402236409-1		

ANALYTICAL RESULTS

Component		Requested Purity		Certified Concentration
NITROGEN		99.999 %		99.999 %
CO + CO2	<	1.0 PPM	<LDL	0.088 PPM
Moisture	<	1.0 PPM		0.43 PPM
Oxygen	<	1.0 PPM		0.59 PPM
THC	<	0.5 PPM		0.110 PPM

Cylinders in Batch:

ALM-026323, ALM-034739, CC142549, CC192909, CC197414, CC198608, CC220587, CC264952, CC328553, CC425088, CC430714, CC442233, CC443834, CC453429, CC702005, CC704230, CC704239, CC704258, CC704261, CC704286, CC70709, CC75743, CC817953, EB0010209, EB0033659

Impurities verified against analytical standards traceable to NIST by weight and/or analysis.

Signature on file

Approved for Release

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number:	E04NI99E15A0031	Reference Number:	153-401902298-1
Cylinder Number:	CC702206	Cylinder Volume:	144.5 CF
Laboratory:	124 - Tooele (SAP) - UT	Cylinder Pressure:	2015 PSIG
PGVP Number:	B72020	Valve Outlet:	660
Gas Code:	CO,NO,NOX,PPN,BALN	Certification Date:	Sep 16, 2020

Expiration Date: Sep 16, 2028

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	1650 PPM	1641 PPM	G1	+/- 0.9% NIST Traceable	09/08/2020, 09/16/2020
CARBON MONOXIDE	1650 PPM	1682 PPM	G1	+/- 0.7% NIST Traceable	09/08/2020
NITRIC OXIDE	1650 PPM	1639 PPM	G1	+/- 0.8% NIST Traceable	09/08/2020, 09/16/2020
PROPANE	1700 PPM	1753 PPM	G1	+/- 0.7% NIST Traceable	09/08/2020
NITROGEN	Balance			-	

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	14060137	CC436581	990.9 PPM CARBON MONOXIDE/NITROGEN	0.6%	Nov 15, 2025
PRM	12386	D685025	9.91 PPM NITROGEN DIOXIDE/AIR	2.0%	Feb 20, 2020
NTRM	08011737	KAL004010	970.9 PPM NITRIC OXIDE/NITROGEN	0.6%	Feb 16, 2024
GMIS	401203436105	CC513880	4.732 PPM NITROGEN DIOXIDE/NITROGEN	2.1%	May 02, 2022
NTRM	12062314	CC367519	2503 PPM PROPANE/NITROGEN	0.6%	Mar 12, 2024

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 AMP0900119 CO HCO	FTIR	Aug 12, 2020
Nicolet 6700 AMP0900119 NO HNO	FTIR	Aug 26, 2020
Nicolet 6700 AMP0900119 NO2 impurity	FTIR NO2 impurity	Aug 27, 2020
Nicolet 6700 AMP0900119 C3H8 MC3H8	FTIR	Sep 02, 2020

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:	E04NI99E15A00U1	Reference Number:	153-401628329-1
Cylinder Number:	CC280768	Cylinder Volume:	144.4 CF
Laboratory:	124 - Tooele (SAP) - UT	Cylinder Pressure:	2015 PSIG
PGVP Number:	B72019	Valve Outlet:	660
Gas Code:	CO,NO,NOX,PPN,BALN	Certification Date:	Oct 29, 2019

Expiration Date: Oct 29, 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	800.0 PPM	806.2 PPM	G1	+/- 0.8% NIST Traceable	10/22/2019, 10/29/2019
CARBON MONOXIDE	800.0 PPM	811.5 PPM	G1	+/- 0.8% NIST Traceable	10/22/2019
NITRIC OXIDE	800.0 PPM	805.5 PPM	G1	+/- 0.8% NIST Traceable	10/22/2019, 10/29/2019
PROPANE	850.0 PPM	853.9 PPM	G1	+/- 0.9% NIST Traceable	10/22/2019
NITROGEN	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	14060109	CC432562	990.9 PPM CARBON MONOXIDE/NITROGEN	0.6%	Nov 18, 2019
PRM	12376	D562879	10.01 PPM NITROGEN DIOXIDE/NITROGEN	2.0%	Aug 17, 2018
NTRM	15010324	KAL004276	980.7 PPM NITRIC OXIDE/NITROGEN	0.5%	Aug 21, 2021
GMIS	7301017103	CC506597	4.451 PPM NITROGEN DIOXIDE/NITROGEN	2.0%	Dec 18, 2020
NTRM	15060815	CC462626	992.3 PPM PROPANE/NITROGEN	0.6%	Jul 22, 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 AMP0900119 CO HCO	FTIR	Oct 09, 2019
Nicolet 6700 AMP0900119 NO HNO	FTIR	Oct 03, 2019
Nicolet 6700 AMP0900119 NO2 impurity	FTIR NO2 impurity	Oct 03, 2019
Nicolet 6700 AMP0900119 C3H8 MC3H8	FTIR	Sep 25, 2019

Triad Data Available Upon Request

Signature on file
Approved for Release

Airgas
an Air Liquide company

Airgas USA, LLC
525 North Industrial Loop Road
Tooele, UT 84074
Airgas.com

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number:	E04NI99E15A00W0	Reference Number:	153-402113796-1
Cylinder Number:	CC129528	Cylinder Volume:	144.4 CF
Laboratory:	124 - Tooele (SAP) - UT	Cylinder Pressure:	2015 PSIG
PGVP Number:	B72021	Valve Outlet:	660
Gas Code:	CO,NO,NOX,PPN,BALN	Certification Date:	May 24, 2021

Expiration Date: May 24, 2029

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	400.0 PPM	408.9 PPM	G1	+/- 0.6% NIST Traceable	05/17/2021, 05/24/2021
CARBON MONOXIDE	400.0 PPM	404.4 PPM	G1	+/- 0.8% NIST Traceable	05/17/2021
NITRIC OXIDE	400.0 PPM	407.9 PPM	G1	+/- 0.6% NIST Traceable	05/17/2021, 05/24/2021
PROPANE	500.0 PPM	502.8 PPM	G1	+/- 0.7% NIST Traceable	05/17/2021
NITROGEN	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	13010136	KAL003851	495.4 PPM CARBON MONOXIDE/NITROGEN	0.6%	Jul 03, 2024
PRM	12376	D562879	10.01 PPM NITROGEN DIOXIDE/NITROGEN	2.0%	Aug 17, 2018
NTRM	15010133	KAL004417	494.6 PPM NITRIC OXIDE/NITROGEN	0.5%	Sep 01, 2021
PRM	12386	D685025	9.91 PPM NITROGEN DIOXIDE/AIR	2.0%	Feb 20, 2020
GMIS	7302017111	CC511391	4.634 PPM NITROGEN DIOXIDE/NITROGEN	2.0%	Aug 15, 2021
GMIS	401648675102	CC500959	5.074 PPM NITROGEN DIOXIDE/NITROGEN	2.1%	Feb 01, 2023
NTRM	01010323	K012489	499.3 PPM PROPANE/AIR	0.6%	Jul 02, 2024

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 AMP0900119 CO MCO	FTIR	May 13, 2021
Nicolet 6700 AMP0900119 NO MNO	FTIR	May 05, 2021
Nicolet 6700 AMP0900119 NO2 impurity	FTIR NO2 impurity	May 05, 2021
Nicolet 6700 AMP0900119 C3H8 MC3H8	FTIR	May 13, 2021

Triad Data Available Upon Request

Approved for Release

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number:	E02AI99E15W0021	Reference Number:	153-401669673-1
Cylinder Number:	CC507600	Cylinder Volume:	146.2 CF
Laboratory:	124 - Tooele (SAP) - UT	Cylinder Pressure:	2015 PSIG
PGVP Number:	B72020	Valve Outlet:	660
Gas Code:	NO2,BALA	Certification Date:	Jan 08, 2020

Expiration Date: Jan 08, 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 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
NITROGEN DIOXIDE	50.00 PPM	50.12 PPM	G1	+/- 2.0% NIST Traceable	12/10/2019, 01/08/2020
AIR	Balance			-	

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
GMIS	401206801105	CC513733	58.35 PPM NITROGEN DIOXIDE/NITROGEN	1.8%	May 02, 2022
PRM	12388	D685030	59.5 PPM NITROGEN DIOXIDE/NITROGEN	1.7%	Feb 20, 2020

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
MKS FTIR NO2 018143349	FTIR	Jan 08, 2020

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:	E03NI56E15A1055	Reference Number:	153-401902218-1
Cylinder Number:	CC210288	Cylinder Volume:	161.7 CF
Laboratory:	124 - Tooele (SAP) - UT	Cylinder Pressure:	2015 PSIG
PGVP Number:	B72020	Valve Outlet:	590
Gas Code:	CO2,O2,BALN	Certification Date:	Sep 14, 2020

Expiration Date: Sep 14, 2028

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 DIOXIDE	22.00 %	21.69 %	G1	+/- 0.8% NIST Traceable	09/14/2020
OXYGEN	22.00 %	22.03 %	G1	+/- 0.3% NIST Traceable	09/14/2020
NITROGEN	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	13060802	CC415397	24.04 % CARBON DIOXIDE/NITROGEN	0.6%	Dec 11, 2025
NTRM	12062008	CC367433	22.883 % OXYGEN/NITROGEN	0.2%	May 14, 2024

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Horiba VIA-510 SV4MEUTJ CO2	CO2 NDIR (Dixon)	Sep 03, 2020
Horiba MPA-510 W603MM58 O2	O2 Paramagnetic (Mason)	Sep 10, 2020

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:	E03NI80E15A0138	Reference Number:	153-401834846-1
Cylinder Number:	CC84055	Cylinder Volume:	150.9 CF
Laboratory:	124 - Tooele (SAP) - UT	Cylinder Pressure:	2015 PSIG
PGVP Number:	B72020	Valve Outlet:	590
Gas Code:	CO2,O2,BALN	Certification Date:	Jun 15, 2020

Expiration Date: Jun 15, 2028

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 DIOXIDE	10.00 %	9.936 %	G1	+/- 0.7% NIST Traceable	06/15/2020
OXYGEN	10.00 %	10.02 %	G1	+/- 0.7% NIST Traceable	06/15/2020
NITROGEN	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	13060405	CC411744	7.489 % CARBON DIOXIDE/NITROGEN	0.6%	May 14, 2025
NTRM	98051017	SG9142416BAL	12.05 % OXYGEN/NITROGEN	0.7%	Dec 14, 2023

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Horiba VIA-510 SV4MEUTJ CO2	CO2 NDIR (Dixon)	Jun 11, 2020
Horiba MPA-510 W603MM58 O2	O2 Paramagnetic (Mason)	May 21, 2020

Triad Data Available Upon Request

Signature on file

Approved for Release

TRC Report No: 454646.0000.0000

ThermoFisher SCIENTIFIC

Thermo Scientific Model 42 NO-NO_2-NO_x Analyzer
Potential Interference Gas Responses

Potential Interferent		***Model 42iLS***			***Model 42iHL***		
Test Gas	***Concentration***	***NO***	***NO_2***	***NO_x***	***NO***	***NO_2***	***NO_x***
CO_2	5.20%	0.001	0.004	0.004	0.001	0.003	0.004
CO_2	15.60%	0	0.003	0.003	0.001	0.004	0.005
H_2O	1.00%	0	0	0	0.003	0.001	0.004
NO	15 ppm	14.9	0.1	15	15	-0.06	14.99
NO_2	15 ppm	1.1	14	15	0.4	14.6	15
N_2O	10 ppm	0	0	0	0	0	0
CO	50 ppm	0	0	0	0	0	0
SO_2	21 ppm	-0.01	0	-0.01	0.007	0	0.007
CH_4	50 ppm	0	0	0	0	0	0
HCl	10 ppm	0	0.006	0.006	0	0.004	0.004
NH_3[1]	10 ppm	0	0	0	0.17	8.9	9.1
Sum of Responses		**0.011**	**0.01**	**0.02**	**0.011**	**0.009**	**0.02**
Span Value		**160**	**152**	**160**	**160**	**152**	**160**
% of Calibration Span		**0.01%**	**0.01%**	**0.01%**	**0.01%**	**0.01%**	**0.01%**

Acceptance Criteria found in Section 13.4 of Method 7E is the sum of responses must not be greater than 2.5% of the analyzer calibration span value.

[1]NH_3 interferent results shown for the Model 42iHL was not used in calculation of interference response check because it is a known interferent with an approximate 1 ppm to 1 ppm positive bias in analyzers using stainless steel NO_2 to NO converters. Thermo recommends that NO_x analyzers with stainless steel NO_2 to NO converters must use a NH_3 scrubber when testing sources with potential NH_3 in the flue gas.

This document is subject to change without notice.

Analyzer Interference Response Tests

Test Date: *3/13/2003* *Technician:* *JDM*

Location: *TRC Austin, Texas*

Analyzer	Manufacturer	Model	Serial Number	Detection Method/Comments
NO_X Analyzer	Thermo Environmental Instruments	42C	42CHL74320376	Chemiluminescence with Ozone
CO Analyzer	Thermo Environmental Instruments	48	48-27403-228	Infrared Absorption
O_2 Analyzer	Servomex	1440	01420C1/2534	Paramagnetic
CO_2 Analyzer	Servomex	1440	1415C/2650	Infrared Absorption
THC Analyzer	JUM	3-300A	03021534-33	Flame ionization

Interferrent Test Gases		Analyzer Response (ppmv or % as applicable)				
Gas	**Concentration**	**NO_X**	**CO**	**O_2**	**CO_2**	**THC**
NO_X in N_2	1768 ppm		-0.20 ppmv	0.00 ppmv	0.03 ppmv	0.50 ppmv
Propane / CO in Air	1755 ppm / 1767 ppm	0.21 ppmv			0.04 ppmv	
SO_2 in N_2	254 ppm	0.00 ppmv	-0.20 ppmv	0.00 ppmv	0.03 ppmv	0.50 ppmv
O_2/CO_2 in N_2	20.9% / 3.96%	0.00 ppmv	-0.20 ppmv			0.20 ppmv

Analyzer Interference Response Tests

Test Date: 3/13/2003 *Technician:* JDM

Location: TRC, Austin, Texas

Analyzer	Manufacturer	Model	Serial Number	Detection Method/Comments
NO_X Analyzer	ermo Environmental Instrume	42C	42CHL74320376	Chemiluminescence with Ozone
CO Analyzer	ermo Environmental Instrume	48C	48C69334363	Infrared Absorption
O_2 Analyzer	alifornia Analytical Instrumer	Model 200	1N08009	Paramagnetic
CO_2 Analyzer	alifornia Analytical Instrumer	Model 200	1N08009	Infrared Absorption
THC Analyzer	JUM	3-300A	03021534-33	Flame ionization
NO_x B Analyzer	ermo Environmental Instrume	42H	42H35784251	Chemiluminescence with Ozone
CO B Analyzer	ermo Environmental Instrume	48C		Infrared Absorption

Interferrent Test Gases		Analyzer Response (ppmv or % as applicable)				
Gas	Concentration	NO_X	CO	O_2	CO_2	THC
NO_X in N_2	1768 ppm		-0.20 ppmv	0.00 ppmv	0.03 ppmv	0.50 ppmv
Propane / CO in Air	1755 ppm / 1767 ppm	0.21 ppmv			0.04 ppmv	
SO_2 in N_2	254 ppm	0.00 ppmv	-0.20 ppmv	0.00 ppmv	0.03 ppmv	0.50 ppmv
O_2/CO_2 in N_2	20.9% / 3.96%	0.00 ppmv	-0.20 ppmv			0.20 ppmv

Test Date: 4/1/2003 *Technician:* JDM

Location: TRC, Austin, Texas

Analyzer	Manufacturer	Model	Serial Number	Detection Method/Comments
O_2 B Analyzer	alifornia Analytical Instrumer	Model 200	P02004	Paramagnetic
CO_2 B Analyzer	alifornia Analytical Instrumer	Model 200	P02004	Infrared Absorption
THC Analyzer	JUM	5-100	51068099	Flame ionization

Interferrent Test Gases		Analyzer Response (ppmv or % as applicable)		
Gas	Concentration	THC	O_2	CO_2
NO_X in N_2	901	0.00 ppmv	0.00 %	0.01 %
Propane/ CO in Air	899/907			0.00 %
SO_2 in N_2	254	0.02 ppmv	0.00 %	0.01 %
O_2/CO_2 in N_2	20.9%/ 3.96%	-0.01 ppmv		

Part 60 Subpart JJJJ Compliance Test
Initial Stratification Check and Test Point Selection

Test Date:	11/4/2020	Diameter	12.00	inches
Project Number:	454646	Port Length:	0.25	inches
Company:	Curia New Mexico LLC	Upstream:	2.0	Dia.
Location:	Curia New Mexico LLC	Downstream:	14.0	Dia.
Source:	Emergency Generator			

Sample Point Selection using 40 CFR 60, Subpart JJJJ, Table 2 for NO_X, CO, VOC, O_2, and moisture
Ducts > 6 and ≤ 12 inches in diameter may be sampled at 3 traverse points located at 16.7, 50.0, and 83.3% of the measurement line ('3-point long line').

Number of Points Used for Stratification Check: 3

Stratification Check Traverse Data				
Port/Point	NO_X (ppmv)	CO (ppmv)	CO_2 (%vol)	O_2 (%vol)
1				8.6
2				8.7
3				8.6
Mean:	-	-	-	8.6

Parameter	Max Concentration Difference	Max % Difference From Mean	Stratification Check Result	Required Number of Sampling Points
NO_X	-	-	-	-
CO	-	-	-	-
CO_2	-	-	-	-
O_2	0.0	0.6	Un-Stratified	1

Recommended Sampling Strategy: -

Sampling Strategy selected: Single Point

Part 60 Subpart JJJJ Compliance Test
Initial Stratification Check and Test Point Selection

Test Date:	11/4/2020	Diameter	12.00	inches
Project Number:	454646	Port Length:	0.25	inches
Company:	Curia New Mexico LLC	Upstream:	2.0	Dia.
Location:	Curia New Mexico LLC	Downstream:	14.0	Dia.
Source:	Emergency Generator			

Sample Point Selection using 40 CFR 60, Subpart JJJJ, Table 2 for NO_X, CO, VOC, O_2, and moisture

Ducts > 6 and ≤ 12 inches in diameter may be sampled at 3 traverse points located at 16.7, 50.0, and 83.3% of the measurement line ('3-point long line').

Number of Points Used for Stratification Check: 3

Stratification Check Traverse Data

Port/Point	NO_X (ppmv)	CO (ppmv)	CO_2 (%vol)	O_2 (%vol)
1				7.9
2				7.9
3				7.9
Mean:	-	-	-	7.9

Parameter	Max Concentration Difference	Max % Difference From Mean	Stratification Check Result	Required Number of Sampling Points
NO_X	-	-	-	-
CO	-	-	-	-
CO_2	-	-	-	-
O_2	0.0	0.5	Un-Stratified	1

Recommended Sampling Strategy: -

Sampling Strategy selected: Single Point

METHOD 5 PRETEST CONSOLE CALIBRATION USING CALIBRATED CRITICAL ORIFICES
4-POINT CALIBRATION - ENGLISH UNITS

METER CONSOLE INFORMATION	
Console Model Number	XC-522
Console Serial Number	1204011
DGM Model Number	S-110
DGM Serial Number	998871

CALIBRATION CONDITIONS			
Date	Time	10-May-21	1330
Barometric Pressure		23.96	in. Hg
Theoretical Critical Vacuum[1]		11.309	in. Hg
Calibration Technician		SJJ	

FACTORS/CONVERSIONS		
Std. Temp.	528	°R
Std. Pressure	29.92	in. Hg
K_1	17.647	°R/in. Hg

[1]For valid test results, the Actual Vacuum should be 1 to 2 in. Hg greater than the Theoretical Critical Vacuum shown above.
[2]The Critical Orifice Coefficient, K', must be entered in English units, $(ft^3*°R^{1/2})/(in.\ Hg*min)$.

CALIBRATION DATA

Run Time	Metering Console					Critical Orifice				
Elapsed	DGM Orifice ΔH	Volume Initial	Volume Final	Outlet Temp. Initial	Outlet Temp. Final	Serial Number	Orifice Coefficient	Amb. Temp. Initial	Amb. Temp. Final	Actual Vacuum
(Θ) min.	(P_m) in. H_2O	(V_{mi}) cubic feet	(V_{mf}) cubic feet	(t_{mi}) °F	(t_{mf}) °F		K' see above[2]	(t_{amb}) °F	(t_{amb}) °F	in. Hg
15.0	0.56	901.743	908.402	65.0	66.0	CI-48	0.3422	69.0	69.0	16.5
15.0	0.56	908.402	915.058	66.0	67.0	CI-48	0.3422	69.0	69.0	16.5
15.0	0.98	915.058	923.947	67.0	68.0	CI-55	0.4568	69.0	69.0	15.5
15.0	0.98	923.947	932.860	68.0	69.0	CI-55	0.4568	69.0	69.0	15.5
15.0	1.60	932.860	944.297	69.0	70.0	CI-63	0.5862	69.0	69.0	14.0
15.0	1.60	944.297	955.743	70.0	71.0	CI-63	0.5862	69.0	69.0	14.0
15.0	2.90	955.743	971.435	71.0	72.0	CI-73	0.8125	70.0	70.0	11.5
15.0	2.90	971.435	987.171	72.0	73.0	CI-73	0.8125	70.0	70.0	11.5

RESULTS

Standardized Data				Dry Gas Meter				
				Calibration Factor		Flowrate	ΔH@	
Dry Gas Meter		Critical Orifice		Value	Variation	Std. & Corr.	0.75 SCFM	Variation
($V_{m(std)}$) cubic feet	($Q_{m(std)}$) cfm	($Vcr_{(std)}$) cubic feet	($Q_{cr(std)}$) cfm	(Y)	(ΔY) (from avg.)	($Q_{m(std)(corr)}$) cfm	(ΔH@) in. H2O	(ΔΔH@) (from avg.)
5.367	0.358	5.347	0.356	0.996		0.356	2.003	0.064
5.355	0.357	5.347	0.356	0.999	0.003	0.356	1.999	0.060
7.147	0.476	7.138	0.476	0.999		0.476	1.965	0.025
7.152	0.477	7.138	0.476	0.998	0.002	0.476	1.961	0.022
9.178	0.612	9.160	0.611	0.998		0.611	1.948	0.009
9.168	0.611	9.160	0.611	0.999	0.002	0.611	1.944	0.005
12.595	0.840	12.684	0.846	1.007		0.846	1.849	0.090
12.606	0.840	12.684	0.846	1.006	0.006	0.846	1.845	0.094
				1.00	Y Average		1.939	ΔH@ Average

Note: For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptance tolerance of individual values from the average is ± 2%.
Y must be 0.98 - 1.02 ΔH@ must be 1.84 ± 0.25

Leak check must be performed before calibration.

Leak Check: Negative: 0.00 CFM (for 60 secs.) <--- Must not exceed 0.02 cfm over 60 seconds.
Positive: pass (Pass/Fail) <--- ΔH between 5 and 7 in. H_2O, must hold steady for 60 seconds.

I certify that the above Dry Gas Meter was calibrated in accordance with USEPA Methods, CFR Title 40, Part 60, Appendix A-3, Method 5, 16.2.3.

Technician Name: Samuel Jaeger Date: 10-May-21
Signature: Samuel Jaeger

Reviewed and Approved by: Date: 10-May-21

TEMPERATURE DISPLAY CALIBRATION FORM

Meter Console Number: 1204011

Reference Calibrator Make: Piecal Model: 520B Serial No.: 128331

Operator: SJJ Date: 05/10/21

Pretest: X Posttest:

TC Channel ID	Reference Temp. 1, °F	Temperature Reading 1, °F	% Diff.	Criteria Met	Reference Temp. 2, °F	Temperature Reading 2, °F	% Diff.	Criteria Met
1	0	1	-0.22%	Pass	500	496	0.42%	Pass
2	0	1	-0.22%	Pass	500	496	0.42%	Pass
3	0	1	-0.22%	Pass	500	497	0.31%	Pass
4	0	1	-0.22%	Pass	500	497	0.31%	Pass
5	0	1	-0.22%	Pass	500	497	0.31%	Pass
6	0	1	-0.22%	Pass	500	497	0.31%	Pass
7			0.00%	Pass			0.00%	Pass
8			0.00%	Pass			0.00%	Pass
9			0.00%	Pass			0.00%	Pass
10			0.00%	Pass			0.00%	Pass

TC Channel ID	Reference Temp. 3, °F	Temperature Reading 3, °F	% Diff.	Criteria Met	Reference Temp. 4, °F	Temperature Reading 4, °F	% Diff.	Criteria Met
1	1000	998	0.14%	Pass	1500	1495	0.26%	Pass
2	1000	998	0.14%	Pass	1500	1495	0.26%	Pass
3	1000	998	0.14%	Pass	1500	1495	0.26%	Pass
4	1000	998	0.14%	Pass	1500	1495	0.26%	Pass
5	1000	998	0.14%	Pass	1500	1495	0.26%	Pass
6	1000	998	0.14%	Pass	1500	1495	0.26%	Pass
7			0.00%	Pass			0.00%	Pass
8			0.00%	Pass			0.00%	Pass
9			0.00%	Pass			0.00%	Pass
10			0.00%	Pass			0.00%	Pass

Criteria: Percent difference (% Diff.) between the Reference Temperature and the Average Temperature can be only ± 1.5%°R.

% Difference Equation:

$$\frac{[(\text{Ref. Temp.} + 460) - (\text{Temp. Reading} + 460)] \times 100}{(\text{Ref. Temp.} + 460)}$$

QA/QC Check By:

Date: 5/10/2021

TRC

METHOD 5 POSTTEST CONSOLE CALIBRATION
USING CALIBRATED CRITICAL ORIFICES
3-POINT CALIBRATION - ENGLISH UNITS

METER CONSOLE INFORMATION	
Console Model Number	765
Console Serial Number	1204011
DGM Model Number	522
DGM Serial Number	998871

CALIBRATION CONDITIONS			
Date	Time	8-Nov-21	1055
Barometric Pressure		24.598	in. Hg
Theoretical Critical Vacuum[1]		11.610	in. Hg
Calibration Technician		PSS	

FACTORS/CONVERSIONS		
Std. Temp.	528	°R
Std. Pressure	29.92	in. Hg
K_1	17.647	°R/in Hg

[1]For valid test results, the Actual Vacuum should be 1 to 2 in. Hg greater than the Theoretical Critical Vacuum shown above.
[2]The Critical Orifice Coefficient, K', must be entered in English units, $(ft^3*°R^{1/2})/(in.Hg*min)$.

CALIBRATION DATA

Run Time	Metering Console					Critical Orifice				
Elapsed	DGM Orifice ΔH	Volume Initial	Volume Final	Outlet Temp. Initial	Outlet Temp. Final	Serial Number	Orifice Coefficient	Amb. Temp. Initial	Amb. Temp. Final	Actual Vacuum
(Θ) min.	(P_m) in. H_2O	(V_{mi}) cubic feet	(V_{mf}) cubic feet	(t_{mi}) °F	(t_{mf}) °F		K' see above[2]	(t_{amb}) °F	(t_{amb}) °F	in. Hg
10.0	1.40	755.065	763.565	63.0	64.0	CH-63	0.5964	71.0	71.0	17.5
10.0	1.40	763.565	771.195	64.0	66.0	CH-63	0.5964	71.0	71.0	17.5
10.0	1.40	771.195	778.823	66.0	67.0	CH-63	0.5964	71.0	71.0	17.5

RESULTS

Standardized Data				Dry Gas Meter				
				Calibration Factor		Flowrate	ΔH@	
Dry Gas Meter		Critical Orifice		Value	Variation	Std & Corr	0.75 SCFM	Variation
($V_{m(std)}$) cubic feet	($Q_{m(std)}$) cfm	($V_{cr(std)}$) cubic feet	($Q_{cr(std)}$) cfm	(Y)	(ΔY)	($Q_{m(std)(corr)}$) cfm	(ΔH@) in. H2O	(ΔΔH@)
7.078	0.708	6.366	0.637	0.900	-0.071	0.637	1.626	0.005
6.335	0.634	6.366	0.637	1.005	0.034	0.637	1.621	0.000
6.315	0.632	6.366	0.637	1.008	0.037	0.637	1.617	-0.005
Pretest Gamma	1.00	**% Deviation**	2.9	0.971	Y Average		1.621	ΔH@ Average

Note: For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptance tolerance of individual values from the average is ± 0.02.
Post Calibration Acceptance Criteria is ≤ 5% Deviation

Leak check must be performed before calibration.

Leak Check: Negative: Pass CFM (for 60 secs.) Must not exceed 0.02 cfm over 60 seconds.
Positive: Pass (Pass/Fail) ΔH between 5 and 7 inches, must hold steady for 60 seconds.

I certify that the above Dry Gas Meter was calibrated in accordance with USEPA Methods, CFR Title 40, Part 60, Appendix A-3, Method 5, 16.2.3.

Technician Name: Panteleimon Stathopulos Date: 8-Nov-21

Signature:

Reviewed and Approved by: Date: 11/22/2021

TEMPERATURE DISPLAY CALIBRATION FORM

Meter Console Number: 1204011

Reference Calibrator Make: Piecal Model: 520B Serial No.: 128331

Operator: PSS Date: 11/8/2021

Pretest: _____ Posttest: x

TC Channel ID	Reference Temp 1, °F	Temperature Reading 1, °F	% Diff.	Criteria Met	Reference Temp 2, °F	Temperature Reading 2, °F	% Diff.	Criteria Met
1	32	31	0.20%	**Pass**	200	196	0.61%	**Pass**
2	32	32	0.00%	**Pass**	200	196	0.61%	**Pass**
3	32	31	0.20%	**Pass**	200	196	0.61%	**Pass**
4	32	31	0.20%	**Pass**	200	198	0.30%	**Pass**
5	32	31	0.20%	**Pass**	200	199	0.15%	**Pass**
6	32	31	0.20%	**Pass**	200	199	0.15%	**Pass**
7			0.00%	**Pass**			0.00%	**Pass**
8			0.00%	**Pass**			0.00%	**Pass**
9			0.00%	**Pass**			0.00%	**Pass**
10			0.00%	**Pass**			0.00%	**Pass**

TC Channel ID	Reference Temp 3, °F	Temperature Reading 3, °F	% Diff.	Criteria Met	Reference Temp 4, °F	Temperature Reading 4, °F	% Diff.	Criteria Met
1	500	486	1.46%	**Pass**	1000	980	1.37%	**Pass**
2	500	486	1.46%	**Pass**	1000	980	1.37%	**Pass**
3	500	486	1.46%	**Pass**	1000	980	1.37%	**Pass**
4	500	486	1.46%	**Pass**	1000	980	1.37%	**Pass**
5	500	486	1.46%	**Pass**	1000	980	1.37%	**Pass**
6	500	486	1.46%	**Pass**	1000	980	1.37%	**Pass**
7			0.00%	**Pass**			0.00%	**Pass**
8			0.00%	**Pass**			0.00%	**Pass**
9			0.00%	**Pass**			0.00%	**Pass**
10			0.00%	**Pass**			0.00%	**Pass**

Criteria: Percent difference (% Diff.) between the Reference Temperature and the Average Temperature can be only ± 1.5%°R.

% Difference Equation: $\frac{[(\text{Ref. Temp.} + 460) - (\text{Temp. Reading} + 460)] \times 100}{(\text{Ref. Temp.} + 460)}$

QA/QC Check By: Caleb Bradley

Date: 11/22/2021

Digital Manometer Calibration

TRC Report No: 454646.0000.0000

WORKING DIGITAL MANOMETER

Date:	10/8/2021
Prev. Calib. Date:	12/17/2020
Location:	GLD
Technician:	C. Thomas
Manometer Model:	Shortridge ADM-850
Serial #:	M03823

REFERENCE OIL MANOMETER

Manufacture:	Dwyer Slack Tube
Location:	Golden Lab

Calibration Run #	Target dP (in. H2O	Reference Oil Manometer (in H2O)	Working Digital Manometer (in. H2O)	Difference (in. H2O)	Absolute Difference (%)	***Calibration Point Check (pass/fail)**
1	0.5	0.51	0.5105	0.00	0.1	***PASS***
2	1.0	1.05	1.070	-0.02	1.9	***PASS***
3	3.0	3.05	3.131	-0.08	2.7	***PASS***
4	5.0	5.05	5.140	-0.09	1.8	***PASS***
5	7.5	7.45	7.550	-0.10	1.3	***PASS***

Criteria:

* Method 2 Sec 6.2: at each point, the values of dP as read by the digital manometer and reference manometer must agree to within 5%.

QA/QC Signature:

Digital Manometer Calibration

WORKING DIGITAL MANOMETER

Date:	11/8/2021
Prev. Calib. Date:	10/8/2021
Location:	GLD
Technician:	P.Stathopulos
Manometer Model:	Shortridge ADM-850
Serial #:	M03823

REFERENCE OIL MANOMETER

Manufacture:	Dwyer Slack Tube
Location:	Golden Lab

Calibration Run #	Target dP (in. H2O	Reference Oil Manometer (in H2O)	Working Digital Manometer (in. H2O)	Difference (in. H2O)	Absolute Difference (%)	***Calibration Point Check (pass/fail)**
1	0.5	0.51	0.5300	-0.02	3.9	***PASS***
2	1.0	1.05	1.090	-0.04	3.8	***PASS***
3	3.0	3.05	3.040	0.01	0.3	***PASS***
4	5.0	5.05	5.105	-0.06	1.1	***PASS***
5	7.5	7.45	7.680	-0.23	3.1	***PASS***

Criteria:

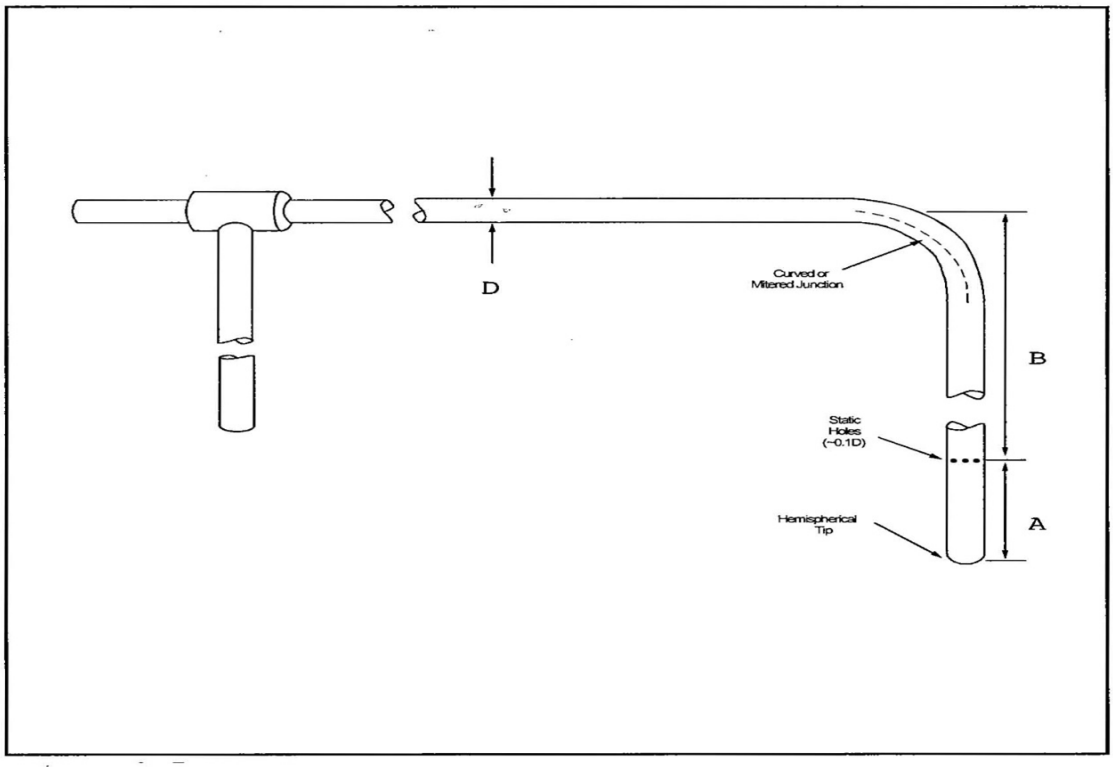
* Method 2 Sec 6.2: at each point, the values of dP as read by the digital manometer and reference manometer must agree to within 5%.

QA/QC Signature:

TRC

STANDARD PITOT TUBE INSPECTION

Analyst:	S. Jaeger
Date:	6/20/21
Project Number:	428060
Client:	UNMH OSIS
Test Location:	Albuquerque, NM
Pitot I.D.	160-24
Coefficient	0.99

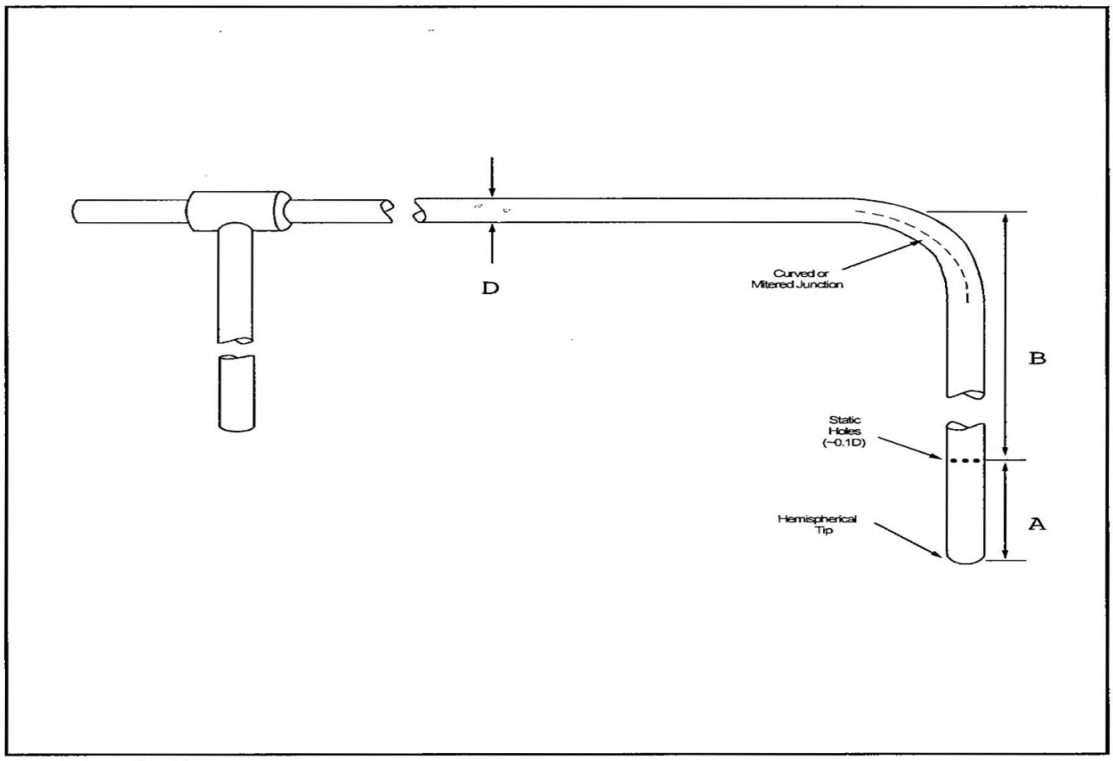


Measurements			**Status**	**Requirement**
A =	6.99	CM	Pass	Must be a minimum of 6 diameters (D)
B =	12.70	CM	Pass	Must be a minimum of 8 diameters (D)
D =	0.79	CM		

Are the holes clear of obstructions? Yes

STANDARD PITOT TUBE INSPECTION

Analyst:	P. Stathopulos
Date:	11/9/21
Project Number:	454646
Client:	Curia
Test Location:	Albuquerque, NM
Pitot I.D.	160-24
Coefficient	0.99



Measurements			**Status**	**Requirement**
A =	6.99	CM	Pass	Must be a minimum of 6 diameters (D)
B =	12.70	CM	Pass	Must be a minimum of 8 diameters (D)
D =	0.79	CM		

Are the holes clear of obstructions? Yes

Digital Thermometer Calibration

DIGITAL Thermometer

Date:	10/8/2021
Location:	Golden, CO
Technician:	C. Thomas
Thermometer Model/Serial #:	Omega HH81A/4708473
TRC ID:	GLD TC-5

Digital Thermometer Calibration Check

Reference Thermometer/Calibrator		Measurements For US EPA Method	Reference Therm/Calib (deg F)	Working Therm. (deg F)	Abs. Temp. Diff. (deg F, ABS)	Abs. Temp. Diff., deg R (%)
Manufacturer	PIEcal	2 & 4	0.0	0.1	0.1	0.02
Model	520B	2 & 4	32.0	32.2	0.2	0.04
Seriel #	114629	2 & 4	70.0	70.2	0.2	0.04
Certificate Date	1/21/2021	2 & 4	100.0	100.2	0.2	0.04
Thermocouple Type	K Type	2 & 4	500.0	500	0.0	0.00
Tested By	BH	2	1000.0	1000	0.0	0.00
(complies with ANSI/Z540-1-1994)		2	1500.0	1499	1.0	0.05
Criteria:						

Digital Thermometer

Calibration Check Results		**Pass/Fail**
^^Ave. Temp. Diff. (°F, ABS):	**0.2**	***PASS***
^Ave. Temp. Diff., deg R (%):	**0.03**	***PASS***

^ Method 2 Sec 4.3 (in-stack thermometers). Agreement must be less than 1.5% absolute temperature difference between reference and working thermometer.

^^ Method 4 Sec 2.1.4 & Method 5 Sec. 2.1.6 (gas meter thermometers). Thermometers capable of measuring temperature within 3 deg C (5.4 deg F).

^^ Method 4 Sec 2.1.2 (last impinger thermometers). Thermometer capable of measuring within 1 deg C (2 deg F).

08-Oct-21

QA/QC Signature:

Digital Thermometer Calibration

DIGITAL Thermometer

Date:	11/8/2021
Location:	Golden, CO
Technician:	P.Stathopulos
Thermometer Model/Serial #:	Omega HH81A/4708473
TRC ID:	GLD TC-5

TRC Report No: 454646.0000.0000

Digital Thermometer Calibration Check

Reference Thermometer/Calibrator	
Manufacturer	PIEcal
Model	520B
Seriel #	114629
Certificate Date	1/21/2021
Thermocouple Type	K Type
Tested By	BH
(complies with ANSI/Z540-1-1994)	

Measurements For US EPA Method	Reference Therm/Calib (deg F)	Working Therm. (deg F)	Abs. Temp. Diff. (deg F, ABS)	Abs. Temp. Diff., deg R (%)
2 & 4	0.0	-0.4	0.4	0.09
2 & 4	32.0	31.6	0.4	0.08
2 & 4	70.0	69.8	0.2	0.04
2 & 4	100.0	99.7	0.3	0.05
2	500.0	500	0.0	0.00
2	1000.0	1000	0.0	0.00
2	1500.0	1499	1.0	0.05

Digital Thermometer

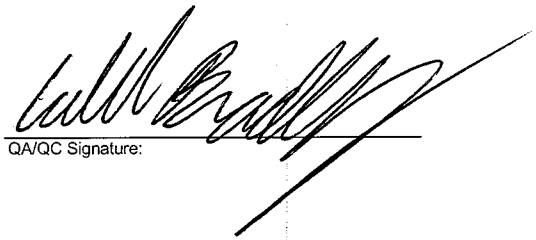
Calibration Check Results		**Pass/Fail**
^^Ave. Temp. Diff. (°F, ABS):	**0.3**	***PASS***
^Ave. Temp. Diff., deg R (%):	**0.04**	***PASS***

Criteria:

^ Method 2 Sec 4.3 (in-stack thermometers). Agreement must be less than 1.5% absolute temperature difference between reference and working thermometer.

^^ Method 4 Sec 2.1.4 & Method 5 Sec. 2.1.6 (gas meter thermometers). Thermometers capable of measuring temperature within 3 deg C (5.4 deg F).

^^ Method 4 Sec 2.1.2 (last impinger thermometers). Thermometer capable of measuring within 1 deg C (2 deg F).



QA/QC Signature:

COLORADO SCALE CENTER
MARKING, CODING AND LABELING EQUIPMENT

SERVICE & CALIBRATION CERTIFICATE

CustomerName:	TRC		
Department:		Capacity:	2000g x .1g
ContactName:	BRADLEY, CALEB	Serial:	7131470376
Phone:	281-979-5801	Date Serviced:	5/6/2021
Manufacturer:	OHAUS	Frequency:	Annual
Model:	SP-2001	Recert Date:	5/6/2022

MEASUREMENT STANDARDS & WEIGHTS USED

Weight #	Nominal Value	As Found	After Correction	Tolerance
Weight #1	500g	500.0 g	500.0 g	+/- .1g
Weight #2	1000g	999.9 g	1000.0 g	+/-.2g
Weight #3	1500g	1499.8 g	1500.0 g	+/-.2g
Weight #4	2000g	1999.7 g	2000.0 g	+/-.2g

General Condition of Scale:

Comments: Calibrated

Note: Scales are checked using certified test weights. The applied tolerance is derived from handbook 44.

NIST Certificate Number	Certificate Date	Expiration Date
3075629	6/24/2020	6/24/2021

Calibrated By: [signature] Registration #001K13

Colorado Scale Center 3914 Youngfield St. / Wheat Ridge, CO 80033 303-431-2555 / 303-431-2722 fax

COLORADO SCALE CENTER
MARKING, CODING AND LABELING EQUIPMENT

SERVICE & CALIBRATION CERTIFICATE

CustomerName:	TRC		
Department:		Capacity:	500g
ContactName:	BRADLEY, CALEB	Serial:	5NL9
Phone:	281-979-5801	Date Serviced:	5/6/2021
Manufacturer:		Frequency:	Annual
Model:	TEST WEIGHT	Recert Date:	5/6/2022

MEASUREMENT STANDARDS & WEIGHTS USED

Weight #	Nominal Value	As Found	After Correction	Tolerance
Weight #1	500g	500.0g		
Weight #2				
Weight #3				
Weight #4				

General Condition of Scale:

Comments: Accurate

Note: Scales are checked using certified test weights. The applied tolerance is derived from handbook 44.

NIST Certificate Number	Certificate Date	Expiration Date
3075629	6/24/2020	6/24/2021

Calibrated By: [signature] Registration #001K13

Colorado Scale Center 3914 Youngfield St. / Wheat Ridge, CO 80033 303-431-2555 / 303-431-2722 fax

COLORADO SCALE CENTER
MARKING, CODING AND LABELING EQUIPMENT

SERVICE & CALIBRATION CERTIFICATE

CustomerName:	TRC		
Department:		Capacity:	1kg
ContactName:	BRADLEY, CALEB	Serial:	5RCW
Phone:	281-979-5801	Date Serviced:	5/6/2021
Manufacturer:		Frequency:	Annual
Model:	TEST WEIGHT	Recert Date:	5/6/2022

MEASUREMENT STANDARDS & WEIGHTS USED

Weight #	Nominal Value	As Found	After Correction	Tolerance
Weight #1	1kg	1000.0 g		
Weight #2				
Weight #3				
Weight #4				

General Condition of Scale:

Comments: Accurate

Note: Scales are checked using certified test weights. The applied tolerance is derived from handbook 44.

NIST Certificate Number	Certificate Date	Expiration Date
3075629	6/24/2020	6/24/2021

Calibrated By: _____ Registration #001K13

Colorado Scale Center 3914 Youngfield St. / Wheat Ridge, CO 80033 303-431-2555 / 303-431-2722 fax

Field Barometer Working Standard Accuracy Verification Check

Procedure 2: Calibration with National Weather Service Barometer at Nearby Station or Local Airport

Instrument Identification: **Manufacturer:** Kestrel

Model: 3500 **Serial Number:** 2647226 **ID Number:** 2647226 **Owner:** GLD

Reference Standard:

Location of NWS Station or Airport Barometer: Broomfield/Jeffco (KBJC)

Certificate Information:

Analyst Full Name: Carter Thomas **Procedure:** SOP AM-CAL-008 **Accuracy Verification Date:** 10/14/2021 **Accuracy Verification Due Date:** 4/14/2022

Test Conditions: **Temp °C** 16.7 **RH%** 65

National Weather Service (NWS) Barometer

Corrected NWS Barometric Pressure	**29.96**	in. Hg (Pbr)
Elevation of NWS Barometer (above Sea Level)	**5253**	feet (A)
Absolute NWS Barometric Pressure	**24.71**	in. Hg (Pbr)

(Station or Absolute Pbr is actual barometer reading at barometer elevation, uncorrected to sea level)

Location of Field Barometer

Elevation at Location (above Sea Level)	**5080**	feet (B)

Altitude Correction:

Elevation of NWS Reference Barometer: (A)	5253	feet
Elevation of Field Barometer: (B)	**5080**	feet
Difference (A-B)	**173**	feet

Correction of Reference Barometric Pressure (Pbr) to Location and Altitude of Field Barometer

Pbr calc = Pbr + [0.001 x (A-B)]

Pbr calc 24.71 + (0.001 * 173)

Pbr calc = 24.88

Pbr Calculated (from above):	24.88	in. Hg
Pb Field Barometer Reading:	**24.83**	in. Hg

Is Field Barometer within 0.1 in. Hg of Pbr Calculated? **Yes**

If no, adjust Field Barometer to Pbr Calculated.

Edward A. Peterson, Senior Technical Manager

Maintaining Accuracy:

The accuracy of this instrument has been checked and found to be in tolerance unless otherwise noted. The instrument should provide accurate readings until the next accuracy verification due date. If this instrument is damaged or abused in any way, it should not be used for making measurements until its accuracy is checked and verified to be in tolerance.

Field Barometer Working Standard Accuracy Verification Check

Procedure 2: Calibration with National Weather Service Barometer at Nearby Station or Local Airport

Instrument Identification: **Manufacturer:** Kestrel

Model: 3500 **Serial Number:** 2647226 **ID Number:** 2647226 **Owner:** GLD

Reference Standard:

Location of NWS Station or Airport Barometer: Broomfield/Jeffco (KBJC)

Certificate Information:

Analyst Full Name: P. Stathopulos **Procedure:** SOP AM-CAL-008 **Accuracy Verification Date:** 11/23/2021 **Accuracy Verification Due Date:** 5/24/2022

Test Conditions: **Temp °C** 19 **RH%** 7

National Weather Service (NWS) Barometer

Corrected NWS Barometric Pressure	**29.85**	in. Hg (Pbr)
Elevation of NWS Barometer (above Sea Level)	**5551**	feet (A)
Absolute NWS Barometric Pressure	**24.30**	in. Hg (Pbr)

(Station or Absolute Pbr is actual barometer reading at barometer elevation, uncorrected to sea level)

Location of Field Barometer

Elevation at Location (above Sea Level)	**5990**	feet (B)

Altitude Correction:

Elevation of NWS Reference Barometer: (A)	5551	feet
Elevation of Field Barometer: (B)	**5990**	feet
Difference (A-B)	**-439**	feet

Correction of Reference Barometric Pressure (Pbr) to Location and Altitude of Field Barometer

Pbr calc = Pbr + [0.001 x (A-B)]

Pbr calc 24.30 + (0.001 * -439)

Pbr calc = 23.86

Pbr Calculated (from above):	23.86	in. Hg
Pb Field Barometer Reading:	**23.93**	in. Hg

Is Field Barometer within 0.1 in. Hg of Pbr Calculated? **Yes**

If no, adjust Field Barometer to Pbr Calculated.

Edward A. Peterson, Senior Technical Manager

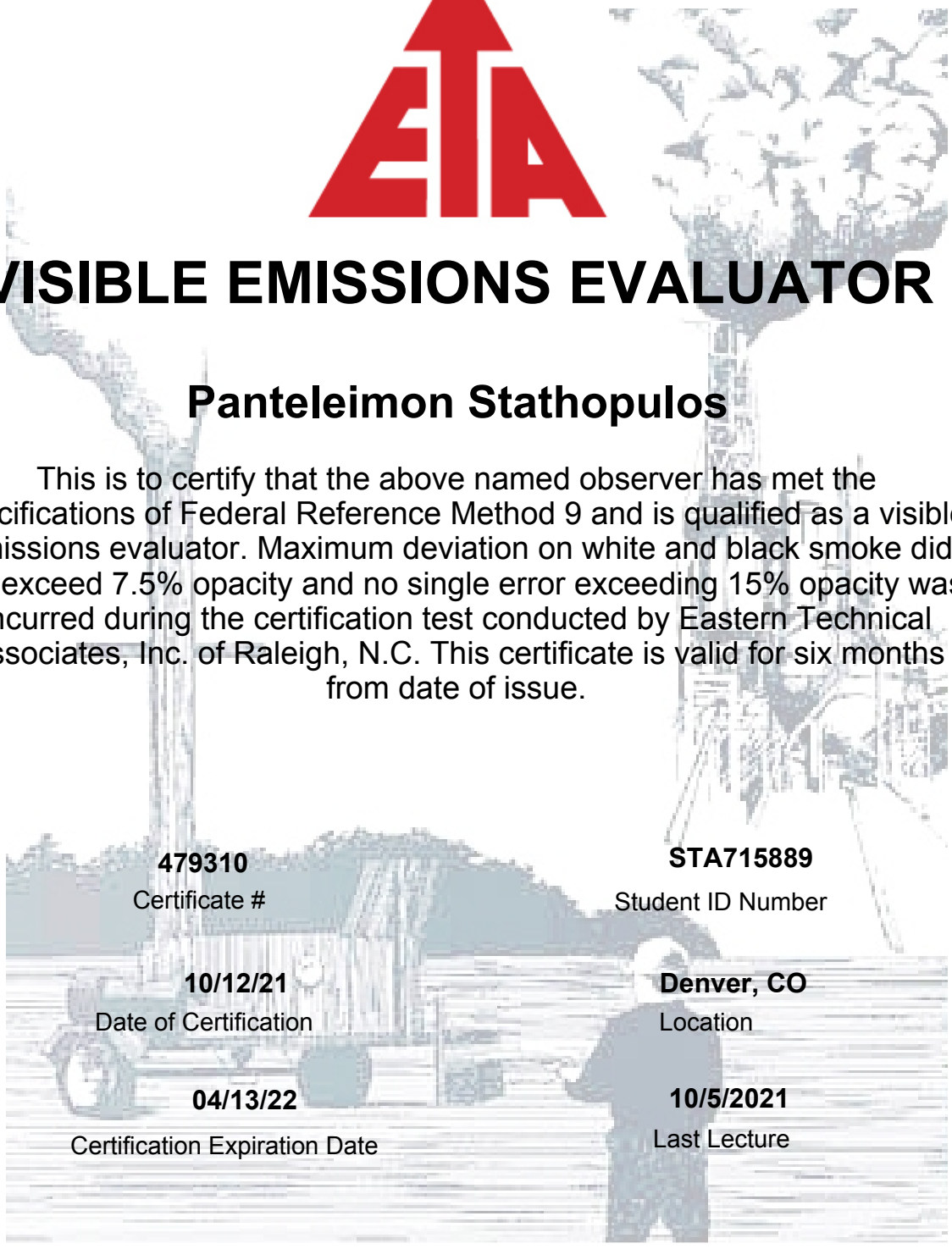
Maintaining Accuracy:

The accuracy of this instrument has been checked and found to be in tolerance unless otherwise noted. The instrument should provide accurate readings until the next accuracy verification due date. If this instrument is damaged or abused in any way, it should not be used for making measurements until its accuracy is checked and verified to be in tolerance.

IV.F Audit Sample Results

Not Applicable

IV.G VISIBLE EMISSIONS FIELD SHEETS AND METHOD 9 CERTIFICATION



VISIBLE EMISSIONS EVALUATOR

Panteleimon Stathopulos

This is to certify that the above named observer has met the specifications of Federal Reference Method 9 and is qualified as a visible emissions evaluator. Maximum deviation on white and black smoke did not exceed 7.5% opacity and no single error exceeding 15% opacity was incurred during the certification test conducted by Eastern Technical Associates, Inc. of Raleigh, N.C. This certificate is valid for six months from date of issue.

479310
Certificate #

STA715889
Student ID Number

10/12/21
Date of Certification

Denver, CO
Location

04/13/22
Certification Expiration Date

10/5/2021
Last Lecture

Jody Monk
General Manager

Visible Emission Observation Form

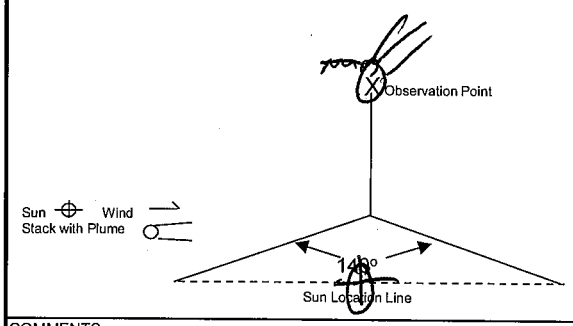
- Pg 1 of 2

TRC

FACILITY NAME	Curia New Mexico LLC
STREET ADDRESS	42410 Balloon Park Road NE
CITY	Albuquerque
STATE	NM
ZIP	87109
SOURCE NAME	Cumins Desil Gen.
ID #	7
PROCESS EQUIPMENT	Emergency generator
OPERATING MODE	Running Bank Load
CONTROL EQUIPMENT	—
OPERATING MODE	—
DESCRIBE EMISSION POINT	Outlet of Stack atop Generator
HEIGHT ABOVE GROUND LEVEL START	45'
HEIGHT ABOVE GROUND LEVEL STOP	45'
HEIGHT RELATIVE TO OBSERVER START	39'
HEIGHT RELATIVE TO OBSERVER STOP	39'
DISTANCE FROM OBSERVER START	90'
DISTANCE FROM OBSERVER STOP	90'
DIRECTION FROM OBSERVER START	NW
DIRECTION FROM OBSERVER STOP	NW
DESCRIBE EMISSIONS START	lofting
DESCRIBE EMISSIONS STOP	lofting
EMISSION COLOR START	Black
EMISSION COLOR STOP	Black
PLUME TYPE	CONTINUOUS ☑ FUGITIVE ☐ INTERMITTENT ☐
WATER DROPLETS PRESENT	NO ☒ YES ☐
IF WATER DROPLET PLUME	ATTACHED ☐ DETACHED ☐
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED START	2 ft Above Stack
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED STOP	2 ft above Stack
DESCRIBE BACKGROUND START	Blue Sky
DESCRIBE BACKGROUND STOP	Blue Sky
BACKGROUND COLOR START	Blue
BACKGROUND COLOR STOP	Blue
SKY CONDITIONS START	Clear
SKY CONDITIONS STOP	Clear
WIND SPEED START	0 mph
WIND SPEED STOP	0 mph
WIND DIRECTION START	Calm
WIND DIRECTION STOP	Calm
AMBIENT TEMP START	55°F
AMBIENT TEMP STOP	55°F
WET BULB TEMP	33°F
RH PERCENT	43%

Source Layout Sketch

Draw North Arrow TN ☒ MN ☐



COMMENTS: R1 on Unit 1

(*) Pg 2. has Corrected opacities

PROJECT NUMBER	L154646.0000.0000
OBSERVATION DATE	11-04-21
START TIME	1104
STOP TIME	1110

SEC	0	15	30	45
1	5	10	10	10
2	5	5	5	5
3	10	10	10	10
4	10	10	10	10
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SEC	0	15	30	45
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AVERAGE OPACITY FOR HIGHEST MINUTE PERIOD: 1-6	8.8
NUMBER OF READINGS ABOVE 8.8 % WERE:	16
RANGE OF OPACITY READINGS	5 MINIMUM — 10 MAXIMUM
OBSERVER'S NAME (PRINT)	Panteleimon Stathopoulos
OBSERVER'S SIGNATURE	
DATE	11-04-21
ORGANIZATION	TRC
CERTIFIED BY	ETA
DATE	10/12/21

Visible Emission Observation Form

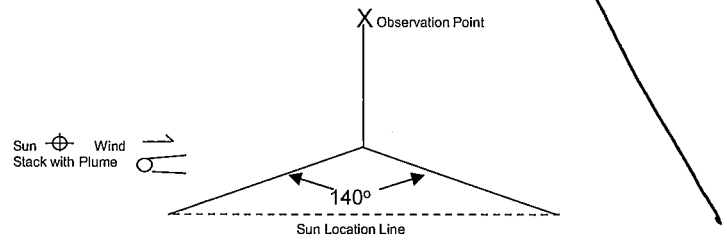
Pg 2 of 2

TRC

FACILITY NAME	Curia New Mexico LLC	
STREET ADDRESS	4240 Balloon Park Rd. NE	
CITY	STATE	ZIP
SOURCE NAME		ID #
PROCESS EQUIPMENT	OPERATING MODE	
CONTROL EQUIPMENT	OPERATING MODE	
DESCRIBE EMISSION POINT		
HEIGHT ABOVE GROUND LEVEL START / STOP	HEIGHT RELATIVE TO OBSERVER START / STOP	
DISTANCE FROM OBSERVER START / STOP	DIRECTION FROM OBSERVER START / STOP	
DESCRIBE EMISSIONS START / STOP		
EMISSION COLOR START / STOP	PLUME TYPE: CONTINUOUS ☐ FUGITIVE ☐ INTERMITTENT ☐	
WATER DROPLETS PRESENT NO ☐ YES ☐	IF WATER DROPLET PLUME ATTACHED ☐ DETACHED ☐	
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED START / STOP		
DESCRIBE BACKGROUND START / STOP		
BACKGROUND COLOR START / STOP	SKY CONDITIONS START / STOP	
WIND SPEED START / STOP	WIND DIRECTION START / STOP	
AMBIENT TEMP START / STOP	WET BULB TEMP	RH PERCENT

Source Layout Sketch

Draw North Arrow TN ☐ MN ☐



COMMENTS: Values are Corrected for a Slant angle of 27°

A2 U1

PROJECT NUMBER	454646.0000.0000								
OBSERVATION DATE				START TIME 1104				STOP TIME 1110	

SEC	0	15	30	45	SEC	0	15	30	45
1	4.5	9	9	9	31				
2	4.5	4.5	4.5	4.5	32				
3	9	9	9	9	33				
4	9	9	9	9	34				
5	9	9	9	9	35				
6	9				36				
7					37				
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AVERAGE OPACITY FOR HIGHEST MINUTE PERIOD: 1-6	7.43
NUMBER OF READINGS ABOVE 7.92 % WERE:	16
RANGE OF OPACITY READINGS	4.5 MINIMUM — 9 MAXIMUM
OBSERVER'S NAME (PRINT)	Panteleimon Stamopoulos
OBSERVER'S SIGNATURE	DATE 11/15/21
ORGANIZATION	TRC
CERTIFIED BY	ISTA DATE 10/12/21

Visible Emission Observation Form

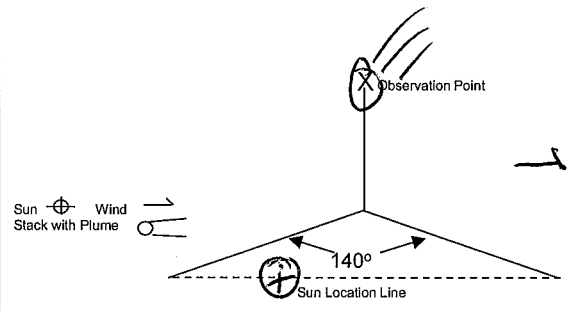
TRC

FACILITY NAME	Curia New Mexico LLC
STREET ADDRESS	42410 Balloon Park Road NE
CITY	Albuquerque
STATE	NM
ZIP	87109
SOURCE NAME	Cumins Desil Generator
ID #	7
PROCESS EQUIPMENT	Emergency Generator
OPERATING MODE	Running Bank Load
CONTROL EQUIPMENT	—
OPERATING MODE	—
DESCRIBE EMISSION POINT	Outlet of Stack atop Generator
HEIGHT ABOVE GROUND LEVEL START	45'
HEIGHT ABOVE GROUND LEVEL STOP	45'
HEIGHT RELATIVE TO OBSERVER START	39'
HEIGHT RELATIVE TO OBSERVER STOP	39'
DISTANCE FROM OBSERVER START	90'
DISTANCE FROM OBSERVER STOP	90'
DIRECTION FROM OBSERVER START	NW
DIRECTION FROM OBSERVER STOP	NW
DESCRIBE EMISSIONS START	lofting 2 Ft Above Stack
DESCRIBE EMISSIONS STOP	lofting 2 Ft above Stack
EMISSION COLOR START	Black
EMISSION COLOR STOP	Black
PLUME TYPE	CONTINUOUS ☑ FUGITIVE ☐ INTERMITTENT ☐
WATER DROPLETS PRESENT	NO ☑ YES ☐
IF WATER DROPLET PLUME	ATTACHED ☐ DETACHED ☐
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED START	2 ft above Stack
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED STOP	2ft abvd Stack
DESCRIBE BACKGROUND START	Blue Sky
DESCRIBE BACKGROUND STOP	Blue Sky
BACKGROUND COLOR START	Blue
BACKGROUND COLOR STOP	Blue
SKY CONDITIONS START	Clear
SKY CONDITIONS STOP	Clear.
WIND SPEED START	7mph
WIND SPEED STOP	7mph
WIND DIRECTION START	SSW
WIND DIRECTION STOP	SSW
AMBIENT TEMP START	61°F
AMBIENT TEMP STOP	61°F
WET BULB TEMP	31°F
RH PERCENT	32%

pgs 11-15-21

Source Layout Sketch

Draw North Arrow TN ☑ MN ☐



COMMENTS: R2 on Unit 1

Pg 2 has Corrected opacities

PROJECT NUMBER	454646.0000.0000
OBSERVATION DATE	11-04-21
START TIME	1238
STOP TIME	1244

SEC	0	15	30	45	SEC	0	15	30	45
1	10	10	10	10	31				
2	10	10	10	10	32				
3	10	10	10	10	33				
4	10	10	10	10	34				
5	10	5	10	10	35				
6	10				36				
7					37				
8					38				
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29					59				
30					60				

AVERAGE OPACITY FOR HIGHEST MINUTE PERIOD: 1-6	9.76
NUMBER OF READINGS ABOVE 9.76 % WERE:	20
RANGE OF OPACITY READINGS	5 MINIMUM — 10 MAXIMUM
OBSERVER'S NAME (PRINT)	Pantelejmon Stefanopoulos
OBSERVER'S SIGNATURE	
DATE	11-4-21
ORGANIZATION	TRC
CERTIFIED BY	ETA.
DATE	10/12/21

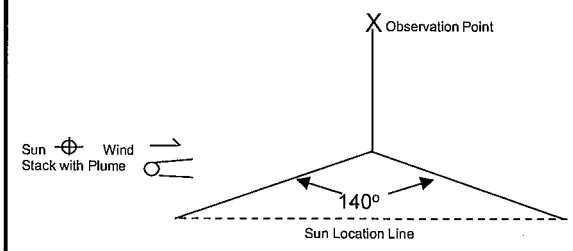
Visible Emission Observation Form

TRC

FACILITY NAME	Curia New Mexico LLC	
STREET ADDRESS	4240 Balloon Park Rd. NE	
CITY	STATE	ZIP
SOURCE NAME		ID #
PROCESS EQUIPMENT	OPERATING MODE	
CONTROL EQUIPMENT	OPERATING MODE	
DESCRIBE EMISSION POINT		
HEIGHT ABOVE GROUND LEVEL START STOP	HEIGHT RELATIVE TO OBSERVER START STOP	
DISTANCE FROM OBSERVER START STOP	DIRECTION FROM OBSERVER START STOP	
DESCRIBE EMISSIONS START	STOP	
EMISSION COLOR START STOP	PLUME TYPE: CONTINUOUS ☐ FUGITIVE ☐ INTERMITTENT ☐	
WATER DROPLETS PRESENT NO ☐ YES ☐	IF WATER DROPLET PLUME ATTACHED ☐ DETACHED ☐	
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED START	STOP	
DESCRIBE BACKGROUND START	STOP	
BACKGROUND COLOR START STOP	SKY CONDITIONS START STOP	
WIND SPEED START STOP	WIND DIRECTION START STOP	
AMBIENT TEMP START STOP	WET BULB TEMP	RH PERCENT

Source Layout Sketch

Draw North Arrow TN ☐ MN ☐



COMMENTS Values are corrected for a slant angle of 27°

PROJECT NUMBER 454646.0000.0000

OBSERVATION DATE | START TIME 1234 | STOP TIME 1244

SEC	0	15	30	45	SEC	0	15	30	45
1	9	9	9	9	31				
2	9	9	9	9	32				
3	9	9	9	9	33				
4	9	9	9	9	34				
5	9	4.5	9	9	35				
6	9				36				
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AVERAGE OPACITY FOR HIGHEST 8.79 MINUTE PERIOD: 1-6

NUMBER OF READINGS ABOVE 8.79 % WERE: 20

RANGE OF OPACITY READINGS 4.5 MINIMUM 9 MAXIMUM

OBSERVER'S NAME (PRINT) Pantelis Stathopulos

OBSERVER'S SIGNATURE [signature] DATE 11/15/21

ORGANIZATION TRC

CERTIFIED BY ETA DATE 10/12/21

R2 V1

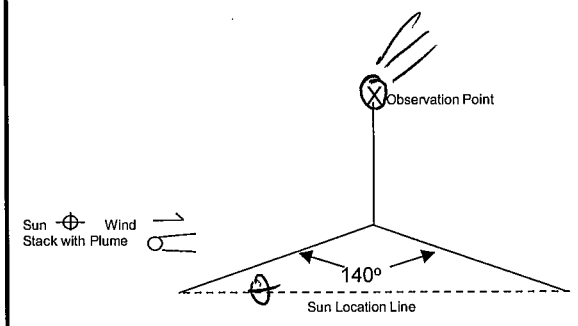
Visible Emission Observation Form

TRC

FACILITY NAME	Curia New Mexico LLC
STREET ADDRESS	4240 Balloon Park Road NE
CITY	Albuquerque
STATE	NM
ZIP	87109
SOURCE NAME	Cummins Desil Generator
ID #	7
PROCESS EQUIPMENT	Emergency Generator
OPERATING MODE	Running Bank Load
CONTROL EQUIPMENT	—
OPERATING MODE	—
DESCRIBE EMISSION POINT	Outlet of Stack atop Generator
HEIGHT ABOVE GROUND LEVEL START	45'
HEIGHT ABOVE GROUND LEVEL STOP	45'
HEIGHT RELATIVE TO OBSERVER START	39'
HEIGHT RELATIVE TO OBSERVER STOP	39'
DISTANCE FROM OBSERVER START	90'
DISTANCE FROM OBSERVER STOP	90'
DIRECTION FROM OBSERVER START	NW
DIRECTION FROM OBSERVER STOP	NW
DESCRIBE EMISSIONS START	Lofting
DESCRIBE EMISSIONS STOP	Lofting
EMISSION COLOR START	Black
EMISSION COLOR STOP	Black
PLUME TYPE	CONTINUOUS ☑ FUGITIVE ☐ INTERMITTENT ☐
WATER DROPLETS PRESENT	NO ☑ YES ☐
IF WATER DROPLET PLUME	ATTACHED ☐ DETACHED ☐
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED START	2 ft above Stack
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED STOP	2 ft above Stack
DESCRIBE BACKGROUND START	Blue Sky
DESCRIBE BACKGROUND STOP	Blue Sky
BACKGROUND COLOR START	Blue
BACKGROUND COLOR STOP	Blue
SKY CONDITIONS START	Clear
SKY CONDITIONS STOP	Clear
WIND SPEED START	0mph
WIND SPEED STOP	0mph
WIND DIRECTION START	Calm
WIND DIRECTION STOP	Calm
AMBIENT TEMP START	63°F
AMBIENT TEMP STOP	63°F
WET BULB TEMP	31°F
RH PERCENT	30%

Source Layout Sketch

Draw North Arrow TN ☑ MN ☐



COMMENTS: #3 on unit 1

(*) Pg 2. has corrected opacities

PROJECT NUMBER 454646.0000.0000

OBSERVATION DATE 11-04-21 | START TIME 1333 | STOP TIME 1339

SEC	0	15	30	45	SEC	0	15	30	45
1	15	15	15	15	31				
2	15	15	15	15	32				
3	15	15	15	15	33				
4	15	15	15	15	34				
5	15	15	15	15	35				
6	15				36				
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AVERAGE OPACITY FOR HIGHEST 15 MINUTE PERIOD: 1-6 15 %

NUMBER OF READINGS ABOVE 15 % WERE: 0

RANGE OF OPACITY READINGS: 15 MINIMUM 15 MAXIMUM

OBSERVER'S NAME (PRINT): Panteleimon Stathopulos

OBSERVER'S SIGNATURE: [signature] DATE 11-04-21

ORGANIZATION: TRC

CERTIFIED BY: ETA DATE 10/12/21

Visible Emission Observation Form

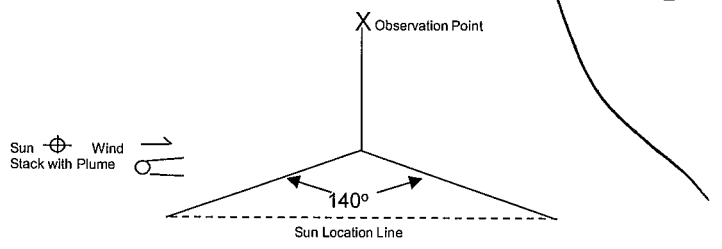
Pg 2 of 2

TRC

FACILITY NAME	Curia New Mexico LLC
STREET ADDRESS	4240 Balloon Park Rd. NE
CITY	STATE: ZIP
SOURCE NAME	ID #
PROCESS EQUIPMENT	OPERATING MODE
CONTROL EQUIPMENT	OPERATING MODE
DESCRIBE EMISSION POINT	
HEIGHT ABOVE GROUND LEVEL START STOP	HEIGHT RELATIVE TO OBSERVER START STOP
DISTANCE FROM OBSERVER START STOP	DIRECTION FROM OBSERVER START STOP
DESCRIBE EMISSIONS START	STOP
EMISSION COLOR START STOP	PLUME TYPE: CONTINUOUS ☐ FUGITIVE ☐ INTERMITTENT ☐
WATER DROPLETS PRESENT NO ☐ YES ☐	IF WATER DROPLET PLUME ATTACHED ☐ DETACHED ☐
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED START	STOP
DESCRIBE BACKGROUND START	STOP
BACKGROUND COLOR START STOP	SKY CONDITIONS START STOP
WIND SPEED START STOP	WIND DIRECTION START STOP
AMBIENT TEMP START STOP	WET BULB TEMP / RH PERCENT

Source Layout Sketch

Draw North Arrow TN ☐ MN ☐



COMMENTS: Values are Corrected for a Slant angle of 27°

R3 V1

PROJECT NUMBER 454646.0000.0000

OBSERVATION DATE | START TIME 1333 | STOP TIME 1339

SEC	0	15	30	45	SEC	0	15	30	45
1	13.5	13.5	13.5	13.5	31				
2	13.5	13.5	13.5	13.5	32				
3	13.5	13.5	13.5	13.5	33				
4	13.5	13.5	13.5	13.5	34				
5	13.5	13.5	13.5	13.5	35				
6	13.5				36				
7					37				
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AVERAGE OPACITY FOR HIGHEST MINUTE PERIOD: 1-6 13.5 | NUMBER OF READINGS ABOVE 13.5 % WERE: 8

RANGE OF OPACITY READINGS: 13.5 MINIMUM 13.5 MAXIMUM

OBSERVER'S NAME (PRINT): Pantelleimon Stathopoulos

OBSERVER'S SIGNATURE: | DATE: 11/15/21

ORGANIZATION: TRC

CERTIFIED BY: ETA | DATE: 10/12/21

Visible Emission Observation Form

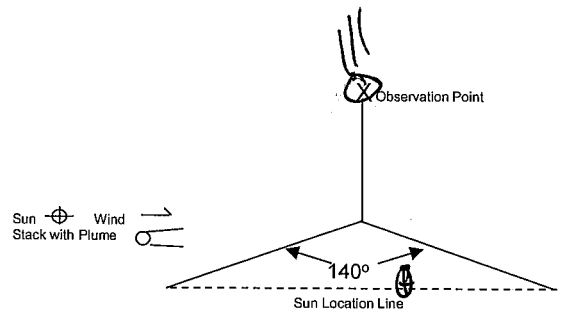
Pg 1 of 2

TRC

FACILITY NAME	Curia New Mexico LLC
STREET ADDRESS	4240 Balloon Park Rd. NE
CITY	Albuquerque
STATE	NM
ZIP	87109
SOURCE NAME	Cumins Diesil Generator
ID #	8
PROCESS EQUIPMENT	Emergency Generator
OPERATING MODE	Running Bank Load
CONTROL EQUIPMENT	—
OPERATING MODE	—
DESCRIBE EMISSION POINT	Circular Stack perpendicular 2 ground.
HEIGHT ABOVE GROUND LEVEL START / STOP	45' / 45'
HEIGHT RELATIVE TO OBSERVER START / STOP	39' / 39'
DISTANCE FROM OBSERVER START / STOP	90' / 90'
DIRECTION FROM OBSERVER START / STOP	N / N
DESCRIBE EMISSIONS START / STOP	lofting / lofting
EMISSION COLOR START / STOP	Black / Black
PLUME TYPE	CONTINUOUS ☑ FUGITIVE ☐ INTERMITTENT ☐
WATER DROPLETS PRESENT	NO ☑ YES ☐
IF WATER DROPLET PLUME	ATTACHED ☐ DETACHED ☐
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED START / STOP	1 ft above exit / 1 ft above exit
DESCRIBE BACKGROUND START / STOP	Blue Sky / Blue sky
BACKGROUND COLOR START / STOP	Blue / Blue
SKY CONDITIONS START / STOP	Clear / Clear
WIND SPEED START / STOP	0mph / 0mph
WIND DIRECTION START / STOP	Calm / Calm
AMBIENT TEMP START / STOP	63°F / 63°F
WET BULB TEMP	28°F
RH PERCENT	27%

Source Layout Sketch

Draw North Arrow TN ☑ MN ☐



COMMENTS: Run 1 on unit 2

*Pg 2 has Corrected opacities

PROJECT NUMBER	454646.0000.0000
OBSERVATION DATE	11-04-2021
START TIME	1630
STOP TIME	1636

SEC	0	15	30	45	SEC	0	15	30	45
1	10	10	10	10	31				
2	10	10	10	10	32				
3	10	10	10	10	33				
4	10	10	10	10	34				
5	10	10	10	10	35				
6	10	—	—	—	36				
7	—	—	—	—	37				
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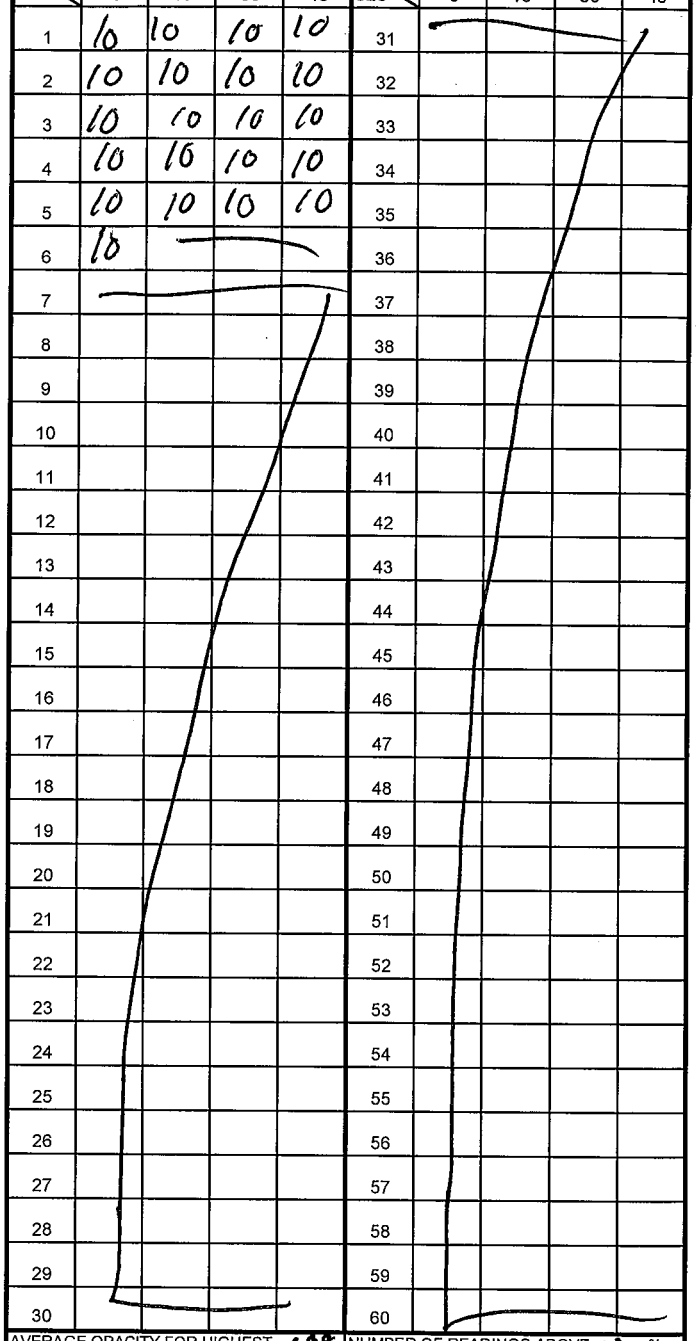
30					60				



AVERAGE OPACITY FOR HIGHEST MINUTE PERIOD: 1-6	10%
NUMBER OF READINGS ABOVE 10 % WERE:	0
RANGE OF OPACITY READINGS	10 MINIMUM — 10 MAXIMUM
OBSERVER'S NAME (PRINT)	Panteleimon Stathopulos
OBSERVER'S SIGNATURE	[signature]
DATE	11/15/21
ORGANIZATION	TRC
CERTIFIED BY	ETA
DATE	10/12/21

pg 2 of 2

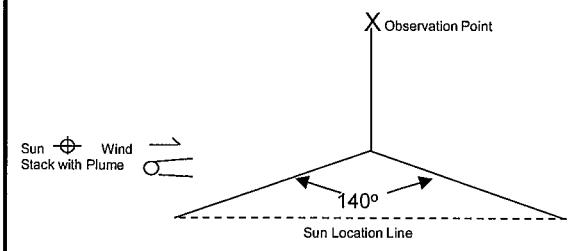
Visible Emission Observation Form

TRC

FACILITY NAME	Curia New Mexico LLC
STREET ADDRESS	4240 Balloon Park Rd. NE
CITY	STATE / ZIP
SOURCE NAME	ID #
PROCESS EQUIPMENT	OPERATING MODE
CONTROL EQUIPMENT	OPERATING MODE
DESCRIBE EMISSION POINT	
HEIGHT ABOVE GROUND LEVEL START / STOP	HEIGHT RELATIVE TO OBSERVER START / STOP
DISTANCE FROM OBSERVER START / STOP	DIRECTION FROM OBSERVER START / STOP
DESCRIBE EMISSIONS START / STOP	
EMISSION COLOR START / STOP	PLUME TYPE: CONTINUOUS ☐ FUGITIVE ☐ INTERMITTENT ☐
WATER DROPLETS PRESENT NO ☐ YES ☐	IF WATER DROPLET PLUME ATTACHED ☐ DETACHED ☐
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED START / STOP	
DESCRIBE BACKGROUND START / STOP	
BACKGROUND COLOR START / STOP	SKY CONDITIONS START / STOP
WIND SPEED START / STOP	WIND DIRECTION START / STOP
AMBIENT TEMP START / STOP	WET BULB TEMP / RH PERCENT

Source Layout Sketch

Draw North Arrow TN ☐ MN ☐



COMMENTS: Values are corrected for a Slant angle of 27 degrees

PROJECT NUMBER: 454646.0000.0000

OBSERVATION DATE | START TIME 1630 | STOP TIME 1836

SEC	0	15	30	45	SEC	0	15	30	45
1	9	9	9	9	31				
2	9	9	9	9	32				
3	9	9	9	9	33				
4	9	9	9	9	34				
5	9	9	9	9	35				
6	9				36				
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30					60				

AVERAGE OPACITY FOR HIGHEST 9 MINUTE PERIOD: 1-6

NUMBER OF READINGS ABOVE 9 %: WERE: 0

RANGE OF OPACITY READINGS: 9 MINIMUM — 9 MAXIMUM

OBSERVER'S NAME (PRINT): Panteleimon Stathopulos

OBSERVER'S SIGNATURE: [signature] DATE: 11-15-21

ORGANIZATION: TRC

CERTIFIED BY: ETA DATE: 10/12/21

Visible Emission Observation Form

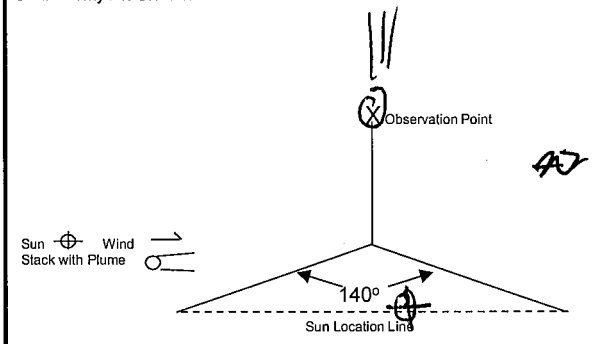
TRC

FACILITY NAME	Curia New Mexico LLC
STREET ADDRESS	4240 Balloon Park Rd. NE
CITY	Albuquerque
STATE	NM
ZIP	87109
SOURCE NAME	Cummins Desil Generator
ID #	~~[illegible]~~ 8
PROCESS EQUIPMENT	Emergency Generator
OPERATING MODE	Running Bank Load
CONTROL EQUIPMENT	—
OPERATING MODE	—
DESCRIBE EMISSION POINT	Circular Stack perpendicular to ground
HEIGHT ABOVE GROUND LEVEL START	45'
HEIGHT ABOVE GROUND LEVEL STOP	45'
HEIGHT RELATIVE TO OBSERVER START	39'
HEIGHT RELATIVE TO OBSERVER STOP	39'
DISTANCE FROM OBSERVER START	90'
DISTANCE FROM OBSERVER STOP	90'
DIRECTION FROM OBSERVER START	N
DIRECTION FROM OBSERVER STOP	N
DESCRIBE EMISSIONS START	lofting
DESCRIBE EMISSIONS STOP	lofting
EMISSION COLOR START	Black
EMISSION COLOR STOP	Black
PLUME TYPE	CONTINUOUS ☑ FUGITIVE ☐ INTERMITTENT ☐
WATER DROPLETS PRESENT	NO ☑ YES ☐
IF WATER DROPLET PLUME	ATTACHED ☐ DETACHED ☐
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED START	1 ft above exit
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED STOP	1 ft above exit
DESCRIBE BACKGROUND START	Blue Sky
DESCRIBE BACKGROUND STOP	Blue Sky
BACKGROUND COLOR START	Blue
BACKGROUND COLOR STOP	Blue
SKY CONDITIONS START	Clear
SKY CONDITIONS STOP	Clear
WIND SPEED START	3 mph
WIND SPEED STOP	3 mph
WIND DIRECTION START	SSE
WIND DIRECTION STOP	SSE
AMBIENT TEMP START	60°F
AMBIENT TEMP STOP	60°F
WET BULB TEMP	27°F
RH PERCENT	28%

pss 11/15/21

Source Layout Sketch

Draw North Arrow TN ☑ MN ☐



COMMENTS	Run 2 on Unit 2
	* pg 2. has Corrected opacities

R2 U2

PROJECT NUMBER	454646.0000.0000
OBSERVATION DATE	11-04-2021
START TIME	1730
STOP TIME	1736

SEC	0	15	30	45	SEC	0	15	30	45
1	10	10	10	10	31				
2	10	10	10	10	32				
3	10	10	10	10	33				
4	10	10	10	10	34				
5	10	10	10	10	35				
6	10	—	—	—	36				
7	—	—	—	—	37				
8					38				
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29					59				
30					60				

AVERAGE OPACITY FOR HIGHEST MINUTE PERIOD: 1-6	10
NUMBER OF READINGS ABOVE 10 % WERE:	0
RANGE OF OPACITY READINGS	10 MINIMUM — 10 MAXIMUM
OBSERVER'S NAME (PRINT)	Panteleimon Stathopoulos
OBSERVER'S SIGNATURE	[signature]
DATE	11-04-21
ORGANIZATION	TRC
CERTIFIED BY	ETA
DATE	10/12/21

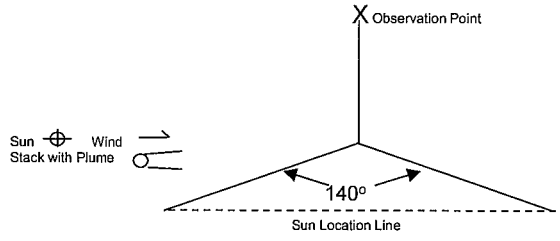
Visible Emission Observation Form

TRC

FACILITY NAME	Curia New Mexico LLC		
STREET ADDRESS	4240 Balloon Park Rd. NE		
CITY	STATE	ZIP	
SOURCE NAME		ID #	
PROCESS EQUIPMENT	OPERATING MODE		
CONTROL EQUIPMENT	OPERATING MODE		
DESCRIBE EMISSION POINT			
HEIGHT ABOVE GROUND LEVEL START / STOP	HEIGHT RELATIVE TO OBSERVER START / STOP		
DISTANCE FROM OBSERVER START / STOP	DIRECTION FROM OBSERVER START / STOP		
DESCRIBE EMISSIONS START / STOP			
EMISSION COLOR START / STOP	PLUME TYPE: CONTINUOUS ☐ FUGITIVE ☐ INTERMITTENT ☐		
WATER DROPLETS PRESENT NO ☐ YES ☐	IF WATER DROPLET PLUME ATTACHED ☐ DETACHED ☐		
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED START / STOP			
DESCRIBE BACKGROUND START / STOP			
BACKGROUND COLOR START / STOP	SKY CONDITIONS START / STOP		
WIND SPEED START / STOP	WIND DIRECTION START / STOP		
AMBIENT TEMP START / STOP	WET BULB TEMP	RH PERCENT	

Source Layout Sketch

Draw North Arrow TN ☐ MN ☐



COMMENTS: Values are corrected for a slant angle of 27°

R2 V2

PROJECT NUMBER 454646.0000.0000

OBSERVATION DATE | START TIME 1730 | STOP TIME 1736

SEC	0	15	30	45	SEC	0	15	30	45
1	9	9	9	9	31				
2	9	9	9	9	32				
3	9	9	9	9	33				
4	9	9	9	9	34				
5	9	9	9	9	35				
6	9	—	—	—	36				
7	—	—	—	—	37				
8					38				
9					39				
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29					59				
30					60				

AVERAGE OPACITY FOR HIGHEST 9 MINUTE PERIOD: 1-6

NUMBER OF READINGS ABOVE 9 % WERE: 0

RANGE OF OPACITY READINGS: 9 MINIMUM 9 MAXIMUM

OBSERVER'S NAME (PRINT): Panteleimon Stathopulos

OBSERVER'S SIGNATURE: [signature] DATE: 11-15-21

ORGANIZATION: TRC

CERTIFIED BY: ETA DATE: 10/12/21

Visible Emission Observation Form

Pg 1 of 2

TRC

FACILITY NAME	Curia New Mexico LLC
STREET ADDRESS	4240 Balloon Park Road NE
CITY	Albuquerque
STATE	NM
ZIP	87109
SOURCE NAME	Cumins Diesel Generator
ID #	~~7448~~ 8
PROCESS EQUIPMENT	~~451~~ Emergency Generator
OPERATING MODE	Running Bank Load
CONTROL EQUIPMENT	—
OPERATING MODE	—

DESCRIBE EMISSION POINT

Circular Stack perpendicular to ground

HEIGHT ABOVE GROUND LEVEL START	45' STOP 45'
HEIGHT RELATIVE TO OBSERVER START	39' STOP 39'
DISTANCE FROM OBSERVER START	90' STOP 90'
DIRECTION FROM OBSERVER START	N STOP N

DESCRIBE EMISSIONS

START ~~Black~~ lofting STOP lofting

EMISSION COLOR START	Black STOP Black
PLUME TYPE:	CONTINUOUS ☑ FUGITIVE ☐ INTERMITTENT ☐
WATER DROPLETS PRESENT	NO ☑ YES ☐
IF WATER DROPLET PLUME	ATTACHED ☐ DETACHED ☐

POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED

START 1 ft above exit STOP 1 ft above exit

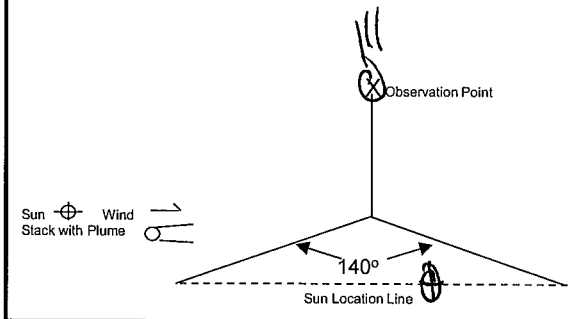
DESCRIBE BACKGROUND

START Blue Sky STOP Blue Sky

BACKGROUND COLOR START	Blue STOP Blue
SKY CONDITIONS START	Clear STOP Clear
WIND SPEED START	3 mph STOP 3 mph
WIND DIRECTION START	SSE STOP SSE
AMBIENT TEMP START	60°F STOP 60°F
WET BULB TEMP	27° F
RH PERCENT	28 %

Source Layout Sketch

Draw North Arrow TN ☑ MN ☐



COMMENTS

Run 3 on unit 2

* Pg 2 has corrected opacities

PROJECT NUMBER	454646.0000.0000
OBSERVATION DATE	11-04-2021
START TIME	1800
STOP TIME	1906

SEC	0	15	30	45	SEC	0	15	30	45
1	15	15	15	15	31				
2	15	15	15	15	32				
3	15	15	15	15	33				
4	15	15	15	15	34				
5	15	15	15	15	35				
6	15				36				
7					37				
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29					59				
30					60				

AVERAGE OPACITY FOR HIGHEST MINUTE PERIOD: 1-6	15%
NUMBER OF READINGS ABOVE 15 % WERE:	0
RANGE OF OPACITY READINGS	15 MINIMUM — 15 MAXIMUM
OBSERVER'S NAME (PRINT)	Panteleimon Stathopulos
OBSERVER'S SIGNATURE	
DATE	11/15/21
ORGANIZATION	TRC
CERTIFIED BY	ETA
DATE	10/12/21

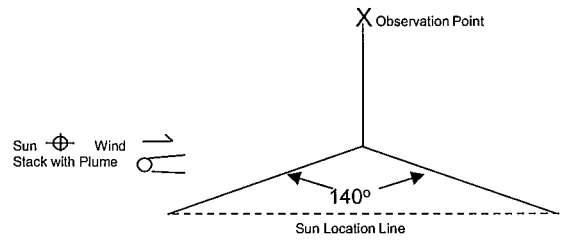
Pg 2 of 2

Visible Emission Observation Form

TRC

FACILITY NAME	Curia New Mexico LLC
STREET ADDRESS	4240 Balloon Park Rd. NE
CITY	STATE: ZIP:
SOURCE NAME	ID #
PROCESS EQUIPMENT	OPERATING MODE
CONTROL EQUIPMENT	OPERATING MODE
DESCRIBE EMISSION POINT	
HEIGHT ABOVE GROUND LEVEL START STOP	HEIGHT RELATIVE TO OBSERVER START STOP
DISTANCE FROM OBSERVER START STOP	DIRECTION FROM OBSERVER START STOP
DESCRIBE EMISSIONS START STOP	
EMISSION COLOR START STOP	PLUME TYPE: CONTINUOUS ☐ FUGITIVE ☐ INTERMITTENT ☐
WATER DROPLETS PRESENT NO ☐ YES ☐	IF WATER DROPLET PLUME ATTACHED ☐ DETACHED ☐
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED START STOP	
DESCRIBE BACKGROUND START STOP	
BACKGROUND COLOR START STOP	SKY CONDITIONS START STOP
WIND SPEED START STOP	WIND DIRECTION START STOP
AMBIENT TEMP START STOP	WET BULB TEMP: RH PERCENT:

Source Layout Sketch — Draw North Arrow TN ☐ MN ☐



COMMENTS: Values are corrected for a Slant angle of 27°

R3 U2

PROJECT NUMBER	454646.0000.0000								
OBSERVATION DATE				START TIME 1800		STOP TIME 1806			

SEC	0	15	30	45	SEC	0	15	30	45
1	13.5	13.5	13.5	13.5	31				
2	13.5	13.5	13.5	13.5	32				
3	13.5	13.5	13.5	13.5	33				
4	13.5	13.5	13.5	13.5	34				
5	13.5	13.5	13.5	13.5	35				
6	13.5				36				
7					37				
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29					59				
30					60				

AVERAGE OPACITY FOR HIGHEST MINUTE PERIOD: 1-6 — 13.5

NUMBER OF READINGS ABOVE 13.5 % WERE: 0

RANGE OF OPACITY READINGS: 13.5 MINIMUM — 13.5 MAXIMUM

OBSERVER'S NAME (PRINT): Panteleimon Stathopulos

OBSERVER'S SIGNATURE: [signature] — DATE: 11/15/21

ORGANIZATION: TRC

CERTIFIED BY: ETA — DATE: 10/12/21

IV.H Sample Chain of Custody

Not Applicable.

V. APPENDIX

V.A Complications during testing

No complications were encountered during this test program and all tests were performed in accordance with EPA reference test methods and the test protocol.

V.B Special Information

Not Applicable.

V.C Test Contractors' Resumes & Qualified Individual Certifications

Presented on following pages.

This is to Certify that:

Caleb Bradley

Is a Qualified Individual as defined in Section 8.3 of ASTM D7036-04 for the following test methods:

EPA Methods 1, 1A, 2, 2A, 2C, 2D, 2F, 2G, 2H, 3, 3B, 4, 5, 5A, 5B, 5D, 5E, 5F, 5i, 17, 19, 201A, and 202.

The individual has met the minimum experience requirements defined in Section 8.3.4.2 of ASTM D7036-04 and has successfully passed a comprehensive examination for the test methods designated above.

This certification is effective until: **02-24-2022**

Edward J MacKinnon

Air Measurements Practice Quality Manager

Date of Issue: 02-28-2017

Certificate Number: 01130

TRC

This certificate is the exclusive property of TRC and is non-transferable.

This is to Certify that:

Caleb Bradley

Is a Qualified Individual as defined in Section 8.3 of ASTM D7036-04 for the following test methods:

EPA Methods 3A, 6C, 7E, 10, 10B, 19, 20, 25A.

CEM Performance Specifications PS2, PS3, PS4, PS4A, PS5, PS6, PS7, PS8, and PS15

The individual has met the minimum experience requirements defined in Section 8.3.4.2 of ASTM D7036-04 and has successfully passed a comprehensive examination for the test methods designated above.

This certification is effective until: **04-07-2022**

Date of Issue: 04-10-2017

Certificate Number: 01138

Edward J MacKinnon

Air Measurements Practice Quality Manager

Caleb R Bradley

Education
BS in Environmental Geography and Natural Resources, May 2015, Texas State University, San Marcos, TX

Experience
2015-Present *Air Specialist*, TRC
Golden, Colorado
Air emission testing team lead experienced with the procedures set forth in the U.S. EPA Code of Federal Regulations, Title 40, Part 60 governing air emissions. Responsibilities include particulate matter and wet chemical sample collection, flow measurements, instrumental analysis, job preparation, process analysis, data collection and reduction, equipment maintenance and upgrading, laboratory analysis, and report writing. Testing experience with a variety of emission generating sources.

SAFETY DATA SHEET

Diesel

HOLLYFRONTIER

Section 1. Identification

Product name : Diesel

Synonyms : Ultra Low Sulfur Diesel, ULSD, Biodiesel, No 1 Diesel, No 2 Diesel, B2, B5, B15, B20

Relevant identified uses of the substance or mixture and uses advised against

Product use : Fuel.

Manufacturer : HollyFrontier Refining & Marketing LLC
2828 North Harwood
Suite 1300
Dallas, Texas 75201
USA
Customer Service: (888) 286-8836

Emergency telephone number : CHEMTREC® (800) 424-9300
CCN 201319

Section 2. Hazards identification

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Classification of the substance or mixture : FLAMMABLE LIQUIDS - Category 3
SKIN CORROSION/IRRITATION - Category 2
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) [Narcotic effects] - Category 3
ASPIRATION HAZARD - Category 1

Percentage of the mixture consisting of ingredient(s) of unknown toxicity: 10%

GHS label elements

Hazard pictograms :

Signal word : Danger

Hazard statements : Flammable liquid and vapor.
Causes skin irritation.
May be fatal if swallowed and enters airways.
May cause drowsiness and dizziness.

Precautionary statements

Prevention : Wear protective gloves. Wear eye or face protection. Keep away from heat, sparks, open flames and hot surfaces. - No smoking. Use explosion-proof electrical, ventilating, lighting and all material-handling equipment. Use only non-sparking tools. Take precautionary measures against static discharge. Keep container tightly closed. Use only outdoors or in a well-ventilated area. Avoid breathing vapor. Wash hands thoroughly after handling.

Response : IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Call a POISON CENTER or physician if you feel unwell. IF SWALLOWED: Immediately call a POISON CENTER or physician. Do NOT induce vomiting. IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. IF ON SKIN: Wash with plenty of soap and water. Take off contaminated clothing. If skin irritation occurs: Get medical attention.

Storage : Store in a well-ventilated place. Keep cool.

Disposal : Dispose of contents and container in accordance with all local, regional, national and international regulations.

Supplemental label elements : Avoid contact with skin and clothing. Wash thoroughly after handling.

Hazards not otherwise classified : Prolonged or repeated contact may dry skin and cause irritation.

Section 3. Composition/information on ingredients

Substance/mixture : Mixture

CAS number/other identifiers

CAS number : Not applicable.

Product code : Not available.

Ingredient name	%	CAS number
Distillates (petroleum), hydrotreated light	0 - 100	64742-47-8
Kerosine (petroleum), hydrodesulfurized	0 - 100	64742-81-0
Fatty acids, C16-18 and C18-unsatd., Me esters	0 - 20	67762-38-3
naphthalene	1 - 3	91-20-3

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

Eye contact : Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Get medical attention. Continue to rinse for at least 15 minutes.

Inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention. If necessary, call a poison center or physician. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Skin contact : Wash skin thoroughly with soap and water or use recognized skin cleanser. Remove contaminated clothing and shoes. Continue to rinse for at least 15 minutes. Get medical attention. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion : Aspiration hazard if swallowed. Can enter lungs and cause damage. Do not induce vomiting. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Get medical attention immediately. Call a poison center or physician. Wash out mouth with water. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact : Causes serious eye irritation.

Inhalation : Can cause central nervous system (CNS) depression. May cause drowsiness and dizziness. Mist/high concentrations: Inhalation may cause irritation to the nose, throat, upper respiratory tract and lungs.

Skin contact : Causes skin irritation. Defatting to the skin.

Ingestion : Can cause central nervous system (CNS) depression. May be fatal if swallowed and enters airways. Irritating to mouth, throat and stomach.

Over-exposure signs/symptoms

Eye contact : pain or irritation; watering; redness

Inhalation : nausea or vomiting; headache; drowsiness/fatigue; dizziness/vertigo; unconsciousness; respiratory tract irritation; coughing

Skin contact : irritation; redness; dryness; cracking

Ingestion : nausea or vomiting

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician : Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled. Epinephrine and other sympathomimetic drugs may initiate cardiac arrhythmias in persons exposed to high concentrations of hydrocarbon solvents.

Specific treatments : No specific treatment.

Protection of medical responders : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media : Use dry chemical, CO_2, water spray (fog) or foam.

Unsuitable extinguishing media : Do not use water jet.

Specific hazards arising from the chemical : Flammable liquid and vapor. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion. The vapor/gas is heavier than air and will spread along the ground. Vapors may accumulate in low or confined areas or travel a considerable distance to a source of ignition and flash back. Runoff to sewer may create fire or explosion hazard. Fire water contaminated with this material must be contained and prevented from being discharged to any waterway, sewer or drain.

Hazardous thermal decomposition products : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide

Special protective actions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For emergency responders : If specialised clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air). Water polluting material. May be harmful to the environment if released in large quantities.

Methods and materials for containment and cleaning up

Small spill : Stop leak if without risk. Move containers from spill area. Use spark-proof tools and explosion-proof equipment. Absorb with an inert material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.

Large spill : Stop leak if without risk. Move containers from spill area. Use spark-proof tools and explosion-proof equipment. Approach release from upwind. Prevent entry into sewers, waterways, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see Section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Do not swallow. Avoid contact with eyes, skin and clothing. Avoid breathing vapor or mist. Avoid release to the environment. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use only non-sparking tools. Take precautionary measures against electrostatic discharges. Empty containers retain product residue and can be hazardous. Do not reuse container. High pressure skin injections are serious medical emergencies. Injury will not appear serious at first. Within a few hours, tissue will become swollen, discolored and extremely painful.

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Store in a segregated and approved area. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Ingredient name	Exposure limits		
Distillates (petroleum), hydrotreated light	-	**ACGIH TLV (United States, 3/2012). Absorbed through skin.** TWA: 200 mg/m³, (as total hydrocarbon vapor) 8 hours.	
Kerosine (petroleum), hydrodesulfurized	-	**ACGIH TLV (United States, 3/2012). Absorbed through skin.** TWA: 200 mg/m³, (as total hydrocarbon vapor) 8 hours.	
naphthalene	**OSHA PEL 1989 (United States, 3/1989).** STEL: 15 ppm 15 minutes. STEL: 75 mg/m³ 15 minutes. TWA: 10 ppm 8 hours. TWA: 50 mg/m³ 8 hours. **OSHA PEL (United States, 6/2010).** TWA: 10 ppm 8 hours. TWA: 50 mg/m³ 8 hours.	**ACGIH TLV (United States, 3/2012). Absorbed through skin.** TWA: 10 ppm 8 hours. TWA: 52 mg/m³ 8 hours. STEL: 15 ppm 15 minutes. STEL: 79 mg/m³ 15 minutes.	**NIOSH REL (United States, 1/2013).** TWA: 10 ppm 10 hours. TWA: 50 mg/m³ 10 hours. STEL: 15 ppm 15 minutes. STEL: 75 mg/m³ 15 minutes.

Appropriate engineering controls : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles.

Skin protection

Hand protection : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

Body protection : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. When there is a risk of ignition from static electricity, wear anti-static protective clothing. For the greatest protection from static discharges, clothing should include anti-static overalls, boots and gloves.

Other skin protection : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory protection : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Section 9. Physical and chemical properties

Appearance

Physical state : Liquid.

Color : Clear to Straw.

Odor : Kerosene.

Odor threshold : Not available.

pH : Not available.

Melting point : Not available.

Boiling point : 162.78 to 371.11°C (325 to 700°F)

Flash point : >37.8 °C (100 °F)

Evaporation rate : Not available.

Flammability (solid, gas) : Not available.

Lower and upper explosive (flammable) limits : Lower: 0.5%
Upper: 8%

Vapor pressure : < 1 mm Hg at 37.8°C (100 F)

Vapor density : 3 to 4 [Air = 1]

Specific gravity : 0.75 to 0.85 [15.5°C (60°F)]

Solubility : Negligible

Partition coefficient: n-octanol/water : Not available.

Auto-ignition temperature : 232.22 to 260°C (450 to 500°F)

Decomposition temperature : Not available.

Viscosity : Kinematic (40°C (104°F)): 0.01 to 0.025 cm^2/s (1 to 2.5 cSt)

Section 10. Stability and reactivity

Reactivity : No specific test data related to reactivity available for this product or its ingredients.

Chemical stability : The product is stable.

Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

Conditions to avoid : Avoid all possible sources of ignition (spark or flame). Do not pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition. Do not allow vapor to accumulate in low or confined areas.

Incompatible materials : Reactive or incompatible with the following materials:
oxidizing materials

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Distillates (petroleum), hydrotreated light	LC50 Inhalation Dusts and mists	Rat	>5.28 mg/l	4 hours
	LD50 Dermal	Rabbit	>2000 mg/kg	-
	LD50 Oral	Rat	>5000 mg/kg	-
Kerosine (petroleum), hydrodesulfurized	LC50 Inhalation Dusts and mists	Rat	>5.28 mg/l	4 hours
	LD50 Dermal	Rabbit	>2000 mg/kg	-
	LD50 Oral	Rat	>5000 mg/kg	-

Irritation/Corrosion

Product/ingredient name	Result	Species	Score	Exposure	Observation
Kerosine (petroleum), hydrodesulfurized	Skin - Moderate irritant	Rabbit	-	24 hours 500 milligrams	-

Carcinogenicity

Product/ingredient name	OSHA	IARC	NTP
naphthalene	-	2B	Reasonably anticipated to be a human carcinogen.

Teratogenicity

Specific target organ toxicity (single exposure)

Name	Category	Route of exposure	Target organs
Distillates (petroleum), hydrotreated light	Category 3	Not applicable.	Narcotic effects
Kerosine (petroleum), hydrodesulfurized	Category 3	Not applicable.	Narcotic effects

Specific target organ toxicity (repeated exposure)

Not available.

Aspiration hazard

Name	Result
Distillates (petroleum), hydrotreated light	ASPIRATION HAZARD - Category 1
Kerosine (petroleum), hydrodesulfurized	ASPIRATION HAZARD - Category 1

Information on the likely routes of exposure : Routes of entry anticipated: Oral, Dermal, Inhalation.

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Potential chronic health effects

General : Prolonged or repeated contact can defat the skin and lead to irritation, cracking and/or dermatitis.

Carcinogenicity : No known significant effects or critical hazards.

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

Numerical measures of toxicity

Acute toxicity estimates

Route	ATE value
Oral	29400 mg/kg

Section 12. Ecological information

Toxicity

Product/ingredient name	Result	Species	Exposure
Distillates (petroleum), hydrotreated light	Acute LC50 2200 µg/l Fresh water	Fish - Lepomis macrochirus	4 days
naphthalene	Acute EC50 1600 µg/l Fresh water	Daphnia - Daphnia magna - Neonate	48 hours
	Acute LC50 2350 µg/l Marine water	Crustaceans - Palaemonetes pugio	48 hours
	Acute LC50 213 µg/l Fresh water	Fish - Melanotaenia fluviatilis - Larvae	96 hours

Conclusion/Summary : Toxic to aquatic life with long lasting effects.

Persistence and degradability

Product/ingredient name	Aquatic half-life	Photolysis	Biodegradability
Kerosine (petroleum), hydrodesulfurized	-	-	Inherent

Bioaccumulative potential

Product/ingredient name	$LogP_{ow}$	BCF	Potential
Kerosine (petroleum), hydrodesulfurized	3.3 to 6	-	high
naphthalene	3.4	36.5 to 168	low

Mobility in soil

Soil/water partition coefficient (K_{OC}) : Not available.

Other adverse effects : No known significant effects or critical hazards.

Section 13. Disposal considerations

Disposal methods : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Vapor from product residues may create a highly flammable or explosive atmosphere inside the container. Do not cut, weld or grind used containers unless they have been cleaned thoroughly internally. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

United States - RCRA Toxic hazardous waste "U" List

Ingredient	CAS #	Status	Reference number
Naphthalene	91-20-3	Listed	U165

Section 14. Transport information

	DOT Classification	TDG Classification	Mexico Classification	ADR/RID	IMDG	IATA
UN number	NA1993	UN1202	UN1202	UN1202	UN1202	UN1202
UN proper shipping name	Diesel fuel. Marine pollutant (Distillates (petroleum), hydrotreated light, Kerosine (petroleum), hydrodesulfurized) RQ (Naphthalene)	DIESEL FUEL	COMBUSTIBLE PARA MOTORES DIESEL. Marine pollutant (Distillates (petroleum), hydrotreated light, Kerosine (petroleum), hydrodesulfurized)	DIESEL FUEL	DIESEL FUEL. Marine pollutant (Distillates (petroleum), hydrotreated light, Kerosine (petroleum), hydrodesulfurized)	Diesel fuel
Transport hazard class(es)	3 	3 	3 	3 	3 	3 
Packing group	III	III	III	III	III	III
Environmental hazards	Yes.	Yes.	Yes.	Yes.	Yes.	No.
Additional information	**Reportable quantity** 6666.7 lbs / 3026.7 kg [999.45 gal / 3783.3 L] Package sizes shipped in quantities less than the product reportable quantity are not subject to the RQ (reportable quantity) transportation requirements. **Limited quantity** Yes. **Packaging instruction**	**Explosive Limit and Limited Quantity Index** 30 **Passenger Carrying Road or Rail Index** 60 **Special provisions** 82, 88	-	**Hazard identification number** 30 **Limited quantity** 5 L **Special provisions** 640L, 363 **Tunnel code** (D/E)	**Emergency schedules (EmS)** F-E, S-E	**Passenger and Cargo Aircraft** Quantity limitation: 60 L Packaging instructions: 355 **Cargo Aircraft Only** Quantity limitation: 220 L Packaging instructions: 366 **Limited Quantities - Passenger Aircraft** Quantity limitation: 10 L Packaging instructions: Y344

	Passenger aircraft Quantity limitation: 60 L **Cargo aircraft** Quantity limitation: 220 L **Special provisions** 144, B1, IB3, T4, TP1, TP29					

Special precautions for user : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

Section 15. Regulatory information

U.S. Federal regulations : **TSCA 8(a) PAIR**: naphthalene

United States inventory (TSCA 8b): All components are listed or exempted.

Clean Water Act (CWA) 307: naphthalene

Clean Water Act (CWA) 311: naphthalene

Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs) : Listed

SARA 302/304

Composition/information on ingredients

No products were found.

SARA 304 RQ : Not applicable.

SARA 311/312

Classification : Fire hazard
Immediate (acute) health hazard

Composition/information on ingredients

Name	%	Fire hazard	Sudden release of pressure	Reactive	Immediate (acute) health hazard	Delayed (chronic) health hazard
Distillates (petroleum), hydrotreated light	0 - 100	Yes.	No.	No.	Yes.	No.
Kerosine (petroleum), hydrodesulfurized	0 - 100	Yes.	No.	No.	Yes.	No.
naphthalene	1 - 3	Yes.	No.	No.	Yes.	Yes.

SARA 313

	Product name	CAS number	%
Form R - Reporting requirements	naphthalene	91-20-3	1 - 3
Supplier notification	naphthalene	91-20-3	1 - 3

SARA 313 notifications must not be detached from the SDS and any copying and redistribution of the SDS shall include copying and redistribution of the notice attached to copies of the SDS subsequently redistributed.

State regulations

Massachusetts : The following components are listed: NAPHTHALENE

New York : The following components are listed: Naphthalene

New Jersey : The following components are listed: NAPHTHALENE; MOTH FLAKES

Pennsylvania : The following components are listed: NAPHTHALENE

California Prop. 65

WARNING: This product contains a chemical known to the State of California to cause cancer.

Ingredient name	Cancer	Reproductive	No significant risk level	Maximum acceptable dosage level
naphthalene	Yes.	No.	Yes.	No.

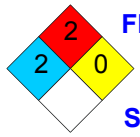
Canada inventory : All components are listed or exempted.

International regulations

International lists : **Australia inventory (AICS)**: All components are listed or exempted.
China inventory (IECSC): All components are listed or exempted.
Japan inventory: Not determined.
Korea inventory: All components are listed or exempted.
Malaysia Inventory (EHS Register): Not determined.
New Zealand Inventory of Chemicals (NZIoC): All components are listed or exempted.
Philippines inventory (PICCS): All components are listed or exempted.
Taiwan inventory (CSNN): Not determined.

Section 16. Other information

National Fire Protection Association (U.S.A.)



Flammability
Health
Instability/Reactivity
Special

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Copyright ©2001, National Fire Protection Association, Quincy, MA 02269. This warning system is intended to be interpreted and applied only by properly trained individuals to identify fire, health and reactivity hazards of chemicals. The user is referred to certain limited number of chemicals with recommended classifications in NFPA 49 and NFPA 325, which would be used as a guideline only. Whether the chemicals are classified by NFPA or not, anyone using the 704 systems to classify chemicals does so at their own risk.

Date of issue/Date of revision : 3/18/2014.

Date of previous issue : 11/4/2013.

Version : 1.01

Key to abbreviations : ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
UN = United Nations

Indicates information that has changed from previously issued version.

Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named manufacturer, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

SAFETY DATA SHEET

Version 6.3
Revision Date 02/03/2020
Print Date 11/20/2020

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers

Product name : 1,2-Dichloroethane

Product Number : 319929
Brand : SIGALD
Index-No. : 602-012-00-7
CAS-No. : 107-06-2

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich Inc.
3050 Spruce Street
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone number

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Flammable liquids (Category 2), H225
Acute toxicity, Oral (Category 4), H302
Acute toxicity, Inhalation (Category 3), H331
Skin irritation (Category 2), H315
Eye irritation (Category 2A), H319
Carcinogenicity (Category 1B), H350
Specific target organ toxicity - single exposure (Category 3), Respiratory system, H335

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram	
Signal word	Danger

Hazard statement(s)

H225	Highly flammable liquid and vapour.
H302	Harmful if swallowed.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H331	Toxic if inhaled.
H335	May cause respiratory irritation.
H350	May cause cancer.

Precautionary statement(s)

P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P210	Keep away from heat/sparks/open flames/hot surfaces. No smoking.
P233	Keep container tightly closed.
P240	Ground/bond container and receiving equipment.
P241	Use explosion-proof electrical/ ventilating/ lighting equipment.
P242	Use only non-sparking tools.
P243	Take precautionary measures against static discharge.
P261	Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P271	Use only outdoors or in a well-ventilated area.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P312 + P330	IF SWALLOWED: Call a POISON CENTER/doctor if you feel unwell. Rinse mouth.
P303 + P361 + P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
P304 + P340 + P311	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/doctor.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P332 + P313	If skin irritation occurs: Get medical advice/ attention.
P337 + P313	If eye irritation persists: Get medical advice/ attention.
P362	Take off contaminated clothing and wash before reuse.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.
P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
P403 + P235	Store in a well-ventilated place. Keep cool.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

SECTION 3: Composition/information on ingredients

3.1 Substances

Synonyms	:	Ethylene dichloride Ethylene chloride
Formula	:	$C_2H_4Cl_2$
Molecular weight	:	98.96 g/mol
CAS-No.	:	107-06-2
EC-No.	:	203-458-1
Index-No.	:	602-012-00-7

Component	Classification	Concentration
Ethylene dichloride		
	Flam. Liq. 2; Acute Tox. 4; Acute Tox. 3; Skin Irrit. 2; Eye Irrit. 2A; Carc. 1B; STOT SE 3; H225, H302, H331, H315, H319, H350, H335	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

SECTION 4: First aid measures

4.1 Description of first aid measures

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media
Dry powder Dry sand

Unsuitable extinguishing media
Do NOT use water jet.

5.2 Special hazards arising from the substance or mixture
Carbon oxides, Hydrogen chloride gas

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
Use water spray to cool unopened containers.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures
Wear respiratory protection. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.
For personal protection see section 8.

6.2 Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up
Contain spillage, and then collect with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local / national regulations (see section 13).

6.4 Reference to other sections
For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling
Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.
Use explosion-proof equipment.Keep away from sources of ignition - No smoking.Take measures to prevent the build up of electrostatic charge.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities
Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.
Storage class (TRGS 510): 3: Flammable liquids

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Ethylene dichloride	107-06-2	TWA	10 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Liver damage Nausea Not classifiable as a human carcinogen		
		TWA	1 ppm 4 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix C See Appendix A		
		ST	2 ppm 8 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix C See Appendix A		
		See Table Z-2		
		TWA	50 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.21-1969		
		CEIL	100 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.21-1969		
		Peak	200 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.21-1969		
		PEL	1 ppm 4 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		C	200 ppm	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		STEL	2 ppm 8 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

8.2 Exposure controls

Appropriate engineering controls

Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

Personal protective equipment

Eye/face protection
Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact
Material: Fluorinated rubber
Minimum layer thickness: 0.7 mm
Break through time: 480 min
Material tested:Vitoject® (KCL 890 / Aldrich Z677698, Size M)

Splash contact
Material: butyl-rubber
Minimum layer thickness: 0.3 mm
Break through time: 62 min
Material tested:Butoject® (KCL 897 / Aldrich Z677647, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection
Complete suit protecting against chemicals, Flame retardant antistatic protective clothing., The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: viscous liquid Colour: colourless
b)	Odour	of solvents
c)	Odour Threshold	No data available

d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: -35 °C (-31 °F) - lit.
f)	Initial boiling point and boiling range	83 °C 181 °F - lit.
g)	Flash point	ca.13 °C (55 °F) - closed cup - DIN 51755 Part 1
h)	Evaporation rate	4.1
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	Upper explosion limit: 15.9 %(V) Lower explosion limit: 6 %(V)
k)	Vapour pressure	102 hPa at 25 °C (77 °F) 87 hPa at 20 °C(68 °F)
l)	Vapour density	4.1 at 20 °C(68 °F)
m)	Relative density	1.256 g/mL at 25 °C (77 °F)
n)	Water solubility	7.9 g/l at 25 °C (77 °F) - OECD Test Guideline 105 - soluble
o)	Partition coefficient: n-octanol/water	log Pow: 1.45 at 20 °C (68 °F) - Bioaccumulation is not expected.
p)	Auto-ignition temperature	440 °C (824 °F) at 1,013 hPa - DIN 51794
q)	Decomposition temperature	300 °C (572 °F) -
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information

Surface tension	32.45 mN/m at 20 °C (68 °F)
Relative vapour density	4.1 at 20 °C (68 °F)

SECTION 10: Stability and reactivity

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
Vapours may form explosive mixture with air.

10.4 Conditions to avoid
Heat, flames and sparks.

10.5 Incompatible materials
Strong oxidizing agents

10.6 Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas
Other decomposition products - No data available
In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - male - 770 mg/kg
(OECD Test Guideline 401)
LC50 Inhalation - Rat - male and female - 4 h - 7.8 mg/l
(OECD Test Guideline 403)
LD50 Dermal - Rabbit - male - 4,890 mg/kg
(OECD Test Guideline 402)
No data available

Skin corrosion/irritation
Skin - Rabbit
Result: irritating
(OECD Test Guideline 404)

Serious eye damage/eye irritation
Eyes - Rabbit
Result: Eye irritation
(OECD Test Guideline 405)

Respiratory or skin sensitisation
Local lymph node assay (LLNA) - Mouse
Result: negative
(OECD Test Guideline 429)

Germ cell mutagenicity
Ames test
S. typhimurium
Result: positive
(ECHA)
Ames test
Escherichia coli
Result: positive
In vitro mammalian cell gene mutation test
human lymphoblastoid cells
Result: positive
In vitro mammalian cell gene mutation test
human lymphoblastoid cells
Result: positive
(ECHA)
Mutagenicity (mammal cell test): chromosome aberration.
Chinese hamster lung cells
Result: positive
(ECHA)

unscheduled DNA synthesis assay
rat hepatocytes
Result: positive
OECD Test Guideline 474
Mouse - male and female
Result: negative
OECD Test Guideline 474
Mouse - male and female - Red blood cells (erythrocytes)
Result: negative

Rat - female - mammary gland
Result: negative
(ECHA)
OECD Test Guideline 477
Drosophila melanogaster - male - sperm
Result: positive

Mouse - male
Result: negative
(ECHA)

Carcinogenicity
Presumed to have carcinogenic potential for humans

IARC:	2B - Group 2B: Possibly carcinogenic to humans (Ethylene dichloride)
NTP:	No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA:	No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity
No data available

Specific target organ toxicity - single exposure
May cause respiratory irritation.

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

Additional Information

Repeated dose toxicity - Rat - male and female - Oral - 90 d - No observed adverse effect level - 37.5 mg/kg
Subchronic toxicity

Repeated dose toxicity - Mouse - male and female - Inhalation - 104 Weeks
RTECS: KI0525000

Acts as a simple asphyxiant by displacing air., anesthetic effects, Difficulty in breathing, Headache, Dizziness, Prolonged or repeated contact with skin may cause:, defatting, Dermatitis, Contact with eyes can cause:, Redness, Blurred vision, Provokes tears., Effects due to ingestion may include:, Gastrointestinal discomfort, Central nervous system depression, Paresthesia., Drowsiness, Convulsions, Conjunctivitis., Pulmonary edema. Effects may be delayed., Irregular breathing., Stomach/intestinal disorders, Nausea,

Vomiting, Increased liver enzymes., Weakness, Heavy or prolonged skin exposure may result in the absorption of harmful amounts of material.
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Pancreas. -

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish	flow-through test LC50 - Pimephales promelas (fathead minnow) - 136 mg/l - 96 h (OECD Test Guideline 203)
Toxicity to daphnia and other aquatic invertebrates	static test EC50 - Daphnia magna (Water flea) - 160 mg/l - 48 h Remarks: (in soft water)(IUCLID)
Toxicity to algae	static test EC50 - Desmodesmus subspicatus (green algae) - 166 mg/l - 72 h (OECD Test Guideline 201)
Toxicity to bacteria	static test EC50 - activated sludge - 35,500 mg/l - 3 h (OECD Test Guideline 209)

12.2 Persistence and degradability

Biodegradability	aerobic - Exposure time 20 d Result: > 90 % - Inherently biodegradable. Remarks: (ECHA)

12.3 Bioaccumulative potential

Bioaccumulation	Lepomis macrochirus - 14 d at 16 °C - 0.957 mg/l(Ethylene dichloride) Bioconcentration factor (BCF): 2

12.4 Mobility in soil

No data available

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

No data available

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product

Contact a licensed professional waste disposal service to dispose of this material. Offer surplus and non-recyclable solutions to a licensed disposal company. Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable.

Contaminated packaging
Dispose of as unused product.

SECTION 14: Transport information

DOT (US)
UN number: 1184 Class: 3 (6.1) Packing group: II
Proper shipping name: Ethylene dichloride
Reportable Quantity (RQ): 100 lbs
Reportable Quantity (RQ): 100 lbs
Poison Inhalation Hazard: No

IMDG
UN number: 1184 Class: 3 (6.1) Packing group: II EMS-No: F-E, S-D
Proper shipping name: ETHYLENE DICHLORIDE

IATA
UN number: 1184 Class: 3 (6.1) Packing group: II
Proper shipping name: Ethylene dichloride

SECTION 15: Regulatory information

SARA 302 Components
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Ethylene dichloride	107-06-2	2007-07-01

SARA 311/312 Hazards
Fire Hazard, Acute Health Hazard, Chronic Health Hazard

Reportable Quantity : D028 lbs

Massachusetts Right To Know Components
No components are subject to the Massachusetts Right to Know Act.

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Ethylene dichloride	107-06-2	2007-07-01

SECTION 16: Other information

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

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Version: 6.3 Revision Date: 02/03/2020 Print Date: 11/20/2020

Material Safety Data Sheet

Acetaldehyde, 99.5%

ACC# 91732

Section 1 - Chemical Product and Company Identification

MSDS Name: Acetaldehyde, 99.5%
Catalog Numbers: AC149510000, AC149510010, AC149510100, AC149512500, O1004-250, S79878
Synonyms: Acetic aldehyde; Acetylaldehyde; Ethylaldehyde; Ethanal.
Company Identification:

Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410

For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
75-07-0	Acetaldehyde	> 99.5	200-836-8

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: clear, colorless liquid. Flash Point: -27 deg C.
Danger! Air sensitive. Oxidizes readily in air to form unstable peroxides that may explode spontaneously. Extremely flammable liquid and vapor. Vapor may cause flash fire. Causes severe eye irritation. Lachrymator (substance which increases the flow of tears). Causes respiratory tract irritation. May be harmful if swallowed. May cause skin irritation. May cause cancer based on animal studies. May cause lung damage. May cause central nervous system depression. May cause liver and kidney damage. Marine pollutant. Store in explosion-proof refrigerator. Hazardous polymerization may occur.
Target Organs: Blood, kidneys, central nervous system, liver, lungs, eyes, skin.

Potential Health Effects

Eye: Causes severe eye irritation. Vapors may cause eye irritation. May cause transient corneal injury. Lachrymator (substance which increases the flow of tears).
Skin: May cause skin irritation. May cause skin sensitization, an allergic reaction, which becomes evident upon re-exposure to this material.
Ingestion: May cause gastrointestinal irritation with nausea, vomiting and diarrhea. May be harmful if swallowed. May cause central nervous system depression.
Inhalation: Causes respiratory tract irritation. May cause narcotic effects in high concentration. Exposure produces central nervous system depression. Vapors may cause dizziness or suffocation. Can produce delayed pulmonary edema. Inhalation of large amounts may cause respiratory

stimulation, followed by respiratory depression, convulsions and possible death due to respiratory paralysis.
Chronic: Prolonged or repeated skin contact may cause dermatitis. Prolonged or repeated eye contact may cause conjunctivitis. Prolonged skin contact may cause erythema (redness) and burns. Long-term inhalation studies of acetaldehyde produced laryngeal cancers in hamsters and nasal cancers in rats.

Section 4 - First Aid Measures

Eyes: In case of contact, immediately flush eyes with plenty of water for a t least 15 minutes. Get medical aid immediately.
Skin: In case of contact, immediately flush skin with soap and plenty of water. Remove contaminated clothing and shoes. Get medical aid if symptoms occur. Wash clothing before reuse.
Ingestion: If swallowed, do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical aid.
Inhalation: If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.
Notes to Physician: Persons with kidney disease, chronic respiratory disease, liver disease, or skin disease may be at increased risk from exposure to this substance. Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Water runoff can cause environmental damage. Dike and collect water used to fight fire. Vapors may form an explosive mixture with air. Use water spray to keep fire-exposed containers cool. Wear appropriate protective clothing to prevent contact with skin and eyes. Wear a self-contained breathing apparatus (SCBA) to prevent contact with thermal decomposition products. Extremely flammable liquid and vapor. Vapor may cause flash fire. Forms peroxides of unknown stability. Containers may explode in the heat of a fire. Will be easily ignited by heat, sparks or flame. Vapors are heavier than air and may travel to a source of ignition and flash back. Vapors can spread along the ground and collect in low or confined areas. Sensitivity to mechanical impact: Yes, if peroxides are formed. Closed containers exposed to heat may explode. Sensitive to static discharge.
Extinguishing Media: For small fires, use dry chemical, carbon dioxide, water spray or alcohol-resistant foam. For large fires, use water spray, fog, or alcohol-resistant foam. Water may be ineffective. Do NOT use straight streams of water.
Flash Point: -27 deg C (-16.60 deg F)
Autoignition Temperature: 175 deg C (347.00 deg F)
Explosion Limits, Lower:4.0%
Upper: 60.0%
NFPA Rating: (estimated) Health: 2; Flammability: 4; Instability: 2

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Use water spray to dilute spill to a non-flammable mixture. Avoid runoff into

storm sewers and ditches which lead to waterways. Use water spray to disperse the gas/vapor. Remove all sources of ignition. Use a spark-proof tool. Provide ventilation. Place under an inert atmosphere. U.S. regulations require reporting spills and releases to soil, water and air in excess of reportable quantities.

Section 7 - Handling and Storage

Handling: Ground and bond containers when transferring material. Do not breathe dust, mist, or vapor. Do not get in eyes, on skin, or on clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Take precautionary measures against static discharges. Keep container tightly closed. Keep away from heat, sparks and flame. Do not ingest or inhale. Handle under an inert atmosphere. Store protected from air. This product may be under pressure; cool before opening. If peroxide formation is suspected, do not open or move container. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames. Use only with adequate ventilation.
Storage: Keep away from heat, sparks, and flame. Keep away from sources of ignition. Keep from freezing. Store in a tightly closed container. Keep from contact with oxidizing materials. Keep away from strong acids. Refrigerator/flammables. Keep away from reducing agents. Do not expose to air. Store in explosion-proof refrigerator. After opening, purge container with nitrogen before reclosing. Periodically test for peroxide formation on long-term storage. Addition of water or appropriate reducing materials will lessen peroxide formation. Store under an inert atmosphere.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Use explosion-proof ventilation equipment. Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Acetaldehyde	25 ppm Ceiling	2000 ppm IDLH	200 ppm TWA; 360 mg/m3 TWA

OSHA Vacated PELs: Acetaldehyde: 100 ppm TWA; 180 mg/m3 TWA
Personal Protective Equipment
Eyes: Wear chemical splash goggles.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Section 9 - Physical and Chemical Properties

Physical State: Liquid
Appearance: clear, colorless
Odor: pungent odor - fruity odor

pH: Not available.
Vapor Pressure: 750 mm Hg @ 20 deg C
Vapor Density: 1.52
Evaporation Rate:49.1
Viscosity: Not available.
Boiling Point: 21 deg C
Freezing/Melting Point:-123 deg C
Decomposition Temperature:> 400 deg C
Solubility: Soluble.
Specific Gravity/Density:0.7800
Molecular Formula:C2H4O
Molecular Weight:44.04

Section 10 - Stability and Reactivity

Chemical Stability: Unstable in air. May undergo autopolymerization. Forms explosive peroxides on prolonged storage and exposure to air. Polymerizes violently in the presence of traces of metals or acids.
Conditions to Avoid: Ignition sources, exposure to air, heat.
Incompatibilities with Other Materials: Strong oxidizing agents, strong reducing agents, acids, strong bases, alcohols, amines, ammonia, halogens, phenols, phosphorus, isocyanates, acid anhydrides, hydrogen sulfide, air, ketones, hydrogen cyanide, cobalt chloride, mercury (II) chlorate, mercury (II) perchlorate, trace metals.
Hazardous Decomposition Products: Carbon monoxide, carbon dioxide, methane.
Hazardous Polymerization: May occur.

Section 11 - Toxicological Information

RTECS#:
CAS# 75-07-0: AB1925000
LD50/LC50:
CAS# 75-07-0:
Draize test, rabbit, eye: 40 mg Severe;
Inhalation, mouse: LC50 = 23 gm/m3/4H;
Inhalation, mouse: LC50 = 20300 mg/m3/2H;
Inhalation, rat: LC50 = 13300 ppm/4H;
Inhalation, rat: LC50 = 25000 mg/m3;
Oral, mouse: LD50 = 900 mg/kg;
Oral, rat: LD50 = 661 mg/kg;
Oral, rat: LD50 = 1930 mg/kg;
Skin, rabbit: LD50 = 3540 mg/kg;
.

Carcinogenicity:
CAS# 75-07-0:

- **ACGIH:** A3 - Confirmed animal carcinogen with unknown relevance to humans
- **California:** carcinogen, initial date 4/1/88
- **NTP:** Suspect carcinogen
- **IARC:** Group 2B carcinogen

Epidemiology: Inhalation, rat: TCLo = 735 ppm/6H/2Y-I (Tumorigenic - Carcinogenic by RTECS criteria - Sense Organs and Special Senses (Olfaction) - tumors).; Inhalation, hamster: TCLo = 2040 ppm/7H/52W-I (Tumorigenic - equivocal tumorigenic agent by RTECS criteria - Sense Organs and Special Senses (Olfaction) - tumors and Lungs, Thorax, or Respiration - tumors).
Teratogenicity: Oral, rat: TDLo = 4800 mg/kg (female 1-20 day(s) after conception) Effects on Embryo or Fetus - fetotoxicity (except death, e.g., stunted fetus) and Specific Developmental Abnormalities - respiratory system and hepatobiliary system.; Oral, rat: TDLo = 5040 mg/kg (female 1-21 day(s) after conception) Specific Developmental Abnormalities - Central Nervous Systemand Endocrine System and Urogenital System.; Oral, rat: TDLo = 5040 mg/kg (female 1-21 day(s) after conception) Effects on Newborn - growth statistics (e.g.%, reduced weight gain).
Reproductive Effects: Intraperitoneal, rat: TDLo = 50 mg/kg (female 12 day(s) after conception) Fertility - post-implantation mortality (e.g. dead and/or resorbed implants per total number of implants).; Intravenous, mouse: TDLo = 4 gm/kg (female 6 day(s) after conception) Fertility - post-implantation mortality (e.g. dead and/or resorbed implants per total number of implants).
Mutagenicity: DNA Damage: Human, Lymphocyte = 1560 umol/L.; DNA Inhibition: Human Cells - not otherwise specified = 30 mmol/L.; Mutation test systems - not otherwise specified: = Human Cells - not otherwise specified = 30 mmol/L.; DNA Inhibition: Human, HeLa cell = 10 mmol/L.; Cytogenetic Analysis: Human, Leukocyte = 1000 ppm/72H (Continuous).; Sister Chromatid Exchange: Human, Lymphocyte = 1200 umol/L.; Mutation in Mammalian Somatic Cells: Human, Fibroblast = 5 mmol/L.
Neurotoxicity: No information found
Other Studies:

Section 12 - Ecological Information

Ecotoxicity: Fish: Fathead Minnow: EC50 = 30.8-37.2 mg/L; 96 Hr; Flow-through at 21.6-23.9°C (pH 7.1-7.63)Fish: Bluegill/Sunfish: LC50 = 53 mg/L; 96 Hr; UnspecifiedWater flea Daphnia: EC50 = 9000-14000 mg/L; 48 Hr; UnspecifiedBacteria: Phytobacterium phosphoreum: EC50 =280.6-403.5 mg/L; 5,15,25 min; Unspecified No data available.
Environmental: In the atmosphere it will degrade in a matter of hours by reaction with hydroxyl radicals and photolysis. If released into water it will rapidly biodegrade and volatilize (half-life 3 hrs for a typical river). If spilled on land it will also rapidly evaporate and leach into the ground where it will biodegrade.
Physical: Log P(oct) = 0.5
Other: No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series:
CAS# 75-07-0: waste number U001 (Ignitable waste).

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	ACETALDEHYDE	ACETALDEHYDE
Hazard Class:	3	3
UN Number:	UN1089	UN1089
Packing Group:	I	I
Additional Info:		FLASHPOINT -39 C

Section 15 - Regulatory Information

US FEDERAL

TSCA

CAS# 75-07-0 is listed on the TSCA inventory.

Health & Safety Reporting List

None of the chemicals are on the Health & Safety Reporting List.

Chemical Test Rules

None of the chemicals in this product are under a Chemical Test Rule.

Section 12b

None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule

None of the chemicals in this material have a SNUR under TSCA.

CERCLA Hazardous Substances and corresponding RQs

CAS# 75-07-0: 1000 lb final RQ; 454 kg final RQ

SARA Section 302 Extremely Hazardous Substances

None of the chemicals in this product have a TPQ.

SARA Codes

CAS # 75-07-0: immediate, delayed, fire, reactive.

Section 313

This material contains Acetaldehyde (CAS# 75-07-0, > 99.5%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

Clean Air Act:

CAS# 75-07-0 is listed as a hazardous air pollutant (HAP).

This material does not contain any Class 1 Ozone depletors.

This material does not contain any Class 2 Ozone depletors.

Clean Water Act:

CAS# 75-07-0 is listed as a Hazardous Substance under the CWA.

None of the chemicals in this product are listed as Priority Pollutants under the CWA.

None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

OSHA:

CAS# 75-07-0 is considered highly hazardous by OSHA.

STATE

CAS# 75-07-0 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

California Prop 65

The following statement(s) is(are) made in order to comply with the California Safe Drinking Water Act:

WARNING: This product contains Acetaldehyde, a chemical known to the state of California to cause cancer.

California No Significant Risk Level: CAS# 75-07-0: 90 æg/day NSRL (inhalation)

European / International Regulations

European Labeling in Accordance with EC Directives
Hazard Symbols:
XN F+
Risk Phrases:
R 12 Extremely flammable.
R 36/37 Irritating to eyes and respiratory system.
R 40 Limited evidence of a carcinogenic effect.

Safety Phrases:
S 16 Keep away from sources of ignition - No smoking.
S 33 Take precautionary measures against static discharges.
S 36/37 Wear suitable protective clothing and gloves.

WGK (Water Danger/Protection)
CAS# 75-07-0: 1
Canada - DSL/NDSL
CAS# 75-07-0 is listed on Canada's DSL List.
Canada - WHMIS
not available.
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.
Canadian Ingredient Disclosure List
CAS# 75-07-0 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 1/11/2001
Revision #4 Date: 2/18/2008

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.

MATERIAL SAFETY DATA SHEET

Date Printed: 03/12/2007
Date Updated: 01/31/2006
Version 1.22

Section 1 - Product and Company Information

Product Name	BENZENE, ANHYDROUS, 99.8%
Product Number	401765
Brand	ALDRICH
Company	Sigma-Aldrich
Address	3050 Spruce Street SAINT LOUIS MO 63103 US
Technical Phone:	800-325-5832
Fax:	800-325-5052
Emergency Phone:	314-776-6555

Section 2 - Composition/Information on Ingredient

Substance Name	CAS #	SARA 313
BENZENE	71-43-2	Yes

Formula	C6H6
Synonyms	(6)Annulene * Benzeen (Dutch) * Benzen (Polish) * Benzene (ACGIH:OSHA) * Benzin (Obs.) * Benzine (Obs.) * Benzol (OSHA) * Benzole * Benzolene * Benzolo (Italian) * Bicarburet of hydrogen * Carbon oil * Coal naphtha * Cyclohexatriene * Fenzen (Czech) * Mineral naphtha * NCI-C55276 * Phene * Phenyl hydride * Pyrobenzol * Pyrobenzole * RCRA waste number U019
RTECS Number:	CY1400000

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Flammable (USA) Highly Flammable (EU). Toxic. May cause cancer. May cause heritable genetic damage. Irritating to respiratory system and skin. Risk of serious damage to eyes. Also toxic: danger of serious damage to health by prolonged exposure through inhalation, in contact with skin and if swallowed. Harmful: may cause lung damage if swallowed. Danger: contains benzene, cancer hazard. Target organ(s): Blood. Bone marrow. Confirmed Carcinogen (US). Calif. Prop. 65 carcinogen & developmental hazard.

HMIS RATING

HEALTH: 2*
FLAMMABILITY: 3
REACTIVITY: 0

NFPA RATING

HEALTH: 2
FLAMMABILITY: 3
REACTIVITY: 0

*additional chronic hazards present.

For additional information on toxicity, please refer to Section 11.

Section 4 - First Aid Measures

ORAL EXPOSURE
If swallowed, wash out mouth with water provided person is conscious. Call a physician. Do not induce vomiting.

INHALATION EXPOSURE
If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen.

DERMAL EXPOSURE
In case of contact, immediately wash skin with soap and copious amounts of water.

EYE EXPOSURE
Assure adequate flushing of the eyes by separating the eyelids with fingers.

Section 5 - Fire Fighting Measures

FLAMMABLE HAZARDS
Flammable Hazards: Yes

EXPLOSION HAZARDS
Vapor may travel considerable distance to source of ignition and flash back. Container explosion may occur under fire conditions.

FLASH POINT
12 °F - 11.0 °C Method: closed cup

EXPLOSION LIMITS
Lower: 1.3 % Upper: 8 %

AUTOIGNITION TEMP
562 °C

FLAMMABILITY
N/A

EXTINGUISHING MEDIA
Suitable: For small (incipient) fires, use media such as "alcohol" foam, dry chemical, or carbon dioxide. For large fires, apply water from as far as possible. Use very large quantities (flooding) of water applied as a mist or spray; solid streams of water may be ineffective. Cool all affected containers with flooding quantities of water.

FIREFIGHTING
Protective Equipment: Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.
Specific Hazard(s): Flammable liquid. Vapor may travel considerable distance to source of ignition and flash back. Emits toxic fumes under fire conditions.

Section 6 - Accidental Release Measures

PROCEDURE TO BE FOLLOWED IN CASE OF LEAK OR SPILL
Evacuate area. Shut off all sources of ignition.

PROCEDURE(S) OF PERSONAL PRECAUTION(S)
Wear self-contained breathing apparatus, rubber boots, and heavy rubber gloves.

METHODS FOR CLEANING UP
Cover with dry-lime, sand, or soda ash. Place in covered containers using non-sparking tools and transport outdoors. Ventilate area and wash spill site after material pickup is complete.

Section 7 - Handling and Storage

HANDLING
User Exposure: Do not breathe vapor. Do not get in eyes, on skin, on clothing. Avoid prolonged or repeated exposure.

STORAGE
Suitable: Keep tightly closed. Keep away from heat, sparks, and open flame.

Section 8 - Exposure Controls / PPE

ENGINEERING CONTROLS
Safety shower and eye bath. Use only in a chemical fume hood. Use nonsparking tools.

PERSONAL PROTECTIVE EQUIPMENT
Respiratory: Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU). Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator.
Other: Wear appropriate government approved respirator, chemical-resistant gloves, safety goggles, other protective clothing.

GENERAL HYGIENE MEASURES
Wash thoroughly after handling. Remove and wash contaminated clothing promptly.

EXPOSURE LIMITS, RTECS

Country	Source	Type	Value
USA	ACGIH	TWA	0.5 PPM3
		STEL	2.5 PPM
USA	MSHA Standard	Ceiling co	25 PPM (80 MG/M3) (SKIN)
New Zealand OEL			
Remarks: check ACGIH TLV			
USA	NIOSH	TWA	0.1 PPM
		Ceiling co	1 PPM/15M

EXPOSURE LIMITS

Country	Source	Type	Value
Poland		NDS	1.6
Poland		NDSCh	-
Poland		NDSP	-

Section 9 - Physical/Chemical Properties

Appearance	Physical State: Liquid Color: Colorless

Property	Value	At Temperature or Pressure
Molecular Weight	78.11 AMU	
pH	N/A	
BP/BP Range	80.0 - 80.2 °C	760 mmHg
MP/MP Range	5.5 °C	
Freezing Point	N/A	
Vapor Pressure	74.6 mmHg	20 °C
Vapor Density	2.77 g/l	
Saturated Vapor Conc.	N/A	
SG/Density	0.879 g/cm3	
Bulk Density	N/A	
Odor Threshold	N/A	
Volatile%	N/A	
VOC Content	N/A	
Water Content	N/A	
Solvent Content	N/A	
Evaporation Rate	N/A	
Viscosity	N/A	
Surface Tension	N/A	
Partition Coefficient	N/A	
Decomposition Temp.	N/A	
Flash Point	12 °F - 11.0 °C	Method: closed cup
Explosion Limits	Lower: 1.3 % Upper: 8 %	
Flammability	N/A	
Autoignition Temp	562 °C	
Refractive Index	1.501	
Optical Rotation	N/A	
Miscellaneous Data	N/A	
Solubility	N/A	

N/A = not available

Section 10 - Stability and Reactivity

STABILITY
Stable: Stable.
Materials to Avoid: Acids, Bases, Halogens, Strong oxidizing agents, Avoid contact with metal salts.

HAZARDOUS DECOMPOSITION PRODUCTS
Hazardous Decomposition Products: Carbon monoxide, Carbon dioxide.

HAZARDOUS POLYMERIZATION
Hazardous Polymerization: Will not occur

Section 11 - Toxicological Information

cancer hazard

ROUTE OF EXPOSURE
Skin Contact: Causes skin irritation.
Skin Absorption: May be harmful if absorbed through the skin.
Eye Contact: Causes eye irritation.
Inhalation: May be harmful if inhaled. Material may be irritating to mucous membranes and upper respiratory tract.
Ingestion: May be harmful if swallowed.

TARGET ORGAN(S) OR SYSTEM(S)
Blood. Female reproductive system. Eyes. Bone marrow.

SIGNS AND SYMPTOMS OF EXPOSURE

Nausea, dizziness, and headache. Blood effects. Inhalation of high concentrations of benzene may have an initial stimulatory effect on the central nervous system characterized by exhilaration, nervous excitation and/or giddiness, depression, drowsiness, or fatigue. The victim may experience tightness in the chest, breathlessness, and loss of consciousness. Tremors, convulsions, and death due to respiratory paralysis or circulatory collapse can occur in a few minutes to several hours following severe exposures. Aspiration of small amounts of liquid immediately causes pulmonary edema and hemorrhage of pulmonary tissue. Direct skin contact may cause erythema. Repeated or prolonged skin contact may result in drying, scaling dermatitis, or development of secondary skin infections. The chief target organ is the hematopoietic system. Bleeding from the nose, gums, or mucous membranes and the development of purpuric spots, pancytopenia, leukopenia, thrombocytopenia, aplastic anemia, and leukemia may occur as the condition progresses. The bone marrow may appear normal, aplastic or hyperplastic, and may not correlate with peripheral blood-forming tissues. The onset of effects of prolonged benzene exposure may be delayed for many months or years after the actual exposure has ceased. Narcotic effect. Exposure can cause:

TOXICITY DATA

Oral
Rat
5,600 mg/kg
LD50
Oral
Rat
*
LD50
Oral
Rat
10,020 mg/kg
LD50
Oral
Rat
2,990 mg/kg
LD50
4 H
Inhalation
rat, female
44,700 mg/m3
LC50

Inhalation
Human
2 PPH/5M
LCLO

Oral
Man
50 mg/kg
LDLO

Inhalation
Human
65 mg/m3
LCLO

Remarks: Blood:Other changes.

Oral
Rat
930 mg/kg
LD50
Remarks: Behavioral:Tremor. Behavioral:Convulsions or effect on seizure threshold.

Inhalation
Rat
10,000 ppm
LC50

Intraperitoneal
Rat
1100 UG/KG
LD50

Oral
Mouse
4700 mg/kg
LD50

Inhalation
Mouse
9,980 ppm
LC50
Remarks: Lungs, Thorax, or Respiration:Dyspnea. Behavioral:Muscle weakness. Behavioral:General anesthetic.

Skin
Mouse
48 mg/kg
LD50

Intraperitoneal
Mouse
340 MG/KG
LD50

Skin
Rabbit
>9400 UL/KG
LD50

Skin
Guinea pig
>9400 UL/KG
LD50

Oral
Mammal
5700 mg/kg
LD50

IRRITATION DATA
Eyes
Rabbit
Remarks: Moderate irritation effect
Skin
Rabbit

Remarks: Moderate irritation effect

Skin
Rabbit
15 mg
24H
Remarks: Open irritation test

Skin
Rabbit
20 mg
24H
Remarks: Moderate irritation effect

Eyes
Rabbit
88 mg
Remarks: Moderate irritation effect

Eyes
Rabbit
2 mg
24H
Remarks: Severe irritation effect

CHRONIC EXPOSURE - CARCINOGEN
Result: This is or contains a component that has been reported to be carcinogenic based on its IARC, OSHA, ACGIH, NTP, or EPA classification.

Species: Man
Route of Application: Inhalation
Dose: 200 MG/M3
Exposure Time: 78W-
Frequency: I
Result: Blood:Thrombocytopenia. Blood:Leukemia Tumorigenic:Carcinogenic by RTECS criteria.

Species: Human
Route of Application: Inhalation
Dose: 10 PPM
Exposure Time: 8H/10Y
Frequency: I
Result: Blood:Leukemia Tumorigenic:Carcinogenic by RTECS criteria.

Species: Rat
Route of Application: Oral
Dose: 52 GM/KG
Exposure Time: 52W
Frequency: I
Result: Tumorigenic:Carcinogenic by RTECS criteria. Endocrine:Tumors. Blood:Leukemia

Species: Rat
Route of Application: Inhalation
Dose: 1200 PPM
Exposure Time: 6H/10W
Frequency: I
Result: Sense Organs and Special Senses (Nose, Eye, Ear, and Taste):Ear:Tumors. Tumorigenic:Equivocal tumorigenic agent by RTECS criteria.

Species: Mouse
Route of Application: Oral
Dose: 18250 MG/KG
Exposure Time: 2Y
Frequency: C
Result: Tumorigenic:Carcinogenic by RTECS criteria.
Endocrine:Tumors. Blood:Lymphomas including Hodgkin's disease.

Species: Mouse
Route of Application: Inhalation
Dose: 300 PPM
Exposure Time: 6H/16W
Frequency: I
Result: Blood:Lymphomas including Hodgkin's disease.
Tumorigenic:Equivocal tumorigenic agent by RTECS criteria.

Species: Mouse
Route of Application: Skin
Dose: 1200 GM/KG
Exposure Time: 49W
Frequency: I
Result: Skin and Appendages: Other: Tumors.
Tumorigenic:Neoplastic by RTECS criteria.

Species: Mouse
Route of Application: Intraperitoneal
Dose: 1200 MG/KG
Exposure Time: 8W
Frequency: I
Result: Tumorigenic:Neoplastic by RTECS criteria. Lungs, Thorax, or Respiration:Tumors.

Species: Mouse
Route of Application: Subcutaneous
Dose: 600 MG/KG
Exposure Time: 17W
Frequency: I
Result: Tumorigenic:Equivocal tumorigenic agent by RTECS criteria. Blood:Leukemia Blood:Lymphomas including Hodgkin's disease.

Species: Mouse
Route of Application: Parenteral
Dose: 670 MG/KG
Exposure Time: 19W
Frequency: I
Result: Blood:Lymphomas including Hodgkin's disease.
Blood:Leukemia Tumorigenic:Equivocal tumorigenic agent by RTECS criteria.

Species: Human
Route of Application: Inhalation
Dose: 150 PPM
Exposure Time: 15M/8Y
Frequency: I
Result: Blood:Leukemia Tumorigenic:Carcinogenic by RTECS criteria.

Species: Rat
Route of Application: Oral
Dose: 52 GM/KG

Exposure Time: 1Y
Frequency: I
Result: Sense Organs and Special Senses (Nose, Eye, Ear, and Taste):Ear:Tumors. Tumorigenic:Carcinogenic by RTECS criteria. Blood:Leukemia

Species: Rat
Route of Application: Oral
Dose: 10 GM/KG
Exposure Time: 52W
Frequency: I
Result: Endocrine:Tumors. Blood:Leukemia Tumorigenic:Carcinogenic by RTECS criteria.

Species: Man
Route of Application: Inhalation
Dose: 600 MG/M3
Exposure Time: 4Y-
Frequency: I
Result: Blood:Leukemia Tumorigenic:Carcinogenic by RTECS criteria.

Species: Man
Route of Application: Inhalation
Dose: 150 PPM
Exposure Time: 11Y
Frequency: I
Result: Tumorigenic:Carcinogenic by RTECS criteria. Blood:Lymphomas including Hodgkin's disease.

Species: Mouse
Route of Application: Inhalation
Dose: 1200 PPM
Exposure Time: 6H/10W
Frequency: I
Result: Tumorigenic:Equivocal tumorigenic agent by RTECS criteria. Sense Organs and Special Senses (Nose, Eye, Ear, and Taste):Ear:Tumors. Lungs, Thorax, or Respiration:Tumors.

Species: Mouse
Route of Application: Oral
Dose: 2400 MG/KG
Exposure Time: 8W
Frequency: I
Result: Tumorigenic:Neoplastic by RTECS criteria. Lungs, Thorax, or Respiration:Tumors.

Species: Human
Route of Application: Inhalation
Dose: 8 PPB
Exposure Time: 4W
Frequency: I
Result: Tumorigenic:Carcinogenic by RTECS criteria. Blood:Leukemia

Species: Human
Route of Application: Inhalation
Dose: 10 MG/M3
Exposure Time: 11Y-
Frequency: I
Result: Blood:Leukemia Tumorigenic:Carcinogenic by RTECS criteria.

Species: Mouse
Route of Application: Inhalation
Dose: 300 PPM
Exposure Time: 6H/16W
Frequency: I
Result: Blood:Leukemia Tumorigenic:Carcinogenic by RTECS criteria.

OSHA CARCINOGEN LIST

cancer hazard

IARC CARCINOGEN LIST

Rating: Group 1

NTP CARCINOGEN LIST

Rating: Clear evidence.
Species: Mouse/rat
Route: Gavage

ACGIH CARCINOGEN LIST

Rating: A1

CHRONIC EXPOSURE - TERATOGEN

Species: Rat
Dose: 50 PPM/24H
Route of Application: Inhalation
Exposure Time: (7-14D PREG)
Result: Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus). Effects on Embryo or Fetus: Extra embryonic structures (e.g., placenta, umbilical cord).

Species: Mouse
Dose: 9 GM/KG
Route of Application: Oral
Exposure Time: (6-15D PREG)
Result: Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus).

Species: Mouse
Dose: 500 PPM/7H
Route of Application: Inhalation
Exposure Time: (6-15D PREG)
Result: Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus). Specific Developmental Abnormalities: Musculoskeletal system.

Species: Mouse
Dose: 500 MG/M3/12H
Route of Application: Inhalation
Exposure Time: (6-15D PREG)
Result: Specific Developmental Abnormalities: Musculoskeletal system. Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus).

Species: Mouse
Dose: 5 PPM

Route of Application: Inhalation
Exposure Time: (6-15D PREG)
Result: Effects on Embryo or Fetus: Cytological changes (including somatic cell genetic material). Specific Developmental Abnormalities: Blood and lymphatic system (including spleen and marrow).

Species: Mouse
Dose: 20 PPM/6H
Route of Application: Inhalation
Exposure Time: (6-15D PREG)
Result: Specific Developmental Abnormalities: Blood and lymphatic system (including spleen and marrow).

Species: Mouse
Dose: 219 MG/KG
Route of Application: Intraperitoneal
Exposure Time: (14D PREG)
Result: Specific Developmental Abnormalities: Blood and lymphatic system (including spleen and marrow). Specific Developmental Abnormalities: Hepatobiliary system.

Species: Mouse
Dose: 1100 MG/KG
Route of Application: Subcutaneous
Exposure Time: (12D PREG)
Result: Effects on Embryo or Fetus: Other effects to embryo.

Species: Mouse
Dose: 7030 MG/KG
Route of Application: Subcutaneous
Exposure Time: (12-13D PREG)
Result: Effects on Embryo or Fetus: Extra embryonic structures (e.g., placenta, umbilical cord). Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus). Specific Developmental Abnormalities: Musculoskeletal system.

Species: Mouse
Dose: 13200 UG/KG
Route of Application: Intravenous
Exposure Time: (13-16D PREG)
Result: Effects on Embryo or Fetus: Cytological changes (including somatic cell genetic material).

Species: Rabbit
Dose: 1 GM/M3/24H
Route of Application: Inhalation
Exposure Time: (7-20D PREG)
Result: Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus). Specific Developmental Abnormalities: Other developmental abnormalities.

CHRONIC EXPOSURE - MUTAGEN
Result: Laboratory experiments have shown mutagenic effects.

Species: Human
Dose: 2200 UMOL/L
Cell Type: leukocyte
Mutation test: DNA inhibition

Species: Human
Dose: 2200 UMOL/L

Cell Type: HeLa cell
Mutation test: DNA inhibition

Species: Human
Dose: 5 UMOL/L
Cell Type: lymphocyte
Mutation test: Other mutation test systems

Species: Human
Route: Inhalation
Dose: 125 PPM
Exposure Time: 1Y
Mutation test: Cytogenetic analysis

Species: Human
Dose: 1 MMOL/L
Exposure Time: 72H
Cell Type: leukocyte
Mutation test: Cytogenetic analysis

Species: Human
Dose: 1 MG/L
Cell Type: lymphocyte
Mutation test: Cytogenetic analysis

Species: Human
Route: Unreported
Dose: 10 PPM
Exposure Time: 4W
Mutation test: Cytogenetic analysis

Species: Human
Dose: 200 UMOL/L
Cell Type: lymphocyte
Mutation test: Sister chromatid exchange

Species: Human
Dose: 1 GM/L
Cell Type: lymphocyte
Mutation test: Mutation in mammalian somatic cells.

Species: Rat
Route: Inhalation
Dose: 1 PPM
Exposure Time: 6H
Mutation test: Micronucleus test

Species: Rat
Dose: 1 MMOL/L
Cell Type: liver
Mutation test: Unscheduled DNA synthesis

Species: Rat
Route: Inhalation
Dose: 400 PPM
Mutation test: DNA inhibition

Species: Rat
Dose: 1 MMOL/L
Cell Type: liver
Mutation test: Other mutation test systems

Species: Rat
Dose: 1 MMOL/L
Cell Type: Bone marrow
Mutation test: Other mutation test systems

Species: Rat
Route: Subcutaneous
Dose: 1 GM/L
Mutation test: Other mutation test systems

Species: Rat
Route: Subcutaneous
Dose: 2200 MG/KG
Mutation test: Other mutation test systems

Species: Rat
Route: Inhalation
Dose: 300 MG/M3/16W-I
Mutation test: Cytogenetic analysis

Species: Rat
Route: Subcutaneous
Dose: 2400 MG/KG
Exposure Time: 12D
Mutation test: Cytogenetic analysis

Species: Rat
Route: Intraperitoneal
Dose: 234 MG/KG
Mutation test: Cytogenetic analysis

Species: Rat
Route: Oral
Dose: 39060 UG/KG
Mutation test: Cytogenetic analysis

Species: Rat
Route: Inhalation
Dose: 3 PPM
Exposure Time: 6H
Mutation test: Sister chromatid exchange

Species: Rat
Dose: 1 MMOL/L
Cell Type: leukocyte
Mutation test: Sister chromatid exchange

Species: Mouse
Dose: 12500 NMOL/L
Cell Type: Embryo
Mutation test: Micronucleus test

Species: Mouse
Route: Subcutaneous
Dose: 440 MG/KG
Mutation test: Micronucleus test

Species: Mouse
Route: Oral
Dose: 40 MG/KG
Mutation test: Micronucleus test

Species: Mouse
Route: Intraperitoneal
Dose: 264 MG/KG
Exposure Time: 24H
Mutation test: Micronucleus test

Species: Mouse
Route: Inhalation
Dose: 10 PPM
Exposure Time: 6H
Mutation test: Micronucleus test

Species: Mouse
Dose: 62500 UG/L (+S9)
Cell Type: lymphocyte
Mutation test: Mutation in microorganisms

Species: Mouse
Dose: 2500 MG/L (+S9)
Cell Type: Embryo
Mutation test: Mutation in microorganisms

Species: Mouse
Dose: 1 GM/L
Cell Type: Embryo
Mutation test: Morphological transformation.

Species: Mouse
Dose: 150 GM/L
Cell Type: fibroblast
Mutation test: Morphological transformation.

Species: Mouse
Dose: 3840 UMOL/L
Cell Type: lymphocyte
Mutation test: DNA damage

Species: Mouse
Route: Intraperitoneal
Dose: 2640 MG/KG
Exposure Time: 3D
Mutation test: DNA

Species: Mouse
Route: Oral
Dose: 2 GM/KG
Mutation test: Other mutation test systems

Species: Mouse
Dose: 5 MMOL/L
Cell Type: Other cell types
Mutation test: Other mutation test systems

Species: Mouse
Route: Oral
Dose: 20 GM/KG
Mutation test: DNA inhibition

Species: Mouse
Dose: 10 MMOL/L
Cell Type: lymphocyte
Mutation test: Other mutation test systems

Species: Mouse
Route: Intraperitoneal
Dose: 880 MG/KG
Mutation test: DNA inhibition

Species: Mouse
Route: Inhalation
Dose: 3000 PPM
Exposure Time: 4H
Mutation test: DNA inhibition

Species: Mouse
Dose: 3 MMOL/L
Cell Type: Bone marrow
Mutation test: DNA inhibition

Species: Mouse
Route: Inhalation
Dose: 10 PPM
Exposure Time: 6H
Mutation test: Sister chromatid exchange

Species: Mouse
Route: Intraperitoneal
Dose: 5 GM/KG
Mutation test: Sister chromatid exchange

Species: Mouse
Route: Oral
Dose: 20 MG/KG
Mutation test: Cytogenetic analysis

Species: Mouse
Route: Intraperitoneal
Dose: 264 MG/KG
Exposure Time: 3D
Mutation test: Cytogenetic analysis

Species: Mouse
Route: Inhalation
Dose: 3000 PPM
Mutation test: Cytogenetic analysis

Species: Mouse
Route: Oral
Dose: 1 MG/KG
Mutation test: Dominant lethal test

Species: Mouse
Route: Intraperitoneal
Dose: 5 MG/KG
Mutation test: Dominant lethal test

Species: Mouse
Dose: 12500 UG/L
Cell Type: lymphocyte
Mutation test: Mutation in mammalian somatic cells.

Species: Mouse
Route: Inhalation
Dose: 40 PPB/6W-C

Mutation test: Mutation in mammalian somatic cells.

Species: Mouse
Route: Oral
Dose: 2 GM/KG
Exposure Time: 5D
Mutation test: Mutation in mammalian somatic cells.

Species: Hamster
Dose: 100 UG/L
Cell Type: Embryo
Mutation test: Morphological transformation.

Species: Hamster
Dose: 17 MMOL/L
Cell Type: ovary
Mutation test: DNA damage

Species: Hamster
Dose: 550 MG/L
Cell Type: lung
Mutation test: Cytogenetic analysis

Species: Hamster
Dose: 600 MG/L
Cell Type: ovary
Mutation test: Cytogenetic analysis

Species: Hamster
Dose: 750 MG/L
Cell Type: ovary
Mutation test: Sister chromatid exchange

Species: Hamster
Dose: 62500 UG/L
Cell Type: liver
Mutation test: SLN

Species: Hamster
Dose: 30 UMOL/L
Cell Type: Embryo
Mutation test: SLN

Species: Hamster
Dose: 10 UMOL/L
Cell Type: Embryo
Mutation test: Mutation in mammalian somatic cells.

Species: Rabbit
Route: Subcutaneous
Dose: 2344 MG/KG
Mutation test: DNA damage

Species: Rabbit
Route: Subcutaneous
Dose: 2 GM/KG
Mutation test: DNA inhibition

Species: Rabbit
Dose: 1 MMOL/L
Cell Type: Bone marrow
Mutation test: Other mutation test systems

Species: Cat
Dose: 1 MMOL/L
Cell Type: Bone marrow
Mutation test: Other mutation test systems

Species: Rabbit
Route: Subcutaneous
Dose: 8400 MG/KG
Mutation test: Cytogenetic analysis

CHRONIC EXPOSURE - REPRODUCTIVE HAZARD

Species: Rat
Dose: 670 MG/M3/24H
Route of Application: Inhalation
Exposure Time: (15D PRE/1-22D PREG)
Result: Effects on Fertility: Female fertility index (e.g., # females pregnant per # sperm positive females; # females pregnant per # females mated).

Species: Rat
Dose: 56600 UG/M3/24H
Route of Application: Inhalation
Exposure Time: (1-22D PREG)
Result: Effects on Newborn: Biochemical and metabolic.

Species: Rat
Dose: 150 PPM/24H
Route of Application: Inhalation
Exposure Time: (7-14D PREG)
Result: Specific Developmental Abnormalities: Musculoskeletal system. Effects on Fertility: Post-implantation mortality (e.g., dead and/or resorbed implants per total number of implants).

Species: Mouse
Dose: 12 GM/KG
Route of Application: Oral
Exposure Time: (6-15D PREG)
Result: Effects on Fertility: Post-implantation mortality (e.g., dead and/or resorbed implants per total number of implants).

Species: Mouse
Dose: 6500 MG/KG
Route of Application: Oral
Exposure Time: (8-12D PREG)
Result: Effects on Newborn: Growth statistics (e.g., reduced weight gain).

Species: Mouse
Dose: 5 MG/KG
Route of Application: Intraperitoneal
Exposure Time: (1D MALE)
Result: Effects on Fertility: Pre-implantation mortality (e.g., reduction in number of implants per female; total number of implants per corpora lutea). Effects on Embryo or Fetus: Fetal death.

Species: Mouse
Dose: 4 GM/KG
Route of Application: Parenteral
Exposure Time: (12D PREG)

Result: Effects on Newborn: Weaning or lactation index (e.g., # alive at weaning per # alive at day 4).

Species: Rabbit
Dose: 1 GM/M3/24H
Route of Application: Inhalation
Exposure Time: (7-20D PREG)
Result: Effects on Embryo or Fetus: Fetal death. Effects on Fertility: Post-implantation mortality (e.g., dead and/or resorbed implants per total number of implants). Effects on Fertility: Abortion.

Species: Rabbit
Dose: 500 PPM/7H
Route of Application: Inhalation
Exposure Time: (6-18D PREG)
Result: Maternal Effects: Other effects.

Section 12 - Ecological Information

ACUTE ECOTOXICITY TESTS

Test Type: EC50 Algae
Species: Selenastrum capricornutum resp.
Time: 72 h
Value: 29 mg/l

Test Type: EC50 Daphnia
Species: Daphnia magna
Time: 48 h
Value: 22 mg/l

Test Type: EC50 Daphnia
Species: Daphnia magna
Time: 48 h
Value: 9.2 mg/l

Test Type: LC50 Fish
Species: Onchorhynchus mykiss (Rainbow trout)
Time: 96 h
Value: 5.9 mg/l

Test Type: LC50 Fish
Species: Pimephales promelas (Fathead minnow)
Time: 96 h
Value: 15.0 - 32.0 mg/l

Test Type: LC50 Fish
Species: Lepomis macrochirus (Bluegill)
Time: 96 h
Value: 230 mg/l

ELIMINATION

Classification: Substantially biodegradable.

Section 13 - Disposal Considerations

APPROPRIATE METHOD OF DISPOSAL OF SUBSTANCE OR PREPARATION
Contact a licensed professional waste disposal service to dispose of this material. Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this

material is highly flammable. Observe all federal, state, and local environmental regulations.

Section 14 - Transport Information

DOT
Proper Shipping Name: Benzene
UN#: 1114
Class: 3
Packing Group: Packing Group II
Hazard Label: Flammable liquid
PIH: Not PIH

IATA
Proper Shipping Name: Benzene
IATA UN Number: 1114
Hazard Class: 3
Packing Group: II

Section 15 - Regulatory Information

EU DIRECTIVES CLASSIFICATION
Symbol of Danger: F-T
Indication of Danger: Highly Flammable. Toxic.
R: 45-46-11-36/38-48/23/24/25-65
Risk Statements: May cause cancer. May cause heritable genetic damage. Highly flammable. Irritating to eyes and skin. Also toxic: danger of serious damage to health by prolonged exposure through inhalation, in contact with skin and if swallowed. Harmful: may cause lung damage if swallowed.
S: 53-45
Safety Statements: Restricted to professional users. Attention - Avoid exposure - obtain special instructions before use. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

US CLASSIFICATION AND LABEL TEXT
Indication of Danger: Flammable (USA) Highly Flammable (EU). Toxic.
Risk Statements: May cause cancer. May cause heritable genetic damage. Irritating to respiratory system and skin. Risk of serious damage to eyes. Also toxic: danger of serious damage to health by prolonged exposure through inhalation, in contact with skin and if swallowed. Harmful: may cause lung damage if swallowed.
Safety Statements: Restricted to professional users. Attention - Avoid exposure - obtain special instructions before use. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
US Statements: Danger: contains benzene, cancer hazard. Target organ(s): Blood. Bone marrow. Confirmed Carcinogen (US). Calif. Prop. 65 carcinogen & developmental hazard.

UNITED STATES REGULATORY INFORMATION
SARA LISTED: Yes
DEMINIMIS: 0.1 %
NOTES: This product is subject to SARA section 313 reporting requirements.
TSCA INVENTORY ITEM: Yes

UNITED STATES - STATE REGULATORY INFORMATION
OSHA Remarks: OSHA-regulated carcinogen. See CFR title 29 part

1910.1028

CALIFORNIA PROP - 65

California Prop - 65: This product is or contains chemical(s) known to the state of California to cause cancer. This product is or contains chemical(s) known to the state of California to cause male developmental toxicity.

CANADA REGULATORY INFORMATION

WHMIS Classification: This product has been classified in accordance with the hazard criteria of the CPR, and the MSDS contains all the information required by the CPR.
DSL: Yes
NDSL: No

Section 16 - Other Information

DISCLAIMER

For R&D use only. Not for drug, household or other uses.

WARRANTY

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Inc., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.

SAFETY DATA SHEET

Version 6.4
Revision Date 07/28/2021
Print Date 02/05/2022

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers

Product name : Chlorobenzene

Product Number : 284513
Brand : Sigma-Aldrich
Index-No. : 602-033-00-1
CAS-No. : 108-90-7

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Flammable liquids (Category 3), H226
Acute toxicity, Inhalation (Category 4), H332
Skin irritation (Category 2), H315
Short-term (acute) aquatic hazard (Category 2), H401
Long-term (chronic) aquatic hazard (Category 2), H411

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word Warning

Hazard statement(s)

H226	Flammable liquid and vapor.
H315	Causes skin irritation.
H332	Harmful if inhaled.
H411	Toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P210	Keep away from heat/ sparks/ open flames/ hot surfaces. No smoking.
P233	Keep container tightly closed.
P240	Ground/bond container and receiving equipment.
P241	Use explosion-proof electrical/ ventilating/ lighting/ equipment.
P242	Use only non-sparking tools.
P243	Take precautionary measures against static discharge.
P261	Avoid breathing dust/ fume/ gas/ mist/ vapors/ spray.
P264	Wash skin thoroughly after handling.
P271	Use only outdoors or in a well-ventilated area.
P273	Avoid release to the environment.
P280	Wear protective gloves/ eye protection/ face protection.
P303 + P361 + P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/ shower.
P304 + P340 + P312	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/ doctor if you feel unwell.
P332 + P313	If skin irritation occurs: Get medical advice/ attention.
P362	Take off contaminated clothing and wash before reuse.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.
P391	Collect spillage.
P403 + P235	Store in a well-ventilated place. Keep cool.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

SECTION 3: Composition/information on ingredients

3.1 Substances

Formula	:	C_6H_5Cl
Molecular weight	:	112.56 g/mol
CAS-No.	:	108-90-7
EC-No.	:	203-628-5
Index-No.	:	602-033-00-1

Component	Classification	Concentration
chlorobenzene		
	Flam. Liq. 3; Acute Tox. 4; Skin Irrit. 2; Aquatic Acute 2; Aquatic Chronic 2; H226, H332, H315, H401, H411	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

SECTION 4: First aid measures

4.1 Description of first-aid measures

General advice
Show this material safety data sheet to the doctor in attendance.

If inhaled
After inhalation: fresh air. If breathing stops: mouth-to-mouth breathing or artificial respiration. Oxygen if necessary. Immediately call in physician.

In case of skin contact
In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower.

In case of eye contact
After eye contact: rinse out with plenty of water. Remove contact lenses.

If swallowed
After swallowing: make victim drink water (two glasses at most). Consult doctor if feeling unwell.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media
Water Foam Carbon dioxide (CO2) Dry powder

Unsuitable extinguishing media
For this substance/mixture no limitations of extinguishing agents are given.

5.2 Special hazards arising from the substance or mixture
Carbon oxides
Hydrogen chloride gas
Combustible.
Vapors are heavier than air and may spread along floors.
Forms explosive mixtures with air at elevated temperatures.
Development of hazardous combustion gases or vapours possible in the event of fire.

5.3 Advice for firefighters
Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

5.4 Further information
Remove container from danger zone and cool with water. Suppress (knock down) gases/vapors/mists with a water spray jet. Prevent fire extinguishing water from contaminating surface water or the ground water system.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Advice for non-emergency personnel: Do not breathe vapors, aerosols. Avoid substance contact. Ensure adequate ventilation. Keep away from heat and sources of ignition.
Evacuate the danger area, observe emergency procedures, consult an expert.
For personal protection see section 8.

6.2 Environmental precautions

Do not let product enter drains. Risk of explosion.

6.3 Methods and materials for containment and cleaning up

Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up with liquid-absorbent material (e.g. Chemizorb®). Dispose of properly. Clean up affected area.

6.4 Reference to other sections

For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Advice on safe handling
Work under hood. Do not inhale substance/mixture. Avoid generation of vapours/aerosols.

Advice on protection against fire and explosion
Keep away from open flames, hot surfaces and sources of ignition.Take precautionary measures against static discharge.

Hygiene measures
Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Storage conditions
Keep container tightly closed in a dry and well-ventilated place. Keep away from heat and sources of ignition.
Storage class (TRGS 510): 3: Flammable liquids

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Ingredients with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
chlorobenzene	108-90-7	TWA	10 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Confirmed animal carcinogen with unknown relevance to humans		

		TWA	75 ppm 350 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		PEL	10 ppm 46 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
chlorobenzene	108-90-7	4-Chlorocatechol	100mg/g Creatinine	Urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of shift at end of workweek			
		p-Chlorophenol	20mg/g Creatinine	Urine	ACGIH - Biological Exposure Indices (BEI)
		End of shift at end of workweek			

8.2 Exposure controls

Appropriate engineering controls
Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.

Personal protective equipment

Eye/face protection
Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU). Safety glasses

Skin protection
This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN374 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).
Full contact
Material: Viton®
Minimum layer thickness: 0.7 mm
Break through time: 480 min
Material tested:Vitoject® (KCL 890 / Aldrich Z677698, Size M)

This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN374 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).
Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.4 mm
Break through time: 10 min
Material tested:Camatril® (KCL 730 / Aldrich Z677442, Size M)

Body Protection
Flame retardant antistatic protective clothing.

Respiratory protection
required when vapours/aerosols are generated. Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

Control of environmental exposure
Do not let product enter drains. Risk of explosion.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: liquid Color: colorless
b)	Odor	weak
c)	Odor Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: -45 °C (-49 °F) - lit.
f)	Initial boiling point and boiling range	132 °C 270 °F - lit.
g)	Flash point	27 °C (81 °F) - DIN 51755 Part 1
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	Upper explosion limit: 11 %(V) Lower explosion limit: 1.3 %(V)
k)	Vapor pressure	12.05 hPa at 20 °C (68 °F) - OECD Test Guideline 104
l)	Vapor density	No data available
m)	Density	1.106 g/cm3 at 25 °C (77 °F) - lit.
	Relative density	No data available
n)	Water solubility	0.207 g/l at 20 °C (68 °F)
o)	Partition coefficient: n-octanol/water	log Pow: 2.84 at 20 °C (68 °F) - - Bioaccumulation is not expected., (ECHA)
p)	Autoignition temperature	No data available
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information
No data available

SECTION 10: Stability and reactivity

10.1 Reactivity
Vapor/air-mixtures are explosive at intense warming.

10.2 Chemical stability
The product is chemically stable under standard ambient conditions (room temperature) .

10.3 Possibility of hazardous reactions
Exothermic reaction with:
Alkali metals
Alkaline earth metals
Oxidizing agents
dimethyl sulfoxide
Nitric acid
Risk of explosion with:
sodium
in finely distributed form.
with
sodium

10.4 Conditions to avoid
Heating.

10.5 Incompatible materials
rubber

10.6 Hazardous decomposition products
In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - male and female - > 2,000 mg/kg
(OECD Test Guideline 401)
LC50 Inhalation - Rat - male - 4 h - 15.57 mg/l
(OECD Test Guideline 403)
Dermal: No data available

Skin corrosion/irritation
Skin - Rabbit
Result: Skin irritation - 4 h
(OECD Test Guideline 404)

Serious eye damage/eye irritation
Eyes - Rabbit
Result: No eye irritation

(OECD Test Guideline 405)

Respiratory or skin sensitization
Local lymph node assay (LLNA) - Mouse
Result: negative
(OECD Test Guideline 429)

Germ cell mutagenicity
Test Type: Ames test
Test system: Salmonella typhimurium
Metabolic activation: with and without metabolic activation
Method: OECD Test Guideline 471
Result: negative
Test Type: Mutagenicity (mammal cell test):
Test system: Chinese hamster lung cells
Metabolic activation: with and without metabolic activation
Method: OECD Test Guideline 476
Result: negative
Test Type: Mutagenicity (mammal cell test): chromosome aberration.
Test system: Chinese hamster ovary cells
Metabolic activation: with and without metabolic activation
Method: OECD Test Guideline 473
Result: negative

Carcinogenicity

IARC: No ingredient of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

NTP: No ingredient of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity
No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

11.2 Additional Information

RTECS: CZ0175000
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Systemic effects:

CNS disorders
tachycardia
drop in blood pressure
agitation, spasms
ataxia (impaired locomotor coordination)
narcosis

Headache

Damage to:

Liver
Kidney

Handle in accordance with good industrial hygiene and safety practice.

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish	static test LC50 - Lepomis macrochirus (Bluegill sunfish) - 4.5 mg/l - 96 h Remarks: (ECHA)
Toxicity to daphnia and other aquatic invertebrates	static test EC50 - Daphnia magna (Water flea) - 26 mg/l - 48 h (OECD Test Guideline 202)
Toxicity to algae	static test EC10 - Desmodesmus subspicatus (green algae) - 5.8 mg/l - 72 h (OECD Test Guideline 201)
	static test ErC50 - Desmodesmus subspicatus (green algae) - 11.4 mg/l - 72 h (OECD Test Guideline 201)
Toxicity to bacteria	static test EC50 - activated sludge - 140 mg/l - 30 min (OECD Test Guideline 209)

12.2 Persistence and degradability

Biodegradability	aerobic - Exposure time 28 d Result: 15 % - Not readily biodegradable. (OECD Test Guideline 301F) aerobic - Exposure time 28 d Result: 0 % - Not readily biodegradable. (OECD Test Guideline 301C)
Theoretical oxygen demand	2,060 mg/g Remarks: (Lit.)
Ratio BOD/ThBOD	1.5 % Remarks: (Lit.)

12.3 Bioaccumulative potential

Bioaccumulation	Cyprinus carpio (Carp) - 49 d at 25 °C(chlorobenzene) Bioconcentration factor (BCF): 3.9 - 23 (OECD Test Guideline 305C)

12.4 Mobility in soil
No data available

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects
Discharge into the environment must be avoided.

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product
Waste material must be disposed of in accordance with the national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself. See www.retrologistik.com for processes regarding the return of chemicals and containers, or contact us there if you have further questions.

SECTION 14: Transport information

DOT (US)
UN number: 1134 Class: 3 Packing group: III
Proper shipping name: Chlorobenzene
Reportable Quantity (RQ): 100 lbs
Reportable Quantity (RQ): 100 lbs
Poison Inhalation Hazard: No

IMDG
UN number: 1134 Class: 3 Packing group: III EMS-No: F-E, S-D
Proper shipping name: CHLOROBENZENE
Marine pollutant : yes

IATA
UN number: 1134 Class: 3 Packing group: III
Proper shipping name: Chlorobenzene

SECTION 15: Regulatory information

SARA 302 Components
This material does not contain any components with a section 302 EHS TPQ.

SARA 313 Components
The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
chlorobenzene	108-90-7	2007-07-01

SARA 311/312 Hazards
Fire Hazard, Acute Health Hazard
:

Reportable Quantity D021 lbs

Massachusetts Right To Know Components
No components are subject to the Massachusetts Right to Know Act.

SECTION 16: Other information

Further information
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

The branding on the header and/or footer of this document may temporarily not visually match the product purchased as we transition our branding. However, all of the information in the document regarding the product remains unchanged and matches the product ordered. For further information please contact mlsbranding@sial.com.

Version: 6.4 Revision Date: 07/28/2021 Print Date: 02/05/2022

MSDS Number: **C2915** * * * * * *Effective Date:* ***08/02/01*** * * * * * *Supercedes:* ***09/15/98***

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS | J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

CHLOROFORM

1. Product Identification

Synonyms: Trichloromethane; Methyl trichloride; Methane trichloride
CAS No.: 67-66-3
Molecular Weight: 119.38
Chemical Formula: CHCl3
Product Codes:
J.T. Baker: 9174, 9175, 9180, 9181, 9182, 9183, 9184, 9186, 9187, 9257
Mallinckrodt: 1473, 2175, 4432, 4434, 4439, 4440, 4441, 4443, 4444, H407, V551

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Chloroform	67-66-3	98 - 100%	Yes
Ethyl Alcohol	64-17-5	0 - 1%	Yes

3. Hazards Identification

Emergency Overview

DANGER! MAY BE FATAL IF SWALLOWED, INHALED OR ABSORBED THROUGH SKIN. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. MAY AFFECT CENTRAL NERVOUS SYSTEM, CARDIOVASCULAR SYSTEM, LIVER AND KIDNEYS. SUSPECT CANCER HAZARD. MAY CAUSE CANCER. Risk of cancer depends on level and duration of exposure.

J.T. Baker SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 3 - Severe (Cancer Causing)
Flammability Rating: 0 - None
Reactivity Rating: 1 - Slight
Contact Rating: 2 - Moderate
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES
Storage Color Code: Blue (Health)

Potential Health Effects

Inhalation:
Acts as a relatively potent anesthetic. Irritates respiratory tract and causes central nervous system effects, including headache, drowsiness, dizziness. Exposure to higher concentrations may result in unconsciousness and even death. May cause liver injury and blood disorders. Prolonged exposure may lead to death due to irregular heart beat and kidney and liver disorders.

Ingestion:
Causes severe burning in mouth and throat, pain in the chest and vomiting. Large quantities may cause symptoms similar to inhalation.

Skin Contact:
Causes skin irritation resulting in redness and pain. Removes natural oils. May be absorbed through skin.

Eye Contact:
Vapors causes pain and irritation to eyes. Splashes may cause severe irritation and possible eye damage.

Chronic Exposure:
Prolonged or repeated exposure to vapors may cause damage to the nervous system, the heart and the liver and kidneys. Contact with liquid has defatting effect and may cause chronic irritation of skin with cracking and drying, and corresponding dermatitis. Chloroform is a suspected human carcinogen.

Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders or eye problems, or impaired liver, kidney or respiratory function may be more susceptible to the effects of the substance.

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4. First Aid Measures

Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Ingestion:

If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Skin Contact:

Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention immediately. Wash clothing before reuse. Thoroughly clean shoes before reuse.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

Note to Physician:

Because kidney and liver effects may be delayed, keep victim under observation for 24 to 48 hr. Administration of fluids may help to prevent kidney failure. Obtain blood glucose, urinalysis, liver function tests, chest x-ray, and monitor cardiac function and fluid/electrolyte status. Monitor liver and kidney function for 4 to 5 days after exposure. Disulfiram, its metabolites, and a high carbohydrate diet appear to protect somewhat against chloroform toxicity. Do not give adrenalin! Tests may show increased bilirubin, ketosis, lowered blood prothombin, and fibrogen.

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5. Fire Fighting Measures

Fire:

Slight fire hazard when exposed to high heat; otherwise, practically not flammable.

Explosion:

Sealed containers may rupture when heated.

Fire Extinguishing Media:

Use any means suitable for extinguishing surrounding fire.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

---

6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker SOLUSORB® solvent adsorbent is recommended for spills of this product.

---

7. Handling and Storage

Keep in a tightly closed light-resistant container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from incompatible substances. Wear special protective equipment (Sec. 8) for maintenance break-in or where exposures may exceed established exposure levels. Wash hands, face, forearms and neck when exiting restricted areas. Shower, dispose of outer clothing, change to clean garments at the end of the day. Avoid cross-contamination of street clothes. Wash hands before eating and do not eat, drink, or smoke in workplace. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product. Chloroform odor threshold: 250 mg/m3. The odor threshold only serves as a warning of exposure; not smelling it does not mean you are not being exposed.

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8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
Chloroform:
-OSHA Permissible Exposure Limit (PEL):
50 ppm (TWA) Ceiling
-ACGIH Threshold Limit Value (TLV):
10 ppm (TWA), Listed as A3 animal carcinogen
Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.
Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded and engineering controls are not feasible, wear a supplied air, full-facepiece respirator, airlined hood, or full-facepiece self-contained breathing apparatus. Breathing air quality must meet the requirements of the OSHA respiratory protection standard (29CFR1910.134). This substance has poor warning properties.
Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.
Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

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9. Physical and Chemical Properties

Appearance:
Clear, colorless liquid.
Odor:
Characteristic ethereal odor.
Solubility:
0.8g/100g water @ 20C (68F).
Specific Gravity:
1.48 @ 20C/4C
pH:
No information found.
% Volatiles by volume @ 21C (70F):
100
Boiling Point:
62C (144F)
Melting Point:
-63.5C (-83F)
Vapor Density (Air=1):
4.1
Vapor Pressure (mm Hg):
160 @ 20C (68F)
Evaporation Rate (BuAc=1):
11.6

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10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage. pH decreases on prolonged exposure to light and air due to formation of HCl.
Hazardous Decomposition Products:
May produce carbon monoxide, carbon dioxide, hydrogen chloride and phosgene when heated to decomposition.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Strong caustics and chemically active metals such as aluminum, magnesium powder, sodium, or potassium; acetone, fluorine, methanol, sodium methoxide, dinitrogen tetroxide, tert-butoxide, triisopropylphosphine.
Conditions to Avoid:
Light, heat, air and incompatibles.

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11. Toxicological Information

Toxicological Data:
Chloroform: oral rat LD50: 908 mg/kg; skin rabbit LD50: > 20 gm/kg; inhalation rat LC50: 47702 mg/m3/4H; irritation data: skin rabbit 10 mg/24H open mild; eye rabbit: 20 mg/24H moderate; investigated as a tumorigen, mutagen, reproductive effector.

Reproductive Toxicity:
Birth defects have been seen in rats and mice exposed by inhalation of chloroform at concentrations greater than 100 ppm in air. Ingestion of chloroform by pregnant laboratory animals has resulted in fetotoxicity but not birth defects, and only at levels causing severe maternal effects.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Chloroform (67-66-3)	No	Yes	2B
Ethyl Alcohol (64-17-5)	No	No	None

---

12. Ecological Information

Environmental Fate:
When released into the soil, this material is expected to leach into groundwater. When released into the soil, this material is expected to quickly evaporate. When released to water, this material is expected to quickly evaporate. When released into the water, this material is expected to have a half-life between 1 and 10 days. This material has a log octanol-water partition coefficient of less than 3.0. This material is not expected to significantly bioaccumulate. When released into the air, this material may be moderately degraded by reaction with photochemically produced hydroxyl radicals. When released into the air, this material may be moderately degraded by photolysis. When released into the air, this material may be removed from the atmosphere to a moderate extent by wet deposition. When released into the air, this material is expected to have a half-life of greater than 30 days.
Environmental Toxicity:
This material is not expected to be toxic to aquatic life. The LC50/96-hour values for fish are over 100 mg/l.

---

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

---

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: RQ, CHLOROFORM

Hazard Class: 6.1
UN/NA: UN1888
Packing Group: III
Information reported for product/size: 52L

International (Water, I.M.O.)

Proper Shipping Name: CHLOROFORM
Hazard Class: 6.1
UN/NA: UN1888
Packing Group: III
Information reported for product/size: 52L

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15. Regulatory Information

--------\Chemical Inventory Status - Part 1\---------------------------------

Ingredient	TSCA	EC	Japan	Australia
Chloroform (67-66-3)	Yes	Yes	Yes	Yes
Ethyl Alcohol (64-17-5)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\---------------------------------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
Chloroform (67-66-3)	Yes	Yes	No	Yes
Ethyl Alcohol (64-17-5)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\----------------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313------ List	Chemical Catg.
Chloroform (67-66-3)	10	10000	Yes	No
Ethyl Alcohol (64-17-5)	No	No	No	No

--------\Federal, State & International Regulations - Part 2\----------------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Chloroform (67-66-3)	10	U044	No
Ethyl Alcohol (64-17-5)	No	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: Yes Fire: No Pressure: No
Reactivity: No (Mixture / Liquid)

WARNING:
THIS PRODUCT CONTAINS A CHEMICAL(S) KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER.

Australian Hazchem Code: 2Z
Poison Schedule: S6

WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

---

16. Other Information

NFPA Ratings: Health: **2** Flammability: **0** Reactivity: **0**
Label Hazard Warning:
DANGER! MAY BE FATAL IF SWALLOWED, INHALED OR ABSORBED THROUGH SKIN. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. MAY AFFECT CENTRAL NERVOUS SYSTEM, CARDIOVASCULAR SYSTEM, LIVER AND KIDNEYS. SUSPECT CANCER HAZARD. MAY CAUSE CANCER. Risk of cancer depends on level and duration of exposure.
Label Precautions:
Do not breathe vapor.
Do not get in eyes, on skin, or on clothing.
Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handling.
Label First Aid:
In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. In all cases get medical attention immediately.
Product Use:
Laboratory Reagent.
Revision Information:
MSDS Section(s) changed since last revision of document include: 8, 16.
Disclaimer:
****

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Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

SAFETY DATA SHEET

Version 6.6
Revision Date 07/28/2021
Print Date 02/05/2022

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers

Product name : Cobalt(II) chloride

Product Number : 232696
Brand : SIGALD
Index-No. : 027-004-00-5
CAS-No. : 7646-79-9

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Acute toxicity, Oral (Category 4), H302
Respiratory sensitization (Category 1), H334
Skin sensitization (Sub-category 1A), H317
Germ cell mutagenicity (Category 2), H341
Carcinogenicity, Inhalation (Category 1B), H350
Reproductive toxicity (Category 1B), H360
Short-term (acute) aquatic hazard (Category 1), H400
Long-term (chronic) aquatic hazard (Category 1), H410

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram	
Signal word	Danger

Hazard statement(s)

H302	Harmful if swallowed.
H317	May cause an allergic skin reaction.
H334	May cause allergy or asthma symptoms or breathing difficulties if inhaled.
H341	Suspected of causing genetic defects.
H350	May cause cancer by inhalation.
H360	May damage fertility or the unborn child.
H410	Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P261	Avoid breathing dust/ fume/ gas/ mist/ vapors/ spray.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P272	Contaminated work clothing must not be allowed out of the workplace.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P285	In case of inadequate ventilation wear respiratory protection.
P301 + P312 + P330	IF SWALLOWED: Call a POISON CENTER/ doctor if you feel unwell. Rinse mouth.
P302 + P352	IF ON SKIN: Wash with plenty of soap and water.
P304 + P341	IF INHALED: If breathing is difficult, remove person to fresh air and keep comfortable for breathing.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P333 + P313	If skin irritation or rash occurs: Get medical advice/ attention.
P363	Wash contaminated clothing before reuse.
P391	Collect spillage.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

SECTION 3: Composition/information on ingredients

3.1 Substances

Synonyms	:	Cobaltous chloride
Formula	:	Cl_2Co
Molecular weight	:	129.84 g/mol
CAS-No.	:	7646-79-9
EC-No.	:	231-589-4
Index-No.	:	027-004-00-5

Component	Classification	Concentration

Cobalt(II) chloride		
	Acute Tox. 4; Resp. Sens. 1; Skin Sens. 1A; Muta. 2; Carc. 1B; Repr. 1B; Aquatic Acute 1; Aquatic Chronic 1; H302, H334, H317, H341, H350, H360, H400, H410 Concentration limits: >= 0.01 %: Carc. 1B, H350; M-Factor - Aquatic Acute: 10 - Aquatic Chronic: 10	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

SECTION 4: First aid measures

4.1 Description of first-aid measures

General advice
First aiders need to protect themselves. Show this material safety data sheet to the doctor in attendance.

If inhaled
After inhalation: fresh air. Call in physician.

In case of skin contact
In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower. Consult a physician.

In case of eye contact
After eye contact: rinse out with plenty of water. Call in ophthalmologist. Remove contact lenses.

If swallowed
After swallowing: immediately make victim drink water (two glasses at most). Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

Unsuitable extinguishing media
For this substance/mixture no limitations of extinguishing agents are given.

5.2 Special hazards arising from the substance or mixture
Hydrogen chloride gas
Cobalt/cobalt oxides
Not combustible.
Ambient fire may liberate hazardous vapours.

5.3 Advice for firefighters
Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

5.4 Further information
Suppress (knock down) gases/vapors/mists with a water spray jet. Prevent fire extinguishing water from contaminating surface water or the ground water system.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures
Advice for non-emergency personnel: Avoid generation and inhalation of dusts in all circumstances. Avoid substance contact. Ensure adequate ventilation. Evacuate the danger area, observe emergency procedures, consult an expert.
For personal protection see section 8.

6.2 Environmental precautions
Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up
Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up carefully. Dispose of properly. Clean up affected area. Avoid generation of dusts.

6.4 Reference to other sections
For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Advice on safe handling
Work under hood. Do not inhale substance/mixture.

Hygiene measures
Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Storage conditions
Tightly closed. Dry. Keep in a well-ventilated place. Keep locked up or in an area accessible only to qualified or authorized persons.

Handle and store under inert gas. Hygroscopic.
Storage class (TRGS 510): 6.1D: Non-combustible, acute toxic Cat.3 / toxic hazardous materials or hazardous materials causing chronic effects

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Ingredients with workplace control parameters
Contains no substances with occupational exposure limit values.

8.2 Exposure controls

Appropriate engineering controls
Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.

Personal protective equipment

Eye/face protection
Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU). Safety glasses

Skin protection
This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN374 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).
Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:KCL 741 Dermatril® L

This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN374 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).
Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:KCL 741 Dermatril® L

Body Protection
protective clothing

Respiratory protection
required when dusts are generated.
Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

Control of environmental exposure
Do not let product enter drains.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: crystalline Color: light blue
b)	Odor	No data available
c)	Odor Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: 724 °C (1335 °F) - lit.
f)	Initial boiling point and boiling range	1,049 °C 1,920 °F at 1,013 hPa
g)	Flash point	()Not applicable
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	The product is not flammable.
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapor pressure	No data available
l)	Vapor density	No data available
m)	Density	3.36 g/cm3 at 25 °C (77 °F)
	Relative density	No data available
n)	Water solubility	585.9 g/l at 20 °C (68 °F) - OECD Test Guideline 105 - soluble
o)	Partition coefficient: n-octanol/water	Not applicable for inorganic substances
p)	Autoignition temperature	No data available
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information

No data available

SECTION 10: Stability and reactivity

10.1 Reactivity

No data available

10.2 Chemical stability

The product is chemically stable under standard ambient conditions (room temperature) .

10.3 Possibility of hazardous reactions
Risk of explosion with:
Alkali metals
Violent reactions possible with:
Oxidizing agents

10.4 Conditions to avoid
Avoid moisture.
no information available

10.5 Incompatible materials
No data available

10.6 Hazardous decomposition products
In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - male and female - 537 mg/kg
(OECD Test Guideline 401)
Inhalation: No data available
LD50 Dermal - Rat - male and female - > 2,000 mg/kg
(OECD Test Guideline 402)
No data available

Skin corrosion/irritation
Skin - Rabbit
Result: No skin irritation - 4 h
(OECD Test Guideline 404)

Serious eye damage/eye irritation
Eyes - Rabbit
Result: Corrosive
(OECD Test Guideline 405)

Respiratory or skin sensitization
No data available

Germ cell mutagenicity
Suspected of causing genetic defects.
Test Type: Ames test
Test system: S. typhimurium
Metabolic activation: with and without metabolic activation
Method: OECD Test Guideline 471
Result: negative

Test Type: In vivo micronucleus test
Species: Mouse

Application Route: inhalation (dust/mist/fume)
Method: OECD Test Guideline 475
Result: negative

Carcinogenicity

Carcinogenicity- Mouse- male and female- inhalation (vapor)Remarks:
May cause cancer by inhalation.

IARC: 2B - Group 2B: Possibly carcinogenic to humans (Cobalt(II) chloride)

2B - Group 2B: Possibly carcinogenic to humans (Cobalt(II) chloride)

NTP: No ingredient of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity
Presumed human reproductive toxicant

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

11.2 Additional Information

RTECS: GF9800000
Blood disorders, Cough, Shortness of breath, Headache, Nausea, Vomiting
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Stomach - Irregularities - Based on Human Evidence

Stomach - Irregularities - Based on Human Evidence

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish	flow-through test LC50 - Danio rerio (zebra fish) - 85.3 mg/l - 96 h Remarks: (ECHA)
Toxicity to daphnia and other aquatic invertebrates	flow-through test LC50 - Chironomus sp. - 429 mg/l - 96 h Remarks: (ECHA)
Toxicity to algae	static test ErC50 - Dunaliella tertiolecta (marine algae) - 71.314 mg/l - 96 h Remarks: (ECHA)
Toxicity to bacteria	static test EC50 - activated sludge - 120 mg/l - 30 min (OECD Test Guideline 209)

12.2 Persistence and degradability

The methods for determining the biological degradability are not applicable to inorganic substances.

12.3 Bioaccumulative potential
No data available

12.4 Mobility in soil
No data available

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects
No data available

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product
Waste material must be disposed of in accordance with the national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself. See www.retrologistik.com for processes regarding the return of chemicals and containers, or contact us there if you have further questions.

SECTION 14: Transport information

DOT (US)
Not dangerous goods

IMDG
UN number: 3077 Class: 9 Packing group: III EMS-No: F-A, S-F
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Cobalt(II) chloride)
Marine pollutant : yes

IATA
UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Cobalt(II) chloride)

Further information
EHS-Mark required (ADR 2.2.9.1.10, IMDG code 2.10.3) for single packagings and combination packagings containing inner packagings with Dangerous Goods > 5L for liquids or > 5kg for solids.Packages smaller than or equal to 5 kg / L , not dangerous goods of Class 9

SECTION 15: Regulatory information

SARA 302 Components
This material does not contain any components with a section 302 EHS TPQ.

SARA 313 Components
The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Cobalt(II) chloride	7646-79-9	2015-07-08

SARA 311/312 Hazards
Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components
No components are subject to the Massachusetts Right to Know Act.

No components are subject to the Massachusetts Right to Know Act.

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Cobalt(II) chloride	7646-79-9	2015-07-08

New Jersey Right To Know Components

	CAS-No.	Revision Date
Cobalt(II) chloride	7646-79-9	2015-07-08

SECTION 16: Other information

Further information
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

The branding on the header and/or footer of this document may temporarily not visually match the product purchased as we transition our branding. However, all of the information in the document regarding the product remains unchanged and matches the product ordered. For further information please contact mlsbranding@sial.com.

Version: 6.6 Revision Date: 07/28/2021 Print Date: 02/05/2022

MSDS Number: **M4420** * * * * * *Effective Date:* ***05/14/03*** * * * * * *Supercedes:* ***07/22/02***

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

J.T.Baker®

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. And Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

METHYLENE CHLORIDE

1. Product Identification

Synonyms: MC; Dichloromethane (DCM); Methylene dichloride; Methylene bichloride; Methane dichloride
CAS No.: 75-09-2
Molecular Weight: 84.93
Chemical Formula: CH2Cl2
Product Codes: 9235, 9264, 9266, 9295, 9315, 9324, 9329, 9330, 9348, 9350, 9965, Q480

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Methylene Chloride	75-09-2	> 99%	Yes

3. Hazards Identification

Emergency Overview

WARNING! HARMFUL IF SWALLOWED, INHALED OR ABSORBED

THROUGH SKIN. AFFECTS CENTRAL NERVOUS SYSTEM, LIVER, CARDIOVASCULAR SYSTEM, AND BLOOD. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. SUSPECT CANCER HAZARD. MAY CAUSE CANCER. Risk of cancer depends on level and duration of exposure.

SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 3 - Severe (Cancer Causing)
Flammability Rating: 1 - Slight
Reactivity Rating: 2 - Moderate
Contact Rating: 3 - Severe
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES
Storage Color Code: Blue (Health)

Potential Health Effects

Inhalation:
Causes irritation to respiratory tract. Has a strong narcotic effect with symptoms of mental confusion, light-headedness, fatigue, nausea, vomiting and headache. Causes formation of carbon monoxide in blood which affects cardiovascular system and central nervous system. Continued exposure may cause increased light-headedness, staggering, unconsciousness, and even death. Exposure may make the symptoms of angina (chest pains) worse.

Ingestion:
May cause irritation of the gastrointestinal tract with vomiting. If vomiting results in aspiration, chemical pneumonia could follow. Absorption through gastrointestinal tract may produce symptoms of central nervous system depression ranging from light headedness to unconsciousness.

Skin Contact:
Causes irritation, redness and pain. Prolonged contact can cause burns. Liquid degreases the skin. May be absorbed through skin.

Eye Contact:
Vapors can cause eye irritation. Contact can produce pain, inflammation and temporal eye damage.

Chronic Exposure:
Can cause headache, mental confusion, depression, liver effects, kidney effects, bronchitis, loss of appetite, nausea, lack of balance, and visual disturbances. Can cause dermatitis upon prolonged skin contact. Methylene chloride may cause cancer in humans.

Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders, eye problems, impaired liver, kidney, respiratory or cardiovascular function may be more susceptible to the effects of this substance.

---

4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.
Ingestion:
If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately.
Skin Contact:
Immediately flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

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5. Fire Fighting Measures

Fire:
Autoignition temperature: 556C (1033F)
Flammable limits in air % by volume:
lel: 12; uel: 23
Forms flammable vapor-air mixtures above 100C (212F).
Explosion:
Concentrated can be ignited by a high intensity ignition source. Vapor may form flammable mixture in atmosphere that contains a high percentage of oxygen. Sealed containers may rupture when heated.
Fire Extinguishing Media:
Dry chemical, foam or carbon dioxide. Water spray may be used to keep fire exposed containers cool.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Combustion by-products include phosgene and hydrogen chloride gases. Structural firefighters' clothing provides only limited protection to the combustion products of this material.

---

6. Accidental Release Measures

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

7. Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from any source of heat or ignition. Outside or detached storage is recommended. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product. To minimize decomposition, all storage containers should be galvanized or lined with a phenolic coating. This material may corrode plastic and rubber. Wear special protective equipment (Sec. 8) for maintenance break-in or where exposures may exceed established exposure levels. Wash hands, face, forearms and neck when exiting restricted areas. Shower, dispose of outer clothing, change to clean garments at the end of the day. Avoid cross-contamination of street clothes. Wash hands before eating and do not eat, drink, or smoke in workplace. Odor Threshold: 205 - 307 ppm. The odor threshold only serves as a warning of exposure; not smelling it does not mean you are not being exposed.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
Methylene Chloride (Dichloromethane):
- OSHA Permissible Exposure Limit (PEL) -
25 ppm (TWA), 125 ppm (STEL), 12.5 ppm (8-hour TWA - Action Level)
- ACGIH Threshold Limit Value (TLV) -
50 ppm (TWA), A3 - suspected human carcinogen.

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded, wear a supplied air, full-facepiece respirator, airlined hood, or full-facepiece self-contained breathing apparatus. The cartridges recommended for this material have a predicted service of less than 30 minutes at concentrations of ten times (10x) the exposure limits. Actual service life will vary considerbly, depending on concentration levels, temperature, humidity, and work rate. This substance has poor warning properties.

Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact. Neoprene is a recommended material for personal protective equipment. Natural rubber and polyvinyl chloride ARE NOT recommended materials for personal protective equipment.

Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

Other Control Measures:
Do not use closed circuit rebreathing system employing soda lime or other carbon dioxide absorber because of formation of toxic compounds capable of producing cranial nerve paralysis. See OSHA Standard for medical surveillance, record keeping, and reporting requirements for methylene chloride (29 CFR 1910.1052).

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9. Physical and Chemical Properties

Appearance:
Clear, colorless liquid.
Odor:
Chloroform-like odor.
Solubility:
1.32 gm/100 gm water @ 20C.
Specific Gravity:
1.318 @ 25C
pH:
No information found.
% Volatiles by volume @ 21C (70F):
100
Boiling Point:
39.8C (104F)
Melting Point:
-97C (-143F)
Vapor Density (Air=1):
2.9
Vapor Pressure (mm Hg):
350 @ 20C (68F)
Evaporation Rate (BuAc=1):
27.5

---

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products:
Emits highly toxic fumes of phosgene when heated to decomposition. Decomposes in a flame or hot surface to form toxic gas phosgene and corrosive mists of hydrochloric acid. Carbon dioxide and carbon monoxide may form when heated to decomposition.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Strong oxidizers, strong caustics, plastics, rubber, nitric acid, water + heat, and chemically active metals, such as aluminum and magnesium powder, sodium, potassium, and lithium. Avoid contact with open flames and electrical arcs. Liquid methylene chloride will attack some forms of plastics, rubber, and coatings.

Conditions to Avoid:
Moisture, heat, flames, ignition sources and incompatibles.

---

11. Toxicological Information

Toxicological Data:
Dichloromethane: Oral rat LD50: 1600 mg/kg; inhalation rat LC50: 52 gm/m3; investigated as a tumorigen, mutagen, reproductive effector.
Reproductive Toxicity:
Dichloromethane has been linked to spontaneous abortions in humans.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Methylene Chloride (75-09-2)	No	Yes	2B

---

12. Ecological Information

Environmental Fate:
When released into the soil, this material may leach into groundwater. When released into the soil, this material is expected to quickly evaporate. When released into water, this material may biodegrade to a moderate extent. When released to water, this material is expected to quickly evaporate. This material has a log octanol-water partition coefficient of less than 3.0. This material is not expected to significantly bioaccumulate. When released into the air, this material may be moderately degraded by reaction with photochemically produced hydroxyl radicals. When released into the air, this material is expected to have a half-life of greater than 30 days. When released into the air, this material may be removed from the atmosphere to a moderate extent by wet deposition.
Environmental Toxicity:
The LC50/96-hour values for fish are over 100 mg/l. This material is not expected to be toxic to aquatic life.

---

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved incinerator or disposed in a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

---

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: DICHLOROMETHANE
Hazard Class: 6.1
UN/NA: UN1593
Packing Group: III
Information reported for product/size: 52L

International (Water, I.M.O.)

Proper Shipping Name: DICHLOROMETHANE
Hazard Class: 6.1
UN/NA: UN1593
Packing Group: III
Information reported for product/size: 52L

International (Air, I.C.A.O.)

Proper Shipping Name: DICHLOROMETHANE
Hazard Class: 6.1
UN/NA: UN1593
Packing Group: III
Information reported for product/size: 52L

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15. Regulatory Information

--------\Chemical Inventory Status - Part 1\---------------------------------

Ingredient	TSCA	EC	Japan	Australia
Methylene Chloride (75-09-2)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\---------------------------------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
Methylene Chloride (75-09-2)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\----------------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313------ List	Chemical Catg.
Methylene Chloride (75-09-2)	No	No	Yes	No

--------\Federal, State & International Regulations - Part 2\----------------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Methylene Chloride (75-09-2)	1000	U080	No

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Chemical Weapons Convention:  No     TSCA 12(b):  No     CDTA:  No
SARA 311/312:  Acute: Yes      Chronic: Yes  Fire: No  Pressure: No
Reactivity: No          (Pure / Liquid)
```

WARNING:
THIS PRODUCT CONTAINS A CHEMICAL(S) KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER.

Australian Hazchem Code: 2Z
Poison Schedule: S5
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

---

16. Other Information

NFPA Ratings: Health: **2** Flammability: **1** Reactivity: **0**
Label Hazard Warning:
WARNING! HARMFUL IF SWALLOWED, INHALED OR ABSORBED THROUGH SKIN. AFFECTS CENTRAL NERVOUS SYSTEM, LIVER, CARDIOVASCULAR SYSTEM, AND BLOOD. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. SUSPECT CANCER HAZARD. MAY CAUSE CANCER. Risk of cancer depends on level and duration of exposure.
Label Precautions:
Do not breathe vapor.
Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handling.
Keep away from heat and flame.
Do not get in eyes, on skin, or on clothing.
Label First Aid:
If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. In all cases, get medical attention.
Product Use:
Laboratory Reagent.
Revision Information:
MSDS Section(s) changed since last revision of document include: 3.
Disclaimer:
****

Mallinckrodt Baker, Inc. provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this product. Individuals receiving the information

must exercise their independent judgment in determining its appropriateness for a particular purpose. MALLINCKRODT BAKER, INC. MAKES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE INFORMATION SET FORTH HEREIN OR THE PRODUCT TO WHICH THE INFORMATION REFERS. ACCORDINGLY, MALLINCKRODT BAKER, INC. WILL NOT BE RESPONSIBLE FOR DAMAGES RESULTING FROM USE OF OR RELIANCE UPON THIS INFORMATION.
****

Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

MSDS Number: **H2381** * * * * * *Effective Date:* ***11/02/01*** * * * * * *Supercedes:* ***04/15/99***

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

J.T.Baker®

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. And Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

HEXANE

1. Product Identification

Synonyms: Hexanes,Normal Hexane; Hexyl Hydride; Hexane 95%
CAS No.: 110-54-3 (n-hexane)
Molecular Weight: 86.18
Chemical Formula: CH3(CH2)4CH3 n-hexane
Product Codes: 9262, 9304, 9308, N168

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Hexane	110-54-3	85 - 100%	Yes
Methylcyclopentane	96-37-7	1 - 2%	Yes
Trace amount of Benzene (10 ppm)	071-43-2	*	No

3. Hazards Identification

Emergency Overview

DANGER! EXTREMELY FLAMMABLE LIQUID AND VAPOR. VAPOR MAY CAUSE FLASH FIRE. HARMFUL OR FATAL IF SWALLOWED. HARMFUL IF INHALED. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. AFFECTS THE CENTRAL AND PERIPHERAL NERVOUS SYSTEMS.

J.T. Baker SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 2 - Moderate
Flammability Rating: 3 - Severe (Flammable)
Reactivity Rating: 0 - None
Contact Rating: 2 - Moderate
Lab Protective Equip: GOGGLES; LAB COAT; VENT HOOD; PROPER GLOVES; CLASS B EXTINGUISHER
Storage Color Code: Red (Flammable)

Potential Health Effects

The health hazards addressed are for the major component: n-hexane.

Inhalation:
Inhalation of vapors irritates the respiratory tract. Overexposure may cause lightheadedness, nausea, headache, and blurred vision. Greater exposure may cause muscle weakness, numbness of the extremities, unconsciousness and death.
Ingestion:
May produce abdominal pain, nausea. Aspiration into lungs can produce severe lung damage and is a medical emergency. Other symptoms expected to parallel inhalation.
Skin Contact:
May cause redness, irritation, with dryness, cracking.
Eye Contact:
Vapors may cause irritation. Splashes may cause redness and pain.
Chronic Exposure:
Repeated or prolonged skin contact may defat the skin and produce irritation and dermatitis. Chronic inhalation may cause peripheral nerve disorders and central nervous system effects.

Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders or eye problems or impaired respiratory function may be more susceptible to the effects of the substance. May affect the developing fetus.

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4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.
Ingestion:
Aspiration hazard. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention

immediately.
Skin Contact:
Remove any contaminated clothing. Wipe off excess from skin. Wash skin with soap and water for at least 15 minutes. Get medical attention if irritation develops or persists.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

Note to Physician:
BEI=2,5-hexadione in urine, sample at end of shift at workweeks end, 5 mg/g creatine. Also, measure n-hexane in expired air. Analgesics may be necessary for pain management, there is no specific antidote. Monitor arterial blood gases in cases of severe aspiration.

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5. Fire Fighting Measures

Fire:
Flash point: -23C (-9F) CC
Autoignition temperature: 224C (435F)
Flammable limits in air % by volume:
lel: 1.2; uel: 7.7
Extremely Flammable Liquid and Vapor! Vapor may cause flash fire. Dangerous fire hazard when exposed to heat or flame.
Explosion:
Above flash point, vapor-air mixtures are explosive within flammable limits noted above. Contact with oxidizing materials may cause extremely violent combustion.Explodes when mixed @ 28C with dinitrogen tetraoxide. Sensitive to static discharge.
Fire Extinguishing Media:
Dry chemical, foam or carbon dioxide. Water may be ineffective.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Water spray may be used to keep fire exposed containers cool. Vapors can flow along surfaces to distant ignition source and flash back. Vapor explosion hazard exists indoors, outdoors, or in sewers.

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6. Accidental Release Measures

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! If a leak or spill has not ignited, use water spray to disperse the vapors, to protect personnel attempting to stop leak, and to flush spills away from exposures. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll

free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker SOLUSORB® solvent adsorbent is recommended for spills of this product.

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7. Handling and Storage

Protect against physical damage. Store in a cool, dry well-ventilated location, away from direct sunlight and any area where the fire hazard may be acute. Store in tightly closed containers (preferably under nitrogen atmosphere). Outside or detached storage is preferred. Inside storage should be in a standard flammable liquids storage room or cabinet. Separate from oxidizing materials. Containers should be bonded and grounded for transfers to avoid static sparks. Storage and use areas should be No Smoking areas. Use non-sparking type tools and equipment. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

---

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
N-Hexane [110-54-3]:
-OSHA Permissible Exposure Limit (PEL): 500 ppm (TWA)
-ACGIH Threshold Limit Value (TLV): 50 ppm (TWA), Skin
other isomers of hexane
-ACGIH Threshold Limit Value (TLV): 500 ppm (TWA),1000ppm (STEL)
Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.
Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded and engineering controls are not feasible, wear a supplied air, full-facepiece respirator, airlined hood, or full-facepiece self-contained breathing apparatus. Breathing air quality must meet the requirements of the OSHA respiratory protection standard (29CFR1910.134).
Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.
Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

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9. Physical and Chemical Properties

Appearance:
Clear, colorless liquid.
Odor:
Light odor.
Solubility:
Insoluble in water.
Specific Gravity:
0.66
pH:
No information found.
% Volatiles by volume @ 21C (70F):
100
Boiling Point:
ca. 68C (ca. 154F)
Melting Point:
ca. -95C (ca. -139F)
Vapor Density (Air=1):
3.0
Vapor Pressure (mm Hg):
130 @ 20C (68F)
Evaporation Rate (BuAc=1):
9

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10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage. Heat will contribute to instability.
Hazardous Decomposition Products:
May produce acrid smoke and irritating fumes when heated to decomposition.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Strong oxidizers.
Conditions to Avoid:
Heat, flames, ignition sources and incompatibles.

---

11. Toxicological Information

N-Hexane: Oral rat LD50: 28710 mg/kg. Irritation eye rabbit: 10 mg mild. Investigated as a tumorigen, mutagen and reproductive effector.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Hexane (110-54-3)	No	No	None
Methylcyclopentane (96-37-7)	No	No	None
Trace amount of Benzene (10 ppm) (071-43-2)	Yes	No	1

12. Ecological Information

Environmental Fate:
When released into the soil, this material may biodegrade to a moderate extent. When released into the soil, this material is not expected to leach into groundwater. When released into the soil, this material is expected to quickly evaporate. When released into water, this material may biodegrade to a moderate extent. When released to water, this material is expected to quickly evaporate. When released into the water, this material is expected to have a half-life between 1 and 10 days. This material has an estimated bioconcentration factor (BCF) of less than 100. This material has a log octanol-water partition coefficient of greater than 3.0. This material is not expected to significantly bioaccumulate. When released into the air, this material is expected to be readily degraded by reaction with photochemically produced hydroxyl radicals. When released into the air, this material is expected to have a half-life between 1 and 10 days.
Environmental Toxicity:
No information found.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved incinerator or disposed in a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: HEXANES
Hazard Class: 3
UN/NA: UN1208
Packing Group: II
Information reported for product/size: 52L

International (Water, I.M.O.)

Proper Shipping Name: HEXANES
Hazard Class: 3
UN/NA: UN1208
Packing Group: II
Information reported for product/size: 52L

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15. Regulatory Information

--------\Chemical Inventory Status - Part 1\---------------------------------

Ingredient	TSCA	EC	Japan	Australia
Hexane (110-54-3)	Yes	Yes	Yes	Yes
Methylcyclopentane (96-37-7)	Yes	Yes	No	Yes
Trace amount of Benzene (10 ppm) (071-43-2)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\---------------------------------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
Hexane (110-54-3)	Yes	Yes	No	Yes
Methylcyclopentane (96-37-7)	Yes	Yes	No	Yes
Trace amount of Benzene (10 ppm) (071-43-2)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\----------------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313------ List	Chemical Catg.
Hexane (110-54-3)	No	No	Yes	No
Methylcyclopentane (96-37-7)	No	No	No	No
Trace amount of Benzene (10 ppm) (071-43-2)	No	No	Yes	No

--------\Federal, State & International Regulations - Part 2\----------------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Hexane (110-54-3)	5000	No	No
Methylcyclopentane (96-37-7)	No	No	No
Trace amount of Benzene (10 ppm) (071-43-2)	10	U019	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: Yes Fire: Yes Pressure: No
Reactivity: No (Mixture / Liquid)

WARNING:
THIS PRODUCT CONTAINS A CHEMICAL(S) KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER.

Australian Hazchem Code: 3[Y]E
Poison Schedule: None allocated.

WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

---

16. Other Information

NFPA Ratings: Health: **1** Flammability: **3** Reactivity: **0**
Label Hazard Warning:
DANGER! EXTREMELY FLAMMABLE LIQUID AND VAPOR. VAPOR MAY CAUSE FLASH FIRE. HARMFUL OR FATAL IF SWALLOWED. HARMFUL IF INHALED. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. AFFECTS THE CENTRAL AND PERIPHERAL NERVOUS SYSTEMS.
Label Precautions:
Keep away from heat, sparks and flame.
Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handling.
Avoid breathing vapor or mist.
Avoid contact with eyes, skin and clothing.
Label First Aid:
Aspiration hazard. If swallowed, vomiting may occur spontaneously, but DO NOT INDUCE. If vomiting occurs, keep head below hips to prevent aspiration into lungs. Never give anything by mouth to an unconscious person. Call a physician immediately. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. In all cases call a physician.
Product Use:
Laboratory Reagent.
Revision Information:
MSDS Section(s) changed since last revision of document include: 8.
Disclaimer:
****

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Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

Material Safety Data Sheet

Section 1. Product and Company Identification

Product Name Hydrochloric Acid, NF

Product Code HX0606

Manufacturer EMD Chemicals Inc.
P.O. Box 70
480 Democrat Road
Gibbstown, NJ 08027
Prior to January 1, 2003 EMD Chemicals Inc. was EM Industries, Inc. or EM Science, Division of EM Industries, Inc.

Effective Date 3/3/2003

For More Information Call
856−423−6300 Technical Service
Monday−Friday: 8:00 AM − 5:00 PM

In Case of Emergency Call
800−424−9300 CHEMTREC (USA)
613−996−6666 CANUTEC (Canada)
24 Hours/Day: 7 Days/Week

Synonym MURIATIC ACID

Material Uses Analytical reagent.

Chemical Family Inorganic Acid.

Section 2. Composition and Information on Ingredients

Component	CAS #	% by Weight
HYDROCHLORIC ACID	7647−01−0	100

Section 3. Hazards Identification

Physical State and Appearance Liquid. (Colorless.)

Emergency Overview DANGER! POISON!
MAY BE FATAL IF INHALED OR SWALLOWED.
CAUSES SEVERE EYE AND SKIN BURNS.
CAUSES SEVERE RESPIRATORY TRACT IRRITATION.
CAUSES DAMAGE TO THE FOLLOWING ORGANS: LUNGS, RESPIRATORY TRACT, SKIN, EYE, LENS OR CORNEA.

Routes of Entry Absorbed through skin. Eye contact. Inhalation. Ingestion.

Potential Acute Health Effects

Eyes Extremely hazardous in case of eye contact (corrosive). Causes severe eye burns.

Skin Extremely hazardous in case of skin contact (corrosive). Skin contact produces severe burns.

Inhalation Extremely hazardous in case of inhalation (lung irritant). May be fatal if inhaled.

Ingestion Extremely hazardous in case of ingestion. May be fatal if swallowed.

Potential Chronic Health Effects

Carcinogenic Effects This material is not known to cause cancer in animals or humans.

Additional information See Toxicological Information (section 11)

Medical Conditions Aggravated by Overexposure:	Repeated or prolonged contact with spray mist may produce chronic eye irritation and severe skin irritation. Repeated or prolonged exposure to spray mist may produce respiratory tract irritation leading to frequent attacks of bronchial infection. Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4. First Aid Measures

Eye Contact	Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention immediately.
Skin Contact	In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cold water may be used. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.
Inhalation	If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.
Ingestion	DO NOT induce vomiting. If affected person is conscious give plenty of water to drink. Get medical attention immediately.

Section 5. Fire Fighting Measures

Flammability of the Product	May be combustible at high temperature.
Auto−ignition Temperature	Not available.
Flash Points	Not available.
Flammable Limits	Not available.
Products of Combustion	These products are carbon oxides (CO, CO2), halogenated compounds.
Fire Hazards in Presence of Various Substances	Not available.
Explosion Hazards in Presence of Various Substances	**Risks of explosion of the product in presence of static discharge:** No. **Risks of explosion of the product in presence of mechanical impact:** No.
Fire Fighting Media and Instructions	Use water spray or fog.
Protective Clothing (Fire)	Wear MSHA/NIOSH approved self−contained breathing apparatus or equivalent and full protective gear.
Special Remarks on Fire Hazards	Flammable hydrogen gas may be produced on prolonged contact with metals such as aluminum, tin, lead and zinc.
Special Remarks on Explosion Hazards	Not available.

Section 6. Accidental Release Measures

Small Spill and Leak	Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container.
Large Spill and Leak	Stop leak if without risk. Cover with DRY earth, DRY sand or other non−combustible material followed with plastic sheet to minimize

spreading or contact with rain. Do not get water inside container. Do not touch spilled material. Use water spray curtain to divert vapor drift. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Call for assistance on disposal. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Spill Kit Information The following EMD Chemicals Inc. SpillSolv ® absorbent is recommended for this product: SX1310 Acid Treatment Kit

Section 7. Handling and Storage

Handling Do not ingest. Do not breathe vapor or mist. Keep container closed. Use only with adequate ventilation. Do not get in eyes, on skin, or on clothing.

Storage Keep container in a cool, well−ventilated area.

Section 8. Exposure Controls/Personal Protection

Engineering Controls Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective occupational exposure limits. Ensure that eyewash stations and safety showers are proximal to the work−station location.

Personal Protection

Eyes Face shield.

Body Full suit.

Respiratory Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate.

Hands Gloves.

Feet Boots.

Protective Clothing (Pictograms)

Personal Protection in Case of a Large Spill Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self−contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Product Name	Exposure Limits
HYDROCHLORIC ACID	**BAUA (Germany, 1997).** Spitzenbegrenzung: 8 mg/m3 MAK: 8 mg/m3 **DK−Arbejdstylsinet (Denmark, 1996).** Loftværdi: 7 mg/m3 Loftværdi: 5 ppm GV: 7 mg/m3 GV: 5 ppm **80/1107/EEC (Europe, 1996).** STEL: 10 mg/m3 STEL: 15 ppm TWA: 5 mg/m3 TWA: 8 ppm **EH40−OES (United Kingdom (UK), 1997).** STEL: 8 mg/m3

STEL: 5 ppm
TWA: 2 mg/m3
TWA: 1 ppm
ACGIH (United States, 1994).
CEIL: 7.5 mg/m3
CEIL: 5 ppm
NIOSH REL (United States, 1994).
CEIL: 7 mg/m3
CEIL: 5 ppm
OSHA Final Rule (United States, 1989).
CEIL: 7 mg/m3
CEIL: 5 ppm

Section 9. Physical and Chemical Properties

Odor	Pungent.
Color	Clear. Colorless.
Physical State and Appearance	Liquid. (Colorless.)
Molecular Weight	36.46 g/mole
Molecular Formula	Cl−H
pH	Not available.
Boiling/Condensation Point	110°C (230°F)
Melting/Freezing Point	−74°C (−101.2°F)
Critical Temperature	51.5°C (124.7°F)
Specific Gravity	1.2 (Water = 1)
Vapor Pressure	21.3 kPa (160 mmHg) (@ 20°C)
Vapor Density	>1 (Air = 1)
Odor Threshold	Not available.
Evaporation Rate	>1
LogKow	Not available.
Solubility	Soluble in water.

Section 10. Stability and Reactivity

Stability and Reactivity	The product is stable.
Conditions of Instability	Not available.
Incompatibility with Various Substances	Reactive with metals, alkalis.
Rem/Incompatibility	Not available.
Hazardous Decomposition Products	These products are halogenated compounds.
Hazardous Polymerization	Will not occur.

Section 11. Toxicological Information

RTECS Number:

Hydrochloric Acid	MW4025000

Toxicity Acute oral toxicity (LD50): 900 mg/kg [Rabbit].
Acute toxicity of the vapor (LC50): 1108 ppm 1 hour(s) [Mouse].

Chronic Effects on Humans Not available.

Acute Effects on Humans Extremely hazardous in case of eye contact (corrosive). Causes severe eye burns. Extremely hazardous in case of skin contact (corrosive). Skin contact produces severe burns. Extremely hazardous in case of inhalation (lung irritant). May be fatal if inhaled. Extremely hazardous in case of ingestion. May be fatal if swallowed.

Synergetic Products (Toxicologically) Not available.

Irritancy Draize Test (Rabbit):
Eyes: 5mg/30s. Reaction: Mild.
Eye: 100 mg/24h moderate

Sensitization Not available.

Carcinogenic Effects This material is not known to cause cancer in animals or humans.

Toxicity to Reproductive System Tests on laboratory animals for reproductive effects are cited in Registry of Toxic Effects on Chemical Substances (RTECS).

Teratogenic Effects Not available.

Mutagenic Effects Tests on laboratory animals for mutagenic effects are cited in Registry of Toxic Effects of Chemical Substances (RTECS).

Section 12. Ecological Information

Ecotoxicity Not available.

BOD5 and COD Not available.

Toxicity of the Products of Biodegradation The products of degradation are as toxic as the product itself.

Section 13. Disposal Considerations

EPA Waste Number D002

Treatment Specified Technology − Neutralize to pH 6−9. Contact your local permitted waste disposal site (TSD) for permissible treatment sites. Always contact a permitted waste disposal (TSD) to assure compliance with all current local, state, and Federal Regulations.

Section 14. Transport Information

DOT Classification Proper Shipping Name:
HYDROCHLORIC ACID
Hazard Class: 8
UN number: UN1789
Packing Group: II
RQ: 5000 lbs. (2268 kg)

TDG Classification Not available.

IMO/IMDG Not available.

Classification	
ICAO/IATA Classification	Not available.

Section 15. Regulatory Information

U.S. Federal Regulations	TSCA 8(b) inventory: HYDROCHLORIC ACID SARA 302/304/311/312 extremely hazardous substances: HYDROCHLORIC ACID SARA 302/304 emergency planning and notification: HYDROCHLORIC ACID SARA 302/304/311/312 hazardous chemicals: HYDROCHLORIC ACID SARA 311/312 MSDS distribution − chemical inventory − hazard identification: HYDROCHLORIC ACID: Sudden Release of Pressure, Immediate (Acute) Health Hazard, Delayed (Chronic) Health Hazard SARA 313 toxic chemical notification and release reporting: HYDROCHLORIC ACID Clean Water Act (CWA) 307: No products were found. Clean Water Act (CWA) 311: HYDROCHLORIC ACID Clean air act (CAA) 112 accidental release prevention: HYDROCHLORIC ACID Clean air act (CAA) 112 regulated flammable substances: No products were found. Clean air act (CAA) 112 regulated toxic substances: HYDROCHLORIC ACID
WHMIS (Canada)	Class D−1A: Material causing immediate and serious toxic effects (VERY TOXIC). CLASS E: Corrosive liquid. CEPA DSL: HYDROCHLORIC ACID This product has been classiifed in accordance with the hazard criteria of the Controlled Product Regulations and the MSDS contains all required information.
International Regulations	
EINECS	HYDROCHLORIC ACID 231−595−7
DSCL (EEC)	R23− Toxic by inhalation. R35− Causes severe burns. R37− Irritating to respiratory system.
International Lists	Australia (NICNAS): HYDROCHLORIC ACID Japan (MITI): HYDROCHLORIC ACID Korea (TCCL): HYDROCHLORIC ACID Philippines (RA6969): HYDROCHLORIC ACID China: No products were found.
State Regulations	Pennsylvania RTK: HYDROCHLORIC ACID: (environmental hazard, generic environmental hazard) Massachusetts RTK: HYDROCHLORIC ACID New Jersey: HYDROCHLORIC ACID California prop. 65: No products were found.

Section 16. Other Information

National Fire Protection Association (U.S.A.)	**0**	**Fire Hazard**
	30	**Health Hazard**
		Reactivity
		Specific Hazard

Other Special Considerations Section 2 lists this product as 100% which indicates that it is a concentrated acid.

Changed Since Last Revision +

Notice to Reader

The statements contained herein are based upon technical data that EMD Chemicals Inc. believes to be reliable, are offered for information purposes only and as a guide to the appropriate precautionary and emergency handling of the material by a properly trained person having the necessary technical skills. Users should consider these data only as a supplement to other information gathered by them and must make independent determinations of suitability and completeness of information from all sources to assure proper use, storage and disposal of these materials and the safety and health of employees and customers and the protection of the environment. EMD CHEMICALS INC. MAKES NO REPRESENTATION OR WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING MERCHANTABILITY OR FITNESS FOR A PARTICULAR USE, WITH RESPECT TO THE INFORMATION HEREIN OR THE PRODUCT TO WHICH THE INFORMATION REFERS.

MSDS Number: **M2015** * * * * * *Effective Date:* ***11/12/01*** * * * * * *Supercedes:* ***12/14/00***

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

METHYL ALCOHOL

1. Product Identification

Synonyms: Wood alcohol; methanol; carbinol
CAS No.: 67-56-1
Molecular Weight: 32.04
Chemical Formula: CH3OH
Product Codes:
J.T. Baker: 5217, 5370, 5794, 5811, 5842, 5869, 9049, 9063, 9065, 9066, 9067, 9069, 9070, 9071, 9073, 9075, 9076, 9077, 9091, 9093, 9096, 9097, 9098, 9263, 9822, 9830, V654
Mallinckrodt: 3004, 3006, 3016, 3017, 3018, 3024, 3041, 3701, 4295, 5160, 8814, H080, H488, H603, H985, V079, V571

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Methyl Alcohol	67-56-1	100%	Yes

3. Hazards Identification

Emergency Overview

POISON! DANGER! VAPOR HARMFUL. MAY BE FATAL OR CAUSE BLINDNESS IF SWALLOWED. HARMFUL IF INHALED OR ABSORBED THROUGH SKIN. CANNOT BE MADE NONPOISONOUS. FLAMMABLE LIQUID AND VAPOR. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. AFFECTS CENTRAL NERVOUS SYSTEM AND LIVER.

SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 3 - Severe (Poison)
Flammability Rating: 3 - Severe (Flammable)
Reactivity Rating: 1 - Slight
Contact Rating: 3 - Severe (Life)
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES; CLASS B EXTINGUISHER
Storage Color Code: Red (Flammable)

Potential Health Effects

Inhalation:
A slight irritant to the mucous membranes. Toxic effects exerted upon nervous system, particularly the optic nerve. Once absorbed into the body, it is very slowly eliminated. Symptoms of overexposure may include headache, drowsiness, nausea, vomiting, blurred vision, blindness, coma, and death. A person may get better but then worse again up to 30 hours later.
Ingestion:
Toxic. Symptoms parallel inhalation. Can intoxicate and cause blindness. Usual fatal dose: 100-125 milliliters.
Skin Contact:
Methyl alcohol is a defatting agent and may cause skin to become dry and cracked. Skin absorption can occur; symptoms may parallel inhalation exposure.
Eye Contact:
Irritant. Continued exposure may cause eye lesions.
Chronic Exposure:
Marked impairment of vision has been reported. Repeated or prolonged exposure may cause skin irritation.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders or eye problems or impaired liver or kidney function may be more susceptible to the effects of the substance.

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4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give

oxygen. Get medical attention immediately.
Ingestion:
Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.
Skin Contact:
Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

---

5. Fire Fighting Measures

Fire:
Flash point: 12C (54F) CC
Autoignition temperature: 464C (867F)
Flammable limits in air % by volume:
lel: 6.0; uel: 36
Flammable Liquid and Vapor!
Explosion:
Above flash point, vapor-air mixtures are explosive within flammable limits noted above. Moderate explosion hazard and dangerous fire hazard when exposed to heat, sparks or flames. Sensitive to static discharge.
Fire Extinguishing Media:
Use alcohol foam, dry chemical or carbon dioxide. (Water may be ineffective.)
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Use water spray to blanket fire, cool fire exposed containers, and to flush non-ignited spills or vapors away from fire. Vapors can flow along surfaces to distant ignition source and flash back.

---

6. Accidental Release Measures

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! If a leak or spill has not ignited, use water spray to disperse the vapors, to protect personnel attempting to stop leak, and to flush spills away from exposures. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker SOLUSORB® solvent adsorbent is recommended for spills of this product.

---

7. Handling and Storage

Protect against physical damage. Store in a cool, dry well-ventilated location, away from any area where the fire hazard may be acute. Outside or detached storage is preferred. Separate from incompatibles. Containers should be bonded and grounded for transfers to avoid static sparks. Storage and use areas should be No Smoking areas. Use non-sparking type tools and equipment, including explosion proof ventilation. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product. Do Not attempt to clean empty containers since residue is difficult to remove. Do not pressurize, cut, weld, braze, solder, drill, grind or expose such containers to heat, sparks, flame, static electricity or other sources of ignition: they may explode and cause injury or death.

---

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
For Methyl Alcohol:
- OSHA Permissible Exposure Limit (PEL):
200 ppm (TWA)
- ACGIH Threshold Limit Value (TLV):
200 ppm (TWA), 250 ppm (STEL) skin

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details. Use explosion-proof equipment.

Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded and engineering controls are not feasible, wear a supplied air, full-facepiece respirator, airlined hood, or full-facepiece self-contained breathing apparatus. Breathing air quality must meet the requirements of the OSHA respiratory protection standard (29CFR1910.134). This substance has poor warning properties.

Skin Protection:
Rubber or neoprene gloves and additional protection including impervious boots, apron, or coveralls, as needed in areas of unusual exposure.

Eye Protection:
Use chemical safety goggles. Maintain eye wash fountain and quick-drench facilities in work area.

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9. Physical and Chemical Properties

Appearance:
Clear, colorless liquid.
Odor:
Characteristic odor.
Solubility:
Miscible in water.
Specific Gravity:
0.8
pH:
No information found.
% Volatiles by volume @ 21C (70F):
100
Boiling Point:
64.5C (147F)
Melting Point:
-98C (-144F)
Vapor Density (Air=1):
1.1
Vapor Pressure (mm Hg):
97 @ 20C (68F)
Evaporation Rate (BuAc=1):
5.9

---

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products:
May form carbon dioxide, carbon monoxide, and formaldehyde when heated to decomposition.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Strong oxidizing agents such as nitrates, perchlorates or sulfuric acid. Will attack some forms of plastics, rubber, and coatings. May react with metallic aluminum and generate hydrogen gas.
Conditions to Avoid:
Heat, flames, ignition sources and incompatibles.

---

11. Toxicological Information

Methyl Alcohol (Methanol) Oral rat LD50: 5628 mg/kg; inhalation rat LC50: 64000

ppm/4H; skin rabbit LD50: 15800 mg/kg; Irritation data-standard Draize test: skin, rabbit: 20mg/24 hr. Moderate; eye, rabbit: 100 mg/24 hr. Moderate. Investigated as a mutagen, reproductive effector.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Methyl Alcohol (67-56-1)	No	No	None

---

12. Ecological Information

Environmental Fate:
When released into the soil, this material is expected to readily biodegrade. When released into the soil, this material is expected to leach into groundwater. When released into the soil, this material is expected to quickly evaporate. When released into the water, this material is expected to have a half-life between 1 and 10 days. When released into water, this material is expected to readily biodegrade. When released into the air, this material is expected to exist in the aerosol phase with a short half-life. When released into the air, this material is expected to be readily degraded by reaction with photochemically produced hydroxyl radicals. When released into air, this material is expected to have a half-life between 10 and 30 days. When released into the air, this material is expected to be readily removed from the atmosphere by wet deposition.
Environmental Toxicity:
This material is expected to be slightly toxic to aquatic life.

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13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved incinerator or disposed in a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

---

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: METHANOL
Hazard Class: 3
UN/NA: UN1230
Packing Group: II
Information reported for product/size: 358LB

International (Water, I.M.O.)

Proper Shipping Name: METHANOL
Hazard Class: 3, 6.1
UN/NA: UN1230
Packing Group: II
Information reported for product/size: 358LB

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15. Regulatory Information

--------\Chemical Inventory Status - Part 1\---------------------------------

Ingredient	TSCA	EC	Japan	Australia
Methyl Alcohol (67-56-1)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\---------------------------------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
Methyl Alcohol (67-56-1)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\----------------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313------ List	Chemical Catg.
Methyl Alcohol (67-56-1)	No	No	Yes	No

--------\Federal, State & International Regulations - Part 2\----------------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Methyl Alcohol (67-56-1)	5000	U154	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: Yes Fire: Yes Pressure: No
Reactivity: No (Pure / Liquid)

Australian Hazchem Code: 2PE
Poison Schedule: S6
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

---

16. Other Information

NFPA Ratings: Health: **1** Flammability: **3** Reactivity: **0**

Label Hazard Warning:
POISON! DANGER! VAPOR HARMFUL. MAY BE FATAL OR CAUSE BLINDNESS IF SWALLOWED. HARMFUL IF INHALED OR ABSORBED THROUGH SKIN. CANNOT BE MADE NONPOISONOUS. FLAMMABLE LIQUID AND VAPOR. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. AFFECTS CENTRAL NERVOUS SYSTEM AND LIVER.
Label Precautions:
Avoid breathing vapor.
Avoid contact with eyes, skin and clothing.
Wash thoroughly after handling.
Keep container closed.
Use only with adequate ventilation.
Keep away from heat, sparks and flame.
Label First Aid:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. If swallowed, induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. In all cases get medical attention immediately.
Product Use:
Laboratory Reagent.
Revision Information:
MSDS Section(s) changed since last revision of document include: 3, 8.
Disclaimer:
****

Mallinckrodt Baker, Inc. provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this product. Individuals receiving the information must exercise their independent judgment in determining its appropriateness for a particular purpose. MALLINCKRODT BAKER, INC. MAKES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE INFORMATION SET FORTH HEREIN OR THE PRODUCT TO WHICH THE INFORMATION REFERS. ACCORDINGLY, MALLINCKRODT BAKER, INC. WILL NOT BE RESPONSIBLE FOR DAMAGES RESULTING FROM USE OF OR RELIANCE UPON THIS INFORMATION.
****

Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

MSDS Number: **M4628** * * * * * *Effective Date:* ***08/02/01*** * * * * * *Supercedes:* ***09/15/98***

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS | J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

METHYL ETHYL KETONE

1. Product Identification

Synonyms: 2-Butanone; ethyl methyl ketone; MEK; Methyl acetone
CAS No.: 78-93-3
Molecular Weight: 72.11
Chemical Formula: CH3COCH2CH3
Product Codes:
J.T. Baker: 5385, 9214, 9319, 9323, 9414, Q531
Mallinckrodt: 6206, 6233, 6240, 6243

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Methyl Ethyl Ketone	78-93-3	99 - 100%	Yes

3. Hazards Identification

Emergency Overview

DANGER! EXTREMELY FLAMMABLE LIQUID AND VAPOR. VAPOR MAY CAUSE FLASH FIRE. HARMFUL OR FATAL IF SWALLOWED. HARMFUL IF INHALED OR ABSORBED THROUGH SKIN. AFFECTS CENTRAL NERVOUS SYSTEM. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT.

J.T. Baker SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 2 - Moderate
Flammability Rating: 4 - Extreme (Flammable)
Reactivity Rating: 2 - Moderate
Contact Rating: 2 - Moderate
Lab Protective Equip: GOGGLES; LAB COAT; VENT HOOD; PROPER GLOVES; CLASS B EXTINGUISHER
Storage Color Code: Red (Flammable)

Potential Health Effects

Inhalation:
Causes irritation to the nose and throat. Concentrations above the TLV may cause headache, dizziness, nausea, shortness of breath, and vomiting. Higher concentrations may cause central nervous system depression and unconsciousness.
Ingestion:
May produce abdominal pain, nausea. Aspiration into lungs can produce severe lung damage and is a medical emergency. Other symptoms expected to parallel inhalation.
Skin Contact:
Causes irritation to skin. Symptoms include redness, itching, and pain. May be absorbed through the skin with possible systemic effects.
Eye Contact:
Vapors are irritating to the eyes. Splashes can produce painful irritation and eye damage.
Chronic Exposure:
Prolonged skin contact may defat the skin and produce dermatitis. Chronic exposure may cause central nervous system effects.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders or eye problems or impaired respiratory function may be more susceptible to the effects of the substance.

---

4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.
Ingestion:
Aspiration hazard. If swallowed, vomiting may occur spontaneously, but DO NOT INDUCE. If vomiting occurs, keep head below hips to prevent aspiration into lungs. Never give anything by mouth to an unconscious person. Call a physician immediately.
Skin Contact:

Immediately flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting upper and lower eyelids occasionally. Get medical attention.

---

5. Fire Fighting Measures

Fire:

Flash point: -9C (16F) CC
Autoignition temperature: 404C (759F)
Flammable limits in air % by volume:
lel: 1.4; uel: 11.4
Extremely Flammable.

Explosion:

Above flash point, vapor-air mixtures are explosive within flammable limits noted above. Vapors can flow along surfaces to distant ignition source and flash back. Contact with strong oxidizers may cause fire. Sealed containers may rupture when heated. Sensitive to static discharge.

Fire Extinguishing Media:

Dry chemical, foam or carbon dioxide. Water spray may be used to keep fire exposed containers cool, dilute spills to nonflammable mixtures, protect personnel attempting to stop leak and disperse vapors.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. This highly flammable liquid must be kept from sparks, open flame, hot surfaces, and all sources of heat and ignition.

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6. Accidental Release Measures

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! If a leak or spill has not ignited, use water spray to disperse the vapors, to protect personnel attempting to stop leak, and to flush spills away from exposures. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker SOLUSORB® solvent adsorbent is recommended for spills of this product.

7. Handling and Storage

Protect against physical damage. Store in a cool, dry well-ventilated location, away from any area where the fire hazard may be acute. Outside or detached storage is preferred. Separate from incompatibles. Containers should be bonded and grounded for transfers to avoid static sparks. Storage and use areas should be No Smoking areas. Use non-sparking type tools and equipment, including explosion proof ventilation. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
-OSHA Permissible Exposure Limit (PEL):
200 ppm (TWA)

-ACGIH Threshold Limit Value (TLV):
200 ppm (TWA), 300 ppm (STEL)
Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details. Use explosion-proof equipment.
Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded and engineering controls are not feasible, a full facepiece respirator with organic vapor cartridge may be worn up to 50 times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air purifying respirators do not protect workers in oxygen-deficient atmospheres.
Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact. Butyl rubber is a suitable material for personal protective equipment.
Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance:

Clear, colorless liquid.
Odor:
Sharp mint-like odor.
Solubility:
29 g in 100 g of water.
Specific Gravity:
0.81 @ 20C/4C
pH:
No information found.
% Volatiles by volume @ 21C (70F):
100
Boiling Point:
80C (176F)
Melting Point:
-86C (-123F)
Vapor Density (Air=1):
2.5
Vapor Pressure (mm Hg):
78 @ 20C (68F)
Evaporation Rate (BuAc=1):
2.7 (Ether = 1)

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10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products:
Carbon dioxide and carbon monoxide may form when heated to decomposition.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Oxidizing materials, caustics, amines, ammonia, strong bases, chloroform, chlorosulfonic acid, oleum, potassium-t-butoxide, heat or flame, hydrogen peroxide, nitric acid. Can attack many plastics, resins and rubber.
Conditions to Avoid:
Heat, flames, ignition sources and incompatibles.

---

11. Toxicological Information

Toxicological Data:
Oral rat LD50: 2737 mg/kg; inhalation rat LC50: 23,500 mg/m3/8-hr; skin rabbit LD50: 6480 mg/kg; investigated as a mutagen, reproductive effector.
Reproductive Toxicity:
Has shown teratogenic effects in laboratory animals.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Methyl Ethyl Ketone (78-93-3)	No	No	None

12. Ecological Information

Environmental Fate:
When released into the soil, this material may leach into groundwater. When released into the soil, this material may evaporate to a moderate extent. When released into water, this material may biodegrade to a moderate extent. When released into water, this material may evaporate to a moderate extent. When released into water, this material is expected to have a half-life between 10 and 30 days. This material is not expected to significantly bioaccumulate. When released into the air, this material is expected to be readily degraded by reaction with photochemically produced hydroxyl radicals. When released into the air, this material is expected to have a half-life between 1 and 10 days.
Environmental Toxicity:
This material is not expected to be toxic to aquatic life. The LC50/96-hour values for fish are over 100 mg/l.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved incinerator or disposed in a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: ETHYL METHYL KETONE
Hazard Class: 3
UN/NA: UN1193
Packing Group: II
Information reported for product/size: 366LB

International (Water, I.M.O.)

Proper Shipping Name: ETHYL METHYL KETONE
Hazard Class: 3
UN/NA: UN1193

Packing Group: II
Information reported for product/size: 366LB

---

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\---------------------------------

Ingredient	TSCA	EC	Japan	Australia
Methyl Ethyl Ketone (78-93-3)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\---------------------------------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
Methyl Ethyl Ketone (78-93-3)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\----------------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313------ List	Chemical Catg.
Methyl Ethyl Ketone (78-93-3)	No	No	Yes	No

--------\Federal, State & International Regulations - Part 2\----------------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Methyl Ethyl Ketone (78-93-3)	5000	U159	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: Yes
SARA 311/312: Acute: Yes Chronic: Yes Fire: Yes Pressure: No
Reactivity: No (Pure / Liquid)

Australian Hazchem Code: 2[Y]E
Poison Schedule: S5
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

---

16. Other Information

NFPA Ratings: Health: **3** Flammability: **3** Reactivity: **0**
Label Hazard Warning:
DANGER! EXTREMELY FLAMMABLE LIQUID AND VAPOR. VAPOR MAY CAUSE FLASH FIRE. HARMFUL OR FATAL IF SWALLOWED. HARMFUL IF INHALED OR ABSORBED THROUGH SKIN. AFFECTS CENTRAL NERVOUS SYSTEM. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT.
Label Precautions:

Keep away from heat, sparks and flame.
Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handling.
Avoid breathing vapor.
Avoid contact with eyes, skin and clothing.

Label First Aid:

Aspiration hazard. If swallowed, vomiting may occur spontaneously, but DO NOT INDUCE. If vomiting occurs, keep head below hips to prevent aspiration into lungs. Never give anything by mouth to an unconscious person. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In all cases, get medical attention.

Product Use:

Laboratory Reagent.

Revision Information:

MSDS Section(s) changed since last revision of document include: 8.

Disclaimer:

****

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Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

Acetonitrile (014, 015, 016, 017, 018)

Version 1 | Revision Date 03/23/2009 | Print Date 09/12/2011

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	Acetonitrile (014, 015, 016, 017, 018)
MSDS Number	:	000000011306
Product Use Description	:	Solvent

Company	:	Honeywell International, Inc. 101 Columbia Road Morristown, NJ 07962-1057
For more information call	:	1-800-368-0050 (Monday-Friday, 9:00am-5:00pm)
In case of emergency call	:	**Medical: 1-800-498-5701**
	:	**Transportation: 1-800-424-9300 or +1-703-527-3887**
	:	(24 hours/day, 7 days/week)

SECTION 2. HAZARDS IDENTIFICATION

Emergency Overview

Form	:	liquid, clear
Color	:	colourless
Odor	:	sweet ether-like
Hazard Summary	:	Flammable. In use, may form flammable/explosive vapour-air mixture. May be harmful if inhaled. May be harmful if absorbed through skin. May be harmful if swallowed. Irritating to eyes, respiratory system and skin. May cause irritation of the gastrointestinal tract. Can cause fatal cyanide poisoning. May cause convulsions. Symptoms may be delayed. Can be absorbed through skin. Repeated exposure may cause skin dryness or cracking.

Potential Health Effects

Skin	:	Irritating to skin. Can be absorbed through skin. May be harmful if absorbed through skin. Can cause fatal cyanide poisoning. Symptoms may be delayed. Prolonged or repeated skin contact with liquid may cause defatting resulting in drying, redness and possible blistering.

Eyes	:	Irritating to eyes. Causes itching, burning, redness and tearing.
Ingestion	:	Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhoea. May cause systemic poisoning with symptoms paralleling those of inhalation. Can cause fatal cyanide poisoning. Symptoms may be delayed.
Inhalation	:	Causes respiratory tract irritation. Inhalation of high vapour concentrations can cause CNS-depression and narcosis. Causes headache, drowsiness or other effects to the central nervous system. Can cause fatal cyanide poisoning. Symptoms may be delayed.
Chronic Exposure	:	Can cause fatal cyanide poisoning. Causes damage to the kidneys/liver/eyes/brain/respiratory system/central nervous system through prolonged or repeated exposure. Prolonged or repeated skin contact with liquid may cause defatting resulting in drying, redness and possible blistering.
Aggravated Medical Condition	:	People suffering from pre-existing thyroid conditions may experience adverse effects. Neurological disorders Heart disease Respiratory disorders Liver disorders Kidney disorders Skin disorders Eye disorders
Target Organs	:	Respiratory system Cardiovascular system Central nervous system Liver Kidney

Carcinogenicity

No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP, IARC, or OSHA.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS-No.	Weight %
Acetonitrile	75-05-8	100.00

SECTION 4. FIRST AID MEASURES

Inhalation	:	Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Use oxygen as required, provided a qualified operator is present. Call a physician.
Skin contact	:	Wash off immediately with plenty of water for at least 15 minutes. Take off contaminated clothing and shoes immediately. Wash contaminated clothing before re-use. Call a physician.
Eye contact	:	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Call a physician.
Ingestion	:	Call a physician. Do not induce vomiting without medical advice. Immediate medical attention is required. Never give anything by mouth to an unconscious person.

Notes to physician

Treatment	:	Treat as cyanide poisoning. Symptoms of poisoning may not appear for several hours. Keep under medical supervision for at least 48 hours.

SECTION 5. FIRE-FIGHTING MEASURES

Flash point	:	6 °C (43 °F) open cup
Ignition temperature	:	524 °C (975 °F)
Lower explosion limit	:	3 %(V)
Upper explosion limit	:	16 %(V)
Suitable extinguishing media	:	Carbon dioxide (CO2) Dry chemical Alcohol-resistant foam Cool closed containers exposed to fire with water spray.
Extinguishing media which shall not be used for safety	:	Do not use a solid water stream as it may scatter and spread fire.

reasons

Specific hazards during fire fighting	:	Flammable. Vapours may form explosive mixtures with air. Vapours are heavier than air and may spread along floors. Vapors may travel to areas away from work site before igniting/flashing back to vapor source. In case of fire hazardous decomposition products may be produced such as: Hydrogen cyanide (hydrocyanic acid) Carbon dioxide (CO2), carbon monoxide (CO), oxides of nitrogen (NOx), dense black smoke.
Special protective equipment for fire-fighters	:	Wear self-contained breathing apparatus and protective suit.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions	:	Wear personal protective equipment. Immediately evacuate personnel to safe areas. Keep people away from and upwind of spill/leak. Ensure adequate ventilation. Remove all sources of ignition. Do not swallow. Avoid breathing vapors, mist or gas. Avoid contact with skin, eyes and clothing.
Environmental precautions	:	Prevent further leakage or spillage if safe to do so. Discharge into the environment must be avoided. Do not flush into surface water or sanitary sewer system. Prevent product from entering drains. Collect contaminated fire extinguishing water separately. This must not be discharged into drains.
Methods for cleaning up	:	Ventilate the area. No sparking tools should be used. Use explosion-proof equipment. Contain and collect spillage with non-combustible absorbent materials, e.g. sand, earth, vermiculite, diatomaceous earth and place in container for disposal according to local regulations (see section 13).

SECTION 7. HANDLING AND STORAGE

Handling

Handling	:	Wear personal protective equipment. Use only in well-ventilated areas. Keep container tightly closed. Do not smoke.

Do not swallow.
Avoid breathing vapors, mist or gas.
Avoid contact with skin, eyes and clothing.

Advice on protection against fire and explosion : Keep away from fire, sparks and heated surfaces.
Take precautionary measures against static discharges.
Ensure all equipment is electrically grounded before beginning transfer operations.
Use explosion-proof equipment.
Keep product and empty container away from heat and sources of ignition.
No sparking tools should be used.
No smoking.

Storage

Requirements for storage areas and containers : Store in area designed for storage of flammable liquids.
Protect from physical damage.
Keep containers tightly closed in a dry, cool and well-ventilated place.
Containers which are opened must be carefully resealed and kept upright to prevent leakage.
Keep away from heat and sources of ignition.
Keep away from direct sunlight.
Store away from incompatible substances.
Container hazardous when empty.
Do not pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Protective measures : Ensure that eyewash stations and safety showers are close to the workstation location.

Engineering measures : Use with local exhaust ventilation.
Prevent vapor buildup by providing adequate ventilation during and after use.

Eye protection : Do not wear contact lenses.
Wear as appropriate:
Safety glasses with side-shields
If splashes are likely to occur, wear:
Goggles or face shield, giving complete protection to eyes

Hand protection : Solvent-resistant gloves
Gloves must be inspected prior to use.
Replace when worn.

Skin and body protection	:	Wear as appropriate: Solvent-resistant apron Flame retardant antistatic protective clothing If splashes are likely to occur, wear: Protective suit
Respiratory protection	:	In case of insufficient ventilation wear suitable respiratory equipment. For rescue and maintenance work in storage tanks use self-contained breathing apparatus. Use NIOSH approved respiratory protection.
Hygiene measures	:	When using, do not eat, drink or smoke. Wash hands before breaks and immediately after handling the product. Keep working clothes separately. Remove and wash contaminated clothing before re-use. Do not swallow. Avoid breathing vapors, mist or gas. Avoid contact with skin, eyes and clothing.

Exposure Guidelines

Acetonitrile	75-05-8	ACGIH	TWA		20 ppm
		Skin designation: Can be absorbed through the skin.			
		NIOSH	REL	20 ppm	34 mg/m3
		US CA OEL	TWA PEL	40 ppm	70 mg/m3
		US CA OEL	STEL	60 ppm	105 mg/m3
		Skin designation: Can be absorbed through the skin.			
		OSHA Z1	PEL	40 ppm	70 mg/m3
		OSHA Z1A	TWA	40 ppm	70 mg/m3
		OSHA Z1A	STEL	60 ppm	105 mg/m3

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Form	:	liquid, clear

Color	:	colourless
Odor	:	sweet ether-like
Molecular Weight	:	41 g/mol
pH	:	not applicable
Melting point/range	:	-46 °C (-51 °F)
Boiling point/boiling range	:	82 °C (180 °F)
Vapor pressure	:	97.325 hPa at 20 °C (68 °F)
Relative vapour density	:	1.42 (Air = 1.0)
Density	:	0.7875 g/cm3 at 15 °C (59 °F)
Water solubility	:	completely soluble

SECTION 10. STABILITY AND REACTIVITY

Conditions to avoid	:	Heat, flames and sparks. Keep away from direct sunlight.
Materials to avoid	:	Acids Bases Oxidizing agents Reducing agents Sulfites Perchlorates May attack many plastics, rubbers and coatings.
Hazardous decomposition products	:	In case of fire hazardous decomposition products may be produced such as: Hydrogen cyanide (hydrocyanic acid) Carbon dioxide (CO2), carbon monoxide (CO), oxides of nitrogen (NOx), dense black smoke.
Hazardous reactions	:	Hazardous polymerisation does not occur. Stable under normal conditions.

SECTION 11. TOXICOLOGICAL INFORMATION

Acute oral toxicity	:	LD50 rat Dose: 2,460 mg/kg
Acute dermal toxicity	:	LD50 rabbit Dose: > 2,000 mg/kg
Acute inhalation toxicity	:	LC50 rat Dose: 7551 ppm Exposure time: 8 h

SECTION 12. ECOLOGICAL INFORMATION

Toxicity to fish	:	flow-through test LC50 Species: Pimephales promelas (fathead minnow) Dose: 1,640 mg/l Exposure time: 96 h

SECTION 13. DISPOSAL CONSIDERATIONS

Waste Information: Observe all Federal, State, and Local Environmental regulations.

SECTION 14. TRANSPORT INFORMATION

DOT	UN-Number	:	1648
	Proper shipping name	:	Acetonitrile
	Class		3
	Packing group		II
	Hazard Label		3
IATA	UN Number	:	1648
	Description of the goods	:	Acetonitrile
	Class	:	3
	Packaging group	:	II
	Hazard Label	:	3
	Packing instruction (cargo aircraft)	:	307
	Packing instruction (passenger aircraft)	:	305
	Packing instruction (passenger aircraft)	:	Y305
IMDG	Substance No.	:	UN 1648
	Description of the goods	:	Acetonitrile

Class	:	3
Packaging group	:	II
Hazard Label	:	3
EmS Number	:	F-E
Marine pollutant	:	no

SECTION 15. REGULATORY INFORMATION

Inventories

EU. EINECS	:	On the inventory, or in compliance with the inventory
US. Toxic Substances Control Act	:	On TSCA Inventory
Australia. Industrial Chemical (Notification and Assessment) Act	:	On the inventory, or in compliance with the inventory
Canada. Canadian Environmental Protection Act (CEPA). Domestic Substances List (DSL). (Can. Gaz. Part II, Vol. 133)	:	All components of this product are on the Canadian DSL list.
Japan. Kashin-Hou Law List	:	On the inventory, or in compliance with the inventory
Korea. Toxic Chemical Control Law (TCCL) List	:	On the inventory, or in compliance with the inventory
Philippines. The Toxic Substances and Hazardous and Nuclear Waste Control Act	:	On the inventory, or in compliance with the inventory
China. Inventory of Existing Chemical Substances	:	On the inventory, or in compliance with the inventory
CH INV - Switzerland	:	On the inventory, or in compliance with the inventory
NZIOC - New Zealand	:	On the inventory, or in compliance with the inventory
TSCA 12B	:	US. Toxic Substances Control Act (TSCA) Section 12(b) Export Notification (40 CFR 707, Subpt D)

Acetonitrile 75-05-8

National regulatory information

SARA 313 Components	:	Acetonitrile	75-05-8
SARA 311/312 Hazards	:	Fire Hazard Acute Health Hazard Chronic Health Hazard	
CERCLA Reportable Quantity	:	5000 lbs	
California Prop. 65	:	WARNING! This product contains a chemical known in the State of California to cause cancer. Acrylonitrile	107-13-1
Massachusetts RTK	:	Acetonitrile	75-05-8
New Jersey RTK	:	Acetonitrile	75-05-8
Pennsylvania RTK	:	Acetonitrile	75-05-8
WHMIS Classification	:	B2 D1A D2B This product has been classified according to the hazard criteria of the CPR and the MSDS contains all of the information required by the CPR.	

SECTION 16. OTHER INFORMATION

		HMIS III	NFPA
Health Hazard	:	2*	2
Flammability	:	3	3
Physical Hazard	:	0	
Instability	:		0

Further information

* - Chronic health hazard

MSDS Number: **T3913** * * * * * *Effective Date:* ***11/02/01*** * * * * * *Supercedes:* ***11/17/99***

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

TOLUENE

1. Product Identification

Synonyms: Methylbenzene; Toluol; Phenylmethane
CAS No.: 108-88-3
Molecular Weight: 92.14
Chemical Formula: C6H5-CH3
Product Codes:
J.T. Baker: 5375, 5584, 5809, 5812, 9336, 9351, 9364, 9456, 9457, 9459, 9460, 9462, 9466, 9472, 9476
Mallinckrodt: 4483, 8091, 8092, 8604, 8608, 8610, 8611, V560

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Toluene	108-88-3	100%	Yes

3. Hazards Identification

Emergency Overview

POISON! DANGER! HARMFUL OR FATAL IF SWALLOWED. HARMFUL IF INHALED OR ABSORBED THROUGH SKIN. VAPOR HARMFUL. FLAMMABLE LIQUID AND VAPOR. MAY AFFECT LIVER, KIDNEYS, BLOOD SYSTEM, OR CENTRAL NERVOUS SYSTEM. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT.

J.T. Baker SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 2 - Moderate
Flammability Rating: 3 - Severe (Flammable)
Reactivity Rating: 0 - None
Contact Rating: 1 - Slight
Lab Protective Equip: GOGGLES; LAB COAT; VENT HOOD; PROPER GLOVES; CLASS B EXTINGUISHER
Storage Color Code: Red (Flammable)

Potential Health Effects

Inhalation:
Inhalation may cause irritation of the upper respiratory tract. Symptoms of overexposure may include fatigue, confusion, headache, dizziness and drowsiness. Peculiar skin sensations (e. g. pins and needles) or numbness may be produced. Very high concentrations may cause unconsciousness and death.

Ingestion:
Swallowing may cause abdominal spasms and other symptoms that parallel over-exposure from inhalation. Aspiration of material into the lungs can cause chemical pneumonitis, which may be fatal.

Skin Contact:
Causes irritation. May be absorbed through skin.

Eye Contact:
Causes severe eye irritation with redness and pain.

Chronic Exposure:
Reports of chronic poisoning describe anemia, decreased blood cell count and bone marrow hypoplasia. Liver and kidney damage may occur. Repeated or prolonged contact has a defatting action, causing drying, redness, dermatitis. Exposure to toluene may affect the developing fetus.

Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders or impaired liver or kidney function may be more susceptible to the effects of this substance. Alcoholic beverage consumption can enhance the toxic effects of this substance.

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4. First Aid Measures

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is

difficult, give oxygen. CALL A PHYSICIAN IMMEDIATELY.

Ingestion:

Aspiration hazard. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately. If vomiting occurs, keep head below hips to prevent aspiration into lungs.

Skin Contact:

In case of contact, immediately flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Call a physician immediately.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

---

5. Fire Fighting Measures

Fire:

Flash point: 7C (45F) CC
Autoignition temperature: 422C (792F)
Flammable limits in air % by volume:
lel: 3.3; uel: 19
Flammable liquid and vapor!
Dangerous fire hazard when exposed to heat or flame. Vapors can flow along surfaces to distant ignition source and flash back.

Explosion:

Above flash point, vapor-air mixtures are explosive within flammable limits noted above. Contact with strong oxidizers may cause fire or explosion. Sensitive to static discharge.

Fire Extinguishing Media:

Dry chemical, foam or carbon dioxide. Water may be used to flush spills away from exposures and to dilute spills to non-flammable mixtures.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Water spray may be used to keep fire exposed containers cool.

---

6. Accidental Release Measures

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! If a leak or spill has not ignited, use water spray to disperse the vapors, to protect personnel attempting to stop leak, and to flush spills away from exposures. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker SOLUSORB® solvent adsorbent is recommended for spills of this product.

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7. Handling and Storage

Protect against physical damage. Store in a cool, dry well-ventilated location, away from any area where the fire hazard may be acute. Outside or detached storage is preferred. Separate from incompatibles. Containers should be bonded and grounded for transfers to avoid static sparks. Storage and use areas should be No Smoking areas. Use non-sparking type tools and equipment, including explosion proof ventilation. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

---

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
Toluene:
- OSHA Permissible Exposure Limit (PEL):
200 ppm (TWA); 300 ppm (acceptable ceiling conc.); 500 ppm (maximum conc.).
- ACGIH Threshold Limit Value (TLV):
50 ppm (TWA) skin, A4 - Not Classifiable as a Human Carcinogen.

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded and engineering controls are not feasible, a half-face organic vapor respirator may be worn for up to ten times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece organic vapor respirator may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-face piece positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

---

9. Physical and Chemical Properties

Appearance:
Clear, colorless liquid.
Odor:
Aromatic benzene-like.
Solubility:
0.05 gm/100gm water @ 20C (68F).
Specific Gravity:
0.86 @ 20C / 4 C
pH:
No information found.
% Volatiles by volume @ 21C (70F):
100
Boiling Point:
111C (232F)
Melting Point:
-95C (-139F)
Vapor Density (Air=1):
3.14
Vapor Pressure (mm Hg):
22 @ 20C (68F)
Evaporation Rate (BuAc=1):
2.24

---

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage. Containers may burst when heated.
Hazardous Decomposition Products:
Carbon dioxide and carbon monoxide may form when heated to decomposition.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Heat, flame, strong oxidizers, nitric and sulfuric acids, chlorine, nitrogen tetraoxide; will attack some forms of plastics, rubber, coatings.
Conditions to Avoid:
Heat, flames, ignition sources and incompatibles.

---

11. Toxicological Information

Toxicological Data:
Oral rat LD50: 636 mg/kg; skin rabbit LD50: 14100 uL/kg; inhalation rat LC50: 49 gm/m3/4H; Irritation data: skin rabbit, 500 mg, Moderate; eye rabbit, 2 mg/24H, Severe. Investigated as a tumorigen, mutagen, reproductive effector.

Reproductive Toxicity:
Has shown some evidence of reproductive effects in laboratory animals.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Toluene (108-88-3)	No	No	3

---

12. Ecological Information

Environmental Fate:
When released into the soil, this material may evaporate to a moderate extent. When released into the soil, this material is expected to leach into groundwater. When released into the soil, this material may biodegrade to a moderate extent. When released into water, this material may evaporate to a moderate extent. When released into water, this material may biodegrade to a moderate extent. When released into the air, this material may be moderately degraded by reaction with photochemically produced hydroxyl radicals. When released into the air, this material is expected to have a half-life of less than 1 day. This material is not expected to significantly bioaccumulate. This material has a log octanol-water partition coefficient of less than 3.0. Bioconcentration factor = 13.2 (eels).
Environmental Toxicity:
This material is expected to be toxic to aquatic life. The LC50/96-hour values for fish are between 10 and 100 mg/l.

---

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved incinerator or disposed in a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

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14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: TOLUENE
Hazard Class: 3
UN/NA: UN1294
Packing Group: II
Information reported for product/size: 390LB

International (Water, I.M.O.)

Proper Shipping Name: TOLUENE
Hazard Class: 3
UN/NA: UN1294
Packing Group: II
Information reported for product/size: 390LB

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15. Regulatory Information

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--------\Chemical Inventory Status - Part 1\---------------------------------
Ingredient                                    TSCA  EC   Japan  Australia
-------------------------------------------  ----  ---  -----  ---------
Toluene (108-88-3)                            Yes  Yes   Yes      Yes

--------\Chemical Inventory Status - Part 2\---------------------------------
                                                      --Canada--
Ingredient                                    Korea  DSL   NDSL  Phil.
-------------------------------------------  -----  ---   ----  -----
Toluene (108-88-3)                            Yes   Yes   No     Yes

--------\Federal, State & International Regulations - Part 1\----------------
                                          -SARA 302-    ------SARA 313------
Ingredient                                RQ    TPQ     List  Chemical Catg.
----------------------------------------  ---   -----   ----  --------------
Toluene (108-88-3)                        No    No      Yes        No

--------\Federal, State & International Regulations - Part 2\----------------
                                                -RCRA-    -TSCA-
Ingredient                                CERCLA     261.33     8(d)
----------------------------------------  ------     ------    ------
Toluene (108-88-3)                        1000       U220       No


Chemical Weapons Convention:  No     TSCA 12(b):  No     CDTA:  Yes
SARA 311/312:  Acute: Yes      Chronic: Yes  Fire: Yes Pressure: No
Reactivity: No          (Pure / Liquid)
```

WARNING:
THIS PRODUCT CONTAINS A CHEMICAL(S) KNOWN TO THE STATE OF CALIFORNIA TO CAUSE BIRTH DEFECTS OR OTHER REPRODUCTIVE HARM.

Australian Hazchem Code: 3[Y]E
Poison Schedule: S6
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

---

16. Other Information

NFPA Ratings: Health: **2** Flammability: **3** Reactivity: **0**
Label Hazard Warning:
POISON! DANGER! HARMFUL OR FATAL IF SWALLOWED. HARMFUL IF INHALED OR ABSORBED THROUGH SKIN. VAPOR HARMFUL. FLAMMABLE LIQUID AND VAPOR. MAY AFFECT LIVER, KIDNEYS, BLOOD SYSTEM, OR CENTRAL NERVOUS SYSTEM. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT.
Label Precautions:
Keep away from heat, sparks and flame.
Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handling.
Avoid breathing vapor.
Avoid contact with eyes, skin and clothing.
Label First Aid:
Aspiration hazard. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. If vomiting occurs, keep head below hips to prevent aspiration into lungs. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. In all cases call a physician immediately.
Product Use:
Laboratory Reagent.
Revision Information:
MSDS Section(s) changed since last revision of document include: 8.
Disclaimer:
****

****

Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

Attachment 7

Calculations Used to Determine Potential Emission Rate and Controlled / Proposed Emissions.

Unit 1.

Engine: John Deere
Process Rate or Capacity: 215 Hp
Fuel Type: Diesel
Emissions controls: Limit hours of operations.

The NOx, CO, VOCs, PM, and HAPs emission rates were determined using AP 42, Fifth Edition, Volume I Chapter 3: Stationary Internal Combustion Sources, 3.3 Gasoline and Diesel Industrial Engines, Final Section - Supplement B, October 1996 (Attachment 6).

The SOx emission rate was determined using a mass balance for ultra-low sulfur diesel fuel (15 ppm).

Example Calculations

- NOx, CO, VOC and PM Emission Rate (lb./hr.) = Emission Factor (lb./hp-hr.) x Horse Power (hp)
- SOx emission rate (lb./hr.) = Sulfur Content of Fuel x Quantity of Fuel Burned x 2 (lbs. SOx /lbs. Sulfur)
- HAP Emission Rate (lb./hr.) = Emission Factor (lb./ MMBtu) x Fuel Input (MMBtu / hr.)
- Uncontrolled Emissions (ton/yr.) = Emission Rate (lbs./hr.) x 8,760 (hr./yr.) ÷ 2,000 (lbs./ton)
- Controlled Emissions (ton/yr.) = Emission Rate (lbs./hr.) x 500 (hr./yr.) ÷ 2,000 (lbs./ton)

Unit 1. NOx, CO, VOC and PM Emissions Rate Calculation

Pollutant	HP	Emission factor (lb./hp-hr.)	Emissions (lb./hr.)	Uncontrolled 8750 hrs./yr. (ton/yr.)	Controlled 500 hrs./yr. (ton/yr.)
NOx	215	0.031	6.67	29.19	1.67
CO	215	6.68 E-03	1.44	6.29	0.36
VOCs	215	2.47 E-03	0.53	2.33	0.13
PM10/2.5	215	2.20 E-03	0.47	2.07	0.12

Unit 1. SOx Emission Rate Calculation

Pollutant	Sulfur Content of Fuel	HP	Fuel Consumption Factor (lb./hp-hr.)	Quantity of Fuel Burned (lbs./hr.)	lbs. SOx / lbs. Sulfur	Emissions (lb./hr.)	Uncontrolled 8750 hrs./yr. (ton/yr.)	Controlled 500 hrs./yr. (ton/yr.)
SOx	1.5E-05	215	0.38	81.7	2	0.002	0.01	0.001

Unit 1. (continued)

Unit 1. HAPs Emission Rate Calculation

Pollutant	HP	Fuel Consumption Factor (lb./hp-hr.)	Quantity of Fuel Burned (lbs./hr.)	Energy Conversion Factor (MMBtu / lb.-diesel fuel)	Fuel Input (MMBtu / hr.)
HAPs	215	0.38	81.7	0.0195	1.59

Pollutant	Emission Factor (lb./MMBtu)	Fuel Input (MMBtu / hr.)	Emissions (lb./hr.)	Uncontrolled 8750 hrs./yr. (ton/yr.)	Controlled 500 hrs./yr. (ton/yr.)
HAPs	6.33E-03	1.59	0.010	0.044	2.52E-03

HAP Pollutant	Emission Factor (lb/MMBtu) (fuel input)	Fuel Input (MMBtu / hr.)	Emissions (lb./hr.)	Uncontrolled 8750 hrs./yr. (ton/yr.)	Controlled 500 hrs./yr. (ton/yr.)
Benzene	9.33E-04	1.59	1.49E-03	6.51E-03	3.72E-04
Toluene	4.09E-04	1.59	6.52E-04	2.85E-03	1.63E-04
Xylenes	2.85E-04	1.59	4.54E-04	1.99E-03	1.14E-04
Propylene	2.58E-03	1.59	4.11E-03	1.80E-02	1.03E-03
Formaldehyde	1.18E-03	1.59	1.88E-03	8.24E-03	4.70E-04
Acetaldehyde	7.67E-04	1.59	1.22E-03	5.35E-03	3.06E-04
Acrolein	9.25E-05	1.59	1.47E-04	6.46E-04	3.69E-05
Naphthalene	8.48E-05	1.59	1.35E-04	5.92E-04	3.38E-05
Total HAPS	6.33E-03	1.59	0.010	0.044	0.0025

Unit 5.

Boiler: Superior
Process Rate or Capacity: 8.369 MMBtu
Fuel Type: pipeline natural gas
Emissions controls: none.

The NOx, CO, VOCs, SOx and PM emission rates were determined using the manufacturer's specifications titled *Webster Combustion Estimated Emissions – JB and JBX Burners, 2016* (Attachment 6).

Example Calculations

- NOx, CO, VOCs, SOx, and PM Emission Rate (lb./hr.) = Emission Factor (lb./MMBtu.) x Process Rate (MMBtu/hr.)
- Uncontrolled Emissions (ton/yr.) = Emission Rate (lbs./hr.) x 8,760 (hr./yr.) ÷ 2,000 (lbs./ton)
- Controlled Emissions (ton/yr.) = Emission Rate (lbs./hr.) x 8,760 (hr./yr.) ÷ 2,000 (lbs./ton)

Unit 5. NOx, CO, VOC, SOx, and PM Emissions Rate Calculation

Pollutant	MMBtu	Emission factor (lb./MMBtu)	Emissions (lb./hr.)	Uncontrolled 8750 hrs./yr. (ton/yr.)	Controlled 8,760 hrs./yr. (ton/yr.)
NOx	8.369	0.03	0.25	1.10	1.10
CO	8.369	0.037	0.31	1.36	1.36
VOCs	8.369	0.008	0.07	0.29	0.29
SOx	8.369	0.001	0.01	0.04	0.04
PM10/2.5	8.369	0.0048	0.04	0.18	0.18

Unit 6.

Boiler: Cleaver Brooks
Process Rate or Capacity (MMBTU): 5.175 MMBtu
Fuel Type: pipeline natural gas
Emissions controls: none.

The NOx, CO, VOCs, SOx and PM emission rates were determined using the manufacturer's specifications titled *Clever-Brooks Boiler Expected Emission Data, 2021* (Attachment 6).

Example Calculations

- NOx, CO, VOCs, SOx, and PM Emission Rate (lb./hr.) = Emission Factor (lb./MMBtu.) x Process Rate (MMBtu/hr.)
- Uncontrolled Emissions (ton/yr.) = Emission Rate (lbs./hr.) x 8,760 (hr./yr.) ÷ 2,000 (lbs./ton)
- Controlled Emissions (ton/yr.) = Emission Rate (lbs./hr.) x 8,760 (hr./yr.) ÷ 2,000 (lbs./ton)

Unit 6. NOx, CO, VOC, SOx, and PM Emissions Rate Calculation

Pollutant	MMBtu	Emissions (lb./hr.)	Uncontrolled 8750 hrs./yr. (ton/yr.)	Controlled 8,760 hrs./yr. (ton/yr.)
NOx	5.175	0.36	1.58	1.58
CO	5.175	0.19	0.83	0.83
VOCs	5.175	0.018	0.08	0.08
SOx	5.175	0.003	0.01	0.01
PM10/2.5	5.175	0.039	0.17	0.17

Unit 7.

Engine: Cummins
Process Rate or Capacity: 2,220 Hp
Fuel Type: Diesel
Emissions controls: Limit hours of operations.

The NOx and CO emission rates are based on 1.25x of the emission rates observed in a 2021 emissions compliance test (Attachment 6).

The VOC, PM, and HAPs emission rates were determined from AP 42, Fifth Edition, Volume I Chapter 3: Stationary Internal Combustion Sources, 3.4 Large Stationary Diesel and All Stationary Dual-fuel Engines, Final Section - Supplement B, October 1996.

The SOx emission rates were determined using a mass balance for ultra-low sulfur diesel fuel (15 ppm).

Example Calculations

- NOx and CO = Measured emission rates (lb./hr.) x 1.25
- VOCs and PM Emission Rate (lb./hr.) = Emission Factor (lb./hp-hr.) x Horse Power (HP)
- SOx emission rate (lb./hr.) = Sulfur Content of Fuel x Quantity of Fuel Burned x 2 (lbs. SOx /lbs. Sulfur)
- HAP Emission Rate (lb./hr.) = Emission Factor (lb./ MMBtu) x Fuel Input (MMBtu / hr.)
- Uncontrolled Emissions (ton/yr.) = Emission Rate (lbs./hr.) x 8,760 (hr./yr.) ÷ 2,000 (lbs./ton)
- Controlled Emissions (ton/yr.) = Emission Rate (lbs./hr.) x 500 (hr./yr.) ÷ 2,000 (lbs./ton)

Unit 7. NOx, CO, VOC and PM Emissions Rate Calculation

Pollutant	HP	Emission factor (lb./hp-hr.)	Emissions (lb./hr.)	Uncontrolled 8750 hrs./yr. (ton/yr.)	Controlled 500 hrs./yr. (ton/yr.)
NOx	2,220	NA	41.63	182.32	10.41
CO	2,220	NA	13.25	58.04	3.31
VOCs	2,220	7.05 E-04	1.57	6.86	0.39
PM10/2.5	2,220	7.0 E-04	1.55	6.81	0.39

Unit 7. SOx Emission Rate Calculation

Pollutant	Sulfur Content of Fuel	HP	Fuel Consumption Factor (lb./hp-hr.)	Quantity of Fuel Burned (lbs./hr.)	lbs. SOx / lbs. Sulfur	Emissions (lb./hr.)	Uncontrolled 8750 hrs./yr. (ton/yr.)	Controlled 500 hrs./yr. (ton/yr.)
SOx	1.5E-05	2,220	0.38	843.6	2	0.025	0.11	0.01

Unit 7. (continued)

Unit 7. HAPs Emission Rate Calculation

Pollutant	HP	Fuel Consumption Factor (lb./hp-hr.)	Quantity of Fuel Burned (lbs./hr.)	Energy Conversion Factor (MMBtu / lb.-diesel fuel)	Fuel Input (MMBtu / hr.)
HAPs	2,220	0.38	843.6	0.0195	16.45

Pollutant	Emission Factor (lb./MMBtu)	Fuel Input (MMBtu / hr.)	Emissions (lb./hr.)	Uncontrolled 8750 hrs./yr. (ton/yr.)	Controlled 500 hrs./yr. (ton/yr.)
HAPs	4.15E-03	16.45	0.068	0.299	0.017

HAP Pollutant	Emission Factor (lb/MMBtu) (fuel input)	Fuel Input (MMBtu / hr.)	Emissions (lb./hr.)	Uncontrolled 8750 hrs./yr. (ton/yr.)	Controlled 500 hrs./yr. (ton/yr.)
Benzene	7.76E-04	16.45	1.28E-02	5.59E-02	3.19E-03
Toluene	2.81E-04	16.45	4.62E-03	2.03E-02	1.16E-03
Xylenes	1.93E-04	16.45	3.18E-03	1.39E-02	7.94E-04
Propylene	2.79E-03	16.45	4.59E-02	2.01E-01	1.15E-02
Formaldehyde	7.89E-05	16.45	1.30E-03	5.69E-03	3.25E-04
Acetaldehyde	2.52E-05	16.45	4.15E-04	1.82E-03	1.04E-04
Acrolein	7.88E-06	16.45	1.30E-04	5.68E-04	3.24E-05
Total HAPS	4.15E-03	16.45	0.068	0.299	0.017

Unit 8.

Engine: Cummins
Process Rate or Capacity: 2,220 Hp
Fuel Type: Diesel
Emissions controls: Limit hours of operations.

The NOx and CO emission rates are based on 1.25x of the emission rates observed in a 2021 emissions compliance test (Attachment 6).

The VOC, PM, and HAPs emission rates were determined from AP 42, Fifth Edition, Volume I Chapter 3: Stationary Internal Combustion Sources, 3.4 Large Stationary Diesel and All Stationary Dual-fuel Engines, Final Section - Supplement B, October 1996.

The SOx emission rates were determined using a mass balance for ultra-low sulfur diesel fuel (15 ppm).

Example Calculations

- NOx and CO = Measured emission rates (lb./hr.)
- VOCs and PM Emission Rate (lb./hr.) = Emission Factor (lb./hp-hr.) x Horse Power (HP)
- SOx emission rate (lb./hr.) = Sulfur Content of Fuel x Quantity of Fuel Burned x 2 (lbs. SOx /lbs. Sulfur)
- HAP Emission Rate (lb./hr.) = Emission Factor (lb./ MMBtu) x Fuel Input (MMBtu / hr.)
- Uncontrolled Emissions (ton/yr.) = Emission Rate (lbs./hr.) x 8,760 (hr./yr.) ÷ 2,000 (lbs./ton)
- Controlled Emissions (ton/yr.) = Emission Rate (lbs./hr.) x 500 (hr./yr.) ÷ 2,000 (lbs./ton)

Unit 8. NOx, CO, VOC and PM Emissions Rate Calculation

Pollutant	HP	Emission factor (lb./hp-hr.)	Emissions (lb./hr.)	Uncontrolled 8750 hrs./yr. (ton/yr.)	Controlled 500 hrs./yr. (ton/yr.)
NOx	2,220	NA	44.0	192.72	11.0
CO	2,220	NA	13.25	58.04	3.31
VOCs	2,220	7.05 E-04	1.57	6.86	0.39
PM10/2.5	2,220	7.0 E-04	1.55	6.81	0.39

Unit 8. SOx Emission Rate Calculation

Pollutant	Sulfur Content of Fuel	HP	Fuel Consumption Factor (lb./hp-hr.)	Quantity of Fuel Burned (lbs./hr.)	lbs. SOx / lbs. Sulfur	Emissions (lb./hr.)	Uncontrolled 8750 hrs./yr. (ton/yr.)	Controlled 500 hrs./yr. (ton/yr.)
SOx	1.5E-05	2,220	0.38	843.6	2	0.025	0.11	0.01

Unit 8. (continued)

Unit 8. HAPs Emission Rate Calculation

Pollutant	HP	Fuel Consumption Factor (lb./hp-hr.)	Quantity of Fuel Burned (lbs./hr.)	Energy Conversion Factor (MMBtu / lb.-diesel fuel)	Fuel Input (MMBtu / hr.)
HAPs	2,220	0.38	843.6	0.0195	16.45

Pollutant	Emission Factor (lb./MMBtu)	Fuel Input (MMBtu / hr.)	Emissions (lb./hr.)	Uncontrolled 8750 hrs./yr. (ton/yr.)	Controlled 500 hrs./yr. (ton/yr.)
HAPs	4.15E-03	16.45	0.068	0.299	0.017

HAP Pollutant	Emission Factor (lb/MMBtu) (fuel input)	Fuel Input (MMBtu / hr.)	Emissions (lb./hr.)	Uncontrolled 8750 hrs./yr. (ton/yr.)	Controlled 500 hrs./yr. (ton/yr.)
Benzene	7.76E-04	16.45	1.28E-02	5.59E-02	3.19E-03
Toluene	2.81E-04	16.45	4.62E-03	2.03E-02	1.16E-03
Xylenes	1.93E-04	16.45	3.18E-03	1.39E-02	7.94E-04
Propylene	2.79E-03	16.45	4.59E-02	2.01E-01	1.15E-02
Formaldehyde	7.89E-05	16.45	1.30E-03	5.69E-03	3.25E-04
Acetaldehyde	2.52E-05	16.45	4.15E-04	1.82E-03	1.04E-04
Acrolein	7.88E-06	16.45	1.30E-04	5.68E-04	3.24E-05
Total HAPS	4.15E-03	16.45	0.068	0.299	0.017

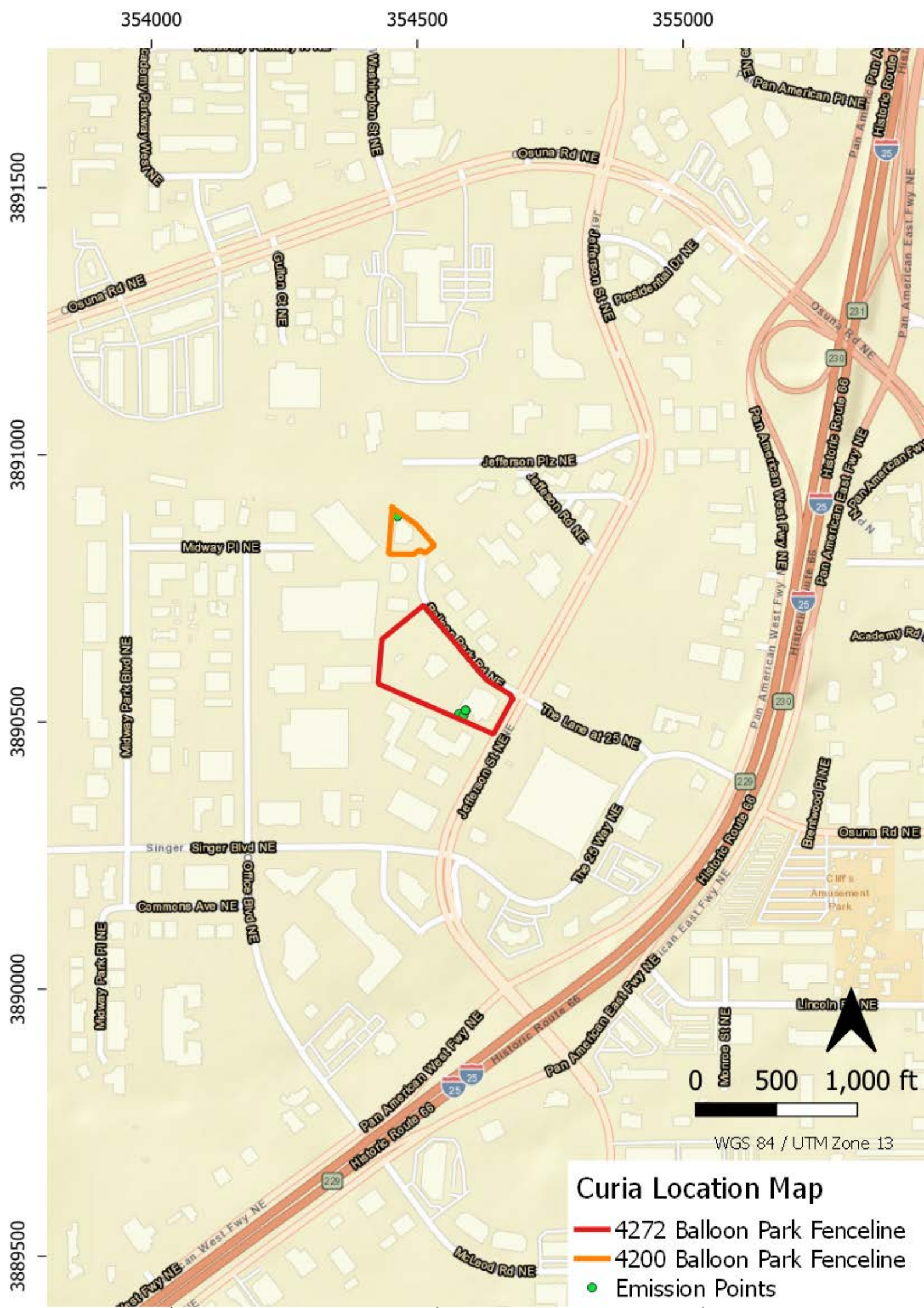
Attachment 8

Curia New Mexico, LLC
Permit 491-M7-RV1 Modification Application
Operational and Maintenance Strategy

1. The engineering and maintenance (E&M) departments performs routine daily, weekly, monthly, semi-annual and annual maintenance on the boilers and emergency generators. If they are not operating within specification and the issue cannot be resolved internally, the E&M Department will schedule an emergency service call with Mountaintop Services, Richard Kingsbury, who specializes in the service of our emergency generators. LDH Enterprises, Larry Hicks, specializes in the service of our boilers. The equipment will be shut down until such service occurs.
2. The boilers operate continuously. The site may shutdown the boilers, only one at a time, due to: 1) routine maintenance (as specified by the manufacturer); 2) site emergency; or 3) equipment malfunction. The boilers do not have pollution control equipment. The site emergency generators are tested monthly and are inspected annual. The emergency generator's pollution control is limited operating hours (not to exceed 500 hours per year and the site has averaged about 10 hours per year of use).
3. The site uses routine daily, weekly, monthly, semi-annual and annual maintenance on the boilers and emergency generators to ensure the equipment is operating according to manufacturer's specifications.

Attachment 9

Site Location Map and Aerial Photograph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Jefferson Plz NE
Jefferson Rd NE
Midway Pl NE
Midway Park Blvd NE
Balloon Park Rd NE
The Lane at 25 NE
Jefferson St NE
The 25 Way NE
Singer Blvd NE
Commons Ave NE
Office Blvd NE
Midway Park Pl NE
Pan American West Fwy NE
Pan American East Fwy NE
Historic Route 66
Brentwood Pl NE
Monroe St NE
McLeod Rd NE
Academy Rd
Cliff's Amusement Park
0 500 1,000 ft
WGS 84 / UTM Zone 13
Curia Location Map
4272 Balloon Park Fenceline
4200 Balloon Park Fenceline
Emission Points

Curia Aerial Photograph

0 100 200 ft

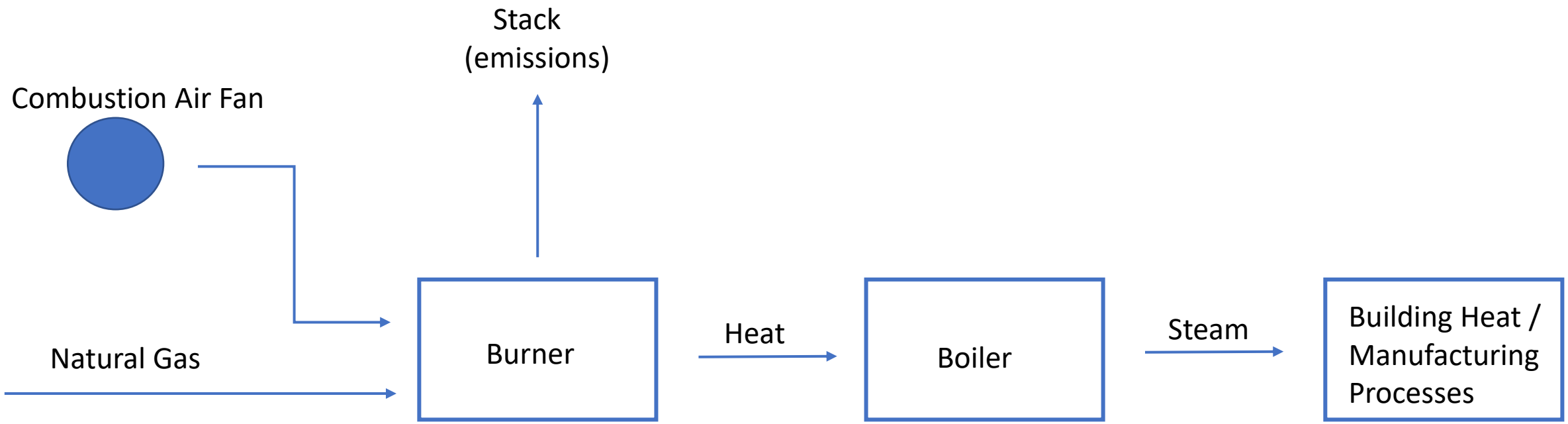
4200 Balloon Park Fenceline

4272 Balloon Park Fenceline

Emission Points

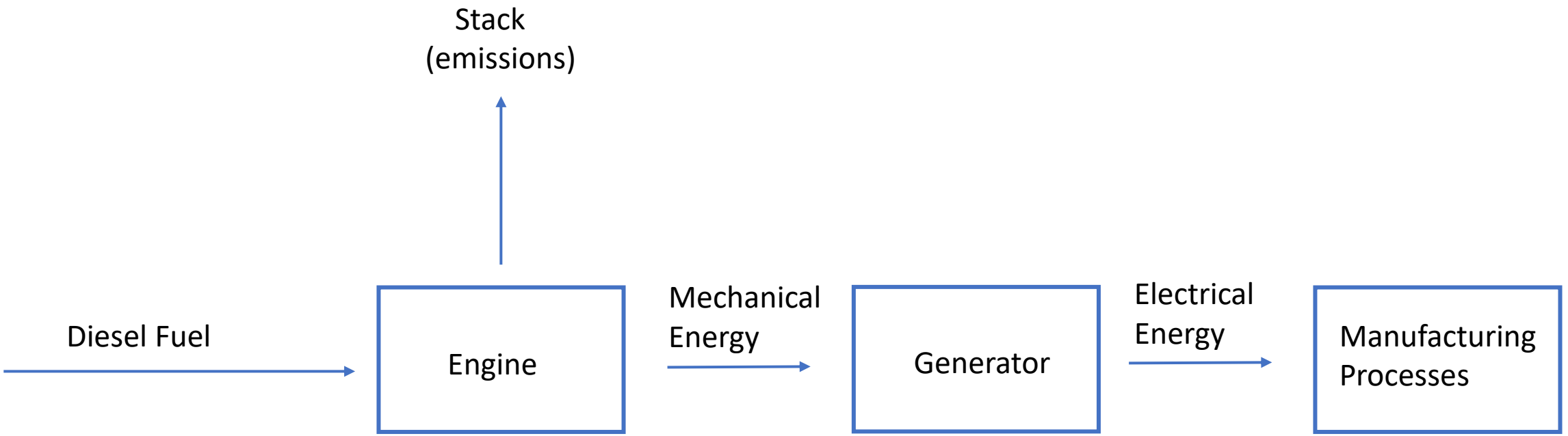
Attachment 10

Process Flow Diagram



Curia New Mexico, LLC
Permit 491-M7-RV1 Modification Application
May 15, 2022

Process Flow Diagram
Units 5 and 6
Boilers



Curia New Mexico, LLC
Permit 491-M7-RV1 Modification Application
May 15, 2022

Process Flow Diagram
Units 1, 7, and 8
Emergency Generators

Attachment 11

Zoning Certification

CITY OF ALBUQUERQUE

CODE ENFORCEMENT
Plaza Del Sol Building, Suite 500
600 2nd Street NW
Albuquerque, NM 87102
Tel: (505) 924-3850 Fax: (505) 924-3847

Date: May 3, 2022

VIA Email, john.gerbackjr@curiaglobal.com
John Gerback Jr.
4401 Alexander Blvd. NE
Albuquerque, NM 87107

RE: 4200 Balloon Park Rd. NE the "property".
UPC: 101706219116630224

To Whom It May Concern:

This letter will certify that according to the map on file in this office on May 3, 2022, the referenced property, legally described as: LT 10A BALLOON FIELD INDUSTRIAL PARK REPL OF TRS 10 & 11 BALLOON FIELD INDUSTRIAL PARK CONT 1.2009 AC M/L OR 52,311 SQ FT M/L Albuquerque, Bernalillo County, New Mexico, is Zoned: NON-RESIDENTIAL – BUSINESS PARK ZONE DISTRICT (NR-BP)

The current use of the property is Office, Wholesaling and distribution center, which is a permissive use in the NR-BP Zone.

This property has been inspected and it was found to be in compliance with the applicable provisions of the Integrated Development Ordinance. This site is controlled by an approved site development plan, Z-79-94. There is an exception for an 8' security fence around the site, #PR-2020-004308. There are no overlays associated with this site.

If you have any questions regarding this matter please contact me at (505) 924-3301 or by email at ametzgar@cabq.gov.

Sincerely:

Angelo Metzgar,
Code Compliance Manager, Code Enforcement, Planning Department

PO Box 1293

Albuquerque

NM 87103

www.cabq.gov

CITY OF ALBUQUERQUE

CODE ENFORCEMENT
Plaza Del Sol Building, Suite 500
600 2nd Street NW
Albuquerque, NM 87102
Tel: (505) 924-3850 Fax: (505) 924-3847

Date: May 3, 2022

VIA Email, john.gerbackjr@curiaglobal.com
John Gerback Jr.
4401 Alexander Blvd. NE
Albuquerque, NM 87107

RE: 4272 Balloon Park Rd. NE the "property".
UPC: 101706224206030215

To Whom It May Concern:

This letter will certify that according to the map on file in this office on May 3, 2022, the referenced property, legally described as: * 1 CORRECTED PLAT OF BALLOON FIELD INDUSTRIAL PARK CONT 1.0044 AC Albuquerque, Bernalillo County, New Mexico, is Zoned: NON-RESIDENTIAL – BUSINESS PARK ZONE DISTRICT (NR-BP)

The current use of the property is Office, Wholesaling and distribution center, which is a permissive use in the NR-BP Zone.

This property has been inspected and it was found to be in compliance with the applicable provisions of the Integrated Development Ordinance. This site is controlled by an approved site development plan, 1002205. There is an exception for an 8' security fence around the site. There are no overlays associated with this site.

If you have any questions regarding this matter please contact me at (505) 924-3301 or by email at ametzgar@cabq.gov.

Sincerely:

Angelo Metzgar,
Code Compliance Manager, Code Enforcement, Planning Department

PO Box 1293
Albuquerque
NM 87103
www.cabq.gov

NON-RESIDENTIAL – BUSINESS PARK ZONE DISTRICT (NR-BP)

Purpose: The purpose of the NR-BP zone district is to accommodate a wide range of nonresidential uses in campus-like settings to buffer potential impacts from surrounding uses and adjacent areas. Allowable uses include a wide variety of office, commercial, research, light industrial, office, distribution, showroom, processing, and institutional uses

This document provides a summary about development in the NR-BP zone district. It includes links to Frequently Asked Questions (FAQs) about allowable uses, use-standards, development standards, and the approval process.

The document also includes a summary of the development standards and a summary of the allowable uses in this zone. To see the full Integrated Development Ordinance (IDO), click the link below.

https://ido.abc-zone.com/

Notes:

1. Check the project website for links to the Integrated Development Ordinance, the Allowable Uses Table, and excerpts from the Allowable Uses Table for each zone district.
   https://abc-zone.com/node/919
2. Check the IDO to see if there are any Use-specific Standards or an Airport Protection Overlay zone that may change the allowable uses on your property. (See IDO Part 4 and Section 3-3, respectively). For more information, see these FAQs:
   https://abc-zone.com/node/915
   https://abc-zone.com/node/931
3. Check the IDO to find development standards for your zone district and any context-specific standards that apply to your property. (See IDO Parts 2 and 5.) For more information, see this FAQ:
   https://abc-zone.com/node/930
4. Check the IDO to find review and approval processes that may apply to a zone district, your project, or your property. (See IDO Part 6.) For more information, see this FAQ:
   https://abc-zone.com/node/933

If you have other questions, contact the Planning Department at 924-3860 and request to schedule a Pre-application Review Team Meeting (PRT).

Development Standards Summary

Table 2-5-3: NR-BP Zone District Dimensional Standards

UC-MS-PT = Urban Centers, Main Street areas, and Premium Transit areas BR = bedroom DU = dwelling units

Note: Any different dimensional standards in Part 14-16-3 (Overlay Zones) and Section 14-16-5-9 (Neighborhood Edges) applicable to the property shall prevail over the standards in this table.

Development Location		General	UC-MS-PT
Site Standards*			
Lot width, minimum	A	100 ft.	
Building coverage,maximum	B	50%	
Setback Standards			
Front, minimum	C	20 ft.	
Side, minimum	D	10 ft.	
Rear, minimum	E	10 ft.	
Building Height			
Building height, maximum	F	65 ft. >100 ft. from all lot lines: N/A	

[1] Residential development that qualifies for funding through Article 14-17 of ROA 1994 (Family Housing Developments) may be eligible for development incentives specified in that Article.

*See IDO Subsection 14-16-5-1(C)(2) Contextual Residential Development in Areas of Consistency, if applicable, for additional standards that modify these general dimensional standards.

Table 2-5-4: Other Applicable IDO Sections

Overlay Zones	Part 14-16-3	Landscaping, Buffering, and Screening	14-16-5-6
Allowable Uses	14-16-4-2	Walls and Fences	14-16-5-7
Use-specific Standards	14-16-4-3	Outdoor Lighting	14-16-5-8
Dimensional Standards	14-16-5-1	Neighborhood Edges	14-16-5-9
Site Design and Sensitive Lands	14-16-5-2	Solar Access	14-16-5-10
Access and Connectivity	14-16-5-3	Building Design	14-16-5-11
Subdivision of Land	14-16-5-4	Signs	14-16-5-12
Parking and Loading	14-16-5-5	Operations and Maintenance	14-16-5-13

Use Table Summary

The following excerpt from Table 4-2-1 shows the allowable uses for the **NR-BP zone district only** (highlighted). See the Integrated Development Ordinance (IDO) for the complete list of uses allowed in all zone districts and use definitions (Table 4-2-1 and Subsection 14-16-7-1, respectively).

- ⇨ Permissive uses (P) are allowed in this zone by right, without any other approvals
- ⇨ Conditional uses (C) require approval at a public hearing (see Subsection 14-16-6-6(A) for more info)
- ⇨ Accessory uses (A) must be in addition to an allowed primary use (either P or C)

The column on the far right (also highlighted), provides IDO section references for Use-specific Standards that may apply to a use. These Use-specific Standards may change the allowable uses depending on the context of the site or may impose requirements on the development.

Table 4-2-1: Allowable Uses

P = Permissive Primary C = Conditional Primary A = Permissive Accessory CA = Conditional Accessory
CV = Conditional if Structure Vacant for 5 years or more T = Temporary Blank Cell = Not Allowed

Zone District >> / Land Uses	Residential						Mixed-use				Non-residential								Use-specific Standards
	R-A	R-1	R-MC	R-T	R-ML	R-MH	MX-T	MX-L	MX-M	MX-H	NR-C	NR-BP	NR-LM	NR-GM	NR-SU	NR-PO A	NR-PO B	NR-PO C	
PRIMARY USES THAT MAY BE ACCESSORY IN SOME ZONE DISTRICTS																			
RESIDENTIAL USES																			
Household Living																			
Dwelling, live-work				C	C	P	P	P	P	P	CA	CA							4-3(B)(6)
CIVIC AND INSTITUTIONAL USES																			
Adult or child day care facility			C	C	C	P	P	P	P	P	P	P	A	A					
Community center or library	C	P		P	P	P	P	P	P	P	C	C	C	C		P		C	4-3(C)(1)
Elementary or middle school	C	C		C	P	P	P	P	P	P	P	P	CV			P		C	4-3(C)(2)
High school	C	C		C	C	P	P	P	P	P	P	P	C			P			4-3(C)(3)
Hospital									P	P	P	P							4-3(C)(4)
Museum				CV	CV	C	P	P	P	P	P	P	P	P		P	A		4-3(C)(5)
Overnight shelter										C	C	C	C	C					4-3(C)(6)
Parks and open space	P	P		P	P	P	P	P	P	P	P	P	C	C	A	P	P	P	4-3(C)(7)
Religious institution	P	P		P	P	P	P	P	P	P	P	P	CV	CV					4-3(C)(8)
Sports field							CV	C	P	P	P	P	P	C		P		C	
University or college						CV	CV	C	P	P	P	P	CV	CV					
Vocational school						CV	P	P	P	P	P	P	P	P					
COMMERCIAL USES																			
Agriculture and Animal-related																			
Community garden	P	P	P	P	P	P	P	P	P	P	P	P	C	C		A	A	A	4-3(D)(1)
General agriculture	P											C	P	P			P	A	4-3(D)(3)
Kennel	C							C	C		P	P	P	P					4-3(D)(4)
Nursery	P								A		P	P	P	P		A	A		

Table 4-2-1: Allowable Uses

P = Permissive Primary C = Conditional Primary A = Permissive Accessory CA = Conditional Accessory
CV = Conditional if Structure Vacant for 5 years or more T = Temporary Blank Cell = Not Allowed

Zone District >> / Land Uses	Residential						Mixed-use				Non-residential								Use-specific Standards
	R-A	R-1	R-MC	R-T	R-ML	R-MH	MX-T	MX-L	MX-M	MX-H	NR-C	NR-BP	NR-LM	NR-GM	NR-SU	NR-PO A	NR-PO B	NR-PO C	
Veterinary hospital	C						C	P	P	P	P	P	P	P					4-3(D)(5)
Other pet services	C						C	P	P	P	P	P	P	P					
Food, Beverage, and Indoor Entertainment																			
Adult entertainment												P	P	P					4-3(D)(6)
Auditorium or theater						A	A	A	P	P	P	P	P	P					4-3(D)(7)
Catering service									P	P	P	P	P	P					
Health club or gym			A		A	A	P	P	P	P	P	P	P	A					4-3(D)(9)
Mobile food truck court							C	P	P	P	P	P	P	C					4-3(D)(10)
Nightclub									P	P	P	P	P						4-3(D)(8)
Restaurant							C	P	P	P	P	P	P	P					4-3(D)(8)
Tap room or tasting room							C	C	P	P	P	P	P	P					4-3(D)(8)
Other indoor entertainment							C	P	P	P	P	P	P	P		P		C	4-3(D)(12)
Lodging																			
Campground or recreational vehicle park									C		P	P					A	C	4-3(D)(14)
Hotel or motel							P	P	P	P	P	P	P	P					4-3(D)(15)
Motor Vehicle-related																			
Car wash								P	P	P	P	P	P	P					4-3(D)(16)
Heavy vehicle and equipment sales, rental, fueling, and repair											P	C	P	P					4-3(D)(17)
Light vehicle fueling station								C	P	P	P	P	P	P					4-3(D)(18)
Light vehicle repair								P	P	P	P	P	P	P					4-3(D)(19)
Light vehicle sales and rental								C	P	P	P	P	P	P					4-3(D)(20)
Outdoor vehicle storage											C	C	P	P			A		4-3(D)(21)
Paid parking lot			A		A	A	C	P	P	A	P	P	P	P	A	A	A		4-3(D)(22)
Parking structure			A		A	A	CA	P	P	P	P	P	P	P	A				4-3(D)(22)
Offices and Services																			
Bank							P	P	P	P	P	P	P	CV					4-3(D)(23)
Blood services facility									C	C	C	P	P	P					
Club or event facility							C	P	P	P	P	P	P	CV		P	P	C	4-3(D)(24)
Commercial services								P	P	P	P	P	P	P					
Construction contractor facility and yard										C	P	P	P	P					4-3(D)(25)
Medical or dental clinic							P	P	P	P	P	P	P	P					4-3(D)(26)
Mortuary								C	P	P	P	P	C		A				

Table 4-2-1: Allowable Uses

P = Permissive Primary C = Conditional Primary A = Permissive Accessory CA = Conditional Accessory
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Zone District >> / Land Uses	Residential						Mixed-use				Non-residential								Use-specific Standards
																NR-PO			
	R-A	R-1	R-MC	R-T	R-ML	R-MH	MX-T	MX-L	MX-M	MX-H	NR-C	NR-BP	NR-LM	NR-GM	NR-SU	A	B	C	
Office							P	P	P	P	P	P	P	P					
Personal and business services, small							P	P	P	P	P	P	P	P					4-3(D)(27)
Personal and business services, large									P	P	P	P	P	P					4-3(D)(27)
Research or testing facility							P	P	P	P	P	P	P	P					4-3(D)(28)
Self-storage								C	C	P	P	P	P	P			A		4-3(D)(29)
Outdoor Recreation and Entertainment																			
Amphitheater										C	C	C	C	C	A	P	A	C	
Drive-in theater									C	C	C	C	C						4-3(D)(31)
Other outdoor entertainment	CA	CA	CA	CA	CA	CA	A	A	A	A	P	P	P	A		P		P	4-3(D)(32)
Retail Sales																			
Adult retail										P		P	P	P					4-3(D)(6)
Bakery goods or confectionery shop							C	P	P	P	P	P	P	P					
Building and home improvement materials store									C	C	P	P	P	C					4-3(D)(34)
Cannabis retail							P	P	P	P	P	P	A	A					4-3(D)(35)
Farmers' market	T		T	T	T	T	T	P	P	P	P	P	CV	CV		P	A	CA	4-3(D)(36)
General retail, small			A			A	P	P	P	P	P	P	P	P					4-3(D)(37)
General retail, medium									P	P	P	C	C						4-3(D)(37)
General retail, large									C	C	P	P							4-3(D)(37)
Liquor retail							C	A	C	C	C	C	C	C					4-3(D)(39)
Nicotine retail							CA	A	C	C	C	C	C	C					4-3(D)(40)
Pawn shop								C	P	P	P	P	P	P					4-3(D)(41)
Transportation																			
Freight terminal or dispatch center												C	P	P					4-3(D)(43)
Helipad									CA	CA	A	P	P	P	A				4-3(D)(44)
Park-and-ride lot						C	C	C	P	C	C	P	C	C	A	A			4-3(D)(45)
Railroad yard												C	P	P					4-3(D)(46)
Transit facility						C	C	C	P	P	P	P	P	P					4-3(D)(47)

Table 4-2-1: Allowable Uses

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Zone District >> / Land Uses	Residential						Mixed-use				Non-residential								Use-specific Standards
	R-A	R-1	R-MC	R-T	R-ML	R-MH	MX-T	MX-L	MX-M	MX-H	NR-C	NR-BP	NR-LM	NR-GM	NR-SU	NR-PO A	NR-PO B	NR-PO C	
INDUSTRIAL USES																			
Manufacturing, Fabrication, and Assembly																			
Artisan manufacturing							C	P	P	P	P	P	P	P					4-3(E)(1)
Cannabis cultivation							C	P	P	P	P	P	P	P					4-3(E)(2)
Cannabis-derived products manufacturing							C	P	P	P	P	P	P	P					4-3(E)(3)
Light manufacturing										A	P	P	P	P					4-3(E)(4)
Telecommunications, Towers, and Utilities																			
Drainage facility	P	P	P	P	P	P	P	P	P	P	P	P	P	P	A	A	A	C	
Electric utility	P	P	P	P	P	P	P	P	P	P	P	P	P	P	A	A	A	A	4-3(E)(8)
Geothermal energy generation	A	A	A	A	A	A	A	A	A	A	A	P	P	P		A	A		4-3(E)(9)
Major utility, other	P	P	P	P	P	P	P	P	P	P	P	P	P	P	A	A	A	A	
Solar energy generation	P	P	P	P	P	P	P	P	P	P	P	P	P	P	A	P	P	P	4-3(E)(10)
Wind energy generation							A	A	A	A	A	A	A	C	A	A	A		4-3(E)(11)
Wireless Telecommunications Facility (WTF)																			4-3(E)(12)
Architecturally integrated	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A			
Non-commercial or broadcasting antenna	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A			
Collocation	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A			
Freestanding							P	P	P	P	P	P	P	P	A				
Public utility collocation	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A			
Roof-mounted			A		A	A	A	A	A	A	A	A	A	A	A				
Small cell	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
Waste and Recycling																			
Recycling drop-off bin facility						A	A	A	A	A	P	P	P	P					4-3(E)(13)
Salvage yard												C	C	P					4-3(E)(15)
Wholesaling and Storage																			
Outdoor storage								CA	C	C	C	A	P	P					4-3(E)(17)
Warehousing									C	C	P	P	P	P					4-3(E)(18)
Wholesaling and distribution center									C	C	P	P	P	P					4-3(E)(19)

Table 4-2-1: Allowable Uses

P = Permissive Primary C = Conditional Primary A = Permissive Accessory CA = Conditional Accessory
CV = Conditional if Structure Vacant for 5 years or more T = Temporary Blank Cell = Not Allowed

Land Uses (Zone District >>)	Residential						Mixed-use				Non-residential								Use-specific Standards
	R-A	R-1	R-MC	R-T	R-ML	R-MH	MX-T	MX-L	MX-M	MX-H	NR-C	NR-BP	NR-LM	NR-GM	NR-SU	NR-PO A	NR-PO B	NR-PO C	
ACCESSORY AND TEMPORARY USES																			
ACCESSORY USES																			4-3(F)(1)
Agriculture sales stand	A	A	A	A	A	A	A	A	A	A	A	A	CA	CA			A		4-3(F)(2)
Animal keeping	A	A	A	A	A	A	A	A	A	A	A	A	A	A				CA	4-3(F)(3)
Automated Teller Machine (ATM)			A		A	A	A	A	A	A	A	A	A	A		T	T		
Drive-through or drive-up facility								A	A	CA	A	A	A						4-3(F)(4)
Dwelling unit, accessory with kitchen		A		A	A	A	A	A	A		A	A	A	A	A		A		4-3(F)(5)
Dwelling unit, accessory without kitchen	CA	A		A	A	A	A	A	A		A	A	A	A	A		A		4-3(F)(5)
Garden	A	A	A	A	A	A	A	A	A	A	A	A	A				A		
Mobile food truck	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A			4-3(F)(11)
Mobile vending cart							A	A	A	A	A	A	A	A		A		A	4-3(F)(12)
Outdoor dining area							CA	A	A	A	A	A	A	A	A				4-3(F)(14)
Other use accessory to non-residential primary use							A	A	A	A	A	A	A	A	A			A	4-3(F)(16)
TEMPORARY USES																			
Temporary Uses That Require A Permit																			
Circus									T		T	T	T						4-3(G)(1)
Construction staging area, trailer, or office	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T		4-3(G)(2)
Dwelling, temporary	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T		4-3(G)(3)
Fair, festival, or theatrical performance	T	T	T	T	T	T	T	T	T	T	T	T			T	T	T		4-3(G)(4)
Open air market							T	T	T	T	T						T		4-3(G)(5)
Park-and-ride facility, temporary						T	T	T	T	T	T	T	T	T	T		T		4-3(G)(6)
Real estate office or model home	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T				4-3(G)(7)
Seasonal outdoor sales							T	T	T	T	T	T	T	T					4-3(G)(8)
Temporary use not listed			T			T	T	T	T	T	T	T	T	T	T		T		4-3(G)(9)
Temporary Uses That Do Not Require A Permit																			
Hot air balloon takeoff/landing	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	4-3(G)(11)

Attachment 12

Regulatory Review

Curia is required to comply with the regulations promulgated by the U.S. Environmental Protection Agency (EPA) with respect to emissions of air pollutants. This attachment evaluates the applicability of federal air quality regulations to the generators and boilers.

National Emission Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines (40 CFR Part 63, Subpart ZZZZ)

This regulation applies to owners and operators of all stationary reciprocating internal combustion engines (RICE) irrespective of the date the engine is constructed. Under Subpart ZZZZ [§63.5690(a)(1)(iii)] the emergency generators are considered “existing, emergency, compression ignition engines at an area source" since construction was before June 12, 2006. Curia will comply with the requirements of 40 CFR Part 63, Subpart ZZZZ.

New Source Performance Standard for Stationary Compression Ignition Internal Combustion (40 CFR Part 60. sub-pan IIII)

This regulation applies to owners and operators of stationary compression ignition (diesel-fired) engines for which construction commenced after July 11, 2005, and which are manufactured after April 1, 2006. Construction commenced on the diesel-fired emergency generators before July 11, 2005, and they were manufactured before April 1, 2006. Hence, these generators are not subject to the requirements of NSPS IIII.

National Emission Standards for Hazardous Air Pollutants for Industrial Commercial and Institutional Boilers Area Sources (40 CFR63 Subpart JJJJJJ)

This regulation applies to an industrial, commercial or institutional boiler as defined in §63.11237 that is located at, or is part of, an area source of hazardous air pollutants (HAPs). The boilers at the Curia Site are gas-fired boilers, and hence will not be subject to the Area Source Boiler MACT requirements, codified in 40 CFR Part 63, Subpart JJJJJJ [§ 63.11195(e)].

Attachment 13

Permit Application Review Fees

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 Effective January 1, 2022 – December 31, 2022

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	Curia New Mexico, LLC	
Company Address	4401 Alexander Blvd NE Albuquerque, NM 87107	
Facility Name	Curia New Mexico	
Facility Address	4272 Balloon Park Road and 4200 Balloon Park Road Albuquerque, NM 87109	
Contact Person	John Gerback, Jr.	
Contact Person Phone Number	505-340-5989	
Are these application review fees for an existing permitted source located within the City of Albuquerque or Bernalillo County?	**Yes☒**	**No**
If yes, what is the permit number associated with this modification?	**Permit #** 491-M7-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**	**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	$599.00	2801
	AQN Technical Amendment	$327.00	2802
	AQN Transfer of a Prior Authorization	$327.00	2803
	Not Applicable	*See Sections Below*	
	Stationary Source Review Fees (Not Based on Proposed Allowable Emission Rate)		
	Source Registration required by 20.11.40 NMAC	$ 610.00	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	$ 1,220.00	2301
	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	$915	2302
	Proposed Allowable Emission Rate Equal to or greater than 5 tpy and less than 25 tpy	$1,830	2303
	Proposed Allowable Emission Rate Equal to or greater than 25 tpy and less than 50 tpy	$3,661	2304
	Proposed Allowable Emission Rate Equal to or greater than 50 tpy and less than 75 tpy	$5,491	2305
	Proposed Allowable Emission Rate Equal to or greater than 75 tpy and less than 100 tpy	$7,321	2306
	Proposed Allowable Emission Rate Equal to or greater than 100 tpy	$9,152	2307
	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)	$1,220	2308
	40 CFR 61 - "Emission Standards for Hazardous Air Pollutants (NESHAPs)	$1,220	2309
☒	40 CFR 63 - (NESHAPs) Promulgated Standards	$1,220	2310
	40 CFR 63 - (NESHAPs) Case-by-Case MACT Review	$12,202	2311
	20.11.61 NMAC, Prevention of Significant Deterioration (PSD) Permit	$6,101	2312
	20.11.60 NMAC, Non-Attainment Area Permit	$6,101	2313
	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	$ 1,220	2321
	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	$915	2322
	Proposed Allowable Emission Rate Equal to or greater than 5 tpy and less than 25 tpy	$1,830	2323
☒	Proposed Allowable Emission Rate Equal to or greater than 25 tpy and less than 50 tpy	$3,661	2324
	Proposed Allowable Emission Rate Equal to or greater than 50 tpy and less than 75 tpy	$5,491	2325
	Proposed Allowable Emission Rate Equal to or greater than 75 tpy and less than 100 tpy	$7,321	2326
	Proposed Allowable Emission Rate Equal to or greater than 100 tpy	$9,152	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	$6,101	2333
	20.11.61 NMAC, Prevention of Significant Deterioration	$6,101	2334
	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)			
	40 CFR 60 - "New Source Performance Standards" (NSPS)	$1,220	2328
	40 CFR 61 - "Emission Standards for Hazardous Air Pollutants (NESHAPs)	$1,220	2329
	40 CFR 63 - (NESHAPs) Promulgated Standards	$1,220	2330
	40 CFR 63 - (NESHAPs) Case-by-Case MACT Review	$12,202	2331
	20.11.61 NMAC, Prevention of Significant Deterioration (PSD) Permit	$6,101	2332
	20.11.60 NMAC, Non-Attainment Area Permit	$6,101	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
	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
	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	$1,220.00
Section III Total	$ 3,661.00
Section IV Total	$ 0
Section V Total	$ 0
Total Application Review Fee	**$ 4,881.00**

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 13 **day of** July **20**22

John Gerback — **Print Name**

Sr. Manager of EHS — **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.