Louisiana Department of Environmental Quality (LDEQ)
Office of Environmental Services

STATEMENT OF BASIS

PCS Nitrogen Fertilizer LP
PCS Nitrogen Fertilizer LP - Nitrate Group - Geismar Agricultural Nitrogen & Phosphate Plant
Geismar Ascension Parish, Louisiana
Agency Interest Number: 3732
Activity Number: PER20080007
Proposed Permit Number: 2240-V5

I. APPLICANT

Company:
PCS Nitrogen Fertilizer LP - Nitrate Group - Geismar Agricultural Nitrogen & Phosphate Plant
PO Box 307
Geismar, Louisiana 70734-0307

Facility:
PCS Nitrogen Fertilizer LP
10886 Hwy 75
GeismarAscension Parish, Louisiana
Longitude of 91° 2' 55.10" and Latitude of 30° 13' 42.30"

II. FACILITY AND CURRENT PERMIT STATUS

Production of nitric acid is initiated by converting anhydrous ammonia to a vapor. Compressed air and gaseous ammonia are mixed and reacted over a catalyst to produce nitrogen oxides (NO_X). The NO_X gas is cooled and sent to an absorption tower where NO_X is absorbed in water to produce nitric acid. The facility consists of four separate nitric acid trains, numbered from 2 through 5.

Nitric acid is reacted with ammonia to form ammonium nitrate in aqueous solution at the Ammonium Nitrate Plants. This solution is prepared for shipment in the mixing plant. The facility currently has two separate ammonium nitrate lines.

PCS Nitrogen Fertilizer is currently permitted for an average nitric acid production rate of 3,300 tons per day and a maximum production rate of 3,520 tons per day. The total ammonium nitrate production rate is currently permitted for 1,975 tons per day.

PCS Nitrogen Fertilizer LP - Nitrate Group - Geismar Agricultural Nitrogen & Phosphate Plant is a designated Part 70 source. Several Part 70 permits have been issued to the operating units within the [complex]. These include:

Permit No.	Unit or Source	Date Issued
2240-V4	Nitrate Group (current permit; being modified)	11/26/2007
2241-V1	Ammonia Complex	7/25/2006
2276-V0	Phosphate Group (Administrative Amendment)	8/10/2007
2247-V1	Sulfuric Acid Plant	3/26/2008

In addition, PSD Permit PSD-LA-603 also issued to the complex on March 18, 2004, as well as PSD-LA-617 for the Ammonia complex on March 9, 1998.

III. PROPOSED PROJECT/PERMIT INFORMATION

Application

A permit application was submitted on December 5, 2008 requesting a Part 70 operating permit for the PCS Nitrogen Fertilizer LP - Nitrate Group.

Project

PCS Nitrogen previously modified the operations of the No. 3 Nitric Acid train by allowing for the production of stronger acid. The previous allowable emission rates were based upon 100% production of 57% strength nitric acid. At times, the market demand for 65% nitric acid is high. A selective catalytic reduction unit on Train No. 3 was installed to the existing outlet of the Absorber Unit to control emissions of NO_X when producing 65% strength nitric acid during the alternate operating scenario.

This modification will also incorporate a previously authorized Authorization to Construct for the conversion of the Uran Storage Tank No. 3, ASL-4 (EQT0118) to the No. 3 Nitric Acid Storage Tank, ASL-17 (EQT0132). With that conversion, a nitric acid fume scrubber was installed to service the tank. In addition to that change, the facility will now demolish the Uran Storage Tank No. 4, ASL-5 (EQT0119) and replace it with a new No. 4 Nitric Acid Storage Tank, ASL-18 (EQT0134) that is also routed to the fume scrubber. That scrubber will be renamed to the Nos. 3 and 4 Nitric Acid Storage Tanks Fume Scrubber, NNA-6 (EQT0133). These two tanks will be used to store nitric acid, allowing greater capacity for storing both the 57% and the 65% strengths.

With this renewal, PCS Nitrogen is deleting the No. 2 Nitric Acid Train, which includes sources NNA2-1 (EQT0003, Nitric Acid Train No. 2) and NNA2-2 (FUG0002, Nitric Acid Train No. 2 fugitives). The train has been physically removed from the facility property.

The fugitive count for Nitric Acid Train No. 5 will be reconciled to reflect existing installed components.

Proposed Permit

Permit 2240-V5 will be the renewal/modification of Part 70 operating permit 2240-V4 for the PCS Nitrogen Fertilizer LP - Nitrate Group.

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Permitted Air Emissions

Estimated emissions in tons per year are as follows:

Pollutant	Before	After	Change
PM_{10}	170.90	169.95	-0.95
SO_2	0.40	0.33	-0.07
NO_X	900.28	627.10	-273.18
CO	946.50	487.20	-459.30
VOC	3.61	2.92	-0.69
Ammonia	134.87	120.86	-14.01
Nitric acid	29.77	27.82	-1.95
Chlorine	3.40	3.40	-

IV REGULATORY ANALYSIS

The applicability of the appropriate regulations is straightforward and provided in the Specific Requirements section of the proposed permit. Similarly, the Monitoring, Reporting and Recordkeeping necessary to demonstrate compliance with the applicable terms, conditions and standards are also provided in the Specific Requirements section of the proposed permit.

Prevention of Significant Deterioration/Nonattainment Review

No changes associated with this modification will require PSD analysis. PSD-LA-603 was issued for the No. 4 Nitric Acid train and is not being affected by this renewal.

Streamlined Equipment Leak Monitoring Program

There are no affected sources under this program

MACT Requirements

The affected sources in the Nitrate Complex are not subject to any MACT or NESHAP.

Air Quality Analysis

Emissions associated with the proposed facility/modification were reviewed by the Air Quality Assessment Division to ensure compliance with the NAAQS and AAS. LDEQ did not require the applicant to model emissions. The facility did perform ISCST3 dispersion modeling for the permit issued June 7, 2004 as shown below.

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Pollutant	Time Period	Calculated Maximum Ground Level Concentration	Louisiana Toxic Air Pollutant Ambient Air Quality Standard or (National Ambient Air Quality Standard {NAAQS})
NH_3	8-hour	426 $\mu g/m^3$	640 $\mu g/m^3$
PM_{10}	24-hour	127.66 $\mu g/m^3$	(150 $\mu g/m^3$)

General Condition XVII Activities

The facility will comply with the applicable General Condition XVII Activities emissions as required by the operating permit rule. However, General Condition XVII Activities are not subject to testing, monitoring, reporting or recordkeeping requirements. For a list of approved General Condition XVII Activities, refer to the Section VIII – General Condition XVII Activities of the proposed permit.

Insignificant Activities

All Insignificant Activities are authorized under LAC 33:III.501.B.5. For a list of approved Insignificant Activities, refer to the Section IX – Insignificant Activities of the proposed permit.

V. PERMIT SHIELD

No permit shield was requested.

VI. PERIODIC MONITORING

Continuous Monitoring (CEMS) [Required by State or Federal Regulations]

None.

Continuous Parameter Monitoring (CPMS) [Required by State or Federal Regulations]

The Utility boiler (EQT 0016) is subject to NSPS Db and is complying with the alternate monitoring of the oxygen, steam flow and fuel flow, with hourly data recording during all periods of operation except for continuous monitoring system breakdowns and repairs.

The three nitric acid trains are using CMS systems as outlined in NSPS Subpart G. The one nitric acid train not subject to the NSPS is still required to use the CMS as required by the PSD permit.

Continuous Monitoring (CAM: 40 CFR 64)

None.

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Periodic Monitoring (Including periodic Stack Testing)

The various fume scrubbers for removing nitric acid emissions monitor the scrubber liquid flow to ensure that the scrubbers are operating properly. Monitoring is performed once every shift during operations.

VII. GLOSSARY

Carbon Monoxide (CO) – A colorless, odorless gas, which is an oxide of carbon.

Maximum Achievable Control Technology (MACT) – The maximum degree of reduction in emissions of each air pollutant subject to LAC 33:III.Chapter 51 (including a prohibition on such emissions, where achievable) that the administrative authority, upon review of submitted MACT compliance plans and other relevant information and taking into consideration the cost of achieving such emission reduction, as well as any non-air-quality health and environmental impacts and energy requirements, determines is achievable through application of measures, processes, methods, systems, or techniques.

Hydrogen Sulfide (H_2S) – A colorless inflammable gas having the characteristic odor of rotten eggs, and found in many mineral springs. It is produced by the reaction of acids on metallic sulfides, and is an important chemical reagent.

New Source Review (NSR) – A preconstruction review and permitting program applicable to new or modified major stationary sources of air pollutants regulated under the Clean Air Act (CAA). NSR is required by Parts C ("Prevention of Significant Deterioration of Air Quality") and D ("Nonattainment New Source Review").

Nitrogen Oxides (NO_X) – Compounds whose molecules consist of nitrogen and oxygen.

Organic Compound – Any compound of carbon and another element. Examples: Methane (CH_4), Ethane (C_2H_6), Carbon Disulfide (CS_2)

Part 70 Operating Permit – Also referred to as a Title V permit, required for major sources as defined in 40 CFR 70 and LAC 33:III.507. Major sources include, but are not limited to, sources which have the potential to emit: $\geq$ 10 tons per year of any toxic air pollutant; $\geq$ 25 tons of total toxic air pollutants; and $\geq$ 100 tons per year of regulated pollutants (unless regulated solely under 112(r) of the Clean Air Act) (25 tons per year for sources in non-attainment parishes).

PM_{10} – Particulate matter with an aerodynamic diameter less than or equal to a nominal 10 micrometers as measured by the method in Title 40, Code of Federal Regulations, Part 50, Appendix J.

Potential to Emit (PTE) – The maximum capacity of a stationary source to emit any air pollutant under its physical and operational design.

Prevention of Significant Deterioration (PSD) – A New Source Review permitting program for major sources in geographic areas that meet the National Ambient Air Quality Standards (NAAQS) at 40 CFR Part 50. PSD requirements are designed to ensure that the air quality in attainment areas will not degrade.

Sulfur Dioxide (SO_2) – An oxide of sulfur.

Sulfuric Acid (H_2SO_4) – A highly corrosive, dense oily liquid. It is a regulated toxic air pollutant under LAC 33:III.Chapter 51.

Title V Permit – See Part 70 Operating Permit.

Volatile Organic Compound (VOC) – Any organic compound, which participates in atmospheric photochemical reactions; that is, any organic compound other than those, which the administrator of the U.S. Environmental Protection Agency designates as having negligible photochemical reactivity.

Pulled from application for Ammonia Group application dated 5/30/07. as sources are being removed from Ammonia service and transferred to Nitrate Service.
KCW 5/15/09.

Department of Environmental Quality
Permits Division
P.O.Box 4313
Baton Rouge, LA 70821-4313
(225) 219-3181

LOUISIANA

SINGLE POINT/AREA/VOLUME SOURCE

Emission Inventory Questionnaire (EIQ)
for Air Pollutants

Company Name	Plant location and name (if any)		Date of Submittal
PCS Nitrogen Fertilizer, LP	Ammonia Group	Geismar, Louisiana	May 2007

Source ID Number	Descriptive name of the equipment served by this stack or vent	Approx. location of stack or vent (see inst. on how to determine location of area srcs)
NNA-6	Nos. 3 and 4 Nitric Acid Storage Tanks Fume Scrubber	UTM Zone No. 15 Horizontal Coordinate 687282 mE; 16 Vertical Coordinate 3344916 mN

Stack and Discharge Physical Characteristics Change ☐Yes ☒No	Height of stack above grade (ft)	Diameter (ft) or stack discharge area (ft^2)	Stack gas exit temperature (Deg F)	Stack gas flow at process conditions, not at standard (ft^3/min)	Stack gas exit velocity (ft/sec)	Date of construction / modification	Operating rate (Max) or tank capacity
	44.00	0.66 .(ft) (ft^2)	Ambient	2450	7.60	2003	5 gal/min

Fuel

Type of fuel used and heat input	Type of fuel	Heat Input (MMBTU/hr)
a	N/A	N/A

Operating Characteristics

Percent of annual throughput of pollutants through this emission point				Normal operating time of this point			Normal Operating Rate
Dec-Feb	Mar-May	Jun-Aug	Sep-Nov	hrs/day	days/wk	wk/yr	
25	25	25	25	24	7	52	5 gal/min

Air Pollutant Specific Information

Pollutant	Control Equipment Code	Control Equipment Efficiency (%)	Emission Rate Average (lbs/hr)	Emission Rate Maximum (lbs/hr)	Emission Rate Annual (tons/yr)	Emission Estimation Method	Add, Change, or Delete Code	Concentration of gases exiting at stack
NITROGEN OXIDES	000	0.00%	0.68	1.35	2.96	3	Add	
NITRIC ACID	002	85.00%	0.04	0.07	0.17	3	Add	

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for Air Pollutants

Company Name	Plant location and name (if any)		Date of Submittal
PCS Nitrogen Fertilizer, LP	Ammonia Group	Geismar, Louisiana	May 2007

Source ID Number	Descriptive name of the equipment served by this stack or vent	Approx. location of stack or vent (see inst. on how to determine location of area srcs)
ASL-4	Uran Storage Tank No. 3	UTM Zone No. 15 Horizontal Coordinate 687283 mE; 16 Vertical Coordinate 3344916 mN

Stack and Discharge Physical Characteristics Change [X] Yes [ ] No	Height of stack above grade (ft)	Diameter (ft) or stack discharge area (ft^2)	Stack gas exit temperature (Deg F)	Stack gas flow at process conditions, not at standard (ft^3/min)	Stack gas exit velocity (ft/sec)	Date of construction / modification	Operating rate (Max) or tank capacity
	17.00	1.00 (ft) (ft^2)	N/A	N/A	N/A	N/A	1600000 gal

Fuel

Type of fuel used and heat input

Type of fuel	Heat Input (MMBTU/hr)

Operating Characteristics

Percent of annual throughput of pollutants through this emission point				Normal operating time of this point			Normal Operating Rate
Dec-Feb	Mar-May	Jun-Aug	Sep-Nov	hrs/day	days/wk	wk/yr	
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Air Pollutant Specific Information

Pollutant	Control Equipment Code	Control Equipment Efficiency (%)	Emission Rate Average (lbs/hr)	Emission Rate Maximum (lbs/hr)	Emission Rate Annual (tons/yr)	Emission Estimation Method	Add, Change, or Delete Code	Concentration of gases exiting at stack
PARTICULATE MATTER	000	0.00%	0.00	0.00	0.00	7	Delete	
AMMONIA	000	0.00%	0.00	0.00	0.00	7	Delete	
NITRIC ACID	000	0.00%	0.00	0.00	0.00	7	Delete	
SULFURIC ACID	000	0.00%	0.00	0.00	0.00	7	Delete	

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Emission Inventory Questionnaire (EIQ)
for Air Pollutants

Company Name	Plant location and name (if any)		Date of Submittal
PCS Nitrogen Fertilizer, LP	Ammonia Group	Geismar, Louisiana	May 2007

Source ID Number	Descriptive name of the equipment served by this stack or vent	Approx. location of stack or vent (see inst. on how to determine location of area srcs)			
ASL-5	Uran Storage Tank No. 4	UTM Zone No.	15	Horizontal Coordinate	687370 mE
			16	Vertical Coordinate	3344995 mN

Stack and Discharge Physical Characteristics Change [X]Yes [ ]No	Height of stack above grade (ft)	Diameter (ft) or stack discharge area (ft^2)	Stack gas exit temperature (Deg F)	Stack gas flow at process conditions, not at standard (ft^3/min)	Stack gas exit velocity (ft/sec)	Date of construction / modification	Operating rate (Max) or tank capacity
	18.00	1.00 (ft) (ft^2)	N/A	N/A	N/A	N/A	1000000 gal

Fuel	Type of fuel used and heat input		Operating Characteristics	Percent of annual throughput of pollutants through this emission point				Normal operating time of this point			Normal Operating Rate
	Type of fuel	Heat Input (MMBTU/hr)		Dec-Feb	Mar-May	Jun-Aug	Sep-Nov	hrs/day	days/wk	wk/yr	
				N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Air Pollutant Specific Information

Pollutant	Control Equipment Code	Control Equipment Efficiency (%)	Emission Rate Average (lbs/hr)	Emission Rate Maximum (lbs/hr)	Emission Rate Annual (tons/yr)	Emission Estimation Method	Add, Change, or Delete Code	Concentration of gases exiting at stack
PARTICULATE MATTER	000	0.00%	0.00	0.00	0.00	7	Delete	
AMMONIA	000	0.00%	0.00	0.00	0.00	7	Delete	
NITRIC ACID	000	0.00%	0.00	0.00	0.00	7	Delete	
SULFURIC ACID	000	0.00%	0.00	0.00	0.00	7	Delete	

PCS Nitrogen Fertilizer, LP
Nos. 3 and 4 Nitric Acid Storage Tanks Fume Scrubber
Emission Point ID: NNA-6

Hours of Operation: 8760 hours/year
Scrubber Efficiency: 85 % (for nitric acid)
0 % [for NO_x (as NO_2)]

Tanks Fume Scrubber Emissions - Stack

		Emissions Before Scrubber[1]				Emissions After Scrubber		
Tank ID	Pollutant	Average (lb/hr)	Maximum (lb/hr)	Annual (tpy)	Control Efficiency (%)[2]	Average (lb/hr)	Maximum (lb/hr)	Annual (tpy)
ASL-17	Nitric Acid	0.086	0.172	0.377	85	0.013	0.026	0.057
ASL-17	NO_x (as NO_2)	0.286	0.572	1.252	0	0.286	0.572	1.252
ASL-18	Nitric Acid	0.117	0.234	0.513	85	0.018	0.035	0.077
ASL-18	NO_x (as NO_2)	0.389	0.778	1.705	0	0.389	0.778	1.705

(1) See the following pages for calculation of tank emissions.
(2) Facility supplied wet scrubber efficiency based on good engineering judgement from scrubber makeup water constituent of URAN, Ph 5.4 (Phil Wood, Process Engineer - Nitrate Group)

Tanks Fume Scrubber Emissions - Fugitives

Nitric Acid Emissions Calculation:

Stream Factor - Liquid 1
Stream Factor - Vapor 0.008 (8,000 ppm)

Component	Service	Equipment Count	Emission Factor (lb/hr/component)	Average (lb/hr)	Maximum (lb/hr)	Annual (tpy)
Valve	Liquid Service	17	0.000194	3.30E-03	3.96E-03	1.44E-02
Flanges (connectors)	Liquid Service	36	0.000077	2.77E-03	3.33E-03	1.21E-02
Flanges (connectors)	Vapor Service	16	0.000077	1.23E-03	1.48E-03	5.40E-03
Pressure Relief Seals	Vapor Service	3	0.000017	5.10E-05	6.12E-05	2.23E-04
Pump Seals	Liquid Service	3	0.000551	1.65E-03	1.98E-03	7.24E-03
			Nitric Acids Totals	0.009	0.011	0.039

Emission Calculations Explanation
Average emissions for no leak situation (lbs/hr) = Equipment Count * Emission Factor * Stream Factor
Annual emissions for no leak situation (tpy) = Average Emissions * 8,760 hrs/yr * 1 ton/2000 lbs
Maximum emissions for no leak situation (lbs/hr) = Average Emissions * 120%

Nos. 3 & 4 Nitric Acid Storage Tanks Fume Scrubber
Emission Point ID: NNA-6

NO_x (as NO_2) Emissions Calculation:

Stream Factor - Vapor 0.008 (8,000 ppm)

Component	Service	Equipment Count	Emission Factor (lb/hr/component)	Average (lb/hr)	Maximum (lb/hr)	Annual (tpy)
Flanges (connectors)	All	9	0.000077	6.93E-04	8.32E-04	3.04E-03
Pressure Relief Seals	Vapor Service	1	0.000017	1.70E-05	2.04E-05	7.45E-05
			NO_x (as NO_2) Totals	**0.001**	**0.001**	**0.003**

Emission Calculations Explanation
Average emissions for no leak situation (lbs/hr) = Equipment Count * Emission Factor * Stream Factor
Annual emissions for no leak situation (tpy) = Average Emissions * 8,760 hrs/yr * 1 ton/2000 lbs
Maximum emissions for no leak situation (lbs/hr) = Average Emissions * 120%

Tanks Fume Scrubber Emissions - SUMMARY TOTAL (Stack and Fugitive Emissions)

Pollutant	Average (lb/hr)	Maximum (lb/hr)	Annual (tpy)
NO_x (as NO_2)	0.676	1.351	2.960
Nitric Acid	0.040	0.072	0.173

PCS Nitrogen Fertilizer, LP
No. 3 Nitric Acid Storage Tank
Controlled Source ID: ASL-17

Basis:

This tank is used to store a 65% Nitric Acid Solution. The working losses and breathing losses are calculated based upon the Ideal Gas Law.

Emissions are calculated using the following parameters:

Chemical Stored:	65%	Nitric Acid
	35%	Water
Nitric Acid Molecular Weight:	63.01	lb/lbmole
Water Molecular Weight:	18.02	lb/lbmole
Average Temperature:	60.33	°F [1]
Atmospheric Pressure:	14.72	psia
Partial Pressure of Nitric Acid @ Average Temperature:	0.039	psia [1]
Liquid Mole Fraction Nitric Acid in Tank:	0.347	[a]
Mole Fraction Nitric Acid in Tank Headspace:	2.64E-03	[b]
Vapor Density:	0.048	lb/ft^3 [c]
Tank Diameter:	60.00	ft [2]
Tank Height:	36.50	ft [2]
Tank Volume:	101,730.91	ft^3 [2]
Tank Volume:	761,000.00	gallons [2]
Working Volume:	50,865.45	ft^3 [d]
Vapor Space:	50,865.45	ft^3 [e]
Annual Turnovers:	10.0	[2]
Tank Throughput:	7,610,000.00	gal/yr [e]
Tank Throughput:	1,017,309.09	ft^3/yr [f]
Annual Average Maximum Daily Temperature:	77.98	°F [3]
Annual Average Minimum Daily Temperature:	57.38	°F [3]

References and Calculation Methods

(1) Per Authorization to Construct (ATC) signed October 8, 2003
(2) Information provided by facility.
(3) Meteorological Data obtained from Tanks 4.09d.

(a) Liquid Mole Fraction Nitric Acid in Tank = (65% Nitric Acid / 63.01 lb/lbmol) / ((65% Nitric Acid / 63.01 lb/lbmol) / (35% Water / 18.02 lb/lbmol))
(b) Mole Fraction (Raoult's Law) = (Partial Pressure of Nitric Acid @ Average Temperature (0.039) / Atmospheric Pressure (14.72))
*(c) Vapor Density = (Atmospheric Pressure (14.72) * (MW of Nitric Acid (63.01) * Mole Fraction Nitric Acid in Tank Headspace (2.64E-03)) + (1-Mole Fraction Nitric Acid in Tank Headspace (2.64E-03)) * MW of Water (18.02)) / (R Constant (10.73)*(Average Temperature in Rankine (459.67 + 60.33)))*
(d) Working Volume (ft^3) = (tank volume (ft^3) / 2)
*(e) Tank Throughput (gallons) = (tank volume (gallons) * annual turnovers)*
(f) Tank Throughput (ft^3) = (tank throughput (gallons) / 7.48 gallons/ft^3)

Nitric Acid Average Emissions Calculation:

Working Losses:

PV = nRT where R = 10.73 (ft^3 psia)/(lb-mole °R)
n = PV / RT
n = [Pressure (psia) * Volume (ft^3)] / [10.73 (ft^3 psia)/(lb-mole °R) * Temperature (°R)]

n = 2,646.44 lb-mol/yr

Total Nitric Acid Displaced = n (lb-mol/yr) * Mole Fraction of Nitric Acid in Tank Headspace

= 6.99 lb-mol Nitric Acid/yr

Working Losses Nitric Acid = Total Nitric Acid Displaced (lb-mol/yr) * Molecular Weight (lb/lb-mol)

= 440.30 lb/yr

PCS Nitrogen Fertilizer, LP
No. 3 Nitric Acid Storage Tank
Controlled Source ID: ASL-17

Breathing Losses:

Initial Total Moles in Tank Headspace (n_i) = PV / RT_i * 365 days/yr

n_i = [Pressure (psia) * Volume (ft^3)] / [10.73 (ft^3 psia/lb-mol °R) * Annual Average Minimum Daily Temperature (°R)] * 365 days/yr

n_i = 49,259.65 lb-mol/yr

Final Total Moles in Tank Headspace (n_f) = PV / RT_f * 365 days/yr

n_f = [Pressure (psia) * Volume (ft^3)] / [10.73 (ft^3 psia/lb-mol °R) * Annual Average Maximum Daily Temperature (°R)] * 365 days/yr

n_f = 47,372.27 lb-mol/yr

Delta Total Moles In Tank Headspace (n_f - n_i) = 1,887.38 lb-mol/yr

Total Nitric Acid Displaced = Delta Total Moles In Tank Headspace (lb-mol/yr) * Mole Fraction Nitric Acid in Tank Headspace

= 4.98 lb-mol Nitric Acid/yr

Breathing Losses Nitric Acid = Total Nitric Acid Displaced (lb-mol Nitric Acid/yr) * Molecular Weight (lb/lb-mole)

= 314.01 lb/yr

Total Average Losses:

Total Nitric Acid Losses = Working Losses Nitric Acid (lb/yr) + Breathing Losses Nitric Acid (lb/yr)

= 754.30 lb/yr
= 0.09 lb/hr

NO_x (as NO_2) Average Emissions Calculation:

NO_x (as NO_2) emissions = Nitric Acid annual emissions (tpy) * (NO_x (as NO_2) tank emissions from TANKS run in October 8, 2003 Authorization to Construct / Nitric Acid tank emissions from TANKS run in October 8, 2003 Authorization to Construct) * (2,000 lb/1 ton)

= 0.377 ton/yr * 3744.77 lb/yr / 1127.94 lb/yr * 2000 lb/ton
= 2,504.29 lb/yr

Summary of Emissions Routed to Scrubber:

Pollutant	Average (lb/hr)	Maximum (lb/hr)	Annual (tpy)
NO_x (as NO_2)	0.286	0.572	1.252
Nitric Acid	0.086	0.172	0.377

Average Hourly NO_x (as NO_2) Emissions = Average Hourly Nitric Acid Emissions (lb/hr) * (NO_x (as NO_2) tank emissions from TANKS run in October 8, 2003 Authorization to Construct / Nitric Acid tank emissions from TANKS run in October 8, 2003 Authorization to Construct)

Maximum Hourly NO_x (as NO_2) Emissions = Maximum Hourly Nitric Acid Emissions (lb/hr) * (NO_x (as NO_2) tank emissions from TANKS run in October 8, 2003 Authorization to Construct / Nitric Acid tank emissions from TANKS run in October 8, 2003 Authorization to Construct)

Annual NO_x (as NO_2) Emissions = Annual NO_x (as NO_2) emissions (lb/yr) / 2000

Maximum Hourly Nitric Acid Emissions = Average Hourly Nitric Acid Emissions (lb/hr) * 2

PCS Nitrogen Fertilizer, LP
No. 4 Nitric Acid Storage Tank
Controlled Source ID: ASL-18

Basis:

This tank is used to store a 65% Nitric Acid Solution. The working losses and breathing losses are calculated based upon the Ideal Gas Law.

Emissions are calculated using the following parameters:

Chemical Stored:	65%	Nitric Acid
	35%	Water
Nitric Acid Molecular Weight:	63.01	lb/lbmole
Water Molecular Weight:	18.02	lb/lbmole
Average Temperature:	60.33	°F [1]
Atmospheric Pressure:	14.72	psia
Partial Pressure of Nitric Acid @ Average Temperature:	0.039	psia [1]
Liquid Mole Fraction Nitric Acid in Tank:	0.347	[a]
Mole Fraction Nitric Acid in Tank Headspace:	2.64E-03	[b]
Vapor Density:	0.048	lb/ft^3 [c]
Tank Diameter:	70.00	ft [2]
Tank Height:	36.00	ft [2]
Tank Volume:	138,493.06	ft^3 [2]
Tank Volume:	1,036,000	gallons [2]
Working Volume:	69,246.53	ft^3 [d]
Vapor Space:	69,246.53	ft^3 [d]
Annual Turnovers:	10.0	[2]
Tank Throughput:	10,360,000.00	gal/yr [e]
Tank Throughput:	1,384,930.64	ft^3/yr [f]
Annual Average Maximum Daily Temperature:	77.98	°F [3]
Annual Average Minimum Daily Temperature:	57.38	°F [3]

References and Calculation Methods

(1) Per Authorization to Construct (ATC) signed October 8, 2003.
(2) Information provided by facility.
(3) Meteorological Data obtained from Tanks 4.09d.

(a) Liquid Mole Fraction Nitric Acid in Tank = (65% Nitric Acid / 63.01 lb/lbmol) / ((65% Nitric Acid / 63.01 lb/lbmol) / (35% Water / 18.02 lb/lbmol))
(b) Mole Fraction (Raoult's Law) = (Partial Pressure of Nitric Acid @ Average Temperature (0.039) / Atmospheric Pressure (14.72))
*(c) Vapor Density = (Atmospheric Pressure (14.72) * (MW of Nitric Acid (63.01) * Mole Fraction Nitric Acid in Tank Headspace (2.64E-03)) + (1-Mole Fraction Nitric Acid in Tank Headspace (2.64E-03)) * MW of Water (18.02)) / (R Constant (10.73)*(Average Temperature in Rankine (459.67 + 60.33)))*
(d) Working Volume (ft^3) = (tank volume (ft^3) / 2)
*(e) Tank Throughput (gallons) = (tank volume (gallons) * annual turnovers)*
(f) Tank Throughput (ft^3) = (tank throughput (gallons) / 7.48 gallons/ft^3)

Nitric Acid Average Emissions Calculation:

Working Losses:

PV = nRT where R = 10.73 (ft^3 psia)/(lb-mole °R)
n = PV / RT
n = [Pressure (psia) * Volume (ft^3)] / [10.73 (ft^3 psia)/(lb-mole °R) * Temperature (°R)]

n = 3,602.78 lb-mol/yr

Total Nitric Acid Displaced = n(lb-mol/yr) * Mole Fraction of Nitric Acid in Tank Headspace

= 9.51 lb-mol Nitric Acid/yr

Working Losses Nitric Acid = Total Nitric Acid Displaced (lb-mol/yr) * Molecular Weight (lb/lb-mol)

= 599.40 lb/yr