CARGILL FERTILIZER, INC.

8813 Highway 41 South · Riverview, Florida 33569 · Telephone 813-677-9111 · TWX 810-876-0648 · Telex 52666 · FAX 813-671-6146

March 1, 1994 CERTIFIED MAIL: P 013 142 192

Mr. Clair Fancy
Bureau of Air Quality Management
Florida Department of Environmental Protection
2600 Blair Stone Rd.
Tallahassee, FL 32399-2400

RECEIVED DER - MAIL ROOM 1994 MAR -3 PM 12: 34

Subject: Cargill Fertilizer, Inc. - Bartow #4 DAP Plant PSD Permit Application

Dear Mr. Fancy,

Please find enclosed four copies of a PSD/Construction Permit application along with a check in the amount of $7,500 (Check #162747) for the processing fee.

This application requests an increase in the allowable production rate of our No. 4 Ammoniated Phosphate Manufacturing plant located at our Bartow facility. Note that the application includes calculations of emissions associated with fuel combustion in the product dryer. The analysis is based on the worst case emissions of combustion of either the primary natural gas fuel or the No. 6 fuel oil used for back-up. However, we request that the permit be issued to also allow utilization of other, less polluting, grades of fuel (Nos. 2, 4 or 5) as back-up.

Should you have any questions, or require additional information, please feel free to contact me at 813/534-9613.

Sincerely,

David B. Jellerson

David B. Jellerson, P.E.
Environmental Superintendent

cc: J. Kissel, DEP-Tampa
Buff - KBN
Pinney, Morris
P-34-01

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MAR 3 1994
Bureau of Air Regulation

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VENDOR NUMBER 4115

CARGILL FERTILIZER, INC.

NORWEST BANK LEWISTOWN, N.A
LEWISTOWN, MONTANA 59457

93-516
929

577- 162747

NUMBER	DATE
162747	01/05/94

002898

THE SUM OF ****************SEVEN THOUSAND FIVE HUNDRED DOLLARS AND 00 CENTS

PAY TO THE ORDER OF
FLORIDA DEPT. OF ENVIRONMENTAL PROTECTION
2600 BLAIR STONE ROAD
TALLAHASSEE FL 32399-2405

$7,500.00

AUTHORIZED SIGNATURE

⑈577162747⑈ ⑆092905168⑆ 21⑈274⑈0⑈

262

Subject: Cargill Fertilizer, Inc. - Bartow #4 DAP Plant
PSD Permit Application

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Sincerely,

David B. Jellerson, P.E.
Environmental Superintendent

cc: J. Kissel, DEP-Tampa
Buff - KBN
Pinney, Morris
P-34-01

Patty
Money Sheet Date 3/9/94
Deposited into acct # 2275
I will contact Ellen to correct this.

recycled paper

eSee-tac Recycled

NO. 577-162747

INVOICE NUMBER	INVOICE DATE	REFERENCE	GROSS	DISCOUNT	NET AMOUNT
123093	01/03/94	NONE	7,500.00	.00	7,500.00
		TOTAL	7,500.00	.00	7,500.00

#4 DAP Production Increase
Construction Permit Application

CARGILL FERTILIZER, INC.

CARGILL FERTILIZER, INC.

NORWEST BANK LEWISTOWN, N.A.
LEWISTOWN, MONTANA 59457

93-516 / 929

577- 162747

VENDOR NUMBER	NUMBER	DATE
4115	162747	01/05/94

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2600 BLAIR STONE ROAD
TALLAHASSEE FL 32399-2405

$7,500.00

AUTHORIZED SIGNATURE

⑈577162747⑈ ⑆092905168⑆ 21⑈274⑈0⑈ 262

PSD PERMIT APPLICATION FOR NO. 4 FERTILIZER PLANT EXPANSION

Prepared For:

Cargill Fertilizer, Inc.
3200 Highway 60 West
Bartow, Florida 33830

Prepared By:

KBN Engineering and Applied Sciences, Inc.
1034 NW 57th Street
Gainesville, Florida 32605

February 1994
13345C1

STATE OF FLORIDA

DEPARTMENT OF ENVIRONMENTAL REGULATION

#7500 pd.
3-3-94
Rcpt.# 224211

AC 53-246403
PSD-FL-211

APPLICATION TO OPERATE/CONSTRUCT AIR POLLUTION SOURCES

SOURCE TYPE: *Phosphate Fertilizer Production* [ ] New[1] [x] Existing[1]

APPLICATION TYPE: [x] Construction [ ] Operation [x] Modification

COMPANY NAME: *Cargill Fertilizer, Inc.* COUNTY: *Polk*

Identify the specific emission point source(s) addressed in this application (i.e., Lime Kiln No. 4 with Venturi Scrubber; Peaking Unit No. 2, Gas Fired) *No. 4 Fertilizer Plant*

SOURCE LOCATION: Street *1 mile North of SR 60* City *3 miles West of Bartow*

UTM: East *17-409.5* North *3086.8*

Latitude *27* ° *54* ' *22* "N Longitude *81* ° *54* ' *59* "W

APPLICANT NAME AND TITLE: *David B. Jellerson, Environmental Superintendent*

APPLICANT ADDRESS: *P.O. Box 471, Bartow, FL 33830*

SECTION I: STATEMENTS BY APPLICANT AND ENGINEER

A. APPLICANT

I am the undersigned owner or authorized representative* of *Cargill Fertilizer, Inc.*

I certify that the statements made in this application for a *construction* permit are true, correct and complete to the best of my knowledge and belief. Further, I agree to maintain and operate the pollution control source and pollution control facilities in such a manner as to comply with the provision of Chapter 403, Florida Statutes, and all the rules and regulations of the department and revisions thereof. I also understand that a permit, if granted by the department, will be non-transferable and I will promptly notify the department upon sale or legal transfer of the permitted establishment.

*Attach letter of authorization

Signed: [signature]

David B. Jellerson, Environmental Superintendent
Name and Title (Please Type)

Date: 3/1/94 Telephone No. *(813) 534-9613*

B. PROFESSIONAL ENGINEER REGISTERED IN FLORIDA (where required by Chapter 471, F.S.) This is to certify that the engineering features of this pollution control project have been designed/examined by me and found to be in conformity with modern engineering principles applicable to the treatment and disposal of pollutants characterized in the permit application. There is reasonable assurance, in my professional judgment, that

[1]See Florida Administration Code Rule 17-2.100(57) and (104)

the pollution control facilities, when properly maintained and operated, will discharge an effluent that complies with all applicable statutes of the State of Florida and the rules and regulations of the department. It is also agreed that the undersigned will furnish, if authorized by the owner, the applicant a set of instructions for the proper maintenance and operation of the pollution control facilities and, if applicable, pollution sources.

Signed *David A. Buff*

David A. Buff
Name (Please Type)

KBN Engineering and Applied Sciences, Inc.
Company Name (Please Type)

1034 NW 57th St., Gainesville, FL 32605
Mailing Address (Please Type)

Florida Registration No. *19011* Date: *2/24/94* Telephone No. *(904) 331-9000*

SECTION II: GENERAL PROJECT INFORMATION

A. Describe the nature and extent of the project. Refer to pollution control equipment, and expected improvements in source performance as a result of installation. State whether the project will result in full compliance. Attach additional sheet if necessary.

See PSD Report

B. Schedule of project covered in this application (Construction Permit Application Only)

Start of Construction *Upon permit issuance* Completion of Construction *N/A*

C. Costs of pollution control system(s): (Note: Show breakdown of estimated costs only for individual components/units of the project serving pollution control purposes. Information on actual costs shall be furnished with the application for operation permit.)

Pollution control equipment already in place

D. Indicate any previous DER permits, orders and notices associated with the emission point, including permit issuance and expiration dates.

A053-167639 issued 11/17/89 expires 10/16/94

E. Requested permitted equipment operating time: hrs/day *24*; days/wk *7*; wks/yr *52*;
If power plant, hrs/yr _____; if seasonal, describe: *Maximum 8,500 hr/yr*

F. If this is a new source or major modification, answer the following questions. (Yes or No)

1. Is this source in a non-attainment area for a particular pollutant? *No*
   a. If yes, has "offset" been applied? ____
   b. If yes, has "Lowest Achievable Emission Rate" been applied? ____
   c. If yes, list non-attainment pollutants. ____
2. Does best available control technology (BACT) apply to this source? If yes, see Section VI. *Yes*
3. Does the State "Prevention of Significant Deterioration" (PSD) requirement apply to this source? If yes, see Sections VI and VII. *Yes*
4. Do "Standards of Performance for New Stationary Sources" (NSPS) apply to this source? *Yes*
5. Do "National Emission Standards for Hazardous Air Pollutants" (NESHAP) apply to this source? *No*

H. Do "Reasonably Available Control Technology" (RACT) requirements apply to this source? *No*

   a. If yes, for what pollutants? ____
   b. If yes, in addition to the information required in this form, any information requested in Rule 17-2.650 must be submitted.

Attach all supportive information related to any answer of "Yes". Attach any justification for any answer of "No" that might be considered questionable.

SECTION III: AIR POLLUTION SOURCES & CONTROL DEVICES (Other than Incinerators)

A. Raw Materials and Chemicals Used in your Process, if applicable:

Description	Contaminants		Utilization Rate - lbs/hr	Relate to Flow Diagram
	Type	% Wt		
Ammonia	–	–	*114,506*	
Phosphoric Acid[a]	*Fluorides*	*1-2*	*531,494 TPH*[b]	
Filler	–	–	*As required*	

[a] *At 46% P_2O_5*
[b] *244,487 lb/hr (122.244 TPH) as 100% P_2O_5*

B. Process Rate, if applicable: (See Section V, Item 1)

1. Total Process Input Rate (lbs/hr): *646,000 (323.00 TPH)*

2. Product Weight (lbs/hr): *510,638 lb/hr (255.319 TPH) @ 47% P_2O_5*
240,000 lb/hr (120.0 TPH) @ 100% P_2O_5

C. Airborne Contaminants Emitted: (Information in this table must be submitted for each emission point, use additional sheets as necessary)

Name of Contaminant	Emission[1]		Allowed[2] Emission Rate per Rule 17-2	Allowable[3] Emission lbs/hr	Potential[4] Emission		Relate to Flow Diagram
	Maximum lbs/hr	Actual T/yr			lbs/hr	T/yr	
	See PSD Report						

[1]See Section V, Item 2.

[2]Reference applicable emission standards and units (e.g. Rule 17-2.600(5)(b)2. Table II, E. (1) - 0.1 pounds per million BTU heat input)

[3]Calculated from operating rate and applicable standard.

[4]Emission, if source operated with~~out~~ control (See Section V, Item 3).

D. Control Devices: (See Section V, Item 4)

Name and Type (Model & Serial No.)	Contaminant	Efficiency	Range of Particles Size Collected (in microns) (If applicable)	Basis for Efficiency (Section V Item 5)
Dryer: Ducon venturi,	*PM, Fl*	*+95%*	*Submicron*	*Eng. Estimate*
cyclonic and cross-				
flow scrubbers				
Cooler: Ducon cross-	*PM, Fl*	*+95%*	*Submicron*	*Eng. Estimate*
flow scrubber				
Reactor, Granulator, Material Handling:	*PM, Fl*	*+95%*	*Submicron*	*Eng. Estimate*
Venturi, cyclonic, and cross-flow scrubbers				

E. Fuels

Type (Be Specific)	Consumption*		Maximum Heat Input (MMBTU/hr)
	avg/hr	max./hr	
Natural gas	*0.035*	*0.040 MMscf/hr*	*40.0*
No. 6 fuel oil	*—*	*266.7 gal/hr*	*40.0*

*Units: Natural Gas--MMCF/hr; Fuel Oils--gallons/hr; Coal, wood, refuse, others--lbs/hr.

Fuel Analysis: *Natural gas/fuel oil*

Percent Sulfur: *4 gr/scf; 2.4% S* Percent Ash: ________

Density: *Fuel Oil:* *8.2* lbs/gal Typical Percent Nitrogen: ________

Heat Capacity: *1,000 Btu/scf;* *18,293* BTU/lb *Fuel Oil:* *150,000* BTU/gal

Other Fuel Contaminants (which may cause air pollution): ________

F. If applicable, indicate the percent of fuel used for space heating.

Annual Average *N/A* Maximum ________

G. Indicate liquid or solid wastes generated and method of disposal.

Scrubber water returned to cooling pond or recycled

H. Emission Stack Geometry and Flow Characteristics (Provide data for each stack):

Stack Height: *140* ft. Stack Diameter: *10.92* ft.

Gas Flow Rate: *300,000* ACFM *238,000* DSCFM Gas Exit Temperature: *132* °F.

Water Vapor Content: *11* % Velocity: *53.4* FPS

SECTION IV: INCINERATOR INFORMATION

Not Applicable

Type of Waste	Type O (Plastics)	Type I (Rubbish)	Type II (Refuse)	Type III (Garbage)	Type IV (Pathological)	Type V (Liq. & Gas By-prod.)	Type VI (Solid By-prod.)
Actual lb/hr Incinerated							
Uncontrolled (lbs/hr)							

Description of Waste ______

Total Weight Incinerated (lbs/hr) ______ Design Capacity (lbs/hr) ______

Approximate Number of Hours of Operation per day ______ day/wk ______ wks/yr. ______

Manufacturer ______

Date Constructed ______ Model No. ______

	Volume (ft)^3	Heat Release (BTU/hr)	Fuel Type	Fuel BTU/hr	Temperature (°F)
Primary Chamber					
Secondary Chamber					

Stack Height: ______ ft. Stack Diameter: ______ Stack Temp. ______

Gas Flow Rate: ______ ACFM ______ DSCFM* Velocity: ______ FPS

*If 50 or more tons per day design capacity, submit the emissions rate in grains per standard cubic foot dry gas corrected to 50% excess air.

Type of pollution control devices: [ ] Cyclone [ ] Wet Scrubber [ ] Afterburner

[ ] Other (specify) ______

Brief description of operating characteristics of control devices: ____________

____

____

____

____

Ultimate disposal of any effluent other than that emitted from the stack (scrubber water, ash, etc.):

____

____

____

____

NOTE: Items 2, 3, 4, 6, 7, 8, and 10 in Section V must be included where applicable.

SECTION V: SUPPLEMENTAL REQUIREMENTS

Please provide the following supplements where required for this application.

1. Total process input rate and product weight -- show derivation [Rule 17-2.100(127)]

2. To a construction application, attach basis of emission estimate (e.g., design calculations, design drawings, pertinent manufacturer's test data, etc.) and attach proposed methods (e.g., FR Part 60 Methods, 1, 2, 3, 4, 5) to show proof of compliance with applicable standards. To an operation application, attach test results or methods used to show proof of compliance. Information provided when applying for an operation permit from a construction permit shall be indicative of the time at which the test was made.

3. Attach basis of potential discharge (e.g., emission factor, that is, AP42 test).

4. With construction permit application, include design details for all air pollution control systems (e.g., for baghouse include cloth to air ratio; for scrubber include cross-section sketch, design pressure drop, etc.)

5. With construction permit application, attach derivation of control device(s) efficiency. Include test or design data. Items 2, 3 and 5 should be consistent: actual emissions = potential (1-efficiency).

6. An 8 ½" x 11" flow diagram which will, without revealing trade secrets, identify the individual operations and/or processes. Indicate where raw materials enter, where solid and liquid waste exit, where gaseous emissions and/or airborne particles are evolved and where finished products are obtained.

7. An 8 ½" x 11" plot plan showing the location of the establishment, and points of airborne emissions, in relation to the surrounding area, residences and other permanent structures and roadways (Examples: Copy of relevant portion of USGS topographic map).

8. An 8 ½" x 11" plot plan of facility showing the location of manufacturing processes and outlets for airborne emissions. Relate all flows to the flow diagram.

9. The appropriate application fee in accordance with Rule 17-4.05. The check should be made payable to the Department of Environmental Regulation.

10. With an application for operation permit, attach a Certificate of Completion of Construction indicating that the source was constructed as shown in the construction permit.

SECTION VI: BEST AVAILABLE CONTROL TECHNOLOGY

See Attachment A

A. Are standards of performance for new stationary sources pursuant to 40 C.F.R. Part 60 applicable to the source?

[ ] Yes [ ] No

Contaminant	Rate or Concentration

B. Has EPA declared the best available control technology for this class of sources (If yes, attach copy)

[ ] Yes [ ] No

Contaminant	Rate or Concentration

C. What emission levels do you propose as best available control technology?

Contaminant	Rate or Concentration

D. Describe the existing control and treatment technology (if any).

1. Control Device/System:
2. Operating Principles:
3. Efficiency:*
4. Capital Costs:

*Explain method of determining

5. Useful Life:

6. Operating Costs:

7. Energy:

8. Maintenance Cost:

9. Emissions:

Contaminant	Rate or Concentration

10. Stack Parameters

a. Height: ft.

b. Diameter ft.

c. Flow Rate: ACFM

d. Temperature: °F.

e. Velocity: FPS

E. Describe the control and treatment technology available (As many types as applicable, use additional pages if necessary).

1.

a. Control Devices:

b. Operating Principles:

c. Efficiency:[1]

d. Capital Cost:

e. Useful Life:

f. Operating Cost:

g. Energy:[2]

h. Maintenance Cost:

i. Availability of construction materials and process chemicals:

j. Applicability to manufacturing processes:

k. Ability to construct with control device, install in available space, and operate within proposed levels:

2.

a. Control Device:

b. Operating Principles:

c. Efficiency:[1]

d. Capital Cost:

e. Useful Life:

f. Operating Cost:

g. Energy:[2]

h. Maintenance Cost:

i. Availability of construction materials and process chemicals:

[1]Explain method of determining efficiency.
[2]Energy to be reported in units of electrical power - KWH design rate.

j. Applicability to manufacturing processes:

k. Ability to construct with control device, install in available space, and operate within proposed levels:

3.

a. Control Device: b. Operating Principles:

c. Efficiency:[1] d. Capital Cost:

e. Useful Life: f. Operating Cost:

g. Energy:[2] h. Maintenance Cost:

i. Availability of construction materials and process chemicals:

j. Applicability to manufacturing processes:

k. Ability to construct with control device, install in available space, and operate within proposed levels:

4.

a. Control Device: b. Operating Principles:

c. Efficiency:[1] d. Capital Cost:

e. Useful Life: f. Operating Cost:

g. Energy:[2] h. Maintenance Cost:

i. Availability of construction materials and process chemicals:

j. Applicability to manufacturing processes:

k. Ability to construct with control device, install in available space, and operate within proposed levels:

F. Describe the control technology selected:

1. Control Device: 2. Efficiency:[1]

3. Capital Cost: 4. Useful Life:

5. Operating Cost: 6. Energy:[2]

7. Maintenance Cost: 8. Manufacturer:

9. Other locations where employed on similar processes:

a. (1) Company:

(2) Mailing Address:

(3) City: (4) State:

[1]Explain method of determining efficiency.
[2]Energy to be reported in units of electrical power - KWH design rate.

(5) Environmental Manager:

(6) Telephone No.:

(7) Emissions:[1]

Contaminant	Rate or Concentration

(8) Process Rate:[1]

b. (1) Company:

(2) Mailing Address:

(3) City: (4) State:

(5) Environmental Manager:

(6) Telephone No.:

(7) Emissions:[1]

Contaminant	Rate or Concentration

(8) Process Rate:[1]

10. Reason for selection and description of systems:

[1]Applicant must provide this information when available. Should this information not be available, applicant must state the reason(s) why.

SECTION VII - PREVENTION OF SIGNIFICANT DETERIORATION

See Attachment A

A. Company Monitored Data

1. __________ no. sites __________ TSP __________ ( ) SO2* __________ Wind spd/dir

Period of Monitoring _____/_____/_____ to _____/_____/_____
month day year month day year

Other data recorded ____________________

Attach all data or statistical summaries to this application.

*Specify bubbler (B) or continuous (C).

2. Instrumentation, Field and Laboratory

a. Was instrumentation EPA referenced or its equivalent? [ ] Yes [ ] No

b. Was instrumentation calibrated in accordance with Department procedures?

[ ] Yes [ ] No [ ] Unknown

B. Meteorological Data Used for Air Quality Modeling

1. ______ Year(s) of data from ______/____/______ to ______/____/______
month day year month day year

2. Surface data obtained from (location)______________________________

3. Upper air (mixing height) data obtained from (location) ______________________________

4. Stability wind rose (STAR) data obtained from (location) ______________________________

C. Computer Models Used

1. ______________________________ Modified? If yes, attach description.

2. ______________________________ Modified? If yes, attach description.

3. ______________________________ Modified? If yes, attach description.

4. ______________________________ Modified? If yes, attach description.

Attach copies of all final model runs showing input data, receptor locations, and principle output tables.

D. Applicants Maximum Allowable Emission Data

Pollutant	Emission Rate
TSP	______________________________ grams/sec
SO^2	______________________________ grams/sec

E. Emission Data Used in Modeling

Attach list of emission sources. Emission data required is source name, description of point source (on NEDS point number), UTM coordinates, stack data, allowable emissions, and normal operating time.

F. Attach all other information supportive to the PSD review.

G. Discuss the social and economic impact of the selected technology versus other applicable technologies (i.e, jobs, payroll, production, taxes, energy, etc.). Include assessment of the environmental impact of the sources.

H. Attach scientific, engineering, and technical material, reports, publications, journals, and other competent relevant information describing the theory and application of the requested best available control technology.

ATTACHMENT A

1.0 PROJECT DESCRIPTION

1.1 EXISTING PROCESS

Cargill Fertilizer, Inc., currently operates a phosphate fertilizer manufacturing facility located just west of Bartow, Florida, (see Figures 1-1 and 1-2). As part of the overall manufacturing process, the No. 4 Fertilizer Plant is operated under operating permit AO53-167639. Diammonium phosphate (DAP) is manufactured by reacting phosphoric acid (at approximately 46 percent P_2O_5) with ammonia and then granulating the resultant product (refer to flow diagram, Figure 1-3). The granulated material is then dried in a rotary dryer, screened, cooled, and sent to storage. Air pollution control equipment associated with the process is portrayed in Figure 1-4.

The maximum hourly DAP production rate is currently limited to 206.2 tons per hour (TPH) of DAP (99.0 TPH of 100 percent P_2O_5) by permit condition based on the December 14, 1991 stack test. This stack test was conducted at a production rate of 90.0 TPH of P_2O_5. The operating permit allows the tested rate to be exceeded by up to 10 percent without requiring a new stack test. If the permitted capacity is exceeded by more than 10 percent, a compliance test must be performed within 30 days of achieving the higher rate. The maximum annual DAP production rate is limited by specific condition to 1,300,000 tons per year (TPY). The current permitted rates for the No. 4 Fertilizer Plant are summarized in Table 1-1.

1.2 PROPOSED PROJECT

Cargill is proposing to increase the maximum production rate of the existing No. 4 Fertilizer Plant to a new maximum rate of 255.319 TPH of DAP (120.000 TPH of 100 percent P_2O_5 input). The maximum annual DAP production rate will be increased to 2,170,212 TPY of DAP (1,020,000 TPY of 100 percent P_2O_5), based on a maximum of 8,500 hr/yr of operation. No physical modifications to the process equipment will be associated with the higher production rates. All process and air pollution control equipment is already in place in the existing No. 4 Fertilizer Plant. The proposed maximum operating rates for the No. 4 Fertilizer Plant are summarized in Table 1-1.

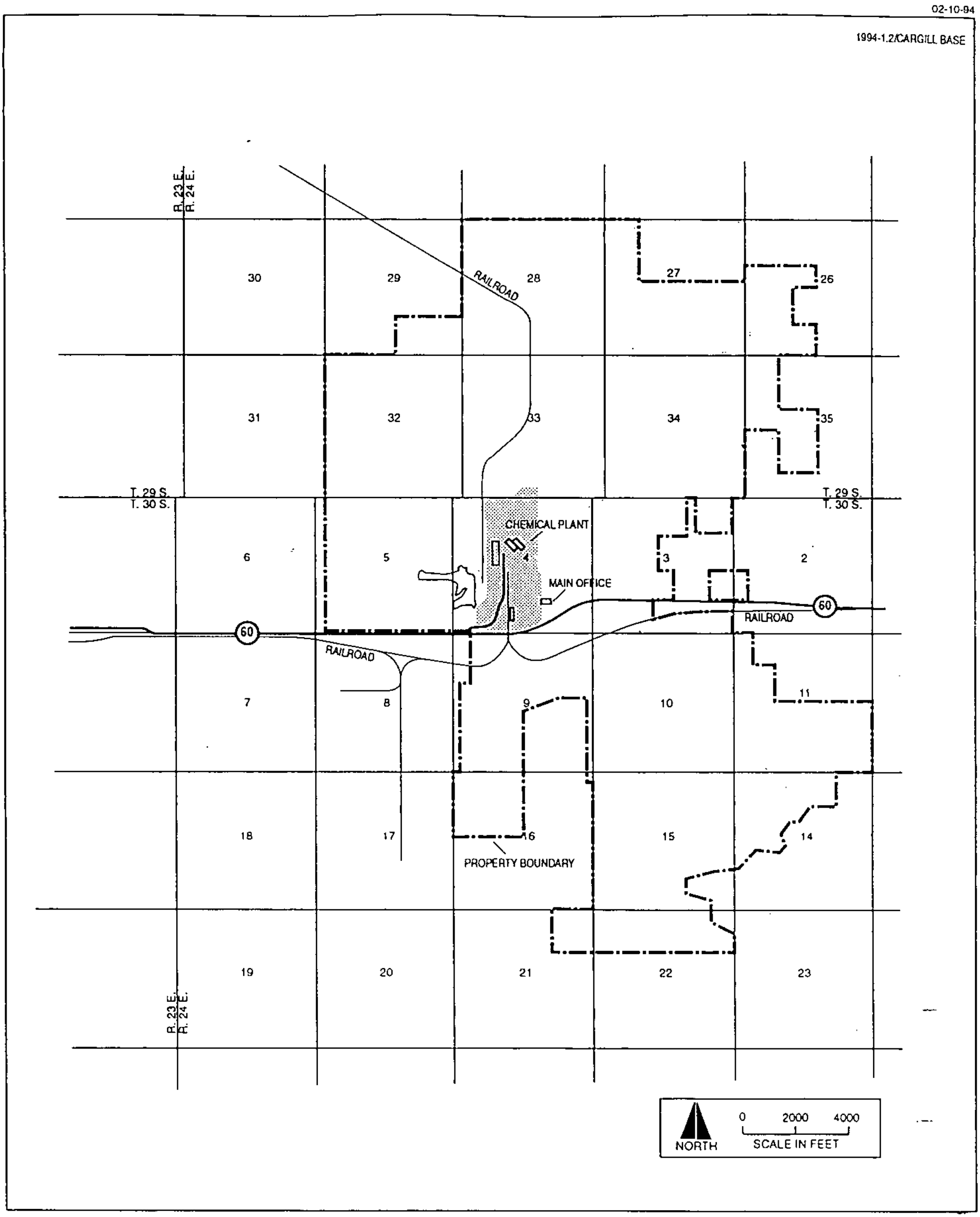

Figure 1-1
Location of Cargill Fertilizer's Bartow Plant

KBN

02-10-94

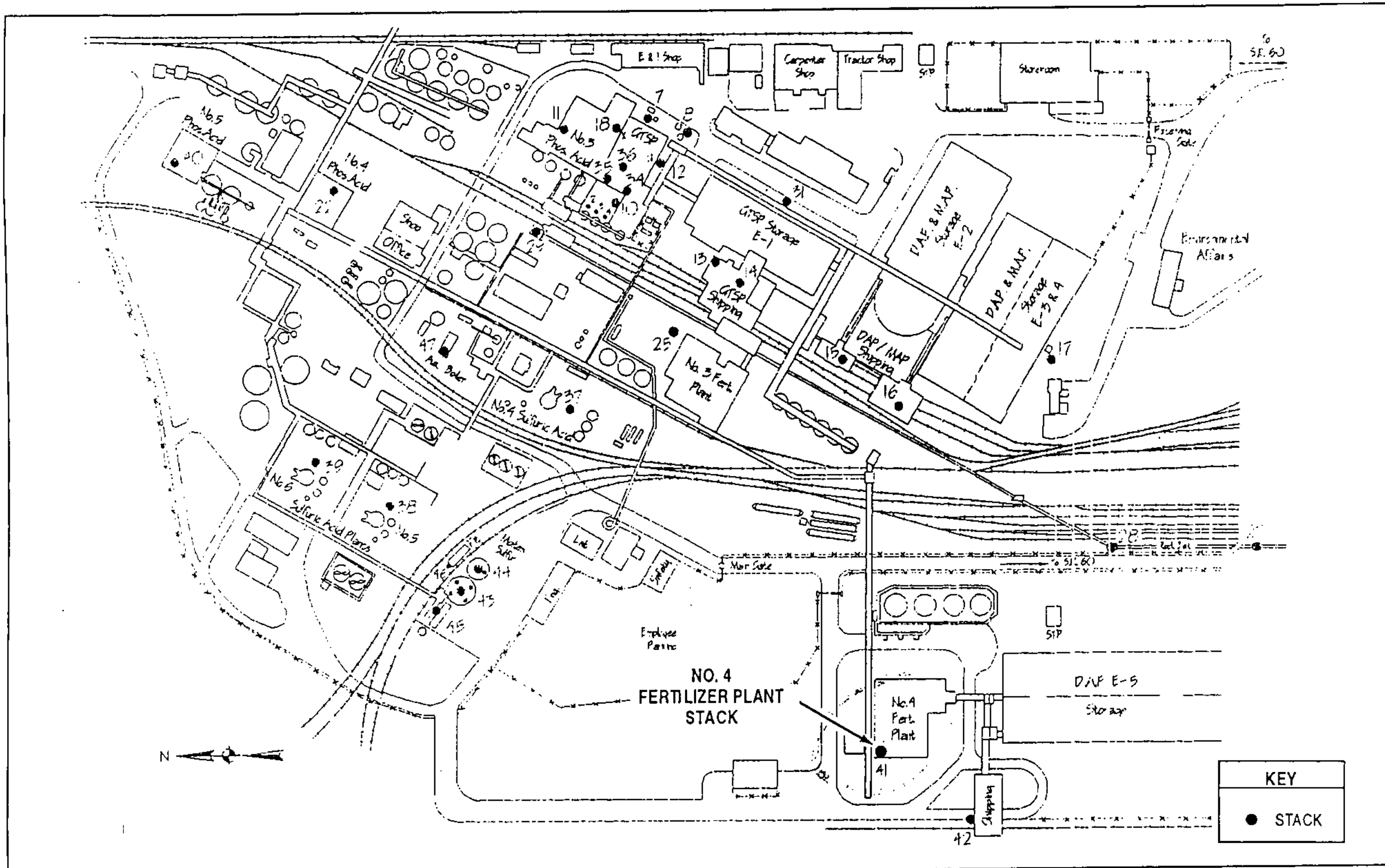

Figure 1-2
Plot of Cargill Fertilizer's Bartow Plant

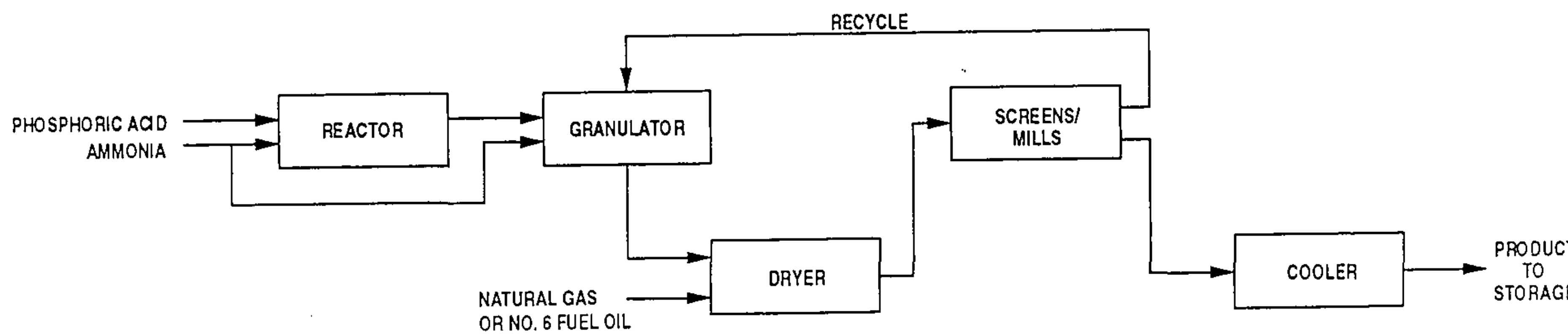

Figure 1-3 PROCESS FLOW DIAGRAM, NO. 4 FERTILIZER PLANT, CARGILL FERTILIZER BARTOW PLANT

KBN

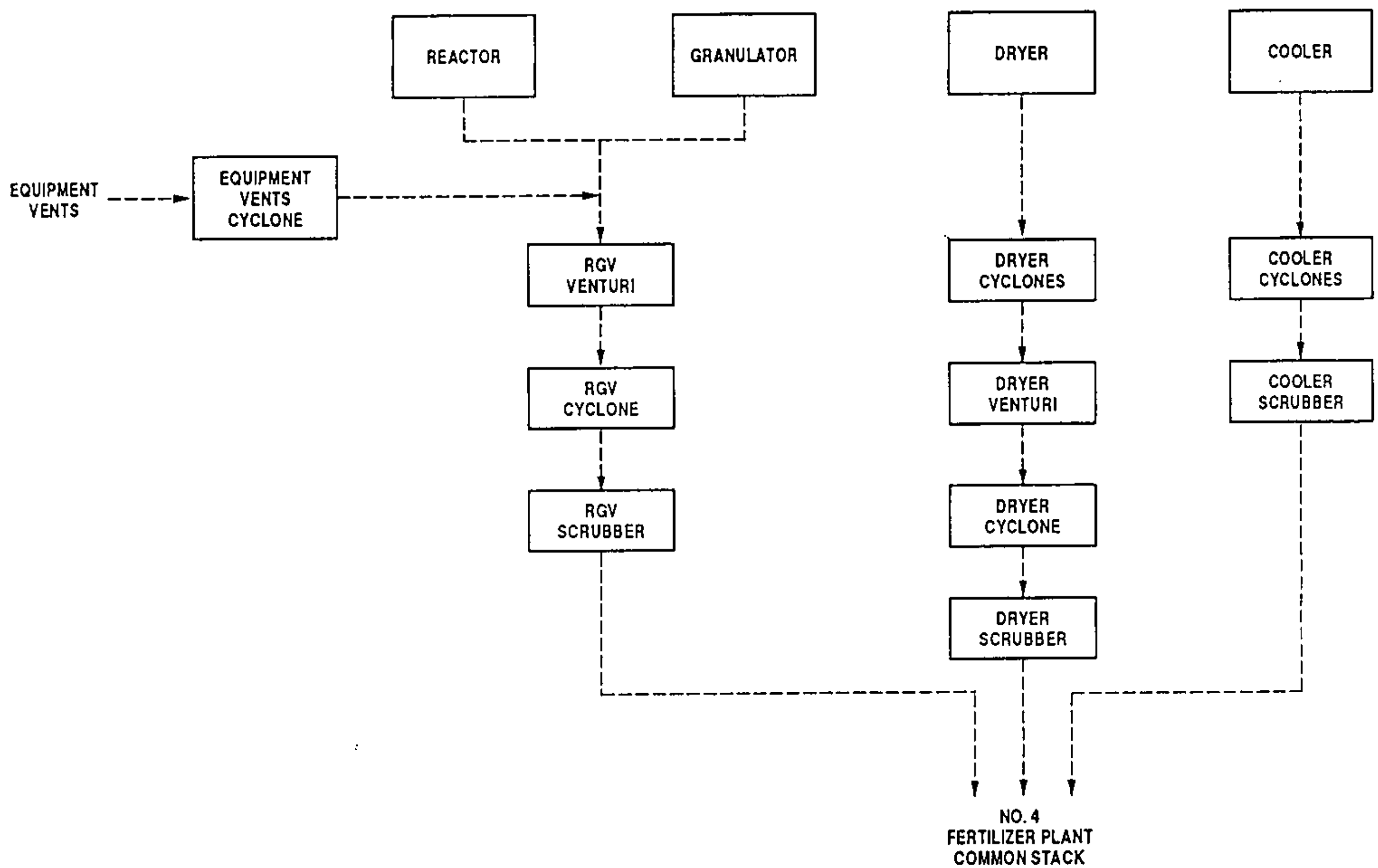

Figure 1-4 CONTROL EQUIIPMENT FOR NO. 4 FERTILIZER PLANT, CARGILL FERTILIZER BARTOW PLANT

KBN

Table 1-1. Comparison of Current and Proposed Maximum Permitted Rates, No. 4 Fertilizer Plant

Parameter	Current Permitted Rate[a]	Proposed Permitted or Maximum Rate
Hourly Production Rate	206.2 TPH DAP[a]	255.319 TPH DAP
	99.0 TPH 100% P_2O_5[a]	120.000 TPH 100% P_2O_5
Annual Production Rate	1,300,000 TPY DAP[a]	2,170,212 TPY DAP
Hours of Operation	8,760 hr/yr	8,500 hr/yr

[a] Basis: AO53-167639 and December 14, 1992, stack test (10% above rate during test).

1.3 EFFECT ON RELATED PROCESS EQUIPMENT

Other equipment that may be affected by the proposed No. 4 Fertilizer Plant production rate increase are described below. In each case, the effect upon the process unit is also described.

1. Wet Rock Handling--The usage of wet phosphate rock will increase proportionately to the increase in DAP production. However, there are no emissions associated with the handling of wet rock due to the wet nature of the rock.
2. No. 3 and No. 4 Phosphoric Acid Plants--The usage of phosphoric acid in the No. 4 Fertilizer Plant will increase in proportion to the increase in DAP production rate. The maximum DAP production rate is increasing by approximately 20 TPH of 100 percent P_2O_5 input over the current maximum hourly production rate of 99 TPH of P_2O_5. However, in 1993, the "X" and "Y" GTSP plants at Cargill were shut down. Each of these plants was permitted to produce 28 TPH of 100 percent P_2O_5, or a total of 56 TPH of 100 percent P_2O_5. As a result of these shutdowns, overall phosphoric acid production at the Cargill facility will not increase.
3. DAP Shipping--Cargill recently submitted a permit application to increase the production rate for the No. 4 DAP product shipping unit. The requested process rate for the shipping unit is 660 TPH and 1,750,00 TPY of DAP. The baseline and maximum future particulate matter (PM) emissions for this change are considered in the PSD source applicability analysis presented in Section 3.0. The 1,750,000 TPY loading rate will not be exceeded in the future without obtaining a further permit revision.

1.4 EMISSION ESTIMATES

1.4.1 Particulate Matter

The current permitted level of PM emissions for the No. 4 Fertilizer Plant is 0.5 pound per ton of P_2O_5 input, 29.9 lb/hr, and 98.0 TPY. At the proposed higher production rate of 255.319 TPH of DAP (120.0 TPH of 100 percent P_2O_5 input) and 2,170,212 TPY of DAP (1,020,000 TPY of 100 percent P_2O_5 at 47 percent P_2O_5 content), Cargill is proposing allowable emissions of 0.5 lb/ton P_2O_5 input, not to exceed 32.0 lb/hr and 136.0 TPY. The current and proposed rates are shown in Table 1-2.

Table 1-2. Comparison of Current and Proposed Maximum Permitted Emission Rates, No. 4 Fertilizer Plant

Pollutant	Current Permitted or Maximum[a]			Proposed Permitted or Maximum		
	lb/ton P_2O_5 Input	lb/hr	TPY	lb/ton P_2O_5 Input	lb/hr	TPY
Particulate Matter	0.5	29.9	98.0	0.5	32.0	136.0
Fluorides	0.06	3.6	11.8	0.06	5.5	23.38
Sulfur Dioxide	0.7	41.9	122.5	—	100.5	37.8
Nitrogen Oxides	—	14.7	64.4	—	14.7	27.2
Carbon Monoxide	—	1.40	6.1	—	1.40	6.0
Volatile Organic Compounds	—	0.34	1.5	—	0.34	0.6

[a] Basis: AO53-167639 and AP-42 emission factors.

1.4.2 Fluorides

The current allowable fluoride emission limit for the No. 4 Fertilizer Plant is 0.06 lb/ton P_2O_5 input, 3.6 lb/hr, and 11.8 TPY. At the proposed higher production rate, Cargill is proposing allowable fluoride emissions of 0.06 lb/ton P_2O_5 input, not to exceed 5.50 lb/hr, and 23.38 TPY. The current and proposed rates are shown in Table 1-2.

1.4.3 Emissions Due To Fuel Burning

Products of combustion are generated from natural-gas and fuel oil burning used to supply heat to the process dryer. The maximum heat input to the dryer is 40×10^6 British thermal units per hour (MMBtu/hr), resulting in a maximum natural gas consumption of 40,000 standard cubic feet per hour (scfh) and a maximum No. 6 fuel oil consumption of 266.7 gal/hr. No. 6 fuel oil will be used as a backup fuel, and consumption will be limited to no more than 200,000 gal/yr. Emissions of sulfur dioxide (SO_2), nitrogen oxides (NO_x), carbon monoxide (CO), and volatile organic compounds (VOCs) are based on AP-42 emission factors (see Appendix A):

Natural Gas

SO_2: 40,000 scfh x 0.6 lb/10^6 scf = 0.024 lb/hr

0.024 lb/hr x 8,500 hr/yr ÷ 2,000 lb/ton = 0.10 TPY

NO_x: 40,000 scfh x 140 lb/10^6 scf = 5.60 lb/hr

5.60 lb/hr x 8,500 hr/yr ÷ 2,000 lb/ton = 23.8 TPY

CO: 40,000 scfh x 35 lb/10^6 scf = 1.40 lb/hr

1.40 lb/hr x 8,500 hr/yr ÷ 2,000 lb/ton = 6.0 TPY

VOC: 40,000 scfh x 2.8 lb/10^6 scf = 0.11 lb/hr

0.11 lb/hr x 8,500 hr/yr ÷ 2,000 lb/ton = 0.47 TPY

No. 6 Fuel Oil

SO_2: 266.7 gal/hr x (157 x 2.4) lb/1000 gal = 100.5 lb/hr

Maximum annual fuel oil consumption will be limited to 200,000 gal/yr. This is equivalent to 750 hr/yr at the maximum fuel oil consumption rate of 266.7 gal/hr.

100.5 lb/hr x 750 hr/yr ÷ 2,000 lb/ton = 37.7 TPY

NO_x: 266.7 gal/hr x 55 lb/1000 gal = 14.7 lb/hr

14.7 lb/hr x 750 hr/yr ÷ 2,000 lb/ton = 5.5 TPY

CO: 266.7 gal/hr x 5 lb/1000 gal = 1.33 lb/hr

1.33 lb/hr x 750 hr/yr ÷ 2,000 lb/ton = 0.50 TPY

VOC: 266.7 gal/hr x 1.28 lb/1000 gal = 0.34 lb/hr

0.34 x 750 hr/yr ÷ 2,000 lb/ton = 0.13 TPY

Maximum Annual Emissions

SO_2: [(100.5 lb/hr x 750 hr/yr)+(0.024 lb/hr x 7,750 hr/yr)] ÷ 2,000 lb/ton = 37.8 TPY

NO_x: [(14.7 lb/hr x 750 hr/yr)+(5.6 lb/hr x 7,750 hr/yr)] ÷ 2,000 lb/ton = 27.2 TPY

CO: 1.40 lb/hr x 8,500 hr/yr ÷ 2,000 lb/ton = 6.0 TPY

VOC: [(0.34 lb/hr x 750 hr/yr)+(0.11 lb/hr x 7,750 hr/yr)] ÷ 2,000 lb/ton = 0.55 TPY

2.0 REGULATORY APPLICABILITY

2.1 EMISSION LIMITING STANDARDS

Federal New Source Performance Standards (NSPS) for phosphate fertilizer plants, 40 CFR 60, Subpart V, Diammonium Phosphate plants, limits emissions of fluorides from the No. 4 Fertilizer Plant. The NSPS is 0.06 lb/ton of equivalent P_2O_5 feed to the process. The proposed limit for the No. 4 Fertilizer Plant after the proposed modification is 0.06 lb/ton P_2O_5, not to exceed 5.5 lb/hr. At the proposed maximum production rate of 120.00 TPH P_2O_5, the lb/hr emission rate is equivalent to 0.046 lb/ton P_2O_5. Therefore, the proposed allowable emission rate complies with the NSPS.

PM emissions from the No. 4 Fertilizer Plant currently are limited to 29.0 lb/hr and 0.5 lb/ton P_2O_5 input. These limits were set based on the previous permit issued in 1989. The modified No. 4 Fertilizer Plant will be limited to 32.0 lb/hr and 0.5 lb/ton P_2O_5.

2.2 NEW SOURCE REVIEW APPLICABILITY

The Cargill Bartow phosphate fertilizer plant is located in an area designated as attainment for all pollutants. Therefore, new source review for prevention of significant deterioration (PSD) would apply to the modification if an increase in emissions greater than the significant emission rate for any pollutant would occur as a result of the modification. Significant emission rates are defined in Table 500-2 of Rule 17-2.500, Florida Administrative Code (F.A.C.). Also considered in determining the net increase in emissions are any contemporaneous increases or decreases in emissions occurring at the facility.

Contemporaneous emission decreases at the facility consist of the shutdown of the "X" and "Y" GTSP plants. These shutdowns and associated reduction in emissions were previously quantified by Cargill (reference Attachment B). Contemporaneous increases consist of an increase in emissions for the No. 4 DAP Loading Unit (reference Attachment B).

The current baseline emissions must be established to determine if a net significant net increase will occur. The baseline emissions for the No. 4 Fertilizer Plant are listed in Table 2-1. These are based on the Annual Operating Report submitted to FDEP for 1992 and 1993 operating data.

Table 2-1. Current Baseline Emissions - No. 4 Fertilizer Plant

Pollutant	1992	1993	Average
Particulate Matter	47.6	59.2	53.4
Fluorides	4.83	10.12	7.48
Sulfur Dioxide	0.04	0.04	0.04
Nitrogen Oxides	9.9	9.5	9.7
Carbon Monoxide	2.5	2.4	2.4
Volatile Organic Compounds	0.41	0.40	0.40

Basis: Annual Operating Reports Submitted to FDEP.

The total net change in emissions is determined by taking the future maximum emissions, in TPY, minus the baseline emissions, plus previous contemporaneous increases in emissions, and minus previous contemporaneous decreases in emissions. This calculation is shown in Table 2-2. The net change in PM emissions as a result of the proposed modification is 62.9 TPY, which is above the PSD significant emission rate of 15 TPY. As a result, new source review applies for PM.

The net change in fluoride emissions is 2.3 TPY because of previous reductions in fluoride emissions; therefore, fluoride is not subject to new source review. Similarly, the net increase in emissions for each of the other pollutants is below the respective PSD significant emission rate level. As a result, PSD review does not apply to these pollutants.

Table 2-2. PSD Source Applicability Analysis, No. 4 Fertilizer Plant Expansion

Pollutant	A Baseline Average 1991-1992 (TPY)	B Proposed No. 4 Fertilizer Plant Emissions (TPY)	C Previous Contemporaneous Decreases (TPY)	D Previous Contemporaneous Increases (TPY)	Net Change (B-A-C+D) (TPY)	PSD Significant Emissions (TPY)
Particulate Matter	53.4	136.0	49.4	29.7[a]	62.9	15
Fluorides	7.5	23.4	13.6	—	2.3	3
Sulfur Dioxide	0.04	37.8	—	—	37.8	40
Nitrogen Oxides	9.7	27.2	12.3	—	5.2	40
Carbon Monoxide	2.4	6.0	—	—	3.6	100
Volatile Organic Compounds	0.40	0.6	0.05	—	0.2	40

[a] Associated with No. 4 DAP Loading Unit. Baseline (1991-1992) emissions were 5.1 TPY; proposed future emissions are 34.8 TPY.

3.0 NEW SOURCE REVIEW FOR PARTICULATE MATTER

3.1 REQUIREMENTS

Under PSD new source review requirements, a proposed modification that results in a significant net emissions increase must undergo the following reviews:

1. Best Available Control Technology (BACT) evaluation,
2. Air quality impact analysis,
3. Ambient monitoring analysis, and
4. Additional impact analysis.

These requirements are addressed in the following sections.

3.2 BACT ANALYSIS FOR PARTICULATE MATTER EMISSIONS

The No. 4 Fertilizer Plant is an existing plant that uses cyclones and wet scrubbers to control PM emissions. Wet scrubbers typically are used in DAP plants throughout Florida where water is readily available from process ponds, and where fluoride control also is required to meet Florida or NSPS emission standards. Although dry PM controls (i.e., fabric filters) could be employed, these would not control fluoride, and an additional wet scrubbing system would have to be added.

A review was conducted of prior BACT/LAER determinations made for PM emissions from DAP plants. Three determinations were found and are summarized below.

Agrico Chemical	1/21/81	PSD-FL-061	0.50 lb/ton DAP	Scrubber	BACT
Chevron USA (WY)	6/13/84	CT-550	0.0180 gr/acf	Scrubber	BACT
W.R. Grace	7/1/80	C53-24460	0.50 lb/ton P_2O_5	Scrubber	BACT
Cargill (Tampa)	11/26/91	PSD-FL-178	0.19 lb/ton P_2O_5	Scrubber	BACT

All four determinations employed wet venturi scrubbers. In the case of W.R. Grace (now Cargill Fertilizer-Bartow), initially BACT was required and was determined to be 0.5 lb/ton P_2O_5. Subsequently, the company amended the permit to include PM offsets, and PSD for PM was no longer required, but the 0.5 lb/ton limit was retained.

Cargill's proposed PM emission rate of 0.5 lb/ton P_2O_5, not to exceed 32.0 lb/hr, is consistent with these previously determined BACT levels, considering the existing emission-control equipment. Cargill's proposed maximum PM emission rate of 32.0 lb/hr is equivalent to

0.27 lb/ton P_2O_5 and 0.0131 gr/acf at the maximum production rate of 120 TPH P_2O_5. These PM levels are well below those previously determined as BACT.

As shown in Figure 1-4, the No. 4 Fertilizer Plant already has in place extensive PM control equipment. This includes a venturi scrubber, cyclone collector, and cross-flow scrubber for the reactor/granulator/vents gas stream; several cyclones, a venturi scrubber, and a cross-flow scrubber for the dryer gas stream; and cyclone collectors and a cross-flow scrubber for the cooler gas stream.

Actual historic PM emissions from Cargill's No. 4 Fertilizer Plant have ranged up to 22.5 lb/hr at production rates of 90 TPH P_2O_5 (refer to Table 3-1). This would equate to approximately 0.25 lb/ton P_2O_5. The requested PM emissions are slightly higher than presently permitted. Considering those aspects and an adequate margin of safety to consistently demonstrate compliance, Cargill's proposed limit of 0.5 lb/ton P_2O_5, not to exceed 32.0 lb/hr, achieved by the existing wet scrubbing system, is considered as BACT.

3.3 AIR QUALITY IMPACT ANALYSIS FOR PARTICULATE MATTER

3.3.1 General Modeling Approach

Significant Impact Analysis--The general modeling approach followed EPA and FDEP modeling guidelines for determining compliance with AAQS and PSD increments. For all criteria pollutants that are emitted in excess of the PSD significant emission rate due to a proposed project, a significant impact analysis is performed to determine whether the emission increase(s) alone will result in predicted impacts in excess of the EPA/FDER significant impact levels. If the project's impacts are above the significant impact levels, then a more detailed modeling analysis is performed. Current FDEP policies stipulate that the highest annual average and highest short-term (i.e., 24 hours or less) concentrations are to be compared to the applicable significant impact levels.

AAQS/PSD Modeling Analysis--For all pollutants that have a significant impact, a full impact analysis is required. In general, when 5 years of meteorological data are used, the highest annual and the highest, second-highest (HSH) short-term concentrations are to be compared to the applicable AAQS and allowable PSD increments. The HSH is calculated for a receptor field by:

1. Eliminating the highest concentration predicted at each receptor,

Table 3-1. Stack Test Results From Bartow No. 4 Fertilizer Plant, Cargill Fertilizer

Test Date	Run	Production Rate (tons P_2O_5/hr)	Fluoride Emissions (lb/hr)	Fluoride Emissions (lb/ton P_2O_5)	Particulate Emissions (lb/hr)	Particulate Emissions (lb/ton P_2O_5)
01/06/90	1	82.7	1.67	0.020	3.70	0.04
	2	82.6	3.41	0.041	6.43	0.08
	3	82.3	1.14	0.014	0.95	0.01
	Avg.	82.5	2.07	0.025	3.69	0.04
01/23/90	1	70.7	3.10	0.044		
	2	71.2	4.67	0.066		
	3	70.8	2.06	0.029		
	Avg.	70.9	3.28	0.046		
10/05/90	1	74.0	0.53	0.007	1.65	0.02
	2	71.9	0.51	0.007	1.36	0.02
	3	77.1	0.32	0.004	2.03	0.03
	Avg.	74.3	0.45	0.006	1.68	0.02
03/07/91	1	88.2	1.25	0.014	7.91	0.09
	2	88.2	0.67	0.008	5.62	0.06
	3	86.0	2.31	0.027	4.91	0.06
	Avg.	87.5	1.41	0.016	6.15	0.07
12/14/91	1	90.4	2.20	0.024	21.35	0.24
	2	90.0	0.78	0.009	25.36	0.28
	3	89.5	0.87	0.010	20.67	0.23
	Avg.	90.0	1.28	0.014	22.46	0.25
01/14/92	1	83.7	0.95	0.011	8.51	0.10
	2	83.7	0.64	0.008	9.31	0.11
	Avg.	83.7	0.80	0.009	8.91	0.11
05/02/92	1	74.0	3.07	0.041	20.15	0.27
	2	73.8	1.34	0.018	12.21	0.17
	3	75.4	1.21	0.016	15.73	0.21
	Avg.	74.4	1.87	0.025	16.03	0.22
12/04/92	1	85.2	0.44	0.005	7.21	0.08
	2	80.0	0.32	0.004	8.93	0.11
	3	82.5	0.71	0.009	9.72	0.12
	Avg.	82.6	0.49	0.006	8.62	0.10
01/06/93	1	86.6	1.22	0.014	14.60	0.17
	2	86.4	1.80	0.021	17.76	0.21
	3	86.4	2.66	0.031	16.09	0.19
	Avg.	86.5	1.89	0.022	16.15	0.19
08/11/93	1	87.2	3.08	0.035	22.10	0.25
	2	87.2	3.16	0.036	10.90	0.13
	3	87.2	3.90	0.045	11.20	0.13
	Avg.	87.2	3.38	0.039	14.73	0.17

2. Identifying the second-highest concentration at each receptor, and
3. Selecting the highest concentration among these second-highest concentrations.

This approach is consistent with air quality standards and allowable PSD increments, which permit a short-term average concentration to be exceeded once per year at each receptor.

Screening and Refinement Phases

To develop the maximum short-term concentrations for the proposed project, the modeling approach was divided into screening and refined phases to reduce the computation time required to perform the modeling analysis. For this study, the only difference between the two phases is the density of the receptor grid spacing employed when predicting concentrations. Concentrations are predicted for the screening phase using a coarse receptor grid and a 5-year meteorological data record.

Refinements of the maximum predicted concentrations are typically performed for the receptors of the screening receptor grid at which the highest and/or HSH concentrations occurred over the 5-year period. Generally, if the maximum concentration from other years in the screening analysis are within 10 percent of the overall maximum concentration, those other concentrations are refined as well. Typically, if the highest and HSH concentrations are in different locations, concentrations in both areas are refined.

Modeling refinements are performed for short-term averaging times by using a denser receptor grid, centered on the screening receptor to be refined. The angular spacing between radials is 2 degrees and the radial distance interval between receptors is 100 m. Annual modeling refinements employ an angular spacing between radials of 2 degrees and a distance interval from 100 to 300 m, depending on the concentration gradient in the vicinity of the screening receptor to be refined. If the maximum screening concentration is located on the plant property boundary, additional plant boundary receptors are input, spaced at a 2 degree angular interval and centered on the screening receptor. The domain of the refinement grid typically extends to all adjacent screening receptors. The air dispersion model is then executed with the refined grid for the entire year of meteorology during which the screening concentration occurred. This approach is used to ensure that a valid HSH concentration is obtained. A more detailed description of the model used, along with the emission inventory, meteorological data, and screening receptor grids used in the analysis, are presented in the following sections.

Model Selection--The selection of an appropriate air dispersion model was based on the model's ability to simulate impacts in areas surrounding the Cargill site. Within 50 km of the site, the terrain can be described as simple, i.e., flat to gently rolling. As defined in EPA modeling guidelines, simple terrain is considered to be an area where the terrain features are all lower in elevation than the top of the stack(s) under evaluation. Therefore, a simple terrain model was selected to predict maximum ground-level concentrations.

The Industrial Source Complex Short-term (ISCST2, Version 92062) dispersion model (EPA, 1992b) was used to evaluate the pollutant emissions from the proposed facility. This model is contained in EPA's User's Network for Applied Modeling of Air Pollution (UNAMAP), Version 6 (EPA, 1988b). The ISCST2 model is applicable to sources located in either flat or rolling terrain where terrain heights do not exceed stack heights. The ISCST2 model is designed to calculate hourly concentrations based on hourly meteorological parameters (i.e., wind direction, wind speed, atmospheric stability, ambient temperature, and mixing heights). The hourly concentrations are processed into non-overlapping, short-term and annual averaging periods. For example, a 24-hour average concentration is based on 24 1-hour averages calculated from midnight to midnight of each day. For each short-term averaging period selected, the highest and second-highest average concentrations are calculated for each receptor. As an option, a table of the 50 highest concentrations over the entire field of receptors can be produced.

Major features of the ISCST2 model are presented in Table 3-2. The ISCST2 model has both rural and urban mode options which affect the wind speed profile exponent law, dispersion rates, and mixing-height formulations used in calculating ground level concentrations. The criteria used to determine when the rural or urban mode is appropriate are based on land use near the source's surroundings (Auer, 1978). If the land use is classified as heavy industrial, light-moderate industrial, commercial, or compact residential for more than 50 percent of the area within a 3-km radius circle centered on the site location, the urban option should be selected. Otherwise, the rural option is more appropriate. For the Cargill Bartow facility, the rural option was selected due to the lack of industrial development within 3 km of the plant.

Table 3-2. Major Features of the ISCST2 Model

ISCST2 Model Features
• Polar or Cartesian coordinate systems for receptor locations
• Rural or one of three urban options which affect wind speed profile exponent, dispersion rates, and mixing height calculations
• Plume rise due to momentum and buoyancy as a function of downwind distance for stack emissions (Briggs, 1969, 1971, 1973, and 1975)
• Procedures suggested by Huber and Snyder (1976) and Huber (1977) for evaluating building wake effects
• Procedures suggested by Briggs (1974) for evaluating stack-tip downwash
• Separation of multiple point sources
• Consideration of the effects of gravitational settling and dry deposition on ambient particulate concentrations
• Capability of simulating point, line, volume and area sources
• Capability to calculate dry deposition
• Variation of wind speed with height (wind speed-profile exponent law)
• Concentration estimates for 1-hour to annual average times
• Terrain-adjustment procedures for elevated terrain including a terrain truncation algorithm
• Consideration of time-dependent exponential decay of pollutants
• The method of Pasquill (1976) to account for buoyancy-induced dispersion
• A regulatory default option to set various model options and parameters to EPA recommended values (see text for regulatory options used)
• Procedure for calm-wind processing
• Wind speeds less than 1 m/s are set to 1 m/s.

Note: ISCST2 = Industrial Source Complex Short-Term.

Source: EPA, 1992b.

In this analysis, the EPA regulatory default options were used to predict all maximum impacts. The regulatory default options include:

1. Final plume rise at all receptor locations,
2. Stack-tip downwash,
3. Buoyancy-induced dispersion,
4. Default wind speed profile coefficients for rural or urban option,
5. Default vertical potential temperature gradients,
6. Calm wind processing, and
7. Reducing calculated SO_2 concentrations in urban areas by using a decay half-life of 4 hours.

Meteorological Data--Meteorological data used in the ISCST2 model to determine air quality impacts consisted of a concurrent 5-year period of hourly surface weather observations and twice-daily upper air soundings from the National Weather Service (NWS) stations at Tampa International Airport and Ruskin, respectively. The 5-year period of meteorological data was from 1982 through 1986. The NWS station at Tampa International Airport, located approximately 70 km to the west of the Cargill plant site, was selected for use in the study because it is the closest primary weather station to the study area which is representative of the plant site. The surface observations included wind direction, wind speed, temperature, cloud cover, and cloud ceiling.

The wind speed, cloud cover, and cloud ceiling values were used in the ISCST2 meteorological preprocessor program, RAMMET, to determine atmospheric stability using the Turner stability scheme. Based on the temperature measurements at morning and afternoon, mixing heights were calculated with the radiosonde data using the Holzworth approach (1972). Hourly mixing heights were derived from the morning and afternoon mixing heights using the interpolation method developed by EPA (Holzworth, 1972). The hourly surface data and mixing heights were used to develop a sequential series of hourly meteorological data (i.e., wind direction, wind speed, temperature, stability, and mixing heights). Because the observed hourly wind directions were classified into one of 36 10-degree sectors, the wind directions were randomized within each sector to account for the expected variability in air flow.

3.3.2 Cargill Emission Inventory

The Cargill PM emission data for the No. 4 Fertilizer Plant is presented in Table 3-3. Stack data were obtained from current operating permits and stack test data. Current PM emission rates and operating parameters for the No. 4 Fertilizer Plant were derived from the compliance test results representing the highest short-term production and emission rate over the last 2 years. Future operating conditions are based on a maximum production rate of 120 TPH P_2O_5 and a maximum of 32.0 lb/hr of PM emitted.

In order to determine the PM significant impact area, the current and future operating conditions of the No. 4 Fertilizer Plant were modeled to determine the net air quality change due to the proposed production rate increase.

Modeling of the existing and future PM emissions from the No. 4 Fertilizer Plant demonstrated that the proposed production rate increase would not have a significant impact within a distance of 10 km from the Cargill facility. Therefore, a full impact analysis for PM is not required.

3.3.3 Receptor Locations

Significant Impact Analysis--To determine the PM significant impact area, concentrations were predicted for a total of 432 receptors located in a radial grid centered on No. 4 Fertilizer Plant stack. Two hundred sixteen regular grid receptors were located in "rings" with 36 receptors per ring, spaced at 10° intervals and at distances of 5, 6, 7, 8, 9, and 10 km from the No. 4 Fertilizer Plant stack location. In addition, 216 discrete receptors were placed at 10° intervals along the plant property boundary and beyond at distances of 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, and 4.5 km (see Table 3-4).

Class I Impact Assessment--The Chassahowitzka National Wilderness Area (NWA) is a PSD Class I Area and is located approximately 105 km north-northwest of the Cargill site. Maximum PM impacts for the Chassahowitzka NWA were predicted at 13 discrete receptors located along the border of the Class I area. Impacts for the proposed modification only were compared to the Class I significance levels recommended by the National Park Service (NPS). A listing of Class I receptors is provided in Table 3-5.

Table 3-3. Summary of Cargill Source Parameters Used for the Modeling Analysis

Sources	PM Emissions (lb/hr)	PM Emissions (g/s)	Stack Height (m)	Stack Diameter (m)	Exit Gas Velocity (m/s)	Exit Gas Temperature (K)
No. 4 Fertilizer Plant (current)[a]	22.5	2.835	42.67	3.33	10.79	322
No. 4 Fertilizer Plant (future)[b]	32.0	4.03	42.67	3.33	16.28	329

Note: F = fluoride.
g/s = grams per second.
K = Kelvin.
lb = pound.
m = meter.
m/s = meters per second.
NA = not applicable for modeling purposes.
PM = particulate matter.
TPH = tons per hour.

[a] Emissions and stack operating data based on December 14, 1991, stack test.
[b] Velocity based on 120 TPH P_2O_5 production rate.

Source: KBN, 1994.

Table 3-4. Cargill Property Boundary Receptors Used in the Modeling Analysis

Direction (deg)	Distance (m)	Direction (deg)	Distance (m)
10	3,760	190	1,158
20	3,941	200	1,212
30	3,344	210	1,313
40	3,780	220	1,481
50	4,789	230	1,761
60	3,789	240	2,256
70	3,065	250	2,092
80	2,213	260	1,996
90	1,951	270	1,966
100	1,981	280	1,996
110	2,100	290	2,092
120	1,460	300	2,270
130	1,265	310	2,566
140	1,179	320	2,706
150	1,137	330	2,393
160	1,131	340	2,627
170	1,160	350	2,507
180	1,142	360	3,703

Note: Distances are relative to No. 4 Fertilizer Plant stack location. Additional off-property receptors were placed at distances of 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, and 4.5 km for each 10 degree direction, as applicable.

deg = degree.
m = meter.

Table 3-5. Chassahowitzka Wilderness Area Receptors Used in the Modeling Analysis

UTM Coordinates	
East (km)	North (km)
340.3	3,165.7
340.3	3,167.7
340.3	3,169.8
340.7	3,171.9
342.0	3,174.0
343.0	3,176.2
343.7	3,178.3
342.4	3,180.6
341.1	3,183.4
339.0	3,183.4
336.5	3,183.4
334.0	3,183.4
331.5	3,183.4

Note: UTM coordinates of Cargill Bartow No. 4 Fertilizer Plant: 409.5 km E, 3086.8 km N.

3.3.4 Building Downwash Effects

The procedures used for addressing the effects of building downwash are those recommended in the ISC Dispersion Model User's Guide. The building height, length, and width are input to the model, which uses these parameters to modify the dispersion parameters. For short stacks (i.e., physical stack height is less than H_b + 0.5 L_b, where H_b is the building height and L_b is the lesser of the building height or projected width), the Schulman and Scire (1980) method is used. If this method is used, then direction-specific building dimensions are input for H_b and L_b for 36 radial directions, with each direction representing a 10 degree sector. The features of the Schulman and Scire method are as follows:

1. Reduced plume rise as a result of initial plume dilution,
2. Enhanced plume spread as a linear function of the effective plume height, and
3. Specification of building dimensions as a function of wind direction.

For cases where the physical stack is greater than H_b + 0.5 L_b but less than GEP, the Huber-Snyder (1976) method is used. For both downwash methods, the ISCST model uses direction-specific building dimensions for H_b and L_b for 36 radial directions, with each direction representing a 10-degree sector.

The building dimensions for the No. 4 Fertilizer Plant considered in the modeling analysis are presented in Table 3-6. Although other building structures were considered, the No. 4 Fertilizer Plant stack is influenced exclusively by the No. 4 Fertilizer Plant building.

3.3.5 Model Results

Significant Impact Analysis--A summary of the maximum PM concentrations predicted for the proposed modification only in the screening analysis is presented in Table 3-7. These results indicate the proposed increase in PM emissions from the No. 4 Fertilizer Plant will result in low ambient impacts and are less than the significant impact levels. The maximum annual and 24-hour concentrations for the averaging period are 0.11 and 2.74 $\mu g/m^3$, which are less than the significance levels of 1 and 5 $\mu g/m^3$, respectively. Because the proposed increase in PM emissions results in ambient concentrations less than the significant impact levels, a full impact analysis for PM is not required.

Table 3-6. Building Dimensions Used in the Modeling Analysis for Cargill Sources

		Associated Building(s)				Dominant Building	
Source	Area of Influence (degrees)	Building Description	Building Height (feet)	Building Length (feet)	Building Width (feet)	Height (feet)	Length & Width[a] (feet)
No. 4 Fertilizer Plant	10-360	No. 4 Fertilizer Plant building	140	185	167	140	216

[a] Calculated to result in model simulation of projected crosswind width.

Source: KBN, 1994.

Table 3-7. Maximum Predicted PM Concentrations for the Proposed Project Only - Screening and Refinement Analysis

Averaging Time	Concentration ($\mu g/m^3$)	Receptor Location[a] Direction (degrees)	Receptor Location[a] Distance (m)	Period Ending (YYMMDDHH)	EPA Significant Impact Levels ($\mu g/m^3$)
Screening					
Annual					
	0.098	250.	2092.	82------	1
	0.050	130.	2000.	83------	
	0.068	270.	2500.	84------	
	0.100	250.	2092.	85------	
	0.053	90.	1951.	86------	
24-Hour High					
	2.01	220.	1481.	82110724	5
	1.75	190.	1158.	83122524	
	2.40	150.	1137.	84022924	
	2.37	120.	1460.	85010424	
	1.98	220.	1481.	86101724	
Refinement					
Annual					
	0.105	248	2120	82------	1
	0.050	130	2000	83------	
	0.073	268	2400	84------	
	0.101	252	2067	85------	
	0.056	96	1961	86------	
24-Hour High					
	2.01	220	1481	82110724	5
	1.99	188	1152	83122524	
	2.40	150	1137	84022924	
	2.37	120	1460	85010424	
	2.74	218	1441	86101724	

Note: YY=Year, MM=Month, DD=Day, HH=Hour.

[a] All receptor coordinates are reported with respect to the No. 4 Fertilizer Plant stack location.

PSD Class I Analysis--Maximum PM concentrations predicted at the PSD Class I area of the Chassahowitzka NWA for comparison to the NPS recommended Class I significance values are presented in Table 3-8. These concentrations are predicted for the proposed No. 4 Fertilizer Plant modification only. The maximum predicted impacts are 0.033 and 0.0013 $\mu g/m^3$ for the 24-hour and annual averaging periods, respectively. These impacts are well below the NPS significance levels for both averaging periods. Therefore, a more extensive PSD Class I modeling analysis was not required.

3.4 AMBIENT MONITORING ANALYSIS

The PSD *de minimis* monitoring concentration for PM is $10 \mu g/m^3$, 24-hour average. Since the predicted increase in PM impacts (2.7 $\mu g/m^3$, 24-hour maximum) is less than the *de minimis* concentration level, the project can be exempted from preconstruction ambient monitoring requirements.

3.5 ADDITIONAL IMPACT ANALYSIS

3.5.1 Introduction

An air quality related values (AQRV) analysis was performed to assess potential incremental and cumulative impacts on vegetation, soils, wildlife, and visibility in the Chassahowitzka NWA PSD Class I area. This AQRV analysis was performed for PM because this pollutant is emitted in quantities exceeding the PSD significant emission rate. PSD regulations specifically provide for the use of atmospheric dispersion models in performing AQRV analyses. Guidance for the use and application of dispersion models is presented in the EPA publication Guideline on Air Quality Models, Revised (EPA, 1993).

The Industrial Source Complex Short Term (ISCST2 Version 93109) model was used to determine potential air quality impacts for this analysis. All air dispersion methodologies used for the AQRV analysis are the same as those used in the air quality impact assessment for the Class I area (see Section 3.3).

The current and future operating conditions of the No. 4 Fertilizer Plant were modeled to determine the net air quality change in the Chassahowitzka NWA Class I area due to the proposed production rate increase. These results were presented in Section 3.3 and Table 3-8. Cumulative Class I impacts were developed from the most recently available (i.e., 1991 and 1992) PM

Table 3-8. Maximum Predicted Concentrations for the Proposed Modification Only at the Chassahowitzka Wilderness Area

Averaging	Concentration	Receptor Location[a] UTM-E	UTM-N	Period Ending (YYMMDDHH)	NPS Recommended Significance Levels ($\mu g/m^3$)
Annual					
	0.0013	340700	3171900	82------	0.01
	0.0010	342000	3174000	83------	
	0.0008	340300	3165700	84------	
	0.0009	340700	3171900	85------	
	0.0012	340300	3165700	86------	
24-Hour High					
	0.033	340700	3171900	82072924	0.33
	0.020	342000	3174000	83090424	
	0.022	341100	3183400	84041924	
	0.017	340300	3165700	85052024	
	0.023	340300	3169800	86080324	

Note: YY=Year, MM=Month, DD=Day, HH=Hour.

[a] All receptor coordinates are reported in Universal Transverse Mercator (UTM) Coordinates.

monitoring data collected near the Class I area. These data were used to represent existing background values near the Chassahowitzka NWA. The incremental impacts due to the proposed increase were added to the background values in order to develop a cumulative impact for use in the AQRV analysis.

A summary of the available monitoring data for PM is included in Table 3-9. The nearest monitor to the Class I area is located at the Twin Rivers Marina, approximately 9 miles north of the Class I area. The highest values for any monitor were taken as the existing background values and, therefore, represents a conservative approach to the analysis. These background values were added to the proposed impacts to represent total air quality impacts at the Class I area. The predicted impacts of the proposed project (0.033 $\mu g/m^3$, 24-hour maximum; 0.0013 $\mu g/m^3$, annual average) are negligible compared to the existing background values. Therefore, the background value of 86 $\mu g/m^3$, 24-hour average, and 33 $\mu g/m^3$, annual average, also represent the cumulative PM concentrations including the proposed project. These cumulative impacts are shown in Table 3-10.

3.5.2 Identification of AQRVs and Methodology

An AQRV analysis was conducted to assess the potential risk to AQRVs of the Chassahowitzka NWA due to the proposed increase from the Cargill Bartow facility. The U.S. Department of the Interior in 1978 administratively defined AQRVs to be:

> All those values possessed by an area except those that are not affected by changes in air quality and include all those assets of an area whose vitality, significance, or integrity is dependent in some way upon the air environment. These values include visibility and those scenic, cultural, biological, and recreational resources of an area that are affected by air quality.
>
> Important attributes of an area are those values or assets that make an area significant as a national monument, preserve, or primitive area. They are the assets that are to be preserved if the area is to achieve the purposes for which it was set aside (Federal Register 1978).

Except for visibility, AQRVs were not specifically defined. However, odor, soil, flora, fauna, cultural resources, geological features, water, and climate generally have been identified by land managers as AQRVs. Since specific AQRVs have not been identified for the Chassahowitzka NWA, this AQRV analysis evaluates the effects of air quality on general vegetation types and wildlife found in the Chassahowitzka NWA.

Table 3-9. Summary of PM Monitoring Data Collected Near the Chassahowitzka NWA

Year	County	Station ID	Monitor Location	Number of Observations	Maximum Concentrations Reported (μg/m³)	
					24-Hour	Annual
1991	Citrus	0580-003-J02	Crystal River; Twin Rivers Marina	60	65	33
1991	Citrus	0580-003-J09	Crystal River; Twin Rivers Marina[a]	60	64	31
1991	Citrus	0580-005-J02	Crystal River; East of FPC Plant	60	44	26
1992	Citrus	0580-003-J02	Crystal River; Twin Rivers Marina	58	86	33
1992	Citrus	0580-003-J09	Crystal River; Twin Rivers Marina[a]	59	77	31
1992	Citrus	0580-005-J02	Crystal River; East of FPC Plant	59	69	24

[a] Colocated monitor.

Table 3-10. Incremental and Cumulative PM Impacts at the Class I Area

Averaging Time	Background PM Concentration (μg/m³)	Increase Due to Proposed Project (μg/m³)	Cumulative PM Concentration with Proposed Project (μg/m³)	Primary/Secondary Ambient Air Quality Standard (μg/m³)
Annual	33	0.0013	33	50
24-hour	86	0.033	86	150
8-hour	151[a]	0.11	151	—
3-hour	194[a]	0.18	194	—
1-hour	215[a]	0.32	215	—

[a] Based on 24-hour concentration and recommended EPA averaging time factors:
24-hour / 1-hour = 0.4
8-hour / 1-hour = 0.7
3-hour / 1-hour = 0.9

Vegetation type AQRVs and their representative species types have been defined as:

Marshlands - black needlerush, saw grass, salt grass, and salt marsh cordgrass

Marsh Islands - cabbage palm and eastern red cedar

Estuarine Habitat - black needlerush, salt marsh cordgrass, and wax myrtle

Hardwood Swamp - red maple, red bay, sweet bay, and cabbage palm

Upland Forests - live oak, scrub oak, longleaf pine, slash pine, wax myrtle, and saw palmetto

Mangrove Swamp - red, white, and black mangrove

Wildlife AQRVs have been identified as endangered species, waterfowl, marsh and waterbirds, shorebirds, reptiles, and mammals.

A screening approach was used which compared the maximum predicted ambient concentration of air pollutants of concern in the Chassahowitzka NWA with effect threshold limits for both vegetation and wildlife as reported in the scientific literature. A literature search was conducted which specifically addressed the effects of air contaminants on plant species reported to occur in the NWA. While the literature search focused on such species as cabbage palm, eastern red cedar, lichens, and species of the hardwood swamplands and mangrove forest, no specific citations that addressed these species were found. It is recognized that effect threshold information is not available for all species found in the Chassahowitzka NWA, although studies have been performed on a few of the common species and on other similar species which can be used as models. In conducting the assessment, both direct (fumigation) and indirect (soil accumulation/uptake) exposures were considered for flora, and direct exposure (inhalation) was considered for wildlife.

3.5.3 Particulate Matter Exposure: Vegetation

Although information pertaining to the effects of particulate matter on plants is scarce, some concentrations are available (Mandoli and Dubey, 1988). Ten species of native Indian plants were exposed to levels of particulate matter that ranged from 210 to 366 $\mu g/m^3$ for an 8-hour averaging period. Damage in the form of a higher leaf area/dry weight ratio was observed at varying degrees for most plants tested. Concentrations of particulate matter lower than 163 $\mu g/m^3$ did not appear to be injurious to the tested plants.

By comparison of these published toxicity values for particulate matter exposure (i.e., concentrations for an 8-hour averaging time), the possibility of plant damage in the Chassahowitzka NWA can be determined. The maximum predicted cumulative 8-hour particulate matter concentration is 151 $\mu g/m^3$. This concentration is approximately 70 percent of the values that affected plant foliage. The contribution of the proposed project (0.22 $\mu g/m^3$, 8 hour) is insignificant in comparison to existing PM concentrations.

3.5.4 Particulate Matter Exposure: Wildlife

A wide range of physiological and ecological effects to fauna has been reported for particulate pollutants (Newman, 1980; Newman and Schreiber, 1988). The most severe of these effects have been observed at concentrations above the secondary ambient air quality standards (150 $\mu g/m^3$, 24-hour average, and 50 $\mu g/m^3$, annual average). Physiological and behavioral effects have also been observed in experimental animals at or below these standards. However, no observable effects to fauna are expected at concentrations below the values reported in Table 3-11. As shown in Table 3-10, the cumulative concentrations of PM with the proposed project are below those that would cause respiratory stress in wildlife. The proposed project's contribution to cumulative impacts is negligible.

3.5.5 Particulate Matter Exposure: Soils

The majority of the soil in the Class I area is classified as Weekiwachee-Durbin muck. This is an euic, hyperthermic type sufihemist that is characterized by high levels of sulfur and organic matter. This soil is flooded daily with the advent of high tide and the pH ranges between 6.1 and 7.8. The upper level of this soil may contain as much as 4 percent sulfur (USDA, 1991).

Any particulate deposition from the proposed project would be neutral or alkaline in nature. Although ground deposition was not calculated, it is evident that the effect of any dust deposited would be inconsequential in light of the existing soil pH. The regular flooding of these soils by the Gulf of Mexico regulates the pH and any change in acidity in the soil would be buffered by this activity.

Table 3-11. Examples of Reported Effects of Air Pollutants at Concentrations Below National Ambient Air Quality Standards

Pollutant	Reported Effect	Concentration ($\mu g/m^3$)	Exposure
Particulates[a]	Respiratory stress, reduced respiratory disease defenses	120 PbO_3	continually for 2 months
	Decreased respiratory disease defenses in rats, same with hamsters	100 $NiCl_2$	2 hours

[a] Newman and Schreiber, 1988. Env. Tox. Chem. 7:381-390.

3.6 IMPACTS UPON VISIBILITY

Because the Chassohowitzka NWA is located approximately 105 km to the north-northwest of the Cargill site, a visibility impact assessment of the Class I area is required. A Level I visibility screening analysis was conducted following the procedures outlined in "Workbook for Estimating Visibility Impairment" (EPA,1980). The Level I screening analysis is designed to provide a conservative estimate of plume visual impacts (i.e., impacts higher than expected). The EPA model, VISCREEN, was used for this analysis. Particulate and NO_x emissions used for the calculations were based upon the total allowable emissions from the No. 4 Fertilizer Plant after the proposed production rate increase.

Model input and output results are presented in Figure 3-1. As indicated, the maximum visual impacts caused by the No. 4 Fertilizer Plant do not exceed the screening criteria inside or outside the Class I area after the proposed production rate increase.

Visual Effects Screening Analysis for
Source: CARGILL-BARTOW FERTILIZER NO.4
Class I Area: CHASSAHOWITZKA NWA

*** Level-1 Screening ***

Input Emissions for

Particulates	136.00	TON/YR
NOx (as NO2)	27.20	TON/YR
Primary NO2	.00	TON/YR
Soot	.00	TON/YR
Primary SO4	.00	TON/YR

**** Default Particle Characteristics Assumed

Transport Scenario Specifications:

Background Ozone:	.04 ppm
Background Visual Range:	25.00 km
Source-Observer Distance:	105.00 km
Min. Source-Class I Distance:	105.00 km
Max. Source-Class I Distance:	123.00 km
Plume-Source-Observer Angle:	11.25 degrees
Stability:	6
Wind Speed:	1.00 m/s

R E S U L T S

Asterisks (*) indicate plume impacts that exceed screening criteria

Maximum Visual Impacts INSIDE Class I Area
Screening Criteria ARE NOT Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	84.	105.0	84.	2.00	.022	.05	.000
SKY	140.	84.	105.0	84.	2.00	.002	.05	-.000
TERRAIN	10.	84.	105.0	84.	2.00	.001	.05	.000
TERRAIN	140.	84.	105.0	84.	2.00	.000	.05	.000

Maximum Visual Impacts OUTSIDE Class I Area
Screening Criteria ARE NOT Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	70.	99.8	99.	2.00	.023	.05	.000
SKY	140.	70.	99.8	99.	2.00	.002	.05	-.000
TERRAIN	10.	60.	96.0	109.	2.00	.002	.05	.000
TERRAIN	140.	60.	96.0	109.	2.00	.001	.05	.000

Figure 3-1
Level-1 Visibility Screening Analysis for Cargill No. 4 DAP

KBN

REFERENCES

Mandoli, B.L. and P.S. Dubey. 1988. The Industrial Emission and Plant Response at Pithampur (M.P.). Int. J. Ecol. Environ. Sci. 14:75-79.

Newman, J.R. 1980 Effects of Air Emissions on Wildlife Resources. U.S. Fish and Wildlife Service. Biological Services Program, National Power Plant Team. FWS/OBS-80/40-1.

Newman, J.R., and R.K. Schreiber. 1988. Air Pollution and Wildlife Toxicology: An Overlooked Problem. Environmental Toxicology and Chemistry, 7-381-390.

APPENDIX A

EMISSION FACTORS

TABLE 1.3-1. UNCONTROLLED EMISSION FACTORS FOR FUEL OIL COMBUSTION

EMISSION FACTOR RATING: A

Boiler Type[a]	Particulate Matter[b]		Sulfur Dioxide[c]		Sulfur Trioxide		Carbon Monoxide[d]		Nitrogen Oxide[e]		Volatile Organics[f] Nonmethane		Volatile Organics[f] Methane	
	kg/10³l	lb/10³gal	kg/10³l	lb/10³gal	kg/10³l	lb/10³gal	kg/10³l	lb/10³gal	kg/10³l	lb/10³gal	kg/10³l	lb/10³gal	kg/10³l	lb/10³gal
Utility Boilers														
Residual Oil	g	g	19S	157S	0.34S[h]	2.9S[h]	0.6	5	8.0 (12.6)(5)[i]	67 (105)(42)[i]	0.09	0.76	0.03	0.28
Industrial Boilers														
Residual Oil	g	g	19S	157S	0.24S	2S	0.6	5	6.6[j]	55[j]	0.034	0.28	0.12	1.0
Distillate Oil	0.24	2	17S	142S	0.24S	2S	0.6	5	2.4	20	0.024	0.2	0.006	0.052
Commercial Boilers														
Residual Oil	g	g	19S	157S	0.24S	2S	0.6	5	6.6	55	0.14	1.13	0.057	0.475
Distillate Oil	0.24	2	17S	142S	0.24S	2S	0.6	5	2.4	20	0.04	0.34	0.026	0.216
Residential Furnaces														
Distillate Oil	0.3	2.5	17S	142S	0.24S	2S	0.6	5	2.2	18	0.085	0.713	0.214	1.78

[a] Boilers can be approximately classified according to their gross (higher) heat rate as shown below:
- Utility (power plant) boilers: >106 x 10^9 J/hr (>100 x 10^6 Btu/hr)
- Industrial boilers: 10.6 x 10^9 to 106 x 10^9 J/hr (10 x 10^6 to 100 x 10^6 Btu/hr)
- Commercial boilers: 0.5 x 10^9 to 10.6 x 10^9 J/hr (0.5 x 10^6 to 10 x 10^6 Btu/hr)
- Residential furnaces: <0.5 x 10^9 J/hr (<0.5 x 10^6 Btu/hr)

[b] References 3-7 and 24-25. Particulate matter is defined in this section as that material collected by EPA Method 5 (front half catch).

[c] References 1-5. S indicates that the weight % of sulfur in the oil should be multiplied by the value given.

[d] References 3-5 and 8-10. Carbon monoxide emissions may increase by factors of 10 to 100 if the unit is improperly operated or not well maintained.

[e] Expressed as NO_2. References 1-5, 8-11, 17 and 26. Test results indicate that at least 95% by weight of NO_x is NO for all boiler types except residential furnaces, where about 75% is NO.

[f] References 18-21. Volatile organic compound emissions are generally negligible unless boiler is improperly operated or not well maintained, in which case emissions may increase by several orders of magnitude.

[g] Particulate emission factors for residual oil combustion are, on average, a function of fuel oil grade and sulfur content:
- Grade 6 oil: 1.25(S) + 0.38 kg/10^3 liter [10(S) + 3 lb/10^3 gal] where S is the weight % of sulfur in the oil. This relationship is based on 81 individual tests and has a correlation coefficient of 0.65.
- Grade 5 oil: 1.25 kg/10^3 liter (10 lb/10^3 gal)
- Grade 4 oil: 0.88 kg/10^3 liter (7 lb/10^3 gal)

[h] Reference 25.

[i] Use 5 kg/10^3 liters (42 lb/10^3 gal) for tangentially fired boilers, 12.6 kg/10^3 liters (105 lb/10^3gal) for vertical fired boilers, and 8.0 kg/10^3 liters (67 lb/10^3 gal) for all others, at full load and normal (>15%) excess air. Several combustion modifications can be employed for NO_x reduction: (1) limited excess air can reduce NO_x emissions 5-20%, (2) staged combustion 20-40%, (3) using low NO_x burners 20-50%, and (4) ammonia injection can reduce NO_x emissions 40-70% but may increase emissions of ammonia. Combinations of these modifications have been employed for further reductions in certain boilers. See Reference 23 for a discussion of these and other NO_x reducing techniques and their operational and environmental impacts.

[j] Nitrogen oxides emissions from residual oil combustion in industrial and commercial boilers are strongly related to fuel nitrogen content, estimated more accurately by the empirical relationship:
kg $NO_2/10^3$ liters = 2.75 + $50(N)^2$ [lb $NO_2/10^3$gal = 22 + $400(N)^2$] where N is the weight % of nitrogen in the oil. For residual oils having high (>0.5 weight %) nitrogen content, use 15 kg $NO_2/10^3$ liter (120 lb $NO_2/10^3$gal) as an emission factor.

TABLE 1.4-1. EMISSION FACTORS FOR PARTICULATE MATTER (PM) FROM NATURAL GAS COMBUSTION[6,a,b]

Combustor type (size, 10^6 Btu/hr heat input)	Filterable PM[c]			Condensible PM[d]		
	$kg/10^6 m^3$	$lb/10^6 ft^3$	Rating	$kg/10^6 m^3$	$lb/10^6 ft^3$	Rating
Utility/large industrial boilers (>100)						
Uncontrolled	16-80	1-5	B	NA	NA	
Small industrial boilers (10 - 100)						
Uncontrolled	99	6.2	B	120	7.5	D
Commercial boilers (0.3 -<10)						
Uncontrolled	72	4.5	C	120	7.5	C
Residential furnaces (<0.3)						
Uncontrolled	2.8	0.18	C	180	11	D

NA = not applicable

a. Expressed as weight pollutant/volume natural gas fired.

b. Based on an average natural gas higher heating value of 8270 $kcal/m^3$ (1000 Btu/scf). The emission factors in this table may be converted to other natural gas heating values by multiplying the given emission factor by the ratio of the specified heating value to this average heating value.

c. Filterable PM is that particulate matter collected on or prior to the filter of an EPA Method 5 (or equivalent) sampling train.

d. Condensible PM is that particulate matter collected in the impinger portion of an EPA Method 5 (or equivalent) sampling train.

TABLE 1.4-2. EMISSION FACTORS FOR SULFUR DIOXIDE (SO_2), NITROGEN OXIDES (NO_x), AND CARBON MONOXIDE (CO) FROM NATURAL GAS COMBUSTION[6,a,b]

Combustor Type (size, 10^6 Btu/hr heat input)	SO_2[c]			NO_x[d]			CO		
	$kg/10^6 m^3$	$lb/10^6 ft^3$	Rating	$kg/10^6 m^3$	$lb/10^6 ft^3$	Rating	$kg/10^6 m^3$	$lb/10^6 ft^3$	Rating
Utility/large industrial boilers (>100)									
Uncontrolled	9.6	0.6	A	8800	550[f]	A	640	40	A
Controlled - Low NO_x burners	9.6	0.6	A	1300	81	D[e]	NA	NA	
Controlled - Flue gas recirculation	9.6	0.6	A	850	53	D[e]	NA	NA	
Small industrial boilers (10-100)									
Uncontrolled	9.6	0.6	A	2240	140	A	560	35	A
Controlled - Low NO_x burners	9.6	0.6	A	1300	81	D[e]	980	61	D
Controlled - Flue gas recirculation	9.6	0.6	A	480	30	C	590	37	C
Commercial boilers (0.3-<10)									
Uncontrolled	9.6	0.6	A	1600	100	B	330	21	C
Controlled - Low NO_x burners	9.6	0.6	A	270	17	C	425	27	C
Controlled - Flue gas recirculation	9.6	0.6	A	580	36	D	NA	NA	
Residential Furnaces (<0.3)									
Uncontrolled	9.6	0.6	A	1500	94	B	640	40	B

NA = Not Applicable.

a. Expressed as weight pollutant/volume natural gas fired.

b. Based on an average natural gas higher heating value of 8270 kcal/m^3 (1000 Btu/scf). The emission factors in this table may be converted to other natural gas heating values by multiplying the given emission factor by the ratio of the specified heating value to this average heating value.

c. Reference 7. Based on average sulfur content of natural gas, 4600 g/10^6 Nm^3 (2000 gr/10^6 scf).

d. Expressed as NO_2. For tangentially fired units, use 4400 kg/10^6 m^3 (275 lb/10^6 ft^3). At reduced loads, multiply factor by load reduction coefficient in Figure 1.4-1. Note that NO_x emissions from controlled boilers will be reduced at load conditions.

e. Emission factors apply to packaged boilers only.

TABLE 1.4-3. EMISSION FACTORS FOR CARBON DIOXIDE (CO_2), AND TOTAL ORGANIC COMPOUNDS (TOC) FROM NATURAL GAS COMBUSTION[6,a]

Combustor Type (size, 10^6 Btu/hr heat input)	CO_2[c]			TOC		
	$kg/10^6m^3$	$lb/10^6ft^3$	Rating	$kg/10^6m^3$	$lb/10^6ft^3$	Rating
Utility/large industrial boilers (>100)						
Uncontrolled	NA	NA		28[b]	1.7[b]	C
Small industrial boilers (10-100)	1.9E06	1.2E05	D	92[c]	5.8[c]	C
Uncontrolled						
Commercial boilers (0.3-<10)	1.9E06	1.2E05	C	92[d]	5.8[d]	C
Uncontrolled	2.0E06	1.3E05	D	180[d]	11[d]	D

NA = Not Applicable.

a. Expressed as weight pollutant/volume natural gas fired. Based on an average natural gas higher heating value of 8270 $kcal/m^3$ (1000 Btu/scf). The emission factors in this table may be converted to other natural gas heating values bay multiplying the given factor by the ratio of the specified heating value to this average heating value.

b. Reference 8: methane comprises 17 percent of organic compounds.

c. Reference 8: methane comprises 52 percent of organic compounds.

d. Reference 8: methane comprises 34 percent of organic compounds.

APPENDIX B

DISPERSION MODEL PRINTOUTS

```
CO STARTING
CO TITLEONE 1982 CARGILL BARTOW / DAP NO. 4 PRODUCTION INCREASE / PM 32 LB/HR
CO TITLETWO PM CLASS 1 / FLOW @ 120 TPH P205
CO MODELOPT DFAULT CONC  RURAL
CO AVERTIME 1  3  8  24 PERIOD
CO POLLUTID PM
CO DCAYCOEF     .000000
CO RUNORNOT RUN
CO FINISHED


SO STARTING

** Source Location Cards:
** D4CURPM;  DAP 4 PM CURRENT EMISSIONS/OPERATING DATA; MAX SHORT TERM EMIS
** D4FUTPM;  DAP 4 PM FUTURE EMISSIONS/OPERATING DATA; MAX SHORT TERM EMIS
**          SRCID SRCTYP        XS            YS           ZS
**                              (m)           (m)          (m)
SO LOCATION D4CURPM  POINT   409500.0     3086800.0        0.0
SO LOCATION D4FUTPM  POINT   409500.0     3086800.0        0.0
** Source Parameter Cards:
** POINT:   SRCID      QS       HS       TS      VS       DS
**                    (g/s)     (m)      (K)    (m/s)     (m)
SO SRCPARAM D4CURPM  -2.84    42.67    322.0   10.79     3.33        DAP NO. 4 ACTUALS BASED ON 12/14/91 STACK TEST
SO SRCPARAM D4FUTPM   4.03    42.67    328.7   16.28     3.33        DAP NO. 4 FUTURE; EMISSIONS BASED ON 32 LB/HR PM; FL
**
SO BUILDHGT D4CURPM-D4FUTPM  36*42.67
SO BUILDWID D4CURPM-D4FUTPM  67.64   72.62   75.39   75.96   75.79   73.73
SO BUILDWID D4CURPM-D4FUTPM  69.44   63.03   54.71   55.56   58.91   64.05
SO BUILDWID D4CURPM-D4FUTPM  67.25   68.40   68.40   67.26   64.08   60.61
SO BUILDWID D4CURPM-D4FUTPM  67.64   72.62   75.39   75.96   75.79   73.73
SO BUILDWID D4CURPM-D4FUTPM  69.44   63.03   54.71   55.56   58.91   64.05
SO BUILDWID D4CURPM-D4FUTPM  67.25   68.40   68.40   67.26   64.08   60.61
**
SO EMISUNIT    .100000E+07 (GRAMS/SEC)           (MICROGRAMS/CUBIC-METER)
SO SRCGROUP ALL
SO FINISHED

RE STARTING
RE DISCCART  340300    3165700
RE DISCCART  340300    3167700
RE DISCCART  340300    3169800
RE DISCCART  340700    3171900
RE DISCCART  342000    3174000
RE DISCCART  343000    3176200
RE DISCCART  343700    3178300
RE DISCCART  342400    3180600
RE DISCCART  341100    3183400
RE DISCCART  339000    3183400
RE DISCCART  336500    3183400
RE DISCCART  334000    3183400
RE DISCCART  331500    3183400
RE FINISHED

ME STARTING
ME INPUTFIL  C:\MET\TPAPRL82.BIN                  UNFORM
ME ANEMHGHT  22 FEET
ME SURFDATA  12842  1982            TAMPA
ME UAIRDATA  12842  1982            RUSKIN
ME WINDCATS  1.54     3.09     5.14     8.23    10.80
ME FINISHED
```

```
OU STARTING
OU RECTABLE ALLAVE FIRST  SECOND
OU FINISHED
```

ISCBOB2 RELEASE 93364

ISCST2 OUTPUT FILE NUMBER 1 :CGBTRF32.082
ISCST2 OUTPUT FILE NUMBER 2 :CGBTRF32.083
ISCST2 OUTPUT FILE NUMBER 3 :CGBTRF32.084
ISCST2 OUTPUT FILE NUMBER 4 :CGBTRF32.085
ISCST2 OUTPUT FILE NUMBER 5 :CGBTRF32.086
First title for last output file is: 1982 CARGILL BARTOW / DAP NO. 4 PRODUCTION INCREASE / 32 LB/HR PM
Second title for last output file is: PM SIG REFINEMENT RUN / FLUORIDE FUTURE / FLOW @ 120 TPH P205

AVERAGING TIME	YEAR	CONC (ug/m3)	DIR (deg) or X (m)	DIST (m) or Y (m)	PERIOD ENDING (YYMMDDHH)
SOURCE GROUP ID: D4PM					
HIGH 24-Hour					
	1982	2.01210	220.	1481.	82110724
	1983	1.99405	188.	1152.	83122524
	1984	2.39809	150.	1137.	84022924
	1985	2.37376	120.	1460.	85010424
	1986	2.73519	218.	1441.	86101724

All receptor computations reported with respect to a user-specified origin

GRID	0.00	0.00
DISCRETE	0.00	0.00

ISCBOB2 RELEASE 93364

ISCST2 OUTPUT FILE NUMBER 1 :CGBTPM32.082
ISCST2 OUTPUT FILE NUMBER 2 :CGBTPM32.083
ISCST2 OUTPUT FILE NUMBER 3 :CGBTPM32.084
ISCST2 OUTPUT FILE NUMBER 4 :CGBTPM32.085
ISCST2 OUTPUT FILE NUMBER 5 :CGBTPM32.086
First title for last output file is: 1982 CARGILL BARTOW / DAP NO. 4 PRODUCTION INCREASE / 32 LB/HR PM
Second title for last output file is: PM SIG IMPACT SCREENING RUN / FLUORIDE FUTURE / FLOW @ 120 TPH P205

AVERAGING TIME	YEAR	CONC (ug/m3)	DIR (deg) or X (m)	DIST (m) or Y (m)	PERIOD ENDING (YYMMDDHH)
SOURCE GROUP ID: D4PM					
Annual					
	1982	0.09757	250.	2092.	82------
	1983	0.05044	130.	2000.	83------
	1984	0.06831	270.	2500.	84------
	1985	0.10032	250.	2092.	85------
	1986	0.05310	90.	1951.	86------
HIGH 8-Hour					
	1982	3.07839	130.	1265.	82060824
	1983	4.08819	190.	1158.	83041708
	1984	3.83424	140.	1179.	84022824
	1985	4.54399	180.	1142.	85122024
	1986	2.87921	140.	1179.	86122024
HIGH 24-Hour					
	1982	2.01210	220.	1481.	82110724
	1983	1.74879	190.	1158.	83122524
	1984	2.39809	150.	1137.	84022924
	1985	2.37376	120.	1460.	85010424
	1986	1.97515	220.	1481.	86101724
SOURCE GROUP ID: D4FL					
Annual					
	1982	0.15594	230.	1761.	82------
	1983	0.14337	230.	1761.	83------
	1984	0.16392	250.	2092.	84------
	1985	0.15705	250.	2092.	85------
	1986	0.13750	230.	1761.	86------
HIGH 8-Hour					
	1982	3.43783	130.	1265.	82060524
	1983	4.66196	190.	1158.	83041708
	1984	3.87437	150.	1137.	84022524
	1985	6.08751	180.	1142.	85122024
	1986	4.09549	190.	1158.	86042308
HIGH 24-Hour					
	1982	1.51135	120.	1460.	82063024
	1983	1.84700	190.	1158.	83041724
	1984	1.77398	250.	2092.	84121624
	1985	1.91600	180.	1142.	85122024
	1986	1.86771	190.	1158.	86042324

All receptor computations reported with respect to a user-specified origin

GRID	0.00	0.00
DISCRETE	0.00	0.00

```
CO STARTING
CO TITLEONE 1982 CARGILL BARTOW / DAP NO. 4 PRODUCTION INCREASE / 32 LB/HR PM
CO TITLETWO PM SIG REFINEMENT RUN / FLUORIDE FUTURE / FLOW  @ 120 TPH P205
CO MODELOPT DFAULT CONC  RURAL
CO AVERTIME 24
CO POLLUTID PM
CO DCAYCOEF     .000000
CO RUNORNOT RUN
CO FINISHED


SO STARTING

** Source Location Cards:
** D4CURPM;  DAP 4 PM CURRENT EMISSIONS/OPERATING DATA; MAX SHORT TERM EMIS
** D4FUTPM;  DAP 4 PM FUTURE EMISSIONS/OPERATING DATA; MAX SHORT TERM EMIS
**          SRCID SRCTYP       XS            YS           ZS
**                             (m)           (m)          (m)
SO LOCATION D4CURPM  POINT     0.00          0.00         0.0
SO LOCATION D4FUTPM  POINT     0.00          0.00         0.0
** Source Parameter Cards:
** POINT:   SRCID      QS      HS       TS       VS       DS
**                    (g/s)    (m)      (K)     (m/s)     (m)
SO SRCPARAM D4CURPM  -2.84    42.67    322.0    10.79    3.33          DAP NO. 4 ACTUALS BASED ON 12/14/91 STACK TEST
SO SRCPARAM D4FUTPM   4.03    42.67    328.7    16.28    3.33          DAP NO. 4 FUTURE; EMISSIONS BASED ON 32 LB/HR PM; FL
**
SO BUILDHGT D4CURPM-D4FUTPM  36*42.67
SO BUILDWID D4CURPM-D4FUTPM  67.64   72.62   75.39   75.96   75.79   73.73
SO BUILDWID D4CURPM-D4FUTPM  69.44   63.03   54.71   55.56   58.91   64.05
SO BUILDWID D4CURPM-D4FUTPM  67.25   68.40   68.40   67.26   64.08   60.61
SO BUILDWID D4CURPM-D4FUTPM  67.64   72.62   75.39   75.96   75.79   73.73
SO BUILDWID D4CURPM-D4FUTPM  69.44   63.03   54.71   55.56   58.91   64.05
SO BUILDWID D4CURPM-D4FUTPM  67.25   68.40   68.40   67.26   64.08   60.61
**
SO EMISUNIT    .100000E+07 (GRAMS/SEC)          (MICROGRAMS/CUBIC-METER)
SO SRCGROUP D4PM  D4CURPM D4FUTPM
SO FINISHED

RE STARTING
RE DISCPOLR D4CURPM      1340.        212
RE DISCPOLR D4CURPM      1400.        212
RE DISCPOLR D4CURPM      1371.        214
RE DISCPOLR D4CURPM      1400.        214
RE DISCPOLR D4CURPM      1404.        216
RE DISCPOLR D4CURPM      1441.        218
RE DISCPOLR D4CURPM      1481.        220
RE DISCPOLR D4CURPM      1526.        222
RE DISCPOLR D4CURPM      1600.        222
RE DISCPOLR D4CURPM      1700.        222
RE DISCPOLR D4CURPM      1800.        222
RE DISCPOLR D4CURPM      1900.        222
RE DISCPOLR D4CURPM      1576.        224
RE DISCPOLR D4CURPM      1600.        224
RE DISCPOLR D4CURPM      1700.        224
RE DISCPOLR D4CURPM      1800.        224
RE DISCPOLR D4CURPM      1900.        224
RE DISCPOLR D4CURPM      1631.        226
RE DISCPOLR D4CURPM      1700.        226
RE DISCPOLR D4CURPM      1800.        226
RE DISCPOLR D4CURPM      1900.        226
RE DISCPOLR D4CURPM      1693.        228
RE DISCPOLR D4CURPM      1700.        228
```

```
RE DISCPOLR D4CURPM      1800.        228
RE DISCPOLR D4CURPM      1900.        228
RE FINISHED

ME STARTING
ME INPUTFIL  C:\MET\TPAPRL82.BIN                      UNFORM
ME ANEMHGHT  22 FEET
ME SURFDATA  12842  1982              TAMPA
ME UAIRDATA  12842  1982              RUSKIN
ME WINDCATS  1.54     3.09     5.14     8.23    10.80
ME FINISHED

OU STARTING
OU RECTABLE ALLAVE FIRST  SECOND
OU FINISHED
```

```
CO STARTING
CO TITLEONE 1982 CARGILL BARTOW / DAP NO. 4 PRODUCTION INCREASE / 32 LB/HR PM
CO TITLETWO PM ANNUAL REFINEMENT RUN / FLOW  @ 120 TPH P205
CO MODELOPT DFAULT CONC  RURAL
CO AVERTIME PERIOD
CO POLLUTID PM
CO DCAYCOEF     .000000
CO RUNORNOT RUN
CO FINISHED


SO STARTING

** Source Location Cards:
** D4CURPM;  DAP 4 PM CURRENT EMISSIONS/OPERATING DATA; MAX SHORT TERM EMIS
** D4FUTPM;  DAP 4 PM FUTURE EMISSIONS/OPERATING DATA; MAX SHORT TERM EMIS
**          SRCID SRCTYP        XS             YS            ZS
**                              (m)            (m)           (m)
SO LOCATION D4CURPM  POINT     0.00           0.00          0.0
SO LOCATION D4FUTPM  POINT     0.00           0.00          0.0
** Source Parameter Cards:
** POINT:  SRCID        QS        HS       TS       VS        DS
**                      (g/s)     (m)      (K)      (m/s)     (m)
SO SRCPARAM D4CURPM  -2.84     42.67    322.0    10.79     3.33          DAP NO. 4 ACTUALS BASED ON 12/14/91 STACK TEST
SO SRCPARAM D4FUTPM   4.03     42.67    328.7    16.28     3.33          DAP NO. 4 FUTURE; EMISSIONS BASED ON 32 LB/HR PM; FL
**
SO BUILDHGT D4CURPM-D4FUTPM  36*42.67
SO BUILDWID D4CURPM-D4FUTPM  67.64   72.62   75.39   75.96   75.79   73.73
SO BUILDWID D4CURPM-D4FUTPM  69.44   63.03   54.71   55.56   58.91   64.05
SO BUILDWID D4CURPM-D4FUTPM  67.25   68.40   68.40   67.26   64.08   60.61
SO BUILDWID D4CURPM-D4FUTPM  67.64   72.62   75.39   75.96   75.79   73.73
SO BUILDWID D4CURPM-D4FUTPM  69.44   63.03   54.71   55.56   58.91   64.05
SO BUILDWID D4CURPM-D4FUTPM  67.25   68.40   68.40   67.26   64.08   60.61
**
SO EMISUNIT    .100000E+07 (GRAMS/SEC)          (MICROGRAMS/CUBIC-METER)
SO SRCGROUP D4PM  D4CURPM D4FUTPM
SO FINISHED

RE STARTING
RE DISCPOLR D4CURPM        2227.        242
RE DISCPOLR D4CURPM        2300.        242
RE DISCPOLR D4CURPM        2400.        242
RE DISCPOLR D4CURPM        2187.        244
RE DISCPOLR D4CURPM        2200.        244
RE DISCPOLR D4CURPM        2300.        244
RE DISCPOLR D4CURPM        2400.        244
RE DISCPOLR D4CURPM        2152.        246
RE DISCPOLR D4CURPM        2200.        246
RE DISCPOLR D4CURPM        2300.        246
RE DISCPOLR D4CURPM        2400.        246
RE DISCPOLR D4CURPM        2120.        248
RE DISCPOLR D4CURPM        2200.        248
RE DISCPOLR D4CURPM        2300.        248
RE DISCPOLR D4CURPM        2400.        248
RE DISCPOLR D4CURPM        2092.        250
RE DISCPOLR D4CURPM        2100.        250
RE DISCPOLR D4CURPM        2200.        250
RE DISCPOLR D4CURPM        2300.        250
RE DISCPOLR D4CURPM        2400.        250
RE DISCPOLR D4CURPM        2067.        252
RE DISCPOLR D4CURPM        2100.        252
RE DISCPOLR D4CURPM        2200.        252
```

```
RE DISCPOLR D4CURPM        2300.        252
RE DISCPOLR D4CURPM        2400.        252
RE DISCPOLR D4CURPM        2045.        254
RE DISCPOLR D4CURPM        2100.        254
RE DISCPOLR D4CURPM        2200.        254
RE DISCPOLR D4CURPM        2300.        254
RE DISCPOLR D4CURPM        2400.        254
RE DISCPOLR D4CURPM        2026.        256
RE DISCPOLR D4CURPM        2100.        256
RE DISCPOLR D4CURPM        2200.        256
RE DISCPOLR D4CURPM        2300.        256
RE DISCPOLR D4CURPM        2400.        256
RE DISCPOLR D4CURPM        2010.        258
RE DISCPOLR D4CURPM        2100.        258
RE DISCPOLR D4CURPM        2200.        258
RE DISCPOLR D4CURPM        2300.        258
RE DISCPOLR D4CURPM        2400.        258
RE FINISHED

ME STARTING
ME INPUTFIL  C:\MET\TPAPRL82.BIN                    UNFORM
ME ANEMHGHT  22 FEET
ME SURFDATA  12842  1982          TAMPA
ME UAIRDATA  12842  1982          RUSKIN
ME WINDCATS  1.54     3.09     5.14     8.23     10.80
ME FINISHED

OU STARTING
OU RECTABLE ALLAVE FIRST  SECOND
OU FINISHED
```

```
CO STARTING
CO TITLEONE 1982 CARGILL BARTOW / DAP NO. 4 PRODUCTION INCREASE / 32 LB/HR PM
CO TITLETWO PM SIG IMPACT SCREENING RUN / FLUORIDE FUTURE / FLOW @ 120 TPH P205
CO MODELOPT DFAULT CONC  RURAL
CO AVERTIME 8 24 PERIOD
CO POLLUTID PM
CO DCAYCOEF     .000000
CO RUNORNOT RUN
CO FINISHED

SO STARTING

** Source Location Cards:
** D4CURPM;  DAP 4 PM CURRENT EMISSIONS/OPERATING DATA; MAX SHORT TERM EMIS
** D4FUTPM;  DAP 4 PM FUTURE EMISSIONS/OPERATING DATA; MAX SHORT TERM EMIS
** D4FUTFL;  DAP 4 FL FUTURE EMISSIONS/OPERATING DATA; MAX SHORT TERM EMIS
**          SRCID SRCTYP        XS            YS           ZS
**                              (m)           (m)          (m)
SO LOCATION D4CURPM  POINT     0.00          0.00         0.0
SO LOCATION D4FUTPM  POINT     0.00          0.00         0.0
SO LOCATION D4FUTFL  POINT     0.00          0.00         0.0
** Source Parameter Cards:
** POINT:   SRCID      QS       HS       TS       VS       DS
**                    (g/s)     (m)      (K)     (m/s)     (m)
SO SRCPARAM D4CURPM  -2.84     42.67    322.0    10.79     3.33          DAP NO. 4 ACTUALS BASED ON 12/14/91 STACK TEST
SO SRCPARAM D4FUTPM   4.03     42.67    328.7    16.28     3.33          DAP NO. 4 FUTURE; EMISSIONS BASED ON 32 LB/HR PM; FL
SO SRCPARAM D4FUTFL   0.76     42.67    328.7    16.28     3.33          DAP NO 4. FLOURIDES BASED ON 6.00 LB/HR
**
SO BUILDHGT D4CURPM-D4FUTPM  36*42.67
SO BUILDWID D4CURPM-D4FUTPM  67.64   72.62   75.39   75.96   75.79   73.73
SO BUILDWID D4CURPM-D4FUTPM  69.44   63.03   54.71   55.56   58.91   64.05
SO BUILDWID D4CURPM-D4FUTPM  67.25   68.40   68.40   67.26   64.08   60.61
SO BUILDWID D4CURPM-D4FUTPM  67.64   72.62   75.39   75.96   75.79   73.73
SO BUILDWID D4CURPM-D4FUTPM  69.44   63.03   54.71   55.56   58.91   64.05
SO BUILDWID D4CURPM-D4FUTPM  67.25   68.40   68.40   67.26   64.08   60.61
**
SO EMISUNIT    .100000E+07 (GRAMS/SEC)          (MICROGRAMS/CUBIC-METER)
SO SRCGROUP D4PM  D4CURPM D4FUTPM
SO SRCGROUP D4FL  D4FUTFL
SO FINISHED

RE STARTING
RE GRIDPOLR POL STA
RE GRIDPOLR POL ORIG   0.0     0.0
RE GRIDPOLR POL DIST  5000.   6000.   7000.   8000.   9000.  10000.
RE GRIDPOLR POL GDIR  36   10.00   10.00
RE GRIDPOLR POL END
RE DISCPOLR D4CURPM      3760.        10
RE DISCPOLR D4CURPM      4000.        10
RE DISCPOLR D4CURPM      4500.        10
RE DISCPOLR D4CURPM      3941.        20
RE DISCPOLR D4CURPM      4000.        20
RE DISCPOLR D4CURPM      4500.        20
RE DISCPOLR D4CURPM      3344.        30
RE DISCPOLR D4CURPM      3500.        30
RE DISCPOLR D4CURPM      4000.        30
RE DISCPOLR D4CURPM      4500.        30
RE DISCPOLR D4CURPM      3780.        40
RE DISCPOLR D4CURPM      4000.        40
RE DISCPOLR D4CURPM      4500.        40
RE DISCPOLR D4CURPM      4789.        50
```

RE DISCPOLR D4CURPM	3789.	60
RE DISCPOLR D4CURPM	4000.	60
RE DISCPOLR D4CURPM	4500.	60
RE DISCPOLR D4CURPM	3065.	70
RE DISCPOLR D4CURPM	3500.	70
RE DISCPOLR D4CURPM	4000.	70
RE DISCPOLR D4CURPM	4500.	70
RE DISCPOLR D4CURPM	2213.	80
RE DISCPOLR D4CURPM	2500.	80
RE DISCPOLR D4CURPM	3000.	80
RE DISCPOLR D4CURPM	3500.	80
RE DISCPOLR D4CURPM	4000.	80
RE DISCPOLR D4CURPM	4500.	80
RE DISCPOLR D4CURPM	1951.	90
RE DISCPOLR D4CURPM	2000.	90
RE DISCPOLR D4CURPM	2500.	90
RE DISCPOLR D4CURPM	3000.	90
RE DISCPOLR D4CURPM	3500.	90
RE DISCPOLR D4CURPM	4000.	90
RE DISCPOLR D4CURPM	4500.	90
RE DISCPOLR D4CURPM	1981.	100
RE DISCPOLR D4CURPM	2000.	100
RE DISCPOLR D4CURPM	2500.	100
RE DISCPOLR D4CURPM	3000.	100
RE DISCPOLR D4CURPM	3500.	100
RE DISCPOLR D4CURPM	4000.	100
RE DISCPOLR D4CURPM	4500.	100
RE DISCPOLR D4CURPM	2100.	110
RE DISCPOLR D4CURPM	2500.	110
RE DISCPOLR D4CURPM	3000.	110
RE DISCPOLR D4CURPM	3500.	110
RE DISCPOLR D4CURPM	4000.	110
RE DISCPOLR D4CURPM	4500.	110
RE DISCPOLR D4CURPM	1460.	120
RE DISCPOLR D4CURPM	1500.	120
RE DISCPOLR D4CURPM	2000.	120
RE DISCPOLR D4CURPM	2500.	120
RE DISCPOLR D4CURPM	3000.	120
RE DISCPOLR D4CURPM	3500.	120
RE DISCPOLR D4CURPM	4000.	120
RE DISCPOLR D4CURPM	4500.	120
RE DISCPOLR D4CURPM	1265.	130
RE DISCPOLR D4CURPM	1500.	130
RE DISCPOLR D4CURPM	2000.	130
RE DISCPOLR D4CURPM	2500.	130
RE DISCPOLR D4CURPM	3000.	130
RE DISCPOLR D4CURPM	3500.	130
RE DISCPOLR D4CURPM	4000.	130
RE DISCPOLR D4CURPM	4500.	130
RE DISCPOLR D4CURPM	1179.	140
RE DISCPOLR D4CURPM	1500.	140
RE DISCPOLR D4CURPM	2000.	140
RE DISCPOLR D4CURPM	2500.	140
RE DISCPOLR D4CURPM	3000.	140
RE DISCPOLR D4CURPM	3500.	140
RE DISCPOLR D4CURPM	4000.	140
RE DISCPOLR D4CURPM	4500.	140
RE DISCPOLR D4CURPM	1137.	150
RE DISCPOLR D4CURPM	1500.	150
RE DISCPOLR D4CURPM	2000.	150
RE DISCPOLR D4CURPM	2500.	150
RE DISCPOLR D4CURPM	3000.	150

RE	DISCPOLR	D4CURPM	3500.	150
RE	DISCPOLR	D4CURPM	4000.	150
RE	DISCPOLR	D4CURPM	4500.	150
RE	DISCPOLR	D4CURPM	1131.	160
RE	DISCPOLR	D4CURPM	1500.	160
RE	DISCPOLR	D4CURPM	2000.	160
RE	DISCPOLR	D4CURPM	2500.	160
RE	DISCPOLR	D4CURPM	3000.	160
RE	DISCPOLR	D4CURPM	3500.	160
RE	DISCPOLR	D4CURPM	4000.	160
RE	DISCPOLR	D4CURPM	4500.	160
RE	DISCPOLR	D4CURPM	1160.	170
RE	DISCPOLR	D4CURPM	1500.	170
RE	DISCPOLR	D4CURPM	2000.	170
RE	DISCPOLR	D4CURPM	2500.	170
RE	DISCPOLR	D4CURPM	3000.	170
RE	DISCPOLR	D4CURPM	3500.	170
RE	DISCPOLR	D4CURPM	4000.	170
RE	DISCPOLR	D4CURPM	4500.	170
RE	DISCPOLR	D4CURPM	1142.	180
RE	DISCPOLR	D4CURPM	1500.	180
RE	DISCPOLR	D4CURPM	2000.	180
RE	DISCPOLR	D4CURPM	2500.	180
RE	DISCPOLR	D4CURPM	3000.	180
RE	DISCPOLR	D4CURPM	3500.	180
RE	DISCPOLR	D4CURPM	4000.	180
RE	DISCPOLR	D4CURPM	4500.	180
RE	DISCPOLR	D4CURPM	1158.	190
RE	DISCPOLR	D4CURPM	1500.	190
RE	DISCPOLR	D4CURPM	2000.	190
RE	DISCPOLR	D4CURPM	2500.	190
RE	DISCPOLR	D4CURPM	3000.	190
RE	DISCPOLR	D4CURPM	3500.	190
RE	DISCPOLR	D4CURPM	4000.	190
RE	DISCPOLR	D4CURPM	4500.	190
RE	DISCPOLR	D4CURPM	1212.	200
RE	DISCPOLR	D4CURPM	1500.	200
RE	DISCPOLR	D4CURPM	2000.	200
RE	DISCPOLR	D4CURPM	2500.	200
RE	DISCPOLR	D4CURPM	3000.	200
RE	DISCPOLR	D4CURPM	3500.	200
RE	DISCPOLR	D4CURPM	4000.	200
RE	DISCPOLR	D4CURPM	4500.	200
RE	DISCPOLR	D4CURPM	1313.	210
RE	DISCPOLR	D4CURPM	1500.	210
RE	DISCPOLR	D4CURPM	2000.	210
RE	DISCPOLR	D4CURPM	2500.	210
RE	DISCPOLR	D4CURPM	3000.	210
RE	DISCPOLR	D4CURPM	3500.	210
RE	DISCPOLR	D4CURPM	4000.	210
RE	DISCPOLR	D4CURPM	4500.	210
RE	DISCPOLR	D4CURPM	1481.	220
RE	DISCPOLR	D4CURPM	1500.	220
RE	DISCPOLR	D4CURPM	2000.	220
RE	DISCPOLR	D4CURPM	2500.	220
RE	DISCPOLR	D4CURPM	3000.	220
RE	DISCPOLR	D4CURPM	3500.	220
RE	DISCPOLR	D4CURPM	4000.	220
RE	DISCPOLR	D4CURPM	4500.	220
RE	DISCPOLR	D4CURPM	1761.	230
RE	DISCPOLR	D4CURPM	2000.	230
RE	DISCPOLR	D4CURPM	2500.	230

RE DISCPOLR D4CURPM	3000.	230
RE DISCPOLR D4CURPM	3500.	230
RE DISCPOLR D4CURPM	4000.	230
RE DISCPOLR D4CURPM	4500.	230
RE DISCPOLR D4CURPM	2256.	240
RE DISCPOLR D4CURPM	2500.	240
RE DISCPOLR D4CURPM	3000.	240
RE DISCPOLR D4CURPM	3500.	240
RE DISCPOLR D4CURPM	4000.	240
RE DISCPOLR D4CURPM	4500.	240
RE DISCPOLR D4CURPM	2092.	250
RE DISCPOLR D4CURPM	2500.	250
RE DISCPOLR D4CURPM	3000.	250
RE DISCPOLR D4CURPM	3500.	250
RE DISCPOLR D4CURPM	4000.	250
RE DISCPOLR D4CURPM	4500.	250
RE DISCPOLR D4CURPM	1996.	260
RE DISCPOLR D4CURPM	2000.	260
RE DISCPOLR D4CURPM	2500.	260
RE DISCPOLR D4CURPM	3000.	260
RE DISCPOLR D4CURPM	3500.	260
RE DISCPOLR D4CURPM	4000.	260
RE DISCPOLR D4CURPM	4500.	260
RE DISCPOLR D4CURPM	1966.	270
RE DISCPOLR D4CURPM	2000.	270
RE DISCPOLR D4CURPM	2500.	270
RE DISCPOLR D4CURPM	3000.	270
RE DISCPOLR D4CURPM	3500.	270
RE DISCPOLR D4CURPM	4000.	270
RE DISCPOLR D4CURPM	4500.	270
RE DISCPOLR D4CURPM	1996.	280
RE DISCPOLR D4CURPM	2000.	280
RE DISCPOLR D4CURPM	2500.	280
RE DISCPOLR D4CURPM	3000.	280
RE DISCPOLR D4CURPM	3500.	280
RE DISCPOLR D4CURPM	4000.	280
RE DISCPOLR D4CURPM	4500.	280
RE DISCPOLR D4CURPM	2092.	290
RE DISCPOLR D4CURPM	2500.	290
RE DISCPOLR D4CURPM	3000.	290
RE DISCPOLR D4CURPM	3500.	290
RE DISCPOLR D4CURPM	4000.	290
RE DISCPOLR D4CURPM	4500.	290
RE DISCPOLR D4CURPM	2270.	300
RE DISCPOLR D4CURPM	2500.	300
RE DISCPOLR D4CURPM	3000.	300
RE DISCPOLR D4CURPM	3500.	300
RE DISCPOLR D4CURPM	4000.	300
RE DISCPOLR D4CURPM	4500.	300
RE DISCPOLR D4CURPM	2566.	310
RE DISCPOLR D4CURPM	3000.	310
RE DISCPOLR D4CURPM	3500.	310
RE DISCPOLR D4CURPM	4000.	310
RE DISCPOLR D4CURPM	4500.	310
RE DISCPOLR D4CURPM	2706.	320
RE DISCPOLR D4CURPM	3000.	320
RE DISCPOLR D4CURPM	3500.	320
RE DISCPOLR D4CURPM	4000.	320
RE DISCPOLR D4CURPM	4500.	320
RE DISCPOLR D4CURPM	2393.	330
RE DISCPOLR D4CURPM	2500.	330
RE DISCPOLR D4CURPM	3000.	330

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RE DISCPOLR D4CURPM     3500.      330
RE DISCPOLR D4CURPM     4000.      330
RE DISCPOLR D4CURPM     4500.      330
RE DISCPOLR D4CURPM     2627.      340
RE DISCPOLR D4CURPM     3000.      340
RE DISCPOLR D4CURPM     3500.      340
RE DISCPOLR D4CURPM     4000.      340
RE DISCPOLR D4CURPM     4500.      340
RE DISCPOLR D4CURPM     2507.      350
RE DISCPOLR D4CURPM     3000.      350
RE DISCPOLR D4CURPM     3500.      350
RE DISCPOLR D4CURPM     4000.      350
RE DISCPOLR D4CURPM     4500.      350
RE DISCPOLR D4CURPM     3703.      360
RE DISCPOLR D4CURPM     4000.      360
RE DISCPOLR D4CURPM     4500.      360
RE FINISHED

ME STARTING
ME INPUTFIL  C:\MET\TPAPRL82.BIN                  UNFORM
ME ANEMHGHT  22 FEET
ME SURFDATA  12842  1982           TAMPA
ME UAIRDATA  12842  1982           RUSKIN
ME WINDCATS  1.54    3.09    5.14    8.23   10.80
ME FINISHED

OU STARTING
OU RECTABLE ALLAVE FIRST  SECOND
OU FINISHED
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ISCBO82 RELEASE 93364

ISCST2 OUTPUT FILE NUMBER 1 :CGBTC1.082
ISCST2 OUTPUT FILE NUMBER 2 :CGBTC1.083
ISCST2 OUTPUT FILE NUMBER 3 :CGBTC1.084
ISCST2 OUTPUT FILE NUMBER 4 :CGBTC1.085
ISCST2 OUTPUT FILE NUMBER 5 :CGBTC1.086
First title for last output file is: 1982 CARGILL BARTOW / DAP NO. 4 PRODUCTION INCREASE / PM 32 LB/HR
Second title for last output file is: PM CLASS 1 / FLOW @ 120 TPH P205

AVERAGING TIME	YEAR	CONC (ug/m3)	DIR (deg) or X (m)	DIST (m) or Y (m)	PERIOD ENDING (YYMMDDHH)
SOURCE GROUP ID: ALL					
Annual					
	1982	0.00129	340700.	3171900.	82------
	1983	0.00101	342000.	3174000.	83------
	1984	0.00082	340300.	3165700.	84------
	1985	0.00092	340700.	3171900.	85------
	1986	0.00121	340300.	3165700.	86------
HIGH 1-Hour					
	1982	0.31196	340300.	3165700.	82092007
	1983	0.31273	340700.	3171900.	83101221
	1984	0.31521	340300.	3165700.	84071201
	1985	0.31196	340300.	3165700.	85052003
	1986	0.31357	340300.	3165700.	86061702
HSH 1-Hour					
	1982	0.29840	342000.	3174000.	82062524
	1983	0.29693	342000.	3174000.	83120222
	1984	0.30416	340700.	3171900.	84041923
	1985	0.28153	340300.	3167700.	85030502
	1986	0.30068	342000.	3174000.	86080502
HIGH 3-Hour					
	1982	0.17590	340700.	3171900.	82062524
	1983	0.14680	342000.	3174000.	83120224
	1984	0.10507	340300.	3165700.	84071203
	1985	0.10856	340300.	3165700.	85052003
	1986	0.10452	340300.	3165700.	86061703
HSH 3-Hour					
	1982	0.15719	340700.	3171900.	82072903
	1983	0.11587	342000.	3174000.	83090403
	1984	0.10165	340700.	3171900.	84041924
	1985	0.09825	340300.	3167700.	85030503
	1986	0.10023	342000.	3174000.	86080503
HIGH 8-Hour					
	1982	0.11085	340700.	3171900.	82072908
	1983	0.06509	342000.	3174000.	83120224
	1984	0.05107	340700.	3171900.	84050208
	1985	0.04999	340300.	3165700.	85052008
	1986	0.05872	340300.	3167700.	86053008
HSH 8-Hour					
	1982	0.07539	340700.	3171900.	82062524
	1983	0.05793	342000.	3174000.	83090408
	1984	0.04409	340300.	3165700.	84102208
	1985	0.04456	340300.	3165700.	85102908
	1986	0.05555	340300.	3167700.	86051908
HIGH 24-Hour					
	1982	0.03258	340700.	3171900.	82072924
	1983	0.02041	342000.	3174000.	83090424
	1984	0.02187	341100.	3183400.	84041924
	1985	0.01666	340300.	3165700.	85052024

	1986	0.02266	340300.	3169800.	86080324
HSH 24-Hour					
	1982	0.02294	340700.	3171900.	82062524
	1983	0.02041	342000.	3174000.	83120224
	1984	0.01654	343700.	3178300.	84052424
	1985	0.01488	342000.	3174000.	85071724
	1986	0.02173	340300.	3167700.	86080324

All receptor computations reported with respect to a user-specified origin

GRID	0.00	0.00
DISCRETE	0.00	0.00