



KOGLER & ASSOCIATES  
ENVIRONMENTAL SERVICES  
4014 NW THIRTEENTH STREET  
GAINESVILLE, FLORIDA 32609  
904/377-5822 • FAX 377-7158

KA 123-90-02

August 20, 1990

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DER-BAQM

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DER - MAIL ROOM

Mr. Clair Fancy  
Florida Department of  
Environmental Regulation  
Twin Towers Office Building  
2600 Blair Stone Road  
Tallahassee, FL 32399-2400

Subject: Application for Construction Permit  
No. 5 Sulfuric Acid Plant  
Farmland Industries, Inc.  
Bartow, Florida

Dear Mr. Fancy:

Enclosed are four copies of the construction application for Farmland Industries, Inc. By this application, Farmland is requesting to increase the production rate of their No. 5 plant from 2,000 to 2,400 short tons per day of sulfuric acid. It has been determined that the application will require a full PSD review. A check for \$5,000 (the application fee) is also enclosed.

If you have any questions or comments concerning the enclosed application, please do not hesitate to contact me.

Very truly yours,

KOGLER & ASSOCIATES

*John B. Koogler*  
John B. Koogler, Ph.D., P.E.

JBK:wa  
Enc.

cc: Mr. Edward Ferking, Farmland



FARMLAND INDUSTRIES, INC.  
 GREEN BAY PLANT  
 P.O. Box 960  
 Bartow, Florida 33830

CHECK NO. 69964710

80-95  
1012

CHECK AMOUNT  
 \*\*\*\*\*5,000.00  
 VOID AFTER 180 DAYS

16 69 F0346 8-17-90  
 CO. BR. VEND. NO. CHECK DATE

PAY EXACTLY \*\*\*\*\*5,000 DOLLARS AND 00 CENTS

UNITED MISSOURI BANK OF  
 CARTHAGE, MO.

FARMLAND INDUSTRIES, INC.

PAY  
 TO THE  
 ORDER  
 OF

Florida Department of  
 Environmental Regulation  
 2600 Blair Stone Rd.  
 Tallahassee, FL 32399

*A. J. Simpson*  
*C. B. Munn*

⑈69964710⑈ ⑆101200958⑆ ⑈25⑈778⑈129⑈

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\$5000 pd.  
8-23-90  
Recpt. # 151156

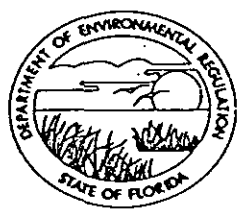
STATE OF FLORIDA

DEPARTMENT OF ENVIRONMENTAL REGULATION

RECEIVED

AUG 23 1990

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AC 53-185490  
PSD-FL-143A

APPLICATION TO OPERATE/CONSTRUCT AIR POLLUTION SOURCES

SOURCE TYPE: Double Absorption Sulfuric Acid Plant  New<sup>1</sup>  Existing<sup>1</sup>

APPLICATION TYPE:  Construction  Operation  Modification

COMPANY NAME: Farmland Industries, Inc. - Green Bay Complex 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) Sulfuric Acid Plant No. 5

SOURCE LOCATION: Street State Road 640 West City Bartow

UTM: East 17-409.5 km North 3079.5 km

Latitude 27 ° 50 ' 37 "N. Longitude 81 ° 56 ' 05 "W

APPLICANT NAME AND TITLE: C. M. Farris, General Manager, Phosphate Fertilizer Manufacture

APPLICANT ADDRESS: P.O. Box 960, Bartow, Florida 33830

SECTION I: STATEMENTS BY APPLICANT AND ENGINEER

A. APPLICANT

I am the undersigned owner or authorized representative\* of Farmland Industries, 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: C. M. Farris

C. M. Farris, General Manager  
Name and Title (Please Type)

Date: 8/16/90 Telephone No. (813) 533-1141

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~~ 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

<sup>1</sup> See Florida Administrative 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 

John B. Koogler, Ph.D., P.E.  
(Name (Please Type))

Koogler & Associates, Environmental Services  
Company Name (Please Type)

4014 N.W. 13th Street, Gainesville, Florida 32609  
Mailing Address (Please Type)

Florida Registration No. 12925 Date: 8/20/90 Telephone No. (904) 377-5822

### 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 Section 1.3 of attached report. All plants will operate in full compliance with applicable regulations.

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

Start of Construction September 1990 Completion of Construction September 1990

- 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.)

Absorbing towers for SO2 emissions are considered part of the production process rather than pollution control devices. Acid mist is controlled by Monsanto Enviro-Chem high efficiency mist eliminators which cost \$93,951 including material, labor and engineering costs.

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

See page 2a.

EXISTING PERMITS FOR  
FARMLAND INDUSTRIES, INC.  
SULFURIC ACID PLANTS

Sulfuric Acid Plant	Permit No.	Issue Date	Expiration Date
No. 1*	A053-99016	3/08/85	9/30/90
No. 2**	A053-99018	3/08/85	Terminated
No. 3	A053-138909	10/16/87	10/12/92
No. 4	A053-138910	10/16/87	10/12/92
No. 5	AC53-171751	1/30/90	9/30/91
No. 5	PSD-FL-143	1/30/90	9/30/91

\* Sulfuric Acid Plant No. 1 will be permanently shutdown when Plant No. 5 is operational.

\*\* Sulfuric Acid Plant No. 2 was permanently shutdown on March 29, 1985.

E. Requested permitted equipment operating time: hrs/day 24; days/wk 7; wks/yr 52; if power plant, hrs/yr \_\_\_\_\_; if seasonal, describe: \_\_\_\_\_

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? NA  
b. If yes, has "Lowest Achievable Emission Rate" been applied? NA  
c. If yes, list non-attainment pollutants. NA

2. Does best available control technology (BACT) apply to this source? If yes, see Section VI. YES(1)

3. Does the State "Prevention of Significant Deterioration" (PSD) requirement apply to this source? If yes, see Sections VI and VII. YES(1)

4. Do "Standards of Performance for New Stationary Sources" (NSPS) apply to this source? YES(1)

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? NA

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.

(1) Additional information is supplied in the attached report.

**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		
Sulfur	Ash	0.005	65,592	Burner of Figure 3-1 (See attached report)

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

- Total Process Input Rate (lbs/hr): 65,592 as sulfur
- Product Weight (lbs/hr): 203,046 as 98.5% H<sub>2</sub>SO<sub>4</sub>

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

Name of Contaminant	Emission <sup>1</sup>		Allowed Emission Rate per Rule 17-2	Allowable Emission lbs/hr	Potential <sup>4</sup> Emission		Relate to Flow Diagram
	Maximum lbs/hr	Actual T/yr			lbs/xx hr	T/yr	
SO <sub>2</sub>	400	1752	17-2.600(2)(b)	400	3000	13140	*
NOx	11.9	52.2	17-2.630	11.9	11.9	52.2	*
Acid Mist	15.0	65.7	17-2.600(2)(b)	15.0	150.0	657.0	*
VE	10%	-	"	10%	-	-	*

\*Stack of Figure 3-1, (See attached report).  
<sup>1</sup>See Section V, Item 2.

<sup>2</sup>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)

<sup>3</sup>Calculated from operating rate and applicable standard.

<sup>4</sup>Emission, if source operated without control (See Section V, Item 3).

Potential SO<sub>2</sub> emissions are based on a 97.7 % absorption efficiency for single absorption plant and acid mist emissions are based on a 90 % overall mist eliminator efficiency.

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)
Dual Absorption Towers	SO <sub>2</sub>	99.7%	NA	Design & Test
High Efficiency Mist Eliminators	Acid Mist	95-98%	1 - 3 microns	Design & Test
	Acid Mist	85-95%	0.75 - 1 microns	Design & Test
	Acid Mist	70-85%	0.5 - 0.75 microns	Design & Test

E. Fuels NOT APPLICABLE

Type (Be Specific)	Consumption*		Maximum Heat Input (MMBTU/hr)
	avg/hr	max./hr	

\*Units: Natural Gas--MCF/hr; Fuel Oils--gallons/hr; Coal, wood, refuse, other--lbs/hr.

Fuel Analysis:

Percent Sulfur: \_\_\_\_\_ Percent Ash: \_\_\_\_\_

Density: \_\_\_\_\_ lbs/gal Typical Percent Nitrogen: \_\_\_\_\_

Heat Capacity: \_\_\_\_\_ BTU/lb \_\_\_\_\_ BTU/gal

Other Fuel Contaminants (which may cause air pollution): \_\_\_\_\_

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

Annual Average NA Maximum \_\_\_\_\_

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

None



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

Stack Height: 150 ft. Stack Diameter: 8 ft.  
 Gas Flow Rate: 114,623 ACFM @ 94;564 °F 68 DSCFM Gas Exit Temperature: 180 °F.  
 Water Vapor Content: 0 % Velocity: 38.0 FPS

SECTION IV: INCINERATOR INFORMATION  
 NOT APPLICABLE

Type of Waste	Type 0 (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) <sup>3</sup>	Heat Release (BTU/hr)	Fuel		Temperature (°F)
			Type	BTU/hr	
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 device:  Cyclone  Wet Scrubber  Afterburner  
 Other (specify) \_\_\_\_\_

Brief description of operating characteristics of control devices: \_\_\_\_\_

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

---

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---

---

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)]  
(SEE SECTION IIIB)
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.  
(SEE ATTACHED REPORT)
3. Attach basis of potential discharge (e.g., emission factor, that is, AP42 test).  
(SEE ATTACHED REPORT)
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.) (SEE ATTACHED REPORT)
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). (SEE SECTION IIID AND ATTACHED REPORT)
6. An 8 1/2" 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. (SEE FIGURE 3-1 IN ATTACHED REPORT)
7. An 8 1/2" 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 (Example: Copy of relevant portion of USGS topographic map).  
(SEE FIGURES 2-1 AND 2-2 IN ATTACHED REPORT)
8. An 8 1/2" x 11" plot plan of facility showing the location of manufacturing processes and outlets for airborne emissions. Relate all flows to the flow diagram.  
(SEE FIGURES 3-1 AND 3-2 IN ATTACHED REPORT)

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 ATTACHED REPORT

- 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

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 Device:

b. Operating Principles:

c. Efficiency:<sup>1</sup>

d. Capital Cost:

e. Useful Life:

f. Operating Cost:

g. Energy:<sup>2</sup>

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:<sup>1</sup>

d. Capital Cost:

e. Useful Life:

f. Operating Cost:

g. Energy:<sup>2</sup>

h. Maintenance Cost:

i. Availability of construction materials and process chemicals:

<sup>1</sup>Explain method of determining efficiency.

<sup>2</sup>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:<sup>1</sup>

d. Capital Cost:

e. Useful Life:

f. Operating Cost:

g. Energy:<sup>2</sup>

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:<sup>1</sup>

d. Capital Costs:

e. Useful Life:

f. Operating Cost:

g. Energy:<sup>2</sup>

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:<sup>1</sup>

3. Capital Cost:

4. Useful Life:

5. Operating Cost:

6. Energy:<sup>2</sup>

7. Maintenance Cost:

8. Manufacturer:

9. Other locations where employed on similar processes:

a. (1) Company:

(2) Mailing Address:

(3) City:

(4) State:

<sup>1</sup>Explain method of determining efficiency.

<sup>2</sup>Energy to be reported in units of electrical power - KWH design rate.

(5) Environmental Manager:

(6) Telephone No.:

(7) Emissions:<sup>1</sup>

Contaminant	Rate or Concentration

(8) Process Rate:<sup>1</sup>

b. (1) Company:

(2) Mailing Address:

(3) City:

(4) State:

(5) Environmental Manager:

(6) Telephone No.:

(7) Emissions:<sup>1</sup>

Contaminant	Rate or Concentration

(8) Process Rate:<sup>1</sup>

10. Reason for selection and description of systems:

<sup>1</sup>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 ATTACHED REPORT

A. Company Monitored Data

1. \_\_\_\_\_ no. sites \_\_\_\_\_ TSP \_\_\_\_\_ ( ) SO<sub>2</sub>\* \_\_\_\_\_ 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

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) \_\_\_\_\_

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.

Applicants Maximum Allowable Emission Data

Pollutant	Emission Rate
TSP	_____ grams/sec
SO <sup>2</sup>	_____ grams/sec

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.

Attach all other information supportive to the PSD review.

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.

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.

REPORT IN SUPPORT OF  
AN APPLICATION FOR A PSD  
CONSTRUCTION PERMIT REVIEW

PREPARED FOR:

FARMLAND INDUSTRIES, INC.  
POLK COUNTY  
BARTOW, FLORIDA

AUGUST 15, 1990

PREPARED BY:

KOGLER & ASSOCIATES  
4014 N.W. 13TH STREET  
GAINESVILLE, FLORIDA 32609  
(904) 377-5822



## TABLE OF CONTENTS

	PAGE
1.0 SYNOPSIS OF APPLICATION	1
1.1 Applicant	1
1.2 Facility Location	1
1.3 Project Description	1
2.0 DESCRIPTION OF EXISTING FACILITY	4
2.1 Sulfuric Acid Plants	4
2.2 Phosphoric Acid Plants	7
2.3 Ammonium Phosphate Plants	7
2.4 Superphosphoric Acid Plants	8
2.5 Other Operations	8
3.0 PROPOSED PROJECT	12
3.1 Rule Applicability	13
4.0 BEST AVAILABLE CONTROL TECHNOLOGY	23
4.1 Emission Standards for Sulfuric Acid Plants	24
4.2 Control Technologies	25
4.2.1 Sulfur Dioxide Control	26
4.2.1.1 Dual Absorption Process	27
4.2.1.2 Sodium Sulfite-Bisulfite Scrubbing	28
4.2.1.3 Ammonia Scrubbing	28
4.2.1.4 Molecular Sieves	29
4.2.2 Sulfuric Acid Mist Control	30
4.2.2.1 Fiber Mist Eliminators	30
4.2.2.2 Electrostatic Precipitators	31
4.3 Cost Analysis	31
4.4 Conclusion	32
5.0 IMPACTS ON SOILS, VEGETATION AND VISIBILITY	38

## TABLE OF CONTENTS (CONTINUED)

6.0	GOOD ENGINEERING PRACTICE STACK HEIGHT	39
7.0	AIR QUALITY REVIEW	40
7.1	Air Quality Modeling for Sulfur Dioxide	43
7.2	Air Quality Modeling for Nitrogen Oxides	45
7.3	Air Quality Modeling for Sulfuric Acid Mist	46

## LIST OF FIGURES

FIGURE	TITLE	PAGE
FIGURE 2-1	AREA LOCATION MAP	9
FIGURE 2-2	SITE LOCATION MAP	10
FIGURE 2-3	PLOT PLAN	11
FIGURE 3-1	TYPICAL SULFURIC ACID DOUBLE ABSORPTION PLANT PROCESS FLOW DIAGRAM	17
FIGURE 3-2	PLANT LAYOUT FOR NO. 5 SULFURIC ACID PLANT	18

## LIST OF TABLES

TABLE	TITLE	PAGE
TABLE 3-1	EXISTING PRODUCTION RATES AND EMISSION RATES AFFECTED BY PROPOSED SULFURIC ACID PLANT CHANGES	15
TABLE 3-2	ANNUAL AIR POLLUTION EMISSION CHANGES RESULTING FROM THE PROPOSED SULFURIC ACID PLANT CHANGES.	16
TABLE 4-1	COST ANALYSIS FOR SO <sub>2</sub> CONTROL BY DUAL ABSORPTION 2400 TPD CONTACT SULFURIC ACID PLANT.	34
TABLE 4-2	COST ANALYSIS FOR SO <sub>2</sub> CONTROL BY AMMONIA SCRUBBING 2400 TPD CONTACT SULFURIC ACID PLANT.	35
TABLE 4-3	COST ANALYSIS FOR ACID MIST CONTROL BY FIBER TYPE MIST ELIMINATORS 2400 TPD CONTACT SULFURIC ACID PLANT.	36
TABLE 4-4	COST ANALYSIS FOR ACID MIST CONTROL BY ELECTROSTATIC PRECIPITATOR 2400 TPD CONTACT SULFURIC ACID PLANT.	73
TABLE 7-1	PLANT CHARACTERISTICS USED FOR AIR QUALITY MODELING	49
TABLE 7-2	SUMMARY OF SULFUR DIOXIDE IMPACT ANALYSIS	50
TABLE 7-3	SUMMARY OF ACID MIST IMPACT ANALYSIS	51

## 1.0 SYNOPSIS OF APPLICATION

### 1.1 Applicant

Farmland Industries, Inc.  
Green Bay Complex  
State Road 640 West  
P.O. Box 960  
Bartow, Florida 33830

### 1.2 Facility Location

Farmland Industries, Inc., Green Bay Complex, operates a phosphate chemical fertilizer manufacturing facility approximately six miles southwest of Bartow, Florida, on State Road 640 in Polk County. The complex occupies approximately 2400 acres and the UTM coordinates are Zone 17, 409.5 km east and 3079.5 km north.

### 1.3 Project Description

On October 20, 1989, Farmland Industries, Inc. submitted an application to construct a Monsanto Enviro-Chem double absorption sulfuric acid plant and a cogeneration facility which would use export steam from the new sulfuric acid plant to generate electrical power. According to the permit application, the new sulfuric acid plant (Plant No. 5) was to have a rated capacity of 2000 short tons per day of 100 percent  $H_2SO_4$ . Farmland Industries, Inc. found that the plant, as constructed, will have greater capacity and is proposing to increase the production of this plant to 2400 short tons per day of 100 percent  $H_2SO_4$ . Plant No. 5 is not yet in operation but is expected to be on-line in September 1990. The

cogeneration facility associated with the plant will remain rated at 38 megawatts of electrical power.

Farmland has four existing sulfuric acid plants on-site. Plants No. 1 and No. 2 are single absorption plants with ammonia scrubbers. Each has a rated capacity of 800 short tons per day of 100 percent  $H_2SO_4$ . Plant No. 2 was permanently shutdown on March 29, 1985. Plant No. 1 will be permanently shutdown when Plant No. 5 is operational. Plants No. 3 and No. 4 are double absorption plants each having a rated capacity of 1600 short tons per day of 100 percent  $H_2SO_4$ . Both plants will continue to operate when Plant No. 5 is operational. The proposed changes will result in a total increase of sulfuric acid capacity from 4800 tons per day to 5600 tons per day.

The proposed rate increase in the No. 5 sulfuric acid plant will result in a significant increase in sulfur dioxide and sulfuric acid mist emissions over emission rates permitted by AC53-171751.

A green superphosphoric acid (GSPA) plant permitted in November 1987 was addressed in the October 1989 application as nitrogen oxides emissions from the plant represented an emission increase that was contemporaneous with nitrogen oxides emission increases and decreases associated with the sulfuric acid plants. The net annual emission increase of nitrogen oxides, as presented in the 1989 permitting, was significant and was addressed in that application. The nitrogen oxides emission rate increase associated with the presently proposed increase in production rate of the No. 5 sulfuric acid plant is less than the de minimis increase defined in

17-2.500, Table 500-2, FAC.

Farmland is submitting the material herein to support an application to the Florida Department of Environmental Regulation for increasing the production rate of the No. 5 sulfuric acid plant. This report includes a description of the existing facility, a description of the No. 5 sulfuric acid plant, a review of Best Available Control Technology, an air quality review and an evaluation of the impact of the proposed modifications on soils, vegetation and visibility.

## 2.0 DESCRIPTION OF EXISTING FACILITY

Farmland Industries, Inc. Green Bay Complex operates a phosphate chemical fertilizer manufacturing facility approximately six miles southwest of Bartow, Florida, on State Road 640 in Polk County (See Figures 2-1 and 2-2). The complex occupies approximately 2400 acres and is located in UTM Zone 17 at coordinates 409.5 km east and 3079.5 km north.

The existing fertilizer complex consists of four sulfuric acid plants, two phosphoric acid plants, two ammonium phosphate plants producing monoammonium and diammonium phosphates (MAP and DAP), one superphosphoric acid plant, one green superphosphoric acid plant, auxiliary steam boilers and storage and shipping facilities for phosphate rock and the fertilizer products. A new sulfuric acid plant (Plant No. 5 - the fifth sulfuric acid plant at the chemical complex) is presently nearing completion of construction. Figure 2-3 shows the location of the existing plants and the new No. 5 sulfuric acid plant. The rate increase proposed for the No. 5 sulfuric acid plant will result in a net increase in sulfuric acid production. This production rate increase will be used to replace current sulfuric acid purchases and will not affect the operation of the other plants. The Farmland complex has an overall production capacity of approximately 600,000 tons per year of  $P_2O_5$ .

### 2.1 Sulfuric Acid Plants

There are four existing sulfuric acid plants at the Farmland Green Bay complex and a new sulfuric acid plant (Plant No. 5) nearing completion of



construction. Plants No. 1 and No. 2 were permitted in 1965 and are rated at 800 tons per day of 100 percent  $H_2SO_4$  each. The plants are single absorption with emissions controlled by ammonia scrubbers. The sulfur dioxide and sulfuric acid mist emission limits for these plants are established by Rule 17-2.600(2)(a)2, FAC. The emission limits are:

Sulfur Dioxide	10 pounds per ton of 100 percent acid
Acid Mist	0.3 pounds per ton of 100 percent acid
Visible Emissions	10 percent opacity

Plant No. 2 was permanently shutdown on March 29, 1985. Plant No. 1 will be shutdown after the No. 5 sulfuric acid plant is operational.

Plants No. 3 and No. 4 were permitted in 1972 and expanded in 1982. These plants are rated at 1600 tons per day of 100 percent  $H_2SO_4$  each and are both double absorption plants with the acid mist controlled by high efficiency mist eliminators. These plants are subject to Federal New Source Performance Standards as set forth in 40 CFR 60, Subpart H. The emission limiting standards for these plants are:

Sulfur Dioxide	4 pounds per ton of 100 percent acid
Acid Mist	0.15 pounds per ton of 100 percent acid
Visible Emissions	10 percent opacity.

The State of Florida has identical emission limiting standards for new sulfuric acid plants as set forth in Rule 17-2.600(2)(b), FAC. The

proposed changes will not affect the operations of the No. 3 and No. 4 sulfuric acid plants. These plants will continue to operate at their current rated capacities.

The No. 5 sulfuric acid plant is presently nearing completion of construction. The plant was permitted under AC53-171751 and PSD-FL-143 on January 30, 1990, at a production rate of 2000 tons per day of 100 percent sulfuric acid. The plant is a double absorption plant subject to the same emission limiting standards as the No. 3 and 4 plants. As constructed, plant No. 5 will have a production capacity of 2400 tons per day of 100 percent sulfuric acid and Farmland Industries, Inc. would like to use this full capacity. As the plant has not yet operated, the actual emissions from the plant have been presumed to be the same as emissions permitted in January 1990.

The actual emission rates of sulfur dioxide and acid mist from Plants No. 1 and No. 2 were determined from a review of emission measurements and production data from the past five years and were documented in the application for permit AC53-171751. The maximum measured sulfur dioxide emission rate was 6.50 pounds per ton of 100 percent  $H_2SO_4$  produced and the maximum measured acid mist emission rate was 0.07 pounds per ton of 100 percent  $H_2SO_4$  produced. The maximum annual acid production from the two plants (used to calculate annual emissions) was 430,516 tons per year (see application for AC53-171751 for documentation of these data).

Nitrogen oxide emissions from the sulfuric acid plants were estimated from an emission factor of  $2.1 \times 10^{-6}$  pounds of nitrogen oxides per cubic foot

of stack gas discharged from a sulfuric acid plant and typical stack gas flow rates for each of the plants.

## 2.2 Phosphoric Acid Plants

Farmland operates two phosphoric acid plants. One plant is an isothermal reactor design which is permitted at a maximum rate of 1850 tons per day of  $P_2O_5$ . The other plant is a Prayon phosphoric acid plant design and consists of two trains. The two trains produce approximately 1056 tons per day of  $P_2O_5$ . The production rate of these plants will not be affected by the production rate increase requested for the sulfuric acid plants.

## 2.3 Ammonium Phosphate Plants

Farmland operates two granular fertilizer plants. The diammonium phosphate plant (DAP) is permitted to operate at 82 tons per hour and produces approximately 600,000 tons per year of DAP with a nominal NPK grade of 18-46-0. The monoammonium phosphate (MAP) plant is permitted to operate at 60 tons per hour and produces approximately 400,000 tons per year of MAP with a nominal NPK grade of 11-52-0. The MAP plant is also permitted to produce granular triple superphosphate (GTSP) and DAP at rates of 33.2 tons per hour and 50 tons per hour, respectively. The change in sulfuric acid production will not affect these plants.

#### 2.4 Superphosphoric Acid Plants

Approximately 100,000 tons per year of  $P_2O_5$  (as 52 percent phosphoric acid) are evaporated to a concentration of 68 percent  $P_2O_5$  in Farmland's superphosphoric acid (SPA) plant. SPA at a maximum rate of 27 tons per hour is further processed at Farmland's new green superphosphoric acid plant (GSPA). The production rate of these plants will not be affected by the proposed increase in sulfuric acid production.

#### 2.5 Other Operations

The Farmland Green Bay complex also includes an auxiliary boiler to provide steam when there is an insufficient amount of export steam available from the sulfuric acid plants. There is also a 38 megawatt cogeneration facility associated with the No. 5 sulfuric acid plant and there are storage and shipping facilities for phosphate rock and fertilizer products. None of these operations will be affected by the production rate increase requested for the No. 5 sulfuric acid plant.

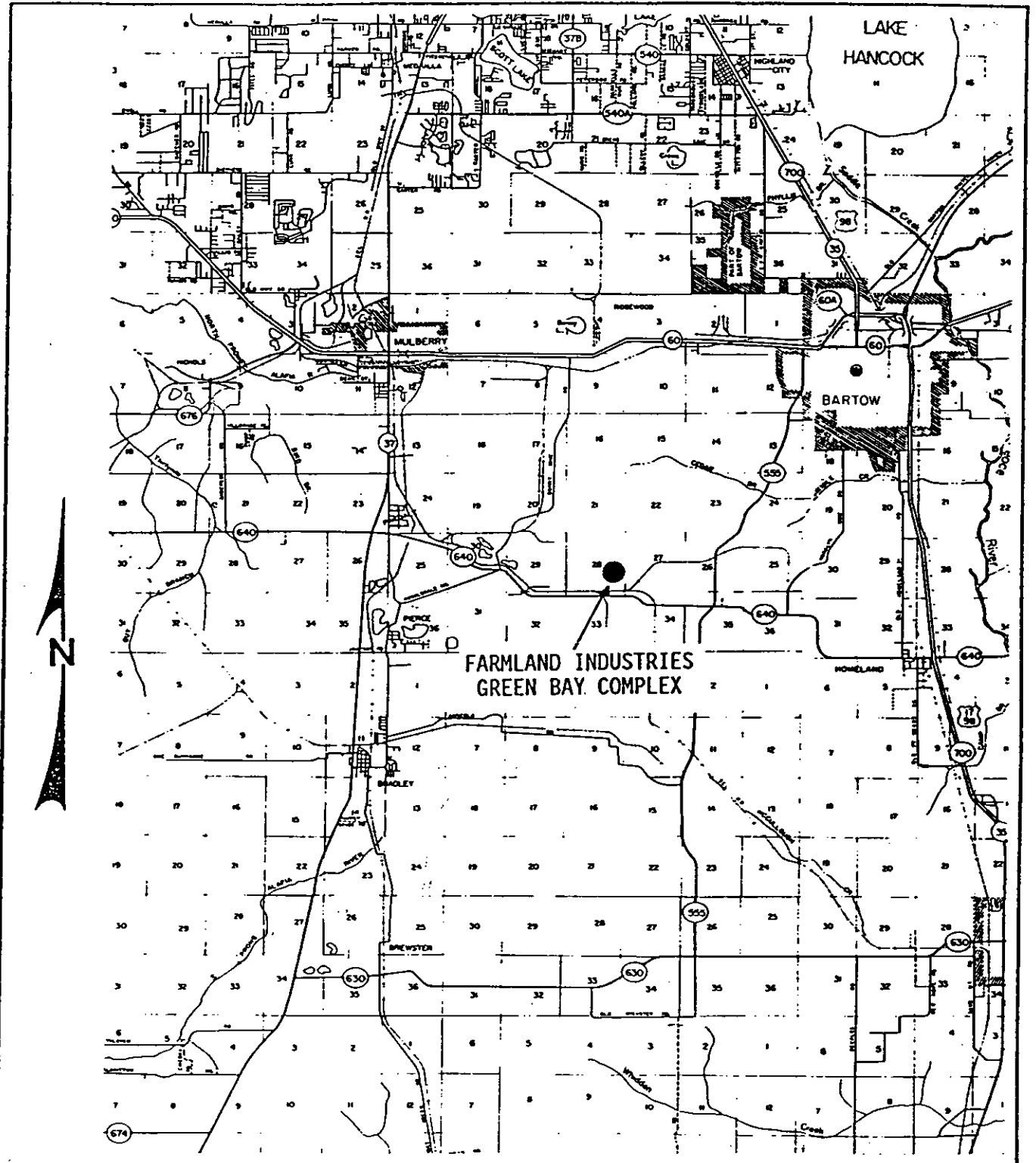


FIGURE 2-1  
 AREA LOCATION MAP  
 FARMLAND INDUSTRIES, INC.



# BRADLEY JUNCTION, FLA.

N2745-W8152.5/7.5

1949  
PHOTOREVISED 1972  
AMS 4639 IV SW-SERIES V847

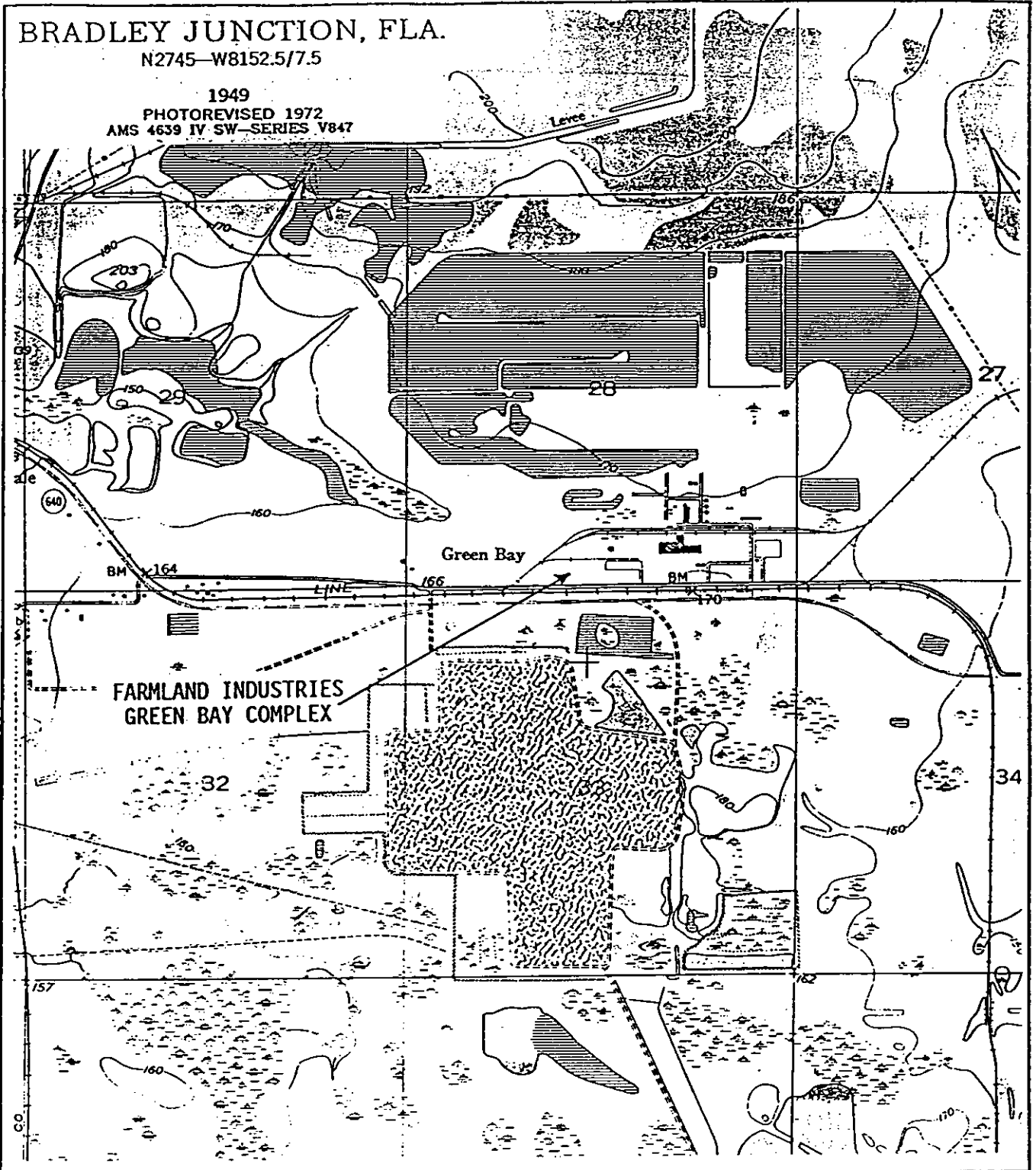
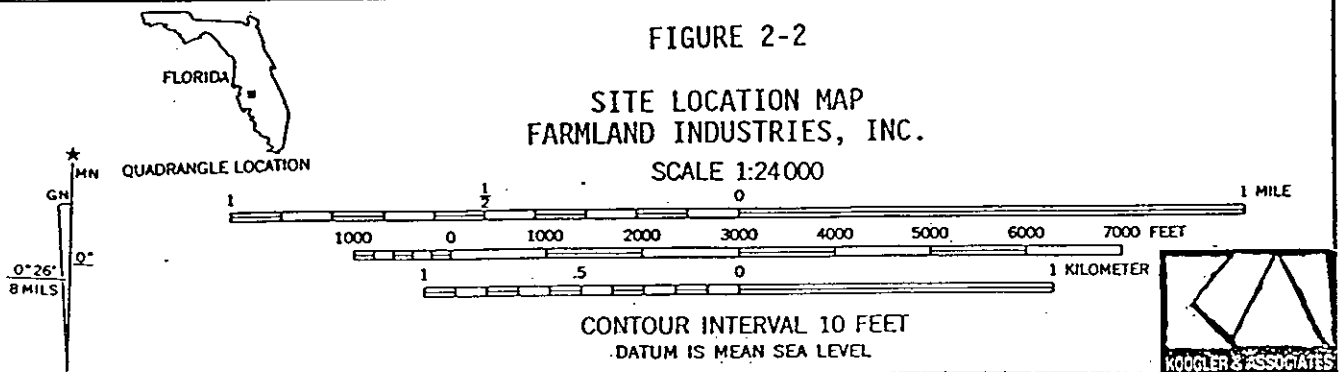


FIGURE 2-2

SITE LOCATION MAP  
FARMLAND INDUSTRIES, INC.

SCALE 1:24 000



CONTOUR INTERVAL 10 FEET  
DATUM IS MEAN SEA LEVEL

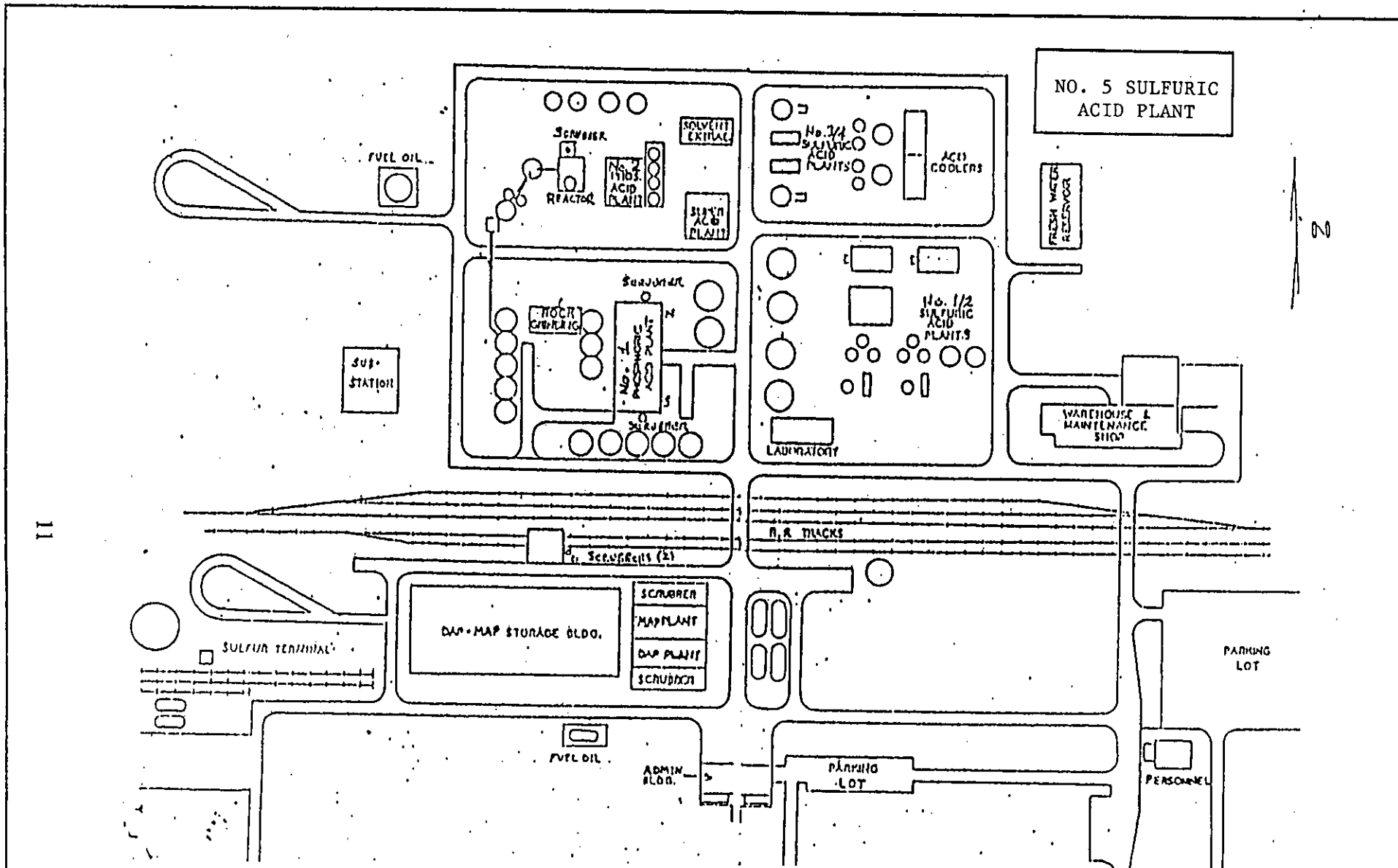


FIGURE 2-3  
 PLOT PLAN  
 FARMLAND INDUSTRIES, INC.



### 3.0 PROPOSED PROJECT

On October 20, 1989, Farmland Industries, Inc. submitted an application to construct a double adsorption sulfuric acid plant (Plant No. 5) rated at 2000 short tons per day of 100 percent  $H_2SO_4$ . Presently, Farmland Industries, Inc. is proposing to increase the production rate of Plant No. 5, which is not yet in operation, from 2000 short tons per day to 2400 short tons per day. The plant will also have cogeneration capabilities to generate 38 megawatts of electrical power with excess steam from the new sulfuric acid plant. A typical process flow diagram for double adsorption sulfuric acid plants is presented in Figure 3-1. Figure 3-2 shows the major equipment locations for the plant.

When the No. 5 plant becomes operational, sulfuric acid plant No. 1, rated at 800 tons per day of 100 percent  $H_2SO_4$ , will be permanently shutdown. The emission limits for Plant No. 5 will be the Federal New Source Performance Standards as set forth in Rule 17-2.600(2)(b), FAC, i.e., the sulfur dioxide and acid mist emission limits will be 4.0 pounds per ton of 100 percent sulfuric acid and 0.15 pounds per ton of 100 percent sulfuric acid respectively.

Table 3-1 summarizes the permitted, actual and proposed conditions at which sulfuric acid plants No. 1, No. 2, and No. 5 presently operate and will operate. The emission rates for plants No. 1 and 2 and the presently permitted emission rates for plant No. 5 were presented in the application for permit AC53-171751. The rates for plants No. 1 and 2 are presented here for reference. The No. 5 plant is the only sulfuric acid plant at



Farmland which will experience changes. In Table 3-2, the annual air pollutant emission rate changes, based on present, actual and proposed operating conditions, are summarized.

The information tabulated in Tables 3-1 and 3-2 for the sulfuric acid plants shows there will be a significant net increase in the hourly emission rates of sulfur dioxide and sulfuric acid mist. The data also show that there will be less than a significant increase in the annual nitrogen oxides emission rate.

There are no other air pollution sources associated with the requested changes at Farmland Industries, Inc. that would have to be considered in this permit application.

### 3.1 Rule Applicability

Sulfuric acid plant No. 5 is classified as a new major source subject to both State and Federal regulations as set forth in Rule 17-2.600(2)(b). The proposed increases in sulfur dioxide and acid mist emissions are significant as defined by Rule 17-2.500(2)(e)2, FAC. The modification to the No. 5 sulfuric acid plant will therefore be subject to the full review required of a PSD construction permit application. This will include a determination of Best Available Control technology, an air quality review, and an evaluation of impacts on soils, vegetation and visibility.

The following sections of the application address the changes requested for modifying the No. 5 sulfuric acid plant and include all information

required for the PSD review. The air quality review will look at impacts of sulfur dioxide emissions and acid mist emissions. The review will focus on the changes to be expected from operating the No. 5 sulfuric acid plant and ceasing operations of sulfuric acid plants No. 1 and No. 2.

TABLE 3-1

EXISTING PRODUCTION RATES AND  
EMISSION RATES AFFECTED BY PROPOSED  
SULFURIC ACID PLANT CHANGES (1)

FARMLAND INDUSTRIES, INC.  
POLK COUNTY, FLORIDA

	Sulfuric Acid Plant			
	1(2)	2(2)	5 Permitted	5 Proposed
Date Permitted	1965	1965	1990	NA
<u>Current Permit Conditions</u>				
Rate (TPD)	800	800	2000	-
SO <sub>2</sub> (lb/ton)	10.0	10.0	4.0	-
(lb/hr)	330	330	333.3	-
(TPY)	1460	1460	1460	-
Mist (lb/ton)	0.30	0.30	0.15	-
(lb/hr)	9.9	9.9	12.5	-
(TPY)	43.8	43.8	54.8	-
Operating Factor	1.0	1.0	1.0	-
<u>Actual Conditions</u>				
Rate (TPD)	800	800	2000(3)	-
SO <sub>2</sub> (lb/ton)	6.5	6.5	4.0	-
(lb/hr)	216.7	216.7	333.3	-
(TPY)	700	700	1460	-
Mist (lb/ton)	0.07	0.07	0.15	-
(lb/hr)	2.3	2.3	12.5	-
(TPY)	7.5	7.5	54.8	-
Operating Factor	0.737	0.737	1.0	-
<u>Proposed Conditions</u>				
Rate (TPD)	0	0	-	2400
SO <sub>2</sub> (lb/ton)	0	0	-	4.0
(lb/hr)	0	0	-	400
(TPY)	0	0	-	1752
(lb/ton)	0	0	-	0.15
(lb/hr)	0	0	-	15.0
(TPY)	0	0	-	65.7
Operating Factor	0	0	-	1.0

(1) See Appendix 3-A for calculations of emission rates.

(2) Presented for reference only.

(3) Plant No. 5 is not yet operational. Actual conditions have therefore been set equal to permitted conditions.

TABLE 3-2

ANNUAL AIR POLLUTANT EMISSION CHANGES RESULTING  
FROM THE PROPOSED SULFURIC ACID PLANT CHANGES(1)FARMLAND INDUSTRIES, INC.  
POLK COUNTY, FLORIDA

Pollutant Tons/year	Sulfuric Acid Plant			
	1(2)	2(2)	5 Permitted	5 Proposed
<b>SO<sub>2</sub></b>				
Present (actual)	700	700	1460	0
Proposed	0	0	0	1752
Change	(700)	(700)	(1460)	1752
Subtotal Significant Increase (3)				292 40
<b>MIST</b>				
Present (actual)	7.5	7.5	54.8	0
Proposed	0	0	0	65.7
Change	(7.5)	(7.5)	(54.8)	65.7
Subtotal Significant Increase (3)				10.9 7
<b>NOX</b>				
Present (actual)	25.2	25.2	43.4	0
Proposed	0	0	0	52.2
Change	(25.2)	(25.2)	(43.4)	52.2
Subtotal Significant Increase (3)				8.8 40

(1) Based on differences between present, permitting and proposed operating conditions. See Appendix 3-A for calculation of emission rates.

(2) Presented for reference only.

(3) Defined in 17-2.500(2)(e)2, FAC.

NOTE: Rate changes in ( ) represent decreases in annual emissions.

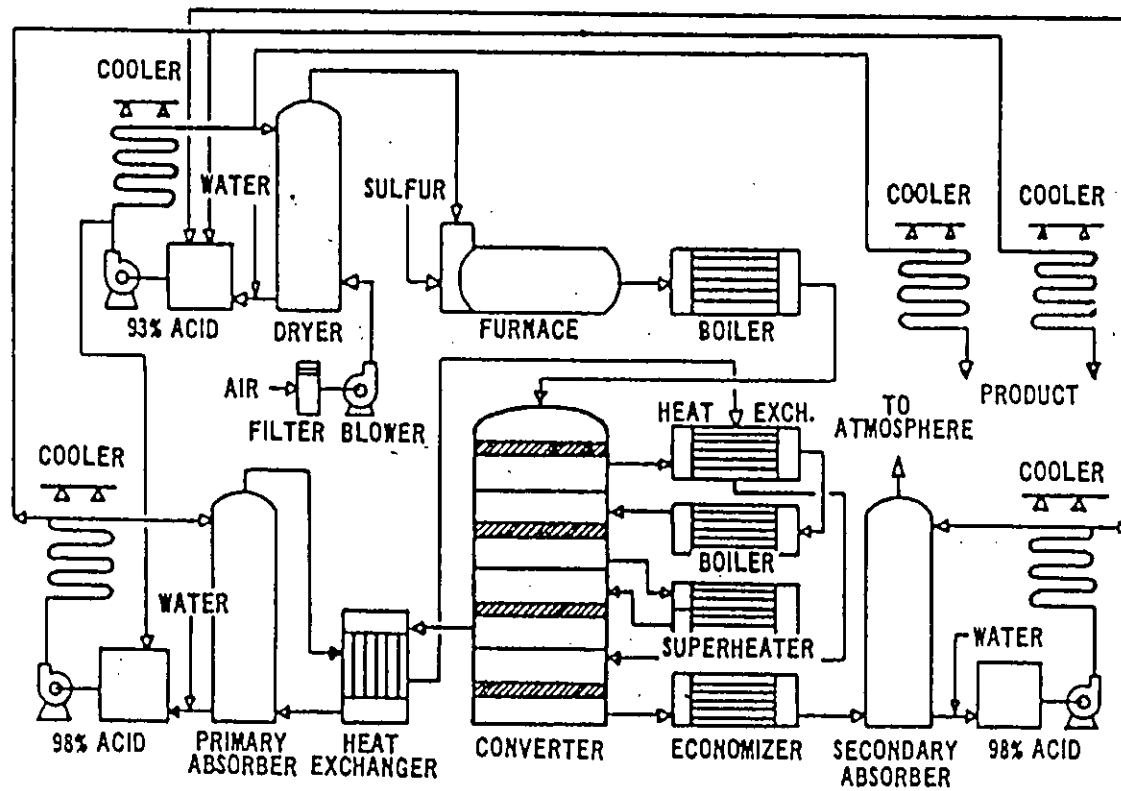
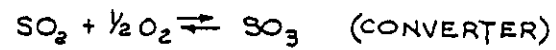
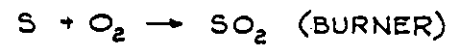
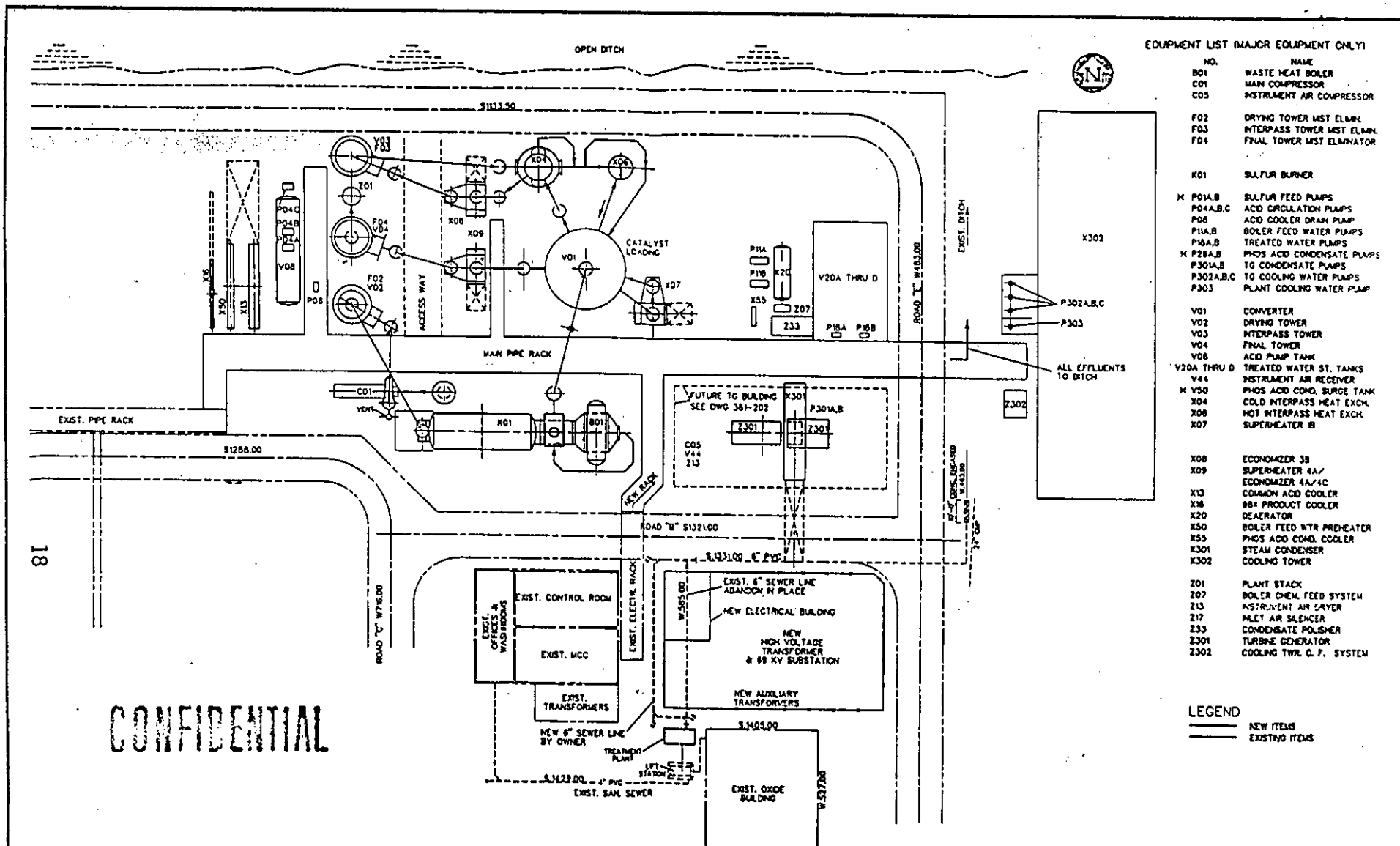


FIGURE 3-1  
TYPICAL SULFURIC ACID  
DOUBLE ABSORPTION PLANT  
PROCESS FLOW DIAGRAM





EQUIPMENT LIST (MAJOR EQUIPMENT ONLY)

NO.	NAME
B01	WASTE HEAT BOILER
C01	MAIN COMPRESSOR
C03	INSTRUMENT AIR COMPRESSOR
F02	DRYING TOWER MST ELMIN.
F03	INTERPASS TOWER MST ELMIN.
F04	FINAL TOWER MST ELMINATOR
K01	SULFUR BURNER
X P01A,B	SULFUR FEED PUMPS
P04A,B,C	ACID CIRCULATION PUMPS
P08	ACID COOLER DRAIN PUMP
P11A,B	BOILER FEED WATER PUMPS
P18A,B	TREATED WATER PUMPS
X P28A,B	PHOS ACID CONDENSATE PUMPS
P301A,B	TG CONDENSATE PUMPS
P302A,B,C	TG COOLING WATER PUMPS
P303	PLANT COOLING WATER PUMP
V01	CONVERTER
V02	DRYING TOWER
V03	INTERPASS TOWER
V04	FINAL TOWER
V08	ACID PUMP TANK
V20A THRU D	TREATED WATER ST. TANKS
V44	INSTRUMENT AIR RECEIVER
X V50	PHOS ACID COND. SURGE TANK
X04	COLD INTERPASS HEAT EXCH.
X06	HOT INTERPASS HEAT EXCH.
X07	SUPERHEATER B
X08	ECONOMIZER 3B
X09	SUPERHEATER 4A/ ECONOMIZER 4A/4C
X13	COMMON ACID COOLER
X16	98% PRODUCT COOLER
X20	DEAERATOR
X50	BOILER FEED WTR PREHEATER
X55	PHOS ACID COND. COOLER
X301	STEAM CONDENSER
X302	COOLING TOWER
Z01	PLANT STACK
Z07	BOILER CHEM. FEED SYSTEM
Z13	INSTRUMENT AIR DRYER
Z17	INLET AIR SILENCER
Z33	CONDENSATE POLISHER
Z301	TURBINE GENERATOR
Z302	COOLING TWR. C. F. SYSTEM

LEGEND  
 ——— NEW ITEMS  
 ——— EXISTING ITEMS

CONFIDENTIAL

FIGURE 3-2  
 PLANT LAYOUT FOR NEW  
 2000 TPD SULFURIC ACID PLANT

SOURCE: MONSANTO ENVIRO-CHEM SYSTEMS, INC.



APPENDIX 3-A  
EMISSION RATE CALCULATIONS

## EMISSION RATE CALCULATIONS

### SULFURIC ACID PLANTS NO. 1 AND NO. 2 (FOR REFERENCE ONLY)

PERMITTED: 800 tons per day 100% acid  
SO<sub>2</sub> - 10 lb/ton, 330 lb/hr  
Mist - 0.30 lb/ton, 9.9 lb/hr  
Operating Factor - 1.0  
(Based on Permits No. A053-99016 and A053-99018)

ACTUAL: 800 tons per day 100% acid  
SO<sub>2</sub> - 6.50 lb/ton  
Mist - 0.07 lb/ton  
Operating Factor - 0.737, Annual, based on historic  
production data documented in Appendix 3-B

PROPOSED: Both plants to be permanently shutdown

NOX: 111,547 dscf per ton of 100% acid (See Appendix 3-B)  
2.1 x 10<sup>(-6)</sup> lb NOX per dscf (See IMC-New Wales PSD  
application for third train expansion)

### EMISSION RATES (each plant)

#### Actual

SO<sub>2</sub>: Hourly = 6.50 lb/ton x 800/24 ton/hr  
= 216.7 lb/hr  
Annual = 216.7 lb/hr x 8760 hr/yr x 1/2000 ton/lb  
x 0.737  
= 700 TPY

MIST: Hourly = 0.07 lb/ton x 800/24 ton/hr  
= 2.3 lb/hr  
Annual = 2.3 lb/hr x 8760 hr/yr x 1/2000 ton/lb  
x 0.737  
= 7.5 TPY

NOX Hourly = 800 ton/day x 111547 dscf/ton  
x 2.1 x 10<sup>(-6)</sup> lb/dscf x 1/24 day/hr  
= 7.8 lb/hr  
Annual = 7.8 lb/hr x 8760 hr/yr x 1/2000 ton/lb  
x 0.737  
= 25.2 TPY (5.75 lb/hr, equivalent annual average  
for modeling purposes)

NOTE: No other air pollutants are discharged from Sulfuric Acid Plants No. 1 and No. 2.



## EMISSION RATE CALCULATIONS

### SULFURIC ACID PLANT NO. 5 (PERMITTED/ACTUAL)

PROPOSED: 2000 tons per day 100% acid

SO<sub>2</sub> - 4.0 lb/ton

Mist - 0.15 lb/ton

Operating Factor - 1.0

NOX: 56739 dscf per ton of 100% acid (Based on Monsanto Enviro-Chem Systems, Inc. design)

2.1 x 10<sup>(-6)</sup> lb NOX per dscf (See IMC-New Wales PSD application for third train expansion)

### EMISSION RATES

#### Proposed

SO<sub>2</sub>: Hourly = 2000 ton/day x 4.0 lb/ton x 1/24 day/hr  
= 333.3 lb/hr  
Annual = 333.3 lb/hr x 8760 hr/yr x 1/2000 ton/lb x 1.0  
= 1460 TPY

MIST: Hourly = 2000 ton/day x 0.15 lb/ton x 1/24 day/hr  
= 12.5 lb/hr  
Annual = 12.5 lb/hr x 8760 hr/yr x 1/2000 ton/lb  
x 1.0  
= 54.8 TPY

NOX Hourly = 2000 ton/day x 56739 dscf/ton  
x 2.1 x 10<sup>(-6)</sup> lb/dscf x 1/24 day/hr  
= 9.9 lb/hr  
Annual = 9.9 lb/hr x 8760 hr/yr x 1/2000 ton/lb  
x 1.0  
= 43.4 TPY

NOTE: No other air pollutants are discharged from Plant No. 5.

## EMISSION RATE CALCULATIONS

### SULFURIC ACID PLANT NO. 5 (PROPOSED)

PROPOSED: 2400 tons per day 100% acid  
SO<sub>2</sub> - 4.0 lb/ton  
Mist - 0.15 lb/ton  
Operating Factor - 1.0

NOX: 56739 dscf per ton of 100% acid (Based on Monsanto Enviro-Chem Systems, Inc. design)  
2.1 x 10<sup>(-6)</sup> lb NOX per dscf (See IMC-New Wales PSD application for third train expansion)

### EMISSION RATES

#### Proposed

SO<sub>2</sub>: Hourly = 2400 ton/day x 4.0 lb/ton x 1/24 day/hr  
= 400 lb/hr  
Annual = 400 lb/hr x 8760 hr/yr x 1/2400 ton/lb x 1.0  
= 1752 TPY

MIST: Hourly = 2400 ton/day x 0.15 lb/ton x 1/24 day/hr  
= 15.0 lb/hr  
Annual = 15.0 lb/hr x 8760 hr/yr x 1/2400 ton/lb  
x 1.0  
= 65.7 TPY

NOX Hourly = 2400 ton/day x 56739 dscf/ton  
x 2.1 x 10<sup>(-6)</sup> lb/dscf x 1/24 day/hr  
= 11.9 lb/hr  
Annual = 11.9 lb/hr x 8760 hr/yr x 1/2400 ton/lb  
x 1.0  
= 52.2 TPY

NOTE: No other air pollutants are discharged from Plant No. 5.

#### 4.0 BEST AVAILABLE CONTROL TECHNOLOGY

Best Available Control Technology (BACT) is required to control air pollutants emitted from newly constructed major sources or from modification to the major emitting facilities if the modification results in significant increase in the emission rate of regulated pollutants. The significance of an emission rate increase is defined by Rule 17-2.500(2)(e)(2), FAC.

The emission rate increases proposed by Farmland have been summarized in Table 3-2. The increases will result from increasing the production rate of a newly constructed double absorption sulfuric acid plant from 2000 tons per day to 2400 tons per day of 100 percent sulfuric acid. From Table 3-2 it will be noted that sulfur dioxide and sulfuric acid mist emissions from the No. 5 sulfuric acid plant at 2400 tons per day will represent a significant increase over emissions from the plant as permitted at 2000 tons per day. The increase in nitrogen oxides emissions from the plant will be less than de minimis.

Sulfur dioxide and acid mist are present in the tail gas from all contact processed sulfuric acid plants. In a typical plant with the single absorption system, the sulfur dioxide in the tail gas is approximately 30 pounds per ton of acid produced and the acid mist is approximately four pounds per ton of acid produced. The nitrogen oxides that are present in the tail gas are formed in the sulfur burners as a result of the fixation of atmospheric nitrogen. Measurements have indicated that the

concentration of nitrogen oxides in the tail gas and sulfuric acid plant is in the range of 18-20 parts per million (volume).

#### 4.1 Emission Standards for Sulfuric Acid Plants

Federal New Source Performance Standards (NSPS) for sulfuric acid plants became effective on August 17, 1971. These standards are codified in 40 CFR 60, Subpart H and require sulfur dioxide emissions to be limited to no more than 4.0 pounds per ton of 100 percent acid produced and require that sulfuric acid mist emissions be limited to no more than 0.15 pounds per ton of 100 percent acid produced. Additionally, the standards limit the opacity of the emissions from new sulfuric acid plants to less than 10 percent. There are no emission standards for nitrogen oxides.

When EPA reviewed the New Source Performance Standards for sulfuric acid plants in 1985 (EPA-450/3-85-012), it was concluded that because of variations in sulfur dioxide emissions as a function of catalyst age, "... the level of SO<sub>2</sub> emissions as specified in the current NSPS (should) not be changed at this time." Regarding the NSPS for sulfuric acid mist, EPA concluded, "Making the acid mist standard more stringent is not believed to be practical at this time because of the need to provide a margin of safety due to in-plant operating fluctuations, which introduce variable quantities of moisture into the sulfuric acid production line."

A review of BACT/LAER determinations published in the EPA Clearinghouse indicates that no new control alternatives have been applied to sulfuric

acid plants since 1990 that would result in a consistent reduction in sulfur dioxide emission below 4.0 pounds per ton of acid nor would result in a consistent reduction of sulfuric acid mist emissions below 0.15 pounds per ton of acid. No control technologies for nitrogen oxides are discussed in either the NSPS review or in BACT/LAER determinations.

#### 4.2 Control Technologies

The control of sulfur dioxide and sulfuric acid mist emissions from sulfuric acid plants can be achieved by various processes. The process of choice for sulfur dioxide control has been dual absorption and the process of choice for controlling sulfuric acid mist emission has been one of the various types of fiber mist eliminators. These processes have been selected based on cost, product recovery, the formation of no undesirable by-products and the fact that neither introduces operating processes that are foreign to plant personnel.

EPA published a review of NSPS for sulfuric acid plants in March 1985 (EPA-450/3-85-012). Another review of NSPS by EPA is currently due but probably will not be published before the early 1990's. In the 1985 report, EPA reviewed 46 sulfuric acid plants built between 1971 and 1985. Of these 46 plants, 40 used the dual absorption process for sulfur dioxide control with the remaining six using some type of acid gas scrubbing. All 46 plants used the high efficiency mist eliminators for acid mist control. The control of nitrogen oxides in sulfur acid plants has not been addressed to date because of the low concentration of nitrogen oxides

in the tail gases of sulfuric acid plants. The nitrogen oxide concentration in the tail gas stream of a typical sulfuric acid plant is in the range of 20 parts per million. This equates to a mass emission rate of nitrogen oxide of approximately 10 pounds per hour or approximately 0.03 pounds per million Btu. As a point of comparison, NSPS for fossil fuel fired steam generators limit nitrogen oxides emissions to 0.1-0.8 pounds per million Btu heat input, depending upon the type of fuel used.

In the March 1985 review (EPA-450/3-85-012), EPA reviewed the control technologies that had been used to control sulfur dioxide and sulfuric acid mist emissions from sulfuric acid plants. The alternatives included the dual absorption process, ammonia scrubbing, sodium sulfite-bisulfite scrubbing, and molecular sieves for sulfur dioxide control and filter type mist eliminators and electrostatic precipitators for sulfuric acid mist control. A review of the EPA BACT/LAER Clearinghouse information indicated that no other control alternatives have been considered for sulfuric acid plants. No control alternatives were addressed for nitrogen oxides control in either the 1985 EPA NSPS review or in the BACT/LAER Clearinghouse.

#### 4.2.1 Sulfur Dioxide Control

The control alternatives for sulfur dioxide have been summarized based upon information compiled by EPA in the 1985 NSPS review for sulfur acid plants. As stated earlier, EPA is due to review these standards again but

will probably not publish the results of their review until sometime in the early 1990's.

#### 4.2.1.1 Dual Absorption Process

The dual absorption process has become the SO<sub>2</sub> control system of choice within the sulfuric acid industry since the promulgation of NSPS in 1971. Of the 46 new sulfuric acid plants constructed between 1971 and 1985, 40 employed this process for sulfur dioxide control. The process offers the following advantages over other SO<sub>2</sub> control technologies:

1. 99.4 percent of the sulfur is converted to sulfuric acid compared with 97.7 percent conversion with a single absorption plant followed by scrubbing;
2. there are no by-products produced;
3. there are no new operating processes that plant personnel must become familiar with;
4. the process permits higher inlet sulfur dioxide concentrations resulting in a reduction in equipment size;
5. there is no reduction in overall plant operating time efficiency; and

6. there is no increase in manpower requirements.

The dual absorption process is capable of reducing sulfur dioxide emission rates to less than 4.0 pounds per ton of acid as required by New Source Performance Standards. The information reviewed by EPA indicates that even lower sulfur dioxide emission levels occur with new catalyst but as the catalyst ages, the conversion efficiency drops and sulfur dioxide emission rates begin to approach the 4.0 pound per ton limit.

#### 4.2.1.2 Sodium Sulfite-Bisulfite Scrubbing

Between 1971 and 1985, two sulfuric acid plants were constructed employing sodium sulfite-bisulfite scrubbing to control sulfur dioxide emissions. One of the plants was subsequently converted to ammonia scrubbing and the second plant has never been used. As a result, sodium sulfite-bisulfite scrubbing is not considered a demonstrated sulfur dioxide control alternative.

#### 4.2.1.3 Ammonia Scrubbing

Ammonia scrubbing uses anhydrous ammonia and water in a scrubbing system to convert sulfur dioxide to ammonium sulfate. Depending upon the market, the ammonium sulfate can be converted to a fertilizer grade product.

Five sulfuric acid plants constructed between 1971 and 1985 use ammonia scrubbing for sulfur dioxide control. The process has proved effective



for reducing sulfur dioxide emissions to below 4.0 pounds per ton and also for controlling sulfuric acid mist emissions.

The major disadvantages of the ammonia scrubbing system, when compared with the dual absorption process are:

1. a waste by-product is produced unless there is a market for fertilizer grade ammonium sulfate;
2. the scrubbing system introduces a process that is foreign to sulfuric acid plant operators;
3. the scrubbing system is a high maintenance item and requires additional manpower for operation; and
4. no sulfuric acid plant size reduction benefits are achieved with the scrubbing system.

#### 4.2.1.4 Molecular Sieves

A molecular sieve was installed at one sulfuric acid plant in Florida for sulfur dioxide control. Extensive operating problems were experienced as the molecular sieve absorbed nitrogen oxides as well as sulfur dioxide. The regeneration of these gases resulted in the formation of nitric acid within the sulfuric acid plant. The nitric acid/sulfuric acid mixture resulted in severe corrosion problems which caused the molecular sieve

system to be scrapped. As a result, molecular sieves are not considered a viable alternative for sulfur dioxide control in the sulfuric acid industry.

#### 4.2.2 Sulfuric Acid Mist Control

Control alternatives that were reviewed by EPA in the 1985 New Source Performance Standards review are summarized in the following sections.

##### 4.2.2.1 Fiber Mist Eliminators

The 46 new sulfuric acid plants constructed between 1971 and 1985, all used the fiber type mist eliminators for sulfuric acid mist control. Operations demonstrated that these types of mist eliminators can control sulfuric acid mist emissions to less than 0.15 pounds per ton of sulfuric acid.

The mist eliminators are the choice of control for sulfuric acid mist within the sulfuric acid industry because they require very little operation and maintenance attention and because of the small space requirement associated with these devices. The disadvantage of this type of mist eliminator is that the pressure drop across the elements varies from five to 15 inches of water; resulting in an increase in operating utility costs.

#### 4.2.2.2 Electrostatic Precipitators

The electrostatic precipitators have the potential for controlling sulfuric acid mist emissions from sulfuric acid plants; however, there is no demonstrated application of precipitators. The disadvantages associated with precipitators, and hence, the reason they have not been used, include the initial cost, size requirements, operating and maintenance requirements and the potential for corrosion. The advantage of the precipitator is that it would operate at a low pressure drop; approximately 0.5 inches of water.

#### 4.3 Cost Analysis

In reviewing the cost analyses presented in this section, it should be recognized that the two control alternatives that have been analyzed for sulfur dioxide achieved about the same degree of efficiency; i.e., there is no advantage of one system over the other from the standpoint of the level of sulfur dioxide control that can be achieved. The same holds true for the control alternatives evaluated for sulfuric acid mist; both alternatives (fiber mist eliminators and electrostatic precipitators) are capable of achieving approximately the same degree of acid mist control.

Hence, the choice of the control alternative for sulfur dioxide and the control alternative for sulfuric acid mist can be made on the basis of cost, operating familiarity and operating convenience.

In Tables 4-1 and 4-2, the capital costs and annual costs of controlling sulfur dioxide emissions by dual absorption and by ammonia scrubbing are presented. In Table 4-3 and 4-4, similar costs are presented for controlling sulfuric acid mist emissions by fiber mist eliminators and electrostatic precipitators. The cost data are based upon analyses presented in EPA-450/3-85-012 and in EPA-450/3-76-014 (Capital and Operating Costs of Selected Air Pollution Control Systems); both updated to 1989 costs. The capital recovery in the annual cost calculation is based upon a 10 percent rate of return and a 10 year equipment life.

The cost analyses demonstrate that the annual cost of the dual absorption process for sulfur dioxide is less than half the annual cost for ammonia scrubbing. Similarly the annual cost for sulfuric acid mist with the fiber type mist eliminators is approximately one-fourth the annual cost of controlling acid mist with electrostatic precipitators. As the two control alternatives for sulfur dioxide and the two control alternatives for sulfuric acid mist are capable of the same level of control, it is evident why the dual absorption and the fiber type mist eliminators have been the control alternatives of choice for sulfur dioxide and sulfuric acid mist, respectively.

#### 4.4 Conclusion

Based upon the analysis presented in previous sections, the dual absorption process had been selected by Farmland as the control alternative for sulfur dioxide control and the fiber type high efficiency

mist eliminator has been selected for sulfuric acid mist control. The dual absorption system will be operated with catalyst screening and make up every three to five years as is typical in the industry.

There is no effective and demonstrated technology for controlling nitrogen oxides emissions from sulfuric acid plants. Farmland will minimize these emissions by operating the sulfur burner of the No. 5 sulfuric acid plant within the limits established by the designer.

TABLE 4-1

COST ANALYSIS FOR SO<sub>2</sub> CONTROL BY DUAL ABSORPTION  
2400 TPD CONTACT SULFURIC ACID PLANT

FARMLAND INDUSTRIES, INC.  
GREEN BAY, FLORIDA

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**CAPITAL COST**

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Direct		
Absorber	1,237,000	
Pumps	248,000	
Piping	371,000	
Heat Exchanger	<u>619,000</u>	
		\$2,475,000
Indirect		
Engineering and Supervision	248,000	
Construction	138,000	
Contractor	149,000	
Contingency	<u>296,000</u>	
		<u>831,000</u>
TOTAL CAPITAL COST		\$3,306,000

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**ANNUAL COST**

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Direct		
Operating Labor and Supervision	8,000	
Maintenance Labor	6,500	
Maintenance Materials	8,000	
Utilities	2,638,000	
Catalyst	<u>36,000</u>	
		\$2,697,500
Indirect		
OH	9,500	
Payroll	<u>4,000</u>	
		13,500
Capital Recovery		539,000
Insurance and Taxes		132,000
Credit for Acid Recovery		<u>(1,020,000)</u>
TOTAL ANNUAL COST		\$2,362,000

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TABLE 4-2

COST ANALYSIS FOR SO<sub>2</sub> CONTROL BY AMMONIA SCRUBBING  
2400 TPD CONTACT SULFURIC ACID PLANT

FARMLAND INDUSTRIES, INC.  
GREEN BAY, FLORIDA

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**CAPITAL COST**

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Direct			
Scrubber and Auxiliaries			\$3,771,000
Indirect			
Engineering and Supervision	377,000		
Construction	301,000		
Contractor	226,000		
Contingency	<u>452,000</u>		
			<u>1,356,000</u>
<b>TOTAL CAPITAL COST</b>			<b>\$5,127,000</b>

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**ANNUAL COST**

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Direct			
Operating Labor and Supervision	540,000		
Maintenance Labor	80,000		
Maintenance Materials	95,000		
Utilities	274,000		
Chemicals	<u>2,314,000</u>		
			\$3,303,000
Indirect			
OH	369,000		
Payroll	<u>124,000</u>		
			493,000
Capital Recovery			836,000
Insurance and Taxes			<u>205,000</u>
<b>TOTAL ANNUAL COST</b>			<b>\$4,837,000</b>

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TABLE 4-3

COST ANALYSIS FOR ACID MIST CONTROL BY FIBER TYPE MIST ELIMINATORS  
2400 TPD CONTACT SULFURIC ACID PLANT

FARMLAND INDUSTRIES, INC.  
GREEN BAY, FLORIDA

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**CAPITAL COST**

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Direct	\$ 76,000
Indirect	<u>36,000</u>
<b>TOTAL CAPITAL COST</b>	<b>\$ 112,000</b>

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**ANNUAL COST**

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Direct	
Utilities	\$ 174,000
Indirect	
Capital Recovery	18,000
Insurance and Taxes	<u>5,000</u>
	23,000
Credit for Acid Recovery	<u>(114,000)</u>
<b>TOTAL ANNUAL COST</b>	<b>\$ 83,000</b>

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TABLE 4-4

COST ANALYSIS FOR ACID MIST CONTROL BY ELECTROSTATIC PRECIPITATOR  
2400 TPD CONTACT SULFURIC ACID PLANT

FARMLAND INDUSTRIES, INC.  
GREEN BAY, FLORIDA

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**CAPITAL COST**

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Direct			
	Collector	379,000	
	Auxiliaries	<u>131,000</u>	\$ 510,000
Indirect			
	Engineering and Supervision	51,000	
	Construction	40,000	
	Contractor	31,000	
	Contingency	<u>61,000</u>	<u>183,000</u>
TOTAL CAPITAL COST			\$ 693,000

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**ANNUAL COST**

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Direct			
	Operating Labor and Supervision	23,000	
	Maintenance Labor	20,000	
	Maintenance Materials	36,000	
	Utilities	<u>60,000</u>	\$ 139,000
Indirect			
	OH	25,000	
	Payroll	<u>9,000</u>	34,000
Capital Recovery			113,000
Insurance and Taxes			<u>27,000</u>
TOTAL ANNUAL COST			\$ 313,000

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## 5.0 IMPACTS ON SOILS, VEGETATION AND VISIBILITY

The land-use in the vicinity of Farmland Industries, Inc. is a mixture of unimproved land, pasture land and land which has been mined for phosphate rock. The town of Bartow is located about six miles northeast of the site and Mulberry is located about eight miles northwest of the site. Additionally, there are scattered residences between Farmland and the two population centers. The No. 5 sulfuric acid plant is not expected to have any significant impact on activities in the area. Air quality modeling has demonstrated that sulfur dioxide levels which will exist after the proposed modifications will not differ significantly from current levels. Also, modeling has indicated that there will not be a significant impact from either sulfuric acid mist or nitrogen oxides emissions. Thus it is expected that the proposed expansion will not adversely impact soils, vegetation and visibility in the area.

The proposed modification will require a minimal increase in personnel to operate the cogeneration facility. Also, the increase in sulfuric acid production may cause a slight increase in truck deliveries of molten sulfur. Both of these changes will have a slight impact on traffic in the area, but when compared with traffic levels that presently exist, the increases will not be significant.

## 6.0 GOOD ENGINEERING PRACTICE STACK HEIGHT

The criteria for good engineering practice stack height in Rule 17-2.270 states that the height of a stack should not exceed the greater of 65 meters (213) feet or the height of nearby structures plus the lesser of 1.5 times the height or cross-wind width of the nearby structure. This stack height policy is designed to prevent achieving ambient air quality goals solely through the use of excessive stack heights and air dispersion.

Based on this policy, the limiting height for the new sulfuric acid plant stack is 213 feet. Farmland intends to construct a stack which will be 150 feet in height above-grade. This stack will satisfy the good engineering practice stack height criteria and will not result in excessive concentrations of air pollutants as a result of plume downwash as the stack will be at least 2.5 times the height of nearby structures.

## 7.0 AIR QUALITY REVIEW

The air quality review required of a PSD construction permit application potentially requires both air quality modeling and air quality monitoring. The air quality monitoring is required when the impact of air pollutant emission increases and decreases associated with a proposed project exceed the de minimis impact levels defined by Rule 17-2.500(3)(e)1, FAC or in cases where an applicant wishes to define existing ambient air quality by monitoring rather than by air quality modeling. The air quality modeling is required to provide assurance that the increases and decreases in air pollutant emissions associated with the project, combined with all other applicable air pollutant emission rate increases and decreases associated with new sources affecting the project area, will not cause or contribute to an exceedance of the applicable PSD increments (defined by Rule 17-2.310, FAC). Additionally, the air quality modeling is required to provide assurance that the emissions from the proposed project, together with the emissions of all other air pollutants in the project area, will not cause or contribute to a violation of any ambient air quality standard.

The de minimis impact levels or the air pollutants associated with the proposed project are:

Sulfur Dioxide	-	13.0 micrograms per cubic meter, 24-hour average
Sulfuric Acid Mist	-	NA

The proposed project involves increasing the permitted production rate of the newly constructed No. 5 sulfuric acid plant from 2000 to 2400 tons per day of 100 percent sulfuric acid. A project permitted in January 1990 by Farmland Industries, Inc. involved the construction of the No. 5 sulfuric acid plant (permitted at 2000 tons per day) and the shutdown of the No. 1 and No. 2 sulfuric acid plants (each rated at 800 tons per day of 100 percent sulfuric acid). This project was permitted by permits AC53-171751 and PSD-FL-143. Included in the application for AC53-171751 was the influence of nitrogen oxides emissions from a green superphosphoric acid plant; a plant resulting in a contemporaneous emission increase.

The air quality review for AC53-171751 included emission increases and decreases associated with the No. 1, No. 2 and No. 5 sulfuric acid plants and the green superphosphoric acid plant. The modeling associated with this review demonstrated that:

- (1) the impact of sulfur dioxide emission increases and decreases would not be significant at any distance for any averaging time;
- (2) the impact of sulfuric acid mist emissions would not exceed an acceptable ambient level; and
- (3) the impact of nitrogen oxides emissions would not cause or contribute to a violation of air quality standards.

As the presently proposed project closely follows the project permitted

by AC53-171751, the air quality modeling for sulfur dioxide and sulfuric acid mist presented herein includes the emission decreases addressed in the application for AC53-171751 plus the increases associated with sulfuric acid plant No. 5 operating at 2400 tons of sulfuric acid per day. This approach will provide the Department with assurance that changes from the baseline that existed prior to the permitting of the No 5 sulfuric acid plant will not result in significant increases in sulfur dioxide or sulfuric acid mist levels in the atmosphere. Nitrogen oxides are not addressed in this air quality review as they were adequately addressed in the application for AC53-171751 and the increases in nitrogen oxides emissions resulting from the project proposed herein are less than de minimis. As the presently proposed increase in nitrogen oxides emissions are less than de minimis, no air quality review is required.

The modeling that has been conducted demonstrates that the net impact of the sulfur dioxide emissions increases addressed in this application and the decreases addressed in the application for AC53-171751 are less than the de minimis impact levels defined by Rule 17-2.500(3)(e)1, FAC and summarized above. Furthermore, the applicant does not intend to define existing ambient sulfur dioxide levels by air quality monitoring. Hence, air quality monitoring is not a requirement of this application.

The air quality modeling that has been conducted demonstrates that the net impact sulfur dioxide emissions from the sulfuric acid plants (increased emissions from proposed Plant No. 5 and the decrease in emissions resulting from the shut-down of Plants 1 and 2) is not significant for the

three-hour, 24-hour or annual periods. Significant, as used in this instance, is defined by Rule 17-2.100(171)(a), FAC. The modeling further shows the net impact of sulfuric acid mist emissions associated with the proposed project is approximately one-tenth of an Acceptable Ambient Level (AAL) defined as a multiple of the Threshold Limit Value for sulfuric acid mist and that acid mist emissions from the three sulfuric acid plants that will operate at Farmland (Nos. 3, 4 and 5) will result in an impact that is about equal to the AAL.

In the following sections, the air quality modeling for sulfur dioxide and sulfuric acid mist is described.

#### 7.1 Air Quality Modeling for Sulfur Dioxide

As previously described, the net change in the emissions rate of sulfur dioxide used for air quality modeling purposes is defined as the emission rate increase associated with sulfuric acid plant No. 5 operating at 2400 tons per day minus the actual sulfur dioxide emissions associated with the shut-down of existing sulfuric acid Plants 1 and 2. These emission rates are addressed in Section 3.0 of this application.

The impact of the net change in sulfur dioxide emissions was assessed with the Industrial Source Complex - Short Term (ISC-ST) air quality model. The modeling was conducted in accordance with guidelines established by EPA and published in the document, Guideline for Air Quality Modeling, (Revised), July 1986. The meteorological data used with the model were

for Orlando, Florida and represented the period 1974-1978.

The sulfur dioxide emissions associated with the project included the increase in emissions associated with the No. 5 sulfuric acid plant and the decrease in emissions associated with the shut-down of existing Plants 1 and 2. The sulfur dioxide emissions from plant No. 5 were based upon a sulfur dioxide emission limit of 4.0 pounds per ton of 100 percent sulfuric acid and a production rate of 2400 tons of 100 percent acid per day. This resulted in an hourly sulfur dioxide emission rate of 400.0 pounds per hour. For modeling purposes, it was assumed that the plant would operate 8,760 hours a year.

The decreases in sulfur dioxide emissions from plants No. 1 and No. 2 were defined as the decrease in actual sulfur dioxide emissions. These emission rates (see Section 3.0) were based on a sulfuric acid production rate of 800 tons of 100 percent sulfuric acid per day for each of the two plants, a sulfur dioxide emission rate of 6.5 pounds per ton of 100 percent acid produced and an annual production-based operating factor of 0.737. These conditions result in a decrease in actual sulfur dioxide emissions of 216.7 pounds per hour and 25.2 tons per year from each of the two plants. Plant characteristics used for the modeling are summarized in Table 7-1.

The modeling conducted with the ISC-ST air quality model was conducted in accordance with EPA guidelines and included receptors established by the polar grid system extending to 15.0 kilometers from the plant. Twelve



sets of receptor rings were placed at distances ranging from 0.1 to 15.0 kilometers from the plant with receptors placed at 10 degree intervals on each receptor ring.

The results of the air quality modeling, summarized in Table 7-2, demonstrate that the impact of the proposed project is not significant for the three-hour, 24-hour or annual time periods. Modeling shows that there will be a net improvement in air quality on an annual basis; that the maximum sulfur dioxide increase for the 24-hour period will be less than 0.0001 micrograms per cubic meter (at a distance of 400 meters from the plant); and that the maximum sulfur dioxide increase for the three-hour period will be less than 0.01 micrograms per cubic meter (also at 400 meters from the plant). As the net impact of the sulfur dioxide emission rate changes resulting from the proposed project are not significant for any time period, no further air quality modeling is required for sulfur dioxide.

## 7.2 Air Quality Modeling for Nitrogen Oxides

Air quality modeling for nitrogen oxides is not required as the increase in nitrogen oxides emissions associated with the increased production in the No. 5 sulfuric acid plant is less than 40 tons per year (less than the de minimis emission rate increase). Modeling conducted in support of the application for AC53-171751 showed that the maximum expected ambient nitrogen oxides concentration in the vicinity of Farmland Industries, Inc. as a result of emissions from all sources impacting the area, would be 7.6

micrograms per cubic meter, annual average. This compares with the ambient air quality standard for nitrogen oxides of 100 micrograms per cubic meter, annual average. The 8.8 ton per year increase in nitrogen oxides emissions associated with the proposed production rate increase in the No. 5 sulfuric acid plant is not expected to significantly change the maximum expected nitrogen oxides concentration.

### 7.3 Air Quality Modeling for Sulfuric Acid Mist

No ambient air quality standards, PSD increments or significant impact levels have been established for sulfuric acid mist. For purposes of this permit application, an Acceptable Ambient Level (AAL) was developed by dividing the Threshold Limit Value of 1,000 micrograms per cubic meter by 210. The factor of 210 includes of a factor of 4.2 to convert the eight-hour per day, five day per week exposure allowed by the Threshold Limit Value to a 24-hour per day, seven day per week exposure; that is,  $(24 \times 7)/(8 \times 5)$ . In addition to the factor of 4.2, a safety factor of 50 was applied to reduce the exposure established for the working population to an exposure that is applicable to the general population. The factor of 50 was selected as sulfuric acid mist is not considered a highly toxic material. The 24-hour AAL that has been established based upon these factors is 5.0 micrograms per cubic meter.

The air quality modeling that was conducted to evaluate the impact of sulfuric acid mist emissions from the Farmland facility on was conducted with ISC-ST air quality model using the guidelines used for sulfuric acid

modeling and described in Section 7.1 of this application. The receptor grid used was identical to the polar coordinate system used in the sulfur dioxide modeling.

The modeling was conducted to determine the net impact of the emission increases associated with the production rate increase in the No. 5 sulfuric acid plant and the decreases associated with the shutdown of the No. 1 and No. 2 sulfuric acid plants. Also, modeling was conducted to determine the impact of sulfuric acid mist emissions from the existing sulfuric acid plants No. 3 and No. 4 plus the emissions from plant No. 5 while operating at 2400 tons per day. The latter assessment was to determine the impact of sulfuric acid mist emissions from the three sulfuric acid plants that will operate at Farmland once the proposed project is completed.

The results of the air quality modeling are summarized in Table 7-3. The result of the modeling demonstrate that the maximum expected increase in ambient sulfuric acid mist levels associated with the shutdown of the No. 1 and No. 2 plants and the operation of plant No. 5 at 2400 tons per day of 100 percent sulfuric acid will be approximately 0.5 micrograms per cubic meter averaged over a 24-hour period. The modeling also shows that the maximum expected sulfuric acid mist impact resulting from the operations of Plants 3, 4 and 5 will be approximately 5.1 micrograms per cubic meter, 24-hour average, at a distance of 1.0 kilometers from the plants. These impacts compare with the AAL for sulfuric acid mist of 5.0 micrograms per cubic meter, 24-hour average.

The impact of sulfuric acid mist emissions from sources outside the Farmland chemical complex were not included in the air quality review based upon an engineering judgment. It was estimated that because of the expected magnitude of the sulfuric acid mist emissions from other sources and the distances of these sources from Farmland, it would be very unlikely that any of the sources, individually or collectively, will result in a significant contribution to ambient acid mist levels in the project area.

TABLE 7-1

## PLANT CHARACTERISTICS USED FOR AIR QUALITY MODELING

FARMLAND INDUSTRIES, INC.  
POLK COUNTY, FLORIDA

PLANT	STACK		STACK GAS		EMISSION RATES (1)					
	Ht	Dis	Vel	Temp	SO <sub>2</sub>		Acid Mist		NO <sub>x</sub>	
	(ft)	(ft)	(FPS)	(°F)	(lb/hr)	(TPY)	(lb/hr)	(TPY)	(lb/hr)	(TPY)
H2S04 #1	100	4.5	66.2	100	216.7	700	2.3	7.5	7.8	25.2
H2S04 #2	100	4.5	66.2	100	216.7	700	2.3	7.5	7.8	25.2
H2S04 #5	150	8.0	37.9	180	400.0	1752	15.0	65.7	11.9	52.2

(1) Annual emission rates are based on the following assumptions:

- (a) H2S04 #1 and #2 - An annual operating factor, based on production, of 0.737.
- (b) H2S04 #5 - Operating time will be 8760 hours/year.

TABLE 7-2  
 SUMMARY OF SULFUR DIOXIDE IMPACT ANALYSIS  
 FARMLAND INDUSTRIES, INC.  
 POLK COUNTY, FLORIDA

METEOROLOGICAL DATA	SULFUR DIOXIDE IMPACT ( $\mu\text{g}/\text{m}^3$ )		
	ANNUAL	3-HOUR	24-HOUR
1974	< 0	0.01	< 0.01
1975	< 0	0.01	< 0.01
1976	< 0	< 0.01	< 0.01
1977	< 0	< 0.01	< 0.01
1978	< 0	< 0.01	< 0.01
Significant Impact (17-2.100(171)(a), FAC	1.0	25.0	5.0
De minimis Impact 17-2.500(3)(e)1, FAC	NA	NA	13.0

TABLE 7-3  
 SUMMARY OF ACID MIST IMPACT ANALYSIS  
 FARMLAND INDUSTRIES, INC.  
 POLK COUNTY, FLORIDA

METEOROLOGICAL DATA	24-HR ACID MIST IMPACT ( $\mu\text{g}/\text{m}^3$ )	
	PLANTS 1, 2 & 5	PLANTS 3, 4 & 5
1974	0.40	5.1
1975	0.45	4.2
1976	0.47	4.6
1977	0.49	5.0
1978	0.52	4.2
AAL (1)	5.0	5.0

(1) AAL = TLV/210, 24-Hour Average