Florida Department of Environmental Regulation

Twin Towers Office Bldg. ● 2600 Blair Stone Road ● Tallahassee, Florida 32399-2400

Bob Martinez, Governor | Dale Twachtmann, Secretary | John Shearer, Assistant Secretary

November 3, 1989

Mr. Wayne Aronson, Chief
Program Support Section
U.S. EPA, Region IV
345 Courtland Street, N.E.
Atlanta, Georgia 30365

Dear Mr. Aronson:

RE: Farmland Industries, Inc.
Sulfuric Acid Plant No. 5
AC 53-171751
PSD-FL-143

Enclosed for you review and comment is the permit application for the above referenced project. Please direct any comments or questions to John Reynolds, Barry Andrews, or Tom Rogers at the above address or (904)488-1344.

Sincerely,

Patricia G. Adams

Patricia G. Adams
Planner
Bureau of Air Regulation

PGA/kt

enclosures

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

RECEIVED
OCT 25 1989
DER - BAQM

KA 123-89-01

October 22, 1989

Ms. Patty Adams
Division of Air Resources
Management
Florida Department of
Environmental Regulation
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Subject: Application for a PSD Construction Permit Review
Farmland Industries, Inc.
Bartow, Polk County, Florida

Dear Ms. Adams:

Enclosed are three (3) copies of the Application for a PSD Construction Permit Review, prepared for Farmland Industries, Inc. in Bartow, Polk County, Florida.

The enclosed applications have been signed and sealed by Richard B. Tedder, P.E.; however, the applicant's signature (Page 1) has been copied.

If you have any questions or if I can be of any assistance, please do not hesitate to give me a call.

Very truly yours,

KOOGLER & ASSOCIATES

John B. Koogler / mB

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

JBK:mab

cc: Mr. Ed Ferking, Farmland Industries, Inc.

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

RECEIVED
DER - MAIL ROOM

1989 OCT 23 PM 1:01

KA 123-89-01

October 20, 1989

RECEIVED
OCT 23 1989
DER - BAQM

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

Subject: Sulfuric Acid Air Construction Permit Application
Farmland Industries, Inc.
Bartow, Polk County, Florida

Dear Mr. Fancy:

Enclosed are four (4) copies of an air application to construct a 2000 ton-per-day double absorption sulfuric acid plant at the Farmland Industries' Green Bay Complex in Polk County. A check in the amount of $5000.00, made payable to the Florida Department of Environmental Regulation, is also enclosed.

Since the sulfuric acid plant will be classified as a New Major Source, it will therefore be subject to the full review required of a PSD construction permit application. Attached to each application is a report which includes the PSD information needed for your review, including a determination of the Best Available Control Technology, an Air Quality Review and an evaluation of impacts on soils, vegetation and visibility.

If you have any questions regarding the content of this application, please feel free to contact me.

Sincerely,

KOOGLER & ASSOCIATES

Richard B. Tedder

Richard B. Tedder, P.E.

RBT:mab

cc: Mr. Ed Ferking, Farmland Industries, Inc.
Mr. Gene Meier, Farmland Industries, Inc.

copied: C. Heron
B. Andrews
J. Rogers
B. Thomas, SW Dist
J. Aronson, EPA

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

CHECK NO. 69957428

80-95
1012

CO. BR.	VEND. NO.	CHECK DATE
16 69	F0346	10-10-89

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

CHECK AMOUNT *******5,000.00

VOID AFTER 180 DAYS

UNITED MISSOURI BANK OF CARTHAGE, MO.

FARMLAND INDUSTRIES, INC.

PAY TO THE ORDER OF
Florida Department of
Environmental Regulation
2600 Blair Stone Road
Tallahassee, FL 32399

S. J. Simpson

R H Hollingsworth

⑈69957428⑈ ⑆101200958⑆ ⑈25⑈778⑈129⑈

2600 Blair Stone Road
Tallahassee, FL 32399-2400

Subject: Sulfuric Acid Air Construction Permit Application
Farmland Industries, Inc.
Bartow, Polk County, Florida

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If you have any questions regarding the content of this application, please feel free to contact me.

Sincerely,

KOOGLER & ASSOCIATES

Richard B. Tedder

Richard B. Tedder, P.E.

RBT:mab

cc: Mr. Ed Ferking, Farmland Industries, Inc.
Mr. Gene Meier, Farmland Industries, Inc.

1031

AN APPLICATION FOR A PSD
CONSTRUCTION PERMIT REVIEW

PREPARED FOR:

FARMLAND INDUSTRIES, INC.
POLK COUNTY, FLORIDA

OCTOBER 20, 1989

KOOGLER & ASSOCIATES
ENVIRONMENTAL SERVICES

4014 NW THIRTEENTH STREET
GAINESVILLE, FLORIDA 32609
904/377-5822 ■ FAX 377-7158

$5000 pd.
10-23-89
Rcpt.#117669

STATE OF FLORIDA

DEPARTMENT OF ENVIRONMENTAL REGULATION

RECEIVED
OCT 23 1989
DER - BAQM

AC 53-171751
PSD-FL-143

APPLICATION TO ~~OPERATE~~/CONSTRUCT AIR POLLUTION SOURCES

SOURCE TYPE: Double Absorption Sulfuric Acid Plant [X] New[1] [ ] Existing[1]

APPLICATION TYPE: [X] 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: CMFarris

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

Date: 10/10/89 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~~/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 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 *Richard B. Tedder*

Richard B. Tedder, 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. 38846 Date: 10-20-89 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 January 1, 1990 Completion of Construction January 1, 1991

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 AND
GREEN SUPERPHOSPHORIC ACID PLANT

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
GSPA	A053-157886	2/27/89	2/13/94

*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 Deteriorlation" (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)

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

Description	Contaminants Type	Contaminants % Wt	Utilization Rate - lbs/hr	Relate to Flow Diagram
ulfur	Ash	0.005	54660	Burner of Figure 3-1 (See attached report)
			--	

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

1. Total Process Input Rate (lbs/hr): 54660 as sulfur

2. Product Weight (lbs/hr): 169200 as 98.5% H_2SO_4

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] Maximum lbs/hr	Emission[1] Actual T/yr	Allowed[2] Emission Rate per Rule 17-2	Allowable[3] Emission lbs/hr	Potential[4] Emission lbs/hr	Potential[4] Emission T/yr	Relate to Flow Diagram
O_2	333.3	1460	17-2.600(2)(b)	333.3	2500	10950	*
NOx	9.9	43.4	17-2.630	9.9	9.9	43.4	*
cid Mist	12.5	54.8	17-2.600(2)(b)	12.5	125	548	*
VE	10%	-	"	10%	-	-	*

*Stack of Figure 3-1 (See attached report).

[1] See Section V, Item 2.

eference 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)

alculated from operating rate and applicable standard.

Emission, if source operated without control (See Section V, Item 3).

Potential SO2 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_2	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	Desing & Test
	Acid Mist	70-85%	0.5 - 0.75 microns	Desing & Test

E. Fuels NOT APPLICABLE

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

*Units: Natural Gas--MMCF/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: 95519 ACFM 78803 @ 68°F DSCFM Gas Exit Temperature: 180 °F.

Water Vapor Content: 0 % Velocity: 31.7 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		Temperature (°F)
			Type	BTU/hr	
Primary Chamber					
Secondary Chamber					

Stack Height: ______ ft. Stack Diamter: ______ 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: ____________________

____

____

____

____

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)] (SEE SECTION IIB)
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

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:[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 Costs:

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 ATTACHED REPORT

A. Company Monitored Data

1. ______ no. sites ______ TSP ______ ( ) SO^2* ______ 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 ____/____/____ (month day year) to ____/____/____ (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
SO2	____________________	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.

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

PREPARED FOR:

FARMLAND INDUSTRIES, INC.
POLK COUNTY
BARTOW, FLORIDA

OCTOBER 20, 1989

PREPARED BY:

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

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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

Farmland Industries, Inc. is proposing to construct a Monsanto Enviro-Chem double absorption sulfuric acid plant and a cogeneration facility which will use export steam from the new sulfuric acid plant to generate electrical power. The new sulfuric acid plant (Plant No. 5) will have a rated capacity of 2000 short tons per day of 100 percent H_2SO_4. The cogeneration facility will be 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 5200 tons per day.

While not part of this proposed project, a green superphosphoric acid (GSPA) plant permitted in November 1987 is addressed in this application as nitrogen oxides emissions from the plant represent a contemporaneous emission increase. This emission increase is addressed in conjunction with emission increases and decreases associated with the sulfuric acid plants.

The requested emission changes, coupled with contemporaneous emission increases from the GSPA plant, will result in a decrease in the hourly emission rate of sulfur dioxide and an increase in hourly emissions of nitrogen dioxides and acid mist. The total annual emissions of sulfur dioxide, acid mist and nitrogen dioxides are all expected to increase significantly.

Farmland is submitting the material herein to support an application to the Florida Department of Environmental Regulation for constructing a new sulfuric acid plant. This report includes a description of the existing facility, a description of the proposed new 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 the UTM coordinates are Zone 17, 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. The plot plan of Figure 2-3 shows the location of the existing plants and the proposed new sulfuric acid plant. The proposed new sulfuric acid plant with cogeneration 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. 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 new 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. None of the proposed changes will affect the existing operations of the No. 3 and No. 4 sulfuric acid plants. They will continue to operate at their current rated capacities.

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. 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 Appendix 3-B for documentation of these data). These values will be used in evaluating the requested increases (or decreases) in emissions.

Nitrogen oxide emissions from the sulfuric acid plants were estimated from an emission factor of 2.1×10^{-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.

The GSPA plant emits nitrogen oxides and fluorine. Fluorine emissions are not a factor in sulfuric acid production. The GSPA plant has permitted maximum nitrogen oxides emission rates of 29.1 pound per hour and 64.8 tons per year. The permitted annual value includes an offset from the permanent shutdown of sulfuric acid plant No. 2. Emissions from the GSPA plant will be included in the nitrogen oxide assessment of emissions from the sulfuric acid plants.

2.5 Other Operations

The Farmland Green Bay complex also includes and auxiliary boiler to provide steam when there is an insufficient amount of export steam available from the sulfuric acid plants and includes 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 sulfuric acid plants.

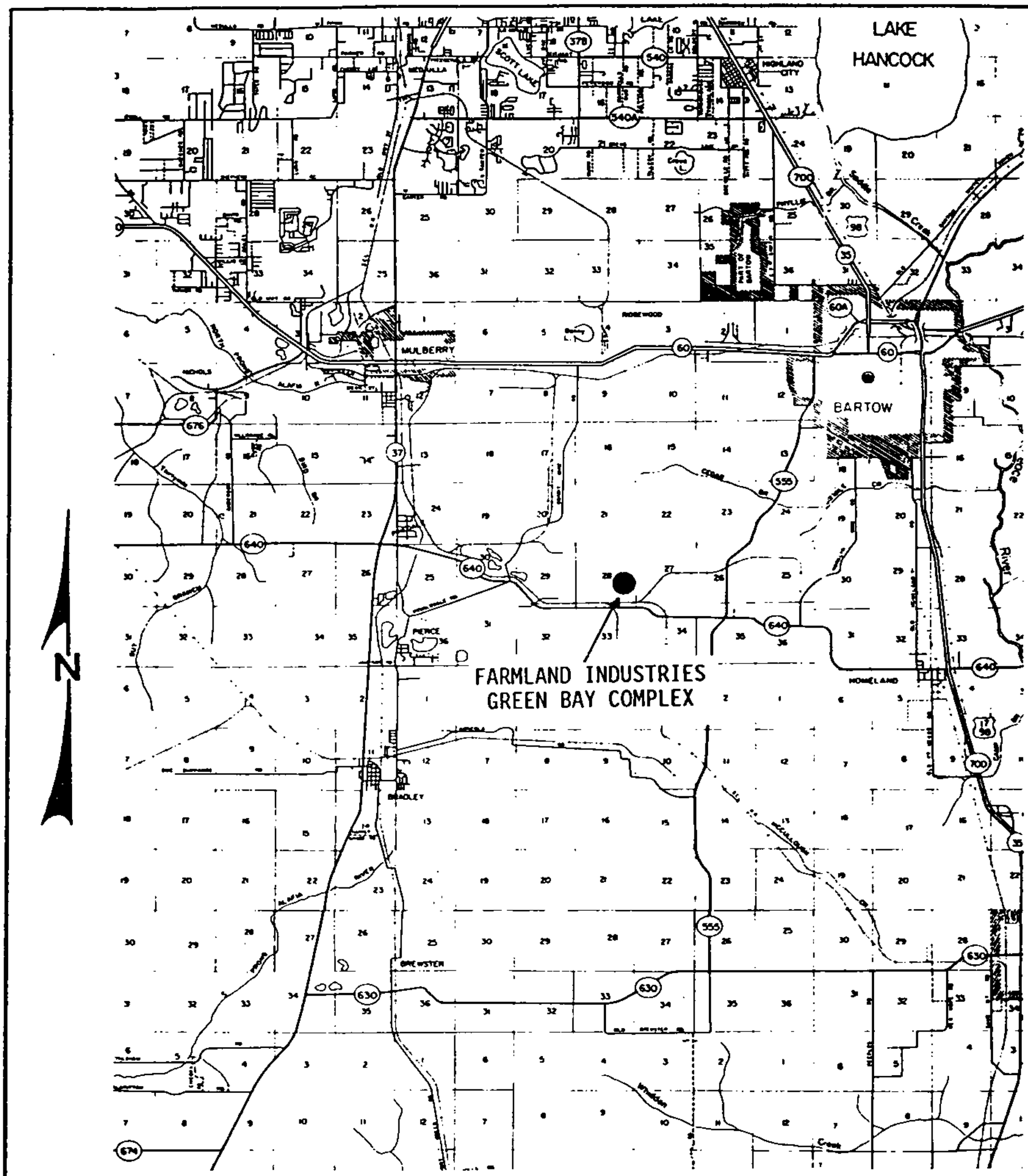
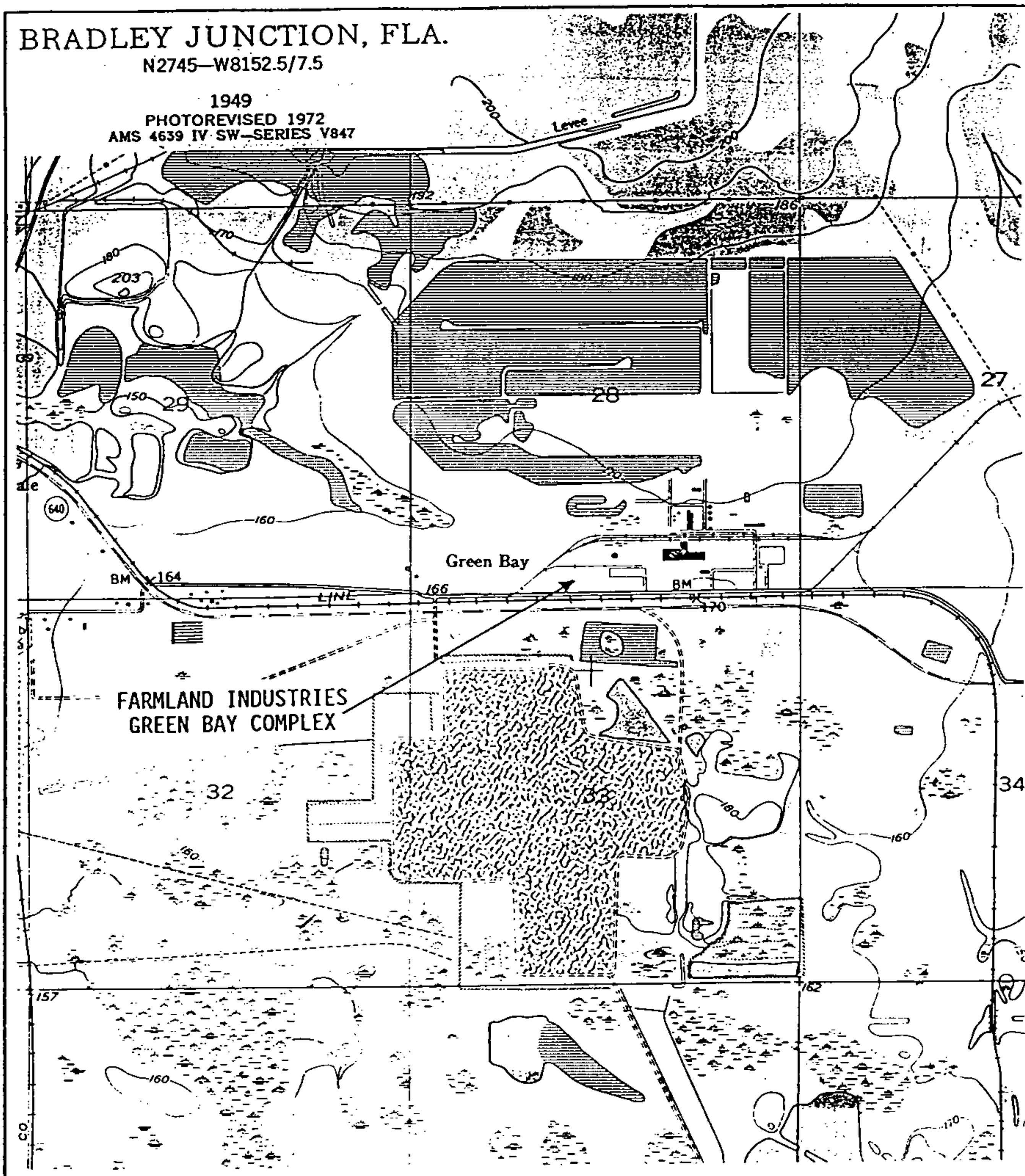


FIGURE 2-1
AREA LOCATION MAP
FARMLAND INDUSTRIES, INC.

KOOGLER & ASSOCIATES



FLORIDA

QUADRANGLE LOCATION

MN GN 0°26' 8 MILS 0°

FIGURE 2-2

SITE LOCATION MAP
FARMLAND INDUSTRIES, INC.

SCALE 1:24000

1 ½ 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

CONTOUR INTERVAL 10 FEET
DATUM IS MEAN SEA LEVEL

KOOGLER & ASSOCIATES

Page 11

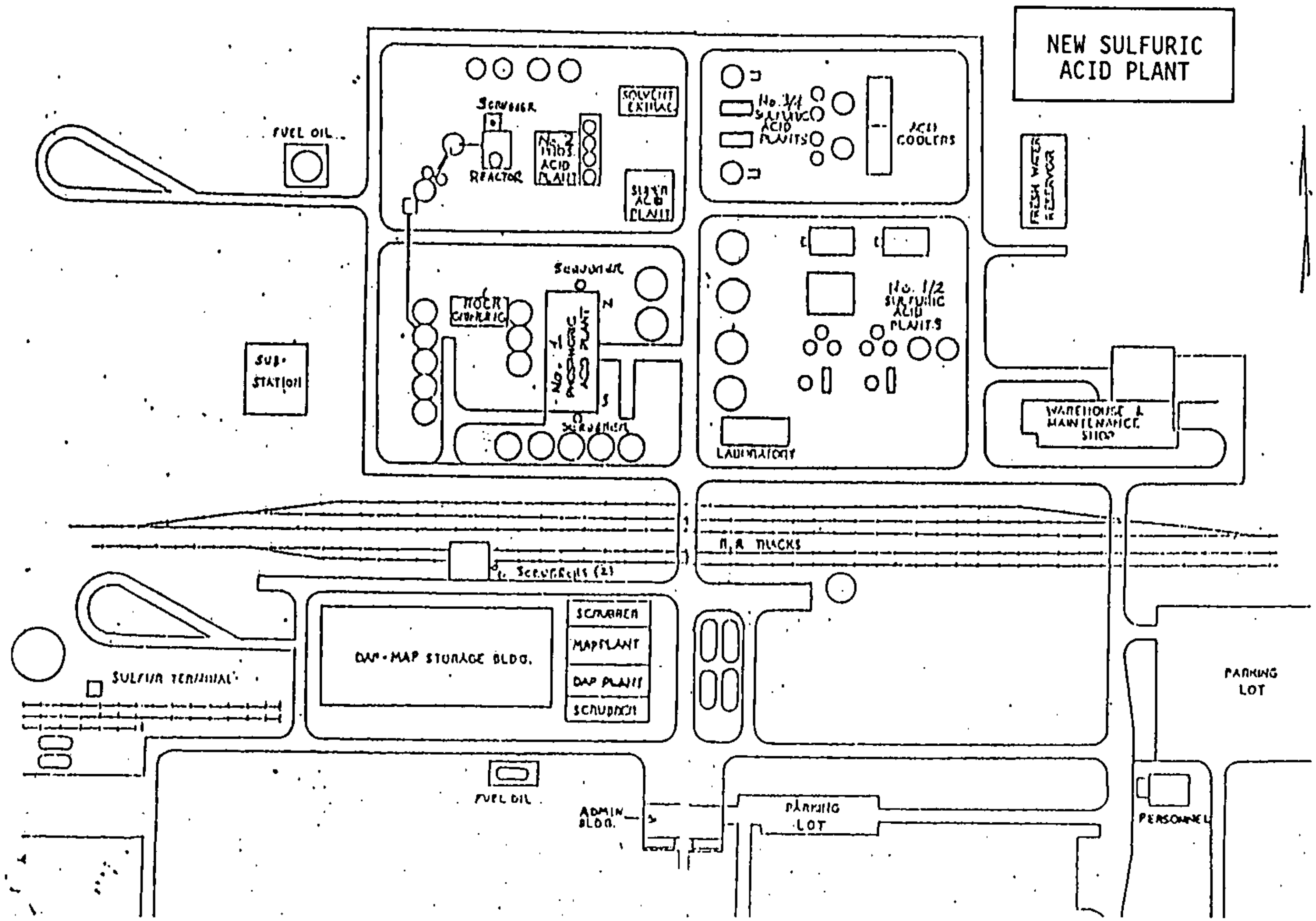


FIGURE 2-3

PLOT PLAN
FARMLAND INDUSTRIES, INC.

KOOGLER & ASSOCIATES

3.0 PROPOSED PROJECT

Farmland is proposing to construct a double absorption sulfuric acid plant (Plant No. 5) rated at 2000 tons per day of 100 percent H_2SO_4. This 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 absorption sulfuric acid plants is presented in Figure 3-1. Figure 3-2 shows the major equipment locations for the new plant.

When the new plant is 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. These are the only sulfuric acid plants 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 for the three affected sulfuric acid plants and for the green superphosphoric acid (GSPA) plant. The GSPA plant contributes to the nitrogen oxides emissions from the Farmland complex. The emission reductions from the shutdown of sulfuric acid plant No. 2 were taken into consideration in establishing the emission limits for the GSPA plant.

The information tabulated in Tables 3-1 and 3-2 for the sulfuric acid plants shows there will be a net reduction in the hourly emission rate of sulfur dioxide but an increase in hourly acid mist emission rate. The data also show that there will be a significant increase in the annual sulfur dioxide and acid mist emissions. Nitrogen oxides data indicate a net reduction in both hourly and annual emissions from the sulfuric acid plants; but a significant increase in both hourly and annual emissions when the green superphosphoric acid plant is included.

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

The existing sulfuric acid plants No. 1 and No. 2 are subject to the limits specified for existing plants in Rule 17-2.600(2)(a)2, FAC. The plants cease to be regulated, however, when they are permanently shutdown and the permits are surrendered. Sulfuric acid plant No. 2 was permanently shutdown on March 29, 1985.

Sulfuric acid plant No. 5 will be 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, acid mist and nitrogen oxides emissions are all significant as defined by Rule 17-2.500(2)(e)2, FAC. The construction of the new 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 constructing the new sulfuric acid plant and include all information required for the PSD review. The air quality review will look at impacts of sulfur dioxide emissions, acid mist emissions and nitrogen oxides emissions. The review will focus on the changes to be expected from operating the new sulfuric acid plant and ceasing operations of sulfuric acid plants No. 1 and No. 2. The evaluation of nitrogen oxides on air quality will also include emissions from the GSPA plant.

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	5
Date Permitted	1965	1965	NA
Current Permit Conditions			
Rate (TPD)	800	800	0
SO2 (lb/ton)	10.0	10.0	0
(lb/hr)	330	330	0
(TPY)	1460	1460	0
Mist (lb/ton)	0.30	0.30	0
(lb/hr)	9.9	9.9	0
(TPY)	43.8	43.8	0
Operating Factor	1.0	1.0	0
Actual Conditions			
Rate (TPD)	800	800	0
SO2 (lb/ton)	6.5	6.5	0
(lb/hr)	216.7	216.7	0
(TPY)	700	700	0
Mist (lb/ton)	0.07	0.07	0
(lb/hr)	2.3	2.3	0
(TPY)	7.5	7.5	0
Operating Factor	0.737	0.737	0
Proposed Conditions			
Rate (TPD)	0	0	2000
SO2 (lb/ton)	0	0	4.0
(lb/hr)	0	0	333.3
(TPY)	0	0	1460
Mist (lb/ton)	0	0	0.15
(lb/hr)	0	0	12.5
(TPY)	0	0	54.8
Operating Factor	0	0	1.0

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

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 Plants 1	2	5	GSPA
SO2				
Present (actual)	700	700	0	0
Proposed	0	0	1460	0
Change	(700)	(700)	1460	0
Subtotal		60		
Significant Increase (2)		40		
MIST				
Present (actual)	7.5	7.5	0	0
Proposed	0	0	54.8	0
Change	(7.5)	(7.5)	54.8	0
Subtotal		39.8		
Significant Increase (2)		7		
NOX				
Present (actual)	25.2	25.2	0	0
New	0	0	0	64.8
Proposed	0	0	43.4	NA
Change	(25.2)	(25.2)	43.4	64.8
Subtotal		57.8		
Significant Increase (2)		40		

(1) Based on differences between present, actual and proposed operating conditions. See Appendix 3-A for calculation of emission rates.
(2) Defined in 17-2.500(2)(e)2, FAC.

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

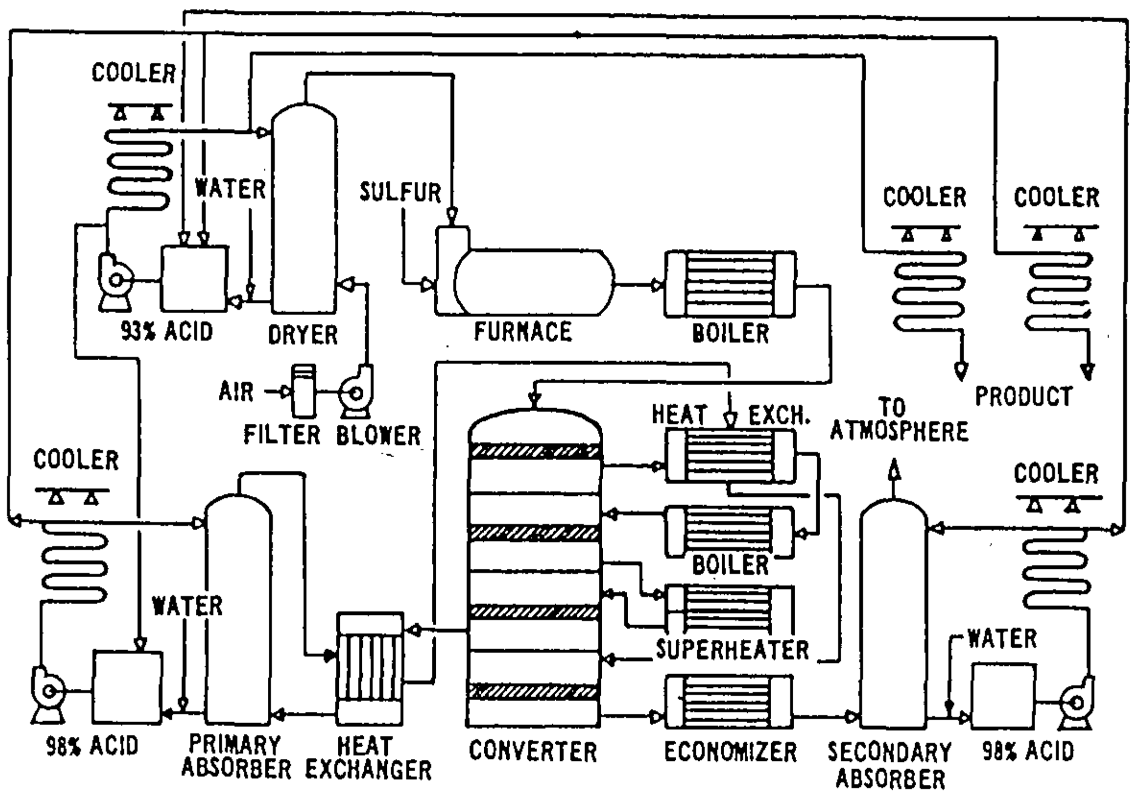
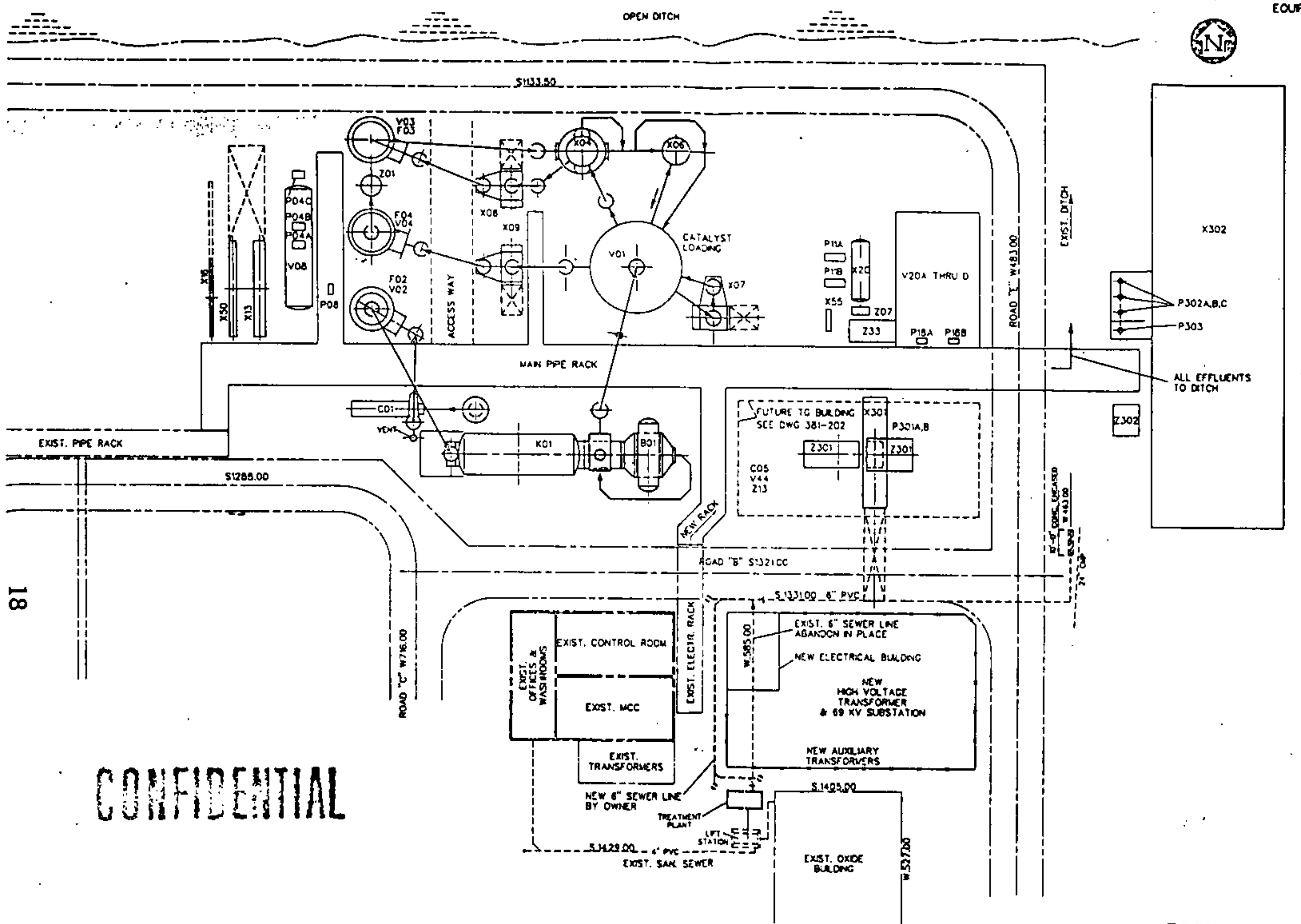


FIGURE 3-1
TYPICAL SULFURIC ACID
DOUBLE ABSORPTION PLANT
PROCESS FLOW DIAGRAM

$S + O_2 \rightarrow SO_2$ (BURNER)

$SO_2 + \frac{1}{2} O_2 \rightleftharpoons SO_3$ (CONVERTER)

$SO_3 + H_2O \rightarrow H_2SO_4$ (ABSORBER)



EQUIPMENT LIST (MAJOR EQUIPMENT ONLY)

NO.	NAME
B01	WASTE HEAT BOILER
C01	MAIN COMPRESSOR
C05	INSTRUMENT AIR COMPRESSOR
F02	DRYING TOWER MIST ELIMIN.
F03	INTERPASS TOWER MIST ELIMIN.
F04	FINAL TOWER MIST ELIMINATOR
K01	SULFUR BURNER
* 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
* P26A,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
* V50	PHOS ACID COND. SURGE TANK
X04	COLD INTERPASS HEAT EXCH.
X06	HOT INTERPASS HEAT EXCH.
X07	SUPERHEATER 1B
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.

KOOGLER & ASSOCIATES

APPENDIX 3-A

EMISSION RATE CALCULATIONS

EMISSION RATE CALCULATIONS

SULFURIC ACID PLANTS NO. 1 AND NO. 2

PERMITTED: 800 tons per day 100% acid
SO_2 - 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_2 - 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(-6) lb NOX per dscf (See IMC-New Wales PSD application for third train expansion)

EMISSION RATES (each plant)

Actual

SO_2: 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(-6) 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

PROPOSED: 2000 tons per day 100% acid
SO_2 - 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(-6) lb NOX per dscf (See IMC-New Wales PSD application for third train expansion)

EMISSION RATES

Proposed

S02:	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(-6) 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

GREEN SUPERPHOSPHORIC ACID PLANT

PERMITTED: 27 tons per hour of 68% P205 SPA Feed
NOX - 29.1 lb/hr, 64.8 TPY
F - 0.2 lb/hr, 0.4 TPY
Operating Factor - 4448 hr/yr
(Based on Permit No. A053-157886)
Emission Factor - 1.5 lb/ton SPA

EMISSION RATES

Short-Term

Maximum Hourly = 29.1 lb/hr

Long-Term

Annual = 64.8 TPY
x 1/(8760 hr/yr/2000 lb/ton)
= 14.8 lb/hr *

* Used for long-term modeling

NOTES: (1) Fluorine emissions are not a factor in the operation of sulfuric acid plants and need not be considered.

(2) The permitted emission rates include an offset from the permanent shutdown of Sulfuric Acid Plant No. 2.

APPENDIX 3-B

DOCUMENTATION OF ACTUAL EMISSION RATES
AND OPERATING FACTORS FOR
SULFURIC ACID PLANTS NO. 1 AND NO. 2

SUMMARY OF ACTUAL EMISSIONS
BASED ON TEST DATA FROM
SULFURIC ACID PLANTS NO. 1 AND NO.2

Plant	Test Date	Rate (TPH)	Stack Gas Flow Rate (DSCF/Ton)	SO2 (lb/ton)	Acid Mist lb/ton
1	2/01/84	37.8	102,557	4.85	0.14
2	5/10/84	31.9	108,925	6.01	0.06
1	10/30/84	30.9	116,508	7.15	0.04
2	11/01/84	26.4	118,198	7.98	0.07
AVERAGE			111,547	6.50	0.07

SUMMARY OF ANNUAL OPERATING FACTORS FOR
SULFURIC ACID PLANTS NO. 1 AND NO. 2
BASED ON 1984 DATA

(Developed for and the basis of Permit AC53-138041)

Plant	Hours of Operation (hr/yr)	Acid Production (TPY)
1	8,467	236,650
2	8,372	193,866
TOTAL	16,839	430,516

Annual Operating Factor
Based on Operating Time = (16839 hr/yr)/(2 plants x 8760 hr/yr)
= 0.961

Annual Operating Factor
Based on Production = (430.516 TPY)/(2 Plants x 800 TPD x 365 D/Y)
= 0.737

SUMMARY SHEET

PLANT: SAD
STACK: #2 STACK
TEST DATE: NOV. 1,1984

PERMIT # A053-67055

	RUN NO. 1	RUN NO. 2	RUN NO. 3
STACK DIAMETER (FT)	4.500	4.500	4.500
NOZZLE DIAMETER (FT)	0.015	0.015	0.015
SAMPLING TIME (MIN)	80.000	80.000	80.000
STACK TEMP (R)	544.000	544.000	544.000
STACK MOISTURE (%)	4.320	4.490	4.421
VOLUME SAMPLED (ACF)	48.779	47.026	48.566
VOLUME SAMPLED (SCF)	48.719	46.790	47.555
STACK VELOCITY (F/S)	59.424	56.757	58.864
VOLUMETRIC FLOWRATE (ACFM)	56705.879	54160.977	56171.578
VOLUMETRIC FLOWRATE (SCFM)	53015.695	50546.383	52460.699
ACID MIST (MG. COLL.)	3.640	1.860	3.510
SULF. DIOXIDE (MG. COLL.)	1371.100	608.400	1536.000
ACID MIST (LBS/HR)	0.524	0.266	0.512
SULF. DIOXIDE (LBS/HR)	197.394	86.953	224.174
STACK GAS MOL. WEIGHT	28.525	28.506	28.514
ISOKINETIC VARIATION %	96.176	96.880	94.871
PRODUCTION RATE (TPH,P205)	26.400	26.400	26.400
EMISSIONS 1 (LB/HR/TON)	0.020	0.010	0.019
EMISSIONS 2 (LB/HR/TON)	7.477	3.294	8.491

SUMMARY SHEET

PLANT: SAD
STACK: #1 STACK PERMIT # A053-67053
TEST DATE: OCT.30,1984

	RUN NO. 1	RUN NO. 2	RUN NO. 3
STACK DIAMETER (FT)	4.500	4.500	4.500
NOZZLE DIAMETER (FT)	0.015	0.015	0.015
SAMPLING TIME (MIN)	80.000	64.000	64.000
STACK TEMP (R)	550.000	550.000	550.000
STACK MOISTURE (%)	4.346	4.161	4.268
VOLUME SAMPLED (ACF)	54.755	42.911	48.603
VOLUME SAMPLED (SCF)	53.906	42.311	47.536
STACK VELOCITY (F/S)	66.097	64.925	72.984
VOLUMETRIC FLOWRATE (ACFM)	63074.133	61955.074	69645.375
VOLUMETRIC FLOWRATE (SCFM)	58268.660	57345.703	64391.410
ACID MIST (MG. COLL.)	7.620	6.820	9.610
SULF. DIOXIDE (MG. COLL.)	1512.700	1198.900	1293.300
ACID MIST (LBS/HR)	1.090	1.223	1.722
SULF. DIOXIDE (LBS/HR)	216.326	214.975	231.776
STACK GAS MOL. WEIGHT	28.522	28.542	28.530
ISOKINETIC VARIATION %	96.822	96.524	96.576
PRODUCTION RATE (TPH,P2O5)	30.900	30.900	30.900
EMISSIONS 1 (LB/HR/TON)	0.035	0.040	0.056
EMISSIONS 2 (LB/HR/TON)	7.001	6.957	7.501

SUMMARY SHEET

PLANT: SAD
STACK: 2
TEST DATE: MAY 10, 1984

PERMIT # A053-67055

	RUN NO. 1	RUN NO. 2	RUN NO. 3
STACK DIAMETER (FT)	4.500	4.500	4.500
NOZZLE DIAMETER (FT)	0.014	0.014	0.014
SAMPLING TIME (MIN)	96.000	64.000	64.000
STACK TEMP (R)	546.000	546.000	546.000
STACK MOISTURE (%)	6.366	6.472	6.513
VOLUME SAMPLED (ACF)	48.935	40.725	39.218
VOLUME SAMPLED (SCF)	48.286	39.477	39.210
STACK VELOCITY (F/S)	64.015	70.374	66.918
VOLUMETRIC FLOWRATE (ACFM)	61087.180	67154.719	63857.145
VOLUMETRIC FLOWRATE (SCFM)	55298.531	60722.203	57715.063
ACID MIST (MG. COLL.)	11.600	4.800	15.200
SO2 (MG. COLL.)	1325.600	1017.800	857.800
ACID MIST (LBS/HR)	1.758	0.977	2.960
SO2 (LBS/HR)	200.848	207.123	167.048
STACK GAS MOL. WEIGHT	28.300	28.288	28.284
ISOKINETIC VARIATION %	90.434	100.998	105.542
PRODUCTION RATE (TPH,P2O5)	31.900	31.900	31.900
EMISSIONS 1 (LB/HR/TON)	0.055	0.031	0.093
EMISSIONS 2 (LB/HR/TON)	6.296	6.493	5.237

SUMMARY SHEET

PLANT: SULFURIC
STACK: 1 PERMIT # A053-67053
TEST DATE: FEB 1, 1984

	RUN NO. 1	RUN NO. 2	RUN NO. 3	
STACK DIAMETER (FT)	4.500	4.500	4.500	
NOZZLE DIAMETER (FT)	0.014	0.014	0.014	
SAMPLING TIME (MIN)	64.000	48.000	48.000	
STACK TEMP (R)	544.000	544.000	544.000	
STACK MOISTURE (%)	3.714	4.873	4.830	
VOLUME SAMPLED (ACF)	43.451	32.780	33.997	
VOLUME SAMPLED (SCF)	43.226	32.550	32.853	
STACK VELOCITY (F/S)	71.651	71.926	74.840	
VOLUMETRIC FLOWRATE (ACFM)	68373.992	68636.203	71417.289	
VOLUMETRIC FLOWRATE (SCFM)	64179.668	63650.500	66259.305	
SO2 (MG. COLL.)	911.710	725.510	686.990	
ACID MIST (MG. COLL.)	15.650	7.020	40.520	
SO2 (LBS/HR)	179.090	187.693	183.308	/ 183.364
ACID MIST (LBS/HR)	3.074	1.816	10.812	/ 5.234
STACK GAS MOL. WEIGHT	28.591	28.464	28.469	
ISOKINETIC VARIATION %	105.288	106.594	103.348	
PRODUCTION RATE (TPH,P2O5)	37.850	37.850	37.850	
EMISSIONS 1 (LB/HR/TON)	4.732	4.959	4.843	4.845
EMISSIONS 2 (LB/HR/TON)	0.081	0.048	0.286	

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 and decreases resulting from the activities proposed by Farmland have been summarized in Table 3-2. The activities include the construction of a new 2,000 ton per day double absorption sulfuric acid plant, the retirement of two existing 800 ton per day single absorption sulfuric acid plants with ammonia scrubbers and the recent construction (1987) of a green superphosphoric acid plant; the latter being a source of nitrogen oxides. From Table 3-2 it will be noted that sulfuric dioxide and sulfuric acid mist emissions from the new sulfuric acid plant will represent a significant increase over emissions from the two existing 800 ton per day plants. There will also be a significant increase in nitrogen oxides emissions as a result of the emission increases and decreases associated with the sulfuric acid plants and the increase associated with the green superphosphoric acid plant.

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_2 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 1985 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_2 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_2 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 SO2 CONTROL BY DUAL ABSORPTION
2000 TPD CONTACT SULFURIC ACID PLANT

FARMLAND INDUSTRIES, INC.
POLK COUNTY, FLORIDA

CAPITAL COST		
Direct		
Absorber	1,039,000	
Pumps	208,000	
Piping	312,000	
Heat Exchanger	520,000	
		$2,079,000
Indirect		
Engineering and Supervision	208,000	
Construction	116,000	
Contractor	125,000	
Contingency	249,000	
		698,000
TOTAL CAPITAL COST		$2,777,000
ANNUAL COST		
Direct		
Operating Labor and Supervision	8,000	
Maintenance Labor	6,500	
Maintenance Materials	6,500	
Utilities	2,216,000	
Catalyst	30,000	
		$2,267,000
Indirect		
OH	8,000	
Payroll	4,000	
		12,000
Capital Recovery		453,000
Insurance and Taxes		111,000
Credit for Acid Recovery		(850,000)
TOTAL ANNUAL COST		$1,993,000

TABLE 4-2

COST ANALYSIS FOR SO2 CONTROL BY AMMONIA SCRUBBING
2000 TPD CONTACT SULFURIC ACID PLANT

FARMLAND INDUSTRIES, INC.
POLK COUNTY, FLORIDA

CAPITAL COST		
Direct		
Scrubber and Auxiliaries		$3,168,000
Indirect		
Engineering and Supervision	317,000	
Construction	253,000	
Contractor	190,000	
Contingency	380,000	
		1,140,000
TOTAL CAPITAL COST		$4,308,000
ANNUAL COST		
Direct		
Operating Labor and Supervision	540,000	
Maintenance Labor	80,000	
Maintenance Materials	80,000	
Utilities	230,000	
Chemicals	1,944,000	
		$2,874,000
Indirect		
OH	310,000	
Payroll	124,000	
		434,000
Capital Recovery		702,000
Insurance and Taxes		172,000
TOTAL ANNUAL COST		$4,182,000

TABLE 4-3

COST ANALYSIS FOR ACID MIST CONTROL BY FIBER TYPE MIST ELIMINATORS
2000 TPD CONTACT SULFURIC ACID PLANT

FARMLAND INDUSTRIES, INC.
POLK COUNTY, FLORIDA

CAPITAL COST		
Direct		$ 64,000
Indirect		30,000
TOTAL CAPITAL COST		$ 94,000
ANNUAL COST		
Direct		
Utilities		$ 146,000
Indirect		
Capital Recovery	15,000	
Insurance and Taxes	4,000	
		19,000
Credit for Acid Recovery		(95,000)
TOTAL ANNUAL COST		$ 70,000

TABLE 4-4

COST ANALYSIS FOR ACID MIST CONTROL BY ELECTROSTATIC PRECIPITATOR
2000 TPD CONTACT SULFURIC ACID PLANT

FARMLAND INDUSTRIES, INC.
POLK COUNTY, FLORIDA

CAPITAL COST		
Direct		
Collector	318,000	
Auxiliaries	110,000	
		$ 428,000
Indirect		
Engineering and Supervision	43,000	
Construction	34,000	
Contractor	26,000	
Contingency	51,000	
		154,000
TOTAL CAPITAL COST		$ 582,000
ANNUAL COST		
Direct		
Operating Labor and Supervision	23,000	
Maintenance Labor	20,000	
Maintenance Materials	30,000	
Utilities	50,000	
		$ 123,000
Indirect		
OH	21,000	
Payroll	9,000	
		30,000
Capital Recovery		95,000
Insurance and Taxes		23,000
TOTAL ANNUAL COST		$ 271,000

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 proposed new 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 proposed eight percent 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
Nitrogen Oxides	-	14.0 micrograms per cubic meter, annual average

Sulfuric Acid Mist - NA

The modeling that has been conducted demonstrates that the net impact of the sulfur dioxide and nitrogen oxides emissions increases and decreases addressed in this application 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 and nitrogen oxides 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 also demonstrates that the net impact of nitrogen oxides emissions is significant (Rule 17-2.100(171)(c), FAC) but the impact of emissions from all sources impacting the project site is less than the ambient air quality standard for nitrogen oxides. The modeling further shows the net impact of sulfuric acid mist emissions associated with the proposed project is approximately one-tenth of the 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 will result in an impact that is less than the AAL.

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

7.1 Air Quality Modeling for Sulfur Dioxide

The net change in the emissions rate of sulfur dioxide associated with the proposed project is defined as the emission rate increase associated with new sulfuric acid Plant No. 5 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 new 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 new 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 2,000 tons of 100 percent acid per day. This resulted in an hourly sulfur dioxide emission rate of 333.3 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 were defined as the decrease in actual sulfur dioxide emissions from existing sulfuric acid Plants 1 and 2. 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 0.0002 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 0.02 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

The nitrogen oxides emissions associated with the project include the increase in emissions associated with proposed sulfuric acid Plant No. 5 and the decrease in emissions associated with the shut-down of existing Plants 1 and 2. Additionally, there is a nitrogen oxides emissions increase associated with the green superphosphoric acid plant that has been permitted within the past five years.

As summarized in Table 3-2, the increase in nitrogen oxides emissions associated with the No. 5 sulfuric acid plant is 43.4 tons per year while the decrease in nitrogen oxides emissions associated with the shut-down of existing Plants 1 and 2 total 50.4 tons per year; or a net decrease of 7.0 tons per year in nitrogen oxides emissions. The increase in nitrogen oxides emissions associated with the green superphosphoric acid plant permitted in November 1987 is 64.8 tons per year. This increase, combined with emission increases and decreases associated with the sulfuric acid plants, results in a nitrogen oxides emissions increase for the past five years of 57.8 tons per year. This increase exceeds the de minimis emission rate increase defined by Rule 17-2,500(2)(e)2, FAC (40 tons per year).

As a result of the net increase in nitrogen oxides emissions over the past five years, air quality modeling has been conducted for nitrogen oxides. The modeling was conducted in accordance with the guidelines used for the sulfur dioxide modeling and described in Section 7.1. The only departure from the sulfur dioxide modeling procedures was that the modeling was conducted only for the annual period as there is only an annual air quality standard for nitrogen oxides; hence, the Industrial Source Complex - Long Term (ISC-LT) model was used. Three receptor grids were used with the ISC-LT; all centered at the plant site:

7 x 7 at 1.0 km spacing,
9 x 9 at 0.5 km spacing, and
6 x 6 at 0.2 km spacing.

The results of the air quality modeling are summarized in Table 7-3. These results show that there will be a net improvement in ambient air quality over the annual period if only the net nitrogen oxides emissions rate changes associated with sulfuric acid plants are considered. This is to be expected as there will be a net emission reduction of 7.0 tons per year of nitrogen oxides associated with the construction of the new No. 5 sulfuric acid plant and the shut-down of the existing Plants 1 and 2.

Combining the emission rate increases associated with the green superphosphoric acid plant with the emission rate changes associated with the sulfuric acid plants results in a net increase of 3.9 micrograms per cubic meter, annual average, at a distance of 0.3 kilometers from the plant. This impact compares with a significant impact (Rule 17-2.100(171)(c), FAC) of 1.0 micrograms per cubic meter, a de minimis impact (Rule 17-2.500(3)(e)1, FAC) of 14.0 micrograms per cubic meter and an air quality standard of 100.0 micrograms per cubic meter, annual average.

As the net impact of new sources at the Farmland facility was significant, additional modeling was conducted, including all sources of nitrogen oxides expected to impact the project area, to demonstrate that the ambient air quality standard of 100 micrograms per cubic meter was not exceeded.

The sources included in the nitrogen oxides modeling, including the Farmland sources, are listed in Table 7-4. The nitrogen oxides emission rates were determined from permit conditions, from emission factors or measurements on similar plants, or from actual test data.

The results of the nitrogen oxides modeling to demonstrate compliance with ambient air quality standards are also summarized in Table 7-3. These results show that the maximum expected impact of all sources will be 7.6 micrograms per cubic meter and will occur 0.5 kilometers from the Farmland facility. This impact compares with an air quality standard of 100 micrograms per cubic meter, annual average.

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 consists 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 x 7)/(8 x 5). In addition to this factor, 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 4.8 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 and decreases associated with the proposed project and also to determine the impact of sulfuric acid mist emissions from existing sulfuric acid Plants 3 and 4 plus the emissions from new Plant 5. 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 7-5. The result of the modeling demonstrate that the maximum expected increase in ambient sulfuric acid mist levels associated with the proposed project will be approximately 0.4 micrograms per cubic meter over a 24-hour period. The modeling results also show that the maximum expected sulfuric acid mist impact resulting from the operations of Plants 3, 4 and 5 will be approximately 3.7 microgram per cubic meter, 24-hour average, at a distance of 1.5 kilometers from the plants. These impacts compare with the AAL for sulfuric acid mist of 4.8 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 Ht (ft)	STACK Dis (ft)	STACK GAS Vel (FPS)	STACK GAS Temp (°F)	EMISSION RATES (1) SO2 (lb/hr)	SO2 (TPY)	Acid Mist (lb/hr)	Acid Mist (TPY)	NOx (lb/hr)	NOx (TPY)
H2SO4 #1	100	4.5	66.2	100	216.7	700	2.3	7.5	7.8	25.2
H2SO4 #2	100	4.5	66.2	100	216.7	700	2.3	7.5	7.8	25.2
H2SO4 #5	150	8.0	31.6	180	333.3	1460	12.5	54.8	9.9	43.4
GSPA	65	1.0	14.7	120	0	0	0	0	29.1	64.8

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

(a) H2SO4 #1 and #2 - An annual operating factor, based on production, of 0.737.
(b) H2SO4 #5 - Operating time will be 8760 hours/year.
(c) GSPA - Annual operating time will be 4448 hours/year.

TABLE 7-2

SUMMARY OF SULFUR DIOXIDE IMPACT ANALYSIS

FARMLAND INDUSTRIES, INC.
POLK COUNTY, FLORIDA

METEOROLOGICAL DATA	SULFUR DIOXIDE IMPACT (ug/m^3)		
	ANNUAL	3-HOUR	24-HOUR
1974	< 0	0.016	0.0002
1975	< 0	0.004	< 0.0001
1976	< 0	0.010	0.0001
1977	< 0	0.001	< 0.0001
1978	< 0	0.001	0.0001
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 NITROGEN OXIDES IMPACT ANALYSES

FARMLAND INDUSTRIES, INC.
POLK COUNTY, FLORIDA

METEOROLOGICAL DATA	ANNUAL NOX IMPACT (ug/m^3)		
	H2SO4 PLANTS	H2SO4 PLANTS AND GSPA	ALL SOURCES (1)
1974-1978 Star Summary	< 0	3.9	7.6
Air Quality Std		100.0	
Significant Impact (17-2.100(171)(c),FAC		1.0	
De minimis Impact (17-2.500(3)(e)1,FAC		14.0	

(1) See Tables 7-1 and 7-4.

TABLE 7-4

LISTING OF SIGNIFICANT SOURCES OF NITROGEN OXIDES IN POLK COUNTY

FARMLAND INDUSTRIES, INC.
POLK COUNTY, FLORIDA

Source Number	Location X (m)	Location Y (m)	Ht. (m)	Temp. (deg k)	Vel. (m/s)	Dia. (m)	NOX (g/s)	Identification
1	388076	3116011	27.44	316.0	19.69	1.52	3.20	CPI A & B H2SO4
2	388155	3116034	60.52	352.0	16.40	2.44	5.16	CPI C & D H2SO4
3	387858	3115904	28.66	322.0	7.20	3.05	2.00	CPI A DAP
4	387890	3115918	54.88	322.0	9.79	2.79	2.00	CPI Z DAP
5	387813	3116041	54.88	325.0	10.55	2.79	6.00	CPI X & Y GTSP
6	408500	3083000	63.40	347.0	6.90	2.10	2.41	CF BARTOW #5,6 & 7 H2SO4
7	408500	3083000	34.50	319.0	20.00	1.30	2.12	CF BARTOW #3 & 4 H2SO4
8	408100	3081800	38.60	341.0	11.00	2.19	4.50	CF BARTOW DAP
9	407380	3071700	38.10	328.0	14.60	3.10	5.30	AGRICO DAP/GTSP
10	407520	3071240	45.70	350.0	9.90	2.70	6.33	AGRICO #10,11 & 12 H2SO4
11	394850	3069770	30.50	334.0	7.26	1.82	5.00	AMAX BIG 4 DRYER
12	398400	3084200	45.70	352.0	10.30	2.30	2.08	CONSERVE H2SO4
13	398400	3084200	10.00	533.0	11.00	0.80	1.80	CONSERVE
14	398400	3084200	24.40	330.0	5.00	1.70	1.70	CONSERVE
15	414700	3080300	13.70	330.0	40.40	1.22	3.30	IMC NORALYN
16	398200	3075700	21.30	344.0	12.90	2.10	1.16	IMC KINGSFORD
17	396560	3078640	60.70	349.7	15.55	2.60	13.88	NEW WALES H2SO4
18	396830	3079430	52.40	319.1	7.10	2.40	17.04	NEW WALES MULTIPHOS/AFI
19	396450	3079150	36.60	319.1	20.80	1.80	9.83	NEW WALES DAP/GTSP
20	398000	3085300	25.90	339.0	16.00	2.30	12.40	MOBIL DRYERS
21	406700	3085200	61.00	360.0	12.20	2.13	2.30	ROYSTER H2SO4
22	406800	3085200	31.10	322.0	8.26	2.67	2.10	ROYSTER DAP/GTSP
23	415920	3068890	28.40	314.0	9.33	1.45	3.10	USSAC FT. MEADE-GTSP
24	415860	3068550	15.90	336.0	11.04	1.83	4.40	USSAC FT. MEADE-DRYER
25	413200	3086300	40.40	314.0	14.50	2.13	2.10	USSAC BARTOW - DAP
26	416120	3068620	53.40	355.0	15.91	2.59	5.64	USSAC FT. MEADE-H2SO4
27	409700	3086000	61.00	346.0	7.30	2.80	3.02	WR GRACE
28	409700	3086000	45.70	322.0	16.70	1.50	1.38	WR GRACE
29	409700	3086000	61.00	346.0	25.90	1.50	2.38	WR GRACE
30	408500	3105800	76.20	354.0	19.70	4.90	176.40	LAKELAND - MCINTOSH
31	408500	3105800	45.70	420.0	24.00	2.74	176.40	LAKELAND - MCINTOSH
32	409000	3102000	50.30	422.0	3.40	3.10	10.60	LAKELAND - LARSEN 7
33	409500	3079500	30.48	355.0	9.27	2.29	2.82	FARMLAND - 3 & 4 H2SO4
34	409500	3079500	30.00	322.0	7.31	2.09	2.00	FARMLAND - DAP
35	409500	3079500	30.48	311.0	20.18	1.37	-1.45	FARMLAND - 1 & 2 H2SO4
36	409500	3079500	45.72	355.0	9.65	2.44	1.25	FARMLAND - 5 H2SO4
37	409500	3079500	19.81	322.0	4.48	0.30	1.86	FARMLAND - GSPA

TABLE 7-5

SUMMARY OF ACID MIST IMPACT ANALYSIS

FARMLAND INDUSTRIES, INC.
POLK COUNTY, FLORIDA

METEOROLOGICAL DATA	24-HR ACID MIST IMPACT (ug/m^3)	
	PLANTS 1, 2 & 5	PLANTS 3, 4 & 5
1974	0.33	3.73
1975	0.37	3.05
1976	0.40	3.26
1977	0.39	3.58
1978	0.41	3.53
AAL (1)	4.8	4.8

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