USS Agri-Chemicals
Division of United States Steel

MAIL: P. O. BOX 867
FORT MEADE, FLORIDA 33841
813/285-8121

January 19, 1984

DER
JAN 23 1984
BAQM

Mr. Claire Fancy
Deputy Director
Bureaū of Air Quality Management
Florida Department of Environmental Regulation
2600 Blair Stone Road
Tallahassee, Florida 32301

Dear Mr. Fancy:

Re: Prevention of Significant Deterioration
PSD Application

USS-Agri-Chemicals is submitting the attached PSD application to increase the production of the existing sulfuric acid and phosphoric acid facilities at the Chemical Complex in Fort Meade, Polk County.

Kindly contact me if you have any questions or require additional information.

Very truly yours,

USS AGRI-CHEMICALS

GWB:cbr

G. W. Beck, General Manager
Administrative Services

Attachments: $1,000 filing fee
PSD Application, 4 copies
Air Model Data Records, 1 copy

cc: Mr. Dan A. Williams
Acting District Manager
DER, Tampa

Dr. J. B. Koogler
Consultant
Gainesville, Fla.

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

No 76013

RECEIPT FOR APPLICATION FEES AND MISCELLANEOUS REVENUE

Received from Ft. Meade Chemical Products Date January 23, 1984

Address P.O. Box 867 Fort Meade, FL 33841 Dollars $ 1,000.00

Applicant Name & Address USS Agrichemicals - same address as above

Source of Revenue

Revenue Code 001001 Application Number AC 53-81664

By Patricia G. Adams

FORT MEADE CHEMICAL PRODUCTS
P.O. BOX 867
FORT MEADE, FLA. 33841
Phone (813) 285-8121 (813) 533-8184

8843

63-122
631

DATE 1-20 19 84

PAY $ **1,000.00**

TO THE ORDER OF FLORIDA DEPT. ENVIRONMENTAL REGULATIONS

FORT MEADE CHEMICAL PRODUCTS
Checks of $25,000.00 and over must be countersigned

AUTHORIZED SIGNATURE

COUNTERSIGNED

FLAGSHIP STATE BANK
OF POLK COUNTY
FORT MEADE, FLORIDA

PSD APPLICATION

⑈008843⑈ ⑆063101221⑆ 1220159697⑈

DER

JAN 23 1984

BAQM

APPLICATION FOR PSD APPROVAL

USS AGRI-CHEMICALS
FT. MEADE CHEMICAL COMPLEX
POLK COUNTY, FLORIDA

JANUARY, 1984

SHOLTES & KOOGLER,
ENVIRONMENTAL CONSULTANTS, INC.
1213 NW 6TH STREET
GAINESVILLE, FLORIDA 32601
(904) 377-5822

TABLE OF CONTENTS

1.0 INTRODUCTION

USS Agri-Chemicals, a division of United States Steel Corporation, operates two phosphate fertilizer manufacturing facilities in Polk County, Florida. These facilities are referred to as the Bartow Chemical Complex and the Ft. Meade Chemical Complex. This application for PSD approval addresses an increase in sulfuric acid production capacity and an increase in phosphoric acid production capacity at the USSAC Ft. Meade Chemical Complex. This chemical complex is located approximately 3.5 miles west of Ft. Meade, Florida on State Road 630.

The chemical complex covers approximately 865 acres of land and consists of production facilities for sulfuric acid, phosphoric acid, and granular triple superphosphate (GTSP), a fluosilicic acid recovery system and supporting facilities such as storage buildings, maintenance areas and offices. The original chemical complex began operation in 1961. Since that time various modifications have been made to the complex. The most recent modification was approved under PSD review PSD-FL-064 in April, 1981. This modification resulted in the addition of wet rock grinding mills, new sulfuric and phosphoric acid plants, the expansion of the cooling pond system and gypsum disposal area and the retirement of the existing sulfuric acid plant, the existing phosphoric acid plant and the existing fluosilicic acid plant. These modifications were undertaken as a joint venture between USSAC, as managing partner for the U.S. Steel Corporation, and W. R. Grace and Company.

The 1981 expansion resulted in the construction of two sulfuric acid plants, each with a capacity of 2,200 tons per day of 100 percent sulfuric acid, two phosphoric acid plants, each with a feed rate of 846 tons per day of P_2O_5 (800 tpd P_2O_5 production) and a new fluosilicic acid plant. The purpose of this PSD application is to obtain approval to increase the production capacity of each of the new sulfuric acid plants to 3,000 tons per day of 100 percent sulfuric acid and to increase the production capacity of each of the new phosphoric acid plants to 1,000 tons per day of P_2O_5. As a result of the increase in capacity of the two phosphoric acid plants, the fluosilicic acid recovery will increase from 295 tons per day of 25 percent acid (58 tons per day of fluorine) to 420 tons per day of 25 percent acid (83 tons per day of fluorine). Other facilities at the chemical complex, including the sulfuric acid plant auxiliary boiler, the GTSP plant and the size of the cooling water system and gypsum disposal area, will not be affected by the proposed production rate increases.

As a result of the proposed production rate increases, there will be significant increases in the sulfur dioxide, sulfuric acid mist, and nitrogen oxides emission rates from the Ft. Meade Chemical Complex. There will also be increases in the carbon monoxide and fluoride emission rates; however, these increases will be less than the de minimus emission rate increases for these pollutants as defined by state and federal PSD regulations.

Since the emission rate increases of sulfur dioxide, sulfuric acid mist and nitrogen oxides will exceed the de minimus emission rate increases, the proposed sulfuric acid plant modification must be reviewed under state and federal PSD regulations. USSAC is submitting the information contained in this document as an Application for PSD Review and Approval. The material in this application includes a description of the affected facilities and a description of the proposed modification, a review of Best Available Control Technology (BACT) for sulfur dioxide, sulfuric acid mist and nitrogen oxides, an air quality review and a review of the secondary impacts of emissions resulting from the proposed modification.

2.0 PLANT DESCRIPTION

The USSAC Ft. Meade Chemical Complex is a phosphate fertilizer manufacturing facility located in southwest Polk County, Florida. The plant is located approximately 3.5 miles west of Ft. Meade, Florida at UTM coordinates 416.0 east and 3069.0 north (Zone 17). The location of the site is shown in Figure 2-1.

2.1 History of the USSAC Ft. Meade Chemical Complex

The Ft. Meade Chemical Complex was put into operation in 1961. At that time the chemical complex included sulfuric acid production facilities, phosphoric acid production facilities and a granular triple superphosphate (GTSP) production facility. In addition to these production units the chemical complex included the necessary intermediate product and product storage areas, phosphate rock dryers and grinders, a process water recirculation system, a gypsum disposal area and support facilities such as offices and maintenance areas. In 1972 fluosilicic acid recovery facilities were added and in 1975 sulfur dioxide control equipment was added to the sulfuric acid plant.

In April, 1981, USSAC received final PSD approval to make major modifications to the Ft. Meade Chemical Complex. These modifications included the construction of two sulfuric acid plants each rated at 2,200 tons per day of 100 percent sulfuric acid, the construction of two phosphoric acid plants each with a feed rate of 846 tons per day of P_2O_5, the construction of new wet rock grinding mills, the expansion of process water ponds and gypsum disposal area and the replacement of the fluosilicic acid recovery facilities. As part of this modification, the existing sulfuric acid plant, phosphoric acid plant and fluosilicic acid plant were retired.

The chemical complex, after completion of the construction approved in 1981, occupies approximately 28 acres. The gypsum disposal area occupies approximately 283 acres and the water surface of the ponds used for process water recirculation occupies 123 acres.

2.2 Description of Existing Facilities

The present USSAC Ft. Meade Chemical Complex consists of manufacturing facilities for sulfuric acid, phosphoric acid and GTSP plus a recovery system for fluosilicic acid and the necessary support facilities for the production units.

Raw materials for the chemical complex include phosphate rock and molten sulfur. The unground rock, received from off-site storage by belt conveyor and/or rail is stored in unground rock silos. Sulfur is transported to the chemical complex in a molten form by truck or rail.

The molten sulfur received on site is converted to sulfuric acid in two double absorption sulfuric acid plants each rated at 2,200 tons per day of 100 percent sulfuric acid. This acid, produced as 98 percent sulfuric acid, is used in the production of phosphoric acid.

The phosphoric acid production facilities at the Ft. Meade Chemical Complex consist of two 800 tons per day phosphoric acid plants. These two plants convert the wet ground phosphate rock and sulfuric acid to 29 percent P_2O_5 phosphoric acid. Over 90 percent of the acid is concentrated in two stages to produce 54 percent P_2O_5 phosphoric acid. The remainder of the 29 percent acid is used in the GTSP plant.

Associated with the phosphoric acid plants is a fluosilicic acid recovery system. This system recovers fluorides that are released in the phosphoric acid evaporator as 25 percent fluosilicic acid. This system presently has a recovery capacity of 295 tons per day of 25 percent fluosilicic acid (58 tons per day of fluoride). The fluorides recovered in this system are fluorides that would otherwise be removed in the phosphoric acid scrubber system and be discharged to the process water ponds with the scrubber water.

The GTSP is a phosphate fertilizer product produced by reacting ground phosphate rock and phosphoric acid. The permitted production capacity of the GTSP facility is 1,110 tons per day as GTSP.

Support facilities for the chemical complex include a 100 million BTU per hour auxiliary boiler used to generate steam to start the sulfuric acid plants and to provide steam to the chemical complex when the sulfuric acid plants are not operating, a 283 acre gypsum disposal area, a 123 acre cooling pond system, a 32 megawatt power generator utilizing steam generated during the cooling of the sulfuric acid process, storage facilities for intermediate products and products, maintenance areas and offices.

2.3 Description of Proposed Modification

USSAC is proposing to increase the production capacity of each of the two sulfuric acid plants permitted in April, 1981 from 2,200 tons per day of 100 percent sulfuric acid to 3,000 tons per day of 100 percent sulfuric acid and to increase the production capacity of each of the two new phosphoric acid plants from 800 tons per day of P_2O_5 to 1,000 tons of P_2O_5. These production rate increases will require certain physical modifications to the sulfuric acid and phosphoric acid plants and will result in increases in the sulfur dioxide, sulfuric acid mist, nitrogen oxides, carbon monoxide and fluoride emission rates.

The increase in the phosphoric acid production capacity will result in an increase in the production capacity of the fluosilicic acid recovery system from 295 tons per day of 25 percent fluosilicic acid to 420 tons per day of 25 percent fluosilicic acid. The phosphoric acid production rate increase will also result in an increase in the gypsum disposal rate, an increase in the water flow rate through the process water ponds and an increase in the heat load to the process water ponds.

The heat load to the process water ponds will increase from 3.57×10^8 BTU per hour to 4.46×10^8 BTU per hour. The increased gypsum disposal rate, the increased process water flow rate and the increased heat load to the process water ponds will not result in an increase in the size of either the gypsum disposal area or the process water ponds since the present areas are sufficient to handle the proposed production rate increases.

The increase in the fluosilicic acid recovery rate will have no effect on fluoride emission rates from the phosphoric acid production facility since this is a closed system within the phosphoric acid plant. Similarly, there will be no increase in air pollutant emissions, hours of operation or production capacities of the sulfuric acid plant auxiliary boiler, the power generator associated with the sulfuric acid plant, or the GTSP production facility as a result of the increased capacities in the sulfuric acid and phosphoric acid plants.

The facilities affected by the proposed production rate increases are the sulfuric acid plants and the phosphoric acid plants. A detailed description of the sulfuric acid plant operation and a sulfuric acid plant flow diagram are presented in Appendix A of this application. A facility description and a process flow diagram for the phosphoric acid plants are presented as Appendix B of this application.

The presently permitted sulfuric acid and phosphoric acid production rates and the proposed increased production rates for both facilities are summarized in Table 2-1. Also included in Table 2-1 are the emission limiting standards that the two production facilities must comply with.

2.4 Air Pollutant Emission Rate Increases

As previously stated, the proposed production rate increases will result in increased emissions of sulfur dioxide, sulfuric acid mist, nitrogen oxides, carbon monoxide, and fluorides. The sulfur dioxide, sulfuric acid mist, nitrogen oxides and carbon monoxide emission increases will result from the production capacity increase in the sulfuric acid plants while the fluoride emission increases will result from the production rate increases in the phosphoric acid plants and the associated changes in the process water system. It has been calculated that only the increases in the sulfur dioxide, sulfuric acid mist and nitrogen oxides emission rates will exceed the de minimus emission rate increases defined in state and federal PSD regulations. As a result of this, the PSD review for the proposed modifications must address only these three pollutants.

The calculation of emission rate changes resulting from the proposed modifications are presented in Appendix C of this application. The presently permitted and proposed emission rates are summarized in Table 2-2.

It has been calculated that, as a result of the proposed production rate increase, the sulfur dioxide emission rate will increase from 2,920 tons per year to 3,984 tons per year; an increase of 1,064 tons per year. This compares with the de minimus emission rate increase for sulfur dioxide of 40 tons per year. The sulfuric acid mist emission rate will increase from 109.6 tons per year to 149.4 tons per year or by 39.8 tons per year. This emission rate increase compares with the de minimus emission rate increase 7.0 tons per year. The nitrogen oxides emission rate will increase 59.2 tons per year; from 88.0 tons per year to 147.2 tons per year. This increase compares with the de minimus emission rate increase of 40 tons per year.

The emission rate increase of the other pollutant emitted from the sulfuric acid plant; that is carbon monoxide will increase by 0.2 tons per year. This emission rate increase compares with a de minimus emission rate increase of 100 tons per year.

The fluoride emissions from both the phosphoric acid plant and the process water recirculation system will be affected by the proposed production rate increase in the two phosphoric acid plants. The fluoride emissions from the phosphoric acid plants will increase from 5.0 tons per year to 7.0 tons per year while the fluoride emissions from the process water pond system will decrease from 41.0 tons per year to 40.6 tons per year. The net change in fluoride emissions resulting from the proposed production rate modification is an increase of 1.6 tons per year. This compares with a de minimus emission rate increase for fluorides of 3.0 tons per year.

The decrease in the fluoride emission rate from the process water ponds is documented in detail in Appendix C. The decrease in emissions results from the use of fluoride vapor pressure data developed by King (see reference in Appendix C) under an EPA grant. King's data show a decrease in the vapor pressure of fluoride over pond water as the water temperature increases from approximately 75° F to 90° F. The data then show an increase in the fluoride vapor pressure as the pond water temperature increases above 90° F. The decrease in fluoride emissions from the USSAC Ft. Meade Chemical Complex ponds results from a decrease in the pond area that is at the annual average equilibrium temperature of 75° F and an increase in the pond cooling area where the water temperature is in the range of 75° F to approximately 100° F.

The emission rate calculations presented in this section of the application demonstrate that only the emission rate increases of sulfur dioxide, sulfuric acid mist and nitrogen oxides exceed the de minimus emission rate increases and, hence, only these three pollutants must be addressed in further detail in this application.

2.5 Good Engineering Practice Stack Height

The stack heights for the two sulfuric acid plants are 175 feet (53.4 meters). These stack heights were evaluated by EPA and FDER during the review of PSD Application PSD-FL-064 and found to satisfy the Good Engineering Practice Stack Height Criteria. The stack heights will not be modified as a result of the proposed action nor will the heights of adjacent structures be modified. Therefore, it can be concluded that the sulfuric acid plant stack heights still satisfy Good Engineering Practice Stack Height Criteria.

TABLE 2-1

SUMMARY OF PERMITTED AND PROPOSED PRODUCTION RATES

USS AGRI-CHEMICALS
FT. MEADE CHEMICAL COMPLEX

Plant	Emission Standard	Production Rate (5) Permitted (1) (tons/day)	Production Rate (5) Proposed (tons/day)
Sulfuric Acid 1	4 lb SO_2/ton H_2SO_4 and 0.15 lb Mist/ton H_2SO_4	2200 (2)	3000 (2)
Sulfuric Acid 2		2200	3000
Phosphoric Acid A	0.02 lb/ton P_2O_5 Input	800 (3)	1000 (4)
Phosphoric Acid B		800	1000

(1) PSD-FL-064 Final Determination dated 4/1/81.

(2) Tons of 100% H_2SO_4 produced.

(3) Tons of P_2O_5 produced; P_2O_5 input is 846 tons/day.

(4) Tons of P_2O_5 produced; P_2O_5 input is 1053 tons/day.

(5) Annual production rates are based on 332 days per year operation.

TABLE 2-2

SUMMARY OF EMISSION RATE INCREASES

USS AGRI-CHEMICALS
FT. MEADE CHEMICAL COMPLEX

	Pollutant Emission Rates (tpy)									
	Sulfur Dioxide		Acid Mist		NOx		CO		Fluorides	
Source	Permitted	Proposed	Permitted	Proposed	Permitted	Proposed	Permitted	Proposed	Permitted	Proposed
Sulfuric Acid Plants										
1	1460	1992	54.8	74.7	44.0	73.6	0.4	0.5	0	0
2	1460	1992	54.8	74.7	44.0	73.6	0.4	0.5	0	0
Phosphoric Acid Plants										
1	0	0	0	0	0	0	0	0	2.5	3.5
2	0	0	0	0	0	0	0	0.	2.5	3.5
Cooling Pond System	0	0	0	0	0	0	0	0	41.0	40.6
TOTAL	2920	3984	109.6	149.4	88.0	147.2	0.8	1.0	46.0	47.6
NET CHANGE	1064		39.8		59.2		0.2		1.6	
DeMinimus Emission Rate	40		7		40		100		3	

Permitted emission rates are based on conditions of Final Determination of PSD-FL-064 dated 4/1/81.

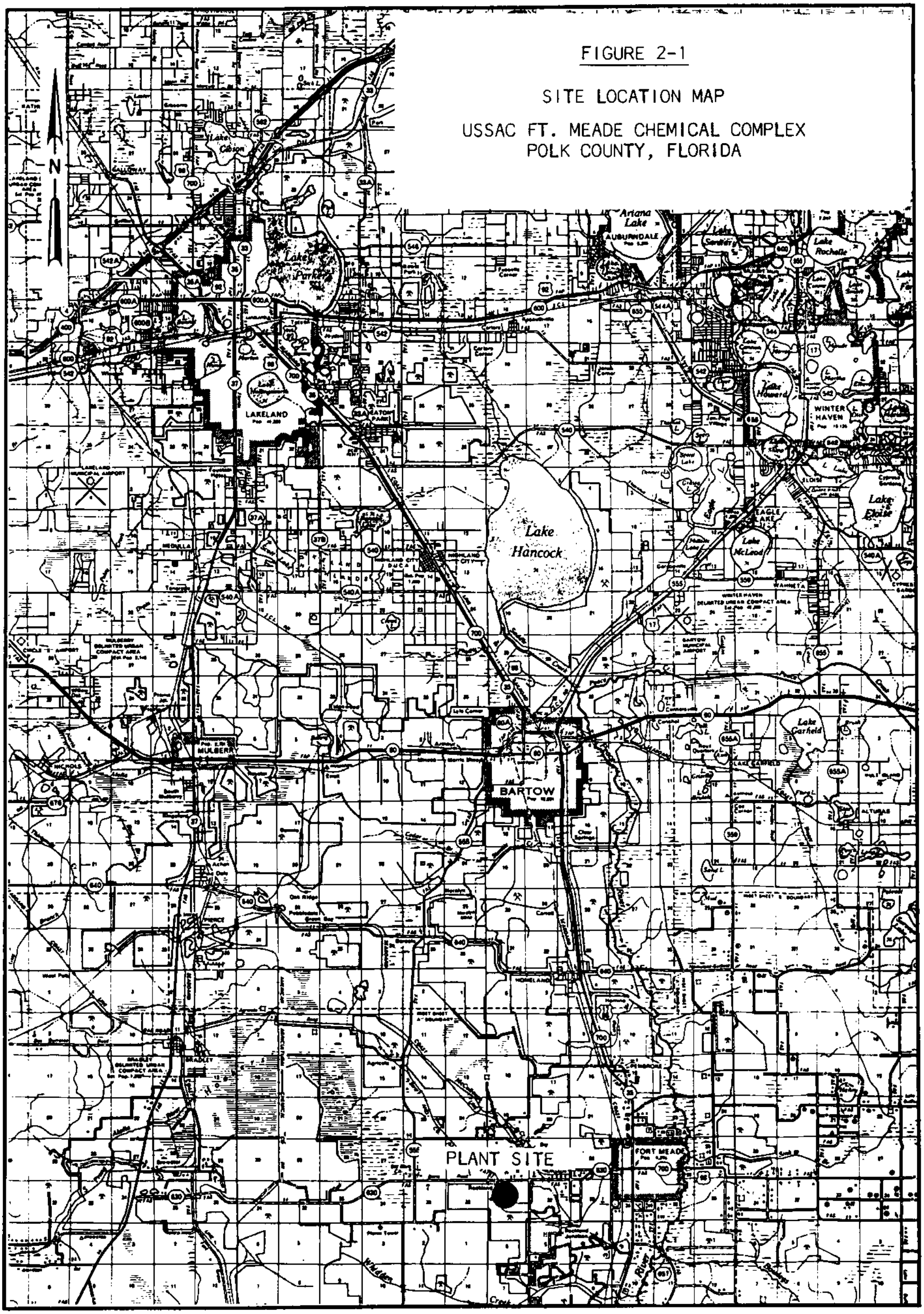


FIGURE 2-1

SITE LOCATION MAP

USSAC FT. MEADE CHEMICAL COMPLEX
POLK COUNTY, FLORIDA

3.0 BEST AVAILABLE CONTROL TECHNOLOGY (BACT)

Best Available Control Technology (BACT) is required to control pollutants emitted from major sources or from major modifications to air pollution sources if the increase(s) in the emission rate(s) exceed the de minimus levels defined in state and federal PSD regulations. The de minimus emission rates for pollutants potentially emitted from sulfuric acid plants and phosphoric acid plants are defined in Table 2-2. For the proposed modifications to the USSAC Ft. Meade Chemical Complex, BACT is to apply only to modified sources emitting sulfur dioxide, sulfuric acid mist and nitrogen oxides; that is the two sulfuric acid plants.

The sulfur dioxide emissions from the two plants will be controlled by double absorption and the acid mist will be controlled with high efficiency mist eliminators. These measures were determined by FDER and EPA to constitute BACT when the plants were permitted in 1981 and are again proposed as BACT for sulfur dioxide and acid mist. There is no technology presently available that can reasonably be used to control nitrogen oxides emissions from sulfuric acid plants.

In the following sections the control technology proposed for each pollutant is discussed.

3.1 Sulfuric Acid Plants

Sulfuric acid plants emit sulfur dioxide, acid mist, nitrogen oxides and possibly carbon monoxide. EPA has New Source Performance Standards (NSPS) regulating the sulfur dioxide and acid mist emission rates from these plants and has recently completed a review of NSPS for sulfuric acid plants.(1) In this document it is concluded that NSPS for sulfuric acid plants should not be made more stringent than the existing 4.0 pounds sulfur dioxide and 0.15 pound acid mist per ton of 100 percent acid produced.

3.1.1 Sulfur Dioxide

Double absorption is the best demonstrated control technology available for sulfur dioxide control. This technology has the advantage of reducing sulfur dioxide emissions, producing no by-products and introducing no unfamiliar operating factors to plant operators. EPA reviewed potential improvements to the double absorption system such as reducing catalyst life from three-five years to two years. EPA rejected these ideas, however, since it reduced pre-tax profit by approximately 20 percent(1).

Scrubbing systems; bisulfite and ammonia, were evaluated and described as feasible by EPA(1). These systems; however, would not be expected to result in significantly lower sulfur dioxide emission rates. In addition, these systems are untested, they will generate by-products, and they will introduce a system that requires completely different operating technology.

Molecular sieves have been tried and found unacceptable because of operating difficulties.

It is concluded that double absorption with catalyst screening and make-up every three to five years represents BACT for sulfur dioxide. This technology will also assure compliance with NSPS.

3.1.2 Sulfuric Acid Mist

Acid mist and the resulting opacity can be controlled by high efficiency mist eliminators and, theoretically, by electrostatic precipitators. Practically, precipitators are not considered an alternative because of operating problems that would develop in the acid environment.

It has been the experience of the industry that the high efficiency mist eliminators are the most effective means of controlling acid mist emissions at this time. High efficiency mist eliminators are proposed by USSAC as BACT for acid mist emissions and will assure that NSPS will be satisfied.

3.1.3 Nitrogen Oxides

In a contact sulfuric acid plant, nitrogen oxide results from the fixation of atmospheric nitrogen in the sulfur burner. Tests conducted by Sholtes & Koogler, Environmental Consultants, Inc. on existing double absorption contact sulfuric acid plants show tail gas nitrogen oxide concentrations of 15-18 ppm. (See PSD FL 014). By comparison, nitrogen oxide concentrations in flue gases from fossil fuel power boilers average 100-200 ppm.

Methods of controlling nitrogen oxide emissions from combustion sources include reducing or eliminating nitrogen in the fuel, reducing the air/fuel ratio, and reducing the peak flame temperature. None of these methods are applicable to sulfur burners.

The sulfur (fuel) fired in the sulfur burner is, for practical purposes, free of nitrogen so the alternative of reducing fuel nitrogen content is eliminated.

The air/fuel ratio adjustment leaves little room for control since this ratio is critical in a sulfuric acid plant. The air flow controls is a major factor in determining the sulfur furnace temperature and the sulfur dioxide concentration in the feed to the converter.

The furnace temperature is limited by the furnace liner. A reduction in the air/fuel ratio will cause the furnace temperature to increase if the sulfur feed is held constant. To maintain the furnace temperature within safe limits, therefore, the air/fuel ratio must be maintained within fixed limits or the rate of sulfur burning, and hence plant production, must be reduced. If the sulfur feed rate is reduced the air/fuel ratio increases to its original value.

The sulfur dioxide concentration in the feed to the converter is also dependent upon the air/fuel ratio. This concentration in turn influences the temperature rise in the converter and to some extent the converter efficiency. At a reduced air/fuel ratio (a higher sulfur dioxide concentration in the converter feed) the converter temperature will increase and the converter efficiency will drop resulting in increased sulfur dioxide emissions.

Another means of controlling nitrogen oxides emissions from combustion sources is the low-NOx burner. With these burners a portion of the combustion air is introduced with the fuel and a portion is introduced in an envelope around the fuel nozzle. This results in a low oxygen level in areas where the peak flame temperature is the highest; thus reducing the formation of nitrogen oxides.

In a sulfur burner, all of the combustion air is introduced adjacent to the burner nozzle; an arrangement that simulates the burning pattern developed in the low-NOx burner. Further staging of the combustion air is not practical.

Water or steam injection to reduce peak flame temperatures is not an alternative in sulfuric acid plants either since water in a sulfuric acid plant will foul the converter catalyst and will cause excessive acid mist emissions. Even the combustion air is dried by contacting it with 93 percent acid prior to injection into the sulfur burner.

As a point of comparison, a 3000 TPD sulfuric acid plant will produce 300,000 pounds of steam per hour and emit approximately 18 pounds per hour of nitrogen oxides. An oil fired power boiler that will produce 300,000 pounds of steam per hour will emit 120-250 pounds of nitrogen oxides per hour based on emission factors from AP-42. A comparison of these emission rates is an indication that the design inherent in a sulfuric acid plant results in nitrogen oxides emission rates much lower than other typical combustion sources. It is concluded that there is no feasible method of further reducing nitrogen oxides emissions from a sulfuric acid plant.

REFERENCES
SECTION 3.0

1. Drabkin, M. and Brooks, J. J., A Review of Standards of Performance for New Stationary Sources - Sulfuric Acid Plants, US EPA-450/3-79-003, January 1979.

4.0 EXISTING AIR QUALITY DATA

State and federal PSD regulations require that air quality monitoring be conducted and that the data be submitted with the application for PSD approval for the application to be considered complete. The regulations set forth two criteria which are to be used in determining whether or not air quality monitoring is required for a specific pollutant. First, the pollutant must be subject to the PSD review process. This means that the emission rate of the pollutant must exceed the de minimus emission rate for that pollutant as defined in state and federal PSD regulations. The second criterion is that the impact of the pollutant must exceed the de minimus impact level for that pollutant; a level also defined in state and federal PSD regulations.

The PSD application prepared by USSAC addresses sulfur dioxide, sulfuric acid mist and nitrogen oxides; the pollutants which exceed the de minimus emission rate increases. The air quality modeling reported in Section 6.0 of this application has shown the new source impact of sulfur dioxide to exceed the de minimus impact level for this pollutant or, to exceed 13 micrograms per cubic meter, 24-hour average. The 24-hour impact of nitrogen oxides emissions was estimated to be less than one microgram per cubic meter; much less than the 14 micrograms per cubic meter de minimus impact level. For sulfuric acid mist, the state and federal PSD regulations do not define a de minimus impact level. A federal de minimus impact level of one microgram per cubic meter has been proposed, however, and modeling results show that the acid mist impact is well below this level.

Based upon the requirements of the PSD regulations and upon discussions with the FDER staff, ambient air quality monitoring was conducted in the vicinity of the Ft. Meade Chemical Complex for only sulfur dioxide. The monitoring was conducted at a single site approximately one kilometer southeast of the Ft. Meade Chemical Complex. Monitoring was conducted with a continuous sulfur dioxide analyzer during the period of February 2, 1983 through June 3, 1983. The monitoring site was approved by FDER and assigned the SAROAD Site Identification Number 10-3680-030. A complete report of the monitoring activities are included as Appendix D to this application.

Over the four-month monitoring period, the data recovery was in excess of 96 percent. The four month average sulfur dioxide concentration was measured to be 5.4 micrograms per cubic meter. The highest measured 3-hour sulfur dioxide concentration was 131 micrograms per cubic meter and the second high 3-hour sulfur dioxide concentration was 130 micrograms per cubic meter. For the 24-hour period, the maximum sulfur dioxide concentration measured was 43.7 micrograms per cubic meter while the second high was 39.8 micrograms per cubic meter.

During the four month monitoring period, data were collected for 2,816 hours. The sulfur dioxide concentration during 2,290 of these hours, or 81 percent of the time, was zero. Based on these data, it is reasonable to assume that the background sulfur dioxide concentration in the area is zero for all periods of time.

5.0 SOURCE EMISSION DATA

The Table 5-1 lists the characteristics of all sulfur dioxide emitting sources within approximately 50 kilometers of the USSAC Ft. Meade Chemical Complex. These sources are the ones that were used to prepare the air quality review which is presented in Section 6.0 of this application.

5.1 USSAC Sources

The only sources affected by the proposed modification to the Ft. Meade Chemical Complex are the sulfuric acid plants and the phosphoric acid plants. Emissions from the phosphoric acid plant are not subject to the PSD review and hence, will not be addressed. Emissions from the sulfuric acid plants include sulfur dioxide and sulfuric acid mist and nitrogen oxides; all of which are addressed in this application. Emission rates of sulfur dioxide, sulfuric acid mist and nitrogen oxides from the modified sulfuric acid plants are calculated in Appendix C of this application.

The operation of the auxiliary boiler which is used to generate steam necessary for the start-up of the sulfuric acid plant will not be affected by the proposed modification since the proposed modification will not affect the frequency of start-ups or the duration of a plant start-up. Neither will the capacity of the GTSP plant, and hence the fuel consumption in the GTSP dryer, be effected by the modifications to the sulfuric acid plants.

5.2 Other Sources

Emission data for all other sources, including sulfur dioxide emitting sources at the USSAC Ft. Meade Chemical Complex, were obtained from records in the FDER office in Tampa or the FDER office in Tallahassee.

Table 5-1
SOURCES USED IN AIR QUALITY REVIEW

Loc	ID	Type	Description	Part	SO2	Height	Diam	Vel	Temp	X-Coord	Y-Coord
				g/s	g/s	m	m	m/s	deg K	km	km
USSAC	101	New	Ft.Meade - H2SO4 1		63.00	53.40	2.59	15.91	355.0	416.120	3068.620
USSAC	102	New	Ft.Meade - H2SO4 2		63.00	53.40	2.59	15.91	355.0	416.120	3068.670
USSAC	103	New	Ft.Meade - H2SO4 x		-78.80	29.00	3.02	6.77	314.0	416.210	3068.740
USSAC	10103		Ft.Meade - H2SO4		78.80	29.00	3.02	6.77	314.0	416.210	3068.740
USSAC	10104		Ft.Meade - Aux Boiler		6.40	21.30	1.12	15.24	477.0	416.040	3068.720
USSAC	10106		Ft.Meade - GTSP Dryer		9.60	28.40	1.45	9.33	314.0	415.920	3068.890
USSAC	10107		Ft.Meade - Rock Dryer		34.80	15.90	1.83	11.04	336.0	415.860	3068.550
USSAC	10201		Bartow - H2SO4		42.00	29.00	2.13	8.30	314.0	413.200	3086.300
USSAC	10202		Bartow - Rock Dryer		34.10	15.80	1.83	11.00	326.0	413.200	3086.300
USSAC	10203		Bartow - DAP Dryer		0.80	40.40	2.13	14.50	314.0	413.200	3086.300
AGRICO	301	New	DAP	0.00	7.36	38.10	3.10	14.60	328.0	407.380	3071.700
AGRICO	302	New	#12 H2SO4	0.00	42.00	45.70	2.90	9.50	350.0	407.580	3071.340
AGRICO	10303		Aux. Boiler	0.00	10.08	10.70	1.50	18.40	491.0	407.520	3071.380
AGRICO	10304		#11 H2SO4	0.00	37.80	45.70	2.70	9.90	350.0	407.570	3071.240
AGRICO	10305		#10 H2SO4	0.00	37.80	45.70	2.70	9.90	350.0	407.520	3071.240
AGRICO	10306		GTSP	0.00	23.18	42.70	2.70	12.90	319.0	407.520	3071.520
AMAX	401	New	Big 4 - Boiler	0.08	0.60	8.20	0.41	7.57	505.0	394.800	3069.720
AMAX	402	New	Big 4 - Rock Dryer	2.27	16.35	30.50	1.82	7.26	334.0	394.850	3069.770
AMAX	10403		Piney Point	0.00	37.80	61.00	1.90	13.40	322.0	348.500	3057.300
BPI	501	New	Brewster (Composite)	0.00	13.40	38.10	2.44	15.20	339.0	389.500	3068.000
BPI	10502		Brewster (Composite)	6.30	35.70	38.10	2.44	15.20	339.0	389.500	3068.000
CF	601	New	C. F.	0.00	-110.60	30.50	1.68	4.60	350.0	408.500	3083.000
CF	602	New	2 52 21 C. F.	0.00	4.30	9.10	0.70	22.50	450.0	408.500	3083.000
CF	603	New	2 52 14 C. F.	0.00	52.90	67.10	2.40	9.80	351.0	408.500	3083.000
CF	10604		3 52 04 C. F.	0.00	46.70	34.50	1.30	20.00	319.0	408.500	3083.000
CF	10605		3 52 06 C. F.	0.00	56.70	63.40	2.10	6.90	351.0	408.500	3083.000
CF	10606		3 52 03 C. F.	0.00	45.40	34.50	1.30	14.20	319.0	408.500	3083.000
CF	10607		3 52 05 C. F.	0.00	56.70	63.40	2.10	6.90	347.0	408.500	3083.000
CF	10601		C. F.	0.00	110.60	30.50	1.68	4.60	350.0	408.500	3083.000
CLM	701		Chloride Metals	0.00	21.02	30.00	0.61	20.00	375.0	361.800	3088.300
CSERVE	801	New	Conserve	0.00	-15.20	30.50	1.80	18.90	308.0	398.400	3084.200
CSERVE	802	New	Conserve	0.00	42.00	45.70	2.30	10.30	352.0	398.400	3084.200
CSERVE	10801		Conserve	0.00	15.20	30.50	1.80	18.90	308.0	398.400	3084.200
CSERVE	10803		Conserve	0.00	18.20	10.00	0.80	11.00	533.0	398.400	3084.200
CSERVE	10804		Conserve	0.00	17.20	24.40	1.70	5.00	330.0	398.400	3084.200
ELECT	10901		Electrophos	0.00	6.20	25.60	2.10	8.00	322.0	405.600	3079.400
ESTECH	11001		Estech SAP	0.00	32.20	30.80	2.10	3.90	358.0	411.500	3074.200
ESTECH	11002		Estech Dryer	0.00	51.50	18.50	3.00	7.00	340.0	411.500	3074.200
EVANS	1101	New	Dryer	12.10	9.37	25.90	1.00	17.30	346.0	383.300	3135.800
EVANS	11102		Dryer	3.90	24.60	25.90	1.00	17.30	346.0	383.300	3135.800
EVANS	11103		Boilers	2.05	28.70	12.20	1.10	11.90	505.0	383.300	3135.800
FARM	1201	New	2 53 26 Farmland	0.00	2.30	14.00	1.20	12.70	444.0	409.500	3079.500
FARM	11202		Farmland (Composite)	0.00	199.40	30.50	1.40	23.30	319.0	409.500	3079.500
FCS	1301	New	Kiln and Power Plant	21.80	157.50	91.50	4.88	14.66	389.0	360.008	3162.392
FPC	1401	New	Crystal River	168.20	2017.60	182.90	6.90	27.40	398.0	334.400	3204.510
FPC	1402	New	Crystal River	0.00	-2173.00	152.40	4.60	45.60	420.0	334.400	3204.510
FPC	11403		Crystal River	120.80	4803.00	152.40	4.60	45.60	420.0	334.400	3204.510
FPC	11404		Higgins 1-3	19.00	523.80	52.90	3.80	7.70	424.0	336.500	3098.200
FPC	11405		#1 Anclote	61.10	1680.50	152.40	7.60	6.50	416.0	324.500	3118.600
FPC	11406		#2 Anclote	61.10	1680.50	152.40	7.30	15.60	416.0	324.500	3187.500

Table 5-1
SOURCES USED IN AIR QUALITY REVIEW

Loc	ID	Type	Description	Part g/s	SO2 g/s	Height m	Diam m	Vel m/s	Temp deg K	X-Coord km	Y-Coord km
FPC	11407		Bartow 2	16.30	448.40	91.50	2.70	31.10	422.0	342.400	3082.700
FPC	11408		Bartow 3	25.80	710.00	91.50	3.40	29.10	430.0	342.400	3082.700
FPL	11501		FPL Manatee (Composite)	133.30	1465.80	152.10	7.90	20.70	425.0	367.100	3053.800
GARD	1601	New	Gardinier (Composite)	66.80	-210.26	36.50	2.00	11.80	344.0	363.400	3082.400
GARD	11602		Gardinier (Composite)	66.80	413.60	29.40	2.10	9.10	333.0	363.400	3082.400
GCL	11701		Gulf Coast Lead	0.00	25.90	30.50	0.61	22.40	350.0	363.900	3093.850
GPI	11801		Gen'l Portland (Composite)	59.00	101.00	44.30	4.72	6.60	473.0	358.000	3090.600
IMC	1901	New	IMC Noralyn	0.00	30.64	13.70	1.22	40.40	330.0	414.700	3080.300
IMC	11902		IMC Noralyn	0.00	9.00	17.00	1.30	36.70	343.0	414.700	3080.300
IMC	11903		IMC Kingsford	0.00	11.60	21.30	2.10	12.90	344.0	398.200	3075.700
LKU	2001	New	Lakeland Utilities #1	0.00	393.60	76.20	4.90	19.70	354.0	408.500	3105.800
LKU	2002	New	Lakeland Utilities #2	0.00	21.20	47.70	3.10	11.70	389.0	408.500	3105.800
LKU	12003		Larsen 7	0.00	7.52	50.30	3.10	3.40	422.0	409.200	3102.800
LKU	12004		McIntosh 1	0.00	139.00	47.70	2.70	15.10	405.0	408.500	3105.800
LYKES	12101		Boilers (3)	10.90	152.60	22.90	1.40	18.20	441.0	383.500	3139.200
LYKES	12102		D1 & D2	8.00	57.60	22.90	0.90	27.80	345.0	383.500	3139.200
MOBIL	2201	New	Mobil	0.00	2.40	25.90	2.30	16.00	339.0	398.000	3085.300
MOBIL	12202		Mobil	0.00	56.50	30.50	2.00	11.00	350.0	398.000	3085.300
NWALES	2301	New	1 59 95 New Wales	0.00	57.75	60.70	2.60	13.40	349.7	396.560	3078.640
NWALES	2302	New	1 59 27 New Wales	0.00	3.78	52.40	2.40	13.00	321.9	396.750	3079.350
NWALES	2303	New	1 59 33 New Wales	0.00	5.36	52.40	2.40	7.10	319.1	396.830	3079.430
NWALES	2304	New	1 59 96 New Wales	0.00	5.54	36.60	1.80	20.80	319.1	396.450	3079.150
NWALES	2305	New	1 59 94 New Wales	0.00	57.75	60.70	2.60	13.40	349.7	396.490	3078.640
NWALES	12306		3 59 02 New Wales	0.00	42.00	61.00	2.50	10.00	350.2	396.600	3078.750
NWALES	12307		3 59 09 New Wales	0.00	0.82	36.60	2.10	15.60	319.1	396.540	3079.030
NWALES	12308		3 59 03 New Wales	0.00	42.00	61.00	2.50	10.00	350.2	396.530	3078.750
NWALES	12309		3 59 04 New Wales	0.00	42.00	61.00	2.50	10.00	350.2	396.450	3078.750
NWALES	12310		3 59 13 New Wales	0.00	4.88	29.00	1.70	17.20	564.1	396.560	3078.810
NWALES	12311		3 59 10 New Wales	0.00	1.89	36.60	1.80	20.40	325.2	396.550	3079.150
PTI	2401	New	Phostech	0.00	2.84	27.40	1.00	29.00	322.0	405.200	3078.500
ROY	2501	New	Royster #1	0.00	-257.60	51.00	2.13	9.90	356.0	406.700	3085.200
ROY	2502	New	Royster #2	0.00	42.00	61.00	2.13	9.93	356.0	406.700	3085.200
ROY	2503	New	Royster (Composite)	0.00	-31.50	61.00	2.13	9.90	356.0	406.700	3085.200
ROY	12501		Royster #1	0.00	257.60	51.00	2.13	9.90	356.0	406.700	3085.200
ROY	12503		Royster (Composite)	0.00	31.50	61.00	2.13	9.90	356.0	406.700	3085.200
ROY	12504		Royster (Composite)	0.00	52.50	61.00	2.13	9.90	356.0	406.700	3085.200
TECo	2601	New	Big Bend 1-3 RED.	0.00	-1764.00	149.40	7.30	12.90	415.0	361.500	3075.000
TECo	2602	New	Big Bend 4	16.38	436.50	149.40	7.32	20.00	342.0	361.600	3075.000
TECo	12603		Big Bend 1-3 B.L.	105.30	8064.00	149.40	7.30	12.90	415.0	361.500	3075.000
TECo	12604		Gannon (Composite)	149.80	1649.60	93.30	3.90	26.50	430.0	360.000	3087.500
TECo	12605		Hookers Pt. (Composite)	35.50	388.90	85.40	3.40	15.90	402.0	358.000	3091.000
WRG	2701	New	W. R. Grace	0.00	-216.00	45.70	1.40	16.50	352.0	409.700	3086.000
WRG	2702	New	2 46 16 W. R. Grace	0.00	36.80	61.00	2.80	7.30	346.0	409.700	3086.000
WRG	2703	New	2 46 17 W. R. Grace	0.00	36.80	61.00	2.80	7.30	346.0	409.700	3086.000
WRG	12701		W. R. Grace	0.00	216.00	45.70	1.40	16.50	352.0	409.700	3086.000
WRG	12704		3 46 15 W. R. Grace	0.00	57.70	45.70	1.50	16.70	322.0	409.700	3086.000
WRG	12705		3 46 14 W. R. Grace	0.00	91.80	61.00	1.50	25.90	346.0	409.700	3086.000

6.0 AIR QUALITY REVIEW

6.1 Introduction

An air quality review was performed to evaluate the impact of sulfur dioxide and sulfuric acid mist emissions from the modified USSAC Ft. Meade Chemical Complex sulfuric acid plants. The sources of sulfur dioxide included in the air quality review were all baseline, existing, and new or proposed sources within approximately 50 kilometers of Ft. Meade. The air quality review consisted of calculating baseline ambient air sulfur dioxide concentrations, the impacts of new or modified sources and the impacts of all existing and proposed sources. These impacts were compared with applicable air quality standards and Class II PSD increments.

The air quality modeling performed to assess long-term and short-term impacts were conducted in accordance with guidelines established by EPA (Guideline for Air Quality Models, March 1978). Sulfur dioxide impacts were evaluated for annual, 24-hour and 3-hour periods; periods of time for which air quality standards for sulfur dioxide have been promulgated.

Both the annual and short-term sulfur dioxide impacts were evaluated with the Industrial Source Complex-Short Term (ISC-ST) air quality model. The meteorological data used with this model were from Tampa and represent the period 1973, 1974, 1975, 1978 and 1979.

6.2 Meteorological Data

The EPA guidelines for air quality modeling suggest that five years of meteorological data be used for an air quality review. The potential sources of meteorological data were Orlando, Florida (100 kilometers northeast of the site) and Tampa, Florida (67 kilometers west of the site). The meteorological data from Tampa were selected for the air quality review because of the closer proximity of Tampa to the USSAC site.

Hourly surface meteorological data are available from Tampa for the period 1970-1981 excluding data for years 1976, 1977 and 1980. The EPA guidelines for air quality modeling suggest that a five year continuous record of meteorological data be used for the air quality review. In checking with EPA, it was found that the term "continuous" referred to "continuously available" data. This term was included in the guidelines to prevent the random selection of meteorological data that would result in impacts favorable to an applicant. The guidelines also imply that the meteorological data us¶dor should be among the most recently available data.

In view of the requirements for meteorological data, it was decided that meteorological data for the period 1973, 1974, 1975, 1978 and 1979 would be used for the air quality review. These data are among the most recently available surface meteorological data from Tampa and the record is broken only one time due to the fact that data for years 1976 and 1977 are not available. The other reasonable alternative would have been to use meteorological data for the period 1974-1981. These data would have represented the most recently available data, however, this record would have been broken twice; during the 1976-1977 period and again during the 1980 period. A decision was made to use the meteorological data for the period 1973-1979 since these data had only one break in the record.

Hourly surface meteorological data for the 1973-1979 period were combined with Tampa upper air data for the same period of record to obtain mixing heights applicable to the Ft. Meade area. These mixing heights were then used with the appropriate surface meteorological data as input to the ISC-ST model.

6.3 Air Quality Review

The first step in the air quality review was to evaluate the significance of sulfur dioxide impacts from new, proposed and retired sources at the USSAC Ft. Meade Chemical Complex. New sources include the two 2,200 ton per day sulfuric acid plants permitted in 1981. Modified sources include the same two sulfuric acid plants with production capacities increased to 3000 tons per day each. Retired sources of sulfur dioxide include the 1,500 ton per day sulfuric acid plant which was retired when the two new sulfuric acid plants were placed on line.

The area of significant impact for the sources was evaluated using the ISC-ST model with five years of meteorological data. It was determined that the sources had a significant impact only for the 3-hour period and the 24-hour period. For the annual period, sulfur dioxide emissions from the new, modified and retired sources were less than zero; that is there was a reduction in annual sulfur dioxide levels as a result of replacing the old sulfuric acid plant with the two new sulfuric acid plants at 3,000 tons per day each. The area of significant impact for the 3-hour and 24-hour periods extended 4.5 kilometers from the Ft. Meade Chemical Complex. The area of significant impact is shown in Figures 6-1 and 6-2.

Since the modified sources at the Ft. Meade Chemical Complex have a significant impact on air quality only in an area within 4.5 kilometers of the Ft. Meade Chemical Complex, the air quality review was limited to impacts within this area. And, since the sources have a significant impact only for the 3-hour and the 24-hour period, the air quality review was further limited to impacts only for these periods of time.

6.3.1 Short-Term Sulfur Dioxide Impact Review

The short-term impact analyses for sulfur dioxide involved the 3-hour impact analysis and the 24-hour impact analysis. These periods of time correspond to periods for which short-term air quality standards for sulfur dioxide have been promulgated. The impact analyses were conducted with the ISC-ST model. The model was first run with the five years of Tampa meteorological data; emission data for baseline sources, new sources and currently existing sources; and with a screening grid which covered the area within 4.5 kilometers of the Ft. Meade Chemical Complex. Based on this model run, the meteorological data resulting in the highest second-high 24-hour and 3-hour impacts at various locations and for all of the source groups were selected. The source groups evaluated were:

1. The retired and newly modified USSAC sulfuric acid plants.
2. All baseline sources of sulfur dioxide.
3. All new or proposed sources of sulfur dioxide.
4. All currently existing and proposed sources of sulfur dioxide.

The meteorological data selected from the screening runs were again input to the ISC-ST model with emission data from the appropriate source group and with a receptor grid with a 0.1 kilometer spacing. The results of these model runs provided the highest second-high impacts of the various source groups located to the nearest 0.1 kilometer.

The impacts determined with the refined model runs were compared with ambient air quality standards and with Class II PSD increments. The results of the short-term sulfur dioxide air quality review are summarized in Table 6-2 and Figures 6-1 and 6-2.

6.3.2 Sulfuric Acid Mist Impact Analysis

EPA published a document in 1980 entitled, Health Impacts, Emissions, and Emission Factors for Non-Criteria Pollutants Subject to De Minimus Guidelines and Emitted from Stationary Conventional Combustion Processes (EPA-450/2-80-074, June 1980). In this document, a proposed de minimus impact level for sulfur acid mist in the ambient air is set at one microgram per cubic meter, 24-hour average. This level was set based upon a comprehensive review of human health effects published by the National Institute for Occupational Safety and Health.

The impact of sulfuric acid mist emissions from USSAC Ft. Meade Chemical Complex for the 24-hour period was estimated based on model results for sulfur dioxide emissions. The modeling took into consideration the emissions from the newly modified sulfuric acid plants (two plants at 3,000 tons per day each) and the emission reduction brought about by retiring an existing 1,500 ton per day sulfuric acid plant.

The sulfur dioxide emissions from both the newly modified sulfuric acid plants and the retired sulfuric acid plant are approximately 30 times greater than the sulfuric acid mist emissions from these plants. If one considers the fact that the highest second-high 24-hour sulfur dioxide impact from the newly modified and retired sulfuric acid plant is 11 micrograms per cubic meter, 24-hour average (Receptor 1 Impact, Figure 6-1) and the ratio between sulfur dioxide and sulfuric acid mist emissions is approximately 30, it follows that the maximum 24-hour sulfuric acid mist impact is going to be approximately 0.4 micrograms per cubic meter. This impact is approximately 40 percent of the proposed de minimus impact for sulfuric acid mist. Since the expected impact of the sulfuric acid mist is less than the proposed de minimus impact level, no further impact analyses are justified for this pollutant.

6.3.3 Nitrogen Oxides Impact Analysis

The impact of nitrogen oxides emissions from USSAC Ft. Meade Chemical Complex for the 24-hour period was estimated based on model results for sulfur dioxide emissions. The 24-hour period was selected since it is the period for which the Florida Department of Environmental Regulation (FDER) defines the de minimus nitrogen oxides impact level; a level of 14 micrograms per cubic meter, 24-hour average. EPA defines the de minimus impact level for nitrogen oxides as 14 micrograms per cubic meter, annual average.

The modeling took into consideration the emissions from the newly modified sulfuric acid plants (two plants at 3,000 tons per day each) and the emission reduction brought about by retiring the existing 1,500 ton per day sulfuric acid plant.

The sulfur dioxide emissions from the newly modified sulfuric acid plants are approximately 27 times greater than the nitrogen oxides emissions from these plants. Sulfur dioxide emissions from the retired sulfuric acid plant were approximately 67 times higher than nitrogen oxides emissions from that plant.

If one considers the fact that the highest second-high 24-hour sulfur dioxide impact from the newly modified and retired sulfuric acid plant is 11 micrograms per cubic meter, 24-hour average (Receptor 1 impact, Figure 6-1) and the ratio between sulfur dioxide and nitrogen oxides emissions is approximately 30, it follows that the maximum 24-hour nitrogen oxides impact is going to be approximately 0.4 micrograms per cubic meter. Even if this impact is doubled, or tripled to 1.2 micrograms per cubic meter, to account for the higher ratio of sulfur dioxide to nitrogen oxides emissions from the retired sulfuric acid plant, the resulting nitrogen oxides impact will be less than 10 percent of the FDER de minimus nitrogen oxides impact level. Since the de minimus impact level is not exceeded, no further impact analyses are justified for this pollutant.

6.4 Impact on Class I Areas and Non-Attainment Areas

It has been established by air quality modeling that the impacts of sulfur dioxide emissions from the affected sources at the USSAC Ft. Meade Chemical Complex are significant only for the 3-hour and 24-hour periods and then, only within 4.5 kilometers of the chemical complex. Annual sulfur dioxide, nitrogen oxides and sulfuric acid mist emissions were determined not to be significant at any distance.

There are no Class I PSD areas or sulfur dioxide non-attainment areas within 4.5 kilometers of the Ft. Meade Chemical Complex; therefore an impact analyses for these areas are not required as part of this application.

6.5 Air Quality Review Summary

The air quality review for the proposed modifications to the USSAC Ft. Meade Chemical Complex sulfuric acid plants was conducted with modeling guidelines established by the U.S. Environmental Protection Agency. The air quality review was conducted with the ISC-ST model.

The air quality review indicates that only sulfur dioxide emissions from the modified sulfuric acid plants will have a significant impact on ambient air quality and that these impacts will be significant only for the 24-hour and 3-hour periods. The impacts of sulfuric acid mist and nitrogen oxides will be less than de minimus impact levels for these pollutants.

The modeling demonstrates that the sulfur dioxide impacts will not violate Class II PSD increments nor will they contribute to violations of sulfur dioxide ambient air quality standards. The air quality modeling further demonstrates that emissions from the modified sulfuric acid plants will impact neither Class I PSD areas nor sulfur dioxide non-attainment areas.

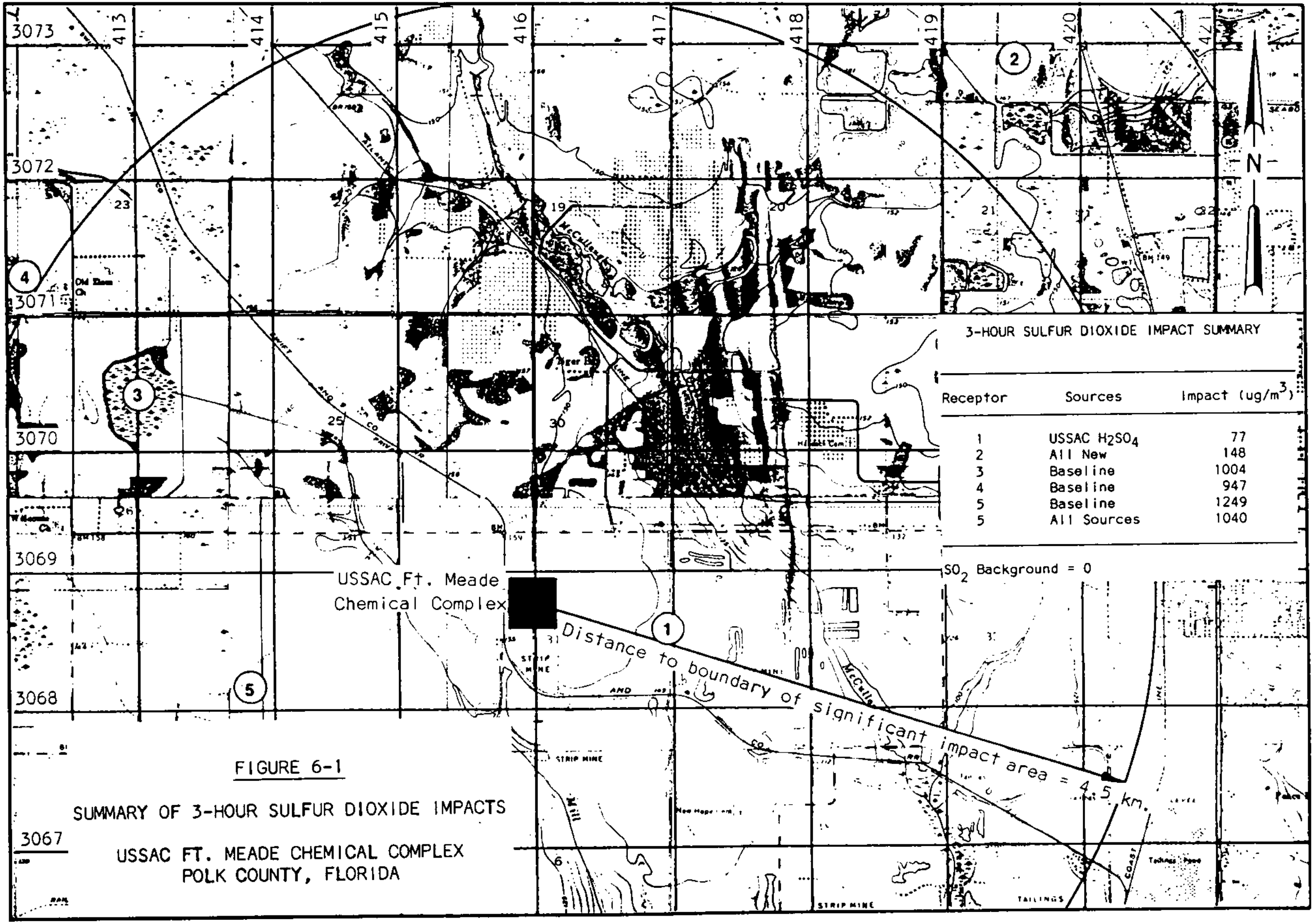
TABLE 6-1

SUMMARY OF AIR QUALITY REVIEW

USSAC FT. MEADE CHEMICAL COMPLEX
POLK COUNTY, FLORIDA

Pollutant/ Averaging Time	Maximum Pollutant Concentration (ug/m^3)						
	USSAC H_2SO_4 Plants(1)	De Minimus Impact	All New Sources(3)	Class II Increment	Baseline Sources	All Sources(4)	Air Quality Standard
Sulfur Dioxide							
Annual	< 0(2)	1	--	--	--	--	60
24-Hour	11.4	5	26.5	91	336	236	260
3-Hour	77	25	148	512	1249	1040	1300
Sulfuric Acid Mist							
24-Hour	0.4(2)	1	--	--	--	--	NA
Nitrogen Oxides							
24-Hour	1.2(2)	14	--	--	--	--	100; Annual

(1) Two new plants at 3000 tpd each and one retired 1500 tpd plant.
(2) Impact less than de minimus, therefore air quality review was not carried further.
(3) All new and proposed sources.
(4) All new, existing and proposed sources minus retired sources.



3-HOUR SULFUR DIOXIDE IMPACT SUMMARY

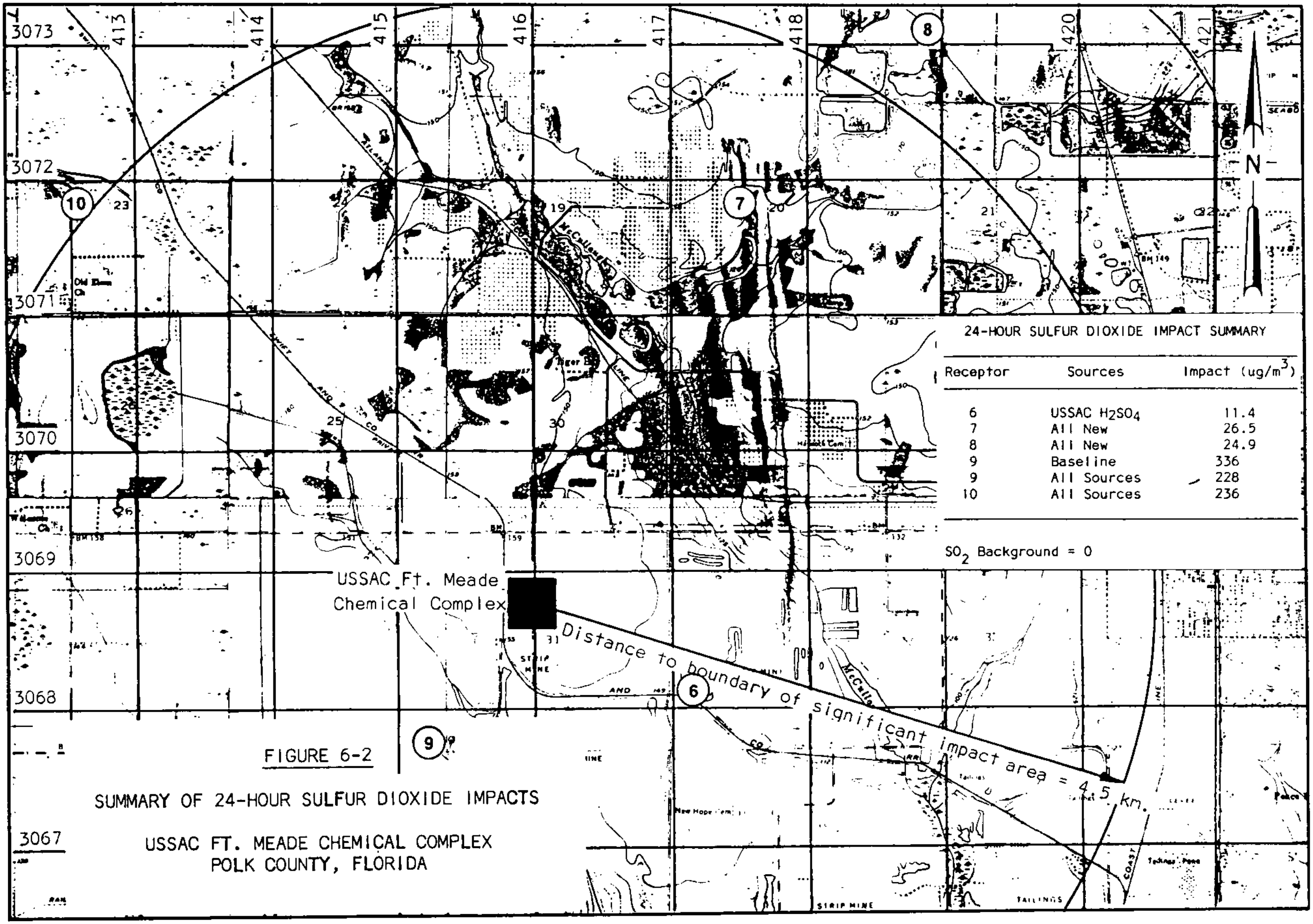
Receptor	Sources	Impact (ug/m^3)
1	USSAC H_2SO_4	77
2	All New	148
3	Baseline	1004
4	Baseline	947
5	Baseline	1249
5	All Sources	1040

SO_2 Background = 0

FIGURE 6-1

SUMMARY OF 3-HOUR SULFUR DIOXIDE IMPACTS

USSAC FT. MEADE CHEMICAL COMPLEX
POLK COUNTY, FLORIDA



24-HOUR SULFUR DIOXIDE IMPACT SUMMARY

Receptor	Sources	Impact (ug/m^3)
6	USSAC H_2SO_4	11.4
7	All New	26.5
8	All New	24.9
9	Baseline	336
9	All Sources	228
10	All Sources	236

SO_2 Background = 0

FIGURE 6-2

SUMMARY OF 24-HOUR SULFUR DIOXIDE IMPACTS

USSAC FT. MEADE CHEMICAL COMPLEX
POLK COUNTY, FLORIDA

7.0 IMPACT ON SOILS, VEGETATION AND VISIBILITY

A qualitative evaluation of the impacts of the proposed modifications on soils, vegetation and visibility in the area has been prepared.

The land use in the general area of the USSAC Ft. Meade Chemical Complex is dedicated to agricultural and mining with agricultural activities being divided between cattle and citrus. Cattle production is limited to an area northwest of the chemical complex and is carried out on property owned by USSAC. Citrus groves are located to the east and southeast of the chemical complex with much of the citrus production being on property owned by USSAC. The town of Ft. Meade. with a population of approximately 5,000, is located approximately 3.5 miles east of the site and scattered residences exist between Ft. Meade and the chemical complex. The proposed expansions of the sulfuric acid plants and phosphoric acid plants proposed by USSAC, including the impacts of increased air pollutant emissions from these facilities, are not anticipated to have a significant impact on any activity presently practiced in the area.

Air quality modeling has demonstrated that sulfur dioxide levels that will exist after the proposed plant modifications will be below secondary air quality standards. Since these standards were promulgated to protect welfare related values, it is projected that the proposed expansion will not adversely impact soils, vegetation and visibility in the surrounding area.

The air quality modeling has also demonstrated that the impacts of increased sulfuric acid mist and nitrogen oxides emissions resulting from the proposed production rate increases will result in impacts that are below the de minimus impact levels for these pollutants. As a result of this, it is anticipated that the increase in sulfuric acid mist and nitrogen oxides emissions will not adversely impact soils, vegetation and visibility in the area.

The proposed production rate increase will result in no new jobs and, hence, no impact on populated growth or automotive traffic will occur in the area as a result of the expansion. The production rate increase will increase the sulfuric acid production capacity by 36 percent and the phosphoric acid production capacity by 25 percent. The increased sulfuric acid production will require the import of 36 percent more sulfur. This increased sulfuric acid production will be used to produce phosphoric acid. The increases in sulfuric and phosphoric acid production will result in an increase in truck and rail traffic to the chemical complex. The increase in truck and rail traffic will not be significant, however, when compared with traffic that presently exists at the chemical complex.

APPENDIX A

SULFURIC ACID PLANT INFORMATION

DESCRIPTION OF SULFURIC ACID PRODUCTION

The principal steps in the process consist of burning sulfur (S) in air to form sulfur dioxide (SO_2), combining the sulfur dioxide with oxygen (O_2) to form sulfur trioxide (SO_3), and combining the sulfur trioxide with water (H_2O) to form a solution containing sulfuric acid (H_2SO_4). The chemical reactions are:

$$S + O_2 = SO_2$$

$$SO_2 + 1/2\ O_2 = SO_3$$

$$SO_3 + H_2O = H_2SO_4$$

The sulfur is burned with air in a horizontal spray-type sulfur burner. Before the air is admitted to the sulfur burner, it is dried by contact with 98 percent sulfuric acid.

The temperature of the SO_2 gas from the sulfur burner is higher than is required for inlet to the conversion system; therefore, the gas is cooled in a waste heat boiler, which recovers the surplus heat as by-product steam.

From the waste heat boiler, the gas flows to the first pass of the converter system where it is partially converted to sulfur trioxide gas in the presence of vanadium catalyst. The conversion reaction produces heat. Gases leaving the first converter pass flow to the superheater where they are cooled. Temperature of the gas stream downstream of the superheater is controlled in the proper range by by-passing a portion of the gas flow around the superheater. The cool gas stream flows from the superheater to the second converter pass where additional conversion of sulfur dioxide to sulfur trioxide takes place, accompanied by the generation of additional heat. Hot gases leaving the second converter pass are cooled by sending them through the tube side of the hot interpass exchanger.

Cooled gases leaving the heat exchanger flow to the third converter pass where additional conversion of sulfur dioxide to sulfur trioxide takes place. Hot gases leaving the third converter pass are cooled by sending them through the tube side of two gas heat exchangers, called cold interpass heat exchangers, connected in series, and the economizer.

Gas leaving the economizer flows to the interpass absorbing tower where the SO_3 in the gas stream is removed. In the interpass absorbing tower, the SO_3 does not combine directly with water, but must be combined indirectly by absorbing it in sulfuric acid where the SO_3 reacts with water in the acid. The temperature of the 98 to 99 percent H_2SO_4 circulated over the interpass absorbing tower increases due to the heat of formation and the sensible heat of the gas stream entering the tower. Acid from the bottom of the interpass absorbing tower is circulated through coolers and returned to the top of the tower. Sufficient water is added to the interpass absorption tower system to control the strength of acid circulated over the interpass tower between 98 and 99 percent. Cool gas leaving the interpass absorbing tower, containing unreacted SO_2, flows to the shell side of the cold interpass gas heat exchangers where it is heated by gases leaving the third converter pass.

From the shell side of the cold interpass heat exchangers, the gas stream flows to the hot interpass heat exchanger where it is further heated by gases flowing from the second converter pass.

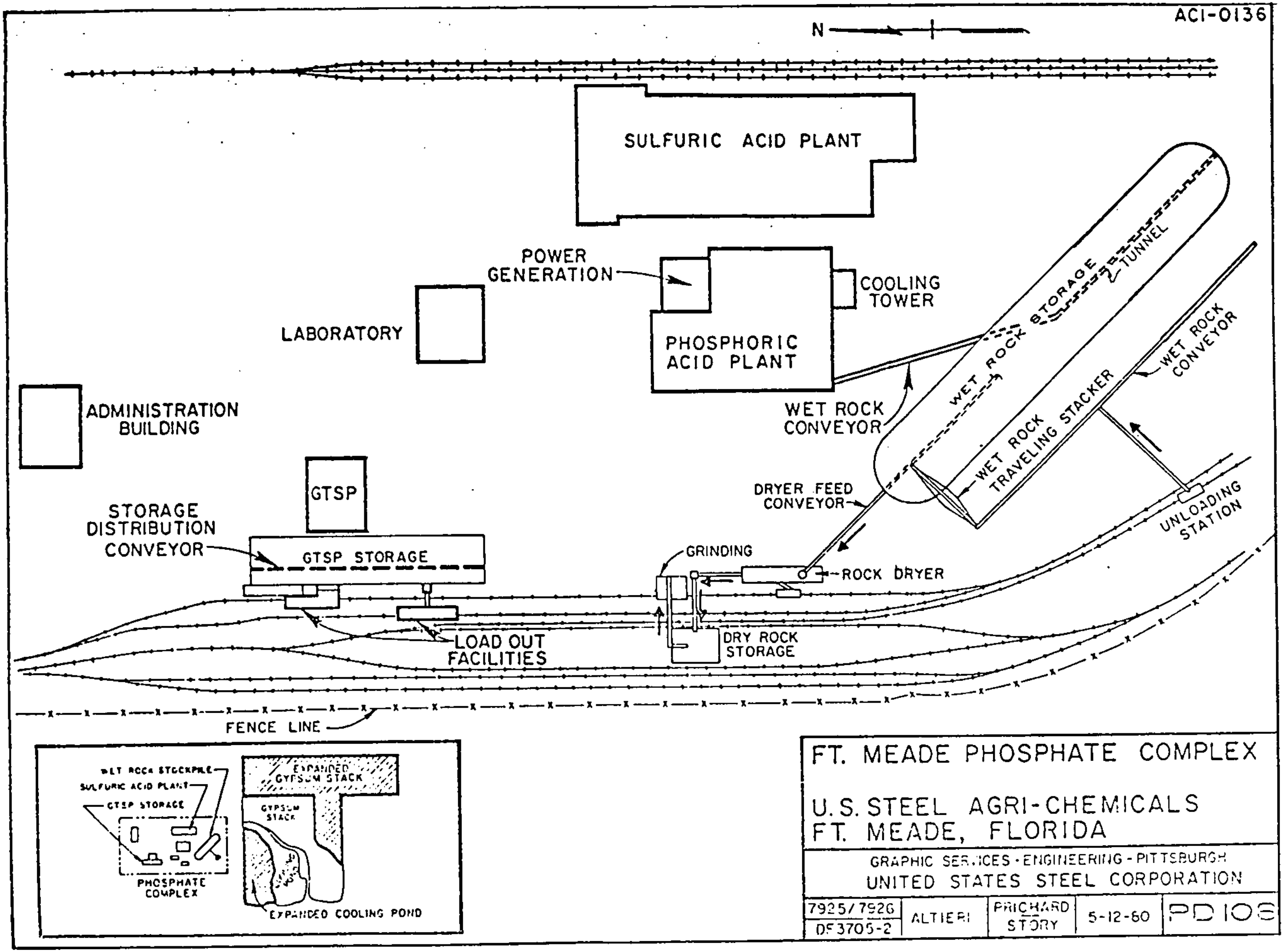
The temperature downstream of the interpass heat exchanger is controlled in the proper range by by-passing a portion of gas around the shell side of the heat exchanger. From the hot interpass heat exchanger, the gas stream flows to the fourth converter pass where final conversion of SO_2 in the gas stream to SO_3 is accomplished.

The gas stream from the fourth converter pass flows to the economizer where it is cooled by boiler feedwater and then flows to the final absorbing tower. In the final absorbing tower, SO_3 in the gas stream reacts with water in the 98 to 99 percent circulating acid. The temperature of the strong acid circulated over the final absorbing tower increases due to the heat of formation and the sensible heat of the gas stream entering the tower. Acid from the bottom of the final absorbing tower is circulated through coolers and returned to the top of the tower. Sufficient water is admitted to the final absorbing tower system to control the strength of acid circulated over the final acid tower between 98 and 99 percent. That acid produced in the final absorbing tower underflows to the drying/interpass acid pump tank.

Gas leaving the final absorbing tower flows to the atmosphere through a stack.

The 98 percent product acid from the drying acid system is pumped directly through a product cooler to storage.

ACI-0136

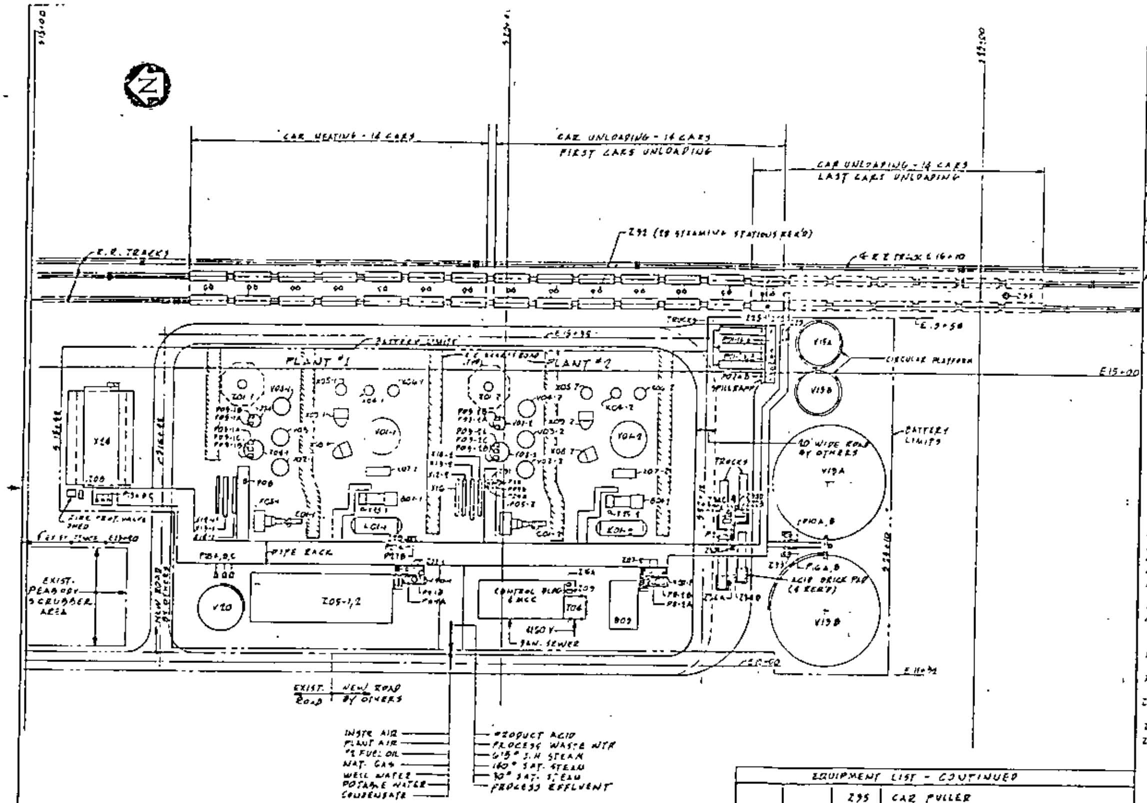


FT. MEADE PHOSPHATE COMPLEX

U.S. STEEL AGRI-CHEMICALS
FT. MEADE, FLORIDA

GRAPHIC SERVICES · ENGINEERING - PITTSBURGH
UNITED STATES STEEL CORPORATION

7925/7926 DF3705-2	ALTIERI	PRICHARD STORY	5-12-60	PD108



PLANT NO. 1	PLANT NO. 2	COMMON TO BOTH PLANTS	DESCRIPTION
B01-1	B01-2		WASTE HEAT BOILER
		B03	AUX BOILER SYSTEM
C01-1	C01-2		MAIN COMPRESSOR
F01-1	F01-2		DRYING TOWER MIST ELIMINATOR
F03-1	F03-2		INTERPASS TOWER MIST ELIMINATOR
F04-1	F04-2		FINAL TOWER MIST ELIMINATOR
F05-1	F05-2		INLET AIR FILTER WITH SILENCER
K01-1	K01-2		SULFUR BURNER
*P01-1A,B	*P01-2A,B		SULFUR BURNER FEED PUMPS
		*P02A,B	SULFUR TRANSFER PUMPS
*P03-1A,B,C	*P03-2A,B,C		DRYING/INTERPASS TOWER ACID PUMPS
*P05-1A,B	*P05-2A,B		FINAL TOWER ACID PUMPS
P09			ACID COOLER DRAIN PUMP
		*P09A,B	PRODUCT ACID BOOSTER PUMP & [illegible]
		*P10A,B	PRODUCT ACID TRANSFER PUMP
*P[illegible]A,B	*P[illegible]A,B		BOILER FEED WATER PUMPS
		*P13A,B,C	COOLING TOWER WTR. SUPPLY PUMPS
		*P15A,B	PRODUCT ACID LOADING PUMPS
		*P16A,B,C	DEAERATOR FEED WATER PUMPS
		P19	TRUCK LOADING SUMP PUMP
		*P22A,B	PROCESS WATER SUMP PUMP
		P23	PRODUCT ACID BOOSTER SUMP PUMP
		T06	4160/480 VOLT TRANSFORMER
V01-1	V01-2		CONVERTER
V02-1	V02-2		DRYING TOWER
V03-1	V03-2		INTERPASS TOWER
V06-1	V06-2		FINAL TOWER
V07-1	V07-2		FINAL TOWER PUMP TANK
V08-1	V08-2		DRYING/INTERPASS TOWER PUMP TANK
		V13A,B	SULFURIC ACID STORAGE TANKS
		V19	MOLTEN SULFUR STORAGE TANK
		V20	TREATED WATER STORAGE TANK
X02-1	X02-2		COLD INTERPASS HEAT EXCHANGER, HOT SHELL
X03-1	X03-2		COLD INTERPASS HEAT EXCHANGER, COLD SHELL
X06-1	X06-2		HOT INTERPASS HEAT EXCHANGER
X07-1	X07-2		SUPERHEATER
X08-1	X08-2		SECONDARY ECONOMIZER
X09-1	X09-2		PRIMARY ECONOMIZER
X12-1	X12-2		DRYING TOWER ACID COOLER
X13-1	X13-2		INTERPASS TOWER ACID COOLER
X14-1	X14-2		FINAL TOWER ACID COOLER
		X16	PRODUCT ACID COOLER
X20-1	X20-2		BOILER FEEDWATER HEATER
		X26	WATER COOLING TOWER
X28-1	X28-2		BOILER B.D. HEAT RECOVERY SYSTEM
Z01-1	Z01-2		PLANT STACK
		Z02	MOLTEN SULFUR PIT
Z05-1	Z05-2		DEMINERALIZER SYSTEM
Z07-1	Z07-2		BOILER CHEMICAL FEED SYSTEM
		Z08	COOLING WATER TREATMENT SYSTEM
		Z09	AUXILIARY GENERATOR
		Z16A	HVAC UNIT FOR CONTROL ROOM
		Z23A,B	ACID TRUCK LOADING STATIONS
		Z25	SULFUR TANK CAR UNLOADING TROUGH
		Z29	PROCESS WASTE WTR. SUMP
		Z39	CONDENSATE RECEIVER SYSTEM
		Z90	TRUCK LOADING SPILL SUMP
		Z91	PRODUCT ACID BOOSTER PUMP BASIN & SUMP
		Z92	TANK CAR STEAMING SYSTEM
		Z93	ACID LOADING & TRANSFER PUMP SPILL BASIN
		Z94A,B,C,D	ACID TRUCK UNLOADING STATIONS

EQUIPMENT LIST - CONTINUED

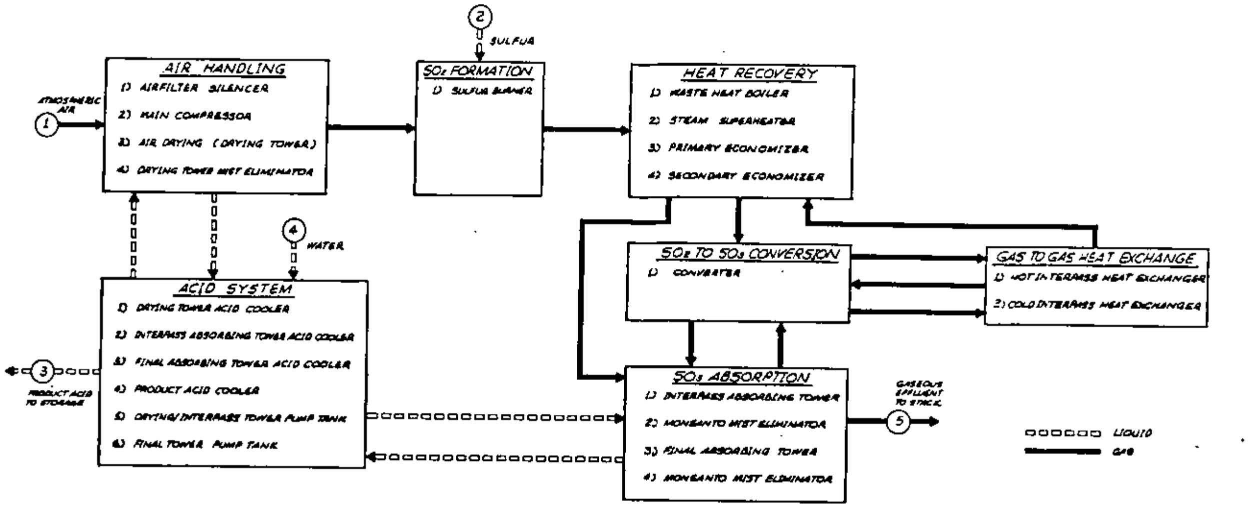
		Z95	CAR PULLER

NOTES
1. * DENOTES ONE IS AN INST. SPARE.
2. FOR DETAILED PLANT LAYOUT SEE DWG. 301-102

NO	DATE	DESCRIPTION	BY
C	[illegible]	ISSUED FOR PROPOSAL	[illegible]
B	[illegible]	[illegible] ACID UNLOADING [illegible]	[illegible]
A	[illegible]	ISSUED FOR ESTIMATE	[illegible]

MONSANTO ENVIRO-CHEM SYSTEMS, INC.
ST. LOUIS, MISSOURI

FIG. A-2
PLOT PLAN
SULFURIC ACID PLANT



STREAM / COMPONENT	UNIT			1	5			
SO_2	SCFM			0	44			
SO_3	SCFM			0	0			
O_2	SCFM			30441	7524			
N_2	SCFM			115209	115209			
H_2O	SCFM			5060	0			
TOTAL	SCFM			150690	122780			
TOTAL	ACFM			169985	151713			
TEMPERATURE	°F	45	100	95	180			
STREAM / COMPONENT	UNIT	2	3	4				
LIQUID		SULFUR	98%	WATER				
	LBS/MIN	1375	4253	593				
	GPM	92	285	71				
TEMPERATURE	°F	270	100	95				

CLIENT: USS AGRICHEM
LOCATION: FORT MEADE, FLORIDA
PRODUCTION: 3000 STPD AS 98% ACID (100% H_2SO_4 BASIS)
NUMBER OF UNITS: TWO PLANTS
CONVERSION: 99.7 CONVERSION OF SO_2 TO SO_3 WITH 8.5% SO_2 TO CONVERTER.
STANDARD CONDITIONS: 0°C AND 760 MM Hg.
EMISSIONS:
SO_2: 4 LBS SO_2/TON 100% H_2SO_4 PRODUCED
ACID MIST: LESS THAN OR EQUIVALENT TO 0.15 LBS H_2SO_4/TON 100% H_2SO_4 PRODUCED

STACK: 175' HIGH, 8'-6" I.D.

REVISIONS

11/88 Revised by SKEC
4-4-88 ISSUED TO EPA

REFERENCES

ISSUE DATE	PURPOSE OF ISSUE
4-?-88	EPA

MONSANTO ENVIRO-CHEM SYSTEMS, INC.
ST LOUIS, MISSOURI

ENVIRONMENTAL
PROCESS MATERIAL FLOW DIAGRAM
SULFUR BURNING PLANT

JOB NO. 2189
DRAWING NO. 321-121

APPENDIX B

PHOSPHORIC ACID PLANT INFORMATION

DESCRIPTION OF PHOSPHORIC ACID AND FLUOCILICIC ACID PRODUCTION

PHOSPHORIC ACID PRODUCTION

Phosphoric acid is produced by reacting ground phosphate rock with sulfuric acid (produced as described above). This reaction produces phosphoric acid and gypsum. The details of the rock grinding, reaction, filtration, evaporation, storage and clarification processes necessary to produce the desired product are described in the following sections.

WET ROCK GRINDING

The proposed wet rock grinding system is designed with the capability of grinding phosphate rock and producing a ground phosphate rock slurry containing no less than 65 percent solids (by weight). The wet rock grinding system is an open circuit system. Open circuit grinding is a method of reducing particle size by a single passage of the material through a mill.

The wet grinding mill is designed to process a feed material having an approximate size analysis of 100 percent minus 1/2 inch and 60 percent plus 35 mesh to a product material of 98 percent minus 35 mesh Tyler.

The unground rock is received from offsite storage via a belt conveyor and/or elevator and stored in the unground rock silo. A bin activator at the discharge cone of this silo provides a steady flow of rock from the silo to the weigh belt feed conveyor that transfers the unground rock to the ball mill. The unground rock feed rate is controlled by varying the speed of the belt.

Fresh water makeup from the mill water supply tank is introduced at two points within the system. A small quantity of this water is used to wash the weigh belt feed conveyor after it discharges rock to the mill. This waste water then enters the rock ball mill feed chute via the belt wash trough. The remainder of the water is used to slurry the rock being fed to the ball mill. The total quantity of water fed to the mill is flow-recorded and is controlled by a ratio-controller which receives its signal from the weigh belt feed conveyor. This rock-to-water ratio-controller system, together with a density recorder, is used to control the concentration of solids in the product slurry.

The ground phosphate rock slurry from the ball mill discharges through a trommel screen into the agitated rock slurry pump tank. This trommel screen is used to remove ball chips and any other oversize material from the phosphate rock slurry. These materials are discharged from the screen to a solids container for removal to the battery limits. The slurry is then pumped from the rock slurry pump tank to the rock slurry storage tank (or, alternatively, to the reactor) using a variable-speed controlled horizontal centrifugal pump. The rock slurry pump tank is equipped with a level control used to vary the speed of this pump. The rock slurry storage tank is an agitated vessel with four hours of surge capacity at design flow.

A varible-speed controlled horizontal centrifugal pump is used to pump the phosphate rock slurry from the rock slurry storage tank to the isothermal reactor. Installed spare pumps are included to ensure a continuous feed from either the rock slurry pump tank or the rock slurry storage tank. The flow of the phosphate rock slurry is recorded and controlled by a flow recorder-controller. The density of the slurry is also recorded and the combination of flow and density is then used to obtain a flow measurement in tons per hour of phosphate rock, dry basis.

REACTION PROCESS

The reactor is specifically designed as a crystallizer to promote controlled growth of the dihydrate gypsum crystals. Adequate crystal growth of the by-product gypsum in the slurry is essential to obtain maximum efficiencies and recoveries in a phosphoric acid plant. Process control is the major factor affecting uniform crystal growth. The internal design and the process control of the reactor are such as to provide the operator with optimum control of the production of phosphoric acid. Vacuum flash evaporation is the most economical and efficient method of removing the heat of reaction and dilution from the reactor. System response to temperature is kept to a minimum by this method of cooling and by high circulation within the reactor. High circulation also allows accurate control of free sulfates, solids, and acid concentration.

Because of the enclosed environment in which the reaction of phosphate rock and sulfuric acid takes place, gaseous fluoride emissions are minimized.

The phosphoric acid reactor is furnished with a draft tube-type agitator-circulator and a vacuum system for vapor removal from the reactor.

The reactor dimensions provide for ample vapor/liquid disengaging space so as to eliminate entrainment.

A propeller-type, top-mounted, agitator-circulator with an electric motor drive is used in the reactor. The impeller is located within the draft tube to achieve proper circulation of the slurry.

The reactor is sufficient to provide a total system retention time (reactor plus filter feed tank) of four hours and allow ample vapor disengaging area.

The agitator-circulator is located in a draft tube to circulate the slurry at a rate to insure the proper conditions are maintained at all points.

Raw material feed is designed for rapid dispersion into the circulating mass of the reactor slurry. The ground rock slurry is fed into the reactor bottom, entering the upward flow into the draft tube. Sulfuric acid is distributed just above the propeller in the draft tube at the point of highest turbulence in the reactor. Recycle acid is fed to the slurry surface in the annular area of the reactor.

The reaction of concentrated sulfuric acid and phosphate rock yields phosphoric acid and gypsum. With the vessel operating under a vacuum of 9 inches Hg absolute and a temperature of 174°F, continuous flash evaporation at the slurry surface removes the exothermic heat of reaction.

Fluorine and carbon dioxide gases are also evolved due to the acidic decomposition of the phosphate rock.

The vapors from the top of the reactor enter the barometric condenser where condensable vapors are removed by direct contact with pond water. The non-condensable vapors containing carbon dioxide and air are removed by the steam jet ejector. As an alternate, vacuum pumps the same size as the filter vacuum pump may be utlized.

Slurry containing phosphoric acid and gypsum overflows the reactor to the filter feed tank which serves both as a seal tank and a surge tank. The overflow piping configuration is vented and provides smooth flow of the slurry from the reactor to the filter feed tank. The vent gases from the filter feed tank are piped to the fume scrubber for the removal of residual fluoride vapors before discharge to the atmosphere. An Auto-Analyzer pulls a sample from the filter feed tank to continuously monitor the free sulfate concentration in the filtrate.

FILTRATION PROCESS

In the filtration section, the phosphoric acid and by-product gypsum are separated on a horizontal, rotary vacuum filter with wet cake discharge and three counter-current washes.

The filter feed slurry is pumped to a splitter box, then flows by gravity to the slurry distributor which evenly distributes the slurry. A pre-cut, or cloudy port, section separates the first portion of filtrate coming through the cloth before the cake is formed. This removes fine solids and insures against the possibility of product dilution by carryover from the cloth wash section.

A conveyor removes most of the dry cake and discharges it into a hopper where it is slurried with pond water and pumped to battery limits. The remaining layer of gypsum is removed by washing with water. The cloth is also thoroughly cleaned by the high pressure water. This water and small amount of gypsum is recirculated to the wash box for the final wash.

EVAPORATION PROCESS

Clarified and aged 29 percent P_2O_5 phosphoric acid is concentrated in two stages to produce 2000 TPD P_2O_5 as 54 percent P_2O_5 phosphoric acid. The 40 percent P_2O_5 phosphoric acid produced by the first stage evaporators is clarified and aged before evaporation to 54 percent P_2O_5 phosphoric acid in the second stage evaporators. Evaporation is carried out in two 40 percent and two 54 percent evaporators. Provision is made for the recovery of fluorine.

The 40 percent evaporation circuit receives 29 percent P_2O_5 clarified and aged acid. The 40 percent P_2O_5 acid product is returned from each evaporator to the 40 percent P_2O_5 acid clarifier tank in the tank farm for further clarification and aging. This includes recycle acid required for 40 percent clarification.

The 54 percent evaporation circuit receives clarified and aged 40 percent acid. The 54 percent P_2O_5 acid product is pumped from each evaporator to the 54 percent P_2O_5 accumulator tank in the tank farm for further clarification, aging, and shipment.

The 29 percent P_2O_5 acid feed contains 1 percent or less solids. Concentration and precipitation in the evaporator raises the solids concentration in the 40 percent P_2O_5 product returned to the tank farm to a value of 4.4 percent. The 40 percent P_2O_5 acid feed contains 0.75 percent or less solids. Concentration and precipitation in the evaporator will raise the solids concentration in the 54 percent P_2O_5 product returned to the tank farm to a design value of 5 percent.

Heater condensate is collected in a condensate flash tank and then transferred to two condensate storage tanks located in the clarification tank farm area. Condensate is monitored for conductivity contamination at three locations.

Each of the two 40 percent evaporators has a single barometric condenser and a single steam ejector which maintain an operating vacuum of 6.8 inches Hg absolute at the outlet of the entrainment separator. Each of the 54 percent evaporators has a barometric condenser and a two stage steam ejector system with intercondenser, which maintains an operating vacuum of 2.5 inches Hg absolute at the outlet of the entrainment separator.

The constant liquid level in the body is designed to provide sufficient submergence to suppress flashing in the heat exchanger tubes. Provision is made for 98 percent H_2SO_4 addition at 20 GPM for evaporator washing and boilouts.

STORAGE AND CLARIFICATION PROCESS

The storage and clarification area comprises the tank farm for 29 percent, 40 percent and 54 percent P_2O_5 storage and clarification. Clarification for 29 percent and 40 percent P_2O_5 is via rake clarifier. Clarification of 54 percent P_2O_5 acid incorporates inclined tray settlers (Lamella settlers). In addition, two 8 hour condensate storage tanks are located in this tank farm.

Filtrate acid from the filtration area containing 29 percent P_2O_5 and approximately 2 percent solids is added to the feedwell of a conventional rake clarifier for initial clarification. The overflow from this tank, containing less than 1 percent solids, is pumped to an agitated storage tank. Sludge acid raked off the bottom of the clarifier is returned to the filter feed tank at a nominal 20 percent solids loading. Clarified 29 percent P_2O_5 acid from the agitated tank is pumped to the 40 percent evaporators for concentration to 40 percent P_2O_5.

The 40 percent phosphoric acid containing 4.4 percent solids is pumped from the evaporators to the feedwell of a conventional rake clarifier for initial clarification. Overflow product containing less than 0.75 percent solids is pumped to a storage tank. A third agitated storage tank is used as a swing tank for either clarified 29 percent or

40 percent acid. Sludge raked off the bottom of the 40 percent P_2O_5 acid clarifier is returned to the 29 percent P_2O_5 clarifier at a nominal 20 percent solids loading. Clarified 40 percent P_2O_5 acid from the agitated storage tank is pumped to the 54 percent evaporators for concentration to 54 percent P_2O_5.

The 54 percent P_2O_5 phosphoric acid containing 5 percent solids is pumped from the evaporators to an agitated tank.

FLUOSILICIC ACID PRODUCTION

A fluosilicic acid recovery system consists essentially of a spray tower located between the phosphoric acid evaporator and the barometric condenser. This spray tower receives vapors from the phosphoric acid evaporator. Fluorine (as HF and SiF_4), water vapor, and minor amounts of air and entrained P_2O_5 (as H_3PO_4), are the major constituents of this stream.

An aqueous solution of H_2SiF_6 is sprayed into the tower to scrub the fluorine compounds in the vapor stream. The H_2SiF_6 solution absorbs the fluorine compounds as the vapor stream and solution approach chemical equilibrium. A small portion of this solution is taken as product and the remainder is recycled back to the scrubber. Water is added to the recycled solution to maintain the desired volume and concentration.

The flow of fluosilicic acid is counter-current to the flow of phosphoric acid in the evaporation system. Phosphoric acid is fed to the first stage evaporator at approximately 30 percent P_2O_5 and concentrated to 42 percent. During this step of concentration, fluorine in the form of SiF_4 is evolved. During the second stage of P_2O_5 concentration (42 percent to 54 percent P_2O_5) the fluorine evolution is in the form of both HF and SiF_4.

In the production of fluosilicic acid, the fluorine compounds from the second stage evaporator are scrubbed first with a solution containing 10 to 11 percent H_2SiF_6. This solution also contains the HF evolved from this evaporator. The primary reaction that occurs in this scrubber is as follows:

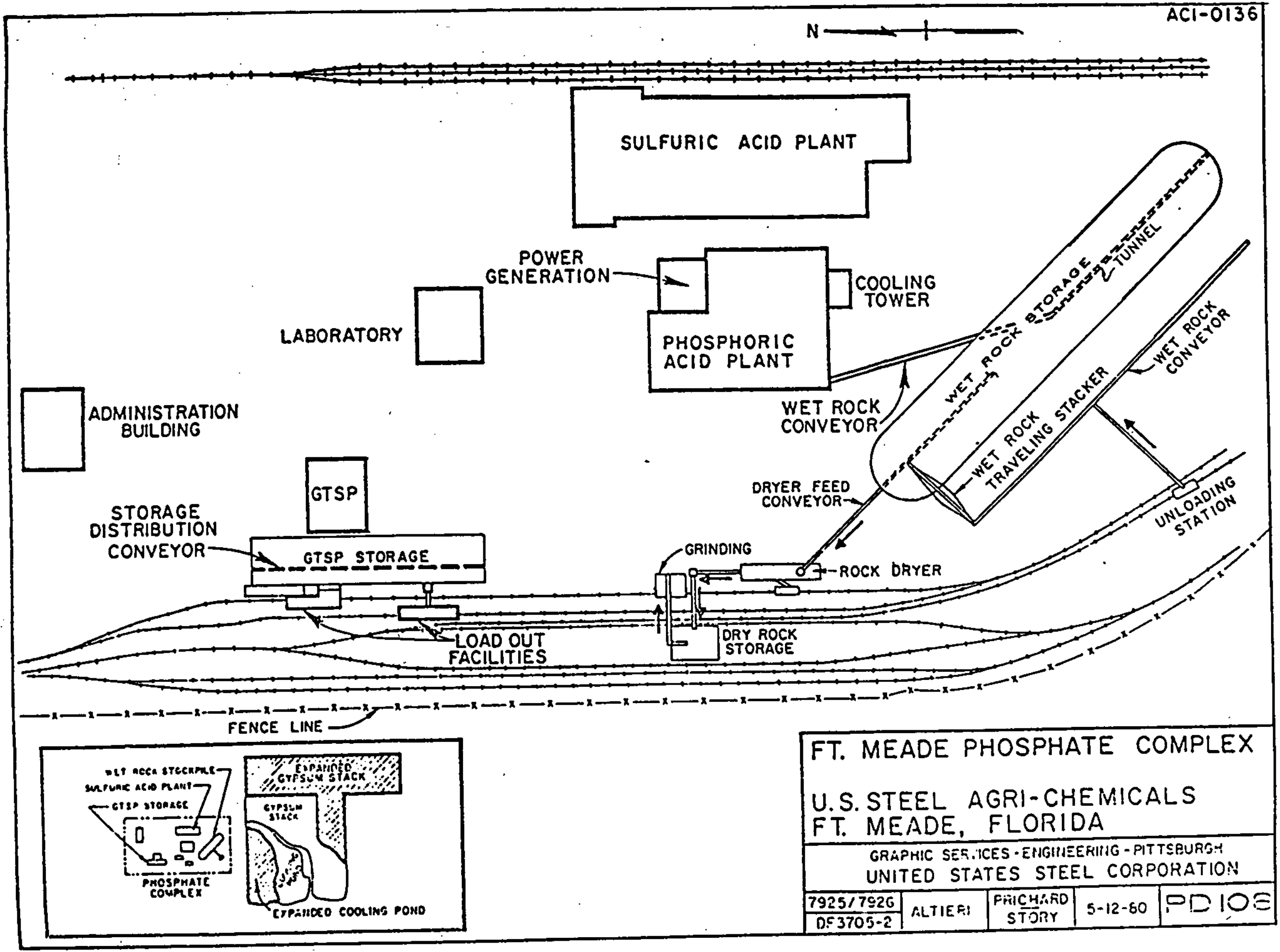
$$3SiF_4 + 4H_2O = SiO_2 \quad 2H_2O + 2H_2SiF_6$$

However, a second reaction takes place because of the dissolved HF in the solution. It is as follows:

$$6HF + SiO_2 \quad 2H_2O = H_2SiF_6 + 4H_2O$$

All of the dissolved HF is not reacted in this stage of the scrubbing process, and it is carried in solution to the scrubber on the first stage evaporator. Additional fluoride compounds are absorbed in this scrubber. The chemical reactions are the same as those previously shown. The concentration of the H_2SiF_6 solution is raised to 25 percent by the absorption step and a side stream is taken as product. The concentration is maintained at this level by adding the scrubber liquor from the second stage evaporator. P_2O_5 entrainment in the scrubber liquor is kept to a minimum by use of an entrainment separator installed in the inlet to the evaporator body.

ACI-0136

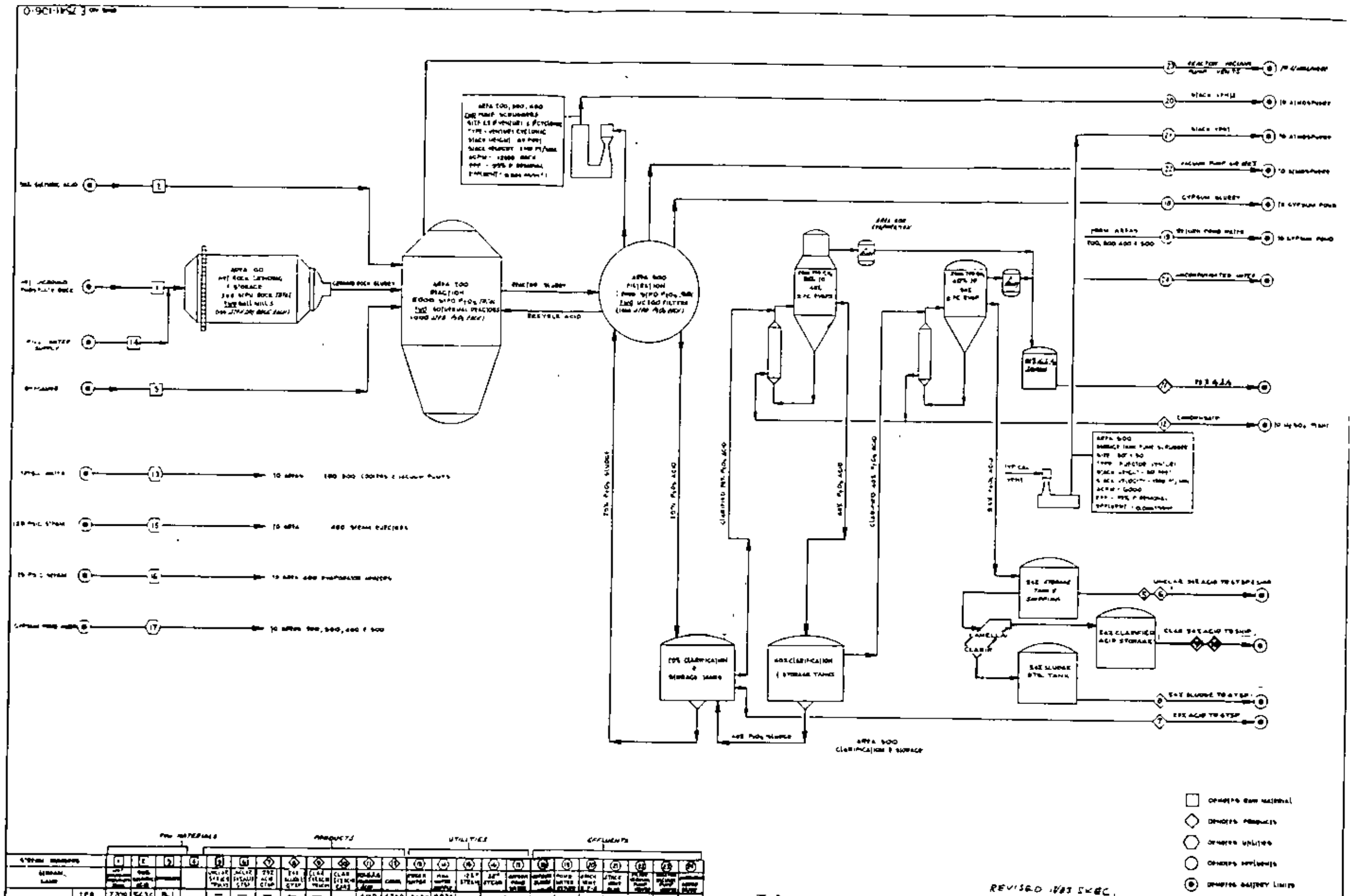


FT. MEADE PHOSPHATE COMPLEX

U.S. STEEL AGRI-CHEMICALS
FT. MEADE, FLORIDA

GRAPHIC SERVICES - ENGINEERING - PITTSBURGH
UNITED STATES STEEL CORPORATION

7925/7926 DF3705-2	ALTIERI	PRICHARD STORY	5-12-60	PD108



STREAM NUMBER		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
COMMON NAME		[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	COND.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	TPD	7709	5636	8.1		—	—	—	—	—	—	420	4300	4630	2970	—	—	—	—	—	—	—	—	—	2640
	[illegible]	[illegible]	—	—		34790	26100	55000	67000	108000	18300	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	[illegible]	—	—	—		—	—	—	—	—	—	—	—	—	—	19500	25000	—	—	—	—	—	—	—	—
	[illegible]	—	—	—		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	34700	85700	2444	7000	—
	[illegible]	—	—	—		(714)	(645)	(430)	(470)	(714)		71	751	[illegible]	494	—	—	[illegible]	[illegible]	[illegible]	—	—	—	—	1440
TEMPERATURE, °F		100	100	90		130	130	130	130	140	140	140	210	80	100	263	267	95	140	[illegible]	100	100	100	100	100
[illegible]		—	—	—		—	—	—	—	—	—	8.5	—	—	—	—	—	—	—	—	30.9	10.9	—	—	—
SOLIDS, TPD		4736	—	—		—	—	—	—	—	—	—	—	—	—	—	—	—	10700	—	~0	~0	~0	~0	—

REVISED 1/83 SKBC

FLOW DIAGRAM
RAW MATERIALS, PRODUCTS,
UTILITIES AND EFFLUENTS
PHOSPHORIC ACID PLANT
USS AGRI-CHEMICALS

FT. MEADE FLORIDA

BADGER AMERICA INC.

DWG NO E-7541-106-0

APPENDIX C

SULFUR DIOXIDE AND FLUORIDE EMISSION RATE CALCULATIONS

EMISSION RATE CALCULATIONS

USSAC FT. MEADE CHEMICAL COMPLEX

I. SULFUR DIOXIDE EMISSIONS

Two sulfuric acid plants presently permitted for a production rate of 2,200 tons/day, each, of 100 percent sulfuric acid (PSD-FL-064) will increase rate to 3,000 tons/day, each, of 100 percent sulfuric acid. This will affect SO_2, acid mist, NO_x and CO emissions from the two plants.

A. Present

E = 2200 tons/day x 4.0 lb SO_2/ton x 1/24 day/hour
= 366.7 lb SO_2/hour, each plant
x 7967 hr/year x 1/2000 ton/lb
= 1460 tpy, each plant

B. Proposed

E = 3000 tons/day x 4.0 lb SO_2/ton x 1/24 day/hour
= 500.0 lb SO_2/hour, each plant
x 7967 hr/year x 1/2000 ton/lb
= 1992 tpy, each plant

II. SULFURIC ACID MIST EMISSIONS

A. Present

E = 2200 x 0.15 x 1/24
= 13.8 lb/hour, each plant
= 54.8 tpy, each plant

B. Proposed

E = 3000 x 0.15 x 1/24
= 18.8 lb/hour, each plant
= 74.7 tpy, each plant

III. NITRIC OXIDES EMISSIONS

Emission Factor - 2.1×10^{-6} lb NO_x/dscf (from PSD-FL-014)

A. Present

PSD Approval PSD-FL-064 permits an annual NOx emission rate of 44.0 tons per year from each sulfuric acid plant.

B. Proposed

Q = 70,400 dscf/ton x 3000 tpd x 1/1440 day/min
= 146,667 dscfm

E = 146,667 dscfm x 60 x 2.1×10^{-6}
= 18.5 lb/hour, each plant
= 73.6 tpy, each plant

IV. CARBON MONOXIDE EMISSIONS

Sulfur consumption per ton of acid is 0.335 tons. Carbon content is approximately 0.25%; assumed to be petroleum.

CO emissions factor (AP-42)is 0.005 lb CO/gal

A. Present

E = 2200 tpd x 332 day/year x 0.335 ton S/ton acid
x 0.0025 ton C/ton S x 2000 lb/ton
x 1/8.0 gal/lb x 0.005 lb CO/gal
x 1/2000 ton/lb
= 0.4 tpy, each plant

B. Proposed

E = 3000 tpd x 332 day/year x 0.335 x 0.0025 x 1/8.0 x 0.005
= 0.5 tpy, each plant

V. FLUORIDE EMISSIONS

Two phosphoric acid plants presently permitted for a production rate of 800 tons/day of P_2O_5, each, (PSD-FL-064) will increase rate to 1000 tons/day of P_2O_5, each. This will affect fluoride emissions from the acid plants and the cooling water ponds. The cooling water ponds will be affected because of an increased heat load to the ponds.

A. Phosphoric Acid Plants

1. Present

PSD Approval PSD-FL-064 permits a fluoride emission rate of 2.5 tons per year from each phosphoric acid plant.

2. Proposed

E = 1000 tpd x 332 day/year x 0.02 lbs F/ton x 1/2000 x 1/0.95 loss
= 3.5 tpy, each plant

B. Cooling Ponds

Currently Permitted Conditions (PSD-FL-064)

1. Production Rate - 1600 tpd P_2O_5

2. Heat Load to Pond System

Phosphoric Acid Plant
Scrubbers & Condensers - 2.29×10^8 BTU/hr
Gypsum Slurry - 1.28×10^8 BTU/hr
GTSP Plant - 0.24×10^8 BTU/hr

TOTAL - 3.81×10^8 BTU/hr

3. Average Flows and Temperatures to Pond System

To Cooling Pond
Phosphoric Acid Scrubbers & Condensers - 20,500 gpm at 94°F
GTSP Plant - 3,000 gpm at 90°F

TOTAL - 23,500 gpm at 93.5°F
or
4.51×10^6 ft^3/day

To Gypsum Stack
Phosphoric Acid Plant - 5,400 gpm at 114°F or 1.04×10^6 ft^3/day

4. Pond Parameters

Size
Cooling Pond - 84 Acres
Gypsum Pond - 40 Acres

Temperatures
Influent
Cooling Pond - 93.5°F
Gypsum Pond - 114.0°F

Effluent
Cooling Pond - 75.0°F
Gypsum Pond - 75.0°F

Ambient Air - 72.5°F

5. Pond Area Required to Cool Influent Water to Effluent Temperature of 75°F.

$$(ti - ta)/(to - ta) = \exp\,[(7.21A)/Q]$$

Where
ti = Influent Temperature, °F
to = Effluent Temperaute, °F
ta = Equilibrium Temperature, °F
A = Pond Area, ft^2
Q = Flow to Pond, ft^3/day

Cooling Pond

$$\begin{aligned}(93.5 - 72.5)/(75.0 - 72.5) &= \exp\,[(7.21A)/4.51 \times 10^6] \\ 8.40 &= \exp\,(1.60A \times 10^{-6}) \\ A &= 1.33 \times 10^6 \text{ ft}^2 \\ &= 30.6 \text{ Acres*}\end{aligned}$$

*In this segment of the pond, the water temperature will decrease from 93.5°F to 75°F. In the remainder of the pond, (84.0 -30.6 = 53.4 acres), the temperature will average 75°F.

Gypsum Pond

$$(114.0 - 72.5)/(75.0 - 72.5) = \exp\left[(7.21A)/1.04 \times 10^{6}\right]$$

$$16.60 = \exp(6.93A \times 10^{-6})$$

$$A = 0.41 \times 10^{6}\ \mathrm{ft}^{2}$$

$$= 9.3\ \text{Acres}^{**}$$

**In this segment of the pond, the water temperature will decrease from 114°F to 75°F. In the remainder of the Gypsum Pond, (40.0 - 9.3 = 30.7 acres), the temperature will average 75°F.

6. Pond System Fluoride Emissions

For Constant Temperature Ponds

$$N_{fc} = 3.653 \times 10^{-3} \times \exp(a + bt + ct^{2}) \qquad [1]$$

where N_{fc} = average fluoride emission rate (lb/acre-day)
a = 26.1131 (a constant)
b = -0.4708 (a constant)
c = 0.002746 (a constant)
t = pond temperature (°F)

The constants a,b and c were derived by TRW (1) from the fluoride vapor pressure data developed by King (2).

For Cooling Ponds (temperature variable)

$$N_{fv} = \frac{\text{Total pond fluoride emissions (lb/day)}}{\text{Pond area (acres)}}$$

$$= \frac{K \times 3.653 \times 10^{-3} \displaystyle\int_{to}^{ti} \frac{\exp(a + bt + ct^{2})\,dt}{t-ta}}{K \times \log_e (ti - ta)/(to - ta)} \qquad [2]$$

where N_{fv} = average fluoride emission rate (lb/acre-day)
a, b, c = contants as in equation [1]
ti = pond inlet temperature (°F)
to = pond outlet temperature (°F)
ta = average ambient air temperature (°F)
t = pond temperature at any given point (°F)
K = a constant which cancells and is eliminated from the equation

(1) See attached TRW correspondence dated 8/27/80
(2) King, W. R. and Ferrel, J.K., EPA-650/2-74-095, October, 1974.

Fluoride Emissions

Cooling Pond

Variable Temperature Portion

Nfv = 1.49 lb/acre-day (numerator of Equation [2] evaluated by computer using Simpson's Rule).
Ecv = (1.49 lb/acre-day) x 30.6 acres
= 45.6 lb F/day
= 8.3 tons F/year

Constant Temperature Portion

Nfc = 1.89 lb/acre-day (from Equation [1] with t = 75°F)
Ecf = (1.89 lb/acre-day) x 53.4 acres
= 101.0 lb F/day
= 18.4 tons F/year

Gypsum Pond

Variable Temperature Portion

Nfv = 2.16 lb/acre-day (from Equation [2])
Egv = 2.16 x 9.3 acres
= 20.1 lb F/day
= 3.7 tons F/year

Constant Temperature Portion

Nfc = 1.89 lb/acre-day (from Equation [1])
Egc = 1.89 x 30.7 acres
= 58.0 lb F/day
= 10.6 tons F/year

Total Fluoride Emissions from Present Pond System

Et = 8.3 + 18.4 + 3.7 + 10.6 tons/year
= 41.0 tons F/year

Proposed Conditions

1. Production Rate - 2000 tpd P_2O_5

2. Heat Load to Pond System

   - Phosphoric Acid Plant
     - Scrubbers & Condensers - 2.86×10^8 BTU/hr
     - Gypsum Slurry - 1.60×10^8 BTU/hr
   - GTSP Plant - 0.24×10^8 BTU/hr

   TOTAL - 4.70×10^8 BTU/hr

3. Average Flows and Temperatures to Pond System

   - To Cooling Pond
     - Phosphoric Acid Scrubbers & Condensers - 25,610 gpm at 94°F
     - GTSP Plant - 3,000 gpm at 90°F

   TOTAL - 28,610 gpm at 93.6°F or 5.49×10^6 ft^3/day

   - To Gypsum Stack
     - Phosphoric Acid Plant - 6,750 gpm at 114°F or 1.30×10^6 ft^3/day

4. Pond Parameters

   - Size
     - Cooling Pond - 84 Acres
     - Gypsum Pond - 40 Acres
   - Temperatures
     - Influent
       - Cooling Pond - 93.6°F
       - Gypsum Pond - 114.0°F
     - Effluent
       - Cooling Pond - 75.0°F
       - Gypsum Pond - 75.0°F
     - Ambient Air - 72.5°F

5. Pond Area Required to Cool Influent Water to Effluent Temperature of 75°F.

$$(ti-ta)/(to-ta) = \exp\,[(7.21A)/Q]$$

Where ti = Influent Temperature, °F
to = Effluent Temperautre, °F
ta = Equilibrium Temperature, °F
A = Pond Area, ft^2
Q = Flow to Pond, ft^3/day

Cooling Pond

$$\begin{aligned}(93.5 - 72.5)/(75.0 - 72.5) &= \exp\,[(7.21A)/5.49 \times 10^6] \\ 8.40 &= \exp\,(1.31A \times 10^{-6}) \\ A &= 1.62 \times 10^6\ ft^2 \\ &= 37.2 \text{ Acres*}\end{aligned}$$

*In this segment of the pond, the water temperature will decrease from 93.5°F to 75°F. In the remainder of the pond, (84.0 - 37.2 = 46.8 acres), the temperature will average 75°F.

Gypsum Pond

$$\begin{aligned}(114.0 - 72.5)/(75.0 - 72.5) &= \exp\,[(7.21A)/1.30 \times 10^6] \\ 16.60 &= \exp\,(5.55A \times 10^{-6}) \\ A &= 0.51 \times 10^6\ ft^2 \\ &= 11.6 \text{ Acres**}\end{aligned}$$

**In this segment of the pond, the water temperature will decrease from 114°F to 75°F. In the remainder of the Gypsum Pond, (40.0 - 11.6 = 28.4 acres), the temperature will average 75°F.

6. Pond System Fluoride Emissions

Fluoride Emissions

Cooling Pond
Variable Temperature Portion

Nfv = 1.49 lb/acre-day (numerator of Equation [2] evaluated by computer using Simpson's Rule).
Ecv = (1.49 lb/acre-day) x 37.2 acres
= 55.4 lb F/day
= 10.1 tons F/year

Constant Temperature Portion

Nfc = 1.89 lb/acre-day (from Equation [1] with t = 75°F)
Ecf = (1.89 lb/acre-day) x 42.0 acres
= 88.4 lb F/day
= 16.1 tons F/year

Gypsum Pond
Variable Temperature Portion

Nfv = 2.16 lb/acre-day (from Equation [2])
Egv = 2.16 x 11.6 acres
= 25.1 lb F/day
= 4.6 tons F/year

Constant Temperature Portion

Nfc = 1.89 lb/acre-day (from Equation [1])
Egc = 1.89 x 28.4 acres
= 53.7 lb F/day
= 9.8 tons F/year

gyp pnd
Total Fluoride Emissions from Present Pond System

8.3 18.4 3.7 10.6 = 41.0
Et = 10.1 + 16.1 + 4.6 + 9.8 tons/year
= 40.6 tons F/year

Var temp port

Const temp portion

Var temp portion

Const temp port

Cooling pond

Gyp pond

APPENDIX D

AMBIENT SULFUR DIOXIDE
MONITORING REPORT FOR
THE PERIOD
FEBRUARY - JUNE, 1983

FINAL REPORT
AMBIENT AIR MONITORING NETWORK

USS AGRI-CHEMICALS
FT. MEADE, FLORIDA

JUNE 1983

SHOLTES & KOOGLER
ENVIRONMENTAL CONSULTANTS, INC.
1213 N.W. 6TH STREET
GAINESVILLE, FLORIDA 32601
(904) 377-5822

TABLE OF CONTENTS

1.0 EXECUTIVE SUMMARY

In February of 1983, Sholtes & Koogler, Environmental Consultants, Inc. (SKEC) of Gainesville, Florida established an ambient air sampling station and trained personnel of the USS Agri-Chemicals plant in its operation. The monitoring site was located to the east of the company's facility near Ft. Meade, Florida. This report deals with the data collected from that station during four months of 1983. These data indicate ambient levels of sulfur dioxide well before any applicable ambient air standard.

This monitoring activity was required as part of the PSD review process required for proposed new construction by the Florida Department of Environmental Regulation.

2.0 INTRODUCTION

USS Agri-Chemicals is proposing to increase the permitted production capacity of two sulfuric acid plants and a phosphoric acid plant at the USSAC Ft. Meade Chemical Complex. The two existing sulfuric acid plants at the facility, each presently rated at a production capacity of 2,200 tons of 100 percent sulfuric acid per day, will each be upgraded to a production capacity of 3,000 tons per day 100 percent sulfuric acid. This increase in sulfuric acid production will support a 400 tons per day increase in phosphoric acid production. This will result in increasing the phosphoric acid production capacity at the facility from 1,600 tons per day to 2,000 tons per day.

The USSAC Ft. Meade Chemical Complex is located in Polk County on Highway 630 approximately six kilometers from Ft. Meade, Florida. The UTM coordinates are Zone 17, 417.1 kilometers east and 3,068.23 kilometers north (SAROAD I.D. No. 10-3680-030-J05).

Potential air pollutant emission rates were calculated for the proposed modifications. Based on the calculations, it was determined that the modification proposed by USSAC will result in significant emission increases of sulfur dioxide (1,064 tons per year), sulfuric acid mist (40 tons per year), and nitrogen oxides (59 tons per year). The fluoride emission increase resulting from the increased capacity of the phosphoric acid plant and the associated effect on the process water ponds will be 1.6 tons per year; an emission increase less than the 3.0 tons per year de minimus emission limit.

Based on the emission rate increases expected as a result of the proposed modifications, the project will be subject to PSD review for sulfur dioxide, sulfuric acid mist and nitrogen oxides only. Included in the PSD review there must be an air quality review which includes air quality monitoring and air quality modeling.

The monitoring requirements for the three subject pollutants were discussed with the FDER staff. It was agreed that continuous monitoring would be conducted for sulfur dioxide at one monitoring site east of the Chemical Complex for a period of four months. It was further agreed that the air quality review for sulfuric acid mist and nitrogen oxides could be prepared without using site specific air quality monitoring data. For this reason, air quality monitoring was not proposed for sulfuric acid mist or nitrogen oxides.

The SKEC ambient air monitoring system consists of a continuous monitoring station for the air pollutant sulfur dioxide. Data recording consisted of strip chart recordings and manual data reduction therefrom. All equipment is certified to be EPA equivalent and was operated in conformance with EPA Quality Assurance guidelines and a written quality assurance plan approved by the Florida Department of Environmental Regulation.

The station equipment consisted of the following:

- 1 each Meloy Laboratories Model SA285 Sulfur Dioxide Analyzer with Automatic Calibration Option,
- 1 each Meloy Laboratories Model CS-10 Calibrator for the Model SA285 Sulfur Dioxide Analyzer, and
- 1 each Esterline-Angus Mini-Servo Stripchart Recorder with Five-Inch Chart.

The continuous monitor installed at this station was provided with an automatic calibration system which carried out this function every night at approximately the midnight hour. Otherwise the operation of the system was intended to be somewhat normal as required for PSD level monitoring activities.

A complete file of weekly and monthly log sheets is available in the offices of SKEC in Gainesville, Florida, should any question arise with respect to the operation of this sytem. All data from the sulfur dioxide measuring instrument have been reduced manually from the stripchart recorders. In similar fashion to the log sheets, the stripcharts are permanently retained in storage by SKEC in Gainesville.

The monitoring station was visited on a nominal twice per week basis. The detailed description of day-to-day operating procedures are outlined in the Standard Operating Procedures Manual prepared for this project. The location of this sampling site is shown on Figure 1.

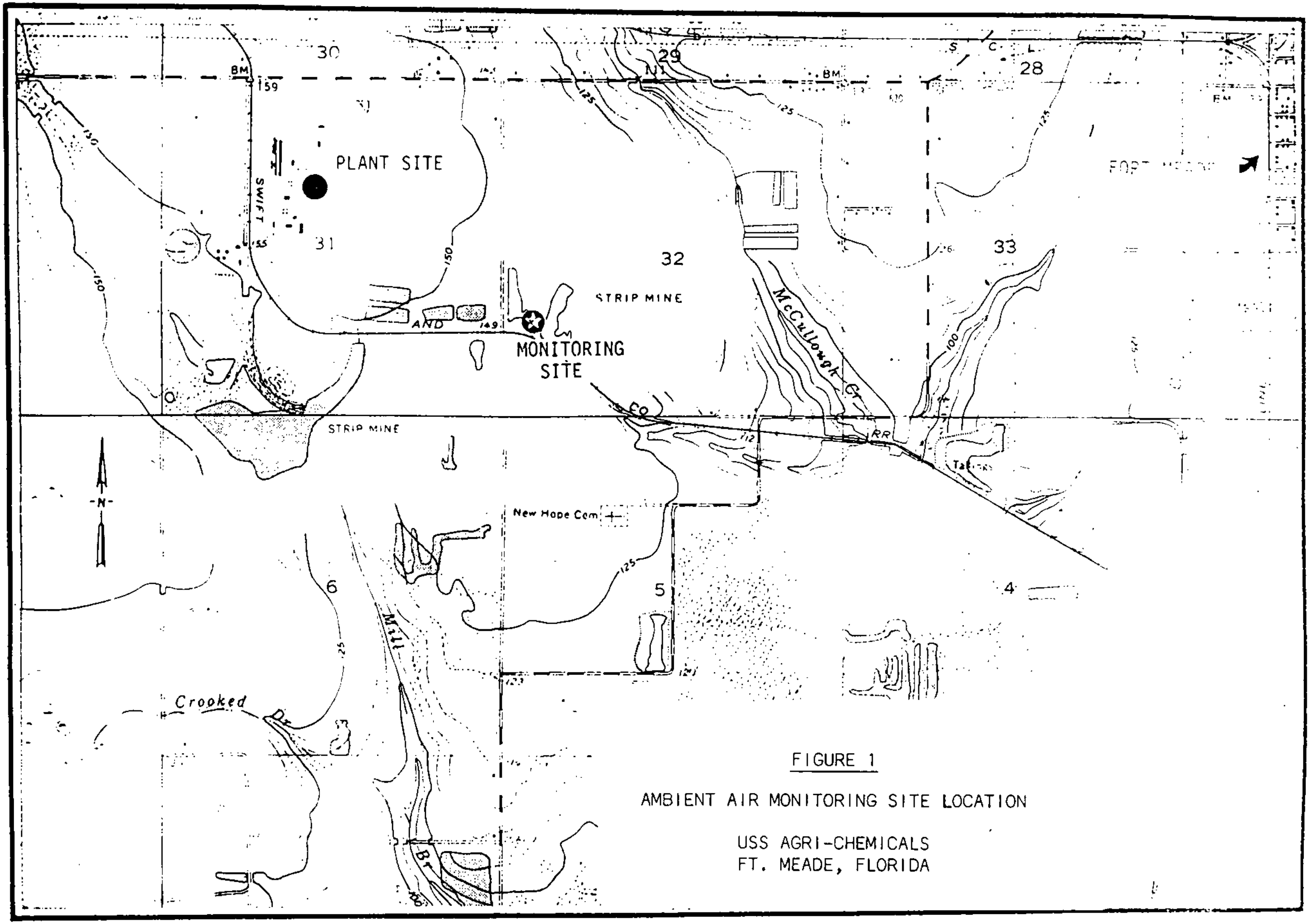


FIGURE 1

AMBIENT AIR MONITORING SITE LOCATION

USS AGRI-CHEMICALS
FT. MEADE, FLORIDA

3.0 RESULTS OF AMBIENT MONITORING

Table 1 summarizes the ambient monitoring results realized in the four months of operation (February through May, 1983). The data in Table 1 suggest that the ambient levels of sulfur dioxide as measured by USSAC/SKEC are very much below those levels described as ambient air quality standards. A full set of SAROAD format data are included in the Appendix of this report.

4.0 QUALITY ASSURANCE

As stated previously, a Quality Assurance plan was prepared and approved by the Florida Department of Environmental Regulation (FDER) offices in Tallahassee in connection with this ambient monitoring program. This Quality Assurance plan was oriented to the EPA requirements for PSD monitoring, however, exceeded those requirements in many respects.

Table 2 represents estimates of precision which are based upon the once per week precision checks carried out on this instrument at the 0.100 parts per million level. Table 3 represents estimates of accuracy based upon two independent audits carried out nominally at the beginning and the end of the four months ambient air monitoring program.

TABLE 1

1983 AMBIENT AIR QUALITY MONITORING
SULFUR DIOXIDE

USS AGRI-CHEMICALS
FT. MEADE, FLORIDA

Month	Percent Data Recovery	Monthly Average SO_2 - ppb	Monthly 3-Hour Max: SO_2 - ppb
February	89	1.62	26.3
March	100	2.67	50.3
April	98	1.87	50.0
May	100	2.18	47.0
		2.09	

TABLE 2

ESTIMATE OF PRECISION

1983 AMBIENT AIR QUALITY MONITORING SULFUR DIOXIDE

USS AGRI-CHEMICALS
FT. MEADE, FLORIDA

Upper 95% Probability Limit = +2.4%

Lower 95% Probability Limit = -18.3%

TABLE 3

ESTIMATE OF ACCURACY

1983 AMBIENT AIR QUALITY MONITORING
SULFUR DIOXIDE

USS AGRI-CHEMICALS
FT. MEADE, FLORIDA

	Level 1	Level 2	Level 3
Upper 95% Probability Limit	+17.8%	+ 9.8%	+ 7.0%
Lower 95% Probability Limit	- 5.0%	- 8.3%	- 3.3%

APPENDIX

	FORM	1
SO2 Station	SITE IDENT	10-3680-030
USSAC	AGENCY	J
Source - Ambient	PROJECT	02
One-Hour	TIME INTVL	1
1983	YEAR	83
February	MONTH	02
Sulfur Dioxide	PARAMETER	42401
Flame Photometric	METHOD	16
Parts Per Billion	UNITS	08
	DP	0

DAY	ST HR	RDG 1	RDG 2	RDG 3	RDG 4	RDG 5	RDG 6	RDG 7	RDG 8	RDG 9	RDG10	RDG11	RDG12
01	00												
01	12												
02	00												
02	12		0	0	0	0	0	0	0	0	0	0	0
03	00	0	0	0	0	0	0	0	0	0	0	0	10
03	12	0	3	13	8	0	0	12	16	30	22	27	10
04	00	0	0	0	0	0	0	0	0	0	0	0	0
04	12	0	0	0	0	0	0	0	0	0	0	0	0
05	00	0	0	0	0	0	0	0	0	0	0	0	0
05	12	0	0	0	0	0	0	0	0	0	0	0	0
06	00	0	0	0	0	0	0	0	0	0	0	0	0
06	12	0	0	0	0	0	0	0	0	0	0	0	0
07	00	0	0	0	0	5	20	10	16	1	0	0	12
07	12	7	11	12	10	10	24	18	20	17	2	0	0
08	00	0	0	0	0	0	0	0	0	0	0	0	0
08	12	0	0	0	0	0	0	0	0	0	0	0	0
09	00	0	0	0	0	0	0	0	0	0	0	0	0
09	12	0	0	0	0	0	0	0	0	0	0	0	0
10	00	0	0	0	0	0	0	0	0	0	0	0	0
10	12	0	0	0	0	0	0	3	2	0	0	0	0
11	00	0	0	0	0	0	0	0	0	3	5	2	10
11	12	4	10	20	4	18	17	5	0	0	0		
12	00												0
12	12	0	0	0	0	0	0	0	0	0	0	0	0
13	00	0	0	0	0	0	0	0	0	0	0	0	0
13	12	0	0	0	0	4	0	10	6	0	4	0	20
14	00	20	30	0	0	20	0	28	3	10	0	0	0
14	12	0	0	0	0	0	4	6	3	8	17	14	25
15	00	5	4										
15	12												
16	00												

	FORM	1
SO2 Station	SITE IDENT	10-3680-030
USSAC	AGENCY	J
Source - Ambient	PROJECT	02
One-Hour	TIME INTVL	1
1983	YEAR	83
February	MONTH	02
Sulfur Dioxide	PARAMETER	42401
Flame Photometric	METHOD	16
Parts Per Billion	UNITS	08
	DP	0

DAY	ST HR	RDG 1	RDG 2	RDG 3	RDG 4	RDG 5	RDG 6	RDG 7	RDG 8	RDG 9	RDG10	RDG11	RDG12
16	12												
17	00											0	0
17	12	0	0	0	0	0	0	0	0	0	0	0	0
18	00	0	0	0	0	0	0	0	0	0	0	0	0
18	12	0	0	0	0	0	0	0	0	3	0	0	0
19	00	0	0	0	0	0	0	0	0	0	0	0	0
19	12	0	0	0	0	0	0	0	0	0	0	0	0
20	00	0	0	0	0	0	0	0	0	0	0	0	0
20	12	0	0	0	0	0	0	0	0	0	0	0	0
21	00	0	0	0	0	0	0	0	0	0	0	0	0
21	12	0	0	0	0	0	0	0	0	0	0	0	0
22	00	0	0	0	0	0	0	0	0	0	0	0	0
22	12	0	0	0	0	0	0	0	0	0	0	0	0
23	00	0	0	0	0	0	0	0	0	0	0	0	0
23	12	2	6	20	19	5	3	0	0	0	0	0	0
24	00	0	0	0	0	0	0	0	0	0	0	19	28
24	12	11	8	8	2	4	13	3	2	5	2	10	11
25	00	0	0	0	0	0	0	0	0	0	6	3	3
25	12	2	1	2	7	8	7	0	0	0	6	8	7
26	00	0	0	0	0	0	0	0	0	0	0	0	0
26	12	0	0	0	0	0	0	0	0	0	0	0	0
27	00	0	0	0	0	0	0	0	0	0	0	0	0
27	12	0	0	0	0	0	0	0	0	0	0	0	0
28	00	0	0	0	0	0	0	0	0	0	0	0	0
28	12	0	0	0	0	0	0	0	0	0	0	0	0

SO2 Station | Sulfur Dioxide | February 1983

Day	No. of Hourly Samples	Daily Average (PPB)	High 3-Hour Average	Period
1	0			
2	11	0.0	0.0	
3	24	6.3	26.3	2000-2259
4	24	0.0	0.0	
5	24	0.0	0.0	
6	24	0.0	0.0	
7	24	8.1	20.7	1700-1959
8	24	0.0	0.0	
9	24	0.0	0.0	
10	24	.2	1.7	1700-1959
11	22	4.5	14.0	1400-1659
12	13	0.0	0.0	
13	24	1.8	8.0	2100-2359
14	24	7.8	18.7	2100-2359
15	2	4.5	4.5	0- 259
16	0			
17	14	0.0	0.0	
18	24	.1	1.0	1800-2059
19	24	0.0	0.0	
20	24	0.0	0.0	
21	24	0.0	0.0	
22	24	0.0	0.0	
23	24	2.3	15.0	1300-1559
24	24	5.2	19.3	1000-1259
25	24	2.5	7.3	1500-1759
26	24	0.0	0.0	
27	24	0.0	0.0	
28	24	0.0	0.0	

Total # Hours in Month - ~~672~~ 635
Total # Hourly Samples - 566
Percent Data Acquisition - ~~84%~~ 89 %

Project began Feb. 2

	FORM	1
SO2 Station	SITE IDENT	10-3680-030
USSAC	AGENCY	J
Source - Ambient	PROJECT	02
One-Hour	TIME INTVL	1
1983	YEAR	83
March	MONTH	03
Sulfur Dioxide	PARAMETER	42401
Flame Photometric	METHOD	16
Parts Per Billion	UNITS	08
	DP	0

DAY	ST HR	RDG 1	RDG 2	RDG 3	RDG 4	RDG 5	RDG 6	RDG 7	RDG 8	RDG 9	RDG10	RDG11	RDG12
01	00	0	0	0	0	0	0	0	0	0	0	0	0
01	12	0	0	4	3	0	0	0	3	12	7	7	0
02	00	0	0	0	0	8	10	11	10	4	0	0	0
02	12	0	0	0	0	0	0	32	19	5	6	7	7
03	00	0	0	0	0	0	0	0	0	0	0	0	0
03	12	0	0	0	0	0	0	0	0	0	0	0	0
04	00	0	0	0	0	0	0	0	0	0	0	0	0
04	12	0	0	0	0	0	0	0	0	0	0	0	0
05	00	0	0	0	0	0	0	0	0	0	0	0	0
05	12	0	0	0	0	0	0	0	0	0	0	0	0
06	00	0	0	0	0	0	0	0	0	0	0	0	0
06	12	0	0	0	0	0	0	0	0	0	0	0	0
07	00	0	0	0	0	0	0	0	0	0	0	0	0
07	12	0	0	0	0	0	0	0	0	0	0	0	0
08	00	0	0	0	0	0	0	0	0	0	0	0	0
08	12	0	0	0	0	0	0	0	0	0	0	0	0
09	00	0	8	11	4	1	7	13	6	12	0	0	3
09	12	2	4	0	9	18	20	15	4	6	10	7	0
10	00	0	0	0	0	0	0	0	0	0	0	0	0
10	12	0	0	4	2	3	0	17	4	3	9	10	13
11	00	10	10	6	2	3	11	20	25	22	20	16	10
11	12	12	20	15	10	12	22	33	36	20	14	11	7
12	00	8	10	10	14	12	8	8	12	10	14	10	11
12	12	18	16	11	9	6	4	35	5	6	8	18	15
13	00	0	0	0	0	0	0	4	3	4	11	9	6
13	12	43	13	8	6	0	0	0	0	0	0	0	0
14	00	0	0	0	0	0	0	0	0	0	0	0	0
14	12	0	0	0	0	0	0	0	0	0	0	0	0
15	00	0	0	0	0	0	0	0	0	0	0	0	0
15	12	0	0	0	0	0	0	0	0	0	0	0	0
16	00	0	0	0	0	0	0	0	0	0	0	0	0

	FORM	1
SO2 Station	SITE IDENT	10-3680-030
USSAC	AGENCY	J
Source - Ambient	PROJECT	02
One-Hour	TIME INTVL	1
1983	YEAR	83
March	MONTH	03
Sulfur Dioxide	PARAMETER	42401
Flame Photometric	METHOD	16
Parts Per Billion	UNITS	08
	DP	0

DAY	ST HR	RDG 1	RDG 2	RDG 3	RDG 4	RDG 5	RDG 6	RDG 7	RDG 8	RDG 9	RDG10	RDG11	RDG12
16	12	0	0	0	0	0	0	0	0	0	0	0	0
17	00	0	0	0	0	0	0	0	0	0	0	0	0
17	12	0	0	0	0	0	0	0	0	0	0	0	0
18	00	0	0	0	0	0	0	0	0	0	0	0	0
18	12	0	0	0	0	0	0	0	0	0	0	0	0
19	00	0	0	0	0	0	0	0	0	0	4	7	4
19	12	14	15	0	0	0	0	0	0	0	0	0	0
20	00	0	0	0	0	0	0	0	0	0	0	0	0
20	12	0	0	0	0	0	0	0	0	0	0	0	0
21	00	0	0	0	0	0	4	17	5	5	3	13	18
21	12	18	16	7	4	2	18	75	40	36	5	0	0
22	00	0	0	5	17	2	0	0	0	0	0	0	0
22	12	0	0	0	2	4	5	0	0	10	2	0	0
23	00	0	0	0	0	0	0	0	0	0	0	0	0
23	12	0	0	0	0	0	0	0	0	0	0	0	0
24	00	0	0	0	0	0	0	0	0	0	0	0	0
24	12	0	0	0	10	4	2	7	8	15	30	32	12
25	00	8	0	0	0	0	0	0	0	0	0	0	0
25	12	0	0	0	0	0	0	0	0	0	0	0	0
26	00	0	0	0	15	4	0	0	0	0	0	0	0
26	12	0	0	0	0	0	0	0	0	0	0	0	0
27	00	0	0	0	0	0	0	0	0	0	0	0	0
27	12	0	0	0	0	0	0	0	0	0	0	0	0
28	00	0	0	0	0	0	0	0	0	0	13	17	15
28	12	10	0	0	0	0	11	13	21	5	3	10	7
29	00	0	0	0	0	0	0	0	0	0	0	0	0
29	12	0	0	0	0	0	0	0	5	30	2	0	0
30	00	0	0	0	0	0	0	0	0	0	0	0	0
30	12	0	0	0	0	0	0	0	0	6	10	5	3
31	00	0	8	3	0	0	0	0	0	0	22	25	2
31	12	0	10	12	15	7	2	3	5	17	4	2	10

SO2 Station Sulfur Dioxide March 1983

Day	No. of Hourly Samples	Daily Average (PPB)	High 3-Hour Average	Period
1	24	1.5	8.7	2000-2259
2	24	5.0	18.7	1800-2059
3	24	0.0	0.0	
4	24	0.0	0.0	
5	24	0.0	0.0	
6	24	0.0	0.0	
7	24	0.0	0.0	
8	24	0.0	0.0	
9	24	6.7	17.7	1600-1859
10	24	2.7	10.7	2100-2359
11	24	15.3	30.3	1700-1959
12	24	11.6	15.3	1800-2059
13	24	4.5	21.3	1200-1459
14	24	0.0	0.0	
15	24	0.0	0.0	
16	24	0.0	0.0	
17	24	0.0	0.0	
18	24	0.0	0.0	
19	24	1.8	11.0	1100-1359
20	24	0.0	0.0	
21	24	11.9	50.3	1800-2059
22	24	2.0	8.0	200- 459
23	24	0.0	0.0	
24	24	5.0	25.7	2000-2259
25	24	.3	2.7	0- 259
26	24	.8	6.3	200- 459
27	24	0.0	0.0	
28	24	5.2	15.0	900-1159
29	24	1.5	12.3	1900-2159
30	24	1.0	7.0	2000-2259
31	24	6.1	16.3	900-1159

Total # Hours in Month - 744
Total # Hourly Samples - 744
Percent Data Acquisition - 100%

	FORM	1
SO2 Station	SITE IDENT	10-3680-030
USSAC	AGENCY	J
Source - Ambient	PROJECT	02
One-Hour	TIME INTVL	1
1983	YEAR	83
April	MONTH	04
Sulfur Dioxide	PARAMETER	42401
Flame Photometric	METHOD	16
Parts Per Billion	UNITS	08
	DP	0

DAY	ST HR	RDG 1	RDG 2	RDG 3	RDG 4	RDG 5	RDG 6	RDG 7	RDG 8	RDG 9	RDG10	RDG11	RDG12
01	00	0	0	0	0	0	0	0	0	0	0	0	0
01	12	0	0	0	0	0	0	0	0	0	0	0	0
02	00	0	0	0	0	0	0	0	0	0	0	0	0
02	12	0	0	0	0	0	0	0	0	0	0	0	0
03	00	0	0	0	0	3	4	5	22	12	12	8	2
03	12	3	1	0	2	0	0	0	0	0	0	0	0
04	00	0	0	0	0	0	0	0	0	0	0	0	0
04	12	0	0	0	0	0	0	0	0	0	0	0	0
05	00	0	0	0	0	0	0	0	0	0	0	0	0
05	12	0	0	0	0	0	0	0	0	0	0	0	0
06	00	0	0	0	0	0	0	0	0	0	0	0	0
06	12	0	0	0	0	0	0	0	0	0	0	0	0
07	00	0	0	0	0	0	0	0	0	0	0	0	0
07	12	0	0	0	0	0	0	0	0	0	0	0	0
08	00	0	0	0	0	0	0	0	0	0	0	0	0
08	12	0	0	0	0	0	0	0	0	0	0	0	0
09	00	0	0	0	0	0	0	0	0	0	0	0	0
09	12	0	2	3	2	0	0	0	0	0	3	17	5
10	00	0	0	0	0	0	0	0	2	10	14	10	0
10	12	3	14	10	12	12	23	10	25	11	13	15	10
11	00	20	20	15	10	4	0	0	11	7	0	0	2
11	12	1	2	2	2	4	5	0	5	17	10	8	15
12	00	0	0	0	0	0	0	0	0	0	0	0	0
12	12	0	0	0	0	0	0	0	0	0	0	0	0
13	00	0	0	0	0	0	0	0	0	0	0	0	0
13	12	0	0	0	0	0	0	0	0	0	0	0	0
14	00	0	0	0	0	0	0	0	0	0	0	0	0
14	12	0	0	0	0	0	0	0	0	0	0	0	0
15	00	0	0	0	0	0	0	0	0	0	0	0	0
15	12	0	0	0	0	0	0	0	0	0	0	0	0
16	00	0	0	0	0	0	0	0	0	0	0	0	0

	FORM	1
SO2 Station	SITE IDENT	10-3680-030
USSAC	AGENCY	J
Source - Ambient	PROJECT	02
One-Hour	TIME INTVL	1
1983	YEAR	83
April	MONTH	04
Sulfur Dioxide	PARAMETER	42401
Flame Photometric	METHOD	16
Parts Per Billion	UNITS	08
	DP	0

DAY	ST HR	RDG 1	RDG 2	RDG 3	RDG 4	RDG 5	RDG 6	RDG 7	RDG 8	RDG 9	RDG10	RDG11	RDG12
16	12	0	0	3	2	2	0	40	48	18	8	4	5
17	00	0	0	0	0	0	0	0	0	0	0	0	0
17	12	0	0	0	0	0	0	0	9	12	25	22	0
18	00	20	15	14	13	6	2	0	0	0	10	4	0
18	12	0	0	0	0	0	0	0	0	0	0	0	0
19	00	0	0	0	12	0	0	0	0	0	0	0	0
19	12	0	8	4	18	25	27	11	10	12	0	0	0
20	00	0	0	0	0	0	0	0	0	0	0	0	0
20	12	0	0	0	0	0	0	0	0	23	16	1	0
21	00	0	0	0	0	0	0	0	0	0	0	0	0
21	12	0	0	0	0	2	2	0	30	53	67	28	15
22	00	10	0	0	0	0	0	0	0	0	0	0	0
22	12	0	0	0	0	0	0	0	0	0	0	0	0
23	00	0	0	0	0	0	0	0	0	0	0	0	0
23	12	0	0	0	0	0	0	0	0	0	0	0	0
24	00	0	0	0	0	0	0	0	0	4	2	0	1
24	12	3	0	3	17	10	0	0	5	9	13	9	12
25	00	10	10	12	23	15	12	4	1	7	0	1	3
25	12	3	3	3	2	2	0	0	2	6	8	7	7
26	00	2	0	0	0	0	0	0	0	0	0	0	0
26	12	0	0	0	0	0	0	0	0	0	0	0	0
27	00	0	0	0	0	0	0	0	0	0	0	0	0
27	12	0	0	0	0	0	0	0	0	0	0	0	0
28	00	0	0	0	0	0	0	0	0	0	0	0	0
28	12	0	0	0	0	0	0	0	0	0	0	0	0
29	00	0	0	0	0	0	0	0	0	0	0	0	0
29	12	0											
30	00							0	0	0	0	0	0
30	12	0	0	0	0	0	0	0	0	0	0	0	0

SO2 Station   Sulfur Dioxide   April 1983

Day	No. of Hourly Samples	Daily Average (PPB)	High 3-Hour Average	Period
1	24	0.0	0.0	
2	24	0.0	0.0	
3	24	3.1	15.3	700- 959
4	24	0.0	0.0	
5	24	0.0	0.0	
6	24	0.0	0.0	
7	24	0.0	0.0	
8	24	0.0	0.0	
9	24	1.3	8.3	2100-2359
10	24	8.1	19.3	1700-1959
11	24	6.7	18.3	0- 259
12	24	0.0	0.0	
13	24	0.0	0.0	
14	24	0.0	0.0	
15	24	0.0	0.0	
16	24	5.4	35.3	1800-2059
17	24	2.8	19.7	2000-2259
18	24	3.5	16.3	0- 259
19	24	5.3	23.3	1500-1759
20	24	1.7	13.3	2000-2259
21	24	8.2	50.0	1900-2159
22	24	.4	3.3	0- 259
23	24	0.0	0.0	
24	24	3.7	11.3	2100-2359
25	24	5.9	16.7	200- 459
26	24	.1	.7	0- 259
27	24	0.0	0.0	
28	24	0.0	0.0	
29	13	0.0	0.0	
30	18	0.0	0.0	

Total # Hours in Month - 720
Total # Hourly Samples - 703
Percent Data Acquisition - 98%

	FORM	1
SO2 Station	SITE IDENT	10-3680-030
USSAC	AGENCY	J
Source - Ambient	PROJECT	02
One-Hour	TIME INTVL	1
1983	YEAR	83
May	MONTH	05
Sulfur Dioxide	PARAMETER	42401
Flame Photometric	METHOD	16
Parts Per Billion	UNITS	08
	DP	0

DAY	ST HR	RDG 1	RDG 2	RDG 3	RDG 4	RDG 5	RDG 6	RDG 7	RDG 8	RDG 9	RDG10	RDG11	RDG12
01	00	0	0	0	0	0	0	0	0	0	0	0	0
01	12	0	0	0	0	0	0	0	0	0	0	0	0
02	00	0	0	0	0	0	0	0	0	0	0	0	0
02	12	0	0	0	0	0	0	0	18	38	38	23	12
03	00	11	0	0	0	0	0	0	0	0	0	0	0
03	12	0	0	0	0	0	0	0	0	0	0	0	0
04	00	0	0	0	0	0	0	0	0	0	0	0	0
04	12	0	0	0	0	0	0	0	8	10	10	8	8
05	00	7	0	0	0	0	0	0	0	0	0	0	0
05	12	2	1	7	6	0	0	0	0	0	0	0	0
06	00	0	0	0	0	0	0	0	0	0	0	0	0
06	12	0	0	0	0	0	0	0	0	0	0	0	0
07	00	0	0	0	0	0	0	0	0	0	0	0	0
07	12	0	0	0	0	0	0	0	0	0	0	0	0
08	00	0	0	0	0	0	0	0	0	0	0	0	0
08	12	0	0	0	0	0	48	28	37	28	10	4	0
09	00	0	0	0	0	0	0	0	0	0	0	0	0
09	12	0	0	0	0	2	3	3	18	12	0	0	0
10	00	0	0	0	0	0	0	0	0	0	0	0	0
10	12	0	0	0	0	0	0	0	0	0	0	0	0
11	00	0	0	0	0	0	0	0	0	0	0	0	0
11	12	0	0	0	0	0	0	0	0	0	0	0	0
12	00	0	0	0	0	0	0	0	0	0	0	0	0
12	12	0	0	0	0	0	0	0	0	0	0	0	0
13	00	0	0	0	0	0	0	0	0	0	0	0	0
13	12	0	0	0	0	0	0	0	0	0	0	0	0
14	00	0	0	0	0	0	0	0	0	0	0	0	0
14	12	0	0	0	0	0	0	0	0	0	0	0	0
15	00	0	0	0	0	0	0	0	0	0	0	0	0
15	12	0	0	0	0	0	20	38	8	0	0	0	0
16	00	0	0	0	0	0	0	0	0	0	0	0	0

	FORM	1
SO2 Station	SITE IDENT	10-3680-030
USSAC	AGENCY	J
Source - Ambient	PROJECT	02
One-Hour	TIME INTVL	1
1983	YEAR	83
May	MONTH	05
Sulfur Dioxide	PARAMETER	42401
Flame Photometric	METHOD	16
Parts Per Billion	UNITS	08
	DP	0

DAY	ST HR	RDG 1	RDG 2	RDG 3	RDG 4	RDG 5	RDG 6	RDG 7	RDG 8	RDG 9	RDG10	RDG11	RDG12
16	12	0	0	0	0	0	0	0	0	0	0	0	0
17	00	0	0	0	0	0	0	3	3	7	6	10	7
17	12	0	0	0	0	0	0	0	0	0	0	0	0
18	00	0	0	0	0	0	0	0	0	0	0	0	0
18	12	0	0	0	0	0	0	0	0	0	0	0	0
19	00	0	0	0	0	0	0	0	0	0	0	0	0
19	12	0	0	0	0	0	0	0	0	0	0	0	0
20	00	0	0	0	0	0	0	0	0	0	0	0	0
20	12	0	0	0	0	0	0	0	0	0	0	0	0
21	00	0	0	0	0	0	0	0	0	0	0	0	0
21	12	0	0	0	0	0	0	0	0	0	0	0	0
22	00	0	0	0	0	0	0	0	0	0	0	0	0
22	12	0	0	0	0	0	1	63	42	2	0	0	0
23	00	0	0	0	0	0	0	0	0	0	0	0	0
23	12	0	0	0	0	0	0	7	88	37	16	3	0
24	00	0	0	0	0	0	0	0	0	6	15	22	4
24	12	3	0	4	0	0	0	0	0	0	7	3	0
25	00	0	4	10	0	5	2	0	7	11	9	10	3
25	12	12	3	22	20	17	25	13	20	18	12	13	10
26	00	7	4	3	5	10	13	14	18	30	20	18	13
26	12	17	23	30	20	25	20	17	21	20	21	27	7
27	00	8	8	8	8	8	10	17	12	8	6	0	0
27	12	0	0	0	0	0	0	0	0	0	0	0	0
28	00	0	0	0	0	0	0	0	0	0	0	0	0
28	12	0	0	0	0	0	0	0	0	0	0	0	0
29	00	0	0	0	0	0	0	0	0	0	0	0	0
29	12	0	0	0	0	0	0	0	0	0	0	0	0
30	00	0	0	0	0	0	0	0	0	0	0	0	0
30	12	0	0	0	0	0	0	0	0	0	0	0	0
31	00	0	0	0	0	0	0	0	0	0	9	4	12
31	12	20	0	0	1	7	0	0	0	0	0	0	0

SO2 Station Sulfur Dioxide May 1983

Day	No. of Hourly Samples	Daily Average (PPB)	High 3-Hour Average	Period
1	24	0.0	0.0	
2	24	5.4	33.0	2000-2259
3	24	.5	3.7	0- 259
4	24	1.8	9.3	1900-2159
5	24	1.0	4.7	1300-1559
6	24	0.0	0.0	
7	24	0.0	0.0	
8	24	6.5	37.7	1700-1959
9	24	1.6	11.0	1800-2059
10	24	0.0	0.0	
11	24	0.0	0.0	
12	24	0.0	0.0	
13	24	0.0	0.0	
14	24	0.0	0.0	
15	24	2.7	22.0	1700-1959
16	24	0.0	0.0	
17	24	1.5	7.7	800-1059
18	24	0.0	0.0	
19	24	0.0	0.0	
20	24	0.0	0.0	
21	24	0.0	0.0	
22	24	4.5	35.7	1800-2059
23	24	6.3	47.0	1900-2159
24	24	2.7	14.3	800-1059
25	24	10.2	20.7	1500-1759
26	24	16.8	25.0	1400-1659
27	24	3.9	13.0	500- 759
28	24	0.0	0.0	
29	24	0.0	0.0	
30	24	0.0	0.0	
31	24	2.2	12.0	1000-1259

Total # Hours in Month - 744
Total # Hourly Samples - 744
Percent Data Acquisition - 100%

	FORM	1
SO2 Station	SITE IDENT	10-3680-030
USSAC	AGENCY	J
Source - Ambient	PROJECT	02
One-Hour	TIME INTVL	1
1983	YEAR	83
June	MONTH	06
Sulfur Dioxide	PARAMETER	42401
Flame Photometric	METHOD	16
Parts Per Billion	UNITS	08
	DP	0

DAY	ST HR	RDG 1	RDG 2	RDG 3	RDG 4	RDG 5	RDG 6	RDG 7	RDG 8	RDG 9	RDG10	RDG11	RDG12
16	12												
17	00												
17	12												
18	00												
18	12												
19	00												
19	12												
20	00												
20	12												
21	00												
21	12												
22	00												
22	12												
23	00												
23	12												
24	00												
24	12												
25	00												
25	12												
26	00												
26	12												
27	00												
27	12												
28	00												
28	12												
29	00												
29	12												
30	00												
30	12												

	FORM	1
SO2 Station	SITE IDENT	10-3680-030
USSAC	AGENCY	J
Source - Ambient	PROJECT	02
One-Hour	TIME INTVL	1
1983	YEAR	83
June	MONTH	06
Sulfur Dioxide	PARAMETER	42401
Flame Photometric	METHOD	16
Parts Per Billion	UNITS	08
	DP	0

DAY	ST HR	RDG 1	RDG 2	RDG 3	RDG 4	RDG 5	RDG 6	RDG 7	RDG 8	RDG 9	RDG10	RDG11	RDG12
01	00	0	0	0	0	0	0	0	0	0	0	0	1
01	12	3	1	25	18	2	6	15	45	18	9	6	0
02	00	0	0	0	0	0	0	0	0	0	0	0	0
02	12	0	0	0	0	0	0	0	0	0	0	0	0
03	00	0	0	0	0	0	0	0	0	0	0	0	
03	12												
04	00												
04	12												
05	00												
05	12												
06	00												
06	12												
07	00												
07	12												
08	00												
08	12												
09	00												
09	12												
10	00												
10	12												
11	00												
11	12												
12	00												
12	12												
13	00												
13	12												
14	00												
14	12												
15	00												
15	12												
16	00												

Day	No. of Hourly Samples	Daily Average (PPB)	High 3-Hour Average	Period
1	24	6.2	26.0	1800-2059
2	24	0.0	0.0	
3	11	0.0	0.0	
4	0			
5	0			
6	0			
7	0			
8	0			
9	0			
10	0			
11	0			
12	0			
13	0			
14	0			
15	0			
16	0			
17	0			
18	0			
19	0			
20	0			
21	0			
22	0			
23	0			
24	0			
25	0			
26	0			
27	0			
28	0			
29	0			
30	0			

Total # Hours in Month - 720
Total # Hourly Samples - 59
Percent Data Acquisition - 8%

QUALITY ASSURANCE DATA SHEET

PRECISION OF AUTOMATED SAMPLERS

Site Name USSAC SAROAD # 10-3680-030-J05

SO_2 Monitor; Make Meloy Model 285 Ser No. 8C067

NO_x Monitor; Make Model Ser No.

Year 1983 Month Day	3/2	3/16	3/29	4/12	4/20	4/29	5/3	5/10	5/19	5/27	6/2	
SO_2 - Parameter Code Indicated ppm (Yi)	0.090	0.092	0.080	0.090	0.095	0.090	0.093	0.095	0.090	0.100	0.098	
Injected ppm (Xi)	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	
NO - Parameter Code Indicated ppm (Yi)	-10%	-8%	-20%	-10%	-5%	-10%	-7%	-5%	-10%	0%	-2%	
Injected ppm (Xi)												
NO_x - Parameter Code Indicated ppm (Yi)												
Injected ppm (Xi)												

SKEC-8

Computation of Precision

$n = 11$

$$d_j = \frac{1}{11} \sum d_i = \frac{-87}{11} = -7.91$$

$$S_j = \sqrt{\frac{1}{n-1}\left[\sum_1^n d_i^2 - \frac{1}{n}\left(\sum_1^n d_i\right)^2\right]}$$

$$= \sqrt{\frac{1}{10}\left[967 \quad - \frac{1}{11}(7569)\right]} = \sqrt{\frac{1}{10}\left[278.9\right]}$$

$$\cong \quad 5.28$$

$$\text{Upper} = -7.91 + 1.96 \overset{10.35}{(5.28)} = +2.4\%$$

$$\text{Lower} = -7.91 - 10.35 = -18.3\%$$

QUALITY ASSURANCE SHEET
ACCURACY OF AUTOMATED SAMPLERS

Site Name USSAC SAROAD NO. 10-3680-030-J05

SO_2 Monitor; Make Meloy Model 285 Ser.No. 8C067

SO2 Calibrator; Make ___ Model ___ Ser.No. ___

SO2 Calibration Gas Source; SKEC Dilution using Scott 49.61 ppm Certified Gas

NO_x Monitor' Make ___ Model ___ Ser.No. ___

NO_x Calibrator; Make ___ Model ___ Ser.No. ___

NO_x Calibration Gas Source ___

Date of Independent Audit; SO2 3-16-83 NO_x ___

SO_2 - PARAMETER CODE		INDICATED ppm(Yi)	INJECTED ppm(Xi)	
UP	Level 1 (.03 to .08)			
	Level 2 (.15 to .20)			
	Level 3 (.40 to .45)			
	Level 4 (.80 to .90)			
DOWN	Level 1 (.03 to .08)	0.095	0.086	+10.5%
	Level 2 (.15 to .20)	0.206	0.198	+4.0%
	Level 3 (35 ~~.40~~ to .45)	0.392	0.378	+3.7%
	Level 4 (.80 to .90)			

NO_x - PARAMETER CODE		INDICATED ppm(Yi)	INJECTED ppm(Xi)
UP	Level 1 (.03 to .08)		
	Level 2 (.15 to .20)		
	Level 3 (.40 to .45)		
	Level 4 (.80 to .90)		
DOWN	Level 1 (.03 to .08)		
	Level 2 (.15 to .20)		
	Level 3 (.40 to .45)		
	Level 4 (.80 to .90)		

SKEC-6

QUALITY ASSURANCE SHEET
ACCURACY OF AUTOMATED SAMPLERS

Site Name USSAC SAROAD NO. 10-3680-030-J05

SO2 Monitor; Make Melox Model 285 Ser.No. 8C067

SO2 Calibrator; Make ______ Model ______ Ser.No. ______

SO2 Calibration Gas Source; SKEC Dilution using Scott 49.6ppm Cert. Gas

NOx Monitor' Make ______ Model ______ Ser.No. ______

NOx Calibrator; Make ______ Model ______ Ser.No. ______

NOx Calibration Gas Source. ______

Date of Independent Audit; SO2 6-2-83 NOx ______

SO2 - PARAMETER CODE ______		INDICATED ppm(Yi)	INJECTED ppm(Xi)	
UP	Level 1 (.03 to .08)			
	Level 2 (.15 to .20)			
	Level 3 (.40 to .45)			
	Level 4 (.80 to .90)			
DOWN	Level 1 (.03 to .08)	0.089	0.087	+2.3%
	Level 2 (.15 to .20)	0.200	0.195	-2.5%
	Level 3 (.40 to .45)	0.394	0.394	0%
	Level 4 (.80 to .90)			

NOx - PARAMETER CODE ______		INDICATED ppm(Yi)	INJECTED ppm(Xi)
UP	Level 1 (.03 to .08)		
	Level 2 (.15 to .20)		
	Level 3 (.40 to .45)		
	Level 4 (.80 to .90)		
DOWN	Level 1 (.03 to .08)		
	Level 2 (.15 to .20)		
	Level 3 (.40 to .45)		
	Level 4 (.80 to .90)		

Computation of Accuracy

Level 1 $$D = \frac{10.5 + 2.3}{2} = \frac{12.8}{2} = 6.4$$

$$S_a = \sqrt{\frac{1}{k-1}\left[\sum_{i=1}^{k} d_i^2 - \frac{1}{k}\left(\sum d_i\right)^2\right]}$$

$$= \sqrt{115.54 - \frac{1}{2}\overset{81.92}{(163.84)}} = \sqrt{33.62} = 5.8$$

$$\text{Upper} = 6.4 + \overset{11.4}{1.96(5.8)} = 17.8\,\%$$

$$\text{Lower} = 6.4 - 1.96(5.8) = -5.0\,\%$$

Level 2 $$D = \frac{+4.0 - 2.5}{2} = +0.75$$

$$S_a = \sqrt{22.25 - 1.13} = \sqrt{21.12} = 4.60$$

$$\text{Upper} = +0.75 + 1.96(4.60) = +9.8\,\%$$

$$\text{Lower} = +0.75 - 1.96(4.60) = -8.3\,\%$$

Level 3 $$D = \frac{3.7 + 0}{2} = 1.85$$

$$S_a = \sqrt{13.69 - \frac{13.69}{2}} = \sqrt{6.85} = 2.62$$

$$\text{Upper} = +1.85 + \overset{5.14}{1.96(2.62)} = +7.0\,\%$$

$$\text{Lower} = 1.85 - 1.96(2.62) = -3.3\,\%$$