10-11-95

October 11, 1995

Mr. C. H. Fancy
Chief, Bureau of Air Regulation
Florida Department of Environmental Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

RE: AC 29-209018, PSD-FL-215

Dear Mr. Fancy:

Enclosed are the six copies of **Section 6** of the Gulf Coast PSD application as I noted in the package of binders sent to you on Tuesday, October 10, 1995. Please insert them in the appropriate section of each binder. Also enclosed is a diskette containing an ELSA version of **Section 6**. I apologize for the delay and any inconvenience this may have caused you.

Sincerely,

LAKE ENGINEERING, INC.

Larry G. Carlson

Larry G. Carlson
Air Pollution Compliance Specialist

LGC:shm
Enclosures

460.2.1
\460-95\1011FANC.23L

6.0
APPLICATION FORMS

The next 40 pages consist of the completed DEP application forms.

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF AIR RESOURCES MANAGEMENT

APPLICATION FOR AIR PERMIT - LONG FORM

I. APPLICATION INFORMATION

Identification of Facility Addressed in This Application

GULF COAST RECYCLING, INC.
1901 NORTH 66th STREET
TAMPA, FLORIDA 33619

Owner/Authorized Representative or Responsible Official

1. Name and Title of Owner/Authorized Representative or Responsible Official :

Name : Willis M. Kitchen
Title : President

2. Owner or Authorized Representative or Responsible Official Mailing Address :

Organization/Firm : Gulf Coast Recycling, Inc.
Street Address : 1901 N. 66th Street
City : Tampa
State : FL Zip Code : 33619-____

3. Owner/Authorized Representative or Responsible Official Telephone Numbers :

Telephone : (813)626-6151 Fax : (813)622-8388

4. Owner/Authorized Representative or Responsible Official Statement :

I, the undersigned, am the owner or authorized representative of the facility (non-Title V source) addressed in this Application for Air Permit or the responsible official, as defined in Chapter 62-213, F.A.C., of the Title V source addressed in this application, whichever is applicable. I hereby certify, based on information and belief formed after reasonable inquiry, that the statements made in this application are true, accurate and complete and that, to the best of my knowledge, any estimates of emissions reported in this application are based upon reasonable techniques for calculating emissions. Further, I agree to operate and maintain the air pollutant emissions units and air pollution control equipment described in this application so as to comply with all applicable standards for control of air pollutant emissions found in the statutes of the State of Florida and rules of the Department of Environmental Protection and revisions thereof. If the purpose of this application is to obtain an air operation permit or operation permit revision for one or more emissions units which have undergone construction or modification, I certify that, with the exception of any changes detailed as part of this application, each such emissions unit has been constructed or modified in substantial accordance with the information given in the corresponding application for air construction permit and with all provisions contained in such permit. I understand that a permit, if granted by the Department, cannot be transferred without authorization from the Department, and I will promptly notify the Department upon sale or legal transfer of any permitted emissions unit.*

Willis M. Kitchen
Signature

Oct. 12th, 1995
Date

* Attach letter of authorization if not currently on file.

Scope of Application

Emissions Unit ID	Description of Emissions Unit
1, 4, 6	Blast Furnace

Purpose of Application and Category

Category I : All Air Operation Permit Applications Subject to Processing Under Chapter 62-213, F.A.C.

This Application for Air Permit is submitted to obtain :

[ ] Initial air operation permit under Chapter 62-213, F.A.C., for an existing facility which is classified as a Title V source.

[ ] Initial air operation permit under Chapter 62-213, F.A.C., for a facility which, upon start up of one or more newly constructed or modified emissions units addressed in this application, would become classified as a Title V source.

Current construction permit number :

[ ] Air operation permit renewal under Chapter 62-213, F.A.C., for a Title V source.

Operation permit to be renewed :

[ ] Air operation permit revision for a Title V source to address one or more newly constructed or modified emissions units addressed in this application.

Current construction permit number :

Operation permit to be revised :

[ ] Air operation permit revision or adminstrative correction for a Title V source to address one or more proposed new or modified emissions units and to be processed concurrently with the air construction permit application.

Operation permit to be revised/corrected :

[ ] Air operation permit revision for a Title V source for reasons other than construction or modification of an emissions unit.

Operation permit to be revised :

Reason for revision :

Category II : All Air Operation Permit Applications Subject to Processing Under Rule 62-210.300(2)(b), F.A.C.

This Application for Air Permit is submitted to obtain :

[ ] Initial air operation permit under Rule 62-210.300(2)(b), F.A.C., for an existing facility seeking classification as a synthetic non-Title V source.

Current operation/construction permit number(s) :

[ ] Renewal air operation permit under Fule 62-210.300(2)(b), F.A.C., for a synthetic non-Title V source.

Operation permit to be renewed :

[ ] Air operation permit revision for a synthetic non-Title V source.

Operation permit to be revised :

Reason for revision :

Category III : All Air Construction Permit Applications for All Facilities and Emissions Units

This Application for Air Permit is submitted to obtain :

[X] Air construction permit to construct or modify one or more emissions units within a facility (including any facility classified as a Title V source).

Current operation permit number(s), if any :
AO29-173310

[ ] Air construction permit to make federally enforceable an assumed restriction on the potential

emissions of one or more existing, permitted emissions units.

Current operation permit number(s) :

[ ] Air construction permit for one or more existing, but unpermitted, emissions units.

Application Processing Fee

Attached - Amount : NA

Construction/Modification Information

1. Description of Proposed Project or Alterations : This document is a revised PSD application for the installation of a 60-ton blast furnace replacing two smaller furnaces.
2. Projected or Actual Date of Commencement of Construction : 11/ 1/84
3. Projected Date of Completion of Construction : 12/ 1/84

Professional Engineer Certification

1. Professional Engineer Name : Frank J. Burbach Registration Number : 42496
2. Professional Engineer Mailing Address : Organization/Firm : Lake Engineering, Inc. Street Address : 35 Glenlake Parkway, Suite 500 City : Atlanta State : GA Zip Code : 30328-____
3. Professional Engineer Telephone Numbers : Telephone : (770)395-0464 Fax : (770)395-0474
4. Professional Engineer Statement : *I, the undersigned, hereby certified, except as particularly noted herein*, that :* *(1) To the best of my knowledge, there is reasonable assurance (a) that the air pollutant emissions unit(s) and the air pollutant control equipment described in this Application for Air Permit, when properly operated and maintained, will comply with all applicable standards for control of air pollutant emissions in the Florida Statues and rules of the Department of Environmental Protection; or (b) for any application for a TitleV source air operation permit, that each emissions unit described in this Application for Air Permit, when properly operated and maintained, will comply with the applicable requirements identified in the application to which the unit is subject, except those emissions units for which a compliance schedule is submitted with this application;* *(2) To the best of my knowledge, any emission estimates reported or relied on in this application are true, accurate, and complete and are either based upon reasonable techniques available for calculating emissions or, for emission estimates of hazardous air pollutants not regulated for an emissions unit addressed in this application, based solely upon the materials, information and calculations submitted with this application; and* *(3) For any application for an air construction permit for one or more proposed new or modified emissions units, the engineering features of each such emissions unit described in this application have been designed or examined by me or individuals under my direct supervision and found to be in conformity with sound engineering principles applicable to the control of emissions of the air pollutants characterized in this application.* Frank J. Burbach 10/11/95 Signature Date

* Attach any exception to certification statement.

DEP Form No. 62-210.900(1) - Form

Application Contact

1. Name and Title of Application Contact : Name : George Townsend Title :
2. Application Contact Mailing Address : Organization/Firm : Gulf Coast Recycling, Inc. Street Address : 1901 N. 66th Street City : Tampa State : FL Zip Code : 33619-____
3. Application Contact Telephone Numbers : Telephone : (813)626-6151 Fax : (813)622-8388

Application Comment

The application fee was submitted with the original submittal in May 1994.

II. FACILITY INFORMATION

A. GENERAL FACILITY INFORMATION

Facility Name, Location, and Type

1. Facility Owner or Operator :
Gulf Coast Recycling, Inc.

2. Facility Name : Gulf Coast Recycling, Inc.

3. Facility Identification Number : 0057

4. Facility Location Information :

GULF COAST RECYCLING, INC.
1901 NORTH 66th STREET
TAMPA, FLORIDA 33619

Facility Street Address : 1901 N. 66th Street
City : Tampa
County : Hillsborough   Zip Code : 33619-____

5. Facility UTM Coordinates :

Zone : 17   East (km) : 364.00   North (km) : 3093.60

6. Facility Latitude/Longitude :

Latitude (DD/MM/SS) : 27 57 43   Longitude (DD/MM/SS) : 82 22 49

7. Governmental Facility Code :	8. Facility Status Code :	9. Relocatable Facility ?	10. Facility Major Group SIC Code :
0	A	N	33

11. Facility Comment :

Facility Contact

1. Name and Title of Facility Contact : Name : George Townsend Title :
2. Facility Contact Mailing Address : Organization/Firm : Gulf Coast Recycling, Inc. Street Address : 1901 N. 66th Street City : Tampa State : FL Zip Code : 33619-____
3. Facility Contact Telephone Numbers : Telephone : (813)626-6151 Fax : (813)622-8388

Facility Regulatory Classifications

1. Small Business Stationary Source?	N
2. Title V Source?	Y
3. Synthetic Non-Title V Source?	N
4. Major Source of Pollutants Other than Hazardous Air Pollutants (HAPs)?	Y
5. Synthetic Minor Source of Pollutants Other than HAPs?	N
6. Major Source of Hazardous Air Pollutants (HAPs)?	N
7. Synthetic Minor Source of HAPs?	Y
8. One or More Emissions Units Subject to NSPS?	Y
9. One or More Emission Units Subject to NESHAP?	Y
10. Title V Source by EPA Designation?	N
11. Facility Regulatory Classifications Comment : Although this facility is classified as a Title V source, the scope of this application does not include a Title V application. Regulatory classifications are after construction being proposed in this application is complete.	

D. FACILITY SUPPLEMENTAL INFORMATION

Supplemental Requirements for All Applications

1. Area Map Showing Facility Location :	Figure 1.1
2. Facility Plot Plan :	Figure 1.2
3. Process Flow Diagram(s) :	Figure 1.3
4. Precautions to Prevent Emissions of Unconfined Particulate Matter :	NA
5. Fugitive Emissions Identification :	NA
6. Supplemental Information for Construction Permit Application :	NA

Additional Supplemental Requirements for Category I Applications Only

7. List of Insignificant Activities :	NA
8. List of Equipment/Activities Regulated under Title VI :	NA
9. Alternative Methods of Operation :	NA
10. Alternative Modes of Operation (Emissions Trading) :	NA
11. Enhanced Monitoring Plan :	NA
12. Risk Management Plan Verification :	NA
13. Compliance Report and Plan :	NA
14. Compliance Statement (Hard-copy Required) :	NA

III. EMISSIONS UNIT INFORMATION

A. GENERAL EMISSIONS UNIT INFORMATION

Emissions Unit Information Section 1

Blast Furnace

Type of Emissions Unit Addressed in This Section

[X] This Emissions Unit Information Section addresses, as a single emissions unit, a single process or production unit, or activity, which produces one or more air pollutants and which has at least one definable emission point (stack or vent).

[ ] This Emissions Unit Information Section addresses, as a single emissions unit, an individually-regulated emission point (stack or vent) serving a single process or production unit, or activity, which also has other individually-regulated emission points.

[ ] This Emissions Unit Information Section addresses, as a single emissions unit, a collectively-regulated group of process or production units and activities which has at least one definable emission point (stack or vent) but may also produce fugitive emissions only.

[ ] This Emissions Unit Information Section addresses, as a single emissions unit, one or more process or production units and activities which produce fugitive emissions only.

Emissions Unit Information Section 1

Emissions Unit Description and Status

1. Description of Emissions Unit Addressed in This Section : Blast Furnace		
2. ARMS Identification Number : 1, 4, 6		
3. Emissions Unit Status Code : A	4. Acid Rain Unit? N	5. Emissions Unit Major Group SIC Code : 33
6. Initial Startup Date : 12/ 1/84		
7. Long-term Reserve Shutdown Date :		
8. Package Unit : Manufacturer : Model Number :		
9. Generator Nameplate Rating : MW		
10. Incinerator Information : Dwell Temperature : °F; Dwell Time : seconds; Incinerator Afterburner Temperature : °F		
11. Emissions Unit Comment : This emission unit includes the furnace exhaust (ID 01), tapping (ID 04), and charging (ID 06) operations.		

Emissions Unit Information Section 1

Blast Furnace

Emissions Unit Control Equipment 1

1. Description :

Existing baghouse on Furnace Exhaust (ID 01)

Mfr: assembled by Gulf Coast
Model: NA
Cleaning Mechanism: Shaker type
Air-To-Cloth Ratio: 0.63:1
Design Flow: 35,000 acfm (w/prop. afterburner)
Efficiency Rating: 99%
Outlet Temperature: 200 deg. F (w/prop. afterburner)
Pressure Drop: 1-7" H2O
Cleaning Cycle Duration: 1 min.
Cleaning Cycle Frequency: 4x/day
Delay Periods: 35 mins.
Bag Material: 10 oz. Acrylic, snow filtration, sateen weave

2. Control Device or Method Code : 17

Emissions Unit Information Section 1

Blast Furnace

Emissions Unit Control Equipment 2

1. Description : Existing baghouse on Tapping Hood (ID 04) Mfr: assembled by Gulf Coast Model: NA Cleaning Mechanism: Shaker type Air-To-Cloth Ratio: 1.45:1 Design Flow: 7,000 acfm Efficiency Rating: 99% Outlet Temperature: 100 deg. F Pressure Drop: 1-4" H2O Cleaning Cycle Duration: 2 mins. Cleaning Cycle Frequency: 1x/day Delay Periods: 24 hrs. Bag Material: 10 oz. Acrylic, snow filtration, sateen weave	
2. Control Device or Method Code :	18

Emissions Unit Information Section 1

Blast Furnace

Emissions Unit Control Equipment 3

1. Description :

   Existing baghouse on Charging Hood (ID 04)

   Mfr: assembled by Gulf Coast
   Model: NA
   Cleaning Mechanism: Shaker type
   Air-To-Cloth Ratio: 1.21:1
   Design Flow: 9,000 acfm
   Efficiency Rating: 99%
   Outlet Temperature: 100 deg. F
   Pressure Drop: 1-4" H2O
   Cleaning Cycle Duration: 2 mins.
   Cleaning Cycle Frequency: 1x/day
   Delay Periods: 24 hrs.
   Bag Material: 10 oz. Acrylic, snow filtration, sateen weave

2. Control Device or Method Code : 18

Emissions Unit Information Section 1

Blast Furnace

Emissions Unit Control Equipment 4

1. Description : Proposed Feed Desulfurization System Mfr.: M.A. Industries, Inc. Model: M.A. 41 Efficiency Rating: 1% S content of total Pb feed to furnace (see Appendix O)	
2. Control Device or Method Code :	46

Emissions Unit Information Section 1

Blast Furnace

Emissions Unit Control Equipment 5

1. Description :

   Proposed Afterburner on Furnace Exhaust (ID 01)

   Mfr.: Not yet selected
   Model: Not yet selected
   Min. Chamber Temperature: 1400 deg. F
   Retention Time: 0.5-2.0 secs.
   Efficiency Rating: 90% for CO, 95% for VOCs

2. Control Device or Method Code : 21

Emissions Unit Information Section 1

Blast Furnace

Emissions Unit Operating Capacity

1. Maximum Heat Input Rate :	15 mmBtu/hr
2. Maximum Incinerator Rate :	lb/hr tons/day
3. Maximum Process or Throughput Rate :	13000
Units :	lbs/hr
4. Maximum Production Rate :	7900
Units :	lbs/hr
5. Operating Capacity Comment :	

Emissions Unit Information Section 1

Blast Furnace

Emissions Unit Operating Schedule

Requested Maximum Operating Schedule :

24 hours/day	7 days/week
52 weeks/year	8760 hours/year

B. EMISSIONS UNIT REGULATIONS

Emissions Unit Information Section 1

Blast Furnace

Rule Applicability Analysis

40 CFR Part 60.122, Subpart L (NSPS)
40 CFR Part 52.535
17-2.650 (2)(b)1
17-2.500
17-2.700

C. EMISSION POINT (STACK/VENT) INFORMATION

Emissions Unit Information Section 1

Blast Furnace

Emission Point Description and Type :

1. Identification of Point on Plot Plan or Flow Diagram :	Blast Furnace	
2. Emission Point Type Code :	1	
3. Descriptions of Emission Points Comprising this Emissions Unit : Furnace Exhaust, ID 01, Tapping Hood, ID 04, Charging Hood, ID 06 It will be assumed that all pollutants exhaust through the main furnace exhaust baghouse, ID 01.		
4. ID Numbers or Descriptions of Emission Units with this Emission Point in Common :		
5. Discharge Type Code :	V	
6. Stack Height :	150	feet
7. Exit Diameter :	3.0	feet
8. Exit Temperature :	200	°F
9. Actual Volumetric Flow Rate :	35000	acfm
10. Percent Water Vapor :	3.50	%
11. Maximum Dry Standard Flow Rate :	27020	dscfm
12. Nonstack Emission Point Height :		feet
13. Emission Point UTM Coordinates : Zone : 17 East (km) : 364.050 North (km) : 3093.550		
14. Emission Point Comment : The flow rate and temperature given are with the proposed afterburner.		

D. SEGMENT (PROCESS/FUEL) INFORMATION

Emissions Unit Information Section 1

Blast Furnace

Segment Description and Rate : Segment 1

1. Segment Description (Process/Fuel Type and Associated Operating Method/Mode) : Lead scrap, coke, limestone, iron, and slag charged in furnace (emissions related to tons processed)	
2. Source Classification Code (SCC) :	
3. SCC Units : Tons Processed	
4. Maximum Hourly Rate : 6.500	5. Maximum Annual Rate : 56940
6. Estimated Annual Activity Factor :	
7. Maximum Percent Sulfur : 0.83	8. Maximum Percent Ash : 0.3
9. Million Btu per SCC Unit : 12	
10. Segment Comment : Sulfur content calculated by: lead scrap S content of 1% x 79.2% charge rate + coke S content of 0.58% x 7% charge rate = 0.79% + 0.04% = 0.83% Ash percent calculated by: Coke ash content of 5.4% x 7% charge rate: 0.38% Btu per SCC Unit calculated by: 13,000 Btu/lb coke x 2,000 lbs/ton = 26 mmBtu/ton coke 6.5 tons/hr charge rate x 7% coke = 0.455 tons/hr coke x 26mmBtu/ton coke = 11.83 mmBtu/ton charge (Btu's assumed only from coke)	

E. POLLUTANT INFORMATION

Emissions Unit Information Section 1

Blast Furnace

Pollutant Potential/Estimated Emissions : Pollutant 1

1. Pollutant Emitted : SO2	
2. Total Percent Efficiency of Control : 66.0 %	
3. Primary Control Device Code : 046	
4. Secondary Control Device Code :	
5. Potential Emissions : 520.0000 lb/hour	2277.6000 tons/year
6. Synthetically Limited? N	
7. Range of Estimated Fugitive/Other Emissions:	to tons/year
8. Emissions Factor : 80.00000 Units : lbs/ton charge Reference : AP-42	
9. Emissions Method Code : 3	
10. Calculations of Emissions : 6.5 tons charge/hr (requested) x 80 lbs SO2/ton charge = 520 lbs SO2/hr 520 lbs/hr x 8,760 hrs/yr / 2,000 lbs/ton = 2,277.6 tons SO2/yr	
11. Pollutant Potential/Estimated Emissions Comment :	

E. POLLUTANT INFORMATION

Emissions Unit Information Section 1

Blast Furnace

Pollutant Potential/Estimated Emissions : Pollutant 2

1. Pollutant Emitted : PB	
2. Total Percent Efficiency of Control : 99.8 %	
3. Primary Control Device Code : 017	
4. Secondary Control Device Code :	
5. Potential Emissions : 2.0900 lb/hour	9.1500 tons/year
6. Synthetically Limited? N	
7. Range of Estimated Fugitive/Other Emissions:	to tons/year
8. Emissions Factor : Units : Reference :	
9. Emissions Method Code :	
10. Calculations of Emissions :	
11. Pollutant Potential/Estimated Emissions Comment : Potential emissions are current permitted levels.	

DESCRIPTION

Emissions Unit Information Section 1

Blast Furnace

Pollutant Information Section 2

Allowable Emissions 1

1. Basis for Allowable Emissions Code : ESCPSD	
2. Future Effective Date of Allowable Emissions :	
3. Requested Allowable Emissions and Units :	
4. Equivalent Allowable Emissions : 0.1340 lb/hour	0.5900 tons/year
5. Method of Compliance : Annual source test with process rate within 10% of max., production records	
6. Pollutant Allowable Emissions Comment (Desc. of Related Operating Method/Mode) :	

E. POLLUTANT INFORMATION

Emissions Unit Information Section 1

Blast Furnace

Pollutant Potential/Estimated Emissions : Pollutant 3

1. Pollutant Emitted : PM			
2. Total Percent Efficiency of Control : 99.8 %			
3. Primary Control Device Code : 017			
4. Secondary Control Device Code :			
5. Potential Emissions :	3.2000 lb/hour	14.0200 tons/year	
6. Synthetically Limited? N			
7. Range of Estimated Fugitive/Other Emissions:		to	tons/year
8. Emissions Factor : Units : Reference :			
9. Emissions Method Code :			
10. Calculations of Emissions :			
11. Pollutant Potential/Estimated Emissions Comment : Potential emissions are current permitted levels.			

E. POLLUTANT INFORMATION

Emissions Unit Information Section 1

Blast Furnace

Pollutant Potential/Estimated Emissions : Pollutant 4

1. Pollutant Emitted : CO		
2. Total Percent Efficiency of Control : 90.0 %		
3. Primary Control Device Code : 021		
4. Secondary Control Device Code :		
5. Potential Emissions :	683.3200 lb/hour	2292.9400 tons/year
6. Synthetically Limited? N		
7. Range of Estimated Fugitive/Other Emissions:	to	tons/year
8. Emissions Factor : Units : Reference :		
9. Emissions Method Code : 1		
10. Calculations of Emissions :		
11. Pollutant Potential/Estimated Emissions Comment : Based on October 21 and November 4, 1991 source test.		

DESCRIPTION

Emissions Unit Information Section 1

Blast Furnace

Pollutant Information Section 4

Allowable Emissions 1

1. Basis for Allowable Emissions Code : OTHER	
2. Future Effective Date of Allowable Emissions :	
3. Requested Allowable Emissions and Units :	
4. Equivalent Allowable Emissions : 68.3310 lb/hour	299.2900 tons/year
5. Method of Compliance : Maintenance of afterburner temperature and residence time.	
6. Pollutant Allowable Emissions Comment (Desc. of Related Operating Method/Mode) : Allowable emissions requested as BACT.	

E. POLLUTANT INFORMATION

Emissions Unit Information Section 1

Blast Furnace

Pollutant Potential/Estimated Emissions : Pollutant 5

1. Pollutant Emitted : NOX				
2. Total Percent Efficiency of Control :	%			
3. Primary Control Device Code :				
4. Secondary Control Device Code :				
5. Potential Emissions :	1.9800	lb/hour	8.6700	tons/year
6. Synthetically Limited? N				
7. Range of Estimated Fugitive/Other Emissions:			to	tons/year
8. Emissions Factor : Units : Reference :				
9. Emissions Method Code : 1				
10. Calculations of Emissions :				
11. Pollutant Potential/Estimated Emissions Comment : Based on October 21, 1991 source test.				

E. POLLUTANT INFORMATION

Emissions Unit Information Section 1

Blast Furnace

Pollutant Potential/Estimated Emissions : Pollutant 6

1. Pollutant Emitted : VOC		
2. Total Percent Efficiency of Control : 95.0 %		
3. Primary Control Device Code : 021		
4. Secondary Control Device Code :		
5. Potential Emissions :	33.1010 lb/hour	144.9799 tons/year
6. Synthetically Limited? N		
7. Range of Estimated Fugitive/Other Emissions:	to	tons/year
8. Emissions Factor : Units : Reference :		
9. Emissions Method Code : 1		
10. Calculations of Emissions :		
11. Pollutant Potential/Estimated Emissions Comment : Based on October 21, 1991 source test.		

DESCRIPTION

Emissions Unit Information Section 1

Blast Furnace

Pollutant Information Section 6

Allowable Emissions 1

1. Basis for Allowable Emissions Code : OTHER	
2. Future Effective Date of Allowable Emissions :	
3. Requested Allowable Emissions and Units :	
4. Equivalent Allowable Emissions : 1.6550 lb/hour	7.2500 tons/year
5. Method of Compliance : Maintenance of afterburner temperature and residence time.	
6. Pollutant Allowable Emissions Comment (Desc. of Related Operating Method/Mode) : Allowable emissions are a result of the proposed afterburner installation for CO control and for future MACT compliance.	

F. VISIBLE EMISSIONS INFORMATION

Emissions Unit Information Section 1

Blast Furnace

Visible Emissions Limitation : Visible Emissions Limitation 1

1. Visible Emissions Subtype :	VE
2. Basis for Allowable Opacity :	RULE
3. Requested Allowable Opacity : Normal Conditions : Exceptional Conditions : Maximum Period of Excess Opacity Allowed :	 % % min/hour
4. Method of Compliance :	
5. Visible Emissions Comment : 40 CFR 52.535 (c)(1)(ii), (iii), and (iv)	

H. PREVENTION OF SIGNIFICANT DETERIORATION (PSD) INCREMENT TRACKING INFORMATION

Emissions Unit Information Section 1

Blast Furnace

PSD Increment Consumption Determination

1. Increment Consuming for Particulate Matter or Sulfur Dioxide?

[X] The emissions unit is undergoing PSD review as part of this application, or has undergone PSD review previously, for particulate matter or sulfur dioxide. If so, emissions unit consumes increment.

[ ] The facility addressed in this application is classified as an EPA major source pursuant to paragraph (c) of the definition of "major source of air pollution" in Chapter 62-213, F.A.C., and the emissions unit addressed in this section commenced (or will commence) construction after January 6, 1975. If so, baseline emissions are zero, and emissions unit consumes increment.

[ ] The facility addressed in this application is classified as an EPA major source, and the emissions unit began initial operation after January 6, 1975, but before December 27, 1977. If so, baseline emissions are zero, and emissions unit consumes increment.

[ ] For any facility, the emissions unit began (or will begin) initial operation after December 27, 1977. If so, baseline emissions are zero, and emissions unit consumes increment.

[ ] None of the above apply. If so, the baseline emissions of the emissions unit are nonzero. In such case, additional analysis, beyond the scope of this application, is needed to determine whether changes in emissions have occurred (or will occur) after the baseline date that may consume or expand increment.

2. Increment Consuming for Nitrogen Dioxide?

[ ] The emissions unit addressed in this section is undergoing PSD review as part of this application, or has undergone PSD review previously, for nitrogen dioxide. If so, emissions unit consumes increment.

[ ] The facility addressed in this application is classified as an EPA major source pursuant to paragraph (c) of the definition of "major source of air pollution" in Chapter 62-213, F.A.C., and the emissions unit addressed in this section commenced (or will commence) construction after February 8, 1988. If so, baseline emissions are zero, and emissions unit consumes increment.

[ ] The facility addressed in this application is classified as an EPA major source, and the emissions unit began initial operation after February 8, 1988, but before March 28, 1988. If so, baseline emissions are zero, and emissions unit consumes increment.

[ ] For any facility, the emissions unit began (or will begin) initial operation after March 28, 1988. If so, baseline emissions are zero, and emissions unit consumes increment.

[X] None of the above apply. If so, baseline emissions of the emissions unit are nonzero. In such case, additional analysis, beyond the scope of this application, is needed to determine whether changes in emissions have occurred (or will occur) after the baseline date that may consume or expand increment.

3. Increment Consuming/Expanding Code :

PM :	U
SO2 :	C
NO2 :	U

4. Baseline Emissions :

PM :		lb/hour		tons/year
SO2 :	316.6669	lb/hour	1387.0000	tons/year
NO2 :				tons/year

5. PSD Comment :

I. EMISSIONS UNIT SUPPLEMENTAL INFORMATION

Emissions Unit Information Section 1

Blast Furnace

Supplemental Requirements for All Applications

1. Process Flow Diagram :	Figure 1.3
2. Fuel Analysis or Specification :	in Section 6.0
3. Detailed Description of Control Equipment :	Appendix O
4. Description of Stack Sampling Facilities :	Appendix D
5. Compliance Test Report :	NA
6. Procedures for Startup and Shutdown :	NA
7. Operation and Maintenance Plan :	NA
8. Supplemental Information for Construction Permit Application :	NA
9. Other Information Required by Rule or Statue :	NA

Additional Supplemental Requirements for Category I Applications Only

10. Alternative Methods of Operations :	NA
11. Alterntive Modes of Operation (Emissions Trading) :	NA
12. Enhanced Monitoring Plan :	NA

13. Identification of Additional Applicable Requirements : NA

14. Acid Rain Application (Hard-copy Required) :

NA	Acid Rain Part - Phase II (Form No. 62-210.900(1)(a))
NA	Repowering Extension Plan (Form No. 62-210.900(1)(a)1.)
NA	New Unit Exemption (Form No. 62-210.900(1)(a)2.)
NA	Retired Unit Exemption (Form No. 62-210.900(1)(a)3.)

Material Safety Data Sheet

May be used to comply with OSHA's Hazard Communication Standard, 29 CFR 1910.1200. Standard must be consulted for specific requirements.

U.S. Department of Labor
Occupational Safety and Health Administration
(Non-Mandatory Form)
Form Approved
OMB No. 1218-0072

IDENTITY (As Used on Label and List) CAS No. 65996-77-2
Metallurgical Coke

Note: Blank spaces are not permitted. If any item is not applicable, or no information is available, the space must be marked to indicate that.

Section I

Manufacturer's Name: ABC Coke Division, Drummond Co., Inc.	Emergency Telephone Number: (205) 849-1330 Alabama (800) 523-8661 Other (800) 321-4015
Address (Number, Street, City, State, and ZIP Code): P.O. Box 170189	Telephone Number for Information: Same as above
Birmingham, Ala 35217	Date Prepared: 5/7/86
	Signature of Preparer (optional)

Section II — Hazardous Ingredients/Identity Information

Hazardous Components (Specific Chemical Identity; Common Name(s))	OSHA PEL	ACGIH TLV	Other Limits Recommended	% (optional)
Carbon	N/A	N/A	N/A	93 - 94
Ash	N/A	N/A	N/A	5 - 6
Sulfur	N/A	N/A	N/A	0.5 - 0.6

Section III — Physical/Chemical Characteristics

Boiling Point	N/A	Specific Gravity (H_2O = 1)	1.92
Vapor Pressure (mm Hg.)	N/A	Melting Point	N/A
Vapor Density (AIR = 1)	N/A	Evaporation Rate (Butyl Acetate = 1)	N/A

Solubility in Water: NIL

Appearance and Odor: Irregular dark gray lumps. No distinguishing odor.

Section IV — Fire and Explosion Hazard Data

Flash Point (Method Used)	Flammable Limits	LEL	UEL
Ignition temperature approx. 1,000°F		N/A	N/A

Extinguishing Media: Water

Special Fire Fighting Procedures: None

Unusual Fire and Explosion Hazards: None known

AIRS ID 0570057

AIR QUALITY APPLICATION
PREVENTION OF SIGNIFICANT DETERIORATION
FROM THE MODIFICATION OF A
BATTERY RECYCLING FACILITY

RECEIVED
OCT 11 1995
BUREAU OF
AIR REGULATION

Prepared for

GULF COAST RECYCLING, INC.
TAMPA, FLORIDA

Permit Number AO29-173310

Revised App. submitted following "INTENT TO DENY"

Revised October 1995

Prepared by

Lake Engineering, Inc.
35 Glenlake Parkway
Suite 500
Atlanta, Georgia 30328

Telephone (770) 395-0464
Fax (770) 395-0474

460.20001

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CONTENTS (con't)

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APPENDICES

1.0 INTRODUCTION

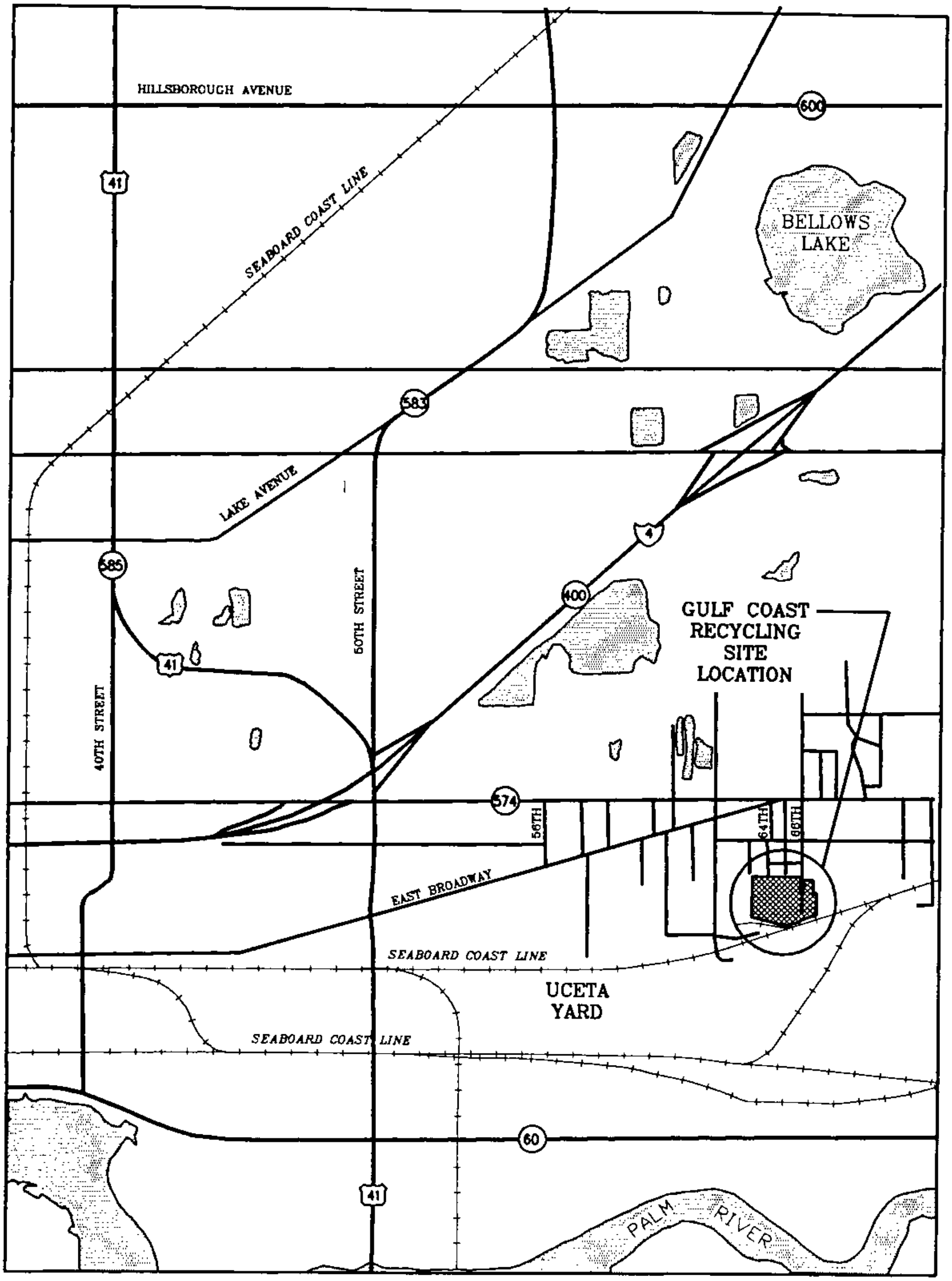
Gulf Coast Recycling, Inc. ("Gulf Coast") is herein making application to the Florida Department of Environmental Protection (DEP) for a Construction Permit to modify a battery recycling facility located southeast of the intersection of Interstate 4 and U.S. Highway 41 in the city of Tampa, Hillsborough County, Florida. The site is depicted on **Figures 1.1 and 1.2**. Based on the emission levels and the location involved, the permitting of this source is subject to the USEPA requirements of 40 CFR §51.166 "Prevention of Significant Deterioration" (PSD) and the corresponding Florida Air Quality Regulations Rule 17-2.500.

This document describes the anticipated air quality impacts from, and the air pollution control techniques used in, the modification of Gulf Coast's facility. It presents a technical demonstration that this modification, which consisted of the replacement of two existing blast furnaces with one furnace 25 percent larger, has and will comply with all applicable state and federal air pollution control regulations. This demonstration generally uses conservative estimates and values regarding control efficiencies and estimates of impacts for purposes of presenting a worst-case scenario. Actual impacts are expected to be significantly less than the projected estimates contained herein.

The actual startup of the new furnace took place in late 1984. This furnace was first permitted on January 28, 1985 by permit number AO29-95366, later by permit number AO29-173310 on July 17, 1990, and finally by amended permit number AO29-173310 on November 19, 1990 (see **Appendix A**). This latter permit expires on November 15, 1995. At the time of the modification it was determined by DEP that no PSD review was required. Subsequent events have, however, determined that a PSD review was applicable and that a full PSD analysis needs to be performed retroactively (see **Appendix B**). The history of the exhaustive permitting process for this modification can be found in the "After-the-Fact Construction Application" previously submitted on February 10, 1992.

1.1 PROCESS DESCRIPTION

In the battery recycling process, discarded automotive and industrial lead-acid storage batteries are crushed and mechanically separated into their component fractions. In this process, the sulfuric acid is drained and neutralized while the plastic casings are segregated and shipped

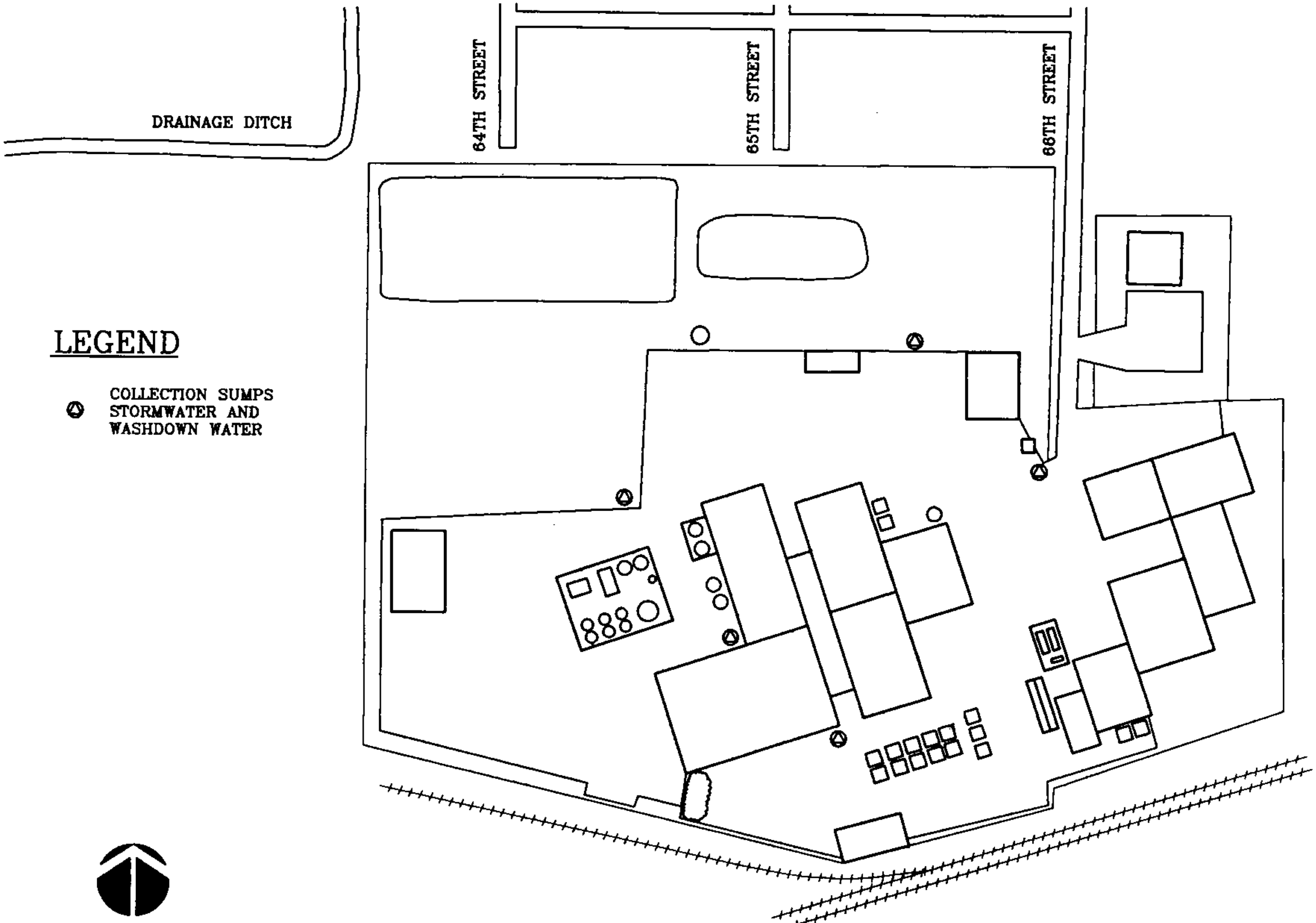


AREA MAP
GULF COAST RECYCLING, INC.
TAMPA, FLORIDA

FIGURE 1.1

460-010 1=1 04-14-94 BKE 460.20001

460-008 1=1 08-18-93 RCW 460.20001



GULF COAST RECYCLING, INC.

FIGURE 1.2

SITE MAP

off-site for further processing and eventual resale. The lead-bearing components are then fed into the blast furnace for lead recovery. The lead is then refined further and eventually combined with alloying metals in refining kettles to produce finished lead alloys meeting customer specifications. Finished lead from the kettles is cast into ingots for shipment and eventual re-use. The major source of air pollution at the facility is the blast furnace which burns metallurgical coke in the smelting of lead scrap. Exhaust gases are emitted to the atmosphere through an existing baghouse and stack. It is this blast furnace which is the subject of this application. A simplified flow diagram is shown on **Figure 1.3**.

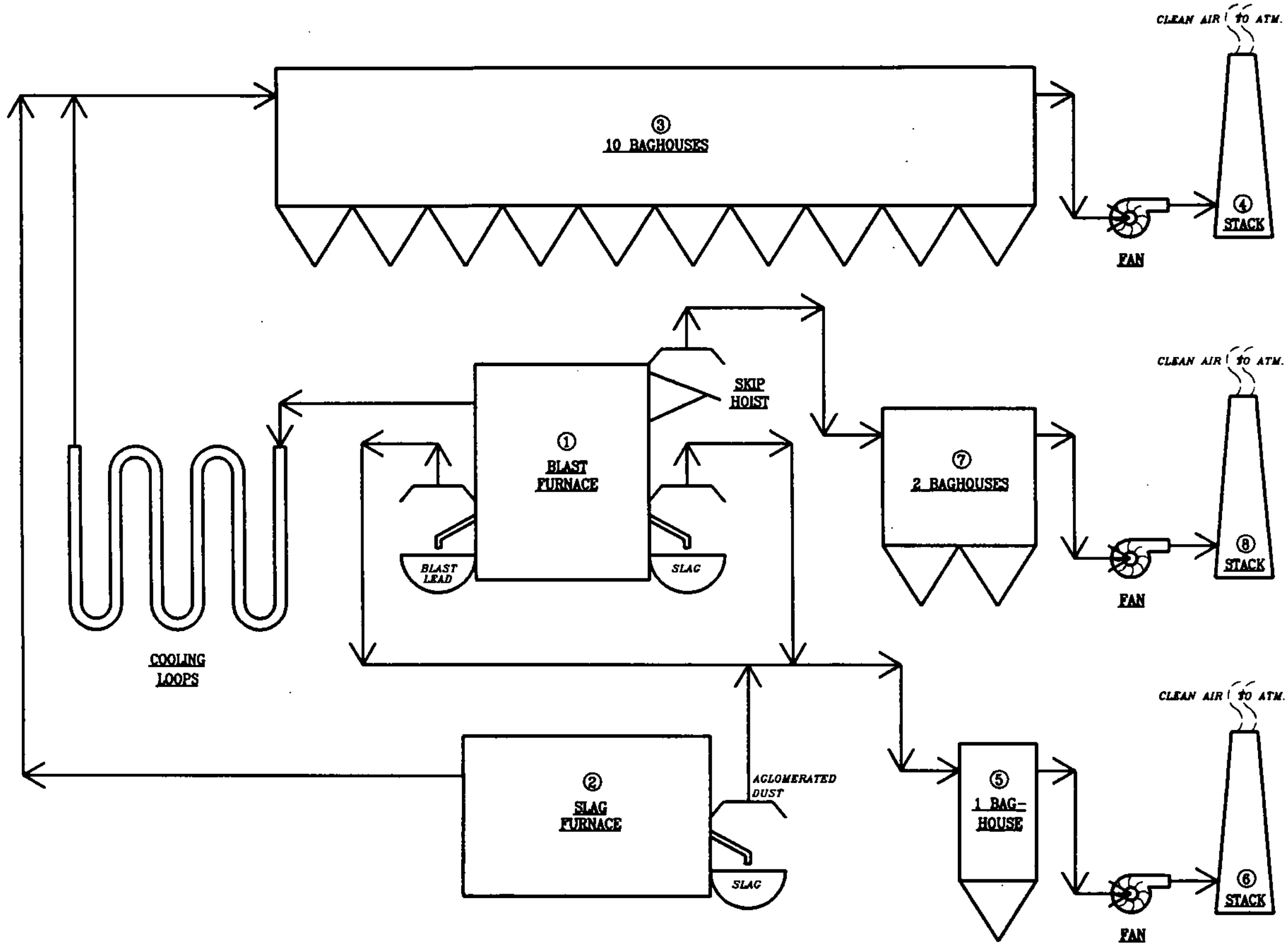
1.2 PSD APPLICABILITY

PSD regulations seek to protect areas in which the ambient air quality is better than the federally-established health-related National Ambient Air Quality Standards (NAAQS). Florida has established lower ambient standards than the federal standards. They will be referred to as the Florida Ambient Air Quality Standards (FAAQS). Sources are considered "major stationary sources" and are subject to the PSD regulations if they fall into either one of the following two categories: (1) One of the 28 specific categories of industries specified in Title 40 of CFR Part 51.166 (b)(1)(i)(a) and with the "potential" to emit more than 100 tons/yr of a regulated pollutant; or, (2) Any source with the "potential" to emit 250 tons or more/yr of a regulated pollutant.

Pollutants emitted from the new blast furnace include lead (Pb), sulfur dioxide (SO_2), carbon monoxide (CO), particulate matter (PM), nitrogen oxides (NO_x), and volatile organic compounds (VOCs). The Gulf Coast facility is considered a secondary lead smelter which is one of the 28 specific categories mentioned above (secondary metal production plants). PSD regulations also establish "significant" or "de minimis" levels for all regulated pollutants. For "major" sources, these "significant" levels determine applicability of PSD review for all pollutants emitted.

Once a facility is determined to be "major" for one pollutant (either the 100 or 250 tons/yr limit described above), then a PSD review must also be done for all other pollutants that have the "potential" to exceed the significant levels. Gulf Coast Recycling was already considered a "major" source due to its existing CO and SO_2 emission levels being greater that 100 tons/yr. It was subsequently determined that the CO and SO_2 emissions increases associated with the replacement of the blast furnace exceeded the 100 and 40 tons/yr significance levels. This made the modification subject to PSD review.

460-009 1=1 04-14-94 BKE 460.20001



FLOW DIAGRAM

FIGURE 1.3

2.0 BEST AVAILABLE CONTROL TECHNOLOGY REVIEW

All affected emissions units, regardless of size, must undergo a Best Available Control Technology (BACT) analysis. However, in light of the criterion of economic reasonableness, an analysis should only be as extensive as the quantity of pollutants emitted and the ambient air impacts created. Experience has shown that facilities that emit small amounts of pollutants have extremely high costs associated with the installation and operation of highly effective emission controls. This section describes and quantifies emissions from the new blast furnace and performs a BACT review for each applicable pollutant. A "top-down" BACT review identifies all reasonable control technologies and analyzes them for control efficiency and environmental, energy, and economic impacts. This analysis is performed for each identified technology in order of control efficiency. If the first technology (highest control efficiency) is not chosen an indication, e.g., cost prohibitiveness, of why it was not chosen must be given.

An emissions summary is presented in **Table 2.1**. The only source associated with this modification is the new blast furnace. Since it has been in operation for about nine years, there are good source test data available. There are three distinct operations associated with the furnace. In addition to the basic *smelting* there is *charging*, when raw material is being added to the furnace, and *tapping*, when the molten lead is tapped from the furnace. All operations are included in the blast furnace total emissions.

2.1 SULFUR DIOXIDE

The primary source of SO_2 is from the furnace exhaust where sulfur-containing lead paste (along with various other material including coke, limestone, and slag) are smelted. Gulf Coast is currently permitted for a maximum SO_2 emission rate of 384.2 lbs/hr and 7,800 hours/yr. This permitted rate has been complied with through operational practices such as enhanced furnace temperature and column height adjustments and feed separation (controlling the ratio of high- versus low-sulfur feed material in the furnace charge). However, for control technology evaluation purposes, the potential to emit for this furnace will be based on the AP-42 emission factor for reverberatory furnaces of 80 lbs/ton processed. The AP-42 factor for blast furnaces is 53 lbs/ton. However, this assumes a blast and reverberatory furnace configuration where the blast furnace is charged with reverb furnace slag, which already has a reduced sulfur content.

PSD APPLICABILITY FOR NEW BLAST FURNACE

values are in tons/year

POLL	CURRENT ACTUAL EMISSIONS (7,800 hrs/yr)	CURRENT POTENTIAL EMISSIONS (8,760 hrs/yr)	OLD FURNACE POTENTIAL EMISSIONS (8,760 hrs/yr)	POTENTIAL EMISSIONS INCREASE	PSD SIGNIF. LEVEL	PSD TRIP?	EMISSION REDUCTION W/ CONTROLS [8]	PROPOSED ALLOWABLE EMISSIONS [12]
SO_2	1,458.60 [1]	2,277.60 [5]	1,387.00	890.60	40	YES	1,511.10	766.50 [11]
Pb	0.023 [2]	0.59 [6]	6.69	-6.10	0.6	NO	0.00	0.59
PM	12.48 [3]	14.02	9.51	4.51	15	NO	0.00	14.02
CO	2,664.95 [4]	2,992.94 [4]	1,774.00	1,218.94	100	YES	2,693.65 [9]	299.29
NO_x	7.72 [4]	8.67 [4]	5.14	3.53	40	NO	0.00	8.67
VOC	129.09 [4]	144.98 [4]	85.91	59.07	40	N/A [7]	137.73 [10]	7.25

1 Based on December 1983 baseline determination source test (374 lbs/hr) 374 x 7800/2000 = 1458.6

2 Based on October 24, 1991 source test (0.006 lbs/hr)

3 Based on October 24, 1991 source test (0.167 lbs/ton charge)

4 Based on October 21, November 4, 1991 source tests

5 Based on AP-42 uncontrolled emission factor of 80 lbs/ton and requested production limit of 6.5 tons/hr

6 Based on requested limit of 0.134 lbs/hr

7 Surrounding area classified as non-attainment for ozone (VOCs), PSD not applicable

8 Desulfurization for SO_2 and afterburner for CO and VOCs

9 Based on a design destruction efficiency of 90%

10 Based on a design destruction efficiency of 95%

11 Based on requested allowable emission rate of 175 lbs/hr for 8,760 hrs/yr

12 Does not include products of combustion generated by the afterburner

"potential" means controlled vs. uncontrolled

Gulf Coast's configuration consists of a blast furnace only. Therefore, the reverb factor of 80 lbs/ton will be used. This results in potential emissions of:

$$80 \frac{lbs\ SO_2}{ton\ processed} \times 6.5 \frac{tons\ processed}{hr} (requested) = 520 \frac{lbs\ SO_2}{hr}$$

$$\frac{520 \frac{lbs\ SO_2}{hr} \times 8,760 \frac{hrs}{yr}}{2,000 \frac{lbs}{ton}} = 2,277.60 \frac{tons\ SO_2}{yr}$$

note: Gulf Coast requested to increase its allowable annual operating hours to 8,760 hours/yr in the original PSD application in May 1994 and to increase its allowable process rate by letter dated August 29, 1995.

The installation of the new blast furnace increased emissions above the 40 tons/yr significance level for SO_2 and subsequently made PSD/BACT applicable for this pollutant. As stated previously, the blast furnace is the primary source of SO_2 emissions and therefore this blast furnace will be the focal point of the BACT analysis. This analysis will attempt to discuss a representative sample of control technologies for SO_2 removal while evaluating the environmental, energy, and economic impacts of each.

Nearly twenty different types of flue gas desulfurization systems (FGDs) have been developed over the years, each of which removes SO_2 from the flue gas by an absorption process. For convenience, FGDs are classified either as "throwaway" or "regenerable," depending on whether the absorber product is treated to recover the reagents or simply disposed. Furthermore, it would not be feasible in this analysis to evaluate the advantages and disadvantages of each and every scrubbing alternative available on the market today. The selection of a specific process as the ideal one would be virtually impossible since so many factors are involved: capital investment, construction costs, operating costs, reagent costs, waste treatment, stabilization, disposal, and possible by-product reclaim.

The New Source Performance Standards (NSPS) concerning this industry do not address SO_2 emissions due to the variation and cost of controlling them. For purposes of this analysis, three representative control strategies that have been proven in reducing potential SO_2 emissions have been selected for a detailed evaluation: dry lime slurry injection (dry scrubbing), wet limestone scrubbing (wet scrubbing), and front-end feed desulfurization.

2.1.1 Dry Scrubbing

In a semi-dry process, the exhaust flue gas from the furnace's metallurgical baghouse and a lime slurry are mixed in a spray dryer. The lime then reacts with and absorbs the sulfur dioxide components in the gas stream forming sulfur-bearing particulates. Baghouses are excellent devices for controlling particulates, including lead. For this reason, the metallurgical baghouse catch is rich in lead and is typically cycled back into the furnace for reprocessing.

There are some process-related constraints concerning dry scrubbing inherent in Gulf Coast's current operation. If a dry scrubber were to precede the metallurgical baghouse, the sulfate particles would contaminate the lead catch and would also be recycled back into the furnace, which would increase the potential for increased SO_2 loading. The only logical solution is to follow the dry scrubbing system with an additional baghouse including a segregated hopper/receiving bin. The collected particulates from this secondary baghouse could not be recycled through the furnace but would likely have to be classified as a hazardous waste and transported to a certified landfill. Historical control efficiencies for this particular type of control technology range from 75-95 percent. The following economic impact analysis is based on an overall removal efficiency of 90 percent.

Economic Impact Analysis (Dry Scrubbing)

Design Parameters:		
	Flow rate:	24,300 acfm
	SO_2 Emission Rate:	520 lbs/hr
	Temperature:	154°F
	Removal Efficiency:	90%
	Expected Life of Equipment:	10 years
Capital Investment[1]:		
	Control Equipment[2] (delivered):	$ 506,250
	Site Preparation[3]/Installation:	$ 300,000
	Total:	$ 806,250

[1] Quote from Electric Controls & Service Co., Inc., Birmingham, AL

[2] Control equipment includes: spray dryer absorber, associated baghouse, reagent and slurry preparation and handling equipment, solids transfer and recycle equipment, fan/motor, other support equipment/instrumentation, delivery, etc.

[3] Installation includes: engineering design, site preparation, erection, field management, startup, etc.

Annual Costs

Operating Labor and Supervision:	$ 15,000
Maintenance and Repairs:	$ 15,200
Power and Utilities:	$ 129,441
Depreciation @ 10%/yr:	$ 80,625
Disposal Cost:	$ 608,750
Total:	$ 849,016

Annualized SO_2 Removal Calculation

Inlet Emission Rate:	520 lbs/hr
Removal Efficiency:	90%
Total SO_2 Removed:	468 lbs/hr
Hours of Operation:	8,760 hours (requested)
Annual Reduction:	2,050 tons/yr
Net Annual Cost:	$ 849,016
Net Ann Cost/Ton SO_2 Removed:	$ 414/ton
Capital Cost:	$ 806,250
Capital Cost/Ton SO_2 Removed:	$ 393/ton

Control Technology Costing Calculations

1. Cost of Dry Scrubbing Reagent (lime)

   88 lbs/hr of lime x $ 75/ton ÷ 2,000 lbs/ton x 8,760 hrs/yr = $ 28,908/yr

2. Cost of Handling and Disposal of Hazardous Waste ($ 250/ton)

   (2,050 tons/yr of SO_2 removed + 385 tons/yr of lime) x $ 250/ton = $ 608,750/yr

3. Power Requirements for Pollution Control System

   Booster Fan/Motor, Process Req., Instrumentation, Air Compressor, etc = 342 hp

   342 hp x 745.7 watts/hp ÷ 1000 watts/kW = 255 kW/hr

   255 kW/hr x $ 0.045/kW x 8,760 hrs/yr = $100,533/yr

Product Costs

Avg. annual pounds of lead produced/sold:	49,415,000 (@ 8,760 hrs/yr)
Annual cost of scrubbing system:	$ 849,016
Cost per pound of lead produced:	$ 0.0172
Current price received for lead:	$ 0.30/lb
Percent of gross income from product sales spent on scrubber system:	5.73%

The economic impact of this technology is estimated above at $414/ton of SO_2 removed. Due to the relatively low throughput of this facility, it is also estimated that 5.73 percent of gross income from product sales would be spent on the scrubbing system. Based on these costs, it is recommended that this technology not be considered BACT for this particular application.

Energy Impact Analysis (Dry Scrubbing)

The total power requirements were addressed in the economic analysis, as far as determining total annual cost for the operation of the subject pollution control equipment. It has been shown that the electrical requirements will be 255 kW or 1.99 million kWh/yr. It has been estimated that the 255 kW electrical demand, for this subject control system, would require an equivalent heat value of 870,672 Btu/hr or approximately 69.6 lbs of coal/hr at 12,500 Btu/lb. Based on these energy requirements, it is recommended that this technology not be considered BACT for this particular application.

Environmental Impact Analysis (Dry Scrubbing)

In conjunction with the additional cost for power, the incremental SO_2 increase associated with the power production phase and the solid waste disposal requirements must also be considered. To provide the 255 kW needed to operate this system, it was estimated above that 271.4 additional tons of coal would need to be burned at a typical power generating station in the area. Assuming a typical coal sulfur content of 1.2 percent would result in a net annual potential increase in air emissions of 13,027 lbs of SO_2/yr.

It was estimated above that approximately 2,435 tons of sulfur-bearing particulates would be generated each year. These particulates would likely be classified as a hazardous waste and buried in a certified landfill. The country's landfills are rapidly nearing capacity, and new ones are proving to be very difficult to permit, especially those that accept hazardous substances. In this situation, the scrubbing system is merely a trade-off of pollutants. Air emissions are reduced while hazardous waste is increased at a cost of reduced landfill space. It is, therefore, recommended that this technology not be considered as BACT for this project.

A potential benefit from installing a dry scrubbing system is the removal of other pollutants such as acid gases. However, the final MACT standard for this industry no longer requires the control of HCl.

2.1.2 Wet Scrubbing

Conventional wet limestone scrubbing was selected over the many other wet scrubbing alternatives because it utilizes a cheap, abundant absorbent and is widely applied commercially. As of 1989, over 48 percent of all scrubbing applications in this country employed wet limestone technology. In this process, a limestone slurry solution is injected in a spray tower to absorb SO_2 and form a calcium sulfite/sulfate sludge. The advantage of this system is that, in some situations, it is capable of achieving an overall removal efficiency of more than 90 percent. The industry average for this type of control technology is more on the order of 82 percent. Some of the disadvantages are:

1. A wet effluent is produced that requires additional treatment with complex effluent treatment systems. For every ton of SO_2 removed, 4.25 tons of sludge are produced and, in this particular application, the sludge would likely be classified as hazardous, thereby requiring highly specialized treating, stabilizing, handling, and disposal requirements.

2. Economics and space requirements are not as attractive as for other alternatives.

3. Wet scrubbers are more prone to corrosion problems and may require expensive materials of construction.

4. Historically, wet scrubbers have experienced more operating problems (i.e., scaling, plugging, erosion, and corrosion) and higher maintenance requirements than the alternatives.

Economic Impact Analysis (Wet Scrubbing)

Design Parameters:

Flow Rate:	24,300 acfm
SO_2 Emission Rate:	520 lbs/hr
Temperature:	154°F
Removal Efficiency:	90%
Expected life of equipment:	10 years

Capital Investment[1]:

Control Equipment[2] (delivered):	$ 530,100
Site Preparation/Installation[3]:	$ 570,000
Total:	$ 1,100,100

[1] Quote from Electric Controls & Service Co., Inc., Birmingham, AL

[2] Control equipment includes: spray dryer absorber, associated baghouse, reagent and slurry preparation and handling equipment, solids transfer and recycle equipment, fan/motor, other support equipment/instrumentation, delivery, etc.

[3] Installation includes: engineering design, site preparation, erection, field management, startup, etc.

Annual Costs

Operating Labor and Supervision:	$ 15,000
Maintenance and Repairs:	$ 20,000
Power & Utilities:	$ 121,430
Depreciation @ 10%/yr:	$ 110,010
Disposal Cost:	$ 2,178,250
Total:	$ 2,444,690

Annualized SO_2 Removal Calculation

Inlet Emission Rate:	520 lbs/hr
Removal Efficiency:	90%
Total SO_2 Removed:	468 lbs/hr
Hours of Operation:	8,760 (requested)
Annual Reduction:	2,050 tons/yr
Net Annual Cost:	$ 2,444,690
Net Ann Cost/Ton SO_2 Removed:	$ 1,193/ton
Capital Cost:	$ 1,100,100
Capital Cost/Ton SO_2 Removed:	$ 537/ton

Control Technology Costing Calculations

1. Cost of Wet Scrubbing Reagent (limestone)

   174 lbs/hr of limestone x $ 75/ton ÷ 2,000 lbs/ton x 8,760 hrs/yr = $ 57,159/yr

2. Cost of Handling and Disposal of Hazardous Waste = $ 250/ton

   For every ton of SO_2 removed, 4.25 tons of sludge are generated

   2,050 tons of SO_2 removed/yr x 4.25 tons of sludge generated = 8,713 tons of sludge/yr

   8,713 tons sludge/yr x $250/ton = $ 2,178,250/yr

3. Power Requirements for Pollution Control System Booster Fan/Motor, pump/motors, agitators, process requirements, instrumentation, etc. = 165 hp

   Conversion Factor = 745.7 watts/hp

   165 hp x 745.7 watts/hp ÷ 1,000 watt/kW = 123 kW/hr

   123 kW/hr x $0.045/kW x 8,760 hrs/yr = $48,503/yr

4. Fresh Water Requirements

   15 gallons/min x 60 min/hr x 8,760 hrs/yr x $ 2.00/1000 gals = $ 15,768/yr

In addition to the above water costs, there also exists a capacity problem. Gulf Coast's current wastewater disposal permit allows for 20 gallons per minute to be discharged into the City's sewer line which runs from the facility to the main trunk line approximately 1 mile away. This rate of 20 gallons per minute is also the current maximum capacity of the line. In a letter from the City of Tampa concerning this issue (see **Appendix C**) they state that the capacity of this line is not scheduled to be increased until 1995 at the earliest.

Product Costs

Avg. annual pounds of lead produced/sold:	49,415,000 (@ 8,760 hrs/yr)
Annual cost of scrubbing system:	$ 2,444,690
Cost per pound of lead produced:	$ 0.0495
Current price received for lead:	$ 0.30/lb
Percent of gross income from product sales spent on scrubber system:	16.49%

The economic impact of this technology is estimated above at $1,193/ton of SO_2

removed. Due to the relatively low throughput of this facility, it is also estimated that 16.49 percent of gross income from product sales would be spent on the scrubbing system. Based on these costs, it is recommended that this technology not be considered BACT for this particular application.

Energy Impact Analysis (Wet Scrubbing)

The total power requirements were addressed in the economic analysis, as far as determining total annual cost for the operation of the subject pollution control equipment. It has been shown that the electrical requirements will be 123 kW/hrs or 1,077,480 kWh/yr. It has been estimated that the 123 kW electrical demand, for this subject control system, would require an equivalent heat value of 471,785 Btu/hr or approximately 37.7 lbs of coal/hr at 12,500 Btu/lb. Based on these energy requirements, it is recommended that this technology not be considered BACT for this particular application.

Environmental Impact Analysis (Wet Scrubbing)

In conjunction with the additional cost for power, the incremental SO_2 increase associated with the power production phase and the solid waste disposal requirements must also be considered. To provide the 123 kW needed to operate this system, it was estimated above that 165 additional tons of coal would need to be burned at a typical power generating station in the area. Assuming a typical coal sulfur content of 1.2 percent would result in a net annual potential increase in air emissions of 7,920 lbs of SO_2/yr.

It was estimated above that approximately 8,713 tons of sludge would be generated each year. This sludge would likely be classified as hazardous and then treated, handled, and buried as such in an appropriate landfill. The country's landfills are rapidly nearing capacity and new ones are proving to be very difficult to permit, especially those that accept hazardous substances. An additional 15 gallons of wastewater per minute is also required by this technology. As stated earlier, the sewer line is already operating at capacity and it is unknown at this time when, or if, the capacity will be increased. It is, therefore, recommended that this technology not be considered as BACT for this project.

A potential benefit from installing a wet scrubbing system is the removal of other pollutants such as acid gases. However, the final MACT standard for this industry no longer requires the control of HCl.

2.1.3 Desulfurization

Desulfurization removes the sulfur contained in the furnace feed material before it is fed into the furnace. The sulfur-bearing paste (lead sulfate) from the batteries is not sent directly to the smelting furnace, but rather is first chemically reacted with sodium carbonate (soda ash) to remove most of the sulfur. This reaction results in lead carbonate and sodium sulfate. Following is the reaction that takes place:

$$PbSO_4 + Na_2CO_3 = PbCO_3 + Na_2SO_4$$

Manufacturer's specifications on the proposed system may be found in **Appendix O.** The desulfurized paste is then fed into the furnace where as much as a 98% reduction can be realized in potential sulfur dioxide emissions. Rather than relying on the exclusive use of add-on pollution control devices, this technology can achieve equivalent reductions in emissions based on modifications of the conventional lead recovery process through such means as material separation and desulfurization. Presently, there are three new lead recovery plants operating in this country which have successfully demonstrated the technological effectiveness of desulfurization as a viable means of minimizing SO_2 emissions (including one in Region IV now being brought on-line). In all cases desulfurization was the accepted control methodology for SO_2 emissions and no add-on controls were required.

Gulf Coast is expecting to be able to reduce the sulfur content of the incoming lead scrap to 1% with the desulfurization system being proposed for installation. This 1% sulfur content is dependent upon the initial sulfur content entering the system (as with many pollution control systems the efficiency increases with the inlet concentration of the subject pollutant). Based on this technology Gulf Coast is requesting an allowable emission rate of 175 lbs/hr. This rate is based on potential SO_2 emissions that may be generated from the sulfur that may remain in the lead scrap after the desulfurization process and from the sulfur content in the coke which is used as fuel. This requested emission rate is an upper bound of the expected range. Emissions of SO_2 will fluctuate somewhat depending on the sulfur content of the incoming feed material which is also highly variable.

The majority of Gulf Coast's incoming feed material is spent lead-acid batteries where most of the sulfur content in the battery has been transformed from sulfuric acid to lead sulfate. Since the acid remaining in the batteries is drained upstream of the desulfurization system this scenario will produce the upper bound of SO_2 emissions, since the majority of the sulfur in the battery is in the form of lead sulfate which is sent to the desulfurization process. However, a smaller percentage of the incoming batteries are relatively new defect batteries with most of the sulfur still being in the form of sulfuric acid. This results in less sulfur being sent to the desulfurization system and ultimately the furnace. The 175 lbs/hr is calculated as follows:

From lead scrap:

$$6.5\ \frac{tons\ processed}{hr} \times 2{,}000\ \frac{lbs}{ton} = 13{,}000\ \frac{lbs\ processed}{hr} \times 80\%\ Pb\ scrap = 10{,}400\ \frac{lbs\ Pb\ scrap}{hr}$$

$$10{,}400\ \frac{lbs\ Pb\ scrap}{hr} \times 1\%\ S = 104\ \frac{lbs\ S}{hr}\ into\ furnace$$

$$104\ \frac{lbs\ S}{hr}\ into\ furnace \times (1 - 20\%)^{A} = 83.20\ \frac{lbs\ S}{hr}\ out\ of\ furnace$$

$$83.20\ \frac{lbs\ S}{hr}\ out\ of\ furnace \times 2^{B} = 166.40\ \frac{lbs\ SO_2}{hr}\ out\ of\ furnace$$

From coke:

$$910\ \frac{lbs\ coke}{hr} \times 0.58\%\ S = 5.3\ \frac{lbs\ S}{hr}$$

$$5.3\ \frac{lbs\ S}{hr}\ into\ furnace \times (1 - 20\%)^{A} = 4.24\ \frac{lbs\ S}{hr}\ out\ of\ furnace$$

$$4.24\ \frac{lbs\ S}{hr}\ out\ of\ furnace \times 2^{B} = 8.48\ \frac{lbs\ SO_2}{hr}\ out\ of\ furnace$$

Total from lead scrap and coke:

$$166.40\ \frac{lbs\ SO_2}{hr} + 8.48\ \frac{lbs\ SO_2}{hr} = 174.88\ \frac{lbs\ SO_2}{hr}$$

[A] This factor takes into account that approximately 20% of the sulfur in the furnace will become fixed in the slag and will not be transformed into SO_2 and emitted as gaseous emissions.

[B] One lb of Sulfur becomes 2 lbs of SO_2 due to the doubling of molecular weights: $S = 16$, $O = 8$; therefore, $SO_2 = 16 + (8 \times 2) = 32$

Economic Impact Analysis (Desulfurization)

To quantify the economic impacts of the proposed desulfurization process would prove to be a difficult task since it is an integral part of the overall battery recycling process. It would suffice to say that the capital expenditure for this process is substantial and has been estimated, since this is an existing plant, at roughly $2 million. However, is would not be justifiable to assign 100 percent of this expenditure to the traditional cost-benefit analysis as typically required for BACT determinations. A practical budgetary estimate would assign a capital value of approximately $1.7 million. Conservative emissions estimates have shown that approximately 1,511 tons of SO_2 will be removed on an annual basis. The associated capital cost-per-ton of SO_2 removal for this process will be approximately $1,125 per ton.

Design Parameters:		
	Flow rate:	24,300 acfm
	SO_2 Emission Rate:	520 lbs/hr
	Temperature:	154°F
	Removal Efficiency:	66%
	Expected Life of Equipment:	10 years
Capital Investment[1]:		
	Control Equipment[2] (delivered):	$1,400,000
	Site Preparation[3]/Installation:	$ 300,000
	Total:	$1,700,000

1 Quote from M.A. Industries, Inc., Peachtree City, Georgia

2 Control equipment includes: feed conveyor, crusher, screening units, elutriator, metals and rubber/plastic classifiers, recirculation and surge tanks, air conveyor unit, reactor vessels, filter presses, instrumentation, delivery, etc.

3 Installation includes: engineering design, site preparation, erection, field management, startup, etc.

Annual Costs	
Operating Labor and Supervision:	$ 32,850
Maintenance and Repairs:	$ 15,200
Utilities (elec. & water):	$ 145,198
Depreciation @ 10%/yr:	$ 170,000
Disposal Cost:	$ 0
Total:	$ 363,248

Annualized SO_2 Removal Calculation

Inlet Emission Rate:	520 lbs/hr
Removal Efficiency:	66%
Total SO_2 Removed:	345 lbs/hr
Hours of Operation:	8,760 hours (requested)
Annual Reduction:	1,511 tons/yr
Net Annual Cost:	$ 363,248
Net Ann Cost/Ton SO_2 Removed:	$ 240/ton
Capital Cost:	$1,700,000
Capital Cost/Ton SO_2 Removed:	$1,125/ton

520
-345
175

Control Technology Costing Calculations

1. Power Requirements for System

   Total connected power = 272 hp

   272 hp x 745.7 watts/hp ÷ 1000 watts/kW = 203 kW/hr

   203 kW/hr x $ 0.045/kW x 8,760 hrs/yr = $80,023/yr

2. Fresh Water Requirements

   62 gallons/min x 60 min/hr x 8,760 hrs/yr x $ 2.00/1000 gals = $ 65,175/yr

Product Costs

Avg. annual pounds of lead produced/sold:	49,415,000 (@ 8,760 hrs/yr)
Annual cost of system:	$ 363,248
Cost per pound of lead produced:	$ 0.0074
Current price received for lead:	$ 0.30/lb
Percent of gross income from product sales spent on scrubber system:	2.45%

The economic impact of this technology is estimated above at $240/ton of SO_2 removed. Due to the relatively low throughput of this facility, it is also estimated that 2.45 percent of gross income from product sales would be spent on the desulfurization system. Based on these costs, it is recommended that this technology be considered BACT for this particular application.

Energy Impact Analysis (Desulfurization)

The total power requirements were addressed in the economic analysis, as far as determining total annual cost for the operation of the system. It has been shown that the electrical requirements will be 203 kW or 1.78 million kW/yr. It has been estimated that the 203 kW electrical demand, for this subject system, would require an equivalent heat value of 693,123 Btu/hr or approximately 55 lbs of coal/hr at 12,500 Btu/lb. Although these energy requirements are higher than for wet scrubbing, the environmental benefits discussed below outweigh the higher energy requirements.

Environmental Impact Analysis (Desulfurization)

To provide the 203 kW needed to operate this system, it was estimated above that 241 additional tons of coal would need to be burned at a typical power generating station in the area. Assuming a typical coal sulfur content of 1.2 percent would result in a net annual potential increase in air emissions of 11,563 lbs of SO_2/yr. The environmental benefits from this proposed control strategy will be such that SO_2 emissions will be controlled upwards of 67% with no additional waste stream, liquid or solid, generated as with all scrubbing systems. Due to these environmental benefits, Gulf Coast is selecting desulfurization as BACT for this project.

2.1.4 Sulfur Dioxide Conclusions

The primary function of this recycling facility is to recover lead from spent lead-acid batteries and then to sell this lead on the open market at a profit. As such point where the recovery costs equal or exceed the market price for lead, such a facility fails to substantiate its existence. Based on rough industry estimates, average plant operating costs vary from 16.8 to 19.6 cents per pound of refined lead. The current price of lead is approximately 30 cents per pound. Just a year and a half ago the average price was 17 cents per pound. It has been estimated that additional SO_2 control equipment would add between 1.7 and 5 cents per pound of refined lead to the proposed operating costs for this facility.

As has been shown in the preceding economic analysis, the economic burden of additional SO_2 removal controls would create distinct economic disadvantages for this recycling facility to compete on the open market. Reasonable cost effectiveness (cost/ton of pollutant removed) for non-boiler sources (Metals Industry) for non-hazardous situations has been estimated at $293/ton ("Cost for Control of SO_2 Emissions," *CEP* June 1982 pg. 52). The scrubbing systems discussed earlier range from $414/ton to $1,193/ton. Desulfurization was estimated at $240/ton.

This BACT analysis showed dry and wet scrubbing systems are cost prohibitive and raise additional solid waste disposal problems. With the deletion of the HCl standard from the MACT standard for this industry a scrubbing system is not needed, further making scrubbing technologies undesirable. Desulfurization of the raw feed material was, therefore, determined to be BACT based on its economic, energy, and environmental considerations. Further, with the addition of the proposed afterburner discussed in section 2.4.3, the blast furnace will be able to operate at lower temperatures. By operating the furnace at lower temperatures sulfur dioxide formation will be decreased, thereby further decreasing SO_2 emissions.

Gulf Coast is the only lead-acid battery recycler remaining in the State of Florida. If Gulf Coast is required to install cost-prohibitive control technology, it will be placed in an extremely tight economic situation that could easily result in the facility becoming uneconomical to operate if an uncontrollable event, such as a slight drop in lead prices, occurs. If this should happen, the nearest battery recycling facility would be in Columbus, Georgia—approximately 425 miles away. The estimated 1.1 million batteries that Gulf Coast recycles annually would therefore have to be shipped by truck to the Columbus facility. This would inherently increase the cost of recycling which would hinder recycling efforts. There is no environmentally acceptable alternative to recycling spent lead-acid batteries. Resource Conservation and Recovery Act (RCRA) land-ban restrictions prohibit their disposal in hazardous waste landfills. As recycling becomes economically prohibitive, the potential for the public discarding batteries along roadways, in vacant lots, etc. increases dramatically.

2.2 LEAD

The current blast furnace permit limits lead emissions to 2.09 lbs/hr and 8.15 tons/yr. This permitted level was established years ago by assuming the lead levels to be a certain percentage of total particulates. This facility employs baghouses for particulate control including control of the blast furnace exhaust. These baghouses typically operate in excess of 99.5 percent control efficiency. Since lead is a particulate these baghouses are also very efficient in controlling lead. A source test performed on October 24, 1991 showed lead levels to be 0.006 lbs/hr (see **Appendix D**). Assuming that rate for a full year of 8,760 operational hours would give 0.0263 tons/yr, well below the 0.6 tons/yr significance level for lead. Therefore, lead levels from the blast furnace have actually decreased as a result of the modification.

Gulf Coast is hereby requesting a federally-enforceable, facility-wide permit limit for lead emissions of 0.59 tons/yr, which correlates to 0.134 lbs/hr for 8,760 hrs/yr. As mentioned above, Gulf Coast utilizes baghouses for particulate (and lead) control throughout the facility. A roof-mounted sprinkler system is also used for ambient dust suppression which minimizes fugitive emissions of particulates (and lead). Since the 0.59 tons/yr requested limit is below the significance level for lead, PSD/BACT is not applicable for this pollutant.

2.3 TOTAL PARTICULATES

must compare new allowable with 2 yr. actual

Current permitted levels are 3.20 lbs/hr and 12.48 tons/yr, which are based on 7,800 hrs/yr. With the requested 8,760 hrs/yr, the annual emission rate correlates to 14.02 tons/yr. This level does not exceed the 15 tons/yr significance level for particulates. Therefore, PSD/BACT is not applicable for this pollutant. In addition, Gulf Coast is located within an Air Quality Maintenance Area for particulate matter, subjecting them to F.A.C. Rule 17-2.650 (2), Reasonably Available Control Technology (RACT). The 14.02 tons/yr emission level requested above also keeps Gulf Coast in compliance with Specific Condition Number Two in the permit, and Exemption Number One of the RACT regulations which exempts facilities from the RACT requirements if facility-wide emissions are less than 5.0 lbs/hr and 15 tons/yr.

The NSPS pertaining to this industry is 40 CFR Subpart L §60.120. This standard limits particulate matter emissions from the blast furnace to 0.022 gr/dscf and 20% opacity. The flow rate of the blast furnace baghouse is 24,350 acfm, correlating to 20,250 dscfm. Assuming the allowable grain loading this results in an allowable emission rate of 3.82 lbs/hr:

$$\frac{20{,}250\ dscfm \times 0.022\ \frac{gr}{dscf}}{7{,}000\ \frac{gr}{lb}} \times 60\ \frac{\text{min}}{hr} = 3.82\ \frac{lbs}{hr}$$

The blast furnace is currently permitted for a maximum of 3.20 lbs/hr, below the NSPS limit. Because of this, it would be expected that the furnace is also in compliance with the opacity limit.

2.4 CARBON MONOXIDE

A source test performed on October 21 and November 4, 1991 showed CO emissions from the new blast furnace to be 683.32 lbs/hr (see **Appendix E**). With the requested hours of operation of 8,760 hrs/yr, the annual rate correlates to a maximum 2,993 tons/yr, compared to the old furnace emission rate of 1,774 tons/yr. This is an increase of 1,219 tons/yr, greater than the 100 tons/yr significance level and making the furnace applicable to PSD/BACT for this pollutant.

There are several technologies available to control carbon monoxide emissions. Most of them fall into one of two categories: *incineration* or *catalytic conversion*. Both categories convert CO to carbon dioxide and water. Incineration techniques employing the combustible properties of CO burn it while catalytic conversion utilizes a catalyst instead of combustion. One catalytic conversion technology and two incineration technologies are reviewed in the following section.

2.4.1 Catalytic Oxidation

This technology utilizes a catalyst bed for the conversion of CO to carbon dioxide and water instead of a combustion device. Advantages to this system are lower fuel costs and no additional emissions from the combustion of natural gas. Disadvantages are high initial cost, cost of new or regenerating the catalyst bed, catalyst disposal problems, and fouling of the catalyst. Because of the high content of impurities in the gas stream from the furnace, e.g., SO_2, lead, particulates, and trace amounts of other metals, fouling of the catalyst would be a significant problem. It is not believed this technology is being used anywhere in this industry for controlling carbon monoxide emissions. It is therefore determined for this analysis that this technology could not be considered BACT.

2.4.2 CO Waste-Heat Boiler

Carbon Monoxide boilers are widely used in the petroleum refining industry as a means of controlling the CO emissions from the Fluid Catalytic Cracking Unit (FCCU). Combustible CO and auxiliary fuel is introduced into the firebox of the boiler. The CO is then converted into carbon dioxide and water. As this control technology may be appropriate for a refinery with large steam needs, it is not appropriate for Gulf Coast. Also, as mentioned previously, Gulf Coast has a wastewater discharge capacity issue. CO boilers also require a very "clean" fuel source, meaning the auxiliary fuel (usually natural gas) and FCCU waste gases must be combined with a high concentration of CO and other combustibles. CO boilers do not work well if large amounts of particulates or non-combustible gases are present. Any inorganic dusts and fumes deposit on heat transfer surfaces causing excess maintenance costs and decreased efficiencies.

2.4.3 Afterburner/Incineration

A search of EPA's BACT/LAER Clearinghouse listed the following BACT determinations for carbon monoxide emissions from cupola and blast furnaces:

Thermal incineration	- 99.5% efficiency	Partek Insulations, Inc.	BLIS ID AL-0063
Afterburner	- 94% efficiency	U.S. Gypsum	BLIS ID IN-0004
3 stack afterburners	- 94% efficiency	Lufkin Industries, Inc.	BLIS ID TX-0023
Incineration	- 98.7% efficiency	Vermont Castings	BLIS ID VT-0001
Incineration	- 1300°F & 0.3 sec	Waupaca Foundry #2	BLIS ID WI-0012

The *Best Available Control Technology Guidelines* document published by the South Coast Air Quality Management District (SCAQMD) in the Los Angeles Air Basin address CO emissions from lead melting furnaces (cupola or blast furnace) associated with secondary lead smelting. The BACT determination for CO from this source type is an afterburner with ≥ 0.3 second retention time at ≥ 1400°F (see **Appendix F**). Also, see **Appendix P** for an afterburner destruction efficiency curve.

2.4.4 Carbon Monoxide Conclusions

Gulf Coast is hereby proposing to install an afterburner on the new furnace as BACT in addition to following good combustion practices to decrease the emissions increase to below the significance level. Assuming a minimum 90 percent reduction in emissions with the added CO emissions from the afterburner, this would result in annual emissions of approximately 299 tons/yr (68.3 lbs/hr for 8,760 hrs/yr). A screening model using this emission rate resulted in an 8-hour high, second-high impact of 27.2 $\mu g/m^3$, well below the significance level of 575 $\mu g/m^3$ (see section 4.1.4). This exempts CO from a refined air quality analysis.

All other sources of CO from the facility, while minor compared to the new furnace, will continue to incorporate operating parameters in an effort to minimize CO formation. An afterburner system with a minimum 1400°F temperature and 0.5-2.0 second retention time to reduce CO emissions at least 90 percent has been identified. Gulf Coast is currently in the process of accepting bids on afterburner systems. A separate application will be submitted at such time as the specific system has been selected. Estimated capital cost is $350,000-500,000.

2.5 NITROGEN OXIDES

The October through November 1991 source tests showed NO_x emissions to be 1.98 lbs/hr (see **Appendix E**). With the requested hours of operation of 8,760 hrs/yr, the annual rate correlates to a maximum 8.67 tons/yr, compared to the old furnace emission rate of 5.14 tons/yr. This is an increase of 3.53 tons/yr, well below the 40 tons/yr significance level. Even with the additional emissions from the proposed afterburner (20.91 tons/yr) NO_x emissions will remain below the significance level. Therefore, PSD/BACT is not applicable for this pollutant.

2.6 VOLATILE ORGANIC COMPOUNDS

The October through November 1991 source tests determined VOC emissions to be 33.10 lbs/hr (see **Appendix E**). With the requested hours of operation of 8,760 hrs/yr, the annual rate correlates to a maximum 145 tons/yr, compared to the old furnace emission rate of 86 tons/yr. This is an increase of 59 tons/yr, greater than the 40 tons/yr significance level outlined in the PSD regulations.

VOC emissions have not been addressed in detail specific to this industry. Neither the EPA BACT/LAER Clearinghouse nor the SCAQMD BACT Guidelines address VOC or reactive organic gases (ROG) from this source type. In addition, the applicable NSPS do not set limits for VOCs. Control technology in other industries varies widely from incinerators and flares to carbon adsorption and condensation. Due to the type of organics present, the lack of in-house reuse opportunities for collected organics, and lack of storage capacity, recovery techniques are not desirable at Gulf Coast. Of the various destruction technologies being used, flares and other open-flame combustion systems are not desirable in urban settings.

THCs are in NESHAPs as surrogates for org. HAPs.

Afterburner destruction efficiencies for VOCs are typically in the 90-99 percent range. Therefore, assuming a 95 percent efficiency, VOC emissions with the proposed afterburner presented earlier (including VOC emissions from the afterburner) are estimated to be 7.67 tons/yr. This is a 90+ percent reduction from the 86 tons/yr from the old furnace. Since the Tampa-St. Petersburg area is classified as non-attainment for ozone, of which VOCs are considered precursors, the non-attainment regulations apply instead of the PSD regulations. This 90 percent reduction, obtained by internal offsets, complies with the net decrease provisions in the non-attainment regulations.

This strategy won't work. For this reviewed permit must consider present emissions >40 tpy ∴ LAER REQ'D And incin. design must be reviewed

VOCs are not addressed in the current operating permit for the furnace. Gulf Coast is currently in the process of accepting bids on afterburner systems. A separate application will be submitted once a specific system has been selected.

They included limits reflecting afterburner, therefore this application must cover the incinerator

3.0
BASELINE DATA

This section discusses the existing air quality and the major sulfur dioxide-emitting sources in the subject area.

3.1 AMBIENT MONITORING DATA SUMMARY

Gulf Coast Recycling, Inc. was not required to conduct any pre-construction monitoring given the availability of data from nearby state-operated monitors. The area is designated as "unclassifiable" (cannot be classified as attainment or non-attainment) for SO_2. According to the Florida Department of Environmental Regulation, the ambient concentrations of sulfur dioxide near the Gulf Coast facility are 21 $\mu g/m^3$, annual average; 93 $\mu g/m^3$, 24-hour average (second-highest 24-hour monitored value in 1992); and 304 $\mu g/m^3$, 3-hour average (second-highest 3-hour monitored value in 1992). These values were recorded at the Davis Island monitoring station, number 4360-0350-G02 located 8 kilometers (approximately 5 miles) WSW from Gulf Coast.

The responsible regulatory authority has discretion in requiring post construction monitoring data and, in general, will not require such monitoring. Factors such as complex terrain, fugitive emissions, and other uncertainties in source or emission characteristics result in significant uncertainties about the projected impact of the source. Gulf Coast is not located in complex terrain nor are fugitive emissions considered significant. Also, emissions of particulates that result in high concentrations near the property boundary are also not significant. Sulfur dioxide emissions, which are considered to result in more of a regional problem, have been modeled and have been shown to be below those emission rates that would result in exceedances of, or significantly contribute to exceedances of, any air quality standards or PSD increments. In addition, the DEP operates the Davis Island SO_2 monitor which is only approximately 5 miles WSW from Gulf Coast. This monitor has not shown any exceedances of the FAAQS.

3.2 SURROUNDING SOURCE EMISSION INVENTORY

The area surrounding Gulf Coast has a high density of large utility power generating stations with high sulfur dioxide emissions. The nine largest emitting units collectively emit over 100,000 lbs/hr compared to Gulf Coast's permitted 384.2 lbs/hr.

4.0
DISPERSION MODELING ANALYSIS

The PSD regulations require modeling analyses to predict the impacts on the ambient air quality standards and on the air quality increments for that area. The regulations also require an analysis of the predicted impacts on any Class I area that may be impacted. Thus, three separate analyses were done for SO_2 for this project:

1) The FAAQS analysis looked at the predicted impacts from Gulf Coast and surrounding sources on the human health-based Federal and Florida Ambient Air Quality Standards;
2) The Class I increment analysis predicted Gulf Coast's and other PSD sources' consumption of air quality increments at the Chassahowitzka National Wilderness Area;
3) The Class II increment analysis predicted Gulf Coast's and other PSD sources' consumption of air quality increments of the surrounding area, which is classified as a Class II area.

A screening analysis was performed for CO to determine if the predicted impacts exceeded the significance level. If it did, full FAAQS and Class I and II analyses would have to be performed.

Both increment analyses aimed at predicting the amount of remaining increments that would be consumed by Gulf Coast and other PSD sources and then comparing that prediction with the allowed consumption. This requirement provides for future growth by assuring that no one new source will deteriorate the air quality to the point that the ambient standards are on the verge of being violated, thereby not allowing any future source to locate in the area without causing a violation of the standards.

4.1 PROTOCOLS AND RESULTS

The modeling was conducted using EPA-approved methods as outlined in *Guideline on Air Quality Models* (Revised, EPA, 1986). The particular models used were the latest versions of the Industrial Source Complex Short Term model (ISCST3), used for the Class II and FAAQS SO_2 analyses, the Class I Level 1 analysis, and the CO screening analysis, and MESOPUFF II long-range transport model, used for the Class I Level 2 SO_2 analysis.

A modeling protocol was submitted to DEP on August 17, 1993 for the SO_2 analyses (see **Appendix G**) and was approved as amended on September 24, 1993 (see **Appendix H**). The modeling protocol called for five years of meteorological data to be used for each analysis. The years 1982-86 were chosen, with the data being collected at the Tampa surface and upper air station number 12842 for all runs. The Class I analysis also utilized surface met data from Orlando and Gainsville. Each modeling run calculated SO_2 impacts for three averaging periods: 3-hour, 24-hour, and annual. For each analysis, the 3-hour and 24-hour standard (or increment) can be exceeded once per year at each receptor. Therefore, the maximum impact for each receptor for these averaging periods is the highest second-high value. The annual standard (or increment) cannot be exceeded. Therefore, the maximum impact for the annual averaging period for each receptor is the highest value.

The ISCST3 model was run in the regulatory default mode resulting in conservative impacts. Wet and dry deposition as well as SO_2 conversion were not used which further overestimates the impacts. All modeling assumed the blast furnace operates 8,760 hrs/yr. The Gulf Coast facility is located in a mixed-use area with both industrial facilities and residential areas located within a 50 km radius. The area is assumed to be rural with flat terrain for modeling purposes. The model did not calculate building downwash or wake effects due to the sufficient height of the furnace stack. This resulted in maximum downwind concentrations being calculated.

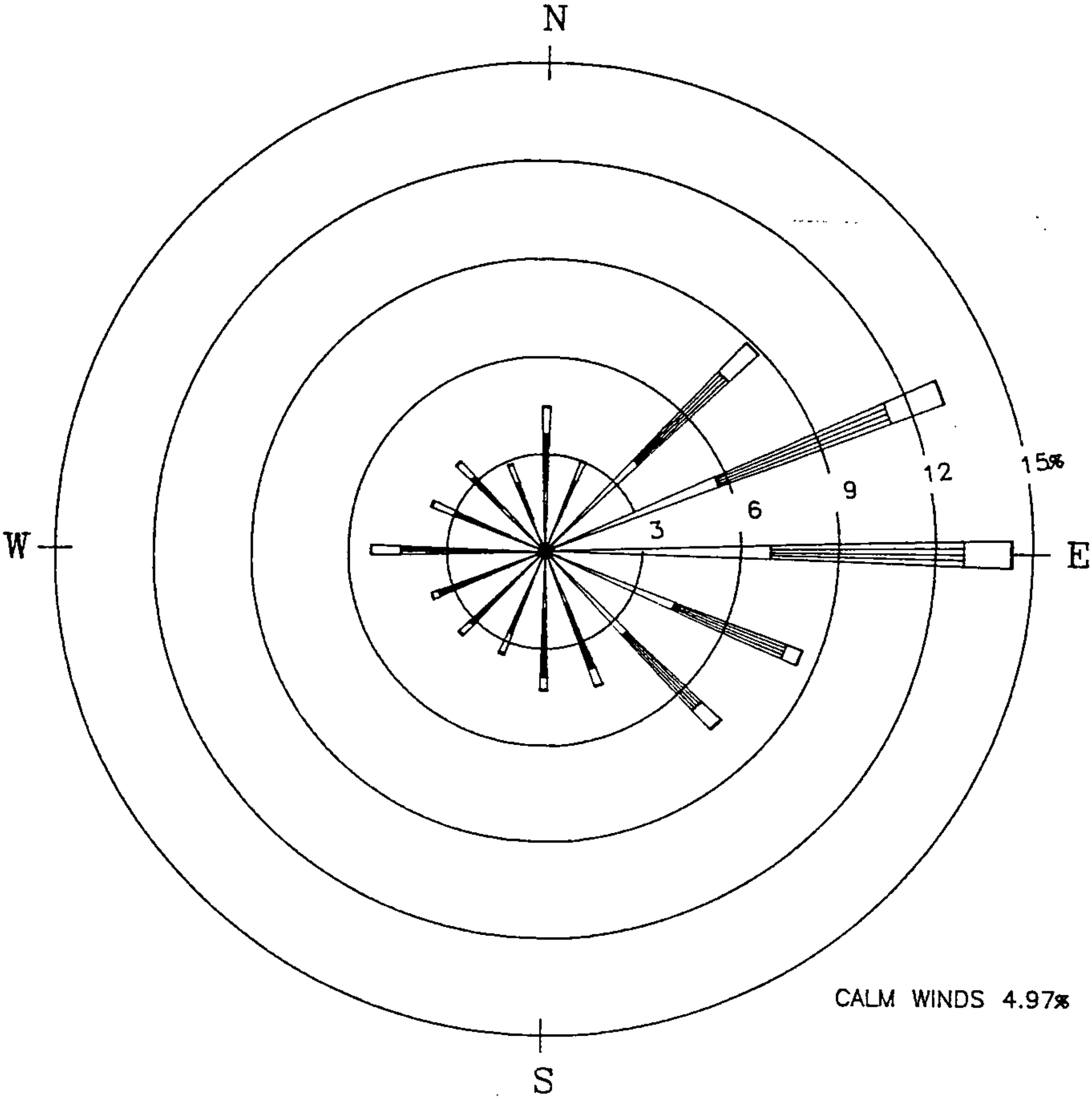
Three separate Cartesian receptor grids were used for the FAAQS and Class II analyses. The first grid placed 441 receptors at 100-meter intervals from Gulf Coast out to 1 kilometer. The second grid placed 441 receptors at 1-kilometer intervals from Gulf Coast out to 10 kilometers. The third grid placed 121 receptors at 10-kilometer intervals from Gulf Coast out to 50 kilometers, for a total of 1,003 receptors. The DEP identified 13 discrete receptors to be used for the Class I analysis. See **Appendix L** for these receptor locations.

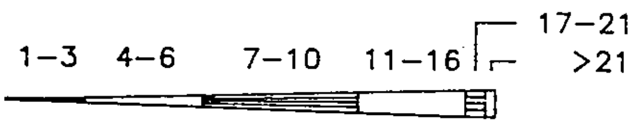
4.1.1 Florida Ambient Air Quality Standards (FAAQS) Analysis

The FAAQS analysis compared the modeled impacts of emissions from Gulf Coast and sixty-eight surrounding sources with the Florida Ambient Air Quality Standards for SO_2. A listing of the 68 sources can be found in **Appendix I**. Florida's ambient standards were used for comparison instead of the federal standards because Florida's are more stringent for two of the three averaging periods (24-hour and annual). Background values measured at the Davis Island monitor, located approximately 8 kilometers (5 miles) WSW from Gulf Coast, were originally added to the modeled impacts, then compared to the ambient standards. These values were 304 $\mu g/m^3$, 3-hour average; 93 $\mu g/m^3$, 24-hour average; and 21 $\mu g/m^3$, annual average.

However, due to the location of the monitor in relation to all sources included in this analysis and the prevailing wind direction (see **Figure 4.1** for a Wind Rose for this area) it appeared as though many of the sources, including Gulf Coast, were already impacting the monitor. Tampa Electric Company's (TECO) Hooker's Point generating station, with a combined SO_2 emission rate for all units of over 3,087 lbs/hr, is located between 1.0 and 2.3 miles upwind (predominant wind direction) of the monitor, depending on the exact location of the monitor on Davis Island. This scenario resulted in those sources' emissions apparently being double-counted, once in the model and once in the background values. Since the background values were required to be added, it was thought the requirement to include all of the 68 surrounding sources identified by DEP into the model was overly burdensome. (A portion of the receptor grid placed six receptors within 1.2 kilometers of the Davis Island monitor. Due to the overly conservative requirements discussed above, the model was predicting values, as close as 400 meters from the Davis Island monitor, that were twice as high as those actually measured by the monitor.)

By letter dated March 7, 1994 (see **Appendix J**) DEP recognized this problem and reconsidered the background values originally chosen. DEP identified another monitor less likely to be impacted by sources included in the modeling, the TECO Big Bend Road monitor, number 1800-021-G02. The highest recorded annual value in the last three years at this monitor is 6 $\mu g/m^3$. The EPD stated this value could be used for all three averaging periods. The ambient impacts with the revised background values added are shown in **Table 4.1**.





WIND SPEED CLASSES
(KNOTS)

NOTES:
DIAGRAM OF THE FREQUENCY OF OCCURRENCE FOR EACH WIND DIRECTION. WIND DIRECTION IS THE DIRECTION FROM WHICH THE WIND IS BLOWING. EXAMPLE – WIND IS BLOWING FROM THE NORTH 4.5 PERCENT OF THE TIME.

WINDROSE

STATION NO. 12842
TAMPA, FL
PERIOD: 1982

FIGURE 4.1

Table 4.1
FAAQS ANALYSIS RESULTS [3]

values are in $\mu g/m^3$

AVG. PERIOD	FED. STND.	FLA. STND.	1982	1983	1984	1985	1986
3-hour [1]	1300	1300	1277	1071	1018	1269	**1404**
24-hour [1]	365	260	**410**	**287**	**278**	**277**	**299**
annual [2]	80	60	**61**	56	**61**	**65**	**68**

[1] Highest second-high modeled impacts

[2] Highest first-high modeled impacts

[3] Results include background value of 6 $\mu g/m^3$ for all averaging periods. Value recorded at the TECO Big Bend Road monitoring station, no. 1800-021-G02.

The model was then re-run with two source groups, one with Gulf Coast's emissions only and one with the other 68 sources' emissions, for each year and averaging period that there was a predicted violation of the FAAQS. It was found that, even with Gulf Coast's emissions excluded, the model was showing exceedances of the standards. The model also showed that the maximum impacts with Gulf Coast's emissions excluded were no more than 1 $\mu g/m^3$ lower than with Gulf Coast's emissions included. This tended to show that Gulf Coast was not contributing to the modeled FAAQS violations.

To prove that Gulf Coast was not contributing to the FAAQS violations, a further analysis was performed. A determination was made by DEP's modeling section that each FAAQS exceedance could be disregarded if the model showed Gulf Coast did not "significantly" contribute to the exceedance. An exceedance is a violation of the FAAQS for one averaging period (one year for the annual averaging period, one day for the 24-hour averaging period, and one 3-hour period for the 3-hour averaging period at any one receptor) for any one of the 1,003 receptors . The SO_2 significance levels are 25 $\mu g/m^3$ for the 3-hour averaging period, 5 $\mu g/m^3$ for the 24-hour averaging period, and 1 $\mu g/m^3$ for the annual averaging period.

The "Maxi-file" output option in ISCST3 was used to create files listing all values that exceeded the respective FAAQS (eg. 82-24.ovr; 1982 met data, 24-hour averaging period), for modeling all sources, and files listing the values that exceeded the significance levels, for modeling Gulf Coast only (eg. G82-24.ovr; Gulf Coast, 1982 met data, 24-hour averaging period). The FAAQS-exceeding Maxi-files were set at a threshold 6 $\mu g/m^3$ below the respective FAAQS to account for the background value.

The FAAQS-exceeding files (all sources) for the 3-hour and 24-hour averaging periods were then compared to the respective significance level-exceeding Maxi-file (Gulf Coast only) to determine if, at the same receptor and during the same averaging period the AAQS were being exceeded, Gulf Coast was significantly contributing. In other words, they were compared to see if there were any receptors exceeding the FAAQS (all sources) that were also exceeding the significance levels (Gulf Coast only) on the same day during the same time period. If there were any duplications it was determined whether that exceedance was a first-high. If it was, it was disregarded (since the FAAQS can be exceeded once per year at each receptor, except for the annual averaging period). If there were any non-first-high duplications, that would mean that at that receptor on that day (and that time period for the 3-hour averaging period) Gulf Coast was significantly contributing to the FAAQS exceedance. This analysis showed no duplications, meaning Gulf Coast was not significantly contributing to any of the FAAQS violations predicted by the model.

Copies of the FAAQS-exceeding files (all sources) and significance level-exceeding files (Gulf Coast only), as well as all input and output files, can be found on diskette in **Appendix N**. Maxi-files can not be generated for the annual averaging period; therefore, the respective ".lst" files were used for that averaging period.

4.1.2 Class I Increment Analysis

The Class I increment analysis predicted the consumption by Gulf Coast and all other surrounding PSD sources of the air quality increments associated with the nearest Class I area. Gulf Coast is located approximately 75 kilometers (47 miles) SSE from the Chassahowitzka National Wilderness Area, and was thus required to perform dispersion modeling to determine the air quality impacts on the area. DEP identified 13 discrete receptors to be used as the receptor grid and 137 sources to be included in the modeling in addition to Gulf Coast. These additional sources, listed in **Appendix K**, were both *increment consuming*, meaning they were permitted after the baseline date, and *increment expanding*, meaning they had shut down since the baseline date and were thus entered into the model with the appropriate negative emission rate. The baseline date is that date after the implementation of the PSD regulations when the first PSD source was permitted in the respective area for the respective pollutant (December 27, 1977).

Class I Level 1 modeling using ISCST3 showed slight exceedances of the Class I increments for the 3-hour and 24-hour averaging periods at the previous emission rate of 374 lbs/hr. Since Gulf Coast is located 75 kilometers from the Wildlife Area, exceeding the accepted limit of 50 kilometers for the ISCST3 model, a long-range transport analysis was performed by Jim Clary and Associates using the updated MESOPUFF II model and the 374 lbs/hr emission rate. These Level 2 results are summarized in **Table 4.2**. The complete protocol and results summary can be found in **Appendix L**. Model outputs can be found in **Volume III** of the May 1994 application.

Table 4.2
CLASS I INCREMENT ANALYSIS RESULTS [1]

values are in $\mu g/m^3$

AVERAGING PERIOD	ALLOWED INCREMENT	PREDICTED IMPACTS
3-hour	25	21.18
24-hour	5	**7.32** [2]
annual	2	-0.81

1 Highest modeled impacts, 1986 met data

2 Gulf Coast not significantly contributing

Since Gulf Coast is now requesting an SO_2 emission limit of 175 lbs/hr, the Class I Level 1 model was re-run with this lower limit. Overall impacts did not change due to the 137 surrounding sources' emission rates not changing. There were 321 total exceedances of the 3- and 24-hour increments out of a possible 213,525 (a 0.15% exceedance rate). The annual increment was not exceeded. An analysis was then performed to determine if Gulf Coast was significantly contributing to the exceedances by modeling Gulf Coast's emissions separately. Of the 321 total exceedances Gulf Coast was significantly contributing to 11 (a 3% rate).

The next step would be to re-run the MESOPUFF II model at 175 lbs/hr. However,

Table 4.2 shows that the 3-hour and annual increments are not being exceeded at 374 lbs/hr. The table also shows that Gulf Coast is not significantly contributing to the 24-hour exceedance, also using the 374 lbs/hr. Predicted impacts using the requested 175 lbs/hr for Gulf Coast would obviously be no higher, and most likely lower, than those using 374 lbs/hr and depicted in **Table 4.2**. In review of the previous PSD application, concerns were raised regarding the previous MESOPUFF II analysis. The "deficiencies" are as follows:

1) Only 1 upper air station was used. It was suggested that two additional stations (West Palm Beach, FL and Waycross, GA) be incorporated to address the windflow from other sources.

   As shown in Figure 2 of Appendix L of the previous application (copy attached) the vast majority of sources are located near the Tampa met station. It is felt that re-running the MESOPUFF II model using upper air stations in Georgia and in West Palm Beach is not going to influence the sources included in this project and, therefore, not necessary.

2) The MESOPUFF II analysis only used the SO_2 conversion and dry deposition options for Gulf Coast impacts, not for the other 137 sources.

   This option was used as a conservative factor. The IWAQM allows for SO_2 conversion, dry deposition, and wet removal processes. Each of these processes reduce ambient SO_2 concentrations. Using the SO_2 conversion and dry deposition options for all sources will result in lower impacts. In addition, the use of wet deposition (which was not used for any sources) will significantly reduce impacts at long range. Therefore, it is felt that re-running the MESOPUFF II model using these options is not necessary.

4.1.3 Class II Increment Analysis

The Class II increment analysis predicted the consumption of the air quality increments for the project impact area, which is classified as a Class II area, by Gulf Coast and all other surrounding PSD sources. DEP identified 106 sources to be included in the modeling in addition to Gulf Coast. These additional sources, listed in **Appendix M**, were both increment consuming, meaning they were permitted after the baseline date, and increment expanding, meaning they had shut down since the baseline date and were thus entered into the model with the appropriate negative emission rate. The baseline date is that date after the implementation of the PSD regulations when the first PSD source was permitted in the respective area for the respective pollutant (December 27, 1977). These results are shown in **Table 4.3**. Copies of the input and output files can be found on diskette in **Appendix N**.

Table 4.3

CLASS II INCREMENT ANALYSIS RESULTS

values are in $\mu g/m^3$

AVERAGING PERIOD	ALLOWED INCREMENT	1982	1983	1984	1985	1986
3-hour [1]	512	262	277	262	251	256
24-hour [1]	91	64	71	73	51	61
annual [2]	20	0 [3]	0	0	0	0

[1] Highest second-high modeled impacts

[2] Highest first-high modeled impacts

[3] Zero values are actually negative, ISCST3 reports negative values as zero

4.1.4 CO Screening Analysis

A screening model was performed for CO to determine if Gulf Coast exceeded the significance level of 575 $\mu g/m_3$, 8-hour averaging period, as outlined in 40 CFR 51.166 (i)(8)(i)(a). If this significance level was exceeded, a refined analysis would have to be done to include CO emissions from surrounding sources to determine compliance with the FAAQS and the Class I and II increments. The CO screening analysis used ISCST3 using the same default values and receptor grids as the SO_2 modeling. An emission rate of 69.5 lbs/hr was used, which is the emission rate with the afterburner installed. Even though the 8-hr standard may be exceeded once per year, the first-high value must be used in the screening analysis for conservative purposes. The results indicated a predicted maximum impact of 37.2 $\mu g/m^3$, less than seven percent of the 575 $\mu g/m^3$ significance level (see **Table 4.4**). No further analysis is therefore required. Copies of the input and output files can be found on diskette in **Appendix N**. Model outputs can be found in **Volume II** of the May 1994 application.

Table 4.4
CO SCREENING ANALYSIS RESULTS [1]

values are in $\mu g/m^3$

AVERAGING PERIOD	FED. & FLA. SIG. LEVEL	1986
8-hour	575	37

[1] Highest second-high modeled impact, 1986 met data

4.2 MODELING SUMMARY

The air dispersion modeling demonstrates that Gulf Coast will not cause or significantly contribute to a violation of the FAAQS or exceed the allowed increment consumption for all applicable areas and pollutants. The FAAQS analysis showed that although the model predicted a few violations of the Florida standards, Gulf Coast did not significantly contribute. The analysis also showed that this modeling protocol was very conservative, in that it predicted violations even with Gulf Coast's emissions excluded.

The Class I increment analysis showed that Gulf Coast, along with the applicable surrounding PSD sources, will not exceed the increment consumption allowed for the Chassahowitzka National Wilderness Area. The Class II increment analysis showed that Gulf Coast, along with the applicable surrounding PSD sources, will not exceed the increment consumption allowed for that area. The CO screening model showed that Gulf Coast will not exceed the significant level and therefore will not exceed the FAAQS or Class I or II increments.

The annual modeling results, which were based on 8,760 hrs/yr, supports Gulf Coast's request to increase the allowable operating hours from 7,800 to 8,760 hrs/yr.

5.0 EFFECTS ON AIR QUALITY RELATED VALUES (AQRV)

This section discusses the predicted impacts by Gulf Coast on air quality-related aspects other than ambient concentrations of sulfur dioxide. Among these aspects are impacts on soils, vegetation, wildlife, aquatic resources, and visibility. In addition, the economic impact of Gulf Coast is discussed.

5.1 INDUCED GROWTH IMPACT

It is anticipated that no induced growth impacts will occur as a result of this project. This modification was simply a replacement of a piece of equipment with no additional employees needed to operate it or any long-term construction-related employment. Therefore, no additional local or industrial support factors will be needed. Further, no additional air pollution will occur from any permanent residential, commercial, or industrial growth, since none is anticipated.

5.2 IMPACTS ON SOILS AND VEGETATION

The response of plants to SO_2 exposure is a complex process that involves not only the pollutant concentration and duration of exposure, but also the genetic composition of the plant and the environmental factors under which the exposure occurs. This process involves entrance of SO_2 into the plant through leaf openings called stomata, and contact within the leaf with wet cellular membranes and subsequent liquid phase reactions resulting in the formation of sulfite and sulfate compounds. The formation of these compounds can initiate changes within plants' metabolic systems that will produce physiological dysfunctions. If sufficient physiological modifications occur, plant homeostasis or equilibrium is disturbed and visible symptoms of injury may or may not be manifested. Plant repair mechanisms can result in a return to homeostasis and recovery.

In general, plants have an inherent, and apparently species-dependent, capacity to absorb, detoxify, and metabolically incorporate SO_2, and may absorb low concentrations of SO_2 over long time periods without damage. Thomas et al., for example, exposed alfalfa to SO_2 continuously, at 520 $\mu g/m^3$ (0.20 ppm), for eight weeks without adverse effects. It is therefore reasonable to expect that either no effects or beneficial effects may be associated with low-level SO_2 exposures.

Under certain conditions atmospheric SO_2 can have beneficial effects on agronomic vegetation. Sulfur is one of the elements required for plant growth and Coleman reported that crop deficiencies of sulfur have been occurring with increasing frequency throughout the world. Faller conducted a series of experiments to determine effects of varying atmospheric concentrations of SO_2 on sunflower, corn, and tobacco. Yields of leaves and stems increased by 80 percent in tobacco when exposed to atmospheric SO_2 concentrations of 1490 $\mu g/m^3$ (0.57 ppm), sunflower and corn had their highest biomass at SO_2 concentrations of 1050 $\mu g/m^3$ (0.40 ppm) and 520 $\mu g/m^3$ (0.20 ppm), respectively. Nogales and Jones showed that cotton grown in specifically designed growth containers in the vicinity of certain coal-fired power plants accumulated significant amounts of atmospheric sulfur (as SO_2) and produced significantly more biomass than those grown at a location further from the industrial source of sulfur.

Limitations of space do not permit a listing here of all plants known to be sensitive to various doses of SO_2. Furthermore, in a listing of sensitive plants, the evidence collected should also indicate environmental, genetic, and cultural considerations that may in fact determine such sensitivities. In addition, general descriptions are difficult because plant responses to air pollutants vary at the genus, species, variety, and cultivar levels. **Table 5.1** is based on a 20-year study as conducted by Jones et al. This listing of sensitivity groupings is based on observations of 120 species growing in the vicinity of coal-fired power plants in the Southeast. From this table, it can be seen that the most sensitive vegetation showed visible signs of damage at exposure levels of 1310-2620 $\mu g/m^3$ (1-hour period) and 790-1570 $\mu g/m^3$ (3-hour period). The dispersion modeling results provided in this document revealed maximum ground level impacts of SO_2 in the Chassahowitzka Wilderness Area to be less than 10 $\mu g/m^3$ (3-hour period) which is well below the critical levels for the most sensitive plants.

Extensive efforts have been made to identify and develop certain sensitive plant species as potential bioindicators of ambient air SO_2 effects. Perhaps the most extensively examined plants for this use are the eastern white pine. **Table 5.2** indicates the degree of injury of the white pine at various distances from the Sudbury Smelters over a ten year period. As the distance from the smelters increases, the annual exposure concentrations decrease and the degree of foliable injury also decreases. It was observed that at an annual concentration of 21 $\mu g/m^3$ very little chronic injury resulted from the exposure. It should be noted here that the maximum allowable increase for SO_2 in a Class II area under the PSD regulations is 20 $\mu g/m^3$. The

SENSITIVITY GROUPINGS OF VEGETATION BASED ON VISIBLE INJURY AT DIFFERENT SO_2 EXPOSURES[a]

Sensitivity Grouping	SO_2 concentration, $\mu g/m^3$ (ppm), and duration time, hr			Plants
	Peak[b]	1-hr	3-hr	
Sensitive:	2620-3930 $\mu g/m^3$ (1.0 - 1.5 ppm)	1310-2620 $\mu g/m^3$ (0.5 - 1.0 ppm)	790-1570 $\mu g/m^3$ (0.3 - 0.6 ppm)	Ragweeds Legumes Blackberry Southern pines Red and black oaks White ash Sumacs
Intermediate:	3930-5240 $\mu g/m^3$ (1.5 - 2.0 ppm)	2620-5240 $\mu g/m^3$ (1.0 - 2.0 ppm)	1570-2100 $\mu g/m^3$ (0.6 - 0.8 ppm)	Maples Locust Sweetgum Cherry Elms Tuliptree Many crop and garden species
Resistant:	>5240 $\mu g/m^3$ (> 2.0 ppm)	>5240 $\mu g/m^3$ (> 2.0 ppm)	>2100 $\mu g/m^3$ (> 0.8 ppm)	White oaks Potato Upland cotton Corn Dogwood Peach

[a]Based on observations over a 20-year period of visible injury occurring on over 120 species growing in the vicinities of coal-fired power plants in the southeastern United States.

[b]Maximum 5 minute concentration.

Source: After Jones et al., 1974.

TABLE 5.1

TABLE 5.2

THE DEGREE OF INJURY OF EASTERN WHITE PINE OBSERVED AT VARIOUS DISTANCES FROM THE SUDBURY SMELTERS FOR 1953-63

Forest Sampling Station[a] (Distance and Direction from Sudbury)	Trees with Current Year's Foliage Injured in August 1963 (%)	Trees with 1-Year-Old (1962) Foliage Injured: June 1963 (%)	Trees with 1-Year-Old (1962) Foliage Injured: August 1963 (%)	Trees with 2-Year Old Foliage: Injured in June 1963 (%)	Trees with 2-Year Old Foliage: Lacking in August 1963 (%)	Net Annual Average Gain or Loss in Total Volume, 1953-1963 (%)	Annual Average Mortality 1953-1963 (%)	Degree of SO_2 Damage	Average SO_2 Concentration[b] for Total Measurement Period 1954-1963 $\mu g/m^3$ (ppm)
West Bay (19 miles NE)	2.0	38.0	77.9	96.0	20.6	-1.3	2.6	Acute and chronic injury	115 (0.045)
Portage Bay (25 miles NE)	1.1	21.5	55.6	77.0	15.2	-0.5	2.5	Mostly chronic and little acute injury	45 (0.017)
Grassy to Emerald Lake (40-43 miles NE)	0.4	2.5	16.7	37.5	9.1	+1.8	1.4	Very little chronic injury	21 (0.008)
Lake Matinenda (93 miles W)	0.6	0.3	2.1	10.1	3.9	+2.1	0.5	Control: no SO_2 injury	3 (0.001)[c] (Sturgeon Falls)
Correlation Coefficient (r)	0.96	0.96	0.93**	0.90**	0.94**	0.90**	0.81		

[a]Linzon (1971) (Pollutants other than SO_2 were not measured and the monitoring was done several miles from the pine stands.)

[b]Dreisinger (1965)

[c]Data for 5-month growing season-1971

*$p < 0.05$

**$p < 0.10$

Derived from Linzon, 1980.

dispersion modeling results provided in this document show the annual increment impacts for both the Class I and Class II areas to be negative.

5.3 IMPACTS ON VISIBILITY

"Atmospheric visibility" is a term often used by airport weather observers to connote visual range, which refers to the farthest distance at which a large, black object can be seen against the horizon sky in the daytime. Visibility relates to atmospheric clarity and the perceived characteristics of viewed surroundings, including the contrast and the color of objects and sky. Pollution affects visibility in two primary ways: (1) as coherent plumes or haze layers visible because of their contrast with the background; and (2) as widespread, relatively homogeneous haze that reduces contrast of viewed targets and reduces visual range. The kind and degree of effects are determined largely by the distribution and characteristics of atmospheric particulate matter, which scatters and absorbs light.

For purposes of evaluating the potential effects that Gulf Coast's emissions may have on the visibility in the Chassahowitzka National Wilderness Area, EPA's *Workbook for Plume Visual Impact Screening and Analysis (Revised)*" EPA-454/R-92-023 was followed. This guidance document is designed to assist the user in the evaluation of plume visual impact as required by the PSD and visibility regulations of the EPA. This document provides guidance on the assessment of plume visual impacts, including the use of a plume visual impact screening model (VISCREEN), which was used to calculate the potential visual impacts of a plume of specified emissions for specific worst-case transport and dispersion conditions. If these screening calculations, using VISCREEN, demonstrate that during worst-cast meteorological conditions a plume is either imperceptible or is not likely to be objectionable, further analysis of plume visual impact would not be required as part of the air quality review of a source.

VISCREEN is a simple plume visibility model. The objective of the model is to calculate the contrast and the color difference of a plume and its viewing background. Because VISCREEN is to be used for screening calculations, it was designed to be conservative (i.e., to overpredict potential plume visual impacts). Therefore, VISCREEN calculates greater plume visual impacts, for the same input specifications, than more sophisticated models such as PLUVUE and PLUVUE II. The VISCREEN Level-1 screening analysis determines whether the plume from Gulf Coast has the potential to be perceptible to untrained observers under "reasonable worst-case" conditions. This conservatism was achieved by making the following worst-case assumptions:

- Worst-case meteorological conditions are assumed: atmospheric stability is extremely stable (F), wind speed is very low (1 meter per second), and wind direction is such that it would transport the plume directly perpendicular to the observer. It is assumed these meteorological conditions persist for 12 hours, after which some additional dispersion is assumed but the plume is still considered to remain intact;

- The line of sight is horizontal, so that it intersects the most plume material. Non horizontal lines of sight intersect less plume material because horizontal dispersion of plumes exceeds vertical dispersion, especially under stable conditions;

- Sun (scattering) angles are such that the forward scatter case ($\Theta=10°$) yields very bright plumes because the sun is placed nearly directly in front of the observer. This geometry would rarely occur in reality. The background scatter case ($\Theta=140°$) yields the darkest possible plumes. Thus, the screening calculations are likely to yield the brightest and the darkest plumes;

- No multiple scattering occurs. Light scattered into the line of sight from directions other than directly from the sun tend to slightly decrease the plume contrast for the worst-case sun angles assumed;

- For terrain viewing backgrounds, the terrain is black (the darkest possible) and is located as close to the observer and the plume as possible. This assumption yields the darkest possible background against which particulate plumes are likely to be most visible. In reality, terrain viewing backgrounds (if indeed terrain is behind the plume) would be less dark and would be located farther from the observer;

- The screening thresholds ($\Delta E=2$; contrast of 0.05) were selected at the upper bound of the perceptibility threshold, representing a reasonable estimate for casual observers in the field;

- Particulate mass median diameters are 0.3 μm for background fine particles, 6 μm for background coarse particles, 2 μm for plume particulate particles, 0.1 μm for plume soot particles, and 0.5 μm for plume primary sulfate particles; and

- All emissions of particulate matter from the facility are dispersed in one plume.

This conservatism was increased in this particular analysis with the following:

- Allowable emissions of particulates and nitrogen oxides were included even though these emissions did not exceed the PSD thresholds; and

- 100% of the requested 175 lbs/hr of SO_2 were assumed to be emitted as SO_4 which has a much greater affect on visibility. This was done despite the following guidance from *Workbook For Plume Visual Impact Screening and Analysis (Revised)*: "SO_2 emissions are not required as input to VISCREEN. Moreover, the issue of secondary sulfate formation (SO_4) is not treated in VISCREEN because of the limited range of applicability of a steady state Gaussian dispersion model and because of the uncertainty of estimating the conversion of SO_2 to SO_4 in a coherent plume.

The results of this analysis, which can be found in **Tables 5.3-5**, summarize the screening calculations by comparing the criteria levels of the two screening parameters; delta E-color contrast, and Contrast-total plume contrast against the calculated results. The Level 1 results indicate that the screening criteria were not exceeded. This visibility analysis satisfies all EPA criteria for Class I areas and demonstrates that the Gulf Coast blast furnace does not adversely impact visibility in the Chassahowitzka National Wilderness Area.

Visual Effects Screening Analysis for
Source: GULF COAST RECYC.
Class I Area: CHASSAHOWITZKA NWA

*** Level-1 Screening ***

Input Emissions for

Particulates	3.20	LB /HR
NOx (as NO2)	1.98	LB /HR
Primary NO2	.00	LB /HR
Soot	.00	LB /HR
Primary SO4	262.50	LB /HR

**** Default Particle Characteristics Assumed

Transport Scenario Specifications:

Background Ozone:	.04 ppm
Background Visual Range:	25.00 km
Source-Observer Distance:	76.00 km
Min. Source-Class I Distance:	76.00 km
Max. Source-Class I Distance:	95.60 km
Plume-Source-Observer Angle:	11.25 degrees
Stability: 6	
Wind Speed: 1.00 m/s	

R E S U L T S

Asterisks (*) indicate plume impacts that exceed screening criteria

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

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	84.	76.0	84.	2.00	.414	.05	.006
SKY	140.	84.	76.0	84.	2.00	.180	.05	-.009
TERRAIN	10.	84.	76.0	84.	2.00	.294	.05	.003
TERRAIN	140.	84.	76.0	84.	2.00	.082	.05	.003

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

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	75.	73.6	94.	2.00	.430	.05	.006
SKY	140.	75.	73.6	94.	2.00	.187	.05	-.010
TERRAIN	10.	60.	69.5	109.	2.00	.389	.05	.004
TERRAIN	140.	60.	69.5	109.	2.00	.109	.05	.004

DELTA E RESULTS

LINE OF SIGHT	OUT/ IN	PHI	ALPHA	X	RP	RO	PSI	CONTRAST THRESHLD	DELTA E THRESHLD	DELTA E PL/SKY FORW'D	DELTA E THRESHLD	DELTA E PL/SKY BACK	DELTA E THRESHLD	DELTA E PL/TER FORW'D	DELTA E THRESHLD	DELTA E PL/TER BACK
1	0	5.0	163.8	23.7	53.0	63.0	0.30	0.05	2.00	0.00	2.00	0.00	2.00	0.01	2.00	0.00
2	0	10.0	158.8	36.4	40.9	54.1	0.44	0.05	2.00	0.02	2.00	0.01	2.00	0.03	2.00	0.01
3	0	15.0	153.8	44.5	33.5	47.8	0.57	0.05	2.00	0.06	2.00	0.04	2.00	0.07	2.00	0.02
4	0	20.0	148.8	50.1	28.6	43.0	0.69	0.05	2.00	0.11	2.00	0.06	2.00	0.11	2.00	0.03
5	0	25.0	143.8	54.3	25.1	39.4	0.80	0.05	2.00	0.16	2.00	0.09	2.00	0.16	2.00	0.05
6	0	30.0	138.8	57.6	22.5	36.7	0.90	0.05	2.00	0.20	2.00	0.11	2.00	0.21	2.00	0.06
7	0	35.0	133.8	60.3	20.5	34.5	1.00	0.05	2.00	0.24	2.00	0.13	2.00	0.26	2.00	0.07
8	0	40.0	128.8	62.6	19.0	32.8	1.09	0.05	2.00	0.28	2.00	0.15	2.00	0.30	2.00	0.09
9	0	45.0	123.8	64.6	17.8	31.5	1.17	0.05	2.00	0.32	2.00	0.16	2.00	0.34	2.00	0.10
10	0	50.0	118.8	66.4	16.9	30.5	1.24	0.05	2.00	0.36	2.00	0.17	2.00	0.37	2.00	0.10
11	0	55.0	113.8	68.0	16.2	29.8	1.30	0.05	2.00	0.38	2.00	0.18	2.00	0.38	2.00	0.11
12	0	60.0	108.8	69.5	15.7	29.3	1.35	0.05	2.00	0.40	2.00	0.18	2.00	0.39	2.00	0.11
13	0	65.0	103.8	70.9	15.3	29.1	1.39	0.05	2.00	0.42	2.00	0.19	2.00	0.39	2.00	0.11
14	0	70.0	98.8	72.3	15.0	29.1	1.42	0.05	2.00	0.43	2.00	0.19	2.00	0.37	2.00	0.10
15	0	75.0	93.8	73.6	14.9	29.3	1.44	0.05	2.00	0.43	2.00	0.19	2.00	0.35	2.00	0.10
16	0	80.0	88.8	74.9	14.8	29.8	1.45	0.05	2.00	0.42	2.00	0.18	2.00	0.32	2.00	0.09
17	1	85.0	83.8	76.2	14.9	30.5	1.45	0.05	2.00	0.41	2.00	0.18	2.00	0.29	2.00	0.08
18	1	90.0	78.8	77.5	15.1	31.5	1.43	0.05	2.00	0.39	2.00	0.17	2.00	0.25	2.00	0.07
19	1	95.0	73.8	78.9	15.4	32.8	1.41	0.05	2.00	0.37	2.00	0.17	2.00	0.21	2.00	0.06
20	1	100.0	68.8	80.3	15.9	34.5	1.37	0.05	2.00	0.34	2.00	0.16	2.00	0.16	2.00	0.05
21	1	105.0	63.8	81.9	16.5	36.7	1.32	0.05	2.00	0.31	2.00	0.15	2.00	0.12	2.00	0.03
22	1	110.0	58.8	83.5	17.3	39.4	1.27	0.05	2.00	0.27	2.00	0.13	2.00	0.08	2.00	0.02
23	1	115.0	53.8	85.4	18.4	43.0	1.20	0.05	2.00	0.23	2.00	0.12	2.00	0.05	2.00	0.01
24	1	120.0	48.8	87.5	19.7	47.8	1.13	0.05	2.00	0.19	2.00	0.10	2.00	0.03	2.00	0.01
25	1	125.0	43.8	90.0	21.4	54.1	1.04	0.05	2.00	0.15	2.00	0.08	2.00	0.01	2.00	0.00
26	1	130.0	38.8	93.0	23.7	63.0	0.95	0.05	2.00	0.11	2.00	0.07	2.00	0.00	2.00	0.00
27	0	135.0	33.8	96.7	26.7	76.0	0.85	0.05	2.00	0.08	2.00	0.05	2.00	0.00	2.00	0.00
28	0	140.0	28.8	101.6	30.8	96.7	0.74	0.05	2.00	0.05	2.00	0.03	2.00	0.00	2.00	0.00
29	0	145.0	23.8	108.2	36.8	134.4	0.63	0.05	2.00	0.02	2.00	0.01	2.00	0.00	2.00	0.00
30	0	150.0	18.8	118.2	46.1	222.8	0.51	0.05	2.00	0.01	2.00	0.00	2.00	0.00	2.00	0.00
31	0	155.0	13.8	135.1	62.4	666.8	0.38	0.05	2.00	0.00	2.00	0.00	2.00	0.00	2.00	0.00
32	0	0.1	168.6	1.0	75.0	75.5	0.05	0.09	5.67	0.00	2.00	0.00	5.67	0.00	2.00	0.00
33	1	84.4	84.4	76.0	14.9	30.4	1.45	0.05	2.00	0.41	2.00	0.18	2.00	0.29	2.00	0.08
34	1	133.6	35.1	95.6	25.8	71.8	0.88	0.05	2.00	0.09	2.00	0.05	2.00	0.00	2.00	0.00

C O N T R A S T   R E S U L T S

C O N T R A S T   R E S U L T S

LINE OF SIGHT	OUT/ IN	PHI	CONTRAST THRESHLD	GREEN CONTRAST PL/SKY FORW'D	GREEN DELTA C SKY/TER FORW'D	GREEN CONTRAST PL/SKY BACK	GREEN DELTA C SKY/TER BACK	BLUE CONTRAST PL/SKY FORW'D	BLUE DELTA C SKY/TER FORW'D	BLUE CONTRAST PL/SKY BACK	BLUE DELTA C SKY/TER BACK	RED CONTRAST PL/SKY FORW'D	RED DELTA C SKY/TER FORW'D	RED CONTRAST PL/SKY BACK	RED DELTA C SKY/TER BACK	BLUE-RED RATIO PL/SKY FORW'D	BLUE-RED RATIO PL/SKY BACK
1	0	5.0	0.050	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	1.000
2	0	10.0	0.050	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	-0.001	0.001	1.000	1.001
3	0	15.0	0.050	0.001	0.000	-0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.002	-0.002	0.002	1.000	1.002
4	0	20.0	0.050	0.002	0.001	-0.002	0.001	0.001	0.000	-0.001	0.000	0.001	0.003	-0.004	0.003	1.000	1.003
5	0	25.0	0.050	0.002	0.001	-0.004	0.001	0.002	0.000	-0.001	0.000	0.001	0.004	-0.005	0.004	1.001	1.004
6	0	30.0	0.050	0.003	0.002	-0.005	0.002	0.003	0.000	-0.002	0.000	0.001	0.005	-0.006	0.005	1.002	1.004
7	0	35.0	0.050	0.004	0.002	-0.006	0.002	0.004	0.000	-0.003	0.000	0.001	0.005	-0.007	0.005	1.003	1.004
8	0	40.0	0.050	0.004	0.003	-0.007	0.003	0.004	0.001	-0.004	0.001	0.001	0.006	-0.008	0.006	1.003	1.004
9	0	45.0	0.050	0.005	0.003	-0.008	0.003	0.005	0.001	-0.005	0.001	0.001	0.007	-0.008	0.007	1.004	1.003
10	0	50.0	0.050	0.005	0.003	-0.008	0.003	0.006	0.001	-0.005	0.001	0.001	0.007	-0.009	0.007	1.005	1.004
11	0	55.0	0.050	0.006	0.004	-0.009	0.004	0.007	0.001	-0.006	0.001	0.001	0.007	-0.009	0.007	1.006	1.003
12	0	60.0	0.050	0.006	0.004	-0.009	0.004	0.007	0.001	-0.006	0.001	0.001	0.007	-0.009	0.007	1.006	1.003
13	0	65.0	0.050	0.006	0.004	-0.009	0.004	0.007	0.001	-0.007	0.001	0.001	0.007	-0.009	0.007	1.006	1.002
14	0	70.0	0.050	0.006	0.004	-0.010	0.003	0.008	0.001	-0.007	0.001	0.001	0.007	-0.009	0.007	1.007	1.002
15	0	75.0	0.050	0.006	0.003	-0.010	0.003	0.008	0.001	-0.007	0.001	0.001	0.007	-0.009	0.007	1.007	1.002
16	0	80.0	0.050	0.006	0.003	-0.009	0.003	0.008	0.001	-0.007	0.001	0.001	0.006	-0.009	0.006	1.007	1.002
17	1	85.0	0.050	0.006	0.003	-0.009	0.003	0.007	0.001	-0.007	0.001	0.001	0.006	-0.009	0.005	1.006	1.002
18	1	90.0	0.050	0.006	0.002	-0.009	0.002	0.007	0.001	-0.006	0.001	0.001	0.005	-0.008	0.005	1.006	1.002
19	1	95.0	0.050	0.005	0.002	-0.008	0.002	0.007	0.000	-0.006	0.000	0.001	0.004	-0.008	0.004	1.006	1.002
20	1	100.0	0.050	0.005	0.001	-0.008	0.001	0.006	0.000	-0.005	0.000	0.001	0.003	-0.008	0.003	1.005	1.003
21	1	105.0	0.050	0.005	0.001	-0.007	0.001	0.005	0.000	-0.005	0.000	0.001	0.003	-0.007	0.003	1.004	1.002
22	1	110.0	0.050	0.004	0.001	-0.006	0.001	0.005	0.000	-0.004	0.000	0.001	0.002	-0.007	0.002	1.004	1.003
23	1	115.0	0.050	0.004	0.000	-0.006	0.000	0.004	0.000	-0.003	0.000	0.001	0.001	-0.006	0.001	1.003	1.003
24	1	120.0	0.050	0.003	0.000	-0.005	0.000	0.003	0.000	-0.003	0.000	0.001	0.001	-0.005	0.001	1.002	1.002
25	1	125.0	0.050	0.002	0.000	-0.004	0.000	0.002	0.000	-0.002	0.000	0.001	0.000	-0.004	0.000	1.001	1.002
26	1	130.0	0.050	0.002	0.000	-0.003	0.000	0.001	0.000	-0.001	0.000	0.001	0.000	-0.003	0.000	1.000	1.002
27	0	135.0	0.050	0.001	0.000	-0.002	0.000	0.001	0.000	-0.001	0.000	0.000	0.000	-0.002	0.000	1.001	1.001
28	0	140.0	0.050	0.001	0.000	-0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-0.002	0.000	1.000	1.002
29	0	145.0	0.050	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-0.001	0.000	1.000	1.001
30	0	150.0	0.050	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	1.000
31	0	155.0	0.050	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	1.000
32	0	0.1	0.093	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	1.000
33	1	84.4	0.050	0.006	0.003	-0.009	0.003	0.007	0.001	-0.007	0.001	0.001	0.006	-0.009	0.006	1.006	1.002
34	1	133.6	0.050	0.001	0.000	-0.002	0.000	0.001	0.000	-0.001	0.000	0.000	0.000	-0.003	0.000	1.001	1.002

REFERENCES

Thomas et el., Coleman, Faller, Nogales and Jones, Jones et al. "Air Quality Criteria for Particulate Matter and Sulfur Oxides, Volume III." United States Environmental Protection Agency, EPA-600/8 - 82/029 c, December 1982

6.0 APPLICATION FORMS

The next 12 pages consist of the completed DEP application forms.

7.0 SUMMARY AND CONCLUSIONS

The information contained in this document supports the issuance of the Prevention of Significant Deterioration construction and operating permit for Gulf Coast Recycling, Inc. located in Tampa, Florida. Air dispersion modeling, along with current operating permits and ambient monitoring data, have shown that Gulf Coast currently is and will continue to be in compliance with all applicable local, state, and federal air quality regulations. The BACT analysis showed that desulfurization of the feed material is the most cost-effective and environmentally-friendly means of reducing SO_2 emissions. The modeling analysis showed that the emission reductions achieved with the desulfurization system are sufficient to ensure that SO_2 emissions from Gulf Coast are not exceeding any ambient standards or PSD increments, nor are they degrading visibility in the nearest Class I area.

Gulf Coast has also committed to installing an afterburner to control VOC and CO emissions. As mentioned earlier, Gulf Coast is the only lead-acid battery recycler in the state of Florida. A shutdown of this facility will require the transport of approximately 1.1 million batteries per year 425 miles to the nearest recycling facility in Columbus, Georgia, thus increasing mobile-source air emissions to the region.

APPENDIX A

CURRENT OPERATING PERMIT
NO. AO29-173310

Florida Department of Environmental Regulation

Southwest District • 4520 Oak Fair Boulevard • Tampa, Florida 33610-7347 • 813-623-5561

Bob Martinez, Governor | Dale Twachtmann, Secretary | John Shearer, Assistant Secretary
Dr. Richard Garrity, Deputy Assistant Secretary

PERMITTEE:
Gulf Coast Recycling, Inc.
1901 North 66th Street
Tampa, FL 33619

PERMIT/CERTIFICATION
Permit No: AO29-173310
County: Hillsborough
Amendment Date: 11/19/90
Expiration Date: 11/15/95
Project: Blast Furnace and Agglomeration Furnace

This amended permit is issued under the provisions of Chapter 403, Florida Statutes, and Florida Administrative Code Rules 17-2 & 17-4. The above named permittee is hereby authorized to perform the work or operate the facility shown on the application and approved drawing(s), plans and other documents, attached hereto or on file with the department and made a part hereof and specifically described as follows:

For the operation of a secondary lead blast furnace and a flue dust agglomeration furnace. At the facility leadbearing scrap materials (LSM's), coke, lime rock, cast iron and slag are loaded into a skip-hoist and charged into the blast furnace (60 ton capacity). Lead in the liquid form collects at the base of the blast furnace. In this process lime rock is added to displace the lead in any lead silicate which might have been formed, while cast iron (iron oxide) binds with any sulfur to produce iron sulfide thus reducing sulfur dioxide emissions. The lead is tapped from the blast furnace and cast into buttons. Emissions generated by the charging (Point 06), the blast furnace exhaust (Point 01) and the tapping (Point 04) are controlled by three (3) sets of baghouses which vent separately. Flue dust collected by the baghouses is conveyed to an agglomeration furnace fired on natural gas. The blast furnace is subject to the New Source Performance Standards of 40 CFR 60, Subpart L, Standards of Performance for Secondary Lead Smelters and the Federal Implementation Plan contained in 40 CFR 52.535.

Location: 1901 North 66th Street, Tampa

UTM: 17-364.0 E 3093.6 N   NEDS NO: 0057   Point ID: 01 - Furnace Exhaust
04 - Tapping
06 - Charging

Replaces Permit No.: AO29-95366

PERMITTEE:
Gulf Coast Recycling, Inc.

PERMIT/CERTIFICATION NO.: A029-173310
PROJECT: Blast Furnace and Agglomeration Furnace

SPECIFIC CONDITIONS:

1. A part of this permit is the attached 15 General Conditions.

2. Pursuant to Rule 17-2.650(2)(b)1., F.A.C., this facility qualifies for an exemption of the Reasonably Available Control Technology (RACT) requirements since, at the request of the permittee, the total allowable emissions of the facility shall not exceed 4.4 pounds per hour and 14.9 tons per year.

3. Pursuant to 40 CFR 60.122(a)(1), the permittee shall not discharge from the baghouses particulate emissions greater than 0.022 grains per dry standard cubic foot.

4. In order to insure compliance with Specific Condition No. 2, the maximum allowable particulate matter emissions* and hours of operation of the sources authorized to operate under this permit shall be:

Source	Emission Limitations	Hours of Operation
Blast Furnace Charging	0.65 lbs./hr. (2.54 TPY)	7800
Blast Furnace	2.15 lbs./hr. (8.38 TPY)	7800
Blast Furnace Tapping	0.40 lbs./hr. (1.56 TPY)	7800

* Prior to initiating any actions to increase the capture efficiency of the system, the permittee shall request written authorization from the Environmental Protection Commission of Hillsborough County.

5. Pursuant to 40 CFR 52.535(c)(1)(i), the maximum allowable lead emissions from the sources authorized to operate under this permit shall be:

Source	Emissions Limitations
Blast Furnace Charging	0.22 lbs./hr. (0.86 TPY)
Blast Furnace	1.81 lbs./hr. (7.06 TPY)
Blast Furnace Tapping	0.06 lbs./hr. (0.23 TPY)

6. Pursuant to 40 CFR 52.535(c)(1)(ii), visible emissions from the closed charge doors on the blast furnace shall not exceed five (5) percent opacity during furnace operation.

7. Pursuant to 40 CFR 52.535(c)(1)(iii), visible emissions from the charge doors on the blast furnace shall not exceed ten (10) percent opacity during charging operations.

PERMITTEE:
Gulf Coast Recycling, Inc.

PERMIT/CERTIFICATION NO.: AO29-173310
PROJECT: Blast Furnace and Agglomeration Furnace

SPECIFIC CONDITIONS: (continued)

8. Pursuant to 40 CFR 52.535(c)(1)(iv), visible emissions from all other sources authorized to operate under this permit shall not exceed five (5) percent opacity.

9. Sulfur dioxide (SO_2) emissions shall not exceed 384.2 pounds per hour. If testing indicates that SO_2 emissions exceed 384.2 (374 lbs./hr. base line + 40 tons/yr., 12/83) than the permittee shall immediately reapply for a new permit under the provisions of Section 17-2.500, F.A.C.

10. Test emissions from the blast furnace charging, blast furnace, and blast furnace tapping operations for the following pollutants at intervals of twelve (12) months from February 14, 1990 and submit 2 copies of test data to the Environmental Protection Commission of Hillsborough County within forty-five (45) days of such testing pursuant to Section 17-2.700, F.A.C.:

(X) Particulates	(X) Sulfur Oxides*
(X) Opacity	(X) Lead

* Applies only to the blast furnace emissions.

11. Compliance with the emission limitations of Specific Conditions Nos. 3, 4, 5, 6, 7 and 8 shall be determined using EPA Methods 1, 2, 3, 4, 6, 9 and 12 contained in 40 CFR 60, Appendix A and adopted by reference in Section 17-2.700, F.A.C. In the case of the Method 9, Section 2.5 shall be excluded, pursuant to 40 CFR 52.535(b)(5).; thus waiving the six minute averaging period and establishing an instantaneous standard. The annual sulfur oxide test will be conducted by the same method used in the December, 1983 test. The minimum requirements for stack sampling facilities, source sampling and reporting, shall be in accordance with Section 17-2.700, F.A.C. and 40 CFR 60, Appendix A.

12. The visible emission test on the blast furnace shall be sixty (60) minutes in duration pursuant to Section 17-2.700, F.A.C., and shall be conducted concurrent with one of the Method 12 runs.

13. The visible emission tests on the blast furnace charging operation shall each be sixty (60) minutes in duration, pursuant to Rule 17-2.700(1)(d)1.b.i., F.A.C. Readings shall be taken on the :

A) Charge doors on the blast furnace during charging (closest potential emission point).
B) Closed charge doors on the blast furnace during furnace operation (closest potential emission point).
C) Baghouse exhaust during blast furnace operation.

PERMITTEE:
Gulf Coast Recycling, Inc.

PERMIT/CERTIFICATION NO.: A029-173310
PROJECT: Blast Furnace and Agglomeration Furnace

SPECIFIC CONDITIONS: (continued)

14. The visible emission test on the blast furnace tapping shall be sixty (60) minutes in duration pursuant to Rule 1702.700(1)(d)1.b.i., F.A.C. Readings shall be taken only during product tapping.

15. The maximum process input rate shall be 4.58 tons per hour of raw materials. Raw material charging rates on a daily basis shall be consistent with the following percentages based on the February, 1990 test.

Raw Material	Percentage
Lead Scrap and Re-Run Slag	88% – 4.03
Coke	7% · 0.32
Lime Rock	2.5% - 0.11
Cast Iron	2.5% - 0.115

16. Testing of emissions must be accomplished at approximately the maximum process weight rate of 4.58 tons per hour of raw materials. The actual charging rate and type of materials charged during the test shall be specified in each test result. Failure to include the actual process or production rate in the results may invalidate the test [Rule 17-4.070(3), F.A.C.].

17. Pursuant to 40 CFR 52.535(b)(2), non-process fugitive emissions (road dust, stockpiles, plant grounds, etc.) shall be minimized. Minimization efforts shall include such fugitive dust suppression activities as chemical stabilization, water spraying with appropriate runoff collection, resurfacing, sweeping, revegetation, and other EPA approved methods.

18. Pursuant to 40 CFR 52.535(b)(4), the permittee shall maintain continuous records of plant process and emission control operations as necessary to determine continuous compliance. Such records shall include reports of all process operations and control equipment operating parameters. Such records shall also include reports of all types of process upsets and emission control equipment malfunction, detailing the nature and duration of the upset or malfunction, the expected effects on emissions, and the corrective actions taken or planned to avoid recurrences. Such records shall be available at the plant site for inspection for a period of at least two (2) years.

PERMITTEE:
Gulf Coast Recycling, Inc.

PERMIT/CERTIFICATION NO.: A029-173310
PROJECT: Blast Furnace and Agglomeration Furnace

SPECIFIC CONDITIONS: (continued)

19. Pursuant to Rule 1-1.04.1 of the Rules of the Environmental Protection Commission of Hillsborough County and consistent with Specific Condition No. 15, the permittee shall maintain daily records on the number of charges to the blast furnace and the make-up of each charge (i.e., groups, coke, limerock, etc.). The permittee shall also maintain monthly inventory records showing types and quantities of materials charged to the furnace during the month.

20. Pursuant to Chapter 1-3.22(3) of the Rules of the Environmental Protection Commission of Hillsborough County, the permittee shall not allow the discharge of air pollutants which contribute to an objectionable odor.

21. The Environmental Protection Commission of Hillsborough County shall be notified in writing 15 days in advance of any compliance test to be conducted on this source.

22. Submit for this facility, each calendar year, on or before March 1, an emission report for the preceding calendar year containing the following information pursuant to Subsection 403.061(13), Florida Statutes:

(A) Annual amount of materials and/or fuels utilized.
(B) Annual emissions (note calculation basis).
(C) Any changes in the information contained in the permit application.

Duplicate copies of all reports shall be submitted to the Environmental Protection Commission of Hillsborough County.

23. Pursuant to Section 17-4.090, F.A.C., an application for renewal of permit to operate this source, completed in quadruplicate, shall be submitted to the Environmental Protection Commission of Hillsborough County at least 60 days prior to its expiration date.

Originally Issued: July 17, 1990
Amended this 19 day of 19[illegible].

STATE OF FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION

CHMENT - GENERAL CONDITIONS:

The terms, conditions, requirements, limitations and restrictions set
n in this permit, are "permit conditions" and are binding and enforceable
uant to Sections 403.141, 403.161, 403.727, or 403.859 through 403.861,
ida Statutes. The permittee is placed on notice that the Department will
ew this permit periodically and may initiate enforcement action for any
ation of these conditions.

This permit is valid only for the specific processes and operations
ied for and indicated in the approved drawings or exhibits. Any
thorized deviation from the approved drawings, exhibits, specifications,
onditions of this permit may constitute grounds for revocation and
rcement action by the Department.

As provided in subsections 403.087(6) and 403.722(5), F.S., the issuance
his permit does not convey any vested rights or any exclusive privileges.
her does it authorize any injury to public or private property or any
sion of personal rights, nor any infringement of federal, State, or local
or regulations. This permit is not a waiver of or approval of any other
rtment permit that may be required for other aspects of the total project
h are not addressed in this permit.

This permit conveys no title to land or water, does not constitute State
gnition or acknowledgement of title, and does not constitute authority for
use of submerged lands unless herein provided and the necessary title or
ehold interests have been obtained from the State. Only the Trustees of
Internal Improvement Trust Fund may express State opinion as to title.

This permit does not relieve the permittee from liability for harm or
ry to human health or welfare, animal, or plant life, or property caused
he construction or operation of this permitted source, or from penalties
efore; nor does it allow the permittee to cause pollution in contravention
lorida Statutes and Department rules, unless specifically authorized by an
r from the Department.

The permittee shall properly operate and maintain the facility and systems
reatment and control (and related appurtenances) that are installed and
by the permittee to achieve compliance with the conditions of this
it, are required by Department rules. This provision includes the
ation of backup or auxiliary facilities or similar systems when necessary
chieve compliance with the conditions of the permit and when required by
rtment rules.

The permittee, by accepting this permit, specifically agrees to allow
orized Department personnel, upon presentation of credentials or other
nents as may be required by law and at reasonable times, access to the
ises where the permitted activity is located or conducted to:

(a) Have access to and copy any records that must be kept under conditions of the permit;

(b) Inspect the facility, equipment, practices, or operations regulated or required under this permit; and

(c) Sample or monitor any substances or parameters at any location reasonably necessary to assure compliance with this permit or Department rules.

Reasonable time may depend on the nature of the concern being investigated.

If, for any reason, the permittee does not comply with or will be unable :omply with any condition or limitation specified in this permit, the ıittee shall immediately provide the Department with the following ›rmation:

(a) A description of and cause of noncompliance; and

(b) The period of noncompliance, including dates and times; or, if not corrected, the anticipated time the noncompliance is expected to continue, and steps being taken to reduce, eliminate, and prevent recurrence of the noncompliance.

permittee shall be responsible for any and all damages which may result may be subject to enforcement action by the Department for penalties or revocation of this permit.

In accepting this permit, the permittee understands and agrees that all rds, notes, monitoring data and other information relating to the truction or operation of this permitted source which are submitted to the rtment may be used by the Department as evidence in any enforcement case lving the permitted source arising under the Florida Statutes or rtment rules, except where such use is prescribed by Sections 403.111 and 73, F.S. Such evidence shall only be used to the extent it is consistent the Florida Rules of Civil Procedure and appropriate evidentiary rules.

The permittee agrees to comply with changes in Department rules and ida Statutes after a reasonable time for compliance; provided, however, ›ermittee does not waive any other rights granted by Florida Statutes or rtment rules.

This permit is transferable only upon Department approval in accordance Rule 17-4.120 and 17-730.300, Florida Administrative Code, as icable. The permittee shall be liable for any non-compliance of the itted activity until the transfer is approved by the Department.

This permit or a copy thereof shall be kept at the work site of the itted activity.

This permit also constitutes:

( ) Determination of Best Available Control Technology (BACT)

( ) Determination of Prevention of Significant Deterioration (PSD)

( ) Certification of compliance with State Water Quality Standards (Section 401, PL 92-500)

( ) Compliance with New Source Performance Standards

The permittee shall comply with the following:

(a) Upon request, the permittee shall furnish all records and plans required under Department rules. During enforcement actions, the retention period for all records will be extended automatically unless otherwise stipulated by the Department.

(b) The permittee shall hold at the facility or other location designated by this permit records of all monitoring information (including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation) required by the permit, copies of all reports required by this permit, and records of all data used to complete the application for this permit. These materials shall be retained at least three years from the date of the sample, measurement, report, or application unless otherwise specified by Department rule.

(c) Records of monitoring information shall include:

1. the date, exact place, and time of sampling or measurements;
2. the person responsible for performing the sampling or measurements;
3. the dates analyses were performed;
4. the person responsible for performing the analyses;
5. the analytical techniques or methods used;
6. the results of such analyses.

Nhen requested by the Department, the permittee shall within a reasonable
 furnish any information required by law which is needed to determine
liance with the permit. If the permittee becomes aware the relevant facts
 not submitted or were incorrect in the permit application or in any
rt to the Department, such facts or information shall be corrected
ɔtly.

APPENDIX B

EPA MEMO REGARDING PSD APPLICABILITY

APPENDIX C

LETTER FROM CITY OF TAMPA TO GULF COAST REGARDING SEWER CAPACITY

CITY OF TAMPA

Sandra W. Freedman, Mayor

Department of Sanitary Sewers

Ralph L. Metcalf, II, P.E.
Director

August 3, 1993

Joyce Morales-Caramela
Gulf Coast Recycling, Inc.
1901 North 66th Street
Tampa, Florida 33619

Re: Allocation of capacity for additional wastewater streams at Gulf Coast Recycling Plant.

Dear Joyce:

Due to other service commitment allocations and capacity limitations in our downstream gravity collection system, capacity is not presently available in our manifold force main system in 62nd Street to accept all the additional flows specified in your May 14, 1993 letter.

We have no plans to upgrade the collection system prior to calendar year 1998; however, some limited capacity should become available in approximately two (2) years because one of our prior service commitment allocations is only temporary.

Your letter mentioned the need to resume operation of the groundwater recovery system. Please be advised that any flows from this source will need to be controlled so that our present 20 GPM restriction on the total flow from your plant is not exceeded.

In addition, prior to your resuming operation of the groundwater recovery system, we will need groundwater samples from your monitoring wells analyzed to determine the level of Molybdenum. EPA Test Method 246.2 is to be used. Certified test results should be submitted for our review at your earliest convenience.

Permission to resume pumping of groundwater will be contingent on the determination of the Molybdenum concentration and the installation of pretreatment facilities if deemed necessary.

In addition, we request that the analysis of the effluent samples from your existing pretreatment facilities be expanded to include Molybdenum.

If possible, the test results should be included in the next report to John Daily of our Industrial Waste Division. This will assist us in the review of your plant's annual Industrial Wastewater Discharge Permit Application.

We trust this letter will meet your present needs. Please contact Bill Schafer at 223-8053 or me at 223-8040 if you have any question regarding this matter.

Sincerely,

DEPARTMENT OF SANITARY SEWERS

Michael A. Salgado, Engineer
Planning Division

MAS/pa

xc: John Daily
Executive
Planning
Engineering

APPENDIX D

1991 LEAD SOURCE TEST

STACK SAMPLING EMISSION REPORT
and
VISIBLE EMISSION TESTS

GULF COAST RECYCLING

Tampa, Florida
October 21 - 25, 1991

STEVENSON & ASSOCIATES
333 Falkenburg Road, Suite B-214
Tampa, Florida 33619

TABLE OF CONTENTS

APPENDICES

1.0 INTRODUCTION

1.0 INTRODUCTION

On October 21, 22, 23, 24 & 25, 1991, Stevenson & Associates, represented by Lynne Stevenson, Ron Oliver and Tim Capelle, conducted emission sampling (EPA Methods 1, 2, 4, 5, 6, and 12) and visible emission (EPA Method 9) tests for Gulf Coast Recycling, 1901 North 66th Street, Tampa, Florida.

These tests were performed to meet compliance test specifications of Permits Nos.: AO29-130736/Keel Cast Baghouse; AO29-173310/Furnace Tapping, Furnace Charging and Blast Furnace; and, AC29-184883/Refining Baghouse; and, to determine if these sources were operating within the limits of said permits as per requirements of the Hillsborough County Environmental Protection Commission and the State of Florida Department of Environmental Regulation.

2.0 SOURCE DESCRIPTION

2.0 SOURCE DESCRIPTION

Gulf Coast Recycling recovers lead from damaged or spent lead-acid batteries. Battery groups and posts are removed from the batteries and resmelted in a blast furnace. The blast lead is cast into 3,700 pound "buttons". These buttons are then remelted and cast into boat keels or the lead is refined or alloyed to customer specifications. These operations are controlled with five (5) separate collection and discharge systems.

Dust and fumes from the blast furnace and the slagging furnace are collected, routed through a series of cooling loops and forced through a fabric baghouse collector system (10 modules) prior to discharge through a stack. The stack is 36 inches in diameter, 150 feet high with two (2) sample ports located at 45 feet. The sampling ports are located 8 stack diameters upstream and 28 diameters downstream of any flow disturbances. The sulfur dioxide sampling port is located at the same sampling ports.

The blast furnace charging operation is vented through a double module baghouse.

Exhaust hoods covering the blast furnace, lead and slag taps and the slag tap from the slag furnace are vented through a single module baghouse collector and exhausted through a 13-inch square stack that is 45 feet tall. This process is called blast furnace tapping.

The refining kettle ventilation system consists of exhaust hoods enclosing each of three (3) melting kettles and lead drossing bins. The exhaust from these hoods is routed through a two module baghouse and vented through a 22-inch diameter stack that is 25 feet tall.

The keel cast melt kettle is enclosed with a hood that is exhausted to a single module baghouse and vented through a 14.5 inch diameter stack that is 25 feet tall.

3.0 SUMMARY OF RESULTS

3.0 SUMMARY OF RESULTS

The results of the emission testing are presented in the following Tables. The average emission rates for all parameters for all sources were below the allowable rates as specified in the current operating permits. Therefore, these sources wer oeprating within the limits of compliance during the testing on October 21 through October 25, 1991.

The visible emission highest six minute average for all sources was 0%.

No problems were encountered in accomplishing this assignment.

TABLE II

TEST SUMMARY - LEAD

GULF COAST RECYCLING - BLAST FURNACE

October 24, 1991

RUN NO.	LEAD (LBS/HR)	CONCNTRTN (GR/DSCF)	GAS FLOW (ACFM)	GAS FLOW (DSCFM)	VOLM. AIR (VMSTD)	ISOKENET. (%)
1	0.007	0.000039	24,335	20,308	40.06	100.41%
2	0.005	0.000031	24,485	20,321	39.57	99.14%
3	0.007	0.000039	24,243	20,108	39.17	99.17%
AVG.	0.006	0.000036	24,354	20,246	39.60	99.57%

APPENDIX E

1991 NO_x, VOC, AND CO SOURCE TEST

SOURCE TEST REPORT
for
OXIDES OF NITROGEN, VOLATILE ORGANIC COMPOUNDS AND CARBON MONOXIDE

BLAST FURNACE OUTLET
GULF COAST RECYCLING
TAMPA, FLORIDA

OCTOBER 21 & NOVEMBER 4, 1991

Prepared for:

STEVENSON & ASSOCIATES
333 FALKENBURG ROAD N, UNIT A-115
TAMPA, FLORIDA 33619

Prepared by:

AIR CONSULTING AND ENGINEERING, INC.
2106 N.W. 67TH PLACE, SUITE 4
GAINESVILLE, FLORIDA 32606
(904) 335-1889

289-91-07

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AIR CONSULTING
& ENGINEERING, INC.
2106 N.W. 67th Place • Suite 4 • Gainesville, Florida • 32606
(904) 335-1889 FAX (904) 335-1891

REPORT CERTIFICATION

To the best of my knowledge, all applicable field and analytical procedures comply with Florida Department of Environmental Regulation requirements and all test data and plant operating data are true and correct.

Dagmar Neck

Dagmar Neck

11/22/91

Date

1.0 INTRODUCTION

On October 21, 1991, Air Consulting and Engineering, Inc. (ACE), conducted oxides of nitrogen (NO_x), Carbon Monoxide (CO), and Volatile Organic Compound (VOC) testing on the Blast Furnace Outlet at Gulf Coast Recycling in Tampa, Florida.

Testing was performed using United States Environmental Protection Agency (EPA) Method 7E for NO_x emission determination, EPA Method 10 for CO and EPA Method 25A for VOC. The CO, CO2, and O2 tests were repeated by orsat analysis (EPA Method 3) on November 4, 1991.

This work was done as a subcontract to Stevenson & Associates of Tampa, Florida.

2.0 SUMMARY AND DISCUSSION OF RESULTS

The emission results are summarized in Table 1.

Oxides of nitrogen and VOC emissions averaged 1.98 and 33.10 pounds per hour (lbs/Hr), respectively.

Carbon monoxide testing was repeated by orsat on November 4, 1991, since the CO analyzer results were off scale during the scheduled testing. CO emission averaged 8440 ppm or 683.32 lbs/Hr.

Flow calculations, emission summary with strip chart copies and orsat results are presented in Appendices A, B, and C, respectively.

Table 1 Emission Summary
Blast Furnace Outlet
Gulf Coast Recycling
Tampa, Florida
October 21, 1991 & November 4, 1991

Run Number	Flow Rate SCFMD	NOx Emissions ppm	NOx Emissions lbs/Hr	VOC Emissions as propane ppm	VOC Emissions as propane lbs/Hr	CO Emissions %	CO Emissions ppm	CO Emissions lbs/Hr
1	18676	17.5	2.34	303	38.77	--	---	-----
2	17974	14.3	1.84	237	29.18	--	---	-----
3	19062	12.8	1.75	240	31.34	--	---	-----
AVERAGE	18571	14.9	1.98	260	33.10	0.844	8440	683.32

lbs/Hr = ppm (2.595×10^{-9}) MW (SCFMD) 60

MW NO_x = 46

MW C_3H_8 = 44

MW CO = 28

10^6 ppm = 100%

APPENDIX F

SCAQMD CO BACT DETERMINATION

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

Best Available Control Technology (BACT) Guideline

Equipment or Process: Lead Melting Furnace - Cupola, Secondary Melting Operations

Equipment Rating: All

Revision:
Date: 10/07/88

	ROG	NOx	SOx	CO	PART.
BACT Technologically Feasible[1]				Afterburner (≥ 0.3 Sec. Retention Time at ≥ 1400 °F)	
BACT Achieved in Practice or Contained in EPA Approved SIP[2]			Scrubber and ≤ 1% Sulfur in Coke	Afterburner (≥ 0.3 Sec. Retention Time at ≥ 1200 °F)	Baghouse
BACT For Small Business[1,3]			1. Scrubber and ≤ 1% Sulfur in Coke 2. Scrubber 3. ≤ 1% Sulfur in Coke	1. Afterburner (≥ 0.3 Sec. Retention Time at ≥ 1400 °F) 2. Afterburner (≥ 0.3 Sec. Retention Time at ≥ 1200 °F)	1. Baghouse 2. Venturi Scrubber
Alternate Basic Equipment or Process[1]					

1. Requires Economic Analysis
2. No Economic Analysis
3. Control technologies are in descending order of efficiency. The most efficient control technology must be considered first when conducting an economic analysis.