HOPPING BOYD GREEN & SAMS

ATTORNEYS AND COUNSELORS

SUITE 420, LEWIS STATE BANK BUILDING
POST OFFICE BOX 6526
TALLAHASSEE, FLORIDA 32314
(904) 222-7500

September 10, 1985

BY HAND DELIVERY

C. H. Fancy, P.E.
Deputy Bureau Chief
Bureau of Air Quality Management
Department of Environmental Regulation
2600 Blair Stone Road
Tallahassee, Florida 32301

Re: Collier County
Solid Waste Energy Recovery Facility
Application for Air Construction Permit

Dear Clair:

Enclosed for filing please find four air construction permit applications for Collier County's proposed Solid Waste Energy Recovery Facility (SWERF), along with our check in the amount of $1,000.00 to cover the application fee. The application has been prepared by David Buff, P.E., of KBN Engineering and Applied Sciences, Inc., working in connection with Collier County's Solid Waste Department and its consultant Dr. Carl Stokes, P.E. A number of questions arising during preparation of the application have been discussed with Ed Svec of the Central Air Permitting Section, and his cooperation is much appreciated.

As I believe you are aware based upon your meeting with Collier County representatives in July, there is a real need for expedited permitting of the proposed facility. In order to obtain the necessary financing for this project and to avoid the ramification of potential federal tax law changes, the County believes that permits must be in hand before the end of 1985. On behalf of Collier County, I would therefore request that the Department process the enclosed permit application as expeditiously as possible.

There are several aspects of the permit application that should be noted at the outset. First, the application does not specify a particular design or vendor for the SWERF because the bidding process is still pending. In addition, the precise capacity of the facility and the precise fuel type have not yet been determined, with 800 and 600 ton per day capacities along with unprocessed municipal solid waste and refuse derived fuel as options under consideration.

The application utilizes a conservative, worst-case approach that we believe provides reasonable assurance of compliance with applicable requirements for any possible design, capacity or fuel. Based on past permitting actions of the Department and discussions with Ed Svec, we believe this approach should prove sufficient. We recognize that a more definite proposal may be necessary before notice of the agency's intent to issue a permit can be published, and the County expects to provide that additional information by November 15, 1985 at the latest. In the meantime, we are hopeful that processing of the permit can proceed, and along with Collier County and David Buff, I stand ready to answer without delay any questions you or your staff may have.

Thank you in advance for your consideration in this matter.

Sincerely,

Peter

Peter C. Cunningham

PCC/gb

Enclosures

cc: Robert E. Fahey
Dr. Carl Stokes, P.E.
David Buff, P.E.

HOPPING BOYD GREEN & SAMS
ATTORNEYS AND COUNSELORS
SUITE 420, FIRST FLORIDA BANK BUILDING
POST OFFICE BOX 6526
TALLAHASSEE, FLORIDA 32314
(904) 222-7500

October 8, 1985

Ed Svec
Air Permitting Engineer
Florida Department of Environmental Regulation
Bureau of Air Quality Management
2600 Blair Stone Road
Tallahassee, Florida 32301

Re: Collier County
Solid Waste Energy Recovery Facility
Air Construction Permit

Dear Ed:

Enclosed please find the following items concerning Collier County's pending air construction permit application for its proposed Solid Waste Energy Recovery Facility (SWERF).

1. Collier County Board of County Commissioners' Check No. 134044 in the amount of $2,000.00 payable to the Florida Department of Environmental Regulation. As per your request, this check is provided to cover the permit application fee for the two units proposed for the County's SWERF in lieu of our law firm's previously submitted Check No. 10396 in the amount of $1,000.00. I would appreciate it if you would ensure that our firm's check is returned to my attention.

2. A letter to you from Robert E. Fahey, Director of Collier County's Solid Waste Department, confirming that the County does not intend to process any asbestos-containing wastes through the SWERF.

3. A copy of a letter from David Buff of KBN Engineering and Applied Sciences, Inc. to

BOARD OF COUNTY COMMISSIONERS
NAPLES, FLORIDA

134044

PV NUMBER	VENDOR INV. NO.		DATE	AMOUNT
PV53474	Permit Fees		9-27-85	$2,000.00

PLEASE DETACH BEFORE DEPOSITING

134044

BOARD OF COUNTY COMMISSIONERS
COLLIER COUNTY
NAPLES, FLORIDA 33942

DATE Sept. 27, 1985
AMOUNT ****$2,000.00****

63-622
670

PAY EXACTLY *******TWO THOUSAND DOLLARS & 00/100*******

CHARGEABLE TO GENERAL FUND
TO COLLIER COUNTY DEPOSITORY

AUTHORIZED IN OPEN SESSION

TO THE ORDER OF FLORIDA DEPARTMENT OF REGULATION

CHAIRMAN BOARD OF COUNTY COMMISSIONERS

CLERK CIRCUIT COURT EX-OFFICIO CLERK
BOARD OF COUNTY COMMISSIONERS

THE FIRST NATIONAL BANK AND TRUST COMPANY OF NAPLES

⑈134044⑈ ⑆067006225⑆ 0000005193⑈

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

№ 76092

RECEIPT FOR APPLICATION FEES AND MISCELLANEOUS REVENUE

Received from Board of County Commissioners Date October 9, 1985

Address Collier County, Naples, FL 33940 Dollars $ 2000.00

Applicant Name & Address Same as above

Source of Revenue

Revenue Code 01031 Application Number AC 11-109042 1-1243

By Patricia B. Adams

AC 11-109642 (Unit 1)
AC 11-109643 (Unit 2)

STATE OF FLORIDA

DEPARTMENT OF ENVIRONMENTAL REGULATION

DER
SEP 10 1985
BAQM

BOB GRAHAM
GOVERNOR

VICTORIA J. TSCHINKEL
SECRETARY

ALEX SENKEVICH
DISTRICT MANAGER

APPLICATION TO OPERATE/CONSTRUCT AIR POLLUTION SOURCES

SOURCE TYPE: Solid Waste Energy Recovery Facility [X] New[1] [ ] Existing[1]

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

COMPANY NAME: Collier County Board of County Commissioners COUNTY: Collier

Identify the specific emission point source(s) addressed in this application (i.e. Lime Kiln No. 4 with Venturi Scrubber; Peaking Unit No. 2, Gas Fired) Solid Waste Energy Recovery Units 1 and 2 with Electrostatic Precipitator

SOURCE LOCATION: Street S.R. 84 at Naples Sanitary Landfill City Near Golden Gate

UTM: East Zone 17 | 434.5 North 2893.0

Latitude 26 ° 09 ' 30 "N Longitude 81 ° 39 ' 00 "W

APPLICANT NAME AND TITLE: Robert E. Fahey, Director, Solid Waste Department

APPLICANT ADDRESS: 3301 Tamiami Trail East, Naples, Fl. 33962-4977

SECTION I: STATEMENTS BY APPLICANT AND ENGINEER

A. APPLICANT

I am the undersigned owner or authorized representative* of Collier Co. Board of County Commissions

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

*Attach letter of authorization

Signed: Robert E. Fahey

Robert E. Fahey, Director, Solid Waste Dept.
Name and Title (Please Type)

Date: 9/6/85 Telephone No. 813/774-8418

B. PROFESSIONAL ENGINEER REGISTERED IN FLORIDA (where required by Chapter 471, F.S.)

This is to certify that the engineering features of this pollution control project have been designed/examined by me and found to be in conformity with modern engineering principles applicable to the treatment and disposal of pollutants characterized in the permit application. There is reasonable assurance, in my professional judgment, that

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

Board of County Commissioners
COLLIER COUNTY GOVERNMENT COMPLEX

RECEIVED 9/9/85

September 6, 1985

State of Florida
Department of Environmental Regulation
2600 Blair Stone Road
Tallahassee, FL 32301

Gentlemen:

Mr. Robert E. Fahey, serving Collier County in the capacity of Solid Waste Director, is authorized to represent Collier County in its application to operate/construct an air pollution source. This application will enable Collier County to process 600 to 800 tons of waste per day and generate electric energy. Please contact the undersigned, should additional information be required.

Sincerely,

Neil Dorrill
Assistant County Manager

ND/jhc

enclosure

3301 TAMIAMI TRAIL EAST NAPLES, FLORIDA 33962-4977 813-774-8999

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

Signed David A. Buff

David A. Buff
Name (Please Type)

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

P.O. Box 14288, Gainesville, Fla. 32604
Mailing Address (Please Type)

Florida Registration No. 19011 Date: Sept. 9, 1985 Telephone No. 904/375-8000

SECTION II: GENERAL PROJECT INFORMATION

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

SEE ATTACHMENT A

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

Start of Construction Dec. 1, 1985 Completion of Construction 1st Quarter 1989

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

SEE ATTACHMENT D

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

NONE

E. Requested permitted equipment operating time: hrs/day 24 ; days/wk 7 ; wks/yr 52 ;

if power plant, hrs/yr 8,760; if seasonal, describe: Not seasonal

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

1. Is this source in a non-attainment area for a particular pollutant? No

   a. If yes, has "offset" been applied? -

   b. If yes, has "Lowest Achievable Emission Rate" been applied? -

   c. If yes, list non-attainment pollutants. -

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

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

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

5. Do "National Emission Standards for Hazardous Air Pollutants" (NESHAP) apply to this source? No

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

   a. If yes, for what pollutants? -

   b. If yes, in addition to the information required in this form, any information requested in Rule 17-2.650 must be submitted.

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

SEE ATTACHMENT A

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

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

NOT APPLICABLE

Description	Contaminants		Utilization Rate - lbs/hr	Relate to Flow Diagram
	Type	% Wt		

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

1. Total Process Input Rate (lbs/hr): 66,667 lb/hr MSW/wood waste (total two units)

2. Product Weight (lbs/hr): 210,000 lb/hr steam (total two units)

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

SEE ATTACHMENT B

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

[1]See Section V, Item 2.

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

[3]Calculated from operating rate and applicable standard.

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

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

Name and Type (Model & Serial No.)	Contaminant	Efficiency	Range of Particles Size Collected (in microns) (If applicable)	Basis for Efficiency (Section V Item 5)
ESP (vendor not yet selected), or equivalent	Particulate	98.4%+	0.1 u and up	SEE ATT. D

E. Fuels

Type (Be Specific)	Consumption*		Maximum Heat Input (MMBTU/hr)
	avg/hr	max./hr	
Municipal Solid Waste/ Wood Waste (total both Units)	66,667	66,667	333.3*
		*Based on maximum of 5,000 Btu/lb	expected heat content

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

Fuel Analysis: SEE ATTACHMENT A

Percent Sulfur: ____________ Percent Ash: ____________

Density: ____________ lbs/gal Typical Percent Nitrogen: ____________

Heat Capacity: ____________ BTU/lb ____________ BTU/gal

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

See emissions estimates for other contaminants

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

Annual Average NA Maximum ____________

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

Liquid wastes will include boiler blowdown and leachate from the boiler ash disposal cells. All liquid wastes will either be discharged to the sanitary sewer for treatment by the City of Naples, or discharged to a new package treatment plant located on-site or nearby. Solid wastes generated will consist of boiler bottom ash and fly ash collected in the ESP. This ash will be placed in a lined cell in the Naples Sanitary Landfill.

H. Emission Stack Geometry and Flow Characteristics (Provide data for each stack):
Note: A single stack serves both units

Stack Height: 200 (minimum) ft. Stack Diameter: 6.5 ft.

Gas Flow Rate: 116,500 *ACFM 105,700** DSCFM Gas Exit Temperature: 400 °F.

Water Vapor Content: approx. 15 % Velocity: 58.5 FPS

*Represents minimum expected flow for two 300 TPD units (for dispersion modeling purposes)
**Represents maximum expected flow for two 400 TPD units (for maximum emission estimation)

SECTION IV: INCINERATOR INFORMATION

Type of Waste	Type 0 (Plastics)	Type I (Rubbish)	Type II (Refuse)	Type III (Garbage)	Type IV (Pathological)	Type V (Liq.& Gas By-prod.)	Type VI (Solid By-prod.)
Actual lb/hr Incinerated			SEE	ATTACHMENT	A		
Uncontrolled (lbs/hr)			SEE	ATTACHMENT	A		

Description of Waste Municipal solid waste supplemented by wood waste

Total Weight Incinerated (lbs/hr) 66,667 Design Capacity (lbs/hr) 66,667

Approximate Number of Hours of Operation per day 24 day/wk 7 wks/yr. 52

Manufacturer Not yet selected

Date Constructed Not yet selected Model No. Not Applicable

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

Stack Height: 200.0 min. ft. Stack Diamter: 6.5 Stack Temp. 400

Gas Flow Rate: 116,500 * ACFM 105,700** DSCFM* Velocity: 58.5 FPS

*If 50 or more tons per day design capacity, submit the emissions rate in grains per standard cubic foot dry gas corrected to 50% excess air. 0.03 gr/dscf

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

[X] Other (specify) Electrostatic precipitator or equivalent

Brief description of operating characteristics of control devices: ESP or equivalent with maximum outlet loading of 0.03 gr/dscf corrected to 12% CO_2. See BACT analysis for further information.

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

See Section III.G.

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

SECTION V: SUPPLEMENTAL REQUIREMENTS

Please provide the following supplements where required for this application.

1. Total process input rate and product weight -- show derivation [Rule 17-2.100(127)]
   SEE ATTACHMENT A
2. To a construction application, attach basis of emission estimate (e.g., design calculations, design drawings, pertinent manufacturer's test data, etc.) and attach proposed methods (e.g., FR Part 60 Methods 1, 2, 3, 4, 5) to show proof of compliance with applicable standards. To an operation application, attach test results or methods used to show proof of compliance. Information provided when applying for an operation permit from a construction permit shall be indicative of the time at which the test was made.
   SEE ATTACHMENT B
3. Attach basis of potential discharge (e.g., emission factor, that is, AP42 test).
   SEE ATTACHMENT B
4. With construction permit application, include design details for all air pollution control systems (e.g., for baghouse include cloth to air ratio; for scrubber include cross-section sketch, design pressure drop, etc.)
   SEE ATTACHMENT D
5. With construction permit application, attach derivation of control device(s) efficiency. Include test or design data. Items 2, 3 and 5 should be consistent: actual emissions = potential (1-efficiency).
   SEE ATTACHMENT D
6. An 8 1/2" x 11" flow diagram which will, without revealing trade secrets, identify the individual operations and/or processes. Indicate where raw materials enter, where solid and liquid waste exit, where gaseous emissions and/or airborne particles are evolved and where finished products are obtained.
   SEE ATTACHMENT
7. An 8 1/2" x 11" plot plan showing the location of the establishment, and points of airborne emissions, in relation to the surrounding area, residences and other permanent structures and roadways (Example: Copy of relevant portion of USGS topographic map).
   SEE ATTACHMENT A
8. An 8 1/2" x 11" plot plan of facility showing the location of manufacturing processes and outlets for airborne emissions. Relate all flows to the flow diagram.
   SEE ATTACHMENT A

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

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

NOT APPLICABLE

SECTION VI: BEST AVAILABLE CONTROL TECHNOLOGY

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

[X] Yes [ ] No

Contaminant	Rate or Concentration
Particulate	0.08 gr/dscf correct to 12% CO_2

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

[X] Yes [ ] No

Contaminant	Rate or Concentration
Particulate	See BACT analysis
SO_2	
NO_x	

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

Contaminant	Rate or Concentration
SEE ATTACHMENT B AND D	

D. Describe the existing control and treatment technology (if any). NOT APPLICABLE

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

*Explain method of determining

5. Useful Life:

6. Operating Costs:

7. Energy:

8. Maintenance Cost:

9. Emissions:

Contaminant	Rate or Concentration

10. Stack Parameters

a. Height: ft.

b. Diameter: ft.

c. Flow Rate: ACFM

d. Temperature: °F.

e. Velocity: FPS

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

1.

a. Control Device:

b. Operating Principles:

c. Efficiency:[1]

d. Capital Cost:

e. Useful Life:

f. Operating Cost:

g. Energy:[2]

h. Maintenance Cost:

i. Availability of construction materials and process chemicals:

j. Applicability to manufacturing processes:

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

2.

a. Control Device:

b. Operating Principles:

c. Efficiency:[1]

d. Capital Cost:

e. Useful Life:

f. Operating Cost:

g. Energy:[2]

h. Maintenance Cost:

i. Availability of construction materials and process chemicals:

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

j. Applicability to manufacturing processes:

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

3.

a. Control Device:

b. Operating Principles:

c. Efficiency:[1]

d. Capital Cost:

e. Useful Life:

f. Operating Cost:

g. Energy:[2]

h. Maintenance Cost:

i. Availability of construction materials and process chemicals:

j. Applicability to manufacturing processes:

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

4.

a. Control Device:

b. Operating Principles:

c. Efficiency:[1]

d. Capital Costs:

e. Useful Life:

f. Operating Cost:

g. Energy:[2]

h. Maintenance Cost:

i. Availability of construction materials and process chemicals:

j. Applicability to manufacturing processes:

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

F. Describe the control technology selected: see BACT analysis , Attachment D

1. Control Device:

2. Efficiency:[1]

3. Capital Cost:

4. Useful Life:

5. Operating Cost:

6. Energy:[2]

7. Maintenance Cost:

8. Manufacturer:

9. Other locations where employed on similar processes:

a. (1) Company:

(2) Mailing Address:

(3) City:

(4) State:

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

(5) Environmental Manager:

(6) Telephone No.:

(7) Emissions:[1]

Contaminant	Rate or Concentration

(8) Process Rate:[1]

b. (1) Company:

(2) Mailing Address:

(3) City: (4) State:

(5) Environmental Manager:

(6) Telephone No.:

(7) Emissions:[1]

Contaminant	Rate or Concentration

(8) Process Rate:[1]

10. Reason for selection and description of systems:

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

SECTION VII - PREVENTION OF SIGNIFICANT DETERIORATION

A. Company Monitored Data Not required - See ATTACHMENT C

1. ________ no. sites ________ TSP ________ ( ) SO^2* ________ Wind spd/dir

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

Other data recorded ________________________________

Attach all data or statistical summaries to this application.

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

2. Instrumentation, Field and Laboratory

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

b. Was instrumentation calibrated in accordance with Department procedures?

[ ] Yes [ ] No [ ] Unknown

Meteorological Data Used for Air Quality Modeling

1. 1 Year(s) of data from 1 / 1 / 75 (month day year) to 12 / 31 / 75 (month day year)

2. Surface data obtained from (location) Ft. Myers, Florida

3. Upper air (mixing height) data obtained from (location) Ruskin, Florida

4. Stability wind rose (STAR) data obtained from (location) Ft. Myers, Florida

Computer Models Used

1. ISCST Modified? If yes, attach description.

2. ________ Modified? If yes, attach description.

3. ________ Modified? If yes, attach description.

4. ________ Modified? If yes, attach description.

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

Applicants Maximum Allowable Emission Data

Pollutant	Emission Rate	
TSP	SEE ATTACHMENT B	grams/sec
SO^2		grams/sec

Emission Data Used in Modeling NOT APPLICABLE

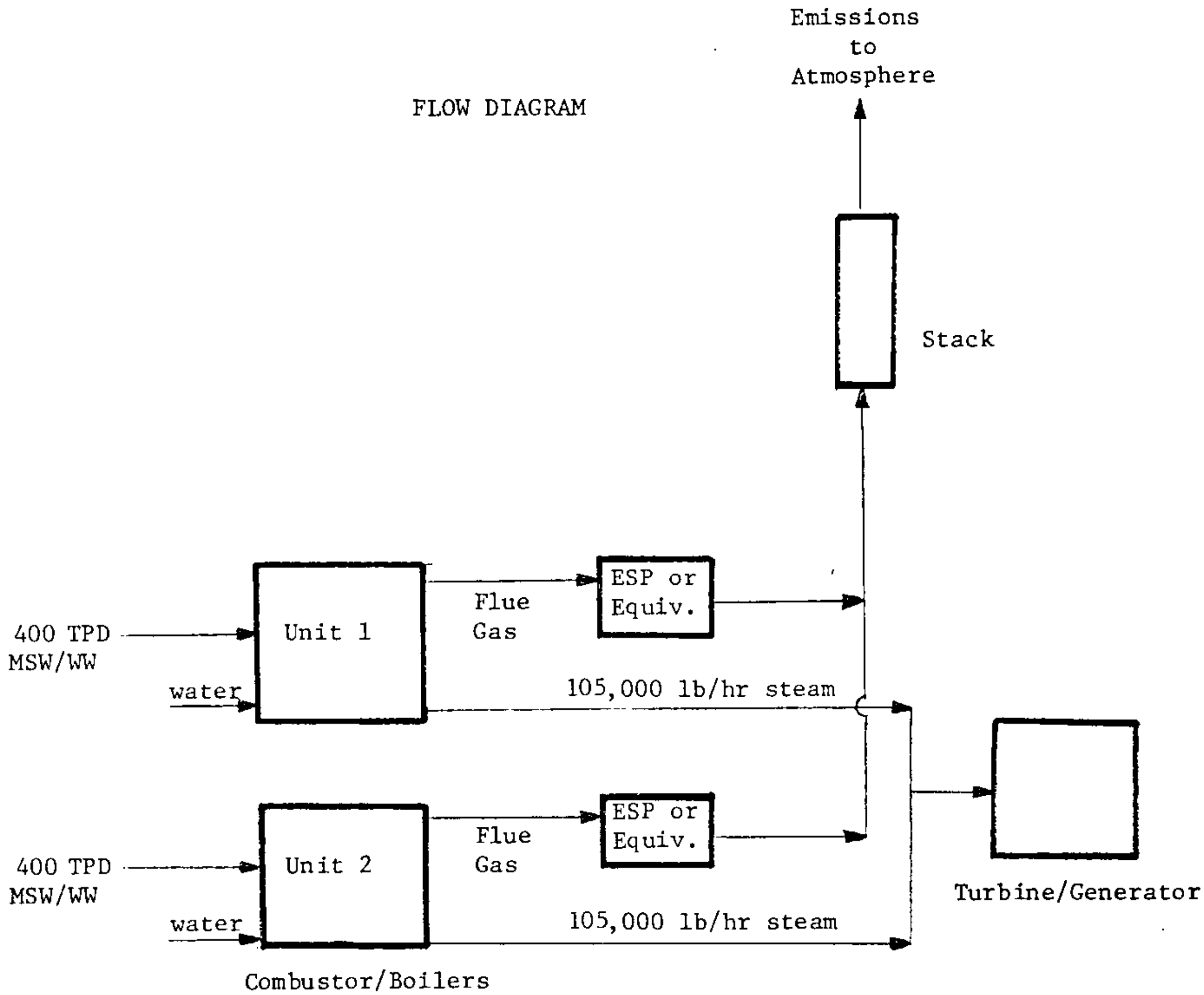
Attach list of emission sources. Emission data required is source name, description of point source (on NEDS point number), UTM coordinates, stack data, allowable emissions, and normal operating time.

Attach all other information supportive to the PSD review. SEE ATTACHMENTS

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

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

FLOW DIAGRAM



ATTACHMENT A

ATTACHMENT A

1.0 PROJECT DESCRIPTION

The Collier County Board of County Commissioners, Solid Waste Department, proposes to construct and operate a 800 ton per day (TPD) solid waste energy recovery facility (SWERF). The site of the proposed facility is the Naples Sanitary Landfill, located in western Collier County (Figure A-1). The facility will be fueled primarily by municipal solid waste (MSW), with wood waste (WW) supplementing the MSW as required. WW will progressively comprise a smaller fraction of the fuel as quantities of MSW increase due to growth in the county. Sewage sludge will not be burned in the facility.

Current design is to have two (2) 400 TPD combustion/boiler units. The boiler units will provide steam to generate about 12 megawatts (MW) of electrical energy each. Power will be sold to Florida Power & Light or Seminole Electric Cooperative. Each combustor/boiler will be served by an electrostatic precipitator (ESP), or equivalent, to control particulate matter and certain trace element emissions. The flue gases from the two units will be discharged through a common stack.

As an alternative, two (2) 300 TPD combustion/boiler units may be selected by Collier County. To adequately address this possibility, all emissions estimates in this application are conservatively based on the maximum expected emissions from two (2) 400 TPD units. However, the air quality impacts presented in Attachment C are based upon the stack height, plume characteristics and dispersion associated with two (2) 300 TPD units. Therefore, this application presents a worst-case analysis regardless of which option is chosen by Collier County.

The project will result in full compliance with all federal and state air quality regulations, including federal New Source Performance Standards (NSPS) for municipal incinerators, ambient air quality standards (AAQS), and Prevention of Signifcant Deterioration (PSD) allowable increments.

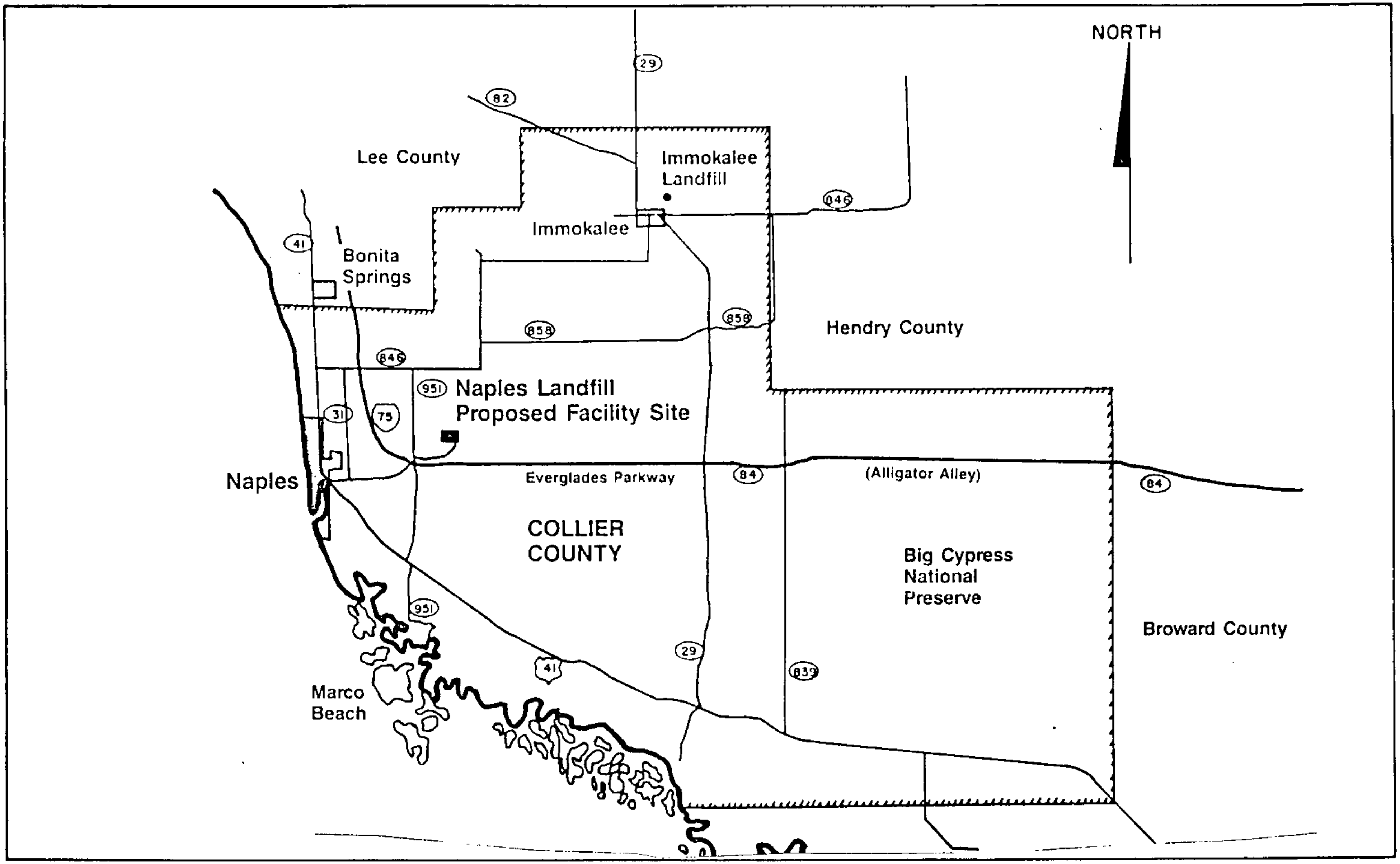


FIGURE A-1. PROPOSED COLLIER COUNTY SWERF VICINITY LOCATION MAP

Source: Henningson, Durham & Richardson, 1985a

The current project schedule calls for selecting the vendor for construction and/or operation of the facility by November 15, 1985. Initial construction activities are scheduled to begin by December 1, 1985, along with detailed engineering. Major construction activities are due to begin by the second quarter of 1986. Construction is scheduled to end by the third quarter of 1988, with startup and final accceptance testing to be completed by the first quarter of 1989.

2.0 PROPOSED SITE DESCRIPTION

The Naples Sanitary Landfill site, proposed as the waste-to-energy facility location, consists of approximately 311 acres of land owned by the County in western central Collier County. An approximately 20-acre area, in the southeastern corner of the site, has been identified as the proposed SWERF site. Figure A-2 shows the vicinity location of the proposed site and Figure A-3 indicates the configuration of the facility in relation to the planned landfill development.

The landfill site is located in a rural area, as designated by the current Comprehensive Land Use Plan. The site and surrounding areas consist of mixed scrub cypress and pine forests. A paved access road, which connects to State Road 951, already exists to serve the Naples Landfill. State Road 951 is located approximately two miles west of the landfill and will provide access to the SWERF facility. In addition, Interstate 75 (Alligator Alley/S.R. 84) is situated adjacent to the southern boundary of the site.

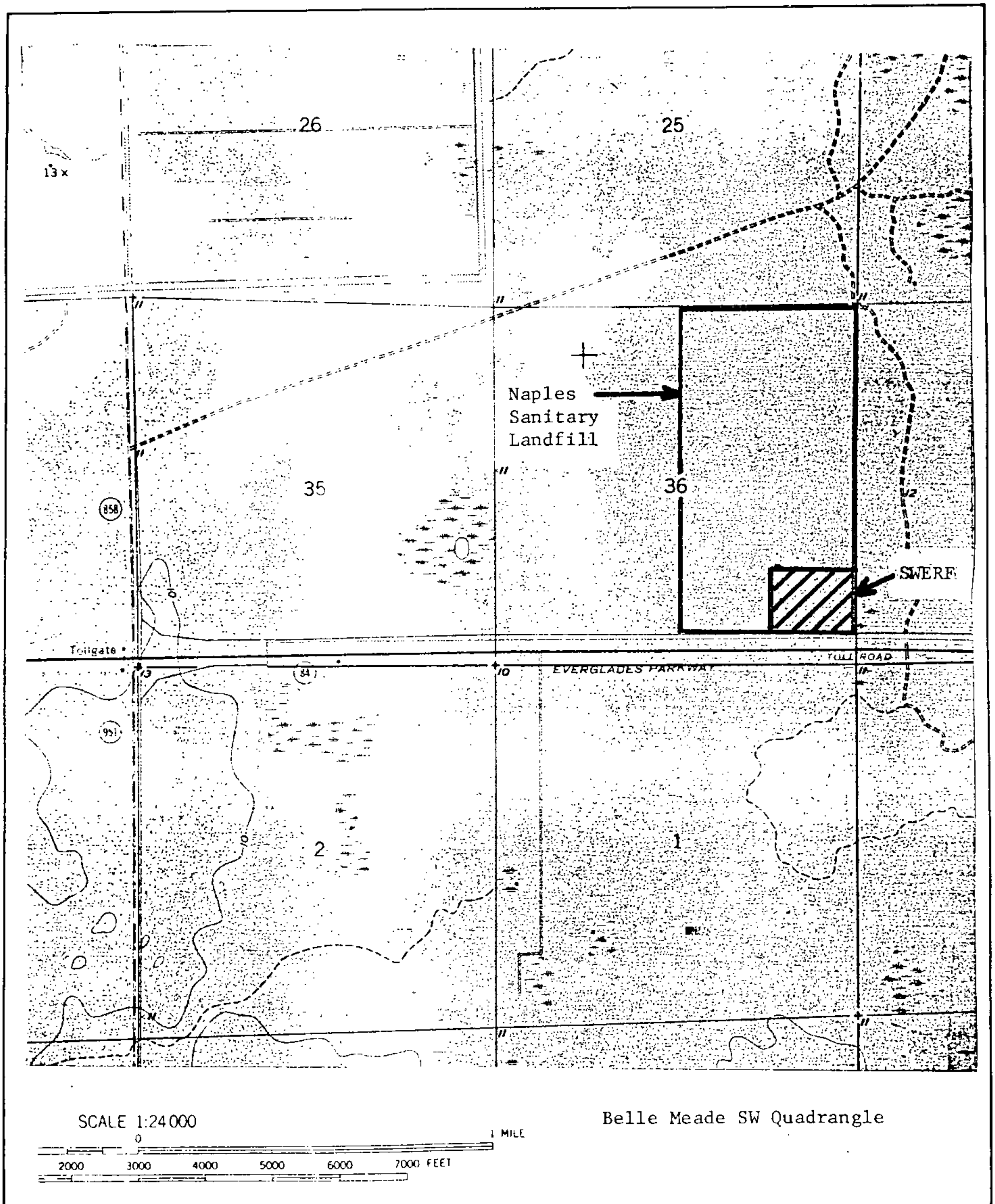


FIGURE A-2. LOCATION OF PROPOSED COLLIER COUNTY SWERF

Source: U.S. Geological Survey, 1973

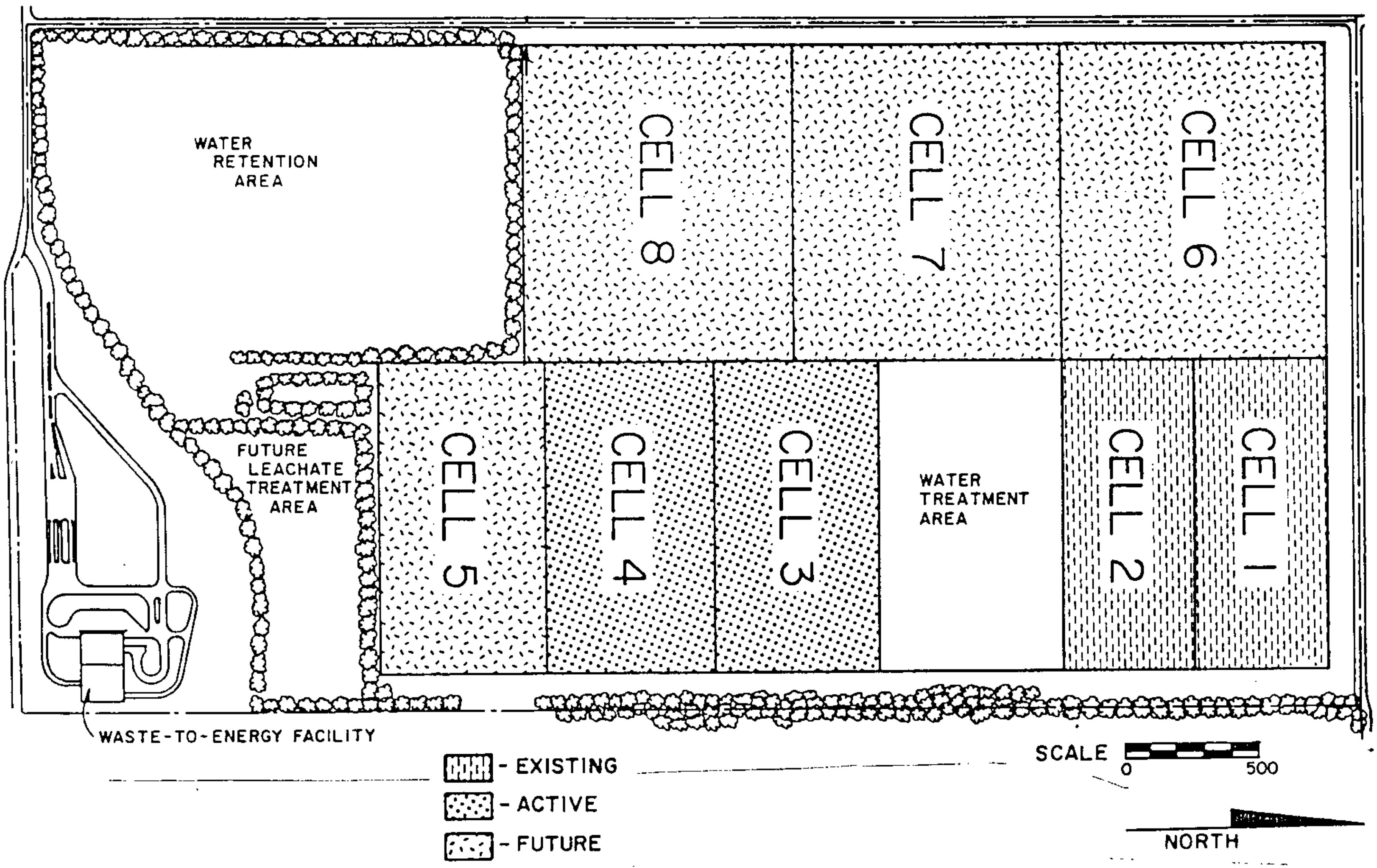


FIGURE A-3. NAPLES SANITARY LANDFILL SITE PLAN

Source: Henningson, Durham & Richardson, 1985a

KBN

3.0 SOLID WASTE COMBUSTION TECHNOLOGY

"Mass burn" technology refers to a general group of municipal solid waste combustion and steam generation methods which have in common the ability to burn solid waste with little or no prior processing. Solid waste collection vehicles will proceed to an enclosed tipping floor and discharge their load into a storage pit. Large non-burnable items such as washing machines are set aside. There is no separation of recoverable metals or other materials prior to burning. The solid waste is lifted by overhead cranes and placed into charging hoppers, which feed waste onto the furnace grates. On the grates, the solid waste is ignited and combustion takes place. The waste is agitated or tumbled for further combustion until primarily ash remains. In heat recovery facilities, hot gases move through the boiler sections of the furnace to generate steam. The ash can be expected to be in the range of 5% to 10% of the incoming volume and 18% to 30% of the incoming weight. This reduction in volume can extend the life of a landfill by many years even though 10% to 20% of the solid waste stream may be non-processible and must be delivered directly to a landfill.

Mass burn SWERF plants have been operating successfully in Europe for more than 30 years, and they have been operating in the United States for about 15 years. The larger plants using European grate systems offer the most advanced and reliable technology. These plants can be expected to operate successfully for at least 20 years with periodic maintenance and replacement parts.

The primary advantages of the mass burn technology when compared to refuse derived fuel (RDF) technologies are: fewer maintenance problems, better reliability and performance record, and lower in-plant power consumption. The disadvantages include the need for larger air pollution control equipment because of increased excess air, ash removal problems, and recovered metals which are of a poorer quality.

The major difference between the RDF and mass burn technologies is that in the RDF technology, solid waste is processed prior to combustion to recover recyclable materials and to produce a more homogeneous fuel. The RDF technology has two distinct elements: processing the waste into RDF and combusting the RDF. A variety of RDF processing systems have been installed in the United States. The systems have few common characteristics. The percent of RDF produced, as compared to the incoming waste, varies with the amount of processing and has been demonstrated in a range from 60% to 80%. The remaining process rejects (20% to 40%) must be sent to the sanitary landfill or further processed to recover recyclable materials. The RDF, after combusting, can be expected to produce ash which requires landfilling in an amount of 10% to 15% (by weight of RDF). Electricity to power the processing equipment will use in the range of 20% of the gross facility electrical output. Since the aluminum and other metals may be recovered before burning, the materials are relatively clean and more valuable than that recovered from a mass burn facility.

RDF facilities have been operating in the United States for approximately ten years. The RDF technology does not have as long an operating history as the European mass burn plants, and its development in the United States during the 1970s was accompanied by mechanical failures and expensive plant modifications. Many RDF plants have experienced difficulties in processing and handling the RDF, such as clogging of RDF chutes, explosions in the shredders, excessive downtime, unsatisfactory air classifiers, ash removal problems, and rapid wear-out of process equipment. However, the processing problems of the 1970s are being solved and many plants have been simplified and processing is now more reliable.

The primary advantages of the RDF technology as compared to the mass burn technology are: the combustion system and process system can be located at separate sites; metals or other recyclable materials can be reclaimed prior to combustion with a higher value; standard stoker-fired boilers for combustion can be used; less excess air is used resulting in more efficient combustion; and RDF provides a more homogeneous fuel with a higher heating value than raw waste. The disadvantages are: increased maintenance with higher in-plant power consumption; a greater percentage of waste is non-processible, resulting in less available fuel and more landfill rejects; and the potential for explosions when handling and shredding the waste.

Currently, there is only one operating SWERF in Florida using RDF (Dade County, Florida). Interestingly, this was also the first SWERF built in Florida. A second RDF facility is being proposed for Palm Beach County. Several other SWERFS have been constructed, licensed or are planned in Florida, all based upon mass-burn technology. These are:

Pinellas County Units 1 and 2 (Operating)
Pinellas County Unit 3 (Licensed)
Hillsborough County/McKay Bay (Licensed)
Hillsborough County (Licensed)
Bay County (Licensed)
Broward County (Proposed)

The proposed Collier County SWERF will probably use the mass-burn technology because of its better reliability and performance and lower power consumption. However, RDF is not being ruled out prior to receipt of vendor bids for the facility.

4.0 FUEL COMPOSITION

4.1 MUNICIPAL SOLID WASTE

Waste generation in the County is typically residential and light commercial waste. No large industrial waste sources have been identified in the County. To estimate the amount of solid waste generated in the County which is suitable for processing, landfill scale records kept by the Collier County Solid Waste Department were used. These records categorize the types of waste received at the Naples Landfill. Figure A-4 graphically illustrates the type of waste currently received at the Naples Landfill. Based on an evaluation of available records, approximately 92% of the solid waste stream has been assumed to be processible in a SWERF facility.

Collier County has not conducted chemical analysis on the solid waste received at the Naples Sanitary Landfill. However the solid waste is expected to be typical of other municipal wastes collected in Florida. A summary of analysis published for Florida wastes is presented in Table A-1. For permitting purposes, a minimum MSW heating value of 4,000 Btu/lb (as received basis) was used for the Collier County SWERF.

No trace element analysis of Florida MSW is available. The California Air Resources Board (CARB) conducted an exhaustive literature search on the trace element content of MSW/RDF and summarized the results on a lb/million Btu, as-fired basis (CARB, 1984). The results are presented in Table A-2. The range of trace element concentrations shown are likely representative of Florida MSW.

4.2 WOOD WASTE

Wood waste burned in the proposed facility will generally consist of wood chips and vegetative debris from land clearing operations. Typical analysis of wood (bark) are presented in Table A-3 (Babcock and Wilcox, 1975) and Table A-4 {U.S. Environmental Protection Agency (EPA), 1982}. Wood is typically 50 percent moisture by weight. A minimum wood waste heating value of 4,000 Btu/lb (as received) was used for the proposed facility as a conservative estimate.

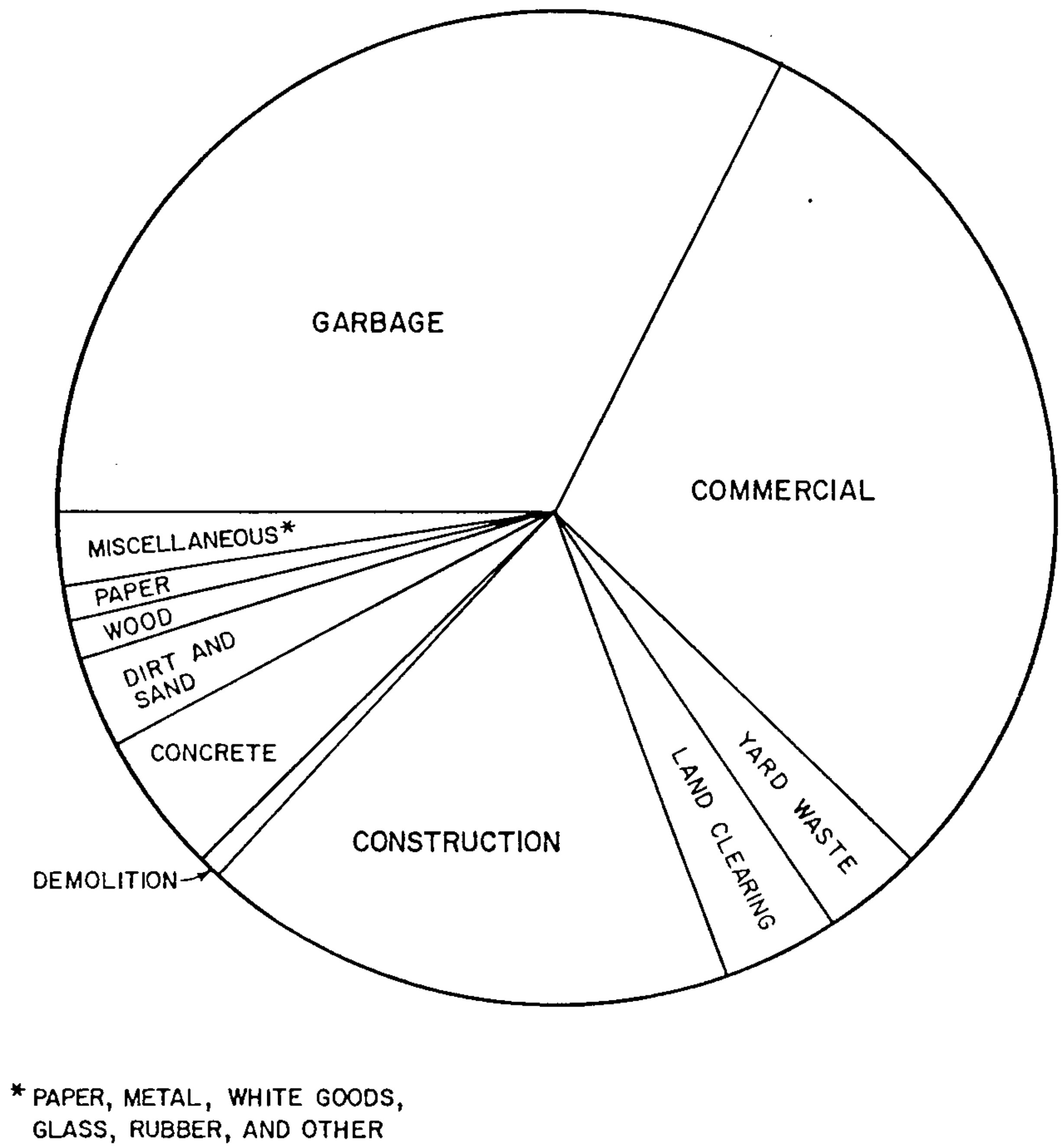


FIGURE A-4. FISCAL YEAR 1983-84
SOLID WASTE COMPOSITION NAPLES LANDFILL

Source: Henningson, Durham & Richardson, 1985a

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Table A-1. Solid Waste Analysis, Florida Resource Recovery Projects

Constituent (As Received Basis)	Bay County, Florida	Broward County, Florida*	Hillsborough County, Florida
Carbon (%)	27.90	24.2-36.6	25.6
Hydrogen (%)	3.55	5.5-8.6	3.4
Nitrogen (%)	0.04	0.25-0.49	0.6
Oxygen (%)	18.15	34.9-59.4	21.3
Sulfur (%)	0	0.05-0.17	0.1
Chlorine (%)	---	0.10-0.11	---
Moisture (%)	50.0	19.3-52.2	28.2
Ash (%)	0.36	7.3-25.1	NA
Density (lb/cu.ft.)	20-25	---	NA
Heating Value (Btu/lb)	5230	4500-5000	4500

*Garbage fraction only

Sources: 1) Bay County Energy Resources, 1984. Application to Construct/Operate Air Pollution Sources.

2) Malcolm Pirnie, 1985

3) Camp, Dresser & McKee, Inc., 1984

Table A-2. Metal Concentrations in Various Fuels, Refuse and Sewage Sludge (ug/MJ)

	Oil			Western Coal			U.S. Coal			RDF & MSW			Sludge		
Metal	Low	High	Avg.	Low	High	Avg.	Low	High	Avg.	Low	High	Avg.	Low	High	Avg.
As	nr	nr	nr	20.3	537	194	20.3	1,501	331	23.0	1,392	380	240	2395	114
Be	nr	nr	nr	11.2	159	51.9	4.2	1,550	171[a]	nd	nd	nd	nd	nd	nd
Cd	nr	nr	nr	1.9	179	34.4	1.9	1,001	110	17.4	3,538	702	54.3	35,422	7935
Cr	0.26	7.4	3.2	186	1385	445	186	3,367	1,017	280	125,623	15,102	13,492	1117667	168547
Cu	1.1	26.0	4.6	233	1026	476	138	1,218	510	1,046	180,039	26,237	36,564	230,718	105138
Hg	nr	nr	nr	2.3	9.0	4.6	2.3	96.7	18.7	< 130	362	166[b]	271	1437	665
Mn	0.69	9.4	3.6	287	3472	1733	47	4,753	2,081	1,059	48,022	15,419	2555	42,072	15,702
Mo	0.50	4.3	1.4	35.8	390	131	35.5	390	173	59.8	2,982	938	95.8	6778	1469
Ni	9.7	371	251	104	534	288	104	2,131	677	90	51,564	6,380[a]	2906	44,866	18,801
Pb	3.1	28.7	13.9	87.9	476	291	83	3,084	738	877	136,663	39,290	10,857	608,889	143266
Sb	nr	nr	nr	5.6	537	110	2.7	537	98.4	30.1	5,404	2,152	208	3545	842
Se	nr	nr	nr	28.7	75.3	56.4	9.2	542	109	8.1	237	61.4	136	695	264
Sn	2.6	57.3	16.2	25.7	100	62.9	10.2	710	153	80.9	8,179	2,466	7464	39,278	16,359
V	5.2	358	129	342	1471	823	342	3,341	1,401	586	5,988	2,432	1182	7305	3147
Zn	5.0	42.6	17.8	186	8825	1685	186	8,825	1,582	3,018	303,716	60,943[a]	44,707	550,052	168556

nr: not reported
nd: not detected

[a] Average strongly influenced by high value.

[b] Average of a very small number of measurements.

Source: California Air Resources Board (1984)

Note: $ug/MJ \times 2.32 \times 10^{-6} = lb/10^6$ BTU

Table A-3. Typical Analysis of Wood (Bark)

Wood analyses (dry basis), % by wt	Pine Bark	Oak Bark	Spruce Bark*	Redwood Bark*
Proximate				
Volatile matter	72.9	76.0	69.6	72.6
Fixed carbon	24.2	18.7	26.6	27.0
Ash	2.9	5.3	3.8	0.4
Ultimate				
Hydrogen	5.6	5.4	5.7	5.1
Carbon	53.4	49.7	51.8	51.9
Sulfur	0.1	0.1	0.1	0.1
Nitrogen	0.1	0.2	0.2	0.1
Oxygen	37.9	39.3	38.4	42.4
Ash	2.9	5.3	3.8	0.4
Heating value, Btu/lb	9030	8370	8740	8350

*Salt water stored

Source: Babcock and Wilcox, 1975

Table A-4. REPRESENTATIVE ULTIMATE ANALYSES OF FUELS FIRED IN WOOD-FIRED AND WOOD/COAL COFIRED BOILERS

Fuel[a]	Composition, percent by weight (wet basis)							Gross Heating Value kJ/kg (Btu/lb)
	Moisture	Carbon	Hydrogen	Nitrogen	Oxygen	Sulfur	Ash	
Wood	50.00	26.95	2.85	0.08	19.10	0.02	1.00	10,600 (4,560)
HAB	50.00	25.85	2.73	0.08	18.32	0.02	3.00	10,160 (4,370)
SLW	50.00	26.68	2.83	0.08	18.91	0.02	1.49[b]	10,500 (4,513)
HSE	8.79	64.80	4.43	1.30	6.56	3.54	10.58	27,440 (11,800)
LSW	20.80	57.60	3.20	1.20	11.20	0.60	5.40	22,330 (9,600)

[a]Wood - Hog Fuel (wood/bark mixture)
HAB - High Ash Bark
SLW - Salt-Laden Wood
HSE - High Sulfur Eastern Coal
LSW - Low Sulfur Western Coal

[b]Includes salt which makes up 0.5 percent of the fuel on a wet basis.

Source: EPA (1982)

Trace element concentration data for wood waste was not available. However, MSW likely contains trace elements in greater concentrations then those found in wood waste. The CARB (1984) report found that MSW contains higher concentrations of most trace metals than coal or oil.

5.0 APPLICABLE EMISSION LIMITATIONS

5.1 FEDERAL NEW SOURCE PERFORMANCE STANDARDS

New Source Performance Standards (NSPS) have been promulgated by the U.S. Environmental Protection Agency (EPA) for incinerators with a charging rate of more than 50 tons per day (Code of Federal Regulations, Title 40, Part 60, Subpart E). An emission limit was promulgated for particulate matter (PM) only. The limit for PM is 0.08 grains per dry standard cubic feet (gr/dcsf) corrected to 12% CO_2.

A NSPS has been proposed for Industrial-Commercial-Institutional steam generating units with a heat input rate of greater than 100 x 10^6 Btu/hr (Federal Register, Vol. 49, No. 119, June 19, 1984). However, these have not yet been promulgated as final regulations by EPA. In the event that NSPS for this source category are promulgated, they may apply retroactively to the proposed Collier County facility. The numerical emission limits or form of the final standards cannot be anticipated at this time. The proposed standards limit PM due to wood or solid waste firing to 0.10 lb/10^6 Btu heat input. As shown in Attachment B, the proposed Collier County SWERF is proposing a PM emission limit equivalent to a maximum of 0.10 lb/10^6 Btu, and thus would comply with the proposed NSPS. No other emission limitations for wood or solid waste firing were included in the proposed NSPS.

5.2 STATE OF FLORIDA EMISSION LIMITATIONS

The Florida Department of Environmental Regulation (FDER) emission limiting standards that apply to the proposed facility are contained in Florida Administrative Code (FAC), Chapter 17-2.600(1)(c). Incinerators with a charging rate equal to or greater than 50 tons per day are restricted to PM emissions of 0.08 gr/dscf, corrected to 50 percent excess air. This is very nearly identical to the NSPS found in the federal code. The Florida regulation further requires that no objectionable odors be emitted from the facility. The general opacity rule found in FAC, Chapter 17-2.610 does not apply to a source for which either a specific partiulate standard or specific opacity standard is provided elsewhere in Chapter 17-2. Because the proposed SWERF is subject to the specific particulate standard in Rule 17-2.600(1)(c), the general opacity standard does not apply.

5.3 NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS

The EPA has promulgated standards for certain hazardous air pollutants in the Code of Federal Regulations, Title 40, Part 61 (40 CFR 61). Pollutants regulated consist of asbestos, beryllium, mercury and vinyl chloride. Currently, the National Emission Standards for Hazardous Air Pollutants (NESHAP) do not effect the design or operation of a SWERF which utilizes municipal solid waste or wood waste. The proposed facility will not burn sewage sludge and therefore, will not be subject to the NESHAP for mercury (40 CFR, Part 61, Subpart E).

6.0 METHODS TO DEMONSTRATE COMPLIANCE

Compliance with the NSPS for PM will be demonstrated through source emission tests as specified in 40 CFR 60, Subpart E and by the Federal Reference Methods in 40 CFR 60, Appendix A. These methods are as follows:

* Particulate matter - Method 5
* Sample and velocity traverses - Method 1
* Velocity and volumetric flow rate - Method 2
* Gas analysis and excess air - Method 3

If source testing of pollutants other than PM is required by permit condition, approved DER and EPA test methods will be utilized.

In accordance with 40 CFR 60.53, the daily charging rate and hours of operation of the facility will be recorded. Stack sampling access and ports for the two proposed ESP units will be installed in conformance with FAC Chapter 17-2.700(4). A drawing detailing the sampling access and sampling ports will be submitted to DER prior to construction of the ESP's and associated stack.

ATTACHMENT B

EMISSION ESTIMATES

ATTACHMENT B
EMISSION ESTIMATES

1.0 EMISSION FACTORS

Emission factors for regulated pollutants for the proposed Collier County SWERF are shown in Tables B-1 and B-2. Factors used by other SWERF facilities in Florida are also shown for discussion purposes. Emission factors for MSW are presented in Table B-1, and factors for WW combustion are presented in Table B-2. The factors selected for the Collier County SWERF are based upon preliminary design information, permitted emission rates for other SWERF's in Florida, review of available literature, and information submitted by a few prospective vendors. Each pollutant is discussed individually in the following sections. Emission factors for hydrogen chloride (HCl) are also shown in Tables B-1 and B-2. Although HCl is not a regulated pollutant, it was included at Florida DER's request.

The only State of Florida emission limiting standard for MSW/WW-burning facilities is for PM. Similarly, the only proposed or promulgated NSPS which applies to the proposed SWERF is for PM. Emission limiting standards have not been promulgated for any other emissions from MSW/WW-fired facilities.

1.1 MUNICIPAL SOLID WASTE

Particulate Matter

The proposed particulate matter (PM) emission limit is 0.03 gr/dscf, corrected to 12% CO_2, based upon operation of a well designed ESP or fabric filter. This level of control is substantially lower than the federal NSPS and Florida emission standards of 0.08 gr/dscf, and is consistent with two recent permit approvals in Florida (Pinellas County Unit 3 and Bay County). It is also consistant with the emission rate currently proposed for another Florida SWERF (Broward County). A PM emission factor is developed as follows:

Table B-1. Emission Factors for MSW, Florida Resource Recovery Facilities (lb/ton of MSW)

Pollutant	Hillsborough	Pinellas 1 & 2	Pinellas 3	McKay Bay	Bay County	Broward County (proposed)	Collier County (proposed)
Particulate Matter	0.42*	1.6	0.5	0.67*	0.56	0.67	0.815
Sulfur Dioxide	3.2	3.0	1.9	4.1	2.8	4.91	6.3
Nitrogen Oxides	3.0	---	3.0	7.2	2.2	5.0	7.2
Carbon Monoxide	1.8	---	1.5	0.4	11.4	0.80	5.0
Vol. Org. Cmpds.	0.2	---	0.3	0.2	0.232	0.12	0.5
Lead	0.048	---	0.03	0.074	0.0036	0.27	0.3
Mercury	0.0052	---	0.01	0.0996	0.00171	0.0023	0.013
Beryllium (x 10^{-6})	13.1	---	1.3	6.2	48	8.4	56
Fluorides	0.06	---	0.1	0.1	---	0.23	0.23
Sulfuric Acid	0.0768	---	---	---	---	0.025	0.077
Hydrogen Chloride	4.0	---	4.0	4.51	---	---	6.2
Inorganic Arsenic	---	---	---	---	---	0.00028	0.0088

* Required LAER due to non-attainment area

Sources:
1) CDM, 1984
2) HDR, 1983
3) FDER Permit AC 29-47277
4) FDER Permits AC 03-84703 and AC 03-84704
5) Malcolm Pirnie, 1985
6) FDER, Hillsborough County, Energy Recovery Facility, Case No. 83-19, Conditions of Certification, Revised 11/6/84
7) FDER, Pinellas County, Resource Recovery Facility, Case No. PA 78-11 and PA 83-18, Conditions of Certification.

Table B-2. Emission Factors for WW, Florida Resource Recovery Facilities (lb/ton WW)

Pollutant	Bay County	Collier County (Proposed)
Particulate Matter	0.56	0.815
Sulfur Dioxide	---	0.2
Nitrogen Oxides	2.8	2.8
Carbon Monoxide	---	54.0 (max)/4.5 (avg.)
Vol. Org. Cmpds.	1.7	1.76
Lead	---	0.00104
Mercury	---	---
Beryllium ($x10^{-6}$)	---	3.97
Fluorides	---	---
Sulfuric Acid	---	---
Hydrogen Chloride	---	---
Inorganic Arsenic	---	0.000244

Source: 1) FDER Permits AC 03-84703 and AC 03-84704

Each unit = 52,850 dscfm at 12% CO_2 (maximum)

52,850 ft^3/min x 0.03 gr/dscf x lb/7000 gr x 60 min/hr = 13.59 lb/hr

Each unit = 400 TPD MSW = 16.67 TPH

Heat input @ 4,000 BTU/lb (minimum) = 133.3 x 10^6 Btu/hr (minimum)

Emission Factor = 13.59/16.67 = 0.815 lb/ton MSW

= 13.59/133.3 = 0.10 lb/10^6 Btu (maximum)

The dscfm used in the calculation is a worst-case flow rate based upon review of design data for other SWERF in Florida and vendor information received to date. Use of this conservative flow rate results in slightly higher PM emissions on a lb/ton MSW basis than other permitted or operating SWERF in Florida.

The calculated PM emissions of 0.10 lb/10^6 Btu are based upon a minimum MSW/WW heating value of 4,000 Btu/lb. A typical heating value is expected to be 4,500 Btu/lb, which would then equate to 0.09 lb/10^6 Btu. This level is below the currently proposed NSPS for solid waste/wood firing of 0.10 lb/10^6 Btu.

Sulfur Dioxide

Sulfur dioxide (SO_2) formation in a MSW-fired furnace is a function of the sulfur content of the fuel and the chemical form in which it occurs. Sulfur in refuse occurs in several organic forms as sulfides, sulfates, and sulfites. Only the sulfate fraction can be converted to SO_2 during combustion. Literature has suggested that a significant fraction of the total sulfur in the fuel is retained in the furnace bottom ash and in the flyash. The form of the sulfur emitted in the flue gas exiting the ESP is predominantly SO_2, with a very small percentage as gaseous sulfur trioxide and sulfuric acid mist.

There are no state emission limiting standards for SO_2 from MSW/WW fired boilers. NSPS have not been promulgated or proposed which would regulate SO_2 emissions from the proposed facility.

From Table B-1, SO_2 emission factors for other permitted or proposed SWERF in Florida have ranged from 1.9 to 4.9 lb/ton MSW. According to

Florida DER, the lower factor of 1.9 lb/ton (Pinellas County Unit 3) has not been achieved based on source testing, and a revised higher emission rate has been requested. According to Camp, Dresser & McKee, Inc. (CDM)(1984), stack test results from six mass-burn facilities located throughout the U.S. showed SO_2 emissions ranging from 1.0 to 4.0 lb/ton. Three other facilities were permitted at rates ranging from 2.0 to 4.0 lb/ton. EPA (1984a) cites an average emission factor of 2.5 lb/ton. HDR (1985b) surveyed a total of sixteen incinerators throughout the world and reported SO_2 emissions ranging from 0.8 to 6.5 lb/ton. An A.D. Little (1981) literature survey found emissions to range from 0.77 to 4.6 lb/ton.

EPA (1982) has reported an average SO_2 emission rate of 0.492 $lb/10^6$ Btu for overfeed stoker mass-burn facilities. CARB (1984) reported emission rates from mass-burn and RDF facilities ranging from 0.02 to 1.19 $lb/10^6$ Btu, with average emissions of about 0.3 $lb/10^6$ Btu.

Vendor information received to date for the proposed Collier County SWERF indicate SO_2 emissions from MSW firing ranging up to 6.3 lb/ton. These data illustrate that MSW is a non-homogeneous fuel and that sulfur content and SO_2 emissions can vary over a wide range. As a result, an SO_2 emission factor of 6.3 lb/ton (0.79 $lb/10^6$ Btu) was considered to be a conservative maximum which can be achieved on a continuous basis by the proposed Collier County SWERF.

Nitrogen Oxides

Factors that influence nitrogen oxides (NO_x) emissions from MSW-fired furnaces include furnace design, excess air, and combustion temperatures. Formation of NO_x is due to "thermal" NO_x formation and "fuel" NO_x formation. Thermal NO_x is produced by oxidizing the nitrogen contained in the combustion air at high temperatures. Fuel NO_x is formed when the nitrogen contained in the fuel is oxidized to NO_2. Fuel NO_x is most likely the dominant formation mechanism. The level of NO_x produced, therefore, is a function of temperature and excess air (oxygen availability).

Review of Table B-1 shows NO_x emission factors for other SWERF in Florida have ranged from 2.2 to 7.2 lb/ton. CDM (1984) reported emission factors for five operating SWERF in the U.S. ranging from 2.1 to 4.6 lb/ton. Three other facilities were permitted at a rate of about 3.0 lb/ton. EPA (1984a) also cites a factor of 3.0 lb/ton. Available vendor information for Collier County indicates NO_x emissions ranging up to 6.6 lb/ton. CARB (1984) in its exhaustive study of SWERF throughout the U.S., found NO_x emissions ranging from 0.08 to 0.47 lb/10^6 Btu for mass-burn and RDF facilities. EPA (1982) found an average emission rate of 0.308 lb/10^6 Btu for overfeed stoker mass-burn units. HDR (1985b) surveyed eleven MSW incinerators throughout the U.S. and found NO_x emisssions ranging between 1.1 and 4.7 lb/ton. A.D. Little's (1981) survey showed emissions to range from 0.7 to 4.4 lb/ton.

It appears from this information that NO_x emissions from MSW firing can be variable. For the proposed Collier County SWERF, a factor of 7.2 lb/ton (0.9 lb/10^6 Btu) was selected to be conservative and provide a safety factor for variations in furnace operation and fuel.

Carbon Monoxide

Carbon monoxide (CO) emissions from MSW-fired furnaces are a product of incomplete combustion conditions and solid waste composition is not an important factor. The quantity of CO produced is dependent upon the design and operation of the furnace. Advancements in combustion technology have resulted in a decreasing trend in CO emissions from MSW furnaces.

High excess air and proper air/fuel mixing are important factors in reducing CO emissions. Even when operated at high excess air levels, CO can be generated from localized areas of the furnace where oxygen deficiencies may exist. Modern MSW-fired furnaces are designed to maximize air and fuel mixing and complete combustion through proper design and refuse feed control.

Review of Table B-1 shows that CO emission factors approved or selected by other SWERF in Florida have ranged from 0.4 to 11.4 lb/ton.

CDM (1984) reported CO emission factors ranging from 0.62 to 4.3 lb/ton for over eight operating or permitted SWERF located throughout the U.S. EPA (1984a) cites a factor of 35 lb/ton, and A.D. Little (1981) reported a range of 0.05 to 34.8 lb/ton based on a literature survey. However, these higher factors are based on an old-design (prior to 1970) furnace. The CARB (1984) study found CO emissions from SWERF facilities ranging from 0.13 to 2.0 lb/10^6 Btu for mass-burn and RDF units.

For the Collier County SWERF, a CO emission factor of 5.0 lb/ton (0.625 lb/10^6 Btu) was selected based upon the CDM (1984) study with a safety factor. This rate appears to be conservative, but achievable on a continuous basis. The Bay County factor of 11.4 lb/ton was not considered representative of typical modern-design SWERF facilities.

Volatile Organic Compounds

Volatile organic compounds (VOC) emissions from MSW-fired furnaces are also a function of combustion conditions rather than the composition of the MSW. VOC results in general from poor combustion at low temperatures with insufficient oxygen. Control of VOC emissions is provided through furnace design and fuel feed rate controls. Such controls include providing adequate oxygen in the refuse bed, agitating the input refuse, and ensuring sufficient combustion residence time, all of which will contribute to more complete combustion.

VOC emissions have in general not been quantified at SWERF. CO rather than VOC emissions have generally been relied upon as indicators of combustion efficiency. The range of VOC emission factors for Florida SWERF, as shown in Table B-1, range from 0.12 to 0.30 lb/ton MSW. These represent a fairly narrow range compared to other pollutant emission factors. Vendor information received to date by Collier County indicate VOC emissions as high as 0.4 lb/ton MSW. EPA (1984a) has developed an average VOC emission factor of 1.5 lb/ton, but this factor appears high and is probably based upon old design furnaces. A.D. Little (1931) reports total hydrocarbon emissions from MSW incinerators ranging from 0.08 to 2.7 lb/ton, but the higher levels were for old-design incinerators. The comprehensive CARB (1984) study showed a range of 0.001 to 0.4 lb/10^6 Btu (non-methane hydrocarbons), with an average of less than 0.04 lb/10^6 Btu. A factor of 0.50 lb/ton (0.063 lb/10^6 Btu) appears to represent a conservative estimate which can be achieved by the proposed Collier County SWERF.

Lead

Emissions of Lead (Pb) from MSW-fired furnaces is primarily a function of the lead content of the MSW. Lead is a trace metal in most components of the combustible faction of solid waste. Lead is melted and then volatilized in the combustion process, but then is deposited onto the flyash or condensed into the solid phase after leaving the furnace. The Pb is thus susceptible for collection by an ESP or other particulate control device. Lead emission factors for Florida SWERF, shown in Table B-1, range from 0.0036 to 0.27 lb/ton. This range spans two orders of magnitude. A.D. Little (1981) reports emission rates ranging from 0.04 to 0.34 lb/ton. The CARB (1984) study showed a range of from 5600 to 16,000 ug/MJ (0.013 to 0.037 lb/10^6 Btu) with an average of 9531 ug/MJ (0.022 lb/10^6 Btu). Based upon this data, a factor of 0.30 lb/ton MSW (0.0375 lb/10^6 Btu) appears to be a reasonable maximum Pb emission rate for the proposed Collier County SWERF.

Mercury

Mercury (Hg) is present in MSW in trace quantities. Because of its low boiling point and high vapor pressure, it will exit MSW-fired furnace primarily in the vapor phase. As a result, Hg emissions are not generally capable of control by the PM control device. Florida SWERF facilities have accepted or proposed Hg emission factors ranging from 0.00171 to 0.0996 lb/ton MSW. CARB (1984) found rates ranging from 17 to 390 ug/MJ (0.000039 to 0.000905 lb/10^6 Btu), with an average emission level of 157 ug/MJ (0.00036 lb/10^6 Btu). Vendor information received for the Collier County SWERF have indicated Hg emissions may be as high as 0.013 lb/ton. Based on this information, a Hg emission factor of 0.013 lb/ton (0.00163 lb/10^6 Btu) was considered to represent a reasonable upper limit for the Collier County SWERF. The McKay Bay emission factor of 0.0996 lb/ton, which is considerably higher than the other values, is considered unrepresentative of Florida SWERF.

The proposed Collier County SWERF will not burn any sewage sludge, which may contain Hg in higher concentrations than MSW. Therefore, the proposed Hg emission rate is based solely upon MSW or WW burning (see Section 1.2 for WW emissions).

Beryllium

Beryllium (Be) emissions from MSW-fired furnaces, like Pb emissions, are emitted primarily in the solid phase, and are dependent upon trace element content of the MSW and PM control device collection efficiency.

Beryllium emission factors for Florida SWERF (Table B-1) range from 1.3×10^{-6} lb/ton to 48×10^{-6} lb/ton. The CARB (1984) study reported a range of from less than 0.08 to 3.0 ug/MJ (0.19×10^{-6} to 7.0×10^{-6} lb/10^6 Btu). Based upon these studies, a Be factor of 56×10^{-6} lb/ton (7.0×10^{-6} lb/10^6 Btu) was considered a maximum emission level for the proposed facility.

Fluorides

Fluoride (Fl) emissions from MSW-fired furnaces are a function of the Fl content of the MSW. Little is known about concentrations of Fl in MSW. Fluoride can be emitted as a gaseous product or be bound or absorbed in the flyash. In the gaseous form, the Fl will be emitted primarily as hydrogen fluoride (HF).

Little test data is available for Fl emissions from MSW-fired furnaces. Florida SWERF have used emission factors ranging from 0.06 to 0.23 lb/ton. A.D. Little (1981) reported HF emissions from MSW incinerators, based upon a literature survey, to range from 0.1 to 0.12 lb/ton (only two facilities reporting). The CARB (1984) study found limited test data (only one facility), and reported emissions were 0.003 lb/10^6 Btu. Based on the highest factor used for Florida SWERF, a factor of 0.23 lb/ton (0.029 lb/10^6 Btu) was selected for the proposed facility.

Sulfuric Acid

Sulfuric acid (H_2SO_4) emissions are expected from SWERF due to small quantities of sulfur trioxide (SO_3) associated with the SO_2 emissions. The SO_3 reacts with water droplets in the flue gases to from H_2SO_4 mist. H_2SO_4 formation will depend upon the amount of SO_3 present and the degree of oxidation to H_2SO_4. Test data for H_2SO_4 from MSW-fired furnaces is not known to exist. Only two of the proposed or permitted Florida SWERF presented emission factors for this pollutant (Table B-1). These factors ranged from 0.025 to 0.077 lb/ton MSW. The higher factor of 0.077 lb/ton was selected for the proposed Collier County SWERF.

Inorganic Arsenic

Arsenic (As) is another trace element present in MSW which will be emitted primarily in the solid phase, and therefore is susceptible to collection by the PM control device. The only information available concerning As emission rates is an estimate from one proposed Florida SWERF (0.00028 lb/ton) and from the A.D. Little (1981) and CARB (1984) studies. A.D. Little found four MSW facilities in the literature which had reported As emissions, which ranged from 0.0001 to 0.0014 lb/ton. The CARB study reported uncontrolled As emissions ranging from 16 to 1763 ug/MJ (0.000037 to 0.0041 lb/10^6 Btu), with an average of 469 ug/MJ (0.0011 lb/10^6 Btu). Based on the CARB data, an emission factor of 0.0088 lb/ton (0.0011 lb/10^6 Btu) is proposed for the Collier County SWERF.

Hydrogen Chloride

Hydrogen Chloride (HCl) emissions from MSW-fired furnaces are due to trace quantities of chlorine in the MSW. HCl emissions may occur as both gaseous and as a solid precipitate in the flyash. It is estimated that about 60 percent of the chlorine in the MSW is converted to HCl (CARB, 1984).

CDM (1984) reported HCl stack test data from four operating SWERF in the U.S. Emission rates ranged from 1.6 to 4.5 lb/ton MSW. Only three permitted SWERF in Florida have quantified HCl emissions (Table B-1), and emission rates ranged from 4.0 to 4.51 lb/ton MSW. A.D. Little (1981) reports emissions varying from 1.0 to 10.7 lb/ton. CARB (1984) reports HCl emissions from SWERF to range from 0.18 to 1.49 lb/10^6 Btu, with an average of about 0.6 lb/10^6 Btu. Limited data obtained from a few vendors by Collier County indicate HCl emissions ranging up to 6.2 lb/ton. Based upon these data, a factor of 6.2 lb/ton (0.78 lb/10^6 Btu) was considered a conservative estimate for the proposed Collier County SWERF.

Hydrogen Sulfide, Reduced Sulfur Compounds, Total Reduced Sulfur, Vinyl Chloride and Asbestos

Emissions of hydrogen sulfide, reduced sulfur compounds, total reduced sulfur, vinyl chloride and asbestos are not expected from MSW-fired furnaces. These compounds, if present in MSW, are converted or decompose to other pollutants previously discussed. Sulfur compounds are expected to convert to SO_2, and chlorinated compounds are expected to convert to HCl. Asbestos in the MSW will burn and may emit small, insignificant quantities of asbestos, which will be largely recovered by the PM control device.

1.2 WOOD WASTE

Particulate Matter

PM emissions from WW firing will be controlled to the same level as PM from MSW firing (i.e., 0.815 lb/ton). Refer to Section 1.1 for the derivation of the emission factor. The exhaust gas flow rate for WW combustion (dscfm) should be no greater than that for MSW, and therefore mass emissions of PM will be no greater. The estimated exhaust gas flow rate for 400 TPD WW firing at 50% excess air is about 30,700 dscfm for each of the proposed Collier County units (based on EPA, 1982). This compares with 52,850 dscfm conservatively estimated for MSW firing.

Sulfur Dioxide

Trace quantities of sulfur exist in WW. The mechanisms of formation and retention in a WW-fired furnace are generally the same as those for MSW.

The Bay County MSW/WW-fired SWERF permit application assumed no sulfur in WW. EPA (1984a) in AP-42 cites an average emission factor of 0.15 lb/ton with a range of 0.02 to 0.4 lb/ton (all dry weight basis). The Background Information Document (BID) for Nonfossil Fuel Fired Industrial Boilers (EPA, 1982) cites SO_2 emissions from combustion of wood derived fuels as less than 0.02 lb/10^6 Btu. Based upon this information, a factor of 0.4 lb/ton, dry basis (0.2 lb/ton, wet basis, or 0.025 lb/10^6 Btu) was selected for the Collier County SWERF.

Nitrogen Oxides

NO_x from WW combustion is formed in generally the same manner as NO_x from MSW combustion. Control mechanisms are also the same, and consist of furnace operation and design.

The Bay County SWERF used an NO_x emission factor from WW combustion of 2.3 lb/ton, wet basis. This is the same as the EPA (1984a) AP-42 factor, although EPA did not specify whether this factor is on a wet or dry basis. EPA (1982) derived an NO_x factor of 2.28 lb/ton, wet basis (0.250 lb/10^6 Btu). National Council for Air and Stream Improvement (NCASI) (1980a) performed an NO_x emission survey on several wood residue-fired boilers. NO_x emissions were found to range from 0.45 to 2.28 lb/ton, wet basis. To be conservative, a factor of 2.8 lb/ton, wet basis, was selected for the proposed facility.

Carbon Monoxide

CO from WW combustion is formed in generally the same manner as CO from MSW combustion. Control mechanisms are also the same, consisting of high excess air, proper combustion temperature, furnace design, and air/fuel mixing.

The Bay County SWERF permit application did not provide an estimate of CO emissions from WW combustion. EPA's (1984a) AP-42 document gives a large range of 4 to 47 lb/ton, but does not specify wet or dry basis. A NCASI study (1984) measured CO emissions from three wood-fired boilers and found emissions averaging from 0.18 to 0.50 lb/10^6 Btu. The highest

1-hour CO emission rate for any of the three boilers was about 6.0 lb/10^6 Btu (equal to about 54 lb/ton, wet basis). Another NCASI study (1980) found CO emissions from four wood residue-fired boilers to range from 0.042 to 4.00 lb/10^6 Btu. The average of all four boilers was 1.1 lb/10^6 Btu (about 9.9 lb/ton, wet basis). Due to this rather large variability, the 54 lb/ton factor was selected to represent maximum hourly emissions for the proposed facility. However, a lower factor of 4.5 lb/ton (0.56 lb/10^6 Btu) was selected to represent an annual average emission factor.

Volatile Organic Compounds

The formation and control mechanisms for VOC emissions from WW combustion are generally the same as those for MSW combustion. The Bay County SWERF, in its permit application, cited the EPA (1984a) AP-42 factor of 1.7 lb/ton. Bay Conty assumed a wet basis for the factor, but EPA did not specify the basis. NCASI (1980b) conducted a VOC emission study on wood-residue fired boilers in the Pacific Northwest. Four boilers were sampled, and VOC (non-methane) emissions ranged from 0.03 to 0.22 lb/10^6 Btu. The average VOC for the boilers ranged from 0.014 to 0.016 lb/10^6 Btu. The highest factor measured of 0.22 lb/10^6 Btu (1.76 lb/ton, wet basis) was selected for the proposed Collier County facility.

Trace Element Emissions

Emission factors for emissions of Pb, Be, and As from wood-fired combustion were obtained from an EPA assessment of commercial/institutional combustion sources (EPA, 1981a). The wood-fired boilers studied ranged in size up to about 150 x 10^6 Btu/hr heat input. The emission factors represent uncontrolled emissions and therefore, should overestimate actual emissions for these trace elements, which are susceptible to collection by the PM control device. The emission factors are as follows:

Pb - 49.8 pg/J (116 lb/10^{12} Btu or about 0.00104 lb/ton WW)

Be - 0.19 pg/J (0.441 lb/10^{12} Btu or about 3.97 x 10^{-6} lb/ton WW)

As - 11.7 pg/J (27.1 lb/10^{12} Btu or about 0.000244 lb/ton WW)

Emission factors for other trace elements (Hg and Fl) could not be found in the literature.

Other Regulated Pollutants

Little information exists on emissions of other regulated pollutants due to WW combustion. No emission factors are available.

2.0 EMISSION SUMMARY AND POLLUTANT APPLICABILITY

Summarized in Table B-3 are the maximum hourly and annual pollutant emission rates for the proposed Collier County SWERF. The annual rates are based upon firing the worst-case fuel (MSW or WW) at 800 TPD charging rate for 365 days per year. The PSD significant emission rates are also shown in Table B-3. Since the proposed facility will be a major stationary source (i.e., annual emissions greater than 100 TPY for any regulated pollutant), the facility is subject to PSD review requirements. PSD review is required for each pollutant emitted in greater than significant quantities. As shown in Table B-3, maximum annual emissions for all the pollutants listed are estimated to exceed the significant emission rate.

Table B-3. Emission Rates of Regulated Air Pollutants From the Proposed Collier County SWERF, and PSD Significant Emission Rates.

Pollutant	Maximum MSW	lb/hr* WW	Maximum** Tons/Year	PSD Significant Emission Rate (Tons/Year)	Pollutant Subject to PSD
Particulate Matter	27.2	27.2	119	25	Yes
Sulfur Dioxide	210.0	6.7	920	40	Yes
Nitrogen Oxides	240.0	93.3	1051	40	Yes
Carbon Monoxide	166.7	1350.0+	730	100	Yes
Vol. Org. Cmpds.	16.7	58.7	257	40	Yes
Lead	10.0	0.026	43.8	0.6	Yes
Mercury	0.43	---	1.9	0.1	Yes
Beryllium	0.0019	0.00010	0.0083	0.0004	Yes
Fluorides	7.67	---	33.6	3	Yes
Sulfuric Acid	2.57	---	11.3	7	Yes
Hydrogen Chloride	206.7	---	905.3	NA	Yes
Inorganic Arsenic	0.29	0.0061	1.3	0	Yes

*Based upon 800 TPD charging rate.

**Based upon 365 days per year operation.

+Maximum hourly emissions; average hourly emissions are estimated at 150.0 lb/hr.

ATTACHMENT C

AIR QUALITY IMPACT ANALYSIS

ATTACHMENT C

AIR QUALITY IMPACT ANALYSIS

1.0 METHODOLOGY

1.1 ATMOSPHERIC DISPERSION MODEL

The Industrial Source Complex Short-Term (ISCST) model (EPA, 1979) was used to predict maximum short-term (i.e., 24-hours or less) and annual average concentrations. The ISCST model is a U.S. EPA and Florida DER approved dispersion model applicable to flat or rolling terrain. The terrain in the vicinity of the proposed Collier County SWERF is basically flat.

The ISCST model is a Gaussian plume dispersion model which calculates hourly concentrations at multiple receptor points based upon hourly emissions and meteorological data. Hourly meteorological inputs consist of wind direction, wind speed, temperature, atmospheric stability and mixing height. The model uses the hourly concentrations to calculate (at the user's request) non-overlapping, 3-hour, 8-hour and 24-hour average concentrations and annual average concentrations. Because of the rural, remote nature of the proposed SWERF site, the model was executed in the rural dispersion mode.

The formulas of Briggs (1971, 1975) are used to calculate plume rise of the emitted stack gases. Plume rise is a function of stack volumetric flow rate and temperature, ambient temperature, and atmospheric stability and wind speed.

The model can roughly simulate the effects of building downwash on the emitted plume. Building downwash may occur if stack gases are released into the downwind wake caused by wind flow over and around a structure such as a building. The equations used in the ISCST model to simulate downwash are based on empirical data which has not been well validated. These general equations cannot be expected to accurately simulate all building downwash conditions. Therefore, the results of downwash simulations should be viewed with caution.

1.2 METEOROLOGICAL DATA

Meteorological data used in the ISCST model consisted of one year (1975) of hourly surface data taken at Ft. Myers, Florida. Mixing heights used in the model were based upon upper air data from Tampa, Florida for 1975 and Ft. Myers surface temperature data. Because one year of meteorological data was used in the analysis, the highest predicted short-term concentrations were used for comparison to the air quality standards.

1.3 RECEPTOR LOCATIONS

Screening modeling was performed initially using a coarse receptor grid. A radial grid was used with the center of the grid coinciding with the location of the proposed facility. Radials were spaced at 10^{o} increments from 10^{o} to 360^{o}. Receptors were located along each radial from 0.5 km to 3.3 km from the proposed facility, at increments of 0.4 km. The screening modeling analysis also evaluated a total of seven (7) receptors located along the northern boundary of the Everglades National Park Class I area (see Figure C-1). This area is located about 35 km from the proposed Collier County SWERF site .

Refined modeling was performed for meteorological conditions which produced maximum short-term concentrations in the vicinity of the proposed facility. The refined receptor grid consisted of seven receptors spaced at 0.1 km intervals, located along each of three radials. One radial was aligned along the direction of maximum impact, as defined in the screening modeling. The remaining two radials were placed at 2^{o} increments from the first radial. Refined modeling was not performed for the Class I area receptors because of the distance to the Class I area.

1.4 STACK AND EMISSION PARAMETERS

Stack parameters utilized in the modeling were the same as those presented in Section III.H. of the application form. The flue gas flow rate and stack height are representative of a 600 TPD facility. A generic emission rate of 100 lb/hr was used. The results of the modeling were

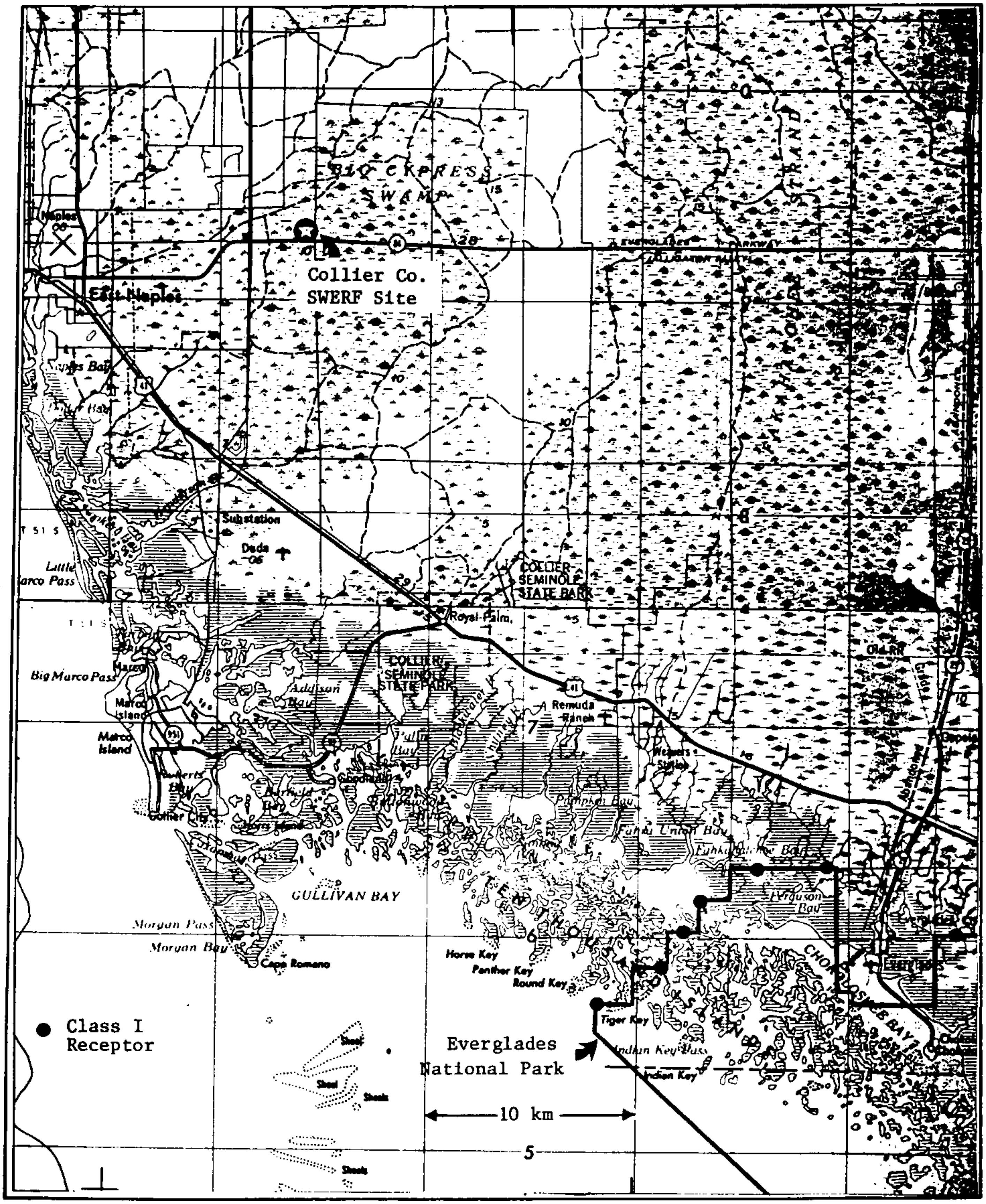

FIGURE C-1. CLASS I AREA RECEPTORS UTILIZED IN MODELING ANALYSIS.

Source: U.S. Geological Survey 1972, 1973

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then corrected for actual emission rates for each pollutant based upon a 800 TPD facility (shown in Table B-3). This procedure results in worst-case predicted concentrations, regardless if a 600 or an 800 TPD facility is selected by Collier County.

1.5 GOOD ENGINEERING PRACTICE (GEP) STACK HEIGHT EVALUATION

The 1977 Clean Air Act Amendments require that emission limitations established for any source are not based upon a stack height which exceeds GEP. GEP stack height is defined as the height necessary to insure that emissions from the stack do not result in excessive concentrations of any air pollutant in the immediate vicinity of the source as a result of atmospheric downwash, eddies, and wakes which may be created by the source itself, nearby structures, or nearby terrain obstacles. The Act did not restrict the actual height of any stack, but only limits the stack height used in determining a source's allowable emission rate (e.g. based upon dispersion modeling).

The EPA promulgated final GEP stack height regulations on July 8, 1985 (Federal Register, Vol. 50, No. 130). The GEP stack height is the greater of 65 meters or the height calculated from the following formula:

$$H_G = H + 1.5L$$

where:

H_G = the maximum GEP stack height
H = the height of the strcuture
L = the lesser dimension (height or width) of the influencing structure.

The area of influence of a structure is defined as five times the dimension "L", but not exceeding 0.8 km from the proposed stack. The width of a structure is based on the frontal area of the structure projected onto a plane perpendicular to a line originating from the stack and following the direction of the wind. Thus, the stack height predicted by the formula can be a function of wind direction, but GEP height is the greatest calculated height.

The dimensions of the building housing the combustor/boilers, based upon two 300 TPD units, are as follows:

Height - 43 m (141 ft)

Maximum projected width - 33 m (108 ft)

This building will be the largest influencing structure at the facility. The proposed stack serving the two combustion units will be located adjacent to this building, and thus in its area of influence. Based upon these dimensions, the building width is the lesser dimension (L) of the height or width, and the GEP stack is calculated as

$$43 + 1.5\ (33) = 92.5\ m\ (303\ ft).$$

Construction of two 400 TPD units should result in a GEP height equal to or greater than this height. Since the proposed stack height of 61 m is less than the maximum GEP stack height of 92.5 m, the effects of downwash must be considered in predicting ground level concentrations.

2.0 IMPACT ANALYSIS RESULTS

The State of Florida ambient air quality standards (AAQS) and allowable PSD increments are shown in Tables C-1 and C-2, respectively. The proposed Collier County facility is located in an area designated as Class II for PSD purposes. The Everglades National Park Class I area is located about 35 km south-southeast from the proposed facility site.

The results of the impact analysis for the proposed Collier County SWERF are presented in Tables C-3 and C-4. Presented in Table C-3 are maximum impacts predicted at any location for the facility. Table C-4 shows maximum impacts predicted for the Everglades National Park PSD ClassI area.

Maximum predicted impacts of PM, NO_x and CO are all below the significant impact levels as defined by U.S. EPA and Florida DER. As a result, the proposed facility is not expected to result in or significantly contribute to a violation of the AAQS or the allowable Class II PSD increments for these pollutants, and no further ambient impact analysis is required.

The predicted maximum SO_2 impacts are just above the significant impact level, and further analysis is required. The only existing or permitted sources of SO_2 emissions within Collier County are four (4) asphalt plants, all of which are minor sources of SO_2. These are located in Naples or other areas along the Florida west coast. The only major source of SO_2 emissions within about 35 miles (55 km) of the site is the Florida Power & Light Ft. Myers power plant. Since there are no nearby significant sources of SO_2, ambient SO_2 monitoring data from Ft. Myers was used to estimate the impacts due to existing anthropogenic and natural SO_2 sources. Summarized in Table C-5 are the Ft. Myers data from 1983 and 1984, which were obtained with a continous monitor at Ft. Myers water treatment plant. These data should overestimate actual background SO_2 in the area of the proposed Collier County SWERF due to the existance of a large oil-fired power plant (Florida Power & Light's Ft. Myers plant) and several small sources of SO_2 in Ft. Myers.

Table C-1. Federal and State AAQS (ug/m^3) Applicable to the Proposed Project

Pollutant	Averaging Time	Federal Primary Standard	Federal Secondary Standard	State of Florida
Suspended Particulate Matter	Annual Geometric Mean	75	60	60
	24-Hour Maximum*	260	150	150
Sulfur Dioxide	Annual Arithmetic Mean	80	N/A	60
	24-Hour Maximum*	365	N/A	260
	3-Hour Maximum*	N/A	1,300	1,300
Carbon Monoxide	8-Hour Maximum*	10,000	10,000	10,000
	1-Hour Maximum*	40,000	40,000	40,000
Nitrogen Dioxide	Annual Arithmetic Mean	100	100	100
Ozone	1-Hour Maximum+	235	235	235
Lead	Calendar Quarter	1.5	1.5	1.5

* Maximum concentration not to be exceeded more than once per year.

+ Maximum concentration not to be exceeded more than an average of 1 calendar day per year.

Sources: 40 CFR, Parts 50 and 52.
Ch 17-2, FAC.

Table C-2. Federal* and State+ PSD Allowable Increments

Pollutant/Averaging Time	Allowable Increment (ug/m^3) Class I	Class II	Class III
Particulate Matter			
Annual Geometric Mean	5	19	37
24-Hour Maximum**	10	37	75
Sulfur Dioxide			
Annual Arithmetic Mean	2	20	40
24-Hour Maximum**	5	91	182
3-Hour Maximum**	25	512	700

* 40 CFR Part 52, Section 52.21.

\+ Ch 17-2, FAC

**Maximum concentration not to be exceeded more than once per year.

Table C-3. Predicted Maximum Concentrations for the Proposed Collier County SWERF.

Pollutant	Averaging Time	Maximum Concentration (ug/m^3)	Receptor Location+		Meteorological Condition (1975)		Significant Impact Level (ug/m^3)	De Minimis Ambient Impact Level (ug/m^3)
			Direction* (°)	Distance (km)	Day	Period		
SO_2	3-hour	35.8	130	1.1	154	4	25	NA
	24-hour	7.4	60	1.5	187	-	5	13
	Annual	0.8	270	1.7	-	-	1	NA
PM	24-hour	1.0	60	1.5	187	-	5	10
	Annual	0.1	270	1.7	-	-	1	NA
NO_2	Annual	1.0	270	1.7	-	-	1	14
CO	1-hour	411.8	148	1.5	207	9	2000	NA
	8-hour	124.2	268	1.5	250	2	500	575
Pb	24-hour	0.35	60	1.5	187	-	NA	0.1
	Annual	0.04	270	1.7	-	-	NA	NA
Fl	24-hour	0.27	60	1.5	187	-	NA	0.25
Be	24-hour	0.000065	60	1.5	187	-	NA	0.0005
Hg	24-hour	0.015	60	1.5	187	-	NA	0.25

NA = Not Applicable

+With respect to proposed facility.

*South = 180°, North = 360°

Table C-4. PSD Class I Area Predicted Maximum Concentrations, Proposed Collier County SWERF.

Pollutant	Averaging Time	Maximum Concentration (ug/m^3)	Receptor Location+ East (km)	Receptor Location+ North (km)	Meteorological Condition (1975) Day	Meteorological Condition (1975) Period	PSD Class I Allowable Increment (ug/m^3)
SO_2	3-hour	6.5	451.0	2859.0	326	1	25
	24-hour	1.9	459.0	2863.0	342	-	5
	Annual	<0.1	-	-	-	-	2
PM	24-hour	0.24	459.0	2863.0	342	-	10
	Annual	<0.1	-	-	-	-	5

+UTM Location

Table C-5. Summary of Continuous SO_2 Data, 1983-1984, Ft.Myers, Florida (Site 1300-005-F01).

Sampling Period	No. of Obs.	Annual Average	24-Hour Average Highest	24-Hour Average Second-Highest	3-Hour Average Highest	3-Hour Average Second-Highest
Jan. - Dec. 1983	5943	9	64	60	169	113
Jan. - Dec. 1984	3732	6	30	25	79	69

Source: FDER, 1983, 1984

To estimate total SO_2 concentrations due to the proposed Collier County SWERF, the annual average and maximum 3-hour and 24-hour average concentrations shown in Table C-5 were added to the maximum impacts for the proposed SWERF, shown in Table C-3. These total estimated impacts are:

Annual average: 10 ug/m^3

24-hour: 71 ug/m^3

3-hour: 205 ug/m^3

These maximum predicted SO_2 concentrations are well below the AAQS.

Although no significance level has been set for Pb, the proposed facility's maximum annual average impact is more than a factor of 30 below the AAQS for Pb of 1.5 ug/m^3 (calendar quarter average). AAQS or PSD increments have not been set for other regulated pollutants.

The proposed facility's maximum impacts on the Everglades National Park Class I area are well below significance levels and allowable Class I increments (Table C-4). No other significant increment consuming sources have been identified in Collier County. Therefore, no exceedances of allowable Class I increments are expected due to operation of the proposed facility.

In conclusion, the air quality impact analysis demonstrates that the operation of the proposed facility will not cause or contribute to violations of any AAQS or PSD increment.

The ambient air monitoring de minimis levels are also shown in Table C-3. According to U.S. EPA and Florida DER PSD regulations, if the maximum impacts due to a new source are less than the de minimis levels, then the source applicant may be exempted from PSD air monitoring requirements. As shown in Table C-3, the proposed Collier County SWERF maximum impacts are less than the de minimis levels for all pollutants except Pb. The U.S. EPA has revised the de minimis level for Pb in its PSD air monitoring guideline document (EPA, 1981b) to 0.1 ug/m^3, calendar quarter average. However, U.S. EPA and Florida DER have not revised their respective PSD regulations to reflect this change. Nevertheless, the proposed facility's impacts are a factor of three below this revised level, and it is requested that Collier County be exempted from PSD preconstruction ambient monitoring for Pb.

3.0 DOWNWASH ANALYSIS

An atmospheric downwash analysis was performed using the building downwash option within the ISCST model. From Table C-3, the 3-hour and 24-hour SO_2 impacts are highest in relation to the significant impact levels. Therefore, these impacts were analyzed for building downwash potential. The meteorological periods identified in Table C-3 for these impacts were analyzed using the building downwash option. The resulting maximum impacts were as follows:

24-hour SO_2: 10.1 ug/m^3
3-hour SO_2: 37.8 ug/m^3

These impacts reflect a 2.7 ug/m^3 increase for the 24-hour averaging period, and a 2.0 ug/m^3 increase for the 3-hour averaging period compared to the non-downwash results. These increases are insignificant, and it is concluded that building downwash conditions potentially affecting the proposed facility will not cause or contribute to violations of any air quality standards.

ATTACHMENT D

BEST AVAILABLE CONTROL TECHNOLOGY EVALUATION

ATTACHMENT D

BEST AVAILABLE CONTROL TECHNOLOGY EVALUATION

1.0 REQUIREMENTS

The control technology review requirements of the federal and state PSD regulations require that all applicable federal and state emission limiting standards be met, and that "Best Available Control Technology" (BACT) be applied to control emissions from the source. The BACT requirements are applicable to all pollutants for which the increase in emissions from the source or modification exceeds the significant emission rate.

BACT is defined in FAC Chapter 17-2.100(23) as an emission limitation, including a visible emissions standard, based on the maximum degree of reduction of each pollutant emitted which DER, on a case by case basis, taking into account energy, environmental and economic impacts, and other costs, determines is achievable through application of production processes and available methods, systems, and techniques (including fuel cleaning or treatment or innovative fuel combustion techniques) for control of each such pollutant. If the imposition of an emission standard is not feasible, a design, equipment, work practice, operational standard, or combination thereof, may be prescribed instead to satisfy the requirement for the application of BACT.

Guidelines for the evaluation of BACT can be found in EPA's Guidelines for the Evaluation of BACT (EPA, 1978) and in the PSD Workshop Manual (EPA, 1980a). The BACT requirements are intended to ensure that the control systems incorporated in the design of a proposed facility reflect the latest in control technologies used in a particular industry and take into consideration existing and future air quality in the vicinity of the proposed facility. BACT must, as a minimum, demonstrate compliance with NSPS for this source. An evaluation of the air pollution control techniques and systems, including a cost-benefit analysis of alternative control technologies capable of achieving a higher degree of emission reduction than NSPS, is also required. The cost-benefit analysis requires the documentation of the materials, energy, and economic penalties associated with the proposed and alternative control systems as well as the environmental benefits derived from these systems.

2.0 PARTICULATE MATTER

Paticulate matter control technologies for MSW and/or WW firing in furnaces and boilers has been extensively examined by EPA (1979) in its review of the NSPS for incinerators, by EPA (1982) in its Background Information Document (BID) for nonfossil fuel fired industrial boilers, by CARB (1984), and in the several applications for SWERF in Florida as discussed in Attachment B. The major conclusions of these studies are summarized below:

- Three types of control devices are potentially applicable to MSW/WW fueled facilities: electrostatic precipitators (ESP), fabric filters, and venturi scrubbers.
- Fabric filters can provide a greater degree of emission reduction than ESP, and ESP provide a much better emission reduction than do venturi scrubbers.
- Fabric filters and venturi scrubbers have not been extensively tested and proven on MSW boilers. Those which have been installed on MSW boilers have encountered severe operational and maintenance problems.
- The ESP is by far the most common control technique for control of PM at these facilities, and are well proven.
- Venturi scrubbers require much greater energy requirements in order to provide adequate PM control, operating and maintenance costs are high, and the liquid scrubber waste must be treated and/or disposed.
- ESP and fabric filters have low energy requirements and the waste by-product can be handled in a dry manner.
- ESP have been proven capable of meeting the proposed BACT emission limit of 0.03 gr/dscf, corrected to 12% CO_2. A fabric filter would also be capable of meeting the 0.03 gr/dscf limit, but this control technique has not been proven as reliable as the ESP.
- ESP have been used on both MSW and WW burning facilities, and have been proven reliable.
- All operating, permitted or proposed SWERF in Florida have selected the ESP as the PM control device.

Based upon these conclusions, the venturi scrubber was not considered further as PM a control alternative. The ESP is considered to be the most reliable, proven control device for PM on MSW-burning installations. However, the vendor for the PM control device for the proposed Collier County SWERF has not yet been selected, and therefore, a fabric filter is not being ruled out as potentially applicable to the facility.

The proposed PM BACT emission limit is 0.03 gr/dscf, corrected to 12% CO_2, for both MSW and WW firing in the combustor/boilers. This is equivalent to a maximum of 0.10 lb/10^6, assuming a minimum heating value of the MSW/WW of 4,000 Btu/lb, or 0.09 lb/10^6 Btu at 4,500 Btu/lb.

EPA's survey of nonfossil fuel-fired boilers (EPA, 1982) evaluated emissions from ESP-controlled wood-fired boilers. Two boilers were found which burned only wood or woodwaste materials (no fossil fuel). Emissions were very similar and ranged between 0.04 and 0.10 lb/10^6 Btu. The average for these boilers was approximately 0.06 lb/10^6 Btu. Therefore, a well designed ESP should be capable of meeting the proposed emission limit when firing WW in the combustor/boiler. The proposed level of control when burning WW is much more stringent than Florida DER's emission limitation for new carbonaceous fuel burning equipment, which limits PM emissions to 0.2 lb/10^6 Btu (FAC Chapter 17-2.600 (10)(b)).

EPA (1982) also surveyed operating MSW-fired boilers. The only test data available were from four boilers controlled by an ESP, since these type boilers almost exclusively use the ESP for PM control. Average PM emissions for the four boilers ranged from 0.05 to 0.20 lb/10^6 Btu, with an overall average of about 0.10 lb/10^6 Btu. Emissions were found to decrease with increasing specific collection area (SCA) of the ESP. SCA's ranged from about 140 to 570 ft^2/1,000 acfm.

These data show that the proposed BACT emission limit of 0.03 gr/dscf is representative of PM emission levels achieved by currently operating MSW and WW-fired boilers employing ESP. This level is also better than or equal to most BACT determinations for MSW-fired facilities located throughout the U.S. CDM (1984) reported a total of five such facilities, with two facilities permitted at 0.03 gr/dscf, one at 0.04 gr/dscf and one at 0.05 gr/dscf. Three Lowest Achievable Emission Rate (LAER) determinations were also reported, with one facility permitted at 0.03 gr/dscf and the other two at 0.025 gr/dscf. A recent BACT determination in Florida for a MSW/WW fired boiler (Bay County) also resulted in a PM emission limit of 0.03 gr/dscf.

It is concluded that the ESP with an outlet grain loading of 0.03 gr/dscf, corrected to 12% CO_2, approaches LAER and is representative of BACT. The ESP has low energy impacts, and the environmental impacts of PM emissions from the proposed Collier County facility, detailed in Attachment C, are insignificant.

A fabric filter is also capable of achieving this level of control, and energy and environmental impacts are similar to the ESP. The only significant questions with the fabric filter are reliability and maintenance. Since a vendor for the PM control device has not yet been selected, Collier County desires to retain this control technique as an option. However, in order for this control technique to be selected, the vendor will be required to substantiate the long-term reliability and operation of the device, and guarantee PM emission levels lower than or equal to the ESP.

3.0 SULFUR DIOXIDE, SULFURIC ACID, FLUORIDES, AND HYDROGEN CHLORIDE

There are no emission limiting standards which apply to SO_2, H_2SO_4, Fl or HCl emissions from MSW/WW fired boilers. NSPS have not been proposed or promulgated, and there are no FDER emission limiting standards.

Emissions of SO_2, H_2SO_4, Fl and HCl can all be controlled by the same control technique. Sulfuric acid emissions are a function of SO_2 emissions; thus controlling SO_2 also controls H_2SO_4.

Pre- and post-combustion control technologies for SO_2 have been developed for fossil fuel fired boilers, but not for MSW or WW combustion, primarily due to the low sulfur content of the MSW/WW fuel and resultant low SO_2 emissions. Pre-combustion controls include using low sulfur fuel and physical or chemical cleaning. MSW/WW would be classified as a low-sulfur fuel. MSW, at a maximum of 5.0 lb/ton SO_2 emissions, would yield about 0.625 lb/10^6 Btu. By comparison, high sulfur (2.5%) coal and low sulfur (0.5%) coal would yield about 5.0 lb/10^6 Btu and 1.0 lb/10^6 Btu, respectively. Physical/chemical cleaning methods to remove sulfur from MSW/WW fuel are not known to have been developed, primarily because there has not been a need for such methods. Consequently, pre-combustion sulfur, HCl and Fl removal from MSW/WW is considered unnecessary and technologically infeasible at this time.

Post-combustion controls for SO_2 include wet scrubbers and dry scrubbers, the latter requiring a PM collection device to remove the dry waste material from the flue gases. Wet scrubbing systems developed to date include limestone/lime, sodium and dual alkali scrubbing. Dry scrubbing systems are based upon calcium or sodium scrubbing and evaporation of the scrubbing medium, leaving behind a dry waste material which can be captured in an ESP or fabric filter.

CARB (1984) presented a comprehensive review of SO_2, H_2SO_4, Fl and HCl control technologies for SWERF. This study concluded that both wet and dry scrubbing systems have been satisfactorily proven for application to MSW-fired facilities. Depending on scrubber technology and scrubbing media, SO_2, H_2SO_4, HCl and Fl (as HF) removal efficiencies can exceed 90 percent.

The major drawbacks of all these systems are:

- The capital and annual operating costs of a wet or dry scrubbing system is large. Malcolm Pirnie (1985) estimated annual costs of an SO_2 scrubbing system for a 1,900 TPD MSW-fired faciity to range from \$4.6 million to \$6.5 million. CDM (1984) estimated annual operating costs to range from \$2.0 million to \$3.2 million for acid gas control of a 1,600 TPD facility (above base ESP cost). Based upon these estimates, minimum costs for the proposed Collier County SWERF (800 TPD facility) are estimated at \$1,000,000 per year. Assuming 90 percent removal of acid gases, the annual cost per ton of pollutant removal would be:

  SO_2 - \$ 1,208/ton
  Fl - \$33,069/ton
  HCl - \$ 1,227/ton
  H_2SO_4 - \$93,323/ton

- These systems are rarely available 100 percent of the time due to operational problems. Costly redundancy built into the system is required to insure 100 percent availability.

- They produce large amounts of solid and/or liquid wastes which must be treated and/or disposed. Proper disposal to avoid related environmental contamination is required and is costly.

- Energy usage of these systems is high, typically requiring 10 to 15 percent of the energy output of the facility.

- Large amounts of water are required for the scrubber systems.

The predicted maximum impacts of SO_2 from the proposed facility are extremely low (0.8 ug/m^3, annual average), and well below all SO_2 AAQS (see Attachment C). Federal or State of Florida AAQS do not exist for H_2SO_4, Fl or HCl. CDM (1984) developed acceptable ambient levels for these pollutants based upon State of New York guidelines.

These levels and the predicted maximum impacts of the proposed Collier County facility are:

Pollutant	Averaging Time	Acceptable Level (ug/m^3)	Maximum Collier County Impact (ug/m^3)
HCl	Annual	140	0.8
H_2SO_4	Annual	3.33	0.01
HF	Annual	2.85	0.03

As shown, the maximum impacts of the proposed facility are well below these levels.

Considering the low emissions and associated impacts from the proposed Collier County facility, and the significant economic penalties, potential associated environmental impacts, and additional water and energy requirements, utilization of a gas scrubbing system is considered economically and environmentally unacceptable. The selected SO_2 and H_2SO_4 BACT is firing low-sulfur solid waste fuel in the boiler. No other operating or permitted SWERF in Florida have been required to implement acid gas controls. Most of these facilities have the potential to emit much greater quantities of acid gases than does the Collier County facility. The proposed BACT emission limits for MSW burning are as follows:

SO_2 - 6.3 lb/ton
H_2SO_4 - 0.077 lb/ton
Fl - 0.23 lb/ton
HCl - 6.2 lb/ton

The proposed limits for WW burning are:

SO_2 - 0.2 lb/ton

Emission estimates for H_2SO_4, Fl and HCl are not available for WW combustion, and therefore, no BACT emission rates are proposed for these substances.

4.0 NITROGEN OXIDES

NO_x emissions from MSW/WW combustion processes result from the oxidation of nitrogen compounds in the combustion air (thermal NO_x) and in the fuel (fuel NO_x). Thermal NO_x formation is highly dependent on temperature and design of the combustion unit (i.e., heat release rates, residence time and oxygen availability). However, according to CARB (1984), 75 to 80 percent of the NO_x generated from refuse burners is a result of fuel NO_x. Fuel NO_x is influenced by the fuel nitrogen content, combustion air distribution, and excess air. The amount of NO_x released from a specific source, both thermal and fuel, is therefore a function of the design and operation of the combustion unit.

NO_x emissions from combustion sources can potentially be reduced by three methods:

- Reduce fuel nitrogen content
- Combustion design
- Flue gas denitrification

Reducing fuel nitrogen content is not presently feasible. No cost-effective method has been found to separate out materials in MSW which are high in nitrogen content. Flue gas denitrification processes have been developed, but none have been demonstrated on MSW or WW combustion systems on a commercial scale. One process, the Selective Non-catalytic Reduction (SNCR) method, has been applied to four refuse burning facilities in Japan (CARB, 1984). However, operating problems are reported, reflective of the developmental status of this technology. Flue gas denitrification processes were not considered further as BACT for the Collier County facility due to the lack of reliable, full-scale operating experience and the large costs associated with such a process.

No emission limiting standards or NSPS exist for NO_x emissions from MSW/WW-fired facilities. The proposed BACT for NO_x emissions due to MSW/WW firing, and the only feasible control alternative, is combustion controls. This will include use of low excess air, limiting peak combustion temperatures, and good air/fuel mixing in the combustion chamber. However, it must be considered that low excess air firing tends to create greater emissions of CO and VOC due to incomplete combustion. Thus, the combustion design will attempt to limit NO_x, CO and VOC emissions to the greatest extent possible within practical limits. Since the combustor/boiler has not yet been selected, specific furnace design information is not available. The selected vendor will be required to incorporate state-of-the art combustion controls into the furnace design. The proposed BACT emission limit is 7.2 lb/ton for MSW and 2.8 lb/ton for WW firing.

The air quality impacts of the proposed NO_x emission levels were discussed in Attachment C. This analysis demonstrated minimal NO_x impacts as a result of operation of the proposed facility at the proposed BACT emission rate. This proposed BACT is also consistent with control technologies and BACT determinations for all operating and permitted SWERF in Florida.

5.0 CARBON MONOXIDE AND VOLATILE ORGANIC COMPOUNDS

Carbon monoxide and VOC emissions from MSW/WW burning is a result of incomplete combustion. High combustion temperatures, good mixing and proper air/fuel ratios afford optimum control of CO and VOC. However, high combustion temperatures and high excess air rates can lead to greater levels of NO_x, and therefore a tradeoff must exist between NO_x and CO/VOC emissions.

No emission limiting standards exist for CO and VOC emissions from MSW/WW-fired facilities. Specific add-on technologies for control of CO have not been developed or incorporated into operating or permitted SWERF designs. As a result, the selected BACT for the proposed facility is good combustion control and furnace design. This BACT is consistant with CO/VOC control techniques employed at all operating or permitted SWERF in Florida, including four facilities located in ozone nonattainment areas (two in Hillsborough County, one in Pinellas County, and one in Dade County). The proposed BACT emission rate for CO is 5.0 lb/ton for MSW and 54.0 lb/ton (maximum) or 4.5 lb/ton (average) for WW firing. The air quality impact of the proposed CO BACT emission level is predicted to be insignificant, as discussed in Attachment C.

6.0 LEAD, BERYLLIUM AND ARSENIC

As discussed in Attachment B, small quantities of Pb, Be and As are present in MSW and WW, and a portion of these metals will be volatilized and then condensed or absorbed upon other particulates contained in the flue gas exhaust stream. Thus, control of particulate matter will also control these trace metals. No emission limiting standards have been promulgated or proposed to restrict emissions of these trace metals from MSW/WW-fired boilers.

As discussed in Section 2.0 of this attachment, the ESP or fabric filter was selected as BACT for control of PM emssions. For the same reasons discussed therein, the ESP or fabric filter is also selected as BACT for these trace metal emissions. The proposed BACT emission rates are as follows:

MSW -- Pb - 0.3 lb/ton
Be - 56×10^{-6} lb/ton
As - 0.0088 lb/ton

WW -- Pb - 0.00104 lb/ton
Be - 3.97×10^{-6} lb/ton
As - 0.000244 lb/ton

The maximum predicted impact of Pb emissions at the BACT emission rate is small and well below the AAQS (see Attachment C). No Florida AAQS exist for Be or As, although the State of New York has established an AAQS of 0.01 ug/m^3, monthly average, for Be. The maximum predicted 24-hour impact of Be due to the proposed Collier County facility is 0.000065 ug/m^3, well below the New York State standard. This impact is insignificant.

7.0 MERCURY

As discussed in Attachment B, emissions of Hg from MSW/WW combustion will occur primarily in the gaseous phase, and therefore will not be controlled by the ESP or fabric filter. No known technology currently exists to remove trace quantities of Hg in flue gas streams. Therefore, no further controls are proposed for Hg emissions. No emission limiting standards for Hg emissions from MSW/WW-fired facilities exist. The proposed BACT emission rate is 0.013 lb/ton for MSW. No emission factor is available for WW firing.

An AAQS has not been established for Hg. However, EPA (1984b) developed a guideline level of 1.0 ug/m^3, 30-day average, as part of the development of the NESHAPS for Hg. (The NESHAPS for Hg does not apply to the proposed Collier County SWERF because sewage sludge will not be burned at the facility). The predicted maximum impact of the proposed Collier County facility is 0.015 ug/m^3, 24-hour average. This short-term maximum is well below the 30-day average guideline, and impacts of Hg emissions are considered insignificant.

8.0 ESP DESIGN INFORMATION

The vendor for the PM control device (ESP or fabric filter) has not yet been selected, and therefore specific design information is not available at this time. Such data will be supplied to Florida DER for review and approval upon receipt of information from the vendor and prior to construction of the control device.

Basic criteria which the control device will need to be designed for can be derived from available test data and literature. These criteria are described below.

INLET PARTICULATE LOADING

Fuel	Boiler Type	Reference	$lb/10^6$ Btu	gr/dscf @ 12% CO_2
MSW	Overfeed Stoker	EPA, 1982	3.36	1.60
MSW	Waterwall	CARB, 1984	0.68 - 6.2	0.33 - 3.5
RDF	Spreader Stoker	CARB, 1984	2.8 - 14.2	2.6 - 8.5
WW	Spreader Stoker	EPA, 1932	4.88 - 6.87	2.17 - 3.06

INLET PARTICLE SIZE DISTRIBUTION

			Weight Percent Less than Stated Size					
Fuel	Boiler Type	Reference	10 um	5 um	2 um	1 um	0.5 um	0.2 um
MSW	Mass-burn w/recip. grate	CARB, 1984	38-98	28-96	24-93	20-86	16-70	16-50
RDF	Spreader Stoker	CARB, 1984	95	87	70	55	40	--
MSW	Mass-burn	EPA, 1982	35-45	32-40	25-34	20-30	3-17	--
RDF/ Coal	Suspension	EPA, 1982	35	18	6	2	1.4	--
WW	Spreader Stoker	EPA, 1982	52	30	21	15	--	--

FLYASH RESISTIVITY (ohm-cm)

MSW - (CARB, 1984): 10^{10} to 10^{11} @ 450° F

MSW - (EPA, 1982): 10^{6} to 10^{12} @ 300 to 400° F

WW - (EPA, 1982): 10^{5} to 10^{13}

RDF - (EPA, 1982): 10^{8} to 10^{11}

FLUE GAS CONDITIONS AT ESP INLET (APPROXIMATE)

Temperature: 400 to 450° F

Gas Flow rate: 52,850 dscfm each unit

Moisture: 15%

CONTROL EFFICIENCY

All efficiencies based upon proposed emission limit of 0.03 gr/dscf @ 12% CO_2, equal approximately to 0.10 lb/10^6 Btu or 0.815 lb/ton

1) MSW/Mass burn facility

   Highest inlet loading estimated at 6.2 lb/10^6 Btu or 3.5 gr/dscf

   Grain loading basis: (3.5 - 0.03)/3.5 = 99.1%

   Heat input basis: (6.2 - 0.10)/6.2 = 98.4%

2) Refuse-derived fuel facility

   Highest inlet loading estimated at 14.2 lb/10^6 Btu or 8.5 gr/dscf

   Grain loading basis: (8.5 - 0.03)/8.5 = 99.6%

   Heat input basis: (14.2 - 0.10)/14.2 = 99.3%

3) WW/Mass-burn facility

   Highest inlet loading estimated at 6.87 lb/10^6 Btu or 3.06 gr/dscf

   Grain loading basis: (3.06 - 0.03)/3.06 = 99.0%

   Heat input basis: (6.87 - 0.10)/6.87 = 98.5%

ATTACHMENT E

ADDITIONAL IMPACT ANALYSIS

ATTACHMENT E

ADDITIONAL IMPACT ANALYSIS

1.0 REQUIREMENTS

PSD regulations require that all new or modified sources assess impacts upon visibility, soils, vegetation, and growth associated with the proposed project. These analyses are to be conducted primarily for PSD Class I areas, for each pollutant emitted in significant quantities and subject to PSD review requirements.

2.0 IMPACTS UPON VISIBIITY

This section discusses the results of the EPA Level-1 visibility screening analysis for the proposed Collier County SWERF. The analysis addresses impacts upon the Everglades National Park (ENP) Class I area. ENP is located 35 km to the south-southeast of the proposed facility site. The Level-1 visibility screening analysis is a very conservative analysis designed to identify whether emissions from a proposed facility would have the potential to adversely affect visibility. If the screening criteria are not exceeded, the proposed facility is not likely to cause adverse visibility impairment, and further analysis becomes unnecessary.

The Level-1 visibility screening analysis is described in Workbook for Estimating Visibility Impairment (EPA, 1980b). The following parameters are calculated in the Level-1 visibility analysis: C_1 - plume contrast against the sky; C_2 - plume contrast against terrain; and C_3 - the change in sky terrain contrast caused by primary and secondary aerosols. If the absolute value of any of these parameters exceeds 0.10, then the source fails the Level-1 test and must proceed to the refined, Level-2 analysis.

The pertinent input parameters and results of the Level-1 analysis were as follows:

Q_{part} = 0.326 TPD = 0.296 metric TPD
Q_{SO2} = 2.52 TPD = 2.29 metric TPD
Q_{NO2} = 2.88 TPD = 2.62 metric TPD
x = 35 km
$Sigma_z$ = 70 m
$p = 1.02 \times 10^5$
r_{vo} = 25 km
τ_{part} = 0.030
τ_{NO2} = 0.045
$\tau_{aerosol} = 8.73 \times 10^{-4}$
C_1 = 0.018
C_2 = 0.015
C_3 = 0.00032

The results of the Level-1 calculation show the absolute value of all three visibility parameters to be well below the Level-1 criteria of 0.10. Therefore the proposed Collier County SWERF is considered not to cause any visibility impairment at the ENP Class I area.

3.0 SOILS AND VEGETATION IMPACT ANALYSIS

The air quality analysis presented in Attachment C demonstrates that the proposed Collier County facility will have very low or insignificant impacts on ambient air quality levels in the vicinity of the site and in the ENP Class I area. The maximum air quality impacts of criteria pollutants (i.e., PM, SO_2, NO_x, CO and Pb) in the vicinity of the site are predicted to be less than significant impact levels (except for SO_2) and less than 6 percent of any AAQS (except for SO_2, for which maximum impacts will be less than 30 percent of the AAQS).

Maximum impacts of the proposed Collier County SWERF are also less than 10 percent of the PSD Class II allowable increments. Maximum impacts for other regulated pollutants are also predicted to be insignificant (see Attachments C and D).

Maximum predicted impacts of SO_2 and PM in the ENP Class I area are predicted to be less than 40 percent of any allowable Class I increments, and less than significant impact levels. On the basis of these results, impacts to soils and vegetation in the vicinity of the site and at the ENP Class I area are considered to be insignificant.

4.0 GROWTH ANALYSIS

The proposed Collier County SWERF will employ less than 60 persons. The majority of these personnel requirements will originate from within the local labor force, and no significant increase in population due to the proposed facility is expected to occur.

The construction and operation of the proposed facility is not expected to have an effect on industrial and commercial development. A small increase in truck traffic to the site is expected to occur as solid waste and wood waste quantities increase. However, the majority of this increase would be expected without operation of the proposed facility. No net significant change in employment, population, housing, or commercial/industrial development will be expected due to the proposed project.

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APPENDIX

LISTING OF SO_2 EMISSION SOURCES IN COLLIER COUNTY
(ASPHALT PLANTS)

Plant Name	UTM Location East	UTM Location North	SO_2 Emissions (Tons/Year)
Better Roads	421.98	2899.408	10.4
Brisson Enterprises	424.0	2893.15	6.0
Mac Asphalt	429.2	2898.8	25.0
General Asphalt	467.1	2905.6	82.0

The following references are on file in FDER's Bureau of Air Quality Management:

Camp, Dresser & McKee, Inc. 1984. Solid Waste Energy Recovery Facility - Application for Power Plant Site Certification, Hillsborough County Board of County Commissions.

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Subpart Db—Standards of Performance for Industrial-Commercial-Institutional Steam Generating Units

§ 60.40b Applicability and definition of affected facility.

(a) The affected facility to which this subpart applies is each industrial-commercial-institutional steam generating unit for which construction, modification, or reconstruction is commenced after June 19, 1984 and which has a heat input capacity from fuels combusted in the steam generating unit of more than 29 MW (100 million Btu/hour).

(b) Coal-fired industrial-commercial-institutional steam generating units meeting both the applicability requirements under this subpart and the applicability requirements under Subpart D (Standards of performance for fossil fuel-fired steam generators; § 60.40) are subject to the particulate matter and nitrogen oxides standards under this subpart and the sulfur dioxide standards under Subpart D (§ 60.43).

(c) Oil-fired industrial-commercial-institutional steam generating units meeting both the applicability requirements under this subpart and the applicability requirements under Subpart D (Standards of performance for fossil fuel-fired steam generators; § 60.40) are subject to the nitrogen oxides standards under this subpart and the sulfur dioxide and particulate matter standards under Subpart D (§ 60.42 and § 60.43).

(d) Industrial-commercial-institutional steam generating units meeting the applicability requirements under this subpart and the applicability requirements under Subpart J (Standards of performance for petroleum refineries; § 60.104) are subject to the particulate matter and nitrogen oxides standards under this subpart and the sulfur dioxide standards under Subpart J (§ 60.104).

(e) Steam generating units meeting the applicability requirements under Subpart Da (Standards of performance for electric utility steam generating units; § 60.40a) are not subject to this subpart.

§ 60.41b Definitions.

As used in this subpart, all terms not defined herein shall have the meaning given them in the Act and in Subpart A of this part.

"Annual capacity factor" means the ratio between the actual heat input to a steam generating unit from the fuels listed in § 60.42b(a) or § 60.43b(a), as applicable, during a calendar year and the potential heat input to the steam generating unit from all fuels had it been operated for 8,760 hours at the maximum design heat input capacity.

"By-product/waste" means any substance produced during an industrial process which is not produced for the primary purpose of being combusted, but which is ultimately combusted in a steam generating unit for heat recovery or for disposal.

"Coal" means all solid fuels classified as anthracite, bituminous, subbituminous, or lignite by the American Society of Testing and Materials (ASTM Specification D 388-66). Coal-derived synthetic fuels, including but not limited to solvent refined coal, gasified coal and coal-water mixtures, are included in this definition for the purposes of this subpart.

"Combined cycle steam generating unit" means a steam generation unit in which exhaust gases from a gas turbine are introduced into a steam generating unit.

"Distillate oil" means fuel oils number 1 and 2, as defined by the American Society of Testing and Materials (ASTM burner fuel specification D 396).

"Fluidized bed combustion steam generating unit" means a steam generating unit which combusts fuel on a bed of sorbent or inert material which is suspended or fluidized by a stream of air.

"Full capacity" means operation of the steam generating unit at 90 percent or more of the maximum design heat input capacity.

"Heat input" means heat derived from combustion of fuel in a steam generating unit and does not include the heat input from preheated gases, such as gas turbine exhaust supplied to a steam generator for heat recovery.

"Heat input capacity" means the ability of a steam generating unit to combust a stated maximum amount of fuel, as determined by the physical design and characteristics of the steam generating unit.

"Industrial-commercial-institutional steam generating unit" means any steam generating unit not covered under Subpart Da (Standards of performance for electric utility steam generating units).

"Lignite" means a type of coal classified as lignite A or lignite B by the American Society of Testing and Materials (ASTM Specification D 388-66).

"Mass-feed stoker steam generating unit" means a steam generating unit where solid fuel is introduced directly into a retort or is fed directly onto a grate where it is combusted.

"Municipal-type waste" means paper, wood, yard wastes, food wastes, plastics, leather, rubber, and other combustible materials, and noncombustible materials such as glass and rock, or any mixture of these materials.

"Natural gas" means natural gas and all gaseous byproducts/wastes which contain less than 10 percent carbon monoxide (by volume).

"Oil" means a liquid fuel derived from petroleum, including distillate and residual oil.

"Pulverized coal-fired steam generating unit" means a steam generating unit in which pulverized coal is introduced into an air stream that carries the coal to the combustion chamber of the steam generating unit where it is fired in suspension.

"Residual oil" means fuel oils number 4, 5 and 6, as defined by the American Society of Testing and Materials (ASTM burner fuel specification D 396). For the purposes of this subpart, residual oil also includes all liquid by-products/wastes.

"Solid waste" means any fuel which contains more than 50 weight percent municipal-type waste or combustible material derived from municipal-type waste.

"Spreader stoker steam generating unit" means a steam generating unit in which solid fuel is introduced to the combustion zone by a mechanism that throws the fuel onto a grate from above. Combustion take place both in suspension and on the grate.

"Steam generating unit" means a device which combusts fuel to produce steam or heated water, including steam generating units which combust fuel and are part of a cogeneration system, a combined cycle system, or an incinerator with a heat recovery steam generating unit.

"Steam generating unit operating day" means a 24-hour period between 12:01 a.m. and 12:00 midnight during which any fuel is combusted in the steam generating unit. It is not necessary for fuel to be combusted continuously for the entire 24-hour period.

"Wet scrubber system" means any emission control device which uses an aqueous stream or slurry injected into the scrubbing chamber to control emissions of particulate matter or sulfur dioxide.

"Wood" means wood, wood residue, bark, or any derivative fuel or residue thereof, in any form, including but not limited to, sawdust, sanderdust, wood chips, scraps, slabs, millings, shavings, and processed pellets made from wood or other forest residues.

§ 60.42b Standards for particulate matter.

(a) On and after the date on which the performance test required to be conducted under § 60.8 is completed, no owner or operator of an affected facility which combusts coal, wood, or solid waste, or simultaneously combusts mixtures of these fuels with or without other fuels, shall cause to be discharged into the atmosphere from that affected facility any gases which contain particulate matter in excess of the following emission limits, except as provided under paragraph (b) of this section:

Steam generating unit fuel type	Particulate matter emission limit nanograms per joule heat input (lb/million Btu heat input)
(1) Coal	22 (0 05)
(2) Wood or solid waste	43 (0 10)
(3) Mixtures including wood, coal, or solid waste, with or without other fuels, as provided under paragraph (c) of this section	43 (0.10)

(b) On and after the date on which the performance test required to be conducted under § 60.8 is completed, no owner or operator of an affected facility which has a heat input capacity of 73 MW (250 million Btu/hour) or less and which combusts coal, wood, or solid waste, or simultaneously combusts mixtures of these fuels with or without other fuels and which has an annual capacity factor for coal, wood, or solid waste, or any mixtures of these fuels of 30 percent (0.30) or less, and who has a Federal, State, or local permit which limits operation of the facility to an annual capacity factor of 30 percent (0.30) or less for these fuels or fuel mixtures, shall cause to be discharged into the atmosphere from that facility any gases which contain particulate matter in excess of 86 nanograms per joule (0.20 lb/million Btu) heat input.

(c) Except as provided under paragraph (b) of this section, on and after the date on which the performance test required to be conducted under § 60.8 is completed, no owner or operator of an affected facility which combusts coal with wood, solid waste or other fuels, which has an annual capacity factor for wood, solid waste or other fuels of more than 5 percent (0.05), and which is subject to a Federal, State or local permit which specifies that during the operation of the affected facility, the affected facility will achieve an annual capacity factor for wood, solid waste, or other fuels of more than 5 percent (0.05), shall cause to be discharged from that affected facility any gases which contain particulate matter in excess of 43 nanograms per joule (0.10 lb/million Btu) heat input, as required by paragraph (a)(3) of this section. An affected facility which combusts coal with wood, solid waste or other fuels and which either has an annual capacity factor for wood, solid waste or other fuels of 5 percent (0.05) or less, or which is not subject to a Federal, State or local permit which specifies that during the operation of the affected facility, the affected facility will achieve an annual capacity factor for wood, solid waste, or other fuels of more than 5 percent (0.05), is subject to the 22 nanograms per joule (0.05 lb/million Btu) heat input emission limit under paragraph (a)(1) of this section.

(d) For the purposes of this section, the annual capacity factor shall be determined by dividing the actual heat input to the steam generating unit during the calendar year from the combustion of coal, wood, or solid waste, or any mixture of these fuels, by the potential heat input from all fuels if the steam generating unit had been operated for 8,760 hours at the maximum design heat input capacity.

(e) On and after the date the particulate matter performance test required to be conducted under § 60.8 is completed, no owner or operator of an affected facility subject to the particulate matter emission limits under paragraphs (a) or (b) of this section shall cause to be discharged into the atmosphere any gases which exhibit greater than 20 percent opacity (6-minute average).

§ 60.43b Standards for nitrogen oxides.

(a) On and after the date on which the initial performance test required to be conducted under § 60.8 is completed, no owner or operator of an affected facility subject to the provisions of this section which combusts coal, oil, or natural gas, or simultaneously combusts mixtures of these fuels with or without other fuels, shall cause to be discharged into the atmosphere from that affected facility any gases which contain nitrogen oxides in excess of the following emission limits, except as provided under paragraph (e) of this section:

Fuel/steam generating unit type	Nitrogen oxide emission limits nanograms per joule heat input (lb/million Btu heat input)
(1) Natural gas and distillate oil	43 (0 10).
(2) Residual oil.	
(i) 0 35 weight percent nitrogen or less	129 (0.30).
(ii) Greater than 0 35 weight percent nitrogen	172 (0 40).
(3) Coal (other than lignite):	
(i) Mass-feed stoker	215 (0.50).
(ii) Spreader stoker and fluidized bed combustion.	258 (0 60).
(iii) Pulverized coal	301 (0.70)
(4) Lignite, all units except (5)	258 (0.60).
(5) Lignite mined in North Dakota, South Dakota, or Montana and combusted in a slag tap furnace.	340 (0.80).
(6) Mixtures of natural gas or distillate oil with wood or solid waste.	129 (0.30).
(7) Mixtures of coal, oil, or natural gas with wood, solid waste, or any other fuel (other than (5)).	Applicable emission limit for coal, oil, or natural gas as listed above or as determined pursuant to paragraph (b).

(b) On and after the date on which the initial performance test required to be conducted under § 60.8 is completed, no owner or operator of an affected facility which simultaneously combusts mixtures of coal, oil, or natural gas, with or without any other fuel, shall cause to be discharged into the atmosphere from that affected facility any gases which contain nitrogen oxides in excess of a limit determined by use of the following formula:

$$E_{NO_x} = (43H_s + 129H_u + 172H_v + 215H_w + 258H_x + 301H_y + 340H_z)/H_t$$

where:

E_{NO_x} is the nitrogen oxides emission limit (nanograms per joule),

H_s is the heat input from combustion of natural gas or oil subject to the 43 nanogram per joule standard.

H_u is the heat input from combustion of oil or mixtures of natural gas with wood or solid waste subject to the 129 nanogram per joule standard.

H_v is the heat input from combustion of oil subject to the 172 nanogram per joule standard.

H_w is the heat input from combustion of coal subject to the 215 nanogram per joule standard.

H_x is the heat input from combustion of coal subject to the 258 nanogram per joule standard.

H_y is the heat input from combustion of pulverized coal subject to the 301 nanogram per joule standard.

H_z is the heat input from combustion of lignite subject to the 340 nanogram per joule standard.

H_t is the total heat input to the steam generating unit from combustion of coal, oil, or natural gas.

(c) On and after the date on which the performance test required to be conducted under § 60.8 is completed, any owner or operator of an affected facility which simultaneously combusts coal, oil or natural gas in a mixture with a liquid by-product/waste or with a toxic, corrosive or reactive hazardous waste (as defined by 40 CFR Part 261) may petition the Administrator to establish a nitrogen oxides emission limit which shall apply specifically to that affected facility when the liquid by-product waste or the hazardous waste is combusted. The petition submitted by the owner or operator of the affected facility shall include sufficient and appropriate data on nitrogen oxides emissions from the affected facility, waste destruction efficiencies, waste composition (including nitrogen content), and combustion conditions to allow the Administrator to determine if the affected facility is able to comply with the nitrogen oxides emission limits under paragraphs (a) and (b) of this section when coal, oil or natural gas are combusted in the steam generating unit, but is unable to comply with the emission limits in paragraphs (a) and (b) of this section when:

(1) Liquid by-product/waste with a high nitrogen content is combusted under the same combustion conditions which were used to achieve compliance with the emission limits under paragraphs (a) and (b) of this section when coal, oil, or natural gas was fired; or

(2) Toxic, corrosive, or reactive hazardous waste is combusted in the affected facility, pursuant to thermal destruction efficiency requirements for hazardous waste as specified in an applicable Federal, State or local permit which requires combustion conditions which preclude compliance with the nitrogen oxides emission limits under paragraphs (a) and (b) of this section. If a site specific nitrogen oxide emission limit is approved by the Administrator, it will be established at the nitrogen oxide emission level achieved when the affected facility was firing liquid by-product/waste at combustion conditions which were used to achieve compliance with the emision limits under paragraph (a) or (b) of this sectrion when coal, oil or natural gas is fired, or at the nitrogen oxide emission level achieved when toxic, corrosive, or reactive hazardous waste is combusted in the affected facility during a test burn to determine the thermal destruction efficiency of hazardous waste as specified in an applicable Federal, State, or local permit which requires thermal destruction of hazardous waste.

(d) Modification of a facility, as defined in § 60.15, shall not, by itself, subject the facility to the requirements of this section limiting nitrogen oxides emissions.

(e) Any affected facility which has an annual capacity utilization factor for coal, oil, or natural gas or any mixture of these fuels of 5 percent (0.05) or less, and which is subject to a Federal, State, or local permit which limits operation of the facility to an annual capacity factor of 5 percent (0.05) or less for these fuels is not subject to the requirements of this section.

§ 60.44b Compliance and performance testing.

(a) The particulate matter emission standards under § 60.42b and the nitrogen oxides emission standards under § 60.42b apply at all times except during periods of startup, shutdown, or malfunction.

(b) Compliance with the particulate matter emission standards under § 60.42b shall be determined through performance testing as described in paragraph (d) of this section.

(c) Compliance with the nitrogen oxides emission limits under § 60.43b shall be determined through performance testing as described in paragraph (e)(1) or (e)(2) of this section, as applicable.

(d) The following procedures and reference methods are used to determine compliance with the standards for particulate matter emissions under § 60.42b.

(1) Reference Method 3 is used for gas analysis when applying Reference Method 5 or Reference Method 17.

(2) Reference Method 5 or Reference Method 17 shall be used to measure the concentration of particulate matter and the associated moisture content as follows:

(i) Reference Method 5 shall be used at affected facilities without wet scrubber systems; and

(ii) Reference Method 17 shall be used at facilities with or without wet scrubber systems provided that the stack gas temperature at the sampling location does not exceed an average temperature of 160°C (320°F).

(3) Reference Method 1 is used to select the sampling site and the number of traverse sampling points. The sampling time for each run is at least 120 minutes and the minimum sampling volume is 1.7 dscm (60 dscf) except that smaller sampling times or volumes, when necessitated by process variables or other factors, may be approved by the Administrator.

(4) For Reference Method 5 the temperature of the sample gas in the probe and filter holder is monitored and is maintained at 160°C (320°F).

(5) For determination of particulate emissions, the oxygen or carbon dioxide sample is obtained simultaneously with each run of Reference Method 5 or Reference Method 17 by traversing the duct at the sampling location.

(6) For each run using Reference Method 5 or Reference Method 17, the emission rate expressed in nanograms per joule heat input is determined using:

(i) The oxygen or carbon dioxide measurements and particulate matter measurements obtained under this section,

(ii) The dry basis F_c factor, and

(iii) The dry basis emission rate calculation procedure contained in Reference Method 19 (Appendix A).

(7) Reference Method 9 is used for determining the opacity of stack emissions.

(e) The following procedures are used in performance testing to determine compliance with the emission limits for nitrogen oxides required under § 60.43b:

(1) For affected facilities having an annual capacity factor for the fuels listed in § 60.43b(a) of 30 percent (0.30) or less, the owner or operator shall conduct a 30-day performance test using a chemiluminescent nitrogen oxides monitor following the procedures prescribed in § 60.8;

(2) For affected facilities having an annual capacity factor for the fuels listed in § 60.43b(a) greater than 30 percent (0.30), the owner or operator shall conduct the performance test as required under § 60.8 using the continuous system for monitoring nitrogen oxides under § 60.45b(b). The nitrogen oxides emissions from the steam generating unit shall be monitored for 30 successive steam generating unit operating days after initial startup and a 30-day average nitrogen oxide emission rate is calculated based on the hourly nitrogen oxide emissions recorded by the monitoring system for the preceding 720 hours of boiler operation.

§ 60.45b Emission monitoring.

(a) The owner or operator of an affected facility subject to the opacity standard under § 60.42b shall install, calibrate, maintain and operate a continuous monitoring system for measuring the opacity of emissions discharged to the atmosphere and record the output of the system.

(b) Except as provided in paragraph (g) of this section, the owner or operator of an affected facility subject to the nitrogen oxides standard of § 60.43b shall install, calibrate, maintain, and operate a continuous monitoring system for measuring nitrogen oxides emissions discharged to the atmosphere and record the output of the system.

(c) The continuous monitoring systems required under paragraph (b) of this section shall be operated and data recorded during all periods of operation of the affected facility, including periods of startup, shutdown, or malfunction, except for continuous monitoring system breakdowns, repairs, calibration checks, and zero and span adjustments.

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AP-42
Supplement 15

SUPPLEMENT NO. 15
FOR
COMPILATION OF AIR POLLUTANT EMISSION FACTORS, THIRD EDITION (INCLUDING SUPPLEMENTS 1-7)

U.S. ENVIRONMENTAL PROTECTION AGENCY
Office of Air, Noise and Radiation
Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711

January 1984

2.1 REFUSE INCINERATION

2.1.1 Process Description[1-4]

The most common types of incinerators consist of a refractory-lined chamber with a grate upon which refuse is burned. In some newer incinerators water-walled furnaces are used. Combustion products are formed by heating and burning of refuse on the grate. In most cases, since insufficient underfire (undergrate) air is provided to enable complete combustion, additional over-fire air is admitted above the burning waste to promote complete gas-phase combustion. In multiple-chamber incinerators, gases from the primary chamber flow to a small secondary mixing chamber where more air is admitted, and more complete oxidation occurs. As much as 300 percent excess air may be supplied in order to promote oxidation of combustibles. Auxiliary burners are sometimes installed in the mixing chamber to increase the combustion temperature. Many small-size incinerators are single-chamber units in which gases are vented from the primary combustion chamber directly into the exhaust stack. Single-chamber incinerators of this type do not meet modern air pollution codes.

2.1.2 Definitions of Incinerator Categories[1]

No exact definitions of incinerator size categories exist, but for this report the following general categories and descriptions have been selected:

1. *Municipal incinerators* — Multiple-chamber units often have capacities greater than 50 tons (45.3 MT) per day and are usually equipped with automatic charging mechanisms, temperature controls, and movable grate systems. Municipal incinerators are also usually equipped with some type of particulate control device, such as a spray chamber or electrostatic precipitator.

2. *Industrial/commercial incinerators* — The capacities of these units cover a wide range, generally between 50 and 4,000 pounds (22.7 and 1,800 kilograms) per hour. Of either single- or multiple-chamber design, these units are often manually charged and intermittently operated. Some industrial incinerators are similar to municipal incinerators in size and design. Better designed emission control systems include gas-fired afterburners or scrubbing, or both.

3. *Trench incinerators* — A trench incinerator is designed for the combustion of wastes having relatively high heat content and low ash content. The design of the unit is simple: a U-shaped combustion chamber is formed by the sides and bottom of the pit and air is supplied from nozzles along the top of the pit. The nozzles are directed at an angle below the horizontal to provide a curtain of air across the top of the pit and to provide air for combustion in the pit. The trench incinerator is not as efficient for burning wastes as the municipal multiple-chamber unit, except where careful precautions are taken to use it for disposal of low-ash, high-heat-content refuse, and where special attention is paid to proper operation. Low construction and operating costs have resulted in the use of this incinerator to dispose of materials other than those for which it was originally designed. Emission factors for trench incinerators used to burn three such materials[7] are included in Table 2.1-1.

4. *Domestic incinerators* — This category includes incinerators marketed for residential use. Fairly simple in design, they may have single or multiple chambers and usually are equipped with an auxiliary burner to aid combustion.

5. *Flue-fed incinerators* — These units, commonly found in large apartment houses, are characterized by the charging method of dropping refuse down the incinerator flue and into the combustion chamber. Modified flue-fed incinerators utilize afterburners and draft controls to improve combustion efficiency and reduce emissions.

Table 2.1-1. EMISSION FACTORS FOR REFUSE INCINERATORS WITHOUT CONTROLS[a]
EMISSION FACTOR RATING: A

Incinerator type	Particulates		Sulfur oxides[b]		Carbon monoxide		Organics[c]		Nitrogen oxides[d]	
	lb/ton	kg/MT	lb/ton	kg/MT	lb/ton	kg/MT	lb/ton	kg/MT	lb/ton	kg/MT
Municipal[e]										
Multiple chamber, uncontrolled	30	15	2.5	1.25	35	17.5	1.5	0.75	3	1.5
With settling chamber and water spray system[f]	14	7	2.5	1.25	35	17.5	1.5	0.75	3	1.5
Industrial/commercial										
Multiple chamber[g]	7	3.5	2.5[h]	1.25	10	5	3	1.5	3	1.5
Single chamber[i]	15	7.5	2.5[h]	1.25	20	10	15	7.5	2	1
Trench[j]										
Wood	13	6.5	0.1[k]	0.05	NA[l]	NA	NA	NA	4	2
Rubber tires	138	69	NA	NA	NA	NA	NA	NA	NA	NA
Municipal refuse	37	18.5	2.5[h]	1.25	NA	NA	NA	NA	NA	NA
Controlled air[m]	1.4	0.7	1.5	0.75	Neg	Neg	Neg	Neg	10	5
Flue-fed single chamber[n]	30	15	0.5	0.25	20	10	15	7.5	3	1.5
Flue-fed (modified)[o,p]	6	3	0.5	0.25	10	5	3	1.5	10	5
Domestic single chamber										
Without primary burner[q]	35	17.5	0.5	0.25	300	150	100	50	1	0.5
With primary burner[r]	7	3.5	0.5	0.25	Neg	Neg	2	1	2	1
Pathological[s]	8	4	Neg	Neg	Neg	Neg	Neg	Neg	3	1.5

[a] Average factors given based on EPA procedures for incinerator stack testing.
[b] Expressed as sulfur dioxide.
[c] Expressed as methane.
[d] Expressed as nitrogen dioxide.
[e] References 5 and 8 through 14.
[f] Most municipal incinerators are equipped with at least this much control: see Table 2.1-2 for appropriate efficiencies for other controls.
[g] References 3, 5, 10, 13, and 15.
[h] Based on municipal incinerator data.
[i] References 3, 5, 10, and 15.
[j] Reference 7.
[k] Based on data for wood combustion in conical burners.
[l] Not available.
[m] Reference 9.
[n] References 3, 10, 11, 13, 15, and 16.
[o] With afterburners and draft controls.
[p] References 3, 11, and 15.
[q] References 5 and 10.
[r] Reference 5.
[s] References 3 and 9.

3

6. *Pathological incinerators* — These are incinerators used to dispose of animal remains and other organic material of high moisture content. Generally, these units are in a size range of 50 to 100 pounds (22.7 to 45.4 kilograms) per hour. Wastes are burned on the hearth in the combustion chamber. The units are equipped with combustion controls and afterburners to ensure good combustion and minimal emissions.

7. *Controlled air incinerators* — These units operate on a controlled combustion principle in which the waste is burned in the absence of sufficient oxygen for complete combustion in the main chamber. This process generates a highly combustible gas mixture that is then burned with excess air in a secondary chamber, resulting in efficient combustion. These units are usually equipped with automatic charging mechanisms and are characterized by the high effluent temperatures reached at the exit of the incinerators.

2.1.3 Emissions and Controls[1]

Operating conditions, refuse composition, and basic incinerator design have a pronounced effect on emissions. The manner in which air is supplied to the combustion chamber or chambers has, among all the parameters, the greatest effect on the quantity of particulate emissions. Air may be introduced from beneath the chamber, from the side, or from the top of the combustion area. As underfire air is increased, and increase in fly-ash emissions occurs. Erratic refuse charging causes a disruption of the combustion bed and a subsequent release of large quantities of particulates. Large quantities of uncombusted particulate matter and carbon monoxide are also emitted for an extended period after charging of batch-fed units because of interruptions in the combustion process. In continuously fed units, furnace particulate emissions are strongly dependent upon grate type. The use of rotary kiln and reciprocating grates results in higher particulate emissions than the use of rocking or traveling grates.[14] Emissions of oxides of sulfur are dependent on the sulfur content of the refuse. Carbon monoxide and unburned hydrocarbon emissions may be significant and are caused by poor combustion resulting from improper incinerator design or operating conditions. Nitrogen oxide emissions increase with an increase in the temperature of the combustion zone, an increase in the residence time in the combustion zone before quenching, and an increase in the excess air rates to the point where dilution cooling overcomes the effect of increased oxygen concentration.[14]

Hydrochloric acid emissions were found to approximate 1.0 lb/ton of feed in early work[14] and 1.8 lb/ton in more recent work.[23] The level can be sharply increased in areas where large quantities of plastics are consumed. Methane levels found in recent work[22] range from 0.04 to 0.4 lb/ton of feed.

Table 2.1-2 lists the relative collection efficiencies of particulate control equipment used for municipal incinerators. This control equipment has little effect on gaseous emissions. Table 2.1-1 summarizes the uncontrolled emission factors for the various types of incinerators previously discussed.

Table 2.1-2. COLLECTION EFFICIENCIES FOR VARIOUS TYPES OF MUNICIPAL INCINERATION PARTICULATE CONTROL SYSTEMS[a]

Type of system	Efficiency, %
Settling chamber	0 to 30
Settling chamber and water spray	30 to 60
Wetted baffles	60
Mechanical collector	30 to 80
Scrubber	80 to 95
Electrostatic precipitator	90 to 96
Fabric filter	97 to 99

[a]References 3, 5, 6, and 17 through 21.

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1.6 WOOD WASTE COMBUSTION IN BOILERS

1.6.1 General[1-3]

The burning of wood waste in boilers is mostly confined to those industries where it is available as a byproduct. It is burned both to obtain heat energy and to alleviate possible solid waste disposal problems. Wood waste may include large pieces like slabs, logs and bark strips as well as cuttings, shavings, pellets and sawdust, and heating values for this waste range from about 4,400 to 5,000 kilocalories per kilogram of fuel dry weight (7,940 to 9,131 Btu/lb). However, because of typical moisture contents of 40 to 75 percent, the heating values for many wood waste materials as fired range as low as 2,200 to 3,300 kilocalories per kilogram of fuel. Generally, bark is the major type of waste burned in pulp mills, and a varying mixture of wood and bark waste, or wood waste alone, are most frequently burned in the lumber, furniture and plywood industries.

1.6.2 Firing Practices[1-3]

A variety of boiler firing configurations is used for burning wood waste. One common type in smaller operations is the dutch oven, or extension type of furnace with a flat grate. This unit is widely used because it can burn fuels with a very high moisture content. Fuel is fed into the oven through apertures at the top of a firebox and is fired in a cone shaped pile on a flat grate. The burning is done in two stages, drying and gasification, and combustion of gaseous products. The first stage takes place in a cell separated from the boiler section by a bridge wall. The combustion stage takes place in the main boiler section. The dutch oven is not responsive to changes in steam load, and it provides poor combustion control.

In a fuel cell oven, the fuel is dropped onto suspended fixed grates and is fired in a pile. Unlike the dutch oven, the fuel cell also uses combustion air preheating and repositioning of the secondary and tertiary air injection ports to improve boiler efficiency.

In many large operations, more conventional boilers have been modified to burn wood waste. These units may include spreader stokers with traveling grates, vibrating grate stokers, etc., as well as tangentially fired or cyclone fired boilers. The most widely used of these configurations is the spreader stoker. Fuel is dropped in front of an air jet which casts the fuel out over a moving grate, spreading it in an even thin blanket. The burning is done in three stages in a single chamber, (1) drying, (2) distillation and burning of volatile matter and (3) burning of carbon. This type of operation has a fast response to load changes, has improved combustion control and can be operated with multiple fuels. Natural gas or oil are often fired in spreader stoker boilers as auxiliary fuel. This is done to maintain constant steam when the wood waste supply fluctuates and/or to provide more steam than is possible from the waste supply alone.

Sander dust is often burned in various boiler types at plywood, particle board and furniture plants. Sander dust contains fine wood particles with low moisture content (less than 20 weight percent). It is fired in a flaming horizontal torch, usually with natural gas as an ignition aid or supplementary fuel.

1.6.3 Emissions and Controls[4-28]

The major pollutant of concern from wood boilers is particulate matter, although other pollutants, particularly carbon monoxide, may be emitted in significant amounts under poor operating conditions. These emissions depend on a number of variables, including (1) the composition of the waste fuel burned, (2) the degree of flyash reinjection employed and (3) furnace design and operating conditions.

The composition of wood waste depends largely on the industry whence it originates. Pulping operations, for example, produce great quantities of bark that may contain more than 70 weight percent moisture and sand and other noncombustibles. Because of this, bark boilers in pulp mills may emit considerable amounts of particulate matter to the atmosphere unless they are well controlled. On the other hand, some operations such as furniture manufacture produce a clean dry (5 to 50 weight percent moisture) wood waste that results in relatively few particulate emissions when properly burned. Still other operations, such as sawmills, burn a variable mixture of bark and wood waste that results in particulate emissions somewhere between these two extremes.

Furnace design and operating conditions are particularly important when firing wood waste. For example, because of the high moisture content that can be present in this waste, a larger than usual area of refractory surface is often necessary to dry the fuel before combustion. In addition, sufficient secondary air must be supplied over the fuel bed to burn the volatiles that account for most of the combustible material in the waste. When proper drying conditions do not exist, or when secondary combustion is incomplete, the combustion temperature is lowered, and increased particulate, carbon monoxide and hydrocarbon emissions may result. Lowering of combustion temperature generally results in decreased nitrogen oxide emissions. Also, emissions can fluctuate in the short term due to significant variations in fuel moisture content over short periods of time.

Flyash reinjection, which is common in many larger boilers to improve fuel efficiency, has a considerable effect on particulate emissions. Because a fraction of the collected flyash is reinjected into the boiler, the dust loading from the furnace, and consequently from the collection device, increases significantly per unit of wood waste burned. It is reported that full reinjection can cause

TABLE 1.6-1. EMISSION FACTORS FOR WOOD AND BARK COMBUSTION IN BOILERS

Pollutant/Fuel Type	kg/Mg	lb/ton	Emission Factor Rating
Particulate[a,b]			
Bark[c]			
Multiclone, with flyash reinjection[d]	7	14	B
Multiclone, without flyash reinjection[d]	4.5	9	B
Uncontrolled	24	47	B
Wood/bark mixture[e]			
Multiclone, with flyash reinjection[d,f]	3	6	C
Multiclone, without flyash reinjection[d,f]	2.7	5.3	C
Uncontrolled[g]	3.6	7.2	C
Wood[h]			
Uncontrolled	4.4	8.8	C
Sulfur Dioxide[i]	0.075 (0.01 - 0.2)	0.15 (0.02 - 0.4)	B
Nitrogen Oxides (as NO_2)[j]			
50,000 - 400,000 lb steam/hr	1.4	2.8	B
<50,000 lb steam/hr	0.34	0.68	B
Carbon Monoxide[k]	2-24	4-47	C
VOC			
Nonmethane[l]	0.7	1.4	D
Methane[m]	0.15	0.3	E

[a] References 2,4,9,17-18. For boilers burning gas or oil as an auxiliary fuel, all particulates are assumed to result from only wood waste fuel.

[b] May include condensible hydrocarbons consisting of pitches and tars, mostly from back half catch of EPA Method 5. Tests reported in Reference 20 indicate that condensible hydrocarbons account for 4% of total particulate weight.

[c] Based on fuel moisture content of about 50%.

[d] After control equipment, assuming an average collection efficiency of 80%. Data from References 4, 7 and 8 indicate that 50% flyash reinjection increases the dust load at the cyclone inlet 1.2 to 1.5 times, while 100% flyash reinjection increases the load 1.5 to 2 times the load without reinjection.

[e] Based on fuel moisture content of 33%.

[f] Based on large dutch ovens and spreader stokers (averaging 23,430 kg steam/hr) with steam pressures from 20 - 75 kpa (140 - 530 PSI).

[g] Based on small dutch ovens and spreader stokers (usually operating <9075 kg steam/hr), with pressures from 5 - 30 kpa (35 - 230 PSI). Careful air adjustments and improved fuel separation and firing were used on some units, but the effects cannot be isolated.

[h] References 12-13, 19, 27. Wood waste includes cuttings, shavings, sawdust and chips, but not bark. Moisture content ranges from 3 - 50% by weight. Based on small units (<3000 kg steam/hr) in New York and North Carolina.

[i] Reference 23. Based on tests of fuel sulfur content and sulfur dioxide emissions at four mills burning bark. The lower limit of the range (in parentheses) should be used for wood, and higher values for bark. A heating value of 5000 kcal/kg (9000 BTU/lb) is assumed. The factors are based on the dry weight of fuel.

[j] References 7, 24-26. Several factors can influence emission rates, including combustion zone, temperatures, excess air, boiler operating conditions, fuel moisture and fuel nitrogen content.

[k] Reference 30.

[l] References 20, 30. Nonmethane VOC reportedly consists of compounds with a high vapor pressure such as alpha pinene.

[m] Reference 30. Based on an approximation of methane/nonmethane ratio, which is very variable. Methane, expressed as a percent of total volatile organic compounds, varied from 0 - 74 weight %.

a tenfold increase in the dust loadings of some systems, although increases of 1.2 to 2 times are more typical for boilers using 50 to 100 percent reinjection. A major factor affecting this dust loading increase is the extent to which the sand and other noncombustibles can successfully be separated from the flyash before reinjection to the furnace.

Although reinjection increases boiler efficiency from 1 to 4 percent and minimizes the emissions of uncombusted carbon, it also increases boiler maintenance requirements, decreases average flyash particle size and makes collection more difficult. Properly designed reinjection systems should separate sand and char from the exhaust gases, to reinject the larger carbon particles to the furnace and to divert the fine sand particles to the ash disposal system.

Several factors can influence emissions, such as boiler size and type, design features, age, load factors, wood species and operating procedures. In addition, wood is often cofired with other fuels. The effect of these factors on emissions is difficult to quantify. It is best to refer to the references for further information.

The use of multitube cyclone mechanical collectors provides the particulate control for many hogged boilers. Usually, two multicyclones are used in series, allowing the first collector to remove the bulk of the dust and the second collector to remove smaller particles. The collection efficiency for this arrangement is from 65 to 95 percent. Low pressure drop scrubbers and fabric filters have been used extensively for many years. On the West Coast, pulse jets have been used.

Emission factors for wood waste boilers are presented in Table 1.6-1.

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STATE OF FLORIDA

DEPARTMENT OF ENVIRONMENTAL REGULATION

TWIN TOWERS OFFICE BUILDING
2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32301-8241

BOB GRAHAM
GOVERNOR

VICTORIA J. TSCHINKEL
SECRETARY

PERMITTEE:
Bay County Energy Resources
c/o Westinghouse Waste
Technology Service Division
P. O. Box 286
Madison, PA 15663

Permit Number: AC 03-84703
Date of Issue:
Expiration Date: March 31, 1987
County: Bay
Latitude/Longitude: 30° 15' 54"N/ 85° 30' 08"W
Project: O'Connor Incinerator Unit 1

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

The construction of an O'Connor incinerator with 65.6 million Btu heat input per hour in Panama City, Bay County, Florida. The incinerator only burns municipal solid waste (MSW) and wood wastes. The average daily fuel consumption will be 150 tons of MSW and 89 tons of wood wastes.

Construction shall be in accordance with the attached permit application except as otherwise noted on pages 5 and 6, Specific Conditions.

Attachments:

1. Application to Construct Air Pollution Sources, DER Form 17-1.22(16), received on March 26, 1984.
2. DER's incompleteness letter to Westinghouse, dated April 16, 1984.
3. Revised Application to DER, received on May 29, 1984.
4. Additional Information to DER, received on June 18, 1984.
5. Best Available Control Technology (BACT) Determination made by DER.

PERMITTEE:
Bay County Energy Resources

I. D. Number:
Permit Number: AC 03-84703
Date of Issue:
Expiration Date: March 31, 1987

GENERAL CONDITIONS:

b. The permittee shall retain 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), copies of all reports required by this permit, and records of all data used to complete the application for this permit. The time period of retention shall be 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:

- the date, exact place, and time of sampling or measurements;
- the person responsible for performing the sampling or measurements;
- the date(s) analyses were performed;
- the person responsible for performing the analyses;
- the analytical techniques or methods used; and
- the results of such analyses.

15. When requested by the department, the permittee shall within a reasonable time furnish any information required by law which is needed to determine compliance with the permit. If the permittee becomes aware that relevant facts were not submitted or were incorrect in the permit application or in any report to the department, such facts or information shall be submitted or corrected promptly.

SPECIFIC CONDITIONS:

1. Except as required pursuant to DER's BACT determination (attachment 5) and these specific conditions, the proposed incinerator construction shall be carried out in accordance with the statements in the revised application submitted by the permittee.

2. Allowable fuels to be fired in the incinerator are solid waste and wood waste. The maximum municipal solid waste is limited to 175 tons per day. Municipal sewage sludge may not be fired in the incinerator.

PERMITTEE:
Bay County Energy Resources

I. D. Number:
Permit Number: AC 03-84703
Date of Issue:
Expiration Date: March 31, 1987

SPECIFIC CONDITIONS:

3. The electrostatic precipitator shall be operated during firing of the incinerator on solid waste, or solid and wood wastes. No flue gas bypass of the precipitator shall be permitted.

4. The emission limit for particulates is 0.03 gr/dscf, corrected to 12 percent CO_2. Compliance with the particulate limitation shall be demonstrated in accordance with 40 CFR 60, Appendix A, Methods 1, 2, 3, and 5.

5. Visible emissions shall not be greater than 10 percent opacity, except that no more than 20 percent opacity may be allowed for up to three minutes in any one hour. Opacity compliance shall be demonstrated in accordance with FAC Rule 17-2.700(6)(a)9., DER Method 9.

6. A continuous monitoring system to measure the opacity shall be installed, calibrated, and maintained in accordance with the provisions of Rule 17-2.710, Continuous Monitoring Requirements. The system shall be installed and operational prior to compliance testing.

7. The incinerator with the electrostatic precipitator is allowed to operate up to 8,760 hours annually.

8. The tests of particulate and visible emissions shall be accomplished at 90% to 100% of the incinerator's design capacity. The permittee shall notify DER's Northwest District 14 days prior to source testing.

9. Reasonable precautions to prevent fugitive particulate emissions during construction, such as coating or spraying roads and the construction area, shall be taken by the permittee.

10. Prior to 90 days before the expiration of this permit, a complete application for an operating permit shall be submitted to the District office. Full operation of the source may then be conducted in compliance with the terms of this permit until expiration of this permit or receipt of an operating permit.

STATE OF FLORIDA

DEPARTMENT OF ENVIRONMENTAL REGULATION

TWIN TOWERS OFFICE BUILDING
2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32301-8241

BOB GRAHAM
GOVERNOR

VICTORIA J. TSCHINKEL
SECRETARY

PERMITTEE:
Bay County Energy Resources
c/o Westinghouse Waste
Technology Service Division
P. O. Box 286
Madison, PA 15663

Permit Number: AC 03-84704
Date of Issue:
Expiration Date: March 31, 1987
County: Bay
Latitude/Longitude: 30° 15' 54"N/ 85° 30' 08"W
Project: O'Connor Incinerator Unit 2

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

The construction of an O'Connor incinerator with 65.6 million Btu heat input per hour in Panama City, Bay County, Florida. The incinerator only burns municipal solid waste (MSW) and wood wastes. The average daily fuel consumption will be 150 tons of MSW and 89 tons of wood wastes.

Construction shall be in accordance with the attached permit application except as otherwise noted on pages 5 and 6, Specific Conditions.

Attachments:

1. Application to Construct Air Pollution Sources, DER Form 17-1.22(16), received on March 26, 1984.
2. DER's incompleteness letter to Westinghouse, dated April 16, 1984.
3. Revised Application to DER, received on May 29, 1984.
4. Additional Information to DER, received on June 18, 1984.
5. Best Available Control Technology (BACT) Determination made by DER.

PERMITTEE:
Bay County Energy Resources

I. D. Number:
Permit Number: AC 03-84704
Date of Issue:
Expiration Date: March 31, 1987

GENERAL CONDITIONS:

b. The permittee shall retain 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), copies of all reports required by this permit, and records of all data used to complete the application for this permit. The time period of retention shall be 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:

- the date, exact place, and time of sampling or measurements;
- the person responsible for performing the sampling or measurements;
- the date(s) analyses were performed;
- the person responsible for performing the analyses;
- the analytical techniques or methods used; and
- the results of such analyses.

15. When requested by the department, the permittee shall within a reasonable time furnish any information required by law which is needed to determine compliance with the permit. If the permittee becomes aware that relevant facts were not submitted or were incorrect in the permit application or in any report to the department, such facts or information shall be submitted or corrected promptly.

SPECIFIC CONDITIONS:

1. Except as required pursuant to DER's BACT determination (attachment 5) and these specific conditions, the proposed incinerator construction shall be carried out in accordance with the statements in the revised application submitted by the permittee.

2. Allowable fuels to be fired in the incinerator are solid waste and wood waste. The maximum municipal solid waste is limited to 175 tons per day. Municipal sewage sludge may not be fired in the incinerator.

PERMITTEE:
Bay County Energy Resources

I. D. Number:
Permit Number: AC 03-84704
Date of Issue:
Expiration Date: March 31, 1987

SPECIFIC CONDITIONS:

3. The electrostatic precipitator shall be operated during firing of the incinerator on solid waste, or solid and wood wastes. No flue gas bypass of the precipitator shall be permitted.

4. The emission limit for particulates is 0.03 gr/dscf, corrected to 12 percent CO_2. Compliance with the particulate limitation shall be demonstrated in accordance with 40 CFR 60, Appendix A, Methods 1, 2, 3, and 5.

5. Visible emissions shall not be greater than 10 percent opacity, except that no more than 20 percent opacity may be allowed for up to three minutes in any one hour. Opacity compliance shall be demonstrated in accordance with FAC Rule 17-2.700(6)(a)9., DER Method 9.

6. A continuous monitoring system to measure the opacity shall be installed, calibrated, and maintained in accordance with the provisions of Rule 17-2.710, Continuous Monitoring Requirements. The system shall be installed and operational prior to compliance testing.

7. The incinerator with the electrostatic precipitator is allowed to operate up to 8,760 hours annually.

8. The tests of particulate and visible emissions shall be accomplished at 90% to 100% of the incinerator's design capacity. The permittee shall notify DER's Northwest District 14 days prior to source testing.

9. Reasonable precautions to prevent fugitive particulate emissions during construction, such as coating or spraying roads and the construction area, shall be taken by the permittee.

10. Prior to 90 days before the expiration of this permit, a complete application for an operating permit shall be submitted to the District office. Full operation of the source may then be conducted in compliance with the terms of this permit until expiration of this permit or receipt of an operating permit.

State of Florida Department of Environmental Regulation
Hillsborough County
Energy Recovery Facility
Case No. 83-19
CONDITIONS OF CERTIFICATION Revised 11/6/84

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C. Reporting

1. Starting three (3) months after certification, a quarterly construction status report shall be submitted to the Southwest Florida District Office of the Department of Environmental Regulation. The report shall be a short narrative describing the progress of construction.

2. Upon completion of construction the DER Southwest Florida District Office will be notified in order that a pre-operational inspection can be performed.

II. OPERATION

A. Air

The operation of the Resource Recovery Facility shall be in accordance with all applicable provisions of Chapter 17-2, 17-4, and 17-7, Florida Administrative Code. In addition to the foregoing, the permittee shall comply with the following specific conditions of certification:

1. Emission Limitations

a. Stack emissions from each unit shall not exceed the following:

(1) Particulate matter: 0.021 grains per standard cubic foot dry gas corrected to 12% CO_2 with a maximum cap of 7.0 pounds per hour per unit

(2) SO_2: 3.2 lbs/ton of solid waste-fired, maximum 24 hour average

(3) Nitrogen Oxides: 3 lbs/ton

(4) Carbon Monoxide: 1.8 lbs/ton

(5) VOC: 0.2 lbs/ton

(6) Mercury: 2200 grams/day

(7) Odor: there shall be no objectionable odor

(8) Visible emissions: opacity shall not be greater than 15% except that visible emissions with no more than 20% opacity may be allowed for up to three minutes in any one hour except during start up or upsets when the provisions of 17-2.250, FAC, shall apply. Opacity compliance shall be demonstrated in accordance with Florida Administrative Code Rule 17-2.700(6)(a)., DER Method 9.

(9) Beryllium: 13.1 x $\underline{10^{-6}}$ lbs/ton

b. The height of the boiler exhaust stack shall not be less than 220 feet above grade.

c. The incinerator boilers shall not be loaded in excess of their rated capacity of 36,666 pounds per hour each.

d. The incinerator boilers shall have a metal name plate affixed in a conspicuous place on the shell showing manufacturer, model number, type waste, rated capacity and certification number.

e. Compliance with the limitations for particulates, sulfur oxides, nitrogen oxides, carbon monoxide and lead shall be determined in accordance with Florida Administrative Code Rule 17-2.700, DER Methods 1, 2, 3, 5, 6, and 40 CFR 60, Appendix A, Method 7. Compliance with the opacity of stack emissions shall be demonstrated in accordance with Florida Administrative Code Rule 17-2.700(6)(a)9., DER Method 9. The stack test shall be performed at +10% of the heat input rate of 150 million Btu per hour; however, compliance with the particulate matter emission limit shall be at design capacity.

State of Florida Department of Environmental Regulation
Pinellas County
Resource Recovery Facility
Case No. PA 78-11 and PA 83-18
CONDITIONS OF CERTIFICATION

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irreversible environmental damage are detected during construction, the permittee shall notify the DER Southwest Florida District Office, 7601 Highway 301 North, Tampa, Florida, 33610, by telephone during the working day that the effect or damage occurs and shall confirm this in writing within seventy-two (72) hours of becoming aware of such conditions, and shall provide in writing an analysis of the problem and a plan to eliminate or significantly reduce the harmful effects of damage.

C. Reporting

1. Starting three (3) months after certification, a quarterly construction status report shall be submitted to the Southwest Florida District Office of the Department of Environmental Regulation. The report shall be a short narrative describing the progress of construction.

2. Upon completion of construction the DER Southwest Florida District Office will be notified in order that a pre-operational inspection can be performed.

XIV. OPERATION

A. Air

The operation of the Resource Recovery Facility shall be in accordance with all applicable provisions of Chapter 17-2, 17-5, and 17-7, Florida Administrative Code. In addition to the foregoing, the permittee shall comply with the following specific conditions of certification:

1. Emission Limitations

a. Stack emissions from each unit shall not exceed the following:

(1) Particulate matter: 0.03 grains per standard

cubic foot dry gas corrected to 12% CO_2

(2) SO_2: 83 lbs/hr of Sulfur Dioxide

(3) Nitrogen Oxides: 132 lbs/hr

(4) Carbon Monoxide: 66 lbs/hr

(5) Lead: 1.3 lbs/hr

(6) Mercury: 3200 grams/day when more than 2205 lbs/day of municipal sludge is fired. Compliance shall be determined in accordance with 40 CFR 61, Method 101, Appendix B.

(7) Odor: there shall be no objectionable odor.

(8) Visible emissions: opacity shall be no greater than 10% except that visible emissions with no more than 20% opacity may be allowed for up to three minutes in any one hour except during start up or upsets when the provisions of 17-2.250, FAC shall apply. Opacity compliance shall be demonstrated in accordance with Florida Administrative Code Rule 17-2, 700(6)(2)9;, DER Method 9.

b. The height of the boiler exhaust stackes shall not be less than 161 feet above grade.

c. The incinerator boilers shall not be loaded in excess of their rated capacity of 87,500 pounds per hour each.

d. The incinerator boilers shall have a metal name plate affixed in a conspicuous place on the shell showing manufacturer, model number, type waste, rated capacity and certification number.

EPA-450/3-82-007

Nonfossil Fuel Fired Industrial Boilers- Background Information

Emission Standards and Engineering Division

U.S. ENVIRONMENTAL PROTECTION AGENCY
Office of Air, Noise and Radiation
Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711

March 1982

TABLE 3-4. EMISSIONS FROM REPRESENTATIVE WOOD AND WOOD/COAL FIRED SPREADER STOKER BOILERS[35]

Fuel[a]	Capacity (thermal input)	Pollutant[d]	Mass kg/hr (lb/hr)	Concentration[b] g/Nm^3 (gr/dscf)	Heat Input ng/J ($lb/10^6$ Btu)
		PM (BMC)	332 (732)	4.97 (2.17)	2090 (4.88)
	44 MW	PM (AMC)	66.4 (146)	0.993 (0.434)	418 (0.973)
Wood	(150×10^6 Btu/hr)	SO_2[e]	-	-	-
		NO_x	17.0 (37.5)	133[c]	107 (0.250)
		PM (BMC)	467 (1030)	7.00 (3.06)	2950 (6.87)
	44 MW	PM (AMC)	93.9 (207)	1.40 (0.612)	592 (1.38)
HAB	(150×10^6 Btu/hr)	SO_2[e]	-	-	-
		NO_x	17.0 (37.5)	133[c]	107 (0.250)
	44 MW	PM (BMC)	411 (905)	6.13 (2.68)	2590 (6.03)
SLW	(150×10^6 Btu/hr)	PM (AMC)	142 (314)	2.12 (0.930)	899 (2.09)
		SO_2[e]	-	-	-
		NO_x	17.0 (37.5)	133[c]	107 (0.250)
		PM (BMC)	348 (767)	5.26 (2.30)	2200 (5.11)
75% Wood/	44 MW	PM (AMC)	69.6 (153)	1.05 (0.461)	438 (1.02)
25% HSE	(150×10^5 Btu/hr)	SO_2	102 (224)	576[c]	639 (1.49)
		NO_x	23.5 (51.7)	185[c]	148 (0.344)
		PM (BMC)	364 (803)	5.63 (2.46)	2300 (5.35)
50% Wood/	44 MW	PM (AMC)	72.8 (160)	1.13 (0.493)	460 (1.07)
50% HSE	(150×10^6 Btu/hr)	SO_2	197 (434)	1140[c]	1240 (2.89)
		NO_x	29.9 (66.0)	242[c]	189 (0.440)
		PM (BMC)	290 (640)	4.32 (1.89)	1840 (4.27)
50% Wood/	44 MW	PM (AMC)	58 (128)	0.863 (0.377)	366 (0.853)
50% LSW	(150×10^6 Btu/hr)	SO_2	43.5 (95.8)	242[c]	274 (0.639)
		NO_x	29.9 (66.0)	232[c]	189 (0.440)

[a]Wood - Hog Fuel (wood/bark misture)
HAB - High Ash Bark
SLW - Salt Laden Wood
HSE - High Sulfur Eastern Coal
LSW - Low Sulfur Western Coal

[b]Corrected to 12 percent CO_2

[c]Gaseous emissions are in parts per million (ppm)

[d]BMC - before multicyclone
AMC - after multicyclone
Both values are listed since these boilers include flyash reinjection.

[e]The SO_2 emission rate for boilers firing 100 percent wood derived fuels is negligible. Available test data have shown emissions ranging up to 8.6 ng/J (0.02 $lb/10^6$ Btu), but for many test runs, SO_2 emissions were below the detection level for the applicable EPA test method.

TABLE 3-12. UNCONTROLLED EMISSIONS FROM REPRESENTATIVE MSW-FIRED BOILERS[97]

Boiler Type	Capacity (thermal input)	Pollutant	Emissions: Mass kg/hr (lb/hr)	Emissions: Concentration[a] ng/Nm^3 (gr/dscf)	Emissions: Heat Input ng/J (lb/10^6 Btu)
Modular Controlled Air	2.9 MW (10×10^6 Btu/hr)	PM	1.36 (3.0)	3.25 (1.42)	129 (0.300)
		SO_2	2.23 (4.92)	201[b]	211 (0.492)
		NO_x	1.40 (3.08)	175[b]	132 (0.308)
Overfeed Stoker "Mass-burn"	44 MW (150×10^6 Btu/hr)	PM	229 (504)	3.66 (1.60)	1440 (3.36)
		SO_2	33.5 (73.8)	201[b]	211 (0.492)
		NO_x	21.0 (46.2)	175[b]	132 (0.308)

[a]At 12% CO_2.

[b]Gaseous concentrations are in ppm.

80-15.3

NO_x Emissions from Combustion Sources in the Pulp and Paper Industry

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Table I   NOx emission rate summary for wood residue boilers.

Sampling Site and Boiler Type	NOx (3) Hour Average Mean (lb/10^6 Btu)	(ng/J)[a]	(lb/TWWF)[b]	NOx (3) Hour Average Range (lb/10^6 Btu)	(ng/J)[a]	(lb/TWWF)[b]
1: S.S.[c]	0.11	48	1.10	0.09-0.17	37-72	0.84-1.65
2: S.S.	0.14	61	1.14	0.11-0.16	46-69	0.86-1.28
3: S.S.	0.08	32	0.67	0.05-0.10	22-41	0.45-0.85
4: S.S.	0.13	57	1.18	0.08-0.18	36-77	0.75-1.60
5: S.S.	0.20	86	1.78	0.19-0.22	82-95	1.69-1.97
5B: S.S.	0.17	72	1.50	0.15-0.18	65-79	1.35-1.64
6A: S.S.	0.17	72	1.51	0.15-0.19	63-81	1.32-1.69
6B: S.S.	0.11	47	0.98	0.09-0.12	38-55	0.78-1.15
7A: S.S.	0.18	78	1.62	0.15-0.22	64-96	1.33-1.98
8A: S.S.	0.21	92	1.91	0.19-0.23	82-100	1.69-2.06
9A: S.S.(f)[d]	0.22	94	1.43	0.11-0.29	45-125	0.69-1.91
10: F.B.[e]	0.23	97	1.52	0.17-0.28	72-119	1.13-1.87
11: C.B.[f]	0.11	48	1.82	0.08-0.14	36-60	1.37-2.28

a. 1 lb/10^6 Btu = 430 nanograms/Joule heat input.
b. Pounds NOx per ton wet wood fuel.
c. Spreader stoker boiler.
d. Spreader stoker boiler with fuel dryer and fines injection in overfire air (these results were based on bark fuel only from multiple regression of NOx total (y), steam from bark (x_1) and steam produced from oil (x_2).
e. Fluidized bed boiler.
f. Cyclone burner w/o boiler section.

T/S

ncasi technical bulletin

NATIONAL COUNCIL OF THE PAPER INDUSTRY FOR AIR AND STREAM IMPROVEMENT, INC., 260 MADISON AVENUE, NEW YORK, N Y 10016

CARBON MONOXIDE EMISSIONS FROM SELECTED COMBUSTION

SOURCES BASED ON SHORT-TERM MONITORING RECORDS

TECHNICAL BULLETIN NO. 416

JANUARY 1984

Carbon monoxide emissions expressed in terms of $lb/10^6$ Btu fired and lb/ton lime were calculated with the formulas:

$$\text{Emission Rate, } lb/10^6 \text{ Btu} = (\text{ppm CO at } 0\% \ O_2)(\text{Gas flow, dscfm})(4.8 \times 10^{-7})/(\text{oil fired, GPM})$$

$$\text{Emission Rate, lb/ton lime} = (\text{ppm CO at } 0\% \ O_2)(\text{Gas flow, dscfm})(4.35 \times 10^{-6})/(\text{lime prod., ton/hr})$$

B. Carbon Monoxide Emissions from Wood-Residue Fired Boilers

Average carbon monoxide emission rates from boilers, A, B, and C, representing more than 150 hourly averages of monitoring data from each unit, are listed in Table 4. These data show average CO emission rates for boilers A, B, and C of between 0.18 and 0.50 $lb/10^6$ Btu. A previous study showed the average carbon monoxide emissions as based on 6 to 8 one hour samples from four wood-residue fired boilers ranged between 0.20 and 2.5 $lb/10^6$ Btu (4). Carbon monoxide emission rates tend to be below the average most of the time. Emission levels that are above the average tend to be significantly higher than the average, but occur less frequently. This is illustrated in Figures 7 through 9 which present 1 hr and 8 hr average carbon monoxide emission rates as a function of the cumulative frequency of occurrence plotted on Weibull distribution paper. The carbon monoxide emission rate is less than the value shown on the y axis for the percentage of time shown on the x axis.

TABLE 4 AVERAGE CO EMISSION RATES FROM THREE WOOD-RESIDUE FIRED BOILERS

Boiler	CO ($lb/10^6$ Btu)	Average O_2 Dry Basis (Percent)
A	0.18	5.6
B	0.50	10.7
C	0.43	8.8

The difference in average CO emissions from these boilers appeared to be associated with oxygen content of the flue gas. The average oxygen content in the flue gas of the boilers sampled is listed in Table 4. High oxygen concentrations in the flue gas appeared to increase carbon monoxide emission rates at boilers A and C as illustrated in plots of carbon dioxide or oxygen vs carbon monoxide for each boiler studied presented in Figures 10 to 12. Figure 12 indicates minimum carbon monoxide emission rates occurred at a flue gas oxygen content of between 6.5 and 8.5 percent on a dry gas basis at the stack. This percent oxygen

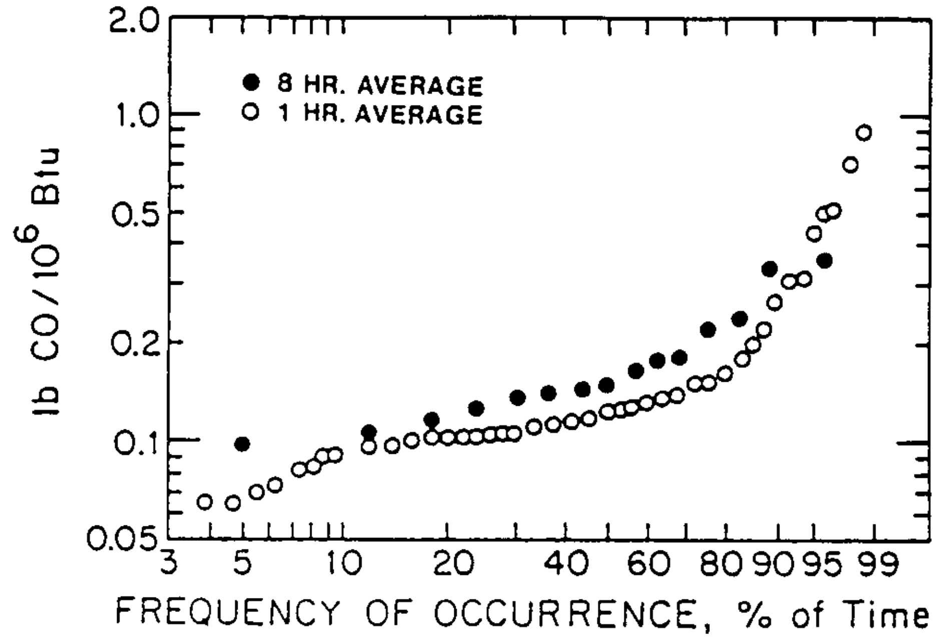

FIGURE 7

FREQUENCY OF OCCURRENCE OF CO EMISSIONS MEASURED AT BOILER A

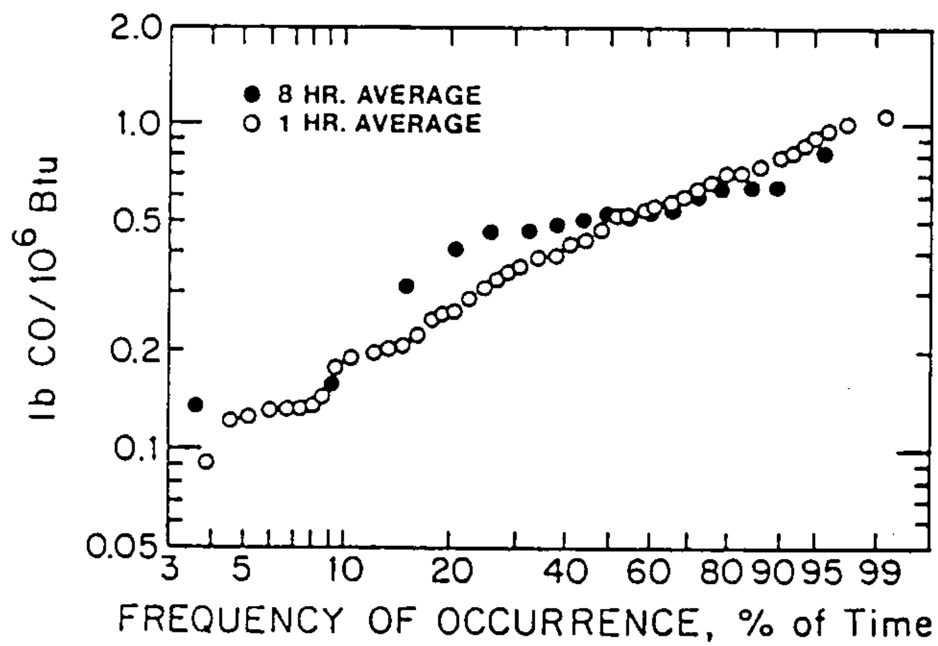

FIGURE 8

FREQUENCY OF OCCURRENCE OF CO EMISSIONS MEASURED AT BOILER B

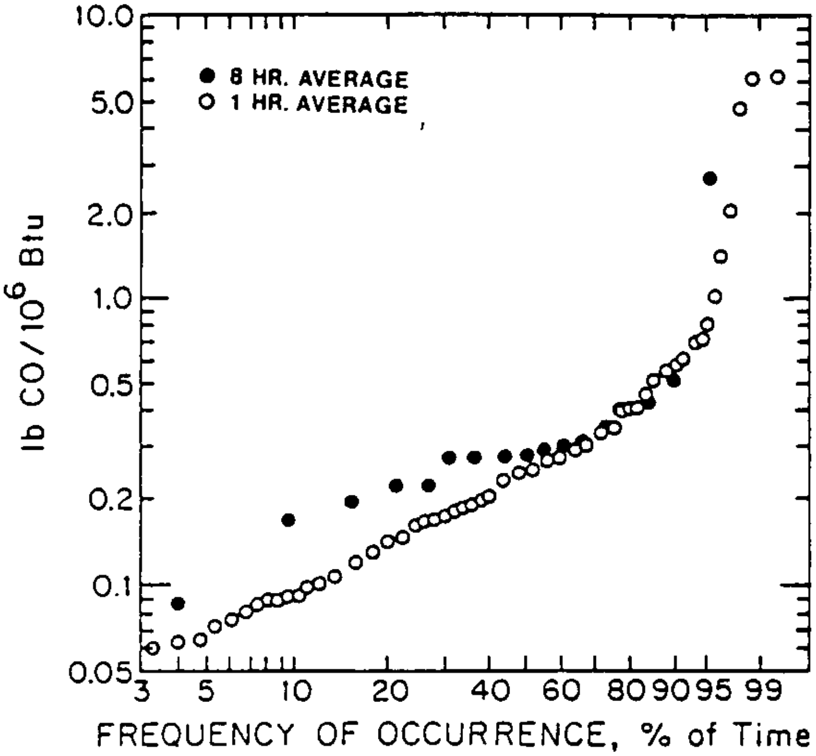

FIGURE 9

FREQUENCY OF OCCURRENCE OF CO EMISSIONS MEASURED AT BOILER C

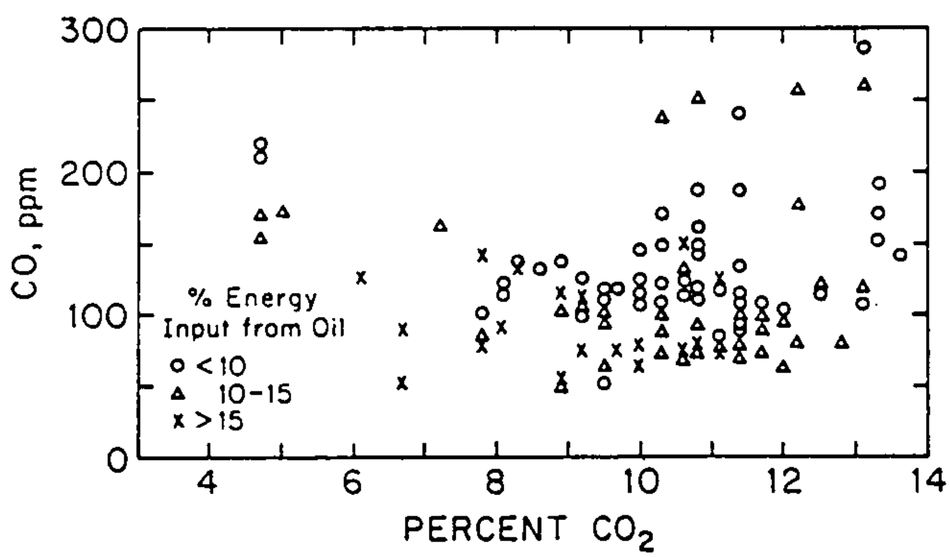

FIGURE 10

CARBON MONOXIDE EMISSIONS FROM BOILER A AS A FUNCTION OF STACK GAS CARBON DIOXIDE CONCENTRATIONS ON A WET BASIS

ncasi technical bulletin

NATIONAL COUNCIL OF THE PAPER INDUSTRY FOR AIR AND STREAM IMPROVEMENT, INC., 260 MADISON AVENUE, NEW YORK, N.Y. 10016

A STUDY OF WOOD-RESIDUE FIRED POWER BOILER TOTAL GASEOUS NON-METHANE ORGANIC EMISSIONS IN THE PACIFIC NORTHWEST

ATMOSPHERIC QUALITY IMPROVEMENT
TECHNICAL BULLETIN No. 109

SEPTEMBER 1980

A. TGNMO Emissions from Boilers Sampled

TGNMO as methane, carbon monoxide, and other pertinent data for duplicated samples are shown in Table 6. The average uncorrected TGNMO's for each boiler was 0.12, 0.07, 0.09 and 0.05 lb as methane/10^6 Btu fired for boilers A through D respectively. Little or no ethane or ethylene were found in the samples.

During the early part of the work on wood-residue fired boilers, water collected in the burnout moisture removal trap was not measured. Calculation of an estimate of the CO_2 absorption interference for each piece of data could not be performed. Interference estimates were calculated for each source with the data that was available for that source. Wood-residue boilers C and D had complete information for estimating the CO_2 interference. Average corrections for the boilers were 0.016, 0.015, 0.014, and 0.015 lb/10^6 Btu representing a corrected TGNMO contribution of 0.10, 0.05, 0.07, and 0.04 lb/10^6 Btu for boilers A through D respectively.

The average 1 hour geometric mean of the carbon monoxide values were 0.90, 0.20, 2.52 and 0.22 lb/10^6 Btu were found to be log normal distributed. All analytical data generated is presented in Appendix B.

B. Precision

Two factors must be accounted for when considering the precision of this data. The hidden variation in the carbon dioxide interference correction factor and the variation found between the duplicate samples. It is difficult to predict the uncertainty contribution due to application of the interference factor because of the large variation in the data producing the correction factor. At best the correction factor variation is plus or minus the correction factor. The variation in the interference factor need not be considered when working with uncorrected data.

The precision of the data as indicated by duplicate samples is obtained from an analysis of variance. Results of analysis of variance on uncorrected lb/10^6 Btu data is shown in Table 7.

TABLE 7 ANALYSIS OF VARIANCE RESULTS

Boiler	n	S Sample	S Error	MSR	F	Significant?	95% Confidence About Average
A	12	0.066	0.019	28.9	2.8	yes	0.043
B	8	0.021	0.021	2.9	2.8	no	0.025
C	7	0.018	0.026	3.2	4.3	no	0.032
D	8	0.005	0.011	1.4	3.8	no	0.010

TABLE 6 WOOD RESIDUE FIRED BOILER TGNMO DATA

TGNMO as CH_4		CO as CO		Stack O_2	Stack Moisture	Average Steam Production
lb/10^6 Btu	ppm	lb/10^6 Btu	ppm	%	%	lb/hr
Boiler A						
0.06	100	3.25	3000	7.5	-	145,000
0.19	190	3.03	1750	11.2	-	75,000
0.22	310	-	3050	10.5	-	125,000
0.18	190	1.20	740	11.5	-	130,000
0.10	140	0.64	640	7.3	12.3	135,000
0.14	210	0.31	260	7.8	25.3	100,000
0.08	100	0.38	300	8.4	17.4	100,000
0.05	76	2.16	2230	8.0	11.7	130,000
0.21	316	1.45	5610	7.0	15.3	130,000
0.04	53	0.42	350	9.0	16.0	140,000
0.06	63	0.66	410	8.6	16.3	100,000
0.06	75	1.50	1010	11.5	12.6	105,000
Boiler B						
0.03	79	0.042	48	6.0	16.6	300,000
0.10	180	0.091	97	6.8	15.3	350,000
0.09	120	0.417	641	5.4	-	475,000
0.08	100	0	0	9.5	20.9	350,000
0.07	60	0.604	273	12.5	7.0	250,000
0.04	30	0.539	255	11.6	10.6	250,000
0.04	40	0.249	156	7.8	13.9	410,000
0.07	80	0.110	70	7.8	12.3	420,000
Boiler C						
0.06	61	1.44	900	11.0	9.7	100,000
0.14	116	4.00	1900	12.1	15.0	80,000
0.08	74	2.92	1570	11.6	15.5	90,000
0.08	84	2.99	1460	11.3	15.9	100,000
0.08	77	2.71	1640	12.0	12.0	110,000
0.08	84	2.29	1420	11.3	16.8	100,000
Boiler D						
0.03	41	0.117	87	8.9	13.9	300,000
0.05	70	0.151	116	8.9	13.3	300,000
0.05	78	0.224	217	7.4	17.7	340,000
0.04	71	0.144	148	7.2	18.7	350,000
0.06	99	0.242	230	6.6	13.9	350,000
0.06	84	0.291	252	8.8	13.3	340,000
0.04	61	0.243	212	9.3	19.4	300,000
0.05	71	0.537	410	10.2	11.9	275,000