SOLID WASTE AUTHORITY OF PALM BEACH COUNTY
NORTH COUNTY REGIONAL RESOURCE RECOVERY FACILITY

APPLICATION FOR MODIFICATION OF CONDITIONS OF CERTIFICATION PA 84-20 AND REISSUANCE OF PREVENTION OF SIGNIFICANT DETERIORATION PERMIT

SUBMITTED TO:

FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION
TWIN TOWERS OFFICE BUILDING
2400 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA

SUBMITTED BY:

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NOVEMBER 27, 1989

SOLID WASTE AUTHORITY OF PALM BEACH COUNTY
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INTRODUCTION AND BACKGROUND

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The Solid waste Authority of Palm Beach County, formally known as Palm Beach County Solid Waste Authority, (hereafter referred to as "Authority"), is seeking a modification to the Conditions of Certification of its Site Certification issued by the Florida Power Plant Siting Board in July, 1986, and a modification and reissuance of its Environmental Protection Agency Prevention of Significant Deterioration Permit issued on or about December 16, 1986. The Authority requests the Florida Department of Environmental Regulation ("FDER") to process this application and modify the conditions of certification and issue a new PSD permit in accordance with the information and data contained herein. A brief background history and reasons for the requested modification are set out hereafter.

The Authority's project to construct a 3,000-ton-per-day resource recovery facility ("Facility") was conceived, planned and set into motion during 1983 and 1984. Financing of the project was accomplished by issuing tax-free revenue bonds taking advantage of favorable federal tax provisions under provisions known as the TEFRA. Changes in the TEFRA provisions were scheduled to take place January 1, 1985, which significantly diminished this favorable financing mechanism for local governments, so the Authority successfully sold a $320,000,000 bond issue in late December 1984 to finance the project. One of the conditions of such financing required certification that the project would feasibly be completed within five (5) years of the bond issuance.

At this point the Authority had not yet developed a final engineering concept for the project or begun soliciting design and construction proposals. Because of this five-year time constraint and the time required to fully complete a Power Plant Siting Permit application process, including hearings and appeals, the Authority deemed it prudent and necessary to begin the permitting process as soon as possible. In approximately April 1985, the Authority began the permitting process. A Power Plant Site Certification public hearing, application PA 84-20, was conducted from March 17-21, 1986, in West Palm Beach, Florida, before a duly designated Hearing Officer, William J. Kendrick. After a favorable ruling the Certification was issued in July, 1986. Simultaneously, an application to EPA (through FDER) was being pursued for the PSD permit, and was issued in December 1986.

During 1985 the Authority finalized its conceptual engineering plans for the project and developed and issued a request for proposals for complete design and construction of the Facility. Proposals from four contractors were received in early 1986, and the Authority proceeded with an evaluation and selection of a contractor, and began contract negotiations in April 1986. At that point it was determined that there were minor variances between the permits applied for and the contractor's proposal for the Facility. Accordingly, a meeting was arranged between FDER, the Authority, and the Authority's proposed contractor. On May 8, 1986, the meeting took place at FDER'S offices in Tallahassee and was attended by Clair Fancy, Barry Andrews and Ed Svec.

During that meeting the Authority advised FDER of its need to effect minor modifications to certain elements of the conditions of certifications based upon the contractor's proposal for design and construction. All of the elements contained in this present request for modifications were presented and discussed at the May 8, 1986 meeting. Since the Authority's pending permits at that time had progressed to a significant stage of completion, FDER advised that the permit would be issued as it had been processed. However, the Authority was advised that the requested changes could be formally submitted at a later time. FDER was at that time quite involved in the processing of the Broward County permit application so FDER advised it would not be able to address the Authority's requested modification until a later time. Since that time, contact has been maintained with FDER regarding the Authority's need to modify the permits.

The Authority's request for modification is not the result of significant changes in the scope of the project since its original permitting; rather, it is reflective of the minor variations from the permit application previously discussed with the Department. Neither the project scope nor requested modifications have changed since the Authority made its initial request for changes in the permit application in May 1986, prior to issuance of the final permit.

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1.0 REQUESTED PERMIT MODIFICATIONS

1.1 NOx AND CO

The permit for the Solid Waste Authority of Palm Beach County North County Regional Resource Recovery Facility (NCRRRF) currently specifies a NOx limit of 0.32 Lb/MMBTU and a CO limit of 400 PPMDV corrected to 12% CO_2. The emission factors used to derive the estimates of NOx and CO emissions in the original permit application were based on limited test data available from older refuse combustion facilities.

It is generally acknowledged that CO and NOx emissions are inversely related. Effective control of CO and other trace organic emissions is accomplished by combustion design parameters which optimize the 3 - T's of combustion - time, temperature, and turbulence. However , as EPA's <u>Municipal Waste Combustion Study</u> concludes: "High Temperature, well mixed excess air conditions favor the formation of NOx from both thermal fixation of molecular nitrogen and the conversion of fuel nitrogen."

Fuel bound nitrogen is believed to be the predominant NOx formation mechanism during refuse combustion. Tests conducted at Ogden's Tulsa facility indicate that NOx emission may increase when higher quantities of yard waste are present in the MSW fuel stream.[1] Ogden has also presented data showing a rough correlation between NOx emissions and the season of the year.[2] The Authority's NCRRRF will receive yard wastes such as grass clippings, hedge trimmings and other nitrogen-containing organic matter throughout the year.

As noted, CO emissions are best controlled through good combustion design parameters. Recent test data from modern refuse combustion facilities demonstrating that CO emissions can be controlled to less than 400 PPMDV corrected to 12% CO_2. However, to determine an appropriate, achievable CO limitations, a distinction must be made between RDF and mass-burn combustion technologies.

Numerous modern mass-burn facilities have demonstrated an ability to achieve CO levels lower than 50 PPMDV. While considerably more limited, CO data from state-of-the-art RDF combustion facilities ranges from approximately 100 to 200 PPMDV. Two modern RDF combustion facilities, the Penobscot Energy Recovery Co. (PERC) facility in Maine and the SEMASS RDF facility in Massachusetts, are in the early stages of operation. Official test data is not yet available, but a PERC representative stated, when contacted by telephone, that average CO test results were approximately 200 PPMDV.

The current Authority NCRRRF permit limit for CO of 400 PPMDV is considered to be an appropriate short-term (one hour) limitation to account for infrequent combustion upsets, and, based on a review of current test data from state-of-the-art RDF facilities, a longer term CO emission limit of 200 PPMDV is realistically achievable.

While seemingly unprecedented, a more restrictive CO permit limit of 200 PPMDV, maximum four (4) hour average, and 400 PPMDV, maximum one (1) hour average, is requested.

Current Permit Language:

CO - 400 PPMDV @ 12% CO_2 (3-hr avg)

NOx - 0.32 Lb/MMBTU

Requested Permit Modification:

CO - 200 PPMDV @ 12% CO_2 (4-hr avg)

400 PPMDV @ 12% CO_2 (1-hr avg)

NOx - 0.56 Lb/MMBTU

1.2 OPACITY

As reviewed with USEPA Region IV during a meeting of October 6, 1988, the permit has no provision for opacity higher than 15% limit, even during soot blowing or precipitator rapping. Since the ESP has been designed to meet the limit with only three of four fields operating, it is felt that the current limitation is achievable.

No Permit Modification Requested

1.3 VOC

It was previously thought that the limit for VOC, as provided for in the current limit, would be difficult to achieve. Recent data, however, indicate that the current permit limitation of 0.023 Lb/MMBTU is achievable. It should be noted that modeling was conducted using an emission factor of 0.016 Lb/MMBTU, consistent with the limitation contained in FDER Conditions of Certification.

No Permit Modification Requested

1.4 SO_2

The current permit limitation is given as:

65% removal (0.32 Lb/MMBTU heat input max.)

The dry scrubber has been designed to meet this limitation as a minimum, and as such, the current limitation is achievable.

No Permit Modification Requested

1.5 ACID GASES

Emissions of the three acid gases of interest, Hydrochloric, Hydrofluoric and Sulfuric Acid Gases, will be limited by the dry scrubber. It has been designed for a minimum of 90% removal of these gases.

1.5.1 HYDROCHLORIC ACID GAS

The current permit contains no numerical limitation for HCl, only the 90% design removal provision. The dry scrubber vendor has designed the dry scrubber to meet this limitation.

No Permit Modification Requested

1.5.2 HYDROFLUORIC ACID GAS

The current permit contains a limitation for HF of 0.0032 Lb/MMBTU which appears to be achievable, based upon a review of test results obtained from other modern facilities.

No Permit Modification Requested

1.5.3 SULFURIC ACID MIST

The current permit limitation for H_2SO_4 which was used in earlier modeling was based on data several years old. Latest data on H_2SO_4 emission from recently constructed resource recovery plant with dry scrubbers which are located in Sacco /Bidderford, ME; Commerce, CA; and Millbury, MA ranges from 0.006 to 0.02 Lb/MMBTU heat input. Based on this latest data, an emission factor of 0.02 Lb/MMBTU was used in modeling. In any case, the Method 8 test has been documented in technical literature to give unreliable results at the extremely low concentrations expected from this facility. USEPA, in an October 6, 1988 meeting, appeared to agree with this position, and we would propose that the numerical limitation be eliminated, in a manner similar to HCl, and the permit requirement be 90% design removal.

Current Permit Language:

Sulfuric Acid Mist - 0.32 x 10^{-5} Lb/MMBTU input

Requested Permit Modification:

Delete numerical limitation for sulfuric acid mist since it is covered under the provision for 90% removal of acid gases by the dry scrubber.

1.6 HEAVY METALS

Uncontrolled emissions of heavy metals are primarily a function of trace metals present in the MSW fuel stream. As such, uncontrolled emission of heavy metals are among the most variable parameters at a refuse combustion facility.

EPA's <u>Municipal Waste Combustion Study</u> states that partitioning of metals among residual ash, fly ash and fume emissions is dependent upon the temperature and air/fuel stoichiometry. It concludes that higher combustion temperatures and stoichiometries in modern combustor designs may increase the volatilization of heavy metals from the fuels. BACT control of heavy metal emissions from the Authority's NCRRRF will be accomplished through the use of flue gas temperature control and high efficiency particulate control. The dry scrubber has been designed to cool the flue gases to below 300 deg. F, a temperature at which most vaporous metallic compounds will condense onto solid particulates. The ESP provides final emissions control via high efficiency particulate removal.

An additional control factor, although not yet proven, is that the RDF fuel processing may remove some of the sources of heavy metals before they enter the combustion process. Insufficient test data is available to accurately assess the magnitude of beneficial impact fuel processing may have upon heavy metal emissions.

1.6.1 LEAD

The current permit specifies a lead emission limit of 4.0E-4 Lb/MMBTU. This BACT limit was apparently derived from uncontrolled emissions data extracted from CARB reports, with an assumed 99% lead removal efficiency.

Recent test data from various state-of-the-art facilities reveal a wide degree of variation in lead emission rates and removal efficiencies

A revised lead emissions limit of 15.0E-4 Lb/MMBTU is requested. Since BACT control technology is being utilized, actual emissions of lead will be, to a large degree, a function of the MSW fuel composition. Due to the limited availability of stack test data, and unknowns associated with the MSW composition, a slightly conservative lead emission limit of 15.0E-4 Lb/MMBTU would appear appropriate.

Current Permit Language:

Lead - 4.0 E-4 Lb/MMBTU

Requested Permit Modification:

Lead - 15.0 E-4 Lb/MMBTU

1.6.2 BERYLLIUM

Based upon a review of current test data, the current permit limit of 7.3E-7 Lb/MMBTU appears to be appropriate and achievable.

No Permit Modification Requested

1.6.3 MERCURY

The current Authority NCRRRF permit specifies a mercury emission limit of 3200 grams per day. This limit was determined as a BACT limit based upon the NESHAPS standards for municipal waste water sludge incineration plants. The Agency's Final Determination and Permit document (PSD-FL-108) states that this limit does not apply to the incineration of municipal solid waste, and as such, that limitation should not apply to the Authority's NCRRRF. At the design maximum continuous rating of the Authority's NCRRRF, the limit of 3200 grams per day equates to 3.6E-4 Lb/MMBTU.

Recent mercury test data, like other heavy metals, reflects wide variability from facility to facility. Six (6) individual test runs conducted at Wheelabrator's Millbury facility produced controlled mercury emissions ranging from 8.3 E-4 to 23.0E-4 Lb/MMBTU.[11]

Mercury will be the most difficult metal to control due to its volatility. Some limited test data does exit and indicates that RDF processing may remove sources of mercury prior to combustion. However, considering the recent Millbury test data, the current mercury emission limitation equating to 3.6 E-4 Lb/MMBTU does not appear to be a reasonable BACT limitation. Review of this data, along with recent BACT determinations and permits from other modern refuse combustion facilities indicate that a revised mercury permit limitation of 7.5 E-4 Lb/MMBTU would be appropriate.

Current Permit Language:

Mercury - 3200 grams per day

Requested Permit Modification:

Mercury - 7.5E-4 Lb/MMBTU

1.7 PLANT CAPACITY

The current permit restrict the operation of each boiler to burning 360 MMBTU/hr, or 58,333 pounds per hour of [6164 BTU/Lb] refused derived fuel (RDF).

The final boiler design has been based upon a different factor for the MSW to RDF conversion. The original plant design requirement was to burn the RDF portion of 3000 TPD of MSW in three boilers. However, while the plant was modeled with the three boilers, the initial application was for an expandable, two boiler plant.

The final system design for the Authority's NCRRRF is much more efficient in recovering the heat content of the MSW than original estimates reflect. The mass recovery rate of the MSW is designed to be 83% rather than 70%. This results in the incineration of a larger fraction of the MSW, requiring a larger boiler and a heat/mass input. This will eliminate the landfilling of a significant fraction of waste which has heating value, and likely includes putrescible material.

As required by prudent design, the boiler is actually capable of firing at higher than the nominal rating for extended period of time. This will allow the incineration of MSW, rather than landfilling, after periods of maintenance, or if feed system problems should occur. The maximum rated capacity, as actually designed by the manufacturer is 412.5 MMBTU/hr, which corresponds to the nameplate rating. The requested limit allows for 115% of the nominal mass loading rate to allow for catch-up capacity. This is common in other permits issued for Florida facilities, as well as for those issued in other states.

This position is consistent with good engineering design, and supports the maximum recycling of MSW into useful products (electrical energy and recycled ferrous).

Current Permit Language:

3. The incinerator boilers shall not be loaded in excess of their rated capacity of 58,333 pounds of RDF per hour each or 360.0 x 10^6 Btu per hour each.

Requested Permit Modification:

3. The maximum boiler heat input shall not exceed 412.5 mmBtu per hour. This corresponds to the nameplate rating of 324,300 pounds per hour steam capacity.

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2.0 OPERATIONAL GUIDANCE

2.1 GENERAL

It was requested by Region IV personnel that recent operational guidance developed by USEPA be reviewed, and addressed, as it may relate to the Authority's NCRRRF. The Operational Guidance is divided into three general areas:

1. Design Considerations
2. Operation and plant controls
3. Verification

The Authority's NCRRRF has been designed to be a state-of-the-art facility. The facility is equipped with a dry scrubber, electrostatic particulate control, and incorporates the latest design in RDF combustion Technology. It incorporates most of the requirements listed in the operational guidance. The purpose of the Operational Guidance was to insure that the best available technology was incorporated for environmental control. Since the NCRRRF was designed prior to USEPA's issuance of Operational Guidance, and construction is now 95% complete, it is not feasible to incorporate hardware changes to comply with some of the details in the Operational Guidance, especially in the area of verification. However, the NCRRRF was designed, constructed, and will be operated in substantial compliance with the intent of USEPA's Operational Guidance.

The Operational Guidance Summary Sheet (Table 9-2 from the Municipal Waste Combustion Study) lists the basic aspects of the recommended combustion practices. As presented herein, the Authority's NCRRRF is in substantial compliance with the intent of these guidelines.

2.2 DESIGN

Five (5) design parameters were listed to minimize trace organic emissions from RDF combustors:

1. Temperature at fully mixed height is recommended to be 1800 deg. F.

Based upon the design of the Authority's NCRRRF furnace and the characteristics of the RDF fuel, combustion gas temperature will be 1800 deg. F or greater up to a height twenty (20) feet above the last overfire air port. One (1) meter above the last overfire air injection point is generally considered to be the fully mixed height. Thus, the guideline temperature criteria is easily satisfied.

2. Underfire air control is recommended to be as required to provide uniform bed burning stoichiometry.

RDF burns both in suspension and on stoker grates. The Authority's NCRRRF units have been designed to achieve uniform bed combustion by providing a proven fuel feed system which uniformly distributes fuel to the grates. Overall bed burning stoichiometry is subsequently maintained by controlling the total undergrate combustion air flow. Suspension burning is controlled by the overfire air system.

3. Overfire air capacity is recommended to be capable of supplying 40% of the total combustion air capacity.

The Authority's NCRRRF overfire air system has been designed to provide up to 50% of the total combustion air requirements.

4. Overfire air injector design is recommended to be as required for penetration and coverage of the furnace cross-section.

The size, number and location of the overfire air nozzles utilized in the Authority's NCRRRF units are designed to achieve optimum penetration and fuel/air mixing. The overfire air system design is based upon Babcock & Wilcox design experience on both RDF and mass fired application, and on the results of specific flow model studies.

5. Auxiliary fuel capacity is recommended to be as required to meet the start-up temperature and 1800 deg. F criteria under part-load operations.

The Authority's NCRRRF units are designed to fire auxiliary fuel via four (4) natural gas burners. These burners will be utilized to raise furnace temperature during start-up, shut-down, and other periods of abnormal operation.

2.3 OPERATION/CONTROL

Four elements were listed as recommendation for operations and plant control:

1. Excess air should contain 3 to 9% oxygen in the flue gas on a dry basis.

The Authority's NCRRRF units are designed to operate in the range of 6 to 8% oxygen. This will be monitored by the computerized combustion control system.

2. The recommendation is to restrict turndown to 80 to 110% of design, with extensions of the lower limit with verification testing.

The range of 80 to 110% was given as a preference for operating by boiler manufacturers. It is apparent from reading the background documents in the <u>Municipal Waste Combustion Study</u> that the authors were strongly oriented towards mass-burn facilities. This is understandable, as most of the plants operating at that time were mass-burn plants. It appears, however, that they have drawn their conclusions based upon mass-burn plants and parameters, and applied them, generally without justification, to RDF facilities. The RDF process lends itself to easy and efficient turn-down, as the fuel feed and air flow can be easily correlated and controlled.

3. Start-up should be on auxiliary fuel to design temperature.

The units will be started using the auxiliary gas burners. during a cold start, the auxiliary burners will be fired to bring the boiler up to temperature before the feed of RDF is started.

4. Auxiliary fuel should be fired on prolonged high CO or low furnace temperature.

It is not anticipated that such conditions will occur during normal operations. However, the auxiliary fuel system is capable of being fired during such periods of unusual combustion. The plant will utilize a carbon monoxide monitor as an operational tool.

2.4 VERIFICATION

Four (4) parameters were listed as recommendations for verification of good combustion:

1. **Verify that oxygen in flue gas is 3-9%.**

An Oxygen meter has been provided as a part of the Authority's NCRRRF combustion control system.

2. Verify that CO in the flue gas is less than 50 ppm on a 4 hour average.

A continuous CO monitor will be utilized on the Authority's NCRRRF units to aid in maintaining optimum combustion conditions, however, as presented in the request for modified permit limitations, we believe that a CO limit of 200 PPMDV is a justifiable value for RDF combustion facilities.

Based upon various discussions with USEPA personnel at Research Triangle Park, it is our understanding that the operational guidance was not intended to mandate specific permit limits, but rather, that specific limits should be selected on a site specific basis considering the design and operating parameters of the facility. Quoting from the Municipal Waste Combustion Study (EPA/530-SW-87-021C), page 1 - 6:

> "The best combustion practices defined for mass-burn MSW, RDF, and starved-air modular combustors were derived from an analysis of available information which includes little direct evidence relating to the appropriateness of the preliminary target values recommended."

Considering the intent of the Operational Guidance, coupled with an analysis of recent test data from state-of-the-art RDF facilities, a CO limit of 50 PPMDV is not considered to be realistic or justifiable for the Authority's NCRRRF.

3. **Verify the temperature is a minimum of 1800 deg. F at a fully mixed height.**

Based upon the design performance of the Authority's NCRRRF boilers, an 1800 deg. F gas temperature at a fully mixed height can be readily achieved. The facility was designed and permitted well in advance of USEPA's Operational Guidance, and as such, no provisions were made to continuously verify 1800 deg. F furnace temperature. However, due to the sufficiency of the designed performance in this area, we feel that such verification should not be required.

4. Verify adequate air distribution via Verification Tests.

The combustion air control system has been designed to provide sufficient flexibility needed to optimize combustion under the variable conditions which will be encountered during continuous operation. We are not aware of any EPA air distribution testing protocol, nor specific performance objectives of any such verification tests. The overall performance of the Authority's NCRRRF will be demonstrated via established environmental test procedures.

2.5 SUMMARY

As addressed in the preceding sections, the Authority's NCRRRF is believed to be in substantial compliance with USEPA's June 26, 1987 Operational Guidance for Municipal Waste Combustors. The facility is now in final stages of construction, with commercial operation expected to occur by mid-to late-1989.

Overall, the design of the facility has incorporated equipment and emissions control technology which are BACT. The Authority's NCRRRF had been designed, constructed, and will be operated as a showplace for RDF technology, to be a good neighbor to the community it serves, and to comply with all applicable environmental regulations.

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3.0 REFERENCES

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1. Ogden Projects, Inc.; "Environmental Compliance Test Report"; Walter B. Hall Resource Recovery Facility Units 1 and 2; October 20, 1987.

2. Hahn, Jeff and Sofaer, Donna; "variability of NOx Emissions From Modern Mass-Fired Resource Recovery Facilities"; Presented at the 81st Annual Meeting of APCA; Dallas, Texas; June 19-24, 1988.

3. Interpoll Laboratories; "Result of the March 21-26, 1988 Air Emissions Compliance Test on the No. 2 Boiler at the Red Wing Station"; May 10, 1988.

4. Ferraro, F.A., KTI Energy, Inc.; "Results of Emissions and Ash Testing at the Maine Energy Recovery Company Waste-to-Energy Plant"; Presented at the 81st Annual Meeting of APCA; Dallas, Texas; June 19-24, 1988.

5. Bresowar, G.E., Collins, D.J., and Accortt, J.I., Combustion Engineering, Inc.; "Operating Experience with a Spray Dry Scrubbing System on a RDF Fired Boiler"; Presented at the IGCI Forum '88; Washington, D.C.; November 3-4, 1988.

6. See Reference 2.

7. Ogden Projects, Inc.; "Environmental Compliance Test Report"; Marion County Solid Waste-to-Energy Facility; December 5, 1986.

8. Entropy Environmental, Inc.; "Stationary Source Sampling Report"; Wheelabrator Millbury, Inc. Resource Recovery Facility; Millbury, Massachusetts; Revision 1 - August 5, 1988.

9. Entropy Environmental, Inc.; "Stationary Source Sampling Report"; Wheelabrator Environmental Systems, Inc.; Bridgeport, Connecticut; August 25, 1988.

10. See Reference 8.

11. See Reference 8.

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4.0 UPDATE TO THE REPORT ON AIR QUALITY IMPACT ANALYSIS

4.1 INTRODUCTION

4.1.1 BACKGROUND

In support of the Palm Beach County Solid Waste Resource Recovery Power Plant Site Certification Application, ambient air quality impact analyses were prepared and submitted to the State of Florida, Department of Environmental Regulation (FDER) in April, 1985 and updated in December, 1985.

The basis for these analyses and their results were reviewed in public hearing during the period from March 17-21, 1986 in West Palm Beach, Florida before a duly designated Hearing Officer, William J. Kendrick. The Power Plant Site Certification was approved subject to specified conditions. These conditions specified by the FDER were emission limitations on the stack emissions from each boiler. In order to meet emission limitations imposed, each boiler train has been equipped with a dry scrubber-electrostatic precipitator system rather than an electrostatic precipitator as originally proposed.

These emission limitations were accepted by the Palm Beach County Solid Waste Authority[1] and its Associates.

4.1.2 DESIGN MODIFICATIONS

The final plant design incorporates a stack design which calls for a review of previous dispersion modeling efforts. Three changes have been made that will specifically affect the ambient air quality impact analyses that were a part of the Site Certification Application. These changes are the increase in stack diameter; the decrease in the stack gas exit velocity; and decrease

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[1] The offical title of the Solid Waste Authority is designated as "Solid Waste Authority of Palm Beach County" by recent legislation change. The previous title of "Palm Beach County Solid Waste Authority" is no longer in effect.

in the stack gas exit temperature.

4.1.3 AIR PERMIT MODIFICATIONS

Revised emission limitations, based upon a review of more recent test data from state-of-the-art refuse combustion facilities as presented in Section 1 of this report.

4.1.4 UPDATES

This report describes the technical analyses that have been performed to determine the air quality impact of the facility incorporating the latest design changes and emission factor modification as described in sections 4.1.2 and 4.1.3. Such analyses are required as a condition for obtaining a permit to construct and operate facilities that may emit air pollutants. The analyses reported upon herein have been performed in accordance with the requirements and specifications of Florida Department of Environmental Regulation (FDER) and the United States Environmental Protection Agency (USEPA).

4.1.5 SOURCE DESCRIPTION

The initial Resource Recovery Facility construction involves the installation of 2000 TPD of MSW processing capacity, but the permit application was for the ultimate plant capacity of 3000 tpd of MSW.

The MSW will be processed from 4700 Btu/lb heterogeneous MSW into a more homogenous 5500 Btu/lb Refuse Derived Fuel (RDF) in a RDF Manufacturing Facility located on a common site with the combustion facility. Table 4.1-1 provides a breakdown of MSW components and heating values. Table 4.1-2 provides a breakdown of RDF components and heating values. 2490 TPD of RDF will be produced by the RDF Manufacturing Plant from the 3000 TPD of MSW.

TABLE 4.1 - 1

PALM BEACH COUNTY SOLID WASTE COMPOSITION STUDY

ANALYSIS AND COMPOSITION OF MUNICIPAL SOLID WASTE (MSW)
PERCENT BY WEIGHT

COMPONENT	MOISTURE	INORGANIC	CARBON	HYDROGEN	OXYGEN	NITROGEN	CHLORINE	SULFUR	TOTAL	HHV BTU/LB
CORRUGATED BOARD	1.42	0.11	1.86	0.26	1.79	0.01	0.01	0.01	5.46	315
NEWSPAPER	4.91	0.25	5.98	0.76	5.19	0.02	0.02	0.03	17.16	1017
MAGAZINES	0.75	0.42	1.06	0.15	1.05	0.00	0.00	0.01	3.44	178
OTHER PAPER	5.57	1.64	5.85	0.81	5.40	0.06	0.11	0.04	19.46	989
PLASTICS	1.09	0.62	4.09	0.56	0.58	0.06	0.22	0.02	7.24	839
RUBBER, LEATHER	0.19	0.44	0.84	0.10	0.22	0.03	0.10	0.02	1.94	164
WOOD	0.13	0.02	0.34	0.04	0.29	0.00	0.00	0.00	0.83	58
TEXTILES	0.40	0.07	1.33	0.18	0.97	0.11	0.01	0.01	3.07	235
YARD WASTE	0.56	0.10	0.23	0.03	0.18	0.01	0.00	0.00	1.11	40
FOOD WASTE	1.10	0.33	1.17	0.17	0.84	0.07	0.02	0.00	3.71	213
MIXED COMBUSTIBLES	8.81	1.31	3.74	0.52	2.96	0.09	0.06	0.03	17.52	653
FERROUS	0.11	5.15	0.08	0.01	0.08	0.00	0.00	0.00	5.43	14
ALUMINUM	0.04	1.71	0.03	0.00	0.03	0.00	0.00	0.00	1.80	5
OTHER NON-FERROUS	0.01	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.32	1
GLASS	0.23	11.17	0.06	0.01	0.04	0.00	0.00	0.00	11.51	9
TOTALS	25.30	23.64	26.65	3.61	19.61	0.46	0.55	0.17	100.00	4728

HEAT VALUE AS RECEIVED (25.3% H2O) = 4728 BTU/LB MSW
HEAT VALUE OF DRY SOLIDS = 6329 BTU/LB DRY SOLID
HEAT VALUE OF COMBUSTIBLES = 9260 BTU/LB COMBUSTIBLES

TABLE 4.1 - 2

PALM BEACH COUNTY SOLID WASTE COMPOSITION STUDY

TYPICAL ANALYSIS AND COMPOSITION OF REFUSE DERIVED FUEL (RDF)
PERCENT BY WEIGHT

COMPONENT	RECOVERY RATE (%)	MOISTURE	INORGANIC	CARBON	HYDROGEN	OXYGEN	NITROGEN	CHLORINE	SULFUR	TOTAL	HHV BTU/LB
CORRUGATED BOARD	99.00	1.68	0.14	2.22	0.31	2.13	0.01	0.01	0.01	6.50	375
NEWSPAPER	99.00	5.79	0.30	7.13	0.91	6.19	0.02	0.02	0.04	20.41	1212
MAGAZINES	99.00	0.88	0.50	1.26	0.18	1.26	0.00	0.00	0.01	4.09	212
OTHER PAPER	99.00	6.57	1.95	6.97	0.97	6.44	0.07	0.13	0.04	23.14	1180
PLASTICS	98.00	1.27	0.73	4.82	0.67	0.69	0.07	0.26	0.02	8.54	990
RUBBER, LEATHER	99.00	0.23	0.52	1.00	0.12	0.27	0.03	0.12	0.03	2.31	195
WOOD	99.00	0.16	0.03	0.41	0.05	0.34	0.00	0.00	0.00	0.99	69
TEXTILES	98.00	0.47	0.08	1.57	0.21	1.14	0.13	0.01	0.01	3.62	277
YARD WASTE	85.00	0.63	0.12	0.27	0.03	0.20	0.01	0.00	0.00	1.26	46
FOOD WASTE	60.00	1.18	0.36	1.27	0.18	0.91	0.08	0.03	0.00	4.01	231
MIXED COMBUSTIBLES	40.00	9.99	1.49	4.29	0.60	3.39	0.10	0.07	0.03	19.95	747
FERROUS	7.00	0.01	0.31	0.01	0.00	0.00	0.00	0.00	0.00	0.33	1
ALUMINUM	35.00	0.01	0.62	0.01	0.00	0.01	0.00	0.00	0.00	0.65	2
OTHER NON-FERROUS	10.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0
GLASS	35.00	0.08	4.04	0.02	0.00	0.01	0.00	0.00	0.00	4.16	3
TOTALS		28.94	11.23	31.24	4.23	22.98	0.53	0.65	0.20	100.00	5541

HEAT VALUE AS PRODUCED = 5541 BTU/LB RDF
HEAT VALUE OF DRY SOLIDS = 7799 BTU/LB RDF DRY SOLID
HEAT VALUE OF COMBUSTIBLES = 9263 BTU/LB RDF COMBUSTIBLES
ASH AS PRODUCED = 11.23%
DENSITY = 2.5 TO 3.5 POUNDS/CUBIC FOOT
SIZE = MINUS 4" X MINUS 4" X MINUS 4"

4.1.6 SOURCE LOCATION

The waste-to-energy facility for Palm beach County is located on a 1320 acre parcel of land bounded on the north by the Beeline Highway; on the south by 45th street; on the east by the Florida Turnpike; and on the west by the West Palm Beach Water Catchment Area. The ground elevation at the site is 17 feet above sea level as are the surrounding area of the county.

4.1.7 STUDY AREA

The land surface of Palm Beach County slopes gently to the south. Highest general elevations (approximately 25 feet above mean sea level) occur near the north county line. The southern Everglades have the lowest base level elevations at approximately 11 feet above mean sea level.

The combustion facilities stack is located approximately 2600 feet to the west of the Florida Turnpike and 4000 feet to the north of 45th street. Since the waste-to-energy facility is subject to PSD regulations, the area considered as the study area for the air quality analyses included all PSD Class I areas located within a radius of 100 kilometers (62 miles). For PSD Class II, all areas within a radius of 50 kilometers (31 miles) comprise the study area. No PSD Class I area is located within the study area. Everglades National Park is the closest PSD Class I area and is located about 120 km to the southwest. Therefore the study area has been limited to 50 km radius and visibility analysis is not required pursuant to PSD regulations.

4.1.8 AIR QUALITY STANDARD ATTAINMENT STATUS IN THE STUDY AREA

The study area includes Palm Beach and Martin Counties. Air quality monitoring in Palm Beach County is performed by the Palm Beach County Health Department.

Based on the most recent information available (Palm Beach County Health Department's Annual Report dated 1983), Palm Beach County is in attainment with all NAAQS standards except pollutant ozone.

4.2 REGULATION APPLICABILITY

An air quality impact analysis begins with the determination of which regulation are applicable to the source. The first step in the regulatory analysis is the determination of the applicability of PSD regulations. The issue of applicability involves determining whether the source and its emissions are subject to PSD review and, if so, what analyses must be performed.

PSD regulations are only applicable in areas where National Ambient Air Quality Standards (NAAQS) for a given pollutant are met (or where monitoring is insufficient to determine compliance with NAAQS). In such areas, PSD regulations apply to the construction or modification of major air pollution sources. Although the general concept of an air pollution source is a stack, vent or other emission point, for PSD purpose a source is essentially defined as the aggregate of all such emission points that have the potential to emit a regulated pollutant at a given facility. A source's potential to emit is defined as its design capacity emission rate, after the application of any emission controls or other legally enforceable emission limitations. A proposed new source is considered major if it either falls within one of 28 specific source categories and has the potential to emit 100 tons per year of any regulated pollutant or if it falls in an unspecified source category and has the potential to emit 250 tons per year of any regulated pollutant.

The Solid Waste Authority waste-to-energy facility falls within one of the 28 categories of sources subject to PSD review. As a municipal incinerator, it will be subject to review because it has the capability of charging more than 250 tons of RDF per day. Because the Solid Waste Authority waste-to-energy facility will emit more than 100 tons per year of several regulated pollutants, it is subject to PSD review and related analyses for those pollutants. For each pollutant emitted at a rate in excess of 100 tons/year, three sets of analyses may be required: one for

BACT; one for air quality impacts and one for additional type of impacts.

In some instances, ambient air quality monitoring may be required in support of the air quality impact analyses, but the Florida DER has determined that existing monitoring provides sufficient ambient air quality data for the study area. Air quality impact analyses and additional impacts analyses performed for the Solid Waste Authority waste-to-energy facility are discussed in subsequent sections of this report.

As noted above, PSD regulations are applicable only in areas where the NAAQS are met or indeterminate with relation to compliance. When an area is designated as non-attainment, a non-attainment review is required for each pollutant not in attainment when the net increase in emissions of that pollutant is more than 100 tpy. Such pollutants are exempt from PSD review. The source, however, must meet the requirements of New Source Review (NSR). The review requirements include:

- Meet the lowest Achievable Emission Rate (LAER) for the affected pollutant.
- Demonstrate that the facility is in compliance with applicable emission limitations.
- Obtain offsets, as necessary.
- Demonstrate a net air quality improvement.

Palm Beach County has been declared non-attainment for ozone. The indicator for the non-attainment pollutant, ozone, is volatile organic hydrocarbons (VOC). As shown in table 4.4-1, projected emissions for hydrocarbons (VOC) are 80 tons per year. A non-attainment review is not required.

It will be shown, however, that the facility's increase in VOC emissions cannot make a significant contribution to the formation of oxidants (ozone) in and around Palm Beach County.

4.3 BEST AVAILABLE CONTROL TECHNOLOGY (BACT)

The BACT analysis, required by PSD review, addresses energy, economic and environmental impacts for alternative emission control strategies. BACT is defined in the 40 CFR 52.21 as "an emission limitation based on the maximum degree of reduction of each pollutant emitted which the Department, taking into account, energy, environmental and economic impacts and other costs, determines on a case by case basis, is achievable through application of production processes and available methods, systems, and techniques, for control of each pollutant".

Technical feasibility is the important first step in this analysis. A technically feasible control technology is one that has been demonstrated to function on identical or similar processes in the U. S.

Once technically feasible control alternatives have been established, they are ranked by their environmental, economic and energy consumption impacts. The starting point for this process is a "base case" control level which is specified by the standard and regulations that would apply in the absence of PSD. They typically include New Source Performance Standards (NSPS).

Table 4.3 - 1 lists the air emissions for which an evaluation for BACT was conducted and control alternatives which are considered for the control of each of the pollutants.

TABLE 4.3 - 1

BACT POLLUTANTS AND CONTROL ALTERNATIVES

Air Emission Parameter	Control Alternatives
Nitrogen Oxide	Design and Operating Procedures
Carbon Monoxide	Design and Operating Procedures
Mercury	Dry Scrubber and Electrostatic Precipitator
Lead	Dry Scrubber and Electrostatic Precipitator

This BACT evaluation of the above described control alternatives considered their technical feasibility, energy usage and certain environmental factors. The proposed units are projected to be on-line approximately 85% of the time. Air pollution control equipment must be reliable to minimize contribution to unit downtime. Installation of air pollution control equipment increases the facility cost, but results in benefits to the surrounding area and pollution. At some point, the cost of air pollution control equipment is not outweighed by the resulting benefits. To this end, the capital, operational and energy costs, were compared to the benefits.

4.3.1 BACT FOR CARBON MONOXIDE (CO)

No add-on type controls have been demonstrated for CO emissions from the RDF fired incinerators. Good boiler design and proper operating conditions are the only effective emission control methodology.

The state-of-the-art design of the Authority's combustion chamber and the advanced combustion air and temperature control capability being provided will minimize formation of CO, particularly on boiler start-up and shut-down and/or when heating value of RDF is low. The boiler will be equipped with supplemental burners, natural gas fired, located in the furnace walls above the stoker grate and with continuous CO and O_2 monitors to assist the plant operators maintain optimum combustion conditions, thereby further reducing CO formation.

Optimum furnace design and practice plus supplemental natural gas-fired burners and continuous monitors are proposed as BACT for CO control of the requested modification system.

4.3.2 BACT FOR NITROGEN DIOXIDE (NO_x)

Oxides of nitrogen (NO_x) are compounds consisting of nitrogen and oxygen and are products of all combustion processes. NO_x emissions result from two separate sources during combustion. In the first, NO_x is formed by the oxidation of nitrogen in the fuel (fuel NO_x); the second source of NO_x occurs as a result of high temperature oxidation of atmospheric nitrogen (thermal NO_x). Studies generally support the conclusion that the majority of the total NO_x emitted from refuse firing is a result of fuel nitrogen oxidation.

Optimum combustion design and practice are the demonstrated control alternative for nitrogen dioxide. No add-on type controls had been demonstrated for nitrogen oxides (NO_x) emissions from municipal incinerators in the United States when the Authority's facility was permitted, designed and constructed. Recently thermal denox systems were installed in the State of California at mass burn boilers in Long Beach and Stanislaus County which shows promise for reducing NO_x emissions in mass burn boiler. However, technical feasibility has not yet been demonstrated on a RDF combustion facility.

4.3.2.1 Design and Operating Procedures

The furnace units constructed for Palm Beach County will employed advanced combustion systems in which the primary air is added through multiple compartments located underneath the stokers. Uniform mixing of air and burning RDF eliminates high oxygen concentration gradients that favor the formation of NO_x. Secondary combustion air is introduced at high velocity through specially designed nozzles, into the gas stream along the front and rear walls of the combustion chamber. The temperature at the end of combustion chamber can thus be maintained at about 1800 - 2000 deg. F. Significant NO_x emissions typically occur at temperatures greater than 2000 deg. F.

4.3.3 BACT FOR PARTICULATE MERCURY AND PARTICULATE LEAD

A dry scrubber and a electrostatic precipitator with an outlet particulate loading of 0.015 gr/dscf corrected to 12% CO_2 is selected for BACT based on analysis of all the control alternatives reviewed.

The Authority's decision to use the RDF technology was influenced by the ability to remove sources of mercury and other heavy metals prior to combustion to lower potential emissions.

4.4 EMISSION DATA

The Florida DER requested emission estimates for sixteen pollutants. Six of these are criteria pollutants: 1) particulate; 2) sulfur dioxide (SO_2); 3) carbon monoxide (CO); 4) volatile organic compounds (VOC); 5) nitrogen oxides (NO_x); and 6) lead (Pb). The remaining 10 pollutants included: 7) chloride (HCl); 8) ozone (O_3); 9) total reduced sulfur (including H_2S); 10) reduced sulfur compounds (including H_2S); 11) sulfuric acid mist; 12) fluorides (HF); 13) vinyl chloride; 14) mercury (Hg); 15) asbestos; and 16) beryllium (Be).

Most of the pollutants are emitted to a certain degree by the Solid Waste Authority waste-to-energy facility. Ambient concentrations of the criteria pollutants are regulated through the implementation of NAAQS. The NAAQS have been incorporated in their entirety as part of the Florida State Implementation Plan (SIP).

Emission estimates of the aforementioned pollutants, in conjunction with stack and facility operating parameters, were used as input data to an air quality dispersion models to predict facility impacts.

In order to adequately demonstrate compliance with the NAAQS and PSD increments, it is required that the applicant include in its modeling analysis the pollutant contribution from all existing and PSD sources having a significant impact within the modeling area of the applicant's source. Stack and emissions data for these other sources were developed in conjunction with FDER.

4.4.1 EMISSION DATA FOR THE SOLID WASTE AUTHORITY WASTE-TO-ENERGY FACILITY

Table 4.4-1 lists the pollutants that will be emitted

TABLE 4.4 - 1

CONTROLLED EMISSION FACTORS DEVELOPMENT FOR RDF FIRED SPREADER STOKER FURNACES

(BASED ON THREE BOILERS IN OPERATION)

POLLUTANT	(1) EMISSION FACTOR	(2) LB/TON RDF	(3) LBS/HR (100% LOAD)	(4) TONS/YR (100% LOAD)	(5) GM/SEC (100% LOAD) (380.4 MMBTU/HR)	(6) GM/SEC (115% LOAD) (412.5 MMBTU/HR)
CARBON MONOXIDE (1):						
1 - HOUR AVERAGE	400 PPMV,12% CO2	6.65	690	3,022	86.9	94.3
4 - HOUR AVERAGE	200 PPMV,12% CO2	3.33	345	1,511	43.5	47.1
NITROGEN DIOXIDE (1)	0.56 LB/MMBTU	6.16	639	2,799	80.5	87.3
SULFUR DIOXIDE (2)	0.32 LB/MMBTU	3.52	365	1,600	46.0	49.9
CHLORIDES (2)	0.032 LB/MMBTU	0.35	36.31	159.05	4.58	4.96
VOLATILE ORGANIC COMP. (2)	0.016 LB/MMBTU	0.18	18.26	79.98	2.30	2.49
PARTICULATE MATTER (2)	0.015 GR/SCFD,12%CO2	0.36	37.35	163.59	4.71	5.10
SULFURIC ACID MIST (1)	0.020 LB/MMBTU	0.220	22.83	99.97	2.88	3.12
FLUORIDES (2)	0.0032 LB/MMBTU	0.035	3.65	16.00	0.46	0.50
LEAD (1)	1.50E-03 LB/MMBTU	0.017	1.71	7.50	0.22	0.23
MERCURY (1)	7.50E-04 LB/MMBTU	8.25E-03	8.56E-01	3.75E+00	1.08E-01	1.17E-01
BERYLLIUM (2)	7.30E-07 LB/MMBTU	8.03E-06	8.33E-04	3.65E-03	1.05E-04	1.14E-04

NOTES: (1) REQUESTED PERMIT MODIFICATION

(2) CURRENT PERMIT LIMITATION

from the facility. The table is based on the revised emission limitation as presented in Section 1 of this report. Emission factors are based on a higher heating value (HHV) of 5500 Btu/lb for the RDF. Design capacity emission rates are derived from a waste throughput of 2,490 tons/day or 908,805 tons/year. Each of the three furnaces is rated at 380.4 mmBtu/hr heat input at full load and 412.5 mmBtu/hr heat input at peak load.

Table 4.4-2 lists revised stack parameter data, including location coordinates, height, diameter and volumetric rate and temperature for the waste-to-energy facility. For modeling purposes, the three flues in the one stack were treated as a single stack with an inside diameter equal to that of one of the flues. The modeled emission rate for each pollutant was set equal to the sum from the three flues, and the modeled volume flow rates and temperatures were those of an individual flue. These actions ensured that the modeled plume rise was calculated correctly for the stack.

TABLE 4.4 - 2

STACK PARAMETERS FOR EACH OF THREE SPREADER STOKER FURNACES

	ENGLISH	METRIC
LOCATION		UTM ZONE 17
X-COORDINATE		0585820 METERS EAST
Y-COORDINATE		2980474 METERS NORTH
BASE ELEVATION		
FOR MODEL INPUT	0.00 FEET	0.00 METERS
STACK DIAMETER	8.00 FEET	2.44 METERS
STACK HEIGHT	250 FEET	76.22 METERS
VOLUMETRIC FLOW		
115% LOAD (3 HOURS)	194,099 ACFM	91.67 M3/SEC
100% LOAD	168,782 ACFM	79.72 M3/SEC
75% LOAD	126,586 ACFM	59.79 M3/SEC
50% LOAD	84,159 ACFM	39.75 M3/SEC
EXIT GAS VELOCITY		
115% LOAD (3 HOURS)	64.36 FT/SEC	19.62 M/SEC
100% LOAD	55.96 FT/SEC	17.06 M/SEC
75% LOAD	41.97 FT/SEC	12.80 M/SEC
50% LOAD	27.90 FT/SEC	8.51 M/SEC
STACK GAS TEMPERATURE		
115% LOAD (3 HOURS)	250 DEG F	394 DEG K
100% LOAD	250 DEG F	394 DEG K
75% LOAD	250 DEG F	394 DEG K
50% LOAD	250 DEG F	394 DEG K
FURNACE HEAT INPUT		
115% LOAD (3 HOURS)	412.5 MMBTU	
100% LOAD	380.4 MMBTU	
75% LOAD	285.3 MMBTU	
50% LOAD	190.2 MMBTU	
RDF FUEL INPUT		
115% LOAD (3 HOURS)	79,542 LB/HR	
100% LOAD	69,167 LB/HR	
75% LOAD	51,875 LB/HR	
50% LOAD	34,583 LB/HR	

4.5 AIR QUALITY MODELING ANALYSES

4.5.1 MODEL REQUIREMENTS

4.5.1.1 DETERMINATION OF WORST-CASE LOAD CONDITIONS

A pollutant source does not generally operate or emit pollutant at a constant rate. Most facilities, particularly waste-to-energy facilities, operate at variable rates depending on supply and demand, weekday versus weekend or day versus night work schedules or other factors. Changes in source operating rates produce different pollutant emission rates and exhaust gas flow rates and temperature. When flow rates and temperatures vary, so does pollutant dispersion (plume rise) such that different points of maximum pollutant impact are produced. As a results, screening modeling was performed to determine the source operating load that produce the worst-case impacts. Such screening modeling was performed for 115, 100, 75, and 50 percent loads on hourly averaging period. Model results indicated that 115% load produced worst case conditions.

4.5.1.2 DETERMINATION OF THE MODELING AREA

The next required modeling analysis determined the territorial extent of significant impact of the source. Significant impact levels have been defined for various averaging periods for specific pollutants as shown in Table 4.5-1. Significant monitored concentration (De Minimus values) have also been defined for other pollutants as shown in Table 4.5-2. Model results indicated that only SO_2 and NO_x produced significant impacts in both short-term and long-term averaging periods.

4.5.1.3 DETERMINATION OF THE SCREENING AREA

An additional "screening area" was defined for additional sources to be considered for inclusion in subsequent modeling analyses. This screening area was contained in the

TABLE 4.5 - 1

SIGNIFICANCE LEVELS FOR AIR QUALITY IMPACTS

POLLUTANT	AVERAGING TIME	SIGN. LEVEL CONC. (ug/m3)	DISTANCE (KM) FROM SOURCE # TO SIGNIFICANCE LEVEL: HIGHEST HIGH	SECOND HIGH
Sulfur Dioxide	3 Hour	25	10.0	5.0
	24 Hour	5	20.0	15.0
	Annual	1	9.0	NA
Total Suspended Particulate	24 hour	5	#	#
	Annual	1	#	NA
Nitrogen Dioxide	Annual	1	15.0	NA
Carbon Monoxide	8 Hour	2000	#	#
	Annual	500	#	NA

Notes:

NA Not applicable

\# Less than significant levels at all distances. Minimum boundary line distance from RDF Source: 0.73 km.

\#\# Facility UTM Coordinates: 2960474N; 0585820E; UTM Zone 17

TABLE 4.5 - 2

COMPARISION OF IMPACT OF PALM BEACH COUNTY RDF FIRED
SPREADER STOKER FURNACES TO DE-MINIMUS LEVELS (ISC MODEL)

SIGNIFICANT MONITORING CONCENTRATIONS
(FACILITY UTM COORDINATES: 2960474N; 0585820E; UTM ZONE 17)

POLLUTANT	AVERAGING TIME	DE-MINIMUS GUIDELINES ug/m3	HIGHEST 2ND HIGHEST# CONCENTRATION ug/m3	DISTANCE (KM) FROM SOURCE TO DE-MINIMUS LEVEL HIGH	HI 2ND HI
TSP	24 Hour	10	2.0	##	##
SO2	24 Hour	13	18.8	5.0	5.0
CO	8 Hour	575	53.7	##	##
NOx	24 Hour	14	32.9	5.0	5.0
Ozone (VOC)	1 Hour	*	4.1	##	##
Mercury	24 Hour	0.25	0.044	##	##
Fluorides	24 Hour	0.25	0.19	##	##
Lead	24 Hour	0.1	0.09	##	##
Beryllium	24 Hour	5.0E-4	4.2E-5	##	##

Notes:

* No value established. Ambient air standard: 235 ug/m3 not to be exceeded on more than an average of one day per year over a three year period.

\# Model analyses for SO2 based on 412.5 mmBtu/hr heat input. Concentrations for other pollutants based on their emissions ratio to SO2.

** Assumes VOC is equivalent to Ozone

\## Less than de-minimus values at all distances equal to or greater than 0.73 km from the Source. 0.73 km is the minimum distance of the Source from its boundary line.

annular ring that extends 50 kilometers (31 miles) beyond the applicant's source modeling area. Sources located in the screening area were included in subsequent modeling along with the applicant's source, if their impact within the applicant's source modeling area were as much as 1 ug/m^3 on an annual basis and 5 ug/m^3 on a 24-hour basis.

4.5.1.4 PSD INCREMENT CONSUMPTION AND NAAQS ANALYSIS

The PSD regulations have established limits for increases in concentrations of two pollutants, PM on a 24-hour and annual basis, and SO_2 on a 3-hour, 24-hour and annual basis. These limits of concentration increases have been defined as increment which are shown in Table 4.5-3. The starting point for PSD increment consumption is January 6, 1975. In a given area, the starting point for tracking PSD increment consumption is the date thereafter on which the first PSD source permit application is submitted for baseline date for the given area. No major PSD increment consuming source has triggered the baseline date in the study area.

No multisource modeling for PSD increment consumption is required since no major source has been constructed since January 6, 1975 within the modeling area.

The sum of the impacts of the PSD source emissions must also not produce concentrations that violate NAAQS. The NAAQS concentrations are shown in Table 4.5-4. Modeling for compliance with NAAQS must include: 1) all source emissions from the proposed PSD source, 2) actual emission from all operating sources and all allowable emissions from permitted (but not operating) sources within the modeling area, and 3) actual emissions from all operating sources and all allowable emissions from permitted (but not operating) sources within the screening area, if such sources have significant impacts (>1 ug/m^3, annual

TABLE 4.5 - 3

ALLOWABLE PSD INCREMENTS (ug/m3)

	Class I Area	Class II Area	Class III Area
Sulfur Dioxide			
Annual	2	20	40
24-hour	5*	91*	182*
3-hour	25*	512*	700*
Total Suspended Particulate Matter			
Annual	5	19	37
24-hour	10*	37*	75*

* Not to be exceeded more than once a year.

TABLE 4.5 - 4

AMBIENT AIR QUALITY STANDARDS

POLLUTANT	FEDERAL PRIMARY	FEDERAL SECONDARY	STATE	MAXIMUM CONCENTRATION MEASURED IN 1983 (SITE #)	MAXIMUM 2ND MAX CONCENTRATION(3) MEASURED IN 1983 (SITE #)
SULFUR DIOXIDE					
MAX 3-HOUR CONCENTRATION (2)	NO STANDARD	1300 UG/M3 (0.5 PPM)	1300 UG/M3 (0.5 PPM)	65 UG/M3 (11) (0.025 PPM)	63 UG/M3 (11) (0.024 PPM)
MAX 24-HOUR CONCENTRATION	365 UG/M3 (0.14 PPM)	NO STANDARD	260 UG/M3 (0.1 PPM)	39 UG/M3 (11) (0.015 PPM)	29 UG/M3 (11) (0.011 PPM)
ANNUAL ARITHMETIC MEAN	80 UG/M3 (0.03 PPM)	NO STANDARD	60 UG/M3 (0.02 PPM)	7 UG/M3 (11) (0.0027 PPM)	
PARTICULATE MATTER					
MAX 24-HOUR CONCENTRATION (2)	260 UG/M3	150 UG/M3	150 UG/M3	134 UG/M3 (5)	107 UG/M3 (4)
ANNUAL GEOMETRIC MEAN	75 UG/M3	60 UG/M3	60 UG/M3	43 UG/M3 (12)	
NITROGEN DIOXIDE					
ANNUAL ARITHMETIC MEAN	100 UG/M3 (.05 PPM)	100 UG/M3 (.05 PPM)	100 UG/M3 (.05 PPM)	20 UG/M3 (1) (0.01 PPM)	
OZONE					
DAILY MAX 1-HOUR CONCENTRATION (1)	235 UG/M3 (0.12 PPM)	235 UG/M3 (0.12 PPM)	235 UG/M3 (0.12 PPM)	180 UG/M3 (10) (0.092 PPM)	172 UG/M3 (10) (0.088 PPM)
LEAD					
QUARTERLY ARITHMETIC MEAN	NO STANDARD	NO STANDARD	1.5 UG/M3	NOT MONITORED	
CARBON MONOXIDE					
MAX 1-HOUR CONCENTRATION	40000 UG/M3 (35 PPM)	40000 UG/M3 (35 PPM)	40000 UG/M3 (35 PPM)	10171 UG/M3 (1) (8.9 PPM)	9943 UG/M3 (1) (8.7 PPM)
MAX 8-HOUR CONCENTRATION (2)	10000 UG/M3 (10 PPM)	10000 UG/M3 (10 PPM)	10000 UG/M3 (10 PPM)	6600 UG/M3 (1) (6.6 PPM)	4500 UG/M3 (1) (4.5 PPM)

NOTES: 1. THE STANDARD IS ATTAINED WHEN THE EXPECTED NUMBER OF DAYS PER CALENDAR YEAR WITH MAXIMUM HOURLY AVERAGE CONCENTRATIONS ABOVE 0.12 PPM IS EQUAL TO OR LESS THAN 1.

2. CONCENTRATION LIMITS NOT TO BE EXCEEDED MORE THAN ONCE PER YEAR.

3. SINCE SHORT TERM CONCENTRATION LIMITS ARE NOT TO BE EXCEEDED MORE THAN ONCE PER YEAR, THE VALUES PRESENTED IN COLUMN (5) FOR SHORT TERM CONCENTRATIONS REFLECT THE HIGHEST VALUES OF THE SECOND HIGHEST CONCENTRATION MEASURED AT THE MONITORING STATION.

and >5 ug/m^3, 24-hour) within the modeling area. Modeling impacts must be added to appropriate background levels to determine compliance with NAAQS.

4.5.1.5 SOILS AND VEGETATION IMPACTS

The emission of pollutants listed in Table 4.5-1 are not expected to cause any harm to the vegetation or soils within the study area. For these pollutants, either all applicable NAAQS and state standards will be met, emissions will be less than de minimus values, or ambient impacts will be insignificant.

The potential impact to soil and vegetation resulting from emission from the modified facility are discussed for the following specific compounds and materials: carbon monoxide (CO); and nitrogen dioxide (NO_2).

Carbon Monoxide. Plants appear to be resistant to high levels of CO. In most species tested, exposure to 115 mg/m^3 for up to three weeks did not produce visible injuries (Zimmerman, et al., 1983). Additionally, exposure to less than 27 ug/m^3 (Chakrabarti, 1976) also produced no visible injury.

The facility will contribute a maximum annual concentration of 2.9 ug/m^3. Total concentration, as a result of the operation of the proposed modified facility, will thus be considerably below concentrations causing visible injury to vegetation.

Nitrogen Dioxide. Nitrogen dioxide can be beneficial to vegetation in specific amounts. Uptake of NO_2 varies with a number of factors such as nutrient supply in the soil, fertilization, and rainfall. NO_2 can also be converted to nitric acid and contribute to acid precipitation. Natural biological cycling of nitrogen compounds produces greater acidity than does atmospheric decomposition (Frank, et al., 1976).

Short-term injury threshold for NO_2-tolerant species, such as corn and sorghum, has been found to be 24,000 ug/m^3 NO_2 for a one-hour exposure when grown in a controlled environment (Heck and Tingey, 1970). Continuous exposure throughout the growth period to 470 ug/m^3 reduced size and productivity and increased senescence in tomatoes and navel oranges (Taylor, et al., 1971). The concentration of NO_2 has been found to be a greater influence on the extent of injury than the length of exposure.

The additive effect of NO_2 and SO_2 in combination on crops has been shown to vary between crop species and varieties. In a recent study of yield reduction in soybeans, no adverse effect was observed at atmospheric concentrations of 481 ug/m^3 SO_2 in combination with 155 ug/m^3 of NO_2 (Admunson, 1983). The results of these investigations indicate that the presence of elevated levels of NO_2 in the atmosphere in combination with SO_2 above a threshold level lead to adverse crop response. NO_2 concentrations below 120 ug/m^3 have not been reported to produce injury in the absence of other pollutants (Thompson, et al., 1974).

The facility will produce a maximum annual concentration of 5.4 ug/m^3 NO_2. The maximum annual ambient NO_2 concentration recorded on the county was 20 ug/m^3. Total concentration will thus be well below the estimated threshold level (120 ug/m^3) of injury to certain plants.

4.5.2 REFINED MODELING ANALYSIS

4.5.2.1 PROCEDURES

The latest version of the EPA Industrial Source Complex Short Term Model (UNAMAP 6, Ver 3.4, dated 88348) was used for the refined analysis.

4.5.2.2 AVAILABLE SOURCES OF METEOROLOGICAL DATA

When refined dispersion modeling analyses are performed, a full year (or more) of meteorological data is required. The short-term dispersion models require hour-by-hour meteorological data. The meteorological parameters needed include wind direction, wind speed, temperature, cloud cover, solar insolation, and mixing height. Mixing height is calculated using the CRSTER preprocessor program from surface temperature and upper air soundings of the rate of temperature change with height.

The nearest NWS station to the waste-to-energy facility is West Palm Beach Airport which is located 9.5 kilometers (5.9 miles) to the southwest. The nearest NWS station for upper air data is Miami Airport located 100 kilometers (62 miles) to the south. The Florida DER provided the most recent five-year surface and upper air meteorological data for the years 1970 thru 1974 inclusive and these data were used for the ISCST model runs.

4.5.2.3 GEP DETERMINATION AND POTENTIAL FOR DOWNWASH

The relationship between a source's stack height and the dimensions of adjacent structures and terrain determine whether plume downwash will occur. EPA has developed criteria for constructing stacks with heights defined according to good engineering practice (GEP) criteria in order to minimize plume downwash. The ISC models are the only ones capable of calculating impacts caused by plume downwash. Modeling for downwash is required only if the applicant's stack is not constructed according to GEP criteria.

The GEP analysis was performed in accordance with latest EPA regulations (1985). Building dimensions are 145 feet long by 95 feet wide by 120 feet high. GEP stack height was determined to be 300 feet. Accordingly, the results of this analysis indicated that the source stack was below GEP height so downwash modeling was performed.

4.5.2.4 RECEPTOR SELECTION

A polar grid system was used on the refined RDF source and multisource modeling analyses. Discrete receptors were placed at ambient air quality monitoring stations within the study area. Table 4.5-5 lists the monitoring stations together with the pollutions that are monitored at each site. When additional refined modeling was performed, these discrete receptors were supplemented by the location of the specific sources and the nearest point of impact of the Class I area: Everglades National Park. The UTM coordinates for all the discrete receptors are shown in Table 4.5-6.

4.5.3 MODELING RESULTS

Refined multisource runs were performed for the existing sources in Table 4.5-7 to determine the maximum combined SO_2 impacts of all sources. Also included in Table 4.5-7 are the stack parameters and UTM coordinates for each source. Single source ISCST modeling determined that the source did not produce significant short-term SO_2 impacts upon the existing source as shown in Tables 4.5-8 and 4.5-8A.

TABLE 4.5 - 5

MONITORING STATION LOCAL ADDRESSES. UTM COORDINATES AND LOCATION (DISTANCE & ANGLE) RELATIVE TO THE SOLID WASTE AUTHORITY RDF FIRED WATERWALL FURNACE FACILITY

(FACILITY UTM COORDINATES: 2960474N; 585820E; UTM ZONE 17)

SITE NO.	ADDRESS (MONITORING CAPABILITY)	UTM COORDINATES ZONE 17	DISTANCE FROM FACILITY (METERS)	DIRECTION RELATIVE TO FACILITY (NORTH = 0 (360) DEGREES) (DEGREES)
1 (4760-001)	WEST PALM BEACH WATER TREATMENT PLANT FIRST STREET & TAMARIND AVENUE WEST PALM BEACH, FLORIDA (CO, NO2, METEOROLOGY)	2955030N 0593232E	9197	126
1A (4760-003)	PALM BEACH COUNTY HEALTH DEPARTMENT 901 EVERNIA STREET WEST PALM BEACH, FLORIDA (SUSPENDED PARTICULATE)	2955030N 0593232E	9197	126
2 (3060-001)	NORTH PALM BEACH WATER TREATMENT PLANT 603 ANCHORAGE DRIVE NORTH PALM BEACH, FLORIDA (SUSPENDED PARTICULATE)	2965817N 0592780E	8774	053
3 (2220-001)	LAKE WORTH WATER TREATMENT PLANT 301-303 COLLEGE STREET LAKE WORTH, FLORIDA (SUSPENDED PARTICULATE)	2943537N 0592793E	18316	158
4 (1000-002)	DELRAY BEACH WATER TREATMENT PLANT 202 NW FIRST STREET DELRAY BEACH, FLORIDA (SUSPENDED PARTICULATE)	2927488N 0592195E	33596	169
5 (0280-001)	BOCA RATON FIRE STATION #1 1151 NORTH FEDERAL HIGHWAY BOCA RATON, FLORIDA (SUSPENDED PARTICULATE)	2915768N 05913137E	45042	173

TABLE 4.5 - 5 (CONTINUED)

MONITORING STATION LOCAL ADDRESSES, UTM COORDINATES AND LOCATION (DISTANCE & ANGLE)
RELATIVE TO THE SOLID WASTE AUTHORITY RDF FIRED WATERWALL FURNACE FACILITY

(FACILITY UTM COORDINATES: 2960474N; 585820E; UTM ZONE 17)

SITE NO.	ADDRESS (MONITORING CAPABILITY)	UTM COORDINATES ZONE 17	DISTANCE FROM FACILITY (METERS)	DIRECTION RELATIVE TO FACILITY (NORTH = 0 (360) DEGREES) (DEGREES)
6 (3420-005)	SOUTHWEST FIRE DEPARTMENT 1180 SOUTH MILITARY TRAIL WEST PALM BEACH, FLORIDA (SUSPENDED PARTICULATE)	2949018N 0588207E	11702	168
7 (0280-002)	COLLEGE OF BOCA RATON SOUTH MILITARY TRAIL BOCA RATON, FLORIDA (SUSPENDED PARTICULATE)	2918354N 0587320E	42147	178
8 (3420-006)	SOUTH FLORIDA WATER MANAGEMENT PUMP STATION TWENTY MILE BEND STATE ROAD 80 (SUSPENDED PARTICULATE, OZONE, METEOROLOGY)	2951402N 0562879E	24669	248
9 (3340-001)	PAHOKEE SEWAGE TREATMENT PLANT 1050 McCLURE ROAD PAHOKEE, FLORIDA (SUSPENDED PARTICULATE)	2964200N 0532300E	53650	274
10 (3420-007)	ROYAL PALM BEACH R.V. AREA 10999 OKEECHOBEE BOULEVARD ROYAL PALM BEACH, FLORIDA (OZONE, METEOROLOGY)	2954150N 0578100E	9980	231
11 (3840-003)	PALM BEACH COUNTY HEALTH DEPARTMENT WAREHOUSE 2030 AVENUE "L" RIVIERA BEACH, FLORIDA (SULFUR DIOXIDE)	2962350N 0592480E	6919	074
12 (0240-003)	BELLE GLADE HEALTH DEPARTMENT 1024 NW AVENUE "D" BELLE GLADE, FLORIDA (SUSPENDED PARTICULATE)	2953082N 0533180E	53176	262

TABLE 4.5 - 6

DISCRETE RECEPTOR SEQUENCE
RDF FACILITY UTM COORDINATES: 2960474 N; 585820 E
UTM ZONE 17

STATION SAROAD NO.	SITE NO.	UNIT COORD. (ZONE 17)	STATION SAROAD NO.	SITE NO.	UNIT COORD. (ZONE 17)
4760-001 4760-003	1 & 1A	2955030 N 0593232 E	3060-001	2	2965817 N 0592780 E
2220-001	3	2943537 N 0592793 E	1000-002	4	2927488 N 0592195 E
0280-001	5	2915768 N 05913137 E	3420-005	6	2949018 N 0588207 E
0280-002	7	2918354 N 0587320 E	3420-006	8	2951402 N 0562879 E
3340-001	9	2964200 N 0532300 E	3420-007	10	2951402 N 0578100 E
3840-003	11	2962350 N 0592480 E	0240-003	12	2953082 N 0533160 E
ADDITIONAL RECEPTORS					
EVERGLADES NATIONAL PARK		2848635 N 0533619 E	PRATT & WHITNEY		2974400 N 0565500 E
FLORIDA POWER & LIGHT		2960600 N 0594200 E	LAKE WORTH UTILITIES		2943700 N 0592800 E

TABLE 4.5 - 7

STACK PARAMETERS OF MAJOR SOURCES WITHIN 50 KM OF THE SOLID WASTE AUTHORITY
RDF FIRED SPREADER STOKER FURNACE FACILITY

(FACILITY UTM COORDINATES: 2960474N; 585820E; UTM ZONE 17)

SOURCE	EMISSION POINT NO.	VOLUMETRIC FLOW (M3/SEC)	STACK DIAMETER (METERS)	STACK HEIGHT (METERS)	EXIT VELOCITY (MPS)	EXIT TEMPERATURE (DEG K)	SO2 EMISSION (GPS)
PRATT & WHITNEY	UNIT 1	42.83	2.29	19.96	10.40	533.	67.95
	UNIT 2	42.83	2.29	19.96	10.40	533.	67.95
LAKE WORTH UTILITIES	UNIT S-1	12.34	1.52	18.29	6.80	433.	36.3
	UNIT S-2	11.25	1.52	18.29	6.20	434.	36.3
	UNIT S-3	27.44	2.13	38.10	7.70	408.	103.9
	UNIT S-4	39.95	2.29	38.10	9.70	408.	133.9
	UNIT S-5	133.70	3.05	22.86	18.30	450.	11.6
FLORIDA POWER AND LIGHT	UNIT 2	103.34	4.57	45.72	6.30	430.	54.2
	UNIT 3	353.50	4.88	90.83	18.90	408.	349.3
	UNIT 4	353.50	4.88	90.83	18.90	408.	349.3

TABLE 4.5 - 8

SO2 IMPACT OF SOLID WASTE AUTHORITY WASTE-TO-ENERGY FACILITY
ON EXISTING MAJOR SO2 SOURCES WITHIN THE MODELING AND SCREENING AREA

(FACILITY UTM COORDINATES: 2960474N; 585820E; UTM ZONE 17)

SOURCE NO.	NAME & ADDRESS	DISTANCE (METERS)/ DIRECTION (DEGREES) (NORTH = 0 (360) DEGREES) RELATIVE TO FACILITY	MET YEAR	MAXIMUM IMPACT OF FACILITY ON THE EXIST. SOURCE (ug/m3)		
				3-HOUR (1)	24-HOUR (1)	ANNUAL MEAN (2)
1	PRATT & WHITNEY	24634/304	1970	7.34	1.56	0.13
	301-303 COLLEGE STREET		1971	6.34	1.69	0.17
	LAKE WORTH, FLORIDA		1972	6.57	1.65	0.16
	UTM ZONE 17;		1973	6.16	2.13	0.22
	2974400N; 0565500E		1974	5.76	1.78	0.18
2	FLORIDA POWER & LIGHT	8381/089	1970	11.49	2.42	0.23
	RIVIERA BEACH, FLORIDA		1971	10.46	3.12	0.20
	UTM ZONE 17;		1972	9.88	2.62	0.18
	2960600N: 0594200E		1973	12.94	3.15	0.18
			1974	12.75	3.06	0.19
3	LAKE WORTH UTILITIES AUTHORITY	18168/157				
	TOM G. SMITH MUNICIPAL POWER PLANT		1970	5.44	1.60	0.11
	127 COLLEGE STREET		1971	7.89	1.28	0.09
	LAKE WORTH, FLORIDA 33460		1972	8.63	1.24	0.11
	UTM ZONE 17;		1973	8.45	2.29	0.13
	2943700N; 0592800E		1974	6.81	1.42	0.10

Note 1: Highest Second Highest Concentration (412.5 mmBtu/hr; 49.9 gms-1; 19.62 ms-1)

Note 2: Average of N Days (380.4 mmBtu/hr; 46 gms-1; 17.06 ms-1)

TABLE 4.5 - 8A

SO2 IMPACTS OF COMBINED SOURCES ON EXISTING MAJOR SOURCES

(FACILITY UTM COORDINATES: 2960474N; 585820E; UTM ZONE 17)

SOURCE NO.	NAME & ADDRESS	DISTANCE (METERS)/ DIRECTION (DEGREES) (NORTH = 0 (360) DEGREES) RELATIVE TO FACILITY	MET YEAR	MAXIMUM IMPACT OF FACILITY ON THE EXIST. SOURCE (ug/m3) 3-HOUR (1)	24-HOUR (1)	ANNUAL MEAN (2)
1	PRATT & WHITNEY	24634/304	1970	85.42	22.11	2.41
	301-303 COLLEGE STREET		1971	79.23	21.99	2.73
	LAKE WORTH, FLORIDA		1972	84.15	24.16	2.70
	UTM ZONE 17;		1973	79.18	22.53	3.12
	2974400N; 0565500E		1974	62.87	15.96	2.91
2	FLORIDA POWER & LIGHT	8381/089	1970	155.29	33.62	2.33
	RIVIERA BEACH, FLORIDA		1971	180.46	35.51	3.43
	UTM ZONE 17;		1972	164.56	37.94	3.38
	2960600N; 0594200E		1973	139.40	32.39	3.41
			1974	155.78	34.74	3.15
3	LAKE WORTH UTILITIES AUTHORITY	18168/157				
	TOM G. SMITH MUNICIPAL POWER PLANT		1970	51.17	10.86	1.26
	127 COLLEGE STREET		1971	61.41	12.80	1.43
	LAKE WORTH, FLORIDA 33460		1972	153.66	24.10	1.70
	UTM ZONE 17;		1973	62.07	10.97	1.30
	2943700N; 0592800E		1974	71.68	12.97	1.43

Note 1: Highest Second Highest Concentration (412.5 mmBtu/hr; 49.9 gms-1; 19.62 ms-1)

Note 2: Average of N Days (380.4 mmBtu/hr; 46 gms-1; 17.06 ms-1)

TABLE 5 - 9

IMPACT OF SOLID WASTE AUTHORITY RDF FIRED SPREADER STOKER FURNACES ON AIR QUALITY
BASED ON ISCST MODEL FOR METEROLOGICAL YEAR 1970

HIGHEST 2ND HIGH MODELED CONCENTRATION (ug/m3) FOR THE INDICATED AVERAGING TIMES (1)

	1-HOUR (2) (730M; 060D) (D161; P11)	3-HOUR (2) (1500M; 270D) (D213; P5)	8-HOUR (2) (1500M; 260D) (D211; P2)	24-HOUR (2) (900M; 250D) (D121; P1)	ARITHMETIC MEAN (3) (1300M; 270D)
Carbon Monoxide (4)	133.49	80.82	32.31	16.72	2.89
Nitrogen Dioxide	123.66	74.87	59.87	30.98	5.36
Sulfur Dioxide	70.66	42.78	34.21	17.70	3.06
Chlorides	7.03	4.25	3.40	1.76	0.30
Volatile Organic Compounds	3.53	2.14	1.71	0.89	0.15
Particulate Matter	7.23	4.38	3.50	1.81	0.31
Sulfuric Acid Mist	4.42	2.67	2.14	1.11	0.19
Fluorides	7.07E-01	4.28E-01	3.42E-01	1.77E-01	3.06E-02
Lead	3.31E-01	2.01E-01	1.60E-01	8.30E-02	1.43E-02
Mercury	1.66E-01	1.00E-01	8.02E-02	4.15E-02	7.17E-03
Beryllium	1.61E-04	9.76E-05	7.80E-05	4.04E-05	6.98E-06

Notes:

1. Data developed by ISCST modeling the impacts of the SO2 emission then multiplying the ratio of the component emission to the SO2 emission by the maximum SO2 impact to determine the component's impact.

2. Based on 412.5 mmBtu/hr-fired; 49.9 gmsec-1 SO2; vs = 19.62 ms-1

3. Based on 380.4 mmBtu/hr-fired; 46.0 gmsec-1 SO2; vs = 17.06 ms-1; 365 days

4. CO conc. for 1- and 3-hour averages are based on an emission factor of 400 ppmdv @ 12% CO2.
   CO conc. for 8-, 24-hour and annual mean averages are based on an emission factor of 200 ppmdv @ 12% CO2.

TABLE 5 - 9A

IMPACT OF SOLID WASTE AUTHORITY RDF FIRED SPREADER STOKER FURNACES ON AIR QUALITY
BASED ON ISCST MODEL FOR METEROLOGICAL YEAR 1971

HIGHEST 2ND HIGH MODELED CONCENTRATION (ug/m3) FOR THE INDICATED AVERAGING TIMES (1)

	1-HOUR (2) (730M; 360D) (D176; P13)	3-HOUR (2) (1400M; 290D) (D207; P4)	8-HOUR (2) (1500M; 290D) (D146; P2)	24-HOUR (2) (730M; 260D) (D320; P1)	ARITHMETIC MEAN (3) (1300M; 270D)
Carbon Monoxide (4)	151.04	79.55	24.32	15.28	1.88
Nitrogen Dioxide	139.91	73.69	45.06	28.32	3.48
Sulfur Dioxide	79.95	42.11	25.75	16.18	1.99
Chlorides	7.95	4.19	2.56	1.61	0.20
Volatile Organic Compounds	4.00	2.11	1.29	0.81	0.10
Particulate Matter	8.18	4.31	2.63	1.65	0.20
Sulfuric Acid Mist	5.00	2.63	1.61	1.01	0.12
Fluorides	8.00E-01	4.21E-01	2.58E-01	1.62E-01	1.99E-02
Lead	3.75E-01	1.97E-01	1.21E-01	7.58E-02	9.33E-03
Mercury	1.87E-01	9.87E-02	6.04E-02	3.79E-02	4.66E-03
Beryllium	1.82E-04	9.61E-05	5.87E-05	3.69E-05	4.54E-06

Notes:

1. Data developed by ISCST modeling the impacts of the SO2 emission then multiplying the ratio of the component emission to the SO2 emission by the maximum SO2 impact to determine the component's impact.

2. Based on 412.5 mmBtu/hr-fired; 49.9 gmsec-1 SO2; vs = 19.82 ms-1

3. Based on 380.4 mmBtu/hr-fired; 46.0 gmsec-1 SO2; vs = 17.06 ms-1; 365 days

4. CO conc. for 1- and 3-hour averages are based on an emission factor of 400 ppmdv @ 12% CO2.
   CO conc. for 8-, 24-hour and annual mean averages are based on an emission factor of 200 ppmdv @ 12% CO2.

TABLE 5 - 9B

IMPACT OF SOLID WASTE AUTHORITY RDF FIRED SPREADER STOKER FURNACES ON AIR QUALITY
BASED ON ISCST MODEL FOR METEROLOGICAL YEAR 1972

HIGHEST 2ND HIGH MODELED CONCENTRATION (ug/m3) FOR THE INDICATED AVERAGING TIMES (1)

	1-HOUR (2) (730M; 040D) (D109; P13)	3-HOUR (2) (730M; 270D) (D169; P4)	8-HOUR (2) (1400M; 300D) (D222; P2)	24-HOUR (2) (730M; 240D) (D295; P1)	ARITHMETIC MEAN (3) (1400M; 270D)
Carbon Monoxide (4)	160.68	76.23	25.48	13.88	1.91
Nitrogen Dioxide	148.84	70.61	47.20	25.71	3.54
Sulfur Dioxide	85.05	40.35	26.97	14.69	2.02
Chlorides	8.46	4.01	2.68	1.46	0.20
Volatile Organic Compounds	4.25	2.02	1.35	0.73	0.10
Particulate Matter	8.70	4.13	2.76	1.50	0.21
Sulfuric Acid Mist	5.32	2.52	1.69	0.92	0.13
Fluorides	8.51E-01	4.04E-01	2.70E-01	1.47E-01	2.02E-02
Lead	3.99E-01	1.89E-01	1.26E-01	6.89E-02	9.47E-03
Mercury	1.99E-01	9.46E-02	6.32E-02	3.44E-02	4.73E-03
Beryllium	1.94E-04	9.20E-05	6.15E-05	3.35E-05	4.61E-06

Notes:

1. Data developed by ISCST modeling the impacts of the SO2 emission then multiplying the ratio of the component emission to the SO2 emission by the maximum SO2 impact to determine the component's impact.

2. Based on 412.5 mmBtu/hr-fired; 49.9 gmsec-1 SO2; vs = 19.62 ms-1

3. Based on 380.4 mmBtu/hr-fired; 46.0 gmsec-1 SO2; vs = 17.06 ms-1; 365 days

4. CO conc. for 1- and 3-hour averages are based on an emission factor of 400 ppmdv @ 12% CO2.
   CO conc. for 8-, 24-hour and annual mean averages are based on an emission factor of 200 ppmdv @ 12% CO2.

TABLE 5 - 9C

IMPACT OF SOLID WASTE AUTHORITY RDF FIRED SPREADER STOKER FURNACES ON AIR QUALITY
BASED ON ISCST MODEL FOR METEROLOGICAL YEAR 1973

HIGHEST 2ND HIGH MODELED CONCENTRATION (ug/m3) FOR THE INDICATED AVERAGING TIMES (1)

	1-HOUR (2) (730M; 110D) (D259; P11)	3-HOUR (2) (1400M; 260D) (D255; P5)	8-HOUR (2) (1100M; 300D) (D216; P2)	24-HOUR (2) (730M; 270D) (D107; P1)	ARITHMETIC MEAN (3) (1300M; 270D)
Carbon Monoxide (4)	160.68	78.70	26.10	15.41	2.05
Nitrogen Dioxide	148.84	72.91	48.35	28.54	3.80
Sulfur Dioxide	85.05	41.66	27.63	16.31	2.17
Chlorides	8.46	4.14	2.75	1.62	0.22
Volatile Organic Compounds	4.25	2.08	1.38	0.82	0.11
Particulate Matter	8.70	4.26	2.83	1.67	0.22
Sulfuric Acid Mist	5.32	2.60	1.73	1.02	0.14
Fluorides	8.51E-01	4.17E-01	2.76E-01	1.63E-01	2.17E-02
Lead	3.99E-01	1.95E-01	1.30E-01	7.65E-02	1.02E-02
Mercury	1.99E-01	9.76E-02	6.48E-02	3.82E-02	5.09E-03
Beryllium	1.94E-04	9.50E-05	6.30E-05	3.72E-05	4.95E-06

Notes:

1. Data developed by ISCST modeling the impacts of the SO2 emission then multiplying the ratio of the component emission to the SO2 emission by the maximum SO2 impact to determine the component's impact.

2. Based on 412.5 mmBtu/hr-fired; 49.9 gmsec-1 SO2; vs = 19.62 ms-1

3. Based on 380.4 mmBtu/hr-fired; 46.0 gmsec-1 SO2; vs = 17.06 ms-1; 365 days

4. CO conc. for 1- and 3-hour averages are based on an emission factor of 400 ppmdv @ 12% CO2.
   CO conc. for 8-, 24-hour and annual mean averages are based on an emission factor of 200 ppmdv @ 12% CO2.

TABLE 5 - 9D

IMPACT OF SOLID WASTE AUTHORITY RDF FIRED SPREADER STOKER FURNACES ON AIR QUALITY
BASED ON ISCST MODEL FOR METEROLOGICAL YEAR 1974

HIGHEST 2ND HIGH MODELED CONCENTRATION (ug/m3) FOR THE INDICATED AVERAGING TIMES (1)

	1-HOUR (2) (730M; 080D) (D127; P11)	3-HOUR (2) (1100M; 320D) (D92; P5)	8-HOUR (2) (800M; 260D) (D111; P2)	24-HOUR (2) (730M; 260D) (D101; P1)	ARITHMETIC MEAN (3) (1300M; 270D)
Carbon Monoxide (4)	156.31	76.48	26.86	17.77	2.13
Nitrogen Dioxide	144.80	70.84	49.77	32.92	3.96
Sulfur Dioxide	82.74	40.48	28.44	18.81	2.26
Chlorides	8.23	4.03	2.83	1.87	0.22
Volatile Organic Compounds	4.14	2.02	1.42	0.94	0.11
Particulate Matter	8.46	4.14	2.91	1.92	0.23
Sulfuric Acid Mist	5.17	2.53	1.78	1.18	0.14
Fluorides	8.27E-01	4.05E-01	2.84E-01	1.88E-01	2.26E-02
Lead	3.88E-01	1.90E-01	1.33E-01	8.82E-02	1.06E-02
Mercury	1.94E-01	9.49E-02	6.67E-02	4.41E-02	5.30E-03
Beryllium	1.89E-04	9.23E-05	6.49E-05	4.29E-05	5.16E-06

Notes:

1. Data developed by ISCST modeling the impacts of the SO2 emission then multiplying the ratio of the component emission to the SO2 emission by the maximum SO2 impact to determine the component's impact.
2. Based on 412.5 mmBtu/hr-fired; 49.9 gmsec-1 SO2; vs = 19.62 ms-1
3. Based on 380.4 mmBtu/hr-fired; 46.0 gmsec-1 SO2; vs = 17.06 ms-1; 365 days
4. CO conc. for 1- and 3-hour averages are based on an emission factor of 400 ppmdv @ 12% CO2.
   CO conc. for 8-, 24-hour and annual mean averages are based on an emission factor of 200 ppmdv @ 12% CO2.

TABLE 5 - 9E

IMPACT OF SOLID WASTE AUTHORITY RDF FIRED SPREADER STOKER FURNACES ON AIR QUALITY
BASED ON ISCST MODEL FOR METEROLOGICAL YEARS 1970-1974

HIGHEST 2ND HIGH MODELED CONCENTRATION (ug/m3) FOR THE INDICATED AVERAGING TIMES (1)

	1972 1-HOUR (2) (730M; 040D) (D109; P13)	1970 3-HOUR (2) (1500M; 270D) (D213; P5)	1970 8-HOUR (2) (1500M; 260D) (D211; P2)	1974 24-HOUR (2) (900M; 250D) (D121; P1)	1970 ARITHMETIC MEAN (3) (1300M; 270D)
Carbon Monoxide	160.68	80.82	32.31	17.77	2.89
Nitrogen Dioxide	148.84	74.87	59.87	32.92	5.36
Sulfur Dioxide	85.05	42.78	34.21	18.81	3.06
Chlorides	8.46	4.25	3.40	1.87	0.30
Volatile Organic Compounds	4.25	2.14	1.71	0.94	0.15
Particulate Matter	8.70	4.38	3.50	1.92	0.31
Sulfuric Acid Mist	5.32	2.67	2.14	1.18	0.19
Fluorides	8.51E-01	4.28E-01	3.42E-01	1.88E-01	3.06E-02
Lead	3.99E-01	2.01E-01	1.60E-01	8.82E-02	1.43E-02
Mercury	1.99E-01	1.00E-01	8.02E-02	4.41E-02	7.17E-03
Beryllium	1.94E-04	9.76E-05	7.80E-05	4.29E-05	6.98E-06

Notes:

1. Data developed by ISCST modeling the impacts of the SO2 emission then multiplying the ratio of the component emission to the SO2 emission by the maximum SO2 impact to determine the component's impact.

2. Based on 412.5 mmBtu/hr-fired; 49.9 gmsec-1 SO2; vs = 19.62 ms-1

3. Based on 380.4 mmBtu/hr-fired; 46.0 gmsec-1 SO2; vs = 17.06 ms-1; 365 days

4. CO conc. for 1- and 3-hour averages are based on an emission factor of 400 ppmdv @ 12% CO2.
   CO conc. for 8-, 24-hour and annual mean averages are based on an emission factor of 200 ppmdv @ 12% CO2.

The results of the five years of single source ISCST modeling analyses are summarized by year in Tables 4.5-9 thru 9D. Cumulative 5-year results presented in Table 4.5-9E show that the facility will not produce any impacts that exceed ambient air quality standard or PSD requirements.

The results of five years of ISCST multisource modeling analysis are summarized in Table 4.5-10.

Table 4.5-11 provides an overall summary of both single and multisource impacts as well as background levels and the Air Quality and PSD standards and demonstrates that the facility's air quality impact together with other sources will not exceed ambient air quality or PSD requirements.

TABLE 4.5 - 10

CUMULATIVE IMPACTS OF SOLID WASTE AUTHORITY RDF-FIRED SPREADER STOKER FURNACES AND OTHER MAJOR SOURCES OF SO2 ON AIR QUALITY

BASIS: 3-HR & 24-HR: 412.5 MMBTU/HOUR HEAT INPUT; 49.9 GMSEC-1 SO2
ANNUAL: 380.4 MMBTU/HOUR HEAT INPUT; 46.0 GMSEC-1 SO2

		MAX. ALL SOURCES PEAK CONCENTRATION		RDF SOURCE CONTRIBUTION		LOCATION	
YEAR	AVERAGING TIME	ug/m3	MET. DAY	ug/m3	MET. DAY	METERS	DEGREE
1970	3 HR*	185.5	D118: P1	28.7	D340: P4 #	1800	130
	24 HR*	63.5	D268: P1	16.6	D270: P1 #	1600	270
	ANNUAL	12.7		0.3 #		6000	090
1971	3 HR*	212.9	D282: P8	22.9	D11: P5 #	2000	090
	24 HR*	57.9	D320: P1	7.5	D89: P1 #	2000	140
	ANNUAL	10.5		0.2 #		6000	090
1972	3 HR*	170.7	D79: P7	22.1	D290: P4 #	2000	150
	24 HR*	53.4	D55: P1	14.6	D364: P1 #	1200	270
	ANNUAL	9.8		2.0 #		1100	270
1973	3 HR*	169.9	D364: P7	29.1	D344: P5 #	1700	130
	24 HR*	60.7	D107: P1	16.3	D107: P1 ##	730	270
	ANNUAL	10.1		2.0 #		900	270
1974	3 HR*	210.9	D196: P8	24.4	D316: P4 #	1900	110
	24 HR*	60.0	D74: P1	16.0	D357: P1 #	730	270
	ANNUAL	10.6		0.2 #		6000	080
5 YEAR MAXIMUMS							
1971	3 HR*	212.9	D282: P8	22.9	D11: P5 #	2000	090
1970	24 HR*	63.5	D268: P1	16.6	D270: P1 #	1600	270
1970	ANNUAL	12.7		0.3 #		6000	090

* Maximum highest 2nd high (HSH) impact for all sources
\# Concentration for same location as all sources but not concurrent occurrences
\## Concentration for same location and same met. day

TABLE 4.5 - 11

SUMMARY OF MAXIMUM AIR QUALITY IMPACTS OF THE SOLID WASTE AUTHORITY WASTE TO ENERGY FACILITY

POLLUTANT	AMBIENT AIR QUALITY STANDARD (UG/M3)	PREVENTION OF SIGNIFICANT DETERIORATION (PSD) INCREMENT (UG/M3)	BACKGROUND CONCENTRATION (UG/M3) (2)	PALM BEACH COUNTY WASTE TO ENERGY FACILITY IMPACT (UG/M3) (3)	TOTAL POINT SOURCE IMPACT (UG/M3) (5) TOTAL IMPACT	TOTAL POINT SOURCE IMPACT (UG/M3) (5) RDF(7) CONTRIB.
SULFUR DIOXIDE						
MAX 3-HOUR CONCENTRATION	1300 (1)	512	63	43	213	23
MAX 24-HOUR CONCENTRATION	260 (1)	91	29	19	64	17
ANNUAL ARITHMETIC MEAN	60	20	7	3.1	13	0.3
PARTICULATE MATTER						
MAX 24-HOUR CONCENTRATION	150 (1)	37	107	2		NC
ANNUAL GEOMETRIC MEAN	60	19	43	0.3		NC
NITROGEN DIOXIDE						
ANNUAL ARITHMETIC MEAN	100	NO STANDARD	20	5.4	22.2 (6)	0.5 (6)
OZONE						
DAILY MAX 1-HOUR CONCENTRATION	235 (1)	NO STANDARD	172	NE		NA
LEAD						
QUARTERLY ARITHMETIC MEAN	1.5	NO STANDARD	NM	8.8E-2 (4)	0.06 (6)	1.4E-3 (6)
CARBON MONOXIDE						
MAX 1-HOUR CONCENTRATION	40000 (1)	NO STANDARD	9943	161		NC
MAX 8-HOUR CONCENTRATION	10000 (1)	NO STANDARD	4500	65		NC

NA = NOT APPICABLE; NC = NOT CALCULATED SINCE PROPOSED FACILITY'S IMPACT IS BELOW SIGNIFICANT LEVEL;
NE = NOT EMITTED; NM = NOT MONITORED.

1. Concentration not to be exceeded more than once per year.
2. Background information is based upon data compiled by THE PALM BEACH COUNTY ANNUAL REPORT dated 1983.
3. Detailed modeling results for the proposed source covering 5 years of hourly meteorological data is included in Tables 5 - 9 thru 9E.
4. Quarterly mean not generated. Value cited is 24-hour maximum 2nd-high.
5. Total impacts are inclusive of the proposed source.
6. Total impacts assume same emission factor for all sources applied to annual averages.
7. Concentrations for same location as all sources but not concurrent occurences.

4.6 SUMMARY AND CONCLUSIONS

Extensive air quality impact analyses have been performed based on modifications requested to certain provisions of the air emission permits for the North County Resource Recovery Facility. Modifications include boiler design parameter and emission factors for carbon monoxide, nitrogen oxides, sulfuric acid gas, lead and mercury.

These analyses demonstrate that applicable PSD increments, federal and state air quality standards are not exceeded as a result of the Solid Waste Authority waste-to-energy facility acting alone or in concert with other existing sources.

On an annual basis, all impacts will be less than any established de-minimus levels. In making this determination, a variety of conservative assumptions were employed in the analysis. For example, 100% load operations were assumed for all 8,760 hours of the year: other major sources were assumed to fire oil continuously when in fact natural gas which contain virtually no sulfur is predominantly used: and the other source category includes Florida Power and Light whose operations will be offset by the electrical output of the facility. Because of these and other conservative assumptions, it can be stated with confidence that public health will be protected with an adequate margin of safety.

4.7 REFERENCES

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