

AC 1C

**CDM** Camp Dresser & McKee Inc.

consulting  
engineering  
construction  
operations

1601 Belvedere Road, Suite 211 South  
West Palm Beach, Florida 33406  
Tel: 561 689-3336 Fax: 561 689-9713

**RECEIVED**

SEP 21 1998

BUREAU OF  
AIR REGULATION

September 15, 1998

Mr. A.A. Linero, P.E.  
Administrator  
New Source Review Section  
Florida Department of Environmental Protection  
Twin Towers Office Building  
2600 Blairstone Road  
Tallahassee, FL 32399-2400

Subject: Solid Waste Authority of Palm Beach County  
Request for a Minor Modification-PSD-FL-108 (B)

0990234-002-AC

Dear Mr. Linero:

Transmitted herewith is a check in the amount of \$4,500.00. As indicated in your letter, copy attached, this check is required to process the Solid Waste Authority's request for minor modification of PSD-FL-108(B).

We appreciate the Department's expeditious review of this request. If you should have any questions, please call me at your convenience.

Very truly yours,

CAMP DRESSER & McKEE INC.



Alex H. Makled, P.E., DEE  
Principal Engineer

AHM/bes  
Enclosure

File: 2678-23062-042.PA.FDEP

cc: Mr. Isidore Goldman, P.E. Southeast District DEP w/o enclosure  
Mr. Robert Worobel, SWA w/enclosure  
Mr. Richard Statom, SWA w/enclosure

BS4094.WPD

cc: J. Kahn

**SOLID WASTE AUTHORITY PALM BEACH COUNTRY**

7501 NORTH JOG ROAD  
WEST PALM BEACH, FLORIDA 33412

No. 117976

63-858  
670

CHECK NO.	DATE	AMOUNT
0117976	09/04/98	*****4500.00**

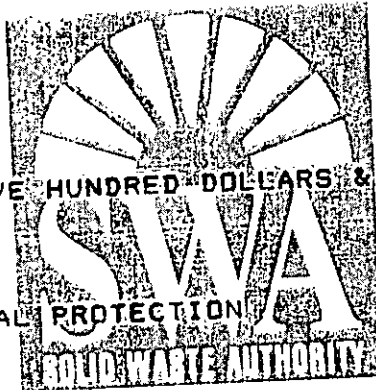
PAY:

FOUR THOUSAND, FIVE HUNDRED DOLLARS & ZERO CENTS

VOID AFTER 90 DAYS

TO THE  
ORDER OF:

DEPT. OF ENVIRONMENTAL PROTECTION  
2600 BLAIR STONE RD  
TALLAHASSEE, FL  
32399-2407



*Donald J. Schubert*  
*Carol M. Munn*

AUTHORIZED SIGNATURE

Barnett Bank of Palm Beach County  
West Palm Beach, FL 33409


⑈ 117976 ⑈ ⑆067008582⑆

1611656535⑈

Memorandum

Florida Department of  
Environmental Protection

TO: Al Linero, P.E.  
Administrator, New Source Review Section

FROM: Steve Palmer, P.E.   
Siting Coordination Office

DATE: August 27, 1998

SUBJECT: Solid Waste Authority of Palm Beach County Request for Modification of Conditions of Certification for North County Resource Recovery Facility; PA 8420E.

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We received this request for modification on August 26, 1998. In the previous modification to these Conditions of Certification we included language that allows automatic modification of the conditions when a federally delegated program permit is modified. Consequently this modification request will be evaluated on the basis of the PSD permit modification review.

Attached is a copy of the documentation submitted in support of the request. If you need additional copies, please let me know. Also, please add me to the mailing list for correspondence relating to the PSD review and send me a proposed review schedule as soon as it is developed.

If I can be of assistance, please call me.

attachment--

xc (w/o attachment): Alex H. Makled, P.E., DEE

RECEIVED

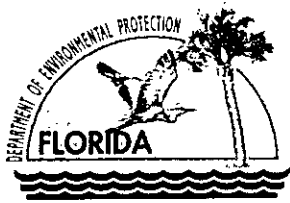
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AIR REGULATION

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AUG 28 1998

BUREAU OF  
AIR REGULATION



# Department of Environmental Protection

Lawton Chiles  
Governor

Twin Towers Office Building  
2600 Blair Stone Road  
Tallahassee, Florida 32399-2400

Virginia B. Wetherell  
Secretary

August 31, 1998

## CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. Alex H. Makled, P.E.  
Principal Engineer  
Camp Dresser & McKee, Inc.  
1601 Belvedere Road, Suite 211 South  
West Palm Beach, Florida 33406

Re: Solid Waste Authority of Palm Beach County  
Request for a Minor Modification - PSD-FL-108(B)

Dear Mr. Makled:

The Bureau of Air Regulation received your request for a revision to the above referenced minor modification. Before we can begin processing your request, we will need a processing fee of \$4,500 pursuant to Rule 62-4.050(4)(a)4 and (4)(a)2.b, F.A.C. We have forwarded a copy of your request to Mr. Joseph Kahn who will begin review upon receipt of the fee.

If you have any questions regarding the construction permit, please call call Mr. Joseph Kahn at (850)921-9519.

Sincerely,

A. A. Linero, P.E.  
Administrator  
New Source Review Section

AAL/kt

cc: J. Kahn

P 265 659 410

US Postal Service

**Receipt for Certified Mail**

No Insurance Coverage Provided.

Do not use for International Mail (See reverse)

PS Form 3800, April 1995

Sent to	Alex Makled
Street & Number	Camp Dresser
Post Office, State & ZIP Code	McKee West Palm Bch, FL 33406
Postage	W P Bch, FL
Certified Fee	
Special Delivery Fee	
Restricted Delivery Fee	
Return Receipt Showing to Whom & Date Delivered	
Return Receipt Showing to Whom, Date, & Addressee's Address	
TOTAL Postage & Fees	\$
Postmark or Date	8-31-98
	PSD-F1-108(B)

Is your RETURN ADDRESS completed on the reverse side?

**SENDER:**

- Complete items 1 and/or 2 for additional services.
- Complete items 3, 4a, and 4b.
- Print your name and address on the reverse of this form so that we can return this card to you.
- Attach this form to the front of the mailpiece, or on the back if space does not permit.
- Write "Return Receipt Requested" on the mailpiece below the article number.
- The Return Receipt will show to whom the article was delivered and the date delivered.

I also wish to receive the following services (for an extra fee):

- Addressee's Address
- Restricted Delivery

Consult postmaster for fee.

3. Article Addressed to:  
 Alex H. Makled, PE  
 Camp Dresser + McKee  
 1001 Belvedere Rd  
 West Palm Bch, FL  
 33406

4a. Article Number  
 P 265 659 410

4b. Service Type  
 Registered  Certified  
 Express Mail  Insured  
 Return Receipt for Merchandise  COD

7. Date of Delivery  
 SEP 02 1998

5. Received By: (Print Name)  
 R Simpson

6. Signature: (Addressee or Agent)  
 X R Simpson

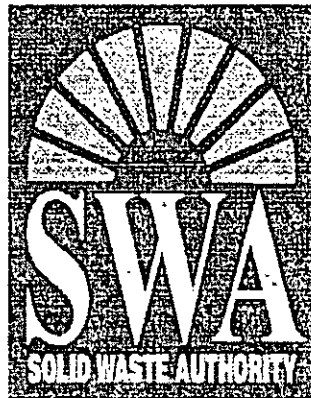
8. Addressee's Address (Only if requested and fee is paid)

Thank you for using Return Receipt Service.

ATTACHMENT D

LANDFILL GAS SYSTEM  
ANNUAL OPERATING REPORT

FILE 2711  
ANNUAL OPERATING REPORT FOR THE  
CLASS I AND CLASS III LANDFILLS AT THE  
NORTH COUNTY RESOURCE RECOVERY FACILITY  
(NCRRF)



**Operating Year Two**

**January 1, 1997 - December 31, 1997**

**Prepared For:**

**The Department of Planning & Environmental Programs**

**Solid Waste Authority  
of  
Palm Beach County, Florida**

**February 1998**

**(Revised May 5, 1998)**

**Prepared By:**

**Adam D. Vernati  
Landfill Gas Technician  
Utilities Department**

**INTRODUCTION:**

The Solid Waste Authority of Palm Beach County (SWA) owns and operates a comprehensive waste disposal facility at its North Jog Road location in Palm Beach County known as the North County Resource Recovery Facility (NCRRF). The Florida Department of Environmental Protection (FDEP) issued permit amendment PSD-FL-108(B) to the waste-to-energy operating permit for the installation and operation of a landfill gas collection system to control emissions from the NCRRF Class I and Class III landfills. Per the specific conditions identified in the PSD-FL-108(B) permit, yearly compliance testing has been performed. The SWA has retained Waste Energy Technology, Inc. (WET) to complete the gas extraction monitoring and analysis of each flare system. The results of the compliance testing and operational data for each of the flare systems as a requirement of the permit are provided in this annual operating report.

**DIRECTOR OF ENGINEERING & PUBLIC WORKS:**

John D. Booth, P.E.

**DIRECTOR OF PLANNING & ENVIRONMENTAL PROGRAMS:**

Marc C. Bruner, Ph.D.

**ASSISTANT DIRECTOR OF PLANT ENGINEERING,  
UTILITIES & FACILITIES MAINTENANCE:**

Robert F. Worobel

**UTILITIES/FACILITIES MAINTENANCE SUPERINTENDENT:**

Ronald G. Schultz



ANNUAL OPERATING REPORT FOR THE  
CLASS I AND CLASS III LANDFILLS AT THE  
NORTH COUNTY RESOURCE RECOVERY FACILITY  
(NCRRF)

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## EXECUTIVE SUMMARY

The Florida Department of Environmental Protection (FDEP) received the Solid Waste Authority's (SWA) request of August 11, 1995, and supporting information to install a landfill gas collection system to control emissions from the Class I and Class III landfills at the North County Resource Recovery Facility (NCRRF). The FDEP acknowledged the request and issued a permit amendment identified as PSD-FL-108(B) on February 20, 1996.

This Annual Operating Report is one of the requirements identified as a new specific condition of the PSD-FL-108(B) permit. The data obtained in this report, along with the results of the specified testing protocol, insures compliance with the operating permit.

The landfill gas collection systems were operated and maintained per design specifications. All gas monitoring and sampling equipment was maintained according to manufacturers instructions. Any calibrations or equipment modifications made to said equipment was logged per permit requirements and has been included as part of the annual report.

The official compliance testing of the Class I and Class III flares was performed by Waste Energy Technologies, Inc. (WET) on November 5, 1997. The results of this testing indicated passing results for both flares and full compliance with PSD-FL-108(B) permit. Reporting will continue on an annual basis.

**ANNUAL OPERATING REPORT FOR THE  
CLASS I AND THE CLASS III LANDFILLS AT THE  
NORTH COUNTY RESOURCE RECOVERY FACILITY  
(NCRRF)**

Specific conditions review of amended Permit No. PSD-F1-108(B) issued by the Florida Department of Environmental Protection on February 20,1996.

We have repeated each of the specific conditions in this Annual Report as shown in bold, followed by the respective comment and /or data.

Specific condition No.1

**This source shall be allowed to operate continuously (i.e., 8760 hours/year).**

Comment /Supporting Data: The operating permit allows for continuous operation of the flares. The Class I flare has operated for 8587 hours and the Class III flare has operated for 8589 hours. Compliance testing on both Class I and Class III flares was conducted on November 5,1997. The data compiled for this report commenced on January 1,1997 through December 31,1997.

Specific condition No. 2

**The utility flare system shall be designed, manufactured, and operated according to U.S Environmental Protection Agency criteria as specified in 40 CFR 60.18 in order to ensure high efficiency combustion of landfill gas at the 98 percent level of destruction of total hydrocarbons with a flame temperature of at or above 1400 degrees Fahrenheit.**

Comment /Supporting Data: The utility flare systems were designed, manufactured, and are operated according to the U.S Environmental Protection Agency's established criteria for open flares, 40 CFR 60.18, in order to ensure high efficiency combustion of landfill gas at the 98 percent level of destruction of total hydrocarbons. The factory installed thermocouples, located within the flame, are used to monitor flare stability.

Specific condition No. 3

**There shall be no visible emissions from any individual flare, except for periods not to exceed a total of five minutes during any two consecutive hours at which visible emissions can be up to 20 percent opacity.**

Comment /Supporting Data: The visible emission evaluation performed during compliance testing ,support and confirm no indication of visible emissions from the flares.

Specific condition No.4

For inventory purposes, the pollutant emission rates from each of the flare systems are:

EMISSIONS RATE

<u>Pollutant</u>	<u>Emission Factors</u>	<u>Pounds /Hour</u>	<u>Tons/Year</u>
NOx	0.07 lb./million Btu	1.67	7.33
VOC	36 lb./million cubic ft.	1.94	8.51
SO <sub>2</sub>	0.002 lb./scf	1.67	7.33
PM <sub>10</sub>	1.69 E-05 lb./scf	0.91	3.99
CO	0.37 lb./million Btu	9.10	39.87

Comment /Supporting Data: The Typographical error of 1.33 tons SO<sub>2</sub> per year in the original permit has been changed to 7.33 tons SO<sub>2</sub> per year in the above table.

Specific Condition No. 5

**This source shall meet the applicable requirements of 40 CFR subpart WWW, NSPS for Municipal Solid Waste Landfills upon adoption by the Florida Department of Environmental Protection; 40 CFR 60.18, General Control Device Requirements; Chapters 62-209 through 297 and 62-4, F.A.C.**

Comment /Supporting Data: The system is designed, manufactured, and operated to meet NSPS regulations for MSW Landfills. Future expansion of the system is presently being evaluated and final as-built drawings will be submitted accordingly.

Specific Condition No. 6

**Compliance with the visible emissions standard shall be determined using EPA Method 22 and shall be for the duration of two hours. Such tests shall be conducted within 60 days of completion of construction and initial start-up operation, and annually thereafter. The required visible emissions test report shall also contain the gas flow rate from the extraction wells and the flare temperature data.**

Comment /Supporting Data: EPA Method 22 testing per permit requirements was conducted on November 5,1997, by Mr. Tom Siergert of South Florida Environmental Services. The test results indicated no visible emissions during the two hour evaluation. The log sheets are included in the compliance report, in Appendix 5. The gas flow rate and temperature data were also recorded per the permit conditions and are in the compliance report as well.

Specific Condition No.7

**Sulfur content of the input gas to any flare shall not exceed 0.65 pounds per hour.**

Comment /Supporting Data: The sulfur content of the flare input gas was tested and determined to be 0.13 pounds per hour for the Class I flare and 0.63 pounds per hour for the Class III flare.

Specific Condition No.8

**An analysis shall be performed to determine the sulfur content of input gas to the flare by the American Society for Testing and Materials (ASTM) test method, D 1072-90, prior to any flare start-up. Additional testing shall be performed on a yearly basis and the results included as part of the facility's annual operating report.**

Comment /Supporting Data: Total sulfur content of input gas to the flare in ppmv was determined by GC analysis EPA 15/ASTM D5504, approved substitute method for ASTM D1072-90. A Tedlar bag served as sample container for the analysis. The results of the total sulfur determination for Class I input gas was 0.13 pounds per hour and Class III was input gas was 0.63 pounds per hour. Testing will continue to be performed on a yearly basis and the results will be included in the annual operating report.

Specific Condition No.9

**Pursuant to Rule 62-296.302(2), F.A.C., Objectionable Odors caused by these sources are prohibited.**

Comment /Supporting Data: The installation, commissioning and continuous operation of landfill gas wells has greatly reduced the presence of objectionable odors produced by the landfill.

Specific Condition No.10

**Total volumetric flow to any flare in the system shall be limited to 900 scfm. Total volumetric flow to the aggregate of the two flares shall be limited to 1800 scfm.**

Comment /Supporting Data: The flow of landfill gas for each of the flare systems are reported in Table No. 1 Through Table No. 17 for this operating year. The average of the quarterly data indicates that the Class I flare flow rate was 738 scfm and the Class III flare flow rate was 392 scfm.

Specific Condition No. 11

Proper devices shall be installed at all wellheads and at the flare station for 1) gas flow volume and gas pressure measurements, 2) gas composition analysis, 3) gas temperature and flame temperature recording, and 4) flow control prior to collection and disposal of the active landfill gases. Such devices shall be properly calibrated and maintained at all times according to manufacturers' written instructions. The checking and recording of the gas flow, temperature, and pressure shall be performed on a quarterly basis for all wells and on a monthly basis for the flare station.

The permittee shall keep a hard copy of the gas extraction monitoring and analysis data, as well as instrumentation history records on site at all times. The data shall be summarized and included as part of the facility's annual operating report. The sources shall comply with recording and record keeping requirements specified in 40CFR 60 Subpart WWW, NSPS for Municipal Solid Waste Landfills.

Comment /Supporting Data: Permanent recording keeping practices were established and maintained since commercial operation began in 1996. A detailed account of well field status has been recorded in the compliance report. A summary of the monthly and quarterly data for 1997 can be found in Table No. 1 through Table No. 17. The instrumentation installed in the Class I and Class III flare were calibrated and maintained according to manufacturers written instructions. Refer to Appendix 1 for the Gas Sampling and Monitoring Equipment Log. Also, Refer to Appendix 2 for the Gas System Modification/Maintenance Log.

Specific Condition No. 12.

The net heating value of the input gas shall be 200 Btu/scf or greater. Compliance with this parameter shall be determined by methodology specified in Paragraph f of 40 CFR 60.18. Samples shall be taken and results reported annually.

Comment /Supporting Data: The net heating value of input gas to the flare in Btu/scf was determined from major gas components by ASTM D1946-77 and ASTM D2382-76 with calculated real gas properties per ASTM D3588-91. A SUMA type canister served as a sample container for the analysis. The results of the net heating value of the input gas for the Class I flare was 490.9 Btu/scf and the Class III flare was 445.5 Btu/scf.

Specific Condition No. 13.

**Actual exit velocity of each flare shall be calculated and reported on an annual basis using methods specified in Paragraph f of 40 CFR 60.18.**

Comment /Supporting Data: The flare tip velocity was determined by EPA method 2C. The Class I exit velocity was 30.10 ft/sec. And the Class III exit velocity was 36.98 ft/sec. Details of the test procedures and supporting calculations can be found in the compliance report.

Specific Condition No. 14.

**The Southeast District office shall be given at least 15 days written notice prior to compliance testing.**

Comment /Supporting Data: The Southeast District office was provided with written notice on October 1, 1997 that compliance testing would take place on October 21, 1997. However, this date was changed and a second notice was sent on October 20, 1997 stating that the compliance testing would be completed on November 5, 1997.

Specific Condition No. 15.

**Prior to placing the flare in service, the pilot gas for the flare shall be fired by propane at 25 scfh (standard cubic feet per hour). The pilot light is not required when the flame is sustained by the landfill gas alone.**

Comment /Supporting Data: The pilot light is ignited as an automatic function of the startup procedures for the flare. Programmed timers and thermocouple sensors provide the controls to safely start the flare. The pilot gas is automatically shut off after stable conditions of the LFG flame are achieved.

**TABLE 1**

**AVERAGE MONTHLY SUMMARY FOR JANUARY 1997**

	<b>CLASS I</b>	<b>CLASS III</b>
Volumetric Flow	774 scfm.	373 scfm.
Inlet Gas Temperature	92 deg. F	81deg. F
Operating Temperature	1068 deg. F.	941 deg. F.
Vacuum Pressure	33.5 in/wc	16.8 in/wc.
Outlet Pressure	0.3 in/wc.	0.1 in/wc.
Composition (%CH4)	60%	49%

**TABLE 2**

**AVERAGE MONTHLY SUMMARY FOR FEBRUARY 1997**

	<b>CLASS I</b>	<b>CLASS III</b>
Volumetric Flow	761 scfm.	347 scfm.
Inlet Gas Temperature	89 deg. F.	81 deg. F.
Operating Temperature	1130 deg. F.	969 deg. F.
Vacuum Pressure	33.9 in/wc.	10.3 in/wc
Outlet Pressure	0.3 in/wc.	0.1 in/wc.
Composition(%CH4)	63%	49%

**TABLE 3**

**AVERAGE MONTHLY SUMMARY FOR MARCH 1997**

	<b>CLASS I</b>	<b>CLASS III</b>
Volumetric Flow	817scfm	345scfm.
Inlet Gas Temperature	91deg.F.	83 deg. F.
Operating Temperature	1102 deg. F.	915 deg. F.
Vacuum Pressure	33.4 in/wc.	9.5 in/wc.
Outlet Pressure	0.3 in/wc.	0.1 in/wc.
Composition (%CH4)	62%	55%



TABLE 4

AVERAGE FIRST QUARTER SUMMARY FOR 1997

	CLASS I	CLASS III
Volumetric Flow	784 scfm.	355 scfm.
Inlet Gas Temperature	91 deg. F.	82 deg. F.
Operating Temperature	1100 deg. F.	942 deg. F.
Vacuum Pressure	33.6 in/wc.	12.2 in/wc.
Outlet Pressure	0.3 in/wc.	0.1 in/wc.
Composition (%CH4)	62%	51%

TABLE 5

AVERAGE MONTHLY SUMMARY FOR APRIL 1997

	CLASS I	CLASS III
Volumetric Flow	752 scfm.	337 scfm.
Inlet Gas Temperature	91 deg. F.	83 deg. F.
Operating Temperature	1126 deg. F.	926 deg. F.
Vacuum Pressure	33.5 in/wc.	5.7 in/wc.
Outlet Pressure	0.3 in/wc.	0.1 in/wc.
Composition(%CH4)	58%	54%

TABLE 6

AVERAGE MONTHLY SUMMARY FOR MAY 1997

	CLASS I	CLASS III
Volumetric Flow	806 scfm.	431 scfm.
Inlet Gas Temperature	95 deg. F.	85 deg. F.
Operating Temperature	1121 deg. F.	934 deg. F.
Vacuum Pressure	31.3 in/wc.	5.9 in/wc.
Outlet Pressure	0.3 in/wc.	0.1 in/wc.
Composition (%CH4)	54%	47%

TABLE 7

AVERAGE MONTHLY SUMMARY FOR JUNE 1997

	CLASS I	CLASS III
Volumetric Flow	716 scfm.	446 scfm.
Inlet Gas Temperature	95 deg. F.	87 deg. F.
Operating Temperature	1066 deg. F.	861 deg. F.
Vacuum Pressure	32.5 in/wc.	7.9 in/wc.
Outlet Pressure	0.4 in/wc.	0.1 in/wc.
Composition (%CH4)	65%	49%

TABLE 8

AVERAGE SECOND QUARTER SUMMARY FOR 1997

	CLASS I	CLASS III
Volumetric Flow	758 scfm.	405 scfm.
Inlet Gas Temperature	94 deg. F.	85 deg. F.
Operating Temperature	1104 deg. F.	907 deg. F.
Vacuum Pressure	32.4 in/wc.	6.5 in/wc.
Outlet Pressure	0.3 in/wc.	0.1 in/wc.
Composition(%CH4)	59%	50%

TABLE 9

AVERAGE MONTHLY SUMMARY FOR JULY 1997

	CLASS I	CLASS III
Volumetric Flow	800 scfm.	506 scfm.
Inlet Gas Temperature	97 deg. F.	88 deg. F.
Operating Temperature	1171 deg. F.	947 deg. F.
Vacuum Pressure	32.9 in/wc.	6.2 in/wc.
Outlet Pressure	0.5 in/wc.	0.1 in/wc.
Composition (%CH4)	63%	51%

**TABLE 10**

**AVERAGE MONTHLY SUMMARY FOR AUGUST 1997**

	<b>CLASS I</b>	<b>CLASS III</b>
Volumetric Flow	757 scfm.	463 scfm.
Inlet Gas Temperature	92 deg. F.	87 deg. F.
Operating Temperature	1170 deg. F.	814 deg. F.
Vacuum Pressure	33.6 in/wc.	5.8 in/wc.
Outlet Pressure	0.5 in/wc.	0.1 in/wc.
Composition (%CH4)	65%	46%

**TABLE 11**

**AVERAGE MONTHLY SUMMARY FOR SEPTEMBER 1997**

	<b>CLASS I</b>	<b>CLASS III</b>
Volumetric Flow	656 scfm.	447 scfm.
Inlet Gas Temperature	90 deg. F.	87 deg. F.
Operating Temperature	1082 deg. F.	883 deg. F.
Vacuum Pressure	34.2 in/wc.	6.0 in/wc.
Outlet Pressure	0.4 in/wc.	0.1 in/wc.
Composition(%CH4)	62%	50%

**TABLE 12**

**AVERAGE THIRD QUARTER SUMMARY FOR 1997**

	<b>CLASS I</b>	<b>CLASS III</b>
Volumetric Flow	738 scfm.	472 scfm.
Inlet Gas Temperature	93 deg. F.	87 deg. F.
Operating Temperature	1141 deg. F.	881 deg. F.
Vacuum Pressure	33.6 in/wc.	6.0 in/wc.
Outlet Pressure	0.5 in/wc.	0.1 in/wc.
Composition (%CH4)	63%	49%

TABLE 13

AVERAGE MONTHLY SUMMARY FOR OCTOBER 1997

	CLASS I	CLASS III
Volumetric Flow	552 scfm.	423 scfm.
Inlet Gas Temperature	88 deg.F.	87 deg. F.
Operating Temperature	1093 deg. F.	915 dg. F.
Vacuum Pressure	34.0 in/wc.	6.6 in/wc.
Outlet Pressure	0.5 in/wc.	0.5 in/wc.
Composition (%CH4)	59%	47%

TABLE 14

AVERAGE MONTHLY SUMMARY FOR NOVEMBER 1997

	CLASS I	CLASS III
Volumetric Flow	625 scfm.	280 scfm.
Inlet Gas Temperature	89 deg. F.	82 deg. F.
Operating Temperature	1068 deg. F.	985 deg. F.
Vacuum Pressure	31.5 in/wc.	8.6 in/wc.
Outlet Pressure	0.5 in/wc.	0.5 in/wc.
Composition(%CH4)	64%	48%

TABLE 15

AVERAGE MONTHLY SUMMARY FOR DECEMBER 1997

	CLASS I	CLASS III
Volumetric Flow	833 scfm.	298 scfm.
Inlet Gas Temperature	85 deg. F.	76 deg.F.
Operating Temperature	1071 deg. F.	964 deg. F.
Vacuum Pressure	29.9 in/wc.	8.2 in/wc.
Outlet Pressure	0.4 in/wc.	0.5 in/wc.
Composition (%CH4)	62%	47%

**TABLE 16**

**AVERAGE FOURTH QUARTER SUMMARY FOR 1997**

	<b>CLASS I</b>	<b>CLASS III</b>
Volumetric Flow	670 scfm.	334 scfm.
Inlet Gas Temperature	87 deg. F.	82 deg. F.
Operating Temperature	1077 deg. F.	955 deg. F.
Vacuum Pressure	31.8 in/wc.	7.8 in/wc
Outlet Pressure	0.5 in/wc.	0.5 in/wc.
Composition (%CH4)	62%	47%

**TABLE 17**

**AVERAGE OF QUARTERLY SUMMARIES FOR 1997**

	<b>CLASS I</b>	<b>CLASS III</b>
Volumetric Flow	738 scfm.	392 scfm.
Inlet Gas Temperature	91 deg. F.	84 deg. F.
Operating Temperature	1106 deg. F.	921 deg. F.
Vacuum Pressure	32.9 in/wc.	8.1 in/wc.
Outlet Pressure	0.4 in/wc.	0.2 in/wc
Composition(%CH4)	62%	49%

**KEY:**

**FOR LOCATION OF TEST/MONITORING POINTS**

**TABLES 1-17**

- :Volumetric Flow Measures @ CP-1
- :Inlet Gas Temperatures Measured @ T1
- :Operating Temperature Measured @CP-1
- :Vacuum Pressure sampled @ FE
- :Composition % of CH4 Sampled @ FE

Sample port/instrumentation locations can be found on the blower/flare skid details provided in Appendix 3 for Class I and Appendix 4 for Class III.

## APPENDIX 1

### Gas Sampling and Monitoring Equipment Log

#### Calibrations:

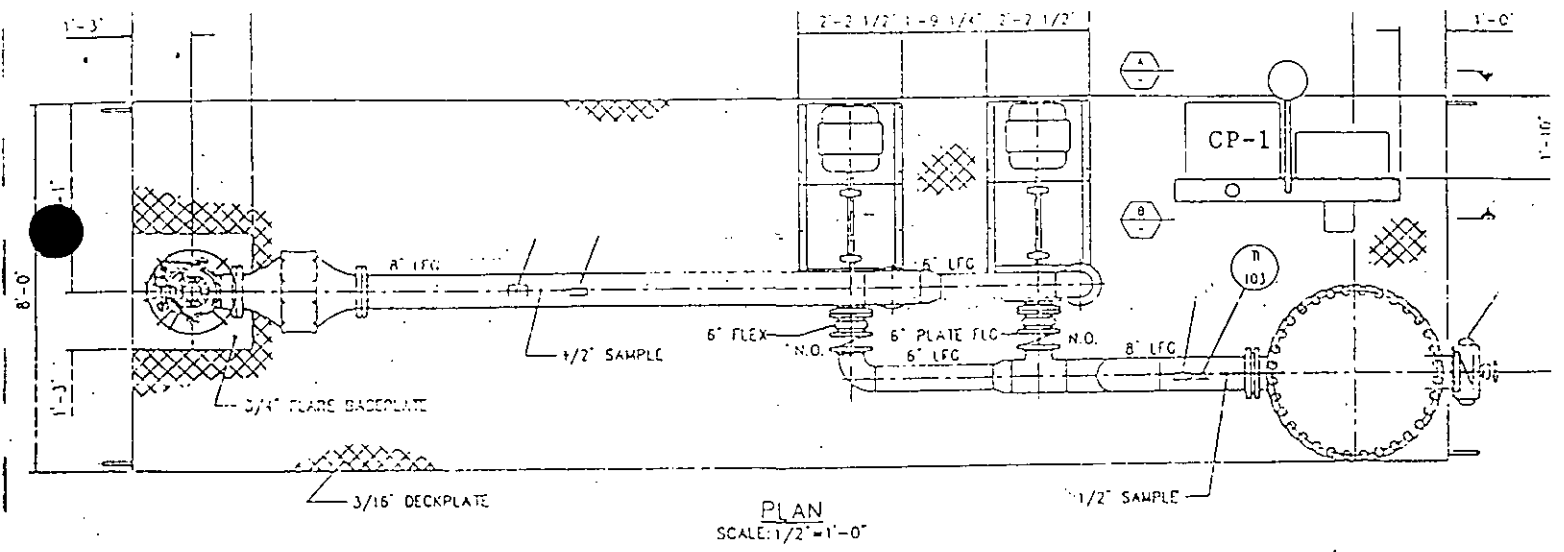
- 1/24/97—performed calibration on Gas Tech Model NP204 gas meter
- 2/27/97-- performed calibration on Gas Tech Model NP204 gas meter
- 3/19/97-- performed calibration on Gas Tech Model NP204 gas meter
- 4/3/97 -- performed calibration on Gas Tech Model NP204 gas meter
- 5/6/97 -- performed calibration on Gas Tech Model NP204 gas meter
- 6/20/97-- performed calibration on Gas Tech Model NP204 gas meter
- 7/23/97-- performed calibration on Gas Tech Model NP204 gas meter
- 8/15/97-- performed calibration on Gas Tech Model NP204 gas meter
- 9/8/97 -- performed calibration on Gas Tech Model NP204 gas meter
- 9/23/97—switched from Gas Tech NP204 gas meter to LandTec Model GEM 500 multigas meter.  
--performed calibration on LandTec Model GEM 500.
- 10/9/97 -- performed calibration on LandTec Model GEM 500
- 11/6/97 -- performed calibration on LandTec Model GEM 500
- 11/17/97- Checked calibration of Class I and Class III gas flowmeters, Model DPR-100.  
--No adjustment was necessary.
- 12/8/97 -- performed calibration on LandTec Model GEM 500

## APPENDIX 2

### GAS SYSTEM MODIFICATIONS/MAINTENANCE LOG

#### Modifications:

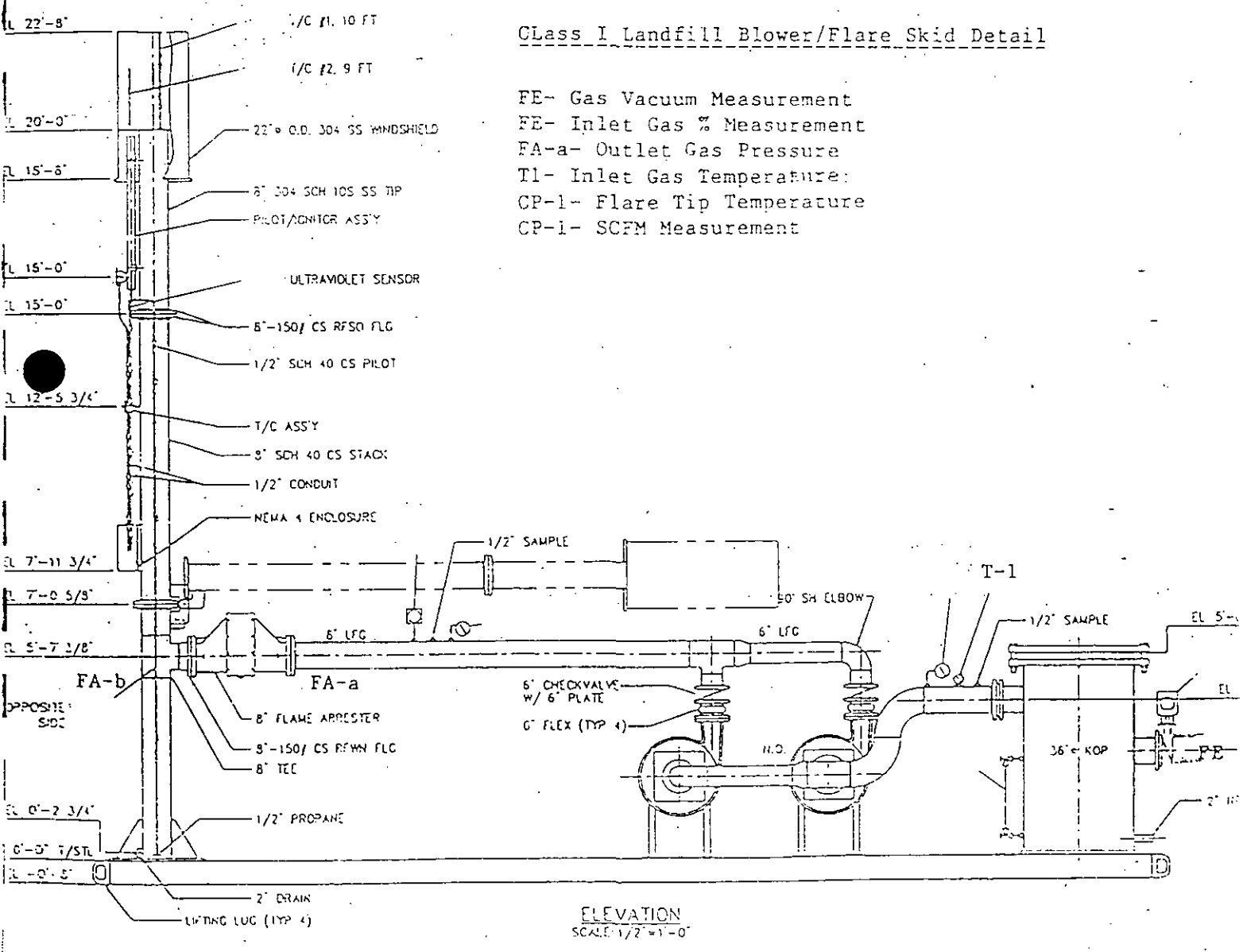
- 3/4/97 --Adjusted Class I flare skid propane regulator to 7 psi. per manufacturers instructions.
- 3/12/97 --Removed ½ inch pilot nozzle from the propane discharge and drilled out the center of the nozzle from 1/16 inch up to 1/8 inch. Reinstalled pilot nozzle.  
--Raised gas probe #2, located on the Class III landfill, 7 feet.
- 6/13/97 --Raised drip leg #4, located on the Class I landfill, 5 feet.
- 7/9/97 --Coated the Class III condensate sump pump with anti-corrosive sealant.
- 8/15/97 --Installed a 4 inch sampling plug in the Class I condensate sump.
- 8/18/97 --Installed a 4 inch sampling plug in the Class III condensate sump.
- 9/22/97 --Raised gas probe #4, located on the Class III landfill, 10 feet.
- 11/06/97--Drip leg #2, located on the Class I landfill, was excavated and condensate drainage was improved in the drip leg.  
--Condensate knock out #4, located on the Class I landfill, was raised 5 feet.
- 12/17/97--Clear PVC sight glasses were installed on the Class I and Class III flame arrestor and flare stack condensate drains.



PLAN  
SCALE: 1/2" = 1'-0"

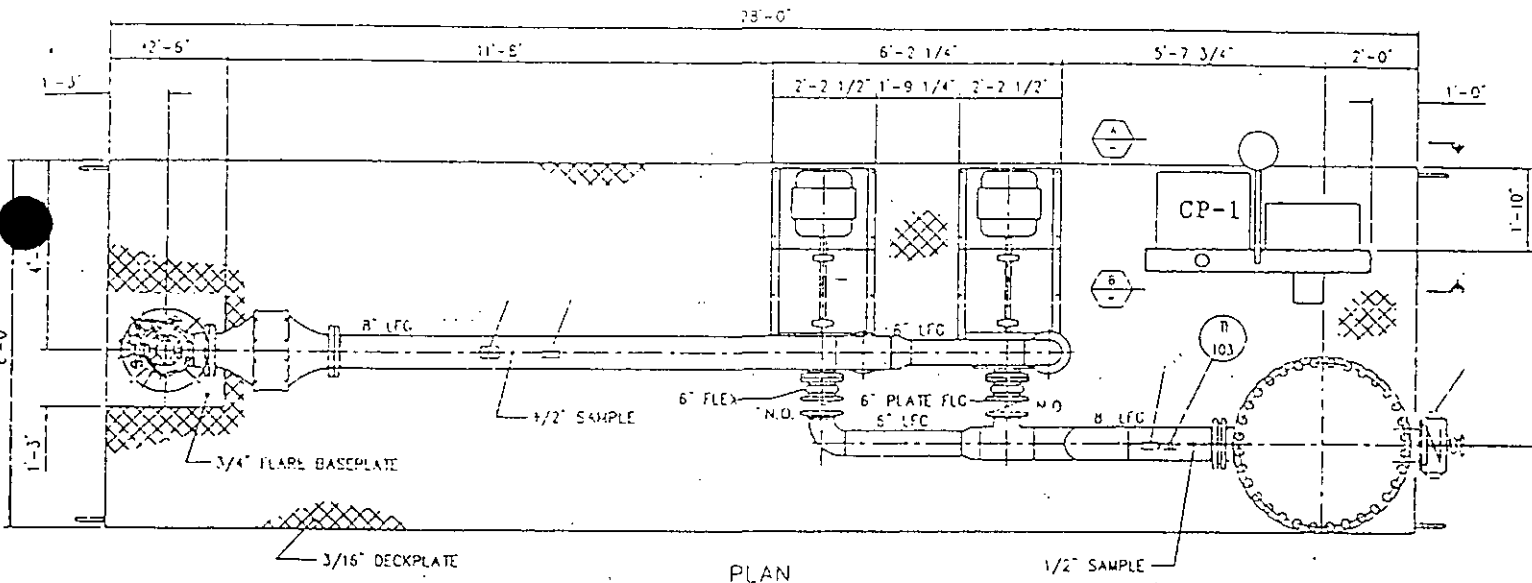
Class I Landfill Blower/Flare Skid Detail

- FE- Gas Vacuum Measurement
- FE- Inlet Gas % Measurement
- FA-a- Outlet Gas Pressure
- TI- Inlet Gas Temperature
- CP-1- Flare Tip Temperature
- CP-1- SCFM Measurement



ELEVATION  
SCALE: 1/2" = 1'-0"

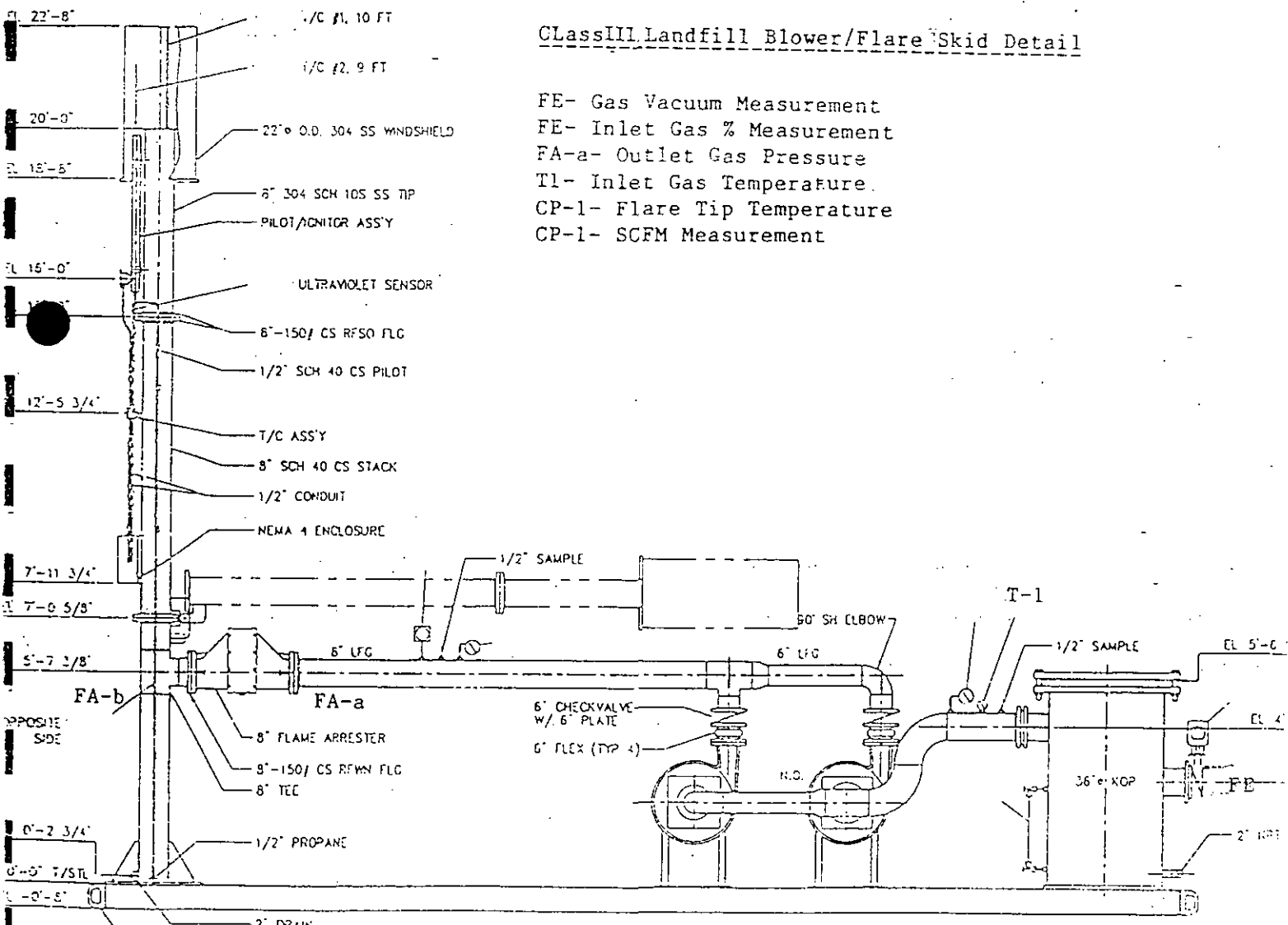




PLAN  
SCALE: 1/2" = 1'-0"

Class III Landfill Blower/Flare Skid Detail

- FE- Gas Vacuum Measurement
- FE- Inlet Gas % Measurement
- FA-a- Outlet Gas Pressure
- T1- Inlet Gas Temperature
- CP-1- Flare Tip Temperature
- CP-1- SCFM Measurement



ELEVATION  
SCALE: 1/2" = 1'-0"

---

# LANDFILL GAS MANAGEMENT SYSTEM ANNUAL OPERATIONAL TESTING REPORT - 1997

---

NORTH COUNTY RESOURCE RECOVERY FACILITY  
Class I and Class III Landfills  
Palm Beach County, Florida

PREPARED FOR:  
The Solid Waste Authority of Palm Beach County  
West Palm Beach, Florida

WET PROJECT No: 97433  
January 8, 1998  
Revised May 5, 1998



ENVIRONMENTAL MANAGEMENT  
ENGINEERS & CONTRACTORS

FORT WALTON BEACH, FLORIDA



11 Tupelo Avenue, S.E. • Fort Walton Beach, Florida 32548-5414  
Tel (850) 243-0033 • Fax (850) 243-0077

**LANDFILL GAS MANAGEMENT SYSTEM  
ANNUAL OPERATIONAL TESTING REPORT - 1997  
FOR  
NORTH COUNTY RESOURCE RECOVERY FACILITY  
CLASS I AND CLASS III LANDFILLS  
PALM BEACH COUNTY, FLORIDA**

January 8, 1998  
Revised May 5, 1998

Prepared for:

Solid Waste Authority of Palm Beach County  
7501 North Jog Road  
West Palm Beach, Florida 33412  
(561) 640-4000

Prepared by:

Waste Energy Technology, Inc.  
11 Tupelo Avenue, SE  
Fort Walton Beach, Florida 32548  
(850) 243-0033

WET Project No: 97433

LANDFILL GAS MANAGEMENT SYSTEM  
ANNUAL OPERATIONAL TESTING REPORT - 1997  
FOR  
NORTH COUNTY RESOURCE RECOVERY FACILITY  
CLASS I AND CLASS III LANDFILLS  
PALM BEACH COUNTY, FLORIDA

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Appendix 6: Trace Gas Analysis Study - Fixed Gases, by Quanterra	
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L:\PROJECTS\swaom433\433FlareRep2.wpd



## INTRODUCTION

The Solid Waste Authority of Palm Beach County (SWA) operates a comprehensive waste disposal facility at its Jog Road location in Palm Beach County, known as the North County Resource Recovery Facility (NCRRF) of Palm Beach County. The Florida Department of Environmental Protection (FLDEP) issued permit amendment PSD-FL-108(B) to the landfill's operating permit for installation and operation of a landfill gas collection system to control emissions from the NCRRF Class I and Class III landfills. SWA retained Waste Energy Technology, Inc. (WET) to perform the annual operational testing as specified in the above referenced FLDEP permit amendment Specific Conditions. A copy of the Permit Specific Conditions, dated February 20, 1996 is included as Appendix 1.

## PERMIT SPECIAL CONDITIONS REVIEW

### **Annual Monitoring Data Recording**

Permit Special Conditions 6, 8, 12, 13, and 14 address the annual operational testing requirements. These operational parameters require the field collection of gas samples and laboratory analysis, and the evaluation of results against PSD permit limit values. These are addressed in the Operational Assessment section below.

## OPERATIONAL ASSESSMENT

LFG extraction monitoring of the Class I and Class III landfill gas collection systems was accomplished during the week of November 5 & 6, 1997. The FLDEP Southeast District office was given written notice of this scheduled compliance testing on October 20, 1997, satisfying the permit special condition 14 requirement. WET arrived onsite November 4, 1997, to verify steady state flow conditions and methane concentrations in preparation for permit compliance gas sampling and flow analysis. On November 5, 1997, South Florida Environmental Services (SFES), under a subcontract to WET, performed the visible emissions testing on the Class I & Class III Flares. Wet collected field data and gas samples to perform the following analysis for compliance with the annual permit specific conditions:

- |                            |  |
|----------------------------|--|
| Specific Condition No. 6:  | Compliance Testing of Visible emissions              |
| Specific Condition No. 8:  | Compliance Testing of Input Gas Total Sulfur Content |
| Specific Condition No. 12: | Compliance Testing of Input Gas Net Heating Value    |
| Specific Condition No. 13: | Compliance Testing of Flare Tip Exit Velocity        |

Concurrently with the collection of this field data and gas samples, WET recorded LFG system operating data to include 1) Wellhead gas composition (percent methane), gas temperatures, and applied well pressures, and available header pressures, and 2) Blower Flare Station gas composition (percent methane), gas temperatures, and blower inlet and outlet available pressures.

Results of the WET field and laboratory analysis for the annual specific conditions are presented in the report titled "Utility Flare System Compliance Study", dated November 5, 1997, and are included as Appendix 3 to this document. Results of the corresponding field operational data gathered by WET, is included in Appendix 4, with project testing photographs shown in Appendix 5. The Trace Gas Analyses are included in Appendix 6 (Sulfur content) & 7 (Fixed gases). The Smoke Emission Test report is detailed in Appendix 8. A summary of the field and laboratory testing results are presented in Table 1, and a summary of the special permit condition test methods, permit limits, and measured results is presented in Table 2.

## CONCLUSIONS

Based on the results of the study, the NCRRF Class I and Class III landfill gas collection and flaring systems are currently operating in compliance with the FLDEP permit PSD-FL-108(B).

**Table 1: Flare Inlet Gas Testing - Summary of Testing Results**

November 5, 1997	Class I	Class III
Pipe Duct Diameter	7.981 in.	7.981 in.
Pipe Duct Area	0.3474 sf	0.3474 sf
Pipe Duct Average Gas Velocity, ft/sec	35.1ft/sec	22.0 ft/sec
Average Gas Temperature, Deg. F	112.5 F	102.3 F
Average Gas Moisture, % volume	4.3 %	3.9%
Average Gas Pressure, in. Hg	30.26 in Hg	30.24 in HG
Barometric Pressure, in. Hg	30.20 in Hg	30.20 in Hg
Average Gas Volumetric Flow Rate:		
@ Field Conditions, acfm	731.6 acfm	458.6 acfm
@ Standard Conditions, scfm	692.6 scfm	435.6 scfm
@ Standard Conditions, dscfm	653.2 dscfm	418.6 dscfm
Flare Tip Diameter, inches	3.329 in.	6.00 in.
Flare Tip Area, sf	0.3784 sf	0.1963 sf
Flare Tip Exit Velocity, fps	30.10 fps	36.96 fps
Net Heating Value, Btu/scf	490.9 Btu/scf	445.5 Btu/scf
Maximum Permitted Exit Velocity, fps	101.0 fps	88.96 fps
Gas Composition by Laboratory Analysis: For determination of Net Heating Value		
Methane, % by volume	54.00%	49.00%
Carbon Dioxide, % by volume	24.00%	34.00%
Nitrogen, % by volume	14.00%	14.00%
Oxygen, % by volume	4.50%	1.90%
Gas Composition Field Analysis		
Methane, % by volume	55%	50%

**Table 2: Flare Inlet Permit Testing - Summary of Permit Requirements and Results**

	Permit Test Method	Permit Limits	Measured Results			
Flare Inlet Test location			Class I	Pass/Fail	Class III	Pass/Fail
Date			11/05/97		11/05/97	
Flare Flow Rate (SC#10)	Pitot Tube	900 scfm maximum	682.6 scfm	Pass	435.6 scfm	Pass
Net Heating Value (SC#12)	40 CFR 60.18(f) i.e. ASTM D1946-77 and ASTM D2382-76	200 Btu/scf minimum	490.9 Btu/scf	Pass	445.5 Btu/scf	Pass
Flare Tip Exit Velocity (SC#13)	40 CFR 60.18(f) i.e. EPA Method 2C	60 fps @ 300 Btu/scf 120 fps @ 600 Btu/scf				
-Class I		101.0 @ 490.9 Btu/scf	30.10 ft/sec	Pass		
-Class III		88.96 @ 445.5 Btu/scf			36.98ft/sec	Pass
Sulfur Content (SC#8)	ASTM D1072-90 Substituted EPA15/ASTM D5504	0.65 lbs/hr maximum	0.13 lbs/hr	Pass	0.63 lbs/hr	Pass
Visible Emissions (SC#6)	EPA Method 22	20% opacity maximum during 2 hour observation	0% opacity	Pass	0% opacity	Pass
Flow Rate per Thermal Flow Meter			684 scfm		418 scfm	
Flame Detection Thermocouple Temperature, Deg F			1140 F		966 F	

# APPENDIX SECTION 1

NCRRF Permit No: PSD-FL-108(B)





# Department of Environmental Protection

Lawton Chiles  
Governor

Twin Towers Office Building  
2600 Blair Stone Road  
Tallahassee, Florida 32399-2400  
February 20, 1996

Virginia B. Wetherell  
Secretary

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. David B. Lowe  
Solid Waste Authority of  
Palm Beach County  
7501 North Jog Road  
West Palm Beach, Florida 33412

Dear Mr. Lowe:

Re: North County Resource Recovery Facility (NCRRF)  
PSD-FL-108(B), Solid Waste Authority of Palm Beach County

The Department received your request of August 11, 1995, and supporting information to install a landfill collection system to control emissions from the Class I and Class III landfills at the North County Resource Recovery Facility (NCRRF). This request will require adding new specific conditions to the above referenced PSD permit. This permit is amended as follows:

**NEW SPECIFIC CONDITIONS:**

1. This source shall be allowed to operate continuously (i.e., 8760 hours/year).
2. The utility flare system shall be designed, manufactured, and operated according to U.S. Environmental Protection Agency criteria as specified in 40 CFR 60.18, in order to ensure high efficiency combustion of landfill gas at the 98% level of destruction of total hydrocarbons, with a flame temperature of at or above 1400°F.
3. There shall be no visible emissions from any individual flare, except for periods not to exceed a total of five minutes during any two consecutive hours at which visible emissions can be up to 20 percent opacity.
4. For inventory purposes, the pollutant emission rates from each of the flare systems are:

**EMISSION RATE**

Pollutant	Emission Factor	Pounds/Hour	Tons/Year
NOx	3.07 lb/million Btu	1.67	7.33
VOC	36 lb/million ft <sup>3</sup>	1.94	8.51
SO2	0.002 lb/scf	1.67	1.33
PM10	1.59 E-05 lb/scf	0.91	3.99
CO	0.37 lb/million Btu	9.10	39.87

5. This source shall meet the applicable requirements of 40 CFR Subpart WWW, NSPS for Municipal Solid Waste Landfills upon adoption by the Florida Department of Environmental Protection; 40 CFR 60.12, General Control Device Requirements; Chapters 62-209 through 297 and 62-4, F.A.C.
6. Compliance with the visible emissions standard shall be determined using EPA Method 22 and shall be for the duration of 2 hours. Such tests shall be conducted within 60 days of completion of construction and initial startup operation, and annually thereafter. The required visible emissions test report shall also contain the gas flow rate from the extraction wells and the flare temperature data.
7. Sulfur content of the input gas to any flare shall not exceed 0.65 pounds per hour.

Mr. David B. Lowe  
Page Two  
February 20, 1996

8. An analysis shall be performed to determine the sulfur content of input gas to the flare, by the American Society for Testing and Materials (ASTM) test method, D 1072-90, prior to any flare startup. Additional tests shall be performed on a yearly basis, and results included as part of the facility's annual operating report.

9. Pursuant to Rule 62-296.320(2), F.A.C., Objectionable Odors caused by these sources are prohibited.

10. Total volumetric flow to any flare in the system shall be limited to 900 scfm. Total volumetric flow to the aggregate of the two flares shall be limited to 1800 scfm.

11. Proper devices shall be installed at all wellheads, and at the flare station for 1) gas flow volume and gas pressure measurements, 2) gas composition analysis, 3) gas temperature and flame temperature recording, and 4) flow control, prior to the collection and disposal of the active landfill gases. Such devices shall be properly calibrated and maintained at all times, according to manufacturers' written instructions. The checking and recording of the gas flow, temperature, and pressure, shall be performed on a quarterly basis for all wells and on a monthly basis for the flare station.

The permittee shall keep a hard copy of the gas extraction monitoring and analysis data, as well as instrumentation history records, on site at all times. The data shall be summarized and included as part of the facility's annual operating report. These sources shall comply with recording and recordkeeping requirements specified in 40 CFR 60 Subpart WWW, NSFS for Municipal Solid Waste Landfills.

12. The net heating value of the input gas shall be 200 Btu/scf or greater. Compliance with this parameter shall be determined by methodology specified in paragraph f of 40 CFR 60.18. Samples shall be taken, and results reported annually.

13. Actual exit velocity of each flare shall be calculated and reported on an annual basis, using methods specified in paragraph e of 40 CFR 60.18.

14. The Southeast District office shall be given at least 15 days written notice prior to compliance testing.

15. Prior to placing the flare in service, the pilot gas for the flare shall be fired by propane at 25 scfh (standard cubic feet per hour). The pilot light is not required when the flame is sustained by the landfill gas alone.

A copy of this letter shall be filed with the PSD-FL-108, and shall become a part of the permit.

Sincerely,



Howard L. Rhodes  
Director  
Division of Air Resources  
Management

HLR/ch/t

cc: J. Kahn, SED  
J. Bunyak, NPS  
A. Makled, P.E.  
J. Harper, EPA  
H. Owen, PPS  
J. Koerner, PBCHU

Attachments available upon request:

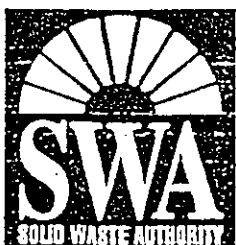
Application to construct/modify the NCRRF facility submitted on August 11, 1995.

Additional correspondence submitted on October 30, November 3 and December 4, 1995.

## APPENDIX SECTION 2

FLDEP Permit Compliance Testing Notification

FILE # 44,100



YOUR PARTNER FOR  
SOLID WASTE SOLUTIONS

MEMORANDUM

September 19, 1997

TO: Michael P. Voich  
FROM: Robert F. Worobel *RFW*  
RE: LFG Flare Compliance Testing

I have coordinated the testing of our Site 7 landfill flares with Waste Energy Technology. The plans will be to conduct compliance testing on both "candle type" flare systems per the specific conditions in the PSD-FL-108 (B) permit. The testing is anticipated to take a full day to complete and has been scheduled to start on the morning of October 21, 1997. The balance of the testing program will be conducted on October 22, 1997, if required.

Please notify the proper local, state, and federal authorities and all SWA personnel concerned with this testing.

If you have any questions or require additional information, please contact me.

RFW/kal  
cc: J. Booth  
R. Statom  
K. Kinley  
R. Schultz  
File #22,700



YOUR PARTNER FOR  
SOLID WASTE SOLUTIONS

**FILE COPY**

October 1, 1997

Florida Department of Environmental Protection  
Southeast District  
Post Office Box 15425  
West Palm Beach, FL 33416

Attn: Mr. Andrew Neita

RE: North County Solid Waste Disposal Facility (NCSWDF)  
PSD-FL-108(B) issued February 20, 1996; amended June 25, 1996

Dear Mr. Neita:

This letter serves to provide the FDEP Southeast District office with written notice that the SWA plans to perform compliance testing for the Class I and Class III landfill gas collection systems as required by the PSD-FL-108(B) permit. The testing program is scheduled to start on October 21, 1997 and is anticipated to take a full day to complete. The balance of the testing program will be conducted on October 22, 1997, if required.

If you have any questions or comments regarding the testing program, please contact me at (407) 640-4000 ext. 4614.

Sincerely,

Michael P. Voich  
Environmental Specialist

cc: Mr. John Booth, SWA  
Mr. Richard Statom, SWA  
Mr. Bob Worobel, SWA  
Mr. Marc Bruner, SWA



YOUR PARTNER FOR  
SOLID WASTE SOLUTIONS

**FILE COPY**

October 20, 1997

Florida Department of Environmental Protection  
Southeast District  
Post Office Box 15425  
West Palm Beach, FL 33416

Attn: Mr. Tom Tittle

RE: North County Solid Waste Disposal Facility (NCSWDF)  
PSD-FL-108(B) issued February 20, 1996; amended June 25, 1996

Dear Mr. Tittle:

This letter serves to provide the FDEP Southeast District office with written notice that the NCSWDF Landfill Gas Collection System Compliance Testing scheduled for October 21<sup>st</sup> and 22<sup>nd</sup>, 1997 has been rescheduled for November 5<sup>th</sup>, 1997.

If you have any questions or comments regarding the testing program, please contact me at (561) 640-4000 ext. 4614.

Sincerely,

Michael P. Voich  
Environmental Specialist

cc: Mr. Andrew Neita, FDEP  
Mr. John Booth, SWA  
Mr. Richard Statom, SWA  
Mr. Bob Worobel, SWA  
Mr. Marc Bruner, SWA

# APPENDIX SECTION 3

Utility Flare System Compliance Study

**UTILITY FLARE SYSTEM COMPLIANCE STUDY**

Performed by

**WASTE ENERGY TECHNOLOGY, INC.**

At the

**Solid Waste authority of Palm Beach County**

**Class I and Class III Flare Stack**

**West Palm Beach, Florida**

**November 5, 1997**



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## UTILITY FLARE SYSTEM COMPLIANCE STUDY

Performed by

**WASTE ENERGY TECHNOLOGY, INC.**

At the

**Solid Waste Authority of Palm Beach County**

**Class I and Class III Flare Stack**

**West Palm Beach, Florida**

**November 5, 1997**

---

### 1.0 INTRODUCTION

A utility flare system test program was performed by Waste Energy Technology, Inc. (WET), on the Southwest, Class I landfill area and Northeast, Class III landfill area Flare Stacks of Solid Waste Authority of Palm Beach County (SWA) in West Palm Beach, Florida on November 5, 1997. The tests were authorized by Solid Waste Authority of Palm Beach County and performed by Waste Energy Technology, Inc.

The purpose of this test program was to determine the landfill gas flare net heating value and sulfur content, flare tip exit velocity and flare visible emissions during normal operating conditions.

The tests were conducted by Scott Fowler of WET. Robert Worobel and Adam Vernati of Solid Waste Authority of Palm Beach County provided assistance and coordinated plant operating conditions during the test program:

## 2.0 DISCUSSION OF RESULTS

The following table summarizes the results for maximum permitted velocity, opacity, total sulfur content, net heat value and flare stack exit velocities.

TABLE 2.1

	Class I	Class III
<b>Parameter</b>		
<b>Net Heating Value</b>		
Btu/scf	490.9	445.5
MJ/scm	18.33	16.63
<b>Maximum Permitted Velocity</b>		
ft/sec	101.0	88.96
m/sec	30.67	27.11
<b>Exit Velocity</b>		
ft/sec	30.10	36.98
m/sec	9.16	11.27
<b>*Sulfur Content</b>		
lbs/hr	0.13	0.63
grams/hr	58.97	285.77
<b>Opacity</b>		
%	0	0

L:\PROJECTS\WAQM433\TABLE2.WB3

\* Flare inlet total sulfur input rate.

A summary of test conditions can be found in Table 6.1. Visible emission test results and major components have been appended. No problems were encountered with the testing equipment during the course of the test program. Source operation appeared normal during the entire test program.

### 3.0 TEST PROCEDURES

All testing, sampling, analytical, and calibration procedures used for this test program were performed as described in the Code of Federal Regulations, Title 40, Part 60, Appendix A (40CFR60), Methods 1 through 4 and 22 and the latest revisions thereof. Where applicable, the Quality Assurance Handbook for Air Pollution Measurement Systems, Volume III, Stationary Source Specific Methods, United States Environmental Protection Agency (USEPA) 600/4-77-027b was used to determine the precise procedures.

Sample recovery was performed at the test site by WET. Samples were transported to an approved lab for analysis.

Copies of all sample analysis sheets are appended to this report.

Calculations were performed by computer and by hand; an explanation of the nomenclature and calculations along with the complete test results are appended. Also appended are the calibration data and copies of the raw field data sheets.

Raw data are kept on file at the WET offices in Fort Walton Beach, Florida. All samples from this test program (not already used in analysis) will be retained for 60 days after the submittal of the report, after which they will be discarded unless WET is advised otherwise.

#### 3.1 Net Heating Value Determination

Net heating value of input gas to the flare in Btu/scf was determined from major gas components by ASTM D1946-77 and ASTM D2382-76 with calculated real gas properties per ASTM D3588-91. A SUMA-type cannister served as a sample container for the analysis.

#### 3.2 Total Sulfur Determination

Total sulfur content of input gas to the flare in ppmv was determined by GC analysis EPA15/ASTM D5504, approved substitute method for ASTM D1072-90. A Tedlar bag served as sample container for the analysis.

#### 3.3 Volumetric Flowrate Determination

In order to determine the total sulfur inlet emission rate on a lbs/hr basis, the gas velocity and volumetric flowrate were determined using reference Method 2.

Velocity pressures were determined by traversing the test locations with a standard pitot tube. Temperatures were measured using a K-type thermocouple with a calibrated digital temperature indicator. The molecular weight and moisture content of the gases were determined to permit the calculation of the volumetric flowrate. Sampling points utilized were determined using Method 1, 40CFR60.

#### 3.4 Moisture (H<sub>2</sub>O) Determination

Determining the moisture content in the gas stream is necessary to calculate the stack gas volumetric air flow on a dry basis and the total sulfur inlet emission rate in lbs/hr. For this purpose, WET used the wet bulb/dry bulb method.

1. American National Standards Institute (ANSI)/American Standard Testing Method (ASTM) Method E337-62 reapproved 1979, wet bulb/dry bulb measurements were made at each flare stack inlet location during each sampling run and the water vapor content was calculated as follows:

$$Bws = \left[ \frac{e' - AP(t - t')}{P} \right]$$

Where:

- $e'$  = saturated vapor pressure of water, in Hg, at the wet bulb temperature ( $t'$ )
- $A$  =  $3.67 \times 10^{-4} [1 + 0.00064 (t' - 32)]$
- $P$  = absolute pressure, in. Hg, in the duct
- $t$  = dry bulb temperature, °F
- $t'$  = wet bulb temperature, °F

### 3.5 Visible Emissions Determination

Reference Method 22, 40CFR60, procedures were used to make a visual determination of visible emissions from the flare stack. The method specifies that the qualified observer stand at a distance sufficient to provide a clear view of the emissions with the sun not directly in the observer's eyes.

Opacity observations were made at the point of greatest opacity in the portion of the plume where condensed water vapor was not present. Observations were made at 15-second intervals for the duration of the time period.

The observer, Tom Seigert (South Florida Environmental Services), meets the certification requirements of Method 22.

## 4.0 QUALITY ASSURANCE PROCEDURES

Waste Energy Technology, Inc. recognizes the previously described reference methods to be very technique oriented and have attempted to minimize all factors which can increase error by implementing its Quality Assurance Program into every segment of its testing activities.

### 4.1 CALIBRATION PROCEDURES

#### PITOT TUBES

The pitot tubes used during this test program are fabricated according to the specification described and illustrated in the Code of Federal Regulations, Title 40, Part 60, Appendix A, Methods 1 through 5 as published in the Federal Register, Volume 42, No. 160; hereafter referred to by the appropriate method number. The pitot tubes comply with the alignment specifications in Method 2, Section 4, and the pitot tube assemblies are in compliance with specifications in the same section.

Pitot tube assemblies are calibrated in accordance with Method 2, Section 4, against a standard hemispherical pitot utilizing a wind tunnel meeting the specification in Method 2, Section 4.1.2.

#### TEMPERATURE SENSING DEVICES

The potentiometer and thermocouples are calibrated against a mercury thermometer in a calibration well. Alternatively, readings are checked utilizing a NBS traceable millivolt source.

#### DRY GAS METERS

The test meters are calibrated according to Method 5, Section 5.3 and "Procedures for Calibrating and Using Dry Gas Volume Meters as Calibration Standards": by P.R. Westlin and R. T. Shigehara, March 10, 1978.

#### 5.0 ACKNOWLEDGMENTS

Waste Energy Technology, Inc. would like to thank all personnel involved in this project for their assistance in completing this test program, especially Robert Worobel and Adam Vernati of Solid Waste Authority of Palm Beach County..

Respectfully submitted,

WASTE ENERGY TECHNOLOGY, INC.



Scott Fowler  
Field Services Manager

SF/ssg

L:\PROJECTS\WAOM433\433FLTEST.WPD

6.0 TEST CONDITION SUMMARY

TABLE 6.1

Plant: Solid Waste Authority of Palm Beach County	Source: Class I and Class III Flare Stacks	
Test Location	Class I Flare Inlet	Class III Flare Inlet
Source Condition	Normal	Normal
Date	11/05/97	11/05/97
Average Gas Volumetric Flow Rate:		
@ Flue Conditions, acfm	731.6	458.6
@ Flue Conditions, scfm	682.6	435.6
@ Standard Conditions, dscfm	653.2	418.6
Flare tip diameter, inches	8.329	6.000
Flare tip area, square feet	0.3784	0.1963
Average Gas Temperature, deg. F	112.5	102.3
Average Flue Gas Velocity, ft/sec	35.1	22.0
Flue Gas Moisture, percent by volume	4.30	3.90
Average Flue Pressure, in. Hg	30.26	30.24
Barometric Pressure, in. Hg	30.20	30.20

L:\PROJECTS\SWAOM43\TABLE2.WB3

## 7.0 SAMPLE CALCULATIONS

### Sample Calculation

The sulfur input rate is calculated in the following manner:

Southwest (Class I)  
Sulfur Content 38.5 ppm  
DSCFM 653.2

$$\begin{aligned}\text{lbs/dscf} &= 38.5 \text{ ppm} \times \frac{32}{385 \times 10^6} \\ &= 3.20 \times 10^{-6} \text{ lbs/dscf}\end{aligned}$$

$$\begin{aligned}\text{lbs/hr} &= 3.20 \times 10^{-6} \text{ lbs/dscf} \times 653.2 \text{ DSCFM} \times 60 \text{ min/hr} \\ &= 0.13 \text{ lbs/hr}\end{aligned}$$

Northeast (Class III)  
Sulfur Content 300.0 ppm  
DSCFM 418.6

$$\begin{aligned}\text{lbs/dscf} &= \text{ppm} \times \frac{\text{Molecular wt (S)}}{385 \times 10^6} \\ &= 300 \text{ PPM} \times \frac{32}{385 \times 10^6} \\ &= 2.49 \times 10^{-5} \text{ lbs/dscf}\end{aligned}$$

$$\begin{aligned}\text{lbs/hr} &= \text{lbs/dscf} \times \text{DSCFM} \times 60 \text{ min/hr} \\ &= 2.49 \times 10^{-5} \text{ lbs/dscf} \times 418.6 \text{ DSCFM} \times 60 \text{ min/hr} \\ &= 0.63 \text{ lbs/hr}\end{aligned}$$



**SAMPLE CALCULATION**  
**Class I Flare**

The exit velocity and maximum permitted velocity is calculated in the following manner:

$$\text{Exit Velocity (ft/sec)} = \frac{\text{Volumetric Flowrate (SCFM)} \times \frac{1}{60}}{\text{Flare Tip Area}}$$

Maximum Permitted Velocity (M/Sec) as per 40CFR60, Section 60.18

$$\log_{10} (V_{\text{MAX}}) = \frac{H_r + 28.8}{31.7}$$

Where  $H_r$  = Net Heat Value of Landfill Gas, MJ/scm  
28.8 and 31.7 = Constants

Example Calculation of the Class I flare stack maximum permitted velocity

$$\log_{10} (V_{\text{MAX}}) = \frac{18.33 + 28.8}{31.7} \quad \text{Where: Net Heat Value} = (54\% \times 909.1 \text{ LNHV Btu/scf}) = 490.9 \text{ Btu/scf or } 18.33 \text{ MJ/scm (300 Btu/scf} = 11.2 \text{ MJ/scm)}$$

$$V_{\text{MAX}} = 30.67 \text{ m/sec}$$

$$\frac{30.67 \text{ m/sec}}{0.3048} = 101.0 \text{ ft/sec} \quad \text{Where: } 0.3048 \text{ meters} = 1 \text{ ft.}$$

**Exit Velocity**

Example Calculation of Class I flare stack

Flare Tip Area 0.3784

Flow Rate 682.6 scfm

$$\frac{682.6 \text{ SCFM} \times \frac{1 \text{ min}}{60 \text{ sec}}}{0.3784 \text{ ft}^2} = 30.1 \text{ ft/sec}$$

$$30.1 \text{ ft/sec} \times 0.3048 = 9.16 \text{ m/sec}$$

**SAMPLE CALCULATION**  
**Class III Flare**

The exit velocity and maximum permitted velocity is calculated in the following manner:

$$\text{Exit Velocity (ft/sec)} = \frac{\text{Volumetric Flowrate (SCFM)}}{\text{Flare Tip Area}} \times \frac{1}{60}$$

Maximum Permitted Velocity (M/Sec) as per 40CFR60, Section 60.18

$$\log_{10} (V_{\text{MAX}}) = \frac{H_T + 28.8}{31.7}$$

Where  $H_T$  = Net Heat Value of Landfill Gas, MJ/scm  
28.8 and 31.7 = Constants

Example Calculation of the Class I flare stack maximum permitted velocity

$$\log_{10} (V_{\text{MAX}}) = \frac{16.63 + 28.8}{31.7} \quad \text{Where: Net Heat Value} = (49\% \times 909.1 \text{ LNHC Btu/scf}) = 445.5 \text{ Btu/scf or } 16.63 \text{ MJ/scm } (300 \text{ Btu/scf} = 11.2 \text{ MJ/scm})$$

$$V_{\text{MAX}} = 27.11 \text{ m/sec}$$

$$\frac{27.11 \text{ m/sec}}{0.3048} = 88.96 \text{ ft/sec} \quad \text{Where: } 0.3048 \text{ meters} = 1 \text{ ft.}$$

**Exit Velocity**

Example Calculation of Class III flare stack

Flare Tip Area 0.1963

Flow Rate 435.6 scfm

$$\frac{435.6 \text{ SCFM}}{0.1963 \text{ ft}^2} \times \frac{1 \text{ min}}{60 \text{ sec}} = 36.98 \text{ ft/sec}$$

$$36.98 \text{ ft/sec} \times 0.3048 = 11.27 \text{ m/sec}$$

# APPENDIX SECTION 4

Field Operational Data







PITOT TRAVERSE DATA

Project: SOLID WASTE AUTHORITY Location: CLASS I FLARE STACK

Date NOVEMBER 5, 1997 Time 0830 Test No. 1, 2, 3

Point No.	$\Delta P$	$\sqrt{\Delta P}$	$t_s$	$\alpha$	Point No.	$\Delta P$	$\sqrt{\Delta P}$	$t_s$	$\alpha$
1.1	.22		112.5		3.1	.22		112.5	
1.2	.24		112.5		3.2	.24		112.4	
1.3	.25		112.4		3.3	.23		112.4	
1.4	.22		112.6		3.4	.23		112.4	
1.5	.23		112.5		3.5	.25		112.3	
1.6	.25		112.6		3.6	.22		112.2	
1.7	.22		112.6		3.7	.22		112.1	
1.8	.19		112.7		3.8	.20		112.2	
AVG	(.228)		(112.6)		AVG	(.226)		(112.3)	
2.1	.22	112.5							
2.2	.24	112.4			3	Run	AVG		
2.3	.23	112.4			#	$\Delta P$	T		
2.4	.23	112.4			1	.228	112.6		
2.5	.25	112.3			2	.214	112.7		
2.6	.22	112.2			3	.226	112.3		
2.7	.22	112.1							
2.8	.20	112.2			AVG	.223	112.5		
AVG	(.214)	(112.7)			WET-Bulb	87°F			

$P_{bar}$  30.20 "Hg Static 0.90 "H<sub>2</sub>O  $P_s$  30.26 "Hg  $C_p$  0.99

$\sqrt{\Delta P}$  0.472  $t_s$  112.5 °F x 460 = 573 °R

Flue Area .3474 ft<sup>2</sup> Duct dimensions 7.981 in. dia.  $B_w$  0.043  $1-B_w$  0.957

$(24.57 \text{ Md} \times 0.957 \text{ } 1-B_w) + (18 \times 0.043 \text{ } B_w) = 24.28 \text{ Ms}$

$$V_s = 85.49 \times C_p \times \sqrt{\frac{(573) T}{24.28 \text{ Ms} \times 30.26 \text{ Ps}}} \times 0.472 \sqrt{\Delta P} = 35.1 \text{ ft/sec}$$

$Q_{adm} = 35.1 \text{ Vs} \times .3474 \text{ Flue Area} \times 60 = 731.6 \text{ ACFM}$

$Q_{adm} = 17.647 \times 731.6 \text{ ACFM} \times \rho_{1,1} = 682.6 \text{ SCFM}$

$Q_{adm} = 17.647 \times 731.6 \text{ ACFM} \times \rho_{1,1} \times 0.957 \text{ } 1-B_w = 653.2 \text{ DSCFM}$

Pre-test leak check  "H<sub>2</sub>O Post-test leak check  "H<sub>2</sub>O

Data taken By: JSA

PITOT TRAVERSE DATA

Project: SOLID WASTE AUTHORITY Location: CLASS III FLARE STACK

Date NOVEMBER 5, 1997 Time 1130 Test No. 1, 2, 3

Point No.	$\Delta P$	$\sqrt{\Delta P}$	$t_s$	$\alpha$	Point No.	$\Delta P$	$\sqrt{\Delta P}$	$t_s$	$\alpha$
1.1	.08		102.3		3.1	.07		102.4	
1.2	.10		102.4		3.2	.10		102.4	
1.3	.11		102.4		3.3	.11		102.4	
1.4	.11		102.3		3.4	.11		102.4	
1.5	.11		102.4		3.5	.11		102.5	
1.6	.11		102.3		3.6	.11		102.5	
1.7	.10		102.4		3.7	.10		102.5	
1.8	.08		102.3		3.8	.08		102.4	
AVG	.100		102.4		AVG	.098		102.2	
2.1	.07	102.1			3	RUN	AVG		
2.2	.10	102.2			#	$\Delta P$	T		
2.3	.11	102.3			1	.100	102.4		
2.4	.10	102.2			2	.096	102.2		
2.5	.10	102.2			3	.098	102.2		
2.6	.11	102.3				AVG .098	102.3		
2.7	.10	102.3				WCT Bulb	89°F		
2.8	.08	102.3							
AVG	.096	102.2							

$P_{BAR}$  30.20 "Hg Static 0.5 "H<sub>2</sub>O  $P_s$  30.24 "Hg  $C_p$  0.99

$\sqrt{\Delta P}$  .313  $t_s$  102.3 °F x 460 = 562 °R

Flue Area .3474 ft<sup>2</sup> Duct dimensions 7.981 in. dia.  $B_w$  .039 1- $B_w$  0.961

(27.34 Md x .961 1- $B_w$ ) + (18 x .039  $B_w$ ) = 26.97 Ms

$$V_s = 85.49 \times C_p \times \sqrt{\frac{(562)T}{26.97 \text{ Ms} \times 30.24 \text{ Ps}}} \times .313 \sqrt{\Delta P} = 22.0 \text{ ft/sec}$$

$$Q_{scfm} = 22.0 V_s \times .3474 \text{ Flue Area} \times 60 = 458.6 \text{ ACFM}$$

$$Q_{scfm} = 17.647 \times 458.6 \text{ ACFM} \times P^{.71} t_s = 435.6 \text{ SCFM}$$

$$Q_{scfm} = 17.647 \times 458.6 \text{ ACFM} \times P^{.71} t_s \times .961 \text{ 1-} B_w = 418.6 \text{ DSCFM}$$

Pre-test leak check  "H<sub>2</sub>O Post-test leak check  "H<sub>2</sub>O

Data taken By: 



# APPENDIX SECTION 5

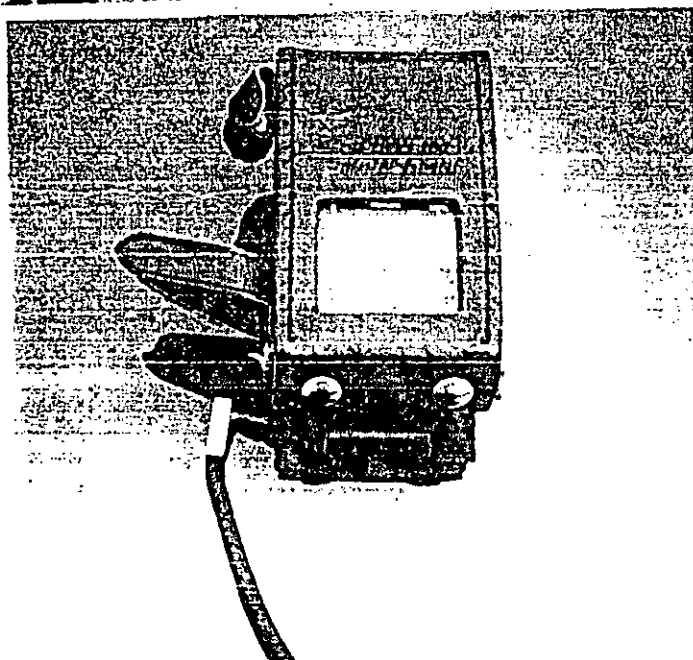
Project Photographs

PHOTOGRAPHIC RECORD OF FLARE TESTING PROCEDURE  
FOR  
NCRRF CLASS I AND CLASS III  
WEST PALM BEACH, FLORIDA

PHOTOGRAPHS

TOP TO BOTTOM

- Visible Emission Testing  
Class I Flare
- Combustible Gas Meter -  
ISC MDU 420

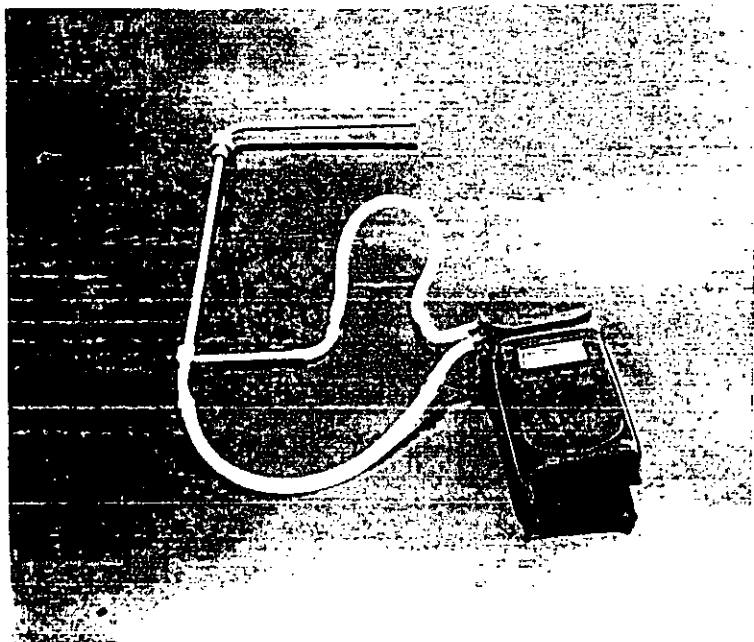
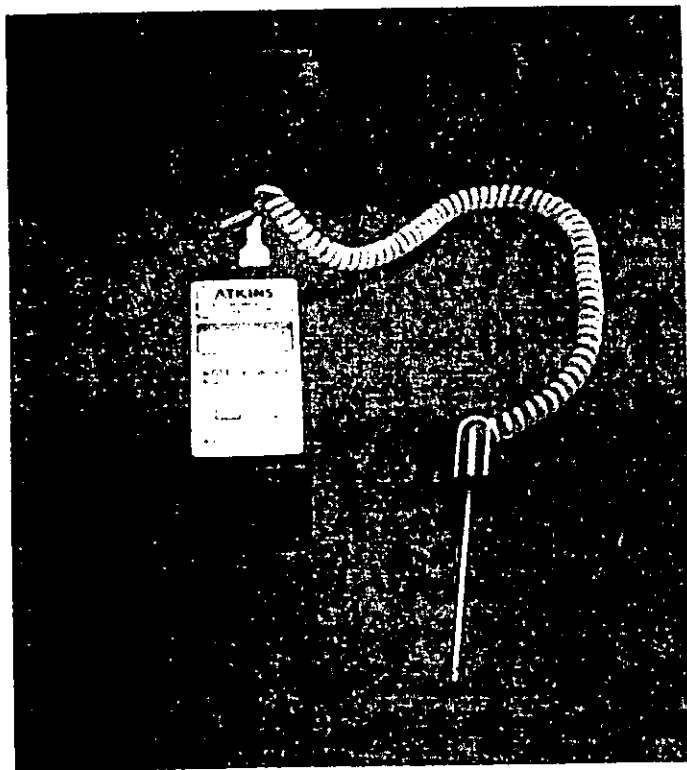


PHOTOGRAPHIC RECORD OF FLARE TESTING PROCEDURE  
FOR  
NCRRF CLASS I AND CLASS III  
WEST PALM BEACH, FLORIDA

PHOTOGRAPHS

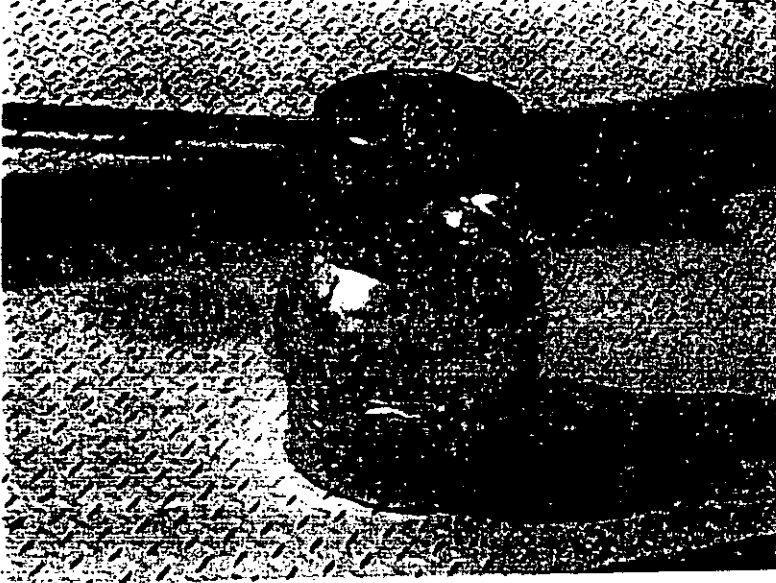
TOP TO BOTTOM

- Digital Thermometer w/ K Type Thermocouple
- S-Type Pitot Tube w/Digital Manometer - Neutronics PDM - 305



PHOTOGRAPHIC RECORD OF FLARE TESTING PROCEDURE  
FOR  
NCRRF CLASS I AND CLASS III  
WEST PALM BEACH, FLORIDA

PHOTOGRAPHS



TOP TO BOTTOM

- SUMA Type Cannister
- SUMA Type Canniser w/  
Teflon Adapter (Fixed  
Gases)

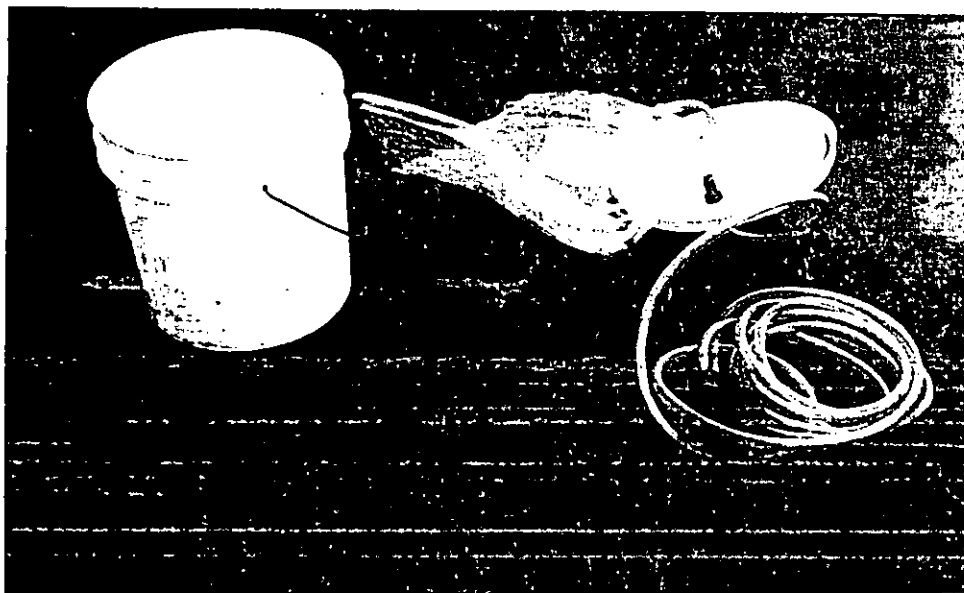
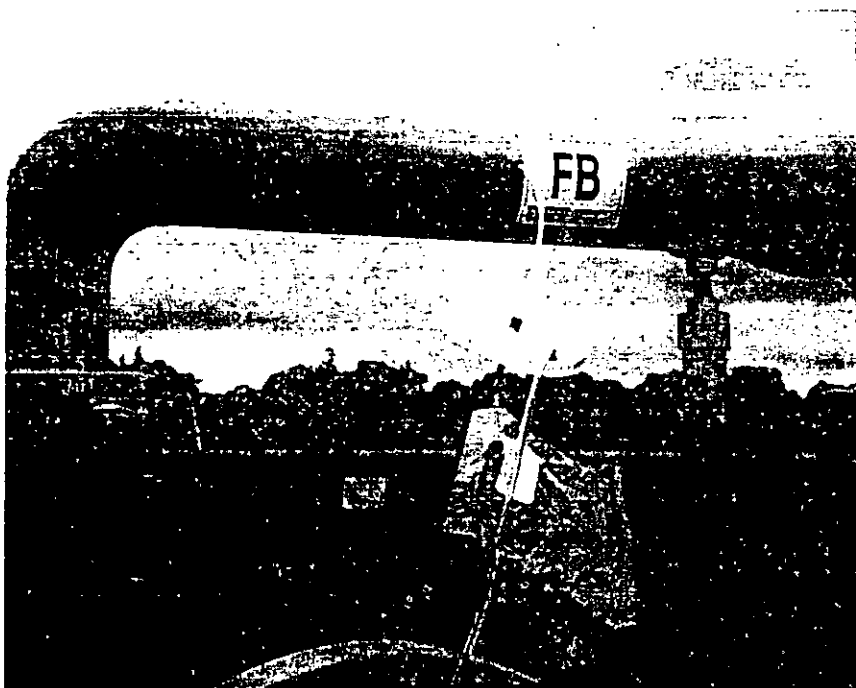


PHOTOGRAPHIC RECORD OF FLARE TESTING PROCEDURE  
FOR  
NCRRF CLASS I AND CLASS III  
WEST PALM BEACH, FLORIDA

PHOTOGRAPHS

TOP TO BOTTOM

• Tedlar Bag w/ Vacuum Chamber (Sulfur Content Testing)



# APPENDIX SECTION 6

Trace Gas Analysis Study  
Fixed Gases



Environmental  
Services

Quanterra Incorporated  
18501 East Gale Avenue #130  
City of Industry, California 91748

818 965-1006 Telephone  
818 965-1003 Fax

DEC - 1 1997

November 26, 1997

WASTE ENERGY TECHNOLOGY  
11 Tupelo Ave. SE  
Fort Walton Beach, FL 32548  
ATTN: Mr. Scott Fowler

ANALYSIS NO.: 129291-0001/0002-SA  
ANALYSIS: Fixed Gases (ASTM-D1946)  
DATE SAMPLED: 11/04/97  
DATE SAMPLES REC'D: 11/11/97

PROJECT: SWA

Enclosed with this letter is the report on the chemical and physical analyses for the samples from ANALYSIS NO.: 129291-0001/0002-SA as shown above.

The samples were received by Quanterra Incorporated, City of Industry, intact and with the chain-of-custody record attached.

Please note that ND means not detected at the reporting limits expressed.

\_\_\_\_\_  
Maria O. Jones  
Project Manager

\_\_\_\_\_  
Date  
Approved

SAMPLE DESCRIPTION INFORMATION  
for  
Waste Energy Technology

Lab ID	Client ID	Matrix	Sampled		Received
			Date	Time	Date
129291-0001-SA	F/S-CLASS I-93018	AIR	04 NOV 97	10:30	11 NOV 97
129291-0002-SA	F/S-CLASS III-11196	AIR	04 NOV 97	11:20	11 NOV 97



Fixed Gases  
ASTM-D1946

Client Name: Waste Energy Technology  
Client ID: F/S-CLASS I-93018  
LAB ID: 129291-0001-SA  
Matrix: AIR  
Authorized: 11 NOV 97  
Instrument: GC-1

Sampled: 04 NOV 97  
Prepared: N/A  
Dilution: 1.7

Received: 11 NOV 97  
Analyzed: 13 NOV 97

Parameter	Result	Qualifier	RL	Units
Carbon dioxide	24		0.17	% (v/v)
Oxygen	4.5		0.17	% (v/v)
Nitrogen	14		1.7	% (v/v)
Methane	54		0.17	% (v/v)
Carbon monoxide	ND		0.0017	% (v/v)

ND = Not Detected

Fixed Gases  
ASTM-D1946

Client Name: Waste Energy Technology  
Client ID: F/S-CLASS III-11196  
LAB ID: 129291-0002-SA  
Matrix: AIR  
Authorized: 11 NOV 97  
Instrument: GC-1

Sampled: 04 NOV 97  
Prepared: N/A  
Dilution: 1.7

Received: 11 NOV 97  
Analyzed: 13 NOV 97

Parameter	Result	Qualifier	RL	Units
Carbon dioxide	34		0.17	% (v/v)
Oxygen	1.9		0.17	% (v/v)
Nitrogen	14		1.7	% (v/v)
Methane	49		0.17	% (v/v)
Carbon monoxide	ND		0.0017	% (v/v)

ND = Not Detected

QC LOT ASSIGNMENT REPORT - MS QC  
Air Toxics

Laboratory Sample Number	QC Matrix	QC Category	QC Lot Number (DCS)	QC Run Number (SCS/BLANK/LCS)	MS QC Run Number (SA, MS, SD, DU)
129291-0001-SA	AIR	ASTM-D1946	13 NOV 97-A1	13 NOV 97-A1	
129291-0002-SA	AIR	ASTM-D1946	13 NOV 97-A1	13 NOV 97-A1	



Environmental  
Services

DUPLICATE CONTROL SAMPLE REPORT  
Air Toxics  
Project: 129291

Category: ASTM-D1946 Fixed Gases (ASTM-D1946)  
Matrix: AIR  
QC Lot: 13 NOV 97-A1  
Concentration Units: % (v/v)

Date Analyzed: 13 NOV 97

Analyte	Spiked	Concentration		%Recovery		RPD	Acceptance	
		DCS1	DCS2	DCS1	DCS2		Recov.	RPD
Methane	0.0100	0.0117	0.0112	117	112	4.4	80-120	20
Carbon dioxide	10.0	9.60	9.61	96	96	0.1	80-120	20

Calculations are performed before rounding to avoid round-off errors in calculated results.

METHOD BLANK REPORT  
Air Toxics  
Project: 129291

Test: ASTM-D1946  
Matrix: AIR  
QC Run: 13 NOV 97-A1

Method ASTM-D1946 - Fixed Gases

Date Analyzed: 13 NOV 97  
Reporting  
Limit

Analyte	Result	Units	Limit
Carbon dioxide	ND	% (v/v)	0.010
Oxygen	ND	% (v/v)	0.10
Nitrogen	ND	% (v/v)	1.0
Methane	ND	% (v/v)	0.00020
Carbon monoxide	ND	% (v/v)	0.0010

ND = Not Detected

CANISTER FIELD DATA RECORD

- 1

CLIENT: SWA

CANISTER SERIAL #: 93018

DATE CLEANED: 10/30/97 *C*

CLIENT SAMPLE #: WASTE ENERGY - SWA I

SITE LOCATION: SWA - F/S I

VFR ID: \_\_\_\_\_

Duration of sample: \_\_\_\_\_

Flow settings: \_\_\_\_\_ ml/min

Initials: \_\_\_\_\_

READING	TIME	VAC. (inches Hg or PRESS. (psia))	DATE	INITIALS
INITIAL VACUUM CHECK		30"	10/30/97	<i>CV</i>
INITIAL FIELD VACUUM		30"	11/4/97	<i>g/s</i>
FINAL FIELD READING		0	11/4/97	<i>g/s</i>
GAUGE READING UPON RECEIPT				

LABORATORY CANISTER PRESSURIZATION

INITIAL VACUUM (inches Hg and PSIA)	1"	11/11/97	<i>da</i>
FINAL PRESSURE (PSIA)	24.6	11/11/97	<i>da</i>

PURIFICATION GAS: N<sub>2</sub>

COMMENTS: Cap not on canister at arrival

Canis. Time (Hours)	Flow rate (ml/min)
0.5	152 - 122.7
1	79.2 - 32.2
2	39.2 - 16.1
4	19.2 - 8.1
8	13.2 - 5.4
2	8.2 - 3.4
10	7.22 - 3.1
12	5.2 - 2.1
24	2.2 - 1.1

CANISTER FIELD DATA RECORD

- 2

CLIENT: SWA  
 CANISTER SERIAL #: 11196  
 DATE CLEANED: 10/30/97 C  
 CLIENT SAMPLE #: Waste Energy - SWA III  
 FIELD LOCATION: SWA - F/5 III

VER ID: \_\_\_\_\_  
 Duration of sample: \_\_\_\_\_ hr/min  
 Flow setting: \_\_\_\_\_ ml/min  
 Initials: \_\_\_\_\_

READING	TIME	VAC. (inches Hg) or PRESS. (PSIA)	DATE	INITIALS
INITIAL VACUUM CHECK		30"	10/30/97	EN
INITIAL FIELD VACUUM		30"	11/9/97	gjt
FINAL FIELD READING		0	11/9/97	gjt
FINAL READING UPON RECEIPT				

LABORATORY CANISTER PRESSURIZATION 11/11/97

INITIAL VACUUM (inches Hg and PSIA)	1"	7 11/11/97	te
FINAL PRESSURE (PSIA)	24.6	11/11/97	sk

PURIFICATION GAS: N2

COMMENTS Cap loose on can at arrival to

Canis. Time (Hours)	Flow rate Range (ml/min)
0.5	155 - 155.7
1	79.5 - 82.5
2	45.5 - 47.7
4	19.5 - 20.8
8	13.5 - 13.9
8	9.5 - 10.4
10	7.55 - 8.5
12	6.5 - 6.9
24	3.5 - 3.5

# Chain of Custody Record



QUA-4124-1

Client <b>Waste Energy Tech</b>		Project Manager <b>Scott Fowler</b>		Date <b>11/4/97</b>	Chain Of Custody Number <b>71478</b>
Address <b>11 Tupelo S.E</b>		Telephone Number (Area Code)/Fax Number <b>850-243-0033</b>		Lab Number <b>129291</b>	Page <b>1</b> of <b>1</b>
City <b>FT Walton Beach</b>	State <b>FL</b>	Zip Code <b>32548</b>	Site Contact <b>S. Fowler</b>	Lab Contact <b>Marin Jones</b>	Analysis (Attach list if more space is needed)
Project Name <b>SWA</b>			Carrier/Waybill Number		

Sample I.D. No. and Description <small>(Containers for each sample may be combined on one line)</small>	Date	Time	Matrix			Containers & Preservatives						Special Instructions/ Conditions of Receipt	
			Aqueous	Sed.	Soil	Unpres.	H2SO4	HNO3	HCl	NaOH	ZnAc2		NaOH
<b>F/S - Class I - 93018</b>	<b>11/4/97</b>	<b>10:30 A</b>											<b>(Landfill 1195)</b> <b>Fixed gases</b>
<b>F/S - Class III - 11196</b>	<b>11/4/97</b>	<b>11:20 A</b>											<b>" "</b>

Possible Hazard Identification		Sample Disposal		(A fee may be assessed if samples are retained longer than 3 months)	
<input type="checkbox"/> Non-Hazard	<input type="checkbox"/> Flammable	<input type="checkbox"/> Skin Irritant	<input type="checkbox"/> Poison B	<input type="checkbox"/> Unknown	<input type="checkbox"/> Return To Client
<input type="checkbox"/> 24 Hours	<input type="checkbox"/> 48 Hours	<input type="checkbox"/> 7 Days	<input type="checkbox"/> 14 Days	<input type="checkbox"/> 21 Days	<input type="checkbox"/> Disposal By Lab
Turn Around Time Required					<input type="checkbox"/> Archive For _____ Months
1. Relinquished By <b>S. Fowler</b>			Date <b>11/4/97</b>	Time <b>12:00</b>	QC Requirements (Specify)
2. Relinquished By			Date	Time	1. Received By
3. Relinquished By			Date	Time	2. Received By <b>[Signature]</b>
			Date	Time	3. Received By

Comments

WPS



# APPENDIX SECTION 7

Trace Gas Analysis Study  
Sulfur Analysis

Quanterra Incorporated  
18501 East Gale Avenue #130  
City of Industry, California 91748

818 965-1006 Telephone  
818 965-1003 Fax

RECEIVED  
NOV 25 1997  
WASTE ENERGY TECHNOLOGY

November 21, 1997

WASTE ENERGY TECHNOLOGY  
11 Tupelo Ave. SE  
Fort Walton Beach, FL 32548  
ATTN: Mr. Scott Fowler

ANALYSIS NO.: 129198-0001/0004-SA  
ANALYSIS: Method EPA 15/16  
(Sulfur Compounds)  
DATE SAMPLED: 11/05/97  
DATE SAMPLES REC'D: 11/06/97


PROJECT: SWA


Enclosed with this letter is the report on the chemical and physical analyses for the samples from ANALYSIS NO.: 129198-0001/0004-SA as shown above.

The samples were received by Quanterra Incorporated, City of Industry, intact and with the chain-of-custody record attached.

Please note that ND means not detected at the reporting limits expressed.

The preliminary results were faxed to Mr. Scott Fowler on November 13, 1997.

  
\_\_\_\_\_  
Maria O. Jones  
Project Manager

  
\_\_\_\_\_  
11/21/97  
Date  
Approved



Environmental  
Services

SAMPLE DESCRIPTION INFORMATION  
for  
Waste Energy Technology

Lab ID	Client ID	Matrix	Sampled Date	Time	Received Date
129198-0001-SA	F/S-CLASS I (SWA IA)	AIR	05 NOV 97	11:00	06 NOV 97
129198-0002-SA	F/S-CLASS I (SWA IB)	AIR	05 NOV 97	11:00	06 NOV 97
129198-0003-SA	F/S-CLASS III (SWA IIIA)	AIR	05 NOV 97	11:00	06 NOV 97
129198-0004-SA	F/S-CLASS III (SWA IIIB)	AIR	05 NOV 97	11:00	06 NOV 97



Environmental  
Services

EPA 15/16-Sulfur Compounds  
Method EPA 15/16

Client Name: Waste Energy Technology  
Client ID: F/S-CLASS I (SWA IA)  
LAB ID: 129198-0001-SA  
Matrix: AIR  
Authorized: 06 NOV 97  
Instrument: GC-4  
Sampled: 05 NOV 97  
Prepared: N/A  
Dilution: 10  
Received: 06 NOV 97  
Analyzed: 06 NOV 97

Parameter	Result	Qualifier	RL	Units
Hydrogen sulfide	20		2.0	ppm (v/v)
Carbonyl sulfide	ND		2.0	ppm (v/v)
Methyl mercaptan	7.5		2.0	ppm (v/v)
Carbon disulfide	ND		2.0	ppm (v/v)
Ethyl mercaptan	ND		2.0	ppm (v/v)
Dimethylsulfide	11		2.0	ppm (v/v)
Dimethyldisulfide	ND		2.0	ppm (v/v)

ND = Not Detected

EPA 15/16-Sulfur Compounds  
Method EPA 15/16

Client Name: Waste Energy Technology  
Client ID: F/S-CLASS I (SWA IB)  
LAB ID: 129198-0002-SA  
Matrix: AIR  
Authorized: 06 NOV 97  
Instrument: GC-4  
Sampled: 05 NOV 97  
Prepared: N/A  
Dilution: 10  
Received: 06 NOV 97  
Analyzed: 06 NOV 97

Parameter	Result	Qualifier	RL	Units
Hydrogen sulfide	17		2.0	ppm (v/v)
Carbonyl sulfide	ND		2.0	ppm (v/v)
Methyl mercaptan	7.6		2.0	ppm (v/v)
Carbon disulfide	ND		2.0	ppm (v/v)
Ethyl mercaptan	ND		2.0	ppm (v/v)
Dimethylsulfide	11		2.0	ppm (v/v)
Dimethyldisulfide	ND		2.0	ppm (v/v)

ND = Not Detected



EPA 15/16-Sulfur Compounds  
Method EPA 15/16

Client Name: Waste Energy Technology  
Client ID: F/S-CLASS III (SWA IIIA)  
LAB ID: 129198-0003-SA  
Matrix: AIR  
Authorized: 06 NOV 97  
Instrument: GC-4  
Sampled: 05 NOV 97  
Prepared: N/A  
Dilution: 10  
Received: 06 NOV 97  
Analyzed: 06 NOV 97

Parameter	Result	Qualifier	RL	Units
Hydrogen sulfide	300	D	40	ppm (v/v)
Carbonyl sulfide	ND		2.0	ppm (v/v)
Methyl mercaptan	ND		2.0	ppm (v/v)
Carbon disulfide	ND		2.0	ppm (v/v)
Ethyl mercaptan	ND		2.0	ppm (v/v)
Dimethylsulfide	ND		2.0	ppm (v/v)
Dimethyldisulfide	ND		2.0	ppm (v/v)

D = Compound quantitated using a secondary dilution.  
ND = Not Detected

EPA 15/16-Sulfur Compounds  
Method EPA 15/16

Client Name:	Waste Energy Technology		
Client ID:	F/S-CLASS III (SWA IIIB)		
LAB ID:	129198-0004-SA		
Matrix:	AIR	Sampled: 05 NOV 97	Received: 06 NOV 97
Authorized:	06 NOV 97	Prepared: N/A	Analyzed: 06 NOV 97
Instrument:	GC-4	Dilution: 200	

Parameter	Result	Qualifier	RL	Units
Hydrogen sulfide	280		40	ppm (v/v)
Carbonyl sulfide	ND		40	ppm (v/v)
Methyl mercaptan	ND		40	ppm (v/v)
Carbon disulfide	ND		40	ppm (v/v)
Ethyl mercaptan	ND		40	ppm (v/v)
Dimethylsulfide	ND		40	ppm (v/v)
Dimethyldisulfide	ND		40	ppm (v/v)

ND = Not Detected

QC LOT ASSIGNMENT REPORT - MS QC  
Air Toxics

Laboratory Sample Number	QC Matrix	QC Category	QC Lot Number (DCS)	QC Run Number (SCS/BLANK/LCS)	MS QC Run Number (SA,MS,SD,DU)
129198-0001-SA	AIR	EPA-15-16	06 NOV 97-A4	06 NOV 97-A4	
129198-0002-SA	AIR	EPA-15-16	06 NOV 97-A4	06 NOV 97-A4	
129198-0003-SA	AIR	EPA-15-16	06 NOV 97-A4	06 NOV 97-A4	
129198-0004-SA	AIR	EPA-15-16	06 NOV 97-A4	06 NOV 97-A4	



DUPLICATE CONTROL SAMPLE REPORT  
Air Toxics  
Project: 129198

Category: EPA-15-16 EPA Method 15-16  
Matrix: AIR  
QC Lot: 06 NOV 97-A4  
Concentration Units: ppm (v/v)

Date Analyzed: 06 NOV 97

Analyte	Spiked	Concentration Measured		%Recovery		RPD	Acceptance Limits	
		DCS1	DCS2	DCS1	DCS2		Recov.	RPD
Hydrogen sulfide	0.950	1.21	1.14	128	120	5.9	60-160	25
Carbonyl sulfide	0.950	1.43	1.48	151	156	3.0	80-160	25
Methyl mercaptan	0.950	1.45	1.27	152	133	13	80-160	25
Carbon disulfide	0.950	1.12	1.14	118	120	1.1	80-120	25

Calculations are performed before rounding to avoid round-off errors in calculated results.

METHOD BLANK REPORT  
Air Toxics  
Project: 129198

Test: EPA-15-16-G  
Matrix: AIR  
QC Run: 06 NOV 97-A4

Method EPA 15/16 - Sulfur Compounds.

Date Analyzed: 06 NOV 97

Analyte	Result	Units	Reporting Limit
Hydrogen sulfide	ND	ppm (v/v)	0.20
Carbonyl sulfide	ND	ppm (v/v)	0.20
Methyl mercaptan	ND	ppm (v/v)	0.20
Carbon disulfide	ND	ppm (v/v)	0.20
Ethyl mercaptan	ND	ppm (v/v)	0.20
Dimethylsulfide	ND	ppm (v/v)	0.20
Dimethyldisulfide	ND	ppm (v/v)	0.20

ND = Not Detected

# Chain of Custody Record



QUA-4124-1

Client <b>Waste Energy Tech.</b>		Project Manager <b>Scott Fowler</b>		Date <b>11/5/97</b>	Chain Of Custody Number <b>75057</b>
Address <b>11 Tupelo Ave S.E.</b>		Telephone Number (Area Code)/Fax Number <b>850-243-0033</b>		Lab Number <b>129198</b>	Page <b>1</b> of <b>1</b>
City <b>FT Walton Beh</b>	State <b>FL</b>	Zip Code <b>32548</b>	Site Contact <b>S Fowler</b>	Lab Contact <b>Marie Jones</b>	Analysis (Attach list if more space is needed)
Project Name <b>SWA</b>			Carrier/Waybill Number		

Sample I.D. No. and Description <small>(Containers for each sample may be combined on one line)</small>	Date	Time	Matrix			Containers & Preservatives						Special Instructions/ Conditions of Receipt	
			Aqueous	Sed.	Soil	Unpres.	H2SO4	HNO3	HCl	NaOH	ZnAc2		NaOH
F/S - class I (SWA IA)	11/5/97	11 <sup>00</sup>											Sulfur Content  " "
F/S - class I (SWA IB)	11/5/97	11 <sup>00</sup>											
F/S - class III (SWA IIIA)	11/5/97	11 <sup>00</sup>											
F/S - class III (SWA IIIB)	11/5/97	11 <sup>00</sup>											

Possible Hazard Identification			Sample Disposal			(A fee may be assessed if samples are retained longer than 3 months)		
<input type="checkbox"/> Non-Hazard	<input type="checkbox"/> Flammable	<input type="checkbox"/> Skin Irritant	<input type="checkbox"/> Poison B	<input type="checkbox"/> Unknown	<input type="checkbox"/> Return To Client	<input type="checkbox"/> Disposal By Lab	<input type="checkbox"/> Archive For _____ Months	
Turn Around Time Required			QC Requirements (Specify)					
<input type="checkbox"/> 24 Hours	<input type="checkbox"/> 48 Hours	<input type="checkbox"/> 7 Days	<input type="checkbox"/> 14 Days	<input type="checkbox"/> 21 Days	<input type="checkbox"/> Other _____			
1. Relinquished By <i>J. Fowler</i>	Date	Time	1. Received By	Date	Time			
2. Relinquished By	Date	Time	2. Received By <i>J. E. Dal...</i>	Date <b>11/6/97</b>	Time <b>0930</b>			
3. Relinquished By	Date	Time	3. Received By	Date	Time			

Comments

(Fed-Ex)

# APPENDIX SECTION 8

Smoke Emissions Test Report (SFES)



# South Florida Environmental Services

## SMOKE EMISSIONS TEST REPORT

**PREPARED FOR:**

Waste Energy Technology, Inc.  
11 Tupelo Avenue, SE  
Fort Walton Beach, FL 32548-5414

**CONCERNING:**

Smoke Emissions Test Program  
Landfill Gas Recovery System  
Solid Waste Authority of West Palm Beach  
7501 Jog Road  
West Palm Beach, FL  
November 5, 1997

**PREPARED BY:**

Tom Siegert  
Environmental Scientist  
South Florida Environmental Services  
6821 Vista Parkway North  
West Palm Beach, Florida 33411

**COMPENDIUM:**

On November 5, 1997, South Florida Environmental Services performed Compliance Testing for Smoke Emissions for Solid Waste Authority of West Palm Beach, Florida. Testing was conducted on behalf of Waste Energy Technology, Inc. on the two Landfill Gas Flares which service the facility.

All testing and data reduction was conducted in accordance with EPA Method 22 as found in 40 CFR 60 Appendix A, as amended.

The two flares were responsible for gas combustion from class I and III landfills. For this facility, no smoke emissions were observed for either flare throughout the observation period.

Tom Siegert of South Florida Environmental Services was the smoke emissions evaluator during the observation period. Tom is a certified visible emission evaluator for Method 9 which meets and exceeds all requirements for Method 22. Ms. Terri Hilliard of the Florida Department of Environmental Protection in West Palm Beach observed the testing.



**SMOKE EMISSIONS TEST PROGRAM**  
Field Data Sheets

SFES # 97-576  
November 5, 1997



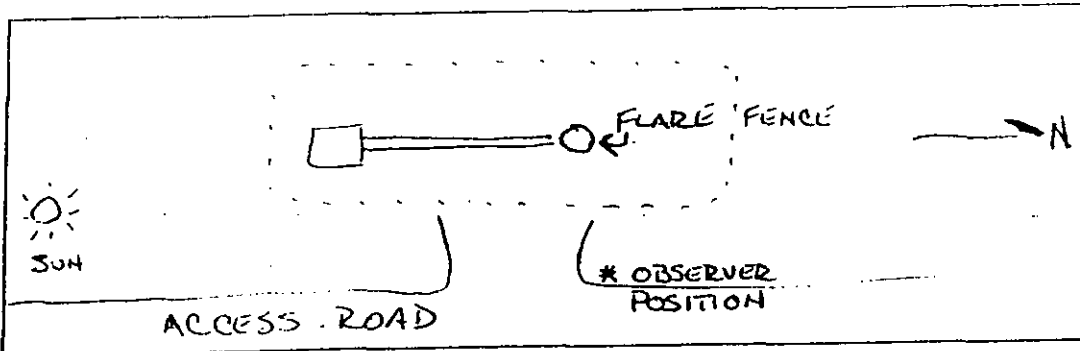


# South Florida Environmental Services

## FUGITIVE OR SMOKE EMISSION INSPECTION OUTDOOR LOCATION

Company <u>SOLID WASTE AUTHORITY</u>	Observer <u>TOM SIEBERT</u>
Location <u>WEST PALM BEACH</u>	Affiliation <u>SFES</u>
Representative _____	Date <u>11.5.97</u>
Sky Conditions <u>CLOUDY</u>	Wind Direction <u>E</u>
Precipitation <u>NONE</u>	Wind Speed <u>0-5</u>
Industry <u>WASTE MANAGEMENT</u>	Process Unit <u>FLARE (CLASS I)</u>

Sketch process unit; indicate observer position relative to source and sun; indicate potential emission points and/or actual emission points.



OBSERVATIONS	Clock Time	Observation period duration	Accumulated emission time
Begin Observation	<u>8:15-8:35</u>	<u>20 MIN</u>	<u>0 MIN</u>
	<u>8:40-9:00</u>	<u>20 MIN</u>	<u>0 MIN</u>
	<u>9:05-9:25</u>	<u>20 MIN</u>	<u>0 MIN</u>
	<u>9:30-9:50</u>	<u>20 MIN</u>	<u>0 MIN</u>
	<u>9:55-10:15</u>	<u>20 MIN</u>	<u>0 MIN</u>
	<u>10:20-10:40</u>	<u>20 MIN</u>	<u>0 MIN</u>
	_____	_____	_____
	_____	_____	_____
End Observation	_____	_____	_____



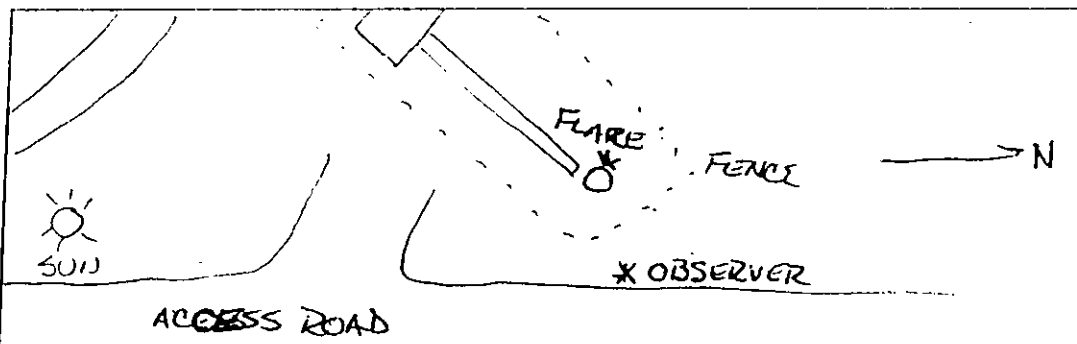


# South Florida Environmental Services

## FUGITIVE OR SMOKE EMISSION INSPECTION OUTDOOR LOCATION

Company <u>SOLID WASTE AUTH.</u>	Observer <u>TOM SIEBERG</u>
Location <u>WEST PALM BEACH</u>	Affiliation <u>SEES</u>
Representative _____	Date <u>11-5-97</u>
Sky Conditions <u>CLOUDY</u>	Wind Direction _____
Precipitation <u>NONE</u>	Wind Speed _____
Industry <u>WASTE MANAGEMENT</u>	Process Unit <u>FLARE (CLASS III)</u>

Sketch process unit; indicate observer position relative to source and sun; indicate potential emission points and/or actual emission points.



OBSERVATIONS	Clock Time	Observation period duration	Accumulated emission time
Begin Observation	<u>10:55-11:15</u>	<u>20 MIN</u>	<u>0 MIN</u>
	<u>11:20-11:40</u>	<u>20 MIN</u>	<u>0 MIN</u>
	<u>11:45-12:05</u>	<u>20 MIN</u>	<u>0 MIN</u>
	<u>12:10-12:30</u>	<u>20 MIN</u>	<u>0 MIN</u>
	<u>12:35-12:55</u>	<u>20 MIN</u>	<u>0 MIN</u>
	<u>13:00-13:20</u>	<u>20 MIN</u>	<u>0 MIN</u>
	_____	_____	_____
	_____	_____	_____
End Observation	_____	_____	_____

**SMOKE EMISSIONS TEST REPORT**  
Certification

SFES # 97-576  
November 5, 1997



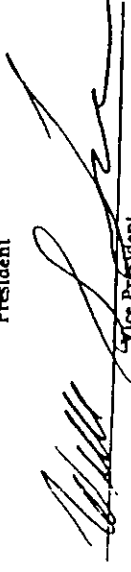
# VISIBLE EMISSIONS EVALUATOR

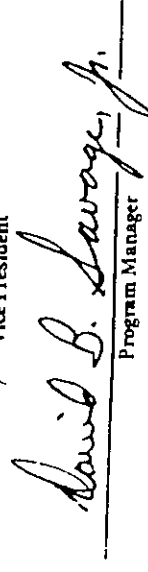
This is to certify that

**Tom Siejert**

met the specifications of Federal Reference Method 9 and qualified as a visible emissions evaluator. Maximum deviation on white and black smoke did not exceed 7.5% opacity and no single error exceeding 15% opacity was incurred during the certification test conducted by Eastern Technical Associates of Raleigh, North Carolina. This certificate is valid for six months from date of issue.

  
President

  
Vice President

  
Program Manager

259749

Certificate Number

West Palm Beach, Florida

Location

July 16, 1997

Date of Issue