Commonwealth of Pennsylvania
Environmental Resources
September 24, 1990

Subjects: Source Test Review

To: Data File
Waste Management of North America, Inc.
Morrisville, Bucks County

From: Thomas P. Bianca
Air Pollution Control Engineer
Division of Technical Services and Monitoring
Bureau of Air Quality Control

Through: Chief, Source Testing and Monitoring Section

Waste Management of North America, Inc. operates two identical Solar Turbines, Inc. gas turbines each rated at 42 million BTU per hour. Gas is extracted from various locations throughout the C.E.L.C.W.S. Landfill. For each turbine, the gas flows through a series of scrubbers, compressors, gas coolers, liquid separators, and then to the turbine which produces electricity. Effluent from each turbine is exhausted to the atmosphere to a four feet diameter stack having a discharge point approximately 38 feet above grade.

BCM Engineers conducted a source testing program to determine the combustion/destruction efficiency of one of the turbines and outlet emissions for benzene, chloroform, methylene chloride, perchloroethylene, trichloroethylene, carbon tetrachloride, and 1,2-dichloroethane. The tests were conducted in accordance with the preapproved test protocol. The calculations are correct and the results appear to be valid.

The following was extracted from the test report:

RUN NO.	1	2	3
Total Hydrocarbons Mass Emission Rate - Inlet - lb/hr	1756	1833	1721
Total Hydrocarbons Mass Emission Rate - Outlet - lb/hr	2.80	0.964	0.679
Combustion/Destruction Efficiency, %	99.84	99.95	99.96
OUTLET			
Methylene Chloride Mass Emission Rate, lb/hr	4.09x10-4	3.14x10-4	2.56x10-4
Chloroform Mass Emission Rate, lb/hr	103.3x10-6	11.0x10-6	17.3x10-6
Benzene Mass Emission Rate, lb/hr	0.013	0.003	0.004
1,2-Dichloroethane Mass Emission Rate, lb/hr	4.30x10-6	4.13x10-6	4.32x10-6
Trichloroethylene Mass Emission Rate, lb/hr	4.30x10-6	6.88x10-6	4.32x10-6
Perchloroethylene Mass Emission Rate, lb/hr	1.59x10-4	0.80x10-4	1.01x10-4
Carbon Tetrachloride Mass Emission Rate, lb/hr	25.8x10-6	4.13x10-6	4.32x10-6

cc: John Petrelli through N. Rao Kona, Norristown Regional Office
Tom McGinley, Norristown Regional Office
09-399-023
EPA/RSL
Reading File
Doug Lesher

TPEbtaw

RESEARCH TRIANGLE INSTITUTE

Center for Environmental Measurements

OCT 25, 1989

Tom Bianca
PA DER
1st floor Executive House, Room 108
2nd & Chestnut Street
Harrisburg, PA 17120

Dear Mr. Biancas

Please find attached the evaluation of the results for audits (373).

If you have any questions or comments concerning the audit, please feel free to call me at (919) 541-6483.

Sincerely,

R.K.M Jayanty
Project Leader

RKMJ/sbt/373
cc: Darryl von Lehmden, EPA/AREAL, RTP
Robert Lampe, EPA/AREAL, RTP
Carla Dempsey, Washington, D.C.

Post Office Box 12194 Research Triangle Park, North Carolina 27709-2194 Telephone 919 541-6000
FAX: 919 541-5929

PPB FIELD AUDIT REPORT AUDIT # 373 page 1

PART A - To be filled out by organization supplying audit cylinders

1. Individual requesting Audit, organization, and phone numbers:
   Tom Blanca
   PA DER
   1st Floor Executive House, Room 108
   2nd & Chestnut Street
   Harrisburg, PA 17120

2. Audit supervisor, organization, and phone numbers:
   Dr. R.K.M. Jayanty, Research Triangle Institute (919) 541-6483

3. Shipping instructions:
   Nick Charno
   B.C.M. Engineers
   521 W. Germantown Pike
   Norristown, PA 19401

4. Cylinder shipping date: 08/14/1989
5. Expected arrival date: 08/22/1989

6. Audit cylinder status:
   a. Cylinder ID: 373
   b. Pressure, psig: 1470
   c. Construction: aluminum
   d. Balance gas: nitrogen

7. Organic chemical manufacturing process:
   none

8. Name of individual or organization being audited:
   BCM Engineers

9. Location of audit:
   Falls Town, PA

10. Use of audit materials:
    Ascertain accuracy of VOST sampling and GC/MS analysis procedures prior to ambient air measurements at a landfill.

    a. Sampling method: VOST
    b. Analytical methods: GC/MS
    c. Accuracy assessment of:

    [ ] VOST method prior to RCRA trial burn
    [ ] bag method prior to RCRA trial burn
    [ ] VOST method during actual RCRA trial burn
    [ ] bag method during actual RCRA trial burn
    [ ] measurement method used for routine ambient air measurements
    [XX] measurement method used at hazardous waste landfill
    [ ] other (explain): _____

cc: Darryl von Lehmden, EPA/AREAL, RTP
    Robert Lampe, EPA/AREAL, RTP
    Carla Dempsey, Washington, D.C.

PART B - To be filled out by audit supervisor

1. Audit Results:

a. Cylinder ID: 373
b. Last Analysis: 8/88
c. psig pre-audit: 1470
d. psig after audit: 1400

COMPOUND (GROUP I)	AUDITEE CONC (ppbv)	RTI CONC (ppbv)	AUDIT % BIAS*
Carbon Tetrachloride	15.7	20.9±1.8	-25
Chloroform	7.1	11.2±1.2	-37
Perchloroethylene	12.3	21.2±1.9	-42
Benzene	13.5	10.4±1.1	+30
Vinyl Chloride	NA	29.1±2.1	NA

*Audit Accuracy expressed as % Bias = $\frac{\text{Auditee conc} - \text{RTI conc}}{\text{RTI conc}} \times 100$

Comments _____

cc: Darryl von Lehmden, EPA/AREAL, RTP
Robert Lampe, EPA/AREAL, RTP
Carla Dempsey, Washington, D.C.

Waste Management of North America
Pennsylvania

Emission Evaluation of a T-4500 Solar Centaur Gas Turbine at the Pennsbury Power Production Plant

August 1990

FINAL REPORT

FOR

PENNSBURY POWER PRODUCTION PLANT
G.R.O.W.S INC.
MORRISVILLE, PENNSYLVANIA

ON

DESTRUCTION EFFICIENCY DETERMINATION

OF A

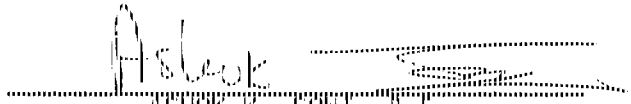
T-4500 SOLAR CENTAUR GAS TURBINE

BCM PROJECT NO. 00-5743-06

PREPARED BY

NICHOLAS J. CIOFFETTI, P.E.
PROJECT MANAGER

AND



ASHOK K. SONI, P.E.
VICE PRESIDENT

BCM
Engineers, Planners, Scientists and Laboratory Services
One Plymouth Meeting • Plymouth Meeting, PA 19462 • Phone: (215) 825-3600

BCM

CONTENTS

TABLES

CONTENTS (continued)

TABLES

BCM

1.0 EXECUTIVE SUMMARY

Waste Management of North America, Inc. (Waste Management) on behalf of the Pennsbury Power Production Plant (PPPP), retained BCM Engineers Inc. (BCM) to demonstrate that a T-4500 Solar Centaur gas turbine complies with the 98 percent destruction efficiency rate imposed by the Pennsylvania Department of Environmental Resources (PADER).

The Pennsbury Power Production Plant operates two gas turbine driven electric power generators. The turbines are fueled by medium Btu (500 Btu/ft^3) methane gas generated in closed sections of the landfill. The test program was performed on turbine unit one to show compliance for both turbines. The compliance testing included volatile organic sampling train (VOST) analysis; total hydrocarbon analysis; carbon dioxide (CO_2), and oxygen (O_2) determinations; moisture content; and volumetric flow rate at the turbine outlet. A total hydrocarbon analysis was performed on fuel gas samples collected concurrent with VOST sampling periods. Volumetric flow values for the fuel usage calculations are from Waste Management process data.

The results of the test program demonstrate that the turbine system evaluated is in compliance with the PADER permit condition of 98 percent destruction efficiency (see Table 1). The list of target compounds provided by PADER for VOST analysis included: methylene chloride; chloroform; 1,2-dichloroethane; carbon tetrachloride; trichloroethylene; benzene; and perchloroethylene. The results of the VOST analysis are presented in Table Nos. 4 through 10.

BCM

2.0 PROGRAM OBJECTIVES

The purpose of the test program was to determine the compliance status of the two power generating gas turbines with respect to the 98 percent volatile organic compound (VOC) destruction efficiency requirement imposed by PADER. In addition, VOST analysis of the turbine outlet was required by PADER to determine levels of: methylene chloride; chloroform; 1,2-dichloroethane; carbon tetrachloride; trichloroethylene; benzene; and perchloroethylene.

Methods utilized in the test program were agreed upon at a meeting held at PADER's Norristown Regional office on April 26, 1990. Attending the meeting were: Richard St. Louis, Tom Bianca, Tom McGinley, and John Petrella (PADER); Mark Messics and Joe Coronitti (Waste Management); and Nick Cicfrettl and Ed DiEgidio (BCM). A written test protocol was submitted to PADER and approved by PADER in a letter dated May 21, 1990.

BCM

3.0 PROCEDURES

3.1 FIELD WORK

The test program was conducted on July 6, 1990 with equipment set-up on the previous day. The primary plant contact was Mr. Mark Messics.

BCM field team was composed of:

Bill Kesack - Engineer III
Nick Charno - Technician IV
Joel Stettina - Technician III

3.2 TEST METHODOLOGY

BCM utilized EPA Reference Methods in the performance of the Waste Management test program. All test methods referred to below are found in 40 CFR 60 Appendix A, except VOST which can be found in SW846 Method 0030.

3.3 VOLATILE ORGANIC SAMPLING TRAIN (VOST)

Emissions of benzene, chloroform, methylene chloride, perchloroethylene, trichloroethylene, carbon tetrachloride, and 1,2-dichloroethane were targeted in the VOST analysis. Three 1-hour tests were conducted, and each test consisted of three 20-minute runs. For each run a 20-liter sample of effluent gas was extracted from the source at a rate of 1-liter per minute. After 20 minutes, sampling was stopped and sorbant cartridges changed. The VOST method is summarized in Method No. 0030 of SW-846, "Test Methods of Solid Waste, 3rd Edition."

3.4 TOTAL HYDROCARBON ANALYSIS (EPA METHOD 25A)

EPA Reference Method 25A, "Determination of Total Gaseous Organic Concentration using a Flame Ionization Analyzer", was used on both inlet and outlet streams to determine total hydrocarbon concentration expressed as parts per million (ppm) as methane. Because of the high organic concentration in the inlet stream (approximately 55 percent by volume), it was necessary to dilute the sample prior to the flame ionization analyzer (FIA). This was accomplished by an in-line dilution system which metered a measured volume of hydrocarbon-free nitrogen into the sample line. The goal of the system was to achieve approximately 30:1 dilution. In practice, however, it was possible only to achieve dilutions in the range of 10.5:1 (see Table 2). This meant that inlet samples were in the range of 52,000 ppm. This was above the methane calibration standard used (30,000 ppm). However, the calibration curve shows linear response to that point (see curve in Appendix A). The assumption was made, therefore, that the FIA response continued to be linear. This assumption produced values of methane concentration which were in excellent agreement with Waste Management's fuel gas analysis (see Tables 1 and 3 respectively). The outlet stream required no dilution due to low organic concentration.

3.5 MOLECULAR WEIGHT DETERMINATION

The molecular weight of the exhaust gas was determined according to EPA Reference Method 3, "Gas Analysis for Carbon Dioxide, Oxygen, and Excess Air and Dry Molecular Weight."

3.6 FLOW AND TEMPERATURE MEASUREMENTS

Gas flow and temperature were determined simultaneously. Gas flow was performed according to EPA Reference Method 1 and 2, "Determination of Stack Gas Velocity and Volumetric Flow Rate." Temperature was measured with a K-type thermocouple attached directly to the pitot tube used for velocity measurements. The raw data is contained in Appendix A and is summarized on the enclosed computer print-out.

3.7 MOISTURE CONTENT

The moisture content of the gas stream was determined in accordance with EPA Reference Method 4, "Determination of Moisture Content in Stack Gas."

BCM

4.0 SUMMARY OF RESULTS

The results of the program are summarized in Table Nos. 1 through 10 of this section. Table 1 contains a summary of: inlet and outlet hydrocarbon concentrations as determined by BCM utilizing EPA Reference Method 25A; inlet and outlet hydrocarbon mass rates; and corresponding destruction efficiencies. Table 2 contains a summary of inlet sample dilution ratios as measured utilizing the in-line dilution system (dilution ratios were applied to as-measured inlet hydrocarbon concentrations to obtain the values of Table 1). Table 3 contains a summary of Waste Management's fuel gas (i.e., inlet sample) analyses for the time period of BCM's sampling program. Table Nos. 4 through 10 contain summaries of the VOST results for the targeted compounds (methylene chloride; chloroform; carbon tetrachloride; benzene; 1,2-dichloroethane; trichloroethylene; and perchloroethylene). During analysis of the VOST samples, the analytical laboratory accidentally broke the tubes from Run 1, Pair 1.

BCM

TABLE 1

DESTRUCTION EFFICIENCY

Sample	Total Hydrocarbon (ppm as Methane)(1)	Volumetric Rate (DSCFM)(2)	Methane Mass (lb/hr)	Destruction Efficiency (%)
Run 1 (11:11-12:09)(3)				
Inlet	563,300	1250	1756	99.84
Outlet	26.2	42,949	2.80	
Run 2 (12:09-2:04)				
Inlet	588,000	1250	1833	99.95
Outlet	9.40	41,066	0.964	
Run 3 (2:04-3:54)				
Inlet	552,700	1250	1721	99.96
Outlet	6.37	42,772	0.679	

(1) As determined by BCM utilizing EPA Reference Method 25A

(2) Inlet flow rate provided by Waste Management (average volumetric flow from 11:00 a.m. to 4:00 p.m.) Outlet flow rates determined by BCM utilizing EPA Reference Methods 1 through 4.

(3) All calculations for Run 1 based only on time period of simultaneous analysis of inlet and outlet samples (11:11-11:56); inlet sample data unavailable for time period 11:56-12:09)

/0635M

TABLE 2

INLET SAMPLE DILUTION FACTORS

Sample	Time	Dilution Gas Dry Gas Meter Reading	Sample Gas Dry Gas Meter Reading	Uncorrected Dilution Volume, ft^3	Corrected Dilution Volume, ft^3	Uncorrected Sample Volume, ft^3	Corrected Sample Volume, ft^3	Dilution Ratio(1)
Start	11:11	834.241	718.722	---	---	---	---	---
End Run 1	12:09	848.490	715.580	14.249	18.737	1.858	1.793	10.45:1
End Run 2	2:04	870.800	719.075	27.310	35.913	3.495	3.374	10.648:1
End Run 3	3:54	892.244	722.629	26.444	34.774	3.454	3.333	10.433:1

(1) Dilution ratio = corrected dilution volume to corrected sample volume, expressed as ratio

TABLE 3

FUEL GAS ANALYSIS (1)

Sample Period(2)	Total Gaseous Organics (percent by volume as methane)(3)	Volumetric Flow (DSCFM)(3)	Mass (lb/hr)(3) as methane
11:00-12:00	54.9	1250.4	1712
12:00-2:00	55.0	1251.3	1715
2:00-4:00	55.0	1249.2	1713
Average	55.0	1250.3	1714

(1) Analyses performed by Waste Management
(2) Three sample periods' approximate run times for Run Nos. 1, 2, and 3, respectively
(3) Average for sample period shown

/0835N

TABLE 4 - VOST RESULTS

METHYLENE CHLORIDE
MW= 84.94

	Pair No.		Sample Collected (ng)	Sample Volume (std liters)	Concentration (ppmv)	Emission Rate (lb/hr)
Run 1	1	T/C	------	16.706	0.000E+00	0.000E+00
	2	T/C	29	16.662	4.390E-04	2.496E-04
	3	T/C	66	16.667	9.988E-04	5.679E-04
Run 2	4	T/C	69	16.681	1.045E-03	5.681E-04
	6	T/C	22	16.606	3.346E-04	1.819E-04
	7	T/C	23	16.564	3.506E-04	1.906E-04
Run 3	8	T/C	20	16.505	3.058E-04	1.732E-04
	9	T/C	30	16.564	4.573E-04	2.589E-04
	10	T/C	39	16.534	5.954E-04	3.371E-04
Field Blank			13			
Trip Blank			36			
Audit						
Trip Blank			17			
Run 1	12		43	9.795	1.242E-03	
Run 2	13		27	9.715	7.864E-04	
Run 3	16		31	9.634	9.105E-04	

Air Flows (dscfm)

Run 1	42,949.4
Run 2	41,065.6
Run 3	42,772.2

NOTE: Pair no. 1 of run 1 results are not available due to broken sampling tube

TABLE 5 - VOST RESULTS

CHLOROFORM
MW= 119.39

	Pair No.		Sample Collected (ng)	Sample Volume (std liters)	Concentration (ppmw)	Emission Rate (lb/hr)	
Run 1	1	T/C	.....	18.706	0.000E+00	0.000E+00	
	2	T/C	16	18.682	1.723E-04	1.377E-04	10.3×10^{-6}
	3	T/C	6	18.697	6.614E-05	6.863E-05	
Run 2	4	T/C	2	18.681	2.155E-05	1.647E-05	11.0×10^{-6}
	5	T/C	1	18.606	1.082E-05	8.267E-06	
	7	T/C	1	18.564	1.084E-05	8.286E-06	
Run 3	8	T/C	1	18.505	1.088E-05	8.658E-06	17.3×10^{-6}
	9	T/C	1	18.564	1.084E-05	8.630E-06	
	10	T/C	4	18.534	4.345E-05	3.458E-05	
Field Blank			< 0.5				
Trip Blank			< 0.5				
Audit							
Trip Blank			< 0.5				
Run 1	12		571	9.795	1.174E-02		
Run 2	13		582	9.715	1.206E-02		
Run 3	16		510	9.634	1.066E-02		

Air Flows (dscfm)

Run 1	42,949.4
Run 2	41,065.6
Run 3	42,772.2

NOTE: Pair no. 1 of run 1 results are not available due to broken sampling tube
Less than 0.5 ng indicates samples collected beyond detection limit

TABLE 6 - VOST RESULTS

CARBON TETRACHLORIDE
MW= 153.84

	Pair No.		Sample Collected (ng)	Sample Volume (std liters)	Concentration (ppmv)	Emission Rate (lb/hr)
Run 1	1	T/C	------	16.706	0.000E+00	0.000E+00
	2	T/C	3	16.662	2.507E-05	2.562E-05
	3	T/C	3	16.697	2.507E-05	2.561E-05
Run 2	4	T/C	< 0.5	16.661	4.181E-06	4.117E-06
	6	T/C	< 0.5	16.606	4.196E-06	4.134E-06
	7	T/C	< 0.5	16.564	4.208E-06	4.143E-06
Run 3	8	T/C	< 0.5	16.505	4.221E-06	4.329E-06
	9	T/C	< 0.5	16.564	4.206E-06	4.315E-06
	10	T/C	< 0.5	16.534	4.215E-06	4.322E-06
Field Blank			< 0.5			
Trip Blank			< 0.5			
Audit						
Trip Blank			< 0.5			
Run 1	12		1255	9.796	2.002E-02	
Run 2	13		1241	9.715	1.996E-02	
Run 3	16		1148	9.634	1.862E-02	

Air Flows (dscfm)

Run 1	42,949.4
Run 2	41,065.6
Run 3	42,772.2

NOTE: Pair no. 1 of run 1 results are not available due to broken sampling tube
Less than 0.5 ng indicates samples collected beyond detection limit

TABLE 7 - VOST RESULTS

BENZENE - - - -
MW= 78.11

	Pair No.		Sample Collected (ng)	Sample Volume (std liters)	Concentration (ppmv)	Emission Rate (lb/hr)
Run 1	1	T/C	------	18.706	0.000E+00	0.000E+00
	2	T/C	1230 *	18.692	2.025E-02	1.059E-02
	3	T/C	1120 *	18.697	1.843E-02	9.637E-03
Run 2	4	T/C	455 *	18.681	7.494E-03	3.746E-03
	6	T/C	289	18.606	4.763E-03	2.381E-03
	7	T/C	245	18.564	4.061E-03	2.030E-03
Run 3	8	T/C	196	18.505	3.259E-03	1.697E-03
	9	T/C	188	18.564	3.116E-03	1.622E-03
	10	T/C	836 *	18.534	1.386E-02	7.226E-03
Field Blank			3			
Trip Blank			4			
Audit						
Trip Blank			4			
Run 1	12		368 *	9.735	1.156E-02	
Run 2	13		345	9.715	1.093E-02	
Run 3	16		346 *	9.634	1.105E-02	

Air Flows (dscfm)

Run 1	42,949.4
Run 2	41,065.6
Run 3	42,772.2

NOTE: Pair no. 1 of run 1 results are not available due to broken sampling tube
* - Indicates saturated sample

TABLE 6 - VOST RESULTS

1,2, - DICHLOROETHANE
MW = 98.97

	Pair No.		Sample Collected (ng)	Sample Volume (std liters)	Concentration (ppmv)	Emission Rate (lb/hr)
Run 1	1	T/C	.....	18.706	0.000E+00	0.000E+00
	2	T/C	< 0.5	18.692	6.496E-06	4.303E-06
	3	T/C	< 0.5	18.697	6.494E-06	4.302E-06
Run 2	4	T/C	< 0.5	18.681	6.500E-06	4.117E-06
	6	T/C	< 0.5	18.606	6.526E-06	4.134E-06
	7	T/C	< 0.5	18.564	6.541E-06	4.143E-06
Run 3	8	T/C	< 0.5	18.505	6.562E-06	4.329E-06
	9	T/C	< 0.5	18.564	6.541E-06	4.315E-06
	10	T/C	< 0.5	18.534	6.551E-06	4.322E-06
Field Blank			< 0.5			
Trip Blank			< 0.5			
Audit						
Trip Blank			< 0.5			
Run 1	12		< 0.5	9.795	1.240E-05	
Run 2	13		< 0.5	9.715	1.250E-05	
Run 3	16		< 0.5	9.634	1.260E-05	

Air Flows (dscfm)

Run 1	42,949.4
Run 2	41,065.6
Run 3	42,772.2

NOTE: Pair no. 1 of run 1 results are not available due to broken sampling tube
Less than 0.5 ng indicates samples collected beyond detection limit

TABLE 9 - VOST RESULTS

TRICHLOROETHYLENE
MW= 131.4

	Pair No.		Sample Collected (ng)	Sample Volume (std liters)	Concentration (ppmv)	Emission Rate (lb/hr)
Run 1	1	T/C	.....	16.706	0.0000E+00	0.0000E+00
	2	T/C	1	16.682	9.7865E-06	8.6066E-06
	3	T/C	< 0.5	16.697	4.8911E-06	4.3032E-06
Run 2	4	T/C	1	16.681	9.7911E-06	8.2334E-06
	6	T/C	1	16.606	9.8311E-06	8.2677E-06
	7	T/C	< 0.5	16.564	4.8927E-06	4.1143E-06
Run 3	8	T/C	< 0.5	16.505	4.8942E-06	4.3229E-06
	9	T/C	< 0.5	16.564	4.8927E-06	4.3115E-06
	10	T/C	< 0.5	16.534	4.8934E-06	4.3222E-06
Field Blank			< 0.5			
Trip Blank			< 0.5			
Audit						
Trip Blank			< 0.5			
Run 1	12		< 0.5	9.795	9.3337E-06	
Run 2	13		< 0.5	9.715	9.4144E-06	
Run 3	16		< 0.5	9.634	9.4936E-06	

Air Flows (dscfm)

Run 1	42,949.4
Run 2	41,065.6
Run 3	42,772.2

NOTE: Pair no. 1 of run 1 results are not available due to broken sampling tube
Less than 0.5 ng indicates samples collected beyond detection limit

TABLE 10 - VOST RESULTS

PERCHLOROETHYLENE
MW= 165.85

	Pair No.		Sample Collected (ng)	Sample Volume (std liters)	Concentration (ppmv)	Emission Rate (lb/hr)
Run 1	1	T/C	------	16.706	0.000E+00	0.000E+00
	2	T/C	20	16.692	1.551E-04	1.721E-04
	3	T/C	17	16.697	1.316E-04	1.463E-04
Run 2	4	T/C	12	16.691	9.309E-05	9.881E-05
	6	T/C	8	16.606	6.231E-05	6.614E-05
	7	T/C	9	16.564	7.026E-05	7.457E-05
Run 3	8	T/C	12	16.505	9.396E-05	1.039E-04
	9	T/C	9	16.564	7.026E-05	7.767E-05
	10	T/C	14	16.534	1.095E-04	1.210E-04
Field Blank			< 0.5			
Trip Blank			< 0.5			
Audit						
Trip Blank			< 0.5			
Run 1	12		1059 *	9.795	1.567E-02	
Run 2	13		1055	9.715	1.574E-02	
Run 3	16		983 *	9.634	1.479E-02	

Air Flows (dscfm)

Run 1	42,949.4
Run 2	41,065.6
Run 3	42,772.2

NOTE: Pair no. 1 of run 1 results are not available due to broken sampling tube
* - Indicates saturated sample

BCM

TABLE 11

WASTE MANAGEMENT TURBINE GENERATOR, FLOW DETERMINATIONS

PARAMETERS:	1	2	3
Area of Breeching (Sq. Ft.)	12.57	12.57	12.57
Sample Volume (DSCF)	43.560	39.516	36.139
Moisture (%)	4.9	5.3	5.2
Molecular Weight (lb/lb-mole)	28.86	28.75	28.77
Gas Temperature (F)	691.5	696.5	712.5
Gas Velocity (ft/min)	7863.6	7622.8	8020.1
Gas Volume (dry/SCFM)	42949.4	41065.6	42772.0
Gas Volume (ACFM)	99070.8	95793.3	100785.5
Orsat Analysis:			
Carbon Dioxide (Vol %)	4.4	4.0	4.0
Carbon Monoxide (Vol %)	.4	.5	.2
Oxygen (Vol %)	17.8	18.0	17.8
Nitrogen (Vol %)	77.4	77.5	78.0
Excess Air (%)	621.1	655.0	612.0
Isokinetics (%)	.5	.5	.0

/0835N

BCM

5.0 DISCUSSION OF RESULTS

Results of inlet/outlet turbine testing indicate that the turbine system is in compliance with the PADER 98 percent destruction efficiency requirement. All three test runs indicated efficiencies well in excess of 98 percent (99.84 percent, 99.95 percent, and 99.96 percent).

As previously stated in Section 3.4, the ability of the in-line dilution system for inlet samples to achieve only dilutions in the 10.5:1 range rather than the desired 30:1 meant higher concentrations of hydrocarbon being analyzed by the FIA (approximately 52,000 ppm) than had been anticipated. While inlet samples exceeded the 30,000 ppm methane calibration standard used, extrapolation of the linear calibration curve (enclosed in Appendix A) to that higher range produced methane concentrations (see Table 1) in excellent agreement with those provided by Waste Management for the same time periods (see Table 3).

VOST results indicate negligible emissions of chloroform, carbon tetrachloride, trichloroethylene, and perchloroethylene, and non-detectable (i.e., less than 0.5 nanograms per tube pair) emissions of 1,2-dichloroethane. Levels of methylene chloride found on sample tubes were in the range of that found on both field and trip blanks, indicating that the low level emissions of methylene chloride should be either discounted or adjusted downward. Benzene was found in the highest concentration (although still in the parts per billion range). Four of the eight tube pairs analyzed indicated saturated samples of benzene (i.e., concentrations and emission rates at least as great as those shown). There was, however, significant variability between samples, ranging from samples saturated to 1230 nanograms benzene to samples containing only 188 nanograms benzene. Due to the fact that the first pair of tubes analyzed were saturated with benzene, successive sets of tube pairs were not summed to improve detection limits. However, a quantitation limit of 0.5 nanograms per tube pair gives detection limits in the parts per trillion range.

Analyses of the audit gas indicate a very high level of precision among the three audit gas runs leading to a high confidence in both sampling and analysis of the VOST samples.

BOM

APPENDIX A

FIELD DATA

SCM

VELOCITY DETERMINATIONS

Client: Waste M. Sample Port Location:

Location: Incinerator Outlet

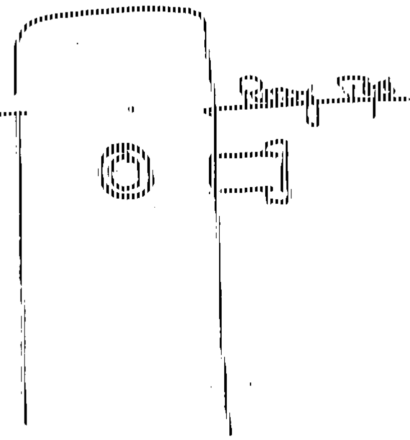
Date: 7/5/90

Stack Pressure: -1.7 Run 1, -1.9 Run 2, -1.9 Run 3

Barometric Pressure: 29.88

Pitot Factor: .84

Engineer: Jacks BTL K.



Pitot/Temperature Readings

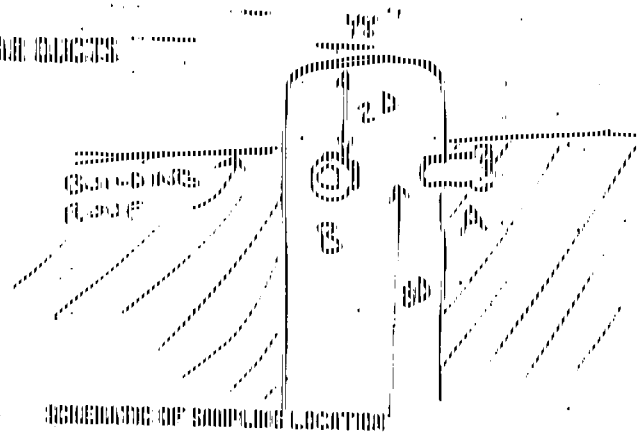
Run 1 — Run 2

Point No.	Distance (Inches)	Port A ΔP	Port A T	Port B ΔP	Port B T	Port A ΔP	Port A T	Port B ΔP	Port B T	Port __ ΔP	Port __ T
1	8.5	1.3	691	1.4	692	1.4	698	1.3	694		
2	12.0	1.7	691	1.6	692	1.8	698	1.6	694		
3	16.5	2.1	691	1.7	692	2.0	695	1.8	694		
4	22.5	2.3	691	2.2	692	2.4	698	2.1	694		
5	34.5	3.15	691	2.5	692	3.1	698	2.6	694		
6	45 5/8	3.1	691	2.8	692	2.7	698	3.2	690		
7	50	3.1	691	4.1	692	2.9	698	3.8	694		
8	53.5	3.5	691	4.3	692	3.7	698	4.9	692		
	AVE √ΔP = 1.54	Run	3			AVE √ΔP = 1.52					
1	8.5	1.4	710	1.2	704						
2	12.0	1.7	710	1.5	704						
3	16.5	1.9	710	1.8	704						
4	22.5	2.4	709	2.2	704						
5	34.5	3.1	709	2.6	705						
6	45 5/8	3.0	709	2.8	705						
7	50	3.1	709	4.0	705						
TOTALS	53.5	3.3	706	4.6	705						
AVG.	AVE √ΔP = 1.57										

Betz • Converse • Murdoch • Inc. BCM

TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

PLANT [illegible]
DATE 7-6-89
SAMPLING LOCATION [illegible]
INSIDE OF FAR WALL TO
OUTSIDE OF NIPPLE (DISTANCE A) 55 inches
INSIDE OF NEAR WALL TO
OUTSIDE OF NIPPLE (DISTANCE B) 7 inches
STACK I.D., (DISTANCE A - DISTANCE B) 48 inches
NEAREST UPSTREAM DISTURBANCE 2 Diameters
NEAREST DOWNSTREAM DISTURBANCE 8 Diameters
CALCULATOR Joe L. S.



TRAVERSE POINT NUMBER	FRACTION OF STACK I.D.	STACK I.D.	PRODUCT OF COLUMNS 2 AND 3 (TO NEAREST 1/8 INCH)	DISTANCE B	TRAVERSE POINT LOCATION FROM OUTSIDE OF NIPPLE (SUM OF COLUMNS 4 & 5)
1	.032	96"		7"	8.5
2	.135	96"		7"	12.0
3	.194	96"		7"	16.5
4	.323	96"		7"	23.5
5	.677	96"		7"	38.5
6	.806	96"		7"	45.5
7	.865	96"		7"	49.0
8	.968	96"		7"	52.5

EQUATIONS FOR PARTICULATE, NOZZLE, AND FLOW CHARACTERISTICS

(BASED ON STANDARD CONDITIONS OF 68°F AND 29.92"Hg)

1. $V_{w(std.)} = 0.0471\ V_{wc}$

2. $V_{m(std.)} = 17.64\ V_m \left(\frac{P_{bar} + .07355\ \Delta H}{T_m + 460} \right) J$

3. $B_{wo} = \frac{V_{w(std)}}{V_{m(std.)} + V_{w(std)}}$

4. $M_d = 0.44(\%CO_2) + 0.28(\%CO) + 0.32(\%O_2) + 0.28(\%N_2)$

5. $M_s = M_d\ (1 - B_{wo}) + 18\ B_{wo}$

6. $EA = \frac{(\%O_2) - 0.5(\%CO)}{0.264(\%N_2) - (\%O_2) + 0.5(\%CO)}\ 100$

7. $V_n = (85.49)\ (60)\ (C_p)\ \sqrt{\Delta P}\ \sqrt{\frac{T_s + 460}{(P_n)\ (M_s)}}$

8. $Q_n = \frac{(V_n)\ (A_n)}{144}$

9. $Q_{n(std.)} = Q_n\ (1 - B_{wo})\ 17.64\ \frac{P_n}{T_s + 460}$

10. $C'_s = 0.0154\ \frac{W_t}{V_{m(std.)}}$

11. $C'_w = 0.0154\ \frac{W_t}{V_{m(std.)} + V_{w(std)}}$

12. $C'_c = \frac{1.2\ C'_s}{\%CO_2}$

13. $C'_a = W_w\ \frac{(P_n + 460)\ (29.92)}{(528)\ (P_s)}$

14. $E = 0.00857\ Q_{s(std.)}\ C'_s$

15. $A_n = \frac{(\pi)\ (D_n)^2}{(144)\ (4)}$

16. $I = \frac{(60)\ (1.667)\ (T_s + 460)\ (0.00267\ V_{wc} + V_{m(std)}/17.64)}{(6)\ (V_s)\ (P_n)\ (A_n)}$

LEGEND

A_n = Area of nozzle, ft^2

A_s = Area of stack, in^2

B_{wo} = Moisture content of gas stream, dimensionless

C_p = Pitot correction factor, dimensionless

C'_a = Particulate concentration (stack conditions), gr/ft^3

C'_c = Particulate concentration at 12% CO_2 (dry), gr/dscf

C'_s = Particulate concentration (dry), gr/dscf

C'_w = Particulate concentration (wet), gr/scf

D_n = Diameter of nozzle, in.

E = Particulate emission rate, lb/hr

EA = Excess air, percent

ΔH = Orifice pressure drop, in. H_2O

I = Isokinetic ratio, percent

M_d = Dry molecular weight of stack gas, lb/lb-mole

M_s = Molecular weight of stack gas, lb/lb-mole

P_{bar} = Barometric pressure, in. Hg

P_s = Stack pressure (absolute), in. Hg

$\sqrt{\Delta P}$ = Average of square roots of pitot pressure differential, in. H_2O

Q_s = Stack gas flow, acfm

$Q_{s(std)}$ = Stack gas flow, scfm

T_m = Average dry gas meter temperature, ^oF

T_s = Average stack temperature, ^oF

V_m = Dry sample volume (meter conditions), ft^3

$V_{m(std)}$ = Dry sample volume (standard conditions), ft^3

V_s = Stack velocity, ft/min

V_{wc} = Volume of liquid collected in impingers and silica gel, ml

$V_{w(std)}$ = Volume of liquid collected, ft^3

W_t = Total weight of particulates collected, mg

θ = Duration of test, min.

BCM

COMPUTATION SHEET

Name of Client: WASTE MANAGEMENT

Project: O, R, O, W, E

Description: VOST

Sheet Number ____ Of ____

Date ____

Job Number ____

Computed by ____ Checked by ____

[illegible]

Pair #	Sample ID #	Sample Date	Description
①	1-1-T 1-1-T/C	7-6-90	Run 1, Pair 1
②	1-2-T 1-2-T/C	7-6-90	Run 1, Pair 2
③	1-3-T 1-3-T/C	7-6-90	Run 1, Pair 3
④	2-1-T 2-1-T/C	7-6-90	Run 2, Pair 1
⑤	FB-T FB-T/C	7-6-90	Field Blank
⑥	2-2-T 2-2-T/C	7-6-90	Run 2, Pair 2
⑦	2-3-T 2-3-T/C	7-6-90	Run 2, Pair 3
⑧	3-1-T 3-1-T/C	7-6-90	Run 3, Pair 1
⑨	3-2-T 3-2-T/C	7-6-90	Run 3, Pair 2
⑩	3-3-T 3-3-T/C	7-6-90	Run 3, Pair 3
⑪	TB-T TB-T/C	7-6-90	Trip Blank
⑫	A-1-T A-1-T/C	7-10-90	Audit, Pair 1
⑨	A-2-T A-2-T/C	7-10-90	Audit, Pair 2

BCM

COMPUTATION SHEET

Name of Client ....

Project ....

Description VCST

Sheet Number .... Of ....

Date ....

Job Number ....

Computed by .... Checked by ....

Page No	Sample ID #	Sample Date	Description
(4)	AB-T AB-TTC	7-10-90	Audit Blank
(5)	No Good		
(6)	A-3-T A-3-TTC	7-10-90	Audit, Page 3

BCM

COMPUTATION SHEET

Name of Client ....

Project ....

Description ..... VDC? .....

Sheet Number ..... Of .....

Date ....

Job Number ....

Computed by ..... Checked by .....

Run			Time						ΔH	Vac
①	OK 1-17 1-1?		1102					603.5?		
	T/C 4??		1107	130	17	40	603.9		1.1	15
			1112	133	16	40	610.5		1.0	14
		70	1117	131	16	40	615.4		1.0	14
	OK@ 15" Hg		1122				618.461			
②	OK@ 15" Hg	80	1134	131	18	40	621.800		1.1	5
			1139	135	18	40	626.7			-6
	1-2-T?	80	1144	132	19	40	631.8		1.0	6
	1-2-T/C		1149	135	19	40	636.9		1.1	-6.5
	OK@ 7" Hg		1154				641.795			
③	OK@ 15" Hg	80	1207	135	17	40	642.080		1.1	5
		80	1212	133	16	40	647.0		1.0	5.5
	1-3-T	70	1217	130	17	40	652.0		1.0	5.5
	1-3-T/C	80	1222	133	16	40	657.0		1.0	6
	OK@ 8" Hg		1227				662.080		1	

BCM

COMPUTATION SHEET

Name of Client: .....

Project: .....

Description: V-97

Sheet Number ..... of .....

Date .....

Job Number .....

Computed by ..... Checked by .....

Sheet 2

BCM

COMPUTATION SHEET

Name of Client: .....

Project: .....

Description: .....

Sheet Number ..... of .....

Date .....

Job Number .....

Computed by ..... Checked by .....

COMPUTATION SHEET

BCM

Name of Client ....

Project ....

Description ....VEST

Sheet Number .... Of ....

Date 1-19-90

Job Number ....

Computed by .... Checked by ....

AUDIT

Run No / [illegible] / [illegible] / [illegible] / [illegible] / [illegible] / [illegible] / [illegible] / [illegible] / Dry Gas Meter / Sample Vac / [illegible] / [illegible]

(12) OK@15" Hg	80	0854	137	16	25	770.4??	1.0	8
	80	0857	136	17	25	776.4	1.0	8
A-1-T		0904				~~799.4~~		
A-1-T/C						801.439		
OK@ 10" Hg								
(13) OK@ 15" Hg		~~0917~~	~~135~~	~~19~~	~~27~~	~~802.867~~		
	80	0919	134	19	27	803.991	1.1	8
A-2-T	80	0924	135	20	26	809.9	1.0	9
A-2-T/C						815.991		
OK@ 10" Hg								
(14) AB -								
(15) OK@ 15" Hg No Good								
(16) OK@ 15" Hg	80	0948	133	12	30	817.945	1.1	7.5
			134	11	30	822.9	1.1	7.0
A-3-T						827.915		
A-3-T/C								
OK@ 9" Hg								

	Pair No.	Time		Dry Gas Meter		Sample Volume (liters)	Barometric Pressure (in Hg)	Meter Temp (deg C)	Sample Volume (std liters)
		Start	Stop	Start	Stop				
Run 1	1	11:02	11:22	600.451	620.451	20.010	29.88	40.00	18.706
	2	11:34	11:54	621.800	641.795	19.995	29.88	40.00	18.692
	3	12:07	12:27	642.080	662.080	20.000	29.88	40.00	18.697
Run 2	4	12:43	13:03	662.395	682.394	19.999	29.88	40.25	18.681
	6	13:16	13:36	683.178	703.176	19.998	29.88	41.50	18.606
	7	13:47	14:07	703.446	723.446	20.000	29.88	42.25	18.584
Run 3	8	14:22	14:42	723.718	743.718	20.000	29.88	43.25	18.505
	9	14:55	15:15	743.978	763.978	20.000	29.88	42.25	18.584
	10	15:26	15:46	764.690	784.690	20.000	29.88	42.75	18.594
Audit	12	8:54	9:04	790.440	800.439	9.999	29.81	25.00	9.795
	13	9:19	9:29	803.991	813.991	10.000	29.81	27.50	9.715
	15	9:48	9:58	817.946	827.945	10.000	29.81	30.00	9.634

Scott Environmental Technology Inc.

CHAIN OF CUSTODY RECORD

No. 000663

Client: BCM Engrs / Waste Mgmt

Project Number: 3743 06

Project Name: Waste Mgmt

Task Number:

Task Name:

Samplers Signature: [illegible signature]

Remarks: Note: # in ( ) indicates Set # ID #, for Pairs

Site Number	Date	Time			Sample Identification	Site Description	[illegible]	[illegible]					No. of Containers	Remarks
1	7-6-[illegible]				1-1		1	1					2	Run 1, Pair 1 (Pair # 1)
↓	↓				1-2		1						2	Run 1, Pair 2 (Pair # 2)
					1-3		1	1					2	Run 1, Pair 3 (Pair # 3)
					2-1		1	1					2	Run 2, Pair 1 (Pair # 4)
					FB		1	1					2	Field Blank (Pair # 5)
					2-2		1	1					2	Run 2, Pair 2 (Pair # 6)
					2-3		1	1					2	Run 2, Pair 3 (Pair # 7)
					3-1		1	1					2	Run 3, Pair 1 (Pair # 8)
					3-2		1	1					2	Run 3, Pair 2 (Pair # 9)
					3-3		1	1					2	Run 3, Pair 3 (Pair # 10)
↓	↓				TB		1	1					2	Trip Blank (Pair # 11)
2	7-[illegible]				A-1		1	1					2	Audit, Pair 1 (Pair # 12)
↓	↓				A-2		1	1					2	Audit, Pair 2 (Pair # 13)
↓	↓				AB		1	1					2	Audit Blank (Pair # 14)

Relinquished by: (Sig.)	Date:	Time:	Received by: (Sig.)	Relinquished by: (Sig.)	Date:	Time:	Received by: (Sig.)
[illegible signature]	7/10	17[illegible]	Joe [illegible signature]				
Joe [illegible signature]	7/[illegible]	10:05	[illegible signature]				

Relinquished by: (Sig.)	Date:	Time:	Received for Laboratory by: (Sig.)	Date:	Time:	Remarks

Scott Environmental Technology Inc.

CHAIN OF CUSTODY RECORD

№ 000662

Client: BCM

Project Number: 5743 06

Project Name: Waste Mgmt

Task Number:

Task Name:

Samplers Signature:

Site Number	Date	Time			Sample Identification	Site Description	Ald Tube	Cetox Tube					No. of Containers	Remarks
2	7/10/90				A-3									Audit Pair 3 (Pair # 16)

Relinquished by: (Sig.)	Date:	Time:	Received by: (Sig.)	Relinquished by: (Sig.)	Date:	Time:	Received by: (Sig.)
[signature]	7/10	14[illegible]	Joe [signature]				
Relinquished by: (Sig.) Joe [signature]	Date: 7/10	Time: 15:15	Received by: (Sig.) [signature]	Relinquished by: (Sig.)	Date:	Time:	Received by: (Sig.)
Relinquished by: (Sig.)	Date:	Time:	Received for Laboratory by: (Sig.)	Date:	Time:	Remarks	

BCM Engineers
Engineers, Planners, Scientists and Laboratory Services
One Plymouth Meeting • Plymouth Meeting, PA 19462 • (215) 825-3800

July 3, 1990

Mr. Mark C. Messics, P.E.
Project Manager
Waste Management of North America, Inc.
1121 Bordentown Road
Morrisville, PA 19067

Subject: Solar Centaur T-4500 Gas Turbine
Emission Testing
BCM Project No. 00-5743-06

Dear Mr. Messics:

This letter documents a phone conversation between Mr. Rick Bagly, Air Pollution Control Engineer for PADER and myself with respect to calibrations procedures for the dry gas meter of the VOST sampling train.

Method 003 "Volatile Organic Sampling Train" of SW-846 states in Section 4.5 Pretest Preparation that

> "A dry gas meter shall have been calibrated within 30 days prior to use, using an EPA-supplied standard orifice."

However, BCM calibrates the dry gas meter using a calibrated wet test meter. Therefore, BCM contacted PADER to confirm the calibration procedure was an acceptable alternative method. Mr. Rick Bagly concurred that this was an acceptable alternative method for calibrating VOST dry gas meter and this letter documents the approval.

If you have any questions concerning this information please do not hesitate to contact me.

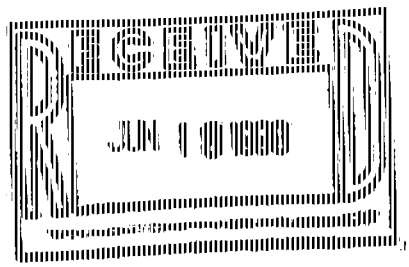
Very truly yours,

William J. Kosack, Jr.
Engineer III

/0478N
cc: A.K. Soni, BCM
N.J. Ciciretti, BCM
R. Bagly, PADER

RESEARCH TRIANGLE INSTITUTE

Center for Environmental Measurements



PROJECT FILE
CC:

June 12, 1990

BCM Engineers
Ed Diegidio
521 W. Germantown Pike
Norristown, Pa. 19401

Dear Mr. Diegidio:

Research Triangle Institute (RTI) has been requested to provide you with 1 cylinder of parts-per-billion level multicomponent mixture in nitrogen for an audit by EPA. We are shipping the cylinder today by Overnite Transportation Company, as per the request.

NOTE:You will notice that the cylinder identification number is the same number as the audit number. DO NOT REMOVE THE WHITE CYLINDER LABEL ON WHICH THIS NUMBER APPEARS. If this label is tampered with in any way, the agency requesting the audit will be notified and your audit results may be invalidated.

A plastic tie and bag binds the valve on each cylinder. Do not remove this tie until a government representative is present. After the audit is complete the enclosed tie and bag must be placed on the valve by the government representative before the cylinder is returned.

Please note that each cylinder has been analyzed several times and is very valuable. Each cylinder costs approximately $2,000-$6,000. We urge you to use only the amount of gas required to conduct the audit of your analytical system and to be certain the cylinder valves are properly closed to prevent slow loss of the contents. Return the cylinder as soon as possible so that other organizations may also participate in the audit program.

Post Office Box 12194 Research Triangle Park, North Carolina 27709 Telephone: 919 541-6000

We request that you submit the audit results (ppbV) to me and ship the cylinder (and VOST suitcase, if supplied) back within 30 days of the date of delivery, at your cost, (prepaid, not collect) to:

Research Triangle Institute
ATTN: Shonna Tompkins, Building #6
3040 Cornwallis Road
Research Triangle Park, NC 27709

You must insure each cylinder for at least $3,000 upon shipment back to RTI. We would appreciate your cooperation in this regard. If you have any questions concerning the audit cylinder, please feel free to call me at (919) 541-6483.

Sincerely,

R.K.M. Jayanty
Project Leader

RKMJ/sbt/416
cc: Darryl von Lehmden, EPA/AREAL, RTP
Robert Lampe, EPA/AREAL, RTP
Jeanne Hankins, Washington, D.C.
Tom Bianca, Bur. of Air Quality, Pa.

PPB FIELD AUDIT REPORT AUDIT # 416 page 1

PART A - To be filled out by organization supplying audit cylinders

1. Individual requesting Audit, organization, and phone numbers:
   Tom Bianca
   Bur. of AIR Quality Control
   P.O. Box 2357
   2nd & Chestnut St.
   Harrisburg, Pa. 17120 (717) 783-9720
2. Audit supervisor, organization, and phone numbers:
   Dr. R.K.M. Jayarty, Research Triangle Institute (919) 541-6483

3. Shipping Instructions:
   BCM Engineers
   Ed Diegidio
   521 W. Germantown, Pa. 19401
4. Cylinder shipping date: 6/12/90
5. Expected arrival date: 6/19/90
6. Audit cylinder status:
   a. Cylinder ID: 416
   b. Pressure, psig: 1155
   c. Construction: aluminum
   d. Balance gas: nitrogen

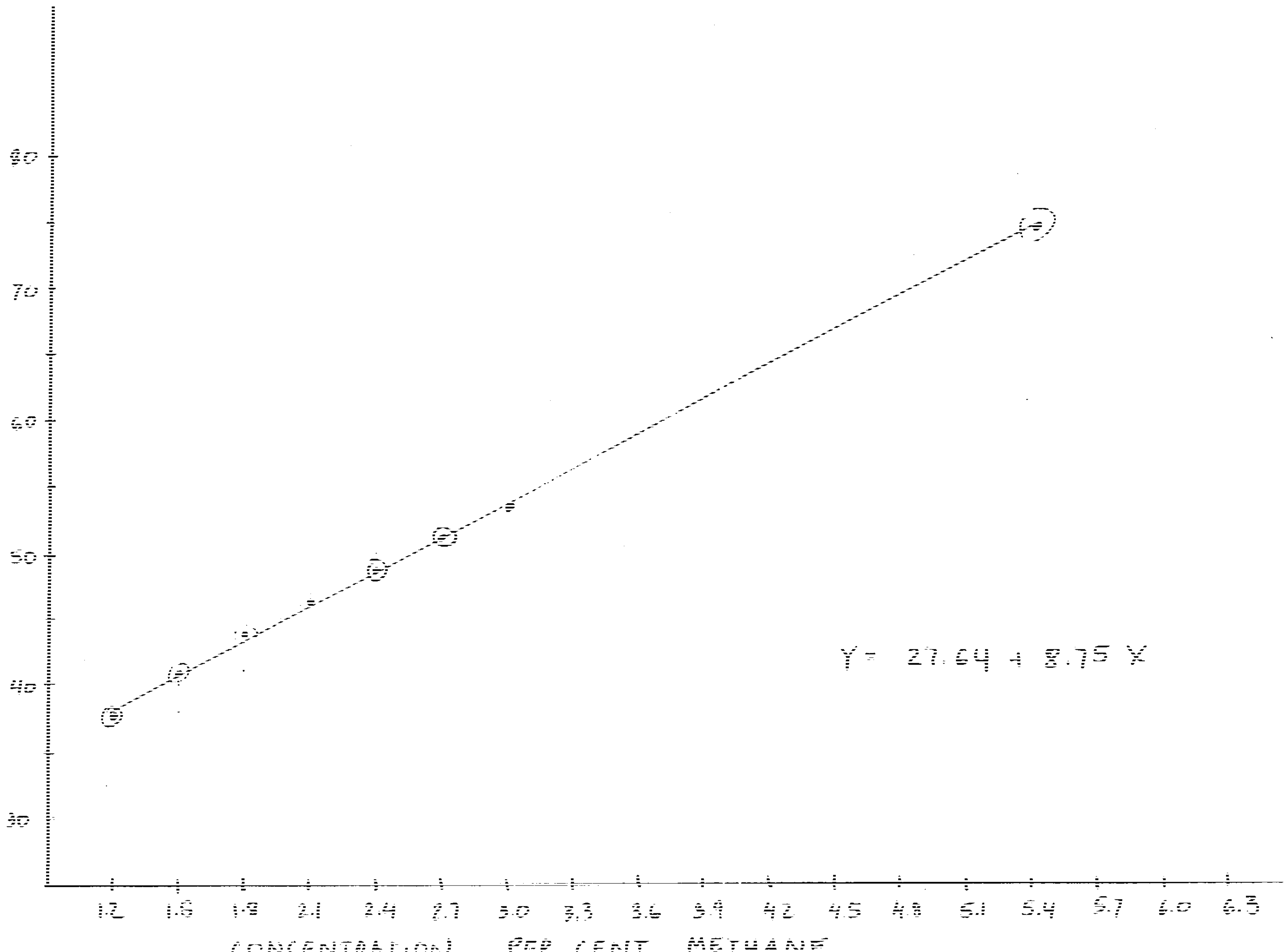
7. Organic chemical manufacturing process:
   Landfill Gas Fired Turbine.

8. Name of individual or organization being audited:
   BCM Engineers
9. Location of audit:
   BCM Lab - Norristown
10. Use of audit material:
    Acertain accuracy of VOST sampling and GC/MS analysis procedure
    during RCRA trial burn.

    a. Sampling method: VOST
    b. Analytical method: GC/MS
    c. Accuracy assessment of:

       [ ] VOST method prior to RCRA trial burn
       [ ] bag method prior to RCRA trial burn
       [xx] VOST method during actual RCRA trial burn
       [ ] bag method during actual RCRA trial burn
       [ ] measurement method used for routine ambient air measurements
       [ ] measurement method at hazardous waste landfill
       [ ] other (explain):

cc: Darryl von Lehmden, EPA/AREAL, RTP
    Robert Lampe, EPA/AREAL, RTP
    Jeanne Rankins, Washington, D.C.
    Tom Bianca, Bur. of Air Quality,Pa.


Y= 27.64 + 8.75 X
80
70
60
50
40
30
1.2 1.5 1.8 2.1 2.4 2.7 3.0 3.3 3.6 3.9 4.2 4.5 4.8 5.1 5.4 5.7 6.0 6.3
CONCENTRATION PER CENT METHANE

APPENDIX B

MOST RESULTS

Scott Environmental Technology, Inc.

PLUMSTEADVILLE, PA 18949 PHONE: (215) 766-8861 FAX: (215) 766-8251

ANALYTICAL REPORT

CLIENT: BCM ENGINEERS, INC.
ADDRESS: ONE PLYMOUTH MEETING
PLYMOUTH MEETING, PA 19462
ATTENTION: Ed Diegidio

PROJECT #: 2153
DATE: 8-06-90
DATE REC'D: 7-10-90

REPORT RELEASED BY:
Carmine M. Picciglio, Laboratory Manager

SCOTT SAMPLE ID.	CLIENT ID.	DATE SAMPLED	TEST	DATE ANALYZED
90-2018	Run 1-1	7/6/90	624	7/31/90
90-2019	Run 1-2	7/6/90	624	7/31/90
90-2020	Run 1-3	7/6/90	624	7/31/90
90-2021	Run 2-1	7/6/90	624	7/31/90
90-2022	Field Blank	7/6/90	624	7/31/90
90-2023	Run 2-2	7/6/90	624	7/31/90
90-2024	Run 2-3	7/6/90	624	7/31/90
90-2025	Run 3-1	7/6/90	624	8/2/90
90-2026	Run 3-2	7/6/90	624	8/2/90
90-2027	Run 3-3	7/6/90	624	8/2/90
90-2028	Trip Blank	7/6/90	624	8/2/90
90-2029	Audit-1	7/10/90	624	8/3/90
90-2030	Audit-2	7/10/90	624	8/3/90
90-2031	Audit Blank	7/10/90	624	8/3/90
90-2032	Audit-3	7/10/90	624	8/3/90

LABORATORY RESULTS

CLIENT: BCM PROJECT: 2153
TEST NAME: METHOD 624 DATE: 8-06-90
UNITS: ng ANALYST: _____

SCOTT ID:	90-2018	90-2019	90-2020	90-2021	90-2022
CLIENT ID:	1-1 (Broken tube)	1-2	1-3	2-1	FB
COMPOUND					
Methylene Chloride	-	29	66	69	13
Chloroform	-	16	8	2	ND
Carbon Tetrachloride	-	3	3	ND	ND
Benzene	-	12304*	11211*	4559*	3
1,2-Dichloroethane	-	ND	ND	ND	ND
Trichloroethylene	-	1	ND	1	ND
Tetrachloroethylene	-	20	17	12	ND

* Value not accurate.
Sample was saturated, overloading the detector.
ND= Not Detected, <0.5

CLIENT: BCM
TEST NAME: METHOD 624
UNITS: ug

SCOTT ID:	90-2023	90-2024	90-2025	90-2026	90-2027
CLIENT ID:	2-2	2-3	3-1	3-2	3-3
COMPOUND					
Methylene Chloride	22	23	20	30	39
Chloroform	1	1	1	1	4
Carbon Tetrachloride	ND	ND	ND	ND	ND
Benzene	288	245	196	186	836*
1,2-Dichloroethane	ND	ND	ND	ND	ND
Trichloroethylene	1	ND	ND	ND	ND
Tetrachloroethylene	8	9	12	9	14

* Value not accurate.
Sample was saturated, overloading the detector.
ND= Not Detected, <0.5

CLIENT: BCM
TEST NAME: METHOD 624
UNITS: ug

SCOTT ID:	90-2028	90-2029	90-2030	90-2031	90-2032
CLIENT ID:	TB	A-1	A-2	AB	A-3
COMPOUND					
Methylene Chloride	36	43	27	17	31
Chloroform	ND	571	582	ND	510
Carbon Tetrachloride	ND	1255	1241	ND	1148
Benzene	4	3684	345	4	3466
1,2-Dichloroethane	ND	ND	ND	ND	ND
Trichloroethylene	ND	ND	ND	ND	ND
Tetrachloroethylene	ND	10594	1055	ND	983*

* Value not accurate.
Sample was saturated, overloading the detector.
ND= Not Detected, <0.5

LABORATORY QC SUMMARY

Client: BCM
Project No: 2153
Instrument Blank For Method 624

DATE REPORTED: 8-06-90
ANALYST: [signature]

Analysis Date	Contaminants
7-31-90	ND
8-02-90	ND
8-03-90	ND

ND=No Interferences Detected

LABORATORY QC SUMMARY

Client: BCM
Project No: 2153
Calibration Check Standard for Method 624

DATE REPORTED: 8-06-90
ANALYSIS RELEASED BY:

Compound	CCS 4 RECOVERY 7-31-90	CCS 4 RECOVERY 8-02-90	CCS 4 RECOVERY 8-03-90
Methylene chloride	98	96	114
Chloroform	98	97	99
Carbon tetrachloride	97	87	100
Benzene	98	88	117
1,2-Dichloroethane	104	111	97*
Trichloroethylene	101	115	99
Tetrachloroethylene	99	95	101

BCM

APPENDIX C

PROCESS DATA

ANALYSIS

DATE: 87/06/30 ANALYSIS TIME: 165 STREAM SEQUENCE: 1
TIME: 13:23 CYCLE TIME: 180 STREAM#: 1
ANALYZER#: 51386 MODE: RUN CYCLE START TIME: 13:20

COMP NAME	COMP CODE	MOLE %	B.T.U.*	SP. GR.*
C O 2	117	43.712	0.00	0.6642
OXYGEN	116	0.093	0.00	0.0010
NITROGEN	114	1.235	0.00	0.0119
METHANE	100	54.960	556.19	0.3044
TOTALS		100.000	556.19	0.9816

* @ 14.730 PSIA DRY & UNCORRECTED FOR COMPRESSIBILITY

COMPRESSIBILITY FACTOR (1/2)	= 1.0033
DRY B.T.U. @ 14.730 PSIA & 60 DEG. F CORRECTED FOR (1/2)	= 558.1
SAT B.T.U. @ 14.730 PSIA & 60 DEG. F CORRECTED FOR (1/2)	= 548.3
REAL SPECIFIC GRAVITY	= 0.9844
UNNORMALIZED TOTAL	= 99.80

ACTIVE ALARMS

NONE

ANALYSIS

DATE: 87/06/30 ANALYSIS TIME: 165 STREAM SEQUENCE: 1
TIME: 13:38 CYCLE TIME: 180 STREAM#: 1
ANALYZER#: 51386 MODE: RUN CYCLE START TIME: 13:29

COMP NAME	COMP CODE	MOLE %	B.T.U.*	SP. GR.*
C O 2	117	43.702	0.00	0.6640
OXYGEN	116	0.093	0.00	0.0010
NITROGEN	114	1.236	0.00	0.0120
METHANE	100	54.969	556.28	0.3045
TOTALS		100.000	556.28	0.9815

[illegible]	[illegible]	3.6[illegible]	0.1 [illegible]
[illegible]	10.77440	0.3044113	9.6110E-02
[illegible]	[illegible]	1.060861	4.7346E-02
[illegible]	[illegible]078	1.146049	0.1074344
[illegible]	[illegible]71	1.293936	0.1187886
[illegible]	[illegible]760	1.326484	0.1281494
[illegible]	41.641	1.415962	0.1383005
11.06667	44.46786	1.479405	0.1927360
14.66832	45.38786	1.624356	0.2210418
14.[illegible]	44.47581	1.536508	0.1595740
14.40440	43.66352	1.834036	0.1858094
14.67987	[illegible]	1.262649	4.9805E-02
14.94040	43.71336	1.222037	9.2566E-02
15.56456	43.[illegible]147	1.305352	3.6781E-02
14.97627	43.74856	1.105483	8.3887E-02
14.9867	44.74905	1.192022	6.1888E-02
34.46801	0.	0.	0.
0.	0.	0.	0.
0.	0.	0.	0.
0.	0.	0.	0.
0.	0.	0.	0.
0.	0.	0.	0.
0.	0.	0.	0.

AUGRH[illegible]	AUGRIU	AUGPRES	AUGTEMP
0.[illegible]100	561.5256	151.5575	106.4964
0.[illegible]19	560.6687	152.7149	106.5083
0.[illegible]	560.0006	170.6351	106.4941
0.[illegible]880	559.2447	176.3531	105.9054
0.[illegible]	558.5418	176.7896	105.0022
0.4445430	557.7448	177.0701	104.4082
0.[illegible]	557.1149	177.3525	103.8049
0.[illegible]1724	556.4331	174.0053	103.7664
0.[illegible]	554.9998	171.0271	101.7588
0.[illegible]	551.851	175.2805	105.8094
0.[illegible]	557.6777	174.4117	106.6582
0.[illegible]	557.4096	154.8106	107.5647
0.[illegible]	557.8731	153.3411	108.8108
0.[illegible]	[illegible].0947	172.0856	111.5415
0.[illegible]	558.2230	172.3165	112.2446
0.[illegible]	556.280	172.2009	112.4596
0.[illegible]	556.3864	172.281	112.5276
		0.	0.