



SCEC

**WAIMANALO GULCH
SOLID WASTE LANDFILL FLARE
COMPLIANCE SOURCE TEST REPORT
2005**

PREPARED FOR:

Shaw Environmental, Inc.
2360 Bering Drive
San Jose, CA 95131

EQUIPMENT LOCATION:

Waimanalo Gulch Solid Waste Landfill
92-460 Farrington Highway
Kapolei, HI 96897

TEST DATES:

December 16, 2005

SUBMITTAL DATE:

January 26, 2006

PARAMETERS MEASURED:

O₂ and TGNMO Emissions

TESTED BY:

Harry J. Johnson

SCEC Hawaii

98-030 Hekaha Street, Suite 1
Aiea, HI. 96701

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1.0 INTRODUCTION

SCEC was contracted to perform a source test program on one (1) landfill gas fired flare located at the Waimanalo Gulch Solid Waste Landfill in Oahu, Hawaii. The testing was performed to satisfy requirements of the State of Hawaii, Department of Health (DOH), Covered Source Permit (CSP) Number 0489-01-C.

Measurements of the flare emissions and operating parameters were conducted at the flare exhaust, and at the inlet (landfill gas) of the flare. Table 1-1 provides a test matrix of the parameters tested at each sample location.

The test was conducted on December 16, 2005 and was performed by Harry J. Johnson – Project Manager and David B. Cummings – Environmental Specialist, of SCEC. Rajan Phadnis and Willie Gomez of Shaw Environmental, Inc. coordinated the source test program.

The results of the emission test are summarized in Table 1-2. The source test demonstrates that the flare operates with criteria pollutant emissions below the permit limits. Detailed test results are presented in Section 4.0. All raw data, laboratory results, calculations and QA/QC data can be found in the Appendices.

**TABLE 1-1
TEST MATRIX
WAIMANALO GULCH SOLID WASTE LANDFILL FLARE**

Parameter	Method	No. of Runs	Duration
O ₂ /CO ₂	EPA Method 3a	3	60 minutes
Visible Emissions	EPA Method 9	2	6 minutes
THC as CH ₄	EPA Method 25	3	60 minutes

**TABLE 1-2
SUMMARY OF TEST RESULTS
WAIMANALO GULCH SOLID WASTE LANDFILL FLARE**

Parameter	Units	Unit TU-2301	Permit Limit
THC as CH ₄	PPMVD @ 3% O ₂	< 1.0	120
O ₂	%	12.89	N/A
V.E.	%	0	20

2.0 TEST UNIT DESCRIPTION

The landfill gas control system and flare station at the Waimanalo Gulch Solid Waste Landfill includes a gas collection system, gas wells, and an enclosed flare to incinerate the landfill gas.

The flare was manufactured by Shaw LFG Specialty, Inc. The flare is equipped with a propane-fueled pilot, two centrifugal blowers (only one was operational during testing-the second is a back-up) and UV flame sensor. The flare has three (3) monitoring thermocouples. Testing was conducted at two of the four flanged ports at a height of 24 feet.

The site contact and physical location of the flare is as follows:

Physical Address:

Waimanalo Gulch Solid Waste Landfill
92-460 Farrington Highway
Kapolei, HI 96897

Contacts:

Rajan Phadnis
Shaw Environmental, Inc.
2360 Bering Drive
San Jose, CA 95131

Willie Gomez
Shaw Environmental, Inc.
Waimanalo Gulch Solid Waste Landfill
92-460 Farrington Highway
Kapolei, HI 96897

3.0 TEST DESCRIPTION

3.1 Test Conditions

The landfill gas flow rate averaged 4,174 dscfm during the source testing. Temperature and fuel flow rate were monitored and recorded by the automatic operation control system throughout the test period. On-site data for landfill flow (scfm), flare temperature and flare set point temperature data was collected every two (2) minutes. Flare operation data is contained in Appendix E.

Wind conditions on day of the testing were not a factor.

3.2 Sample Locations

Samples were collected at the flare exhaust and at the inlet (landfill gas fuel) to the flare. The flare has an inner dimension of six (6) feet, three (3) inches. The ports are approximately twenty-four (24) feet above the ground; the stack exit is thirty (30) feet above the ground.

3.3 Test Procedures

The test procedures used for the inlet and flare exhaust measurements are summarized below in Tables 3-1 and 3-2, respectively. Brief discussions of each procedure are given below in Sections 3.3.1 through 3.3.4. Triplicate measurements of each parameter were performed.

**TABLE 3-1
FLARE INLET TEST PROCEDURES
WAIMANALO GULCH SOLID WASTE LANDFILL**

Parameter	Sample Medium	Analytical Technique	Reference Method	Number of Replicates
Total gaseous non-methane organics (TGNMO)	Tedlar Bag	TCA/FID	EPA Method 25	3
Fuel Analysis	Tedlar Bag	GC/TCD	ASTM D-3588	3
VOC Component Analysis	Tedlar Bag	GC/MS	TO-15	1

**TABLE 3-2
FLARE EXHAUST TEST PROCEDURES
WAIMANALO GULCH SOLID WASTE LANDFILL**

Parameter	Sample Medium	Reference Method	Number of Replicates
O ₂	CEM	EPA Method 3A	3
CO ₂	CEM	EPA Method 3A	3
V.E.	V.E.E.R	EPA Method 9	2
THC as CH ₄	CEM	EPA Method 25a	3

3.0 TEST DESCRIPTION (Continued)

3.3.1 Methane and Total Gaseous Non-Methane Organics

Permanent Gases and Total Gaseous Non-Methane Organics (TGNMO) were measured following EPA Method 25. The landfill gas was collected into a Tedlar bag. ATMAA, Inc., in Calabasas, California analyzed the samples using TCA/FID. The F factor was calculated according to the equation in ASTM D-3588. The TO-15 Component Analysis was measured by GC/MS.

The exhaust gas measurements were conducted using EPA Method 25a. The sample was drawn through a stainless steel probe connected by a heated Teflon sample line to a Total Hydrocarbon (THC) Analyzer. The exhaust sampling was conducted simultaneously with the collection of the inlet samples for the determination of destruction efficiency.

3.3.2 Oxygen and Carbon Dioxide

Measurements of O₂ and CO₂ at the exhaust were conducted using EPA Method 3A sampling with a CEMS.

These CEMS measurements were obtained using SCEC's continuous emissions monitoring system described in Appendix A. The system includes a stainless steel probe connected to a 25 foot Teflon line to extract the exhaust sample. The sample gas is then directed through a moisture knockout cooled with ice and water. A peristaltic pump continuously drains the knockout. The sample then travels to the ground using Teflon tubing to an additional conditioning and filtering system. Leak checks were conducted prior to and at the conclusion of compliance testing by operating the sample pump, plugging the probe inlet and all pressure side system exits except for one analyzer rotameter, then measuring the leakage rate on that rotameter.

A calibration error test was performed on each analyzer prior to testing. The calibration error test was conducted by spanning the instrument with zero and high span gas and then recording the as-found value when injecting zero, mid and high span gases.

EPA Protocol 1 Calibration Gases were used for all analyzer calibrations. In accordance with EPA Method procedures, pre- and post-test system bias checks were conducted for each test run. The system bias check was conducted by delivering zero and span gas to the CEM probe tip and recording the as-found species concentration. No analyzer adjustments were made between these pre- and post-system bias checks. Calculations for the correction of measured system bias and instrument drift were then applied to each test run.

Triplicate emissions measurements were performed to determine the concentration of O₂ and CO₂. The average concentrations were determined during each test for a period of sixty minutes. This test average was then corrected for measured system bias and drift.

4.0 RESULTS

During this compliance test, triplicate sixty (60) minute were performed. Concurrent with each run, a landfill gas sample was collected for analysis. The results of the source tests of the Waimanalo Gulch Solid Waste Landfill Flare show that the flare emissions are below State of Hawaii DOH permit limits. Table 1-2 present the summarized test results and applicable permit limits. Table 4-1 present detailed test results of each parameter.

4.1 Test Critique

No sampling or analytical problems occurred during the test program.

All calibration errors and system bias checks and drifts were below their allowable tolerance, 2%, 5% and 3% respectively.

**TABLE 4-1
WAIMANALO GULCH SOLID WASTE LANDFILL
SUMMARY OF RESULTS**

Parameter	Units	Run #1	Run #2	Run #3	Average	Permit Limit
THC	PPMVD as CH ₄	0.00	0.13	0.08	0.07	---
	PPMVD @ 3% O ₂	0.00	0.28	0.17	0.150	120
O ₂	%	13.14	12.82	12.71	12.89	---
CO ₂	mole - %	7.24	7.54	7.64	7.47	---
Flare Temperature	Degrees F	1,506	1,507	1,507	1,507	---
Flare Flow	DSCFM	4,292	4,133	4,097	4,174	---

APPENDIX A

SAMPLING AND ANALYTICAL PROCEDURES EXAMPLE CALCULATIONS

SAMPLING AND ANALYTICAL PROCEDURES

EPA METHOD 3a - GAS ANALYSIS FOR DRY MOLECULAR WEIGHT AND EXCESS AIR

A gas sample was continuously extracted from the stack using the SCEC continuous monitoring system. Carbon dioxide and oxygen concentrations were determined in accordance with EPA Method 3A.

EPA METHOD 25a - Total Non-Methane Organics Compounds

The THC as CH₄ measurements were obtained using SCEC's Total Hydrocarbon Analyzer (THC). The system includes a stainless steel probe connected to a fifty (50) foot heated Teflon line to extract the exhaust sample. The heated sample line connects directly to the inlet of the THC analyzer. The THC analyzer operates on the principle of flame ionization detection (FID).

A calibration error test was performed on each analyzer prior to testing. The calibration error test was conducted by spanning the instrument with zero and high span gas and then recording the as-found value when injecting zero, mid and high span gases.

A continuous sample was extracted from the stack through a stainless steel probe, coarse filter, sample conditioner (condensate train) and then drawn via 3/8" Teflon line to the Mobile Emissions Laboratory (MEL). The sample was filtered again through a fine Balston filter and finally delivered to the analyzers through the sample manifold and dedicated flow meters.

Prior to beginning the compliance test, a system leak check and calibration check was performed. The leak check was accomplished by plugging the probe tip and drawing >25" Hg vacuum on the entire sampling system. When all flow meters indicated 0.000 scfh flow, the system was proven to be free of all leaks. A system calibration check (SCC) was performed by valving calibration gas to the probe tip and drawing sample. SCC did not exceed 5%.

After zeroing all analyzers, EPA Protocol I gases were used to calibrate each analyzer within 80-90% and 40%-60% full scale of the selected range.

All concentrations from the O₂ and CO₂ analyzers were recorded on a Johnson Yokogawa HR2400 and a data acquisition system (DAS). The data was reduced via computer in SCEC's Laboratory.

EQUATION:

$$\text{NMOC ppm} = (\text{NMOC\%FS} - \text{Average NMOC Zero}) \times \frac{\text{NMOC Cal Gas Value}}{\text{Average NMOC Span} - \text{Average NMOC Zero}}$$

$$\text{ppm @ 3\% O}_2 = \text{ppm obsv.} \times 17.95 / (20.95 - \text{\%O}_2 \text{ obsv.})$$

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EXAMPLE CALCULATIONS

CONTINUOUS MONITORING

Client : _____

Facility : _____

Sample Location : _____

Date : _____

Run No : _____

EFFLUENT GAS CONCENTRATION

$$C_{gas} = \frac{(C_{avg} - C_o)}{(C_m - C_o)} \cdot C_{ma}$$

$$C_{gas} = \left(\frac{\quad - \quad}{\quad - \quad} \right) \cdot (\quad)$$

$$C_{gas} = \quad \text{ppmvd}$$

EFFLUENT GAS CONCENTRATION - OXYGEN CORRECTION

$$C_{gas}(\text{Corr}) = C_{gas} \cdot \frac{(20.9 - \%O_2\text{corr})}{(20.9 - \%O_2\text{stk})}$$

$$C_{gas}(\text{Corr}) = (\quad) \cdot \left(\frac{\quad - \quad}{\quad - \quad} \right)$$

$$C_{gas}(\text{Corr}) = \quad \text{ppmvd}$$

EFFLUENT GAS MASS EMISSION RATE

$$E1 = C_{gas} \cdot MW \cdot Q_{sd} \cdot K1$$

$$E1 = (\quad) \cdot (\quad) \cdot (\quad) \cdot (\quad)$$

$$E1 = \quad \text{LB/Hr}$$

$$E2 = C_{gas} \cdot MW \cdot K2 \cdot F_d \cdot (20.9 / (20.9 - \%O_2\text{stk}))$$

$$E2 = (\quad) \cdot (\quad) \cdot (\quad) \cdot (\quad) \cdot (20.9 / (20.9 - \quad))$$

$$E2 = \quad \text{LB/mmBtu}$$

NOMENCLATURE

		<u>Units</u>
Cavg	Average gas concentration of analyzer	ppmvd
Cgas	Effluent gas concentration	ppmvd
Cgas(Corr)	Effluent gas concentration, oxygen corrected	ppmvd
Co	Average of initial and final system bias checks for the zero gas	ppmvd
Cm	Average of initial and final system bias checks for the upscale gas	ppmvd
Cma	Actual concentration of the upscale calibration gas	ppmvd
E1	Mass Emission Rate based on volume flow rate	lb/hr
E2	Mass Emission Rate based on Fd Factor	lb/mmBtu
Fd	Dry Based F-Factor (8710-Gas, 9190-Oil, 9240-Wood)	-----
K1	Conversion Factor (1.583 E-07, 1.557 E-07, 1.553 E-07 @ 60,68,70 deg F Std Temp	lb-mole*min/mg*dscf*Hr
K2	Conversion Factor (2.59 E-09 @ 68 deg F)	lb-mole/dscf*E-06
MW	Molecular Weight (Nox = 46.01, SO2 = 64.06, CO = 28)	lb/lb-mole
O2corr	Oxygen value to be corrected to	%
O2stk	Oxygen value of effluent	%

APPENDIX B - QUALITY ASSURANCE

- **CEMS CALIBRATION ERROR**
- **CEMS BIAS AND DRIFT DATA**
- **CEMS RM TEST DATASHEETS**
- **CALIBRATION GAS CERTIFICATIONS**

CALIBRATION ERROR

FACILITY:	WGSWL	DATA FOR SAMPLING RUNS:		COMPLIANCE RUNS 1,2,3	
SOURCE ID/CONDITION:	Flare	DATE:			12/16/2005
OPERATOR:	HJJ	PROJECT No.:			1929.3001
PARAMETER	CYLINDER VALUE	ANALYZER CALIBRATION RESPONSE	ABSOLUTE DIFFERENCE	DIFFERENCE	
UNITS	PPMV or % VOL	PPMV or % VOL	PPMV or % VOL	% OF SPAN	
O ₂ - FULL SCALE	25.00				
O ₂ - ZERO	0.00	0.07	-0.07	-0.28	
O ₂ - MID CAL	12.16	12.22	-0.06	-0.24	
O ₂ - HIGH CAL	21.24	21.25	-0.01	-0.04	
CO ₂ - FULL SCALE	20.00				
CO ₂ - ZERO	0.00	-0.02	0.02	0.10	
CO ₂ - MID CAL	9.95	9.88	0.07	0.35	
CO ₂ - HIGH CAL	17.97	17.89	0.08	0.40	
THC - FULL SCALE	100.00				
THC - ZERO	0.00	0.20	-0.20	-0.20	
THC - LOW CAL	15.01	15.10	-0.09	-0.09	
THC - MID CAL	44.63	44.30	0.33	0.33	
THC - HIGH CAL	82.55	82.20	0.35	0.35	

SYSTEM CALIBRATION BIAS AND DRIFT DATA

FACILITY:	WGSWL	DATA FOR SAMPLING RUN:		COMPLIANCE RUN 1		
SOURCE ID/CONDITION:	Flare	DATE:			12/16/05	
OPERATOR:	HJJ	PROJECT No.:			1929.3001	
		INITIAL VALUES		FINAL VALUES		
PARAMETER	ANALYZER CALIBRATION RESPONSE	SYSTEM CALIBRATION RESPONSE	SYSTEM CALIBRATION BIAS	SYSTEM CALIBRATION RESPONSE	SYSTEM CALIBRATION BIAS	CALIBRATION DRIFT
UNITS	PPMV or % VOL	PPMV or % VOL	% OF SPAN	PPMV or % VOL	% OF SPAN	% OF SPAN
O ₂ - ZERO	0.07	0.07	0.00	0.10	-0.12	-0.12
O ₂ - SPAN	12.22	12.11	0.44	12.21	0.04	-0.40
CO ₂ - ZERO	-0.02	0.02	-0.20	0.05	-0.35	-0.15
CO ₂ - SPAN	9.88	9.92	-0.20	9.92	-0.20	0.00
THC - ZERO	0.20	0.20	0.00	-1.70	0.95	0.95
THC - SPAN	15.10	15.10	0.00	15.20	-0.05	-0.05

SYSTEM CALIBRATION BIAS AND DRIFT DATA

FACILITY:	WGSWL	DATA FOR SAMPLING RUN:		COMPLIANCE RUN 2		
SOURCE ID/CONDITION:	Flare	DATE:			12/16/05	
OPERATOR:	HJJ	PROJECT No.:			1929.3001	
		INITIAL VALUES		FINAL VALUES		
PARAMETER	ANALYZER CALIBRATION RESPONSE	SYSTEM CALIBRATION RESPONSE	SYSTEM CALIBRATION BIAS	SYSTEM CALIBRATION RESPONSE	SYSTEM CALIBRATION BIAS	CALIBRATION DRIFT
UNITS	PPMV or % VOL	PPMV or % VOL	% OF SPAN	PPMV or % VOL	% OF SPAN	% OF SPAN
O ₂ - ZERO	0.07	0.10	-0.12	0.08	-0.04	0.08
O ₂ - SPAN	12.22	12.21	0.04	12.22	0.00	-0.04
CO ₂ - ZERO	-0.02	0.05	-0.35	0.07	-0.45	-0.10
CO ₂ - SPAN	9.88	9.92	-0.20	9.92	-0.20	0.00
THC - ZERO	0.20	-1.70	0.95	-1.90	1.05	0.10
THC - SPAN	15.10	15.20	-0.05	15.00	0.05	0.10

SYSTEM CALIBRATION BIAS AND DRIFT DATA

FACILITY:	WGSWL	DATA FOR SAMPLING RUN:		COMPLIANCE RUN 3		
SOURCE ID/CONDITION:	Flare	DATE:			12/16/05	
OPERATOR:	HJJ	PROJECT No.:			1929.3001	
		INITIAL VALUES		FINAL VALUES		
PARAMETER	ANALYZER CALIBRATION RESPONSE	SYSTEM CALIBRATION RESPONSE	SYSTEM CALIBRATION BIAS	SYSTEM CALIBRATION RESPONSE	SYSTEM CALIBRATION BIAS	CALIBRATION DRIFT
UNITS	PPMV or % VOL	PPMV or % VOL	% OF SPAN	PPMV or % VOL	% OF SPAN	% OF SPAN
O2 - ZERO	0.07	0.08	-0.04	0.08	-0.04	0.00
O2 - SPAN	12.22	12.22	0.00	12.20	0.08	0.08
CO2 - ZERO	-0.02	0.07	-0.45	0.07	-0.45	0.00
CO2 - SPAN	9.88	9.92	-0.20	9.90	-0.10	0.10
THC - ZERO	0.20	-1.90	1.05	-1.80	1.00	-0.05
THC - SPAN	15.10	15.00	0.05	15.00	0.05	0.00

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CEMS RM TEST DATA

Test No.: <u>Comp Run #1</u>	Date: <u>12/16/05</u>
Client: <u>Shaw Env.</u>	Condition: _____
Location: <u>WGSWL</u>	Operator: <u>HJ</u>
Unit: <u>Flare</u>	Barometric Pressure: <u>30.20</u>

Gas Temperatures	
Stack: <u>1465°F</u>	Knockout: <u>58°F</u>
Probe: <u>—</u>	Ambient: <u>78°F</u>
Heated Line: <u>~248</u>	Chiller: <u>3.73°C</u>

			Expected Values					
			O2 (%)	CO2 (%)	NOx (PPM)	CO (PPM)	SO2 (PPM)	THC (PPM)
Analyzer Span Range:			25	20	100	200		100
Low Span Cylinder Value:								15.01
Mid Span Cylinder Value:			12.16	9.95	44.27	86.57		44.63
High Span Cylinder Value:			21.24	17.97	88.00	175.60		82.55
			Direct Analyzer Calibration Values					
Zero Actual Value:			.07	-.02	.20	-.1		.20
Low Span Actual Value:								15.1
Mid Span Actual Value:			12.22	9.88	45.30	88.7		44.3
High Span Actual Value:			21.25	17.89	87.8	173.4		82.2
			Pre-Test Analyzer System Bias Values					
System Bias Zero:			.07	.02	.70	.10		.20
System Bias Span:			12.11	9.92	45.3	88.4		15.1
			Raw Test Data					
Sample Point	Time		O2 (%)	CO2 (%)	NOx (PPM)	CO (PPM)	SO2 (PPM)	THC (PPM)
	Start	Stop						
	0940	1105						
			Post-Test Analyzer System Bias Values					
System Bias Zero:			.10	.05	.20	.10		-1.7
System Bias Span:			12.21	9.92	44.3	89.5		15.2
			Post-Test Analyzer Calibration Values					
Zero Actual Value:								
Low Span Actual Value:								
Mid Span Actual Value:								
High Span Actual Value:								
			Test Results Summary					
			O2 (%)	CO2 (%)	NOx (PPM)	CO (PPM)	SO2 (PPM)	THC (PPM)
Raw Average:								
Corrected Average:								
Lbs/Hr. Average:								

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CEMS RM TEST DATA

Test No.: <u>Comp Run#2</u> Client: <u>Shaw Env.</u> Location: <u>WGSWC</u> Unit: <u>Flare</u>	Date: <u>12/16/05</u> Condition: _____ Operator: <u>HS</u> Barometric Pressure: <u>30.20</u>
Gas Temperatures	
Stack: <u>1465°F</u> Probe: _____ Heated Line: <u>~248</u>	Knockout: <u>58°F</u> Ambient: <u>77°F</u> Chiller: <u>3.8°C</u>

			Expected Values				
			O2 (%)	CO2 (%)	NOx (PPM)	CO (PPM)	SO2 (PPM) THC (PPM)
Analyzer Span Range:							
Low Span Cylinder Value:				See	Run	#1	
Mid Span Cylinder Value:							
High Span Cylinder Value:							
			Direct Analyzer Calibration Values				
Zero Actual Value:							
Low Span Actual Value:				See	Run	#1	
Mid Span Actual Value:							
High Span Actual Value:							
			Pre-Test Analyzer System Bias Values				
System Bias Zero:			.10	.05	.20	.10	-1.7
System Bias Span:			12.21	9.92	44.3	89.5	15.2
			Raw Test Data				
Sample Point	Time		O2 (%)	CO2 (%)	NOx (PPM)	CO (PPM)	SO2 (PPM) THC (PPM)
	Start	Stop					
	1129	1229					
			Post-Test Analyzer System Bias Values				
System Bias Zero:			.08	.07	.20	.10	-1.9
System Bias Span:			12.22	9.92	44.5	89.5	15.0
			Post-Test Analyzer Calibration Values				
Zero Actual Value:							
Low Span Actual Value:							
Mid Span Actual Value:							
High Span Actual Value:							
			Test Results Summary				
			O2 (%)	CO2 (%)	NOx (PPM)	CO (PPM)	SO2 (PPM) THC (PPM)
Raw Average:							
Corrected Average:							
Lbs/Hr. Average:							

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CEMS RM TEST DATA

Test No.: <u>Comp Run#3</u> Client: <u>Shaw Env.</u> Location: <u>WGSULT</u> Unit: <u>Flare</u>	Date: <u>12/16/05</u> Condition: _____ Operator: <u>HS</u> Barometric Pressure: <u>30.20</u>
Gas Temperatures	
Stack: <u>1465°F</u> Probe: _____ Heated Line: <u>~248</u>	Knockout: <u>58°F</u> Ambient: <u>77°F</u> Chiller: <u>4.2°C</u>

			Expected Values					
			O2 (%)	CO2 (%)	NOx (PPM)	CO (PPM)	SO2 (PPM)	THC (PPM)
Analyzer Span Range:								
Low Span Cylinder Value:				See	Run	#1		
Mid Span Cylinder Value:								
High Span Cylinder Value:								
			Direct Analyzer Calibration Values					
Zero Actual Value:								
Low Span Actual Value:				See	Run	#1		
Mid Span Actual Value:								
High Span Actual Value:								
			Pre-Test Analyzer System Bias Values					
System Bias Zero:			.08	.07	.20	.10		-1.9
System Bias Span:			12.22	9.92	44.5	89.5		15.0
			Raw Test Data					
Sample Point	Time		O2 (%)	CO2 (%)	NOx (PPM)	CO (PPM)	SO2 (PPM)	THC (PPM)
	Start	Stop						
	1252	1352						
			Post-Test Analyzer System Bias Values					
System Bias Zero:			.08	.07	.20	.10		-1.8
System Bias Span:			12.20	9.90	44.5	89.3		15.0
			Post-Test Analyzer Calibration Values					
Zero Actual Value:								
Low Span Actual Value:								
Mid Span Actual Value:								
High Span Actual Value:								
			Test Results Summary					
			O2 (%)	CO2 (%)	NOx (PPM)	CO (PPM)	SO2 (PPM)	THC (PPM)
Raw Average:								
Corrected Average:								
Lbs/Hr. Average:								

Certificate of Analysis: E.P.A. Protocol Gas Mixture

Certification performed in accordance with "EPA Traceability Protocol (Sept.1997)"
using assay procedures listed.

Cylinder No: SG9199648BAL
Certification Date: 2/9/2004
Cylinder Pressure: 2013 psig
*Do not use cylinder below 150 psig.

Reference Number: 54-80656900-001
Expiration Date: 2/9/2007
Part No: E02NI99E15A0013
Lab: Chicago

Component	Certified Concentration	Unit of Measure	Accuracy	Procedure	Analytical Principle
Methane	15.01	PPM	1%	G-1	FTIR
Nitrogen	Balance				

Nox
(Reference Value Only) ppm.

Reference Standard Information

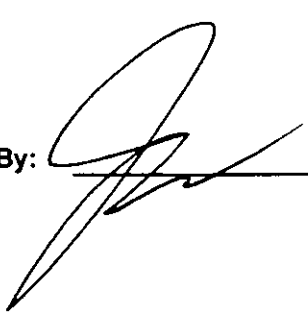
Type	Component	Concentration	Unit	Cylinder Number
GMIS	Methane	25.6	PPM	SG9147096BAL

Analytical Data

Analysis Date: 2/9/2004

R	<u>25.94</u>	S	<u>15.18</u>	Z	<u>0.00</u>
S	<u>15.21</u>	Z	<u>0.00</u>	R	<u>25.85</u>
Z	<u>0.00</u>	R	<u>25.92</u>	S	<u>15.19</u>

NOTE:

Approved By: 



Certificate of Analysis: EPA Protocol Gas Mixture

Cylinder Number: CC47188 Reference Number: 48-124029819-97
Cylinder Pressure: 1999.6 PSIG Expiration Date: 2/21/2008
Certification Date: 2/21/2005 Laboratory: ASG - Los Angeles - CA

Airgas Specialty Gases
11711 S. Alameda Street
Los Angeles, CA 90059-2130
323.357.6891 fax: 323.567.3686
www.airgas.com

Certified Concentrations

Component	Concentration	Accuracy	Analytical Principle	Procedure
METHANE	44.63 PPM	+/- 1%	FID	G1
NITROGEN	Balance			

Certification performed in accordance with "EPA Traceability Protocol (Sept. 1997)" using the assay procedures listed. Analytical Methodology does not require correction for analytical interferences.

Notes:

Do not use cylinder below 150 psig.

Approval Signature _____

Reference Standard Information

Type	Reference Gas	Component	Cyl. Number	Concentration
GMIS 6		METHANE	K959196	104.0 PPM

Analytical Results

1st Component **METHANE**

1st Analysis Date: 02/21/2005

R 8398	S 3604	Z 0000	Conc 44.63 PPM
S 3604	Z 0000	R 8398	Conc 44.63 PPM
Z 0000	R 8398	S 3604	Conc 44.63 PPM
AVG: 44.63 PPM			



Certificate of Analysis: EPA Protocol Gas Mixture

Cylinder Number: CC53847 Reference Number: 48-124029935-2
Cylinder Pressure: 1999.6 PSIG Expiration Date: 2/24/2008
Certification Date: 2/24/2005 Laboratory: ASG - Los Angeles - CA

Airgas Specialty Gases
11711 S. Alameda Street
Los Angeles, CA 90059-2130
323.357.6891 fax: 323.567.3686
www.airgas.com

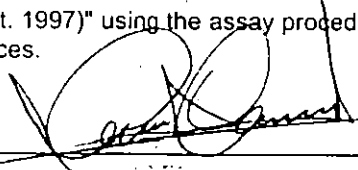
Certified Concentrations

Component	Concentration	Accuracy	Analytical Principle	Procedure
METHANE	82.55 PPM	+/- 1%	TCD	G1
NITROGEN	Balance			

Certification performed in accordance with "EPA Traceability Protocol (Sept. 1997)" using the assay procedures listed. Analytical Methodology does not require correction for analytical interferences.

Notes:

Do not use cylinder below 150 psig.

Approval Signature 

Reference Standard Information

Type	Balance Gas	Component	Cyl. Number	Concentration
GMIS 6		METHANE	K959196	104.0 PPM

Analytical Results

1st Component **METHANE**

1st Analysis Date: 02/24/2005

R 8683	S 6892	Z 0000	Conc 82.55 PPM
S 6892	Z 0000	R 8683	Conc 82.55 PPM
Z 0000	R 8683	S 6892	Conc 82.55 PPM
AVG: 82.55 PPM			



SCOTT-MARRIN, INC.

6531 BOX SPRINGS BLVD. • RIVERSIDE, CA 92507
TELEPHONE (909) 653-6780 • FAX (909) 653-2430

REPORT OF ANALYSIS
EPA PROTOCOL GAS MIXTURES

SCEC01

TO: Harry Johnson
SCEC - Air Quality Specialists
98-030 Hekaha St Ste 1
Aiea HI 96701

DATE: September 29 2003

CUSTOMER ORDER NUMBER: 104

COMPONENT	CONCENTRATION(v/v) ± EPA UNCERTAINTY	REFERENCE STANDARD	ANALYZER MAKE, MODEL, S/N, DETECTION	EXPIRATION DATE	REPLICATE ANALYSIS DATA
CYLINDER NO:	LL38046				
Oxygen	11.91 ± 0.12%	GMIS	VARIAN MODEL 1860 TCD S/N NONE	09/29/06	09/29/03 11.83%
		CYLINDER #:	THERMAL CONDUCTIVITY		11.96%
Nitrogen	Balance	CA03201	GAS CHROMATOGRAPHY		11.95%
CYLINDER PRESSURE: 2000 psig		@ 24.82%	LAST CAL DATE: 09/29/03	MEAN:	11.91%

ppm = μ mole/mole

% = mole-%

The above analyses were performed in accordance with Procedure G1 of the EPA Traceability Protocol, Report Number EPA-600/R97/121, dated September 1997.

This cylinder should not be used if the pressure is less than 150 psig.

ANALYST:

M. S. CALHOUN

APPROVED:

J. T. MARRIN

The only liability of this company for gas which fails to comply with this analysis shall be replacement or reanalysis thereof by the company without extra cost.

STANDARD CALIBRATION GASES IN ALUMINUM CYLINDERS



SCOTT-MARRIN, INC.

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REPORT OF ANALYSIS
EPA PROTOCOL GAS MIXTURES

SCEC01

TO: Harry Johnson
SCEC - Air Quality Specialists
98-030 Hekaha St Ste 1
Aiea HI 96701

DATE: September 29 2003

CUSTOMER ORDER NUMBER: 104

COMPONENT	CONCENTRATION(V/V) ± EPA UNCERTAINTY	REFERENCE STANDARD	ANALYZER MAKE, MODEL, S/N, DETECTION	EXPIRATION DATE	REPLICATE ANALYSIS DATA
CYLINDER NO:	CC28991				
Oxygen	20.95 ± 0.21%	GMIS	VARIAN MODEL 1860 TCD S/N NONE	09/29/06	09/29/03 20.97%
Nitrogen	Balance	CA03201	CYLINDER #: THERMAL CONDUCTIVITY GAS CHROMATOGRAPHY		20.95%
CYLINDER PRESSURE:	2000 psig	@ 24.82%	LAST CAL DATE: 09/29/03	MEAN:	20.94%
					20.95%

ppm = $\mu\text{mole/mole}$

% = mole-%

The above analyses were performed in accordance with Procedure G1 of the EPA Traceability Protocol, Report Number EPA-600/R97/121, dated September 1997.
This cylinder should not be used if the pressure is less than 150 psig.

ANALYST:

M. S. CALHOUN

APPROVED:

J. T. MARRIN

The only liability of this company for gas which fails to comply with this analysis shall be replacement or reanalysis thereof by the company without extra cost.

STANDARD CALIBRATION GASES IN ALUMINUM CYLINDERS



SCOTT-MARRIN, INC.

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REPORT OF ANALYSIS
EPA PROTOCOL GAS MIXTURES

SCEC01

TO: Harry Johnson
SCEC - Air Quality Specialists
98-030 Hekaha St Ste 1
Aiea HI 96701

DATE: September 29 2003

CUSTOMER ORDER NUMBER: 104

COMPONENT	CONCENTRATION(V/V) ± EPA UNCERTAINTY	REFERENCE STANDARD	ANALYZER MAKE, MODEL, S/N, DETECTION	EXPIRATION DATE	REPLICATE ANALYSIS DATA
CYLINDER NO:	CA01314				
Carbon Dioxide	9.99 ± 0.02%	GMIS	VARIAN MODEL 1860 TCD S/N NONE	09/26/05	09/26/03 9.97%
		CYLINDER #:	THERMAL CONDUCTIVITY		9.99%
		CC51172	GAS CHROMATOGRAPHY		9.99%
		@ 17.98%	LAST CAL DATE: 08/29/03	MEAN:	9.98%
Nitric Oxide	124.5 ± 1.5 ppm	GMIS	BOVAR MODEL 922M S/N VD92284844	09/24/05	09/24/03 124.2 ppm
NOx	124.5 ppm	CYLINDER #:	CONTINUOUS		124.3 ppm
Nitrogen, O2-Free Balance		CA03023	UV PHOTOMETRY		124.0 ppm
CYLINDER PRESSURE: 1400 psig		@ 100.4 ppm	LAST CAL DATE: 08/28/03	MEAN:	124.2 ppm

ppm = $\mu\text{mole/mole}$

% = mole-%

The above analyses were performed in accordance with Procedure G1 of the EPA Traceability Protocol, Report Number EPA-600/R97/121, dated September 1997.

This cylinder should not be used if the pressure is less than 150 psig.

ANALYST:

B.M. MARRIN

APPROVED:

J.T. MARRIN

The only liability of this company for gas which fails to comply with this analysis shall be replacement or reanalysis thereof by the company without extra cost.

STANDARD CALIBRATION GASES IN ALUMINUM CYLINDERS



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REPORT OF ANALYSIS
EPA PROTOCOL GAS MIXTURES

SCEC01

TO: Harry Johnson
SCEC - Air Quality Specialists
98-030 Hekaha St Ste 1
Aiea HI 96701

DATE: September 29 2003

CUSTOMER ORDER NUMBER: 104

COMPONENT	CONCENTRATION(V/V) ± EPA UNCERTAINTY	REFERENCE STANDARD	ANALYZER MAKE, MODEL, S/N, DETECTION	EXPIRATION DATE	REPLICATE ANALYSIS DATA
=====					
CYLINDER NO:	CC108763				
Carbon Dioxide	17.92 ± 0.03%	GMIS	VARIAN MODEL 1860 TCD S/N NONE	09/26/05	09/26/03 17.85%
		CYLINDER #:	THERMAL CONDUCTIVITY		17.91%
		CC51172	GAS CHROMATOGRAPHY		17.91%
		@ 17.98%	LAST CAL DATE: 08/29/03	MEAN:	17.89%
=====					
Nitric Oxide	221.7 ± 1.2 ppm	GMIS	BOVAR MODEL 922M S/N VD92284844	09/24/05	09/24/03 222.4 ppm
NOx	221.7 ppm	CYLINDER #:	CONTINUOUS		221.3 ppm
Nitrogen, O2-Free Balance		CC72078	UV PHOTOMETRY		221.4 ppm
CYLINDER PRESSURE: 700 psig		@ 252.6 ppm	LAST CAL DATE: 08/28/03	MEAN:	221.7 ppm

ppm = $\mu\text{mole/mole}$

% = mole-%

The above analyses were performed in accordance with Procedure G1 of the EPA Traceability Protocol, Report Number EPA-600/R97/121, dated September 1997.

This cylinder should not be used if the pressure is less than 150 psig.

ANALYST:

B.M. MARRIN

APPROVED:

J. T. MARRIN

The only liability of this company for gas which fails to comply with this analysis shall be replacement or reanalysis thereof by the company without extra cost.

STANDARD CALIBRATION GASES IN ALUMINUM CYLINDERS

APPENDIX C – RESULTS

- **SUMMARY OF CONTINUOUS MONITORING DATA**
- **RAW DAS DATA**
- **CHART RECORDER DATA**

SUMMARY OF CONTINUOUS MONITORING DATA

FACILITY:	WGSWL	DATA FOR SAMPLING RUN:		COMPLIANCE RUN 1	
SOURCE ID/CONDITION:	Flare	DATE: 12/16/05		TIME: 09:40 - 11:05	
OPERATOR:	HJJ	PROJECT No.:	1929.3001		
PARAMETER	O ₂	CO ₂			THC
UNITS	% VOL DRY	% VOL DRY			PPMV as CH ₄
INITIAL ZERO BIAS	0.07	0.02			0.20
INITIAL SPAN BIAS	12.11	9.92			15.10
FINAL ZERO BIAS	0.10	0.05			-1.70
FINAL SPAN BIAS	12.21	9.92			15.20
AVERAGE ZERO BIAS	0.09	0.04			-0.75
AVERAGE SPAN BIAS	12.16	9.92			15.15
BIAS GAS CONCENTRATION	12.16	9.95			15.01
FULL SCALE RANGE	25.00	20.00			100.00
UNCORRECTED CONC.	13.14	7.23			-1.54
CORRECTED CONC.	13.14	7.24			0.0
PPMV @ 3% O ₂					0.00

SUMMARY OF CONTINUOUS MONITORING DATA

FACILITY:	WGSWL	DATA FOR SAMPLING RUN:	COMPLIANCE RUN 2
SOURCE ID/CONDITION:	Flare	DATE: 12/16/05	TIME: 11:29 - 12:29
OPERATOR:	HJJ	PROJECT No.: 1929.3001	
PARAMETER UNITS	O ₂ % VOL DRY	CO ₂ % VOL DRY	THC PPMV as CH ₄
INITIAL ZERO BIAS	0.10	0.05	-1.70
INITIAL SPAN BIAS	12.21	9.92	15.20
FINAL ZERO BIAS	0.08	0.07	-1.90
FINAL SPAN BIAS	12.22	9.92	15.00
AVERAGE ZERO BIAS	0.09	0.06	-1.80
AVERAGE SPAN BIAS	12.22	9.92	15.10
BIAS GAS CONCENTRATION	12.16	9.95	15.01
FULL SCALE RANGE	25.00	20.00	100.00
UNCORRECTED CONC.	12.87	7.53	-1.66
CORRECTED CONC.	12.82	7.54	0.13
PPMV @ 3% O ₂			0.28

SUMMARY OF CONTINUOUS MONITORING DATA

FACILITY:	WGSWL	DATA FOR SAMPLING RUN:		COMPLIANCE RUN 3	
SOURCE ID/CONDITION:	Flare	DATE:	12/16/05	TIME: 12:52 - 13:52	
OPERATOR:	HJJ	PROJECT No.:	1929.3001		
PARAMETER UNITS	O ₂ % VOL DRY	CO ₂ % VOL DRY			THC PPMV as CH4
INITIAL ZERO BIAS	0.08	0.07			-1.90
INITIAL SPAN BIAS	12.22	9.92			15.00
FINAL ZERO BIAS	0.08	0.07			-1.80
FINAL SPAN BIAS	12.20	9.90			15.00
AVERAGE ZERO BIAS	0.08	0.07			-1.85
AVERAGE SPAN BIAS	12.21	9.91			15.00
BIAS GAS CONCENTRATION	12.16	9.95			15.01
FULL SCALE RANGE	25.00	20.00			100.00
UNCORRECTED CONC.	12.76	7.62			-1.76
CORRECTED CONC.	12.71	7.64			0.08
PPMV @ 3% O2					0.17

WAIMANALO GULCH SOLID WASTE LANDFILL
LANDFILL GAS FLARE
DECEMBER 16, 2005
RAW DAS DATA - COMPLIANCE RUN 1
TIME: 09:40 - 11:05

DATA PT	DATE	TIME	O2 % VD	CO2 % VD		THC PPMV
1	12/16/05	09:40:46	13.37	7.00		-1.10
2	12/16/05	09:41:46	12.89	7.41		-1.30
3	12/16/05	09:42:46	14.97	5.60		0.50
4	12/16/05	09:43:46	12.34	7.92		1.40
5	12/16/05	09:44:46	13.07	7.24		-0.90
6	12/16/05	09:45:46	13.63	6.80		-0.60
7	12/16/05	09:46:46	13.31	7.10		-1.00
8	12/16/05	09:47:46	13.17	7.22		-0.20
9	12/16/05	09:48:46	12.79	7.52		-1.10
10	12/16/05	09:49:46	12.78	7.50		-1.20
11	12/16/05	09:50:46	12.44	7.81		-0.60
12	12/16/05	09:51:46	13.07	7.27		-1.30
13	12/16/05	09:52:46	12.86	7.46		-0.80
14	12/16/05	09:53:46	12.71	7.59		-1.40
15	12/16/05	09:54:46	12.93	7.39		-1.60
16	12/16/05	09:55:46	12.51	7.77		-1.40
17	12/16/05	09:56:46	12.54	7.75		-1.60
18	12/16/05	09:57:46	13.13	7.25		-0.90
19	12/16/05	09:58:46	12.95	7.33		-1.50
20	12/16/05	09:59:46	14.20	6.23		-1.50
21	12/16/05	10:00:46	13.07	7.29		-1.40
22	12/16/05	10:01:46	13.40	7.06		-1.70
23	12/16/05	10:02:46	13.28	7.13		-1.20
24	12/16/05	10:03:46	13.50	6.82		-1.70
25	12/16/05	10:04:46	14.49	6.12		-1.70
26	12/16/05	10:05:46	13.96	6.34		-1.70
27	12/16/05	10:06:46	13.60	6.81		-1.70
28	12/16/05	10:07:46	12.79	7.46		-1.80
29	12/16/05	10:08:46	12.46	7.72		-1.80
30	12/16/05	10:09:46	13.05	7.16		-1.60
31	12/16/05	10:10:46	12.58	7.66		-2.00
32	12/16/05	10:11:46	12.62	7.62		-1.90
33	12/16/05	10:12:46	12.93	7.42		-1.90
34	12/16/05	10:13:46	13.20	7.11		-1.90
35	12/16/05	10:14:46	13.22	7.14		-2.00
36	12/16/05	10:15:46	13.20	7.17		-2.00
37	12/16/05	10:16:46	12.39	7.89		-2.00
38	12/16/05	10:17:46	12.27	7.97		-1.90
39	12/16/05	10:18:46	12.78	7.55		-1.80
40	12/16/05	10:19:46	12.79	7.53		-1.40
41	12/16/05	10:20:02	13.01	7.38		-1.80
42	12/16/05	10:21:02	12.91	7.49		-2.00
43	12/16/05	10:22:02	12.81	7.56		-1.90
44	12/16/05	10:23:02	12.98	7.40		-1.90
45	12/16/05	10:24:02	13.13	7.29		-2.00
46	12/16/05	10:25:02	13.04	7.33		-1.80
47	12/16/05	10:26:02	13.85	6.61		-2.00
48	12/16/05	10:27:02	13.01	7.38		-2.10
49	12/16/05	10:28:02	13.01	7.41		-1.80
50	12/16/05	10:29:02	13.48	6.92		-2.10
51	12/16/05	10:30:02	14.00	6.56		-2.10
52	12/16/05	10:31:02	13.24	7.16		-1.90
53	12/16/05	10:32:02	13.37	7.06		-1.70
54	12/16/05	10:33:02	13.47	6.98		-2.10
55	12/16/05	10:34:02	13.17	7.24		-2.00
56	12/16/05	10:35:02	13.08	7.42		-1.90
57	12/16/05	10:36:02	13.79	6.65		-2.10
58	12/16/05	10:37:02	13.03	7.37		-2.00
59	12/16/05	10:38:02	13.04	7.39		-2.10
60	12/16/05	10:39:02	13.47	7.00		-2.10
AVERAGES:			13.14	7.23		-1.54

WAIMANALO GULCH SOLID WASTE LANDFILL
LANDFILL GAS FLARE
DECEMBER 16, 2005
RAW DAS DATA - COMPLIANCE RUN 2
TIME: 11:29 - 12:29

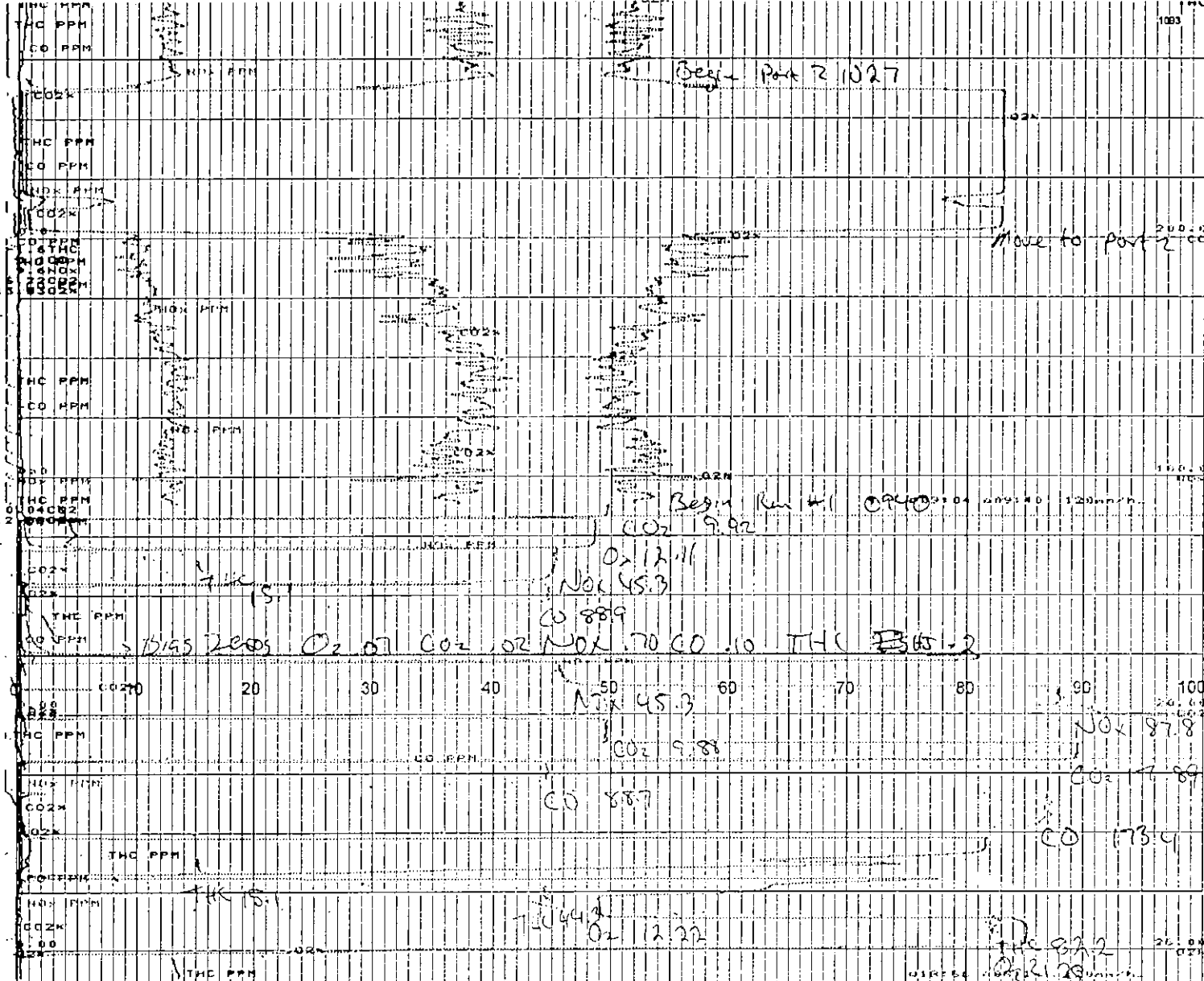
DATA PT	DATE	TIME	O2 % VD	CO2 % VD		THC PPMV
1	12/16/05	11:29:24	12.74	7.69		-1.50
2	12/16/05	11:30:24	12.83	7.65		-1.40
3	12/16/05	11:31:24	13.14	7.30		-1.40
4	12/16/05	11:32:24	12.05	8.22		-1.50
5	12/16/05	11:33:24	12.33	7.98		-1.40
6	12/16/05	11:34:24	13.11	7.31		-1.00
7	12/16/05	11:35:24	13.34	7.13		-1.50
8	12/16/05	11:36:24	12.89	7.55		-1.50
9	12/16/05	11:37:24	13.07	7.36		-1.80
10	12/16/05	11:38:24	12.81	7.54		-1.30
11	12/16/05	11:39:24	12.84	7.53		-1.70
12	12/16/05	11:40:24	12.94	7.47		-1.30
13	12/16/05	11:41:24	13.10	7.37		-1.70
14	12/16/05	11:42:24	13.12	7.34		-1.70
15	12/16/05	11:43:24	12.91	7.49		-1.70
16	12/16/05	11:44:24	12.98	7.43		-1.50
17	12/16/05	11:45:24	12.90	7.49		-1.80
18	12/16/05	11:46:24	12.93	7.50		-1.60
19	12/16/05	11:47:24	12.97	7.42		-1.70
20	12/16/05	11:48:24	12.98	7.42		-1.40
21	12/16/05	11:49:24	13.07	7.40		-1.80
22	12/16/05	11:50:24	12.43	7.90		-1.80
23	12/16/05	11:51:24	12.80	7.57		-1.10
24	12/16/05	11:52:24	13.17	7.22		-1.40
25	12/16/05	11:53:24	12.99	7.42		-1.80
26	12/16/05	11:54:24	13.14	7.29		-1.00
27	12/16/05	11:55:24	12.74	7.63		-1.90
28	12/16/05	11:56:24	12.37	7.98		-1.90
29	12/16/05	11:57:24	12.62	7.73		-1.30
30	12/16/05	11:58:24	12.64	7.72		-1.70
31	12/16/05	11:59:24	12.79	7.61		-1.60
32	12/16/05	12:00:24	12.74	7.65		-1.70
33	12/16/05	12:01:24	12.63	7.73		-1.50
34	12/16/05	12:02:24	13.10	7.31		-1.80
35	12/16/05	12:03:24	13.10	7.35		-1.50
36	12/16/05	12:04:24	12.23	8.08		-1.90
37	12/16/05	12:05:24	12.55	7.74		-1.80
38	12/16/05	12:06:24	13.00	7.45		-1.80
39	12/16/05	12:07:24	12.88	7.52		-1.70
40	12/16/05	12:08:24	13.23	7.20		-1.60
41	12/16/05	12:09:24	13.23	7.26		-1.80
42	12/16/05	12:10:24	12.58	7.77		-1.70
43	12/16/05	12:11:24	12.62	7.69		-1.50
44	12/16/05	12:12:24	12.11	8.21		-1.90
45	12/16/05	12:13:24	13.07	7.36		-1.80
46	12/16/05	12:14:24	13.23	7.29		-1.50
47	12/16/05	12:15:24	12.43	7.87		-2.00
48	12/16/05	12:16:24	13.14	7.29		-1.90
49	12/16/05	12:17:24	12.86	7.49		-1.90
50	12/16/05	12:18:24	12.99	7.44		-1.70
51	12/16/05	12:19:24	13.24	7.23		-1.90
52	12/16/05	12:20:24	12.86	7.54		-2.00
53	12/16/05	12:21:24	12.90	7.50		-1.90
54	12/16/05	12:22:24	12.78	7.62		-1.90
55	12/16/05	12:23:24	13.04	7.40		-1.60
56	12/16/05	12:24:24	12.99	7.45		-2.00
57	12/16/05	12:25:24	12.82	7.64		-2.00
58	12/16/05	12:26:24	13.24	7.25		-1.90
59	12/16/05	12:27:24	13.21	7.27		-1.60
60	12/16/05	12:28:24	12.94	7.51		-2.00
AVERAGES:			12.87	7.53		-1.66

WAIMANALO GULCH SOLID WASTE LANDFILL
LANDFILL GAS FLARE
DECEMBER 16, 2005
RAW DAS DATA - COMPLIANCE RUN 3
TIME: 12:52 - 13:52

DATA PT	DATE	TIME	O2 % VD	CO2 % VD		THC PPMV
1	12/16/05	12:50:24	13.03	7.37		-1.80
2	12/16/05	12:51:24	12.56	7.76		-1.90
3	12/16/05	12:52:24	12.62	7.72		-1.80
4	12/16/05	12:53:24	12.47	7.85		-1.80
5	12/16/05	12:54:24	12.79	7.55		-1.60
6	12/16/05	12:55:24	12.42	7.96		-1.60
7	12/16/05	12:56:24	12.44	7.89		-1.60
8	12/16/05	12:57:24	12.46	7.87		-1.60
9	12/16/05	12:58:24	12.21	8.07		-0.10
10	12/16/05	12:59:24	11.93	8.28		-1.50
11	12/16/05	13:00:24	12.48	7.84		-1.60
12	12/16/05	13:01:24	12.85	7.49		-1.70
13	12/16/05	13:02:24	13.08	7.34		-1.50
14	12/16/05	13:03:24	12.95	7.48		-1.30
15	12/16/05	13:04:24	13.02	7.41		-1.60
16	12/16/05	13:05:24	12.92	7.48		-1.80
17	12/16/05	13:06:24	12.68	7.67		-1.70
18	12/16/05	13:07:24	12.50	7.83		-1.70
19	12/16/05	13:08:24	12.71	7.70		-1.40
20	12/16/05	13:09:24	12.63	7.72		-1.70
21	12/16/05	13:10:24	12.89	7.49		-0.80
22	12/16/05	13:11:24	12.82	7.54		-1.50
23	12/16/05	13:12:24	12.88	7.48		-1.90
24	12/16/05	13:13:24	12.95	7.42		-1.90
25	12/16/05	13:14:24	13.36	7.05		-1.90
26	12/16/05	13:15:24	13.19	7.21		-1.90
27	12/16/05	13:16:24	13.02	7.40		-1.30
28	12/16/05	13:17:24	12.68	7.73		-1.80
29	12/16/05	13:18:24	12.74	7.63		-2.00
30	12/16/05	13:19:24	12.52	7.81		-2.00
31	12/16/05	13:20:24	13.05	7.34		-1.50
32	12/16/05	13:21:24	12.53	7.81		-2.00
33	12/16/05	13:22:24	12.22	8.12		-2.10
34	12/16/05	13:23:24	12.99	7.42		-2.00
35	12/16/05	13:24:24	13.06	7.36		-1.40
36	12/16/05	13:25:24	12.90	7.50		-1.80
37	12/16/05	13:26:24	12.86	7.53		-2.00
38	12/16/05	13:27:24	12.97	7.46		-2.00
39	12/16/05	13:28:24	13.05	7.41		-2.00
40	12/16/05	13:29:24	12.49	7.92		-2.10
41	12/16/05	13:30:24	12.46	7.89		-2.00
42	12/16/05	13:31:24	12.82	7.60		-0.40
43	12/16/05	13:32:24	13.16	7.32		-1.70
44	12/16/05	13:33:24	13.16	7.29		-2.10
45	12/16/05	13:34:24	12.62	7.82		-1.60
46	12/16/05	13:35:24	12.41	7.94		-2.00
47	12/16/05	13:36:24	12.97	7.42		-2.10
48	12/16/05	13:37:24	12.73	7.68		-1.80
49	12/16/05	13:38:24	13.06	7.45		-1.80
50	12/16/05	13:39:24	12.35	8.06		-2.10
51	12/16/05	13:40:24	12.47	7.85		-2.10
52	12/16/05	13:41:24	12.75	7.66		-2.20
53	12/16/05	13:42:24	12.35	7.97		-2.20
54	12/16/05	13:43:24	12.10	8.25		-1.80
55	12/16/05	13:44:24	12.68	7.64		-2.20
56	12/16/05	13:45:24	12.78	7.64		-2.20
57	12/16/05	13:46:24	13.17	7.27		-2.30
58	12/16/05	13:47:24	13.60	6.92		-2.40
59	12/16/05	13:48:24	13.17	7.35		-1.20
60	12/16/05	13:49:24	12.97	7.42		-2.30
AVERAGES:			12.76	7.62		-1.76

THC PPM
CO PPM
NOx PPM
CO2%
120mm/h
Dec. 16 10:00

CO2%
O2%
120mm/h
Dec. 16 09:00



Direct Zeros O₂ 0.07 CO₂ 0.02 NOx 12 CO 1.11 THC 1.2
Warmanalo Gulch Landfill Flare Compliance Test 2005 H. Johnson

THC PPM
CO PPM
NOX PPM
CO2 PPM
Dec. 16 12:00

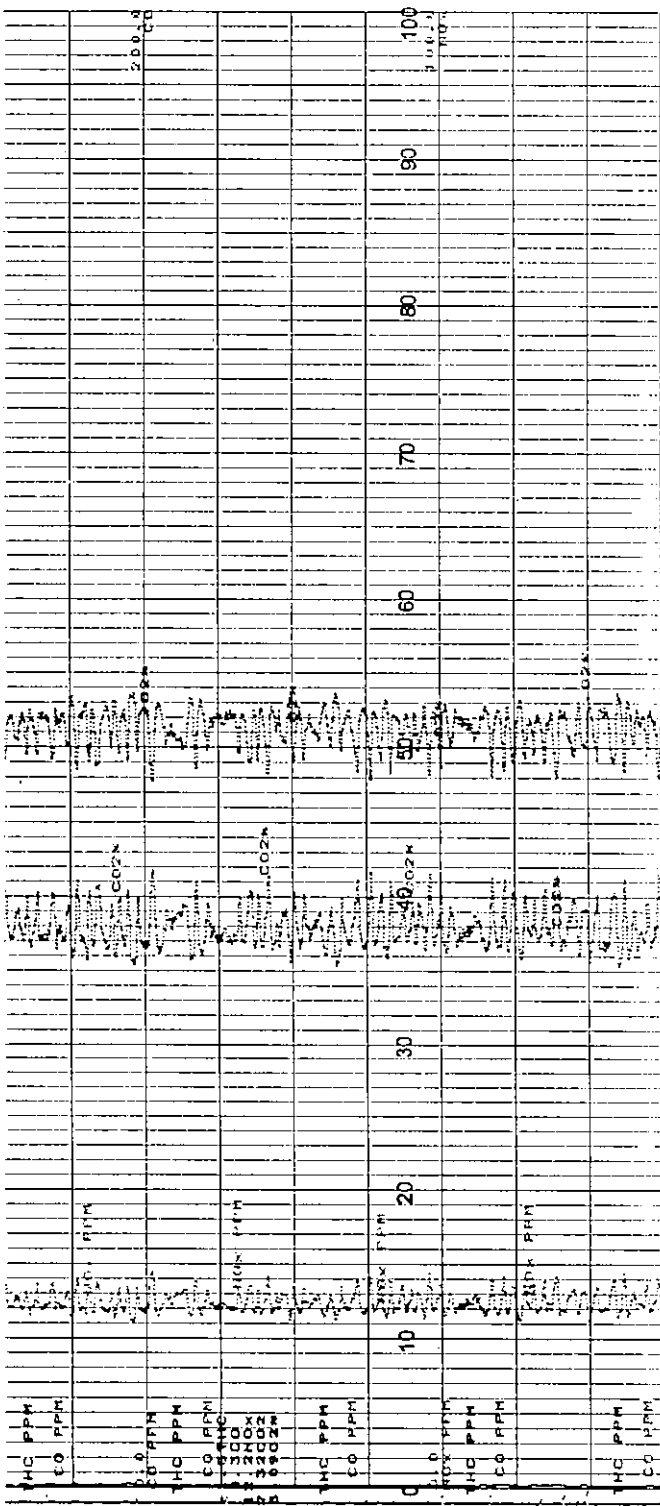
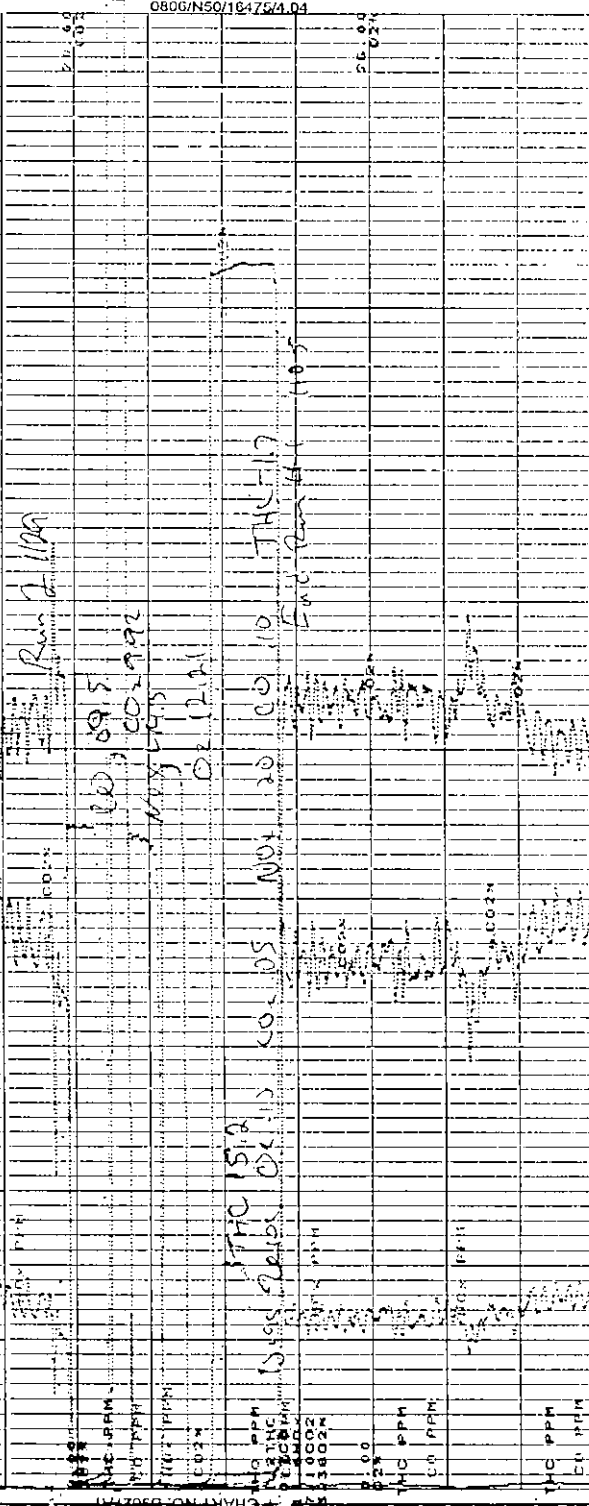


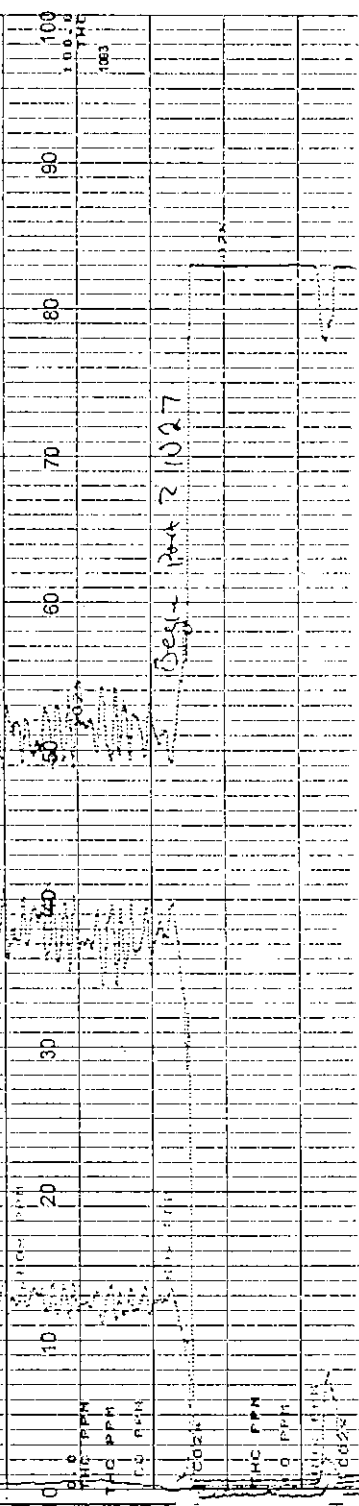
CHART NO. B9827M

THC PPM
CO PPM
NOX PPM
CO2 PPM
Dec. 16 12:00



0806/N50/164754.04

THC PPM
CO PPM
NOX PPM
CO2 PPM
Dec. 16 12:00



THC PPM
CO PPM
NOX PPM
CO2 PPM
Dec. 12 14:00

CO 89.30
NOX 44.50
CO2 9.80
Dec. 12 12:20

Dec. 12 14:00

THC 15.0
CO2 0.08
CO2 0.07
NOX 0.10
THC 1.8
Dec. 12 13:52

THC PPM
CO PPM
NOX PPM

THC PPM

THC PPM
CO PPM

THC PPM

THC PPM
CO PPM

THC PPM

THC PPM
CO PPM

THC PPM

THC PPM
CO PPM
NOX PPM
CO2 PPM
Dec. 12 13:00

THC PPM
CO PPM

THC PPM

THC PPM
CO PPM

THC PPM

CO 89.30
NOX 44.50
CO2 9.80
Dec. 12 12:20

THC PPM
CO PPM

THC PPM

THC PPM
CO PPM

THC PPM

THC PPM
CO PPM
NOX PPM
CO2 PPM

THC PPM
CO PPM

THC PPM

APPENDIX D – VISIBLE EMISSIONS FIELD DATASHEET

**VISIBLE EMISSIONS FORM
STATE OF HAWAII**

(Make Copies for Future Use For Each Equipment)

Permit No.: 0489-01-C

Company Name: Waste Management

Equipment and Fuel: Flare / Landfill Gas

Site Conditions:

Stack height above ground (ft): 30'

Stack distance from observer (ft): 100'

Emission color (black or white): Clear

Sky conditions (% cloud cover): Broken

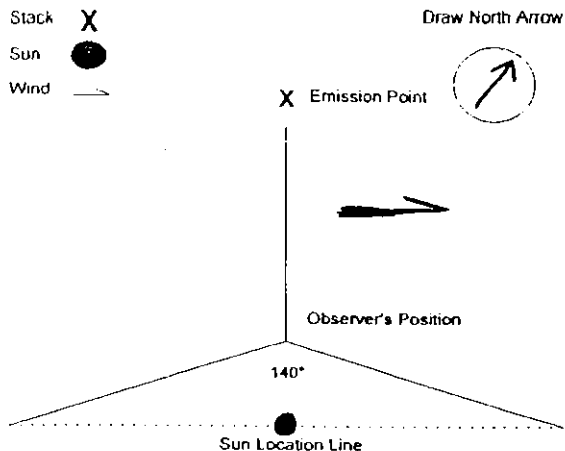
Wind speed (mph): 0-5

Temperature (°F): 83°F RH 55%

Observer Name: Harry J. Johnson

Certified? (Yes/No): Yes

Observation Date and Start Time: 12/16/05 1200



SECONDS	0	15	30	45	COMMENTS
MINUTES					
1	○	○	○	○	
2	○	○	○	○	
3	○	○	○	○	
4	○	○	○	○	
5	○	○	○	○	
6	○	○	○	○	
Six (6) Minute Average Opacity Reading (%):					○

Observation Date and Start Time: 12/16/05 1206

SECONDS	0	15	30	45	COMMENTS
MINUTES					
1	○	○	○	○	
2	○	○	○	○	
3	○	○	○	○	
4	○	○	○	○	
5	○	○	○	○	
6	○	○	○	○	
Six (6) Minute Average Opacity Reading (%):					○

APPENDIX E – FLARE OPERATION DATA

**WAIMANALO GULCH SOLID WASTE LANDFILL
LANDFILL GAS FLARE
DECEMBER 16, 2005
FLARE OPERATION DATA - COMPLIANCE RUN 1**

Date	Time	Flare Temp °F		Flare Flow SCFM		Pilot Temp °F	
		MIN	MAX	MIN	MAX	MIN	MAX
2005/12/16	09:40:00	1490	1507	335	337	969	1022
2005/12/16	09:42:00	1496	1505	335	338	973	1016
2005/12/16	09:44:00	1495	1503	335	337	978	1021
2005/12/16	09:46:00	1498	1507	336	337	972	1021
2005/12/16	09:48:00	1498	1508	335	337	971	1015
2005/12/16	09:50:00	1498	1506	335	337	968	1013
2005/12/16	09:52:00	1498	1504	335	337	968	1018
2005/12/16	09:54:00	1500	1506	336	337	976	1026
2005/12/16	09:56:00	1497	1506	335	337	978	1024
2005/12/16	09:58:00	1498	1505	335	337	977	1024
2005/12/16	10:00:00	1499	1507	335	337	978	1023
2005/12/16	10:02:00	1495	1506	335	338	962	1015
2005/12/16	10:04:00	1501	1507	335	336	966	1016
2005/12/16	10:06:00	1497	1504	335	337	966	1023
2005/12/16	10:08:00	1497	1506	335	337	981	1025
2005/12/16	10:10:00	1499	1504	335	336	978	1021
2005/12/16	10:12:00	1499	1508	335	336	975	1029
2005/12/16	10:14:00	1502	1505	334	336	984	1027
2005/12/16	10:16:00	1500	1504	334	337	983	1026
2005/12/16	10:18:00	1498	1506	334	336	982	1030
2005/12/16	10:20:00	1500	1507	333	335	977	1023
2005/12/16	10:22:00	1498	1507	333	335	972	1018
2005/12/16	10:24:00	1498	1508	332	334	967	1015
2005/12/16	10:26:00	1498	1505	332	335	976	1024
2005/12/16	10:28:00	1498	1505	332	334	977	1020
2005/12/16	10:30:00	1498	1506	332	334	973	1023
2005/12/16	10:32:00	1499	1507	332	334	974	1027
2005/12/16	10:34:00	1498	1508	332	333	968	1021
2005/12/16	10:36:00	1498	1505	331	333	976	1020
2005/12/16	10:38:00	1499	1507	331	334	977	1022
2005/12/16	10:40:00	1500	1506	331	333	976	1025
2005/12/16	10:42:00	1499	1507	331	333	977	1023
2005/12/16	10:44:00	1499	1507	330	332	979	1027
2005/12/16	10:46:00	1499	1507	331	332	978	1026
2005/12/16	10:48:00	1500	1507	331	332	978	1026
2005/12/16	10:50:00	1500	1507	331	333	976	1025
2005/12/16	10:52:00	1499	1507	330	332	979	1024
2005/12/16	10:54:00	1499	1507	330	332	981	1026
2005/12/16	10:56:00	1498	1507	330	332	982	1034
2005/12/16	10:58:00	1500	1507	330	332	974	1020
2005/12/16	11:00:00	1502	1507	330	332	970	1026
2005/12/16	11:02:00	1499	1507	330	332	985	1031
2005/12/16	11:04:00	1500	1507	330	332	977	1024
Averages:			1506		335		1023

**WAIMANALO GULCH SOLID WASTE LANDFILL
LANDFILL GAS FLARE
DECEMBER 16, 2005
FLARE OPERATION DATA - COMPLIANCE RUN 2**

Date	Time	Flare Temp °F		Flare Flow SCFM		Pilot Temp °F	
		MIN	MAX	MIN	MAX	MIN	MAX
2005/12/16	11:30:00	1498	1508	330	334	970	1013
2005/12/16	11:32:00	1501	1507	330	333	962	1010
2005/12/16	11:34:00	1500	1507	330	332	970	1014
2005/12/16	11:36:00	1500	1507	330	333	970	1015
2005/12/16	11:38:00	1500	1508	331	333	977	1022
2005/12/16	11:40:00	1499	1507	330	333	968	1020
2005/12/16	11:42:00	1499	1507	331	334	973	1023
2005/12/16	11:44:00	1500	1508	331	333	969	1014
2005/12/16	11:46:00	1500	1507	331	333	969	1025
2005/12/16	11:48:00	1499	1508	330	333	969	1020
2005/12/16	11:50:00	1500	1506	331	333	970	1013
2005/12/16	11:52:00	1500	1508	331	333	973	1021
2005/12/16	11:54:00	1500	1506	331	333	977	1019
2005/12/16	11:56:00	1500	1507	331	333	976	1020
2005/12/16	11:58:00	1500	1508	331	333	975	1023
2005/12/16	12:00:00	1500	1507	330	332	973	1022
2005/12/16	12:02:00	1500	1507	331	333	970	1014
2005/12/16	12:04:00	1501	1508	332	333	974	1018
2005/12/16	12:06:00	1498	1509	331	333	975	1023
2005/12/16	12:08:00	1500	1507	330	332	978	1026
2005/12/16	12:10:00	1502	1505	330	332	974	1020
2005/12/16	12:12:00	1501	1508	331	333	971	1017
2005/12/16	12:14:00	1500	1506	331	334	973	1027
2005/12/16	12:16:00	1499	1509	331	333	982	1030
2005/12/16	12:18:00	1500	1508	331	333	969	1016
2005/12/16	12:20:00	1500	1507	331	333	975	1018
2005/12/16	12:22:00	1499	1508	331	333	976	1022
2005/12/16	12:24:00	1499	1507	331	334	977	1021
2005/12/16	12:26:00	1499	1507	331	333	973	1020
2005/12/16	12:28:00	1500	1507	331	333	975	1019
2005/12/16	12:30:00	1499	1507	331	332	974	1021
Averages:			1507		333		1021

**WAIMANALO GULCH SOLID WASTE LANDFILL
LANDFILL GAS FLARE
DECEMBER 16, 2005
FLARE OPERATION DATA - COMPLIANCE RUN 3**

Date	Time	Flare Temp °F		Flare Flow SCFM		Pilot Temp °F	
		MIN	MAX	MIN	MAX	MIN	MAX
2005/12/16	12:52:00	1499	1508	331	333	980	1027
2005/12/16	12:54:00	1500	1507	331	333	982	1026
2005/12/16	12:56:00	1500	1507	331	333	976	1026
2005/12/16	12:58:00	1500	1508	331	333	979	1024
2005/12/16	13:00:00	1499	1508	332	333	973	1028
2005/12/16	13:02:00	1500	1507	331	333	982	1033
2005/12/16	13:04:00	1500	1509	332	333	985	1034
2005/12/16	13:06:00	1501	1507	331	333	983	1031
2005/12/16	13:08:00	1500	1507	331	333	985	1032
2005/12/16	13:10:00	1501	1507	330	333	978	1022
2005/12/16	13:12:00	1500	1507	331	332	981	1030
2005/12/16	13:14:00	1501	1507	331	333	982	1032
2005/12/16	13:16:00	1500	1506	331	333	979	1026
2005/12/16	13:18:00	1500	1507	331	333	982	1033
2005/12/16	13:20:00	1501	1510	331	333	988	1031
2005/12/16	13:22:00	1501	1507	331	333	978	1028
2005/12/16	13:24:00	1499	1507	332	333	971	1026
2005/12/16	13:26:00	1500	1508	331	333	982	1031
2005/12/16	13:28:00	1501	1508	331	333	980	1022
2005/12/16	13:30:00	1500	1508	331	333	977	1021
2005/12/16	13:32:00	1500	1507	332	334	980	1030
2005/12/16	13:34:00	1500	1508	331	333	980	1026
2005/12/16	13:36:00	1499	1509	331	333	980	1029
2005/12/16	13:38:00	1501	1508	331	333	974	1021
2005/12/16	13:40:00	1499	1507	331	332	978	1030
2005/12/16	13:42:00	1500	1507	331	333	976	1028
2005/12/16	13:44:00	1500	1508	331	333	981	1026
2005/12/16	13:46:00	1498	1506	332	333	982	1026
2005/12/16	13:48:00	1500	1507	332	333	983	1028
2005/12/16	13:50:00	1500	1507	331	333	973	1026
2005/12/16	13:52:00	1501	1509	331	332	975	1023
Averages:			1507		333		1026

APPENDIX F – LAB RESULTS

- **LABORATORY ANALYSIS REPORT (TGNMO)**
- **QUALITY ASSURANCE SUMMARY**
- **CALCULATED VALUES FOR:**
 - SPECIFIC VOLUME**
 - BTU**
 - F (FACTOR)**
- **LABORATORY ANALYSIS REPORT (TO-15)**
- **CHAIN OF CUSTODY**



AtmAA Inc.

23917 Craftsman Rd., Calabasas, CA 91302 • (818) 223-3277 • FAX (818) 223-8250

environmental consultants
laboratory services

LABORATORY ANALYSIS REPORT

Permanent Gases and Total Gaseous Non-Methane Organics (TGNMO)
Analysis in Tedlar Bag Samples

Report Date: January 6, 2006
Client: Shaw
Project Location: Waimanalo Gulch Landfill
Date Received: December 19, 2005
Date Analyzed: December 21, 2005

ANALYSIS DESCRIPTION

Permanent gases were measured by thermal conductivity detection/gas chromatography (TCD/GC). Total gaseous non-methane organics (TGNMO) was measured by flame ionization detection/total combustion analysis (FID/TCA), EPA Method 25.

AtmAA Lab No.:	03535-6	03535-7	03535-8
Sample I.D.:	Sample #1	Sample #2	Sample #3
Components	(Concentration in %,v)		
Nitrogen	8.54	7.36	6.20
Oxygen	1.10	0.92	0.67
Methane	45.8	46.3	47.4
Carbon dioxide	39.1	40.2	42.8
	(Concentration in ppmv)		
TGNMO	19500	20700	24800

The reported oxygen concentration includes any argon present in the sample. Calibration is based on a standard atmosphere containing 20.95% oxygen and 0.93% argon. The accuracy of permanent gas analysis by TCD/GC is +/- 2%, actual results are reported. TGNMO is total gaseous non-methane organics measured and reported as ppm methane.

Michael L. Porter
Laboratory Director

QUALITY ASSURANCE SUMMARY
(Repeat Analyses)

Project Location: Waimanalo Gulch Landfill

Date Received: December 19, 2005

Date Analyzed: December 21, 2005

Components	Sample ID	Repeat Analysis		Mean Conc.	% Diff. From Mean
		Run #1	Run #2		
(Concentration in %,v)					
Nitrogen	Sample #1	8.54	8.55	8.54	0.06
	Sample #2	7.31	7.41	7.36	0.68
	Sample #3	6.21	6.20	6.20	0.080
Oxygen	Sample #1	1.06	1.15	1.10	4.1
	Sample #2	0.90	0.93	0.92	1.6
	Sample #3	0.69	0.65	0.67	3.0
Methane	Sample #1	45.9	45.6	45.8	0.33
	Sample #2	46.5	46.1	46.3	0.43
	Sample #3	47.9	46.8	47.4	1.2
Carbon dioxide	Sample #1	39.0	39.2	39.1	0.26
	Sample #2	40.4	40.0	40.2	0.50
	Sample #3	43.0	42.5	42.8	0.58
(Concentration in ppmv)					
TGNMO	Sample #1	20000	19000	19500	2.6

Three Tedlar bag samples, laboratory numbers 03535-(6-8), were analyzed for permanent gases and TGNMO. Agreement between repeat analyses is a measure of precision and is shown above in the column "% Difference from Mean". Repeat analyses are an important part of AtmAA's quality assurance program. The average % Difference from Mean for 13 repeat measurements from the three Tedlar bag samples is 1.2%.



Calculated values for Specific Volume, BTU and F (factor)

Report Date: January 6, 2006
 Client: Shaw
 Project Location: Waimanalo Gulch Landfill
 Date Received: December 19, 2005
 Date Analyzed: December 21, 2005
 AtmAA Lab No.: 03535-6 / Sample #1

Specific volume, BTU, and F factor are calculated using laboratory analysis results for methane, carbon dioxide, nitrogen, oxygen, total gaseous non-methane organics (TGNMO), and sulfur compounds in equations that include assumed values for the specific volume of gases (CH₄, CO₂, N₂, O₂, Ar, and (CH₂)_n). The specific volume of gases were taken from the Scott Speciality Gases catalogue, 2001, and represents as is gas at 60° F and 1 atm. The F factor is calculated according to the equation in ASTM D-3588.

Component	Mole %	Wt %	C,H,O,N,S, Wt. %
Methane	45.75	26.57	Carbon 37.81
Carbon dioxide	39.10	62.45	Hydrogen 6.78
Nitrogen	8.55	8.69	Oxygen 46.65
Oxygen	1.06	1.23	Nitrogen 8.69
Argon	0.047	0.068	Argon 0.07
(CH ₂) _n	1.950	0.991	Sulfur 0.00
Specific Volume		13.109	
BTU/ft ³		478	
BTU/ lb.		6262	
F (factor)		9949	

dry gas at 60° F, 1 atm, where CH₄-1010, TGNMO-802 BTU/cu.ft.

Component	Specific volume reference values *
Methane	23.35 (ft ³ /lb)
Carbon dioxide	8.59
Nitrogen	13.54
Oxygen	11.87
Argon	9.52
(CH ₂) _n	21

* reference, Scott Specialty Gases Catalogue, 2001 adjusted to 60°F



Calculated values for Specific Volume, BTU and F (factor)

Report Date: January 6, 2006
 Client: Shaw
 Project Location: Waimanalo Gulch Landfill
 Date Received: December 19, 2005
 Date Analyzed: December 21, 2005
 AtmAA Lab No.: 03535-7 / Sample #2

Specific volume, BTU, and F factor are calculated using laboratory analysis results for methane, carbon dioxide, nitrogen, oxygen, total gaseous non-methane organics (TGNMO), and sulfur compounds in equations that include assumed values for the specific volume of gases (CH₄, CO₂, N₂, O₂, Ar, and (CH₂)_n). The specific volume of gases were taken from the Scott Speciality Gases catalogue, 2001, and represents as is gas at 60° F and 1 atm. The F factor is calculated according to the equation in ASTM D-3588.

Component	Mole %	Wt %	C,H,O,N,S, Wt. %
Methane	46.30	26.70	Carbon 38.31
Carbon dioxide	40.20	63.76	Hydrogen 6.82
Nitrogen	7.36	7.43	Oxygen 47.38
Oxygen	0.88	1.01	Nitrogen 7.43
Argon	0.039	0.056	Argon 0.06
(CH ₂) _n	2.070	1.045	Sulfur 0.00

Specific Volume	13.065
BTU/ft ³	484
BTU/ lb.	6327
F (factor)	9911

dry gas at 60° F, 1 atm, where CH₄-1010, TGNMO-802 BTU/cu.ft.

Component	Specific volume reference values *
Methane	23.35 (ft ³ /lb)
Carbon dioxide	8.59
Nitrogen	13.54
Oxygen	11.87
Argon	9.52
(CH ₂) _n	21

* reference, Scott Specialty Gases Catalogue, 2001 adjusted to 60°F



Calculated values for Specific Volume, BTU and F (factor)

Report Date: January 6, 2006
 Client: Shaw
 Project Location: Waimanalo Gulch Landfill
 Date Received: December 19, 2005
 Date Analyzed: December 21, 2005
 AtmAA Lab No.: 03535-8 / Sample #3

Specific volume, BTU, and F factor are calculated using laboratory analysis results for methane, carbon dioxide, nitrogen, oxygen, total gaseous non-methane organics (TGNMO), and sulfur compounds in equations that include assumed values for the specific volume of gases (CH₄, CO₂, N₂, O₂, Ar, and (CH₂)_n). The specific volume of gases were taken from the Scott Speciality Gases catalogue, 2001, and represents as is gas at 60° F and 1 atm. The F factor is calculated according to the equation in ASTM D-3588.

Component	Mole %	Wt %	C,H,O,N,S, Wt.%
Methane	47.35	26.41	Carbon 38.73
Carbon dioxide	42.75	65.57	Hydrogen 6.78
Nitrogen	6.21	6.06	Oxygen 48.40
Oxygen	0.64	0.72	Nitrogen 6.06
Argon	0.028	0.040	Argon 0.04
(CH ₂) _n	2.480	1.210	Sulfur 0.00
Specific Volume		12.965	
BTU/ft ³		498	
BTU/ lb.		6458	
F (factor)		9677	

dry gas at 60° F, 1 atm, where CH₄-1010, TGNMO-802 BTU/cu.ft.

Component	Specific volume reference values *
Methane	23.35 (ft ³ /lb)
Carbon dioxide	8.59
Nitrogen	13.54
Oxygen	11.87
Argon	9.52
(CH ₂) _n	21

* reference, Scott Specialty Gases Catalogue, 2001 adjusted to 60°F





AtmAA Inc.

23917 Craftsman Rd., Calabasas, CA 91302 • (818) 223-3277 • FAX (818) 223-8250

LABORATORY ANALYSIS REPORT

environmental consultants
laboratory services

TO-15 Component Analysis in Landfill Gas Tedlar Bag Sample, by GC/MS

Report Date: January 12, 2006

Client: Shaw

Project Location: Waimanalo Gulch Landfill

Date Received: December 19, 2005

Date Analyzed: December 22, 2005

AtmAA Lab No.: 03535-6

Sample ID: Sample #1

Components	(Concentrations in ppmv)
Freon 12	1.82
Chloromethane	<0.60
Freon 114	<0.50
Vinyl Chloride	<0.50
1,3-Butadiene	<0.60
Bromomethane	<0.60
Chloroethane	<0.50
Bromoethene	<0.60
Freon 11	<0.50
Isopropyl Alcohol	<0.50
1,1-Dichloroethene	<0.60
Methylene Chloride	<0.60
3-Chloro-1-Propene	<0.50
Carbon Disulfide	<0.50
Freon 113	<0.50
trans-1,2-Dichloroethene	<0.60
1,1-Dichloroethane	<0.60
MTBE	<0.70
Vinyl Acetate	<0.70
cis-1,2-Dichloroethene	0.757
n-Hexane	4.12
Chloroform	<0.50
Ethyl Acetate	968
Tetrahydrofuran	<0.50
1,2-Dichloroethane	<0.60
1,1,1-Trichloroethane	<0.50
Benzene	18.6
Carbon Tetrachloride	<0.50
Cyclohexane	<0.70
1,2-Dichloropropane	<0.70
Bromodichloromethane	<0.60
Trichloroethene	<0.50
1,4-Dioxane	<0.70
2,2,4-Trimethyl Pentane	1.82



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LABORATORY ANALYSIS REPORT
(continued)

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laboratory services**

TO-15 Component Analysis in Landfill Gas Tedlar Bag Sample, by GC/MS

Report Date: January 12, 2006

Client: Shaw

Project Location: Waimanalo Gulch Landfill

Date Received: December 19, 2005

Date Analyzed: December 22, 2005

AtmAA Lab No.: 03535-6

Sample ID: Sample #1

Components	(Concentrations in ppmv)
n-Heptane	20.7
cis-1,3-Dichloropropene	<0.60
trans-1,3-Dichloropropene	<0.60
1,1,2-Trichloroethane	<0.60
Toluene	58.0
Dibromochloromethane	<0.50
1,2-Dibromomethane	<0.50
Tetrachloroethene	0.738
Chlorobenzene	<0.60
Ethylbenzene	26.2
m,p-Xylene	63.4
Bromoform	<0.50
Styrene	38.4
1,1,2,2-Tetrachlorethane	<0.50
o-Xylene	18.7
2-Chlorotoluene	<0.80
4-Ethyl Toluene	116
1,3,5-Trimethyl Benzene	56.2
1,2,4-Trimethyl Benzene	94.7
1,3-Dichlorobenzene	<0.50
1,4-Dichlorobenzene	0.666
1,2-Dichlorobenzene	<0.50
1,2,4-Trichlorobenzene	<0.50
Hexachlorobutadiene	<0.50
Acetone	36.9
2-Butanone	<1.50
4-Methyl-2-pentanone	536
2-Hexanone	<1.20

Michael L. Porter
Laboratory Director

QUALITY ASSURANCE SUMMARY
(Repeat Analyses)

Project Location: Waimanalo Gulch Landfill

Date Received: December 19, 2005

Date Analyzed: December 22, 2005

Components	Sample ID	Repeat Analysis		Mean Conc.	% Diff. From Mean
		Run #1	Run #2		
		(Concentration in ppmv)			
Freon-12	Sample #1	1.82	1.82	1.82	0.0
Chloromethane	Sample #1	<0.60	<0.60	---	---
Freon 114	Sample #1	<0.50	<0.50	---	---
Vinyl Chloride	Sample #1	<0.50	<0.50	---	---
1,3-Butadiene	Sample #1	<0.60	<0.60	---	---
Bromomethane	Sample #1	<0.60	<0.60	---	---
Chloroethane	Sample #1	<0.50	<0.50	---	---
Bromoethene	Sample #1	<0.60	<0.60	---	---
Freon 11	Sample #1	<0.50	<0.50	---	---
Isopropyl Alcohol	Sample #1	<0.50	<0.50	---	---
1,1-Dichloroethene	Sample #1	<0.60	<0.60	---	---
Methylene Chloride	Sample #1	<0.60	<0.60	---	---
3-Chloro-1-Propene	Sample #1	<0.50	<0.50	---	---
Carbon Disulfide	Sample #1	<0.50	<0.50	---	---
Freon 113	Sample #1	<0.50	<0.50	---	---
trans-1,2-Dichloroethene	Sample #1	<0.60	<0.60	---	---
1,1-Dichloroethane	Sample #1	<0.60	<0.60	---	---
MTBE	Sample #1	<0.70	<0.70	---	---
Vinyl Acetate	Sample #1	<0.70	<0.70	---	---
cis-1,2-Dichloroethene	Sample #1	0.757	0.757	0.757	0.0
n-Hexane	Sample #1	3.69	4.54	4.12	10



QUALITY ASSURANCE SUMMARY
(Repeat Analyses)
(continued)

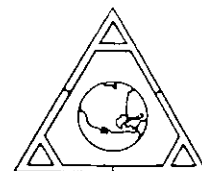
Components	Sample ID	Repeat Analysis		Mean Conc.	% Diff. From Mean
		Run #1	Run #2		
		(Concentration in ppmv)			
Chloroform	Sample #1	<0.50	<0.50	---	---
Ethyl Acetate	Sample #1	944	992	968	2.5
Tetrahydrofuran	Sample #1	<0.50	<0.50	---	---
1,2-Dichloroethane	Sample #1	<0.60	<0.60	---	---
1,1,1-Trichloroethane	Sample #1	<0.50	<0.50	---	---
Benzene	Sample #1	19.4	17.8	18.6	4.3
Carbon Tetrachloride	Sample #1	<0.50	<0.50	---	---
Cyclohexane	Sample #1	<0.70	<0.70	---	---
1,2-Dichloropropane	Sample #1	<0.70	<0.70	---	---
Bromodichlorometnane	Sample #1	<0.60	<0.60	---	---
Trichloroethene	Sample #1	<0.50	<0.50	---	---
1,4-Dioxane	Sample #1	<0.70	<0.70	---	---
2,2,4-Trimethyl Pentane	Sample #1	1.93	1.71	1.82	6.0
n-Heptane	Sample #1	20.7	20.7	20.7	0.0
cis-1,3-Dichloropropene	Sample #1	<0.60	<0.60	---	---
trans-1,3-Dichloropropene	Sample #1	<0.60	<0.60	---	---
1,1-2-Trichloroethane	Sample #1	<0.60	<0.60	---	---
Toluene	Sample #1	58.4	57.6	58.0	0.69
Dibromochloromethane	Sample #1	<0.50	<0.50	---	---
1,2-Dibromomethane	Sample #1	<0.50	<0.50	---	---
Tetrachloroethene	Sample #1	0.738	0.738	0.738	0.0
Chlorobenzene	Sample #1	<0.60	<0.60	---	---



QUALITY ASSURANCE SUMMARY
(Repeat Analyses)
(continued)

Components	Sample ID	Repeat Analysis		Mean Conc.	% Diff. From Mean
		Run #1	Run #2		
		(Concentration in ppmv)			
Ethylbenzene	Sample #1	25.8	26.7	26.2	1.7
m,p-Xylene	Sample #1	63.1	63.6	63.4	0.39
Bromoform	Sample #1	<0.50	<0.50	---	---
Styrene	Sample #1	39.4	37.3	38.4	2.7
1,1,2,2-Tetrachlorethane	Sample #1	<0.50	<0.50	---	---
o-Xylene	Sample #1	18.7	18.7	18.7	0.0
2-Chlorotoluene	Sample #1	<0.80	<0.80	---	---
4-Ethyl Toluene	Sample #1	115	118	116	1.3
1,3,5-Trimethyl Benzene	Sample #1	56.0	56.4	56.2	0.36
1,2,4-Trimethyl Benzene	Sample #1	94.4	95.0	94.7	0.32
1,3-Dichlorobenzene	Sample #1	<0.50	<0.50	---	---
1,4-Dichlorobenzene	Sample #1	0.666	0.666	0.666	0.0
1,2-Dichlorobenzene	Sample #1	<0.50	<0.50	---	---
1,2,4-Trichlorobenzene	Sample #1	<0.50	<0.50	---	---
Hexachlorobutadiene	Sample #1	<0.50	<0.50	---	---
Acetone	Sample #1	38.4	35.4	36.9	4.1
2-Butanone	Sample #1	<1.50	<1.50	---	---
4-Methyl-2-pentanone	Sample #1	545	528	536	1.6
2-Hexanone	Sample #1	<1.20	<1.20	---	---

One Tedlar bag sample, laboratory number 03535-6, was analyzed for TO-15 components by GC/MS. Agreement between repeat analyses is a measure of precision and is shown above in the column "% Difference from Mean". Repeat analyses are an important part of AtmAA's quality assurance program. The average % Difference from Mean for 19 repeat measurements from the one Tedlar bag sample is 1.9%.



Fuel Sample Chain of Custody

Location Waimanalo Gulch Landfill
Unit Number LG Flare
Date 12/16/05
Project Manager Harry Johnson

03535-6 Sample # 1 [Signature] Date 12/16/05 Time 0950
Recovered By _____
-7 Sample # 2 [Signature] Date 12/16/05 Time 1151
Recovered By _____
-8 Sample # 3 [Signature] Date 12/16/05 Time 1305
Recovered By _____

Sample # _____
Recovered By _____ Date _____ Time _____

Sample # _____
Recovered By _____ Date _____ Time _____

Sample # _____
Recovered By _____ Date _____ Time _____

Sample # _____
Recovered By _____ Date _____ Time _____

Sample # _____
Recovered By _____ Date _____ Time _____

Comments/Special Instructions Please test for the following:
1) NMOC on all three samples 25C
2) Fixed Gases on all three samples 3C
3) TO15 on any one of the samples (1 sample only)
4) EPA19 on all three samples (flowrate BTU and F Factor)

Method of Transportation fed Ex

Received By [Signature] For Transport Date 12/16/05 Time 1530

Received At Lab By [Signature] Date 12-19-05 Time _____

Samples Analyzed By _____ Date _____ Time _____

Lab Supervisor _____ Date _____ Time _____