AMTEST
AIR QUALITY, INC.

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SOURCE

EMISSION

EVALUATION

DECEMBER 8, 1992

Prepared For:

KING COUNTY SOLID WASTE DIVISION
CEDAR HILLS REGIONAL LANDFILL
GAS COMBUSTOR TESTING
FLARE #3
MAPLE VALLEY, WASHINGTON
SEPTEMBER 30-OCTOBER 1, 1992

Submitted by:

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We certify that the information contained herein is accurate and complete to the best of our knowledge.

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1.0
INTRODUCTION

The purpose of this source emission evaluation was to quantify emission levels during typical operation of one (1) of the newest of three (3) landfill gas (LFG) combustors (also called a flare) at the Cedar Hills Regional Landfill near Issaquah, Washington. The gases produced from the decomposition of buried organic wastes are extracted and piped to the combustors where they are burned prior to emitting the exhaust gases to the atmosphere. Testing of the emissions at the inlet and the outlet of the newly installed Flare #3 were performed to demonstrate compliance with Puget Sound Air Pollution Control Agency (PSAPCA) air permit requirements. This flare will be retested ninety (90) days after the initial test.

Testing was performed at Flare #3 on September 30-October 1, 1992 to determine the emission rate and destruction efficiency of selected compounds entering and exiting the flare. The inlet and outlet gas streams of the flare were measured to quantify the gas velocity, gas temperature, percent carbon dioxide (CO_2), percent oxygen (O_2), percent (inlet) or parts per million (outlet) carbon monoxide (CO), percent moisture, ppm sulfur dioxide (SO_2), ppm nitrogen oxides (NO_x as NO_2), chloride (as hydrochloric acid (HCl)), and volatile organic compounds (VOCs). The inlet gas stream at the flare was also measured to quantify the percent methane (CH_4).

Environmental Protection Agency (EPA) sampling and analysis methods specified in the July 1, 1991 edition of Title 40 Code of Federal Regulations, Part 60 (40CFR60), Appendix A, Methods 1, 2, 3A, 4, 6C, 7E and 10 were utilized. Methods 1 and 2 were performed to measure the stack gas temperature and velocity

and for calculating the volumetric flow rate. Method 3A was performed to determine the molecular weight of the stack gas based on measurements of combustion (fixed) gases. Method 4 was performed to measure the moisture content of the stack gas at the outlet. Methods 6C, 7E and 10 are instrumental methods which measure gas concentrations on a continuous basis. Method 6C was performed to determine the SO_2 emission concentration at the flare outlet. Method 7E was performed to determine the NO_X emission concentration at the flare outlet. Method 10 was performed to determine the CO emission concentration at the flare outlet. VOCs were collected at the inlet and outlet of the flare using Compendium Method TO-14. This technique allows an integrated sample of gas to be collected in an evacuated electropolished SUMMA^R stainless steel canister. The integrated samples were analyzed by Coast-to-Coast Analytical Services (CCAS) using a gas chromatograph equipped with a mass spectrophotometer detector (GC-MS). In addition to the volatile organic compounds identified by GC-MS procedures, the fixed gases at the inlet (CO_2, O_2, CO, nitrogen (N_2) and methane (CH_4), were analyzed by CCAS using a GC equipped with a thermal conductivity detector (GC-TCD). Three (3) replicate samples of each type were collected.

The samples were collected by Mr. K. Steven Mackey and Mr. E. Ray Lawrence of Am Test-Air Quality, Inc. Analysis of the samples collected in SUMMA^R canisters was performed by Coast-to-Coast Analytical Services, Inc. of San Luis Obispo, California. Analysis of the chloride samples was performed by Am Test, Inc.'s Water Chemistry Division of Redmond, Washington. Mr. Kris A. Hansen, Ms. Angela F. Blaisdell, Ms. Jan W. Alden, Ms. Amy M. Brotherton and Ms. Cassie B. Heaton performed data reduction, quality assurance review, and report preparation. Mr. Charles S. Key, Jr. and Mr. Ed Henderson of the King County Solid Waste Division coordinated this project.

2.0
SUMMARY OF RESULTS

The following sections of this report summarize the findings of this emission evaluation. The order of presentation is by method number as follows: Method 1, 2, 3A, 4/HCl, 6C, 7E, 10, fixed gases (including methane), and VOCs by TO-14. Inlet data are presented before outlet data. Summary tables are included for each type of analysis which present the results from each test, and the average for each set of three (3) runs. Please refer to the Table of Contents to locate specific information for a particular type of test. The summary tables contain information obtained from computer printouts of results for each individual run which are included in Appendix A of this report. Appendix B of this report contains copies of the original laboratory data from Coast-to-Coast Analytical Services and Am Test, Inc. Appendix C of this report contains example calculations of the derivation of emission concentration and emission rate units. Appendix D of this report contains copies of the original field data sheets. Appendix E of this report contains miscellaneous supporting information and schematics of the sample trains utilized.

2.1 Velocity, Temperature and Airflow - Inlet

The results of the three (3) 60-minute Method 1, 2 and 3A tests at the inlet to Flare #3 are summarized on page 4 in a computer printout titled "Summary of Results - Methods 1, 2 and 3A". The velocity of the gas at the inlet to the flare averaged 46.9 ft/second. The average temperature of gas at the inlet was 111.2° F. The average airflow of landfill gas into the flare was 1991.4 dry standard cubic feet per minute (dscf/min). An example calculation of the airflow results for run 2 at the inlet is included in Appendix C of this report. Field data are included in Appendix D of this report.

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SUMMARY OF RESULTS - METHODS 1, 2 AND 3A
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FILE NAME: 182B\KCCHIVSM
CLIENT: KING COUNTY SOLID WASTE
@ CEDAR HILLS LANDFILL
LOCATION: MAPLE VALLEY, WASHINGTON

	FLARE #3 INLET			
	RUN #1	RUN #2	RUN #3	AVERAGE
LAB #:	I-4118-1	I-4118-2	I-4118-3	
DATE:	9/30/92	9/30/92	10/1/92	
	11/5/92	11/5/92	11/5/92	
START TIME:	14:15	16:30	08:17	
STOP TIME:	15:15	17:30	09:17	
SAMPLE LENGTH (minutes):	60.0	60.0	60.0	
PSYCHROMETRIC MOISTURE:	2.9	3.1	2.8	2.9
BAROMETRIC PRESSURE (inches of Hg):	29.60	29.57	29.58	29.58
STATIC PRESSURE (inches of H2O):	6.0	6.0	6.0	6.0
STACK PRESSURE (inches of Hg):	30.04	30.01	30.02	30.02
STACK TEMPERATURE (degrees F.):	115.3	113.1	105.3	111.2
STACK TEMPERATURE (degrees R.):	575.3	573.1	565.3	571.2
CARBON DIOXIDE (percent):	34.0	35.0	36.0	35.0
OXYGEN (percent):	7.5	6.8	6.5	6.9
CARBON MONOXIDE (percent):	< 0.1	< 0.1	< 0.1	< 0.1
METHANE (percent):	29	30	31	30
MOLECULAR WEIGHT (dry, g/g-mole):	30.26	30.27	30.30	30.28
MOLECULAR WEIGHT (wet, g/g-mole):	29.90	29.89	29.96	29.92
AVERAGE VELOCITY HEAD (inches of H2O):	0.501	0.473	0.477	0.484
PITOT TUBE Cp:	0.99	0.99	0.99	
STACK GAS VELOCITY (feet/second):	48.0	46.5	46.3	46.9
STACK DIAMETER (inches):	12.00	12.00	12.00	
STACK AREA (square feet):	0.785	0.785	0.785	
STACK GAS AIRFLOW (dry std. cubic feet per min.):	2022.1	1962.8	1989.4	1991.4
STACK GAS AIRFLOW (actual cubic feet per min.):	2259.8	2192.1	2183.8	2211.9

2.2 Airflow and Chloride (as HCl) - Outlet

The results of the three (3) 60-minute Method 1, 2, 3A, 4/HCl tests performed at the outlet of Flare #3 are summarized on page 6 in a computer printout titled "Summary of Results - Methods 1, 2, 3A, 4 and Chloride". The average velocity at the outlet was 12.7 ft/second. The average temperature at the outlet was 1658° F. The average airflow through the stack was 17,720 dscf/min. The residence time based on combustion from the top of the burner to the height of the sample ports was calculated to be 2.8 seconds using an average of 79,266 actual cubic feet per minute (acfm) and an average temperature of 1658° F as measured on September 30-October 1, 1992. Example calculations of the airflow results for run 2 at the outlet and the residence time are included in Appendix C of this report.

Chloride emissions are presented in emission concentration units of milligrams per dry standard cubic meter (mg/dscm) and parts per million (ppm) uncorrected and corrected to 7% oxygen, and in emission rate units of milligrams per minute (mg/min) and pounds per hour (lb/hr). An acceptable leak check of less than 0.02 cfm at the highest vacuum rate (or greater) used during the test preceded and followed each run. Computer printouts for each chloride run are included in Appendix A of this report. Laboratory analysis results from Am Test, Inc. are included in Appendix B of this report. Example calculations of the chloride emission concentration and emission rate results are included in Appendix C of this report. Field data are included in Appendix D of this report.

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SUMMARY OF RESULTS - METHODS 1, 2, 3A, 4 AND CHLORIDE
AM TEST - AIR QUALITY, INC.

FILE NAME: 173A\KCCHLSUM
CLIENT: KING COUNTY SOLID WASTE @ CEDAR HILLS LANDFILL
LOCATION: MAPLE VALLEY, WASHINGTON

	FLARE #3 OUTLET			
	RUN #1	RUN #2	RUN #3	AVERAGE
LAB #:	3253	3254	3255	
DATE:	9/30/92	9/30/92	10/1/92	
START TIME:	14:15	16:30	08:17	
STOP TIME:	15:15	17:30	09:17	
SAMPLE LENGTH (minutes):	60.0	60.0	60.0	
VOLUME SAMPLED (cubic feet):	39.219	40.272	39.700	39.730
VOLUME SAMPLED (dry std. cubic feet):	35.635	37.044	38.101	36.927
VOLUME SAMPLED (dry std. cubic meters):	1.009	1.049	1.079	1.046
STACK GAS MOISTURE (percent):	9.44	9.49	9.01	9.31
BAROMETRIC PRESSURE (inches of Hg):	29.60	29.57	29.58	29.58
STATIC PRESSURE (inches of H2O):	-0.08	-0.09	-0.08	-0.08
STACK PRESSURE (inches of Hg):	29.59	29.56	29.57	29.57
STACK TEMPERATURE (degrees F.):	1660.5	1671.1	1642.6	1658.1
STACK TEMPERATURE (degrees R.):	2120.5	2131.1	2102.6	2118.1
CARBON DIOXIDE (percent):	7.8	7.7	7.3	7.6
OXYGEN (percent):	11.8	11.9	12.3	12.0
MOLECULAR WEIGHT (dry, lb/lb-mole):	29.72	29.71	29.66	29.70
MOLECULAR WEIGHT (wet, lb/lb-mole):	28.61	28.60	28.61	28.61
AVERAGE VELOCITY HEAD (inches of H2O):	0.011	0.013	0.014	0.013
PITOT TUBE Cp:	0.84	0.84	0.84	
STACK GAS VELOCITY (feet per second):	11.7	12.8	13.6	12.7
STACK DIAMETER (inches):	138.0	138.0	138.0	
STACK AREA (square feet):	103.87	103.87	103.87	
AIRFLOW (dry std. cubic feet per min.):	16306.7	17727.3	19124.9	17719.6
AIRFLOW (actual cubic feet per min.):	73113.7	80007.8	84677.2	79266.2
CHLORIDE EMISSION CONCENTRATION (mg/dscm):	3.99	5.44	4.58	4.67
CHLORIDE EMISSION CONCENTRATION (ppm):	2.64	3.59	3.02	3.08
CHLORIDE EMISSION CONC. (ppm @ 7% oxygen):	4.03	5.54	4.88	4.82
CHLORIDE EMISSION RATE (mg/min):	1793.8	2655.9	2409.4	2286.4
CHLORIDE EMISSION RATE (lb/hr):	0.244	0.361	0.328	0.311

2.3 EPA Method 3A, 6C, 7E, 10 and Fixed Gases Analysis

Fixed gases at the inlet to Flare #3 were to have been quantified by Coast-to-Coast Analytical Services (CCAS) using the gas collected in SUMMA^R canisters on September 30-October 1, 1992. The fixed gas analysis was inadvertently omitted, and the problem was not discovered before CCAS had cleaned the canisters for use on another project. To obtain fixed gas data for molecular weight calculations, it was necessary to resample the inlet gas on November 5, 1992. Methane was not quantified in the outlet samples because it was not expected and the analysis is typically not performed on flare gas samples. The GC analysis performed on the inlet samples by CCAS quantifies percent levels of carbon monoxide (CO). Am Test analyzed the flare outlet gas for parts per million (ppm) CO using a gas filter correlation non-dispersive infrared analyzer (NDIR). Average combustion gas values obtained at the inlet and outlet of Flare #3 are presented in Table 2.3 below.

Table 2.3 Concentration of gaseous constituents of the landfill gases quantified from samples collected at the inlet and outlet of Flare #3 on September 30-October 1, 1992 and November 5, 1992 at the Cedar Hills Landfill in Maple Valley, Washington.

Compound	Average Inlet Gas Concentrations	Average Outlet Gas Concentrations
Methane (%)	30	NA*
Carbon Dioxide (%)	35	7.6
Oxygen (%)	6.9	12.0
Carbon Monoxide	< 0.1%	1 ppm
Nitrogen (%)	28	80.4

*NA = Not Analyzed

Method 3A, 6C, 7E and 10 data were recorded at 1-minute intervals during three (3) 60-minute sample periods on September 30-October 1, 1992 at the Flare #3 exhaust using instrumental analyzers. These data were averaged, and the average values were bias-corrected for calibration drift during each test. The Method 3A results for oxygen and carbon dioxide from data collected at the flare outlet are presented in the summary table on page 6. The Method 6C, 7E and 10 results for sulfur dioxide, nitrogen oxides and carbon monoxide from samples collected at the flare oulet are presented in the summary table on page 9. Copies of the bias-corrected results for each Method 3A, 6C, 7E and 10 test at the outlet of the flare are included in Appendix A of this report in printouts titled "Calibration Summary - Gaseous Emission Monitors". Example calculations of the emission rate equations are included in Appendix C of this report. The individual 1-minute readings are included in Appendix D of this report along with the sampling system bias checks.

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SUMMARY OF RESULTS - METHODS 6C, 7E AND 10
AM TEST - AIR QUALITY, INC.

FILE NAME: 182B\KCCHSUM
CLIENT: King County Solid Waste @ Cedar Hills Landfill
LOCATION: Maple Valley, Washington

	FLARE #3 OUTLET			
	RUN #1	RUN #2	RUN #3	AVERAGE
LAB #:	3253	3254	3255	
DATE:	9/30/92	9/30/92	10/1/92	
START TIME:	14:15	16:30	08:17	
STOP TIME:	15:15	17:30	09:17	
AIRFLOW (dry std. cubic feet per min.):	16306.7	17727.3	19124.9	17719.6
METHOD 6C - SULFUR DIOXIDE (SO2)				
SULFUR DIOXIDE CONCENTRATION (ppm):	2.1	3.8	4.1	3.3
SULFUR DIOXIDE EMISSION RATE (lb/hr):	0.341	0.671	0.781	0.598
METHOD 7E - NITROGEN OXIDES (NOx)				
NITROGEN OXIDES EMISSION CONC. (ppm):	19.2	18.1	16.9	18.1
NOx EMISSION RATE (lb/hr as NO2):	2.24	2.30	2.32	2.29
METHOD 10 - CARBON MONOXIDE (CO)				
CARBON MONOXIDE CONCENTRATION (ppm):	1	1	1	1
CARBON MONOXIDE EMISSION RATE (lb/hr):	0.07	0.08	0.08	0.08

2.4 EPA Method TO-14 - Volatile Organic Compounds (VOCs)

Three (3) EPA Method TO-14 samples were collected at the inlet and outlet of Flare #3 on September 30-October 1, 1992 for quantifying volatile organic compound (VOC) emissions. VOC emission rates were calculated in units of milligrams per minute (mg/min). VOC emission rate calculations were performed using the laboratory analysis data provided by Coast-to-Coast Analytical Services, and from airflow data collected during concurrent testing periods. The VOC results are summarized in a computer printout titled "Summary of Emission Rate Results - TO-14 Volatile Organic Compounds" on pages 11 and 12 of this report. The emission rate results and detection limits for each individual run are presented on the computer printouts titled "TO-14 Emission Rate Results" in Appendix A of this report. The printouts for the individual runs include the instrument blank and detection limit values. Copies of the VOC laboratory analysis results in emission concentration units of ug/m^3 are included in Appendix B of this report. Example calculations of the results are included in Appendix C of this report. Field data are included in Appendix D of this report.

It should be noted that when the results for three (3) runs are averaged together, if a value is less than (<) the detection limit (DL), it is counted as zero (0) in the average. If 1 or 2 values are < the DL and the average is a value larger than the detection limit, then it is presented as an approximation (~) in the average column. In cases where a compound is found in levels above the detection limit for only 1 or 2 of 3 runs, the data should be considered to be less significant than cases where a compound was found for all 3 runs. The data becomes increasingly significant as the concentration value increases in orders of magnitude. The converse of this would be true as the concentration value approaches the detection limit.

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SUMMARY OF EMISSION RATE RESULTS
TO-14 VOLATILE ORGANIC COMPOUNDS
AM TEST - AIR QUALITY, INC.

FILE NAME: 187B\CHF3ISUM
CLIENT: King County Solid Waste @ Cedar Hills Landfill
LOCATION: Maple Valley, Washington
SAMPLE SITE: Flare #3 Inlet

	RUN #1 (mg/min)	RUN #2 (mg/min)	RUN #3 (mg/min)	AVERAGE
LAB NUMBER:	I-4118-1	I-4118-2	I-4118-3	
DATE:	9/30/92	9/30/92	10/1/92	
START TIME:	14:15	16:30	08:17	
STOP TIME:	15:15	17:30	09:17	
ANALYTE				
Acetone	1259.9	1111.8	1295.8	1222.5
Benzene	206.2	183.4	214.1	201.2
Bromodichloromethane	< DL	< DL	< DL	< DL
Bromomethane (Methyl Bromide)	< DL	< DL	< DL	< DL
Bromoform	< DL	< DL	< DL	< DL
1,3-Butadiene	< DL	< DL	< DL	< DL
2-Butanone (MEK)	1947.1	1612.0	1802.9	1787.3
Carbon Disulfide	< DL	< DL	< DL	< DL
Carbon Tetrachloride	< DL	< DL	< DL	< DL
Chlorobenzene	252.0	244.6	264.8	253.8
Chloroethane (Ethyl Chloride)	< DL	< DL	< DL	< DL
2-Chloroethyl Vinyl Ether	< DL	< DL	< DL	< DL
Chloroform	< DL	< DL	< DL	< DL
Chloromethane (Methyl Chloride)	< DL	< DL	< DL	< DL
Dibromochloromethane	< DL	< DL	< DL	< DL
1,2-Dibromoethane (EDB)	< DL	< DL	< DL	< DL
1,2-Dichlorobenzene	< DL	< DL	< DL	< DL
1,3-Dichlorobenzene	< DL	< DL	< DL	< DL
1,4-Dichlorobenzene	< DL	< DL	< DL	< DL
1,1-Dichloroethane	97.4	83.4	90.1	90.3
1,2-Dichloroethane (EDC)	< DL	< DL	< DL	< DL
1,1-Dichloroethene	< DL	< DL	< DL	< DL
cis-1,2-Dichloroethene	315.0	283.5	309.9	302.8
trans-1,2-Dichloroethene	< DL	< DL	< DL	< DL
Dichloromethane	315.0	266.8	293.0	291.6
1,2-Dichloropropane	< DL	< DL	< DL	< DL
cis-1,3-Dichloropropene	< DL	< DL	< DL	< DL
trans-1,3-Dichloropropene	< DL	< DL	< DL	< DL
Ethylbenzene	4581.4	4391.4	4845.3	4606.0
2-Hexanone	< DL	< DL	< DL	< DL
4-Methyl-2-Pentanone (MIBK)	355.1	311.3	383.1	349.8
Styrene	412.3	416.9	450.7	426.6
1,1,2,2-Tetrachloroethane	< DL	< DL	< DL	< DL
Tetrachloroethene (PCE)	687.2	667.1	732.4	695.6
Toluene	7444.7	6670.5	7887.7	7334.3
1,1,1-Trichloroethane (TCA)	< DL	< DL	< DL	< DL
1,1,2-Trichloroethane	< DL	< DL	< DL	< DL
Trichloroethene (TCE)	269.2	239.0	281.7	263.3
Trichlorofluoromethane (F-11)	19.5	19.5	23.1	20.7
Trichlorotrifluoroethane (F-113)	< DL	< DL	< DL	< DL
Vinyl Acetate	< DL	< DL	< DL	< DL
Vinyl Chloride	509.7	416.9	473.3	466.6
Xylenes, Total	12026.1	11673.4	12958.4	12219.3

< DL designates that the compound was not detected, or was found at levels below the practical quantitation limit.

mg/min = milligrams of analyte emitted per minute.

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SUMMARY OF EMISSION RATE RESULTS
TO-14 VOLATILE ORGANIC COMPOUNDS
AM TEST - AIR QUALITY, INC.

FILE NAME: 187B\CHF3OSUM
CLIENT: King County Solid Waste @ Cedar Hills Landfill
LOCATION: Maple Valley, Washington
SAMPLE SITE: Flare #3 Outlet

	RUN #1	RUN #2	RUN #3	AVERAGE
	(mg/min)	(mg/min)	(mg/min)	
LAB NUMBER:	I-4118-4	I-4118-5	I-4118-6	
DATE:	9/30/92	9/30/92	10/1/92	
START TIME:	14:15	16:30	08:17	
STOP TIME:	15:15	17:30	09:17	
ANALYTE				
Acetone	170.9	1.91	46.0	72.9
Benzene	60.0	6.02	48.7	38.3
Bromodichloromethane	< DL	< DL	< DL	< DL
Bromomethane (Methyl Bromide)	< DL	1.36	< DL	-0.452
Bromoform	< DL	< DL	< DL	< DL
1,3-Butadiene	212.4	< DL	< DL	-70.8
2-Butanone (MEK)	10.2	< DL	5.36	-5.17
Carbon Disulfide	115.5	8.03	< DL	-41.2
Carbon Tetrachloride	< DL	23.6	< DL	-7.87
Chlorobenzene	2.03	< DL	< DL	-0.677
Chloroethane (Ethyl Chloride)	< DL	3.21	< DL	-1.07
2-Chloroethyl Vinyl Ether	< DL	< DL	< DL	< DL
Chloroform	< DL	11.5	< DL	-3.85
Chloromethane (Methyl Chloride)	19.9	21.1	< DL	-13.6
Dibromochloromethane	< DL	< DL	< DL	< DL
1,2-Dibromoethane (EDB)	< DL	< DL	< DL	< DL
1,2-Dichlorobenzene	< DL	< DL	< DL	< DL
1,3-Dichlorobenzene	< DL	< DL	< DL	< DL
1,4-Dichlorobenzene	< DL	< DL	< DL	< DL
1,1-Dichloroethane	< DL	< DL	< DL	< DL
1,2-Dichloroethane (EDC)	< DL	3.01	< DL	-1.00
1,1-Dichloroethene	< DL	< DL	< DL	< DL
cis-1,2-Dichloroethene	< DL	< DL	< DL	< DL
trans-1,2-Dichloroethene	< DL	< DL	< DL	< DL
Dichloromethane	3.74	7.03	< DL	-3.59
1,2-Dichloropropane	< DL	< DL	< DL	< DL
cis-1,3-Dichloropropene	< DL	< DL	< DL	< DL
trans-1,3-Dichloropropene	< DL	< DL	< DL	< DL
Ethylbenzene	3.79	< DL	< DL	-1.26
2-Hexanone	< DL	< DL	< DL	< DL
4-Methyl-2-Pentanone (MIBK)	< DL	< DL	< DL	< DL
Styrene	55.4	14.1	< DL	-23.2
1,1,2,2-Tetrachloroethane	< DL	< DL	< DL	< DL
Tetrachloroethene (PCE)	< DL	2.41	< DL	-0.803
Toluene	39.7	4.92	2.65	15.8
1,1,1-Trichloroethane (TCA)	< DL	< DL	< DL	< DL
1,1,2-Trichloroethane	< DL	< DL	< DL	< DL
Trichloroethene (TCE)	< DL	1.15	< DL	-0.385
Trichlorofluoromethane (F-11)	< DL	< DL	< DL	< DL
Trichlorotrifluoroethane (F-113)	< DL	< DL	< DL	< DL
Vinyl Acetate	< DL	< DL	< DL	< DL
Vinyl Chloride	0.600	< DL	< DL	-0.200
Xylenes, Total	18.0	1.51	< DL	-6.51

< DL designates that the compound was not detected, or was found at levels below the practical quantitation limit.

mg/min = milligrams of analyte emitted per minute.

2.5 Destruction Efficiency of Volatile Organic Compounds

The destruction efficiency is the amount of vapors destroyed through incineration, expressed on a percentage basis. The percent destruction efficiency for each volatile organic compound which was analyzed in the gas at Flare #3 at the Cedar Hills Landfill is reported on page 14. Destruction efficiencies were calculated based on the average emission rate of each compound detected in milligrams per minute (mg/min). The destruction efficiencies of bromomethane, 1,3-butadiene, carbon disulfide, carbon tetrachloride, chloroethane, chloroform, chloromethane and 1,2-dichloroethane (EDC) were not reported because the compounds were not found at the inlet. The laboratory analysis detection limits are lower for the outlet samples because the inlet samples required dilution in the laboratory, therefore, certain compounds may be detected at the outlet and not at the inlet.

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VOLATILE ORGANIC COMPOUNDS IN AIR
DESTRUCTION EFFICIENCY EVALUATION
AM TEST-AIR QUALITY, INC.

FILE NAME: 187B\CHF3DEFF
CLIENT: King County Solid Waste @ Cedar Hills Landfill
LOCATION: Maple Valley, Washington
SAMPLE SITE: Flare #3
SAMPLE DATE: September 30 - October 1, 1992

COMPOUNDS	Average Inlet Emission Rate mg/min	Average Outlet Emission Rate mg/min	Destruction Efficiency Percent
Acetone	1222.5	72.9	94.04
Benzene	201.2	38.3	80.96
Bromodichloromethane	< DL	< DL	-----
Bromomethane (Methyl Bromide)	< DL	~0.452	-----*
Bromoform	< DL	< DL	-----
1,3-Butadiene	< DL	~70.8	-----*
2-Butanone (MEK)	1787.3	~5.17	~99.71
Carbon Disulfide	< DL	~41.2	-----*
Carbon Tetrachloride	< DL	~7.87	-----*
Chlorobenzene	253.8	~0.677	~99.73
Chloroethane (Ethyl Chloride)	< DL	~1.07	-----*
2-Chloroethyl Vinyl Ether	< DL	< DL	-----
Chloroform	< DL	~3.85	-----*
Chloromethane (Methyl Chloride)	< DL	~13.6	-----*
Dibromochloromethane	< DL	< DL	-----
1,2-Dibromoethane (EDB)	< DL	< DL	-----
1,2-Dichlorobenzene	< DL	< DL	-----
1,3-Dichlorobenzene	< DL	< DL	-----
1,4-Dichlorobenzene	< DL	< DL	-----
1,1-Dichloroethane	90.3	< DL	99.99
1,2-Dichloroethane (EDC)	< DL	~1.00	-----*
1,1-Dichloroethene	< DL	< DL	-----
cis-1,2-Dichloroethene	302.8	< DL	99.99
trans-1,2-Dichloroethene	< DL	< DL	-----
Dichloromethane	291.6	~3.59	~98.77
1,2-Dichloropropane	< DL	< DL	-----
cis-1,3-Dichloropropene	< DL	< DL	-----
trans-1,3-Dichloropropene	< DL	< DL	-----
Ethylbenzene	4606.0	~1.20	~99.97
2-Hexanone	< DL	< DL	-----
4-Methyl-2-Pentanone (MIBK)	349.8	< DL	99.99
Styrene	426.6	~23.2	~94.56
1,1,2,2-Tetrachloroethane	< DL	< DL	-----
Tetrachloroethene (PCE)	695.6	~0.803	~99.88
Toluene	7334.3	15.8	99.78
1,1,1-Trichloroethane (TCA)	< DL	< DL	-----
1,1,2-Trichloroethane	< DL	< DL	-----
Trichloroethene (TCE)	263.3	~0.385	~99.85
Trichlorofluoromethane (F-11)	20.7	< DL	99.99
Trichlorotrifluoroethane (F-113)	< DL	< DL	-----
Vinyl Acetate	< DL	< DL	-----
Vinyl Chloride	466.6	~0.200	~99.96
Xylenes, Total	12219.3	~6.51	~99.95

< DL designates that the compound was not detected, or was found at levels below the practical quantitation limit.

mg/min = milligrams of analyte emitted per minute

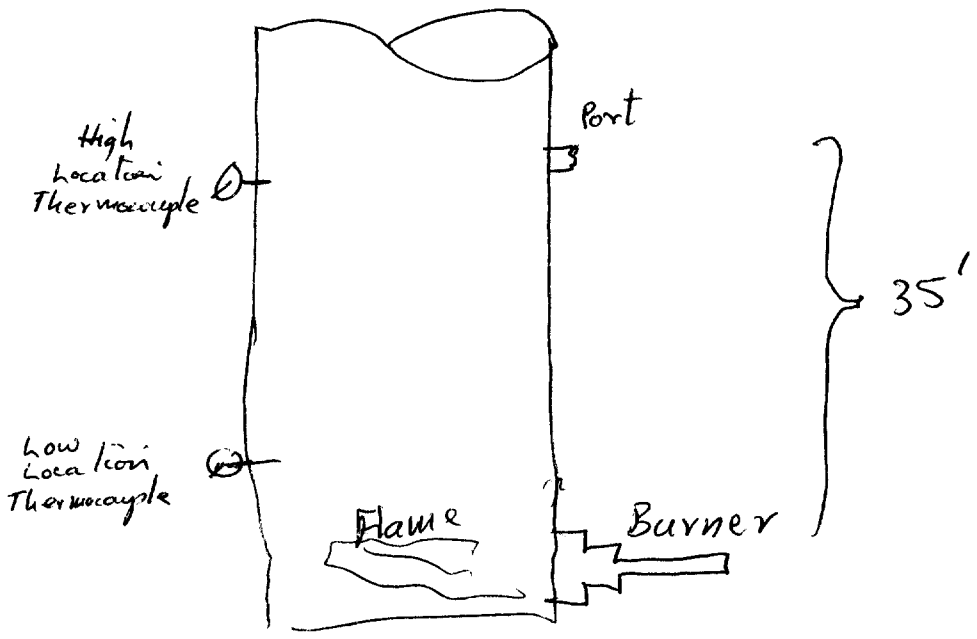
*Not reported due to negative destruction efficiency

2.6 Thermocouple Probe Check

As an additional part of this evaluation, Am Test recorded temperatures from the digital display of two (2) continuous temperature probes. The readouts from the probes were labeled high and low. The "high" probe is located on the flare exhaust stack at the same elevation as the test ports where Am Test collected temperature readings. The "low" probe is located near the base of the flare exhaust stack. The table below compares the average temperatures recorded by Am Test and by the two (2) continuous thermocouples.

Table 2.6 Comparison of temperature probe/indicators at Flare #3 at the Cedar Hills Landfill.

Am Test Stack Temp (°F)	High location Probe Stack Temp (°F)	Low location Probe Stack Temp (°F)
1661	1674	1803
1671	1666	1793
1643	1631	1776



3.0
SOURCE OPERATION

King County's Cedar Hills Regional Landfill is an active municipal solid waste facility located in Maple Valley, Washington. The gas is extracted from the landfill by extraction wells and a network of collection piping which connect to centrifugal blowers installed at the North Flare Station located at the north end of the landfill. The collected gas is discharged from the blowers to 3 flares for incineration. Only the newly installed Flare #3 was tested during this emission evaluation.

Each John Zink ZTOF flare at Cedar Hills consists of a refractory-lined, cylindrical, steel stack 14 feet in diameter by 40 feet in height. Each unit is designed to burn up to 4,000 cubic feet per minute of LFG with a minimum operating temperature of 1,400°F. There are four (4) 4-inch diameter sample ports located at the same elevation and circumferentially 90 degrees apart. The sample ports are located approximately 35 feet above the base of each flare.

4.0
METHODOLOGY REFERENCES

Sampling procedures specified in the July 1, 1991 edition of Title 40 Code of Federal Regulations, Part 60 (40CFR60), Appendix A, Methods 1, 2, 3A, 4, 6C, 7E and 10 were followed throughout this project. Methodology suggested in the EPA Quality Assurance Handbook for Air Pollution Measurement Systems, Volume III, (EPA-600/4-77-027b)" was used for supplemental information with respect to quality assurance and testing protocol. Compendium Method TO-14 is the specific method for the volatile organic compound (VOC) sampling. This is an ambient air sampling method included in the EPA document "Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air".

5.0
SAMPLING AND ANALYSIS PROCEDURES

5.1 EPA Methods 1 and 2 - Velocity, Temperature and Airflow

EPA Method 1 procedures were used to assure that representative measurements of volumetric flow rate were obtained by dividing the cross-section of the exhaust stack into a number of equal areas, and then locating a traverse point within each of the equal areas. Method 2 was performed to measure the stack gas velocity using a pitot tube, and the gas temperature using a thermocouple. The pitot tubes were connected with tubing to an oil-filled inclined manometer or magnehelic gauges to obtain velocity measurements. The pitot tube lines were leak-checked and the inclined manometer was leveled and magnehelic gauges were zeroed prior to use. Temperatures were measured using calibrated thermocouple probes connected to a digital thermocouple indicator.

The inlet gas enters Flare #3 through a 12-inch (I.D.) circular duct which has a tap available to draw gas samples. A standard (P-Type) pitot tube was used to monitor the velocity of the inlet gas at a point near the center of the duct every ten (10) minutes during the time VOC samples were collected. The flare exhaust stack has a 138-inch inside diameter. The stack is fitted with four (4) sampling ports located at the same elevation, and circumferentially 90 degrees apart. These sampling ports are located 35 feet from the nearest upstream flow disturbance, and 6 feet from the nearest downstream flow disturbance. Four (4) velocity and temperature traverses of six (6) points each were performed prior to each Method 4/HCl and VOC test period on September 30-October 1, 1992. The sample probes were marked with felt pen and heat resistant tape to indicate the proper point location at the edge of the port nipple.

5.2 EPA Method 3A and Fixed Gas Analysis

The concentration of fixed gases at the inlet sample sites (carbon dioxide (CO_2), carbon monoxide (CO), oxygen (O_2), nitrogen, and methane (CH_4)) were quantified by Coast-to-Coast Analytical Services using the gas collected in the SUMMA^R canisters on November 5, 1992. A gas chromatograph equipped with a thermal conductivity detector (GC-TCD) was used for this analysis, which detects percent levels of thise compounds.

Measurements were made on-site on September 30-October 1, 1992 to quantify the O_2, CO_2 and CO concentration at the #3 Flare exhaust. An Infrared Industries Model 2200 electrochemical oxygen (O_2) analyzer was utilized to measure the percent O_2 from 0 to 25%. An Automated Custom Systems (ACS) Model 3300 non-dispersive infrared (NDIR) carbon dioxide (CO_2) analyzer was utilized to measure the percent CO_2 from 0 to 50%. A Thermo Environmental Systems (TECO) Model 48 gas filter correlation NDIR was used to measure the parts per million (ppm) carbon monoxide (CO). Measurements from the instruments were digitally recorded once per minute on the test days using an Odessa Engineering data acquisition system. Certified O_2, CO_2 and CO gases were utilized to check the calibration of the instruments after each test. The fixed gas data were used to calculate the molecular weight of the gas.

The Method 3A sample system is illustrated in Figure 1 in Appendix E of this report. Also included in Appendix E are specifications for the analyzers along with copies of the calibration gas certificates used. An effluent gas sample was drawn through an in-stack filter and through a stainless steel sampling probe which was sufficiently heated to prevent condensation. A calibration valve was connected to the outlet of the probe for the purpose of introducing calibration gas. The gas

sample passed through a refrigerator type moisture removal system to continuously remove condensate from the sample gas. A Teflon sample line was used to transport the gas sample to the continuous monitoring system. A Teflon coated leak-free pump was utilized to pull the sample gas through the system at a flow rate sufficient to minimize the response time of the measurement system. A sample flow rate control valve and rotameter were used to maintain a constant sampling rate within 10 percent. Sampling was continuous, with a sampling system bias check at the end of every test period.

The combustion gas measurement system was assembled on-site and calibration gases were introduced and calibration adjustments were made to calibrate the instrument. The sampling system components were adjusted to achieve appropriate sampling rates. Prior to sampling, a calibration error check was performed by introducing calibration gases to the system upstream of the analyzer. Zero and calibration gases were introduced, and no adjustments were made to the system, except as necessary to maintain a constant flow rate of calibration gas through the instrument. Following calibration, testing commenced following a period of at least twice the system response time. The response time was determined by observing the times required to achieve a stable response when both the zero and upscale gas was introduced. The longer of the two times was used as the response time of the analyzer.

Immediately preceding and following every test period, or whenever adjustments to the measurement system were made, a sampling system bias check was performed. In this test, calibration gases were introduced at the calibration valve at the outlet of the sampling probe. A zero gas and span gas were used for this check. Calibration gas was introduced and the concentration displayed by the analyzer was recorded.

Then zero gas was introduced and the reading was recorded. The calibration gas flow rates were adjusted to maintain a constant rate. Once acceptable bias specifications were met, then the average of the initial and final bias check values were used to calculate the gas concentration for the run.

5.3 EPA Method 4 - Moisture and Chloride

The psychrometric moisture content of the flare inlet gas stream was calculated using wet bulb and dry bulb temperatures recorded during each velocity test. The moisture content of the outlet gas stream was measured using EPA Method 4 procedures. The sample probe was positioned in the flare exhaust stack at a point of average velocity and moisture samples were collected over three (3) 60-minute periods.

The sample train used for moisture sampling was an EPA Method 4 design as illustrated in Figure 2 in Appendix E of this report. The gas was pulled through a heated probe liner using a pump into an impinger train which was immersed in an ice water bath. The first impinger was a modified Greenburg-Smith type containing 100 milliliters of deionized water. The second Greenburg-Smith impinger also contained 100 ml of water. The third impinger was empty, and the fourth bubbler contained indicating silica gel desiccant to absorb any moisture from the stack gas before it entered the control box. The impinger section was maintained at a temperature below 68° F by keeping ice on the impingers. The temperature at the outlet of the silica gel bubbler was monitored to verify that it did not exceed 68° F during a test. Prior to each run, the sample train was leak-checked following the procedures in Method 5. Upon completion of each test, the probe was removed from the stack and a post-test leak check was performed.

The sample train was connected to a control box by means of an umbilical cord which contains a vacuum hose, pitot lines, thermocouple wires and a 4-wire electrical cord. The control box (meter box) is used to monitor stack conditions. The control box contains a leak-free pump used to pull the stack gas through the sample train, fine and coarse metering valves to control the sampling rate, a vacuum gauge which measures the pressure drop from the sampling nozzle to the metering valves, and a calibrated dry gas meter readable to 0.001 cubic feet. The dry gas meter inlet and outlet temperatures were monitored by thermocouples which are connected to the multichannel thermocouple indicator. The dry gas meter calibration factor, Y, is determined by calibrating the meter against a wet test meter.

Before and after each run, the impingers in the sample train were removed and weighed with a readability of 0.1 grams using an electronic top loading balance. The difference between the initial and final weights of the condenser section constitute the amount of moisture gained during the run.

In the Am Test-Air Quality laboratory, the contents of the bubblers and impingers containing deionized water were transferred to a 500 ml graduated cylinder. The bubblers and impingers were rinsed with deionized water into the graduated cylinder, and the liquid level was recorded. The solutions were transferred to labeled sample bottles which were shipped to the Am Test, Inc. Water Chemistry laboratory in Redmond, Washington for chloride analysis using EPA Method 325.3.

5.4 EPA Method 6C - Sulfur Dioxide

Sulfur dioxide measurements were collected using Method 6C, which is an instrumental method. Am Test utilized a Western Research Model 721AT ultraviolet SO_2 analyzer. A gas sample was continuously extracted from the gas

stream and passed through the analyzer, which measures the parts per million (ppm) sulfur dioxide (SO_2).

The Method 6C sample train is illustrated in Figure 1 in Appendix E of this report. Also included in Appendix E are specifications for the analyzer along with copies of calibration gas certificates. An effluent gas sample was drawn through a stainless steel sampling probe and through a refrigerator type moisture removal system to continuously remove condensate from the sample gas. A Teflon coated leak-free pump was utilized to pull the sample gas through the system at a flow rate sufficient to minimize the response time of the measurement system. A sample flow rate control valve and rotameter were used to maintain a constant sampling rate within 10 percent. An Odessa Engineering data acquisition system was used to log outputs of the sulfur dioxide analyzer. Measurements from the instrument were digitally recorded once per minute during each run.

The SO_2 measurement system was assembled on-site and calibration gases were introduced and calibration adjustments were made to calibrate the instruments. The sampling system components were adjusted to achieve appropriate sampling rates. Prior to sampling, a calibration error check (linearity check) was performed by introducing calibration gases to the system upstream of the analyzers. Zero, mid-range, and high-range calibration gases were introduced, and no adjustments to the system were made, except as necessary to maintain a constant flow rate of calibration gas through the instrument. Following the initial calibrations, testing commenced following a period of at least twice the system response time. The response time was determined by observing the times required to achieve a stable response when both the zero and upscale gas was introduced. The longer of the two times was used as the response time of the analyzer.

Immediately preceding and following every test period, or whenever adjustments to the measurement system were made, a sampling system bias check was performed. In this test, calibration gases were introduced at the calibration valve at the outlet of the sampling probe. A zero and calibration (span) gas was used for this check. Calibration gas was introduced and the concentration displayed by the analyzer was recorded. Then zero gas was introduced and the reading was recorded. The calibration gas flow rates were adjusted to maintain a constant rate. Once acceptable bias specifications were met, then the average of the initial and final bias check values were used to calculate the gas concentration for the run.

5.5 EPA Method 7E - Nitrogen Oxides

Nitrogen oxides (NO_x) concentration measurements were collected using Method 7E, which is an instrumental method. Am Test utilized a Thermo Environmental Instruments, Inc. Model 10S chemiluminescent NO/NO_x analyzer to measure NO_x as nitrogen dioxide (NO_2). A gas sample was continuously extracted from the stack, and passed through the analyzer, which measures the parts per million (ppm) NO_x.

The Method 7E sampling system is illustrated in Figure 1 in Appendix E of this report. Also included in Appendix E are specifications for the analyzer, and copies of calibration gas certificates. An effluent gas sample was drawn through the same sample system as described for Method 6C sampling. The gas passes through an NO_2 to NO converter which converts the nitrogen dioxide in the sample to nitrogen oxide. The sample is divided into two paths, one leading through the converter and the other leading directly to the reaction chamber of the analyzer. The difference between the 2 channels' readings is NO_2.

The NO_x measurement system was assembled on-site and calibration gases were introduced and calibration adjustments were made to calibrate the instruments. The sampling system components were adjusted to achieve appropriate sampling rates. Prior to sampling, a calibration error check (linearity check) was performed as described in Section 5.4 of this report. Immediately preceding and following each test period a sampling system bias check was performed as described in Section 5.4 of this report.

5.6 EPA Method 10 - Carbon Monoxide

An Thermo Environmental Systems (TECO) Model 48 gas filter correlation non-dispersive infrared analyzer (NDIR) was used to measure the parts per million (ppm) carbon monoxide (CO) using procedures described in Method 10. A gas sample was continuously extracted from the stack and passed through the analyzer, which measures the parts per million (ppm) CO.

The Method 10 sampling system is illustrated in Figure 1 in Appendix E of this report. Also included in Appendix E are specifications for the analyzer, and copies of calibration gas certificates. An effluent gas sample was drawn through the same sample system as described for Method 6C sampling in Section 5.4 of this report. The CO measurement system was assembled on-site and calibration gases were introduced and calibration adjustments were made to calibrate the instruments. The sampling system components were adjusted to achieve appropriate sampling rates. Immediately preceding and following each test period a sampling system bias check was performed as described in Section 5.4 of this report.

5.7 EPA Method TO-14 - Volatile Organic Compounds

Integrated samples of the gas at the inlet and outlet of the flare were collected using Compendium Method TO-14 for volatile organic compound (VOC) analysis. The TO-14 sample train is illustrated in Figure 3 in Appendix E of this report. This ambient air testing method was used for this project to collect integrated samples of gas om evacuated SUMMA^R electropolished stainless steel canisters. The integrated samples were analyzed using EPA Method TO-14, which utilizes a gas chromatograph equipped with a mass spectrophotometer (GC-MS) to quantify a standard list of volatile organic compounds.

The TO-14 sampling apparatus included a stainless steel probe, a mechanical critical orifice flow regulator or metering valve, and a 0-30 inch vacuum gauge to monitor canister vacuum. The system is specifically designed to collect uniformly integrated air samples over a predetermined time period. A stainless steel probe was inserted into the port to pull a gas sample through the flow controller and into the evacuated canister. The teflon sample line was attached to a stainless steel "T" connection, with the side branch connected to a vacuum gauge atop the SUMMA^R canister, the other end of the "T" was connected to a valve with a sample pump attached. The sample train was evacuated to approximately one inch above absolute pressure. A leak check was performed by observing the vacuum gauge for one (1) minute. The SUMMA^R canister valve was opened and the initial vacuum was recorded. The sample line valve was then opened until the canister vacuum was zero.

Coast-to-Coast Analytical Services, Inc., the outside contract laboratory used to analyze these samples, owns and maintains the integrity of the SUMMA^R passivated canisters and performs leak tests to assure that they can contain a gas sample over

time. To prepare the canisters, the contract laboratory heated them in an isothermal oven to 100° C. Once heated, the canisters were evacuated and maintained under vacuum for several hours. At the end of the heated/evacuation cycle, the canisters were pressurized with humid zero air and were quality assurance checked with a gas chromatograph equipped with a flame ionization detector. Once certified clean, the canisters were reevacuated and remained in the evacuated state until they were used.

Each canister was labeled with an identification tag before it was returned to the contract laboratory for analysis. Upon return receipt of the canisters by the contract laboratory, the pressure of each canister was checked by attaching a pressure gauge to the canister inlet and opening the valve briefly to note the pressure. The sample canister was connected to the inlet of the GC-MS-SCAN analytical system. A mass flow controller was placed on the canister and the canister valve was opened. Following preliminary flushing, the canister flow was vented past a tee inlet to the analytical system. The sample was preconcentrated in a cryogenic trap, then the trapped analytes were thermally desorbed onto the head of the column to be separated and scanned. Primary identification is based on retention time and relative abundance of eluting ions as compared to the spectral library stored on the hard disk of the GC-MS data system. The concentration of each compound was calculated using the previously established response factors. Analysis of the gas contained in the canisters was accomplished using GC-MS as described in Method TO-14. This protocol is virtually identical to EPA Method 8240 procedures for quantifying volatile organic compounds. A copy of Coast-to-Coast's standard operating procedures (SOP) for TO-14 is included in Appendix E of this report.

6.0
CALCULATION OF RESULTS

The Method 1, 2, 3A, 4, 6C, 7E and 10 results were calculated in accordance with the 40CFR60, Appendix A criteria. Copies of the pertinent equations used are included in Appendix E of this report. Standard conditions are 68° F and 29.92 inches of mercury.

The laboratory results were converted to emission concentration and emission rate units. The results from each run are presented along with an average for the series of three (3) runs. It should be noted that when the results for three (3) runs are averaged together, if a value is less than (<) the detection limit (DL), it is counted as zero (0) in the average. If 1 or 2 values are < the DL and the average is a value larger than the detection limit, then it is presented as an approximation (~) in the average column. In cases where a compound is found in levels above the detection limit for only 1 or 2 of 3 runs, the data should be considered to be less significant than cases where a compound was found for all 3 runs. The data becomes increasingly significant as the concentration value increases in orders of magnitude. The converse of this would be true as the concentration value approaches the detection limit. Final result calculations were performed using custom-written spreadsheets run on Hewlett-Packard Vectra computer systems. By-hand sample calculations of computerized results were performed to verify computer program integrity. Copies of the original subcontracted laboratory analysis data are included in Appendix B of this report. Copies of the example calculations are included in Appendix C of this report. Copies of the Am Test-Air Quality field data sheets are included in Appendix D of this report.

The average values from instrumental analyzer readings were computed and bias corrected for each test period. The average gas effluent concentration was determined from the average gas concentration displayed by the gas analyzer, adjusted for the zero and upscale sampling system bias checks. Calculations are on a dry basis using the following equation:

$$C_{gas} = (C - C_o) * (C_{ma}/(C_m - C_o)$$

where:

C_{gas} = Effluent gas concentration, dry basis, ppm

C = Average gas concentration indicated by analyzer, dry basis, ppm

C_o = Average of initial and final system calibration bias check responses for the zero gas, ppm

C_{ma} = Actual concentration of the upscale calibration gas, ppm

C_m = Average of initial and final system calibration bias check responses for the upscale calibration gas, ppm

7.0
QUALITY ASSURANCE PLAN

The purpose of the quality assurance plan is to provide guidelines for achieving quality control in air pollution measurements. The detailed procedures Am Test-Air Quality, Inc. utilized are included in the Environmental Protection Agency's (EPA's) reference manual titled Quality Assurance Handbook for Air Pollution Measurements Systems, Volume 3, EPA-600/4-77-027b. Procedures were followed throughout equipment preparation, field sampling, sample recovery, analysis, and data reduction. Am Test-Air Quality, Inc.'s quality assurance procedures are discussed below.

7.1 Calibration Procedures and Frequency

Field equipment utilized for on-site measurements is calibrated at a frequency as recommended by the equipment manufacturer or industry practice. Prior to field use, each instrument is calibrated and the calibration value reported in a calibration log. If any measuring or test device requiring calibration cannot immediately be removed from service, the Project Manager may extend the calibration cycle providing a review of the equipment's history warrants the issuance of an extension. No equipment will be extended more than twice a calibration cycle, nor will the extension exceed one-half the prescribed calibration cycle. Test equipment consistently found to be out of calibration will be repaired or replaced.

The dry gas meters used to accurately measure sample volumes have been calibrated using a laboratory dry gas meter which has been calibrated against a wet test meter. A standard P-type pitot tube or a calibrated S-type pitot tube was used for velocity measurements. The coefficients for S-type pitot tubes have been

determined using Method 2, Section 4.1 procedures and are re-inspected in the field during each emission evaluation. The digital thermocouple indicator used for temperature measurement has a readability of 1 degree Fahrenheit and has been certified by the manufacturer for its' accuracy. Each thermocouple probe used to monitor stack gas temperature is checked periodically at three (3) temperature settings. The thermocouple probes are typically checked in the field at ambient temperature and in an ice bath. Calibration data for these measurement devices is included in Appendix E of this report.

The sulfur dioxide, nitrogen oxides and carbon monoxide measurement system is capable of meeting the system performance specifications detailed in 40CFR60, Appendix A, Method 6C, Section 4. For meeting these specifications, the analyzer's calibration error must be less than ± 2 percent of the span for the zero, mid-range, and high-range calibration gases. The sampling system bias must be less than $\pm 5\%$ of the span for the zero, and mid- or high-range calibration gases. The zero drift must be less than $\pm 3\%$ of the span over the period of each run. The calibration drift must be less than $\pm 3\%$ of the span over the period of each run. The calibration gases used for all instrumental techniques were purchased from Airco Special Gases and were analyzed following the EPA Traceability Protocol Number 1, or next best available. Purified nitrogen was utilized as zero gas. Specifications for the instruments used for this project are included in Appendix E of this report, along with copies of the calibration certificates for each tank of gas utilized.

Support equipment is defined as all equipment, not previously discussed that is required for completing an environmental monitoring or measurement task. This equipment may include storage and transportation containers, sample recovery glassware, and communications gear. Support equipment is periodically inspected

to maintain the performance standards necessary for proper and efficient execution of all tasks and responsibilities.

During the project, a systems audit was performed, consisting of an on-site qualitative inspection and review of the total measurement system. This inspection was conducted on a daily basis by the Project Leader. During the systems audit, the auditor observed the procedures and techniques of the field team in the following general areas:

- Setting up and leak testing the sampling train
- Final leak check of train
- Sample recovery

Visual inspections of pitot tubes, glassware, and other equipment were also made. The main purpose of a systems audit is to ensure that the measurement system will generate valid data, if operated properly.

7.2 Sample Recovery and Field Documentation

Data relative to samples, collected during each test, were immediately inspected for completeness and placed under the custody of the Project Leader until custody was transferred when the samples were turned over to the laboratory. Sample recovery was carried out in a suitable area sheltered from wind and dust to prevent contamination of samples.

Many types of documentation were used in the field to keep track of project information. A field notebook was used to note any conditions which were not covered by the various field data sheets which Am Test uses. The field team leader recorded all information related to sampling or field activities.

7.3 Chain of Custody

The history of each sample was documented from collection through all transfers of custody until it was transferred to the analytical laboratory. Copies of the chain of custody forms are included in Appendix B of this report. Internal laboratory records document the custody of the samples through their final disposition. Care was taken to record precisely the sample type, sample time, and sample location and to help ensure that the sample number on the label exactly matches those numbers on the sample logsheet and the chain-of-custody record. The persons undertaking the actual sampling in the field were responsible for the care and custody of the samples collected until they were properly transferred or dispatched. Sample labels were completed for each sample bottle using water-proof ink.

7.4 Transfer of Custody and Shipment

All sample shipping containers were accompanied by an analysis request or chain-of-custody record form when they left the site. When transferring the possession of samples, the individuals relinquishing and receiving the samples signed, dated, and noted the time on the record. This record documents sample custody transfer from the sampler, often through another person, to the analyst in the laboratory.

The laboratory representative who accepted the incoming sample shipment signed and dated the chain-of-custody record, completing the sample transfer process. It is the laboratory's responsibility to maintain internal logbooks and custody records throughout sample preparation and analysis in accordance with the laboratory's written QA Plan.

It is important to maintain the integrity of the samples from the time of collection until the analyses are performed. The samples were preserved during

transportation and storage to prevent or retard degradation or modification of chemicals in samples. The chloride samples were kept cool with blue ice packets placed in the coolers the sample were shipped in. Prior to shipping the TO-14 canisters, the samples were placed in boxes along with a chain-of-custody form. Empty space in the box was filled with bubble pack and styrofoam to prevent damage during shipment. The samples were shipped to Coast-to-Coast Analytical via UPS blue for second day delivery.

7.5 Data Reduction, Validation, and Reporting

Raw data were handled according to strict guidelines when being transposed into computer files or on other logs. The guidelines include document receipt control procedures, file review, and sign-off by a checker. Raw data were entered into the appropriate software package by a "processor", then the entered figures were checked for accuracy by a "checker," different from the "processor". Any mistakes were corrected, and figures were rechecked and signed off by the "checker". In addition, by-hand calculation checks were made to validate the computer output. All data generated by each phase of a laboratory or field sampling program were reviewed by the senior reviewer. The data were signed off by the senior reviewer prior to releasing the data for report preparation.

APPENDIX A

Computer Printouts of Results

WET BULB/DRY BULB MOISTURE CALCULATION

FILE NAME:	182\KCIN#3-1	LAB #:	I-4118-1
CLIENT:	KING COUNTY SOLID WASTE @ CEDAR HILLS LANDFILL	START TIME:	14:15 o'clock
		STOP TIME:	15:15 o'clock
LOCATION:	MAPLE VALLEY, WASHINGTON		
SITE LOCATION:	FLARE #3 INLET		
SAMPLE DATE:	SEPTEMBER 30, 1992		
RUN #:	1 - MOISTURE		
OPERATORS:	MACKEY/LAWRENCE		

Wet bulb temperature (Tw)	85	°F
Dry bulb temperature (Td)	116	°F
Saturated H2O Vapor Pressure (SVP)	1.21	inches of Hg (wet bulb temperature - from chart)
Barometric Pressure	29.60	inches Hg
Static Pressure	6.0	inches H2O
Stack Pressure	30.04	inches Hg

MOISTURE CALCULATION:

Vapor Pressure (VP) (inches Hg) =	0.860
Bws =	0.029
Moisture (%) =	2.9

WET BULB/DRY BULB MOISTURE CALCULATION

FILE NAME:	182\KCIN#3-2	LAB #:	I-4118-2
CLIENT:	KING COUNTY SOLID WASTE @ CEDAR HILLS LANDFILL	START TIME:	16:30 o'clock
		STOP TIME:	17:30 o'clock
LOCATION:	MAPLE VALLEY, WASHINGTON		
SITE LOCATION:	FLARE #3 INLET		
SAMPLE DATE:	SEPTEMBER 30, 1992		
RUN #:	2 - MOISTURE		
OPERATORS:	MACKEY/LAWRENCE		

Wet bulb temperature (Tw)	86	°F
Dry bulb temperature (Td)	114	°F
Saturated H20 Vapor Pressure (SVP)	1.25	inches of Hg (wet bulb temperature - from chart)
Barometric Pressure	29.57	inches Hg
Static Pressure	6.0	inches H20
Stack Pressure	30.01	inches Hg

MOISTURE CALCULATION:

Vapor Pressure (VP) (inches Hg) =	0.934
Bws =	0.031
Moisture (%) =	3.1

WET BULB/DRY BULB MOISTURE CALCULATION

FILE NAME:	182\KCIN#3-3	LAB #:	I-4118-3
CLIENT:	KING COUNTY SOLID WASTE @ CEDAR HILLS LANDFILL	START TIME:	08:17 o'clock
		STOP TIME:	09:17 o'clock
LOCATION:	MAPLE VALLEY, WASHINGTON		
SITE LOCATION:	FLARE #3 INLET		
SAMPLE DATE:	OCTOBER 1, 1992		
RUN #:	3 - MOISTURE		
OPERATORS:	MACKEY/LAWRENCE		

Wet bulb temperature (Tw)	82	°F
Dry bulb temperature (Td)	105	°F
Saturated H2O Vapor Pressure (SVP)	1.10	inches of Hg (wet bulb temperature - from chart)
Barometric Pressure	29.58	inches Hg
Static Pressure	6.0	inches H2O
Stack Pressure	30.02	inches Hg

MOISTURE CALCULATION:

Vapor Pressure (VP) (inches Hg) =	0.841
Bws =	0.028
Moisture (%) =	2.8

METHODS 1, 2 AND 3A
AM TEST - AIR QUALITY, INC.

FILE NAME:	182\KCVEL#31	LAB #:	I-4118-1
CLIENT:	KING COUNTY SOLID WASTE	START TIME:	14:15 o'clock
	@ CEDAR HILLS LANDFILL	STOP TIME:	15:15 o'clock
LOCATION:	MAPLE VALLEY, WASHINGTON		
SAMPLE SITE:	FLARE #3 INLET		
SAMPLE DATE:	SEPTEMBER 30, 1992		
RUN #:	1 - VELOCITY		
OPERATORS:	MACKEY/LAWRENCE		

MOISTURE (%):	2.9
Bws:	0.0290
PITOT TUBE Cp:	0.99
STACK DIAMETER:	12.00 inches
STACK AREA:	0.785 sq. feet
BAROMETRIC PRES.:	29.60 inches Hg
STATIC PRESSURE:	6.0 inches H2O
STACK PRESSURE:	30.04 inches Hg
AVERAGE CO2 CONC:	34.0 percent
AVERAGE O2 CONC:	7.5 percent
AVERAGE CO CONC:	< 0.1 percent
AVERAGE CH4 CONC:	29 percent
MOLECULAR WEIGHT:	30.26 g/g-mole-dry
MOLECULAR WEIGHT:	29.90 g/g-mole-wet

SAMPLE POINT	VELOCITY " OF H2O	TEMPERATURE °F	SAMPLE POINT	VELOCITY " OF H2O	TEMPERATURE °F
Point of	0.49	116	Point of	0.52	115
Average	0.50	115	Average	0.52	115
Velocity	0.48	115	Velocity	0.50	116
	0.50	115			

STACK GAS TEMPERATURE:	115.3 degrees F
STACK GAS TEMPERATURE:	575.3 degrees R
AVERAGE VELOCITY HEAD:	0.501 " of H2O
STACK GAS VELOCITY:	48.0 ft/sec
STACK GAS AIR FLOW:	2022.1 dscf/min
STACK GAS AIR FLOW:	2259.8 acf/min

*Fixed gas analysis results from samples collected on November 5, 1992 were used to calculate the molecular weight.

METHODS 1, 2 AND 3A
AM TEST - AIR QUALITY, INC.

FILE NAME:	182\KCVEL#32	LAB #:	I-4118-2
CLIENT:	KING COUNTY SOLID WASTE	START TIME:	16:30 o'clock
	@ CEDAR HILLS LANDFILL	STOP TIME:	17:30 o'clock
LOCATION:	MAPLE VALLEY, WASHINGTON		
SAMPLE SITE:	FLARE #3 INLET		
SAMPLE DATE:	SEPTEMBER 30, 1992		
RUN #:	2 - VELOCITY		
OPERATORS:	MACKEY/LAWRENCE		

MOISTURE (%):	3.1
Bws:	0.0310
PITOT TUBE Cp:	0.99
STACK DIAMETER:	12.00 inches
STACK AREA:	0.785 sq. feet
BAROMETRIC PRES.:	29.57 inches Hg
STATIC PRESSURE:	6.0 inches H2O
STACK PRESSURE:	30.01 inches Hg
AVERAGE CO2 CONC:	35.0 percent
AVERAGE O2 CONC:	6.8 percent
AVERAGE CO CONC:	< 0.1 percent
AVERAGE CH4 CONC:	30 percent
MOLECULAR WEIGHT:	30.27 g/g-mole-dry
MOLECULAR WEIGHT:	29.89 g/g-mole-wet

SAMPLE POINT	VELOCITY " OF H2O	TEMPERATURE °F	SAMPLE POINT	VELOCITY " OF H2O	TEMPERATURE °F
Point of	0.48	114	Point of	0.48	113
Average	0.46	113	Average	0.48	113
Velocity	0.46	113	Velocity	0.47	113
	0.48	113			

STACK GAS TEMPERATURE:	113.1 degrees F
STACK GAS TEMPERATURE:	573.1 degrees R
AVERAGE VELOCITY HEAD:	0.473 " of H2O
STACK GAS VELOCITY:	46.5 ft/sec
STACK GAS AIR FLOW:	1962.8 dscf/min
STACK GAS AIR FLOW:	2192.1 acf/min

*Fixed gas analysis results from samples collected on November 5, 1992 were used to calculate the molecular weight.

METHODS 1, 2 AND 3A
AM TEST - AIR QUALITY, INC.

FILE NAME:	182\KCVEL#33	LAB #:	I-4118-3
CLIENT:	KING COUNTY SOLID WASTE	START TIME:	08:17 o'clock
	@ CEDAR HILLS LANDFILL	STOP TIME:	09:17 o'clock
LOCATION:	MAPLE VALLEY, WASHINGTON		
SAMPLE SITE:	FLARE #3 INLET		
SAMPLE DATE:	OCTOBER 1, 1992		
RUN #:	3 - VELOCITY		
OPERATORS:	MACKEY/LAWRENCE		

MOISTURE (%):	2.8
Bws:	0.0280
PITOT TUBE Cp:	0.99
STACK DIAMETER:	12.00 inches
STACK AREA:	0.785 sq. feet
BAROMETRIC PRES.:	29.58 inches Hg
STATIC PRESSURE:	6.0 inches H2O
STACK PRESSURE:	30.02 inches Hg
AVERAGE CO2 CONC:	36.0 percent
AVERAGE O2 CONC:	6.5 percent
AVERAGE CO CONC:	< 0.1 percent
AVERAGE CH4 CONC:	31 percent
MOLECULAR WEIGHT:	30.30 g/g-mole-dry
MOLECULAR WEIGHT:	29.96 g/g-mole-wet

SAMPLE POINT	VELOCITY " OF H2O	TEMPERATURE °F	SAMPLE POINT	VELOCITY " OF H2O	TEMPERATURE °F
Point of	0.51	105	Point of	0.48	105
Average	0.46	106	Average	0.47	105
Velocity	0.45	106	Velocity	0.48	105
	0.49	105			

STACK GAS TEMPERATURE:	105.3 degrees F
STACK GAS TEMPERATURE:	565.3 degrees R
AVERAGE VELOCITY HEAD:	0.477 " of H2O
STACK GAS VELOCITY:	46.3 ft/sec
STACK GAS AIR FLOW:	1989.4 dscf/min
STACK GAS AIR FLOW:	2183.8 acf/min

*Fixed gas analysis results from samples collected on November 5, 1992 were used to calculate the molecular weight.

METHODS 1, 2, 3A, 4 AND CHLORIDE
AM TEST - AIR QUALITY, INC.

FILE NAME:	182\KCCHCLR1
CLIENT:	KING COUNTY AT CEDAR HILLS LANDFILL
LOCATION:	MAPLE VALLEY, WA
SAMPLE SITE:	FLARE #3 OUTLET
SAMPLE DATE:	SEPTEMBER 30, 1992
RUN #:	1 - METHOD 4/HCl
OPERATORS:	R. LAWRENCE

LAB #:	3253
START TIME:	14:15 o'clock
STOP TIME:	15:15 o'clock
SAMPLE LENGTH:	60.0 minutes

IMPINGER WEIGHTS

FINAL grams	INITIAL grams	NET grams
694.4	644.0	50.4
654.9	638.3	16.6
540.2	537.4	2.8
843.9	834.9	9.0
TOTAL H2O GAIN:		78.8
TOTAL VOLUME (SCF):		3.72
PERCENT MOISTURE:		9.44
Bws:		0.0944

PITOT TUBE Cp:	0.84
NOZZLE DIAMETER:	NA inches
NOZZLE AREA:	NA sq. feet
STACK DIAMETER:	138.0 inches
STACK AREA:	103.87 sq. feet
METER TEMPERATURE:	107.8 degrees F
BAROMETRIC PRES.:	29.60 inches Hg
STATIC PRESSURE:	-0.08 inches H2O
STACK PRESSURE:	29.59 inches Hg
ORIFICE PRESSURE:	1.5 inches H2O
METER PRESSURE:	29.71 inches Hg

INIT. METER VOLUME:	983.778
FINAL METER VOLUME:	1022.997
VOLUME SAMPLED:	39.219
STD VOLUME (DSCF):	35.635
STD VOLUME (DSCM):	1.009
Y FACTOR:	0.984

AVERAGE CONC. CO2:	7.8 percent
AVERAGE CONC. O2:	11.8 percent
AVERAGE CONC. CO:	1 ppm
MOLECULAR WEIGHT:	29.72 g/g-mole-dry
MOLECULAR WEIGHT:	28.61 g/g-mole-wet

SAMPLE POINT		VELOCITY " OF H2O	TEMPERATURE °F	SAMPLE POINT		VELOCITY " OF H2O	TEMPERATURE °F
E	1	0.003	1650	W	1	0.003	1657
	2	0.002	1642		2	0.010	1659
	3	0.007	1662		3	0.015	1661
	4	0.006	1684		4	0.017	1661
	5	0.006	1671		5	0.016	1663
	6	0.014	1668		6	0.018	1672
N	1	0.011	1656	S	1	0.001	1650
	2	0.018	1640		2	0.002	1658
	3	0.025	1660		3	0.005	1660
	4	0.021	1661		4	0.009	1662
	5	0.019	1661		5	0.020	1662
	6	0.020	1670		6	0.022	1662

STACK TEMPERATURE:	1660.5 degrees F	2120.5 degrees R
AVERAGE VELOCITY HEAD:	0.011 inches H2O	
STACK GAS VELOCITY:		11.7 ft/sec
STACK GAS AIR FLOW:	73113.7 acf/min	16306.7 dscf/min

GASEOUS CHLORIDE EMISSIONS (as HYDROCHLORIC ACID)

CHLORIDE DETECTION LIMIT (ug/ml):	1.0
TOTAL VOLUME OF SAMPLE (milliliters):	450
CHLORIDE DETECTION LIMIT (micrograms):	450
CHLORIDE CONCENTRATION IN SAMPLE (micrograms):	3920
CHLORIDE CONCENTRATION IN AIR (mg/dscm):	3.99
CHLORIDE AS HCL (ppm):	2.64
CHLORIDE AS HCL (ppm @ 7% O2):	4.03
CHLORIDE EMISSION RATE (mg/min):	1793.8
CHLORIDE EMISSION RATE (lb/hr):	0.244

METHODS 1, 2, 3A, 4 AND CHLORIDE
AM TEST - AIR QUALITY, INC.

FILE NAME:	182\KCCHCLR2
CLIENT:	KING COUNTY AT CEDAR HILLS LANDFILL
LOCATION:	MAPLE VALLEY, WA
SAMPLE SITE:	FLARE #3 OUTLET
SAMPLE DATE:	SEPTEMBER 30, 1992
RUN #:	2 - METHOD 4/HCl
OPERATORS:	R. LAWRENCE/MACKEY

LAB #:	3254
START TIME:	16:30 o'clock
STOP TIME:	17:30 o'clock
SAMPLE LENGTH:	60.0 minutes

IMPINGER WEIGHTS

FINAL grams	INITIAL grams	NET grams
690.0	638.2	51.8
649.1	632.3	16.8
539.1	535.9	3.2
754.4	743.8	10.6
TOTAL H2O GAIN:		82.4
TOTAL VOLUME (SCF):		3.89
PERCENT MOISTURE:		9.49
Bws:		0.0949

INIT. METER VOLUME:	23.258
FINAL METER VOLUME:	63.530
VOLUME SAMPLED:	40.272
STD VOLUME (DSCF):	37.044
STD VOLUME (DSCM):	1.049
Y FACTOR:	0.984

PITOT TUBE Cp:	0.84
NOZZLE DIAMETER:	NA inches
NOZZLE AREA:	NA sq. feet
STACK DIAMETER:	138.0 inches
STACK AREA:	103.87 sq. feet
METER TEMPERATURE:	100.3 degrees F
BAROMETRIC PRES.:	29.57 inches Hg
STATIC PRESSURE:	-0.09 inches H2O
STACK PRESSURE:	29.56 inches Hg
ORIFICE PRESSURE:	1.5 inches H2O
METER PRESSURE:	29.68 inches Hg

AVERAGE CONC. CO2:	7.7 percent
AVERAGE CONC. O2:	11.9 percent
AVERAGE CONC. CO:	1 ppm
MOLECULAR WEIGHT:	29.71 g/g-mole-dry
MOLECULAR WEIGHT:	28.60 g/g-mole-wet

SAMPLE POINT	VELOCITY " OF H2O	TEMPERATURE °F
E 1	0.001	1667
2	0.011	1640
3	0.010	1647
4	0.012	1697
5	0.009	1665
6	0.008	1674
N 1	0.017	1656
2	0.026	1650
3	0.027	1664
4	0.026	1672
5	0.028	1674
6	0.030	1674

SAMPLE POINT	VELOCITY " OF H2O	TEMPERATURE °F
W 1	0.002	1678
2	0.009	1671
3	0.007	1673
4	0.011	1674
5	0.015	1689
6	0.019	1691
S 1	0.009	1671
2	0.007	1679
3	0.008	1674
4	0.011	1674
5	0.016	1678
6	0.016	1674

STACK TEMPERATURE:	1671.1 degrees F	2131.1 degrees R
AVERAGE VELOCITY HEAD:	0.013 inches H2O	
STACK GAS VELOCITY:		12.8 ft/sec
STACK GAS AIR FLOW:	80007.8 acf/min	17727.3 dscf/min

GASEOUS CHLORIDE EMISSIONS (as HYDROCHLORIC ACID)

CHLORIDE DETECTION LIMIT (ug/ml):	1.0
TOTAL VOLUME OF SAMPLE (milliliters):	380
CHLORIDE DETECTION LIMIT (micrograms):	380
CHLORIDE CONCENTRATION IN SAMPLE (micrograms):	5550
CHLORIDE CONCENTRATION IN AIR (mg/dscm):	5.44
CHLORIDE AS HCL (ppm):	3.59
CHLORIDE AS HCL (ppm @ 7% O2):	5.54
CHLORIDE EMISSION RATE (mg/min):	2655.9
CHLORIDE EMISSION RATE (lb/hr):	0.361

METHODS 1, 2, 3A, 4 AND CHLORIDE
AM TEST - AIR QUALITY, INC.

FILE NAME:	182\KCCHCLR3	LAB #:	3255
CLIENT:	KING COUNTY AT CEDAR HILLS LANDFILL	START TIME:	08:17 o'clock
		STOP TIME:	09:17 o'clock
LOCATION:	MAPLE VALLEY, WA	SAMPLE LENGTH:	60.0 minutes
SAMPLE SITE:	FLARE #3 OUTLET		
SAMPLE DATE:	OCTOBER 1, 1992		
RUN #:	3 - METHOD 4/HCl		
OPERATORS:	R. LAWRENCE/MACKEY		

IMPINGER WEIGHTS

FINAL grams	INITIAL grams	NET grams
690.8	639.8	51.0
655.0	638.0	17.0
528.4	526.4	2.0
664.9	654.9	10.0

TOTAL H2O GAIN:	80.0	PITOT TUBE Cp:	0.84
TOTAL VOLUME (SCF):	3.77	NOZZLE DIAMETER:	NA inches
PERCENT MOISTURE:	9.01	NOZZLE AREA:	NA sq. feet
Bws:	0.0901	STACK DIAMETER:	138.0 inches
		STACK AREA:	103.87 sq. feet
INIT. METER VOLUME:	63.698	METER TEMPERATURE:	77.2 degrees F
FINAL METER VOLUME:	103.398	BAROMETRIC PRES.:	29.58 inches Hg
VOLUME SAMPLED:	39.700	STATIC PRESSURE:	-0.08 inches H2O
STD VOLUME (DSCF):	38.101	STACK PRESSURE:	29.57 inches Hg
STD VOLUME (DSCM):	1.079	ORIFICE PRESSURE:	1.5 inches H2O
Y FACTOR:	0.984	METER PRESSURE:	29.69 inches Hg
		AVERAGE CONC. CO2:	7.3 percent
		AVERAGE CONC. O2:	12.3 percent
		AVERAGE CONC. CO:	1 ppm
		MOLECULAR WEIGHT:	29.66 g/g-mole-dry
		MOLECULAR WEIGHT:	28.61 g/g-mole-wet

SAMPLE POINT		VELOCITY " OF H2O	TEMPERATURE °F	SAMPLE POINT		VELOCITY " OF H2O	TEMPERATURE °F
S	1	0.005	1606	N	1	0.016	1609
	2	0.005	1629		2	0.026	1631
	3	0.005	1615		3	0.031	1619
	4	0.011	1669		4	0.029	1670
	5	0.020	1674		5	0.029	1681
	6	0.015	1684		6	0.027	1650
W	1	0.015	1629	E	1	0.004	1616
	2	0.014	1650		2	0.006	1629
	3	0.020	1652		3	0.006	1619
	4	0.021	1653		4	0.012	1650
	5	0.021	1653		5	0.006	1654
	6	0.027	1651		6	0.008	1629

STACK TEMPERATURE:	1642.6 degrees F	2102.6 degrees R
AVERAGE VELOCITY HEAD:	0.014 inches H2O	
STACK GAS VELOCITY:		13.6 ft/sec
STACK GAS AIR FLOW:	84677.2 acf/min	19124.9 dscf/min

GASEOUS CHLORIDE EMISSIONS (as HYDROCHLORIC ACID)

CHLORIDE DETECTION LIMIT (ug/ml):	1.0
TOTAL VOLUME OF SAMPLE (milliliters):	390
CHLORIDE DETECTION LIMIT (micrograms):	390
CHLORIDE CONCENTRATION IN SAMPLE (micrograms):	4800
CHLORIDE CONCENTRATION IN AIR (mg/dscm):	4.58
CHLORIDE AS HCL (ppm):	3.02
CHLORIDE AS HCL (ppm @ 7% O2):	4.88
CHLORIDE EMISSION RATE (mg/min):	2409.4
CHLORIDE EMISSION RATE (lb/hr):	0.328

CALIBRATION SUMMARY - GASEOUS EMISSION MONITORS

FILE NAME:	172\CEDAR-1
CLIENT:	KING COUNTY SOLID WASTE @ CEDAR HILLS LANDFILL
LOCATION:	MAPLE VALLEY, WASHINGTON
SAMPLE SITE:	FLARE #3 OUTLET STACK
DATE:	SEPTEMBER 30, 1992
RUN #:	1 - METHODS 3A, 6C, 7E AND 10
SAMPLE TIMES:	14:15-15:15

PARAMETER	MEASUREMENT UNIT	INITIAL ZERO CHECK	FINAL ZERO CHECK	INITIAL SPAN CHECK	FINAL SPAN CHECK	UPSCALE CAL. GAS VALUE Cma	AVERAGE ZERO BIAS Co	AVERAGE SPAN BIAS Cm	AVERAGE MEASURED CONC. C
Carbon Dioxide (CO2)	%	0.0	0.0	12.0	11.9	12.0	0.0	12.0	7.8
Oxygen (O2)	%	0.0	0.0	10.0	10.0	10.0	0.0	10.0	11.8
Carbon Monoxide (CO)	ppm	-1.0	-1.0	610.0	609.0	606.0	-1.0	609.5	0
Sulfur Dioxide (SO2)	ppm	-0.2	-2.7	52.6	49.4	52.2	-1.5	51.0	0.7
Nitrogen Oxides (NOx as NO2)	ppm	-0.1	0.0	56.0	55.8	56.0	-0.1	55.9	19.1

PARAMETER	EFFLUENT GAS CONCENTRATION Cgas
Carbon Dioxide (CO2)	7.8 %
Oxygen (O2)	11.8 %
Carbon Monoxide (CO)	1 ppm
Sulfur Dioxide (SO2)	2.1 ppm
Nitrogen Oxides (NOx as NO2)	19.2 ppm

CALIBRATION SUMMARY - GASEOUS EMISSION MONITORS

FILE NAME: 172\CEDAR-2
CLIENT: KING COUNTY SOLID WASTE @ CEDAR HILLS LANDFILL
LOCATION: MAPLE VALLEY, WASHINGTON
SAMPLE SITE: FLARE #3 OUTLET STACK
DATE: SEPTEMBER 30, 1992
RUN #: 2 - METHODS 3A, 6C, 7E AND 10
SAMPLE TIMES: 16:30-17:30

PARAMETER	MEASUREMENT UNIT	INITIAL ZERO CHECK	FINAL ZERO CHECK	INITIAL SPAN CHECK	FINAL SPAN CHECK	UPSCALE CAL. GAS VALUE Cma	AVERAGE ZERO BIAS Co	AVERAGE SPAN BIAS Cm	AVERAGE MEASURED CONC. C
Carbon Dioxide (CO2)	%	0.0	0.0	12.0	12.0	12.0	0.0	12.0	7.7
Oxygen (O2)	%	0.0	0.0	10.0	10.0	10.0	0.0	10.0	11.9
Carbon Monoxide (CO)	ppm	-1.0	-1.0	606.0	636.0	606.0	-1.0	621.0	0
Sulfur Dioxide (SO2)	ppm	0.2	1.4	51.7	54.4	52.2	0.8	53.1	4.6
Nitrogen Oxides (NOx as NO2)	ppm	0.4	0.0	56.0	56.9	56.0	0.2	56.5	18.4

PARAMETER	EFFLUENT GAS CONCENTRATION Cgas
Carbon Dioxide (CO2)	7.7 %
Oxygen (O2)	11.9 %
Carbon Monoxide (CO)	1 ppm
Sulfur Dioxide (SO2)	3.8 ppm
Nitrogen Oxides (NOx as NO2)	18.1 ppm

CALIBRATION SUMMARY - GASEOUS EMISSION MONITORS

FILE NAME: 172\CEDAR-3
CLIENT: KING COUNTY SOLID WASTE @ CEDAR HILLS LANDFILL
LOCATION: MAPLE VALLEY, WASHINGTON
SAMPLE SITE: FLARE #3 OUTLET STACK
DATE: OCTOBER 1, 1992
RUN #: 3 - METHODS 3A, 6C, 7E AND 10
SAMPLE TIMES: 08:17-09:17

PARAMETER	MEASUREMENT UNIT	INITIAL ZERO CHECK	FINAL ZERO CHECK	INITIAL SPAN CHECK	FINAL SPAN CHECK	UPSCALE CAL. GAS VALUE Cma	AVERAGE ZERO BIAS Co	AVERAGE SPAN BIAS Cm	AVERAGE MEASURED CONC. C
Carbon Dioxide (CO2)	%	0.0	0.1	12.0	12.2	12.0	0.1	12.1	7.4
Oxygen (O2)	%	0.0	0.0	10.0	9.9	10.0	0.0	10.0	12.2
Carbon Monoxide (CO)	ppm	0.0	1.0	603.0	591.0	606.0	0.5	597.0	1
Sulfur Dioxide (SO2)	ppm	0.3 •	2.2	52.5	55.5	52.2	1.3	54.0	5.4
Nitrogen Oxides (NOx as NO2)	ppm	-0.2	0.0	56.1	54.9	56.0	-0.1	55.5	16.7

PARAMETER	EFFLUENT GAS CONCENTRATION Cgas
Carbon Dioxide (CO2)	7.3 %
Oxygen (O2)	12.3 %
Carbon Monoxide (CO)	1 ppm
Sulfur Dioxide (SO2)	4.1 ppm
Nitrogen Oxides (NOx as NO2)	16.9 ppm

EMISSION RATE RESULTS
TO-14 VOLATILE ORGANIC COMPOUNDS
AM TEST-AIR QUALITY, INC.

FILE NAME: 187B\TO14CHI1
CLIENT: King County Solid Waste @ Cedar Hills Landfill
LOCATION: Maple Valley, Washington
SAMPLE LOCATION: Flare #3 Inlet
SAMPLE DATE: September 30, 1992
SAMPLE TIME: 14:15-15:15
LAB NUMBER(S): I-4118-1
CANISTER #: 476
AIRFLOW: 2022.1 dscf/min

ANALYTE	Run 1 mg/min	Blank mg/min	DL Run 1 mg/min
Acetone	1259.9	< DL	34.4
Benzene	206.2	< DL	5.73
Bromodichloromethane	< DL	< DL	11.5
Bromomethane (Methyl Bromide)	< DL	< DL	14.3
Bromoform	< DL	< DL	11.5
1,3-Butadiene	< DL	< DL	11.5
2-Butanone (MEK)	1947.1	< DL	14.3
Carbon Disulfide	< DL	< DL	57.3
Carbon Tetrachloride	< DL	< DL	11.5
Chlorobenzene	252.0	< DL	5.73
Chloroethane (Ethyl Chloride)	< DL	< DL	2.86
2-Chloroethyl Vinyl Ether	< DL	< DL	57.3
Chloroform	< DL	< DL	34.4
Chloromethane (Methyl Chloride)	< DL	< DL	7.16
Dibromochloromethane	< DL	< DL	11.5
1,2-Dibromoethane (EDB)	< DL	< DL	28.6
1,2-Dichlorobenzene	< DL	< DL	5.73
1,3-Dichlorobenzene	< DL	< DL	5.73
1,4-Dichlorobenzene	< DL	< DL	5.73
1,1-Dichloroethane	97.4	< DL	5.73
1,2-Dichloroethane (EDC)	< DL	< DL	5.73
1,1-Dichloroethene	< DL	< DL	5.73
cis-1,2-Dichloroethene	315.0	< DL	5.73
trans-1,2-Dichloroethene	< DL	< DL	5.73
Dichloromethane	315.0	< DL	57.3
1,2-Dichloropropane	< DL	< DL	5.73
cis-1,3-Dichloropropene	< DL	< DL	5.73
trans-1,3-Dichloropropene	< DL	< DL	5.73
Ethylbenzene	4581.4	< DL	14.3
2-Hexanone	< DL	< DL	5.73
4-Methyl-2-Pentanone (MIBK)	355.1	< DL	5.73
Styrene	412.3	< DL	14.3
1,1,2,2-Tetrachloroethane	< DL	< DL	11.5
Tetrachloroethene (PCE)	687.2	< DL	11.5
Toluene	7444.7	< DL	14.3
1,1,1-Trichloroethane (TCA)	< DL	< DL	5.73
1,1,2-Trichloroethane	< DL	< DL	5.73
Trichloroethene (TCE)	269.2	< DL	5.73
Trichlorofluoromethane (F-11)	19.5	< DL	5.73
Trichlorotrifluoroethane (F-113)	< DL	< DL	28.6
Vinyl Acetate	< DL	< DL	57.3
Vinyl Chloride	509.7	< DL	7.16
Xylenes, Total	12026.1	< DL	14.3

< DL designates that the compound was not detected, or was found at levels below the practical quantitation limit.

mg/min = milligrams of analyte emitted per minute

EMISSION RATE RESULTS
TO-14 VOLATILE ORGANIC COMPOUNDS
AM TEST-AIR QUALITY, INC.

FILE NAME:	187B\TO14CH12
CLIENT:	King County Solid Waste @ Cedar Hills Landfill
LOCATION:	Maple Valley, Washington
SAMPLE LOCATION:	Flare #3 Inlet
SAMPLE DATE:	September 30, 1992
SAMPLE TIME:	16:30-17:30
LAB NUMBER(S):	I-4118-2
CANISTER #:	483
AIRFLOW:	1962.8 dscf/min

ANALYTE	Run 2 mg/min	Blank mg/min	DL Run 2 mg/min
Acetone	1111.8	< DL	33.4
Benzene	183.4	< DL	5.56
Bromodichloromethane	< DL	< DL	11.1
Bromomethane (Methyl Bromide)	< DL	< DL	13.9
Bromoform	< DL	< DL	11.1
1,3-Butadiene	< DL	< DL	11.1
2-Butanone (MEK)	1612.0	< DL	13.9
Carbon Disulfide	< DL	< DL	55.6
Carbon Tetrachloride	< DL	< DL	11.1
Chlorobenzene	244.6	< DL	5.56
Chloroethane (Ethyl Chloride)	< DL	< DL	2.78
2-Chloroethyl Vinyl Ether	< DL	< DL	55.6
Chloroform	< DL	< DL	33.4
Chloromethane (Methyl Chloride)	< DL	< DL	6.95
Dibromochloromethane	< DL	< DL	11.1
1,2-Dibromoethane (EDB)	< DL	< DL	27.8
1,2-Dichlorobenzene	< DL	< DL	5.56
1,3-Dichlorobenzene	< DL	< DL	5.56
1,4-Dichlorobenzene	< DL	< DL	5.56
1,1-Dichloroethane	83.4	< DL	5.56
1,2-Dichloroethane (EDC)	< DL	< DL	5.56
1,1-Dichloroethene	< DL	< DL	5.56
cis-1,2-Dichloroethene	283.5	< DL	5.56
trans-1,2-Dichloroethene	< DL	< DL	5.56
Dichloromethane	266.8	< DL	55.6
1,2-Dichloropropane	< DL	< DL	5.56
cis-1,3-Dichloropropene	< DL	< DL	5.56
trans-1,3-Dichloropropene	< DL	< DL	5.56
Ethylbenzene	4391.4	< DL	13.9
2-Hexanone	< DL	< DL	5.56
4-Methyl-2-Pentanone (MIBK)	311.3	< DL	5.56
Styrene	416.9	< DL	13.9
1,1,2,2-Tetrachloroethane	< DL	< DL	11.1
Tetrachloroethene (PCE)	667.1	< DL	11.1
Toluene	6670.5	< DL	13.9
1,1,1-Trichloroethane (TCA)	< DL	< DL	5.56
1,1,2-Trichloroethane	< DL	< DL	5.56
Trichloroethene (TCE)	239.0	< DL	5.56
Trichlorofluoromethane (F-11)	19.5	< DL	5.56
Trichlorotrifluoroethane (F-113)	< DL	< DL	27.8
Vinyl Acetate	< DL	< DL	55.6
Vinyl Chloride	416.9	< DL	6.95
Xylenes, Total	11673.4	< DL	13.9

< DL designates that the compound was not detected, or was found at levels below the practical quantitation limit.

mg/min = milligrams of analyte emitted per minute

EMISSION RATE RESULTS
TO-14 VOLATILE ORGANIC COMPOUNDS
AM TEST-AIR QUALITY, INC.

FILE NAME: 187B\TO14CHI3
CLIENT: King County Solid Waste @ Cedar Hills Landfill
LOCATION: Maple Valley, Washington
SAMPLE LOCATION: Flare #3 Inlet
SAMPLE DATE: October 1, 1992
SAMPLE TIME: 08:17-09:17
LAB NUMBER(S): I-4118-3
CANISTER #: 545
AIRFLOW: 1989.4 dscf/min

ANALYTE	Run 3 mg/min	Blank mg/min	DL Run 3 mg/min
Acetone	1295.8	< DL	33.8
Benzene	214.1	< DL	5.63
Bromodichloromethane	< DL	< DL	11.3
Bromomethane (Methyl Bromide)	< DL	< DL	14.1
Bromoform	< DL	< DL	11.3
1,3-Butadiene	< DL	< DL	11.3
2-Butanone (MEK)	1802.9	< DL	14.1
Carbon Disulfide	< DL	< DL	56.3
Carbon Tetrachloride	< DL	< DL	11.3
Chlorobenzene	264.8	< DL	5.63
Chloroethane (Ethyl Chloride)	< DL	< DL	2.82
2-Chloroethyl Vinyl Ether	< DL	< DL	56.3
Chloroform	< DL	< DL	33.8
Chloromethane (Methyl Chloride)	< DL	< DL	7.04
Dibromochloromethane	< DL	< DL	11.3
1,2-Dibromoethane (EDB)	< DL	< DL	28.2
1,2-Dichlorobenzene	< DL	< DL	5.63
1,3-Dichlorobenzene	< DL	< DL	5.63
1,4-Dichlorobenzene	< DL	< DL	5.63
1,1-Dichloroethane	90.1	< DL	5.63
1,2-Dichloroethane (EDC)	< DL	< DL	5.63
1,1-Dichloroethene	< DL	< DL	5.63
cis-1,2-Dichloroethene	309.9	< DL	5.63
trans-1,2-Dichloroethene	< DL	< DL	5.63
Dichloromethane	293.0	< DL	56.3
1,2-Dichloropropane	< DL	< DL	5.63
cis-1,3-Dichloropropene	< DL	< DL	5.63
trans-1,3-Dichloropropene	< DL	< DL	5.63
Ethylbenzene	4845.3	< DL	14.1
2-Hexanone	< DL	< DL	5.63
4-Methyl-2-Pentanone (MIBK)	383.1	< DL	5.63
Styrene	450.7	< DL	14.1
1,1,2,2-Tetrachloroethane	< DL	< DL	11.3
Tetrachloroethene (PCE)	732.4	< DL	11.3
Toluene	7887.7	< DL	14.1
1,1,1-Trichloroethane (TCA)	< DL	< DL	5.63
1,1,2-Trichloroethane	< DL	< DL	5.63
Trichloroethene (TCE)	281.7	< DL	5.63
Trichlorofluoromethane (F-11)	23.1	< DL	5.63
Trichlorotrifluoroethane (F-113)	< DL	< DL	28.2
Vinyl Acetate	< DL	< DL	56.3
Vinyl Chloride	473.3	< DL	7.04
Xylenes, Total	12958.4	< DL	14.1

< DL designates that the compound was not detected, or was found at levels below the practical quantitation limit.

mg/min = milligrams of analyte emitted per minute

EMISSION RATE RESULTS
TO-14 VOLATILE ORGANIC COMPOUNDS
AM TEST-AIR QUALITY, INC.

FILE NAME: 187B\TO14CH01
CLIENT: King County Solid Waste @ Cedar Hill Landfill
LOCATION: Maple Valley, Washington
SAMPLE LOCATION: Flare #3 Outlet
SAMPLE DATE: September 30, 1992
SAMPLE TIME: 14:15-15:15
LAB NUMBER(S): I-4118-4
AIRFLOW: 16306.7 dscf/min

ANALYTE	Run 1 mg/min	Blank mg/min	DL Run 1 mg/min
Acetone	170.9	< DL	1.39
Benzene	60.0	< DL	0.231
Bromodichloromethane	< DL	< DL	0.462
Bromomethane (Methyl Bromide)	< DL	< DL	0.462
Bromoform	< DL	< DL	0.462
1,3-Butadiene	212.4	< DL	0.092
2-Butanone (MEK)	10.2	< DL	0.231
Carbon Disulfide	115.5	< DL	0.462
Carbon Tetrachloride	< DL	< DL	0.462
Chlorobenzene	2.03	< DL	0.231
Chloroethane (Ethyl Chloride)	< DL	< DL	0.231
2-Chloroethyl Vinyl Ether	< DL	< DL	2.31
Chloroform	< DL	< DL	0.231
Chloromethane (Methyl Chloride)	19.9	< DL	0.092
Dibromochloromethane	< DL	< DL	0.462
1,2-Dibromoethane (EDB)	< DL	< DL	0.462
1,2-Dichlorobenzene	< DL	< DL	0.462
1,3-Dichlorobenzene	< DL	< DL	0.462
1,4-Dichlorobenzene	< DL	< DL	0.462
1,1-Dichloroethane	< DL	< DL	0.231
1,2-Dichloroethane (EDC)	< DL	< DL	0.231
1,1-Dichloroethene	< DL	< DL	0.231
cis-1,2-Dichloroethene	< DL	< DL	0.231
trans-1,2-Dichloroethene	< DL	< DL	0.231
Dichloromethane	3.74	< DL	2.31
1,2-Dichloropropane	< DL	< DL	0.231
cis-1,3-Dichloropropene	< DL	< DL	0.231
trans-1,3-Dichloropropene	< DL	< DL	0.231
Ethylbenzene	3.79	< DL	0.462
2-Hexanone	< DL	< DL	0.231
4-Methyl-2-Pentanone (MIBK)	< DL	< DL	0.231
Styrene	55.4	< DL	0.462
1,1,2,2-Tetrachloroethane	< DL	< DL	0.462
Tetrachloroethene (PCE)	< DL	< DL	0.462
Toluene	39.7	< DL	0.462
1,1,1-Trichloroethane (TCA)	< DL	< DL	0.462
1,1,2-Trichloroethane	< DL	< DL	0.462
Trichloroethene (TCE)	< DL	< DL	0.231
Trichlorofluoromethane (F-11)	< DL	< DL	0.462
Trichlorotrifluoroethane (F-113)	< DL	< DL	0.924
Vinyl Acetate	< DL	< DL	2.31
Vinyl Chloride	0.600	< DL	0.231
Xylenes, Total	18.0	< DL	0.462

< DL designates that the compound was not detected, or was found at levels below the practical quantitation limit.

mg/min = milligrams of analyte emitted per minute

EMISSION RATE RESULTS
TO-14 VOLATILE ORGANIC COMPOUNDS
AM TEST-AIR QUALITY, INC.

FILE NAME: 187B\TO14CH02
CLIENT: King County Solid Waste @ Cedar Hill Landfill
LOCATION: Maple Valley, Washington
SAMPLE LOCATION: Flare #3 Outlet
SAMPLE DATE: September 30, 1992
SAMPLE TIME: 16:30-17:30
LAB NUMBER(S): I-4118-5
AIRFLOW: 17727.3 dscf/min

ANALYTE	Run 2 mg/min	Blank mg/min	DL Run 2 mg/min
Acetone	1.91	< DL	1.51
Benzene	6.02	< DL	0.251
Bromodichloromethane	< DL	< DL	0.502
Bromomethane (Methyl Bromide)	1.36	< DL	0.502
Bromoform	< DL	< DL	0.502
1,3-Butadiene	< DL	< DL	0.100
2-Butanone (MEK)	< DL	< DL	0.251
Carbon Disulfide	8.03	< DL	0.502
Carbon Tetrachloride	23.6	< DL	0.502
Chlorobenzene	< DL	< DL	0.251
Chloroethane (Ethyl Chloride)	3.21	< DL	0.251
2-Chloroethyl Vinyl Ether	< DL	< DL	2.51
Chloroform	11.5	< DL	0.251
Chloromethane (Methyl Chloride)	21.1	< DL	0.100
Dibromochloromethane	< DL	< DL	0.502
1,2-Dibromoethane (EDB)	< DL	< DL	0.502
1,2-Dichlorobenzene	< DL	< DL	0.502
1,3-Dichlorobenzene	< DL	< DL	0.502
1,4-Dichlorobenzene	< DL	< DL	0.502
1,1-Dichloroethane	< DL	< DL	0.251
1,2-Dichloroethane (EDC)	3.01	< DL	0.251
1,1-Dichloroethene	< DL	< DL	0.251
cis-1,2-Dichloroethene	< DL	< DL	0.251
trans-1,2-Dichloroethene	< DL	< DL	0.251
Dichloromethane	7.03	< DL	2.51
1,2-Dichloropropane	< DL	< DL	0.251
cis-1,3-Dichloropropene	< DL	< DL	0.251
trans-1,3-Dichloropropene	< DL	< DL	0.251
Ethylbenzene	< DL	< DL	0.502
2-Hexanone	< DL	< DL	0.251
4-Methyl-2-Pentanone (MIBK)	< DL	< DL	0.251
Styrene	14.1	< DL	0.502
1,1,2,2-Tetrachloroethane	< DL	< DL	0.502
Tetrachloroethene (PCE)	2.41	< DL	0.502
Toluene	4.92	< DL	0.502
1,1,1-Trichloroethane (TCA)	< DL	< DL	0.502
1,1,2-Trichloroethane	< DL	< DL	0.502
Trichloroethene (TCE)	1.15	< DL	0.251
Trichlorofluoromethane (F-11)	< DL	< DL	0.502
Trichlorotrifluoroethane (F-113)	< DL	< DL	1.00
Vinyl Acetate	< DL	< DL	2.51
Vinyl Chloride	< DL	< DL	0.251
Xylenes, Total	1.51	< DL	0.502

< DL designates that the compound was not detected, or was found at levels below the practical quantitation limit.

mg/min = milligrams of analyte emitted per minute

EMISSION RATE RESULTS
TO-14 VOLATILE ORGANIC COMPOUNDS
AM TEST-AIR QUALITY, INC.

FILE NAME:	187B\TO14CH03
CLIENT:	King County Solid Waste @ Cedar Hill Landfill
LOCATION:	Maple Valley, Washington
SAMPLE LOCATION:	Flare #3 Outlet
SAMPLE DATE:	October 1, 1992
SAMPLE TIME:	08:17-09:17
LAB NUMBER(S):	I-4118-6
AIRFLOW:	19124.9 dscf/min

ANALYTE	Run 3 mg/min	Blank mg/min	DL Run 3 mg/min
Acetone	46.0	< DL	1.62
Benzene	48.7	< DL	0.271
Bromodichloromethane	< DL	< DL	0.542
Bromomethane (Methyl Bromide)	< DL	< DL	0.542
Bromoform	< DL	< DL	0.542
1,3-Butadiene	< DL	< DL	0.108
2-Butanone (MEK)	5.36	< DL	0.271
Carbon Disulfide	< DL	< DL	0.542
Carbon Tetrachloride	< DL	< DL	0.542
Chlorobenzene	< DL	< DL	0.271
Chloroethane (Ethyl Chloride)	< DL	< DL	0.271
2-Chloroethyl Vinyl Ether	< DL	< DL	2.71
Chloroform	< DL	< DL	0.271
Chloromethane (Methyl Chloride)	< DL	< DL	0.108
Dibromochloromethane	< DL	< DL	0.542
1,2-Dibromoethane (EDB)	< DL	< DL	0.542
1,2-Dichlorobenzene	< DL	< DL	0.542
1,3-Dichlorobenzene	< DL	< DL	0.542
1,4-Dichlorobenzene	< DL	< DL	0.542
1,1-Dichloroethane	< DL	< DL	0.271
1,2-Dichloroethane (EDC)	< DL	< DL	0.271
1,1-Dichloroethene	< DL	< DL	0.271
cis-1,2-Dichloroethene	< DL	< DL	0.271
trans-1,2-Dichloroethene	< DL	< DL	0.271
Dichloromethane	< DL	< DL	2.71
1,2-Dichloropropane	< DL	< DL	0.271
cis-1,3-Dichloropropene	< DL	< DL	0.271
trans-1,3-Dichloropropene	< DL	< DL	0.271
Ethylbenzene	< DL	< DL	0.542
2-Hexanone	< DL	< DL	0.271
4-Methyl-2-Pentanone (MIBK)	< DL	< DL	0.271
Styrene	< DL	< DL	0.542
1,1,2,2-Tetrachloroethane	< DL	< DL	0.542
Tetrachloroethene (PCE)	< DL	< DL	0.542
Toluene	2.65	< DL	0.542
1,1,1-Trichloroethane (TCA)	< DL	< DL	0.542
1,1,2-Trichloroethane	< DL	< DL	0.542
Trichloroethene (TCE)	< DL	< DL	0.271
Trichlorofluoromethane (F-11)	< DL	< DL	0.542
Trichlorotrifluoroethane (F-113)	< DL	< DL	1.08
Vinyl Acetate	< DL	< DL	2.71
Vinyl Chloride	< DL	< DL	0.271
Xylenes, Total	< DL	< DL	0.542

< DL designates that the compound was not detected, or was found at levels below the practical quantitation limit.

mg/min = milligrams of analyte emitted per minute

APPENDIX B

Laboratory Analysis Results

AMTEST

ANALYSIS REPORT

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Am Test Air Quality, Inc.
30545 SE 84th Street
Suite 5
Preston, WA 98050

Date Received: 10/ 5/92
Date Reported: 10/ 8/92

Project Name: Cedar Hills Landfill
Project #: 92-157
Date Sampled: 9/30/92

Tel: 206 885 1664

PARAMETER	UNITS	RESULT
92-A020980		
Client ID: R1 Flare #3 outlet #3253		
Volume	(mls)	450.
Chloride	(ug)	3920
92-A020981		
Client ID: R2 Flare #3 Outlet #3254		
Volume	(mls)	380.
Chloride	(ug)	5550
92-A020982		
Client ID: R3 Flare #3 Outlet #3255		
Volume	(mls)	390.
Chloride	(ug)	4800
92-A020983		
Client ID: Blank #3256		
Volume	(mls)	400.
Chloride	(ug)	< 400

Reported by: Kathy Fugiel

AMTEST

METHODOLOGY REPORT

ANALYTE	METHOD	METHOD REFERENCE	DETECTION LIMIT	DATE ANALYZED
AM TEST IDENTIFICATION NUMBER 92-A020980 CLIENT ID R1 Flare #3 outlet #3253				
Chloride	325.3		1.0	10/ 7/92

A.

AMTEST

AMTest Inc.
Professional Analytical Services

14603 N.E. 87th St
Redmond, WA
98052

Fax: 206 [illegible]
Tel: 206 885 1664

CHAIN OF CUSTODY RECORD

PROJ. NO.	PROJECT NAME
92-157	Cedar Hills Landfill

SAMPLERS: *(Signature)*

Client Name: Ambient Air Quality
Client Address: 30545 SE [illegible] Preston WA 98050
Client Phone: 206 [illegible]
Contact Person: Angela
~~P.O.~~ No.: 92-157

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	Chloride - [illegible]					
	9-3-92	1415			R1 Flare #3 Outlet	1	✓					IN# 3202 450
	↓	1530			R2 Flare #3 Outlet	1	✓					3204 380
	10-1-92				R3 Flare #3 Outlet	1	✓					3205 390
	↓				Blank	1	✓					3206 400

Relinquished by: *(Signature)*	Date/Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date/Time	Received by: *(Signature)*
[illegible]	[illegible]				

Relinquished by: *(Signature)*	Date/Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date/Time	Received by: *(Signature)*
Angela [illegible]					

Relinquished by: *(Signature)*	Date/Time	Received for Laboratory by: *(Signature)*	Date/Time	Remarks

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Original Accompanies Shipment; Copy to Coordinator Field Files

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San Luis Obispo Division
141 Suburban Road, San Luis Obispo, California 93401

(805) 543-2553
FAX (805) 543-2685

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CLIENT: Angela Blaisdell
AmTest - Air Quality Inc.
30545 S. E. 84th Street #5
Preston, WA 98050

Lab Number : I-4619-1
Project : 92-157 King County Landfill @ Cedar Hills
Analyzed : 11/06/92
Analyzed by: GD
Method : GC/TCD

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED	DATE RECEIVED
R1-Inlet C#490	Air	K.O.	11/05/92	11/06/92

CONSTITUENT	(CAS RN)	*PQL PERCENT	RESULT PERCENT	NOTE
FIXED GASES AND METHANE				
Carbon Dioxide	(124389)	0.1	34.	
Oxygen	(7782447)	0.01	7.5	
Nitrogen	(7727379)	0.02	30.	
Methane	(74828)	0.005	29.	
Carbon Monoxide	(630080)	0.1	ND	

Lab Certifications: CAELAP#1598, UTELAP#E-142, A2LA#0136-01, L.A.Co.CSD#10187.
*RESULTS listed as 'ND' were not detected at or above the listed PQL (Practical Quantitation Limit)

11/12/92
TCD/110692 03
LRH/ge/yl
IK06TA

Respectfully submitted,
COAST-TO-COAST ANALYTICAL SERVICES, INC.

Gesheng Dai

Gesheng Dai, Ph.D., Group Leader

Laurence R. Hilpert, Ph.D.
Vice President

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CLIENT: Angela Blaisdell
AmTest - Air Quality Inc.
30545 S. E. 84th Street #5
Preston, WA 98050

Lab Number : I-4619-2
Project : 92-157 King County Landfill @ Cedar Hills
Analyzed : 11/06/92
Analyzed by: GD
Method : GC/TCD

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED	DATE RECEIVED
R2-Inlet C#549	Air	K.O.	11/05/92	11/06/92

CONSTITUENT	(CAS RN)	*PQL PERCENT	RESULT PERCENT	NOTE
FIXED GASES AND METHANE				
Carbon Dioxide	(124389)	0.1	35.	
Oxygen	(7782447)	0.01	6.8	
Nitrogen	(7727379)	0.02	28.	
Methane	(74828)	0.005	30.	
Carbon Monoxide	(630080)	0.1	ND	

Lab Certifications: CAELAP#1598, UTELAP#E-142, A2LA#0136-01, L.A.Co.CSD#10187.
*RESULTS listed as 'ND' were not detected at or above the listed PQL (Practical Quantitation Limit)

11/12/92
TCD/110692 04
LRH/ge/yl
IK06TA

Respectfully submitted,
COAST-TO-COAST ANALYTICAL SERVICES, INC.

Gesheng Dai

Gesheng Dai, Ph.D., Group Leader

Laurence R. Hilpert, Ph.D.
Vice President

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60

CLIENT: Angela Blaisdell
AmTest - Air Quality Inc.
30545 S. E. 84th Street #5
Preston, WA 98050

Lab Number : I-4619-3
Project : 92-157 King County Landfill @ Cedar Hills
Analyzed : 11/06/92
Analyzed by: GD
Method : GC/TCD

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED	DATE RECEIVED
R3-Inlet C#565	Air	K.O.	11/05/92	11/06/92

CONSTITUENT	(CAS RN)	*PQL PERCENT	RESULT PERCENT	NOTE
FIXED GASES AND METHANE				
Carbon Dioxide	(124389)	0.1	36.	
Oxygen	(7782447)	0.01	6.5	
Nitrogen	(7727379)	0.02	26.	
Methane	(74828)	0.005	31.	
Carbon Monoxide	(630080)	0.1	ND	

Lab Certifications: CAELAP#1598, UTELAP#E-142, A2LA#0136-01, L.A.Co.CSD#10187.
*RESULTS listed as 'ND' were not detected at or above the listed PQL (Practical Quantitation Limit)

11/12/92
TCD/110692 05
LRH/ge/yl
IK06TA

Respectfully submitted,
COAST-TO-COAST ANALYTICAL SERVICES, INC.

Gesheng Dai

Gesheng Dai, Ph.D., Group Leader

Laurence R. Hilpert, Ph.D.
Vice President

COAST · TO · COAST ANALYTICAL SERVICES

Air, Water & Hazardous Waste Sampling, Analysis & Consultation
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CLIENT: Angela Blaisdell
AmTest - Air Quality Inc.
30545 S. E. 84th Street #5
Preston, WA 98050

QC Batch ID: IK06TA I-4619-3
Project : 92-157 King County Landfill @ Cedar Hills
Analyzed : 11/06/92
Analyzed by: GD
Method : GC/TCD

QC DUPLICATE
REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED DATE	RECEIVED
R3-Inlet C#565	Air	K.O.	11/05/92	11/06/92

CONSTITUENT	(CAS RN)	*PQL PERCENT	RESULT PERCENT	%DIFF	NOTE
FIXED GASES AND METHANE					
Carbon Dioxide	(124389)	0.1	36.	0.	
Oxygen	(7782447)	0.01	6.5	0.	
Nitrogen	(7727379)	0.02	26.	0.	
Methane	(74828)	0.005	31.	0.	
Carbon Monoxide	(630080)	0.1	ND		

Lab Certifications: CAELAP#1598, UTELAP#E-142, A2LA#0136-01, L.A.Co.CSD#10187.
*RESULTS listed as 'ND' were not detected at or above the listed PQL (Practical Quantitation Limit)

11/12/92
TCD/110692 06
LRH/ge/yl
I4619-3

Respectfully submitted,
COAST-TO-COAST ANALYTICAL SERVICES, INC.

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QC Batch ID: IK06TA

CLIENT: Coast-to-Coast Analytical Services, Inc.

Analyzed : 11/06/92
Analyzed by: GD
Method : GC/TCD

QC SPIKE
REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED	DATE RECEIVED
QC SPIKE	Air			

CONSTITUENT	*PQL PERCENT	SPIKE AMOUNT	RESULT PERCENT	%REC	NOTE
FIXED GASES AND METHANE					
Carbon Dioxide	0.1	15.	15.	100.	
Oxygen	0.01	7.1	7.1	100.	
Nitrogen	0.02	66.	66.	100.	
Methane	0.005	4.6	4.6	100.	
Carbon Monoxide	0.1	7.1	7.1	100.	

Lab Certifications: CAELAP#1598, UTELAP#E-142, A2LA#0136-01, L.A.Co.CSD#10187.
*RESULTS listed as 'ND' were not detected at or above the listed PQL (Practical Quantitation Limit)

11/12/92
TCD/110692 09
LRH/ge/yl
I4619-1

Respectfully submitted,
COAST-TO-COAST ANALYTICAL SERVICES, INC.

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63

CLIENT: Angela Blaisdell
AmTest - Air Quality Inc.
30545 S. E. 84th Street #5
Preston, WA 98050

Lab Number : I-4118-1
Project : 92-157 King Co: Cedar Hills Landfill
Analyzed : 10/05/92
Analyzed by: GD
Method : EPA TO-14

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED	DATE RECEIVED
R1 Inlet C#476	Air		09/30/92	10/05/92

CONSTITUENT	*PQL ppbv	RESULT ppbv	RESULT µg/cu M	NOTE
VOLATILE ORGANICS BY EPA TO-14				1,2
Acetone	200.	8500.	22000.	
Benzene	20.	1000.	3600.	
Bromodichloromethane	20.	ND	ND	
Bromomethane (Methyl Bromide)	50.	ND	ND	
Bromoform	20.	ND	ND	
1,3-Butadiene	100.	ND	ND	
2-Butanone (MEK)	50.	11000.	34000.	
Carbon Disulfide	200.	ND	ND	
Carbon Tetrachloride	20.	ND	ND	
Chlorobenzene	20.	880.	4400.	
Chloroethane (Ethyl Chloride)	20.	ND	ND	
2-Chloroethyl Vinyl Ether	200.	ND	ND	
Chloroform	100.	ND	ND	
Chloromethane (Methyl Chloride)	50.	ND	ND	
Dibromochloromethane	20.	ND	ND	
1,2-Dibromoethane (EDB)	50.	ND	ND	
1,2-Dichlorobenzene	20.	ND	ND	

Lab Certifications: CAELAP#1598, UTELAP#E-142, A2LA#0136-01, L.A.Co.CSD#10187.
*RESULTS listed as 'ND' were not detected at or above the listed PQL (Practical Quantitation Limit)
(1) Concentrations in ug/cu M reported at Standard Temperature and Pressure.
(2) Canister was received under vacuum at -1.5 in. Hg and pressurized to 15 psig with He.

10/12/92
MSD1/1Y54F
LRH/ge/yl
IJ05M1

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Preston, WA 98050

Lab Number : I-4118-1
Project : 92-157 King Co: Cedar Hills Landfill
Analyzed : 10/05/92
Analyzed by: GD
Method : EPA TO-14

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED	DATE RECEIVED
R1 Inlet C#476	Air		09/30/92	10/05/92

CONSTITUENT	*PQL ppbv	RESULT ppbv	RESULT µg/cu M	NOTE
1,3-Dichlorobenzene	20.	ND	ND	
1,4-Dichlorobenzene	20.	ND	ND	
1,1-Dichloroethane	20.	380.	1700.	
1,2-Dichloroethane (EDC)	20.	ND	ND	
1,1-Dichloroethene	20.	ND	ND	
cis-1,2-Dichloroethene	20.	1300.	5500	
trans-1,2-Dichloroethene	20.	ND	ND	
Dichloromethane	200.	1500.	5500.	
1,2-Dichloropropane	20.	ND	ND	
cis-1,3-Dichloropropene	20.	ND	ND	
trans-1,3-Dichloropropene	20.	ND	ND	
Ethylbenzene	50.	17000.	80000.	
2-Hexanone	20.	ND	ND	
4-Methyl-2-Pentanone (MIBK)	20.	1400.	6200.	
Styrene	50.	1500.	7200.	
1,1,2,2-Tetrachloroethane	20.	ND	ND	
Tetrachloroethene (PCE)	20.	1600.	12000.	
Toluene	50.	32000.	130000.	
1,1,1-Trichloroethane (TCA)	20.	ND	ND	
1,1,2-Trichloroethane	20.	ND	ND	

Lab Certifications: CAELAP#1598, UTELAP#E-142, A2LA#0136-01, L.A.Co.CSD#10187.
*RESULTS listed as 'ND' were not detected at or above the listed PQL (Practical Quantitation Limit)

10/12/92
MSD1/1Y54F
LRH/ge/yl
IJ05M1

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CLIENT: Angela Blaisdell
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30545 S. E. 84th Street #5
Preston, WA 98050

Lab Number : I-4118-1
Project : 92-157 King Co: Cedar Hills Landfill
Analyzed : 10/05/92
Analyzed by: GD
Method : EPA TO-14

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED	DATE RECEIVED
R1 Inlet C#476	Air		09/30/92	10/05/92

CONSTITUENT	*PQL ppbv	RESULT ppbv	RESULT µg/cu M	NOTE
Trichloroethene (TCE)	20.	800.	4700.	
Trichlorofluoromethane (F-11)	20.	60.	340.	
Trichlorotrifluoroethane (F-113)	50.	ND	ND	
Vinyl Acetate	200.	ND	ND	
Vinyl Chloride	50.	3200.	8900.	
Xylenes, Total	50.	44000.	210000.	
Percent Surrogate Recovery			109.	

Lab Certifications: CAELAP#1598, UTELAP#E-142, A2LA#0136-01, L.A.Co.CSD#10187.
*RESULTS listed as 'ND' were not detected at or above the listed PQL (Practical Quantitation Limit)

10/12/92
MSD1/1Y54F
LRH/ge/yl
IJ05M1

Respectfully submitted,
COAST-TO-COAST ANALYTICAL SERVICES, INC.

Gesheng Dai, Ph.D., Group Leader

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CLIENT: Angela Blaisdell
AmTest - Air Quality Inc.
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Preston, WA 98050

QC Batch ID: IJ05M1 I-4118-1
Project : 92-157 King Co: Cedar Hills Landfill
Analyzed : 10/05/92
Analyzed by: EA
Method : EPA TO-14

QC DUPLICATE
REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED	DATE RECEIVED
R1 Inlet C#476 Duplicate	Air		09/30/92	10/05/92

CONSTITUENT	*PQL ppbv	RESULT ppbv	RESULT µg/cu M	%DIFF	NOTE
VOLATILE ORGANICS BY EPA TO-14					1,2
Acetone	200.	7300.	19000.	15.	
Benzene	20.	770.	2700.	29.	
Bromodichloromethane	20.	ND	ND		
Bromomethane (Methyl Bromide)	50.	ND	ND		
Bromoform	20.	ND	ND		
1,3-Butadiene	100.	ND	ND		
2-Butanone (MEK)	50.	7800.	25000.	31.	
Carbon Disulfide	200.	ND	ND		
Carbon Tetrachloride	20.	ND	ND		
Chlorobenzene	20.	660.	3300.	29.	
Chloroethane (Ethyl Chloride)	20.	ND	ND		
2-Chloroethyl Vinyl Ether	200.	ND	ND		
Chloroform	100.	ND	ND		
Chloromethane (Methyl Chloride)	50.	ND	ND		
Dibromochloromethane	20.	ND	ND		
1,2-Dibromoethane (EDB)	50.	ND	ND		
1,2-Dichlorobenzene	20.	ND	ND		
1,3-Dichlorobenzene	20.	ND	ND		
1,4-Dichlorobenzene	20.	ND	ND		
1,1-Dichloroethane	20.	290.	1300.	27.	

Lab Certifications: CAELAP#1598, UTELAP#E-142, A2LA#0136-01, L.A.Co.CSD#10187.
*RESULTS listed as 'ND' were not detected at or above the listed PQL (Practical Quantitation Limit)
(1) Concentrations in ug/cu M reported at Standard Temperature and Pressure.
(2) Canister was received under vacuum at -1.5 in. Hg and pressurized to 15 psig with He.

10/12/92
MSD1/1Y59F
LRH/ge/yl
I4118-1

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CLIENT: Angela Blaisdell
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30545 S. E. 84th Street #5
Preston, WA 98050

QC Batch ID: IJ05M1 I-4118-1
Project : 92-157 King Co: Cedar Hills Landfill
Analyzed : 10/05/92
Analyzed by: EA
Method : EPA TO-14

QC DUPLICATE
REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED	DATE RECEIVED
R1 Inlet C#476	Air		09/30/92	10/05/92

CONSTITUENT	*PQL ppbv	RESULT ppbv	RESULT µg/cu M	%DIFF	NOTE
1,2-Dichloroethane (EDC)	20.	ND	ND		
1,1-Dichloroethene	20.	ND	ND		
cis-1,2-Dichloroethene	20.	990.	4300.	24.	
trans-1,2-Dichloroethene	20.	ND	ND		
Dichloromethane	200.	1200.	4700.	16.	
1,2-Dichloropropane	20.	ND	ND		
cis-1,3-Dichloropropene	20.	ND	ND		
trans-1,3-Dichloropropene	20.	ND	ND		
Ethylbenzene	50.	13000.	62000.	25.	
2-Hexanone	20.	ND	ND		
4-Methyl-2-Pentanone (MIBK)	20.	1100.	4800.	25.	
Styrene	50.	1100.	5200.	32.	
1,1,2,2-Tetrachloroethane	20.	ND	ND		
Tetrachloroethene (PCE)	20.	1300.	9400.	24.	
Toluene	50.	27000.	110000.	17.	
1,1,1-Trichloroethane (TCA)	20.	ND	ND		
1,1,2-Trichloroethane	20.	ND	ND		
Trichloroethene (TCE)	20.	610.	3600.	27.	
Trichlorofluoromethane (F-11)	20.	42.	260.	27.	
Trichlorotrifluoroethane (F-113)	50.	ND	ND		
Vinyl Acetate	200.	ND	ND		
Vinyl Chloride	50.	2300.	6400.	33.	
Xylenes, Total	50.	34000.	160000.	27.	
Percent Surrogate Recovery			102.		

Lab Certifications: CAELAP#1598, UTELAP#E-142, A2LA#0136-01, L.A.Co.CSD#10187.
*RESULTS listed as 'ND' were not detected at or above the listed PQL (Practical Quantitation Limit)

10/12/92
MSD1/1Y59F
LRH/ge/yl
I4118-1

Respectfully submitted,
COAST-TO-COAST ANALYTICAL SERVICES, INC.

Gesheng Dai

Gesheng Dai, Ph.D., Group Leader

Laurence R. Hilpert, Ph.D.

COAST - TO - COAST ANALYTICAL SERVICES

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CLIENT: Angela Blaisdell
AmTest - Air Quality Inc.
30545 S. E. 84th Street #5
Preston, WA 98050

Lab Number : I-4118-2
Project : 92-157 King Co: Cedar Hills Landfill
Analyzed : 10/05/92
Analyzed by: YL
Method : EPA TO-14

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED	DATE RECEIVED
R2 Inlet C#483	Air		09/30/92	10/05/92

CONSTITUENT	*PQL ppbv	RESULT ppbv	RESULT µg/cu M	NOTE
				1,2
VOLATILE ORGANICS BY EPA TO-14				
Acetone	200.	7700.	20000.	
Benzene	20.	950.	3300.	
Bromodichloromethane	20.	ND	ND	
Bromomethane (Methyl Bromide)	50.	ND	ND	
Bromoform	20.	ND	ND	
1,3-Butadiene	100.	ND	ND	
2-Butanone (MEK)	50.	9000.	29000.	
Carbon Disulfide	200.	ND	ND	
Carbon Tetrachloride	20.	ND	ND	
Chlorobenzene	20.	880.	4400.	
Chloroethane (Ethyl Chloride)	20.	ND	ND	
2-Chloroethyl Vinyl Ether	200.	ND	ND	
Chloroform	100.	ND	ND	
Chloromethane (Methyl Chloride)	50.	ND	ND	
Dibromochloromethane	20.	ND	ND	
1,2-Dibromoethane (EDB)	50.	ND	ND	
1,2-Dichlorobenzene	20.	ND	ND	

Lab Certifications: CAELAP#1598, UTELAP#E-142, A2LA#0136-01, L.A.Co.CSD#10187.
*RESULTS listed as 'ND' were not detected at or above the listed PQL (Practical Quantitation Limit)
(1) Concentrations in ug/cu M reported at Standard Temperature and Pressure.
(2) Canister received at 0 psig and pressurized to 16 psig with He.

10/12/92
MSD1/1Y53F
LRH/ge/yl
IJ05M1

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CLIENT: Angela Blaisdell
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30545 S. E. 84th Street #5
Preston, WA 98050

Lab Number : I-4118-2
Project : 92-157 King Co: Cedar Hills Landfill
Analyzed : 10/05/92
Analyzed by: YL
Method : EPA TO-14

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED	DATE RECEIVED
R2 Inlet C#483	Air		09/30/92	10/05/92

CONSTITUENT	*PQL ppbv	RESULT ppbv	RESULT µg/cu M	NOTE
1,3-Dichlorobenzene	20.	ND	ND	
1,4-Dichlorobenzene	20.	ND	ND	
1,1-Dichloroethane	20.	340.	1500.	
1,2-Dichloroethane (EDC)	20.	ND	ND	
1,1-Dichloroethene	20.	ND	ND	
cis-1,2-Dichloroethene	20.	1200.	5100	
trans-1,2-Dichloroethene	20.	ND	ND	
Dichloromethane	200.	1300.	4800.	
1,2-Dichloropropane	20.	ND	ND	
cis-1,3-Dichloropropene	20.	ND	ND	
trans-1,3-Dichloropropene	20.	ND	ND	
Ethylbenzene	50.	17000.	79000.	
2-Hexanone	20.	ND	ND	
4-Methyl-2-Pentanone (MIBK)	20.	1300.	5600.	
Styrene	50.	1600.	7500.	
1,1,2,2-Tetrachloroethane	20.	ND	ND	
Tetrachloroethene (PCE)	20.	1600.	12000.	
Toluene	50.	29000.	120000.	
1,1,1-Trichloroethane (TCA)	20.	ND	ND	
1,1,2-Trichloroethane	20.	ND	ND	

Lab Certifications: CAELAP#1598, UTELAP#E-142, A2LA#0136-01, L.A.Co.CSD#10187.
*RESULTS listed as 'ND' were not detected at or above the listed PQL (Practical Quantitation Limit)

10/12/92
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LRH/ge/yl
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CLIENT: Angela Blaisdell
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30545 S. E. 84th Street #5
Preston, WA 98050

Lab Number : I-4118-2
Project : 92-157 King Co: Cedar Hills Landfill
Analyzed : 10/05/92
Analyzed by: YL
Method : EPA TO-14

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED DATE	RECEIVED
R2 Inlet C#483	Air		09/30/92	10/05/92

CONSTITUENT	*PQL ppbv	RESULT ppbv	RESULT µg/cu M	NOTE
Trichloroethene (TCE)	20.	730.	4300.	
Trichlorofluoromethane (F-11)	20.	60.	350.	
Trichlorotrifluoroethane (F-113)	50.	ND	ND	
Vinyl Acetate	200.	ND	ND	
Vinyl Chloride	50.	2700.	7500.	
Xylenes, Total	50.	44000.	210000.	
Percent Surrogate Recovery			98.	

Lab Certifications: CAELAP#1598, UTELAP#E-142, A2LA#0136-01, L.A.Co.CSD#10187.
*RESULTS listed as 'ND' were not detected at or above the listed PQL (Practical Quantitation Limit)

10/12/92
MSD1/1Y53F
LRH/ge/yl
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Gesheng Dai

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CLIENT: Angela Blaisdell
AmTest - Air Quality Inc.
30545 S. E. 84th Street #5
Preston, WA 98050

Lab Number : I-4118-3
Project : 92-157 King Co: Cedar Hills Landfill
Analyzed : 10/05/92
Analyzed by: YL
Method : EPA TO-14

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED	DATE RECEIVED
R3 Inlet C#545	Air		10/01/92	10/05/92

CONSTITUENT	*PQL ppbv	RESULT ppbv	RESULT µg/cu M	NOTE
VOLATILE ORGANICS BY EPA TO-14				1,2
Acetone	200.	8900.	23000.	
Benzene	20.	1100.	3800.	
Bromodichloromethane	20.	ND	ND	
Bromomethane (Methyl Bromide)	50.	ND	ND	
Bromoform	20.	ND	ND	
1,3-Butadiene	100.	ND	ND	
2-Butanone (MEK)	50.	9900.	32000.	
Carbon Disulfide	200.	ND	ND	
Carbon Tetrachloride	20.	ND	ND	
Chlorobenzene	20.	940.	4700.	
Chloroethane (Ethyl Chloride)	20.	ND	ND	
2-Chloroethyl Vinyl Ether	200.	ND	ND	
Chloroform	100.	ND	ND	
Chloromethane (Methyl Chloride)	50.	ND	ND	
Dibromochloromethane	20.	ND	ND	
1,2-Dibromoethane (EDB)	50.	ND	ND	
1,2-Dichlorobenzene	20.	ND	ND	

Lab Certifications: CAELAP#1598, UTELAP#E-142, A2LA#0136-01, L.A.Co.CSD#10187.
*RESULTS listed as 'ND' were not detected at or above the listed PQL (Practical Quantitation Limit)
(1) Concentrations in ug/cu M reported at Standard Temperature and Pressure.
(2) Canister received at 0 psig and pressurized to 15 psig with He.

10/12/92
MSD1/1Y52F
LRH/ge/yl
IJ05M1

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CLIENT: Angela Blaisdell
AmTest - Air Quality Inc.
30545 S. E. 84th Street #5
Preston, WA 98050

Lab Number : I-4118-3
Project : 92-157 King Co: Cedar Hills Landfill
Analyzed : 10/05/92
Analyzed by: YL
Method : EPA TO-14

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED	DATE RECEIVED
R3 Inlet C#545	Air		10/01/92	10/05/92

CONSTITUENT	*PQL ppbv	RESULT ppbv	RESULT µg/cu M	NOTE
1,3-Dichlorobenzene	20.	ND	ND	
1,4-Dichlorobenzene	20.	ND	ND	
1,1-Dichloroethane	20.	360.	1600.	
1,2-Dichloroethane (EDC)	20.	ND	ND	
1,1-Dichloroethene	20.	ND	ND	
cis-1,2-Dichloroethene	20.	1300.	5500	
trans-1,2-Dichloroethene	20.	ND	ND	
Dichloromethane	200.	1400.	5200.	
1,2-Dichloropropane	20.	ND	ND	
cis-1,3-Dichloropropene	20.	ND	ND	
trans-1,3-Dichloropropene	20.	ND	ND	
Ethylbenzene	50.	18000.	86000.	
2-Hexanone	20.	ND	ND	
4-Methyl-2-Pentanone (MIBK)	20.	1500.	6800.	
Styrene	50.	1700.	8000.	
1,1,2,2-Tetrachloroethane	20.	ND	ND	
Tetrachloroethene (PCE)	20.	1800.	13000.	
Toluene	50.	34000.	140000.	
1,1,1-Trichloroethane (TCA)	20.	ND	ND	
1,1,2-Trichloroethane	20.	ND	ND	

Lab Certifications: CAELAP#1598, UTELAP#E-142, A2LA#0136-01, L.A.Co.CSD#10187.
*RESULTS listed as 'ND' were not detected at or above the listed PQL (Practical Quantitation Limit)

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Lab Number : I-4118-3
Project : 92-157 King Co: Cedar Hills Landfill
Analyzed : 10/05/92
Analyzed by: YL
Method : EPA TO-14

CLIENT: Angela Blaisdell
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Preston, WA 98050

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED	DATE RECEIVED
R3 Inlet C#545	Air		10/01/92	10/05/92

CONSTITUENT	*PQL ppbv	RESULT ppbv	RESULT µg/cu M	NOTE
Trichloroethene (TCE)	20.	850.	5000.	
Trichlorofluoromethane (F-11)	20.	70.	410.	
Trichlorotrifluoroethane (F-113)	50.	ND	ND	
Vinyl Acetate	200.	ND	ND	
Vinyl Chloride	50.	3000.	8400.	
Xylenes, Total	50.	49000.	230000.	
Percent Surrogate Recovery			110.	

Lab Certifications: CAELAP#1598, UTELAP#E-142, A2LA#0136-01, L.A.Co.CSD#10187.
*RESULTS listed as 'ND' were not detected at or above the listed PQL (Practical Quantitation Limit)

10/12/92
MSD1/1Y52F
LRH/ge/yl
IJ05M1

Respectfully submitted,
COAST-TO-COAST ANALYTICAL SERVICES, INC.

Gesheng Dai

Gesheng Dai, Ph.D., Group Leader

Laurence R. Hilpert, Ph.D.
Vice President

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CLIENT: Angela Blaisdell
AmTest - Air Quality Inc.
30545 S. E. 84th Street #5
Preston, WA 98050

Lab Number : I-4118-4
Project : 92-157 King Co: Cedar Hills Landfill
Analyzed : 10/05/92
Analyzed by: YL
Method : EPA TO-14

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED	DATE RECEIVED
R1 Outlet C#301	Air		09/30/92	10/05/92

CONSTITUENT	*PQL ppbv	RESULT ppbv	RESULT µg/cu M	NOTE
VOLATILE ORGANICS BY EPA TO-14				1,2
Acetone	1.	140.	370.	
Benzene	0.1	37.	130.	
Bromodichloromethane	0.1	ND	ND	
Bromomethane (Methyl Bromide)	0.2	ND	ND	
Bromoform	0.1	ND	ND	
1,3-Butadiene	0.5	190.	460.	
2-Butanone (MEK)	0.2	6.8	22.	
Carbon Disulfide	1.	74.	250.	
Carbon Tetrachloride	0.1	ND	ND	
Chlorobenzene	0.1	0.88	4.4	
Chloroethane (Ethyl Chloride)	0.2	ND	ND	
2-Chloroethyl Vinyl Ether	1.	ND	ND	
Chloroform	0.5	ND	ND	
Chloromethane (Methyl Chloride)	0.2	19.	43.	
Dibromochloromethane	0.1	ND	ND	
1,2-Dibromoethane (EDB)	0.2	ND	ND	
1,2-Dichlorobenzene	0.2	ND	ND	

Lab Certifications: CAELAP#1598, UTELAP#E-142, A2LA#0136-01, L.A.Co.CSD#10187.
*RESULTS listed as 'ND' were not detected at or above the listed PQL (Practical Quantitation Limit)
(1) Concentrations in ug/cu M reported at Standard Temperature and Pressure.
(2) Canister was received under vacuum at -2 in. Hg and pressurized to 15.5 psig with He.

10/12/92
MSD1/1Y51F
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Lab Number : I-4118-4
Project : 92-157 King Co: Cedar Hills Landfill
Analyzed : 10/05/92
Analyzed by: YL
Method : EPA TO-14

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED	DATE RECEIVED
R1 Outlet C#301	Air		09/30/92	10/05/92

CONSTITUENT	*PQL ppbv	RESULT ppbv	RESULT µg/cu M	NOTE
1,3-Dichlorobenzene	0.2	ND	ND	
1,4-Dichlorobenzene	0.2	ND	ND	
1,1-Dichloroethane	0.1	ND	ND	
1,2-Dichloroethane (EDC)	0.1	ND	ND	
1,1-Dichloroethene	0.1	ND	ND	
cis-1,2-Dichloroethene	0.1	ND	ND	
trans-1,2-Dichloroethene	0.1	ND	ND	
Dichloromethane	1.	2.	8.1	
1,2-Dichloropropane	0.1	ND	ND	
cis-1,3-Dichloropropene	0.1	ND	ND	
trans-1,3-Dichloropropene	0.1	ND	ND	
Ethylbenzene	0.2	1.7	8.2	
2-Hexanone	0.1	ND	ND	
4-Methyl-2-Pentanone (MIBK)	0.1	ND	ND	
Styrene	0.2	26.	120.	
1,1,2,2-Tetrachloroethane	0.1	ND	ND	
Tetrachloroethene (PCE)	0.1	ND	ND	
Toluene	0.2	21.	86.	
1,1,1-Trichloroethane (TCA)	0.2	ND	ND	
1,1,2-Trichloroethane	0.2	ND	ND	

Lab Certifications: CAELAP#1598, UTELAP#E-142, A2LA#0136-01, L.A.Co.CSD#10187.
*RESULTS listed as 'ND' were not detected at or above the listed PQL (Practical Quantitation Limit)

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Lab Number : I-4118-4
Project : 92-157 King Co: Cedar Hills Landfill
Analyzed : 10/05/92
Analyzed by: YL
Method : EPA TO-14

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED	DATE RECEIVED
R1 Outlet C#301	Air		09/30/92	10/05/92

CONSTITUENT	*PQL ppbv	RESULT ppbv	RESULT µg/cu M	NOTE
Trichloroethene (TCE)	0.1	ND	ND	
Trichlorofluoromethane (F-11)	0.2	ND	ND	
Trichlorotrifluoroethane (F-113)	0.2	ND	ND	
Vinyl Acetate	1.	ND	ND	
Vinyl Chloride	0.2	0.5	1.3	
Xylenes, Total	0.2	8.2	39.	
Percent Surrogate Recovery			108.	

Lab Certifications: CAELAP#1598, UTELAP#E-142, A2LA#0136-01, L.A.Co.CSD#10187.
*RESULTS listed as 'ND' were not detected at or above the listed PQL (Practical Quantitation Limit)

10/12/92
MSD1/1Y51F
LRH/ge/yl
IJ05M1

Respectfully submitted,
COAST-TO-COAST ANALYTICAL SERVICES, INC.

Gesheng Dai

Gesheng Dai, Ph.D., Group Leader

Laurence R. Hilpert, Ph.D.
Vice President

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CLIENT: Angela Blaisdell
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Lab Number : I-4118-5
Project : 92-157 King Co: Cedar Hills Landfill
Analyzed : 10/05/92
Analyzed by: YL
Method : EPA TO-14

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED DATE	RECEIVED
R2 Outlet C#495	Air		09/30/92	10/05/92

CONSTITUENT	*PQL ppbv	RESULT ppbv	RESULT µg/cu M	NOTE
VOLATILE ORGANICS BY EPA TO-14				1,2
Acetone	1.	1.	3.8	
Benzene	0.1	3.4	12.	
Bromodichloromethane	0.1	ND	ND	
Bromomethane (Methyl Bromide)	0.2	0.6	2.7	
Bromoform	0.1	ND	ND	
1,3-Butadiene	0.5	ND	ND	
2-Butanone (MEK)	0.2	ND	ND	
Carbon Disulfide	1.	5.	16.	
Carbon Tetrachloride	0.1	6.8	47.	
Chlorobenzene	0.1	ND	ND	
Chloroethane (Ethyl Chloride)	0.2	2.2	6.4	
2-Chloroethyl Vinyl Ether	1.	ND	ND	
Chloroform	0.5	4.3	23.	
Chloromethane (Methyl Chloride)	0.2	19.	42.	
Dibromochloromethane	0.1	ND	ND	
1,2-Dibromoethane (EDB)	0.2	ND	ND	
1,2-Dichlorobenzene	0.2	ND	ND	

Lab Certifications: CAELAP#1598, UTELAP#E-142, A2LA#0136-01, L.A.Co.CSD#10187.
*RESULTS listed as 'ND' were not detected at or above the listed PQL (Practical Quantitation Limit)
(1) Concentrations in ug/cu M reported at Standard Temperature and Pressure.
(2) Canister was received under vacuum at -2.5 in. Hg and pressurized to 11.5 psig with He.

10/13/92
MSD1/1Y50F
LRH/ge/yl
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CLIENT: Angela Blaisdell
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Lab Number : I-4118-5
Project : 92-157 King Co: Cedar Hills Landfill
Analyzed : 10/05/92
Analyzed by: YL
Method : EPA TO-14

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED	DATE RECEIVED
R2 Outlet C#495	Air		09/30/92	10/05/92

CONSTITUENT	*PQL ppbv	RESULT ppbv	RESULT µg/cu M	NOTE
1,3-Dichlorobenzene	0.2	ND	ND	
1,4-Dichlorobenzene	0.2	ND	ND	
1,1-Dichloroethane	0.1	ND	ND	
1,2-Dichloroethane (EDC)	0.1	1.4	6.0	
1,1-Dichloroethene	0.1	ND	ND	
cis-1,2-Dichloroethene	0.1	ND	ND	
trans-1,2-Dichloroethene	0.1	ND	ND	
Dichloromethane	1.	4.	14.	
1,2-Dichloropropane	0.1	ND	ND	
cis-1,3-Dichloropropene	0.1	ND	ND	
trans-1,3-Dichloropropene	0.1	ND	ND	
Ethylbenzene	0.2	ND	ND	
2-Hexanone	0.1	ND	ND	
4-Methyl-2-Pentanone (MIBK)	0.1	ND	ND	
Styrene	0.2	6.	28.	
1,1,2,2-Tetrachloroethane	0.1	ND	ND	
Tetrachloroethene (PCE)	0.1	0.6	4.8	
Toluene	0.2	2.4	9.8	
1,1,1-Trichloroethane (TCA)	0.2	ND	ND	
1,1,2-Trichloroethane	0.2	ND	ND	

Lab Certifications: CAELAP#1598, UTELAP#E-142, A2LA#0136-01, L.A.Co.CSD#10187.
*RESULTS listed as 'ND' were not detected at or above the listed PQL (Practical Quantitation Limit)

10/13/92
MSD1/1Y50F
LRH/ge/yl
IJ05M1

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CLIENT: Angela Blaisdell
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30545 S. E. 84th Street #5
Preston, WA 98050

Lab Number : I-4118-5
Project : 92-157 King Co: Cedar Hills Landfill
Analyzed : 10/05/92
Analyzed by: YL
Method : EPA TO-14

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED	DATE RECEIVED
R2 Outlet C#495	Air		09/30/92	10/05/92

CONSTITUENT	*PQL ppbv	RESULT ppbv	RESULT µg/cu M	NOTE
Trichloroethene (TCE)	0.1	0.39	2.3	
Trichlorofluoromethane (F-11)	0.2	ND	ND	
Trichlorotrifluoroethane (F-113)	0.2	ND	ND	
Vinyl Acetate	1.	ND	ND	
Vinyl Chloride	0.2	ND	ND	
Xylenes, Total	0.2	0.6	3.0	
Percent Surrogate Recovery			95.	

Lab Certifications: CAELAP#1598, UTELAP#E-142, A2LA#0136-01, L.A.Co.CSD#10187.
*RESULTS listed as 'ND' were not detected at or above the listed PQL (Practical Quantitation Limit)

10/13/92
MSD1/1Y50F
LRH/ge/yl
IJ05M1

Respectfully submitted,
COAST-TO-COAST ANALYTICAL SERVICES, INC.

Gesheng Dai

Gesheng Dai, Ph.D., Group Leader

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CLIENT: Angela Blaisdell
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30545 S. E. 84th Street #5
Preston, WA 98050

Lab Number : I-4118-6
Project : 92-157 King Co: Cedar Hills Landfill
Analyzed : 10/05/92
Analyzed by: YL
Method : EPA TO-14

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED	DATE RECEIVED
R3 Outlet C#542	Air		10/01/92	10/05/92

CONSTITUENT	*PQL ppbv	RESULT ppbv	RESULT µg/cu M	NOTE
VOLATILE ORGANICS BY EPA TO-14				1,2
Acetone	1.	33.	85.	
Benzene	0.1	26.	90.	
Bromodichloromethane	0.1	ND	ND	
Bromomethane (Methyl Bromide)	0.2	ND	ND	
Bromoform	0.1	ND	ND	
1,3-Butadiene	0.5	ND	ND	
2-Butanone (MEK)	0.2	3.1	9.9	
Carbon Disulfide	1.	ND	ND	
Carbon Tetrachloride	0.1	ND	ND	
Chlorobenzene	0.1	ND	ND	
Chloroethane (Ethyl Chloride)	0.2	ND	ND	
2-Chloroethyl Vinyl Ether	1.	ND	ND	
Chloroform	0.5	ND	ND	
Chloromethane (Methyl Chloride)	0.2	ND	ND	
Dibromochloromethane	0.1	ND	ND	
1,2-Dibromoethane (EDB)	0.2	ND	ND	
1,2-Dichlorobenzene	0.2	ND	ND	

Lab Certifications: CAELAP#1598, UTELAP#E-142, A2LA#0136-01, L.A.Co.CSD#10187.
*RESULTS listed as 'ND' were not detected at or above the listed PQL (Practical Quantitation Limit)
(1) Concentrations in ug/cu M reported at Standard Temperature and Pressure.
(2) Canister was received under vacuum at -1.5 in. Hg and pressurized to 14 psig with He.

10/12/92
MSD1/1Y49F
LRH/ge/yl
IJ05M1

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CLIENT: Angela Blaisdell
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Lab Number : I-4118-6
Project : 92-157 King Co: Cedar Hills Landfill
Analyzed : 10/05/92
Analyzed by: YL
Method : EPA TO-14

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED	DATE RECEIVED
R3 Outlet C#542	Air		10/01/92	10/05/92

CONSTITUENT	*PQL ppbv	RESULT ppbv	RESULT µg/cu M	NOTE
1,3-Dichlorobenzene	0.2	ND	ND	
1,4-Dichlorobenzene	0.2	ND	ND	
1,1-Dichloroethane	0.1	ND	ND	
1,2-Dichloroethane (EDC)	0.1	ND	ND	
1,1-Dichloroethene	0.1	ND	ND	
cis-1,2-Dichloroethene	0.1	ND	ND	
trans-1,2-Dichloroethene	0.1	ND	ND	
Dichloromethane	1.	ND	ND	
1,2-Dichloropropane	0.1	ND	ND	
cis-1,3-Dichloropropene	0.1	ND	ND	
trans-1,3-Dichloropropene	0.1	ND	ND	
Ethylbenzene	0.2	ND	ND	
2-Hexanone	0.1	ND	ND	
4-Methyl-2-Pentanone (MIBK)	0.1	ND	ND	
Styrene	0.2	ND	ND	
1,1,2,2-Tetrachloroethane	0.1	ND	ND	
Tetrachloroethene (PCE)	0.1	ND	ND	
Toluene	0.2	1.2	4.9	
1,1,1-Trichloroethane (TCA)	0.2	ND	ND	
1,1,2-Trichloroethane	0.2	ND	ND	

Lab Certifications: CAELAP#1598, UTELAP#E-142, A2LA#0136-01, L.A.Co.CSD#10187.
*RESULTS listed as 'ND' were not detected at or above the listed PQL (Practical Quantitation Limit)

10/12/92
MSD1/1Y49F
LRH/ge/yl
IJ05M1

COAST · TO · COAST ANALYTICAL SERVICES

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Certified Hazardous Waste, Chemistry, Bacteriology & Bioassay Laboratories

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82

CLIENT: Angela Blaisdell
AmTest - Air Quality Inc.
30545 S. E. 84th Street #5
Preston, WA 98050

Lab Number : I-4118-6
Project : 92-157 King Co: Cedar Hills Landfill
Analyzed : 10/05/92
Analyzed by: YL
Method : EPA TO-14

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED	DATE RECEIVED
R3 Outlet C#542	Air		10/01/92	10/05/92

CONSTITUENT	*PQL ppbv	RESULT ppbv	RESULT µg/cu M	NOTE
Trichloroethene (TCE)	0.1	ND	ND	
Trichlorofluoromethane (F-11)	0.2	ND	ND	
Trichlorotrifluoroethane (F-113)	0.2	ND	ND	
Vinyl Acetate	1.	ND	ND	
Vinyl Chloride	0.2	ND	ND	
Xylenes, Total	0.2	ND	ND	
Percent Surrogate Recovery			97.	

Lab Certifications: CAELAP#1598, UTELAP#E-142, A2LA#0136-01, L.A.Co.CSD#10187.
*RESULTS listed as 'ND' were not detected at or above the listed PQL (Practical Quantitation Limit)

10/12/92
MSD1/1Y49F
LRH/ge/yl
IJ05M1

Respectfully submitted,
COAST-TO-COAST ANALYTICAL SERVICES, INC.

Gesheng Dai

Gesheng Dai, Ph.D., Group Leader

Laurence R. Hilpert, Ph.D.
Vice President

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QC Batch ID: IJ05M1

CLIENT: Coast-to-Coast Analytical Services, Inc.

Analyzed : 10/05/92
Analyzed by: YL
Method : EPA TO-14

INSTRUMENT BLANK
REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED	DATE RECEIVED
INSTRUMENT BLANK	Air			

CONSTITUENT	(CAS RN)	*PQL µg/cu M	RESULT µg/cu M	NOTE
				1
VOLATILE ORGANICS BY EPA TO-14				
Acetone	(67641)	3.	ND	
Benzene	(71432)	0.5	ND	
Bromodichloromethane	(75274)	1.	ND	
Bromomethane (Methyl Bromide)	(74839)	1.	ND	
Bromoform	(75252)	1.	ND	
1,3-Butadiene	(106990)	1.	ND	
2-Butanone (MEK)	(78933)	1.	ND	
Carbon Disulfide	(75150)	5.	ND	
Carbon Tetrachloride	(56235)	1.	ND	
Chlorobenzene	(108907)	0.5	ND	
Chloroethane (Ethyl Chloride)	(75003)	0.5	ND	
2-Chloroethyl Vinyl Ether	(110758)	5.	ND	
Chloroform	(67663)	3.	ND	
Chloromethane (Methyl Chloride)	(74873)	0.5	ND	
Dibromochloromethane	(124381)	1.	ND	
1,2-Dibromoethane (EDB)	(106934)	2.	ND	
1,2-Dichlorobenzene	(95501)	1.	ND	
1,3-Dichlorobenzene	(541731)	1.	ND	
1,4-Dichlorobenzene	(106467)	1.	ND	
1,1-Dichloroethane	(75343)	0.5	ND	
1,2-Dichloroethane (EDC)	(107062)	0.5	ND	

Lab Certifications: CAELAP#1598, UTELAP#E-142, A2LA#0136-01, L.A.Co.CSD#10187.
*RESULTS listed as 'ND' were not detected at or above the listed PQL (Practical Quantitation Limit)
(1) Concentrations in ug/cu M reported at Standard Temperature and Pressure.

10/12/92
MSD1/1Y41F
LRH/ge/yl
I4118-1

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84

QC Batch ID: IJ05M1

CLIENT: Coast-to-Coast Analytical Services, Inc.

Analyzed : 10/05/92
Analyzed by: YL
Method : EPA TO-14

INSTRUMENT BLANK
REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED	DATE RECEIVED
INSTRUMENT BLANK	Air			

CONSTITUENT	(CAS RN)	*PQL µg/cu M	RESULT µg/cu M	NOTE
1,1-Dichloroethene	(75354)	0.5	ND	
cis-1,2-Dichloroethene	(156694)	0.5	ND	
trans-1,2-Dichloroethene	(156605)	0.5	ND	
Dichloromethane	(75092)	5.	ND	
1,2-Dichloropropane	(78875)	0.5	ND	
cis-1,3-Dichloropropene	(10061015)	0.5	ND	
trans-1,3-Dichloropropene	(10061026)	0.5	ND	
Ethylbenzene	(100411)	1.	ND	
2-Hexanone	(591786)	0.5	ND	
4-Methyl-2-Pentanone (MIBK)	(108101)	0.5	ND	
Styrene	(100425)	1.	ND	
1,1,2,2-Tetrachloroethane	(79345)	1.	ND	
Tetrachloroethene (PCE)	(127184)	1.	ND	
Toluene	(108883)	1.	ND	
1,1,1-Trichloroethane (TCA)	(71556)	1.	ND	
1,1,2-Trichloroethane	(79005)	1.	ND	
Trichloroethene (TCE)	(79016)	0.5	ND	
Trichlorofluoromethane (F-11)	(75694)	1.	ND	
Trichlorotrifluoroethane (F-113)	(76131)	2.	ND	
Vinyl Acetate	(108054)	5.	ND	
Vinyl Chloride	(75014)	0.5	ND	
Xylenes, Total		1.	ND	
Percent Surrogate Recovery			94.	

Lab Certifications: CAELAP#1598, UTELAP#E-142, A2LA#0136-01, L.A.Co.CSD#10187.
*RESULTS listed as 'ND' were not detected at or above the listed PQL (Practical Quantitation Limit)

10/12/92
MSD1/1Y41F
LRH/ge/yl
I4118-1

Respectfully submitted,
COAST-TO-COAST ANALYTICAL SERVICES, INC.

Gesheng Dai

Gesheng Dai, Ph.D., Group Leader

Laurence R. Hilpert, Ph.D.
Vice President

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85

QC Batch ID: IJ05M1

CLIENT: Coast-to-Coast Analytical Services, Inc.

Analyzed : 10/05/92
Analyzed by: YL
Method : CARB 410A

INSTRUMENT BLANK
REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED	DATE RECEIVED
INSTRUMENT BLANK	Air			

CONSTITUENT	(CAS RN)	*PQL µg/cu M	RESULT µg/cu M	NOTE
				1
CARB 410A				
Benzene	(71432)	0.5	ND	
Toluene	(108883)	1.	ND	
Xylenes		1.	ND	
Ethylbenzene	(100411)	1.	ND	

Lab Certifications: CAELAP#1598, UTELAP#E-142, A2LA#0136-01, L.A.Co.CSD#10187.
*RESULTS listed as 'ND' were not detected at or above the listed PQL (Practical Quantitation Limit)
(1) Concentrations in ug/cu M reported at Standard Temperature and Pressure.

10/12/92
MSD1/1Y41F
LRH/ge/yl
I4103-1

Respectfully submitted,
COAST-TO-COAST ANALYTICAL SERVICES, INC.

Gesheng Dai

Gesheng Dai, Ph.D., Group Leader

Laurence R. Hilpert, Ph.D.
Vice President

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86

QC Batch ID: IJ05M1

CLIENT: Coast-to-Coast Analytical Services, Inc.

Analyzed : 10/05/92
Analyzed by: EA
Method : EPA TO-14

QC SPIKE
REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED	DATE RECEIVED
QC SPIKE	Air			

CONSTITUENT	*PQL µg/cu M	SPIKE AMOUNT	RESULT µg/cu M	%REC	NOTE
VOLATILE ORGANICS BY EPA TO-14					1,2
Acetone	3.		NS		
Benzene	0.5	17.	17.	100.	
Bromodichloromethane	1.		NS		
Bromomethane (Methyl Bromide)	1.	23.	18.	78.	
Bromoform	1.		NS		
1,3-Butadiene	1.	11.	10.	91.	
2-Butanone (MEK)	1.		NS		
Carbon Disulfide	5.		NS		
Carbon Tetrachloride	1.	34.	32.	94.	
Chlorobenzene	0.5	25.	24.	96.	
Chloroethane (Ethyl Chloride)	0.5		NS		
2-Chloroethyl Vinyl Ether	5.		NS		
Chloroform	3.	27.	27.	100.	
Chloromethane (Methyl Chloride)	0.5		NS		
Dibromochloromethane	1.		NS		
1,2-Dibromoethane (EDB)	2.	40.	31.	78.	
1,2-Dichlorobenzene	1.		NS		
1,3-Dichlorobenzene	1.		NS		
1,4-Dichlorobenzene	1.		NS		
1,1-Dichloroethane	0.5		NS		

Lab Certifications: CAELAP#1598, UTELAP#E-142, A2LA#0136-01, L.A.Co.CSD#10187.
* RESULTS listed as 'NS' were not spiked. PQL = Practical Quantitation Limit
(1) Concentrations in ug/cu M reported at Standard Temperature and Pressure.
(2) Zero Air spiked with NIST SRM 1804, Cylinder # ALM-000881.

10/12/92
MSD1/1Y61F
LRH/ge/yl
I4118-1

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FAX (805) 543-2685

87

QC Batch ID: IJ05M1

CLIENT: Coast-to-Coast Analytical Services, Inc.

Analyzed : 10/05/92
Analyzed by: EA
Method : EPA TO-14

QC SPIKE
REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED	DATE RECEIVED
QC SPIKE	Air			

CONSTITUENT	*PQL µg/cu M	SPIKE AMOUNT	RESULT µg/cu M	%REC	NOTE
1,2-Dichloroethane (EDC)	0.5	22.	23.	105.	
1,1-Dichloroethene	0.5		NS		
cis-1,2-Dichloroethene	0.5		NS		
trans-1,2-Dichloroethene	0.5		NS		
Dichloromethane	5.	19.	19.	100.	
1,2-Dichloropropane	0.5	25.	24.	96.	
cis-1,3-Dichloropropene	0.5		NS		
trans-1,3-Dichloropropene	0.5		NS		
Ethylbenzene	1.	22.	22.	100.	
2-Hexanone	0.5		NS		
4-Methyl-2-Pentanone (MIBK)	0.5		NS		
Styrene	1.		NS		
1,1,2,2-Tetrachloroethane	1.		NS		
Tetrachloroethene (PCE)	1.	37.	35.	95.	
Toluene	1.	20.	20.	100.	
1,1,1-Trichloroethane (TCA)	1.	30.	30.	100.	
1,1,2-Trichloroethane	1.		NS		
Trichloroethene (TCE)	0.5	29.	29.	100.	
Trichlorofluoromethane (F-11)	1.	31.	31.	100.	
Trichlorotrifluoroethane (F-113)	2.		NS		
Vinyl Acetate	5.		NS		
Vinyl Chloride	0.5	15.	15.	100.	
Xylenes, Total	1.	24.	23.	96.	
Percent Surrogate Recovery			96.		

Lab Certifications: CAELAP#1598, UTELAP#E-142, A2LA#0136-01, L.A.Co.CSD#10187.
* RESULTS listed as 'NS' were not spiked. PQL = Practical Quantitation Limit

Respectfully submitted,
COAST-TO-COAST ANALYTICAL SERVICES, INC.

Gesheng Dai

Gesheng Dai, Ph.D., Group Leader

Laurence R. Hilpert, Ph.D.

10/12/92
MSD1/1Y61F
LRH/ge/yl
I4118-1

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QC Batch ID: IJ05M1

CLIENT: Coast-to-Coast Analytical Services, Inc.

Analyzed : 10/05/92
Analyzed by: EA
Method : CARB 410A

QC SPIKE
REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED	DATE RECEIVED
QC SPIKE	Air			

CONSTITUENT	*PQL µg/cu M	SPIKE AMOUNT	RESULT µg/cu M	%REC	NOTE
CARB 410A					1,2
Benzene	0.5	17.	17.	100.	
Toluene	1.	20.	20.	100.	
Xylenes	1.	24.	23.	96.	
Ethylbenzene	1.	22.	22.	100.	

Lab Certifications: CAELAP#1598, UTELAP#E-142, A2LA#0136-01, L.A.Co.CSD#10187.
*RESULTS listed as 'ND' were not detected at or above the listed PQL (Practical Quantitation Limit)
(1) Concentrations in ug/cu M reported at Standard Temperature and Pressure.
(2) Zero Air spiked with NIST SRM 1804, Cylinder # ALM-000881.

10/12/92
MSD1/1Y61F
LRH/ge/yl
I4103-1

Respectfully submitted,
COAST-TO-COAST ANALYTICAL SERVICES, INC.

Gesheng Dai

Gesheng Dai, Ph.D., Group Leader

Laurence R. Hilpert, Ph.D.
Vice President

AMTEST

AMTest Inc. sional Analytical Services
14603 N.E. 87th St. Redmond, WA 98052
Fax: 206 [illegible] 2495
Tel: 206 885 1664

CHAIN OF CUSTODY RECORD

PROJ. NO.	PROJECT NAME
92-157	King Co: Cedar Hills Landfill

SAMPLERS: *(Signature)*

Client Name: AmTest Air Quality
Client Address: 30545 SE 84th St, Ste 5, Preston, WA 98050
Client Phone: 206 222 - 7746
Contact Person: Angela Blaisdell
~~P.O. No.~~

STA. NO.	DATE	TIME	COMP	GRAB	STATION LOCATION	NO. OF CONTAINERS	Summa Canister	Canister #
	9/30	14:15 15:15			R1 inlet	1	1	476 I-4118-1
	9/30	16:30 17:30			R2 inlet	1	1	483 FIXGAS -2
	10/1	8:17 9:17			R3 inlet	1	1	545 ALSO -3
	9/30	14:15 15:15			R1 outlet	1	1	301 -4
	9/30	1630 1730			R2 outlet	1	1	495 -5
	10/1	8:17 9:17			R3 outlet	1	1	542 -6

Analysis: ~~EPA TO-14~~ TO-14

Relinquished by: *(Signature)*	Date/Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date/Time	Received by: *(Signature)*
Cassie Blaisdell	10/1/92 PM				
Relinquished by: *(Signature)*	Date/Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date/Time	Received by: *(Signature)*
Relinquished by: *(Signature)*	Date/Time	Received for Laboratory by: *(Signature)* Kelley Milton	Date/Time 10/5/92 1300	Remarks	

Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

AmTest Inc. Professional Analytical Services
14603 N.E. 87th St. Redmond 98052
Fax: 206 883 34[illegible]
Tel: 206 885 1664

CHAIN OF CUSTODY RECORD

PROJ. NO.	PROJECT NAME
92-157	King County Landfill @ Cedar Hills

SAMPLERS: *(Signature)* [signature]

Client Name: AmTest Air Quality
Client Address: 30545 SE 84th St, Ste 5, Preston WA, 98050
Client Phone: 206-222-7746
Contact Person: Angela Blaisdell
P.O. No.:

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	SUMMA CANISTER						Canister #
	11/5/92	11:15 12:15			R1 - Inlet	1	1						490 I4619 -1
	11/5/92	12:20 13:20			R2 - Inlet	1	1						549 -2
	11/5/92	13:25 14:25			R3 - Inlet	1	1						565 -3

Analysis: TO-14
~~Fuel Fingerprint~~
fixed gases

Relinquished by: *(Signature)*	Date/Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date/Time	Received by: *(Signature)*
Angela Blaisdell	11/5/92 3 pm	Glenn Campbell 11/6/92			
Relinquished by: *(Signature)*	Date/Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date/Time	Received by: *(Signature)*
Relinquished by: *(Signature)*	Date/Time	Received for Laboratory by: *(Signature)*	Date/Time	Remarks	

Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

APPENDIX C

Example Calculations

SAMPLE CALCULATION SHEET
MOISTURE (Bws)

CLIENT: King Co. @ Cedar Hills Landfill LOCATION: Flare #3

DATE OF TEST: 9/30/92 RUN #: 2- Inlet

Lab # I-4118-2

Moisture content can be calculated, using the wet bulb/dry bulb technique, from the following equation:

$$B_{ws} = \frac{V.P.}{P_{abs}}$$ Moisture Equation

where: V.P. = Vapor pressure of H_2O

$$= S.V.P. - (3.67 \times 10^{-4})(P_{abs})(T_d - T_w)\left(1 + \frac{t_w - 32}{1571}\right)$$

S.V.P. = Saturated H_2O vapor pressure at wet bulb temperature (inches of Hg) taken from table on page 31.

P_{abs} = Absolute pressure of stack gas

t_d = Temperature of dry bulb measurement, °F

t_w = Temperature of wet bulb inflection point, °F

To determine approximate moisture in a stack gas, perform the wet bulb/dry bulb technique and fill in the following equation:

$$V.P. = \underline{1.253}\text{ in. Hg} - \left[3.67 \times 10^{-4}(\underline{30.01}\text{ in. Hg})(\underline{114}\text{ °F} - \underline{86}\text{ °F})\left(1 + \frac{\underline{86}\text{ °F} - 32\text{°F}}{1571}\right)\right]$$

$$B_{ws} = \frac{\underline{0.9[illegible]}\text{ in. Hg}}{\underline{[illegible]}\text{ in. Hg}} = \underline{0.[illegible]} \times 100 = \underline{3.1}\ \%$$

Another method for determining approximate moisture in the flue gas is by the use of a nomograph. The nomograph has been mathematically constructed to solve various equations when known process information is supplied. While nomographs may not be as accurate as actual analysis they do provide a useful approximate moisture figure needed in solving the isokinetic ratio equation. To properly use the nomograph, determine the wet bulb/dry bulb temperatures and procede with the following steps:

(1) Calculate wet bulb depression

$$t_d - t_{wet} = \text{depression, °F}$$

(2) On the line from stack absolute pressure to wet bulb depression temperature, mark pivot line #1.

Wet Bulb Temp. Deg. F.	0	1	2	3	4	5	6	7	8	9
– – –20	.0126	0119	0112	.0106	.0100	.0095	.0089	.0084	.0080	0075
– – –10	.0222	0209	0199	0187	0176	.0168	.0158	.0150	.0142	.0134
– – –	0376	0359	.0339	.0324	0306	.0289	0275	0250	.0247	0233
0	0376	0398	0417	.0463	0441	.0489	.0517	0541	.0571	.0598
10	.0631	.0660	0696	0728	0768	.0810	.0846	.0892	.0932	0982
20	.1025	.1080	1127	.1186	1248	.1302	1370	.1429	.1502	1567
30	.1647	.1716	.1803	.1878	.1955	.2035	.2118	.2203	.2292	.2382
40	.2478	.2576	.2677	.2782	.2891	.3004	.3120	.3240	.3364	.3493
50	.3626	.3764	.3906	.4052	.4203	.4359	.4520	.4586	.4858	.5035
60	.5218	.5407	.5601	.5802	.6009	.6222	.6442	.6669	.6903	.7144
70	.7392	.7648	.7912	.8183	.8462	.8750	.9046	.9352	.9666	.9989
80	1.032	1.066	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.875
100	1.932	1.991	2.052	2.114	2.178	2.243	2.310	2.379	2.449	2.521
110	2.596	2.672	2.749	2.829	2.911	2.995	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.289	4.406
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.759	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.885	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.96
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	10.01	19.42	19.84	20.27	20.70	21.14	21.50	22.05	22.52	22.99
200	23.47	23.96	24.46	24.97	25.48	26.00	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.75	32.38	33.02	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	39.24	39.99	40.75	41.52
230	42.31	43.11	43.92	44.74	45.57	46.41	47.37	48.14	49.03	49.93
240	50.84	51.76	52.70	53.65	54.62	55.60	56.60	57.61	58.63	59.67
250	60.72	61.79	62.88	63.98	65.10	66.23	67.38	68.54	69.72	70.92
260	72.13	74.36	74.61	75.88	77.17	78.46	79.78	81.11	82.46	83.83
270	85.22	86.63	88.06	89.51	90.97	92.45	93.96	95.49	97.03	98.61
280	100.2	101.8	103.4	105.0	106.7	108.4	110.1	111.8	113.6	115.4
290	117.2	119.0	120.8	122.7	124.6	126.5	128.4	130.4	132.4	134.4
300	136.4	138.5	140.6	142.7	144.8	147.0	149.2	151.4	153.6	155.9
310	158.2	160.5	162.8	165.2	167.6	170.0	172.5	175.0	177.5	180.0
320	182.6	185.2	187.8	190.4	193.1	195.8	198.5	201.3	204.1	206.9
330	209.8	212.7	215.6	218.6	221.6	224.6	227.7	230.8	233.9	237.1
340	240.3	243.5	246.8	250.1	253.4	256.7	260.1	263.6	267.1	270.6
350	274.1	277.7	281.3	284.9	288.6	292.3	296.1	299.9	303.8	307.7
360	311.6	315.5	319.5	323.5	327.6	331.7	335.9	340.1	344.4	348.7
370	353.0	357.4	361.8	366.2	370.7	375.2	379.8	384.4	389.1	393.8
380	398.6	403.4	408.2	413.1	418.1	423.1	428.1	433.1	438.2	443.4
390	448.6	453.9	459.2	464.6	470.0	475.5	481.0	486.2	492.2	497.9
400	503.6	509.3	515.1	521.0	526.9	532.9	538.9	545.0	551.1	557.3

S.V.P. (Saturated H_2O vapor pressure wet bulb temperature—inches of mercury)

SAMPLE CALCULATION SHEET
METHODS 1, 2, 3A, AND 4

CLIENT: King County Solid Waste @ Cedar Hills — DATE OF TEST: 9/30/92

LOCATION: Maple Valley Washington — RUN #: 2-Inlet

Lab # I-4118-2

Dry Gas Volume - Equation 5-1

Vm_{std} =

17.647°R/"Hg* _____ ft^3* _____ *(_____ "Hg + (_____ "H_2O/13.6))/(460 + ___ °F)

= NA dscf

Moisture - Equation 5-2 and 5-3

Vw_{std} = 0.04715 ft^3/g * _____ grams of H_2O collected in impingers

= NA scf

B_{ws} = (_____ scf)/(_____ scf + _____ dscf)

= 0.0310

% Moisture = _____ * 100

= 3.1 % psychrometric moisture

Molecular weight - Equation 3-2

M_d = 0.440 * (35.0 $\%CO_2$) + 0.320 * (6.8 $\%O_2$)$_V$ + 0.280 * (28.2 (100-(6.5+4.8+30)) % CO + $\%N_2$)

+ 0.16 × 30.0

M_d = 30.27 g/g-mole (dry)

M_s = 30.27 g/g-mole * (1 - 0.0310) + 18.0g/g-mole * 0.0310

M_s = 29.89 g/g-mole (wet)

Stack gas velocity and volumetric flow rate - Equation 2-9 and 2-10

V_s = 85.49 * 0.99 * (0.993 * 573.1 °R / 29.89 g/g-mole / 30.21 "Hg)$^{0.5}$

V_s = 46.5 ft/sec (std)

Q_{sd} = 3600 * (1 - 0.031) * 46.5 ft/sec * 0.785 ft^2 * (528 °R/ 573.1 °R) *

(30.21 "Hg / 29.92 "Hg)

= 150,[illegible] dscf/hr / 60 min/hr

= 1114.8 dscf/min (dry standard cubic feet per minute)

acfm = 46.5 ft/sec * 0.785 ft^2* 60 sec/min

= 2192.1 acfm (actual cubic feet per minute)

SAMPLE CALCULATION SHEET
METHODS 1, 2, 3A, AND 4

CLIENT: King County Solid Waste @ Cedar Hills Landfill

DATE OF TEST: 9/30/92

LOCATION: Flare #3 Outlet
Maple Valley, Washington

RUN #: 2 - Methods 1, 2, 3A, 4 and HCL

Dry Gas Volume - Equation 5-1

Vm_{std} =

17.647°R/"Hg* 40.272 ft^3* 0.984 *(29.57 "Hg + (1.5 "H_2O/13.6))/(460 + 100.3° F)

= 37.044 dscf

Moisture - Equation 5-2 and 5-3

Vw_{std} = 0.04715 ft^3/g * 82.4 grams of H_2O collected in impingers

= 3.89 scf

B_{ws} = (3.89 scf)/(3.89 scf + 37.044 dscf)

= 0.0949

% Moisture = 0.0949 * 100

= 9.49 %

Molecular weight - Equation 3-2

M_d = 0.440 * (7.7 $\%CO_2$) + 0.320 * (11.9 $\%O_2$) + 0.280 * ($\frac{80.4}{(100-(11.9+7.7))}$ % CO + $\%N_2$)

M_d = 29.71 g/g-mole (dry)

M_s = 29.71 g/g-mole * (1 - 0.0949) + 18.0g/g-mole * 0.0949

M_s = 28.60 g/g-mole (wet)

Stack gas velocity and volumetric flow rate - Equation 2-9 and 2-10

V_s = 85.49 * 0.84 * $\sqrt{(0.013 * 2131.1\ ^\circ R / 28.60\ g/g\text{-mole} / \frac{29.56\ "Hg}{(29.57+(-.09/13.6))})}$

V_s = 12.8 ft/sec (std)

Q_{sd} = 3600 * (1 - 0.0949) * 12.8 ft/sec * $\frac{103.87\ ft^2}{\pi * 138^2 * 4/144}$ * (528 °R/2131.1 °R) *

(29.56 "Hg / 29.92 "Hg)

= 1063639 dscf/hr / 60 min/hr

= 17727.3 dscf/min (dry standard cubic feet per minute)

acfm = 12.8 ft/sec * 103.87 ft^2* 60 sec/min

= 800078 acfm (actual cubic feet per minute)

AMTEST
AIR QUALITY, INC.

SAMPLE CALCULATION SHEET
HYDROCHLORIC ACID (HCl)

CLIENT: King County Solid Waste @ Cedar Hills Landfill

LOCATION: Flare #3 Outlet Maple Valley, Washington

DATE OF TEST: 9/30/92

RUN #: 2 - HCL

Lab # 3254

Concentration of Hydrochloric Acid (HCl)

mg/dscm = 5550 ug/ 1.049 dscm * 1 mg / 1000 ug * 36.46 g/g-mole (MW HCl) / 35.45 g/g-mole (MW Cl)

= 5.44 mg/dscm

ppm = 5.44 mg/dscm * 22.414 l/g-mole / 36.46 g/g-mole * 293.15°K / 273.15°K * 1 g / 10^3 mg * $1\ m^3$ / 10^3 l * 10^6 ppm

= 3.59 ppm

ppm @ 7% O_2 = 3.59 ppm * (20.9 - 7% O_2) / (20.9 - 11.9 % O_2)

= 5.54 ppm @ 7% O_2

Emission Rate of Hydrochloric Acid (HCl)

g/min = 5550 ug/ 37.044 dscf * 17727.3 dscf/min * 1 mg / 1000 ug * 1 gram / 1000 mg

= 2.1656 g/min mg/min = 2.656 * 1000mg / 1g = 2655.9 mg/min

lb/hr = 5.44 mg/dscm * $1\ m^3$ / 35.31 ft^3 * 17727.3 dscf/min * 1 lb / 453600 mg * 60 min/hr

= 0.361 lb/hr

tons/year = _____ lb/hr * 1 ton/2000 lb * 24 hr/day * 365 days/yr

= NA tons/yr

Example Calculation of Bias Correction

Client: King's Solid Waste @ Cedar Hills **Location:** Maple Valley, Washington

Site Location: Flare #3 Outlet

Run #: 2

Date: 9/30/96

$$C_{gas} = (C - C_o) * (C_{ma}/(C_m - C_o)$$

where:

C_{gas} = Effluent gas concentration, dry basis, ppm

C = Average gas concentration indicated by analyzer, dry basis, ppm

C_o = Average of initial and final system calibration bias check responses for the zero gas, ppm

C_{ma} = Actual concentration of the upscale calibration gas, ppm

C_m = Average of initial and final system calibration bias check responses for the upscale calibration gas, ppm

= [4.6 ppm - 0.8] * [52.2/(53.1 - 0.8)]

= 3.8 ppm SO_2 (bias corrected)

AMTEST

99

EXAMPLE CALCULATION OF GASEOUS EMISSION RATES

RUN 2

CLIENT King County Solid Waste @ Cedar Hills LOCATION Maple Valley, Washington

SAMPLE SITE Flare #3 Outlet DATE 1/30/92

SULFUR DIOXIDE (SO_2)

instrument averaged 3.8 ppm during the run

ppm x 1.660×10^{-7} = lb/dscf SO_2 (from 40 CFR 60, Appendix A, Method 19)

conversion factor

3.8 ppm x 1.660×10^{-7} = 6.308×10^{-7} lb/dscf

6.308×10^{-7} lb/dscf x 17427.3 dscf/min x 60 min/hr = 0.671 lb/hr

NITROGEN OXIDES (NO_x as NO_2)

instrument averaged [illegible] ppm during the run

ppm x 1.194×10^{-7} = lb/dscf NO_x (from Method 19)

conversion factor

[illegible] ppm x 1.194×10^{-7} = 2.161×10^{-6} lb/dscf

2.161×10^{-6} lb/dscf x 17427.3 dscf/min x 60 min/hr = 2.30 lb/hr

EXAMPLE CALCULATION OF CARBON MONOXIDE EMISSION RATE

RUN 2

CLIENT King County Solid Waste [illegible] LOCATION Maple Valley, Washington

SAMPLE SITE Flare #3 Outlet DATE 9/30/92

CARBON MONOXIDE (CO)

instrument averaged 1 ppm during the run

$$1 \text{ ppm} \times \frac{28.01 \text{ g/g-mole}}{22.414 \text{ l/g-mole}} \times \frac{273.15^{\circ} \text{ K}}{293.15^{\circ} \text{ K}} \times \frac{1000 \text{ l}}{1 \text{ m}^3} \times \frac{1}{10^6 \text{ ppm}} = 0.001 \text{ g/m}^3$$

$$0.001 \text{ g/m}^3 \times \frac{1 \text{ m}}{35.31 \text{ ft}^3} \times 17727.3 \text{ dscf/min} \times \frac{1 \text{ lb}}{453.6 \text{ g}} \times \frac{60 \text{ min}}{1 \text{ hr}} = 0.08 \text{ lb/hr}$$

Example Calculation

King County Solid Waste @ Cedar Hills Landfill

VOC Emission Rate (TO-14) & Destruction Efficiency

Flare #2 - Inlet

1/20/94

Run 2 - Inlet

Example Compound - Toluene

Emission Rate

$$mg/min = \mu g/m^3 \times m^3/35.31 ft^3 \times dscf/min \times 1mg/1000\mu g$$

$$= 120000\ ug/m^3 \times 1m^3/35.31 ft^3 \times 1962.8\ dscf/min \times 1mg/1000\ ug$$

$$= 6670.5\ mg/min$$

1

Destruction Efficiency

$$\frac{lb\ In\ Inlet - lb\ Out\ Inlet}{lb\ In\ Inlet} \times 100\ \%$$

$$\frac{7334.3\ lb/hr - 5881.2\ lb/hr}{7334.3\ lb/hr} \times 100\ \% = 19.78\ \%$$

8

Example Calculation of Retention Time
King County Solid Waste at Cedar Hills Landfill
Flare #3

Length of Combustion Zone = 35 feet to test port

Area of Combustion Zone = 103.9 ft²

Exhaust Flow at test port = 79,866 acfm

$$\frac{\text{Area} \times \text{Length}}{\text{Flow}} \times \frac{60}{1} = \text{seconds of retention}$$

$$\frac{103.9\ \text{ft}^2 \times 35\ \text{ft} \times 60\ \text{s/min}}{79{,}866\ \text{ft}^3/\text{min}} = 2.8 \text{ seconds at } 1658^\circ\text{F}$$

APPENDIX D

Field Data Sheets

TRAVERSE SAMPLING DATA SHEET

Page 1 of 104

Client King County - Cedar Hills Landfill
Location Maple Valley, WA
Sample Site Flare No. 3 Inlet Duct
Stack Diameter 12"0
Date 9/30/02
Operators ERL/HSM
Run I.D. 1 - Inlet

EQUIPMENT CHECKS

	Initial/Final
Leak Rate cfm	N/A
Leak Test Vacuum	
✓ Pitots, Pre Leak Ck	
✓ Pitots, Post Leak Ck	
TO-14 Gas Sampling System	
Integrated Bag	
✓ Thermocouples @ °F	

QA FORMS COMPLETED
Stack Schematic —
Sample Train —
Pitot Tube Insp. —
Magnehelic Cal. ✓
Temp. Probe Cal. ✓
Gas Meter Calib. —

Filter # ——— Box # ———

	Final Wt. gram	Initial Wt. gram	Net Wt. gram
#1 Imp.	Dry Bulb = 116	=	°F
#2 Imp.		=	
#3 Imp.	Wet Bulb = 65	=	°F
#4 Imp.		=	
#5 Imp.		=	
#6 S.G.		=	
Total H_2O Volume			g

Start Time 14:15
Stop Time 15:15
Barometric Pressure "Hg 29.60
Static Pres "H_2O -6.0
Production Rate

SAMPLING PARAMETERS
% Moisture
Meter Temp.
Stack Temp.
ΔH@ Y
Pitot # Std Side # Alt
Cp .99
Nozzle Diameter inch
D_1 D_2 D_3
K Factor

Velocity ↓ TO-14 Canister # 476

Plant Flare Stack

Sample Point	Elap Time Min.	Dry Gas Meter Reading Cu. Ft.	Pitot Reading ΔP √ H_2O	Orifice Setting (ΔH) " H_2O Ideal	Orifice Setting (ΔH) " H_2O Actual	Gas Meter Temp °F In	Gas Meter Temp °F Out	Pump Vac. Gauge "Hg	Filter Box Temp °F	Imp. Exit Temp °F	Stack Temp °F	Thermocouples HI	Thermocouples LOW
Center Pt.	0		.49								116	1662	1789
	10		.50								115	1668	1805
	20		.48								115	1671	1788
	30		.50								115	1683	185
	40		.52								115	1674	1799
↓	50		.52								115	1674	1788
	60		.50								116	1681	1801

Use these temperatures to compare w/ our Velocity Traverse Temperatures (They are at same elevation)

$\sqrt{(\Delta P)^2}$ ΔH Tm

115.3 1673.6 1803.0
Ts

TRAVERSE SAMPLING DATA SHEET

Page 1 of 105

Client Kin County - Cedar Hills Landfill
Location Maple Valley, WA
Sample Site Flare #3 Inlet Duct

Stack Diameter 12" ø
Date 9/30/97
Operators ERL/KSM
Run I.D. 2 - Inlet

EQUIPMENT CHECKS

	Initial/Final
Leak Rate cfm	N/A
Leak Test Vacuum	N/A
✓ Pitots, Pre Leak Ck	
Pitots, Post Leak Ck	
TO-14 Gas Sampling System	
TO-14 Integrated Bag	
✓ Thermocouples @ ___ °F	

QA FORMS COMPLETED

Stack Schematic —
Sample Train —
Pitot Tube Insp. —
Magnehelic Cal. ✓
Temp. Probe Cal. ✓
Gas Meter Calib. —

Filter # ____ Box # ____

	Final Wt. gram	Initial Wt. gram	Net Wt. gram
#1 Imp.	Dry Bulb = 114°F		
#2 Imp.		=	
#3 Imp.	Wet Bulb = 86°F		
#4 Imp.	____	- ____ =	____
#5 Imp.	____	- ____ =	____
#6 S.G.	____	- ____ =	____

Total H_2O Volume ____ g

Start Time 1630
Stop Time 1730
Barometric Pressure "Hg 29.57
Static Pres "H_2O +6.0
Production Rate ____

SAMPLING PARAMETERS

% Moisture ____
Meter Temp. ____
Stack Temp. ____
ΔH@ ____ Y ____
Pitot # Std Side # A
Cp .99
Nozzle Diameter ____ inch
D_1 ____ D_2 ____ D_3 ____

K Factor ____

TO-14 Canister #483

Sample Point	Elap Time Min.	Dry Gas Meter Reading Cu.Ft.	Pitot Reading Δ P " H_2O	Orifice Setting (Δ H) " H_2O Ideal	Orifice Setting (Δ H) " H_2O Actual	Gas Meter Temp °F In	Gas Meter Temp °F Out	Pump Vac. Gauge " Hg	Filter Box Temp °F	Imp. Exit Temp °R	Stack Temp °F	Plant Flare Stack Thermocouples HI	Plant Flare Stack Thermocouples LOW
Canister	0		.48								114	1664	1808
	10		.46								113	1661	1783
	20		.46								113	1648	1765
	30		.48								113	1682	1820
	40		.48								113	1670	1816
	50		.48								113	1675	1796
↓	60		.47								113	1660	1772

We Sample @ this elevation

		$\sqrt{(\Delta P)^2}$	$\overline{\Delta H}$	T_m	T_s		
					113.1	1666	1793

TRAVERSE SAMPLING DATA SHEET

Page 1 of 106

Client King Conv. – Cedar Hills Landfill
Location Maple Valley, WA
Sample Site Flare #3 Inlet Duct

Stack Diameter 12"
Date 10/1/02
Operators ERC / KSM
Run I.D. 3-Inlet

EQUIPMENT CHECKS

Initial/Final

Leak Rate cfm N/A
Leak Test Vacuum N/A
✓ Pitots, Pre Leak Ck
✓ Pitots, Post Leak Ck
10-14 Gas Sampling System
Integrated Bag
✓ Thermocouples @ ___ °F

QA FORMS COMPLETED

Stack Schematic —
Sample Train —
Pitot Tube Insp. —
Magnehelic Cal. ✓
Temp. Probe Cal. ✓
Gas Meter Calib. —

Filter # ____ Box # ____

	Final Wt. gram	Initial Wt. gram	Net Wt. gram
#1 Imp.	Dry Bulb = 105°F		
#2 Imp.			
#3 Imp.	Wet Bulb = 82°F		
#4 Imp.			
#5 Imp.			
#6 S.G.			

Total H_2O Volume ____ g

10-14 Canister #545

Start Time 8:17
Stop Time 9:17
Barometric Pressure "Hg 29.58
Static Pres "H_2O +6.0
Production Rate

SAMPLING PARAMETERS

% Moisture
Meter Temp.
Stack Temp.
ΔH@ ____ Y ____
Pitot # Std Side # A
Cp 0.99
Nozzle Diameter ____ inch
D_1 ____ D_2 ____ D_3 ____

K Factor

Sample Point	Elap Time Min.	Dry Gas Meter Reading Cu.Ft.	Pitot Reading Δ P " H_2O	Orifice Setting (Δ H) " H_2O Ideal	Orifice Setting (Δ H) " H_2O Actual	Gas Meter Temp °F In	Gas Meter Temp °F Out	Pump Vac. Gauge " Hg	Filter Box Temp °F	Imp Exit Temp °F	Stack Temp °F	Plant Stack Thermocouples HI	Plant Stack Thermocouples LOW
Comp Pt	0		.51								105	1587	1704
	10		.46								106	1613	1732
	20		.45								106	1603	1733
	30		.49								105	1642	1796
	40		.48								105	1675	1855
	50		.47								105	1670	1851
↓	60		.48								105	1604	1760
												↑	

$\sqrt{(\Delta P)^2}$ $\overline{\Delta H}$ T_m T_s

105.3 1631 1776

STACK SCHEMATIC AND LOCATION OF SAMPLE POINTS

Client KING County

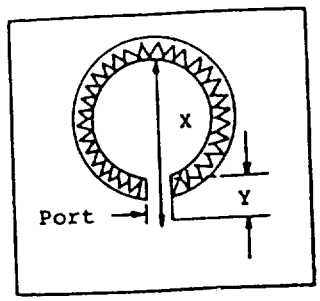
Location CEDAR HILLS LANDFILL

Sampling Location FLARE # 3

Inside of far wall to outside of port (distance, X) _____

Inside of near wall to outside of port (distance, Y) _____

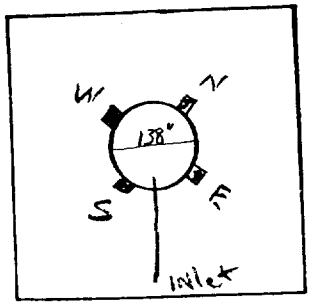
Stack I.D. (distance X - distance Y) 138" (Flare outlet)

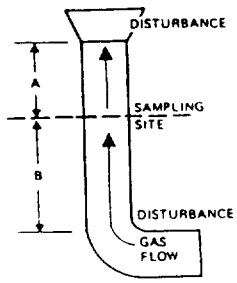


Schematic of Sampling Location

1 Traverse Point #	2 Fractional Percent of Stack I.D.	3 Stack I.D. inches	4 Column 2 x 3	5 Distance Y	6 Traverse Point Location from Outside of Port columns 4 + 5
1	2.1	138	2.90	7.5	10.40
2	6.7	138	9.25		16.75
3	11.8 ~~11.8~~		16.28		23.78
4	17.7 ~~17.7~~		24.43		31.93
5	25.0		34.50		~~42.00~~ 56.63
6	35.6		49.13		
7					
8					
9					
10					
11					
12					

CROSS SECTION

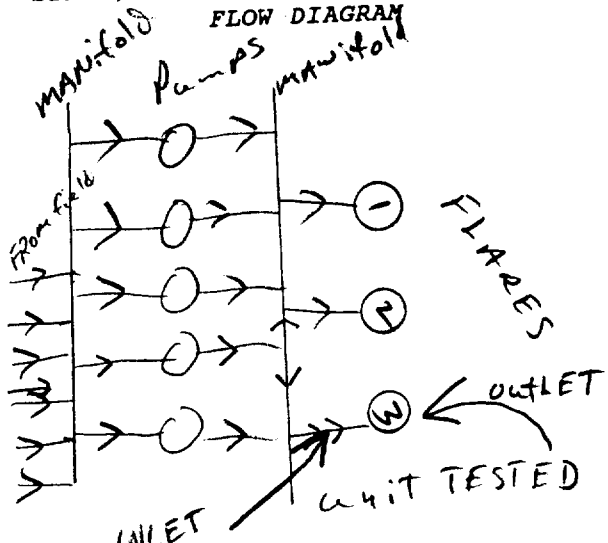




Distance A = 6 ft downstream

Distance B = 35 ft upstream

STACK, CONTROL DEVICE AND PROCESS FLOW DIAGRAM



3253

TRAVERSE SAMPLING DATA SHEET

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Client KING County
Location CEDAR HILLS LANDFILL
Sample Site FLARE #3 Outlet Stack
Stack Diameter 138" Ø
Date 9-30-97
Operators ERL
Run I.D. 1 - M4/HCl

EQUIPMENT CHECKS

	Initial/Final
Leak Rate cfm	.016 / .015
Leak Test Vacuum	15" / 14"
✓	Pitots, Pre Leak Ck
✓	Pitots, Post Leak Ck
✓	Gas Sampling System
N/A	Integrated Bag
✓	Thermocouples @ ___ °F

QA FORMS COMPLETED

Stack Schematic	✓
Sample Train	✓
Pitot Tube Insp.	✓
Magnehelic Cal.	N/A
Temp. Probe Cal.	✓
Gas Meter Calib.	✓

Filter # N/A Box # B1

	Final Wt. gram	Initial Wt. gram	Net Wt. gram
#1 Imp.	694.4	644.0	
#2 Imp.	654.9	638.3	
#3 Imp.	540.2	537.4	
#4 Imp.			
#5 Imp.			
#6 S.G.	843.9	834.9	
Total H_2O Volume			78.8 g

Start Time 14:15
Stop Time 15:15
Barometric Pressure "Hg 29.60
Static Pres "H_2O -.08
Production Rate

SAMPLING PARAMETERS

% Moisture —
Meter Temp. —
Stack Temp. —
ΔH@ 1.992 Y 0.984 (Silver Box)
Pitot # P8A Side # A
Cp .84
Nozzle Diameter N/A inch
D_1 ___ D_2 ___ D_3 ___
K Factor

Sample Point	Elap Time Min.	Dry Gas Meter Reading Cu.Ft.	Pitot Reading Δ P " H_2O	Orifice Setting (Δ H) " H_2O Ideal	Orifice Setting (Δ H) " H_2O Actual	Gas Meter Temp °F In	Gas Meter Temp °F Out	Pump Vac. Gauge " Hg	Filter Box Temp °F	Imp. Exit Temp °F	Stack Temp °F	O_2 %	
East 1	0	983.778	.003	1.5 →		103	103	0	NA	60	1650	(Data logged)	
2	10		.002			104	104	0	NA	57	1642		
3	20		.007			107	106	0	NA	56	1662		
4	30		.006			109	108	0	NA	55	1684		
5	40		.006			111	110	0	NA	60	1671	CO_2	7.8%
6	50		.014			110	110	0	NA	59	1668	O_2	11.8%
North 1	60	1022.997	.011			112	112	0	NA	62	1655	CO	1 ppm
2			.018								1640		
3			.025								1660		
4			.021								1661		
5			.019								1661		
6			.020								1670		
West 1			.003								1657		
2			.010								1659		
3			.015								1661		
4			.017								1661		
5			.016								1663		
6			.018								1672		
South 1			.001								1650		
2			.002								1658		
3			.005								1660		
4			.009								1662		
5			.020								1662		
6			.022								1662		
NET	60	39.219	$\sqrt{(\Delta P)^2}$		$\overline{\Delta H}$		107.8 T_m				1660.5 T_s		

3254

TRAVERSE SAMPLING DATA SHEET

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Client KinG County
Location CEDAR HILLS
Sample Site #3 FLARE Outlet Stack
Stack Diameter 138"
Date 9/30/92
Operators ELI KSm
Run I.D. 2 - M4/HCl

EQUIPMENT CHECKS

	Initial/Final
Leak Rate cfm	.018 /
Leak Test Vacuum	15" /
✓	Pitots, Pre Leak Ck
✓	Pitots, Post Leak Ck
✓	Gas Sampling System
N/A	Integrated Bag
✓	Thermocouples @ ___ °F

QA FORMS COMPLETED

Stack Schematic	✓
Sample Train	✓
Pitot Tube Insp.	✓
Magnehelic Cal.	N/A
Temp. Probe Cal.	✓
Gas Meter Calib.	✓

Filter # N/A Box # B2

	Final Wt. gram	Initial Wt. gram	Net Wt. gram
#1 Imp.	690.0	632.2	
#2 Imp.	649.1	632.3	
#3 Imp.	539.1	535.9	
#4 Imp.			
#5 Imp.			
#6 S.G.	254.4	243.8	
Total H_2O Volume		82.4	g

Start Time 16:30
Stop Time 17:30
Barometric Pressure "Hg 29.57
Static Pres "H_2O -.09
Production Rate

SAMPLING PARAMETERS

% Moisture
Meter Temp.
Stack Temp.
ΔH@ 1.992 Y 0.984 (Silver Box)
Pitot # 18A Side # A
Cp .84
Nozzle Diameter inch
D_1 D_2 D_3
K Factor

Sample Point	Elap Time Min.	Dry Gas Meter Reading Cu.Ft.	Pitot Reading Δ P " H_2O	Orifice Setting (Δ H) " H_2O Ideal	Orifice Setting (Δ H) " H_2O Actual	Gas Meter Temp °F In	Gas Meter Temp °F Out	Pump Vac. Gauge " Hg	Filter Box Temp °F	Imp. Exit Temp °F	Stack Temp °F	O_2 %	
East 1	0	23.258	.001		1.5	100	102	0	N/A	62	1647	(Dry Load)	
2	10		.001			100	101	0		57	1640		
3	20		.000			100	100	0		61	1647		
4	30		.012			100	100	0		64	1697		
5	40		.009			100	100	0		67	1665	CO_2	7.7%
6	50		.008			101	100	0		61	1674	O_2	11.9%
North 1	60	63.530	.017			100	100	0		64	1658	CO	1 ppm
2			.026								1650		
3			.027								1664		
4			.026								1672		
5			.028								1674		
6			.030								1674		
West 1			.002								1678		
2			.009								1671		
3			.007								1673		
4			.011								1674		
5			.015								1689		
6			.019								1691		
South 1			.009								1671		
2			.007								1679		
3			.008								1674		
4			.011								1674		
5			.016								1678		
6			.016								1674		
		40.272	$\sqrt{(\Delta P)^2}$		ΔH	100.3	T_m				1671.1 T_s		

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TRAVERSE SAMPLING DATA SHEET

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Client King County
Location CEDAR HILLS LANDFILL
Sample Site #3 FLARE Outlet Stack
Stack Diameter 138" ø
Date 10/1/92
Operators ERI KSm
Run I.D. 3

EQUIPMENT CHECKS

	Initial/Final
Leak Rate cfm	.018 / .015
Leak Test Vacuum	15" / 15"
✓ / ✓	Pitots, Pre Leak Ck / Post Leak Ck
✓	Gas Sampling System
N/A	Integrated Bag
✓	Thermocouples @ ___ °F

QA FORMS COMPLETED

Stack Schematic ✓
Sample Train ✓
Pitot Tube Insp. ✓
Magnehelic Cal. N/A
Temp. Probe Cal. ✓
Gas Meter Calib. ✓

Filter # N/A Box # B3

	Final Wt. gram	Initial Wt. gram	Net Wt. gram
#1 Imp.	690.8	639.8	
#2 Imp.	655.0	638.0	
#3 Imp.	528.4	526.4	
#4 Imp.			
#5 Imp.			
#6 S.G.	664.9	664.9	
Total H_2O Volume		80.0 g	

Start Time 8:17
Stop Time 9:17
Barometric Pressure "Hg 29.58
Static Pres "H_2O -.08
Production Rate

SAMPLING PARAMETERS

% Moisture
Meter Temp.
Stack Temp.
ΔH@ 1.992 Y 0.984
Pitot # P8A Side #
Cp .84
Nozzle Diameter N/A inch
D_1 D_2 D_3
K Factor

Sample Point	Elap Time Min.	Dry Gas Meter Reading Cu.Ft.	Pitot Reading Δ P " H_2O	Orifice Setting (Δ H) " H_2O Ideal	Orifice Setting (Δ H) " H_2O Actual	Gas Meter Temp °F In	Gas Meter Temp °F Out	Pump Vac. Gauge " Hg	Filter Box Temp °F	Imp. Exit Temp °F	Stack Temp °F	O_2 %	
South 1	0	63.698	.005		1.5	74	74	ø	N/A	44	1606		
2	10		.005			75	75	ø		47	1629		
3	20		.005			78	76	ø		51	1615		
4	30		.011			79	77	ø		52	1669		
5	40		.020			80	78	ø		55	1674	CO_2	7.3%
6	50		.015			80	78	ø		59	1684	O_2	12.3% ✓
West 1	60	103.398	.015		↓	79	78	ø	↓	64	1629	CO	1 ppm
2			.014								1650		
3			.020								1652		
4			.021								1653		
5			.021								1653		
6			.027								1651		
North 1			.016								1609		
2			.026								1631		
3			.031								1619		
4			.029								1670		
5			.029								1681		
6			.027								1650		
East 1			.004								1616		
2			.006								1629		
3			.006								1619		
4			.012								1650		
5			.006								1654		
6			.008								1629		
			$\sqrt{(\Delta P)^2}$		ΔH	77.2 Tm					1642.6 Ts		
		39.700											

SAMPLE TRAIN INFORMATION

Fill Out One Sheet Per Site and Per Test Type

Client: KING County

Location: CEDAR HILLS Landfill

Site: #3 FLARE

Date(s): 9-30-92 10-1-92

Test Team: ERL KSM

Number of Runs: 3

If this information is not accurate for all runs, note all exceptions:

Thimble: ___yes ✓no **Nozzle type:** ✓quartz ___steel

Probe liner: ✓quartz ___glass ___steel ___teflon

Probe type: ✓regular ___water-cooled

Front-half filter: ___yes ✓no **Size (mm):** __90 __110 __125

Support: ___steel ___glass frit ___teflon

Gasket: ___silicon ___teflon

Filter media: ___quartz fiber ___glass fiber ___teflon

Impinger Train Solutions/Quantity of Solution Charged (M4/HCl)
#1 100mL DI
#2 100mL DI
#3 MT
#4 SG
#5
#6

Note: Show the back-half filter location with an arrow

Back-half filter type: __quartz fiber __glass fiber __teflon
tared untared

AMTEST AIR QUALITY, INC.

SAMPLING SYSTEM BIAS CHECK

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CLIENT: King County Cedar Hills Landfill

DATE: 9/30/92 – 10/1/92

LOCATION: Maple Valley, WA

SAMPLE TIME(S): 14:15 – 15:15 (Run 1)

SAMPLE SITE: Flare No. 3 Outlet Stack

CONDITION: 16:30 – 17:30 (Run 2)
8:17 – 9:17 (Run 3)

RUN # 1 14:15 – 15:15

Parameter	Measurement Unit	Initial Zero Check	Final Zero Check	Initial Span Check	Final Span Check	Upscale Cal Gas Value Cma
Carbon Dioxide (CO_2)	%	0.0	0.0	12.0	17.9	12.0%
Oxygen (O_2)	%	0.0	0.0	10.0	10.0	10.0%
Carbon Monoxide (CO)	ppm	-1	-1	610	609	606
Sulfur Dioxide (SO_2)	ppm	-0.2	-2.7	52.6	49.4	52.2
Nitrogen Oxides (NO_x)	ppm	-0.1	0.0	56.0	55.8	56.0
Non-Methane Hydrocarbons (NMHC)	ppm					

RUN # 2 16:30 – 17:30

Parameter	Measurement Unit	Initial Zero Check	Final Zero Check	Initial Span Check	Final Span Check	Upscale Cal Gas Value Cma
Carbon Dioxide (CO_2)	%	0.0	0.0	12.0	12.0	12.0
Oxygen (O_2)	%	0.0	0.0	10.0	10.0	10.0
Carbon Monoxide (CO)	ppm	-1	-1	606	636	606
Sulfur Dioxide (SO_2)	ppm	0.2	1.4	51.7	54.4	52.2
Nitrogen Oxides (NO_x)	ppm	0.4	0.0	56.0	56.9	56.0
Non-Methane Hydrocarbons (NMHC)	ppm					

RUN # 3 8:17 – 9:17 (10/1/92)

Parameter	Measurement Unit	Initial Zero Check	Final Zero Check	Initial Span Check	Final Span Check	Upscale Cal Gas Value Cma
Carbon Dioxide (CO_2)	%	0.0	0.1	12.0	12.2	12.0
Oxygen (O_2)	%	0.0	0.0	10.0	9.9	10.0
Carbon Monoxide (CO)	ppm	0	1	603	591	606
Sulfur Dioxide (SO_2)	ppm	0.3	2.2	52.5	55.5	52.2
Nitrogen Oxides (NO_x)	ppm	-0.2	0.0	56.1	54.9	56.0
Non-Methane Hydrocarbons (NMHC)	ppm					

GAS LOG MEASUREMENT DATA

FILE NAME: 5GASES\CEDAR-30
CLIENT: KING COUNTY SOLID WASTE @ CEDAR HILLS LANDFILL
LOCATION: MAPLE VALLEY, WASHINGTON
SAMPLE SITE: FLARE #3 OUTLET STACK
SAMPLE DATE: SEPTEMBER 30, 1992

TIME	NITROGEN OXIDES (ppm)	SULFUR DIOXIDE (ppm)	CARBON MONOXIDE (%)	CARBON DIOXIDE (%)	OXYGEN (%)
RUN 1 - 14:15-15:15					
14:15:00	19.7	1.9	0	8.3	11.8
14:16:00	19.5	1.9	0	7.5	11.5
14:17:00	18.6	1.7	0	7.9	12.0
14:18:00	19.3	1.6	0	7.9	11.6
14:19:00	19.5	1.5	0	8.3	11.7
14:20:00	21.4	1.6	0	8.6	11.0
14:21:00	20.0	1.6	2	8.0	11.2
14:22:00	19.4	1.4	0	7.9	11.8
14:23:00	18.3	1.3	0	7.3	12.0
14:24:00	17.5	1.2	0	7.4	12.1
14:25:00	16.8	1.0	1	7.2	12.4
14:26:00	16.9	1.1	2	7.4	12.5
14:27:00	18.5	1.0	1	7.3	11.9
14:28:00	17.3	0.9	0	7.2	12.3
14:29:00	17.7	1.0	0	7.3	12.3
14:30:00	18.8	0.9	0	7.9	12.1
14:31:00	20.3	1.0	1	8.3	11.5
14:32:00	21.1	1.1	0	8.2	11.2
14:33:00	19.7	1.1	0	8.1	11.4
14:34:00	19.5	1.0	0	7.9	11.6
14:35:00	19.6	0.9	0	8.0	11.7
14:36:00	20.2	0.9	0	8.2	11.6
14:37:00	19.7	0.9	0	7.9	11.4
14:38:00	19.6	0.8	0	8.0	11.6
14:39:00	19.5	0.8	1	8.2	11.7
14:40:00	21.3	0.8	0	8.2	11.1
14:41:00	19.3	0.8	0	7.9	11.7
14:42:00	19.2	0.8	1	7.8	11.8
14:43:00	20.1	0.7	1	8.0	11.8
14:44:00	17.7	0.6	0	7.3	12.0
14:45:00	18.9	0.6	0	7.9	12.0
14:46:00	20.9	0.6	0	8.4	11.6
14:47:00	19.9	0.6	0	8.0	11.4
14:48:00	21.9	0.6	0	8.6	11.2
14:49:00	18.9	0.5	0	7.6	11.3
14:50:00	18.2	0.4	0	7.5	12.2
14:51:00	18.9	0.4	0	7.9	11.9
14:52:00	18.5	0.3	0	7.6	11.7
14:53:00	17.5	0.4	0	7.5	12.3
14:54:00	18.4	0.2	2	7.6	11.9
14:55:00	18.7	0.2	0	7.5	11.9

14:56:00	18.0	0.2	0	7.7	12.3
14:57:00	19.8	0.2	0	7.9	11.7
14:58:00	21.2	0.3	0	8.4	11.4
14:59:00	19.6	0.2	0	7.7	11.5
15:00:00	20.3	0.2	0	8.1	11.7
15:01:00	18.5	0.1	0	7.7	11.8
15:02:00	19.8	0.1	0	7.8	11.7
15:03:00	17.9	0.2	0	7.3	12.1
15:04:00	17.7	0.1	0	7.1	12.3
15:05:00	18.0	0.1	0	7.4	12.4
15:06:00	17.6	0.0	0	7.2	12.4
15:07:00	18.5	0.0	0	7.4	12.1
15:08:00	18.0	0.0	0	7.4	12.3
15:09:00	19.9	0.1	0	7.8	11.8
15:10:00	18.4	0.0	0	7.5	12.2
15:11:00	19.3	0.1	0	7.6	11.9
15:12:00	19.7	0.2	0	8.0	11.5
15:13:00	19.3	0.2	0	7.9	11.9
15:14:00	19.9	0.2	0	7.9	11.7
15:15:00	18.3	0.3	0	7.4	11.9
AVERAGE RUN 1	19.1	0.7	0	7.8	11.8
	(ppm)	(ppm)	(ppm)	(%)	(%)
	NITROGEN OXIDES	SULFUR DIOXIDE	CARBON MONOXIDE	CARBON DIOXIDE	OXYGEN

TIME	NITROGEN OXIDES (ppm)	SULFUR DIOXIDE (ppm)	CARBON MONOXIDE (ppm)	CARBON DIOXIDE (%)	OXYGEN (%)
RUN 2 - 16:30-17:30					
16:30:00	17.9	4.1	0	7.6	12.2
16:31:00	18.9	4.1	0	7.9	11.9
16:32:00	18.3	4.2	0	7.5	11.9
16:33:00	17.5	4.3	0	7.3	12.2
16:34:00	17.2	4.2	0	7.2	12.4
16:35:00	18.2	4.3	0	7.7	12.2
16:36:00	19.3	4.3	0	8.2	11.6
16:37:00	19.7	4.4	0	8.3	11.5
16:38:00	19.0	4.4	0	8.1	11.5
16:39:00	19.0	4.5	0	7.9	11.6
16:40:00	19.4	4.5	0	8.2	11.6
16:41:00	17.9	4.5	0	7.3	12.0
16:42:00	17.5	4.5	0	7.2	12.2
16:43:00	16.6	4.4	0	7.0	12.5
16:44:00	17.8	4.4	0	7.6	12.4
16:45:00	18.1	4.3	0	7.6	11.9
16:46:00	18.1	4.4	0	7.6	12.1
16:47:00	18.6	4.5	0	7.8	11.9
16:48:00	19.7	4.4	0	8.4	11.7
16:49:00	19.5	4.5	0	7.9	11.3
16:50:00	18.0	4.4	0	7.5	12.0
16:51:00	19.4	4.4	0	8.1	11.8
16:52:00	18.2	4.4	0	7.5	11.8
16:53:00	17.9	4.3	0	7.7	12.2
16:54:00	18.1	4.4	0	7.5	12.0
16:55:00	17.8	4.4	0	7.4	12.1
16:56:00	18.0	4.2	0	7.9	12.2
16:57:00	18.2	4.4	0	7.4	11.9
16:58:00	17.6	4.3	0	7.6	12.0
16:59:00	18.6	4.3	0	7.7	12.1
17:00:00	18.4	4.4	1	7.9	12.1
17:01:00	20.3	4.4	0	8.4	11.5
17:02:00	18.8	4.4	0	7.6	11.5
17:03:00	17.2	4.4	0	7.2	12.2
17:04:00	17.0	4.4	0	7.1	12.5
17:05:00	17.4	4.4	0	7.3	12.3
17:06:00	17.3	4.4	0	7.1	12.3
17:07:00	18.1	4.4	0	7.7	12.4
17:08:00	18.1	4.4	0	7.7	12.0
17:09:00	19.7	4.5	0	8.2	11.6
17:10:00	18.5	4.7	0	7.9	11.6
17:11:00	19.2	5.0	0	7.8	11.7
17:12:00	17.5	4.9	0	7.2	12.2
17:13:00	17.4	4.8	0	7.2	12.4
17:14:00	17.9	4.9	0	7.6	12.2
17:15:00	18.1	4.9	0	7.3	11.9
17:16:00	17.6	4.9	0	7.7	12.4
17:17:00	17.7	4.9	0	7.4	12.0
17:18:00	18.4	4.9	1	7.6	12.1
17:19:00	18.7	4.9	0	7.9	11.9
17:20:00	19.3	5.1	0	8.1	11.7
17:21:00	19.4	5.1	0	8.0	11.6

17:22:00	18.5	5.2	0	7.7	11.9
17:23:00	18.9	5.1	0	7.7	11.9
17:24:00	18.6	5.1	1	7.8	11.8
17:25:00	18.5	5.0	0	7.8	11.8
17:26:00	18.2	5.0	0	7.5	12.0
17:27:00	19.1	5.1	0	7.9	11.8
17:28:00	19.2	5.0	0	8.1	11.8
17:29:00	19.2	5.0	0	8.1	11.6
17:30:00	19.4	5.0	0	8.1	11.5
AVERAGE RUN 2	18.4 (ppm) NITROGEN OXIDES	4.6 (ppm) SULFUR DIOXIDE	0 (ppm) CARBON MONOXIDE	7.7 (%) CARBON DIOXIDE	11.9 (%) OXYGEN

GAS LOG MEASUREMENT DATA

FILE NAME: 5GASES\CEDAR-01
CLIENT: KING COUNTY SOLID WASTE @ CEDAR HILLS LANDFILL
LOCATION: MAPLE VALLEY, WASHINGTON
SAMPLE SITE: FLARE #3 OUTLET STACK
SAMPLE DATE: OCTOBER 1, 1992

TIME	NITROGEN OXIDES (ppm)	SULFUR DIOXIDE (ppm)	CARBON MONOXIDE (ppm)	CARBON DIOXIDE (%)	OXYGEN (%)
RUN 3 - 08:17-09:17					
08:17:00	19.6	5.7	2	8.4	11.4
08:18:00	19.2	5.8	3	8.1	11.4
08:19:00	18.7	5.8	1	8.2	11.6
08:20:00	18.4	5.8	0	7.9	11.5
08:21:00	17.7	5.9	1	7.6	11.8
08:22:00	17.2	5.8	1	7.4	12.1
08:23:00	16.9	5.8	1	7.2	12.5
08:24:00	16.9	5.7	3	7.5	12.3
08:25:00	17.8	5.7	2	7.7	11.9
08:26:00	16.5	5.7	4	7.6	12.2
08:27:00	17.3	5.7	3	7.7	12.1
08:28:00	18.6	5.7	2	8.3	11.6
08:29:00	18.4	5.9	3	8.2	11.6
08:30:00	19.5	6.0	2	8.2	11.3
08:31:00	15.9	5.8	3	7.0	12.3
08:32:00	16.5	5.9	5	7.5	12.2
08:33:00	15.9	5.7	1	7.0	12.2
08:34:00	17.5	5.7	3	7.6	12.3
08:35:00	14.7	5.7	3	6.9	12.7
08:36:00	15.2	5.6	3	6.7	12.6
08:37:00	17.0	5.6	4	7.9	12.6
08:38:00	17.7	5.5	1	8.0	11.7
08:39:00	17.8	5.6	1	7.7	11.7
08:40:00	16.0	5.5	2	7.2	12.2
08:41:00	16.0	5.5	2	7.0	12.5
08:42:00	14.9	5.5	2	7.0	12.8
08:43:00	16.1	5.4	2	7.1	12.4
08:44:00	16.5	5.5	0	7.4	12.4
08:45:00	17.1	5.5	0	7.5	12.3
08:46:00	16.3	5.4	0	7.2	12.2
08:47:00	16.2	5.3	0	7.0	12.5
08:48:00	14.7	5.4	1	6.6	12.8
08:49:00	15.8	5.3	2	7.2	12.7
08:50:00	17.0	5.3	2	7.4	12.3
08:51:00	16.7	5.3	0	7.3	12.3
08:52:00	16.3	5.4	1	7.3	12.3
08:53:00	15.9	5.4	1	7.1	12.6
08:54:00	16.0	5.2	0	7.2	12.5
08:55:00	16.8	5.2	0	7.5	12.2
08:56:00	16.8	5.2	0	7.2	12.2
08:57:00	16.2	5.3	1	7.1	12.5

08:58:00	17.1	5.2	0	7.6	12.4
08:59:00	16.6	5.3	0	7.4	12.2
09:00:00	15.9	5.3	0	7.1	12.5
09:01:00	16.9	5.3	0	7.4	12.3
09:02:00	16.3	5.2	0	7.3	12.3
09:03:00	16.9	5.1	1	7.4	12.2
09:04:00	16.6	5.2	3	7.6	12.3
09:05:00	16.3	5.3	2	7.1	12.2
09:06:00	15.9	5.2	1	7.0	12.6
09:07:00	16.1	5.2	1	7.1	12.5
09:08:00	15.4	5.3	1	6.9	12.7
09:09:00	15.9	5.2	5	7.1	12.6
09:10:00	17.1	5.2	1	7.5	12.1
09:11:00	15.7	5.1	3	7.0	12.5
09:12:00	16.3	5.2	2	7.3	12.4
09:13:00	15.9	5.3	3	7.1	12.4
09:14:00	16.0	5.2	3	7.2	12.5
09:15:00	15.7	5.3	2	7.3	12.4
09:16:00	16.8	5.2	0	7.5	12.2
09:17:00	16.8	5.2	0	7.4	12.1
AVERAGE RUN 3	16.7	5.4	1	7.4	12.2
	(ppm)	(ppm)	(ppm)	(%)	(%)
	NITROGEN OXIDES	SULFUR DIOXIDE	CARBON MONOXIDE	CARBON DIOXIDE	OXYGEN

Cedar Hill Plant #3 9/30/92

AMTEST AIR QUALITY, INC.

CONTINUOUS ANALYZERS CHECKLIST

Oxygen (O_2)

Infrared Industries Model 2200 O_2 Analyzer ✓

Carbon Dioxide (CO_2)

Infrared Industries Model 702D CO_2 Analyzer

Automated Custom Systems Model 3300 CO_2 Analyzer ✓

Carbon Monoxide (CO)

Automated Custom Systems Model 3300 CO Analyzer

Thermo Environmental Instruments Model 48 CO Analyzer ✓

Sulfur Dioxide (SO_2)

Monitor Labs Model 8850 SO_2 Analyzer

Monitor Labs Model 8730 NO_x/SO_2 Dilution Module

Western Research Model 721AT SO_2 Analyzer ✓

Nitrogen Oxides (NO_x)

Monitor Labs Model 8840 NO_x Analyzer

Monitor Labs Model 8730 NO_x/SO_2 Dilution Module

Thermo Environmental Instrument Model 10S NO_x Analyzer ✓

Hydrocarbons (HC)

Byron Model 301 HC Analyzer

Infrared Industries Model 702D HC Analyzer

Infrared Industries Model 703 HC Analyzer

AMTEST
AIR QUALITY, INC.

120

Cedar Hills Flare #3 Stack 9/30 - 10/1/92

GAS CYLINDER CHECKLIST

CYLINDER #		GAS CONCENTRATIONS	EXP. DATE
AAL-6733	____	H_2S - 10.86 ppm	
AAL-16929	____	94.9 ppm SO_2, 91.5 ppm NO_x	
CC-881	✓	52.2 ppm SO_2, 56.0 ppm NO_x	
CC-5210	____	91.0 ppm Propane	
CC-5724	____	143 ppm SO_2, 5.32% O_2	
CC-5771	____	30.9 ppm Propane	
CC-7135	____	207 ppm SO_2, 200 ppm NO_x	
CC-10437	____	88.7 ppm SO_2, 90.7 ppm NO_x	
CC-14468	____	93.1 ppm Propane	
CC-16047	____	464 ppm SO_2, 453 ppm NO_x	
CC-17221	____	57.0 ppm SO_2, 59.4 ppm NO_x	
CC-18833	____	497 ppm CO, 12.0% CO_2, 10.1% O_2	
CC-18962	____	322 ppm SO_2, 9.95% O_2	
CC-36225	____	15.1 ppm H_2S, 4.05% O_2	
CC-56097	____	89.1 ppm SO_2, 90.9 NO_x	
CC-59089	____	964 ppm CO	
CC-59232	____	932 ppm SO_2, 905 ppm NO_x	
CC-59377	____	98.7 ppm CO, 5.99% CO_2, 15.4% O_2	
CC-61175	____	86 ppm SO_2, 86 ppm NO_x	
CC-62049	____	89.6 ppm SO_2, 90.5 ppm NO_x	
CC-68127	____	498 ppm CO	
CC-68130	____	107 ppm SO_2, 272 ppm NO_x, 279 ppm CO	
CC-69475	____	5.00% Propane	
CC-70304	✓	606 ppm CO, 12.00% CO_2, 10.00% O_2	
CC-70636	____	17.2 ppm CO, 25.0% CO_2, 4.99% O_2	
CC-70643	____	3.00% Propane	
CC-72505	____	93.9 ppm SO_2, 94.8 ppm NO_x	
CC-72573	____	219 ppm SO_2, 217 ppm NO_x	
CC-72664	____	49.0 ppm SO_2, 123 ppm NO_x, 130 ppm CO	
CC-77479	____	9.00% Propane	
CC-80456	____	51.5 ppm Propane	
CC-87632	____	606 ppm CO, 12.00% CO_2, 10.01% O_2	
CC-91907	____	429 ppm SO_2, 447 ppm NO_x	
CC-93766	____	186 ppm SO_2, 230 ppm NO_x	
CC-94026	____	186 ppm SO_2, 236 ppm NO_x	
CC-101167	____	500 ppm CO, 12.00% CO_2, 9.85% O_2	
CC-101190	____	498 ppm CO, 12.01% CO_2, 9.99% O_2	

I4118-1

Run 1
INLET

CANISTER SAMPLING FIELD DATA SHEET

A. GENERAL INFORMATION

SITE LOCATION: #3 FLARE INLET
SITE ADDRESS: CEDAR HILLS Land Fill Maple Valley WA
SAMPLING DATE: 9/30/92

SHIPPING DATE: 10/1/92
CANISTER SERIAL NO. 476
SAMPLER ID: RUN1 - INLET
OPERATOR: MSM/ERC
CANISTER LEAK CHECK DATE:

B. SAMPLING INFORMATION

TEMPERATURE

	INTERIOR	AMBIENT	MAXIMUM	MINIMUM
START	116	80°F		
STOP	116	80°F		

PRESSURE

CANISTER PRESSURE	
	-29.5 "Hg
	0

SAMPLING TIMES

	LOCAL TIME	ELAPSED TIME METER READING
START	14:15	
STOP	15:15	

FLOW RATES

MANIFOLD FLOW RATE	CANISTER FLOW RATE	FLOW CONTROLLER READOUT
	~100 mL/m	

SAMPLING SYSTEM CERTIFICATION DATE:
QUARTERLY RECERTIFICATION DATE:

C. LABORATORY INFORMATION

DATE RECEIVED:
RECEIVED BY:
INITIAL PRESSURE: -15 BD
FINAL PRESSURE: 15
DILUTION FACTOR:
ANALYSIS
GC-FID-ECD DATE:
GC-MSD-SCAN DATE: 10/5/92 BD
GC-MSD-SIM DATE:
RESULTS :
GC-FID-ECD:
GC-MSD-SCAN:
GC-MSD-SIM:

Geshenyi Dai
SIGNATURE/TITLE

RUN 2 INLET

CANISTER SAMPLING FIELD DATA SHEET

I 4118-2

A. GENERAL INFORMATION

SITE LOCATION: #3 FLARE INLET
SITE ADDRESS: CEDAR HILLS LANDFILL Maple Valley, WA
SAMPLING DATE: 9/30/92

SHIPPING DATE: 10/1/92
CANISTER SERIAL NO. 483
SAMPLER ID: RUN 2 - INLET
OPERATOR: WSM/ERC
CANISTER LEAK CHECK DATE:

B. SAMPLING INFORMATION

TEMPERATURE

	INTERIOR	AMBIENT	MAXIMUM	MINIMUM
START	113	74°F	X	X
STOP	113	74°F		

PRESSURE

CANISTER PRESSURE	
	-29.5 "Hg
X	0

SAMPLING TIMES

	LOCAL TIME	ELAPSED TIME METER READING
START	16:30	
STOP	17:30	

FLOW RATES

MANIFOLD FLOW RATE	CANISTER FLOW RATE	FLOW CONTROLLER READOUT
	~100 mL/min	

SAMPLING SYSTEM CERTIFICATION DATE:
QUARTERLY RECERTIFICATION DATE:

C. LABORATORY INFORMATION

DATE RECEIVED:
RECEIVED BY:
INITIAL PRESSURE: 0 AP 10/5/92
FINAL PRESSURE: 16
DILUTION FACTOR:
ANALYSIS
GC-FID-ECD DATE:
GC-MSD-SCAN DATE: 10/5/92
GC-MSD-SIM DATE:
RESULTS :

GC-FID-ECD:
GC-MSD-SCAN:
GC-MSD-SIM:

Yusheng Dai
SIGNATURE/TITLE

Run 3 INLET

CANISTER SAMPLING FIELD DATA SHEET

I 4118-3

A. GENERAL INFORMATION

SITE LOCATION: #3 FLARE INLET
SITE ADDRESS: CEDAR HILLS LANDFILL

SAMPLING DATE: 10/1/92

SHIPPING DATE: 10/1/92
CANISTER SERIAL NO. 545
SAMPLER ID: RUN 3 - INLET
OPERATOR: MSM/ERL
CANISTER LEAK CHECK DATE:

B. SAMPLING INFORMATION

TEMPERATURE

	INTERIOR	AMBIENT	MAXIMUM	MINIMUM
START	105	59°F	X	X
STOP	106	61°F		

PRESSURE

CANISTER PRESSURE	
	-29.5 "Hg
X	0

SAMPLING TIMES

	LOCAL TIME	ELAPSED TIME METER READING
START	8:17	
STOP	9:17	

FLOW RATES

MANIFOLD FLOW RATE	CANISTER FLOW RATE	FLOW CONTROLLER READOUT
	~100 ml/s/min	
	✓	

SAMPLING SYSTEM CERTIFICATION DATE:
QUARTERLY RECERTIFICATION DATE:

C. LABORATORY INFORMATION

DATE RECEIVED:
RECEIVED BY:
INITIAL PRESSURE: 0 — GD 10/5/92
FINAL PRESSURE: 15
DILUTION FACTOR:
ANALYSIS
GC-FID-ECD DATE:
GC-MSD-SCAN DATE: 10/5/92 yl
GC-MSD-SIM DATE:
RESULTS :

GC-FID-ECD:
GC-MSD-SCAN:
GC-MSD-SIM:

Gesheng Dai
SIGNATURE/TITLE

CANISTER SAMPLING FIELD DATA SHEET

A. GENERAL INFORMATION

SITE LOCATION: #3 FLARE INLET
SITE ADDRESS: CEDAR HILLS LANDFILL MAPLE VALLEY WA.
SAMPLING DATE: 11/5/92

SHIPPING DATE: 11/5/92
CANISTER SERIAL NO. 490
SAMPLER ID: A-1 INLET. RETEST
OPERATOR: K. ORDON
CANISTER LEAK CHECK DATE:

B. SAMPLING INFORMATION

I4619-1

TEMPERATURE

	INTERIOR	AMBIENT	MAXIMUM	MINIMUM
START	110	70	X	X
STOP	109.	67		

PRESSURE

CANISTER PRESSURE	
	30.0
X	0.0

SAMPLING TIMES

	LOCAL TIME	ELAPSED TIME METER READING
START	11:15	0.0
STOP	12:15	60.0

FLOW RATES

MANIFOLD FLOW RATE	CANISTER FLOW RATE	FLOW CONTROLLER READOUT
	50 cc/min Air	

SAMPLING SYSTEM CERTIFICATION DATE:
QUARTERLY RECERTIFICATION DATE:

C. LABORATORY INFORMATION

DATE RECEIVED:
RECEIVED BY:
INITIAL PRESSURE: 0
FINAL PRESSURE: 13 Psi gl 11/6/92
DILUTION FACTOR:
ANALYSIS
GC-FID-ECD DATE:
GC-MSD-SCAN DATE: 11/6/92 xl
GC-MSD-SIM DATE:
RESULTS :
GC-FID-ECD:
GC-MSD-SCAN:
GC-MSD-SIM:

Goshang Dai
SIGNATURE/TITLE

CANISTER SAMPLING FIELD DATA SHEET

A. GENERAL INFORMATION

SITE LOCATION: #3 FLARE INLET.
SITE ADDRESS: CEDAR HILLS LANDFILL
MAPLE VALLEY WA.
SAMPLING DATE: 11-5-92

SHIPPING DATE:
CANISTER SERIAL NO. 549
SAMPLER ID: R-2 INLET RETEST
OPERATOR: K. Orrow.
CANISTER LEAK CHECK DATE:

B. SAMPLING INFORMATION

TEMPERATURE

	INTERIOR	AMBIENT	MAXIMUM	MINIMUM
START	106	65	X	X
STOP	103	65		

PRESSURE

CANISTER PRESSURE	
	29.5"
X	0.0

I4619-2

SAMPLING TIMES

	LOCAL TIME	ELAPSED TIME METER READING
START	12:20	0.0
STOP	13:20	60.0

FLOW RATES

MANIFOLD FLOW RATE	CANISTER FLOW RATE	FLOW CONTROLLER READOUT
	50cc/mn.	

SAMPLING SYSTEM CERTIFICATION DATE:
QUARTERLY RECERTIFICATION DATE:

C. LABORATORY INFORMATION

DATE RECEIVED:
RECEIVED BY:
INITIAL PRESSURE: 0 — 11/6/92
FINAL PRESSURE: 12 psi
DILUTION FACTOR:
ANALYSIS
GC-FID-ECD DATE:
GC-MSD-SCAN DATE: 11/6/92 GD
GC-MSD-SIM DATE:
RESULTS :

GC-FID-ECD:
GC-MSD-SCAN:
GC-MSD-SIM:

Geosheng Dai
SIGNATURE/TITLE

CANISTER SAMPLING FIELD DATA SHEET

A. GENERAL INFORMATION

SITE LOCATION: #3 FLARE INLET
SITE ADDRESS: CEDAR HILLS LANDFILL
MAPLE VALLEY WA
SAMPLING DATE: 11-5-92

SHIPPING DATE:
CANISTER SERIAL NO. 565
SAMPLER ID: R-3 INLET RETEST
OPERATOR: K. Oliver
CANISTER LEAK CHECK DATE:

B. SAMPLING INFORMATION

I 4619-2

TEMPERATURE

	INTERIOR	AMBIENT	MAXIMUM	MINIMUM
START	104	64	X	X
STOP	101	62		

PRESSURE

CANISTER PRESSURE	
	30.0"
X	0.0"

SAMPLING TIMES

	LOCAL TIME	ELAPSED TIME METER READING
START	13:25	0.0
STOP	14:25	60.0

FLOW RATES

MANIFOLD FLOW RATE	CANISTER FLOW RATE	FLOW CONTROLLER READOUT
	50 cc/min	

SAMPLING SYSTEM CERTIFICATION DATE:
QUARTERLY RECERTIFICATION DATE:

C. LABORATORY INFORMATION

DATE RECEIVED:
RECEIVED BY:
INITIAL PRESSURE: 0
FINAL PRESSURE: 12 PSI
DILUTION FACTOR:
ANALYSIS
GC-FID-ECD DATE:
GC-MSD-SCAN DATE: 11/6/92
GC-MSD-SIM DATE:

GP 11/6/92

RESULTS :

GC-FID-ECD:
GC-MSD-SCAN:
GC-MSD-SIM:

Geshenef Daf
SIGNATURE/TITLE

Run 1 OUTLET

CANISTER SAMPLING FIELD DATA SHEET

I 4118-4

A. GENERAL INFORMATION

SITE LOCATION: # 3 FLARE OUTLET
SITE ADDRESS: CEDAR HILLS LANDFILL Maple Valley, WA
SAMPLING DATE: 9/30/92

SHIPPING DATE: 10/1/92
CANISTER SERIAL NO. 301
SAMPLER ID: [redacted] RUN 1 - OUTLET
OPERATOR: KSM/ERI
CANISTER LEAK CHECK DATE:

B. SAMPLING INFORMATION

TEMPERATURE

	INTERIOR	AMBIENT	MAXIMUM	MINIMUM
START	1661°F	80°F	X	X
STOP	1661°F	80°F		

PRESSURE

CANISTER PRESSURE	
	-29.5" Hg
X	0

SAMPLING TIMES

	LOCAL TIME	ELAPSED TIME METER READING
START	14:15	
STOP	15:15	

FLOW RATES

MANIFOLD FLOW RATE	CANISTER FLOW RATE	FLOW CONTROLLER READOUT
	~100 ml/min	

SAMPLING SYSTEM CERTIFICATION DATE:
QUARTERLY RECERTIFICATION DATE:

C. LABORATORY INFORMATION

DATE RECEIVED:
RECEIVED BY:
INITIAL PRESSURE: -2"
FINAL PRESSURE: 15.5
DILUTION FACTOR:
ANALYSIS
GC-FID-ECD DATE:
GC-MSD-SCAN DATE: 10/5/92
GC-MSD-SIM DATE:

GD 10/5/92

RESULTS :

GC-FID-ECD:
GC-MSD-SCAN:
GC-MSD-SIM:

Geoffrey Dai
SIGNATURE/TITLE

Run 2 OUTLET

CANISTER SAMPLING FIELD DATA SHEET

IC118-5

A. GENERAL INFORMATION

SITE LOCATION: #3 FLARE OUTLET
SITE ADDRESS: CEDAR HILLS LANDFILL Maple Valley, WA
SAMPLING DATE: 9/30/92

SHIPPING DATE: 10/1/92
CANISTER SERIAL NO. 495
SAMPLER ID: RUN 2 - OUTLET
OPERATOR: KSM/ERL
CANISTER LEAK CHECK DATE:

B. SAMPLING INFORMATION

TEMPERATURE

	INTERIOR	AMBIENT	MAXIMUM	MINIMUM
START	1670	74°F	X	X
STOP	1670	74°F		

PRESSURE

	CANISTER PRESSURE
	-29.5"
X	

SAMPLING TIMES

	LOCAL TIME	ELAPSED TIME METER READING
START	16:30	
STOP	17:30	

FLOW RATES

MANIFOLD FLOW RATE	CANISTER FLOW RATE	FLOW CONTROLLER READOUT
	~100 ml/min	
	↓	

SAMPLING SYSTEM CERTIFICATION DATE:
QUARTERLY RECERTIFICATION DATE:

C. LABORATORY INFORMATION

DATE RECEIVED:
RECEIVED BY:
INITIAL PRESSURE: -2.5" GD 10/5/92
FINAL PRESSURE: -11.5"
DILUTION FACTOR:
ANALYSIS
GC-FID-ECD DATE:
GC-MSD-SCAN DATE: 10/5/92 yl
GC-MSD-SIM DATE:
RESULTS :

GC-FID-ECD:
GC-MSD-SCAN:
GC-MSD-SIM:

Geologist Dai
SIGNATURE/TITLE

Run 3 OUTLET

CANISTER SAMPLING FIELD DATA SHEET

IV118-6

A. GENERAL INFORMATION

SITE LOCATION: #3 FLARE OUTLET
SITE ADDRESS: CEDAR HILLS Land Fill

SAMPLING DATE: 10/1/92

SHIPPING DATE: 10/1/92
CANISTER SERIAL NO. 542
SAMPLER ID: RUN 3 OUTLET
OPERATOR: KSM/ERL
CANISTER LEAK CHECK DATE:

B. SAMPLING INFORMATION

TEMPERATURE

	INTERIOR	AMBIENT	MAXIMUM	MINIMUM
START	1645	59°F	X	X
STOP	1645	61°F		

PRESSURE

CANISTER PRESSURE	
	-29.5
X	0

SAMPLING TIMES

	LOCAL TIME	ELAPSED TIME METER READING
START	8:17	
STOP	9:17	

FLOW RATES

MANIFOLD FLOW RATE	CANISTER FLOW RATE	FLOW CONTROLLER READOUT
	~100 mls/min	
	↓	

SAMPLING SYSTEM CERTIFICATION DATE:
QUARTERLY RECERTIFICATION DATE:

C. LABORATORY INFORMATION

DATE RECEIVED:
RECEIVED BY:
INITIAL PRESSURE: -13"
FINAL PRESSURE: 14 GP 10/5/92
DILUTION FACTOR:
ANALYSIS
GC-FID-ECD DATE:
GC-MSD-SCAN DATE: 10/5/92 pl
GC-MSD-SIM DATE:
RESULTS :
GC-FID-ECD:
GC-MSD-SCAN:
GC-MSD-SIM:

Rosheny Dai
SIGNATURE/TITLE

APPENDIX E

Miscellaneous Supporting Information

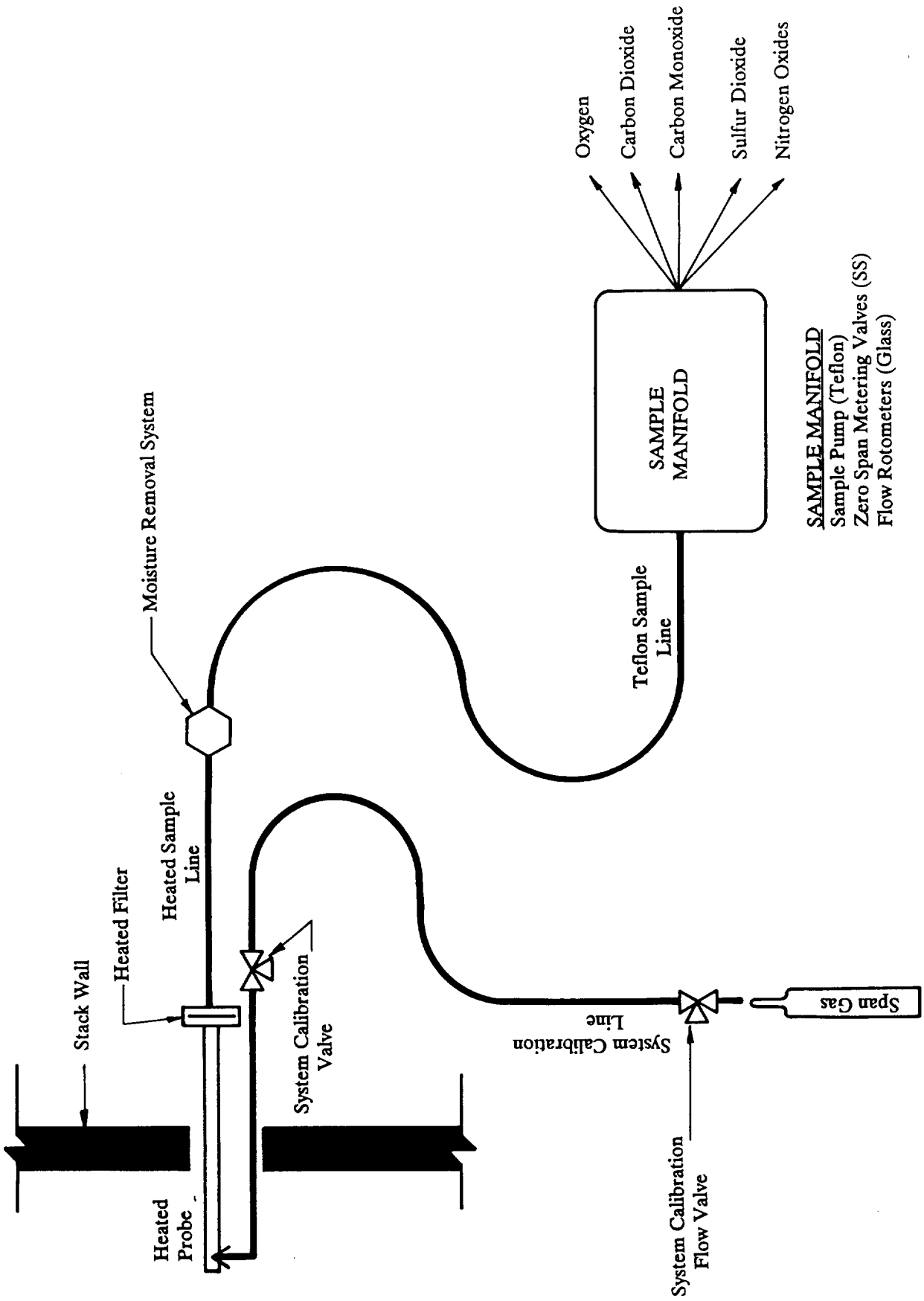

Figure 1 . EPA Method 3A, 6C, 7E and 10 Sample Train

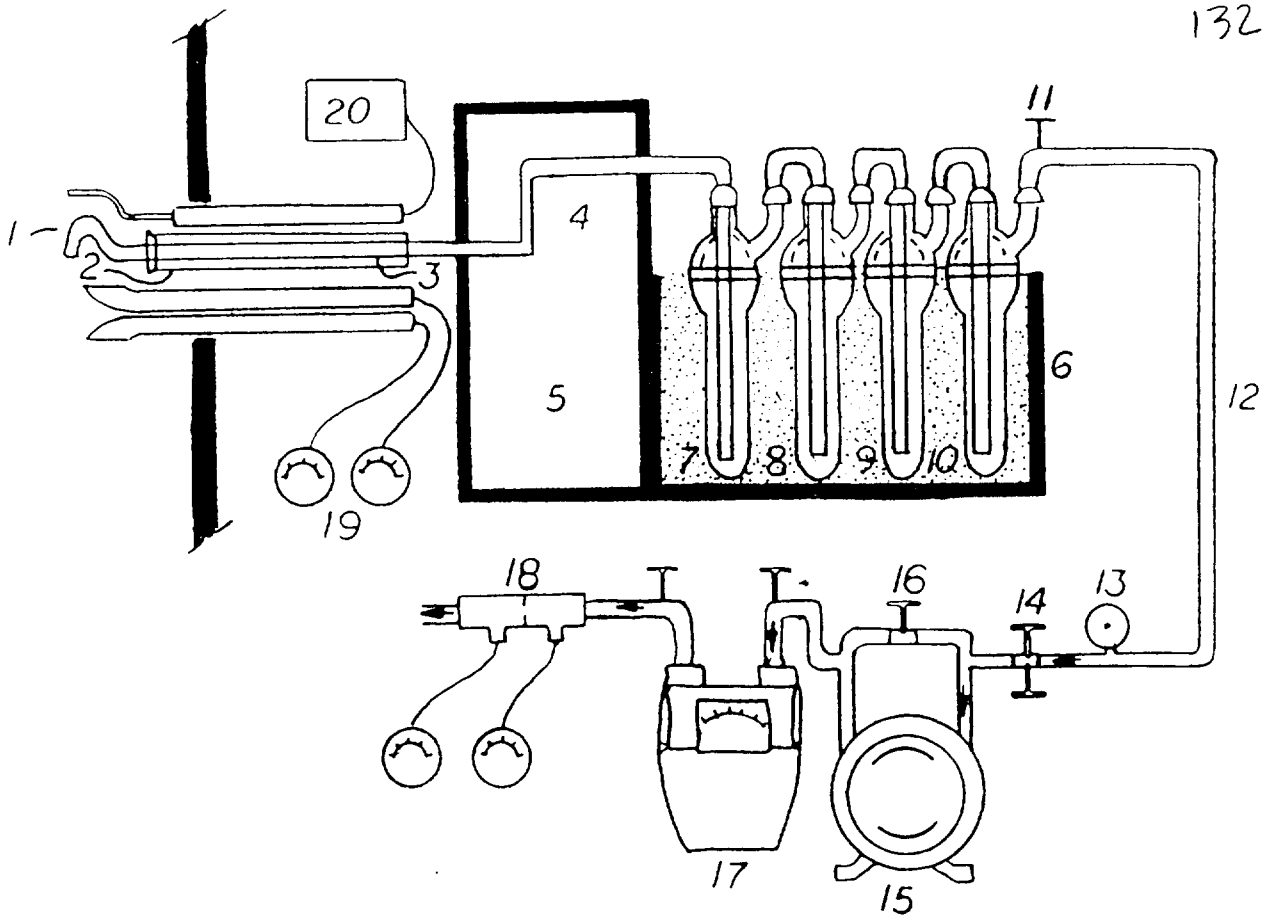

Figure 2. EPA Method 4 Moisture Sample Train.

1. Sampling nozzle
2. Sampling probe sheath
3. Heated sample probe liner
4. Connective glassware
5. Heated compartment
6. Impinger case - contains ice during sampling
7. First impinger containing 100 ml H_2O
8. Modified Greenburg-Smith impinger containing 100 ml H_2O
9. Third impinger - empty
10. Fourth impinger containing indicating silica gel desiccant
11. Impinger exit gas temperature sensor
12. Umbilical cord - vacuum line
13. Vacuum gauge
14. Fine and coarse adjustment valves
15. Leak free pump
16. By-pass valve
17. Dry gas meter with inlet and outlet temperature sensors
18. Orifice meter with magnehelic gauges
19. S-type pitot tube with magnehelic gauges
20. Fluke multi-channel digital thermocouple indicator

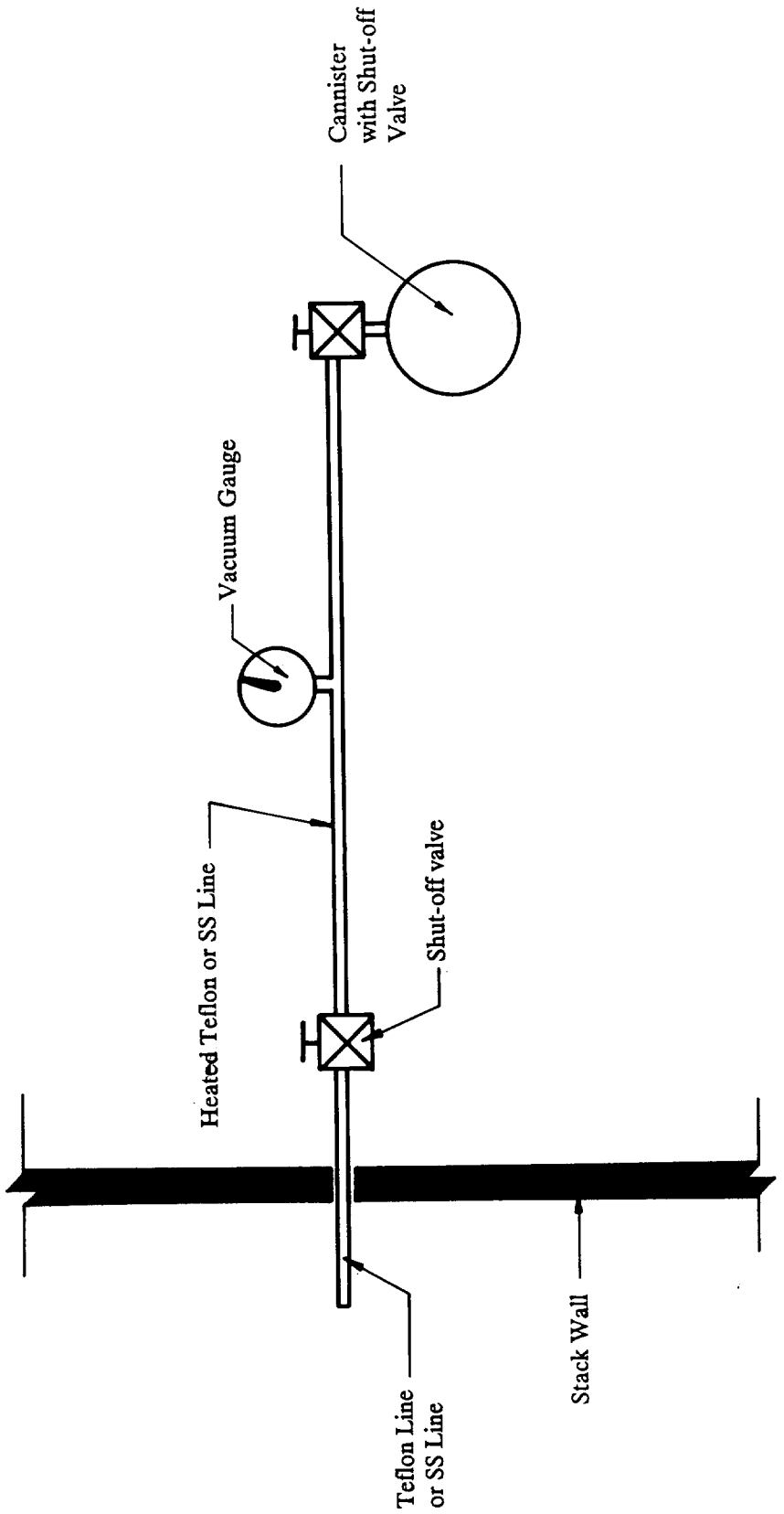

Figure 3. TO-14 Sample System Schematic

METHOD 1 - LOCATION OF TRAVERSE POINTS

Circular Stacks

TRAVERSE POINT	DISTANCE, % of diameter
1	4.4
2	14.7
3	29.5
4	70.5
5	85.3
6	95.6

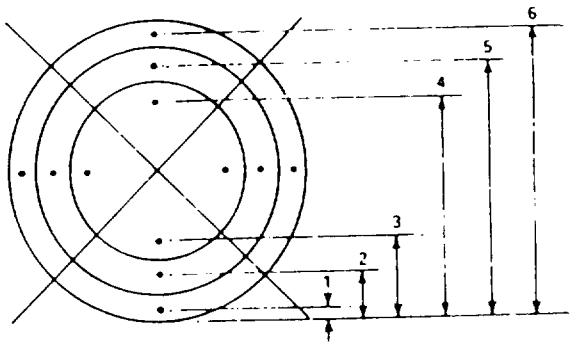

Figure 1-3. Example showing circular stack cross section divided into 12 equal areas, with location of traverse points indicated.

TABLE 1-2. LOCATION OF TRAVERSE POINTS IN CIRCULAR STACKS

(Percent of stack diameter from inside wall to traverse point)

Traverse point number on a diameter	Number of traverse points on a diameter—											
	2	4	6	8	10	12	14	16	18	20	22	24
1	14.6	6.7	4.4	3.2	2.6	2.1	1.8	1.6	1.4	1.3	1.1	1.1
2	85.4	25.0	14.6	10.5	8.2	6.7	5.7	4.9	4.4	3.9	3.5	3.2
3		75.0	29.6	19.4	14.6	11.8	9.9	8.5	7.5	6.7	6.0	5.5
4		93.3	70.4	32.3	22.6	17.7	14.6	12.5	10.9	9.7	8.7	7.9
5			85.4	67.7	34.2	25.0	20.1	16.9	14.6	12.9	11.6	10.5
6			95.6	80.6	65.8	35.6	26.9	22.0	18.8	16.5	14.6	13.2
7				89.5	77.4	64.4	36.6	28.3	23.6	20.4	18.0	16.1
8				96.8	85.4	75.0	63.4	37.5	29.6	25.0	21.8	19.4
9					91.8	82.3	73.1	62.5	38.2	30.6	26.2	23.0
10					97.4	88.2	79.9	71.7	61.8	38.8	31.5	27.2
11						93.3	85.4	78.0	70.4	61.2	39.3	32.3
12						97.9	90.1	83.1	76.4	69.4	60.7	39.8
13							94.3	87.5	81.2	75.0	68.5	60.2
14							98.2	91.5	85.4	79.6	73.8	67.7
15								95.1	89.1	83.5	78.2	72.8
16								98.4	92.5	87.1	82.0	77.0
17									95.6	90.3	85.4	80.6
18									98.6	93.3	88.4	83.9

Rectangular Stacks

For a rectangular cross section, an equivalent diameter (D_e) shall be calculated from the following equation, to determine the upstream and downstream distances:

$$D_e = \frac{2LW}{(L+W)}$$

where L=length and W=width.

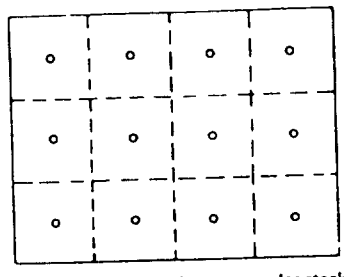

Figure 1-4. Example showing rectangular stack cross section divided into 12 equal areas, with a traverse point at centroid of each area.

METHOD 1 - MINIMUM NUMBER OF TRAVERSE POINTS

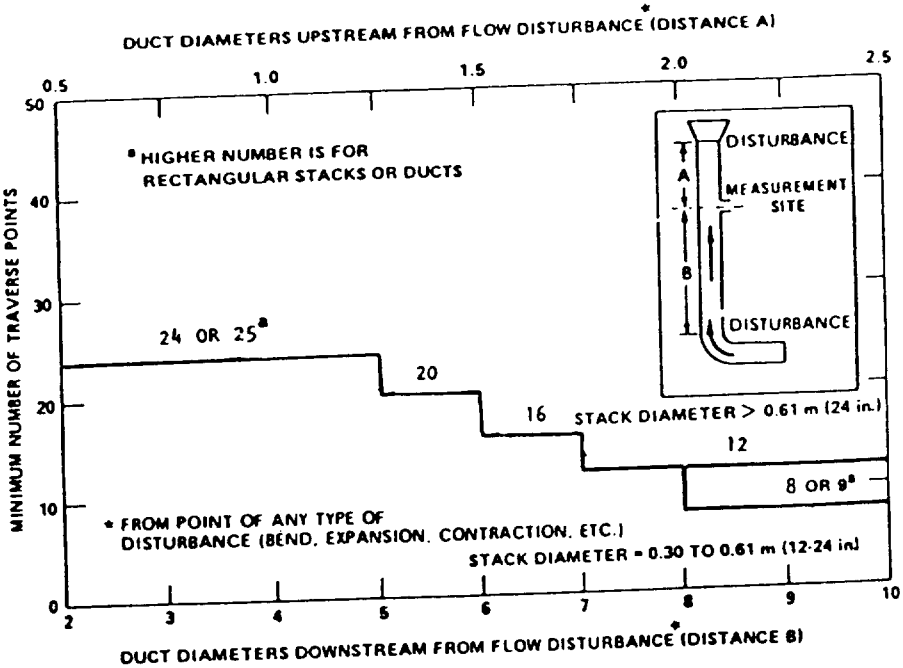

Figure 1-1. Minimum number of traverse points for particulate traverses.

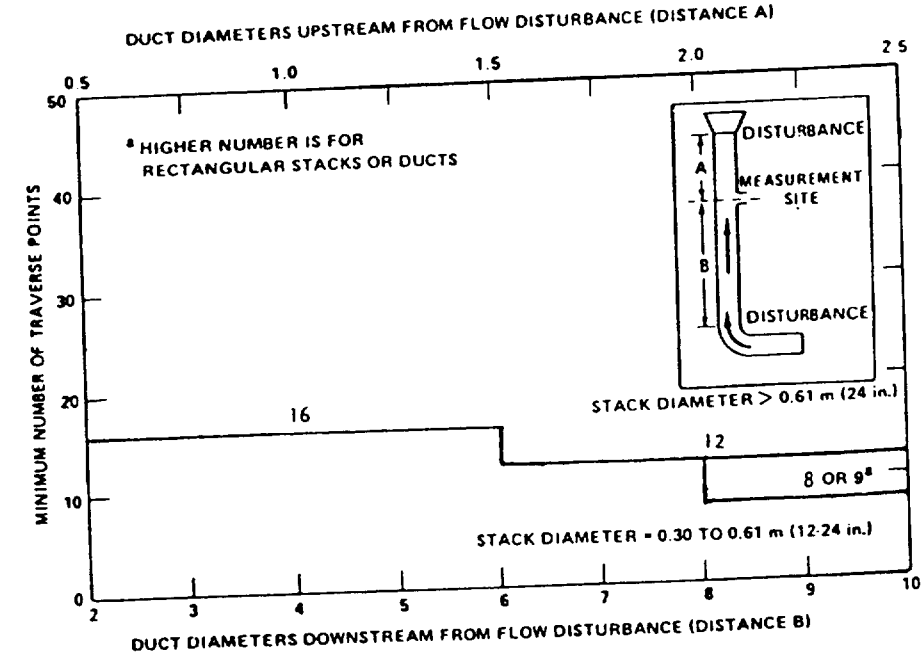

Figure 1-2. Minimum number of traverse points for velocity (nonparticulate) traverses.

METHOD 2 - STACK GAS VELOCITY AND VOLUMETRIC FLOW CALCULATIONS

5.1 Nomenclature.

A = Cross-sectional area of stack, m^2 (ft^2).
B_{ws} = Water vapor in the gas stream (from Method 5 or Reference Method 4), proportion by volume.
C_p = Pitot tube coefficient, dimensionless.
K_p = Pitot tube constant,

$$34.97 \frac{m}{sec}\left[\frac{(g/g\text{-mole})(mm\ Hg)}{(°K)(mm\ H_2O)}\right]^{1/2}$$

for the metric system and

$$85.49 \frac{ft}{sec}\left[\frac{(lb/lb\text{-mole})(in.\ Hg)}{(°R)(in.\ H_2O)}\right]^{1/2}$$

for the English system.

M_d = Molecular weight of stack gas, dry basis (see Section 3.6) g/g-mole (lb/lb-mole).
M_s = Molecular weight of stack gas, wet basis, g/g-mole (lb/lb-mole).

$$= M_d(1-B_{ws}) + 18.0\ B_{ws} \qquad \text{Eq. 2-5}$$

P_{bar} = Barometric pressure at measurement site, mm Hg (in. Hg).
P_g = Stack static pressure, mm Hg (in. Hg).
P_s = Absolute stack gas pressure, mm Hg (in. Hg).

$$= P_{bar} + P_g \qquad \text{Eq. 2-6}$$

P_{std} = Standard absolute pressure, 760 mm Hg (29.92 in. Hg).
Q_{std} = Dry volumetric stack gas flow rate corrected to standard conditions, dscm/hr (dscf/hr).
t_s = Stack temperature, °C (°F).
T_s = Absolute stack temperature, °K, (°R).

$$= 273 + t_s \text{ for metric.} \qquad \text{Eq. 2-7}$$

$$= 460 + t_s \text{ for English.} \qquad \text{Eq. 2-8}$$

T_{std} = Standard absolute temperature, 293 °K (528° R).
v_s = Average stack gas velocity, m/sec (ft/sec).
Δ_p = Velocity head of stack gas, mm H_2O (in. H_2O).
3,600 = Conversion factor, sec/hr.
18.0 = Molecular weight of water, g/g-mole (lb/lb-mole).

5.2 Average Stack Gas Velocity.

$$v_s = K_p C_p (\sqrt{\Delta p})_{avg} \sqrt{\frac{T_{s(avg)}}{P_s M_s}} \qquad \text{Equation 2-9}$$

5.3 Average Stack Gas Dry Volumetric Flow Rate.

$$Q_{std} = 3{,}600(1-B_{ws}) v_s A \left(\frac{T_{std}}{T_{s\ (avg)}}\right)\left(\frac{P_s}{P_{std}}\right) \qquad \text{Eq. 2-10}$$

METHOD 3 - MOLECULAR WEIGHT AND EXCESS AIR CALCULATIONS

6.1 Nomenclature.

M_d = Dry molecular weight, g/g-mole (lb/lb-mole).
%EA = Percent excess air.
$\%CO_2$ = Percent CO_2 by volume (dry basis).
$\%O_2$ = Percent O_2 by volume (dry basis).
%CO = Percent CO by volume (dry basis).
$\%N_2$ = Percent N_2 by volume (dry basis).
0.264 = Ratio of O_2 to N_2 in air, v/v.
0.280 = Molecular weight of N_2 or CO, divided by 100.
0.320 = Molecular weight of O_2 divided by 100.
0.440 = Molecular weight of CO_2 divided by 100.

6.2 Percent Excess Air. Calculate the percent excess air (if applicable), by substituting the appropriate values of percent O_2, CO, and N_2 (obtained from Section 4.1.3 or 4.2.4) into Equation 3-1.

$$\%\ EA = \frac{\%O_2 - 0.5\%\ CO}{0.264\%\ N_2(\%O_2 - 0.5\%\ CO)} \times 100 \qquad \text{Eq. 3-1}$$

NOTE: The equation above assumes that ambient air is used as the source of O_2 and that the fuel does not contain appreciable amounts of N_2 (as do coke oven or blast furnace gases). For those cases when appreciable amounts of N_2 are present (coal, oil, and natural gas do not contain appreciable amounts of N_2) or when oxygen enrichment is used, alternate methods, subject to approval of the Administrator, are required.

6.3 Dry Molecular Weight. Use Equation 3-2 to calculate the dry molecular weight of the stack gas

$$M_d = 0.440(\%CO_2) + 0.320(\%O_2) + 0.280(\%N_2 + \%CO) \qquad \text{Eq. 3-2}$$

METHOD 4 - STACK GAS MOISTURE CALCULATIONS

2.3.1 Nomenclature.

B_{ws} = Proportion of water vapor, by volume, in the gas stream.

M_w = Molecular weight of water, 18.0 g/g-mole (18.0 lb/lb-mole).

P_m = Absolute pressure (for this method, same as barometric pressure) at the dry gas meter, mm Hg (in. Hg).

P_{std} = Standard absolute pressure, 760 mm Hg (29.92 in. Hg).

R = Ideal gas constant, 0.06236 (mm Hg) (m^3)/(g-mole) (°K) for metric units and 21.85 (in. Hg) (ft^3)/(lb-mole) (°R) for English units.

T_m = Absolute temperature at meter, °K (°R).

T_{std} = Standard absolute temperature, 293° K (528°R).

V_m = Dry gas volume measured by dry gas meter, dcm (dcf).

ΔV_m = Incremental dry gas volume measured by dry gas meter at each traverse point, dcm (dcf).

$V_{m(std)}$ = Dry gas volume measured by the dry gas meter, corrected to standard conditions, dscm (dscf).

$V_{wc(std)}$ = Volume of water vapor condensed corrected to standard conditions, scm (scf).

$V_{wg(std)}$ = Volume of water vapor collected in silica gel corrected to standard conditions, scm (scf).

V_f = Final volume of condenser water, ml.

V_i = Initial volume, if any, of condenser water, ml.

W_f = Final weight of silica gel or silica gel plus impinger, g.

W_i = Initial weight of silica gel or silica gel plus impinger, g.

Y = Dry gas meter calibration factor.

ρ_w = Density of water, 0.9982 g/ml (0.002201 lb/ml).

2.3.2 Volume of Water Vapor Condensed.

$$V_{wc(std)} = \frac{(V_f - V_i)\rho_w R T_{std}}{P_{std} M_w}$$

$$= K_1 (V_f - V_i)$$

Eq. 4-1

K_1 = 0.001333 m^3/ml for metric units
= 0.04707 ft^3/ml for English units

2.3.3 Volume of Water Vapor Collected in Silica Gel.

$$V_{wg(std)} = \frac{(W_f - W_i) R T_{std}}{P_{std} M_w}$$

$$= K_2 (W_f - W_i)$$

Eq. 4-2

Where:

K_2 = 0.001335 m^3/g for metric units
= 0.04715 ft^3/g for English units

2.3.4 Sample Gas Volume.

$$V_{m(std)} = V_m Y \frac{(P_m)(T_{std})}{(P_{std})(T_m)}$$

$$= K_3 Y \frac{V_m P_m}{T_m}$$

Eq. 4-3

Where:

K_3 = 0.3858 °K/mm Hg for metric units
= 17.64 °R/in. Hg for English units

NOTE: If the post-test leak rate (Section 2.2.6) exceeds the allowable rate, correct the value of V_m in Equation 4-3, as described in Section 6.3 of Method 5.

2.3.5 Moisture Content.

$$B_{ws} = \frac{V_{wc(std)} + V_{wg(std)}}{V_{wc(std)} + V_{wg(std)} + V_{m(std)}}$$

Eq. 4-4

NOTE: In saturated or moisture droplet-laden gas streams, two calculations of the moisture content of the stack gas shall be made, one using a value based upon the saturated conditions (see Section 1.2), and another based upon the results of the impinger analysis. The lower of these two values of B_{ws} shall be considered correct.

NOMENCLATURE
METHOD 5 CALCULATIONS

Vm_{std} = Volume of gas sample measured by the dry gas meter, corrected to standard conditions, dscm (dscf).

Y = Dry gas meter calibration factor

P_b = Barometric pressure at the sampling site, mm Hg (in. Hg)

H = Average pressure differential across the orifice meter, mm H_2O (in. H_2O)

T_m = Absolute average dry gas meter temperature, ° K (° R)

dscm = Dry standard cubic meters

dscf = Dry standard cubic feet

W_a = Weight of residue in acetone wash

M_a = Mass of residue of acetone after evaporation, mg

C_a = Acetone blank residue concentration, mg/g

V_a = Volume of acetone blank

V_{aw} = Volume of acetone used in wash, ml

M_n = Total amount of particulate matter collected, mg

C_s = Concentration of particulate matter in stack gas, dry basis, corrected to standard conditions, mg/dscm (gr/dscf)

gr/dscf = grains per dry standard cubic foot

Vw_{std} = Volume of water vapor in the gas sample, corrected to standard conditions, scm (scf)

B_{ws} = Water vapor in the gas stream, proportion by volume

M_d = Molecular weight of stack gas, g/g-mole on dry basis

M_s = Molecular weight of stack gas, g/g-mole on wet basis

V_s = Stack gas velocity, calculated by Method 2, Equation 2-9, using data obtained from Method 5, m/sec (ft/sec)

C_p = Pitot tube coefficient, dimensionless

Δ_p = Velocity head of stack gas, mm H_2O (in. H_2O)

P_s = Absolute stack gas pressure, mm Hg (in. Hg)

NOMENCLATURE (continued)
METHOD 5 CALCULATIONS

Q_{std} = Dry volumetric stack gas flow rate corrected to standard conditions, dscm/hr (dscf/hr)

dscf/min = dry standard cubic feet per minute (also identified as dcfm or scfm)

acfm = actual cubic feet per minute

I = Percent of isokinetic sampling

A_n = Cross-sectional area of nozzle, m^2 (ft^2)

Exhibit 1

COAST - TO - COAST ANALYTICAL SERVICES

Air, Water & Hazardous Waste Sampling, Analysis & Consultation
Certified Hazardous Waste, Chemistry, Bacteriology & Bioassay Laboratories

141 Suburban Road	San Luis Obispo, CA 93401	(805) 543-2553	Fax (805) 543-2685
751 S. Kellogg, Suite A	Goleta, CA 93117	(805) 964-7838	Fax (805) 967-4386
1885 North Kelly Road	Napa, CA 94558	(707) 257-7211	Fax (707) 226-1001
9333 Tech Center Dr., Ste. 800	Sacramento, CA 95826	(916) 368-1333	Fax (916) 362-2484
2400 Cumberland Dr.	Valparaiso, Indiana 46383	(219) 464-2389	Fax (219) 462-2953

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Lab Number : G-4000-4
Project : TEST PROJECT

CLIENT: ATTN:
Coast-to-Coast Analytical Services
141 Suburban Rd. Ste. C-4
San Luis Obispo, CA 93401

Analyzed : 11/05/90
Analyzed by: PI
Method : EPA TO-14

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED	DATE RECEIVED
Zero Air Blank	Air	A. Sampler	11/03/90	11/03/90

CONSTITUENT	(CAS RN)	*PQL µg/cu M	RESULT µg/cu M	NOTE
1,1-Dichloroethene	(75354)	0.5	Not Found	
cis-1,2-Dichloroethene	(156694)	0.5	Not Found	
trans-1,2-Dichloroethene	(156605)	0.5	Not Found	
Dichloromethane	(75092)	5.	Not Found	
1,2-Dichloropropane	(78875)	0.5	Not Found	
cis-1,3-Dichloropropene	(10061015)	0.5	Not Found	
trans-1,3-Dichloropropene	(10061026)	0.5	Not Found	
Ethylbenzene	(100411)	1.	Not Found	
2-Hexanone	(591786)	0.5	Not Found	
4-Methyl-2-Pentanone (MIBK)	(108101)	0.5	Not Found	
Styrene	(100425)	1.	Not Found	
1,1,2,2-Tetrachloroethane	(79345)	1.	Not Found	
Tetrachloroethene (PCE)	(127184)	1.	Not Found	
Toluene	(108883)	1.	Not Found	
1,1,1-Trichloroethane (TCA)	(71556)	1.	Not Found	
1,1,2-Trichloroethane	(79005)	1.	Not Found	
Trichloroethene (TCE)	(79016)	0.5	Not Found	
Trichlorofluoromethane (F-11)	(75694)	1.	Not Found	
Trichlorotrifluoroethane (F-113)	(76131)	2.	Not Found	
Vinyl Acetate	(108054)	5.	Not Found	
Vinyl Chloride	(75014)	0.5	Not Found	
Xylenes, Total		1.	Not Found	
Percent Surrogate Recovery			100.	

RESULTS listed as 'Not Found' would have been reported if present at or above the listed PQL
* Practical Quantitation Limit

11/28/90

LRH/lrh/pi

Respectfully submitted,
COAST-TO-COAST ANALYTICAL SERVICES, INC.

Gesheng Dai, Ph.D., Group Leader

Laurence R. Hilpert, Ph.D.
Vice President

Exhibit 1

COAST · TO · COAST ANALYTICAL SERVICES

Air, Water & Hazardous Waste Sampling, Analysis & Consultation
Certified Hazardous Waste, Chemistry, Bacteriology & Bioassay Laboratories

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1885 North Kelly Road	Napa, CA 94558	(707) 257-7211	Fax (707) 226-1001
9333 Tech Center Dr., Ste. 800	Sacramento, CA 95826	(916) 368-1333	Fax (916) 362-2484
2400 Cumberland Dr.	Valparaiso, Indiana 46383	(219) 464-2389	Fax (219) 462-2953

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CLIENT: ATTN:
Coast-to-Coast Analytical Services
141 Suburban Rd. Ste. C-4
San Luis Obispo, CA 93401

Lab Number : G-4000-4
Project : TEST PROJECT

Analyzed : 11/05/90
Analyzed by: PI
Method : EPA TO-14

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED	DATE RECEIVED
Zero Air Blank	Air	A. Sampler	11/03/90	11/03/90

CONSTITUENT	(CAS RN)	*PQL µg/cu M	RESULT µg/cu M	NOTE
VOLATILE ORGANICS BY EPA TO-14				1
Acetone	(67641)	2.	Not Found	
Benzene	(71432)	0.5	Not Found	
Bromodichloromethane	(75274)	1.	Not Found	
Bromomethane (Methyl Bromide)	(74839)	1.	Not Found	
Bromoform	(75252)	1.	Not Found	
1,3-Butadiene	(106990)	0.2	Not Found	
2-Butanone (MEK)	(78933)	0.5	Not Found	
Carbon Disulfide	(75150)	1.	Not Found	
Carbon Tetrachloride	(56235)	1.	Not Found	
Chlorobenzene	(108907)	0.5	Not Found	
Chloroethane (Ethyl Chloride)	(75003)	0.5	Not Found	
2-Chloroethyl Vinyl Ether	(110758)	5.	Not Found	
Chloroform	(67663)	0.5	Not Found	
Chloromethane (Methyl Chloride)	(74873)	0.2	Not Found	
Dibromochloromethane	(124381)	1.	Not Found	
1,2-Dibromoethane (EDB)	(106934)	1.	Not Found	
1,2-Dichlorobenzene	(95501)	1.	Not Found	
1,3-Dichlorobenzene	(541731)	1.	Not Found	
1,4-Dichlorobenzene	(106467)	1.	Not Found	
1,1-Dichloroethane	(75343)	0.5	Not Found	
1,2-Dichloroethane (EDC)	(107062)	0.5	Not Found	

RESULTS listed as 'Not Found' would have been reported if present at or above the listed PQL
* Practical Quantitation Limit
(1) Canister was received under vacuum at -X in. Hg and pressurized to Y psig with He.

11/28/90

LRH/lrh/pi

Respectfully submitted,
COAST-TO-COAST ANALYTICAL SERVICES, INC.

Gesheng Dai, Ph.D., Group Leader

Laurence R. Hilpert, Ph.D.
Vice President

Exhibit 2

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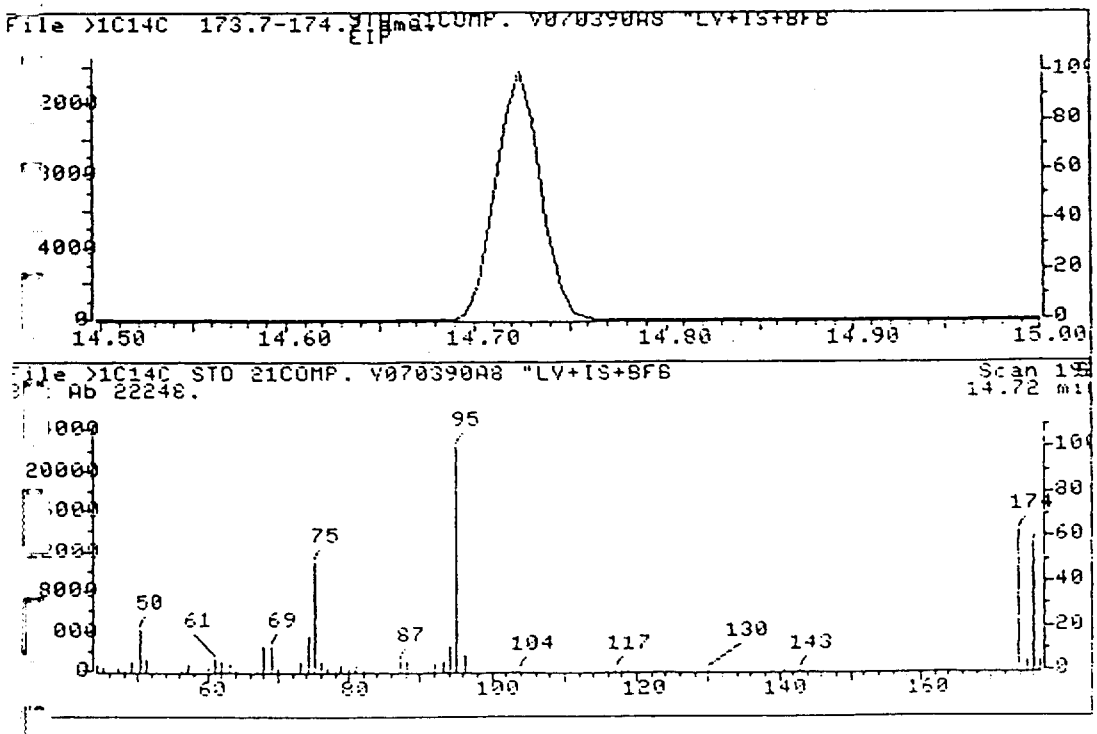
GC/MS PERFORMANCE STANDARD

Bromofluorobenzene (BFB)

m/z	Ion Abundance Criteria	% Relative Abundance Base Peak	% Relative Abundance Appropriate Peak	Status
50	15-40% of mass 95	18.88	18.88	Ok
75	30-60% of mass 95	48.95	48.95	Ok
95	Base peak, 100% relative abundance	100.00	100.00	Ok
96	5-9% of mass 95	6.84	6.84	Ok
173	Less than 2% of mass 174	0.00	0.00	Ok
174	Greater than 50% of mass 95	62.16	62.16	Ok
175	5-9% of mass 174	4.32	6.96	Ok
176	95-101% of mass 174	59.99	96.51	Ok
177	5-9% of mass 176	3.97	6.62	Ok

Injection Date: 03/28/91
Injection Time: 20:12
Data File: >1C14C
Scan: 1923

ok
GD
3/29/91



COAST - TO - COAST ANALYTICAL SERVICES

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Certified Hazardous Waste, Chemistry, Bacteriology & Bioassay Laboratories

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9333 Tech Center Dr., Ste. 800	Sacramento, CA 95826	(916) 368-1333	Fax (916) 362-2484
2400 Cumberland Dr.	Valparaiso, Indiana 46383	(219) 464-2389	Fax (219) 462-2953

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CLIENT: Coast-to-Coast Analytical Services
141 Suburban Rd. Ste. C-4
San Luis Obispo, CA 93401

QC Batch ID: HC20M1

Analyzed : 03/20/91
Analyzed by: EA
Method : EPA TO-14

QC SPIKE
REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED DATE RECEIVED
QC SPIKE	Air		

CONSTITUENT	*PQL µg/cu M	SPIKE AMOUNT	RESULT µg/cu M	%REC	NOTE
VOLATILE ORGANICS PLUS ALL IDENTIFIABLE PEAKS					1
Acetone	2.		NS		
Benzene	0.5	17.	16.	94.	
Bromodichloromethane	1.		NS		
Bromomethane (Methyl Bromide)	1.		NS		
Bromoform	1.		NS		
1,3-Butadiene	0.2		NS		
2-Butanone (MEK)	0.5		NS		
Carbon Disulfide	1.		NS		
Carbon Tetrachloride	1.	34.	32.	94.	
Chlorobenzene	0.5	25.	25.	100.	
Chloroethane (Ethyl Chloride)	0.5		NS		
2-Chloroethyl Vinyl Ether	5.		NS		
Chloroform	0.5		NS		
Chloromethane (Methyl Chloride)	0.2		NS		
Dibromochloromethane	1.		NS		
1,2-Dibromoethane (EDB)	1.	40.	46.	115.	
1,2-Dichlorobenzene	1.		NS		
1,3-Dichlorobenzene	1.		NS		
1,4-Dichlorobenzene	1.		NS		
1,1-Dichloroethane	0.5		NS		
1,2-Dichloroethane (EDC)	0.5	22.	22.	100.	

CCAS is Certified by CA Department of Health Services: Laboratory #131
* RESULTS listed as 'NS' were not spiked. PQL = Practical Quantitation Limit
(1) Zero Air spiked with NIST SRM 1804.

03/22/91
MSD1/1B47C
LRH/ge
H1102-1

Exhibit 3

COAST - TO - COAST ANALYTICAL SERVICES

Air, Water & Hazardous Waste Sampling, Analysis & Consultation
Certified Hazardous Waste, Chemistry, Bacteriology & Bioassay Laboratories

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141 Suburban Road	San Luis Obispo, CA 93401	(805) 543-2553	Fax (805) 543-2685
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QC Batch ID: HC20M1

CLIENT: Coast-to-Coast Analytical Services
141 Suburban Rd. Ste. C-4
San Luis Obispo, CA 93401

Analyzed : 03/20/91
Analyzed by: EA
Method : EPA TO-14

QC SPIKE
REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED DATE RECEIVED
QC SPIKE	Air		

CONSTITUENT	*PQL µg/cu M	SPIKE AMOUNT	RESULT µg/cu M	%REC	NOTE
1,1-Dichloroethene	0.5		NS		
cis-1,2-Dichloroethene	0.5		NS		
trans-1,2-Dichloroethene	0.5		NS		
Dichloromethane	5.	19.	19.	100.	
1,2-Dichloropropane	0.5	25.	23.	92.	
cis-1,3-Dichloropropene	0.5		NS		
trans-1,3-Dichloropropene	0.5		NS		
Ethylbenzene	1.	22.	21.	95.	
2-Hexanone	0.5		NS		
4-Methyl-2-Pentanone (MIBK)	0.5		NS		
Styrene	1.		NS		
1,1,2,2-Tetrachloroethane	1.		NS		
Tetrachloroethene (PCE)	1.	37.	39.	105.	
Toluene	1.	20.	18.	90.	
1,1,1-Trichloroethane (TCA)	1.	30.	30.	100.	
1,1,2-Trichloroethane	1.		NS		
Trichloroethene (TCE)	0.5		NS		
Trichlorofluoromethane (F-11)	1.		NS		
Trichlorotrifluoroethane (F-113)	2.		NS		
Vinyl Acetate	5.		NS		
Vinyl Chloride	0.5	15.	17.	113.	
Xylenes, Total	1.	24.	22.	92.	
Percent Surrogate Recovery		114.	117.		

CCAS is Certified by CA Department of Health Services: Laboratory #131
* RESULTS listed as 'NS' were not spiked. PQL = Practical Quantitation Limit

03/22/91
MSD1/1B47C
LRH/ge
H1102-1

Respectfully submitted,
COAST-TO-COAST ANALYTICAL SERVICES, INC.

Gesheng Dai

Gesheng Dai, Ph.D., Group Leader

Laurence R. Hilpert, Ph.D.
Vice President

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2400 Cumberland Dr.	Valparaiso, Indiana 46383	(219) 464-2389	Fax (219) 462-2953

CANISTER SAMPLING FIELD DATA SHEET

A. GENERAL INFORMATION

SITE LOCATION: _____
SITE ADDRESS: _____
_____
_____
SAMPLING DATE: _____

SHIPPING DATE: _____
CANISTER SERIAL NO.: _____
SAMPLER ID: _____
OPERATOR: _____
CANISTER LEAK CHECK DATE: _____

B. SAMPLING INFORMATION

TEMPERATURE

	INTERIOR	AMBIENT	MAXIMUM	MINIMUM
START				
STOP				

PRESSURE

CANISTER PRESSURE	

SAMPLING TIMES

	LOCAL TIME	ELAPSED TIME METER READING
START		
STOP		

FLOW RATES

MANIFOLD FLOW RATE	CANISTER FLOW RATE	FLOW CONTROLLER READOUT

SAMPLING SYSTEM CERTIFICATION DATE: _____
QUARTERLY RECERTIFICATION DATE: _____

C. LABORATORY INFORMATION

DATE RECEIVED: _____
RECEIVED BY: _____
INITIAL PRESSURE: _____
FINAL PRESSURE: _____
DILUTION FACTOR: _____
ANALYSIS
GC-FID-ECD DATE: _____
GC-MSD-SCAN DATE: _____
GC-MSD-SIM DATE: _____
RESULTS*: _____
_____
GC-FID-ECD: _____
GC-MSD-SCAN: _____
GC-MSD-SIM: _____

_____
SIGNATURE/TITLE

* ATTACH DATA SHEETS

AMTEST
AIR QUALITY, INC.

DRY GAS METER CALIBRATION
AM TEST - AIR QUALITY, INC.

FILE NAME: SILVR592
METER BOX #: SILVER ANDERSON BOX
CALIBRATION DATE: MAY 19, 1992
METHOD OF CALIB.: STANDARD DRY GAS METER (Method 5 Section 7.1)

TOTAL TIME min	DELTA H "H2O	METER VOL V1 cf	METER VOL V2 cf	TEMP IN deg F	TEMP OUT deg F	BARO. PRES. "Hg	STD DGM V1	STD DGM V2	ST.DGM TEMP IN deg F	ST.DGM TEMP OUT deg F	ST.DGM Yds FACTOR	Y FACTOR	DELTA H@
10.286	1.0	173.330	178.943	69.5	68.0	29.25	571.300	576.700	66.0	65.0	1.014	0.9791	2.000
10.425	1.5	180.291	187.227	71.0	68.5	29.25	578.000	584.700	66.0	66.0	1.014	0.9828	2.004
10.373	2.0	189.398	197.362	73.0	69.5	29.25	586.800	594.500	66.0	66.0	1.014	0.9852	1.999
10.406	2.5	199.535	208.514	74.5	70.5	29.25	596.600	605.300	66.0	66.0	1.014	0.9884	1.966
AVERAGE												0.984	1.992

TYPE S PITOT TUBE INSPECTION DATA FORM

Date 4/15/92 Pitot Tube # P8A

Client King County Solid Waste @ Cedar Hills Landfill

Location Maple Valley, Washington

Site(s) Flare #3 Outlet

Test Date(s) September 30 - October 1, 1992

Pitot tube assembly level? X yes _____ no

Pitot tube openings damaged? _____ yes (explain below) X no

α_1 = 2 ° (<10°), α_2 = 3 ° (<10°), β_1 = 2 ° (<5°),

β_2 = 3 ° (<5°)

γ = 4 °, θ = 1 °, A = 1.13 cm (in.)

z = A sin γ = 0.08 cm (in.); <0.32 cm (<1/8 in.),

w = A sin θ = 0.02 cm (in.); <.08 cm (<1/32 in.)

P_A 0.56 cm (in.) P_b 0.57 cm (in.)

D_t = 0.380 cm (in.)

Comments:

_____

_____

_____

Calibration required? _____ yes* X no

*If yes, tag and take out of service until repaired.

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

Date 3/15/92 Thermocouple Indicator # Blue KAH

Ambient Temperature 55 °F Barometric Pressure 29.59 in Hg

THERMOCOUPLE # OR REFERENCE	REFERENCE THERMOMETER TEMPERATURE °F	THERMOCOUPLE TEMPERATURE °F	TEMPERATURE DIFFERENCE °F	TEMPERATURE DIFFERENCE %
T8-1	215	215	Ø	Ø
	60	60	Ø	Ø
	32	32	Ø	Ø

$$\frac{(\text{ref temp, °F} + 460) - (\text{test therm. temp, °F} + 460)}{(\text{ref temp, °F} + 460)} * 100 \leq 1.5\%$$

721AT2 ANALYZER DATA

S/N 90 -721AT2 -7722

CUSTOMER: AMTEST INC

LOCATION: WASH.

P.O. #: 0976

CALIBRATION

CELL LENGTH 35.0 cm
CALIBRATION PRESSURE 760 mm Hg
CALIBRATION TEMP. 25 °C + 273 = 298 °K
MOLAR ABSORBTIVITY CONSTANT "k" 258

ELECTRONIC SPAN VALUE 809 ppm
SCALING RATIO 2mV/ppm

	RANGE 1	RANGE 2
FULL SCALE	200 ppm	2000 ppm
LOW OUTPUT	0.1 VDC	0.1 VDC
HIGH OUTPUT	1.0 VDC	1.0 VDC
V/I	- mA	— mA

LAMP TYPE SMG15MB
PMT TYPE R928HA

MEASURING PMT S/N 1A0361
REFERENCE PMT S/N YC6031

MEASURING FILTER WAVELENGTH 285 nM S/N 89-12
REFERENCE FILTER WAVELENGTH 585 nM S/N 90-04

PRIMARY OUTPUT CARD

TJ1 (DPM)	0.00	Vdc
TJ2 (AGC1)	3.49	Vdc
TJ3 (AGC2)	3.56	Vdc
TJ4 (I_{avg})	4.00	Vdc
TJ5 (M1)	9.00	Vdc
TJ6 (M2)	7.98	Vdc
TJ7 (M1B)	4.51	Vdc
TJ8 (M2B)	4.50	Vdc
TJ9 (OPACITY)	0.00	Vdc

JUMPERS

JH1	A	(B)	C	
JH2	A	(B)	C	D
JH3	A	(B)	C	D
JH4	(A)	B	(C)	D

SWITCHES

SW1-1	(OP)	CAL
SW1-2	(ZERO)	SPAN

SECONDARY OUTPUT CARD

JUMPERS

JH1	(A)	B	C	(D)				
JH2	(A)	(B)	C	D				
JH3	(1)	(2)	3	4	5	6	7	8
JH4	(1)	2	3	4	(5)	6	7	8
JH5	(1)	(2)	3	4	5	6	7	8
JH6	(1)	2	3	4	(5)	6	7	8

HARD WIRED JUMPERS

JW1	JW6
JW2	JW7
(JW3)	(JW8)
(JW4)	(JW9)
(JW5)	(JW10)

721AT2 ANALYZER DATA

LAMP POWER SUPPLY

TEST POINTS

TP1	10.15 Vdc (OC1)	
TP2	10.15 Vdc (OC2)	
TP3 (Scope Measurement)		
Base	0.50 Vdc	
Measuring Pulse	8.80 Vdc	
Reference Pulse	2.60 Vdc	
TJ1 I_{avg}	4.00 Vdc	
LAMP VOLTAGE	150.1 Measured Across TB2 Terminals	

JUMPERS

JH1 (1) 3
JH2 (1) 3
JH3 (1) 3

DETECTOR CARD

TEST JACKS

TJ1 (AGC1)	3.49 Vdc
TJ2 (AGC2)	3.56 Vdc
TJ3 (R1)	8.03 Vdc
TJ4 (R2)	8.05 Vdc
TJ5 (M1)	9.00 Vdc
TJ6 (M2)	7.98 Vdc

TEST POINTS

TP1 (RSIG1)	-0.80 Vdc
TP2 (RSIG2)	-0.80 Vdc
TP3 (MSIG1)	-0.90 Vdc
TP4 (MSIG2)	-0.80 Vdc
TP5 (PMTSIG1)	-1.71 Vdc
TP6 (PMTSIG2)	-1.61 Vdc

SWITCHES

SW1-1	(AUTO)	MANUAL
SW1-2	(AUTO)	MANUAL
SW1-3	(ON)	OFF
SW1-4	(ON)	OFF

AIRCO Special Gases
An operating unit of The BOC Group, Inc.

Union Landing & River Roads
P.O. Drawer No. 272
Riverton
New Jersey 08077
Telephone: Marketing; 609-829-7878
Prod. & Admin.; 609-829-7914
International; 609-829-7917

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ANALYTICAL REPORT

To: General Welding Supply
3623 E. Marginal Way So.
Seattle, WA 98134

Date Reported: 04-15-92
Test Number: 21300
Fill Date: 04-10-92

Material Submitted: 600ppm CO,12% CO2,10% O2/, N2

Specification Number: N/A

Method of Analysis: Gas Chromatograph, Percent Oxygen Analyzer

Result of Investigation: Cylinder No. CC-76304

	Component	Specification	Concentration
*	Carbon Monoxide	600 ppm	606 ppm
**	Carbon Dioxide	12%	12.00%
**	Oxygen	10%	10.00%
	Nitrogen	Balance	Balance

Primary standard *analytical accuracy +/- 1.0% Relative
**analytical accuracy +/- 0.02% Absolute

By _____
Authorized Signature

AIRCO

503570

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CERTIFICATE OF ANALYSIS - EPA PROTOCOL GAS MIX

CUSTOMER: General Welding Supply (Seattle, WA)
CYLINDER #: CC-881
CYLINDER PRESSURE: 2000 psig
LABORATORY: Riverton, NJ
CERTIFICATION DATE: 8/3/92
EXPIRATION DATE: 2/3/93
REFERENCE #: 23053

MIXTURE COMPONENTS	ACTUAL MIXTURE CONCENTRATION	AIRCO INTERMEDIATE STANDARD CYLINDER #	CONC.	NIST SRM#
Nitric Oxide	56.0 ppm	CC-14977	49.8 ppm	1683B
Sulfur Dioxide	52.2 ppm	CC-13085	57.0 ppm	1694B

BALANCE GAS: Nitrogen

COMPONENT 1 GAS ANALYSIS PROCEDURE Chemiluminescence
MAKE/MODEL/SER#: Beckman, 952, 0100204
LAST MULTIPOINT CALIBRATION DATE: 7/1/92

COMPONENT 2 GAS ANALYSIS PROCEDURE Non-Dispersive Infrared
MAKE/MODEL/SER#: Beckman, 865, 0103986
LAST MULTIPOINT CALIBRATION DATE: 7/1/92
R=REFERENCE STANDARD Z=ZERO GAS S=SAMPLE GAS

1ST COMPONENT Nitric Oxide

1ST ANALYSIS: DATE 7/27/92 ANALYST A. Lattanze

1)	Z 0000	R 4350	S 4890		CONC (1)	56.0 ppm
2)	R 4350	Z 0000	S 4890		CONC (2)	56.0 ppm
3)	R 4350	S 4880	Z 0000		CONC (3)	55.9 ppm
					AVE CONC	56.0 ppm

2ND ANALYSIS: DATE 8/3/92 ANALYST Walter E. Miller

1)	Z 0000	R 4290	S 4820		CONC (1)	56.0 ppm
2)	R 4290	Z 0000	S 4820		CONC (2)	56.0 ppm
3)	R 4280	S 4810	Z 0000		CONC (3)	56.0 ppm
					AVE CONC	56.0 ppm

2ND COMPONENT Sulfur Dioxide

1ST ANALYSIS: DATE 7/27/92 ANALYST A. Lattanze

1)	Z 0000	R 6020	S 5500		CONC (1)	52.1 ppm
2)	R 6020	Z 0000	S 5500		CONC (2)	52.1 ppm
3)	R 6020	S 5500	Z 0000		CONC (3)	52.1 ppm
					AVE CONC	52.1 ppm

2ND ANALYSIS: DATE 8/3/92 ANALYST Walter E. Miller

1)	Z 0000	R 6030	S 5525		CONC (1)	52.2 ppm
2)	R 6028	Z 0000	S 5533		CONC (2)	52.3 ppm
3)	R 6030	S 5536	Z 0000		CONC (3)	52.3 ppm
					AVE CONC	52.3 ppm

THIS CALIBRATION STANDARD HAS BEEN CERTIFIED VERSUS EPA TRACEABILITY PROTOCOL NO. 1, PROCEDURE G1, AND ANALYSES PERFORMED PER SECTION 3.0.4.
CERTIFIED CONCENTRATION: Total Oxides of Nitrogen = 56.0ppm; Sulfur Dioxide = 52.2ppm; Nitrogen = Balance

APPROVED BY G. Long
LABORATORY MANAGER