

Office Memorandum

1/17 1990

TO: G. Karels

FROM: C. Ullery

SUBJECT: Source Test Data Review: Application # 457

Please review the attached source test data for accuracy and return.



WASTECHNOLOGIES

January 16, 1990

Mr. Craig Ullery
BAAQMD
939 Ellis Street
San Francisco, CA 94109

**Re: EB86-88
Task 1 - Gas System
Application No. 457**

Dear Craig,

Enclosed is another quarterly test of the flare efficiency at the Contra Costa Landfill. At the end of the first year of quarterly tests the owner did not request a change in the frequency, and has elected to continue with quarterly testing for an unspecified time.

These are the 6th series of quarterly tests and show a destruction efficiency greater than required in the permit.

Very truly yours,
EBA WASTECHNOLOGIES

A handwritten signature in black ink that reads "Duane Butler". The signature is written in a cursive, flowing style.

Duane Butler, P.E.

cc: Silvio Garaventa, Sr.

DB/mt

ECOSERVE, Inc.

ENVIRONMENTAL SERVICES

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Pittsburg, CA 94565
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**DETERMINATION OF THE DESTRUCTION
EFFICIENCY OF VARIOUS HYDROCARBONS
BY THE LANDFILL GAS FLARE
AT THE CCW/PITTSBURG LANDFILL**

January 9, 1990

Prepared for:

Eljumaily and Butler Associates
825 Sonoma Avenue
P.O. Box 4600
Santa Rosa, CA 95402

Report #: 1234

Prepared By:



Bruce Randall

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INTRODUCTION

On December 27, 1989, Ecoserve Inc. performed emissions tests at the CCW/Pittsburg landfill gas flare. The purpose of the testing was to determine the destruction efficiency of the flare for the Calderon Compounds, Non-Methane Hydrocarbons and Methane. In addition, emission rates of NOx and CO were determined. The testing was required in order to comply with Bay Area Air Quality Management District permit conditions.

The results of this testing, as well as sampling procedures and calculations are included in this report.

DESCRIPTION OF TESTING PROGRAM

In order to determine the destruction efficiency of the flare, simultaneous grab samples were taken from the feed line to the flare (the inlet) and from the flare exhaust (the outlet). The gaseous samples were drawn into Suma-Polished canisters provided by Environmental Analytical Services (EAS), Inc. of San Luis Obispo. Each grab sample was analyzed for the Calderon Compounds, Methane and Non-Methane Hydrocarbons and fixed gases by EAS.

The destruction efficiency must be calculated on a mass flow rate basis. However, the temperature of the exhaust gas, 1500°F, prevents the use of EPA Methods 1-4 for determining volume flow rate. Therefore, the following procedure was used to determine exhaust gas volume flow rate:

The static pressure, duct gas temperature, velocity head and moisture content were determined at the inlet. From this information and the results of the fixed gas analysis, the volume flow rate at the inlet can be calculated as follows:

$$V_i = 85.49 * C_p * ((T_d + 460) * d_p / P_d / MW)^{1/2}$$

Where:

- C_p = Pitot correction factor (0.99)
- T_d = Duct gas temperature (70°F)
- d_p = Velocity head (1.5"H₂O)
- P_d = Duct pressure (31.52 "Hg)
- MW = Gas molecular weight (24.7)

Description of Testing Program (Continued)

$$SDCFM_i = v_i * Ad * 60 * (Tstd/Td) * (Pd/Pstd) * (1 - (\%H2O/100))$$

Where:

- Ad = Duct area (0.349 sq. ft.)
- Tstd = Standard temperature (70°F)
- Pstd = Standard pressure (29.92 "Hg)

$$SDCFM_i = 1820$$

As the inlet volume flow rate was known, the outlet volume flow rate was calculated based on a Carbon Dioxide balance as follows:

$$SDCFM_o = \frac{(CO2_i * SDCFM_i) + (CH4_i * SDCFM_i)}{CO2_o}$$

Where:

- CO2_i = Concentration of CO2 at the inlet (1.6%)
- CH4_i = Concentration of CH4 at the inlet (10.7%)
- CO2_o = Concentration of CO2 at the outlet (7.9%)

$$SDCFM_o = 2690$$

With the inlet and outlet volume flow rates known, the destruction efficiency was calculated via the following equation:

$$D.E. = \frac{(C_i * 1820) - (C_o * 2690)}{(C_i * 1820)} * 100$$

DESTRUCTION EFFICIENCY RUN 1

Date: December 27, 1989
Client: Eljumaily and Butler Associates
Unit: CCW/Pittsburg Landfill Flare

COMPOUND	INLET Can # 69	OUTLET Can # 76	Destruction Efficiency
	(ppb)	(ppb)	(%)
Vinyl Chloride	<50	<50	*
Benzene	1100	<50	>93.3
1,2-Dibromoethane	<50	<50	*
1,2-Dichloroethane	<50	<50	*
Methylene Chloride	1400	53	94.4
Tetrachloroethene	320	<50	>76.9
Carbon Tetrachloride	<50	<50	*
1,1,1-Trichloroethane	780	<50	>90.5
Trichloroethene	230	<50	>67.9
Chloroform	<50	<50	*
	(%)	(%)	
Methane	10.88	<0.20	>97.3
	(ppm)	(ppm)	
Non-Methane Hydrocarbons	1028	1.3	99.8

* In the case of several compounds, the concentrations at both the inlet and outlet were below the Minimum Detectable Limit (MDL). In these cases, no destruction efficiency was calculated.

DESTRUCTION EFFICIENCY RUN 2

Date: December 27, 1989
Client: Eljumaily and Butler Associates
Unit: CCW/Pittsburg Landfill Flare

COMPOUND	INLET Can # 123 (ppb)	OUTLET Can # 114 (ppb)	Destruction Efficiency (%)
Vinyl Chloride	<50	<50	*
Benzene	750	<50	>90.2
1,2-Dibromoethane	<50	<50	*
1,2-Dichloroethane	<50	<50	*
Methylene Chloride	1300	<50	>94.3
Tetrachloroethene	250	<50	>70.4
Carbon Tetrachloride	<50	<50	*
1,1,1-Trichloroethane	500	<50	>85.2
Trichloroethene	220	<50	>66.4
Chloroform	<50	<50	*
Methane	(%) 10.57	(%) <0.20	>97.2
Non-Methane Hydrocarbons	(ppm) 1443	(ppm) 2.2	99.8

* In the case of several compounds, the concentrations at both the inlet and outlet were below the Minimum Detectable Limit (MDL). In these cases, no destruction efficiency was calculated.

CONSTANT MONITORING RESULTS

Date: December 27, 1989
 Client: Eljumaily and Butler Associates
 Unit: CCW/Pittsburg Landfill Flare

Process Conditions			
Inlet			
Flow rate, SDCFM:		1820	
O2, %volume dry:		13.5	
CO2, %volume dry:		1.6	
H2O, %volume :		3.5	
Outlet			
Temperature °F :		1500	
Flow rate, SDCFM:		2690	
O2, %volume dry:		12.9	
CO2, %volume dry:		7.9	
H2O, %volume dry:		14.0	
Time	0918-0958	1008-1048	1100-1140
Pollutant Concentrations			
NOx, ppm dry:	21.8	20.3	24.7
CO, ppm dry:	49.6	62.7	36.8*
Emission Rates			
NOx, lb/hr:	0.43	0.40	0.48
CO, lb/hr:	0.59	0.75	0.44*

* During the third run to determine CO concentrations, a negative nine percent calibration drift was noted. Therefore, this CO run should not be considered representative.

CONSTANT MONITORING

REF: Bay Area AQMD, Manual of Procedures, San Francisco, CA, Methods ST-5, ST-6, ST-13A, ST-14, ST-19A, January, 1982
: State of California, Air Resources Board, Draft Stationary Source Test Methods, Method 1-100, June, 1979

METHOD SUMMARY:

A representative sample of duct gas was extracted through a probe, filter, condenser and sample line by a pump. The sample was then pumped into a sampling manifold for distribution to one or more sample analyzers. The analyzers output a continuous analog recording of the concentrations of the analyzed gases in the sample. All analyzers were calibrated with EPA Protocol gases (traceable to National Bureau of Standards SRMs) or with recently analyzed gases (analysis by EPA Reference Methods).

SAMPLING SYSTEM:

A Pyrex glass or stainless steel probe with a Pyrex wool or glass fiber mat filter was positioned in the duct. The end of the probe was located at a point of average duct flow and average pollutant concentrations. The probe was connected with a short (about 2 feet) Teflon line to a sample conditioning train. The conditioning train included three glass knockout traps connected in series with glass unions and immersed in an ice bath. The train was connected with a Teflon line (1/4 inch o.d.) to the pneumatic delivery system which was housed in the monitoring van.

PNEUMATIC DELIVERY SYSTEM:

The Teflon sample line delivered sample gas through an in-line Balston filter to the Teflon-lined diaphragm sample pump. The flow rate of the sample gas was regulated with main and bypass-flow needle valves and was read on the main flow meter (typical setting 10 SCFH). A 10 PSI pressure-relief valve kept the entire system pressure at a safe level. The manifold pressure was regulated with an exhaust needle valve and was read on the pressure gauge (typical setting 1 PSI). The sample in the manifold was delivered through needle valves and flow meters to the various analyzers.

LEAK CHECK PROCEDURE:

The sampling system was checked for leaks by plugging the end of the probe. The exhaust needle valve was closed and the entire sample flow was directed through one analyzer flow meter (range 0-1.0 SCFH). The bypass valve was closed until the vacuum gauge showed at least 15 inches Hg. vacuum. The leak rate was observed at the analyzer flow meter (maximum allowable 2% of total sample flow). The system was checked for leaks before and after sampling.

CALIBRATION PROCEDURE:

Each analyzer was calibrated before and after each sample run. Either a Hoke four-way selector valve or a series of 3-way solenoid valves were used to direct the flow of the various calibration gases into the sample manifold. Each analyzer was calibrated with a zero gas (typically, ambient air or zero grade Nitrogen) and with a span gas (typical span gas concentration 60 to 90 percent of analyzer full scale and/or similar to expected sample concentration). All zero and span checks were recorded and noted on the recorder strip charts.

STRIP CHART DATA REDUCTION:

The analog recordings were averaged over time periods as shown on the data pages (typically 5 minutes, 15 minutes or 30 minutes). The data for each averaging period was digitized and recorded as average percent of full scale. These sample readings were then compared with the zero and span gas readings for calculations of the average concentration for each averaging period.

Any drift of the zero and span readings from the beginning to the end of a sampling period was corrected by calculating apparent zero and span readings for the midpoint of each averaging period. The sample average concentrations were then calculated from the sample readings and the apparent zero and span readings.

CALCULATIONS (Strip Chart Analysis):

Calculations were performed based on the following equations:

Symbol Identification

Subscripts i and f indicate initial and final respectively (beginning and end of sampling period)

z = zero reading, % full scale

s = span reading, % full scale

t = averaging time period numbered 1 to n

n = number of t's in the sampling period

Delta z = rate of change of zero reading, % full scale/time interval

Delta s = rate of change of span reading, % full scale/time interval

Rt = average sample reading over time t, % full scale

zt = corrected (apparent) zero reading for midpoint of t, % full scale

st = corrected (apparent) span reading for midpoint of t, % full data

Cs = span gas concentration, ppm or % vol. (as shown on data sheet)

Ct = average sample concentration for time t, ppm or % vol. (as indicated)

Equations:

Apparent Zero:

$$\text{Delta } z = (z_f - z_i) / n$$

For each t from 1 to n,

$$z_t = \text{Delta } z / 2 + \text{Delta } z * (t-1) + z_i$$

Apparent Span:

$$\text{Delta } s = (s_f - s_i) / n$$

For each t from 1 to n,

$$s_t = \text{Delta } s / 2 + \text{Delta } s * (t-1) + s_i$$

Average Sample Concentrations:

$$C_t = (R_t - Z_t / s_t - z_t) * C_s$$

EMISSION RATE CALCULATIONS

PROCEDURE:

Emission rates were calculated one of two ways:

Either pollutant concentrations and duct gas volume flow rates were used to calculate the emission rates, or

Emission rates were calculated from the measured pollutant concentrations and the measured fuel flows. The calculations were based on the EPA "F" factor for stoichiometric combustion.

The calculations were performed using the equation shown below.

CALCULATIONS:

Symbol Identification:

C = average concentration, ppm volume dry
E = emission rate, lb/MMBTU
ER1 = emission rate, lb/hr based on volume flow rates
ER2 = emission rate, lb/hr based on EPA "f" factor
F = emission rate factor, SDCF/MMBTU
I = unit heat input, MMBTU/hr
K1 = conversion constant
K2 = conversion constant
MW = molecular weight, gm/mole, NO₂= 46.01,
SO₂=64.06, CO=28, etc.
%O₂ = oxygen concentration of sample, % vol. dry
Qstd(dry) = volume flow rate of duct gas at standard conditions, dry basis

EQUATIONS:

ER1 = C * MW * Qstd(dry) * K1
where K1 = 1.581 * 10⁻⁷ for 60°F standard conditions
1.557 * 10⁻⁷ for 68°F standard conditions
1.552 * 10⁻⁷ for 70°F standard conditions

ER2 = E * I
where:

E = C * F * 20.9 / (20.9 - %O₂)
C = PPM * MW * K2
K2 = 2.59 * 10E-09

NOTE: Results are shown on the Results Summary pages.

CONSTANT MONITORING

ANALYZERS:

Thermo Electron Model 10 Nitrogen Oxides Analyzer

The Thermo Electron chemiluminescent analyzer is used to measure parts per million of Nitrogen Oxides in the dry sample gas. The analyzer measures the concentration of NOx by converting NOx to NO and then measuring the light emitted by the reaction of NO with ozone.

The sample gas is drawn into the analyzer by a vacuum pump which partially evacuates the reaction chamber. The sample flows through a NO₂ to NO converter for NOx analysis or may pass through the converter for NO analysis. The sample then flows through a temperature controlled critical orifice into the partially evacuated reaction chamber.

Ambient air is also drawn into the analyzer as a source for the generation of ozone. The air flows through a desiccant cartridge for drying, then through an ozone generator which converts some of the oxygen in the air to ozone. The ozonated air then flows through a temperature controlled critical orifice into the reaction chamber.

The sample gas and the ozonated air are mixed in the reaction chamber, where the following reaction takes place:



The intensity of the chemiluminescence is proportional to the concentration of NO in the reaction chamber. The light emitted by this chemiluminescent reaction shines through a window in the chamber onto a photomultiplier tube (PMT). A spinning chopper wheel between the reaction chamber and the PMT allows the dark PMT output to be compared electronically with the PMT output with light generated by the above reaction. The signal is processed electronically and output for recording of the concentration of NO (or NOx if the converter is used).

CONSTANT MONITORING

Analyzers:

Thermo Electron Corporation Model 48 Carbon Monoxide Analyzer

The Thermo Electron Model 48 is used to measure the parts per million of Carbon Monoxide in the dry sample gas. The analyzer measures the absorption by the CO of specific wavelengths of infrared radiation using the Gas Filter Correlation (GFC) technique.

Radiation from an infrared source is chopped and then passed through a gas filter which alternates between CO and N₂ due to rotation of the filter wheel. The radiation then enters a multiple optical pass sample cell where absorption by the sample gas occurs. The IR radiation exits the sample cell and passes through a narrow bandpass interference filter to fall on an IR detector.

The CO gas filter acts to produce a reference beam which cannot be further affected by CO in the sample chamber. The N₂ side of the filter wheel is transparent to IR radiation and therefore produces a measure beam which can be absorbed by CO. The chopped detector signal is modulated by the alternation between the two gas filters with an amplitude proportional to the concentration of CO in the sample chamber. Other gases do not cause modulation of the detector signal since they absorb the reference and measure beams equally. Thus, the Gas Filter Correlation System responds solely to CO.

The IR detector signal is processed and output to recorder for data recovery.

CONSTANT MONITORING

DATA AND RESULTS:

Client:	EBA	Unit:	Landfill Gas Flare
Date:	12/27/89	Site:	Flare Exhaust
Analyzer:	TECO 10	Zero Gas:	Nitrogen
Analyzer Range:	100	Span Gas:	NOx
Recorder Range:	1V.	Cyl #:	AAL-9950
Interval(min):	5	Value:	82.09
		Units:	ppm

RUN 1

Analysis Interval	Time Hour	Minute	Analyzer response % Full Scale	[Conc.]
Initial Zero	9	8	2.2	0.0
Initial Span	9	13	83.6	82.1
Interval 1	9	18	24.5	22.5
Interval 2	9	23	24.0	22.0
Interval 3	9	28	23.0	21.0
Interval 4	9	33	23.5	21.5
Interval 5	9	38	22.5	20.5
Interval 6	9	43	23.0	21.0
Interval 7	9	48	24.5	22.5
Interval 8	9	53	25.5	23.5
Final Zero	9	58	2.2	0.0
Final Span	10	3	84.2	82.1
Zero Drift %FS =	0.0		Run Average	21.8
Span Drift %FS =	0.6			

CONSTANT MONITORING

DATA AND RESULTS:

Client:	EBA	Unit:	Landfill Gas Flare
Date:	12/27/89	Site:	Flare Exhaust
Analyzer:	TECO 10	Zero Gas:	Nitrogen
Analyzer Range:	100	Span Gas:	NOx
Recorder Range:	1V.	Cyl #:	AAL-9950
Interval (min):	5	Value:	82.09
		Units:	ppm

RUN 2

Analysis Interval	Time Hour	Minute	Analyzer response % Full Scale	[Conc.]
Initial Zero	9	58	2.2	0.0
Initial Span	10	3	84.2	82.1
Interval 1	10	8	27.0	24.8
Interval 2	10	13	24.0	21.8
Interval 3	10	18	21.5	19.3
Interval 4	10	23	21.0	18.8
Interval 5	10	28	21.0	18.8
Interval 6	10	33	16.0	13.8
Interval 7	10	38	27.0	24.8
Interval 8	10	43	22.5	20.3
Final Zero	10	48	2.2	0.0
Final Span	10	53	85.6	82.1
Zero Drift %FS =			0.0	
Span Drift %FS =			1.4	
			Run Average	20.3

CONSTANT MONITORING

DATA AND RESULTS:

Client:	EBA	Unit:	Landfill Gas Flare
Date:	12/27/89	Site:	Flare Exhaust
Analyzer:	TECO 10	Zero Gas:	Nitrogen
Analyzer Range:	100	Span Gas:	NOx
Recorder Range:	1V.	Cyl #:	AAL-9950
Interval (min):	5	Value:	82.09
		Units:	ppm

RUN 3

Analysis Interval	Time		Analyzer response		[Conc.]
	Hour	Minute	% Full Scale		
Initial Zero	10	48	2.2	-	0.0
Initial Span	10	53	85.6	-	82.1
Interval 1	11	0	26.0	-	23.4
Interval 2	11	5	27.0	-	24.4
Interval 3	11	10	28.5	-	25.9
Interval 4	11	15	28.5	-	25.9
Interval 5	11	20	27.5	-	24.9
Interval 6	11	25	26.0	-	23.4
Interval 7	11	30	27.0	-	24.4
Interval 8	11	35	28.0	-	25.4
Final Zero	11	40	2.2	-	0.0
Final Span	11	45	87.0	-	82.1
Zero Drift %FS =	0.0			Run Average	24.7
Span Drift %FS =	1.4				

CONSTANT MONITORING

DATA AND RESULTS:

Client: EBA	Unit: Landfill Gas Flare
Date: 12/27/89	Site: Flare Exhaust
Analyzer: TECO 48	Zero Gas: Nitrogen
Analyzer Range: 1000	Span Gas: CO
Recorder Range: 1V.	Cyl #: AAL-9950
Interval (min): 5	Value: 807.5
	Units: ppm

RUN 1

Analysis Interval	Time		Analyzer response		
	Hour	Minute	% Full Scale		[Conc.]
Initial Zero	9	8	4.0	-	0.0
Initial Span	9	13	82.0	-	807.5
Interval 1	9	18	7.5	-	36.7
Interval 2	9	23	9.5	-	57.6
Interval 3	9	28	10.5	-	68.1
Interval 4	9	33	10.5	-	68.3
Interval 5	9	38	9.0	-	52.9
Interval 6	9	43	7.5	-	37.7
Interval 7	9	48	7.5	-	37.8
Interval 8	9	53	7.5	-	38.0
Final Zero	9	58	3.8	-	0.0
Final Span	10	3	82.0	-	807.5
Zero Drift %FS =			-0.2	Run Average	
Span Drift %FS =			0.2	49.6	

CONSTANT MONITORING

DATA AND RESULTS:

Client:	EBA	Unit:	Landfill Gas Flare
Date:	12/27/89	Site:	Flare Exhaust
Analyzer:	TECO 48	Zero Gas:	Nitrogen
Analyzer Range:	1000	Span Gas:	CO
Recorder Range:	1V.	Cyl #:	AAL-9950
Interval(min):	5	Value:	807.5
		Units:	ppm

RUN 2

Analysis Interval	Time Hour	Minute	Analyzer response % Full Scale	[Conc.]
Initial Zero	9	58	3.8	0.0
Initial Span	10	3	82.0	807.5
Interval 1	10	8	7.0	33.0
Interval 2	10	13	8.5	48.5
Interval 3	10	18	8.5	48.5
Interval 4	10	23	12.0	84.7
Interval 5	10	28	12.0	84.7
Interval 6	10	33	10.5	69.2
Interval 7	10	38	12.5	89.8
Interval 8	10	43	8.0	43.4
Final Zero	10	48	3.8	0.0
Final Span	10	53	82.0	807.5
Zero Drift %FS =	0.0		Run Average	62.7
Span Drift %FS =	0.0			

CONSTANT MONITORING

DATA AND RESULTS:

Client:	EBA	Unit:	Landfill Gas Flare
Date:	12/27/89	Site:	Flare Exhaust
Analyzer:	TECO 48	Zero Gas:	Nitrogen
Analyzer Range:	1000	Span Gas:	CO
Recorder Range:	1V.	Cyl #:	AAL-9950
Interval (min):	5	Value:	807.5
		Units:	ppm

RUN 3

Analysis Interval	Time Hour	Minute	Analyzer response % Full Scale	[Conc.]
Initial Zero	10	48	3.8	0.0
Initial Span	10	53	82.0	807.5
Interval 1	11	0	11.0	75.9
Interval 2	11	5	9.0	55.5
Interval 3	11	10	8.0	45.3
Interval 4	11	15	6.0	24.0
Interval 5	11	20	6.0	24.3
Interval 6	11	25	6.0	24.6
Interval 7	11	30	6.0	24.9
Interval 8	11	35	5.5	19.5
Final Zero	11	40	3.8	0.0
Final Span	11	45	73.0	807.5
Zero Drift %FS =	0.0		Run Average	36.8
Span Drift %FS =	-9.0			

APPENDIX 1
Strip Charts and Calibration Gas Certification

10 0
9 1
8 2
7 3
6 4
5 5
4 6
3 7
2 8
1 9
0 10

11000000000
RUNNING

10000000000
RUNNING

10000000000
RUNNING

10000000000
RUNNING

LOW
SPAN

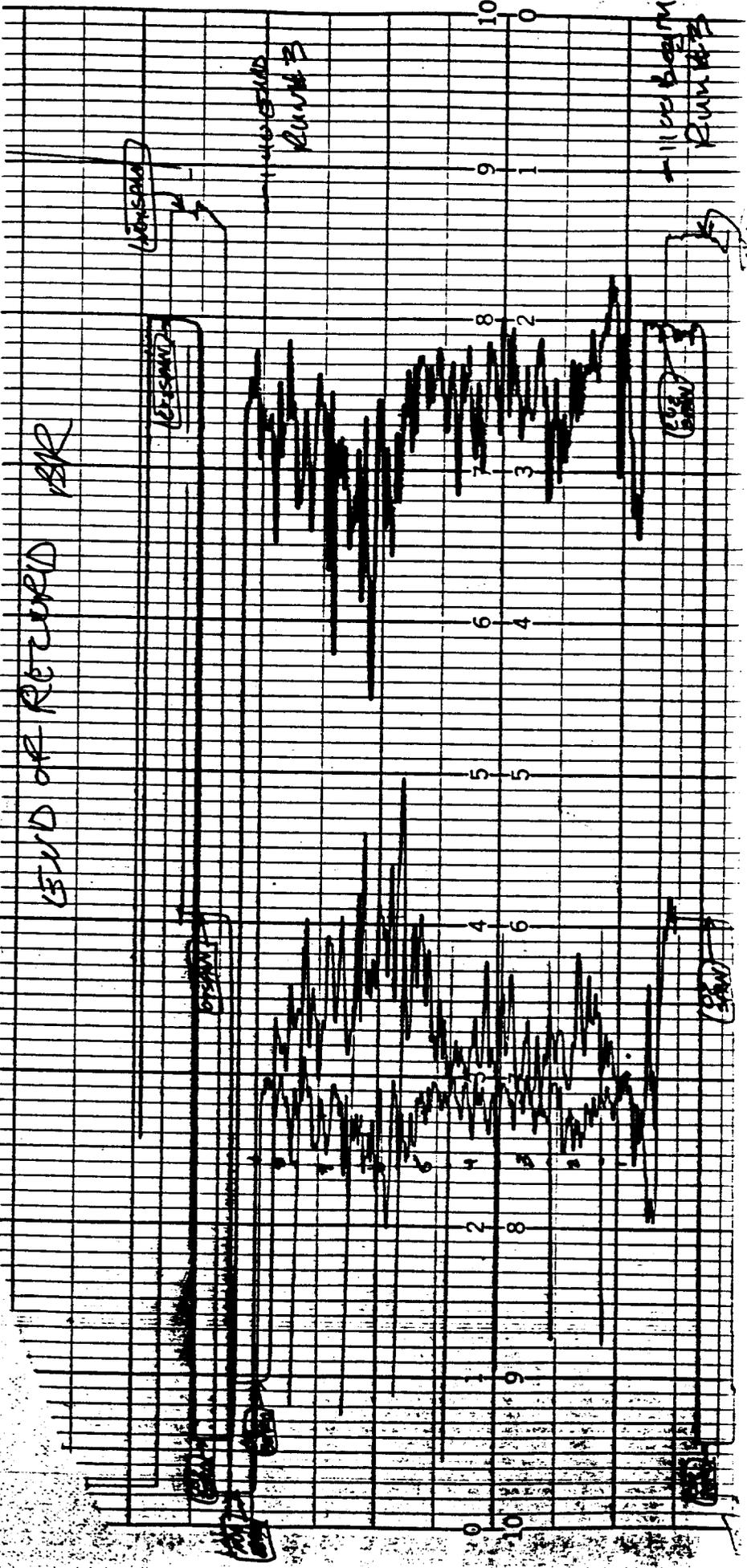
LOW
SPAN

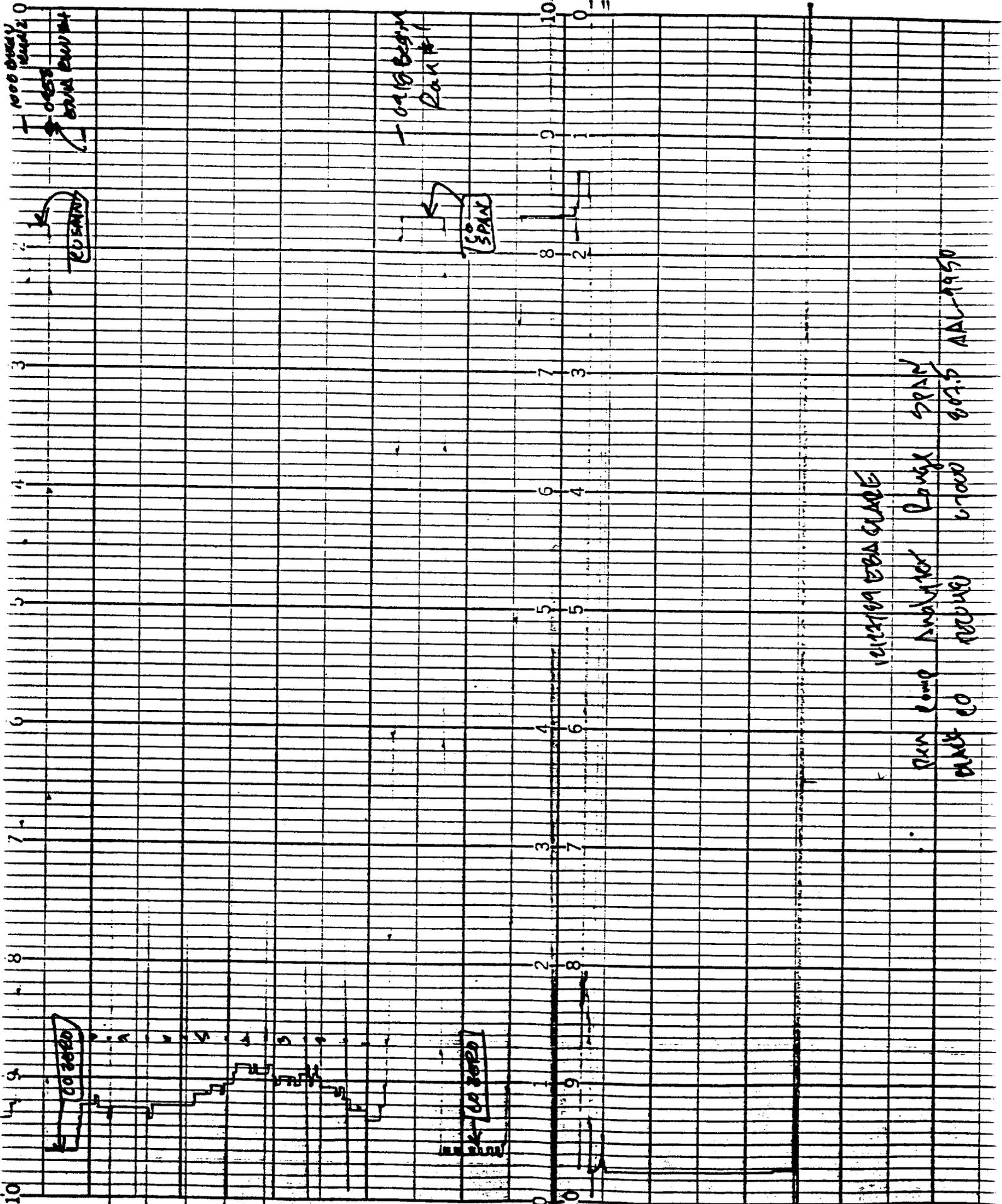
LOW
SPAN

LOW
SPAN

LOW
SPAN

LOW
SPAN





RESEARCH EBA QUARE
 PER COMP ANALYSE LONG SPAN
 DATE 00 REC 1160 0700 0715 AAL-1950

E.M.S. of ROCKS BE

CO SAN

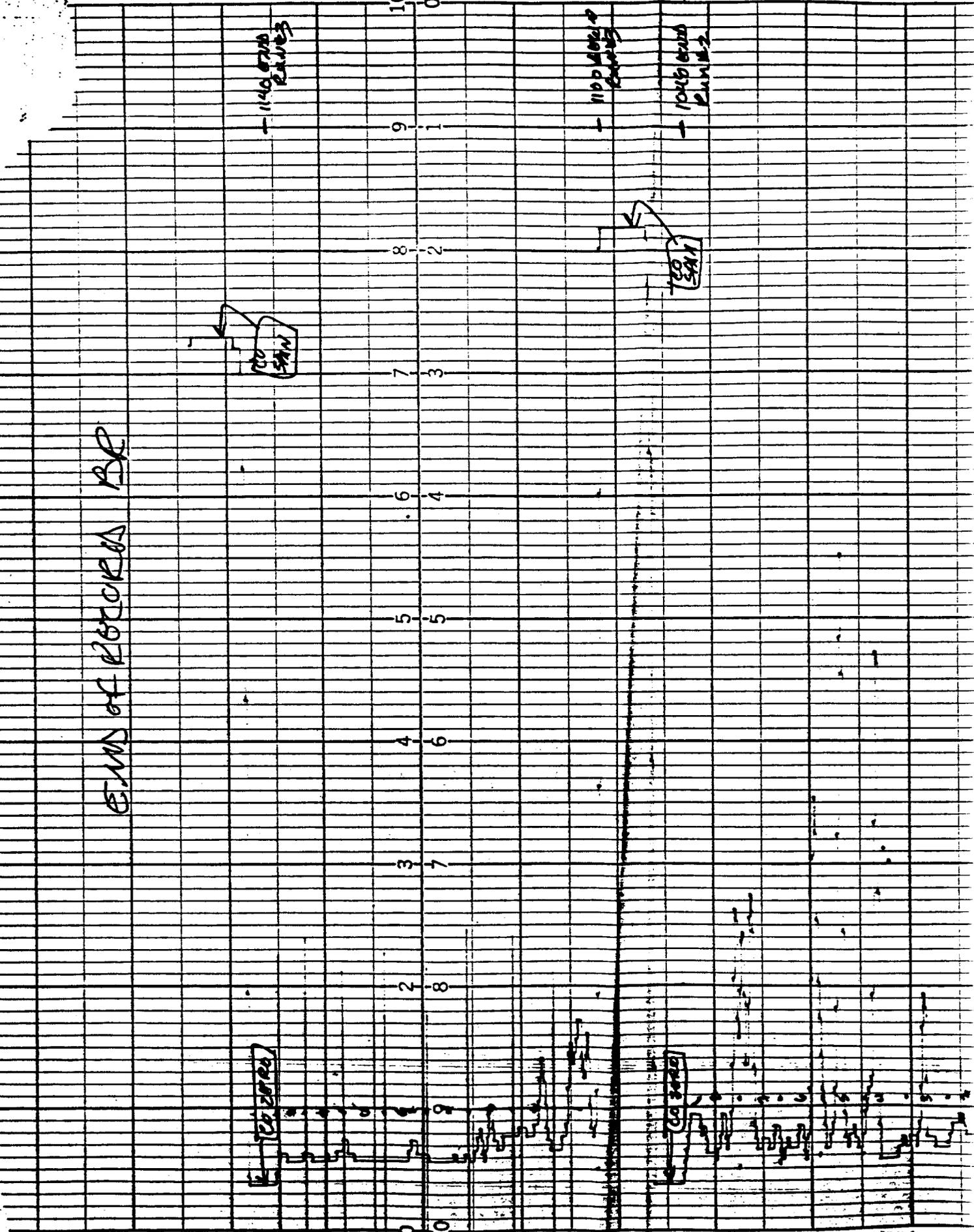
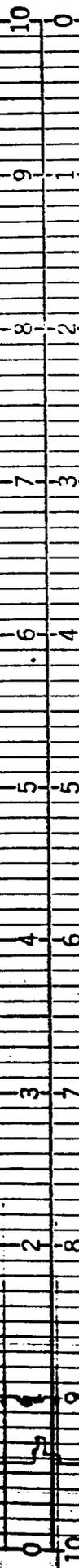
CO SAN



1100 0710
RAVES

1100 0710
RAVES

1045 0710
RAVES





Scott Specialty Gases

TELEX: 510-100-8831 (ScottGas)
FAX: 714-887-0549
PHONE: 714-887-2571

a division of

Scott Environmental Technology Inc. 2600 CAJON BLVD., SAN BERNARDINO, CA 92405

ECOSERVE

attn: BRUCE RANDALL

CERTIFICATE OF ANALYSIS - EPA PROTOCOL GASES*

Certified Per Traceability Protocol No. 1 Procedure No. G1

Cylinder No. AAL-9950

Cylinder Pressure 1900 PSIG

Certified Accuracy ±1 % NBS Traceable

Shipped From: Scott SAN BERNARDINO, CA

Date Shipped March 30, 1989

Our Project No: 417015

Your P.O. No: 5742

Page 1 of 1

Expiration Date: 9/30/89

REFERENCE STD

COMPONENTS	CERTIFIED CONC	SRM/CRM NO.	CYL NO.	CONC.
NITRIC OXIDE	82.06 ppm	SRM 1684 B	CAL-12805	96.9 ppm
NOX	82.09 ppm			
SULFUR DIOXIDE	81.76 ppm	CRM 1694	AAL-6025	95.1 ppm
CARBON MONOXIDE	807.5 ppm	CRM 2637	AAL-10133	2412 ppm

BALANCE GAS NITROGEN

ANALYZER READINGS: Z = Zero Gas T = Test Gas R = Reference Gas

Component	NITRIC OXIDE
First Analysis Date <u>3/20/89</u>	Units ppm
Z <u>0.00</u>	R <u>96.25</u> T <u>81.12</u>
R <u>96.38</u>	Z <u>0.02</u> T <u>81.13</u>
Z <u>0.01</u>	T <u>81.05</u> R <u>96.32</u>
Mean Test Assay	<u>81.59</u> ppm

Second Analysis Date <u>3/27/89</u>	Units ppm
Z <u>0.00</u>	R <u>97.15</u> T <u>82.28</u>
R <u>97.08</u>	Z <u>0.00</u> T <u>82.18</u>
Z <u>0.00</u>	T <u>82.20</u> R <u>97.05</u>
Mean Test Assay	<u>82.06</u> ppm

GAS ANALYZER

MAKE/MODEL/SERIAL NO.	LAST CAL. DATE	ANALYTICAL PRINCIPLE
THERMO-ELECTRON/ <u>10 AR/14853-150</u>	<u>2/2/89</u>	CHEMI-LUMINESCENT
HORIBA/ AIA-23/ <u>56174104</u>	<u>1/17/89</u>	INFRA-RED
HORIBA/AIA 24/ <u>4564403</u>	<u>3/17/89</u>	INFRA-RED

Component SULFUR DIOXIDE

Date <u>3/20/89</u>	Units ppm
Z <u>00.0</u>	R <u>95.0</u> T <u>82.0</u>
R <u>95.0</u>	Z <u>00.0</u> T <u>82.0</u>
Z <u>00.1</u>	T <u>82.0</u> R <u>95.0</u>
Mean Test Assay	<u>81.86</u> ppm

Date <u>3/28/89</u>	Units ppm
Z <u>00.0</u>	R <u>95.0</u> T <u>81.9</u>
R <u>95.0</u>	Z <u>00.1</u> T <u>81.9</u>
Z <u>00.0</u>	T <u>81.9</u> R <u>95.0</u>
Mean Test Assay	<u>81.76</u> ppm

Component CARBON MONOXIDE

Date <u>3/20/89</u>	Units ppm
Z <u>00.0</u>	R <u>93.3</u> T <u>50.6</u>
R <u>93.3</u>	Z <u>00.0</u> T <u>50.6</u>
Z <u>00.0</u>	T <u>50.6</u> R <u>93.3</u>
Mean Test Assay	<u>802.5</u> ppm

Date <u>3/28/89</u>	Units ppm
Z <u>00.0</u>	R <u>93.3</u> T <u>50.6</u>
R <u>93.3</u>	Z <u>00.0</u> T <u>50.6</u>
Z <u>00.0</u>	T <u>50.6</u> R <u>93.3</u>
Mean Test Assay	<u>807.5</u> ppm

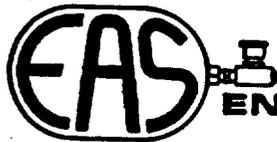
Chronology: Date _____

Assay _____

Analyst DOUG HAGBERG/MAYNARD JOHNSON

Approved By: _____

APPENDIX 2
Results of Laboratory Analysis



ENVIRONMENTAL ANALYTICAL SERVICE, INC.
170-C Granada, San Luis Obispo, CA 93401 (805) 541-3666

ANALYTICAL REPORT

Client: Ecoserve
Site: Antioch Landfill
Station: Flare Exhaust

Sample Date: 12/27/89
Date Anal: 12/28/89
Lab No.: 92311
Can No.: 69

Component	Sample Concentration Percent by Volume
Hydrogen	< 0.20
Oxygen	12.91
Nitrogen	78.88
Methane	< 0.20
Carbon Monoxide	< 0.20
Carbon Dioxide	7.93
Total	99.7

**ENVIRONMENTAL ANALYTICAL SERVICE, INC.**

170-C Granada, San Luis Obispo, CA 93401 (805) 541-3666

ATTACHMENT A - REPORT SHEET

EPA Method TO-14 GC/MS Analysis

Site: Antioch Landfill
Station: Flare Exhaust
Lab #: 92312
Can #: 123

Sample Date: 12-27-89
Date Anal: 12-29-89
Analyst: Vivian Smith

CAS Number	Compound	MDL ppbv	Concentration ppbv
75-01-4	Vinyl Chloride	50	not detected
75-09-2	Dichloromethane	50	not detected
67-66-3	Chloroform	50	not detected
71-55-6	1,1,1-Trichloroethane	50	not detected
107-06-2	1,2-Dichloroethane	50	not detected
71-43-2	Benzene	50	not detected
56-23-5	Carbon Tetrachloride	50	not detected
79-01-6	Trichloroethene	50	not detected
106-93-4	1,2-Dibromoethane	50	not detected
127-18-4	Tetrachloroethene	50	not detected
Non-Methane Hydrocarbon		2.2 ppmv	



ENVIRONMENTAL ANALYTICAL SERVICE, INC.

170-C Granada, San Luis Obispo, CA 93401 (805) 541-3666

ANALYTICAL REPORT

Client: Ecoserve
Site: Antioch Landfill
Station: Flare Exhaust

Sample Date: 12/27/89
Date Anal: 12/28/89
Lab No.: 92312
Can No.: 123

Component	Sample Concentration Percent by Volume
Hydrogen	< 0.20
Oxygen	12.91
Nitrogen	78.66
Methane	< 0.20
Carbon Monoxide	< 0.20
Carbon Dioxide	7.92
Total	99.5

**ENVIRONMENTAL ANALYTICAL SERVICE, INC.**

170-C Granada, San Luis Obispo, CA 93401 (805) 541-3666

ATTACHMENT A - REPORT SHEET

EPA Method TO-14 GC/MS Analysis

Site:	Antioch Landfill	Sample Date:	12-27-89
Station:	Flare Inlet	Date Anal:	12-29-89
Lab #:	92313	Analyst:	Vivian Smith
Can #:	76		

CAS Number	Compound	MDL ppbv	Concentration ppbv
75-01-4	Vinyl Chloride	50	not detected
75-09-2	Dichloromethane	50	1400
67-66-3	Chloroform	50	not detected
71-55-6	1,1,1-Trichloroethane	50	780
107-06-2	1,2-Dichloroethane	50	not detected
71-43-2	Benzene	50	1100
56-23-5	Carbon Tetrachloride	50	not detected
79-01-6	Trichloroethene	50	230
106-93-4	1,2-Dibromoethane	50	not detected
127-18-4	Tetrachloroethene	50	320

Non-Methane Hydrocarbon	1028 ppmv
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ENVIRONMENTAL ANALYTICAL SERVICE, INC.

170-C Granada, San Luis Obispo, CA 93401 (805) 541-3666

ANALYTICAL REPORT

Client: Ecoserve
Site: Antioch Landfill
Station: Flare Inlet

Sample Date: 12/27/89
Date Anal: 12/28/89
Lab No.: 92313
Can No.: 76

Component	Sample Concentration Percent by Volume
Hydrogen	< 0.20
Oxygen	13.49
Nitrogen	62.15
Methane	10.88
Carbon Monoxide	< 0.20
Carbon Dioxide	1.47
Total	88.0



ENVIRONMENTAL ANALYTICAL SERVICE, INC.
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ATTACHMENT A - REPORT SHEET

EPA Method TO-14 GC/MS Analysis

Site: Antioch Landfill
Station: Flare Inlet
Lab #: 92314
Can #: 114

Sample Date: 12-27-89
Date Anal: 12-29-89
Analyst: Vivian Smith

CAS Number	Compound	MDL ppbv	Concentration ppbv
75-01-4	Vinyl Chloride	50	not detected
75-09-2	Dichloromethane	50	1300
67-66-3	Chloroform	50	not detected
71-55-6	1,1,1-Trichloroethane	50	500
107-06-2	1,2-Dichloroethane	50	not detected
71-43-2	Benzene	50	750
56-23-5	Carbon Tetrachloride	50	not detected
79-01-6	Trichloroethene	50	220
106-93-4	1,2-Dibromoethane	50	not detected
127-18-4	Tetrachloroethene	50	250
Non-Methane Hydrocarbon		1443	ppmv



ENVIRONMENTAL ANALYTICAL SERVICE, INC.
170-C Granada, San Luis Obispo, CA 93401 (805) 541-3666

ANALYTICAL REPORT

Client: Ecoserve
Site: Antioch Landfill
Station: Flare Inlet

Sample Date: 12/27/89
Date Anal: 12/28/89
Lab No.: 92314
Can No.: 114

Component	Sample Concentration Percent by Volume
Hydrogen	< 0.20
Oxygen	13.45
Nitrogen	61.82
Methane	10.57
Carbon Monoxide	< 0.20
Carbon Dioxide	1.70
Total	87.5