

Palo Alto

LFG EFD

Note: This is a reference cited in AP 42, *Compilation of Air Pollutant Emission Factors, Volume I Stationary Point and Area Sources*. AP42 is located on the EPA web site at www.epa.gov/ttn/chief/ap42/

The file name refers to the reference number, the AP42 chapter and section. The file name "ref02_c01s02.pdf" would mean the reference is from AP42 chapter 1 section 2. The reference may be from a previous version of the section and no longer cited. The primary source should always be checked.

Data Qual. (C)
more back up data
ss.

need back. FR

EMISSIONS TEST RESULTS

NO_x, CO,
uncont. toxics
but fuel is mixed

NO_x, CO,
SO₂

only.
te. line -
in flow
out flow.
fuel comp.

✓
less 1-grabbed due to
mixed fuel use.

07/09/93

08:51

BAY AREA AIR QUALITY

002

DISTRIBUTION:

Firm
Permit Services
Enforcement
Technical Services
Planning
Requester
DAPCO

PALO ALTO #1 Source Test
BAY AREA
AIR QUALITY MANAGEMENT DISTRICT

939 Ellis Street
San Francisco, California 94109
(415) 771-6000

SUMMARY OF SOURCE TEST RESULTS

Report No. 93271Test Date: 06/02/93

Test Times:

Run A: 1055-1239

Run B: _____

Run C: _____

SOURCE INFORMATION

BAAQMD REPRESENTATIVES

Firm Name and Address PALO ALTO LANDFILL GAS CORP. 2380 Embarcadero Road Palo Alto, CA 94303			Firm Representative and Title Gordon Deane, Environmental Specialist Phone No. (617) 383-1293		Source Test Engineers B. Bartley/G. Colwell	
Permit Conditions			Source: S-2 Internal Combustion Engine #1		Permit Services Division / Enforcement Division	
	gM/HP-hr	lbs/hr	Plant No. 5136 Permit No. 4659		Test Requested by:	
CO	3.00	18.6	Operates 8 hrs/day & 260 days/yr		G. Karels	
NOx	1.45	9.0				
NMOC	1.40	8.7				

Operating Parameters:

At the time of the test IC Engine #1 was producing 1,000 kw.

Applicable Regulations: **2-1-307**VN Recommended: **NO**

Source Test Results and Comments:

<u>METHOD:</u>	<u>TEST</u>	<u>S-2 ENGINE #1</u>	<u>LIMIT</u>
ST-17	Stack Volume Flowrate, SDCFM	3,440	
	Stack Temperature °F	750	
ST-14	Oxygen, Dry Volume %	8.7	
ST-5	Carbon Dioxide, Dry Volume %	11.2	
ST-6	Carbon Monoxide, dry ppm	580	
	Carbon Monoxide, lbs/hr	8.7	18.6
	Carbon Monoxide, g/hp-hr	2.9	3.0
ST-13A	Oxides of Nitrogen, dry ppmv	88	
	Oxides of Nitrogen, lbs/hr	2.2	9.0
	Oxides of Nitrogen, g/hp-hr	0.7	1.45
ST-7	Methane, ppmv	245	
	NMOC, ppmv, as C ₁	5	
	VOC, lbs/hr	0.04	8.7
	VOC, g/hp-hr	0.01	1.4
	Benzene, ppm	<0.5	---

NO COMMERCIAL USE OF THESE RESULTS IS AUTHORIZED

Air Quality Engineer II <i>Bob Bartley</i> B. Bartley	Date JUN 28 1993	Supervising Air Quality Engineer <i>G. Fend</i> G. Fend	Date 6/30/93	Approved by Source Test Manager <i>G. Karels</i> G. Karels	Date 6/30/93
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Form: Summary of Source Test Results

F8876; d: 16 July 88

ENGINE SERIAL #'S

E-1 WPI-489
63-4825

E-2 WPI-485
63-4040

E-2 EMISSIONS TEST

@ 32% blind

PALCO ENGINE 2
LEFT BANK

* LAND COMBUSTION *
* LANCOM 6500 *

Type of fuel: Natural Gas Landfill Gas
Dry analysis
O2 normalisation: on

Date: 19.7.93

Time: 13:42

T ambient	73 F
T gas	86 F
Tg - Ta	12 F
CO	594 ppm
O2	9.02 %
NO	51 ppm
NOx	56 ppm
CO2	6.87 %
efficiency	---
loss	---
excess air	---
water	0.0 %
O2 norm	0.0 %

TEST DONE ON UNIT No. 02
FOR SERVICE INFORMATION
CALL LAND 1-800-922-9679

PALCO ENGINE 2
RIGHT BANK

* LAND COMBUSTION *
* LANCOM 6500 *

Type of fuel: Natural Gas Landfill Gas
Dry analysis
O2 normalisation: on

Date: 19.7.93

Time: 13:47

T ambient	73 F
T gas	86 F
Tg - Ta	12 F
CO	591 ppm
O2	9.00 %
NO	58 ppm
NOx	63 ppm
CO2	6.88 %
efficiency	---
loss	---
excess air	---
water	0.0 %
O2 norm	0.0 %

TEST DONE ON UNIT No. 02
FOR SERVICE INFORMATION
CALL LAND 1-800-922-9679

Palo Alto Landfill Gas Corporation
Palo Alto Power Generating Facility
Engines #1 & #2
Compliance Emissions Test Results
Test Date: January 22, 1991

BEST ENVIRONMENTAL

27343 Industrial Boulevard, Unit E
Hayward, California 94545
Tel. (415) 784-0706
Fax (415) 784-0597

BEST ENVIRONMENTAL, INC.

27343 Industrial Boulevard, Unit E.
Hayward, California 94545
(415) 784-0706

February 18, 1991

Palo Alto Landfill Gas Corporation
3664 Sacramento Street
San Francisco, CA 94118

To: Mr. M.A. Richbourg

Subject: Compliance emissions testing at the Palo Alto Power Generating Facility.

Test Date: January 22, 1990

Sampling Location: Stack outlets of engines S-1 and S-2 located at 2380 Embarcadero Road, Palo Alto, California.

Sampling Personnel: Sherman Smith and Tracy Prevo of BEST ENVIRONMENTAL.

Process Description: Palo Alto Landfill Gas Corp. operates two Waukesha Model 7042GL lean-burn turbocharged engines. Each engine was running at full load producing 1050 KW (1,408 Horsepower). Both engines were burning 75% landfill gas, and 25% natural gas.

Test Program: Three thirty minute test runs for NOx, CO, CO2, O2, THC, and TNMHC were performed at the engine muffler outlet. Engine RPM and fuel rate data was taken to determine volumetric flowrate. The engine was running at approximately 1200 rpm and producing 1050 KW. The left and right bank temperatures were running at 1220 degrees F. Fuel samples were also taken for analysis, at the fuel supply line into engine #2. These samples were collected in new Tedlar sample bags and sent to Curtis & Tompkins Analytical Laboratories, in Berkeley, Ca.

Sampling Methods: The following Source Test Methods of the Bay Area Air Quality Management District (BAAQMD) and the California Air Resources Board (CARB) were used:

CARB 1-100

Continuous NOx, O2, CO2, CO, THC

Instrumentation:

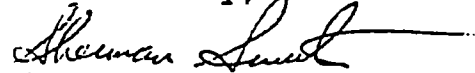
TECO Model 10 NOx Analyzer
Horiba Model PIR-2000 CO2 Analyzer
Infrared Model IR-2200 O2 Analyzer
Horiba Model PIR-2000 CO Analyzer
Bendix Model 8401 Hydrocarbon Analyzer

Test Results: Table 1 presents the results of the #1 engine emissions test. Average NOx concentration and emission rate were 118 ppm and 3.08 lbs/hr. CO concentration and emission rate were 633.3 ppm and 10.06 lb/hr. TNMHC concentration and emission rate were 19.0 ppm and 0.19 lb/hr. Table 2 presents the results of the #2 engine emissions test. Average NOx concentration and emission rate were 114 ppm and 2.98 lb/hr. CO concentration and emission rate were 629.7 ppm and 10.01 lb/hr. TNMHC concentration and emission rate were 23.7 ppm and 0.24 lb/hr.

Fuel Analysis Results: The following volatile organics were found in the fuel sample, bromomethane (1.2 ppm), methylene chloride (2.4 ppm), acetone (4.4 ppm), 1,1-dichloroethane (0.5 ppm), trichloroethylene (0.7 ppm), benzene (0.7 ppm), tetrachloroethylene (0.8 ppm), toluene (8.5 ppm), ethyl benzene (3.7 ppm), and total xylenes (7.5 ppm). Total non-methane hydrocarbons were measured at 21,000 ppm. The detailed lab report is included in the appendix.

Field data sheets, strip chart recordings, calibration gas certifications and volumetric flowrate calculations are appended to this report. If there are any questions, please call Sherman Smith at (415) 784-0706.

Submitted by,



Sherman Smith
Air Pollution Consultant

TABLE 1
PALGC/Engine #1
CEMS TEST RESULTS

TEST	1	2	3	AVERAGE
TEST LOCATION	OUTLET	OUTLET	OUTLET	
TEST TIME	1416-1446	1504-1534	1552-1622	
TEST DATE	01-22-91	01-22-91	01-22-91	
FLOWRATE, SDCFM	3,638	3,638	3,638	3,638
O2, %	9.5	9.5	9.5	9.5
CO2, %	9.6	9.6	9.6	9.60
NOx, ppm	116.00	126.00	112.00	118.00
NOx, ppm corr. 3%, O2	182.1	197.8	175.9	185.3
NOx, lbs/hr	3.03	3.29	2.92	3.08
NOx, gm/Hp-Hr	0.84	0.91	0.81	0.85
CO, ppm	645.0	639.0	616.0	633.3
CO, lbs/hr	10.25	10.15	9.79	10.06
CO, gm/Hp-Hr	2.84	2.81	2.71	2.79
TNMHC, ppm	28.0	17.0	12.0	19.0
TNMHC, lbs/hr	0.29	0.17	0.12	0.19
TNMHC, gm/Hp-Hr	0.079	0.048	0.034	0.054

WHERE,

CO = Carbon Monoxide
NOx = Oxides of Nitrogen
CO2 = Carbon Monoxide
TNMHC = Tot. Non-Methane Hydrocarbons
ppm = Parts Per Million Concentration
lbs/hr = Pounds Per Hour Emission Rate
BTU/hr = 13800000
BTU/Hp-Hr 8425.0
Engine Rating = 1,750 Horsepower

Calculations,

lbs/hr = ppm x SDCFM x 1.56 x 10⁻⁷ x Mol. Wt.
gm/Hp-Hr = (#/hr x BTU/Hp-Hr x 454 gm/#) / BTU/hr

$$160 \text{ lbs/hr} \times \text{ft}^3 \text{CH}_4 / \text{min}$$

$$13.8 \text{ min} \times \frac{1 \text{ hr}}{60 \text{ min}} \times \frac{1 \text{ lb}}{16 \text{ lb}} = 219 \text{ ft}^3 \text{CH}_4 / \text{min}$$

$$\frac{219 \text{ ft}^3 \text{CH}_4}{\text{min}} \times \frac{\text{ft}^3 \text{NMHC}}{\text{ft}^3 \text{CH}_4} \times \frac{21,000 \text{ ppm NMHC}}{517,000 \text{ ppm CH}_4}$$

TABLE 2
PALGC/Engine #2
CEMS TEST RESULTS

TEST	1	2	3	AVERAGE
TEST LOCATION	OUTLET	OUTLET	OUTLET	
TEST TIME	1112-1142	1157-1227	1239-1309	
TEST DATE	01-22-91	01-22-91	01-22-91	
FLOWRATE, SDCFM	3,335	3,335	3,335	3,335
O2, %	8.8	8.8	8.9	8.8
CO2, %	10.5	10.5	10.4	10.47
NOx, ppm	110.00	116.00	116.00	114.00
NOx, ppm corr. 3%, O2	162.7	171.6	173.0	169.1
NOx, lbs/hr	2.87	3.03	3.03	2.98
NOx, gm/Hp-Hr	0.80	0.84	0.84	0.82
CO, ppm	641.0	631.0	617.0	629.7
CO, lbs/hr	10.19	10.03	9.80	10.01
CO, gm/Hp-Hr	2.82	2.78	2.72	2.77
TNMHC, ppm	5.0	21.0	45.0	23.7
TNMHC, lbs/hr	0.05	0.21	0.46	0.24
TNMHC, gm/Hp-Hr	0.014	0.059	0.127	0.067

WHERE,

CO = Carbon Monoxide
 NOx = Oxides of Nitrogen
 CO2 = Carbon Monoxide
 TNMHC = Tot. Non-Methane Hydrocarbons
 ppm = Parts Per Million Concentration
 lbs/hr = Pounds Per Hour Emission Rate
 BTU/hr = 13800000
 BTU/Hp-Hr 8425.0
 Engine Rating = 1,750 Horsepower

Calculations,

-7

lbs/hr = ppm x SDCFM x 1.56 x 10 x Mol. Wt.
 gm/Hp-Hr = (#/hr x BTU/Hp-Hr x 454 gm/#) / BTU/hr

APPENDIX

CONTINUOUS MONITOR DATA SHEET

Plant: PALGC

Date: 1-22-91

Test Location: Eng #1

Run Number: 1

Operator: SS/TP

Ambient Temperature

Barometric Pressure

Static Pressure Duct

Fuel

Time	Sample Point	Fuel Flow	Dry Uncorrected					3% O ₂ Dry		Hydrocarbons			TOC ppm	CO ₂ ppm	VOC ppm	Comments
			O ₂ %	CO ₂ %	CO ppm	SO ₂ ppm	NO ppm	NO _x ppm	ppm	HO _x ppm	THC	CH ₄				
1416	cul		7.66	11.84	398			201.9			92.4					
1421	1		9.5	9.6	642			116				1660				
1426	2		9.5	9.6	642			116				1650				
1431	3		9.5	9.6	642			116				1650				
1436	4		9.5	9.6	642			116				1640				
1441	5		9.5	9.6	650			116				1660				
1446	6		9.5	9.6	650			116			1680					
	Avg		(9.5)	(9.6)	(645)			(116)			1680	1652	258			
	3sec		9.5	9.6	25			2.0			0					
	5min		7.66	11.84	425			200			92.4					
1504	cul		7.66	11.84	398			201.9			92.4					
1509	1		9.5	9.6	638			133			1650					
1514	2		9.4	9.7	650			137			1640					
1519	3		9.5	9.6	643			127								
1524	4		9.5	9.6	638			121								
1529	5		9.5	9.6	627			117								
1534	6		9.5	9.6	638			120								
	Avg		(9.5)	(9.6)	(639)			(126)			1645	1628	17			
	3sec		9.5	9.6	12.5			0			0					
	5min		7.66	11.84	405			203			92.4					

CONTINUOUS MONITOR DATA SHEET

Plant: PALGAC
 Date: 1-22-91
 Test Location: Eng #1
 Run Number: 3
 Operator: SS/TP
 Ambient Temperature: _____
 Barometric Pressure: _____
 Static Pressure Duct: _____
 Fuel: _____

Time	Sample Point	Fuel Flow	Dry				Uncorrected				3% O ₂ Dry		Hydrocarbons			CO ₂ ppm	CO ppm	Comments
			O ₂ %	CO %	CO ₂ %	ppm	CO ppm	SO ₂ ppm	NO ppm	NO _x ppm	ppm	NO _x ppm	THC	CH ₄	Non CH ₄			
1352	cal		7.66	11.84	398					201.9			92.4					
1552	1		9.5	9.6	625					116			1640					
1602	2		9.5	9.6	625					113			1660					
1607	3		9.5	9.6	612					113			1620					
1612	4		9.5	9.6	612					110			1690					
1617	5		9.5	9.6	612					110			1700	1700				
1622	6		9.5	9.6	612					109			1672	1660	12			
	AVG		9.5	9.6	616					112			6					
	3 _{avg}		8	8	8					0			92.4					
	5 _{avg}		7.66	11.84	395					205								

STACK VOLUMETRIC FLOW RATE DETERMINATION

Stack gas velocity at stack conditions (ft/sec)

$$V_s = 85.49 (C_p) (\sqrt{\Delta P})_{\text{avg}} \sqrt{\frac{T_{s,\text{avg}} \cdot 460}{P_s \text{ MW}_{s28.50}}} \quad 115.3$$

Stack gas volume at standard conditions (scfm)

$$O_s = 60 (1 - B_{wo}) V_{s,avg} A_s \left(\frac{528}{T_{s,avg} \cdot 460} \right) \left(\frac{P_s}{29.92} \right) = 3638$$

$\uparrow$
1.23 VELOCITY TRAVERSE DATA

VELOCITY TRAVERSE DATA

Traverse Point Number	Velocity Head in. H ₂ O	Distance from Inside Wall (in.)	Stack Temperature (T _s), °F	Velocity Head in. H ₂ O	/ΔP	Stack Temperature (T _s), °F
1.	1.48					
2	1.51					
3	1.44					
4	1.49					
5	1.46					
6	1.54					
1	1.61					
2	1.45					
3	1.48					
4	1.43					
5	1.41					
6	1.18					
Average			640°			1.206

Floor 1st Acto

Pilot Tube Facing 11

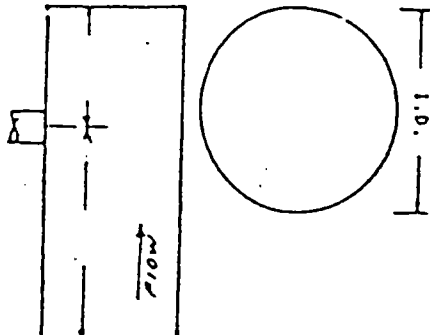
Sampling Site Eng #1 West

Remarks _____

Barometric Pressure, in Hg 30.14

Static Pressure in Block (P_s) In. Hg 41.47

Question 3A5 TP Date 1/21/91



Moisture

BEST ENVIRONMENTAL Particulate Field Data Sheet

Run # _____ Method # _____

Plant Valo Ales
 Date 1/21/91
 Location Engine #1, West
 Port Dim. _____
 Stack I.D. _____
 Stack Area _____ ft²
 Personnel TP

CH₄ 2.296
 Meter Yd 1.0036
 PBar. _____
 Stat Press _____
 X_{CO2} Assum _____
 X_{CO2} Assum _____
 Pre leak ck 0.002 cfm

XH₂O Assum. _____
 Pitot Cp _____
 Noz. Diam. _____
 Noz I.D. _____
 Meter # 8811
 Probe # _____
 Post leak ck 0.002 cfm

Filter # _____
 Pitot # _____
 Net Imp Vol 42.0
 Tot Imp Vol _____
 Sample Time _____
 Sqrt ΔP Ave _____

F.H. Wt. (mg) _____
 B.H. Wt. (mg) _____
 Gel Wt. (mg) 4.7
 X_{CO2} Actual _____
 X_{CO2} Actual _____
 Tot. Moisture 46.7 11.88%
 Std Vm _____

Sample Point	Clock Time	Vel. ΔP	M.R. cfm	Drif. ΔH	Gas Meter Volume ft ²	Gas Meter		Temperatures F				Pump Vac.	Comments
						In	Out	Stack	Imp.	Filter	Probe		
1	15:35				479.918	73	72						
2	15:40				481.634	71	72						
3	15:45												
4	15:50												
5	15:55				486.651	70	70						
6	16:00				488.326	70	70						
7	16:05				490.028	70	70						
8	16:10				491.617	70	69						
9													
10	16:20				495.082	70	69						
11	16:25				496.789	69	69						
12													
13													
14													
15													
16													
17													
18													
19													
20													
21													
22													
23													
24													
25													
26													
27													
28	Average				16.871								

Notes:

Ms =
 Ave. Vs =
 Sample I.D. =

Final Imp Vol =

CONTINUOUS MONITOR DATA SHEET

Plant PALGC Ambient Temperature 30.14
 Date 1-22-91 Barometric Pressure 30.14
 Test Location Eng #12 Static Pressure Duct 25% Nat Gas
 Run Number 1, 2, 3 Fuel 25% Nat Gas
 Operator SS/TPO

Time	Sample Point	Fuel Flow	Dry Uncorrected						3% O ₂ Dry			Hydrocarbons			TOC ppm	CO ₂ ppm	VOC ppm	Comments
			O ₂ %	CO ₂ %	CO ppm	SO ₂ ppm	NO ppm	NO _x ppm	ppm	ppm	NO _x ppm	THC	CH ₄	Non CH ₄				
1112	cal		7.66	11.84	398			201.9				92.4						
1117	1		8.6	10.5	638			115.4				1640	1630	10				
1122	2		8.8	10.5	630			109										
1127	3		8.8	10.5	638			111										
1132	4		8.8	10.5	650			115										
1137	5		8.8	10.5	645			109										
1142	6		8.8	10.5	645			103				1610	1610					
	AVG		8.8	10.5	641			110				1625	1620	5				
	6500 2000		8	+1.5	38			0				0						
1	span		7.66	11.84	438			194				92.4						
1157	cal		7.66	11.84	398			201.9				92.4						
1202	1		8.8	10.5	625			110				1620						
1207	2		8.8	10.5	625			115				1600						
1212	3		8.8	10.5	625			116					1578					
1217	4		8.8	10.5	638			120					1540					
1221	5		8.8	10.5	638			119				1550						
1227	6		8.8	10.5	638			115				1550						
	AVG		8.8	10.5	631			116				1580	1559	21				
	300		8	108	30			0				0						
	span		7.66	11.84	435			200				86						

PALGC

Date 16-22-91

Test Location: Eng #2

רמב"ם

Operator SS/TP

Ambient Temperature

Barometric Pressure

Static Pressure Duct

Fuel

Time	Sample Point	Fuel Flow	Dry Uncorrected						3% O ₂ Dry		Hydrocarbons			TOC ppm	CO ₂ ppm	VOC ppm	Comments
			O ₂ %	CO ₂ %	CO ppm	SO ₂ ppm	NO ppm	NO _x ppm	ppm	HO _x ppm	THC	CH ₄	Non CH ₄				
1339	Cal		7.66	11.84	398				201.9			92.4					
	1		8.9	10.4	613				115			1670					
	2		8.9	10.4	613				115			1660					
	3		8.9	10.4	613				113				1600				
	4.		8.9	10.4	613				115				1600				
	5		8.9	10.4	625				118			1670					
1309	6		8.9	10.4	625				118			1630					
	AU-4		8.9	10.4	617				116			1645	1600	45			
	3rd		D	D	22				D			D					
	5pm		8.0	11.84	412				202			98.4					

STACK VOLUMETRIC FLOW RATE DETERMINATION

Stack gas velocity at stack conditions (ft/sec)

$$V_s = 85.49 \text{ (C}_p) (\sqrt{\Delta P})_{\text{avg}} \sqrt{\frac{T_{s,\text{avg}} \cdot 460}{P_s \text{ MW}_s}}$$

Stack gas volume at standard conditions (scfm)

$$Q_s = 60 (1 - B_{wo}) V_{s,avg} \frac{A_s}{1.23} \left(\frac{528}{T_{s,avg} \cdot 460} \right) \left(\frac{P_s}{29.92} \right) = 3362 \quad 3335$$

VELOCITY TRAVERSE DATA

[illegible]

First *Fdo Alto*

Pitot Tube Factor 0.99

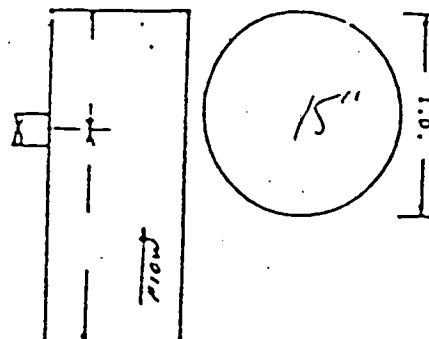
Source: East Engine #2

Records

Barometric Pressure, in. Hg 30.14

Static Pressure in Block (P_k) in. Hg 1.35

Questions: SAS TP Date: 12/91



$$\frac{\text{IMPINGER VOLUMES, ml}}{\text{final - initial}} = \text{net}$$

1	144	100	
2	100	100	
			44.2
			0.2

Run Number _____
Start Time _____
Barometric Pressure _____
Ambient Temperature _____
Static Pressure _____
Probe Number _____
Pitot Coefficient (k_p) _____
Meter Calib. Factor (Y) 1.0036

Test Number	
Date	12/91
Location	2246 Alfo
Boiler	— East Engine # 2
Boiler Load	0
Personnel	T.P.
Filter Wt.	gm.
Nozzle Wt.	gm.

Nozzle Size _____
 Nozzle Number _____
 Sample Unit Number 2811
 Control Unit Number _____
 SILICA GEL, gm
 final - initial = net 225 5.3

Initial Leak Rate 0.002 CFM at 7" "Hg
Final Leak Rate 0.002 CFM at 7" "Hg

[illegible]



Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878

2323 Fifth Street, Berkeley, CA 94710, Phone (415) 486-0900

DATE RECEIVED: 01/29/91

DATE REPORTED: 02/08/91

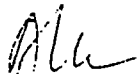
LAB NUMBER: 102861

CLIENT: BEST ENVIRONMENTAL

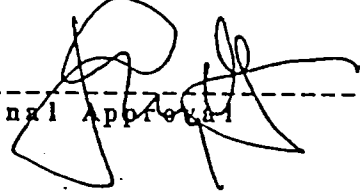
REPORT ON: 1 AIR SAMPLE

PROJECT ID: PALGC
LOCATION: PALO ALTO LANDFILL

RESULTS: SEE ATTACHED



QA/QC Approval



Final Approval



Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 102861-1
CLIENT: BEST ENVIRONMENTAL
PROJECT ID: PALGC (PALO ALTO LANDFILL)
CLIENT ID: PALGC BAG 1

DATE RECEIVED: 01/29/91
DATE ANALYZED: 02/01/91
DATE REPORTED: 02/08/91

Report on Analysis of Gas Samples for Gross Constituents

CALDERON "IN SITU" DISPOSAL SITE TESTING (CH&S Code 41805.5)
METHOD REFERENCE: ARB Method ADDL002, Rev. 3.1, (Modified)

GROSS GAS CONSTITUENTS	RESULTS (%)	REPORTING LIMIT (%)
Oxygen	1.3	0.2
Nitrogen	13.9	0.2
Carbon Monoxide	ND	0.2
Methane	51.7	0.2
Carbon Dioxide	33.2	0.2

ND = Not detected at or above reporting limit.

QA/QC SUMMARY

RPD, %

5



Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 102861
CLIENT: BEST ENVIRONMENTAL
PROJECT ID: PALGC (PALO ALTO LANDFILL)

DATE RECEIVED: 01/29/91
DATE ANALYZED: 01/30, 31/91
DATE REPORTED: 02/08/91

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ANALYSIS: Total Non-methane Hydrocarbons
ANALYSIS METHOD: EPA 25A - Gas Chromatography with FID/ASTM 3416-78

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LAB ID	SAMPLE ID	RESULT	UNITS
102861-1	PALGC BAG 1	21,000	u1/L C (ppmC)

QA/QC SUMMARY

RPD, %

5



Curtis & Tompkins, Ltd

LABORATORY NUMBER: 102861-1
CLIENT: BEST ENVIRONMENTAL
PROJECT ID: PALGC (PALO ALTO LANDFILL)
SAMPLE ID: PALGC BAG1

DATE RECEIVED: 01/29/91
DATE ANALYZED: 01/31/91
DATE REPORTED: 02/08/91

EPA METHOD 8240: VOLATILE ORGANICS IN AIR

COMPOUND	Result	Reporting Limit
	ul/L (ppm)	ul/L (ppm)
chloromethane	ND	1.0
bromomethane	ND	1.0
vinyl chloride	1.2	1.0
chloroethane	ND	1.0
methylene chloride	2.4	0.5
acetone	4.4	1.0
carbon disulfide	ND	0.5
trichlorofluoromethane	ND	0.5
1,1-dichloroethene	ND	0.5
1,1-dichloroethane	0.5	0.5
1,2-dichloroethene (total)	ND	0.5
chloroform	ND	0.5
freon 113	ND	0.5
1,2-dichloroethane	ND	0.5
2-butanone	ND	1.0
1,1,1-trichloroethane	ND	0.5
carbon tetrachloride	ND	0.5
vinyl acetate	ND	1.0
bromodichloromethane	ND	0.5
1,2-dichloropropane	ND	0.5
cis-1,3-dichloropropene	ND	0.5
trichloroethylene	0.7	0.5
dibromochloromethane	ND	0.5
1,1,2-trichloroethane	ND	0.5
benzene	0.7	0.5
trans-1,3-dichloropropene	ND	0.5
2-chloroethylvinyl ether	ND	1.0
bromoform	ND	0.5
2-hexanone	ND	1.0
4-methyl-2-pentanone	ND	1.0
1,1,2,2-tetrachloroethane	ND	0.5
tetrachloroethylene	0.8	0.5
toluene	8.5	0.5
chlorobenzene	ND	0.5
ethyl benzene	3.7	0.5
styrene	ND	0.5
total xylenes	7.5	0.5

ND = Not detected at or above reporting limit

QA/QC SUMMARY: SURROGATE RECOVERIES

1,2-Dichloroethane-d4	111 %
Toluene-d8	106 %
Bromofluorobenzene	96 %

[illegible]

Run 3

4.5996 CO₂
4.5910

7.3310 O₂

16.32

15.52

4.6610 O₂

16.8510 CO₂

15.34

Run 2

7.6620 O₂

15.04

11.84% CO₂

1-22-91

Run 2

92.4 ppm THC

CH₄

1157

Run 1

CH₄

Charcoal
5/rev

92.4 ppm THC

1112

1620 ppm
THC

0-2000 ppm scale changed scale to 740

92.4 ppm

MLGC Eng #2

1-22-91

Run 1

10/14/1931

10/16/1931

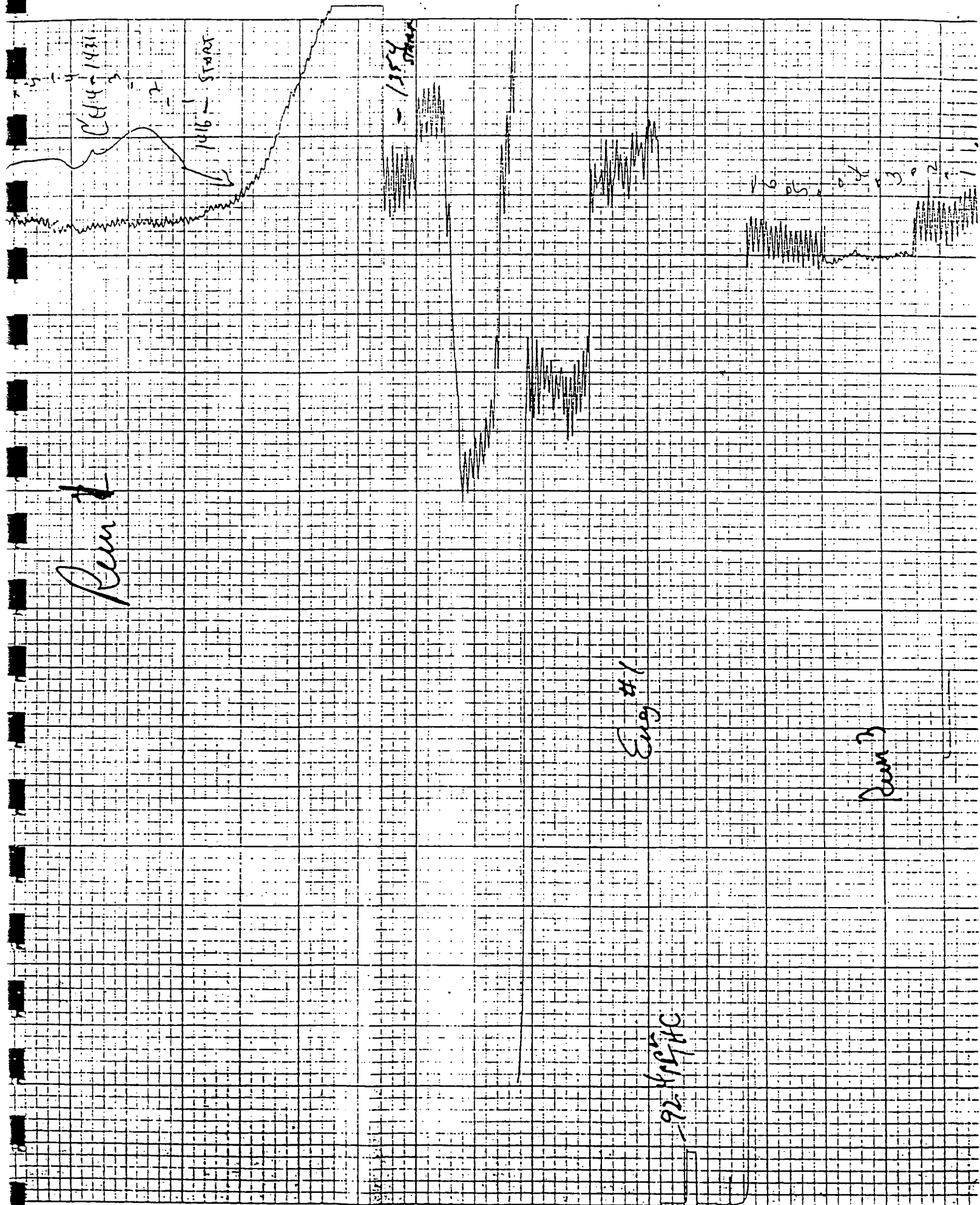
10/15/1931

Eng #1

Run 3

10/14/1931

10/15/1931



92.4 ppm THC

Run 3

92.4 ppm THC

Run 2

92.4 ppm THC

-16:32

6:15

CH4

6:10

CH4

6:02

15:22

6

5

4

3

2

1

-15:15

-15:04

-14:49

~200 ppm COx

Run 2

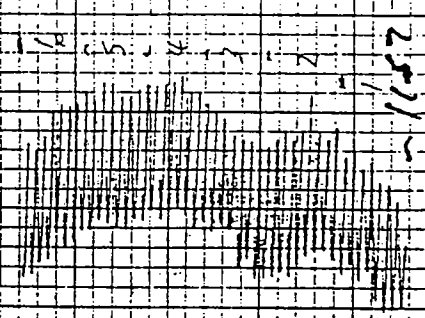
~201.9 ppm COx

~196 ppm COx

Run 1

~201.9 ppm COx

~201.9 ppm COx



changed scale NOx & CO

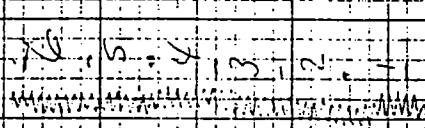
PALCO Segrain

~398 ppm CO

~408 ppm CO

~38 ppm CO

~398 ppm CO



143

Rem

146 start

134 start

Eng #1

598 ppm CO

7-202 ppm CO

1279

598 ppm CO

2018 ppm CO

395 ppm CO

205 ppm

16:32

16:22

16:17

Run 3

15:55

395 ppm CO

105 ppm NOx

15:34

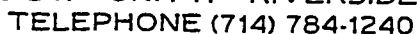
Run 2

15:04

395 ppm CO

202 ppm NOx

14:46



STANDARD CALIBRATION GASES IN ALUMINUM CYLINDERS



REPORT OF ANALYSIS
EPA PROTOCOL GAS MIXTURES

DATE : 10/05/90

PAGE 1

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

J.W. Gay

J.T. Marrin

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