BK016

AIR POLLUTION SOURCE TESTING AT CHALK CLIFF LIMITED COGENERATION FACILITY MARICOPA, CALIFORNIA

Prepared for:

DESTEC OPERATING CO.
34759 Lencioni Avenue
Bakersfield, California 93308

For Submittal to:

San Joaquin Valley Unified Air Pollution Control District/
Kern County Air Pollution Control District
2700 "M" Street, Suite 275
Bakersfield, California 93301

Test Dates:

December 23, 1991

RECEIVED
JAN 24 1992
KERN COUNTY AIR
POLLUTION CONTROL DISTRICT

Prepared by:

Engineering-Science, Inc.
2520 Pegasus Drive
Bakersfield, California 93308
(805)393-0272

Endorsed by:

Project Manager
Engineering-Science, Inc.

Permit Holder
Company Representative

SUMMARY OF SOURCE TEST RESULTS

Company : CHALK CLIFF LIMITED
Test Date : 23–Dec–91

Permit # 4175001
HRSG OUTLET

	gr/scf	gr/scf @12% CO2	ppm(v)	ppm(v) @15% O2	lb/hr	lb/MMBtu
PARTICULATE						
Run 1						
2						
3						
4						
5						
6						
Mean						
SULFATE						
Run 1						
2						
3						
4						
5						
6						
Mean						
NOx as NO2, dry						
Run 1			3.17	3.36	5.45	0.0123
2			3.12	3.28	5.31	0.0120
3			3.30	3.42	5.55	0.0125
4						
5						
6						
Mean			3.20	3.35	5.44	0.0123
CO						
Run 1			2.63	2.79	2.75	0.0062
2			2.96	3.11	3.07	0.0069
3			2.90	3.01	2.97	0.0067
4						
5						
6						
Mean			2.83	2.97	2.93	0.0066
SO2						
Run 1						
2						
3						
4						
5						
6						
Mean						
HC (non–methane)						
Run 1			1.00	1.06	0.60	0.0014
2			0.00	0.00	0.00	0.0000
3			0.00	0.00	0.00	0.0000
4						
5						
6						
Mean			0.33	0.35	0.20	0.0005

Scrubber Liquor Analysis :
Chlorides–

Specific Gravity–

Comments : ANNUAL 210.1 — 48 MW GAS F TURBINE w/ Steam Inj, NH3/SCR, CO CAT, UNFIRED HRU

For Regulatory Agency Use Only :

2/27/92

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SECTION 1

INTRODUCTION

AIR POLLUTION SOURCE TESTING AT CHALK CLIFF LIMITED COGENERATION FACILITY MARICOPA, CALIFORNIA

SECTION 1
INTRODUCTION

On December 23, 1991, Engineering-Science, Inc. (ES), Bakersfield, California, conducted air pollution source testing on the gas turbine located at the Chalk Cliff Limited Cogeneration facility located off Highway 119 near Maricopa, California. Destec Operating Company operates this natural gas fired cogeneration facility. The facility is comprised of a single GE LM-5000 gas turbine which is fired exclusively on natural gas. Steam injection and a Selective Catalytic Reduction (SCR) system using ammonia (NH_3) injection are used for controlling Nitrogen Oxides (NO_X) emissions. Carbon Monoxide (CO) emissions are controlled by the use of a CO reduction catalyst.

Compliance air pollution source testing was conducted on December 23, 1991. Testing was performed to demonstrate compliance with Kern County Air Pollution Control District (KCAPCD) Permit No. 4175001 and was conducted at the exhaust stack of the unit while the plant was operating at full load. The testing consisted of continuous emission monitoring (CEM) for NO_X, CO, and Oxygen (O_2) in addition to testing for methane/non-methane hydrocarbons. The CEMS testing was conducted in accordance with CARB Method 1-100 while the hydrocarbon testing was conducted in accordance with EPA Method 18 as published in title 40 CFR, part 60, Appendix A., revised as of July 1, 1990. The fuel sample and hydrocarbon samples laboratory analyses were performed by Zalco Analytical, located in Bakersfield California.

Mr. Steve Carter of RAP Services coordinated activities for the plant and was responsible for supplying ES with the plant operating data. Mr. Greg LeFore of the San Joaquin Valley Unified Air Pollution Control District/ KCAPCD was present during the

testing program to observe plant operations and source test procedures. Mr. Troy Delfino of ES performed the source testing.

SECTION 2

DATA SUMMARIES

EMISSION DATA SUMMARY
GAS COMPONENTS

CHALK CLIFF LIMITED
HRSG OUTLET

23-Dec-91

NITROGEN DIOXIDE

Run #	% O2	Corrected ppm (dry)	Corrected ppm (dry) @ 15% O2	lb/hr	lb/MMBtu
1	15.33	3.17	3.36	5.45	0.0123
2	15.29	3.12	3.28	5.31	0.0120
3	15.21	3.30	3.42	5.55	0.0125
4					
5					
6					
Average	15.28	3.20	3.35	5.44	0.0123

CARBON MONOXIDE

Run #	Corrected ppm (dry)	Corrected ppm (dry) @ 15% O2	lb/hr	lb/MMBtu
1	2.63	2.79	2.75	0.0062
2	2.96	3.11	3.07	0.0069
3	2.90	3.01	2.97	0.0067
4				
5				
6				
Average	2.83	2.97	2.93	0.0066

SULFUR DIOXIDE

Run #	Corrected ppm (dry)	Corrected ppm (dry) @ 15% O2	lb/hr	lb/MMBtu
1				
2				
3				
4				
5				
6				
Average				

HYDROCARBON (NON-METHANE)

Run #	Corrected ppm (dry)	Corrected ppm (dry) @ 15% O2	lb/hr	lb/MMBtu
1	1.00	1.06	0.60	0.0014
2	0.00	0.00	0.00	0.0000
3	0.00	0.00	0.00	0.0000
4				
5				
6				
Average	0.33	0.35	0.20	0.0005

SECTION 3

TEST METHOD CALCULATIONS

NOMENCLATURE

A_s	= Cross-sectional area of stack (ft^2)
A_n	= Cross-sectional area of nozzle (ft^2)
B_{ws}	= Water vapor in the gas stream, proportion by volume (dimensionless)
C_p	= Pitot tube coefficient (dimensionless)
dH	= Average pressure differential across the orifice meter (inches of water)
Md	= Dry molecular weight of stack gas (lb/lb-mole)
Ms	= Wet molecular weight of stack gas (lb/lb-mole)
N	= Normality of titrant (milliequivalents/ml)
dP	= Velocity pressure of stack gas (inches of water)
Pb	= Barometric pressure at sampling site (in. Hg)
Ps	= Absolute stack gas pressure (in. Hg)
Pstd	= Standard absolute pressure (29.92 in. Hg)
Qs(std)	= Dry volumetric stack gas flow rate, standard conditions (dscfm)
Ts	= Stack temperature (^oF)
Vm	= Dry gas volume as measured by dry gas meter (dcf)
Vm(std)	= Dry gas volume as measured by dry gas meter, corrected to standard conditions (dscf)
Vw(std)	= Volume of water vapor in the gas stream, corrected to standard conditions (scf)
Vlc	= Volume of water vapor condensed in impingers and silica gel (ml)
T(std)	= Standard temperature (^oF)
Tm	= Meter temperature (^oF)
SQ.RT.dP	= Square root of velocity pressure (dimensionless)
y	= Dry gas meter calibration factor (dimensionless)
Pstatic	= Static pressure of stack (in. H_2O)
Pstack	= Static pressure of stack (in. Hg)
I	= Isokinetic sample rate (percent)
vs	= Average velocity of the stack gas (ft/sec)
Qs	= Actual stack gas flow rate at stack conditions (ft^3/min)
Θ	= Total sampling time (min)
% O_2	= Percent oxygen by volume (dry basis)
% CO_2	= Percent carbon dioxide by volume (dry basis)
% CO	= Percent carbon monoxide by volume (dry basis)
% N_2	= Percent nitrogen by volume (dry basis)
Zcf	= Zero drift correction factor
Scf	= Span drift correction factor
Cz	= Zero correction concentration
MW	= Molecular weight (lb/lb-mole)
ppm	= Parts per million by volume

lb/MMBtu	= Emission concentration, pounds per million British thermal units
dscf/MMBtu	= Fuel factor, dry standard cubic feet per million British thermal units
gr/scf	= Emission concentration, grains per standard cubic foot
lb/hr	= Emission rate, pounds per hour
FHW	= Front Half Wash of sampling train
MF	= Mass Filter of sampling train
BHW	= Back Half Wash of Sampling train
gr/dscf	= Emission concentration, grains per dry standard cubic foot
ng	= Mass unit, nanograms
mg	= Mass unit, milligrams
g	= Mass unit, grams
ml	= Unit of volume, milliliters
L	= Unit of volume, liters
ul	= Unit of volume, microliters
H_2SO_4	= Chemical formula, sulfuric acid
$BaCl_2$	= Chemical formula, barium chloride
NaOH	= Chemical formula, sodium hydroxide
H_2S	= Chemical formula, hydrogen sulfide
FHS	= Front Half Sulfate of sampling train
BHS	= Back Half Sulfate of sampling train
F-Factor	= Fuel factor, volume of generated gases per unit of heat content (dscf/MMBtu)
^oF	= Degrees Fahrenheit
^oR	= Degrees Rankine
^oC	= Degrees Celsius
98.076	= Molecular weight of sulfuric acid
64.062	= Molecular weight of sulfur dioxide
46.006	= Molecular weight of nitrogen dioxide
28.010	= Molecular weight of carbon monoxide
60	= Conversion factor, minutes per hour
460	= Conversion factor, ^oF to ^oR
15.432	= Conversion factor, grains per gram
0.000143	= Converson factor, pounds per grain
32/98.076	= Conversion factor, equivalent weight of SO_2 to MW of H_2SO_4
1.60982	= Ideal Gas Law (lb-mole x dscf/ dscf/ ^oR x mg)
0.00000137	= Ideal Gas Law (lb-mole x $^oR/ft^3$)
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
18.0	= Molecular weight of H_2O
32.064	= Equivalent weight of SO_2
85.49	= Pitot tube constant, ft/sec x $[(lb/lb\text{-}mole) \times (in.Hg)/((^oR) \times (in.H_2O))]^{0.5}$
8.223E-05	= Ideal gas constant (1.37E-06 lb-mole $^oR/ft^3$) x (60 min/hr)

EMISSION CALCULATIONS
GAS COMPONENTS

CHALK CLIFF LIMITED
HRSG OUTLET

DATA :

	Run 1	Run 2	Run 3	Run 4	Run 5	Run 6	Average
Date	23-Dec-91	23-Dec-91	23-Dec-91				
Oxygen (%)	15.33	15.29	15.21				15.28
Qs(std), dscfm	235,984	234,301	231,007				233,764
F-Factor, dscf/MMBtu	8,512.07	8,512.07	8,512.07				8,512.07
NOx, ppm	3.17	3.12	3.30				3.20
CO, ppm	2.63	2.96	2.90				2.83
SO2, ppm							0.00
HC (non-methane), ppm	1.00	0.00	0.00				0.33

CALCULATIONS :

NOx, lb/hr	5.45	5.31	5.55				5.44
NOx, ppm @ 15 %O2	3.36	3.28	3.42				3.35
NOx, lb/MMBtu	0.0123	0.0120	0.0125				0.0123
CO, lb/hr	2.75	3.07	2.97				2.93
CO, ppm @ 15 %O2	2.79	3.11	3.01				2.97
CO, lb/MMBtu	0.0062	0.0069	0.0067				0.0066
SO2, lb/hr							
SO2, ppm @ 15 %O2							
SO2, lb/MMBtu							
HC, lb/hr	0.60	0.00	0.00				0.20
HC, ppm @ 15 %O2	1.06	0.00	0.00				0.35
HC, lb/MMBtu	0.0014	0.0000	0.0000				0.0005

EQUATIONS :

lb/hr = (0.00000137 Lb-Mole °R / ft3) x 60 min/hr x Qs(std) x MW x ppm / [T(std) + 460]

ppm @ 15 %O2 = ppm measured x [(20.9 - 15 %O2) / (20.9 - %O2 measured)]

lb/MMBtu = F-Factor x MW x [(1.3711E-6 Lb-Mole °R / ft3) / (T(std) + 460)] x [20.9 / (20.9 - O2%)] x ppm

CONSTANTS :

Standard Temp. T(std): 60 °F
Oxygen Correction : 15 % O2

NOx, MW = 46.005 lb/lb-mole
CO, MW = 28.010 lb/lb-mole
SO2, MW = 64.058 lb/lb-mole
HC, MW = 16.043 lb/lb-mole

FUEL BASED CALCULATIONS

CHALK CLIFF LIMITED
HRSH OUTLET

23-Dec-91

FUEL ANALYSIS DATA

Run #	Fuel Value (%), Moisture & Ash Free: Carbon	Hydrogen	Nitrogen	Oxygen	Sulfur	GCV BTU/lb	ft3/lb	lb/gal
1	72.29	23.13	1.37	3.21	0.00	22,389	21.610	
2	72.29	23.13	1.37	3.21	0.00	22,389	21.610	
3	72.29	23.13	1.37	3.21	0.00	22,389	21.610	
4								
5								
6								

CALCULATIONS

Run #	Stack Gas Oxygen %	Fuel Gas Flowrate lb/hr	Fuel Gas Flowrate ft3/hr	Fuel Oil Flowrate lb/hr	Fuel Oil Flowrate gal/hr	Solid Fuel lb/hr	Heat Input MMBTU/hr	F-Factor dscf/MMBTU	Qs(std) dscfm
1	15.33	19,800					443.310	8,512.07	235,984
2	15.29	19,800					443.310	8,512.07	234,301
3	15.21	19,800					443.310	8,512.07	231,007
4									
5									
6									

Heat Input, MMBTU/hr = (lb/hr fuel gas) x BTU/lb x MM/1E+06

= (ft3/hr fuel gas) x BTU/lb / (ft3/lb fuel gas) x MM/1E+06

= (lb/hr fuel oil) x BTU/lb x MM/1E+06

= (gal/hr fuel oil) x lb/gal x BTU/lb x MM/1E+06

= (lb/hr solid fuel) x BTU/lb x MM/1E+06

F-Factor, dscf/MMBTU = 10E+06 [3.64 x (% H) + 1.53 x (% C) + 0.57 x (% S) + 0.14 x (% N) − 0.46 x (% O2)] / (BTU/lb) x [(Tstd + 460) / 528]

Qs(std), dscfm = MMBTU/hr x [F-Factor x (20.9 / (20.9 − %O2)) x (hr / 60 min)]

GCV = Gross Calorific Value of fuel

Standard Temperature = 60 °F

SECTION 4

CONTINUOUS TEST METHODS

GAS ANALYZER DATA

CHALK CLIFF LIMITED
HRSG OUTLET

Date : 23-Dec-91
Run No. : 1

	O2, %		CO2, %		NOx, ppm		CO, ppm		SO2, ppm	
	Instrument Reading	Drift Corrected Reading	Instrument Reading	Drift Corrected Reading	Instrument Reading	Drift Corrected Reading	Instrument Reading	Drift Corrected Reading	Instrument Reading	Drift Corrected Reading
Point #										
1	15.33	15.33	3.20	3.21	3.10	3.08	2.63	2.63		
2	15.33	15.33	3.20	3.22	3.20	3.14	2.63	2.63		
3	15.33	15.33	3.20	3.24	3.30	3.21	2.63	2.63		
4	15.33	15.33	3.20	3.25	3.40	3.27	2.63	2.63		
5										
6										
7										
8										
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10										
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25										
26										
27										
28										
29										
30										
MEAN :		15.33		3.23		3.17		2.63		

Zero Check	0.00	0.00	0.19	0.00
Span Check	14.06	8.80	5.76	6.21
Initial Span Value	14.06	8.97	5.64	6.21
Drift, Percent	0.0	−1.9	−1.2	0.0
Zero Drift, Zcf	0.00000	0.00000	0.04750	0.00000
Span Drift, Scf	0.00000	−0.00474	−0.00310	0.00000

Drift, Percent = [(Span Check − Zero Check) − Calib. Gas] / Calib. Gas x 100

Zero Drift Correction Factor, Zcf = Zero Check / # of Readings

Span Drift Correction Factor, Scf = (% Drift / 100) / # of Readings

Cz, Zero Corr. Concentration = measured value − [Zcf x (Point # − 0.5)]

Drift Corrected Reading = Cz / [1 + (Scf x (Point # − 0.5))]

GAS ANALYZER DATA

CHALK CLIFF LIMITED
HRSG OUTLET

Date : 23-Dec-91
Run No. : 2

	O2, %		CO2, %		NOx, ppm		CO, ppm		SO2, ppm	
	Instrument Reading	Drift Corrected Reading	Instrument Reading	Drift Corrected Reading	Instrument Reading	Drift Corrected Reading	Instrument Reading	Drift Corrected Reading	Instrument Reading	Drift Corrected Reading
Point #										
1	15.25	15.25	3.26	3.26	3.00	2.99	3.13	3.09		
2	15.25	15.25	3.26	3.25	3.10	3.07	3.13	3.00		
3	15.33	15.33	3.26	3.24	3.20	3.16	3.13	2.92		
4	15.33	15.33	3.26	3.23	3.30	3.24	3.13	2.83		
5										
6										
7										
8										
9										
10										
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28										
29										
30										
MEAN :		15.29		3.24		3.12		2.96		

Zero Check	−0.03	0.05	0.18	0.30
Span Check	14.06	8.97	5.62	6.60
Initial Span Value	14.06	8.97	5.64	6.21
Drift, Percent	0.2	−0.6	−3.5	1.4
Zero Drift, Zcf	−0.00750	0.01250	0.04500	0.07500
Span Drift, Scf	0.00053	−0.00139	−0.00887	0.00362

Drift, Percent = [(Span Check − Zero Check) − Calib. Gas] / Calib. Gas x 100

Zero Drift Correction Factor, Zcf = Zero Check / # of Readings

Span Drift Correction Factor, Scf = (% Drift / 100) / # of Readings

Cz, Zero Corr. Concentration = measured value − [Zcf x (Point # − 0.5)]

Drift Corrected Reading = Cz / [1 + (Scf x (Point # − 0.5))]

GAS ANALYZER DATA

CHALK CLIFF LIMITED
HRSG OUTLET

Date : 23-Dec-91
Run No. : 3

	O2, %		CO2, %		NOx, ppm		CO, ppm		SO2, ppm	
	Instrument Reading	Drift Corrected Reading	Instrument Reading	Drift Corrected Reading	Instrument Reading	Drift Corrected Reading	Instrument Reading	Drift Corrected Reading	Instrument Reading	Drift Corrected Reading
Point #										
1	15.20	15.20	3.20	3.20	3.40	3.39	2.95	2.94		
2	15.20	15.21	3.20	3.19	3.50	3.46	2.85	2.81		
3	15.20	15.21	3.20	3.18	3.39	3.32	2.80	2.73		
4	15.20	15.21	3.20	3.18	3.16	3.06	3.20	3.13		
5										
6										
7										
8										
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19										
20										
21										
22										
23										
24										
25										
26										
27										
28										
29										
30										
MEAN :		15.21		3.19		3.30		2.90		

Zero Check	0.17	0.05	0.15	0.25
Span Check	14.06	8.95	5.73	6.13
Initial Span Value	14.06	8.97	5.64	6.21
Drift, Percent	−1.2	−0.8	−1.1	−5.3
Zero Drift, Zcf	0.04250	0.01250	0.03750	0.06250
Span Drift, Scf	−0.00302	−0.00195	−0.00266	−0.01329

Drift, Percent = [(Span Check − Zero Check) − Calib. Gas] / Calib. Gas x 100

Zero Drift Correction Factor, Zcf = Zero Check / # of Readings

Span Drift Correction Factor, Scf = (% Drift / 100) / # of Readings

Cz, Zero Corr. Concentration = measured value − [Zcf x (Point # − 0.5)]

Drift Corrected Reading = Cz / [1 + (Scf x (Point # − 0.5))]

SECTION 5

LAB ANALYSIS DATA

ZALCO LABORATORIES, INC.

Analytical & Consulting Services

Engineering Science
2520 Pegasus Dr.
Bakersfield, CA 93308

Lab. No.: 029960_004
Received: Dec 23, 1991
Reported: Dec 26, 1991

Attention: Troy Delfino

Sample Description: BK9112041 Fuel Gas All Nat'l Gas

* CHROMATOGRAPHIC ANALYSIS (Z 1635) *

Components	Mole %	Wt %	CHONS	Wt %
Hydrogen	0.000	0.000	CARBON	72.29
Carbon Dioxide	1.755	4.407	HYDROGEN	23.13
Oxygen	0.000	0.000	OXYGEN	3.21
Nitrogen	.860	1.375	NITROGEN	1.37
Carbon Monoxide	0.000	0.000	SULFUR	0.00
Hydrogen Sulfide	0.000	0.000		
Methane	92.740	84.891	Totals	99.99
Ethane	3.592	6.163	Total H/C	.32
Propane	.690	1.737		
IsoButane	.070	.232		
N-Butane	.119	.393		
IsoPentane	.033	.136		
N-Pentane	.029	.120		
Hexanes+	.111	.546		
Totals =	100.000	100.000		

SPECIFIC GRAVITY (Air = 1)		.6062
SPECIFIC VOLUME, cu.ft./lb	*	21.61
GROSS CALORIFIC VALUE, Btu/cu.ft.	*	1018.23
GROSS CALORIFIC VALUE, Btu/cu.ft.	**	1035.84
GROSS CALORIFIC VALUE, Btu/lb	**	22389.40
NET CALORIFIC VALUE, Btu/cu.ft.	**	934.25
NET CALORIFIC VALUE, Btu/lb	**	20193.63
COMPRESSIBILITY FACTOR 'Z' (60 F,1 Atm)		.9978

EPA 'F' Factor @ 68 F: 8642.166 DSCF / MM Btu.
KCAPCD 'F' Factor @ 60 F: 8512.534 DSCF / MM Btu.

* Water Saturated ** Dry Gas @ 60 F, 14.73 psia

Kathe Zimmerman
Analyst

Jim Etherton
Laboratory Director

4309 Armour Avenue Bakersfield, California 93308

(805) 395-0539 FAX (805) 395-3069

ZALCO LABORATORIES, INC.

Analytical & Consulting Services

Engineering Science

2520 Pegasus Dr.

Bakersfield, CA 93308

Lab. No.: 029960_001

Received: Dec 23, 1991
Reported: Dec 24, 1991

Attention: Troy Delfino

Sample Description: BK9112038 HC Run #1 HRSG Stack 12/23

* CHROMATOGRAPHIC ANALYSIS (Z 1645) *

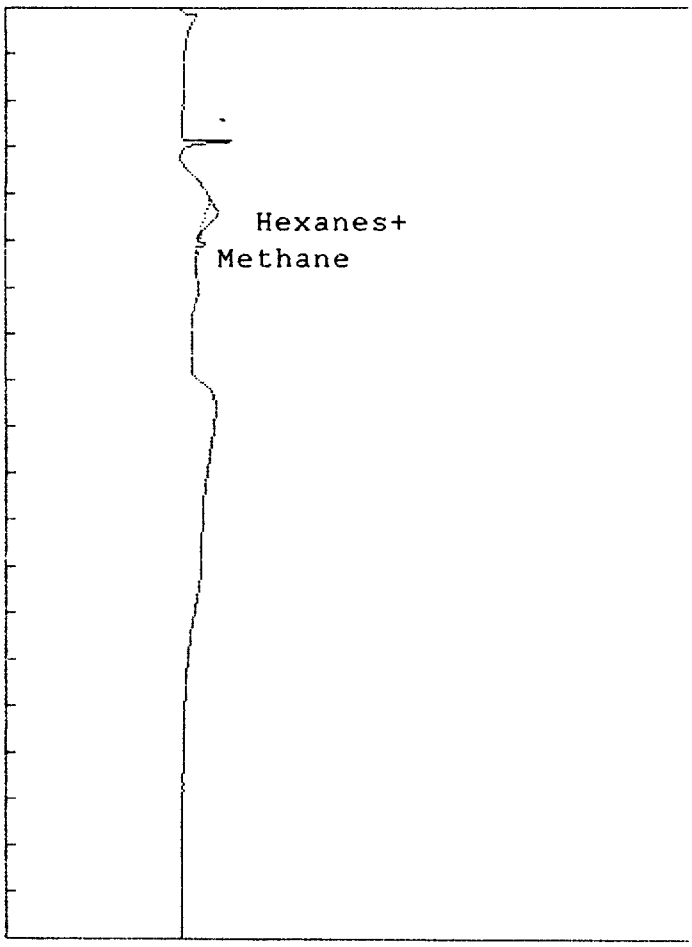
(FID with C6+ Backflush to Detector)

Components		PPM, Volume
Methane	(C1)	1.0
Ethane	(C2)	<0.1
Propane	(C3)	<0.1
Butanes	(I+N C4)	<0.1
Pentanes	(I+N C5)	<0.1
Hexanes+	(C6+)	.7
Total Hydrocarbons		1.7
Total Non-Methane Hydrocarbons		1
Total Non-(C1+C2) Hydrocarbons		1
Total Non-Methane Hydrocarbons as C1		4

Zalco C1-C6 PPM Report

Sample Name : BK9112038 HC Run #1 HRSG Stack 12/23
0001, 029960_001, Dec 23, 1991, Troy Delfino
Peak Processor : Genie Multilevel : False
Instument : ADC_2 Application : Loop
Calculation : ExternalSTD Quantitation: AreaUnits
Result File : /DATA/LOOP/RESULT/ADC_2/ENG29960_001.RES
Run Time : 20.00 Minutes, injected on Tue Dec 24, 1991 11:54:22
Run Status : RunStatusOK
EndOffBaseline

RETENTION TIME	AREA	FACTOR	ppmvol
4.400	1103	6.39805E-04	.7058
5.171	194	5.20135E-03	1.0065
		Total Hydrpcarbons	1.7123



Report Time: Thu Dec 26, 1991 9:09:24 am
Method: /DATA/LOOP/METHOD/LOWPPME.MTH
Format File: /DATA/LOOP/FORMAT/SIDE_BY_SIDE.FMT

ZALCO LABORATORIES, INC.

Analytical & Consulting Services

Engineering Science
2520 Pegasus Dr.
Bakersfield, CA 93308

Lab. No.: 029960_002
Received: Dec 23, 1991
Reported: Dec 24, 1991

Attention: Troy Delfino

Sample Description: BK9112039 HC Run #2 HRSG Stack 12/23

* CHROMATOGRAPHIC ANALYSIS (Z 1645) *

(FID with C6+ Backflush to Detector)

Components	PPM, Volume
Methane (C1)	1.2
Ethane (C2)	<0.1
Propane (C3)	<0.1
Butanes (I+N C4)	<0.1
Pentanes (I+N C5)	<0.1
Hexanes+ (C6+)	<0.1
Total Hydrocarbons	1.2
Total Non-Methane Hydrocarbons	0
Total Non-(C1+C2) Hydrocarbons	0
Total Non-Methane Hydrocarbons as C1	0

Kathe Zimmerman
Analyst

Jim Etherton
Laboratory Director

4309 Armour Avenue Bakersfield, California 93308

(805) 395-0539 FAX (805) 395-3069

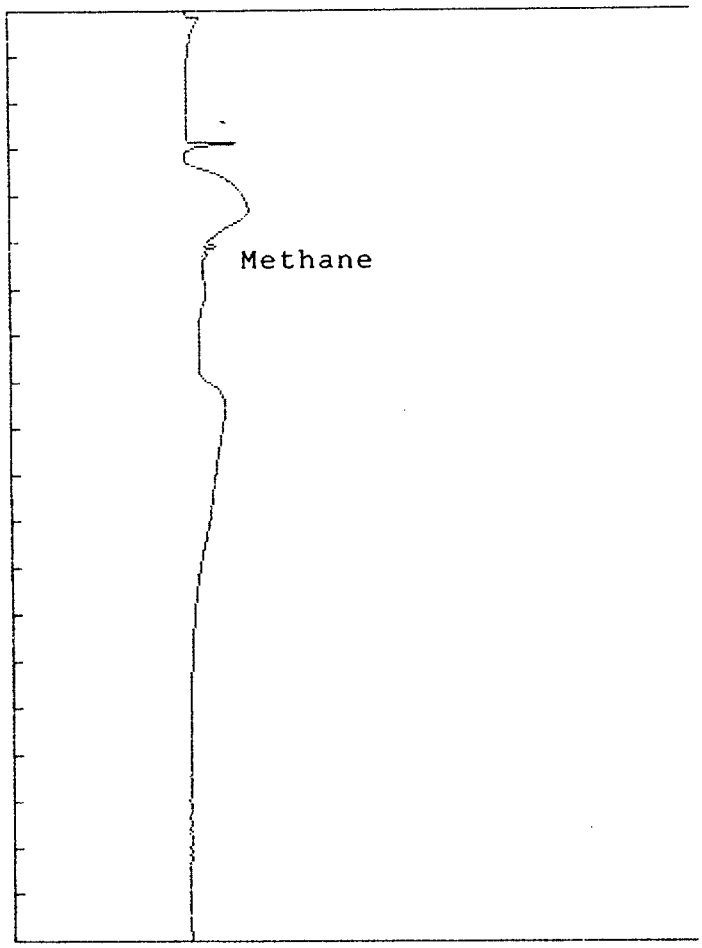
Zalco C1-C6 PPM Report

Sample Name : BK9112039 HC Run #2 HRSG Stack 12/23
0001, 029960_002, Dec 23, 1991, Troy Delfino

Peak Processor	: Genie	Multilevel	: False
Instument	: ADC_2	Application	: Loop
Calculation	: ExternalSTD	Quantitation	: AreaUnits

Result File : /DATA/LOOP/RESULT/ADC_2/ENG29960_002.RES
Run Time : 20.00 Minutes, injected on Tue Dec 24, 1991 12:19:48
Run Status : RunStatusOK
EndOffBaseline

RETENTION TIME	AREA	FACTOR	ppmvol
5.175	229	5.20135E-03	1.1921
		Total Hydrocarbons	1.1921



Report Time: Thu Dec 26, 1991 9:16:09 am
Method: /DATA/LOOP/METHOD/LOWPPME.MTH
Format File: /DATA/LOOP/FORMAT/SIDE_BY_SIDE.FMT

ZALCO LABORATORIES, INC.
Analytical & Consulting Services

Engineering Science
2520 Pegasus Dr.
Bakersfield, CA 93308

Lab. No.: 029960_003
Received: Dec 23, 1991
Reported: Dec 24, 1991

Attention: Troy Delfino

Sample Description: BK9112040 HC Run #3 HRSG Stack 12/23

* CHROMATOGRAPHIC ANALYSIS (Z 1645) *

(FID with C6+ Backflush to Detector)

Components		PPM, Volume
Methane	(C1)	.9
Ethane	(C2)	<0.1
Propane	(C3)	<0.1
Butanes	(I+N C4)	<0.1
Pentanes	(I+N C5)	<0.1
Hexanes+	(C6+)	<0.1
Total Hydrocarbons		.9
Total Non-Methane Hydrocarbons		0
Total Non-(C1+C2) Hydrocarbons		0
Total Non-Methane Hydrocarbons as C1		0

Kathe Zimmerman
Analyst

Jim Etherton
Laboratory Director

4309 Armour Avenue Bakersfield, California 93308
(805) 395-0539 FAX (805) 395-3069

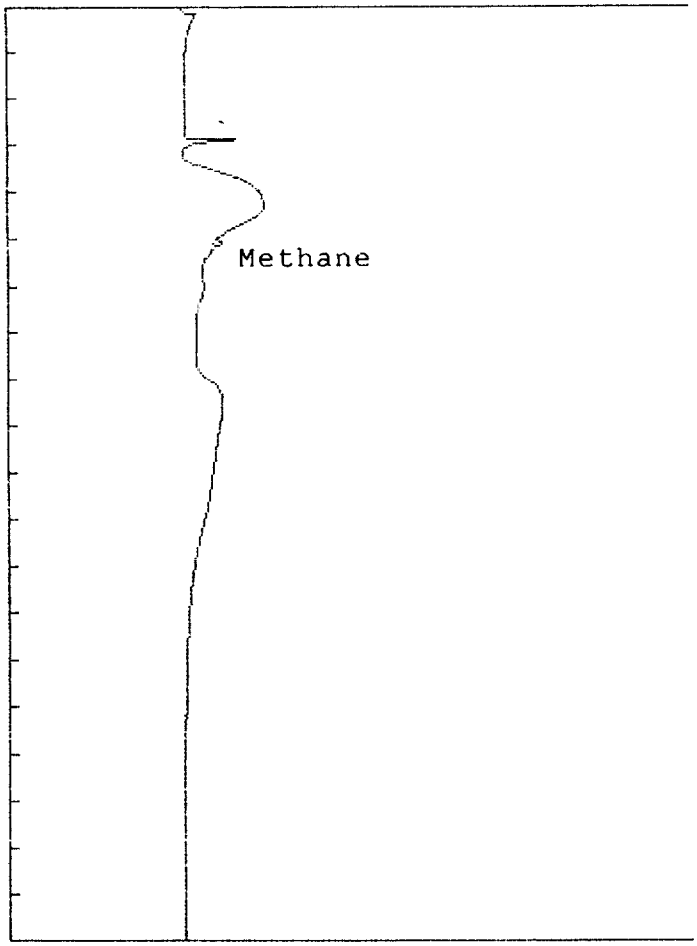
Zalco C1-C6 PPM Report

Sample Name : BK9112040 HC Run #3 HRSG Stack 12/23
0001, 029960_003, Dec 23, 1991, Troy Delfino

Peak Processor	: Genie	Multilevel	: False
Instument	: ADC_2	Application	: Loop
Calculation	: ExternalSTD	Quantitation	: AreaUnits

Result File : /DATA/LOOP/RESULT/ADC_2/ENG29960_003.RES
Run Time : 20.00 Minutes, injected on Tue Dec 24, 1991 12:45:36
Run Status : RunStatusOK
EndOffBaseline

RETENTION TIME	AREA	FACTOR	ppmvol
5.175	182	5.20135E-03	.9473
		Total Hydrocarbons	.9473



Report Time: Thu Dec 26, 1991 9:19:06 am
Method: /DATA/LOOP/METHOD/LOWPPME.MTH
Format File: /DATA/LOOP/FORMAT/SIDE_BY_SIDE.FMT

ZALCO LABORATORIES, INC.
Analytical & Consulting Services

Engineering Science
2520 Pegasus Dr.
Bakersfield, CA 93308

Lab. No.: Cal_12_23
Received: Dec 23, 1991
Reported: Dec 23, 1991

Attention:

Sample Description: Scotty's Gas Can Mix #243 12/23/91

* CHROMATOGRAPHIC ANALYSIS (Z 1645) *

(FID with C6+ Backflush to Detector)

Components	PPM, Volume
Methane (C1)	16.3
Ethane (C2)	16.3
Propane (C3)	16.3
Butanes (I+N C4)	16.3
Pentanes (I+N C5)	16.4
Hexanes+ (C6+)	30.9
Total Hydrocarbons	112.5
Total Non-Methane Hydrocarbons	96
Total Non-(C1+C2) Hydrocarbons	80
Total Non-Methane Hydrocarbons as C1	374

Kathy Zimmerman
Analyst

Jim Etherton
Laboratory Director

4309 Armour Avenue Bakersfield, California 93308
(805) 395-0539 FAX (805) 395-3069

ZALCO LABORATORIES, INC.
Analytical & Consulting Services

Engineering Science
2520 Pegasus Dr.
Bakersfield, CA 93308

Lab. No.: Blnk_12_23
Received: Dec 23, 1991
Reported: Dec 23, 1991

Attention: Troy Delfino

Sample Description: 100% Helium Gas Blank 12/23/91

* CHROMATOGRAPHIC ANALYSIS (Z 1645) *

(FID with C6+ Backflush to Detector)

Components		PPM, Volume
Methane	(C1)	<0.1
Ethane	(C2)	<0.1
Propane	(C3)	<0.1
Butanes	(I+N C4)	<0.1
Pentanes	(I+N C5)	<0.1
Hexanes+	(C6+)	<0.1
Total Hydrocarbons		0.0
Total Non-Methane Hydrocarbons		0
Total Non-(C1+C2) Hydrocarbons		0
Total Non-Methane Hydrocarbons as C1		0

Kathie Zimmerman
Analyst

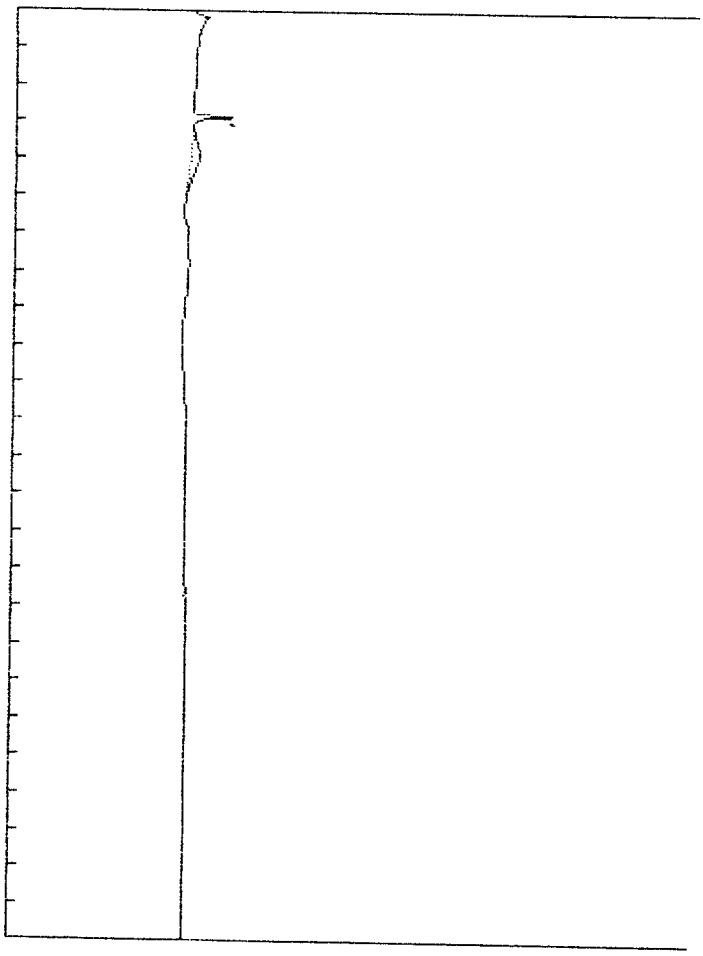
Jim Etherton
Laboratory Director

4309 Armour Avenue Bakersfield, California 93308
(805) 395-0539 FAX (805) 395-3069

Zalco C1-C6 PPM Report

Sample Name : 100% Helium Gas Blank 12/23/91
0001, Blnk_12_23, Dec 23, 1991, Troy Delfino

Peak Processor	: Genie	Multilevel	: False
Instument	: ADC_2	Application	: Loop
Calculation	: ExternalSTD	Quantitation	: AreaUnits
Result File	: /DATA/LOOP/RESULT/ADC_2/BLK_12_23_001.RES		
Run Time	: 25.00 Minutes, injected on Mon Dec 23, 1991 1:00:33		
Run Status	: RunStatusOK NoReference		



RETENTION TIME	AREA	FACTOR	ppmvol
3.912	1914	0.00000E+00	0.0000
		Total Hydrocarbons	0.0000

Report Time: Thu Dec 26, 1991 8:52:33 am
Method: /DATA/LOOP/METHOD/LOWPPME.MTH
Format File: /DATA/LOOP/FORMAT/SIDE_BY_SIDE.FMT

SECTION 6

TEST METHODOLOGY

SECTION 6

METHODOLGY

Continuous Emissions Monitoring

Sample Extraction and Conditioning

Sampling was performed using a system which delivers a conditioned, continuous gas sample to the gas analyzers. The gas sample was extracted through a stainless steel probe, then passed through a heated (250°F) teflon sample line, a sample condenser (for moisture removal), an in-line filter (for particulate removal), and a stainless steel pump. The clean, dry sample was then transported via unheated teflon line to the analyzer manifold (located within the mobile van) for sample distribution to the continuous emissions monitors.

Continuous Emissions Monitors (CEMS)

Table 1 describes the CEMS used in the mobile van to analyze the exhaust gases. Calibrations of the CEMS were performed using EPA Protocol 1 or NIST certified calibration gases. Copies of the gas certification are included in the appendix of this report.

Prior to performing the emissions testing, a leak check of the sample system was performed. A check of sampling system bias was performed by injecting calibration gas (for each parameter) at the sample probe and then observing instrument response. A response within $\pm$ 5 percent of instrument range was considered acceptable. The leak check was repeated at the conclusion of the test day to verify the validity of the tests.

Before each test run, an initial calibration of the analyzers was performed by introducing zero and span gases and making appropriate adjustments. During each test run, analyzer response data was recorded for each instrument. At the conclusion of the test run, a calibration check was performed to verify acceptable zero and span drift limits.

TABLE 1
CEM INSTRUMENT SPECIFICATIONS
CEM VAN NO. 2

PARAMETER	MANUFACTURER	MODEL NO.	ANALYZER PRINCIPLE	SENSITIVITY	LINEARITY	SPECIAL NOTES	RESPONSE TIME	NOISE	PRECISION
O2	MSA Instruments	4000	Electroconductivity Detection	+– .01%	< 2%	Galvanic Fuel Cell	90% Full Scale in 20 sec.	+– 1%	
CO2	Infrared Industries	732	Non–Dispersive Infrared		< 2%		90% Full Scale in 20 sec.		
NOx	Thermo Environmental Instruments Inc.	10	Chemiluminescent	.05 ppm	+– 1% from 0.05 to 10,000	High range has 02 feed.	Approx. 1.5 sec NO mode Approx. 1.7 sec NOx mode	< 1% of Full Scale	
CO	Monitor Labs	8310	Differential Infrared Radiation Absorption		< +– 1% of Full Scale		90% Full Scale in < 45 sec.	< 0.05 ppm	> +– 0.1ppm
SO2									
HC									

Speciated Hydorcarbons: EPA Method 18

Integrated hydrocarbon samples were collected through a 316 stainless steel and teflon line directly into a new Tedlar bag by utilizing an evacuated chamber to draw the exhaust into the bag. The Tedlar bags were purged twice with the exhaust gas before collecting each sample. At the conclusion of sampling, the tedlar bag was closed off, labeled, and delivered to Zalco Analytical laboratory along with a chain-of-custody form. The samples were analyzed by FID packed column gas chromotography for methane/non-methane hydrocarbons in accordance with EPA Method 18.

Fuel Gas

A fuel gas sample was collected in a stainless steel gas sample cylinder, properly labeled, and delivered to Zalco Analytical laboratory with the accompanying chain-of-custody form. The samples were analyzed by gas chromotography for CHONS (carbon, hydrogen, oxygen, nitrogen, and sulfur) and heating value in accordance with ASTM Method D-3588.

SECTION 7

RAW DATA

ENGINEERING–SCIENCE, INC.
CEM FIELD DATA SHEET

PLANT: CHALK CLIFF LIMITED
TEST LOCATION: HRSG OUTLET
CEM VAN NO.: 2
DATE: 12-23-91
OPERATOR: T. DELFINO

O2, %
Calibration Gases :
High 20.9 Cyl. # CC 105077
Mid 14.06 56.3 Cyl. # CC81191
Low ____ Cyl. # ____

CO2, %
Calibration Gases :
High ____ Cyl. # ____
Mid 8.97% (44.5) Cyl. # CC81191
Low ____ Cyl. # ____

NOx, ppm
Calibration Gases :
High 9.29 Cyl. # CC 56894
Mid 5.64 Cyl. # CC 49684
Low 0 Cyl. # ____

CO, ppm 0-25
Calibration Gases :
High 22.9 (91.5) Cyl. # CC28073
Mid 8.83 (35.5) Cyl. # CC12823
Low 6.21 Cyl. # CC49684
0 24.84

SO2, ppm
Calibration Gases :
High ____ Cyl. # ____
Mid ____ Cyl. # ____
Low ____ Cyl. # ____

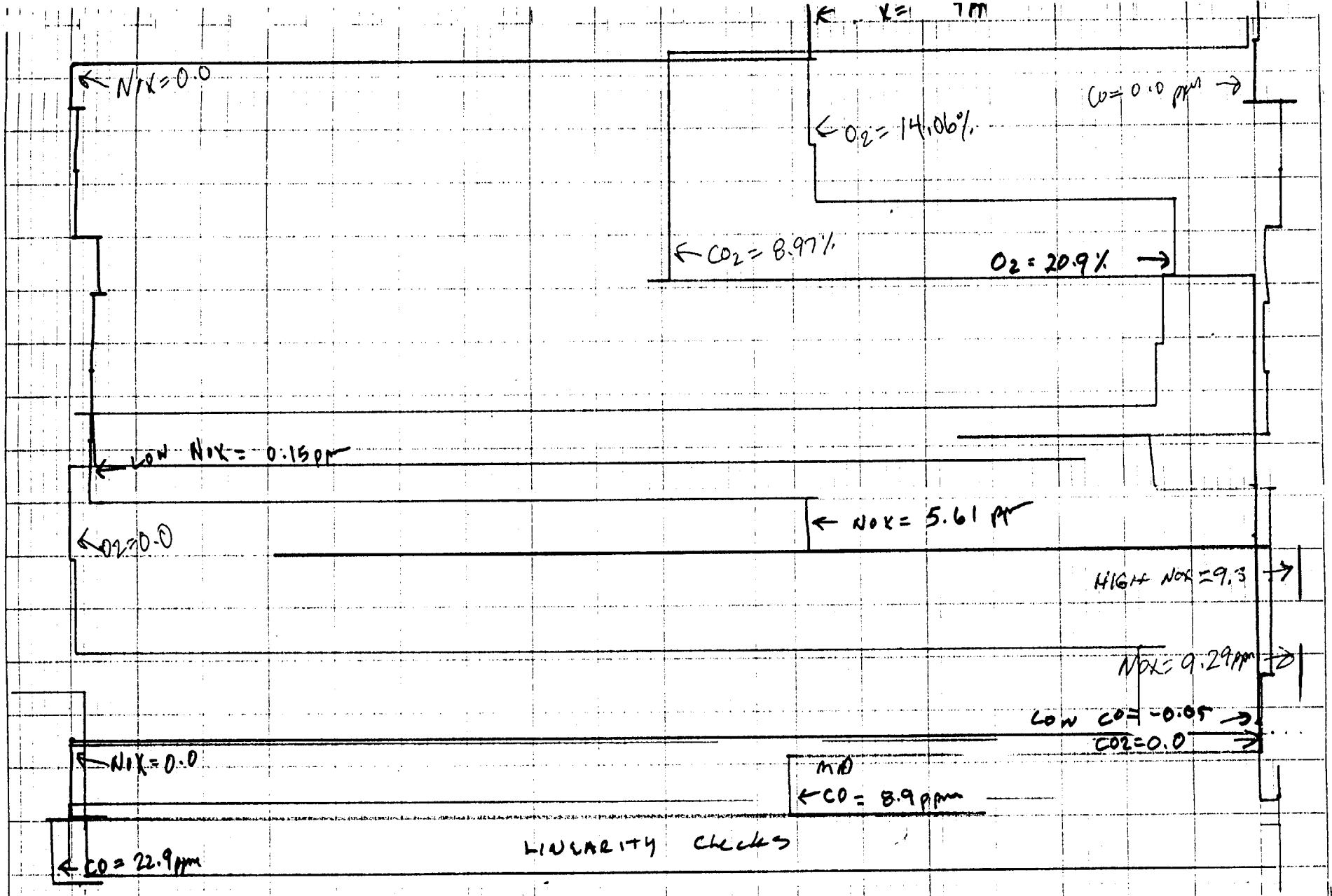
Calibration Gases :
High ____ Cyl. # ____
Mid ____ Cyl. # ____
Low ____ Cyl. # ____

TIME	SAMPLE POINT	O2 (%)	CO2 (%)	NOx (ppm)	CO (ppm)	SO2 (ppm)		COMMENTS / RUN #
		14.06	8.97	5.64	6.21	N/A		Span gas values used for test.
1000								LEAK check = 0" Hg @ 15"
				9.30	22.90			HIGH LINEARITY CHECKS
				5.61	8.90			MID
				0.0	-0.05			ZERO
	CALIBRATE	14.06	8.97	5.64	6.21			RECALIBRATE FOR TEST
1045	Run # 1							RUN # 1 (VOID DUE TO EXCESS DRIFT)
55								
1105								
1115								
								ZERO Check
1125	CAL							SPAN Check
								VOID RUN # 1

ENGINEERING–SCIENCE, INC.
CEM FIELD DATA SHEET

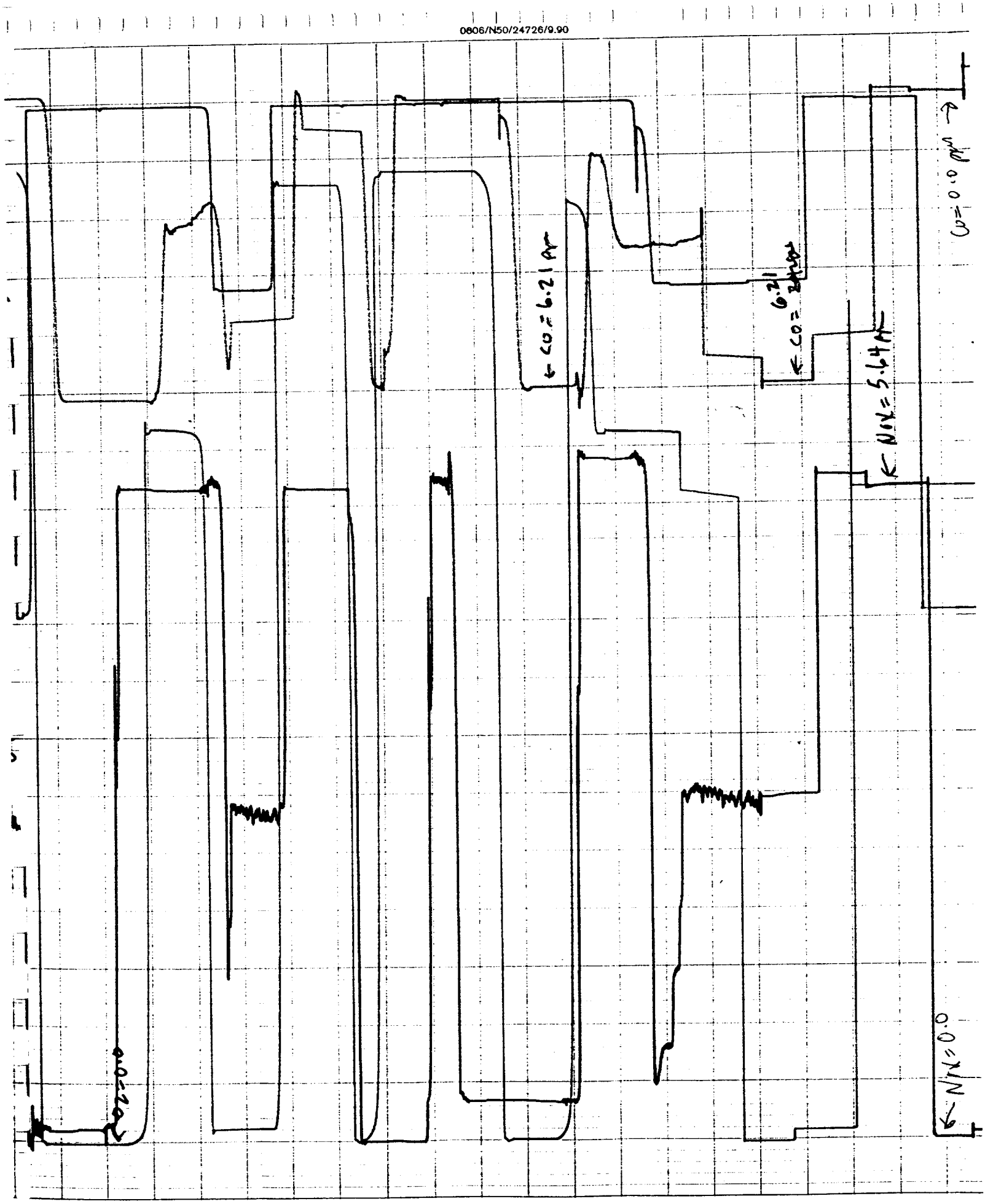
PLANT: Chalk Cliff Limited
CEM VAN NO.: 2
DATE: 12-23-91
OPERATOR: T. DELFINO
TEST LOCATION: HRSG OUTLET

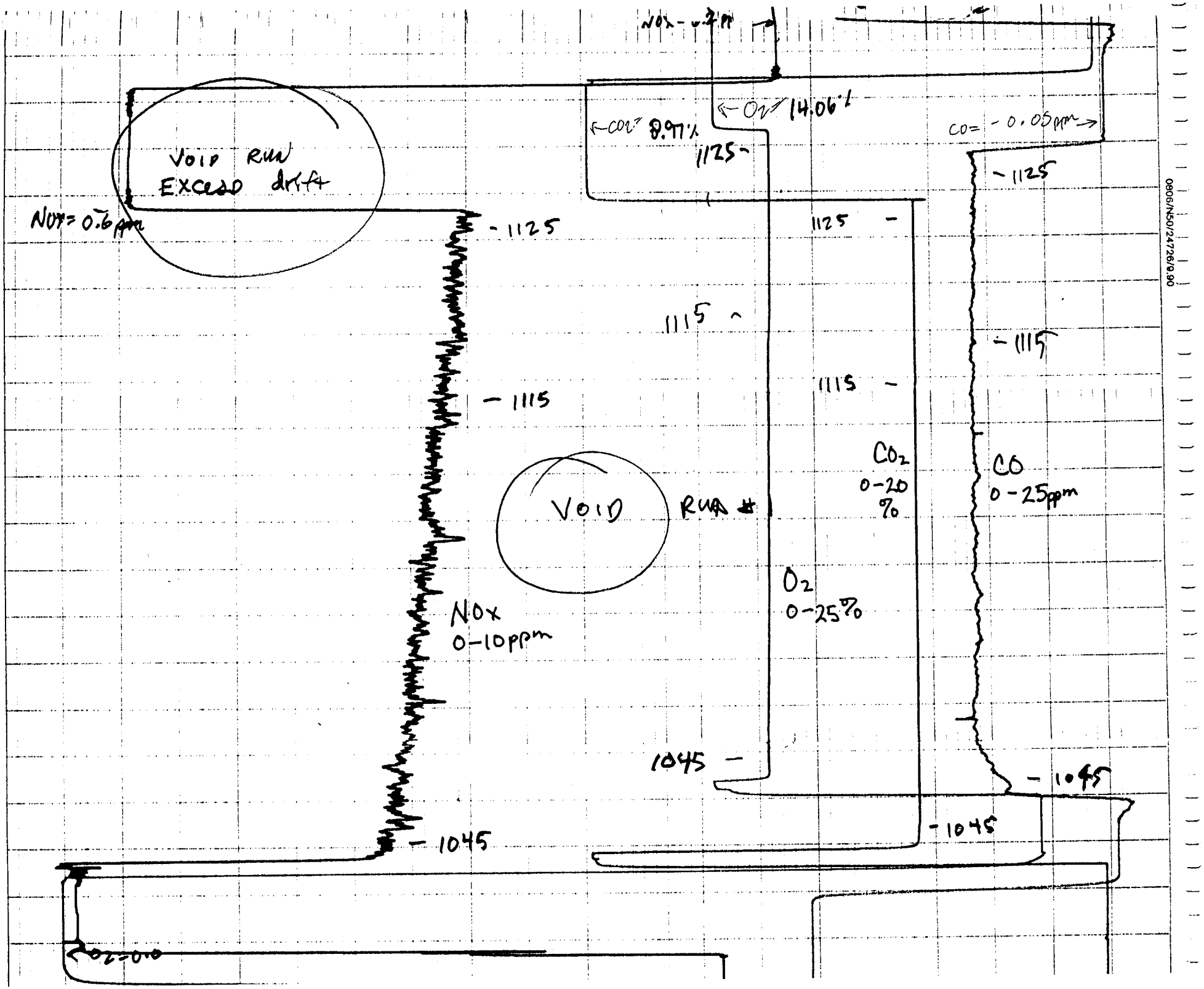
TIME	SAMPLE POINT	O2 (%)	CO2 (%)	NOx (ppm)	CO (ppm)	SO2 (ppm)		COMMENTS / RUN #
		14.06	8.97	5.64	6.21	N/A		Span gas values used for test.
1140		15.33	3.20	3.10	2.63			RUN # 1
50		15.33	3.20	3.20	2.63			
1200		15.33	3.20	3.30	2.63			
10		15.33	3.20	3.40	2.63			
1220	CAL	0.0	0.0	0.19	0.0			ZERO ✓
		14.06	8.80	5.76	6.21			SPAN ✓
1225		15.25	3.26	3.0	3.13			RUN # 2
35		15.25	3.26	3.1	3.13			
45		15.33	3.26	3.2	3.13			
55		15.33	3.26	3.3	3.13			
1305	CAL	-0.03	0.05	0.18	0.30			ZERO ✓
		14.06	8.97	5.62	6.60			SPAN ✓
1315		15.20	3.20	3.40	2.95			
25		15.20	3.20	3.50	2.85			
35		15.20	3.20	3.39	2.80			
45		15.20	3.20	3.16	3.20			
1355	CAL	0.17	0.05	0.15	0.25			ZERO ✓
		14.06	8.95	5.73	6.13			SPAN ✓



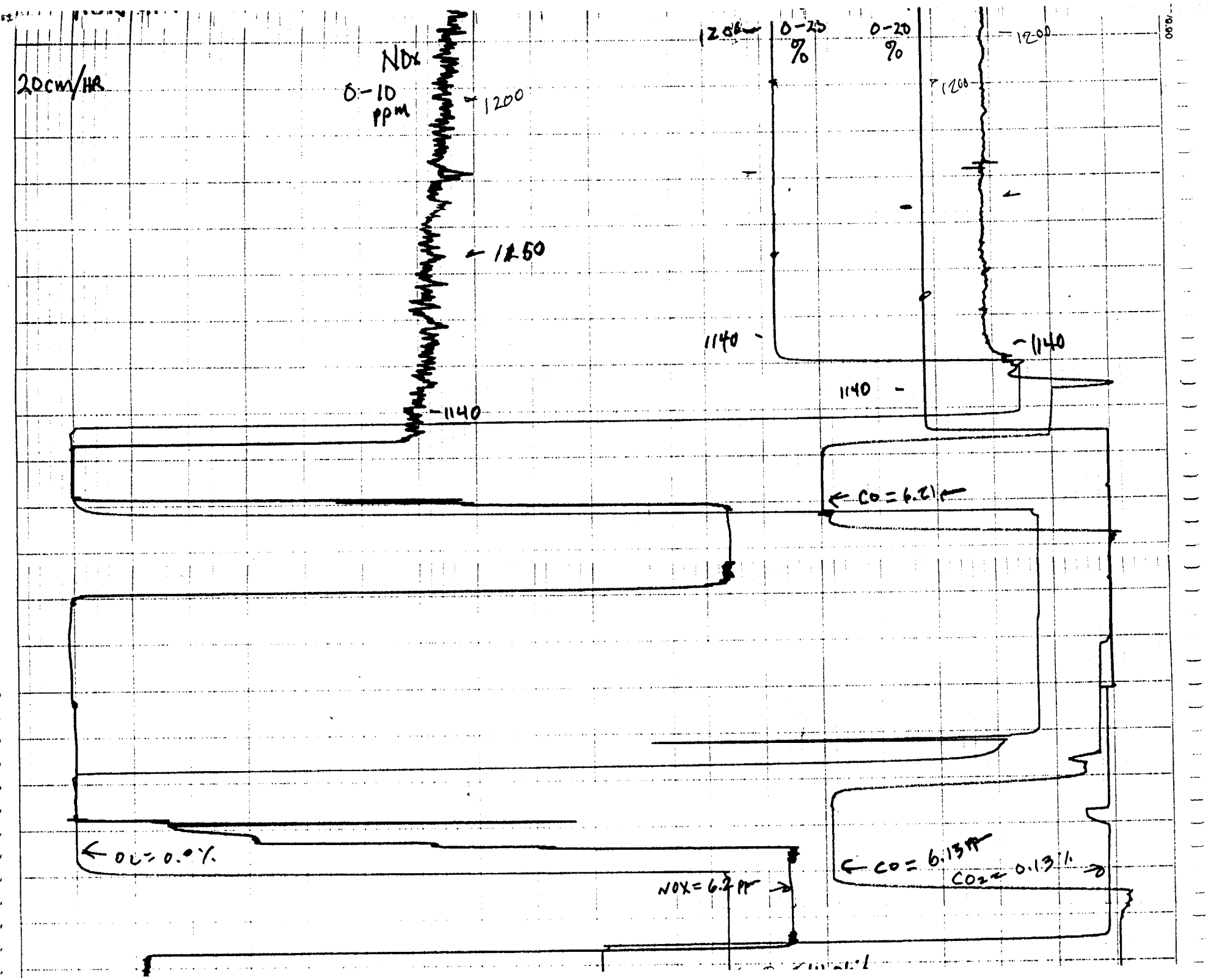
DESTEC Chalk Cliff Cogen
12-23-91
INITIAL CALS

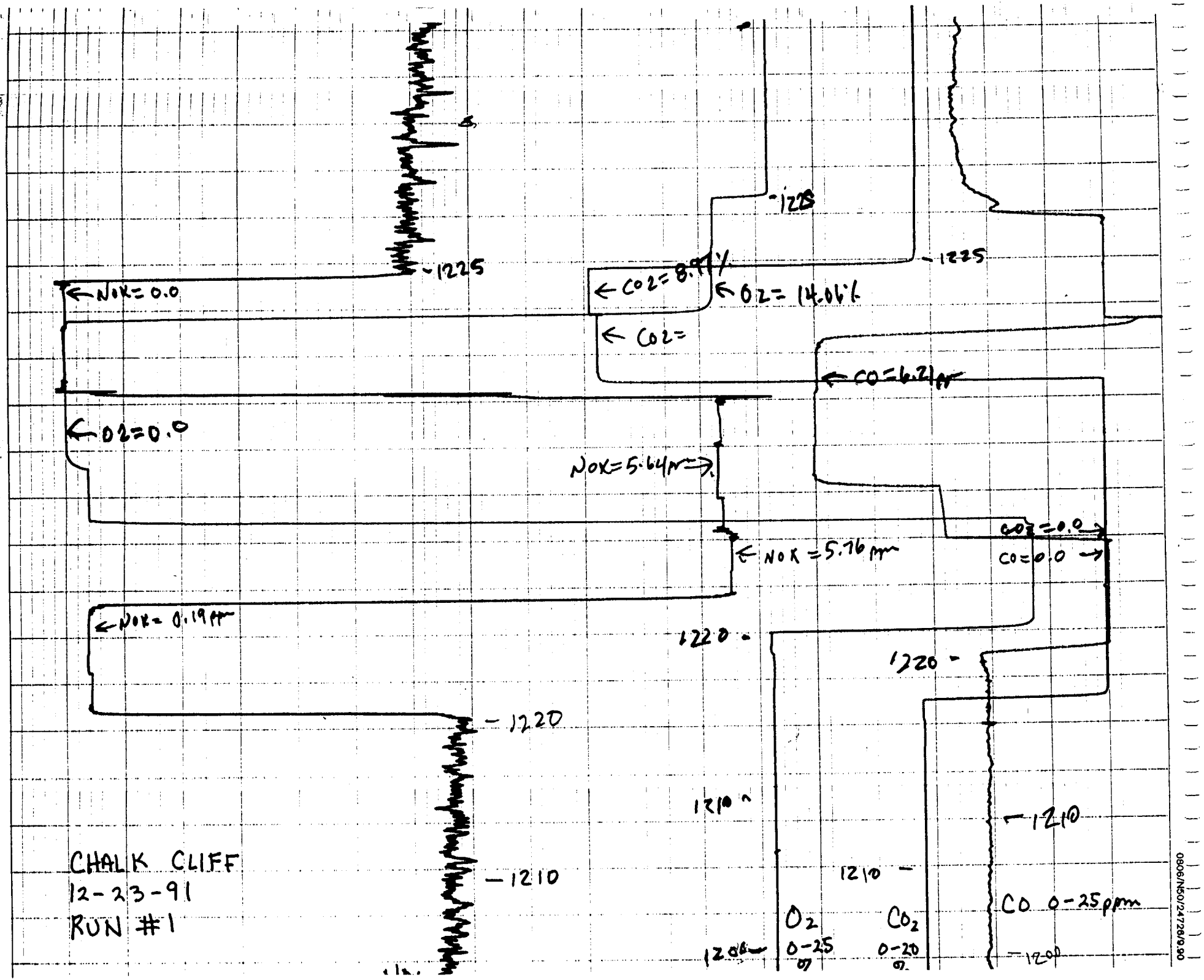
0806/N50/24728/9.90

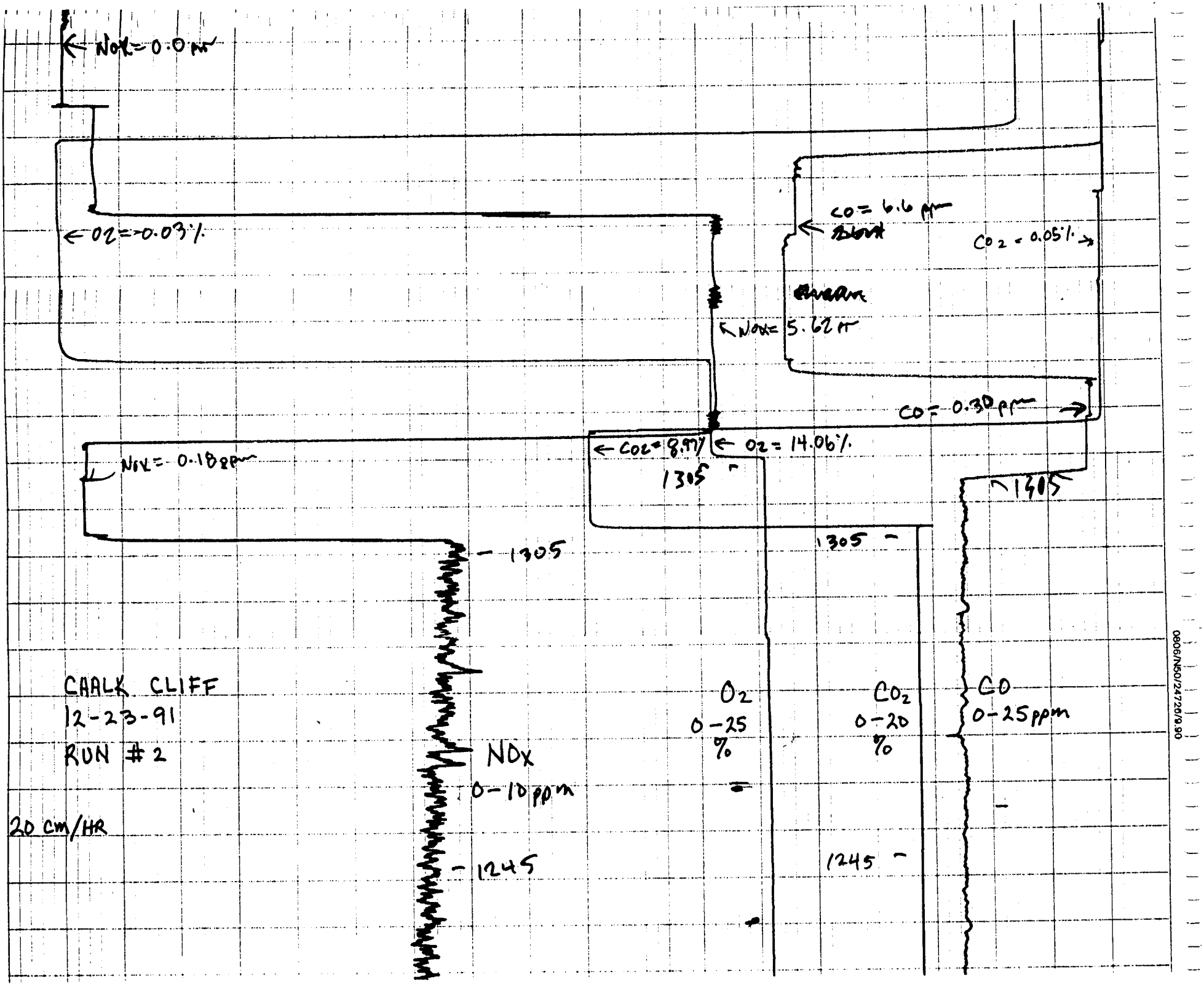

0806/N50/24726/9.90
CO = 6.21 ppm
CO = 6.21
NOx = 5.64 ppm
CO = 0.0 ppm
NOx = 0.0
0.0-2.0



0806/N50/247726/9.90


20cm/HR
NOx
0-10
ppm
1200
1250
1140
1200
0-25
%
0-20
%
1200
1140
1140
1200
1140
← CO = 6.21
← O2 = 0.0%
NOX = 6.7 ppm →
← CO = 6.13 ppm
CO2 = 0.13% →


CHALK CLIFF
12-23-91
RUN #1
NOX = 0.0
O2 = 0.0
NOX = 0.19 ppm
NOX = 5.64 ppm
NOX = 5.76 ppm
CO2 = 8.91%
O2 = 14.06%
CO2 =
CO = 6.21 ppm
CO2 = 0.0
CO = 0.0
1225
1220
1210
1200
O2 0-25 %
CO2 0-20 %
CO 0-25 ppm
0806/N50/247728/9.90



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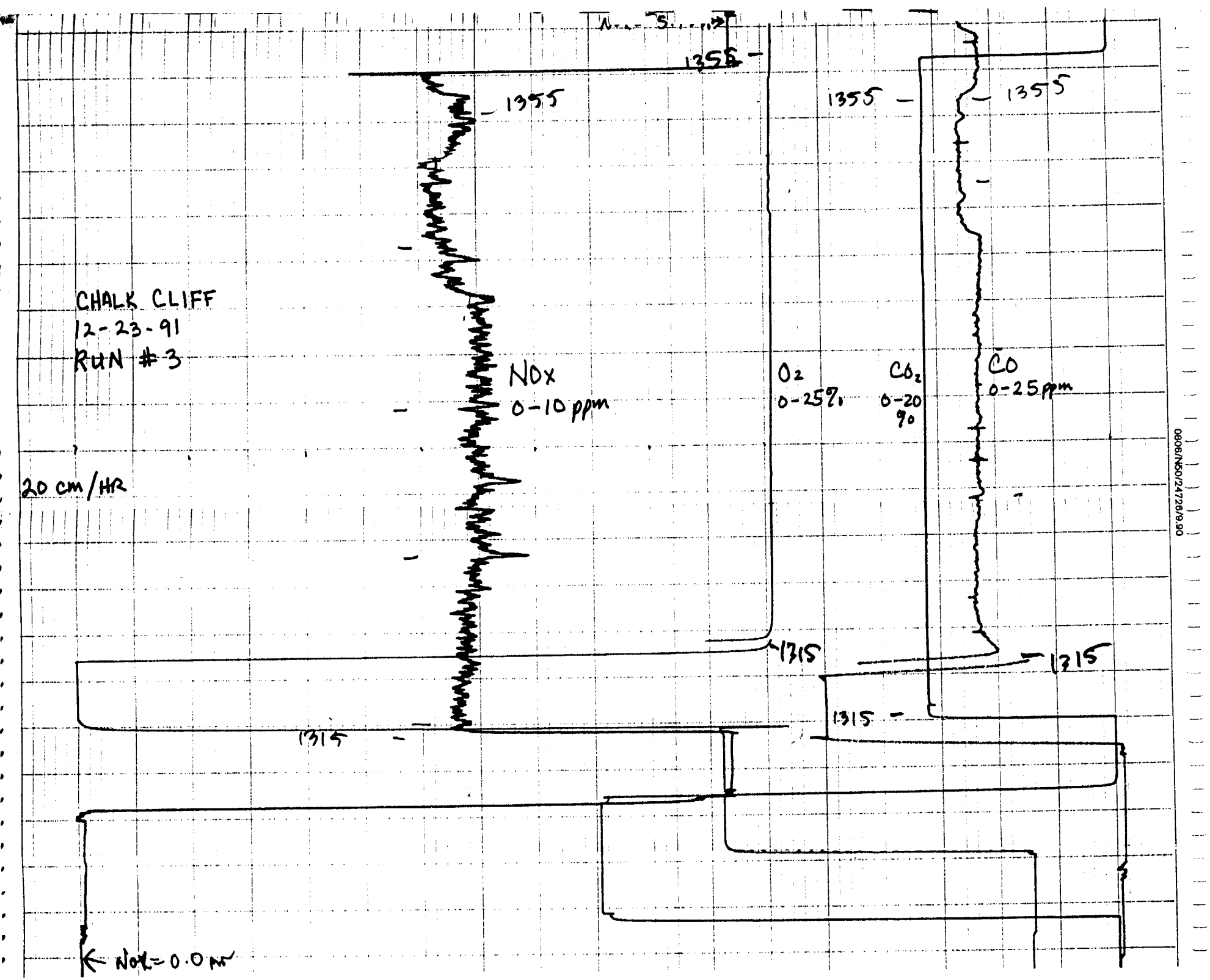

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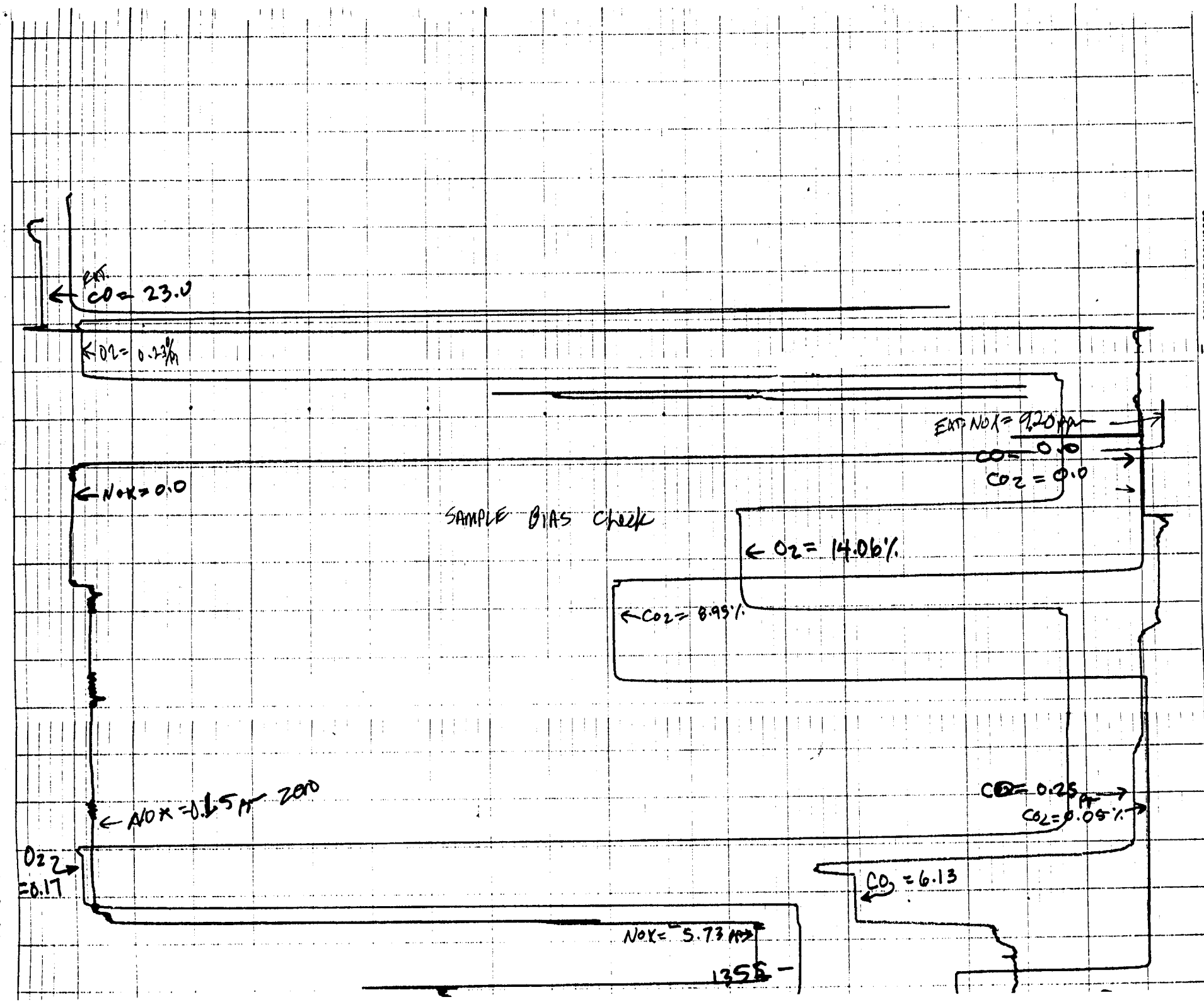

0806/N50/24726/9.90

GAS SAMPLING
FIELD DATA SHEET

ENGINEERING-SCIENCE, INC.

Company CHALK CLIFF LIMITED
Test Location HRSG OUTLET
Test Method / Parameter Hydrocarbons

Date 12-23-91

Sample Bag No.	Start Time	Rotameter (acfh) (cc/min)	End Time	Rotameter (acfh) (cc/min)	Total Time (min)	Leak Rate (acfh) (cc/min)	Comments
1	1050	1L/MIN	1110		20	0.0	RUN #1 HC - VOID 6
2	1150	" "	1210		20	0.0	RUN #1 HC
3	1232	" "	1252		20	0.0	RUN #2 HC
4	1325	" "	1345		20	0.0	RUN #3 HC

PD 23DEC91 14:21:18 C.E.M. LOG #1 LOG # 6 PAGE 1

12 HOUR DATA

1 HP STEAM FLOW TO GTG-01-101
2 FUEL NOZZLE STEAM FLOW
3 CDP STEAM FLOW
4 FUEL GAS FLOW FROM FG COMP
5 GAS FUEL FLOW
6 IP STEAM HEADER FLOW
7 LP STEAM FLOW
8 STEAM FLOW TO OXY
9 TURB EXH FLOW TO NH3 INJ
10 AMMONIA (NH3) STACK GAS
11 AMMONIA INJECTION FLOW
12 AMBIENT TEMPERATURE

HH:MM:SS	1 FI1003 MPPH AVG	2 W1IBU PPH AVG	3 W1IBV PPH AVG	4 FI2712 MSCFH AVG	5 W1IBX PPH AVG	6 FI1060 MPPH AVG	7 W1IFN PPH AVG	8 FI1150 MLB/HR AVG	9 FI1422 MPPH AVG	10 AT1424 PPMVD AVG	11 FI1423 PCT AVG	12 TT1002A DEGF AVG	
02:30:00	104.1	3066.7	3381.5	402.1	19800.0B	16.9	1816.3	38.36	1154800	11.4	35.3	55.5	
02:45:00	104.0	3054.8	3404.6	402.6	19800.0B	16.9	1822.4	38.33	1155400	11.3	35.2	55.3	
03:00:00	104.1	3096.4	3362.7	403.8	19800.0B	16.9	1819.4	38.21	1158880	11.6	35.2	54.4	
03:15:00	104.2	3100.8	3390.0	404.7	19800.0B	16.9	1821.2	38.13	1160280	10.9	35.2	53.6	
03:30:00	103.9	3091.1	3408.3	404.9	19800.0B	16.9	1826.4	37.72	1161320	11.2	35.1	52.3	
03:45:00	103.8	3100.2	3397.6	404.9	19800.0B	16.9	1825.4	37.68	1162120	10.7	35.1	51.9	
04:00:00	103.7	3120.1	3368.4	405.5	19800.0B	16.9	1823.0	37.56	1162760	11.3	35.1	51.7	
04:15:00	103.7	3090.0	3403.2	404.5	19800.0B	16.9	1821.2	37.58	1161360	10.9	35.1	52.2	
04:30:00	103.6	3036.3	3396.4	401.3	19800.0B	16.8	1832.3	37.99	1152560	11.3	35.1	52.2	
04:45:00	103.8	3035.3	3371.9	399.5	19800.0B	16.9	1820.0	38.27	1149760	11.0	35.1	51.7	
05:00:00	103.7	3043.3	3370.9	400.6	19800.0B	16.9	1817.1	38.19	1151840	9.1	26.2	50.8	
05:15:00	103.6	3035.2	3380.7	400.7	19800.0B	16.9	1824.9	38.12	1151440	7.1	25.3	50.2	
05:30:00	103.6	3043.8	3370.1	400.3	19800.0B	16.9	1824.0	38.22	1151400	7.0	25.3	50.3	
05:45:00	103.6	3044.7	3388.2	400.9	19800.0B	16.9	1826.2	38.07	1151960	7.7	25.2	50.5	
06:00:00	103.6	3023.4	3368.0	400.0	19800.0B	16.9	1826.0	38.27	1148360	7.6	25.3	50.9	
06:15:00	103.6	3013.4	3376.2	399.9	19800.0B	16.9	1827.3	38.27	1147720	8.1	25.3	50.5	
06:30:00	103.6	2992.1	3409.5	399.7	19800.0B	16.9	1824.4	38.30	1147400	7.8	25.2	51.0	
06:45:00	103.7	3016.4	3393.8	399.5	19800.0B	16.9	1824.9	38.38	1146520	8.2	25.2	51.0	
07:00:00	103.8	3029.7	3375.0	400.9	19800.0B	16.9	1824.4	38.33	1151120	8.0	25.2	50.4	
07:15:00	103.8	3040.0	3396.7	400.9	19800.0B	16.9	1828.8	38.21	1151720	15.4	25.2	50.2	
07:30:00	103.7	3020.4	3379.3	399.7	19800.0B	16.9	1821.3	38.43	1148240	24.0	25.2	49.6	
07:45:00	103.6	2994.0	3390.7	399.1	19800.0B	16.9	1821.9	38.47	1148040	10.0	25.2	48.5	
08:00:00	103.7	3001.6	3398.3	398.6	19800.0B	16.9	1824.2	38.56	1146960	9.1	25.1	48.9	
08:15:00	103.6	2984.9	3375.7	397.8	19800.0B	16.9	1830.8	38.59	1145520	8.2	25.1	50.7	
08:30:00	103.7	2990.5	3391.9	397.3	19800.0B	16.9	1827.4	38.74	1144040	8.2	25.1	53.0	
08:45:00	103.8	3000.1	3386.3	398.2	19800.0B	16.9	1825.6	38.68	1145000	7.4	25.1	55.0	
09:00:00	103.8	3012.5	3382.0	399.3	19800.0B	16.9	1825.7	38.53	1148120	7.7	25.1	57.1	
09:15:00	103.8	3018.0	3393.3	399.7	19800.0B	16.9	1829.8	38.49	1148320	7.2	25.0	57.7	
09:30:00	104.0	3021.1	3385.7	400.7	19800.0B	16.9	1822.0	38.47	1151400	7.2	25.0	57.9	
09:45:00	103.8	3050.3	3382.1	401.8	19800.0B	16.9	1820.6	38.28	1153400	7.4	25.0	56.7	
10:00:00	103.9	3012.2	3387.0	399.5	19800.0B	16.9	1820.6	38.57	1147400	7.3	25.0	57.4	
10:15:00	103.9	3044.9	3389.0	401.1	19800.0B	16.9	1823.2	38.34	1151200	7.4	24.8	57.7	
10:30:00	103.9	3071.6	3376.3	402.6	19800.0B	16.9	1832.9	38.12	1155560	7.5	24.3	58.2	
10:45:00	103.7	3066.3	3376.5	402.1	19800.0B	16.9	1831.6	38.20	1154440	8.3	24.1	58.6	
11:00:00	103.8	3058.8	3367.0	401.6	19800.0B	16.8	1821.0	38.35	1154120	8.2	24.0	59.7	
11:15:00	103.8	3062.5	3361.9	401.8	19800.0B	16.8	1826.3	38.18	1154360	8.5	23.7	59.3	
11:30:00	103.7	3052.6	3390.5	401.4	19800.0B	16.8	1829.6	38.16	1154920	7.9	22.3	60.1	
11:45:00	103.6	3039.9	3403.3	400.8	19800.0B	16.9	1827.8	38.20	1152240	7.5	22.7	58.8	RUN 1
12:00:00	103.7	3025.7	3395.3	400.1	19800.0B	16.9	1824.9	38.34	1150240	7.3	22.4	58.1	
12:15:00	103.6	3034.5	3374.2	400.3	19800.0B	16.8	1825.5	38.24	1150880	6.8	22.1	58.3	
12:30:00	103.6	3044.4	3378.3	400.6	19800.0B	16.8	1822.6	38.18	1151480	7.1	22.0	58.5	RUN 2
12:45:00	103.6	3031.1	3371.2	399.3	19800.0B	16.9	1820.4	38.38	1148920	6.7	21.9	57.8	
13:00:00	103.5	3016.7	3372.4	399.2	19800.0B	16.8	1825.7	38.38	1148320	6.9	21.9	58.0	
13:15:00	103.5	3017.3	3385.1	399.3	0.0B	16.9	1826.7	38.21	1148640	6.5	21.9	58.4	
13:30:00	103.5	3028.9	3397.9	399.5	19800.0B	16.9	1822.7	38.35	1149640	6.6	21.8	58.8	RUN 3
13:45:00	103.5	3030.4	3398.2	398.9	19800.0B	16.9	1825.7	38.23	1149440	6.5	21.7	59.1	
14:00:00	103.5	3100.1	3382.8	401.2	19800.0B	16.9	1828.4	37.74	1152400	6.4	21.7	59.2	

PD 23DEC91 14:21:25 C.E.M. LOG #1 LOG # 6 PAGE 2

12 HOUR DATA

HH:MM:SS	1 FI1003 MPPH AVG	2 W1IBU PPH AVG	3 W1IBV PPH AVG	4 FI2712 MSCFH AVG	5 W1IBX PPH AVG	6 FI1060 MPPH AVG	7 W1IEN PPH AVG	8 FI1150 MLB/HR AVG	9 FI1422 MPPH AVG	10 AT1424 PPMVD AVG	11 FI1423 PCT AVG	12 TT1002A DEGF AVG
14:15:00	103.6	3114.6	3385.8	405.4	19800.0B	16.8	1826.0	37.48	1161960	6.9	21.6	59.4
SUMMARY DATA												
AVG	103.7	3042.1	3384.8	401.0	IIIIIIIIB	16.9	1824.8	38.23	1152102	8.8	26.4	54.7
MAX	104.2	3120.1	3409.5	405.5	--------B	16.9	1832.9	38.74	1162760	24.0	35.3	60.1
MIN	103.5	2984.9	3361.9	397.3	++++++++B	16.8	1816.3	37.48	1144040	6.4	21.6	48.5

PD 23DEC91 14:21:53 CONTINUOUS EMISSIONS MONITOR LOG # 4 PAGE 1

12 HOUR DATA

1 NOX ACTUAL - STACK
2 NOX CORRECTED (15 O2) - OUTPUT
3 CO ACTUAL - OUTLET
4 CO CORRECTED (15 O2) - OUTLET
5 O2 ACTUAL - OUTLET
6 AMMONIA (NH3) STACK GAS
7 CEM SYS IN CALIBRATION
8 CEM SYSTEM TROUBLE
9 AMBIENT TEMPERATURE
10 DEW POINT TEMPERATURE
11 RELATIVE HUMIDTY
12 FUEL GAS FLOW FROM FG COMP

HH:MM:SS	1 AI1425B PPMVD AVG	2 AI1425D PPMVD AVG	3 AI1427B PPMVD AVG	4 AI1427D PPMVD AVG	5 AI1426B PCT VD AVG	6 AT1424 PPMVD AVG	7 XS1435 CALIB	8 XA1429 NORMAL	9 TT1002A DEGF AVG	10 TT1002B DEGF AVG	11 MT1002 PCT AVG	12 FI2712 MSCFH AVG
02:30:00	2.3	2.6	2.3	2.5	15.62	11.4	NORMAL	NORMAL	55.5	42.2	88.8B	402.1
02:45:00	2.3	2.6	1.8	1.9	15.61	11.3	NORMAL	NORMAL	55.3	42.5	86.9B	402.6
03:00:00	2.3	2.6	1.7	1.8	15.60	11.6	NORMAL	NORMAL	54.4	42.6	96.6B	403.8
03:15:00	2.3	2.6	1.1	1.3	15.58	10.9	NORMAL	NORMAL	53.6	42.5	96.2B	404.7
03:30:00	2.3	2.5	1.1	1.2	15.59	11.2	NORMAL	NORMAL	52.3	42.7	98.9B	404.9
03:45:00	2.2	2.5	1.0	1.1	15.58	10.7	NORMAL	NORMAL	51.9	42.8	100.1B	404.9
04:00:00	2.2	2.5	1.2	1.3	15.58	11.3	NORMAL	NORMAL	51.7	43.1	100.1B	405.4
04:15:00	2.2	2.5	0.8	0.9	15.58	10.9	NORMAL	NORMAL	52.2	43.2	100.1B	404.5
04:30:00	2.3	2.5	0.6	0.6	15.59	11.3	NORMAL	NORMAL	52.2	43.2	100.1B	401.3
04:45:00	2.3	2.6	0.6	0.7	15.59	11.0	NORMAL	NORMAL	51.7	43.2	100.1B	399.5
05:00:00	2.8	3.2	1.7	1.9	15.59	9.1	NORMAL	NORMAL	50.8	42.8	100.1B	400.6
05:15:00	3.1	3.4	1.6	1.8	15.59	7.1	NORMAL	NORMAL	50.2	42.8	100.1B	400.7
05:30:00	3.1	3.4	1.4	1.5	15.58	7.0	NORMAL	NORMAL	50.3	42.6	100.1B	400.3
05:45:00	3.1	3.4	1.4	1.6	15.59	7.7	NORMAL	NORMAL	50.5	42.6	100.1B	400.9
06:00:00	3.1	3.5	1.5	1.7	15.59	7.6	NORMAL	NORMAL	50.9	42.5	100.1B	400.0
06:15:00	3.1	3.5	2.4	2.6	15.60	8.1	NORMAL	NORMAL	50.5	42.2	100.1B	399.9
06:30:00	3.2	3.6	1.7	1.9	15.62	7.8	NORMAL	NORMAL	51.0	42.4	100.1B	399.7
06:45:00	3.1	3.5	1.0	1.1	15.63	8.2	NORMAL	NORMAL	51.0	42.4	100.1B	399.5
07:00:00	3.1	3.5	1.0	1.2	15.62	8.0	NORMAL	NORMAL	50.4	42.1	100.1B	400.9
07:15:00	13.8	5.5	16.7	7.6	2.78	15.4	CALIB	NORMAL	50.2	42.2	100.1B	400.9
07:30:00	18.3	5.6	23.6	45.6	13.57	24.0	NORMAL	NORMAL	49.6	42.8	100.0B	399.7
07:45:00	3.1	3.5	1.0	1.1	15.59	10.0	NORMAL	NORMAL	48.5	43.7	99.1B	399.1
08:00:00	3.1	3.5	3.3	3.6	15.60	9.1	NORMAL	NORMAL	48.9	44.0	100.1B	398.6
08:15:00	3.2	3.5	2.2	2.4	15.60	8.2	NORMAL	NORMAL	50.7	45.1	97.2B	397.8
08:30:00	3.2	3.6	0.6	0.7	15.64	8.2	NORMAL	NORMAL	53.0	45.9	92.0B	397.3
08:45:00	3.2	3.6	0.6	0.7	15.65	7.4	NORMAL	NORMAL	55.0	46.8	94.9B	398.2
09:00:00	3.1	3.5	0.7	0.8	15.64	7.7	NORMAL	NORMAL	57.1	47.2	97.9B	399.3
09:15:00	3.1	3.5	0.7	0.7	15.62	7.2	NORMAL	NORMAL	57.7	46.4	98.1B	399.7
09:30:00	3.1	3.5	0.7	0.8	15.62	7.2	NORMAL	NORMAL	57.9	46.5	99.4B	400.7
09:45:00	3.1	3.5	1.2	1.3	15.62	7.4	NORMAL	NORMAL	56.7	46.5	100.1B	401.8
10:00:00	3.1	3.5	0.8	1.0	15.63	7.3	NORMAL	NORMAL	57.4	46.2	100.1B	399.5
10:15:00	3.1	3.5	0.9	1.0	15.63	7.4	NORMAL	NORMAL	57.7	46.1	100.1B	401.1
10:30:00	3.1	3.5	0.9	1.0	15.63	7.5	NORMAL	NORMAL	58.2	46.3	99.3B	402.6
10:45:00	3.2	3.6	1.1	1.2	15.64	8.3	NORMAL	NORMAL	58.6	46.3	93.6B	402.1
11:00:00	3.2	3.6	1.1	1.3	15.64	8.2	NORMAL	NORMAL	59.7	46.4	95.2B	401.6
11:15:00	3.2	3.7	1.4	1.5	15.65	8.5	NORMAL	NORMAL	59.8	45.9	98.1B	401.8
11:30:00	3.3	3.7	1.2	1.4	15.65	7.9	NORMAL	NORMAL	60.1	45.6	97.6B	401.4
11:45:00	3.4	3.9	1.2	1.4	15.66	7.5	NORMAL	NORMAL	58.8	45.0	98.2B	400.8
12:00:00	3.5	4.0	1.2	1.4	15.66	7.3	NORMAL	NORMAL	58.1	44.6	97.5B	400.1
12:15:00	3.5	4.0	1.3	1.4	15.66	6.8	NORMAL	NORMAL	58.3	45.2	96.6B	400.3
12:30:00	3.5	4.0	1.4	1.6	15.66	7.1	NORMAL	NORMAL	58.5	46.1	97.8B	400.6
12:45:00	3.6	4.1	1.4	1.5	15.66	6.7	NORMAL	NORMAL	57.8	46.8	95.2B	399.3
13:00:00	3.6	4.1	1.4	1.5	15.64	6.9	NORMAL	NORMAL	58.0	46.7	94.5B	399.2
13:15:00	3.6	4.1	1.3	1.5	15.62	6.5	NORMAL	NORMAL	58.4	46.7	95.9B	399.3
13:30:00	3.6	4.1	1.3	1.4	15.61	6.6	NORMAL	NORMAL	58.8	46.5	97.1B	399.5
13:45:00	3.7	4.1	1.3	1.4	15.60	6.5	NORMAL	NORMAL	59.1	46.4	99.1B	398.9
14:00:00	3.4	3.7	1.4	1.5	15.57	6.4	NORMAL	NORMAL	59.2	46.4	95.8B	404.2

PD 23DEC91 14:21:58 CONTINUOUS EMISSIONS MONITOR LOG # 4 PAGE 2

12 HOUR DATA

HH:MM:SS	1 AI1425B PPMVD AVG	2 AI1425D PPMVD AVG	3 AI1427B PPMVD AVG	4 AI1427D PPMVD AVG	5 AI1426B PCT VD AVG	6 AT1424 PPMVD AVG	7 XS1435 CALIB	8 XA1429 NORMAL	9 TT1002A DEGF AVG	10 TT1002B DEGF AVG	11 MT1002 PCT AVG	12 FI2712 MSCFH AVG
14:15:00	3.3	3.7	1.5	1.6	15.58	6.9	NORMAL	NORMAL	59.4	46.3	96.6B	405.4
SUMMARY DATA												
AVG	3.6	3.5	2.1	2.5	15.31	8.8			54.7	44.5	IIIIIIIIB	401.0
MAX	18.3	5.6	23.6	45.6	15.66	24.0			60.1	47.2	--------B	405.4
MIN	2.2	2.5	0.6	0.6	2.78	6.4			48.5	42.1	++++++++B	397.3

SECTION 8

QUALITY ASSURANCE

SECTION 8

QUALITY ASSURANCE

This report has been reviewed for technical and editorial quality and for compliance with project requirements.

All equipment used in testing has been checked for proper maintenance and calibrated prior to testing. Test equipment calibrations have been included in the appendix of this report.

The analyzers employed for continuous monitoring of NO_x, CO, CO_2, and O_2 were California Air Resources Board (CARB) approved instruments. Sampling system bias checks of the continuous monitor sampling system was performed using either the EPA protocol 1 or NIST certified calibration gases (certificate copies included). All other checks of the continuous monitor system required by the regulatory agency methodology were also performed.

All field samples were labeled and logged in on a chain-of-custody sheet. Chain-of-custody sheets remained with samples and documented sample movement.

SAMPLE SYSTEM BIAS CHECK

COMPANY CHALK CLIFF

DATE 12-23-91

TEST LOCATION HRSG OUTLET

OPERATOR T. Delfino

Parameter	Instrument Full Scale	Span Gas Value	Scale	Internal Response	System Response	Percent Difference
O2			Zero			
			Upscale			
CO2			Zero			
			Upscale			
NOx	10 ppm		Zero	0.00		
		9.29	Upscale	9.29	9.20	0.97
CO	25 ppm		Zero	0.00		
		22.9	Upscale	22.9	23.0	0.44
SO2			Zero			
			Upscale			
HC			Zero			
			Upscale			
			Zero			
			Upscale			

For EPA :
Percent Difference = [(System Response – Internal Response) / Instrument Full Scale] x 100

For Kern County :
Percent Difference = [(Internal Response – System Response) / Internal Response] x 100

SCOTT-MARRIN, INC.
2001 THIRD ST. • UNIT H • RIVERSIDE, CA 92507
TELEPHONE (714) 784-1240

REPORT OF ANALYSIS
EPA PROTOCOL GAS MIXTURES

ENSI01
TO: HUMBERT DERIADA
ENGINEERING SCIENCES, INC.
6060 N. IRWINDALE AVE.
SUITE J
IRWINDALE, CA 90607

DATE : 04/05/91

CUSTOMER ORDER NUMBER: FI-1144-26

PAGE 1

COMPONENT	CONCENTRATION (v/v)	REFERENCE STANDARD	ANALYZER MAKE, MODEL, S/N, DETECTION	EXPIRATION DATE	REPLICATE ANALYSIS DATA	
CYLINDER NO.:	CC7219					
			Monitor Labs Model 8440		03/26/91	04/02/91
Nitric Oxide	23.26 ± 0.23 ppm	GMIS	S/N 136	10/02/91	23.25 ppm	23.19 ppm
		Cylinder #	Continuous		23.34 ppm	23.22 ppm
		CC88855	Chemiluminescence		23.24 ppm	23.19 ppm
		@ 50.0 ppm	Last Cal Date: 01/31/91	Mean:	23.31 ppm	23.20 ppm
			Carle Instr Model 8000		03/28/91	04/05/91
Carbon Monoxide	23.20 ± 0.23 ppm	GMIS	S/N 8249	10/05/91	23.04 ppm	23.16 ppm
		Cylinder #	Methanation/FID		22.97 ppm	23.23 ppm
Nitrogen, O2-Free Balance		CC86863	Gas Chromatography		23.13 ppm	23.39 ppm
Cylinder Pressure: 2000 psig		@ 41.9 ppm	Last Cal Date: 04/16/91	Mean:	23.18 ppm	23.27 ppm
CYLINDER NO.:	CC49684					
			Monitor Labs Model 8440		03/26/91	04/02/91
Nitric Oxide	5.63 ± 0.11 ppm	GMIS	S/N 136	10/02/91	5.64 ppm	5.66 ppm
		Cylinder #	Continuous		5.63 ppm	5.64 ppm
		CC7385	Chemiluminescence		5.61 ppm	5.58 ppm
		@ 10.03 ppm	Last Cal Date: 01/31/91	Mean:	5.63 ppm	5.62 ppm
			Carle Instr Model 8000		03/27/91	04/03/91
Carbon Monoxide	6.24 ± 0.12 ppm	GMIS	S/N 8249	10/03/91	6.21 ppm	6.23 ppm
		Cylinder #	Methanation/FID		6.19 ppm	6.25 ppm
Nitrogen, O2-Free Balance		CC183	Gas Chromatography		6.27 ppm	6.27 ppm
Cylinder Pressure: 2000 psig		@ 9.85 ppm	Last Cal Date: 04/16/91	Mean:	6.22 ppm	6.25 ppm

ppm = umole/mole % = mole-%

The above analyses were performed in accordance with EPA-1987 Traceability Protocol # 1, Section 3.0.4, Procedure G1.

Analyst: Mark Monson
M.J. Monson

Approved:
J.T. Marrin

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

STANDARD CALIBRATION GASES IN ALUMINUM CYLINDERS

REPORT OF ANALYSIS

CUSTOMER ORDER NUMBER: FI-1144-26

COMPONENT	CONCENTRATION(v/v)	REFERENCE STANDARD	ANALYZER MAKE,MODEL,S/N,DETECTION	EXPIRATION DATE	REPLICATE ANALYSIS DATA	
CYLINDER NO.: CC12823						
			Carle Instr Model 8500		03/25/91	04/02/91
Carbon Monoxide	8.83 ± 0.18 ppm	GMIS	S/N 8249	10/02/92	8.60 ppm	8.06 ppm
		Cylinder #	Methanation/FID		8.86 ppm	8.79 ppm
		CC181	Gas Chromatography		8.88 ppm	8.82 ppm
Nitrogen	Balance	@ 9.65 ppm	Last Cal Date: 04/16/91		Mean: 8.88 ppm	8.06 ppm
Cylinder Pressure: 2000 psig						
CYLINDER NO.: CC56894						
			Monitor Labs Model 8440		03/26/91	04/02/91
Nitric Oxide	9.29 ± 0.19 ppm	GMIS	S/N 136	10/02/91	9.27 ppm	9.27 ppm
		Cylinder #	Continuous		9.30 ppm	9.29 ppm
		CC7385	Chemiluminescence		9.34 ppm	9.28 ppm
Nitrogen,O2-Free	Balance	@ 10.83 ppm	Last Cal Date: 01/31/91		Mean: 9.30 ppm	9.28 ppm
Cylinder Pressure: 2000 psig						
CYLINDER NO.: CC28278						
			Monitor Labs Model 8440		03/26/91	04/02/91
Nitric Oxide	13.17 ± 0.26 ppm	GMIS	S/N 136	10/02/91	13.21 ppm	13.14 ppm
		Cylinder #	Continuous		13.15 ppm	13.10 ppm
		CC28063	Chemiluminescence		13.21 ppm	13.08 ppm
		@ 19.31 ppm	Last Cal Date: 01/31/91		Mean: 13.20 ppm	13.13 ppm
			Carle Instr Model 8500		03/27/91	04/03/91
Carbon Monoxide	13.05 ± 0.26 ppm	GMIS	S/N 8249	10/03/91	13.16 ppm	13.04 ppm
		Cylinder #	Methanation/FID		13.02 ppm	13.07 ppm
		CC12168	Gas Chromatography		12.94 ppm	13.06 ppm
Nitrogen,O2-Free	Balance	@ 17.79 ppm	Last Cal Date: 04/16/91		Mean: 13.04 ppm	13.05 ppm
Cylinder Pressure: 2000 psig						

ppm = umole/mole % = mole-%

The above analyses were performed in accordance with EPA-1987 Traceability Protocol # 1, Section 3.0.4, Procedure G1.

REPORT OF ANALYSIS
EPA PROTOCOL GAS MIXTURES

ENSI01

TO:

DATE : 09/12/91

D.J. WYMAN
ENGINEERING SCIENCES, INC.
P.O. BOX 2007
Irwindale, CA 91706

CUSTOMER ORDER NUMBER: FI-1216-24

PAGE 1

COMPONENT	CONCENTRATION(v/v)	REFERENCE STANDARD	ANALYZER MAKE,MODEL,S/N,DETECTION	EXPIRATION DATE	REPLICATE ANALYSIS DATA	
CYLINDER NO.:	CC28073					
			Monitor Labs Model 8440		08/28/91	09/04/91
Nitric Oxide	22.64 ± 0.23 ppm	GMIS	S/N 136	03/04/92	22.65 ppm	22.73 ppm
		Cylinder #	Continuous		22.65 ppm	22.57 ppm
		CC99513	Chemiluminescence		22.95 ppm	22.70 ppm
		@ 49.8 ppm	Last Cal Date: 08/07/91	Mean:	22.62 ppm	22.66 ppm
			Carle Instr Model 8060		09/03/91	09/11/91
Carbon Monoxide	22.90 ± 0.23 ppm	GMIS	S/N 8249	03/11/92	22.94 ppm	22.83 ppm
		Cylinder #	Methanation/FID		22.92 ppm	22.92 ppm
Nitrogen,O2-Free	Balance	CC12564	Gas Chromatography		22.78 ppm	23.11 ppm
Cylinder Pressure: 2000 psig		@ 42.4 ppm	Last Cal Date: 07/19/91	Mean:	22.85 ppm	22.95 ppm
CYLINDER NO.:	CC97905					
			Varian Model 1860		09/04/91	
Oxygen	3.07 ± 0.03 %	GMIS	S/N None	03/04/93	3.06 %	
		Cylinder #	Thermal Conductivity		3.08 %	
		CC81219	Gas Chromatography		3.06 %	
		@ 5.12 %	Last Cal Date: 08/06/91	Mean:	3.07 %	
			Varian Model 1860		09/09/91	
Carbon Dioxide	3.12 ± 0.03 %	GMIS	S/N None	03/09/93	3.12 %	
		Cylinder #	Thermal Conductivity		3.12 %	
Nitrogen	Balance	CC20297	Gas Chromatography		3.12 %	
Cylinder Pressure: 2000 psig		@ 7.40 %	Last Cal Date: 08/21/91	Mean:	3.12 %	

ppm = umole/mole % = mole-%

The above analyses were performed in accordance with EPA-1987 Traceability Protocol # 1, Section 3.0.4, Procedure G1.

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REPORT OF ANALYSIS
EPA PROTOCOL GAS MIXTURES

ENSI01

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(714) 653-6780

REPORT OF ANALYSIS
EPA PROTOCOL GAS MIXTURES

ENSI01

TO:

T.J. WIEMAN
ENGINEERING SCIENCES, INC.
P.O. BOX 2007
IRWINDALE, CA 91706

DATE : 10/08/91

CUSTOMER ORDER NUMBER: VERBAL C.HOLT

PAGE 1

COMPONENT	CONCENTRATION(v/v)	REFERENCE STANDARD	ANALYZER MAKE,MODEL,S/N,DETECTION	EXPIRATION DATE	REPLICATE ANALYSIS DATA
CYLINDER NO.:	CC28366				
Oxygen	14.07 ± 0.14 %	GMIS Cylinder # CC12233 @ 23.89 %	Varian Model 1860 S/N None Thermal Conductivity Gas Chromatography Last Cal Date: 10/04/91	03/17/93	09/17/91 14.10 % 14.05 % 14.08 % Mean: 14.07 %
Carbon Dioxide	9.02 ± 0.09 %	GMIS Cylinder # CC60263 @ 17.60 %	Varian Model 1860 S/N None Thermal Conductivity Gas Chromatography Last Cal Date: 08/21/91	03/13/93	09/13/91 8.99 % 9.04 % 9.03 % Mean: 9.02 %
Nitrogen	Balance				
Cylinder Pressure: 2000 psig					
CYLINDER NO.:	CC81191				
Oxygen	14.06 ± 0.14 %	GMIS Cylinder # CC12233 @ 23.89 %	Varian Model 1860 S/N None Thermal Conductivity Gas Chromatography Last Cal Date: 10/04/91	03/17/93	09/17/91 14.05 % 14.07 % 14.04 % Mean: 14.06 %
Carbon Dioxide	8.97 ± 0.09 %	GMIS Cylinder # CC60263 @ 17.60 %	Varian Model 1860 S/N None Thermal Conductivity Gas Chromatography Last Cal Date: 08/21/91	03/13/93	09/13/91 8.97 % 8.96 % 8.97 % Mean: 8.97 %
Nitrogen	Balance				
Cylinder Pressure: 2000 psig					

ppm = umole/mole % = mole-%

The above analyses were performed in accordance with EPA-1987 Traceability Protocol # 1, Section 3.0.4, Procedure G1.

Analyst: M.S. Calhoun

Approved: J.T. Marrin

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

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2520 Pegasus Rd.
BKSFLD. CA, 93308
393-0272

Lab#29960

CHAIN OF CUSTODY RECORD

Project No.	Project Name	Project Manager	Samples Sent To:	Analysis Required
	CHALK CLIFF	GARY McRae	ZALCO LABORATORIES 4309 ARMOUR BKSFLD, CA By: T. DELFINO	Methane / Non-Methane Hydrocarbons
Samples Collected By	Regulatory Agency (EPA, CARB, SCAQMD, etc.)			
T. DELFINO, (ESI)	KCAPCD			

ES Lab Control No.	Test Date	Field Sample ID (Method-Run#-Sample Source)	Sample Amount	Sample Medium	Comments					
BK9112038	12-23-91	HC - Run#1 - HRSG Stack	10L	Tedlar Bag	stack gas Sample					
BK9112039	"	HC - Run 2 - Hrsg Stack	"	"	"					
BK9112040	"	HC - Run 3 - Hrsg Stack	"	"	"					
BK9112041	"	Fuel gas - ALL - NAT'L gas	500cc	SS	NAT'L GAS Fuel	BTU,	CHONS			

Relinquished By: (Sign & Print)	Date/Time	Received By: (Sign & Print)	Comments:
Troy Delfino Troy Delfino Phone: (805) 393-0272		Trudy Smith TRUDY SMITH Of: 805-395-0539	
Relinquished By: (Sign & Print) Phone:	Date/Time	Received By: (Sign & Print) Of:	Comments:
Relinquished By: (Sign & Print) Phone:	Date/Time	Received By: (Sign & Print) Of:	Comments: