APPENDIX A

Nomenclature and Equations
for
Calculation of Source Emissions

NOMENCLATURE FOR PARTICULATE CALCULATIONS

Symbol	English Units	Metric Units	Description
A_s	in.^{2}	m^2	Stack Area
C_{an}	gr/dscf*	g/dscm*	Particulate - probe, cyclone, and filter
C_{ao}	gr/dscf*	g/dscm*	Particulate - total
C_{at}	gr/CF @ stack conditions	g/m^3	Particulate - probe, cyclone, and filter
C_{au}	gr/CF @ stack conditions	g/m^3	Particulate - total
C_{aw}	lbs/hr	kg/hr	Particulate - probe, cyclone, and filter
C_{ax}	lbs/hr	kg/hr	Particulate - total
C_p			Pitot Tube Calibration Factor
D_n	in.	m	Sampling Nozzle Diameter
%EA			Percent Excess Air at sampling point
g	32.174 ft/sec^2		Acceleration of Gravity
%I			Percent Isokinetic
%M			Percent Moisture in the stack gas by volume
M_d			Mole fraction of dry gas

* 29.92 "Hg, 68°F (760 mm Hg, 20°C)

Symbol	English Units	Metric Units	Description
m_f	mg	mg	Particulate - probe, cyclone, and filter
M_{water}	18 lb/lb-mole		Molecular Weight of water
m_t	mg	mg	Particulate - total
MW	lb/lb-mole	g/g-mole	Molecular Weight of stack gas
MW_{air}	28.96 lb/ lb-mole		Molecular Weight of air
MW_d	lb/lb-mole	g/g-mole	Molecular Weight of dry stack gas
P_b	"Hg Absolute	mm Hg	Barometric Pressure
P_m	"H_2O	mm H_2O	Orifice Pressure drop
P_s	"Hg Absolute	mm Hg	Stack Pressure
ΔP	"H_2O	mm H_2O	Velocity Head of stack gas
P_{std}	29.92 "Hg	760 mm Hg	Standard Barometric Pressure
Q_a	ACFM	m^3/hr	Stack Gas Volume at actual stack conditions
Q_s	DSCFM*	dscm/hr*	Stack Gas Volume at 29.92 "Hg, 528°R, dry
R	21.83 "Hg-ft^3/lb-mole°R		Universal Gas Constant
T_m	°F	°C	Average Gas Meter Temperature

* 29.92 "Hg, 68°F (760 mm Hg, 20°C)

Symbol	English Units	Metric Units	Description
T_t	min	min	Net time of test
T_s	°F	°C	Stack Temperature
T_{std}	528°R	293°K	Standard Temperature
V_m	ft^3	m^3	Volume of dry gas sampled @ meter conditions
Vm_{std}	dscf*	dscm*	Volume of dry gas sampled @ standard conditions
V_s	fpm	m/sec	Stack velocity @ stack conditions
V_w	ml	ml	Total water collected in impingers and silica gel
Vw_{gas}	scf*	scm*	Volume of water vapor collected @ standard conditions
ρ_{air}	0.0752 lbs/ft^3		Density of Air
ρ_{water}	1 g/ml		Density of Water
ρ_{man}	62.32 lbs/ft^3		Density of Manometer Oil

Standard Conditions: 29.92 "Hg, 68°F (760 mm Hg, 20°C)

* 29.92 "Hg, 68°F (760 mm Hg, 20°C)

EXAMPLE CALCULATIONS

1. Volume of dry gas sampled at standard conditions.*

$$Vm_{std} = Vm \left(\frac{T_{std}}{T_m + 460} \right) \left[\frac{P_b + \frac{P_m}{13.6}}{P_{std}} \right]$$

$$Vm_{std} = 17.65\ Vm \left[\frac{P_b + \frac{P_m}{13.6}}{T_m + 460} \right] = dscf$$

$$Vm_{std} = dscf \times 0.028317 = dscm$$

2. Volume of water vapor collected at standard conditions.*

$$Vw_{gas} = \frac{(V_w - gms\ SO_2 - gms\ H_2S)\ \rho_{water}\ R\ T_{std}}{P_{std}\ M_{water}\ 453.6}$$

$$Vw_{gas} = 0.0472\ (V_w - gms\ SO_2 - gms\ H_2S) = scf$$

$$Vw_{gas} = scf \times 0.028317 = scm$$

3. Percent moisture in stack gas.

$$\%M = \frac{Vw_{gas}}{Vm_{std} + Vw_{gas}} \times 100 = \%$$

* 29.92 "Hg, 68°F (760 mm Hg, 20°C)

4. Mole fraction of dry gas.

$$M_d = \frac{100 - \%M}{100}$$

5. Average molecular weight of dry stack gas.

$$MW_d = \left[\%CO_2 \times \frac{44}{100}\right] + \left[\%O_2 \times \frac{32}{100}\right] + \left[\%N_2 \times \frac{28}{100}\right] + \left[\%CO \times \frac{28}{100}\right] = lb/lb\text{-}mole$$

$$= g/g\text{-}mole$$

6. Molecular weight of stack gas.

$$MW = MW_d \times M_d + 18\ (1 - M_d) = \frac{lb}{lb\text{-}mole} = g/g\text{-}mole$$

7. Percent excess air at sampling point.

$$\%EA = \frac{100\ [\%O_2 - (0.5\ \%CO)]}{0.265\ (\%N_2) - [\%O_2 - (0.5\ \%CO)]}$$

8. Stack Pressure.

$$P_s = P_b + \frac{Stack\ Pressure\ "H_2O}{13.6} = "Hg\ Absolute$$

$$P_s = "Hg\ Abs. \times 25.4 = mm\ Hg$$

9. Stack velocity at stack conditions.

$$V_s = C_p\ 60 \left[\frac{2g \times \rho_{man} \times P_{std} \times MW_{air} \times (T_s + 460) \times \Delta P_s}{12 \times \rho_{air} \times P_s \times MW \times T_{std}} \right]^{1/2}$$

$$V_s = 5{,}123.8\ C_p \left[\frac{(T_s + 460)}{P_s \times MW} \right]^{1/2} \sqrt{\Delta P}\ average = fpm$$

$$V_s = fpm \times 0.00508 = m/\text{sec}$$

10. Dry stack gas volume at standard conditions.*

$$Q_s = \frac{1}{144} V_s \times A_s \times M_d \times \frac{T_{std}}{T_s + 460} \times \frac{P_s}{P_{std}}$$

$$Q_s = \frac{0.123\ V_s \times A_s \times M_d \times P_s}{T_s + 460} = DSCFM$$

$$Q_s = DSCFM \times 1.6990 = dscm/hr$$

11. Actual stack gas volume at stack conditions.

$$Q_a = \frac{V_s \times A_s}{144} = ACFM$$

$$Q_a = ACFM \times 1.6990 = m^3/hr$$

* 29.92 "Hg, 68°F (760 mm Hg, 20°C)

12. Percent isokinetic.

$$\%I = \frac{Vm_{std} \times (T_s + 460) \times P_{std} \times 100 \times 144\ in^2/ft^2}{M_d \times T_{std} \times P_s \times T_t \times V_s \left(\frac{\pi \times D_n^2}{4}\right)}$$

$$\%I = \frac{1039 \times Vm_{std} \times (T_s + 460)}{M_d \times P_s \times T_t \times V_s \times D_n^2}$$

13. Particulate - probe, cyclone, and filter.

$$C_{an} = \frac{m_f}{Vm_{std}} \times \frac{1\ gr}{64.8\ mg}$$

$$C_{an} = 0.0154 \times \frac{m_f}{Vm_{std}} = gr/dscf*$$

$$C_{an} = gr/dscf \times 2.290 = g/dscm*$$

14. Particulate total.

$$C_{ao} = 0.0154 \times \frac{m_t}{Vm_{std}} = gr/dscf*$$

$$C_{ao} = gr/dscf \times 2.290 = g/dscm*$$

* 29.92 "Hg, 68°F (760 mm Hg, 20°C)

15. Particulate - probe, cyclone, and filter at stack conditions.

$$C_{at} = C_{an} \times \frac{P_s}{P_{std}} \times \frac{(T_{std})}{(T_s + 460)} \times M_d$$

$$C_{at} = \frac{17.65 \times C_{an} \times P_s \times M_d}{T_s + 460} = gr/CF$$

$$C_{at} = gr/CF \times 2.290 = g/m^3$$

16. Particulate - total, at stack conditions.

$$C_{au} = \frac{17.65 \times C_{ao} \times P_s \times M_d}{T_s + 460} = gr/CF$$

$$C_{au} = gr/CF \times 2.290 = g/m^3$$

17. Particulate - probe, cyclone, and filter.

$$C_{aw} = C_{an} \times Q_s \times \frac{60 \text{ min}}{1 \ hr} \times \frac{1 \ lb}{7000 \ gr}$$

$$C_{aw} = 0.00857 \times C_{an} \times Q_s = lbs/hr$$

$$C_{aw} = lbs/hr \times 0.4536 = kg/hr$$

18. Particulate - total.

$$C_{ax} = 0.00857 \times C_{ao} \times Q_s = lbs/hr$$

$$C_{ax} = lbs/hr \times 0.4536 = kg/hr$$

19. Mercury – ug/dscm

ug/dscm = ug ÷ (Vm_{std} x 0.028317m^3/ft^3)

20. Mercury – lbs/10^{12} Btu

lbs/10^{12} Btu = ug ÷ Vm_{std} x (2.205 x 10^{-9} lbs/ug) x F_d x [20.9 ÷ (20.9 – O_2)] x (1.0 x 10^6)

F_d = Oxygen based F factor of 9,780 dscf*/million Btu

* 29.92 "Hg, 68 °F (760 mm Hg, 20 °C)

METCO ENVIRONMENTAL

SOURCE EMISSION SURVEY

JOB NUMBER: 99-95LAW4
JOB NAME: WESTERN RESOURCES, INC.
LOCATION: LAWRENCE, KANSAS
UNIT TESTED: LAWRENCE UNIT NUMBER 4 SOUTH SCRUBBER INLET

SOURCE EMISSION CALCULATIONS

SYMBOL	DESCRIPTION	UNITS			
RUN #			1	2	4
DATE			10/25/99	10/26/99	10/26/99
BEGIN TIME			1746	0900	1740
END TIME			1951	1105	1945
P(b)	BAROMETRIC PRESSURE	"Hg Abs. (mm Hg)	29.15 (740)	29.22 (742)	29.11 (739)
P(m)	ORIFICE PRESSURE DROP	"H2O (mm H2O)	0.476 (12.1)	0.453 (11.5)	0.470 (11.9)
V(m)	VOLUME DRY GAS SAMPLED @ METER CONDITIONS	ft.^3 (m^3)	49.394 (1.399)	47.560 (1.347)	49.323 (1.397)
T(m)	AVERAGE GAS METER TEMPERATURE	DEG.F (DEG.C)	75 (24)	55 (13)	79 (26)
V(m[std])*	VOLUME DRY GAS SAMPLED @ STANDARD CONDITIONS*	DSCF (DSCM)	47.558 (1.347)	47.682 (1.350)	47.072 (1.333)
V(w)	TOTAL WATER COLLECTED, IMPINGERS & SILICA GEL	ml	97.5	105.2	100.9
V(w[gas])	VOLUME WATER VAPOR COLLECTED @ STANDARD CONDITIONS*	SCF (SCM)	4.602 (0.130)	4.965 (0.141)	4.762 (0.135)
%M	MOISTURE IN STACK GAS BY VOLUME	%	8.82	9.43	9.19

* 68 Deg.F, 29.92 "Hg (20 Deg.C, 760 mm Hg)

SOURCE EMISSION CALCULATIONS

WESTERN RESOURCES, INC.
LAWRENCE, KANSAS
LAWRENCE UNIT NUMBER 4 SOUTH SCRUBBER INLET

SYMBOL	DESCRIPTION	UNITS			
Md	MOL FRACTION OF DRY GAS		0.9118	0.9057	0.9081
CO2		%	12.6	13.0	12.8
O2		%	6.6	6.4	7.0
CO		%	0.0	0.0	0.0
N2		%	80.8	80.6	80.2
%EA	EXCESS AIR @ SAMPLING POINT	%	44.6	42.8	49.1
MWd	MOLECULAR WEIGHT OF DRY STACK GAS	LB/LB-MOLE (g/g-MOLE)	30.28 (30.28)	30.34 (30.34)	30.33 (30.33)
MW	MOLECULAR WEIGHT OF STACK GAS	LB/LB-MOLE (g/g-MOLE)	29.20 (29.20)	29.17 (29.17)	29.20 (29.20)
DELTA P	VELOCITY HEAD OF STACK GAS	"H2O (mm H20)	0.556 (14.1)	0.560 (14.2)	0.578 (14.7)
Ts	STACK TEMPERATURE	DEG. F (DEG. C)	341 (172)	315 (157)	337 (169)
Ps	STACK PRESSURE	"Hg Abs. (mm Hg)	28.53 (725)	28.60 (726)	28.49 (724)
Vs	STACK VELOCITY @ STACK CONDITIONS	FPM (m/SEC.)	3,012 (15.30)	2,969 (15.08)	3,055 (15.52)
As	STACK AREA	(SQ.INCHES) (SQ.METERS)	9,216 (5.95)	9,216 (5.95)	9,216 (5.95)
Qs	DRY STACK GAS VOLUME @ STANDARD CONDITIONS*	DSCFM (DSCM/HR)	110,885 (188,394)	112,488 (191,117)	112,416 (190,995)
Qa	ACTUAL STACK GAS VOLUME @ STACK CONDITIONS	ACFM (m^3/HR)	192,780 (327,533)	190,001 (322,812)	195,545 (332,231)

* 68 Deg.F, 29.92 "Hg (20 Deg.C, 760 mm Hg)

SOURCE EMISSION CALCULATIONS

WESTERN RESOURCES, INC.
LAWRENCE, KANSAS
LAWRENCE UNIT NUMBER 4 SOUTH SCRUBBER INLET

SYMBOL	DESCRIPTION	UNITS			
Tt	NET TIME OF TEST	MINUTES	125	125	125
Dn	SAMPLING NOZZLE DIAM.	IN. (m)	0.200 (0.005)	0.200 (0.005)	0.200 (0.005)
%I	PERCENT ISOKINETIC	%	101.0	99.8	98.6
Mf	PARTICULATE - PROBE, CYCLONE AND FILTER	mg	----	----	----
Mt	PARTICULATE - TOTAL	mg	----	----	----
Can	PARTICULATE - PROBE, CYCLONE AND FILTER	gr/DSCF* (g/DSCM)	----	----	----
Cao	PARTICULATE - TOTAL	gr/DSCF* (g/DSCM)	----	----	----
Cat	PARTIC.-PROBE, CYCLONE AND FILTER @ STACK COND.	gr/CF (g/m3)	----	----	----
Cau	PARTICULATE - TOTAL @ STACK CONDITIONS	gr/CF (g/m3)	----	----	----
Caw-	PARTICULATE - PROBE, CYCLONE AND FILTER	LBS/HR (Kg/HR)	----	----	----
Cax	PARTICULATE - TOTAL	LBS/HR (Kg/HR)	----	----	----

* 68 Deg.F, 29.92 "Hg (20 Deg.C, 760 mm Hg)

METCO ENVIRONMENTAL

SOURCE EMISSION SURVEY

JOB NUMBER: 99-95LAW4
JOB NAME: WESTERN RESOURCES, INC.
LOCATION: LAWRENCE, KANSAS
UNIT TESTED: LAWRENCE UNIT NUMBER 4 SOUTH STACK

SOURCE EMISSION CALCULATIONS

SYMBOL	DESCRIPTION	UNITS			
RUN #			1	2	4
DATE			10/25/99	10/26/99	10/26/99
BEGIN TIME			1735	0900	1740
END TIME			1949	1110	2002
P(b)	BAROMETRIC PRESSURE	"Hg Abs. (mm Hg)	29.15 (740)	29.22 (742)	29.11 (739)
P(m)	ORIFICE PRESSURE DROP	"H2O (mm H2O)	1.090 (27.7)	1.070 (27.2)	1.216 (30.9)
V(m)	VOLUME DRY GAS SAMPLED @ METER CONDITIONS	ft.^3 (m^3)	68.346 (1.935)	66.109 (1.872)	73.526 (2.082)
T(m)	AVERAGE GAS METER TEMPERATURE	DEG.F (DEG.C)	77 (25)	53 (12)	82 (28)
V(m[std])*	VOLUME DRY GAS SAMPLED @ STANDARD CONDITIONS*	DSCF (DSCM)	65.662 (1.859)	66.640 (1.887)	69.913 (1.980)
V(w)	TOTAL WATER COLLECTED, IMPINGERS & SILICA GEL	ml	283.8	251.0	266.1
V(w[gas])	VOLUME WATER VAPOR COLLECTED @ STANDARD CONDITIONS*	SCF (SCM)	13.395 (0.379)	11.847 (0.335)	12.560 (0.356)
%M	MOISTURE IN STACK GAS BY VOLUME	%	16.94	15.09	15.23

* 68 Deg.F, 29.92 "Hg (20 Deg.C, 760 mm Hg)

SOURCE EMISSION CALCULATIONS

WESTERN RESOURCES, INC.
LAWRENCE, KANSAS
LAWRENCE UNIT NUMBER 4 SOUTH STACK

SYMBOL	DESCRIPTION	UNITS			
Md	MOL FRACTION OF DRY GAS		0.8306	0.8491	0.8477
CO2		%	12.4	12.2	12.3
O2		%	7.2	7.8	7.7
CO		%	0.0	0.0	0.0
N2		%	80.4	80.0	80.0
%EA	EXCESS AIR @ SAMPLING POINT	%	51.0	58.2	57.0
MWd	MOLECULAR WEIGHT OF DRY STACK GAS	LB/LB-MOLE (g/g-MOLE)	30.27 (30.27)	30.26 (30.26)	30.28 (30.28)
MW	MOLECULAR WEIGHT OF STACK GAS	LB/LB-MOLE (g/g-MOLE)	28.19 (28.19)	28.41 (28.41)	28.41 (28.41)
DELTA P	VELOCITY HEAD OF STACK GAS	"H2O (mm H20)	1.113 (28.3)	1.133 (28.8)	1.216 (30.9)
Ts	STACK TEMPERATURE	DEG. F (DEG. C)	155 (68)	151 (66)	155 (68)
Ps	STACK PRESSURE	"Hg Abs. (mm Hg)	29.08 (739)	29.16 (741)	29.04 (738)
Vs	STACK VELOCITY @ STACK CONDITIONS	FPM (m/SEC.)	3,740 (19.00)	3,737 (18.98)	3,893 (19.78)
As	STACK AREA	(SQ.INCHES) (SQ.METERS)	6,540 (4.22)	6,540 (4.22)	6,540 (4.22)
Qs	DRY STACK GAS VOLUME @ STANDARD CONDITIONS*	DSCFM (DSCM/HR)	118,159 (200,752)	121,818 (206,969)	125,352 (212,973)
Qa	ACTUAL STACK GAS VOLUME @ STACK CONDITIONS	ACFM (m^3/HR)	169,862 (288,596)	169,712 (288,341)	176,787 (300,361)

* 68 Deg.F, 29.92 "Hg (20 Deg.C, 760 mm Hg)

SOURCE EMISSION CALCULATIONS

WESTERN RESOURCES, INC.
LAWRENCE, KANSAS
LAWRENCE UNIT NUMBER 4 SOUTH STACK

SYMBOL	DESCRIPTION	UNITS			
Tt	NET TIME OF TEST	MINUTES	120	120	120
Dn	SAMPLING NOZZLE DIAM.	IN. (m)	0.200 (0.005)	0.200 (0.005)	0.200 (0.005)
%I	PERCENT ISOKINETIC	%	96.8	95.3	97.1
Mf	PARTICULATE - PROBE, CYCLONE AND FILTER	mg	----	----	----
Mt	PARTICULATE - TOTAL	mg	----	----	----
Can	PARTICULATE - PROBE, CYCLONE AND FILTER	gr/DSCF* (g/DSCM)	----	----	----
Cao	PARTICULATE - TOTAL	gr/DSCF* (g/DSCM)	----	----	----
Cat	PARTIC.-PROBE, CYCLONE AND FILTER @ STACK COND.	gr/CF (g/m3)	----	----	----
Cau	PARTICULATE - TOTAL @ STACK CONDITIONS	gr/CF (g/m3)	----	----	----
Caw	PARTICULATE - PROBE, CYCLONE AND FILTER	LBS/HR (Kg/HR)	----	----	----
Cax	PARTICULATE - TOTAL	LBS/HR (Kg/HR)	----	----	----

* 68 Deg.F, 29.92 "Hg (20 Deg.C, 760 mm Hg)

APPENDIX B

Field Data

METCO ENVIRONMENTAL

Job Number 99-95LAW4
Job Name EPRI / Western Resources
Run Number 1
Unit Unit 4 South Scrubber Inlet Duct
Date 10/25/99
Operator Buss / Hart / Hefley
Sample Box No. Hg3 Meter Box No. 27-2

Hg Field Data

Read and record at the start of each test point.

Purge to: –
Purge time: –
Pitot Leak Check Initial ✓ Final ✓

Ambient Temp. °F 75
Assumed Moisture % 5.12
Probe Length 8'
C Factor 1 to 0.245 to reference
Initial Leak @ 15.00 "Hg = 0.001 cfm
Final Leak @ 13.00 "Hg = 0.001 cfm

Point	Clock Time	Dry Gas Meter, CF	"Pitot" "H_2O (ΔP_s)	Orifice ΔH "H_2O Desired	Orifice ΔH "H_2O Actual	Pump Vacuum "Hg Guage (P_m)	Stack Temp °F (T_s)	Probe Temp °F	Oven Temp °F	Effluent Temp °F	Dry Gas Temp. °F Inlet	Dry Gas Temp. °F Outlet (T_m)	Heated Line °F	Remarks
A5	1746	768.311	0.70	0.59	0.59	8.50	347	273	251	62	75	76	279	Thimble Q63
4	1751	770.36	0.68	0.58	0.58	8.50	348	258	252	59	76	77	291	Filter Q74
2	1756	772.57	0.54	0.46	0.46	8.00	350	254	252	57	76	76	272	
2	1801	774.72	0.58	0.49	0.49	8.00	320	261	251	55	76	76	260	intorsat
1	1806	776.55	0.52	0.44	0.44	8.00	309	266	254	54	76	76	250	CDT
B5	1811	778.40	0.70	0.59	0.59	9.00	341	260	253	55	76	76	253	
4	1816	780.49	0.70	0.59	0.59	9.00	345	254	253	54	76	76	252	
3	1821	782.69	0.54	0.46	0.46	8.50	352	254	252	54	77	76	256	
2	1826	784.69	0.58	0.49	0.49	8.50	352	257	253	54	77	76	261	
1	1831	786.71	0.70	0.59	0.59	9.50	354	261	254	54	77	76	264	
C5	1836	788.85	0.68	0.58	0.58	9.50	340	264	253	55	76	75	268	
4	1841	790.68	0.68	0.58	0.58	9.50	326	259	252	53	75	75	271	
3	1846	792.89	0.55	0.46	0.46	9.00	337	263	252	52	76	75	266	
2	1851	794.89	0.42	0.36	0.36	8.00	342	260	252	52	76	75	261	
1	1856	796.65	0.65	0.55	0.55	9.50	312	260	253	53	75	75	260	
D5	1901	798.65	0.58	0.50	0.50	9.50	341	256	253	54	75	75	258	
4	1906	800.51	0.46	0.40	0.40	9.00	350	256	252	52	75	75	257	
3	1911	802.35	0.40	0.35	0.35	8.50	340	257	252	52	74	74	255	

Pitot Tube Calibration Factor C_p 0.808 ✓
Volume Collected V_m 49.394 ✓ ft^3
Water Collected V_w 97.5 ✓ ml
Time of Test T_t 125 ✓ min.
Stack Pressure P_s -8.50 ✓ "H_2O

Pitot Tube No. M2 ✓
Baro. Press. P_b 29.15 ✓ "Hg
Probe Tip Dia. D_n 0.200 ✓ in.
% CO_2 12.6 ✓ % CO 0.0 ✓
% O_2 6.6 ✓ % N_2 80.8 ✓
Area Stack A_s 9216 ✓ in^2

Barometer No. 19-1 ✓
Probe Tip No. TFE1-7 ✓
Total Volume of Leak Checks After Start: – ft^3
V_m = Dry Gas Meter Calibration Factor 48.002 X 1.029 ✓

[Dry Gas Meter Reading – ft^3 - (T_t – min. X Leak Rate – cfm)]

Impinger Box No. Hg 3

			Water Weight Gain		
Impinger 1	Final Weight	729.0	Imp 8 Final 904.8	Impinger 1	72.4
	Initial Weight	656.6	Int. 895.6	Impinger 2	11.6
	Increase	72.4	9.2	Impinger 3	2.2
Impinger 2	Final Weight	756.7	2420 − 2411	Impinger 4	2.7
	Initial Weight	745.1	V_w =		
	Increase	11.6		Impinger 5	−0.4
Impinger 3	Final Weight	753.6	g SO_2 =		
	Initial Weight	751.4	V_w =	Impinger 6	0
	Increase	2.2			
Impinger 4	Final Weight	749.6		Impinger 7	−0.2
	Initial Weight	746.9		Impinger 8	9.2
	Increase	2.7		Total	97.5 = V_w
Impinger 5	Final Weight	750.8	P_b = 29.15	$\%CO_2$ = 12.6	
	Initial Weight	751.2	V_m = 49.394	$\%O_2$ = 6.6	
	Increase	−0.4	V_w = 97.5	%CO = 0.0	
			P_m = 0.476	$\%N_2$ = 80.8	
Impinger 6	Final Weight	755.4	Avg ΔP = 0.556	A_s = 9214	
	Initial Weight	755.4		D_n = 0.200	
	Increase	0	Avg$\sqrt{\Delta P}$ = 0.742	T_t = 125	
			C_p = 0.808		
Impinger 7	Final Weight	759.8	P_s = −8.50 "H_2O	28.53 "Hg	
	Initial Weight	760.0	T_m = 75 °F	535 °R	
	Increase	−0.2	T_s = 341 °F	801 °R	

Moisture Content: %M = 8.82 M_d = 0.9118 MW_d = 30.280 MW = 29.20

$$Vm_{std} = 17.65\ Vm \left[\frac{P_b + \frac{P_m}{13.6}}{T_m + 460}\right] = 17.65 \times 49.394 \left[\frac{29.15 + \frac{0.476}{13.6}}{75 + 460}\right] = 47.558\ sft^3 = 0.380\ scfm$$

Vw_{gas} = 0.0472 x Vw = 0.0472 x 97.5 = 4.602 sft^3

$$\%\ Moisture = \frac{Vw_{gas}}{Vm_{std} + Vw_{gas}} \times 100 = \frac{4.602}{47.558 + 4.602} \times 100 = 8.82\ \%$$

$$V_s = 5123.8 \times 0.808 \sqrt{\frac{801}{28.53 \times 29.20}} \times 0.742 = 3012\ fpm$$

ACFM: 192,780 ~~192,778~~

$$\%I = \frac{1{,}039 \times 47.558 \times 801}{28.53 \times 3012 \times 0.9118 \times 125 \times (0.200)^2} = 101.0\ \%$$

SCFM: 110,885

%EA: 44.6

Run Number 1

Unit 4 South Scrubber Inlet Duct

Date 10/25/99

Hg FIELD DATA

Point	Clock Time	Dry Gas Meter, CF	ΔP_s "Pitot" "H_2O	Orifice ΔH "H_2O Desired	Orifice ΔH "H_2O Actual	P_m Pump Vacuum "Hg Guage	T_s Stack Temp °F	Probe Temp °F	Oven Temp °F	Effluent Temp °F	T_m Dry Gas Temp. °F Inlet	Dry Gas Temp. °F Outlet	Heated Line °F	Remarks
D2	1916	804.09	0.48	0.42	0.42	9.00	355	259	254	53	74	74	255	new C Factor
1	1921	805.94	0.60	0.52	0.52	10.00	309	262	253	53	74	74	263	i to 0.270
E5	1926	807.80	0.35	0.31	0.31	8.50	337	258	254	54	73	74	254	
4	1931	809.29	0.35	0.31	0.31	8.50	350	258	253	54	73	74	254	
3	1936	810.89	0.42	0.37	0.37	9.00	355	255	253	53	73	73	254	
2	1941	812.63	0.52	0.45	0.45	10.00	358	254	253	53	73	73	253	
1	1946	814.56	0.52	0.45	0.45	10.00	359	253	255	52	72	73	254	
END	1951	816.313	—	—	—	—	—	—	—	—	—	—	—	

METCO ENVIRONMENTAL

Job Number: 99-95 LAW 4 ✓
Job Name: EPRI / Western Resources ✓
Run Number: 2 ✓
Unit: 4 South Scrubber Inlet Duct ✓
Date: 10/26/99 ✓
Operator: Bass / Hart / Hefley ✓
Sample Box No. Hg 1 Meter Box No. 27-2 ✓

Hg Field Data

Read and record at the start of each test point.

Purge to: –
Purge time: –
Pitot Leak Check Initial ✓ Final ✓

Ambient Temp. °F 55
Assumed Moisture % 8.82
Probe Length 8'
C Factor 2 to 0.500 to reference
Initial Leak @ 15.00 "Hg = 0.001 cfm
Final Leak @ 13.00 "Hg = 0.001 cfm

Point	Clock Time	Dry Gas Meter, CF	"Pitot" "H_2O (ΔP_s)	Orifice ΔH "H_2O Desired	Orifice ΔH "H_2O Actual	Pump Vacuum "Hg Guage (P_m)	Stack Temp °F (T_s)	Probe Temp °F	Oven Temp °F	Effluent Temp °F	Dry Gas Temp. °F Inlet	Dry Gas Temp. °F Outlet (T_m)	Heated Line °F	Remarks
A5	0900	838.940	0.78	0.64	0.64	9.50	309	259	252	45	48	48	259	
4	0905	840.92	0.75	0.61	0.61	9.50	311	254	253	44	49	48	264	
3	0910	843.11	0.55	0.44	0.44	8.00	334	253	253	44	50	49	264	int. orsat
2	0915	844.98	0.68	0.55	0.55	9.00	307	255	252	44	51	49	267	CDT
1	0920	847.05	0.60	0.48	0.48	8.50	301	257	254	43	52	50	269	
B5	0925	848.95	0.70	0.56	0.56	9.00	311	260	253	43	53	50	265	
4	0930	850.84	0.70	0.56	0.56	9.00	329	265	253	44	53	51	262	
3	0935	852.95	0.55	0.44	0.44	8.50	333	263	255	44	55	52	260	
2	0940	854.85	0.60	0.48	0.48	9.00	308	261	254	44	55	52	262	
1	0945	856.82	0.65	0.53	0.53	9.50	301	265	252	45	56	53	258	
C5	0950	858.80	0.68	0.55	0.55	9.50	318	269	253	46	57	54	258	
4	0955	860.65	0.68	0.55	0.55	9.50	305	255	251	45	58	54	263	
3	1000	862.77	0.52	0.42	0.42	9.00	~~29~~ 331	254	252	44	58	55	264	
2	1005	864.64	0.40	0.32	0.32	8.00	306	257	252	45	59	55	266	
1	1010	866.30	0.60	0.48	0.48	9.50	302	259	253	45	60	57	260	
D5	1015	868.20	0.60	0.48	0.48	9.50	309	263	253	48	60	57	262	
4	1020	869.99	0.43	0.35	0.35	9.00	315	256	255	47	60	57	262	
3	1025	871.74	0.40	0.33	0.33	8.50	333	254	252	47	60	57	260	

Pitot Tube Calibration Factor C_p 0.808 ✓
Volume Collected V_m 47.560 ✓ ft^3
Water Collected V_w 105.2 ✓ ml
Time of Test T_t 125 ✓ min.
Stack Pressure P_s -8.40 ✓ "H_2O

Pitot Tube No. M2 ✓
Baro. Press. P_b 29.22 ✓ "Hg
Probe Tip Dia. D_n 0.200 ✓ in.
% CO_2 13.0 ✓ % CO 0.0 ✓
% O_2 6.4 ✓ % N_2 80.6 ✓
Area Stack A_s 9216 ✓ in^2

Barometer No. 19-1 ✓
Probe Tip No. TFE1-7 ✓
Total Volume of Leak Checks After Start: – ft^3
V_m = Dry Gas Meter Calibration Factor 46.22 X 1.029 ✓

[Dry Gas Meter Reading – ft^3 - (T_t – min. X Leak Rate – cfm)]

Impinger Box No. Hg 1

Impinger 1	Final Weight	718.4	Impinger 8 Final 797.4	Impinger 1	84.4
	Initial Weight	634.0	Initial 788.8	Impinger 2	8.5
	Increase	84.4			
		658.4			
Impinger 2	Final Weight	~~649.9~~	2336.2 / 2327.6	Impinger 3	1.7
	Initial Weight	649.9			
	Increase	8.5		Impinger 4	2.1
			V_w =		
Impinger 3	Final Weight	659.7	g SO_2 =	Impinger 5	-0.1
	Initial Weight	658.0	V_w =		
	Increase	1.7		Impinger 6	-0.1
Impinger 4	Final Weight	750.2		Impinger 7	0.1
	Initial Weight	748.1		Impinger 8	8.6
	Increase	2.1		Total	105.2 = V_w
Impinger 5	Final Weight	764.5	P_b = 29.22	$\%CO_2$ =	13.0
	Initial Weight	764.6	V_m = 47.560	$\%O_2$ =	6.4
	Increase	-0.1	V_w = 105.2	%CO =	0.0
			P_m = 0.453	$\%N_2$ =	80.6
Impinger 6	Final Weight	765.6	Avg ΔP = 0.560	A_s =	9216
	Initial Weight	765.7		D_n =	0.200
	Increase	-0.1	Avg$\sqrt{\Delta P}$ = 0.744	T_t =	125
			C_p = 0.808		
Impinger 7	Final Weight	773.2	P_s = -8.40 "H_2O	28.60	"Hg
	Initial Weight	773.1	T_m = 55 °F	515	°R
	Increase	0.1	T_s = 315 °F	775	°R

Water Weight Gain

Moisture Content: %M = 9.43 M_d = 0.9057 MW_d = 30.336 MW = 29.17

$$Vm_{std} = 17.65\ Vm \left[\frac{P_b + \frac{P_m}{13.6}}{T_m + 460}\right] = 17.65 \times 47.560 \left[\frac{29.22 + \frac{0.453}{13.6}}{55 + 460}\right] = 47.682\ sft^3 = 0.381\ scfm$$

Vw_{gas} = 0.0472 x Vw = 0.0472 x 105.2 = 4.965 sft^3

$$\% \text{ Moisture} = \frac{Vw_{gas}}{Vm_{std} + Vw_{gas}} \times 100 = \frac{4.965}{47.682 + 4.965} \times 100 = 9.43\ \%$$

$$V_s = 5123.8 \times 0.808 \sqrt{\frac{775}{28.60 \times 29.17}} \times 0.744 = 2969\ fpm$$

$$\%I = \frac{1{,}039 \times 47.682 \times 775}{28.60 \times 0.9057 \times 2969 \times 125 \times (0.200)^2} = 99.8\ \%$$

ACFM: 190,001

SCFM: 112,488

%EA: 42.8

Run Number 2

Unit 4 South Scrubber Inlet Duct

Date 10/26/99

Hg FIELD DATA

Point	Clock Time	Dry Gas Meter, CF	"Pitot" "H_2O (ΔP_s)	Orifice ΔH "H_2O Desired	Orifice ΔH "H_2O Actual	Pump Vacuum "Hg Guage (P_m)	Stack Temp °F (T_s)	Probe Temp °F	Oven Temp °F	Effluent Temp °F	Dry Gas Temp. °F Inlet (T_m)	Dry Gas Temp. °F Outlet	Heated Line °F	Remarks
D2	1030	873.39	0.50	0.40	0.40	9.00	312	258	252	48	59	58	263	
1	1035	875.23	0.58	0.47	0.47	10.00	303	261	256	48	59	57	259	
ES	1040	877.15	0.42	0.34	0.34	9.00	320	269	255	48	59	57	258	
4	1045	878.60	0.32	0.26	0.26	8.00	310	257	254	49	59	57	259	
3	1050	880.11	0.38	0.32	0.32	9.00	340	255	253	49	59	58	256	
2	1055	881.76	0.47	0.38	0.38	9.50	325	261	255	49	59	58	255	
1	1100	883.52	0.47	0.38	0.38	9.50	307	269	254	49	59	58	254	
END	1105	885.160	—	—	—	—	—	—	—	—	—	—	—	

METCO ENVIRONMENTAL

Job Number 99-95LAW4
Job Name EPRI / Western Resources
Run Number 3
Unit 4 ~~South~~ Scrubber South Inlet Duct
Date 10/26/99
Operator Bass / Hart / Hefley
Sample Box No. ~~Hg~~ 3 Meter Box No. 27-2

Hg Field Data

Read and record at the start of each test point.

Purge to: —
Purge time:
Pitot Leak Check Initial ✓ Final

Ambient Temp. °F 75
Assumed Moisture % 8
Probe Length 10'
C Factor 2 to 0.53 to reference
Initial Leak @ 15.00 "Hg = 0.001 cfm
Final Leak @ — "Hg = cfm

Point	Clock Time	Dry Gas Meter, CF	"Pitot" "H_2O (ΔP_s)	Orifice ΔH "H_2O Desired	Orifice ΔH "H_2O Actual	Pump Vacuum "Hg Guage (P_m)	Stack Temp °F (T_s)	Probe Temp °F	Oven Temp °F	Effluent Temp °F	Dry Gas Temp. °F Inlet	Dry Gas Temp. °F Outlet (T_m)	Heated Line °F	Remarks
A5	1345	890.614	0.76	0.65	0.65	11.00	330	255	252	67	78	78	281	thimble
4	1350	892.61	0.80	0.68	0.68	11.00	351	259	251	64	78	78	284	filter 47Q80
3	1355	894.97	0.55	0.47	0.47	9.50	357	263	254	65	77	78	264	int. orsat
2	1400	896.98	0.67	0.57	0.57	10.50	353	262	253	64	77	78	258	CDT
1	1405	899.16	0.62	0.53	0.53	10.00	337	259	254	65	78	78	253	—
B5	1410	901.24	0.70	0.60	0.60	11.00	340	256	253	64	78	78	254	
4	1415	903.34	0.70	0.60	0.60	11.00	350	265	252	61	78	78	256	
3	1420	905.60	0.55	0.47	0.47	9.00	355	266	252	60	78	77	259	
2	1425	907.62	0.65	0.47	0.47	9.50	350	269	252	61	77	78	259	
1	1430	909.61	0.64	0.54	0.54	10.00	351	267	253	60	76	77	260	
C5	1435	911.72	0.69	0.60	0.60	11.00	350	255	253	61	76	77	261	
4	1440	913.94	0.69	0.60	0.60	11.00	350	254	261	58	77	77	261	
3	1445	916.19	0.55	0.48	0.48	10.00	351	262	258	57	77	77	261	
2	1450	918.27	0.42	0.36	0.36	8.50	351	264	257	56	77	77	260	
1	1455	920.12	0.59	0.50	0.50	9.00	350	264	255	57	77	78	260	
End	1500	922.98	—	—	—	—	—	—	—	—	—	—	—	

VOID

Pitot Tube Calibration Factor C_p 0.808
Volume Collected V_m — ft^3
Water Collected V_w — ml
Time of Test T_t 125 min.
Stack Pressure P_s — "H_2O

Pitot Tube No. M2
Baro. Press. P_b — "Hg
Probe Tip Dia. D_n 0.200 in.
% CO_2 — % CO 0.0
% O_2 — % N_2 —
Area Stack A_s 9214 in^2

Barometer No. 19-1
Total Volume of Leak Checks After Start: — ft^3
V_m = Dry Gas Meter Calibration Factor — X 1.029

Probe Tip No. TFE1-7

[Dry Gas Meter Reading ____ ft^3 - (T_t ____ min. X Leak Rate ____ cfm)]

R-8

METCO ENVIRONMENTAL

Job Number 99-95LAW4 ✓
Job Name EPRI / Western Resources ✓
Run Number 4 ✓
Unit 4 Scrubber South Inlet Duct ✓
Date 10/26/99 ✓
Operator Bass / Hart / Hefley ✓
Sample Box No. Hg 1 Meter Box No. 27-2 ✓

Hg Field Data

Read and record at the start of each test point.

Purge to: –
Purge time: –
Pitot Leak Check Initial ✓ Final ✓

Ambient Temp. °F 80
Assumed Moisture % 8
Probe Length 8ft.
C Factor 2 to 0.53 to reference
Initial Leak @ 15.00 "Hg = 0.001 cfm
Final Leak @ 14.00 "Hg = 0.001 cfm

Point	Clock Time	Dry Gas Meter, CF	"Pitot" "H_2O (ΔP_s)	Orifice ΔH "H_2O Desired	Orifice ΔH "H_2O Actual	Pump Vacuum "Hg Guage (P_m)	Stack Temp °F (T_s)	Probe Temp °F	Oven Temp °F	Effluent Temp °F	Dry Gas Temp. °F Inlet (T_m)	Dry Gas Temp. °F Outlet	Heated Line °F	Remarks
A5	1740	922.340	0.85	0.73	0.73	11.00	341	260	252	67	80	80	261	
4	1745	924.68	0.75	0.64	0.64	10.00	356	265	254	61	80	80	262	
3	1750	927.01	0.55	0.47	0.47	8.50	357	263	254	58	80	80	263	int. crsat
2	1755	929.03	0.68	0.58	0.58	10.00	343	258	253	57	80	80	263	CDT
1	1800	931.23	0.62	0.53	0.53	9.00	309	254	253	56	80	80	263	
B5	1805	933.28	0.78	0.67	0.67	10.50	342	256	251	55	80	80	263	
4	1810	935.45	0.78	0.67	0.67	10.50	356	264	253	54	80	80	263	
3	1815	937.83	0.52	0.44	0.44	8.50	356	265	252	53	80	80	263	
2	1820	939.81	0.66	0.56	0.56	10.00	342	274	252	55	80	80	264	
1	1825	941.97	0.75	0.64	0.64	10.50	334	269	253	54	80	79	264	
C5	1830	944.21	0.75	0.64	0.64	10.50	321	266	252	55	80	79	267	
4	1835	946.32	0.72	0.62	0.62	10.50	356	264	254	53	80	79	259	
3	1840	948.64	0.60	0.51	0.51	10.00	330	264	254	54	80	79	266	
2	1845	950.77	0.44	0.34	0.34	7.50	320	252	251	53	80	79	265	2 to 0.470
1	1850	952.51	0.60	0.46	0.46	9.00	322	254	251	55	79	79	255	
D5	1855	954.40	0.55	0.42	0.42	8.50	345	257	253	55	78	78	269	
4	1900	956.16	0.42	0.32	0.32	7.50	362	264	253	55	78	78	269	
3	1905	957.84	0.42	0.32	0.32	7.50	360	260	254	55	77	78	267	

Pitot Tube Calibration Factor C_p 0.808 ✓
Volume Collected V_m 49.323 ✓ ft^3
Water Collected V_w 100.9 ✓ ml
Time of Test T_t 125 ✓ min.
Stack Pressure P_s -8.40 ✓ "H_2O

Pitot Tube No. M2 ✓
Baro. Press. P_b 29.11 ✓ "Hg
Probe Tip Dia. D_n 0.200 ✓ in.
% CO_2 12.8 ✓ % CO 0.0 ✓
% O_2 7.0 ✓ % N_2 80.2 ✓
Area Stack A_s 9216 ✓ in^2

Barometer No. 19-1 ✓
Probe Tip No. TFE1-7 ✓
Total Volume of Leak Checks After Start: – ft^3
V_m = Dry Gas Meter Calibration Factor 47.933 X 1.029 ✓

[Dry Gas Meter Reading – ft^3 - (T_t – min. X Leak Rate – cfm)]

Impinger Box No. Hg 1

			Water Weight Gain		
Impinger 1	Final Weight	708.5 ~~898.0~~	Imp 8	Impinger 1	78.1
	Initial Weight	630.4	Final 805.5	Impinger 2	11.2
	Increase	78.1	Int. 797.5		
Impinger 2	Final Weight	656.3	8.0	Impinger 3	2.0
	Initial Weight	645.1	2341 2333.2		
	Increase	11.2	V_w =	Impinger 4	1.8
Impinger 3	Final Weight	658.0	g SO_2 =	Impinger 5	0
	Initial Weight	656.0	V_w =		
	Increase	2.0		Impinger 6	-0.3
Impinger 4	Final Weight	751.0		Impinger 7	0.1
	Initial Weight	749.2		Impinger 8	8.0
	Increase	1.8		Total	100.9 = V_w

Impinger 5	Final Weight	762.2	P_b =	29.11		%CO_2 =	12.8
	Initial Weight	762.2	V_m =	49.323		%O_2 =	7.0
	Increase	0	V_w =	100.9		%CO =	0.0
			P_m =	0.470		%N_2 =	80.2
Impinger 6	Final Weight	766.5	Avg ΔP =	0.578		A_s =	9216
	Initial Weight	766.8				D_n =	0.200
	Increase	-0.3	Avg$\sqrt{\Delta P}$ =	0.754		T_t =	125
			C_p =	0.808			
Impinger 7	Final Weight	769.0	P_s =	-8.40	"H_2O	28.49	"Hg
	Initial Weight	768.9	T_m =	79	°F	539	°R
	Increase	0.1	T_s =	337	°F	797	°R

Moisture Content: %M = 9.19 M_d = 0.9081 MW_d = 30.328 MW = 29.20

$$Vm_{std} = 17.65\ Vm \left[\frac{P_b + \frac{P_m}{13.6}}{T_m + 460}\right] = 17.65 \times 49.323 \left[\frac{29.11 + \frac{0.470}{13.6}}{79 + 460}\right] = \frac{47.072\ sft^3}{0.377\ scfm}$$

Vw_{gas} = 0.0472 x Vw = 0.0472 x 100.9 = 4.762 sft^3

$$\% \text{ Moisture} = \frac{Vw_{gas}}{Vm_{std} + Vw_{gas}} \times 100 = \frac{4.762}{47.072 + 4.762} \times 100 = 9.19\ \%$$

$$V_s = 5123.8 \times 0.808 \sqrt{\frac{797}{28.49 \times 29.20}} \times 0.754 = 3055\ fpm$$

ACFM: 195,545

SCFM: 112,416

$$\%I = \frac{1{,}039 \times 47.072 \times 797}{28.49 \times 0.9081 \times 3055 \times 125 \times (0.200)^2} = 98.6\ \%$$

%EA: 49.1

Run Number 4

Unit 4 Scrubber South Inlet Duct

Date ~~10/20~~ 10/26/99

Hg FIELD DATA

Point	Clock Time	Dry Gas Meter, CF	"Pitot" "H_2O (ΔP_s)	Orifice ΔH "H_2O Desired	Orifice ΔH "H_2O Actual (P_m)	Pump Vacuum "Hg Guage	Stack Temp °F (T_s)	Probe Temp °F	Oven Temp °F	Effluent Temp °F	Dry Gas Temp. °F Inlet (T_m)	Dry Gas Temp. °F Outlet	Heated Line °F	Remarks
D2	1910	959.49	0.50	0.38	0.38	8.00	308	262	253	55	77	78	270	
1	1915	961.25	0.52	0.38	0.38	8.00	305	262	253	55	77	77	263	2 to 0.44
E5	1920	962.87	0.34	0.24	0.24	6.00	344	260	254	56	76	77	260	
4	1925	964.19	0.30	0.22	0.22	6.00	351	264	255	56	76	77	261	
3	1930	965.53	0.40	0.29	0.29	7.00	354	265	254	56	76	77	261	
2	1935	~~966~~ 967.06	0.46	0.33	0.33	7.50	309	267	251	56	75	76	269	
1	1940	968.67	0.50	0.36	0.36	8.00	304	268	255	55	75	76	261	
END	1945	970.273	–	–	–	–	–	–	–	–	–	–	–	

METCO ENVIRONMENTAL

Job Number 99-95 LAW 4 ✓
Job Name EPRD ✓
Run Number 1 ✓
Unit Unit 4 South Stack ✓
Date 10-25-99 ✓
Operator Lee/Brown/Conway/Hofley ✓
Sample Box No. Hg 2 Meter Box No. 29-1 ✓

Hg Field Data

Read and record at the start of each test point.

Purge to: —
Purge time: —
Pitot Leak Check Initial ✓ Final ✓

Ambient Temp. °F 78
Assumed Moisture % 15%
Probe Length 10'
C Factor 0.98 ⇒ 1.0 to reference
Initial Leak @ 16.0 "Hg = 0.000 cfm
Final Leak @ 17.0 "Hg = 0.000 cfm

Point	Clock Time	Dry Gas Meter, CF	"Pitot" "H_2O (ΔP_s)	Orifice ΔH "H_2O Desired	Orifice ΔH "H_2O Actual (P_m)	Pump Vacuum "Hg Guage	Stack Temp °F (T_s)	Probe Temp °F	Oven Temp °F	Effluent Temp °F	Dry Gas Temp. °F Inlet (T_m)	Dry Gas Temp. °F Outlet	Remarks
A 6	1735	300.986	1.35	1.30	1.30	8.0	152	250	252	67	76	78	Pitot Orsat
6	1740	304.07	1.35	1.30	1.30	8.0	155	255	253	55	77	77	Multi-Point
5	1745	307.28	1.30	1.30	1.30	8.0	155	259	269	50	79	77	
5	1750	310.47	1.30	1.30	1.30	8.0	154	260	270	48	82	79	
4	1755	313.63	1.35	1.30	1.30	8.0	155	265	271	47	84	79	
4	1800	316.75	1.35	1.30	1.30	8.0	156	267	273	47	85	79	
3	1805	319.86	1.10	1.10	1.10	8.0	157	270	273	47	85	79	
3	1810	323.02	0.97	0.96	0.96	7.5	156	271	271	47	85	79	
2	1815	325.68	0.73	0.72	0.72	6.5	156	273	272	47	85	79	
2	1820	328.18	0.72	0.71	0.71	6.5	157	272	270	48	85	79	
1	1825	330.57	0.45	0.44	0.44	5.0	156	271	271	48	85	79	
1	1830	332.53	0.45	0.44	0.44	5.0	155	272	270	48	85	78	
End	1835	334.492	—	—	—	—	—	—	—	—	—	—	leak chk to 334.645; 1200 0.000
B 6	1849	334.990	0.90	0.89	0.89	7.5	153	253	272	49	81	75	leak chk to 334.990; 1200 0.000
6	1854	337.41	0.87	0.86	0.86	7.5	153	258	270	48	79	75	
5	1859	340.00	1.35	1.30	1.30	9.0	155	256	268	48	77	75	
5	1904	343.10	1.35	1.30	1.30	9.5	155	256	265	47	76	74	
4	1909	346.21	1.35	1.30	1.30	9.5	156	258	266	48	75	74	

Pitot Tube Calibration Factor C_p 0.808 ✓
Volume Collected V_m 68.346 ft^3
Water Collected V_w 283.8 ml
Time of Test T_t 120 min.
Stack Pressure P_s -0.90 "H_2O

Pitot Tube No. M-3 ✓
Baro. Press. P_b 29.15 "Hg ✓
Probe Tip Dia. D_n ~~0.199~~ 0.200 in.
% CO_2 12.4 % CO 0
% O_2 7.2 % N_2 80.4
Area Stack A_s 6.540 ✓ in^2

Barometer No. 19-1 ✓ Probe Tip No. TFE 2-7 ✓
Total Volume of Leak Checks After Start: 0.498 ✓ ft^3
V_m = Dry Gas Meter Calibration Factor 1.000 ✓ X 68.346

[Dry Gas Meter Reading — ft^3 - (T_t — min. X Leak Rate — cfm)]

Impinger Box No. Hs-2

Impinger 1	Final Weight	938.1	Water Weight Gain	Impinger 1	192.9
	Initial Weight	745.2	Imp. 8 final 864.3 / Init. 850.9	Impinger 2	44.2
	Increase	192.9	13.4		
Impinger 2	Final Weight	794.5		Impinger 3	30.2
	Initial Weight	750.3	2300.5 / 2287.2		
	Increase	44.2		Impinger 4	3.0
			V_w =		
Impinger 3	Final Weight	753.5	g SO_2 = -	Impinger 5	0.2
	Initial Weight	723.3	V_w =		
	Increase	30.2		Impinger 6	0.3
Impinger 4	Final Weight	757.0		Impinger 7	-0.4
	Initial Weight	754.0		Imp. 8	13.4
	Increase	3.0		Total	283.8 = V_w
Impinger 5	Final Weight	679.7	P_b = 29.15	$\%CO_2$ =	12.4
	Initial Weight	679.5	V_m = 68.346	$\%O_2$ =	7.2
	Increase	0.2	V_w = 283.8	%CO =	Ø
			P_m = 1.090	$\%N_2$ =	80.4
Impinger 6	Final Weight	753.7	Avg ΔP = 1.113	A_s =	6540
	Initial Weight	753.4		D_n =	~~0.199~~ 0.200
	Increase	0.3	Avg$\sqrt{\Delta P}$ = 1.043	T_t =	120
			C_p = 0.808		
Impinger 7	Final Weight	682.5	P_s = -0.90 "H_2O	29.08	"Hg
	Initial Weight	682.9	T_m = 77 °F	537	°R
	Increase	-0.4	T_s = 155 °F	615	°R

Moisture Content: %M = 16.94 M_d = 0.8306 MW_d = 30.272 MW = 28.19

$$Vm_{std} = 17.65\ Vm \left[\frac{P_b + \frac{P_m}{13.6}}{T_m + 460}\right] = 17.65 \times 68.346 \left[\frac{29.15 + \frac{1.090}{13.6}}{77 + 460}\right] = 65.662\ sft^3 \quad 0.547\ scfm$$

Vw_{gas} = 0.0472 x Vw = 0.0472 x 283.8 = 13.395 sft^3

% Moisture = $\frac{Vw_{gas}}{Vm_{std} + Vw_{gas}}$ x 100 = $\frac{13.395}{65.662 + 13.395}$ x 100 = 16.94 %

V_s = 5123.8 x 0.808 $\sqrt{\frac{615}{29.08 \times 28.19}}$ x 1.043 = 3740 fpm

%I = $\frac{1{,}039 \times 65.662 \times 615}{120 \times 0.8306 \times 29.08 \times 3740 \times (\cancel{0.199})^2}$ = ~~97.7~~ 96.8 %

0.200

ACFM: 169,862

SCFM: 18,159

%EA: 51

Run Number 1

Unit Unit 4 South Stack

Date 10-25-99

Hg FIELD DATA

Point	Clock Time	Dry Gas Meter, CF	ΔP_s "Pitot" "H_2O	Orifice ΔH "H_2O Desired	P_m Orifice ΔH "H_2O Actual	Pump Vacuum "Hg Guage	T_s Stack Temp °F	Probe Temp °F	Oven Temp °F	Effluent Temp °F	T_m Dry Gas Temp. °F Inlet	Dry Gas Temp. °F Outlet	Remarks
B4	1914	349.29	1.35	1.30	1.30	9.5	156	259	265	48	75	73	
3	1919	352.35	1.45	1.40	1.40	10.0	155	258	262	48	74	72	
3	1924	355.52	1.40	1.40	1.40	11.0	155	257	260	48	74	72	
2	1929	358.69	1.30	1.30	1.30	10.5	155	256	261	48	74	71	
2	1934	361.82	1.30	1.30	1.30	10.5	155	256	263	48	73	71	
1	1939	364.84	0.83	0.82	0.82	8.5	154	252	264	49	73	70	
1	1944	367.41	0.84	0.83	0.83	8.5	154	253	266	49	73	70	
End	1949	369.830	—	—	—	—	—	—	—	—	—	—	

METCO ENVIRONMENTAL

Hg Field Data

Job Number 99-95 LAW 4
Job Name EPRL
Run Number 2
Unit Unit 4 South Stack
Date 10-26-99
Operator Lee / Brown / Conway / Bedley
Sample Box No. Hg 4 Meter Box No. 29-1

Read and record at the start of each test point.

Purge to: —
Purge time: —
Pitot Leak Check Initial ✓ Final ✓

Ambient Temp. °F 42
Assumed Moisture % 17%
Probe Length 10'
C Factor 0.94 ⇒ 1.0 to reference
Initial Leak @ 15.0 "Hg = 0.000 cfm
Final Leak @ 16.0 "Hg = 0.000 cfm

Point	Clock Time	Dry Gas Meter, CF	"Pitot" "H_2O (ΔP_s)	Orifice ΔH "H_2O Desired	Orifice ΔH "H_2O Actual	Pump Vacuum "Hg Guage (P_m)	Stack Temp °F (T_s)	Probe Temp °F	Oven Temp °F	Effluent Temp °F	Dry Gas Temp. °F Inlet (T_m)	Dry Gas Temp. °F Outlet	Remarks
B6	0900	378.068	1.20	1.10	1.10	5.0	148	254	266	54	50	43	Multi-Point
6	0905	380.90	1.20	1.10	1.10	5.0	148	253	266	49	50	43	Bad Orsat
5	0910	383.74	1.35	1.30	1.30	5.5	149	254	262	48	51	44	
5	0915	386.81	1.35	1.30	1.30	5.5	150	252	263	48	51	44	
4	0920	389.83	1.35	1.30	1.30	5.5	150	253	265	49	52	45	
4	0925	392.86	1.35	1.30	1.30	6.0	150	255	267	50	52	45	
3	0930	395.97	1.35	1.30	1.30	6.0	151	256	267	50	52	45	
3	0935	398.84	1.35	1.30	1.30	6.0	150	256	270	50	53	46	
2	0940	401.87	1.20	1.10	1.10	6.0	151	255	270	50	53	46	
2	0945	404.78	1.20	1.10	1.10	6.0	150	252	268	51	53	47	
1	0950	407.59	0.84	0.80	0.80	5.5	149	251	270	52	53	47	
1	0955	410.05	0.85	0.80	0.80	5.5	148	252	271	52	54	48	
End	1000	412.546	—	—	—	—	—	—	—	—	—	—	leak/to 412.660; 8.0 20.000
A6	1010	412.972	1.30	1.20	1.20	8.0	151	251	269	55	61	49	leak/to 412.972; 8.0 20.000
6	1015	415.82	1.30	1.20	1.20	6.5	151	250	270	50	60	49	
5	1020	418.81	1.30	1.20	1.20	7.0	152	252	267	49	60	49	
5	1025	421.73	1.30	1.20	1.20	7.0	152	251	269	49	61	50	
4	1030	424.65	1.35	1.30	1.30	7.0	152	251	266	50	62	51	

Pitot Tube Calibration Factor C_p 0.808 ✓
Volume Collected V_m 66.109 ✓ ft^3
Water Collected V_w 251.0 ✓ ml
Time of Test T_t 120 ✓ min.
Stack Pressure P_s -0.80 ✓ "H_2O

Pitot Tube No. M-3 ✓
Baro. Press. P_b 29.22 ✓ "Hg
Probe Tip Dia. D_n ~~0.199~~ 0.203 in. ✓
% CO_2 12.2 ✓ % CO 0 ✓
% O_2 7.8 ✓ % N_2 80.0
Area Stack A_s 6.540 ✓ in^2

Barometer No. 19-1 ✓
Probe Tip No. TFE 2-7 ✓
Total Volume of Leak Checks After Start: 0.426 ✓ ft^3
V_m = Dry Gas Meter Calibration Factor 1.000 ✓ X 66.109

[Dry Gas Meter Reading — ft^3 - (T_t — min. X Leak Rate — cfm)]

Impinger Box No. Hg 4

Impinger 1	Final Weight	945.9	Impinger 8 Final 906.5 Initial 894.5 Inc. 12.0	Impinger 1	196.0
	Initial Weight	749.9		Impinger 2	31.3
	Increase	196.0			
Impinger 2	Final Weight	789.1		Impinger 3	8.4
	Initial Weight	757.8			
	Increase	31.3		Impinger 4	3.1
Impinger 3	Final Weight	669.3	V_w =	Impinger 5	0.3
	Initial Weight	660.9	g SO_2 =		
	Increase	8.4	V_w =	Impinger 6	0.1
Impinger 4	Final Weight	759.5	2433.6 2421.7	Impinger 7	-0.2
	Initial Weight	756.4		Imp 8	12.0
	Increase	3.1		Total	251.0 = V_w
Impinger 5	Final Weight	760.6	P_b = 29.22	$\%CO_2$ = 12.2	
	Initial Weight	760.3	V_m = 66.109	$\%O_2$ = 7.8	
	Increase	0.3	V_w = 251.0	%CO = 0	
			P_m = 1.070	$\%N_2$ = 80.0	
Impinger 6	Final Weight	766.2	Avg ΔP = 1.133	A_s = 6540	
	Initial Weight	766.1		D_n = ~~0.199~~ 0.200	
	Increase	0.1	Avg$\sqrt{\Delta P}$ = 1.051	T_t = 120	
			C_p = 0.808		
Impinger 7	Final Weight	760.9	P_s = -0.80 "H_2O	29.16 "Hg	
	Initial Weight	761.1	T_m = 53 °F	513 °R	
	Increase	-0.2	T_s = 151 °F	611 °R	

Water Weight Gain

Moisture Content: %M = 15.09 M_d = 0.8491 MW_d = 30.264 MW = 28.41

$$Vm_{std} = 17.65\ Vm \left[\frac{P_b + \frac{P_m}{13.6}}{T_m + 460}\right] = 17.65 \times 66.109 \left[\frac{29.22 + \frac{1.070}{13.6}}{53 + 460}\right] = 66.640\ sft^3 = 0.555\ scfm$$

Vw_{gas} = 0.0472 x Vw = 0.0472 x 251.0 = 11.847 sft^3

% Moisture = $\frac{Vw_{gas}}{Vm_{std} + Vw_{gas}}$ x 100 = $\frac{11.847}{66.640 + 11.847}$ x 100 = 15.09 %

V_s = 5123.8 x 0.808 $\sqrt{\frac{611}{29.16 \times 28.41}}$ x 1.051 = 3737 fpm

%I = $\frac{1{,}039 \times 66.640 \times 611}{120 \times 0.8491 \times 29.16 \times 3737 \times (\cancel{0.199}\ 0.200)^2}$ = ~~96.2~~ 95.3 %

ACFM: 169,712

SCFM: 121,818

%EA: 58.2

Run Number 2

Unit Unit 4 South Stack

Date 10-26-99

Hg FIELD DATA

Point	Clock Time	Dry Gas Meter, CF	ΔP_s "Pitot" "H_2O	Orifice ΔH "H_2O Desired	Orifice ΔH "H_2O Actual	P_m Pump Vacuum "Hg Guage	T_s Stack Temp °F	Probe Temp °F	Oven Temp °F	Effluent Temp °F	T_m Dry Gas Temp. °F Inlet	Dry Gas Temp. °F Outlet	Remarks
A4	1035	427.71	1.35	1.30	1.30	7.0	152	252	264	50	64	52	
3	1040	430.74	1.25	1.20	1.20	7.0	152	252	262	50	65	53	
3	1045	433.71	1.25	1.20	1.20	7.5	153	251	264	50	66	53	
2	1050	436.67	0.75	0.71	0.71	6.0	152	250	263	51	66	54	
2	1055	439.02	0.70	0.66	0.66	6.0	153	252	260	52	67	55	
1	1100	441.27	0.37	0.35	0.35	4.5	150	253	259	52	68	56	
1	1105	442.99	0.37	0.35	0.35	4.5	151	254	260	53	68	56	
End	1110	444.603	—	—	—	—	—	—	—	—	—	—	

METCO ENVIRONMENTAL

Job Number 99-95 LAW4
Job Name EPRI
Run Number 3
Unit Unit 4 South Stack
Date 10-26-99
Operator Lee/Brown/Conway/Hefley
Sample Box No. Hg 2 Meter Box No. 29-1

Hg Field Data

Read and record at the start of each test point.

Purge to: —
Purge time: —
Pitot Leak Check Initial ✓ Final ____

Ambient Temp. °F 74
Assumed Moisture % 17%
Probe Length 10'
C Factor 0.94 ≥1.0 to reference
Initial Leak @ 16.0 "Hg = 0.000 cfm
Final Leak @ — "Hg = — cfm

Point	Clock Time	Dry Gas Meter, CF	"Pitot" "H_2O (ΔP_s)	Orifice ΔH "H_2O Desired	Orifice ΔH "H_2O Actual	Pump Vacuum "Hg Guage (P_m)	Stack Temp °F (T_s)	Probe Temp °F	Oven Temp °F	Effluent Temp °F	Dry Gas Temp. °F Inlet	Dry Gas Temp. °F Outlet (T_m)	Remarks
A6	1345	446.683	1.25	1.20	1.20	8.0	155	251	268	66	76	73	~~1st 20 658~~
6	1350	449.68	1.25	1.20	1.20	8.0	154	253	267	58	76	73	Multi-Point
5	~~1400~~ 1355	452.77	1.30	1.20	1.20	8.0	154	258	268	55	77	73	Port Orsat
5	1400	455.83	1.30	1.20	1.20	8.0	154	263	269	54	78	74	
4	1405	458.95	1.35	1.35	1.35	8.5	154	266	268	54	79	75	DH ≥1.0
4	1410	462.10	1.35	1.35	1.35	8.5	155	267	268	53	80	75	
3	1415	465.31	1.05	1.05	1.05	8.0	155	266	270	52	81	77	
3	1420	468.36	1.10	1.10	1.10	8.0	155	265	271	53	82	78	
2	1425	471.35	0.70	0.70	0.70	6.5	154	263	271	55	85	79	
2	1430	473.78	0.70	0.70	0.70	6.5	155	264	273	56	88	80	
1	1435	476.17	0.50	0.50	0.50	6.0	154	265	271	61	90	81	
1	1440	478.32	0.50	0.50	0.50	6.0	154	267	268	62	90	81	
End	1445	480.357	—	—	—	—	—	—	—	—	—	—	leak/to 480.497; 10.0 0.000
B6													leak/to
													* Broke Liner during Port 2.

ABORTED.

Pitot Tube Calibration Factor C_p 0.808
Volume Collected V_m — ft^3
Water Collected V_w — ml
Time of Test T_t 120 min.
Stack Pressure P_s — "H_2O

Pitot Tube No. M-3
Baro. Press. P_b — "Hg
Probe Tip Dia. D_n ~~0.199~~ 0.203 in.
% CO_2 — % CO Ø
% O_2 — % N_2 —
Area Stack A_s 6540 in^2

Barometer No. 19-1
Total Volume of Leak Checks After Start: ____ ft^3
V_m = Dry Gas Meter Calibration Factor 1.000 X ____

Probe Tip No. TFE 2-7

[Dry Gas Meter Reading — ft^3 - (T_t — min. X Leak Rate — cfm)]

METCO ENVIRONMENTAL

Job Number 99-95 LIAW 4 ✓
Job Name EPRI ✓
Run Number 4 ✓
Unit Unit 4 South Stack ✓
Date 10-26-99 ✓
Operator Lee/Brown/Conway/Hefley ✓
Sample Box No. Hg 4 Meter Box No. 29-1 ✓

Hg Field Data

Read and record at the start of each test point.

Purge to: —
Purge time: —
Pitot Leak Check Initial ✓ Final ✓

Ambient Temp. °F 78
Assumed Moisture % 17%
Probe Length 10'
C Factor 1.0 ⇒ 1.0 to reference
Initial Leak @ 16.0 "Hg = 0.000 cfm
Final Leak @ 15.0 "Hg = 0.000 cfm

Point	Clock Time	Dry Gas Meter, CF	"Pitot" "H_2O (ΔP_s)	Orifice ΔH "H_2O Desired	Orifice ΔH "H_2O Actual (P_m)	Pump Vacuum "Hg Guage	Stack Temp °F (T_s)	Probe Temp °F	Oven Temp °F	Effluent Temp °F	Dry Gas Temp. °F Inlet (T_m)	Dry Gas Temp. °F Outlet	Remarks
B6	1740	482.205	1.30	1.30	1.30	5.0	154	260	263	66	86	85	Multi-Point
6	1745	485.40	1.35	1.35	1.35	5.0	153	262	268	64	86	85	Rate Orsat
5	1750	488.69	1.40	1.40	1.40	5.5	156	260	269	62	87	85	
5	1755	491.96	1.35	1.35	1.35	5.5	156	261	266	62	89	85	
4	1800	495.19	1.50	1.50	1.50	6.0	157	265	264	62	89	85	
4	1805	498.71	1.50	1.50	1.50	6.0	157	269	260	62	90	85	
3	1810	502.08	1.45	1.45	1.45	6.0	157	268	257	63	89	85	
3	1815	505.43	1.50	1.50	1.50	6.0	157	271	256	62	88	85	
2	1820	508.88	1.35	1.35	1.35	6.0	157	270	260	63	89	85	
2	1825	512.10	1.40	1.40	1.40	6.5	157	271	259	64	89	84	
1	1830	515.39	1.15	1.15	1.15	6.0	155	269	257	66	88	84	
1	1835	518.65	1.15	1.15	1.15	6.5	156	266	256	66	88	84	
End	1840	521.915	—	—	—	—	—	—	—	—	—	—	leak ✓ to 522.112; 12.0 20.000
A6	1902	522.352	1.35	1.35	1.35	7.0	153	257	269	65	79	80	leak ✓ to 522.352; 12.0 20.000
6	1907	525.53	1.35	1.35	1.35	7.0	155	259	270	61	78	79	
5	1912	528.72	1.40	1.40	1.40	7.0	156	264	268	58	78	79	
5	1917	531.98	1.40	1.40	1.40	7.5	156	267	270	58	78	78	
4	1922	535.18	1.35	1.35	1.35	7.5	156	268	266	57	78	78	

Pitot Tube Calibration Factor C_p 0.808 ✓
Volume Collected V_m 73.526 ✓ ft^3
Water Collected V_w 266.1 ✓ ml
Time of Test T_t 120 ✓ min.
Stack Pressure P_s -0.90 ✓ "H_2O

Pitot Tube No. M-3 ✓
Baro. Press. P_b 29.11 ✓ "Hg
Probe Tip Dia. D_n ~~0.199~~ 0.202 in. ✓
% CO_2 12.3 ✓ % CO 0 ✓
% O_2 7.7 ✓ % N_2 80.0 ✓
Area Stack A_s 6.540 ✓ in^2

Barometer No. 19-1 ✓
Probe Tip No. TFE-2-7 ✓
Total Volume of Leak Checks After Start: 0.437 ✓ ft^3
V_m = Dry Gas Meter Calibration Factor 1.000 X 73.526

[Dry Gas Meter Reading — ft^3 - (T_t — min. X Leak Rate — cfm)]

Impinger Box No. Hg4

Impinger 1	Final Weight	955.7			
	Initial Weight	750.4			
	Increase	205.3			
Impinger 2	Final Weight	791.7			
	Initial Weight	754.2			
	Increase	37.5			
Impinger 3	Final Weight	666.0			
	Initial Weight	658.1			
	Increase	7.9			
Impinger 4	Final Weight	761.0			
	Initial Weight	756.8			
	Increase	4.2			
Impinger 5	Final Weight	756.0			
	Initial Weight	755.7			
	Increase	0.3			
Impinger 6	Final Weight	751.5			
	Initial Weight	762.3			
	Increase	-10.8			
Impinger 7	Final Weight	760.1			
	Initial Weight	760.4			
	Increase	-0.3			

Water Weight Gain

Imp. 8
Final 928.2
Initial 906.2
Inc. 22.0

V_w =
g SO_2 = -
V_w =

243.4
248.9

Impinger 1	205.3
Impinger 2	37.5
Impinger 3	7.9
Impinger 4	4.2
Impinger 5	0.3
Impinger 6	-10.8
Impinger 7	-0.3
Imp 8	22.0
Total	266.1 = V_w

P_b =	29.11	%CO_2 =	12.3	
V_m =	73.526	%O_2 =	7.7	
V_w =	266.1	%CO =	Ø	
P_m =	1.216	%N_2 =	80.0	
Avg ΔP =	1.216	A_s =	6540	
		D_n =	~~0.199~~ 0.200	
Avg$\sqrt{\Delta P}$ =	1.089	T_t =	120	
C_p =	0.808			
P_s =	-0.90	"H_2O	29.04	"Hg
T_m =	82	°F	542	°R
T_s =	155	°F	615	°R

Moisture Content: %M = 15.23 M_d = 0.8477 MW_d = 30.276 MW = 28.41

$$Vm_{std} = 17.65\ Vm \left[\frac{P_b + \frac{P_m}{13.6}}{T_m + 460}\right] = 17.65 \times 73.526 \left[\frac{29.11 + \frac{1.216}{13.6}}{82 + 460}\right] = \frac{69.913\ sft^3}{0.583\ scfm}$$

Vw_{gas} = 0.0472 x Vw = 0.0472 x 266.1 = 12.560 sft^3

% Moisture = $\frac{Vw_{gas}}{Vm_{std} + Vw_{gas}}$ x 100 = $\frac{12.560}{69.913 + 12.560}$ x 100 = 15.23 %

V_s = 5123.8 x 0.808 $\sqrt{\frac{615}{29.04 \times 28.41}}$ x 1.089 = 3893 fpm

ACFM: 176,787

SCFM: 125,352

%I = $\frac{1{,}039 \times 69.913 \times 615}{120 \times 0.8477 \times 29.04 \times 3893 \times (\cancel{0.199})^2}$ = ~~98.1~~ 97.1 %

0.200

%EA: 57.0

Run Number 4

Unit Unit 4 South Stack

Date 10-26-99

Hg FIELD DATA

Point	Clock Time	Dry Gas Meter, CF	"Pitot" "H_2O (ΔP_s)	Orifice ΔH "H_2O Desired	Orifice ΔH "H_2O Actual	Pump Vacuum "Hg Guage (P_m)	Stack Temp °F (T_s)	Probe Temp °F	Oven Temp °F	Effluent Temp °F	Dry Gas Temp. °F Inlet (T_m)	Dry Gas Temp. °F Outlet	Remarks
A4	1927	538.35	1.35	1.35	1.35	7.5	155	271	263	57	78	78	
3	1932	541.49	1.10	1.10	1.10	7.5	156	268	261	58	78	77	
3	1937	544.55	1.10	1.10	1.10	7.5	156	267	262	58	79	77	
2	1942	547.61	0.85	0.85	0.85	7.0	155	264	263	59	80	77	
2	1947	550.17	0.85	0.85	0.85	7.0	155	263	265	59	80	77	
1	1952	552.81	0.34	0.34	0.34	5.0	154	264	267	60	81	76	
1	1957	554.49	0.35	0.35	0.35	5.0	152	265	266	61	82	76	
End	2002	556.168	—	—	—	—	—	—	—	—	—	—	

PRELIMINARY VELOCITY TRAVERSE DATA
AND
SAMPLING LOCATION DATA

Job Number 99-95LAW4

Job Name EPRI / ~~TRA~~ Western Resources

Sampling Location Unit 4 South Scrubber Inlet Duct

Date 10-25-99 Time 1430

Stack Height ~~865~~ ft.

Sampling Port Height Above Ground 49 ✓ ft.

	Port A	Port B	Port C	Port D	Average
Port & Inside Diameter (in.)	102				102 ✓
Port & Wall Thickness (in.)	6				6 ✓
Inside Stack Diameter (in.)	96				96 ✓

Sampling Ports are 29 ✓ ft. 6 ✓ in. (3.69 ✓ stack diameters) downstream from disturbance (inlet, constriction, bend, expansion)

Sampling Ports are 8 ✓ ft. 0 ✓ in. (1.00 ✓ stack diameters) upstream from disturbance (outlet, constriction, bend, expansion)

Point Number	Percent Diameter	Distance from Ref. Point (decimal in.)	Distance from Ref. Point (fractional in.)	Port A ΔP/T$_s$/α	Port B ΔP/T$_s$/α	Port C ΔP/T$_s$/α	Port D ΔP/T$_s$/α
1		9.625 ✓	9 5/8 ✓	0.60/307/ 0	0.70/302/ 0	0.45/325/ 5	0.50/335/ 5
2		28.8125 ✓	28 13/16 ✓	0.65/335/ 0	0.75/330/ -2	0.50/326/ 0	0.45/332/ 5
3		48.0 ✓	48 ✓	0.60/331/ 0	0.55/337/ 0	0.60/324/ 0	0.45/333/ 5
4		67.1875 ✓	67 3/16 ✓	0.85/328/ 0	0.80/334/ -5	0.70/326/ 0	0.45/333/ 0
5		86.375 ✓	86 3/8 ✓	0.80/337/ 0	0.80/340/ 0	0.65/330/ 0	0.55/332/ -2
6				/ /	/ /	/ /	/ /
7				/ /	/ /	/ /	/ /
8				/ /	/ /	/ /	/ /
9				/ /	/ /	/ /	/ /
10				/E/	/ /	/ /	/ /
11				0.40/339/ 2	/ /	/ /	/ /
12				0.50/340/ 5	/ /	/ /	/ /
13				0.40/346/ 5	/ /	/ /	/ /
14				0.40/345/ 0	/ /	/ /	/ /
15				0.45/337/ 2	/ /	/ /	/ /
16				/ /	/ /	/ /	/ /
17				/ /	/ /	/ /	/ /
18				/ /	/ /	/ /	/ /
19				/ /	/ /	/ /	/ /
20				/ /	/ /	/ /	/ /
21				/ /	/ /	/ /	/ /
22				/ /	/ /	/ /	/ /
23				/ /	/ /	/ /	/ /
24				/ /	/ /	/ /	/ /

Pitot Tube No. M2 ✓

C_p = 0.808 ✓

P_b = 29.12 ✓ "Hg

P_s = -8.40 "H_2O 28.50 "Hg ✓

A_s = 9216 ✓ in.^{2}

Average ΔP 0.590 ✓

Average $\Delta P^{1/2}$ 0.763 ✓

Average T_x 331 ✓ °F

Average α ~~8~~ 1.72 ✓ degrees

PRELIMINARY VELOCITY TRAVERSE DATA
AND
SAMPLING LOCATION DATA

Job Number 99-95 LAW 4
Job Name EPRI
Sampling Location Unit 4 South Stack
Date 10/25/99 Time 1515

Stack Height 172' 4" ft.
Sampling Port Height Above Ground 126' ft.

	Port A	Port B	Port C	Port D	Average
Port & Inside Diameter (in.)	98 1/2	98 1/2			98 1/2
Port & Wall Thickness (in.)	7 1/4	7 1/4			7 1/4
Inside Stack Diameter (in.)	91 1/4	91 1/4			91 1/4

Sampling Ports are 82' ft. — in.
Sampling Ports are 46' ft. 4" in.

~~10.8~~ 10.78 stack diameters) downstream from disturbance (inlet, constriction, bend, expansion)
~~6.1~~ 6.09 stack diameters) upstream from disturbance (outlet, constriction, bend, expansion)

Point Number	Percent Diameter	Distance from Ref. Point (decimal in.)	Distance from Ref. Point (fractional in.)	Port A $\Delta P/T_s/\alpha$	Port B $\Delta P/T_s/\alpha$	Port C $\Delta P/T_s/\alpha$	Port D $\Delta P/T_s/\alpha$
1	4.4	4.015	4	0.27 1521-7	0.81 1521+6	/ /	/ /
2	14.6	13.3225	13 5/16	0.72 1541+7	1.30 1541+4	/ /	/ /
3	29.6	27.010	27	0.83 1541 Ø	1.50 1551 Ø	/ /	/ /
4	70.4	64.240	64 1/4	1.30 1541-7	1.40 1551 Ø	/ /	/ /
5	85.4	77.9275	77 15/16	1.10 1541-10	1.35 1551 Ø	/ /	/ /
6	95.6	87.235	87 1/4	0.99 1531-10	1.20 1541-7	/ /	/ /
7				/ /	/ /	/ /	/ /
8				/ /	/ /	/ /	/ /
9				/ /	/ /	/ /	/ /
10				/ /	/ /	/ /	/ /
11				/ /	/ /	/ /	/ /
12				/ /	/ /	/ /	/ /
13				/ /	/ /	/ /	/ /
14				/ /	/ /	/ /	/ /
15				/ /	/ /	/ /	/ /
16				/ /	/ /	/ /	/ /
17				/ /	/ /	/ /	/ /
18				/ /	/ /	/ /	/ /
19				/ /	/ /	/ /	/ /
20				/ /	/ /	/ /	/ /
21				/ /	/ /	/ /	/ /
22				/ /	/ /	/ /	/ /
23				/ /	/ /	/ /	/ /
24				/ /	/ /	/ /	/ /

Pitot Tube No. ~~M-5~~ M-3
C_p = 0.808
P_b = 29.25 "Hg
P_s = -0.80 "H_2O 29.19 "Hg
A_s = 6540 in.^{2}

Average ΔP 1.064
Average $\Delta P^{1/2}$ 1.014
Average T_x 154 °F
Average α 4.83 degrees

METCO ENVIRONMENTAL

ORSAT ANALYSIS DATA FORM

Job Number: 99-95LAW4 Sample Location: Unit 4 South Scrubber Inlet Duct

Job Name: EPRI / Western Resources Analytical Method: 3B

Location: Lawrence, KS Sample Type: Single point or Multi point; Grab or Integrated

Date: 10/25/95 Leak Check: Time: 4:00 (min. 4 minutes) Rate: 0.000

Operator: Hefley Ambient Air Check:

CO_2 - % Vol.	0.0
O_2 - % Vol.	20.9
N_2 - % Vol.	79.1

Run Number 1 Run Time 1746-1957	Analysis 1	Analysis 2	Analysis 3	Average - % Vol.
CO_2 - % Vol.	12.6	12.6	12.6	12.6
O_2 - % Vol.	6.6	6.6	6.6	6.6
CO - % Vol.	0.0	0.0	0.0	0.0
N_2 - % Vol.	80.8	80.8	80.8	80.8

Fo = 1.135

Run Number 2 Run Time 0900-1105	Analysis 1	Analysis 2	Analysis 3	Average - % Vol.
CO_2 - % Vol.	13.0	13.0	13.0	13.0
O_2 - % Vol.	6.4	6.4	6.4	6.4
CO - % Vol.	0.0	0.0	0.0	0.0
N_2 - % Vol.	80.6	80.6	80.6	80.6

Fo = 1.115

Run Number 4 Run Time 1740-1945	Analysis 1	Analysis 2	Analysis 3	Average - % Vol.
CO_2 - % Vol.	12.8	12.8	12.8	12.8
O_2 - % Vol.	7.0	7.0	7.0	7.0
CO - % Vol.	0.0	0.0	0.0	0.0
N_2 - % Vol.	80.2	80.2	80.2	80.2

Fo = 1.086

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APPENDIX C

Calibration Data

Equipment	Calibration Factor	Calibration Date
Pitot Tube #M-2	0.808	10/04/99
Pitot Tube #M-3	0.808	10/04/99
Probe Tip #TFE-1-7	0.200	10/04/99
Probe Tip #TFE-2-7	0.200	10/05/99
Dry Gas Meter #27-2	1.029	08/13/99
Stack Unit Orifice #27-2		08/14/99
Digital Temperature Indicator #27-2		08/13/99
Dry Gas Meter #29-1	1.000	10/04/99
Stack Unit Orifice #29-1		10/05/99
Digital Temperature Indicator #29-1		10/04/99
Barometer #19-1		10/04/99

APPENDIX C

Post Test

Calibration Data

Equipment	Calibration Factor	Calibration Date
Pitot Tube #M-2	0.810	11/12/99
Pitot Tube #M-3	0.808	11/22/99
Probe Tip #TFE-1-7	0.199	11/19/99
Probe Tip #TFE-2-7	0.195	11/19/99
Dry Gas Meter #27-2	1.015	11/07/99
Stack Unit Orifice #27-2		11/08/99
Digital Temperature Indicator #27-2		11/07/99
Dry Gas Meter #29-1	1.000	11/22/99
Stack Unit Orifice #29-1		11/22/99
Digital Temperature Indicator #29-1		11/22/99
Barometer #19-1		11/22/99

PITOT TUBE CALIBRATION

Date: 10-4-99

Time: 1030

Pitot No.: M2

T_s: 72 °F

Pitot Dimensions: 3/8" tips

C_{pstd}: 0.990

Motor Setting	fps mark	Calibration Standard Start	Calibration Standard End	√Standard Average	High	√High	Cal. Factor	Low	√Low	Cal. Factor
7	20	0.10	0.10	0.316	0.15	0.387	0.808	0.15	0.387	0.808
14	30	0.22	0.22	0.469	0.33	0.574	0.808	0.33	0.574	0.808
20	40	0.34	0.34	0.583	0.51	0.714	0.808	0.51	0.714	0.808
28	50	0.54	0.54	0.735	0.81	0.900	0.808	0.81	0.900	0.808
35	60	0.80	0.80	0.894	1.20	1.095	0.808	1.20	1.095	0.808
41	70	1.00	1.00	1.000	1.50	1.225	0.808	1.50	1.225	0.808
50	80	1.30	1.30	1.140	1.95	1.396	0.808	1.95	1.396	0.808
62	90	1.60	1.60	1.265	2.40	1.549	0.808	2.40	1.549	0.808
28	50	0.54	0.54	0.735	0.81	0.900	0.808	0.81	0.900	0.808
28	50	0.54	0.54	0.735	0.81	0.900	0.808	0.81	0.900	0.808
Average							0.808			0.808

Summary of Results:

Normal high side calibration factor 0.808

variation + 0.00%

variation - 0.00%

Normal low side calibration factor 0.808

variation + 0.00%

variation - 0.00%

Calibrator: Jason Brown 274

Checked By: Jason Conway #273

PITOT TUBE CALIBRATION

Date: 10-4-99 Time: 1130

Pitot No.: M3 T_s: 72 °F

Pitot Dimensions: 3/8" tips C_{pstd}: 0.990

Motor Setting	fps mark	Calibration Standard Start	Calibration Standard End	√Standard Average	High	√High	Cal. Factor	Low	√Low	Cal. Factor
7	20	0.10	0.10	0.316	0.15	0.387	0.808	0.15	0.387	0.808
14	30	0.22	0.22	0.469	0.33	0.574	0.808	0.33	0.574	0.808
20	40	0.34	0.34	0.583	0.51	0.714	0.808	0.51	0.714	0.808
28	50	0.54	0.54	0.735	0.81	0.900	0.808	0.81	0.900	0.808
35	60	0.80	0.80	0.894	1.20	1.095	0.808	1.20	1.095	0.808
41	70	1.00	1.00	1.000	1.50	1.225	0.808	1.50	1.225	0.808
50	80	1.30	1.30	1.140	1.95	1.396	0.808	1.95	1.396	0.808
62	90	1.60	1.60	1.265	2.40	1.549	0.808	2.40	1.549	0.808
28	50	0.54	0.54	0.735	0.81	0.900	0.808	0.81	0.900	0.808
28	50	0.54	0.54	0.735	0.81	0.900	0.808	0.81	0.900	0.808
Average							0.808			0.808

Summary of Results:

Normal high side calibration factor 0.808

variation + 0.00%

variation - 0.00%

Normal low side calibration factor 0.808

variation + 0.00%

variation - 0.00%

Calibrator: Jason Brown 274

Checked By: Jason Conway #273

METCO ENVIRONMENTAL

✓ AM 107

NOZZLE CALIBRATION

Nozzle Set No. TFE-1

Date 10-4-99 Calibrator: Jason Brown 274

	4	6	7	8	10	12
Reading 1	0.114	0.175	0.199	0.226	0.310	0.362
Reading 2	0.116	0.175	0.198	0.227	0.309	0.363
Reading 3	0.114	0.173	0.199	0.226	0.309	0.363
Reading 4	0.114	0.173	0.200	0.226	0.310	0.362
Reading 5	0.116	0.175	0.200	0.227	0.308	0.364
Reading 6	0.117	0.175	0.200	0.227	0.309	0.364
Reading 7	0.118	0.174	0.202	0.226	0.309	0.364
Reading 8	0.116	0.173	0.200	0.225	0.310	0.363
Reading 9	0.118	0.175	0.200	0.226	0.309	0.363
Reading 10	0.118	0.175	0.199	0.227	0.309	0.363
Average	0.116 ✓	0.174 !	0.200 ✓	0.226 !	0.309	0.363

	14	—	—	—	—	—
Reading 1	0.430					
Reading 2	0.432					
Reading 3	0.430					
Reading 4	0.430					
Reading 5	0.432					
Reading 6	0.431					
Reading 7	0.432					
Reading 8	0.432					
Reading 9	0.432					
Reading 10	0.431					
Average	0.431					

METCO ENVIRONMENTAL

NOZZLE CALIBRATION

Nozzle Set No. TFE-2

Date 10-5-99 Calibrator: JASON BROWN 274

	4	6	7	8	10	12
Reading 1	0.117	0.175	0.200	0.234	0.308	0.362
Reading 2	0.116	0.175	0.201	0.234	0.309	0.362
Reading 3	0.118	0.177	0.200	0.235	0.312	0.362
Reading 4	0.116	0.176	0.199	0.236	0.311	0.360
Reading 5	0.114	0.174	0.199	0.234	0.312	0.362
Reading 6	0.116	0.174	0.199	0.234	0.311	0.361
Reading 7	0.115	0.175	0.200	0.235	0.312	0.361
Reading 8	0.117	0.175	0.201	0.235	0.308	0.362
Reading 9	0.115	0.176	0.200	0.235	0.312	0.361
Reading 10	0.114	0.176	0.200	0.235	0.310	0.363
Average	0.116	0.175	0.200	0.235	0.311	0.362

	14	—	—	—	—	—
Reading 1	0.434					
Reading 2	0.430					
Reading 3	0.434					
Reading 4	0.432					
Reading 5	0.430					
Reading 6	0.430					
Reading 7	0.434					
Reading 8	0.434					
Reading 9	0.430					
Reading 10	0.433					
Average	0.432					

METCO ENVIRONMENTAL

Dry Gas Meter Calibration

Dry Gas Meter No.: 27-2

Date: 8-13-99

ΔH ("H_2O)	C_{DG}
0.5	1.036
1.0	1.023
1.5	1.025
2.0	1.033
3.0	1.034
4.0	1.024
Average	1.029

Variation: + 0.68% ✓

- 0.58% ✓

Calibrator: Shane Lee 261

Checked By: Mike Bass 243

C_{DG} @ 2 liters/min. = 1.033

METCO ENVIRONMENTAL

DRY GAS METER CALIBRATION

Meter Number: 27-2

Date: 8-13-99

Calibrator: Shane Lee

$$\text{Calibration Factor } (C_{DG}) = \frac{\text{Wet Test Meter } Vm_{std}}{\text{Dry Gas Meter } Vm_{std}}$$

Run No.: 1 @ 0.5" H.O

P_b: 29.20 "Hg

Control Module Vacuum: 5.0 "Hg

Wet Test Meter (No. 3)

	Time	Meter Reading	Temp.	P_m
End	1512	5.315 cf	73 °F	-1.20 "H_2O
Start	1500	0.000 cf	73 °F	-1.20 "H_2O
Avg.	12	5.315 cf	73 °F	-1.20 "H_2O

Dry Gas Meter

	Meter Reading	Temp. In	Temp. Out	P_m
End	312.440 cf	73 °F	73 °F	0.50 "H_2O
Start	307.333 cf	72 °F	72 °F	0.50 "H_2O
Avg.	5.107 cf	73 °F		0.50 "H_2O

$$\text{Wet Test Meter } Vm_{std} = 17.65 \times 5.315 \left[\frac{29.20 + \frac{-1.20}{13.6}}{73 + 460}\right] \times 1.000\ (C_1) = 5.124 \text{ dcsf}$$

$$\text{Dry Gas Meter } Vm_{std} = 17.65 \times 5.107 \left[\frac{29.20 + \frac{0.50}{13.6}}{73 + 460}\right] = 4.944 \text{ dcsf}$$

$$C_{DG} = \frac{5.124}{4.944} = \boxed{1.036}$$

METCO ENVIRONMENTAL

DRY GAS METER CALIBRATION

Meter Number: 27-2

Date: 8-13-99

Calibrator: Shane Lee

$$\text{Calibration Factor } (C_{DG}) = \frac{\text{Wet Test Meter } Vm_{std}}{\text{Dry Gas Meter } Vm_{std}}$$

Run No.: 1 @ 1.0 "H_2O

P_b: 29.20 "Hg

Control Module Vacuum: 5 "Hg

Wet Test Meter (No. 3)

	Time	Meter Reading	Temp.	P_m
End	1419	5.168 cf	73 °F	-1.80 "H_2O
Start	1410	0.000 cf	73 °F	-1.80 "H_2O
Avg.	9	5.168 cf	73 °F	-1.80 "H_2O

Dry Gas Meter

	Meter Reading	Temp. In	Temp. Out	P_m
End	307.007 cf	73 °F	72 °F	1.00 "H_2O
Start	301.998 cf	72 °F	71 °F	1.00 "H_2O
Avg.	5.009 cf	72 °F		1.00 "H_2O

$$\text{Wet Test Meter } Vm_{std} = 17.65 \times 5.168 \left[\frac{29.20 + \frac{-1.80}{13.6}}{73 + 460} \right] \times 1.000 \ (C_f) = 4.975 \text{ dcsf}$$

$$\text{Dry Gas Meter } Vm_{std} = 17.65 \times 5.009 \left[\frac{29.20 + \frac{1.00}{13.6}}{72 + 460} \right] = 4.865 \text{ dcsf}$$

$$C_{DG} = \frac{4.975}{4.865} = \boxed{1.023}$$

METCO ENVIRONMENTAL

DRY GAS METER CALIBRATION

Meter Number: 27-2

Date: 8-13-99

Calibrator: Shane Lee

$$\text{Calibration Factor } (C_{DG}) = \frac{\text{Wet Test Meter } Vm_{std}}{\text{Dry Gas Meter } Vm_{std}}$$

Run No.: 1 @ 1.5 "H_2O

P_b: 29.20 "Hg

Control Module Vacuum: 5.0 "Hg

Wet Test Meter (No. 3)					Dry Gas Meter			
	Time	Meter Reading	Temp.	P_m	Meter Reading	Temp. In	Temp. Out	P_m
End	1529	10.355 cf	73 °F	-2.20 "H_2O	322.948 cf	77 °F	73 °F	1.50 "H_2O
Start	1515	0.000 cf	73 °F	-2.20 "H_2O	312.925 cf	73 °F	73 °F	1.50 "H_2O
Avg.	14	10.355 cf	73 °F	-2.20 "H_2O	10.023 cf	74 °F		1.50 "H_2O

$$\text{Wet Test Meter } Vm_{std} = 17.65 \times 10.355 \left[\frac{29.20 + \frac{-2.20}{13.6}}{73 + 460} \right] \times 1.000\ (C_f) = 9.957 \text{ dcsf}$$

$$\text{Dry Gas Meter } Vm_{std} = 17.65 \times 10.023 \left[\frac{29.20 + \frac{1.50}{13.6}}{74 + 460} \right] = 9.710 \text{ dcsf}$$

$$C_{DG} = \frac{9.957}{9.710} = \boxed{1.025}$$

METCO ENVIRONMENTAL

DRY GAS METER CALIBRATION

Meter Number: 27-2

Date: 8-13-99

Calibrator: Shane Lee

$$\text{Calibration Factor } (C_{DG}) = \frac{\text{Wet Test Meter } Vm_{std}}{\text{Dry Gas Meter } Vm_{std}}$$

Run No.: 1 @ 2.0 / 4.0

P_b: 29.20 "Hg

Control Module Vacuum: 5.0 "Hg

Wet Test Meter (No. 3)

	Time	Meter Reading	Temp.	P_m
End	1605	10.514 cf	73 °F	-2.60 "H_2O
Start	1552	0000 cf	73 °F	-2.60 "H_2O
Avg.	13	10.514 cf	73 °F	-2.60 "H_2O

Dry Gas Meter

	Meter Reading	Temp. In	Temp. Out	P_m
End	343.568 cf	80 °F	76 °F	2.00 "H_2O
Start	333.427 cf	77 °F	73 °F	2.00 "H_2O
Avg.	10.141 cf	77 °F		2.00 "H_2O

$$Wet\ Test\ Meter\ Vm_{std} = 17.65 \times 10.514 \left[\frac{29.20 + \frac{-2.60}{13.6}}{73 + 460} \right] \times 1.000\ (C_f) = 10.100\ dcsf$$

$$Dry\ Gas\ Meter\ Vm_{std} = 17.65 \times 10.141 \left[\frac{29.20 + \frac{2.00}{13.6}}{77 + 460} \right] = 9.782\ dcsf$$

$$C_{DG} = \frac{10.100}{9.782} = \boxed{1.033}$$

METCO ENVIRONMENTAL

DRY GAS METER CALIBRATION

Meter Number: 27-2

Date: 8-13-99

Calibrator: Shane Lee

$$\text{Calibration Factor } (C_{DG}) = \frac{\text{Wet Test Meter } Vm_{std}}{\text{Dry Gas Meter } Vm_{std}}$$

Run No.: 1 @ 30" H_2O

P_b: 29.20 "Hg

Control Module Vacuum: 50 "Hg

Wet Test Meter (No. 3)						Dry Gas Meter				
	Time	Meter Reading	Temp.		P_m	Meter Reading	Temp. In		Temp. Out	P_m
End	1618	11.961	cf	73 °F	-3.60 "H_2O	355.643	cf	83 °F	75 °F	3.00 "H_2O
Start	1607	0.000	cf	73 °F	-3.60 "H_2O	344.157	cf	78 °F	74 °F	3.00 "H_2O
Avg.	11	11.961	cf	73 °F	-3.60 "H_2O	11.486	cf	78 °F		3.00 "H_2O

$$Wet\ Test\ Meter\ Vm_{std} = 17.65 \times 11.961 \left[\frac{29.20 + \frac{-3.60}{13.6}}{73 + 460} \right] \times 1.000\ (C_f) = 11.461\ dcsf$$

$$Dry\ Gas\ Meter\ Vm_{std} = 17.65 \times 11.486 \left[\frac{29.20 + \frac{3.00}{13.6}}{78 + 460} \right] = 11.086\ dcsf$$

$$C_{DG} = \frac{11.461}{11.086} = \boxed{1.034}$$

METCO ENVIRONMENTAL

DRY GAS METER CALIBRATION

Meter Number: 27-2

Date: 8-13-99

Calibrator: Shane Lee

$$\text{Calibration Factor } (C_{DG}) = \frac{\text{Wet Test Meter } Vm_{std}}{\text{Dry Gas Meter } Vm_{std}}$$

Run No.: 1 @ 4.0" H2O

P_b: 29.20 "Hg

Control Module Vacuum: 5.0 "Hg

Wet Test Meter (No. 3)

	Time	Meter Reading	Temp.	P_m
End	1630	10.708 cf	73 °F	-4.30 "H_2O
Start	1620	0.000 cf	73 °F	-4.30 "H_2O
Avg.	10	10.708 cf	73 °F	-4.30 "H_2O

Dry Gas Meter

	Meter Reading	Temp. In	Temp. Out	P_m
End	366.588 cf	84 °F	75 °F	4.00 "H_2O
Start	356.234 cf	81 °F	75 °F	4.00 "H_2O
Avg.	10.354 cf	79 °F		4.00 "H_2O

$$\text{Wet Test Meter } Vm_{std} = 17.65 \times 10.708 \left[\frac{29.20 + \frac{-4.30}{13.6}}{73 + 460}\right] \times 1.000 \ (C_f) = 10.242 \text{ dcsf}$$

$$\text{Dry Gas Meter } Vm_{std} = 17.65 \times 10.354 \left[\frac{29.20 + \frac{4.00}{13.6}}{79 + 460}\right] = 10.000 \text{ dcsf}$$

$$C_{DG} = \frac{10.242}{10.000} = \boxed{1.024}$$

METCO ENVIRONMENTAL

DRY GAS METER CALIBRATION

Meter Number: 27-2

Date: 8-13-99

Calibrator: Shane Lee

$$\text{Calibration Factor } (C_{DG}) = \frac{\text{Wet Test Meter } Vm_{std}}{\text{Dry Gas Meter } Vm_{std}}$$

Run No.: 1 @ 2.0 l/min.

P_b: 29.20 "Hg

Control Module Vacuum: 5.0 "Hg

Wet Test Meter (No. 3)

	Time	Meter Reading	Temp.	P_m
End	1711	2.700 cf	73 °F	-0.20 "H_2O
Start	1636	0.000 cf	73 °F	-0.20 "H_2O
Avg.	35	2.700 cf	73 °F	-0.20 "H_2O

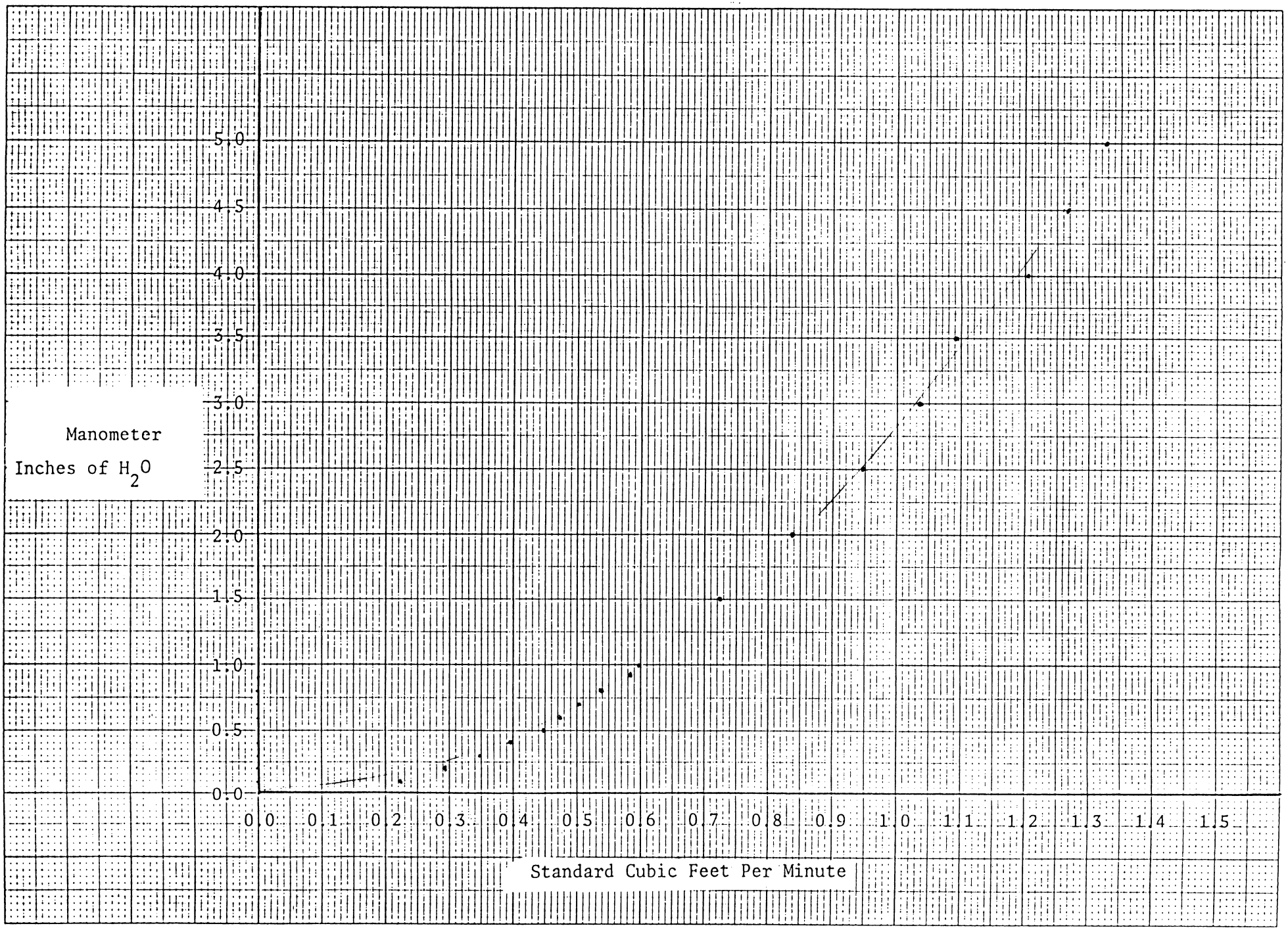
Dry Gas Meter

	Meter Reading	Temp. In	Temp. Out	P_m
End	369.641 cf	73 °F	72 °F	0.02 "H_2O
Start	367.018 cf	79 °F	75 °F	0.02 "H_2O
Avg.	2.623 cf	75 °F		0.02 "H_2O

$$\text{Wet Test Meter } Vm_{std} = 17.65 \times 2.700 \left[\frac{29.20 + \frac{-0.20}{13.6}}{73 + 460}\right] \times 1.000 \ (C_f) = 2.609 \text{ dcsf}$$

$$\text{Dry Gas Meter } Vm_{std} = 17.65 \times 2.623 \left[\frac{29.20 + \frac{0.02}{13.6}}{75 + 460}\right] = 2.527 \text{ dcsf}$$

$$C_{DG} = \frac{2.609}{2.527} = \boxed{1.033}$$


Manometer
Inches of H_2O
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
1.1
1.2
1.3
1.4
1.5
Standard Cubic Feet Per Minute

METCO ENVIRONMENTAL

DIGITAL TEMPERATURE INDICATOR NO. 27-2

CALIBRATION DATA

Date: 8-13-99

Media	Time	Mercury Temperature (°F)	DTI (°F)
Ambient Air	0944	72	72
Ice Bath	0947	32	33
Boiling Water	0958	212	211
Oven	1003	250	250
Oven	1007	300	300
Oven	1010	350	351
Oven	1014	375	375

Meter Adjusted? Yes _____ No ✓

Calibrator: Shane Lee 261

Checked By: Mike Bass 263

METCO ENVIRONMENTAL

Dry Gas Meter Calibration

Dry Gas Meter No.: 29-1

Date: 10-21-99

ΔH ("H_2O)	C_{DG}
0.5	1.000
1.0	1.001
1.5	0.999
2.0	0.995
3.0	0.998
4.0	1.009
Average	1.000

Variation: + 0.90%

- 0.50%

Calibrator: Shane Lee 261

Checked By: Bill Hyfy #107

C_{DG} @ 2 liters/min. = 1.017

METCO ENVIRONMENTAL

DRY GAS METER CALIBRATION

Meter Number: 29-1

Date: 10-4-99

Calibrator: Shane Lee

$$\text{Calibration Factor } (C_{DG}) = \frac{\text{Wet Test Meter } Vm_{std}}{\text{Dry Gas Meter } Vm_{std}}$$

Run No.: 1 @ 0.5" H_2O

P_b: 29.28 "Hg

Control Module Vacuum: 50 "Hg

Wet Test Meter (No. 3)

	Time	Meter Reading		Temp.		P_m	
End	1423	5.380	cf	75	°F	-1.10	"H_2O
Start	1409	0.000	cf	75	°F	-1.10	"H_2O
Avg.	14	5.380	cf	75	°F	-1.10	"H_2O

Dry Gas Meter

	Meter Reading		Temp. In		Temp. Out		P_m	
End	377.116	cf	75	°F	73	°F	0.50	"H_2O
Start	371.767	cf	74	°F	72	°F	0.50	"H_2O
Avg.	5.349	cf	74	°F			0.50	"H_2O

$$Wet\ Test\ Meter\ Vm_{std} = 17.65 \times 5.380 \left[\frac{29.28 + \frac{-1.10}{13.6}}{75 + 460}\right] \times 1.000\ (C_f) = \cancel{5.192}\ 5.183\ dcsf$$

$$Dry\ Gas\ Meter\ Vm_{std} = 17.65 \times 5.349 \left[\frac{29.28 + \frac{0.50}{13.6}}{74 + 460}\right] = 5.183\ dcsf$$

$$C_{DG} = \frac{\cancel{5.192}\ 5.183}{5.183} = \boxed{\cancel{1.002}\ 1.000}$$

METCO ENVIRONMENTAL

DRY GAS METER CALIBRATION

Meter Number: 29-1

Date: 10-4-99

Calibrator: Shane Lee

$$\text{Calibration Factor } (C_{DG}) = \frac{\text{Wet Test Meter } Vm_{std}}{\text{Dry Gas Meter } Vm_{std}}$$

Run No.: 1 @ 1.0" H_2O

P_b: 29.28 "Hg

Control Module Vacuum: 5.0 "Hg

Wet Test Meter (No. 3)

	Time	Meter Reading		Temp.		P_m	
End	1436	5.400	cf	75	°F	-1.60	"H_2O
Start	1426	0.000	cf	75	°F	-1.60	"H_2O
Avg.	10	5.400	cf	75	°F	-1.60	"H_2O

Dry Gas Meter

	Meter Reading		Temp. In		Temp. Out		P_m	
End	383.463	cf	75	°F	73	°F	1.00	"H_2O
Start	378.114	cf	76	°F	73	°F	1.00	"H_2O
Avg.	5.349	cf	74	°F			1.00	"H_2O

$$Wet\ Test\ Meter\ Vm_{std} = 17.65 \times 5.400 \left[\frac{29.28 + \frac{-1.60}{13.6}}{75 + 460}\right] \times 1.000\ (C_f) = 5.195\ dcsf$$

$$Dry\ Gas\ Meter\ Vm_{std} = 17.65 \times 5.349 \left[\frac{29.28 + \frac{1.00}{13.6}}{74 + 460}\right] = 5.190\ dcsf$$

$$C_{DG} = \frac{5.195}{5.190} = \boxed{1.001}$$

METCO ENVIRONMENTAL

DRY GAS METER CALIBRATION

Meter Number: 29-1

Date: 10-4-99

Calibrator: Shane Lee

$$\text{Calibration Factor } (C_{DG}) = \frac{\text{Wet Test Meter } Vm_{std}}{\text{Dry Gas Meter } Vm_{std}}$$

Run No.: 1 @ 1.5 H.O

P_b: 29.28 "Hg

Control Module Vacuum: 50 "Hg

Wet Test Meter (No. 3)

	Time	Meter Reading	Temp.	P_m
End	1454	10.668 cf	75 °F	-2.10 "H_2O
Start	1438	0.000 cf	75 °F	-1.90 "H_2O
Avg.	16	10.668 cf	75 °F	-2.00 "H_2O

Dry Gas Meter

	Meter Reading	Temp. In	Temp. Out	P_m
End	384.790 cf	73 °F	74 °F	1.50 "H_2O
Start	384.223 cf	72 °F	73 °F	1.50 "H_2O
Avg.	10.567 cf	74 °F		1.50 "H_2O

$$\text{Wet Test Meter } Vm_{std} = 17.65 \times 10.668 \left[\frac{29.28 + \frac{-2.00}{13.6}}{75 + 460}\right] \times 1.000 \ (C_f) = 10.253 \text{ dcsf}$$

$$\text{Dry Gas Meter } Vm_{std} = 17.65 \times 10.567 \left[\frac{29.28 + \frac{1.50}{13.6}}{74 + 460}\right] = 10.265 \text{ dcsf}$$

$$C_{DG} = \frac{10.253}{10.265} = \boxed{0.999}$$

METCO ENVIRONMENTAL

DRY GAS METER CALIBRATION

Meter Number: 29-1

Date: 10-4-99

Calibrator: Shane Lee

$$\text{Calibration Factor } (C_{DG}) = \frac{\text{Wet Test Meter } Vm_{std}}{\text{Dry Gas Meter } Vm_{std}}$$

Run No.: 1 @ 2.0" H_2O

P_b: 29.28 "Hg

Control Module Vacuum: 5.0 "Hg

Wet Test Meter (No. 3)

	Time	Meter Reading		Temp.		P_m	
End	1510	11.395	cf	75	°F	-2.40	"H_2O
Start	1456	0.000	cf	75	°F	-2.40	"H_2O
Avg.	14	11.395	cf	75	°F	-2.40	"H_2O

Dry Gas Meter

	Meter Reading		Temp. In		Temp. Out		P_m	
End	406.546	cf	70	°F	76	°F	2.00	"H_2O
Start	395.246	cf	75	°F	75	°F	2.00	"H_2O
Avg.	11.300	cf	74	°F			2.00	"H_2O

$$\text{Wet Test Meter } Vm_{std} = 17.65 \times 11.395 \left[\frac{29.28 + \frac{-2.40}{13.6}}{75 + 460}\right] \times 1.000\ (C_f) = 10.941 \text{ dcsf}$$

$$\text{Dry Gas Meter } Vm_{std} = 17.65 \times 11.300 \left[\frac{29.28 + \frac{2.00}{13.6}}{74 + 460}\right] = 10.991 \text{ dcsf}$$

$$C_{DG} = \frac{10.941}{10.991} = \boxed{0.995}$$

METCO ENVIRONMENTAL

DRY GAS METER CALIBRATION

Meter Number: 29-1

Date: 10-4-99

Calibrator: Shane Lee

$$\text{Calibration Factor } (C_{DG}) = \frac{\text{Wet Test Meter } Vm_{std}}{\text{Dry Gas Meter } Vm_{std}}$$

Run No.: 1 @ 30 "H2O

P_b: 29.28 "Hg

Control Module Vacuum: 5.0 "Hg

Wet Test Meter (No. 3)								Dry Gas Meter					
	Time	Meter Reading		Temp.		P_m		Meter Reading		Temp. In		Temp. Out		P_m	
End	1524	10.800	cf	75	°F	-3.00	"H_2O	417.690	cf	67	°F	77	°F	3.00	"H_2O
Start	1513	0.000	cf	75	°F	-3.00	"H_2O	407.045	cf	75	°F	76	°F	3.00	"H_2O
Avg.	11	10.800	cf	75	°F	-3.00	"H_2O	10.645	cf	74			°F	3.00	"H_2O

$$\text{Wet Test Meter } Vm_{std} = 17.65 \times 10.800 \left[\frac{29.28 + \frac{-3.00}{13.6}}{75 + 460}\right] \times 1.000\ (C_f) = 10.354 \text{ dcsf}$$

$$\text{Dry Gas Meter } Vm_{std} = 17.65 \times 10.645 \left[\frac{29.28 + \frac{3.00}{13.6}}{74 + 460}\right] = \cancel{10.360}\ 10.380 \text{ dcsf}$$

$$C_{DG} = \frac{10.354}{\cancel{10.360}\ 10.380} = \boxed{\cancel{0.999}\ 0.998}$$

METCO ENVIRONMENTAL

DRY GAS METER CALIBRATION

Meter Number: 29-1

Date: 10-4-99

Calibrator: Shane Lee

$$\text{Calibration Factor } (C_{DG}) = \frac{\text{Wet Test Meter } Vm_{std}}{\text{Dry Gas Meter } Vm_{std}}$$

Run No.: 1 @ 4.0" H2O

P_b: 29.28 "Hg

Control Module Vacuum: 5.0 "Hg

Wet Test Meter (No. 3)																
	Time	Meter Reading		Temp.		P_m		Dry Gas Meter								
								Meter Reading		Temp. In		Temp. Out		P_m		
End	1547	10.947	cf	75	°F	-4.00	"H_2O	430.335	cf	68	°F	77	°F	4.00	"H_2O
Start	1537	0.000	cf	75	°F	-3.80	"H_2O	419.698	cf	78	°F	77	°F	4.00	"H_2O
Avg.	10	10.947	cf	75	°F	-3.90	"H_2O	10.637	cf	75			°F	4.00	"H_2O

$$\text{Wet Test Meter } Vm_{std} = 17.65 \times 10.947 \left[\frac{29.28 + \frac{-3.90}{13.6}}{75 + 460}\right] \times 1.000\ (C_f) = 10.471 \text{ dcsf}$$

$$\text{Dry Gas Meter } Vm_{std} = 17.65 \times 10.637 \left[\frac{29.28 + \frac{4.00}{13.6}}{75 + 460}\right] = 10.378 \text{ dcsf}$$

$$C_{DG} = \frac{10.471}{10.378} = \boxed{1.009}$$

METCO ENVIRONMENTAL

DRY GAS METER CALIBRATION

Meter Number: 29-1

Date: 10-4-99

Calibrator: Shane Lee

$$\text{Calibration Factor } (C_{DG}) = \frac{\text{Wet Test Meter } Vm_{std}}{\text{Dry Gas Meter } Vm_{std}}$$

Run No.: 1 @ 2.0 L/min

P_b: 29.28 "Hg

Control Module Vacuum: 50 "Hg

Wet Test Meter (No. 3)

	Time	Meter Reading		Temp.		P_m	
End	1622	2.210	cf	75	°F	-0.20	"H_2O
Start	1606	0.000	cf	75	°F	-0.20	"H_2O
Avg.	16	2.210	cf	75	°F	-0.20	"H_2O

Dry Gas Meter

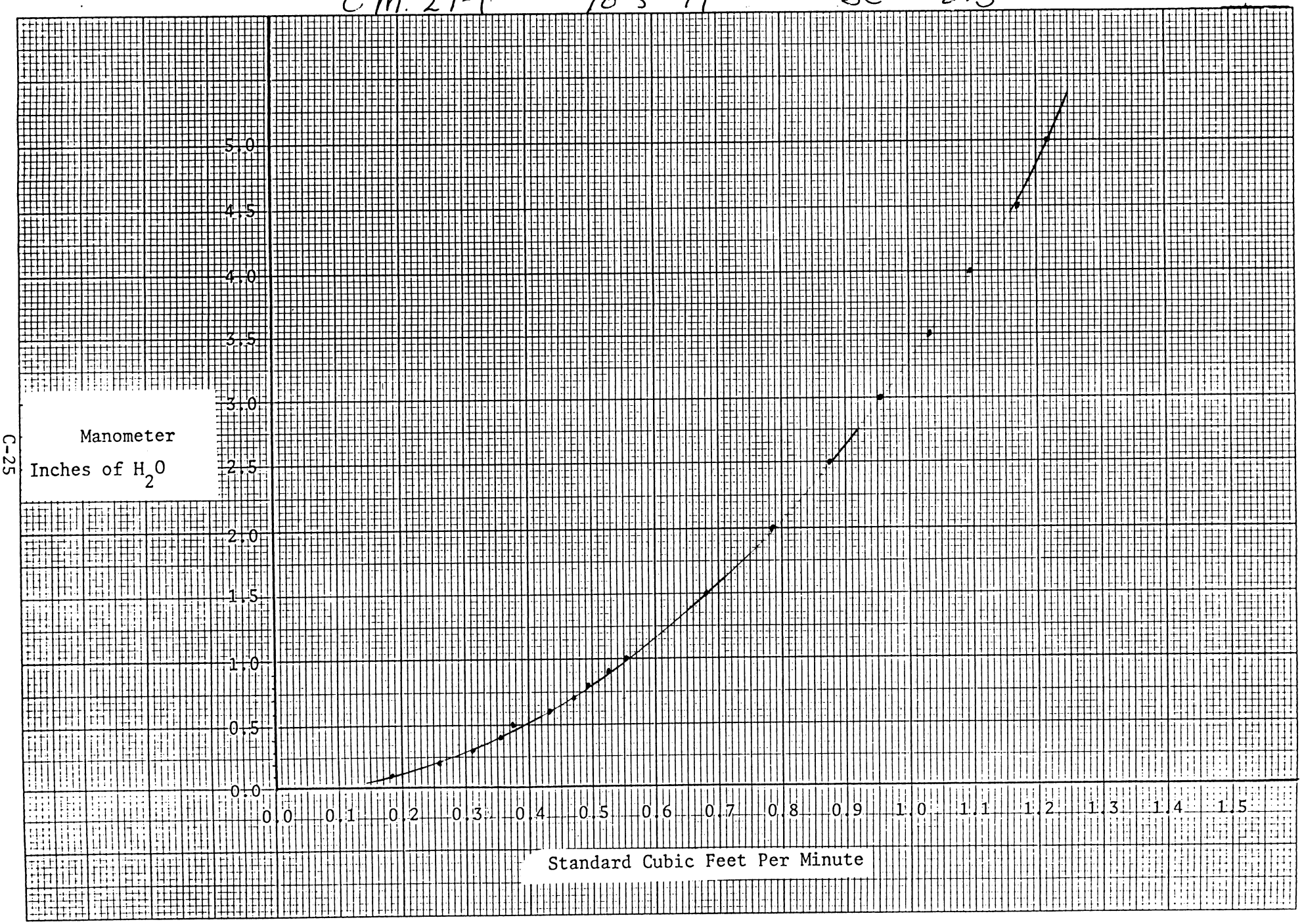
	Meter Reading		Temp. In		Temp. Out		P_m	
End	432.153	cf	81	°F	76	°F	0.01	"H_2O
Start	430.968	cf	78	°F	76	°F	0.01	"H_2O
Avg.	2.185	cf	78			°F	0.01	"H_2O

$$Wet\ Test\ Meter\ Vm_{std} = 17.65 \times 2.210 \left[\frac{29.28 + \frac{-0.20}{13.6}}{75 + 460}\right] \times 1.000\ (C_f) = 2.134\ dcsf$$

$$Dry\ Gas\ Meter\ Vm_{std} = 17.65 \times 2.185 \left[\frac{29.28 + \frac{0.01}{13.6}}{78 + 460}\right] = 2.099\ dcsf$$

$$C_{DG} = \frac{2.134}{2.099} = \boxed{1.017}$$

CM. 29-1 10-5-99 JC # 273



METCO ENVIRONMENTAL

DIGITAL TEMPERATURE INDICATOR NO. 29-1

CALIBRATION DATA

Date: 10-4-99

Media	Time	Mercury Temperature (°F)	DTI (°F)
Ambient Air	1330	70	70
Ice Bath	1337	32	32
Boiling Water	1345	212	212
Oven	1353	250	250
Oven	1355	300	301
Oven	1358	350	350
Oven	1359	375	376

Meter Adjusted? Yes _____ No ✓

Calibrator: Shane Lee #261

Checked By: Bill Hufty #101

METCO ENVIRONMENTAL

BAROMETER CALIBRATION

Barometer No. 19-1

Date: 10-4-99

Time: 1520

Barometric Pressure @ Addison Airport @ 719 ft.	=	30.210
	-	0.719
Absolute Pressure @ Addison Airport	=	29.491
	+	0.083
Absolute Pressure @ METCO @ 636 ft.	=	29.574
Barometer Reading	=	29.610
Variation	=	0.036

Barometer Adjusted? Yes ✓ No _____

Shane Lee 261

Signature of Calibrator

PITOT TUBE CALIBRATION

Date: 11-12-99

Time: 1500

Pitot No.: M2

T_s: 75 °F

Pitot Dimensions: 3/8" tips

C_{pstd}: 0.990

Motor Setting	fps mark	Calibration Standard Start	Calibration Standard End	√Standard Average	High	√High	Cal. Factor	Low	√Low	Cal. Factor
7	20	0.10	0.10	0.316	0.15	0.387	0.808	0.15	0.387	0.808
14	30	0.22	0.22	0.469	0.33	0.574	0.808	0.33	0.574	0.808
20	40	0.34	0.34	0.583	0.51	0.714	0.808	0.51	0.714	0.808
28	50	0.54	0.54	0.735	0.81	0.900	0.808	0.81	0.900	0.808
35	60	0.80	0.80	0.894	1.20	1.095	0.808	1.20	1.095	0.808
41	70	1.00	1.00	1.000	1.45	1.204	0.822	1.45	1.204	0.822
50	80	1.30	1.30	1.140	1.95	1.396	0.808	1.95	1.396	0.808
62	90	1.60	1.60	1.265	2.40	1.549	0.808	2.40	1.549	0.808
28	50	0.54	0.54	0.735	0.81	0.900	0.808	0.81	0.900	0.808
28	50	0.54	0.54	0.735	0.81	0.900	0.808	0.81	0.900	0.808
Average							0.810			0.810

Summary of Results:

Normal high side calibration factor 0.810

variation + 1.48%

variation - 0.25%

Normal low side calibration factor 0.810

variation + 1.48%

variation - 0.25%

Calibrator: Jason Brown #274

Checked By: Jason Conway #273

PITOT TUBE CALIBRATION

Date: 11-22-99

Time: 1330

Pitot No.: M3

T_s: 68 °F

Pitot Dimensions: 3/8" tips

C_{pstd}: 0.990

Motor Setting	fps mark	Calibration Standard Start	Calibration Standard End	√Standard Average	High	√High	Cal. Factor	Low	√Low	Cal. Factor
7	20	0.10	0.10	0.316	0.15	0.387	0.808	0.15	0.387	0.808
14	30	0.22	0.22	0.469	0.33	0.574	0.808	0.33	0.574	0.808
20	40	0.34	0.34	0.583	0.51	0.714	0.808	0.51	0.714	0.808
28	50	0.54	0.54	0.735	0.81	0.900	0.808	0.81	0.900	0.808
35	60	0.80	0.80	0.894	1.20	1.095	0.808	1.20	1.095	0.808
41	70	1.00	1.00	1.000	1.50	1.225	0.808	1.50	1.225	0.808
50	80	1.30	1.30	1.140	1.95	1.396	0.808	1.95	1.396	0.808
62	90	1.60	1.60	1.265	2.40	1.549	0.808	2.40	1.549	0.808
28	50	0.54	0.54	0.735	0.81	0.900	0.808	0.81	0.900	0.808
28	50	0.54	0.54	0.735	0.81	0.900	0.808	0.81	0.900	0.808
Average							0.808			0.808

Summary of Results:

Normal high side calibration factor 0.808

variation + 0.00%

variation - 0.00%

Normal low side calibration factor 0.808

variation + 0.00%

variation - 0.00%

Calibrator: Scott Hart #248

Checked By: Jason Conway #273

METCO ENVIRONMENTAL

NOZZLE CALIBRATION

Nozzle Set No. TFE-1

Date 11-19-99 Calibrator: Shane Dee 261

	4	6	7	8	10	12
Reading 1	0.117	0.175	0.200	0.234	0.309	0.362
Reading 2	0.116	0.174	0.200	0.232	0.308	0.360
Reading 3	0.118	0.173	0.198	0.236	0.308	0.359
Reading 4	0.118	0.173	0.196	0.235	0.307	0.363
Reading 5	0.120	0.174	0.199	0.235	0.308	0.362
Reading 6	0.119	0.173	0.200	0.235	0.306	0.359
Reading 7	0.117	0.173	0.199	0.234	0.306	0.360
Reading 8	0.116	0.174	0.199	0.236	0.308	0.359
Reading 9	0.117	0.175	0.200	0.235	0.308	0.361
Reading 10	0.118	0.175	0.200	0.236	0.306	0.360
Average	0.118 ✓	0.174 ✓	0.199 ✓	0.235 ✓	0.307 ✓	0.361 ✓

	14	—	—	—	—	—
Reading 1	0.429					
Reading 2	0.429					
Reading 3	0.430					
Reading 4	0.429					
Reading 5	0.431					
Reading 6	0.428					
Reading 7	0.429					
Reading 8	0.429					
Reading 9	0.431					
Reading 10	0.430					
Average	0.430 ✓					

METCO ENVIRONMENTAL

NOZZLE CALIBRATION

Nozzle Set No. TFE-2

Date 11-19-99 Calibrator: Mike Bass

	4	6a	7	8	10	12
Reading 1	0.116	0.174	0.193	0.235	0.309	0.363
Reading 2	0.115	0.170	0.195	0.232	0.309	0.362
Reading 3	0.114	0.170	0.195	0.232	0.310	0.363
Reading 4	0.114	0.172	0.194	0.234	0.309	0.363
Reading 5	0.115	0.174	0.197	0.235	0.308	0.361
Reading 6	0.115	0.173	0.196	0.235	0.309	0.361
Reading 7	0.115	0.172	0.197	0.235	0.311	0.362
Reading 8	0.114	0.174	0.195	0.234	0.310	0.362
Reading 9	0.116	0.171	0.196	0.234	0.309	0.363
Reading 10	0.115	0.172	0.195	0.233	0.309	0.363
Average	0.115	0.172	0.195	0.234	0.309	0.362

	14	—	—	—	—	—
Reading 1	0.435					
Reading 2	0.433					
Reading 3	0.434					
Reading 4	0.435					
Reading 5	0.433					
Reading 6	0.434					
Reading 7	0.433					
Reading 8	0.432					
Reading 9	0.433					
Reading 10	0.432					
Average	0.433					

METCO ENVIRONMENTAL

Dry Gas Meter Calibration

Dry Gas Meter No.: 27-2

Date: 11-07-99

ΔH ("H_2O)	C_{DG}
0.5	~~1.012~~ 1.015
1.0	1.018
1.5	1.022
2.0	1.019
3.0	1.011
4.0	1.002
Average	1.015

Variation: + 0.69%

- 1.28%

Calibrator: M. Buss

Checked By: Pam Brown

C_{DG} @ 2 liters/min. = —

METCO ENVIRONMENTAL

DRY GAS METER CALIBRATION

Meter Number: 27-2

Calibrator: M. Buss

Date: 11-07-99

$$\text{Calibration Factor } (C_{DG}) = \frac{\text{Wet Test Meter } Vm_{std}}{\text{Dry Gas Meter } Vm_{std}}$$

Run No.: 1 @ 0.5 " H_2O

P_b: 29.32 "Hg

Control Module Vacuum: 2.00 "Hg

Wet Test Meter (No. 3)

	Time	Meter Reading	Temp.	P_m
End	1310	5.015 cf	74 °F	-0.90 "H_2O
Start	1257	0.000 cf	74 °F	-0.90 "H_2O
Avg.	13	5.015 cf	74 °F	-0.900 "H_2O

Dry Gas Meter

	Meter Reading	Temp. In	Temp. Out	P_m
End	572.057 cf	77 °F	76 °F	0.50 "H_2O
Start	567.114 cf	76 °F	75 °F	0.50 "H_2O
Avg.	4.943 cf	76 °F		0.500 "H_2O

$$\text{Wet Test Meter } Vm_{std} = 17.65 \times 5.015 \left[\frac{29.32 + \frac{-0.900}{13.6}}{74 + 460}\right] \times 1.000\ (C_f) = 4.849 \text{ dcsf}$$

$$\text{Dry Gas Meter } Vm_{std} = 17.65 \times 4.943 \left[\frac{29.32 + \frac{0.500}{13.6}}{76 + 460}\right] = 4.778 \text{ dcsf}$$

$$C_{DG} = \frac{4.849}{4.778} = \boxed{1.015}$$

METCO ENVIRONMENTAL

DRY GAS METER CALIBRATION

Meter Number: 27-2

Calibrator: M. Bass

Date: 11-07-99

$$\text{Calibration Factor } (C_{DG}) = \frac{\text{Wet Test Meter } Vm_{std}}{\text{Dry Gas Meter } Vm_{std}}$$

Run No.: 1 @ 1.0" H_2O

P_b: 29.32 "Hg

Control Module Vacuum: 2.00 "Hg

Wet Test Meter (No. 3)

	Time	Meter Reading	Temp.	P_m
End	1323	5.122 cf	74 °F	-1.30 "H_2O
Start	1314	0.000 cf	74 °F	-1.30 "H_2O
Avg.	9	5.122 cf	74 °F	-1.300 "H_2O

Dry Gas Meter

	Meter Reading	Temp. In	Temp. Out	P_m
End	577.407 cf	78 °F	77 °F	1.00 "H_2O
Start	572.377 cf	77 °F	76 °F	1.00 "H_2O
Avg.	5.030 cf	77 °F		1.000 "H_2O

$$Wet\ Test\ Meter\ Vm_{std} = 17.65 \times 5.122 \left[\frac{29.32 + \frac{-1.300}{13.6}}{74 + 460}\right] \times 1.000\ (C_f) = 4.948\ dcsf$$

$$Dry\ Gas\ Meter\ Vm_{std} = 17.65 \times 5.030 \left[\frac{29.32 + \frac{1.000}{13.6}}{77 + 460}\right] = 4.859\ dcsf$$

$$C_{DG} = \frac{4.948}{4.859} = \boxed{1.018}$$

METCO ENVIRONMENTAL

DRY GAS METER CALIBRATION

Meter Number: 27-2

Calibrator: M. Bass

Date: 11-07-99

$$\text{Calibration Factor } (C_{DG}) = \frac{\text{Wet Test Meter } Vm_{std}}{\text{Dry Gas Meter } Vm_{std}}$$

Run No.: 1 @ 1.5" H_2O

P_b: 29.32 "Hg

Control Module Vacuum: 2.00 "Hg

Wet Test Meter (No. 3)

	Time	Meter Reading	Temp.	P_m
End	1341	10.295 cf	74 °F	-1.60 "H_2O
Start	1324	0.000 cf	74 °F	-1.60 "H_2O
Avg.	15	10.295 cf	74 °F	-1.600 "H_2O

Dry Gas Meter

	Meter Reading	Temp. In	Temp. Out	P_m
End	587.724 cf	82 °F	77 °F	1.50 "H_2O
Start	577.653 cf	78 °F	76 °F	1.50 "H_2O
Avg.	10.071 cf	78 °F		1.500 "H_2O

$$\text{Wet Test Meter } Vm_{std} = 17.65 \times 10.295 \left[\frac{29.32 + \frac{-1.600}{13.6}}{74 + 460}\right] \times 1.000 \ (C_f) = 9.937 \text{ dcsf}$$

$$\text{Dry Gas Meter } Vm_{std} = 17.65 \times 10.071 \left[\frac{29.32 + \frac{1.500}{13.6}}{78 + 460}\right] = 9.724 \text{ dcsf}$$

$$C_{DG} = \frac{9.937}{9.724} = \boxed{1.022}$$

METCO ENVIRONMENTAL

DRY GAS METER CALIBRATION

Meter Number: 27-2

Calibrator: M. Bass

Date: 11-07-99

$$\text{Calibration Factor } (C_{DG}) = \frac{\text{Wet Test Meter } Vm_{std}}{\text{Dry Gas Meter } Vm_{std}}$$

Run No.: 1 @ 2.0" H_2O

P_b: 29.32 "Hg

Control Module Vacuum: 2.50 "Hg

	Wet Test Meter (No. 3)					Dry Gas Meter			
	Time	Meter Reading	Temp.	P_m		Meter Reading	Temp. In	Temp. Out	P_m
End	1356	10.300 cf	74 °F	-2.50	"H_2O	598.026 cf	86 °F	78 °F	2.00 "H_2O
Start	1344	0.000 cf	74 °F	-2.50	"H_2O	587.902 cf	81 °F	77 °F	2.00 "H_2O
Avg.	12	10.300 cf	74 °F	-2.500	"H_2O	10.124 cf	81 °F		2.000 "H_2O

$$\text{Wet Test Meter } Vm_{std} = 17.65 \times 10.300 \left[\frac{29.32 + \frac{-2.500}{13.6}}{74 + 460}\right] \times 1.000\,(C_f) = 9.919 \text{ dcsf}$$

$$\text{Dry Gas Meter } Vm_{std} = 17.65 \times 10.124 \left[\frac{29.32 + \frac{2.000}{13.6}}{81 + 460}\right] = 9.733 \text{ dcsf}$$

$$C_{DG} = \frac{9.919}{9.733} = \boxed{1.019}$$

METCO ENVIRONMENTAL

DRY GAS METER CALIBRATION

Meter Number: 27-2

Calibrator: M. Bass

Date: 11-07-99

$$\text{Calibration Factor } (C_{DG}) = \frac{\text{Wet Test Meter } Vm_{std}}{\text{Dry Gas Meter } Vm_{std}}$$

Run No.: 1 @ 3.0" H_2O

P_b: 29.32 "Hg

Control Module Vacuum: 3.00 "Hg

Wet Test Meter (No. 3)

	Time	Meter Reading	Temp.	P_m
End	1408	10.330 cf	74 °F	-2.90 "H_2O
Start	1358	0.000 cf	74 °F	-2.90 "H_2O
Avg.	10	10.330 cf ✓	74 °F ✓	-2.900 "H_2O ✓

Dry Gas Meter

	Meter Reading	Temp. In	Temp. Out	P_m
End	608.602 cf	89 °F	79 °F	3.00 "H_2O
Start	598.364 cf	85 °F	78 °F	3.00 "H_2O
Avg.	10.238 cf ✓	83 °F ✓		3.000 "H_2O ✓

$$\text{Wet Test Meter } Vm_{std} = 17.65 \times 10.330 \left[\frac{29.32 + \frac{-2.90}{13.6}}{74 + 460}\right] \times 1.000\ (C_f) = 9.938 \text{ dcsf} \checkmark$$

$$\text{Dry Gas Meter } Vm_{std} = 17.65 \times 10.238 \left[\frac{29.32 + \frac{3.000}{13.6}}{83 + 460}\right] = 9.831 \text{ dcsf} \checkmark$$

$$C_{DG} = \frac{9.938}{9.831} = \boxed{1.011} \checkmark$$

METCO ENVIRONMENTAL

DRY GAS METER CALIBRATION

Meter Number: 27-2

Calibrator: M. Buss

Date: 11-07-99

$$\text{Calibration Factor } (C_{DG}) = \frac{\text{Wet Test Meter } Vm_{std}}{\text{Dry Gas Meter } Vm_{std}}$$

Run No.: 1 @ 4.0" H_2O

P_b: 29.32 "Hg

Control Module Vacuum: 3.00 "Hg

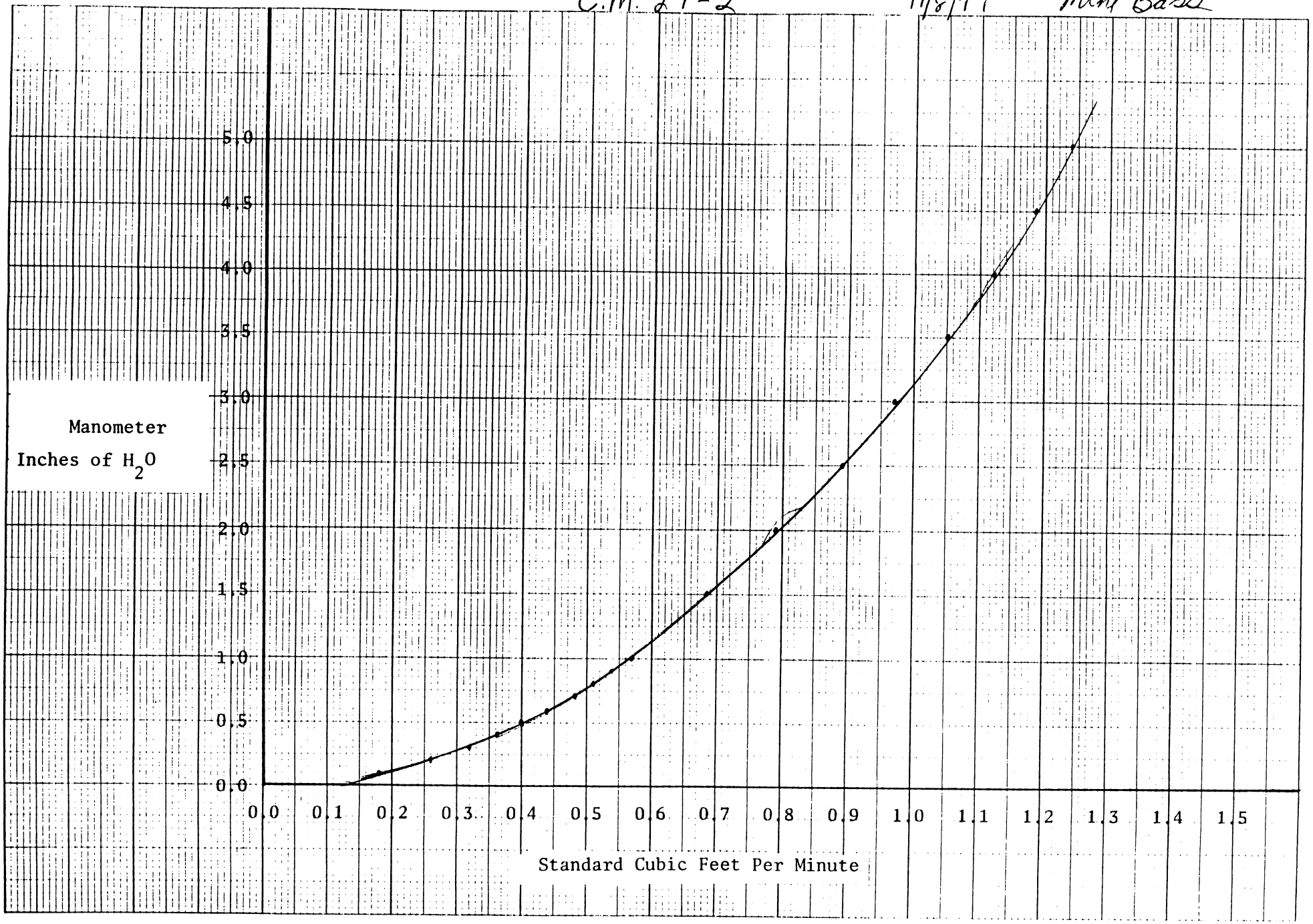
	Wet Test Meter (No. 3)				Dry Gas Meter			
	Time	Meter Reading	Temp.	P_m	Meter Reading	Temp. In	Temp. Out	P_m
End	1419	10.130 cf	74 °F	-3.70 "H_2O	619.031 cf	91 °F	80 °F	4.00 "H_2O
Start	1410	0.000 cf	74 °F	-3.70 "H_2O	608.926 cf	87 °F	79 °F	4.00 "H_2O
Avg.	9	10.130 cf ✓	74 °F ✓	-3.700 "H_2O ✓	10.105 cf ✓	84 ✓ °F		4.000 "H_2O ✓

$$\text{Wet Test Meter } Vm_{std} = 17.65 \times 10.130 \left[\frac{29.32 + \frac{-3.700}{13.6}}{74 + 460}\right] \times 1000 \quad (C_f) = 9.726 \text{ dcsf} \checkmark$$

$$\text{Dry Gas Meter } Vm_{std} = 17.65 \times 10.105 \left[\frac{29.32 + \frac{4.000}{13.6}}{84 + 460}\right] = 9.709 \text{ dcsf} \checkmark$$

$$C_{DG} = \frac{9.726}{9.709} = \boxed{1.002} \checkmark$$

C.M. 27-2 11/8/99 Mike Base



METCO ENVIRONMENTAL

DIGITAL TEMPERATURE INDICATOR NO. 27-2

CALIBRATION DATA

Date: 11-07-99

Media	Time	Mercury Temperature (°F)	DTI (°F)
Ambient Air	1248	77	75 ✓
Ice Bath	1250	36	36 ✓
Boiling Water	1300	210	211 ✓
Oven	1302	250	250 ✓
Oven	1304	300	301 ✓
Oven	1306	352	351 ✓
Oven	1308	376	378 ✓

Meter Adjusted? Yes _____ No ✓

Calibrator: Mike Bass

Checked By: Jason Brown

METCO ENVIRONMENTAL

Dry Gas Meter Calibration

Dry Gas Meter No.: 29-1

Date: 11-22-99

ΔH ("H_2O)	C_{DG}
0.5	1.005 ✓
1.0	0.999 ✓
1.5	1.003 ✓
2.0	1.000 ✓
3.0	0.994 ✓
4.0	0.999 ✓
Average	1.000 ✓

Variation: + 0.5% ✓

- 0.6% ✓

Calibrator: Jason Conning #273

Checked By: Scott Hart #268

C_{DG} @ 2 liters/min. = 1.013

METCO ENVIRONMENTAL

DRY GAS METER CALIBRATION

Meter Number: 29-1

Calibrator: Jason Conway

Date: 11-22-99

$$\text{Calibration Factor } (C_{DG}) = \frac{\text{Wet Test Meter } Vm_{std}}{\text{Dry Gas Meter } Vm_{std}}$$

Run No.: 1 @ 0.50" H2O

P_b: 29.24 "Hg

Control Module Vacuum: 0.00 "Hg

Wet Test Meter (No. 3)						Dry Gas Meter				
	Time	Meter Reading	Temp.	P_m		Meter Reading	Temp. In	Temp. Out	P_m	
End	0935	5.003 cf	69 °F	-0.8	"H_2O	738522 cf	87 °F	71 °F	0.5	"H_2O
Start	0922	0.000 cf	69 °F	-0.8	"H_2O	733.505 cf	72 °F	71 °F	0.5	"H_2O
Avg.	13	5.003 cf	69 °F	-0.8	"H_2O	5.017 cf	75 °F		0.5	"H_2O

$$Wet\ Test\ Meter\ Vm_{std} = 17.65 \times 5.003 \left[\frac{29.24 + \frac{-0.8}{13.6}}{69 + 460}\right] \times 1.000 \quad (C_f) = 4.871\ dcsf$$

$$Dry\ Gas\ Meter\ Vm_{std} = 17.65 \times 5.017 \left[\frac{29.24 + \frac{0.5}{13.6}}{75 + 460}\right] = 4.846\ dcsf$$

$$C_{DG} = \frac{4.871}{4.846} = \boxed{1.005}$$

METCO ENVIRONMENTAL

DRY GAS METER CALIBRATION

Meter Number: 29-1

Calibrator: Jason Conway

Date: 11-22-99

$$\text{Calibration Factor } (C_{DG}) = \frac{\text{Wet Test Meter } Vm_{std}}{\text{Dry Gas Meter } Vm_{std}}$$

Run No.: 1 @ 1.00" H2O

P_b: 29.24 "Hg

Control Module Vacuum: 0.06 "Hg

Wet Test Meter (No. 3)

	Time	Meter Reading	Temp.	P_m
End	1031	5.004 cf	69 °F	-13 "H_2O
Start	1021	0.000 cf	69 °F	-13 "H_2O
Avg.	10 ✓	5.004 ✓ cf	69 ✓ °F	-13 ✓ "H_2O

Dry Gas Meter

	Meter Reading	Temp. In	Temp. Out	P_m
End	244.777 cf	68 °F	71 °F	1.0 "H_2O
Start	239.786 cf	70 °F	71 °F	1.0 "H_2O
Avg.	4.991 ✓ cf	70 ✓ °F	✓ 1.0	"H_2O

$$\text{Wet Test Meter } Vm_{std} = 17.65 \times 5.004 \left[\frac{29.24 + \frac{-13}{13.6}}{69 + 460}\right] \times 1.000\ (C_t) = 4.866 \checkmark \text{ dcsf}$$

$$\text{Dry Gas Meter } Vm_{std} = 17.65 \times 4.991 \left[\frac{29.24 + \frac{1.0}{13.6}}{70 + 460}\right] = 4.872 \checkmark \text{ dcsf}$$

$$C_{DG} = \frac{4.866}{4.872} = \boxed{0.999 \checkmark}$$

METCO ENVIRONMENTAL

DRY GAS METER CALIBRATION

Meter Number: 29-1

Date: 11-22-99

Calibrator: Jason Conway

$$\text{Calibration Factor } (C_{DG}) = \frac{\text{Wet Test Meter } Vm_{std}}{\text{Dry Gas Meter } Vm_{std}}$$

Run No.: 1 @ 1.50 "H2O

P_b: 29.24 "Hg

Control Module Vacuum: 0.00 "Hg

	Wet Test Meter (No. 3)				Dry Gas Meter			
	Time	Meter Reading	Temp.	P_m	Meter Reading	Temp. In	Temp. Out	P_m
End	1049	10,009 cf	69 °F	-16 "H_2O	755.874 cf	65 °F	71 °F	1.50 "H_2O
Start	1034	0.000 cf	69 °F	-16 "H_2O	745.977 cf	69 °F	71 °F	1.50 "H_2O
Avg.	15 ✓	10.009 ✓ cf	69 ✓ °F	-16 ✓ "H_2O	9.897 ✓ cf	69 ✓ °F	✓ 1.50	"H_2O

$$\text{Wet Test Meter } Vm_{std} = 17.65 \times 10.009 \left[\frac{29.24 + \frac{-16}{13.6}}{69 + 460}\right] \times 1.000 \ (C_f) = 9.725 \checkmark \text{ dcsf}$$

$$\text{Dry Gas Meter } Vm_{std} = 17.65 \times 9.897 \left[\frac{29.24 + \frac{1.50}{13.6}}{69 + 460}\right] = 9.692 \checkmark \text{ dcsf}$$

$$C_{DG} = \frac{9.725}{9.692} = \boxed{1.003 \checkmark}$$

METCO ENVIRONMENTAL

DRY GAS METER CALIBRATION

Meter Number: 29.1

Calibrator: Jason Conway

Date: 11-22-99

$$\text{Calibration Factor } (C_{DG}) = \frac{\text{Wet Test Meter } Vm_{std}}{\text{Dry Gas Meter } Vm_{std}}$$

Run No.: 1 @ 2.00 "H2O

P_b: 29.24 "Hg

Control Module Vacuum: 8.00 "Hg

Wet Test Meter (No. 3)

	Time	Meter Reading		Temp.		P_m	
End	1103	10.088	cf	69	°F	-20	"H_2O
Start	1051	0.000	cf	69	°F	-20	"H_2O
Avg.	12 ✓	10.088 ✓	cf	69 ✓	°F	-20 ✓	"H_2O

Dry Gas Meter

	Meter Reading		Temp. In		Temp. Out		P_m	
End	766.667	cf	69	°F	72	°F	2.0	"H_2O
Start	756.663	cf	68	°F	72	°F	2.0	"H_2O
Avg.	10.004 ✓	cf	70 ✓	°F			✓2.0	"H_2O

$$\text{Wet Test Meter } Vm_{std} = 17.65 \times 10.088 \left[\frac{29.24 + \frac{-20}{13.6}}{69 + 460}\right] \times 1.000\,(C_f) = 9.792^{\checkmark}\ \text{dcsf}$$

$$\text{Dry Gas Meter } Vm_{std} = 17.65 \times 10.004 \left[\frac{29.24 + \frac{2.0}{13.6}}{70 + 460}\right] = 9.790^{\checkmark}\ \text{dcsf}$$

$$C_{DG} = \frac{9.792}{9.790} = \boxed{1.000^{\checkmark}}$$

METCO ENVIRONMENTAL

DRY GAS METER CALIBRATION

Meter Number: 29-1

Date: 11-22-99

Calibrator: Jason Conway

$$\text{Calibration Factor } (C_{DG}) = \frac{\text{Wet Test Meter } Vm_{std}}{\text{Dry Gas Meter } Vm_{std}}$$

Run No.: 1 @ 3.00 "H2O

P_b: 29.24 "Hg

Control Module Vacuum: 0.00 "Hg

Wet Test Meter (No. 3)

	Time	Meter Reading	Temp.	P_m
End	1134	10.011 cf	69 °F	-3.0 "H_2O
Start	1124	0.000 cf	69 °F	-3.0 "H_2O
Avg.	10.0	10.0111 cf	69 ✓ °F	-3.0 ✓ "H_2O

Dry Gas Meter

	Meter Reading	Temp. In	Temp. Out	P_m
End	788.042 cf	69 °F	73 °F	3.0 "H_2O
Start	779.107 cf	66 °F	73 °F	3.0 "H_2O
Avg.	9.935 ✓ cf	70 ✓ °F	✓ 3.0	"H_2O

$$Wet\ Test\ Meter\ Vm_{std} = 17.65 \times 10.011 \left[\frac{29.24 + \frac{-3.0}{13.6}}{69 + 460}\right] \times 1.000\ (C_f) = 9.693\ ✓\ dcsf$$

$$Dry\ Gas\ Meter\ Vm_{std} = 17.65 \times 9.935 \left[\frac{29.24 + \frac{3.0}{13.6}}{70 + 460}\right] = 9.747\ ✓\ dcsf$$

$$C_{DG} = \frac{9.693}{9.747} = \boxed{0.994\ ✓}$$

METCO ENVIRONMENTAL

DRY GAS METER CALIBRATION

Meter Number: 29-1

Date: 11-21-99

Calibrator: Jason Conway

$$\text{Calibration Factor } (C_{DG}) = \frac{\text{Wet Test Meter } Vm_{std}}{\text{Dry Gas Meter } Vm_{std}}$$

Run No.: 2 @ 4.00 "H2O

P_b: 29.24 "Hg

Control Module Vacuum: 0.00 "Hg

	Wet Test Meter (No. 3)				Dry Gas Meter			
	Time	Meter Reading	Temp.	P_m	Meter Reading	Temp. In	Temp. Out	P_m
End	1311	10.002 cf	70 °F	-3.8 "H_2O	817.238 cf	68 °F	72 °F	4.0 "H_2O
Start	1302	0.000 cf	70 °F	-3.8 "H_2O	807.425 cf	70 °F	72 °F	4.0 "H_2O
Avg.	9 ✓	10.002 ✓ cf	70 ✓ °F	-3.8 ✓ "H_2O	9.813 ✓ cf	71 ✓ °F		✓ 4.0 "H_2O

$$\text{Wet Test Meter } Vm_{std} = 17.65 \times 10.002 \left[\frac{29.24 + \frac{-3.8}{13.6}}{70 + 460}\right] \times 1.000\ (C_f) = 9.646\ ✓\ \text{dcsf}$$

$$\text{Dry Gas Meter } Vm_{std} = 17.65 \times 9.813 \left[\frac{29.24 + \frac{4.0}{13.6}}{71 + 460}\right] = \cancel{9.651}\ 9.633\ ✓\ \text{dcsf}$$

$$C_{DG} = \frac{9.646}{9.651} = \boxed{0.999\ ✓}$$

METCO ENVIRONMENTAL

DRY GAS METER CALIBRATION

Meter Number: 29-1

Calibrator: Jason Conway

Date: 11-22-99

$$\text{Calibration Factor } (C_{DG}) = \frac{\text{Wet Test Meter } Vm_{std}}{\text{Dry Gas Meter } Vm_{std}}$$

Run No.: 1 @ 2L/min

P_b: 29.15 "Hg

Control Module Vacuum: 0.00 "Hg

Wet Test Meter (No. 1)

	Time	Meter Reading	Temp.	P_m
End	1637	2.229 cf	70 °F	-0.6 "H_2O
Start	1605	0.000 cf	70 °F	-0.6 "H_2O
Avg.	32 ✓	2.229 ✓ cf	70 ✓ °F	-0.6 ✓ "H_2O

Dry Gas Meter

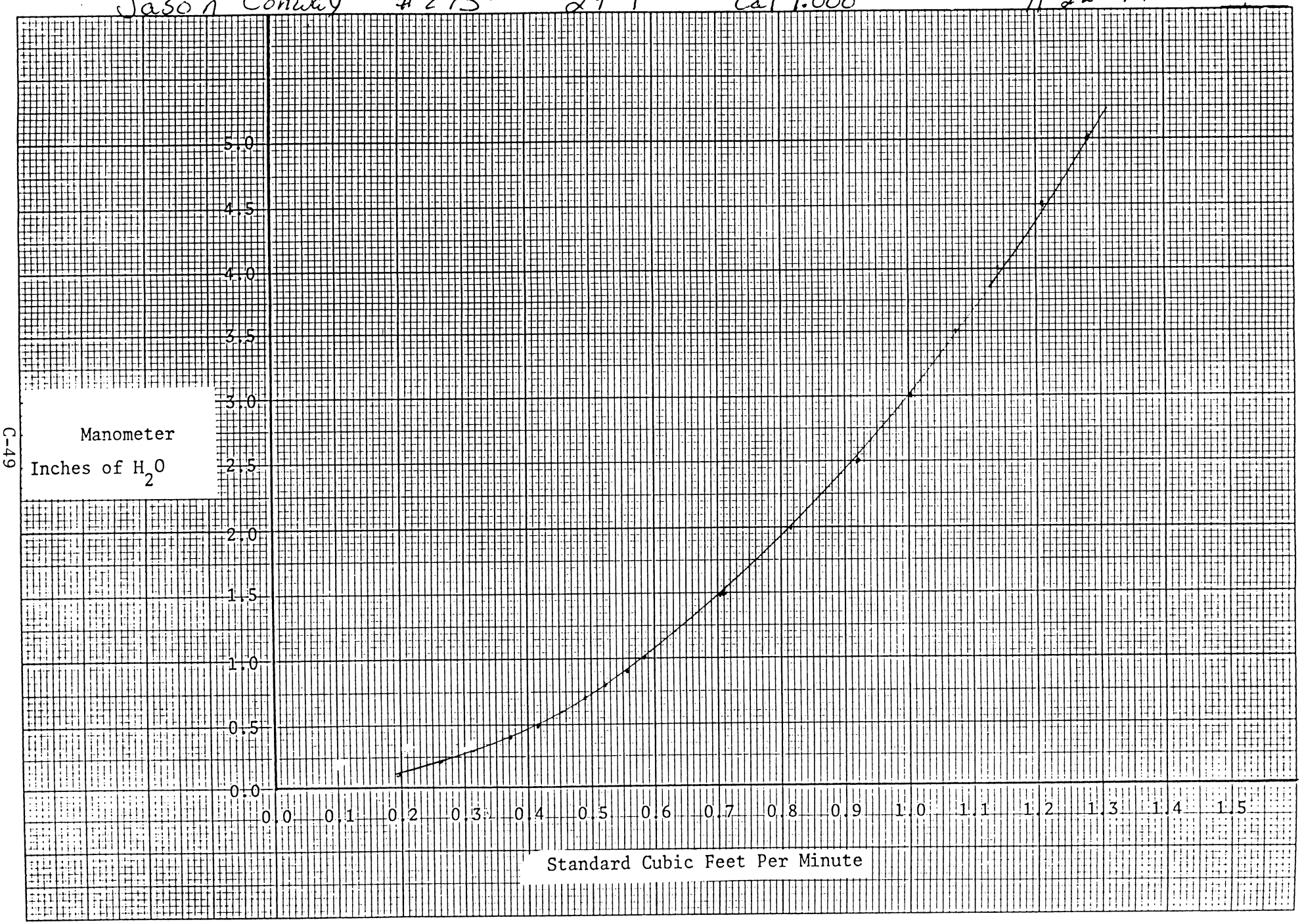
	Meter Reading	Temp. In	Temp. Out	P_m
End	873.468 cf	77 °F	72 °F	0.04 "H_2O
Start	871.246 cf	72 °F	72 °F	0.04 "H_2O
Avg.	2.222 ✓ cf	73 ✓ °F		✓ 0.04 "H_2O

$$\text{Wet Test Meter } Vm_{std} = 17.65 \times 2.229 \left[\frac{29.15 + \frac{-0.6}{13.6}}{70 + 460} \right] \times 1.006 (C_f) = 2.173 \text{ dcsf}$$

$$\text{Dry Gas Meter } Vm_{std} = 17.65 \times 2.222 \left[\frac{29.15 + \frac{0.04}{13.6}}{73 + 460} \right] = 2.145 \text{ dcsf}$$

$$C_{DG} = \frac{2.173}{2.145} = \boxed{1.013}$$

Jason Conway #273 29-1 Cal 1.000 11-22-99



METCO ENVIRONMENTAL

DIGITAL TEMPERATURE INDICATOR NO. 29-1

CALIBRATION DATA

Date: 11-22-99

Media	Time	Mercury Temperature (°F)	DTI (°F)
Ambient Air	1025	70	70
Ice Bath	1112	35	36
Boiling Water	1050	212	212
Oven	1130	250	251
Oven	1141	300	300
Oven	1153	350	353
Oven	1200	375	375

Meter Adjusted? Yes _____ No ✓

Calibrator: Jason Conway #273

Checked By: Scott Watt #268

METCO ENVIRONMENTAL

BAROMETER CALIBRATION

Barometer No. 19-1

Date: 11-22-99

Time: 1115

Barometric Pressure @ Addison Airport @ 719 ft.	=	29.86
	-	0.719
Absolute Pressure @ Addison Airport	=	29.141
	+	0.083
Absolute Pressure @ METCO @ 636 ft.	=	29.224
Barometer Reading	=	29.18
Variation	=	0.044

Barometer Adjusted? Yes ✓ No _____

Scott Hart #268 ✓

Signature of Calibrator

APPENDIX D

Analytical Data

TestAmerica
INCORPORATED

December 20, 1999

Doug Saathoff
METCO Environmental
P.O. Box 598
Addison, Texas 75001

Dear Doug,

Please find included with this letter the analytical report and data package for the Lawrence Energy Center samples submitted to TestAmerica for analysis. The samples were analyzed following the SOP based on the Ontario-Hydro Method.

Case Narrative

TestAmerica received the samples on October 30, 1999. All samples were intact when received. Please note the following:

- All Duplicate and Triplicate sample results had a Relative Percent Difference of <10 %.
- All Matrix Spike sample results had a % Recovery between 75 % and 125 %.
- All other Quality Control Indicators were within acceptance limits.

If you have any questions or need additional information about this data package, please feel free to contact me at 937-294-6856.

Sincerely,

James A. Davis

James A. Davis
QA Coordinator

3601 SOUTH DIXIE DRIVE / DAYTON, OH 45439 / 937-294-6856 / FAX: 937-294-7816

TestAmerica
INCORPORATED

Sample ID: Western Resources Inc.
Lawrence Energy Center
Lawrence, Kansas

Hg Analysis
Ontario Hydro Method

Summary Report

	Unit 4 South Stack Run 1	Unit 4 South Stack Run 2	Unit 4 South Stack Run 4	Unit 4 South Scrubber Inlet Duct Run 1	Unit 4 South Scrubber Inlet Duct Run 2	Unit 4 South Scrubber Inlet Duct Run 4
Particle Bound Hg (ug)	0.026	0.111	0.138	0.242	0.580	0.250
Oxidized Hg (ug)	0.00	0.00	0.00	1.78	0.00	0.00
Elemental Hg (ug)	9.07	9.29	9.06	5.37	4.84	5.15
Total Hg (ug)	9.10	9.40	9.20	7.39	5.42	5.40

	Unit 4 South Stack Blank Train	Unit 4 South Scrubber Inlet Duct Blank Train
Particle Bound Hg (ug)	0.000	0.000
Oxidized Hg (ug)	0.00	0.00
Elemental Hg (ug)	0.00	0.00
Total Hg (ug)	0.00	0.00

	Reagent Blanks
Container # 7 (ug/L)	<0.2
Container # 8 (ug/L)	<2.0
Container # 9 (ug/L)	<4.0
Container # 10 (ug/L)	<2.0
Container # 11 (ug/L)	<0.2
Container # 12A (ug)	<0.01
Container # 12B (ug)	<0.01

TestAmerica
INCORPORATED

Sample ID: Western Resources Inc.
Lawrence Energy Center
Lawrence, Kansas

Hg Analysis
Ontario Hydro Method

Duplicate Summary Report

	Unit 4 South Stack Run 1	Unit 4 South Stack Run 2	Unit 4 South Stack Run 4	Unit 4 South Scrubber Inlet Duct Run 1	Unit 4 South Scrubber Inlet Duct Run 2	Unit 4 South Scrubber Inlet Duct Run 4
Particle Bound Hg (ug)	0.025	0.109	0.137	0.241	0.585	0.250
Oxidized Hg (ug)	0.00	0.00	0.00	1.71	0.00	0.00
Elemental Hg (ug)	9.12	9.34	8.91	5.46	4.85	5.20
Total Hg (ug)	9.15	9.45	9.05	7.41	5.44	5.45

	Unit 4 South Stack Blank Train	Unit 4 South Scrubber Inlet Duct Blank Train
Particle Bound Hg (ug)	0.000	0.000
Oxidized Hg (ug)	0.00	0.00
Elemental Hg (ug)	0.00	0.00
Total Hg (ug)	0.00	0.00

	Reagent Blanks
Container # 7 (ug/L)	<0.2
Container # 8 (ug/L)	<2.0
Container # 9 (ug/L)	<4.0
Container # 10 (ug/L)	<2.0
Container # 11 (ug/L)	<0.2
Container # 12A (ug)	<0.01
Container # 12B (ug)	<0.01

3601 SOUTH DIXIE DRIVE / DAYTON, OH 45439 / 937-294-6856 / FAX: 937-294-7816

TestAmerica
INCORPORATED

Sample ID: **Western Resources Inc.**
Lawrence Energy Center
Lawrence, Kansas
Unit 4 South Stack Run 1

Hg Analysis
Ontario Hydro Method

Collected On: 10/25/99
Collected By: METCO

Container # 1A - Main Filter
Container # 1B - Backup Filter
Container # 2 - 0.1 N HNO3 Rinse
Container # 3 - KCl Impingers (1,2,3)/10 %HNO3 Rinse
Container # 4 - HNO3/H2O2 Impinger (4)/0.1 N HNO3 Rinse
Container # 5 - H2SO4/KMnO4 Impinger (5,6,7)/0.1 N HNO3 Rinse

	ID	Digestion Date	Analysis Date	Analyst	Results	Duplicate Result	RPD	Triplicate Result	RPD	Units	Flags	Notes
Container # 1A	88QH43	12/07/99	12/07/99	jpp	0.026	0.025	2.8	---	---	ug		
Container # 1B		Not Provided		jpp	---	---	---	---	---	ug		
Container # 2	2LW-4	12/03/99	12/06/99	jpp	<0.27	<0.27	0	---	---	ug		
Container # 3	3LW-4	12/03/99	12/06/99	jpp	<1.40	<1.40	0	<1.40	0	ug		
Container # 4	4LW-4	12/04/99	12/04/99	jpp	<0.70	<0.70	0	---	---	ug		
Container # 5	5LW-4	12/04/99	12/04/99	jpp	9.07	9.12	0.5	---	---	ug		

Particle Bound Hg (ug) **0.026**
(Containers 1A, 1B, and 2)

Oxidized Hg (ug) **0.00**
(Containers 3)

Elemental Hg (ug) **9.07**
(Containers 4 and 5)

Total Hg (ug) **9.10**
(Containers 1A, 1B, 2, 3, 4, and 5)

Dup. Part. Bound Hg (ug) **0.025**
(Containers 1A, 1B, and 2)

Dup. Oxidized Hg (ug) **0.00**
(Containers 3)

Dup. Elemental Hg (ug) **9.12**
(Containers 4 and 5)

Dup. Total Hg (ug) **9.15**
(Containers 1A, 1B, 2, 3, 4, and 5)

Notes:

3601 SOUTH DIXIE DRIVE / DAYTON, OH 45439 / 937-294-6856 / FAX: 937-294-7816

TestAmerica
INCORPORATED

Sample ID: **Western Resources Inc.**
Lawrence Energy Center
Lawrence, Kansas
Unit 4 South Stack Run 2

Hg Analysis
Ontario Hydro Method

Collected On: 10/26/99
Collected By: METCO

Container # 1A - Main Filter
Container # 1B - Backup Filter
Container # 2 - 0.1 N HNO3 Rinse
Container # 3 - KCl Impingers (1,2,3)/10 %HNO3 Rinse
Container # 4 - HNO3/H2O2 Impinger (4)/0.1 N HNO3 Rinse
Container # 5 - H2SO4/KMnO4 Impinger (5,6,7)/0.1 N HNO3 Rinse

	ID	Digestion Date	Analysis Date	Analyst	Results	Duplicate Result	RPD	Triplicate Result	RPD	Units	Flags	Notes
Container # 1A	88QH44	12/07/99	12/07/99	jpp	0.111	0.109	1.8	---	---	ug		
Container # 1B		Not Provided		jpp	---	---	---	---	---	ug		
Container # 2	2LW-6	12/03/99	12/06/99	jpp	<0.43	<0.43	0	---	---	ug		
Container # 3	3LW-6	12/03/99	12/06/99	jpp	<1.46	<1.46	0	---	---	ug		
Container # 4	4LW-6	12/04/99	12/04/99	jpp	<0.66	<0.66	0	---	---	ug		
Container # 5	5LW-6	12/04/99	12/04/99	jpp	9.29	9.34	0.5	---	---	ug		

Particle Bound Hg (ug) **0.111**
(Containers 1A, 1B, and 2)

Oxidized Hg (ug) **0.00**
(Containers 3)

Elemental Hg (ug) **9.29**
(Containers 4 and 5)

Total Hg (ug) **9.40**
(Containers 1A, 1B, 2, 3, 4, and 5)

Dup. Part. Bound Hg (ug) **0.109**
(Containers 1A, 1B, and 2)

Dup. Oxidized Hg (ug) **0.00**
(Containers 3)

Dup. Elemental Hg (ug) **9.34**
(Containers 4 and 5)

Dup. Total Hg (ug) **9.4**
(Containers 1A, 1B, 2, 3, 4, and 5)

Notes:

3601 SOUTH DIXIE DRIVE / DAYTON, OH 45439 / 937-294-6856 / FAX: 937-294-7816

TestAmerica
INCORPORATED

Sample ID: **Western Resources Inc.**
Lawrence Energy Center
Lawrence, Kansas
Unit 4 South Stack Run 4

Hg Analysis
Ontario Hydro Method

Collected On: 10/26/99
Collected By: METCO

Container # 1A - Main Filter
Container # 1B - Backup Filter
Container # 2 - 0.1 N HNO3 Rinse
Container # 3 - KCl Impingers (1,2,3)/10 %HNO3 Rinse
Container # 4 - HNO3/H2O2 Impinger (4)/0.1 N HNO3 Rinse
Container # 5 - H2SO4/KMnO4 Impinger (5,6,7)/0.1 N HNO3 Rinse

	ID	Digestion Date	Analysis Date	Analyst	Results	Duplicate Result	RPD	Triplicate Result	RPD	Units	Flags	Notes
Container # 1A	88QH46	12/07/99	12/07/99	jpp	0.138	0.137	1.1	---	---	ug		
Container # 1B		Not Provided		jpp	---	---	---	---	---	ug		
Container # 2	2LW-8	12/03/99	12/06/99	jpp	<0.37	<0.37	0	---	---	ug		
Container # 3	3LW-8	12/03/99	12/06/99	jpp	<1.50	<1.50	0	---	---	ug		
Container # 4	4LW-8	12/04/99	12/04/99	jpp	<0.72	<0.72	0	---	---	ug		
Container # 5	5LW-8	12/04/99	12/04/99	jpp	9.06	8.91	1.6	---	---	ug		

Particle Bound Hg (ug) **0.138**
(Containers 1A, 1B, and 2)

Oxidized Hg (ug) **0.00**
(Containers 3)

Elemental Hg (ug) **9.06**
(Containers 4 and 5)

Total Hg (ug) **9.20**
(Containers 1A, 1B, 2, 3, 4, and 5)

Dup. Part. Bound Hg (ug) **0.137**
(Containers 1A, 1B, and 2)

Dup. Oxidized Hg (ug) **0.00**
(Containers 3)

Dup. Elemental Hg (ug) **8.91**
(Containers 4 and 5)

Dup. Total Hg (ug) **9.05**
(Containers 1A, 1B, 2, 3, 4, and 5)

Notes:

3601 SOUTH DIXIE DRIVE / DAYTON, OH 45439 / 937-294-6856 / FAX: 937-294-7816

TestAmerica
INCORPORATED

Sample ID: **Western Resources Inc.**
Lawrence Energy Center
Lawrence, Kansas
Unit 4 South Scrubber Inlet Duct Run 1

Hg Analysis
Ontario Hydro Method

Collected On: 10/25/99
Collected By: METCO

Container # 1A - Main Filter
Container # 1B - Backup Filter
Container # 2 - 0.1 N HNO3 Rinse
Container # 3 - KCl Impingers (1,2,3)/10 %HNO3 Rinse
Container # 4 - HNO3/H2O2 Impinger (4)/0.1 N HNO3 Rinse
Container # 5 - H2SO4/KMnO4 Impinger (5,6,7)/0.1 N HNO3 Rinse

	ID	Digestion Date	Analysis Date	Analyst	Results	Duplicate Result	RPD	Triplicate Result	RPD	Units	Flags	Notes
Container # 1A	Q63	12/07/99	12/07/99	jpp	0.242	0.241	0.5	0.240	1.2	ug		
Container # 1B	Q74	12/07/99	12/07/99	jpp	<0.01	<0.01	0	---	---	ug		
Container # 2	2LW-3	12/03/99	12/06/99	jpp	<0.15	<0.15	0	---	---	ug		
Container # 3	3LW-3	12/03/99	12/06/99	jpp	1.78	1.71	3.9	---	---	ug		
Container # 4	4LW-3	12/04/99	12/04/99	jpp	<0.72	<0.72	0	---	---	ug		
Container # 5	5LW-3	12/04/99	12/04/99	jpp	5.37	5.46	1.8	---	---	ug		

Particle Bound Hg (ug) **0.242**
(Containers 1A, 1B, and 2)

Oxidized Hg (ug) **1.78**
(Containers 3)

Elemental Hg (ug) **5.37**
(Containers 4 and 5)

Total Hg (ug) **7.39**
(Containers 1A, 1B, 2, 3, 4, and 5)

Dup. Part. Bound Hg (ug) **0.241**
(Containers 1A, 1B, and 2)

Dup. Oxidized Hg (ug) **1.71**
(Containers 3)

Dup. Elemental Hg (ug) **5.46**
(Containers 4 and 5)

Dup. Total Hg (ug) **7.41**
(Containers 1A, 1B, 2, 3, 4, and 5)

Notes:

3601 SOUTH DIXIE DRIVE / DAYTON, OH 45439 / 937-294-6856 / FAX: 937-294-7816

TestAmerica
INCORPORATED

Sample ID: **Western Resources Inc.**
Lawrence Energy Center
Lawrence, Kansas
Unit 4 South Scrubber Inlet Duct Run 2

Hg Analysis
Ontario Hydro Method

Collected On: 10/26/99
Collected By: METCO

Container # 1A - Main Filter
Container # 1B - Backup Filter
Container # 2 - 0.1 N HNO3 Rinse
Container # 3 - KCl Impingers (1,2,3)/10 %HNO3 Rinse
Container # 4 - HNO3/H2O2 Impinger (4)/0.1 N HNO3 Rinse
Container # 5 - H2SO4/KMnO4 Impinger (5,6,7)/0.1 N HNO3 Rinse

	ID	Digestion Date	Analysis Date	Analyst	Results	Duplicate Result	RPD	Triplicate Result	RPD	Units	Flags	Notes
Container # 1A	Q64	12/07/99	12/07/99	jpp	0.580	0.585	0.8	---	---	ug		
Container # 1B	Q75	12/07/99	12/07/99	jpp	<0.01	<0.01	0	---	---	ug		
Container # 2	2LW-5	12/03/99	12/06/99	jpp	<0.19	<0.19	0	---	---	ug		
Container # 3	3LW-5	12/03/99	12/06/99	jpp	<1.40	<1.40	0	---	---	ug		
Container # 4	4LW-5	12/04/99	12/04/99	jpp	<0.72	<0.72	0	---	---	ug		
Container # 5	5LW-5	12/04/99	12/04/99	jpp	4.84	4.85	0.2	---	---	ug		

Particle Bound Hg (ug) **0.580**
(Containers 1A, 1B, and 2)

Oxidized Hg (ug) **0.00**
(Containers 3)

Elemental Hg (ug) **4.84**
(Containers 4 and 5)

Total Hg (ug) **5.42**
(Containers 1A, 1B, 2, 3, 4, and 5)

Dup. Part. Bound Hg (ug) **0.585**
(Containers 1A, 1B, and 2)

Dup. Oxidized Hg (ug) **0.00**
(Containers 3)

Dup. Elemental Hg (ug) **4.85**
(Containers 4 and 5)

Dup. Total Hg (ug) **5.44**
(Containers 1A, 1B, 2, 3, 4, and 5)

Notes:

3601 SOUTH DIXIE DRIVE / DAYTON, OH 45439 / 937-294-6856 / FAX: 937-294-7816

TestAmerica
INCORPORATED

Sample ID: **Western Resources Inc.**
Lawrence Energy Center
Lawrence, Kansas
Unit 4 South Scrubber Inlet Duct Run 4

Hg Analysis
Ontario Hydro Method

Collected On: 10/26/99
Collected By: METCO

Container # 1A - Main Filter
Container # 1B - Backup Filter
Container # 2 - 0.1 N HNO3 Rinse
Container # 3 - KCl Impingers (1,2,3)/10 %HNO3 Rinse
Container # 4 - HNO3/H2O2 Impinger (4)/0.1 N HNO3 Rinse
Container # 5 - H2SO4/KMnO4 Impinger (5,6,7)/0.1 N HNO3 Rinse

	ID	Digestion Date	Analysis Date	Analyst	Results	Duplicate Result	RPD	Triplicate Result	RPD	Units	Flags	Notes
Container # 1A	Q66	12/07/99	12/07/99	jpp	0.250	0.250	0	0.252	0.6	ug		
Container # 1B	47Q81	12/07/99	12/07/99	jpp	<0.01	<0.01	0	---	---	ug		
Container # 2	2LW-7	12/03/99	12/06/99	jpp	<0.22	<0.22	0	---	---	ug		
Container # 3	3LW-7	12/03/99	12/06/99	jpp	<1.50	<1.50	0	---	---	ug		
Container # 4	4LW-7	12/04/99	12/04/99	jpp	<0.74	<0.74	0	---	---	ug		
Container # 5	5LW-7	12/04/99	12/04/99	jpp	5.15	5.20	1.0	---	---	ug		

Particle Bound Hg (ug) **0.250**
(Containers 1A, 1B, and 2)

Oxidized Hg (ug) **0.00**
(Containers 3)

Elemental Hg (ug) **5.15**
(Containers 4 and 5)

Total Hg (ug) **5.40**
(Containers 1A, 1B, 2, 3, 4, and 5)

Dup. Part. Bound Hg (ug) **0.250**
(Containers 1A, 1B, and 2)

Dup. Oxidized Hg (ug) **0.00**
(Containers 3)

Dup. Elemental Hg (ug) **5.20**
(Containers 4 and 5)

Dup. Total Hg (ug) **5.45**
(Containers 1A, 1B, 2, 3, 4, and 5)

Notes:

3601 SOUTH DIXIE DRIVE / DAYTON, OH 45439 / 937-294-6856 / FAX: 937-294-7816

TestAmerica
INCORPORATED

Sample ID: **Western Resources Inc.**
Lawrence Energy Center
Lawrence, Kansas
Unit 4 South Stack Blank Train

Hg Analysis
Ontario Hydro Method

Collected On: 10/26/99
Collected By: METCO

Container # 1A - Main Filter
Container # 1B - Backup Filter
Container # 2 - 0.1 N HNO3 Rinse
Container # 3 - KCl Impingers (1,2,3)/10 %HNO3 Rinse
Container # 4 - HNO3/H2O2 Impinger (4)/0.1 N HNO3 Rinse
Container # 5 - H2SO4/KMnO4 Impinger (5,6,7)/0.1 N HNO3 Rinse

	ID	Digestion Date	Analysis Date	Analyst	Results	Duplicate Result	RPD	Triplicate Result	RPD	Units	Flags	Notes
Container # 1A		Not Provided		jpp	---	---	---	---	---	ug		
Container # 1B		Not Provided		jpp	---	---	---	---	---	ug		
Container # 2		Not Provided		jpp	---	---	---	---	---	ug		
Container # 3	3LW-2	12/03/99	12/06/99	jpp	<0.86	<0.86	0	---	---	ug		
Container # 4	4LW-2	12/04/99	12/04/99	jpp	<0.68	<0.68	0	---	---	ug		
Container # 5	5LW-2	12/04/99	12/04/99	jpp	<0.92	<0.92	0	---	---	ug		

Particle Bound Hg (ug) **0.00**
(Containers 1A, 1B, and 2)

Oxidized Hg (ug) **0.00**
(Containers 3)

Elemental Hg (ug) **0.00**
(Containers 4 and 5)

Total Hg (ug) **0.0**
(Containers 1A, 1B, 2, 3, 4, and 5)

Dup. Part. Bound Hg (ug) **0.00**
(Containers 1A, 1B, and 2)

Dup. Oxidized Hg (ug) **0.00**
(Containers 3)

Dup. Elemental Hg (ug) **0.00**
(Containers 4 and 5)

Dup. Total Hg (ug) **0.0**
(Containers 1A, 1B, 2, 3, 4, and 5)

Notes:

TestAmerica
INCORPORATED

Sample ID: **Western Resources Inc.**
Lawrence Energy Center
Lawrence, Kansas
Unit 4 South Scrubber Inlet Duct Blank Train

Hg Analysis
Ontario Hydro Method

Collected On: 10/26/99
Collected By: METCO

Container # 1A - Main Filter
Container # 1B - Backup Filter
Container # 2 - 0.1 N HNO3 Rinse
Container # 3 - KCl Impingers (1,2,3)/10 %HNO3 Rinse
Container # 4 - HNO3/H2O2 Impinger (4)/0.1 N HNO3 Rinse
Container # 5 - H2SO4/KMnO4 Impinger (5,6,7)/0.1 N HNO3 Rinse

	ID	Digestion Date	Analysis Date	Analyst	Results	Duplicate Result	RPD	Triplicate Result	RPD	Units	Flags	Notes
Container # 1A		Not Provided		jpp	---	---	---	---	---	ug		
Container # 1B		Not Provided		jpp	---	---	---	---	---	ug		
Container # 2		Not Provided		jpp	---	---	---	---	---	ug		
Container # 3	3LW-1	12/03/99	12/06/99	jpp	<0.89	<0.89	0	---	---	ug		
Container # 4	4LW-1	12/04/99	12/04/99	jpp	<0.60	<0.60	0	---	---	ug		
Container # 5	5LW-1	12/04/99	12/04/99	jpp	<0.96	<0.96	0	---	---	ug		

Particle Bound Hg (ug) **0.00**
(Containers 1A, 1B, and 2)

Oxidized Hg (ug) **0.00**
(Containers 3)

Elemental Hg (ug) **0.00**
(Containers 4 and 5)

Total Hg (ug) **0.0**
(Containers 1A, 1B, 2, 3, 4, and 5)

Dup. Part. Bound Hg (ug) **0.00**
(Containers 1A, 1B, and 2)

Dup. Oxidized Hg (ug) **0.00**
(Containers 3)

Dup. Elemental Hg (ug) **0.00**
(Containers 4 and 5)

Dup. Total Hg (ug) **0.0**
(Containers 1A, 1B, 2, 3, 4, and 5)

Notes:

3601 SOUTH DIXIE DRIVE / DAYTON, OH 45439 / 937-294-6856 / FAX: 937-294-7816

TestAmerica
INCORPORATED

Sample ID: **Western Resources Inc.**
Lawrence Energy Center
Lawrence, Kansas
Reagent Blanks

Hg Analysis
Ontario Hydro Method

Collected On: 10/26/99
Collected By: METCO

Container # 7 - 0.1 N HNO_3 Blank
Container # 8 - 1 N KCl Blank
Container # 9 - 5 % HNO_3/10 % H_2O_2 Blank
Container # 10 - H_2SO_4-/$KMnO_4$ Blank
Container # 11 - 10 % Hydroxylamine Sulfate/Sodium Chloride Blank
Container # 12 Filter Blank

	ID	Digestion Date	Analysis Date	Analyst	Results	Duplicate Result	RPD	Triplicate Result	RPD	Units	Flags	Notes
Container # 7	RBLW-7	---	12/04/99	jpp	<0.2	<0.2	0	---	---	ug/L		
Container # 8	RBLW-8	12/03/99	12/06/99	jpp	<2.0	<2.0	0	---	---	ug/L		
Container # 9	RBLW-9	12/04/99	12/04/99	jpp	<4.0	<4.0	0	---	---	ug/L		
Container # 10	RBLW-10	12/04/99	12/04/99	jpp	<2.0	<2.0	0	---	---	ug/L		
Container # 11	RBLW-11	---	12/04/99	jpp	<0.2	<0.2	0	---	---	ug/L		
Container # 12A	QH49	12/07/99	12/07/99	jpp	<0.01	<0.01	0	---	---	ug	*1	88 mm
Container # 12B	Q82	12/07/99	12/08/99	jpp	<0.01	<0.01	0	---	---	ug	*1	47 mm

Notes: *1 It was not neceassy to analyze a thimble blank as only the particulate matter was digested.

Mercury Sample Train Receipt Records

Mercury Sample Train Receipt Record

Client ID
WESTERN RESOURCES, INC.
LAWRENCE ENERGY CENTER
LAWRENCE, KS

Location ID/Run #
UNIT 4
SOUTH STACK
RUN #1

Solutions:

Cont. ID/(#)	Volumes (mL)	TestAmerica ID(s)	Comments
☒ 2 (1)	133 + — + — = 133.	2LW-4	
☒ 3 (2)	459 + 241 + — = 700.	3LW-4A+B	
☒ 4 (1)	175 + — + — = 175.	4LW-4	
☒ 5 (1)	481 + — + — = 481.	5LW-~~4~~4	
☐ 7 ( )	___ + ___ + ___ = ___.		
☐ 8 ( )	___ + ___ + ___ = ___.		
☐ 9 ( )	___ + ___ + ___ = ___.		
☐ 10 ( )	___ + ___ + ___ = ___.		
☐ 11 ( )	___ + ___ + ___ = ___.		

Filters:

Cont. ID/(#)	Filter ID(s)		
☐ 1A ( )			
☐ 1B ( )			
☐ 12A ( )			
☒ 12B (1)	FILTER 88 QH43		

12/20 JMC

Notes:

Checked By: SGS/

Date:

TestAmerica

Mercury Sample Train Receipt Record

Client ID
WESTERN RESOURCES, INC.
LAWRENCE ENERGY CENTER
LAWRENCE, KS

Location ID/Run #
UNIT 4
SOUTH STACK
RUN # 2

Solutions:

Cont. ID/(#)	Volumes (mL)	TestAmerica ID(s)	Comments
☒ 2 (1)	212 + — + — = 212.	2LW-6	
☒ 3 (2)	448 + 280 + — = 728.	3LW-6A+B	
☒ 4 (1)	164 + — + — = 164.	4LW-6	
☒ 5 (1)	506 + — + — = 506.	5LW-6	
☐ 7 ( )	___ + ___ + ___ = ___.		
☐ 8 ( )	___ + ___ + ___ = ___.		
☐ 9 ( )	___ + ___ + ___ = ___.		
☐ 10 ( )	___ + ___ + ___ = ___.		
☐ 11 ( )	___ + ___ + ___ = ___.		

Filters:

Cont. ID/(#)	Filter ID(s)		
☐ 1A ( )			
☐ 1B ( )			
☐ 12A ( )			
☒ 12B (1)	FILTER 88 QH44		

JBP 1/4/2

Notes:

Checked By: SGS

Date:

TestAmerica

Mercury Sample Train Receipt Record

Client ID
WESTERN RESOURCES, INC.
LAWRENCE ENERGY CENTER
LAWRENCE, KS

Location ID/Run #
UNIT 4
SOUTH STACK
RUN #4

Solutions:

Cont. ID/(#)	Volumes (mL)	TestAmerica ID(s)	Comments
☒ 2 (1)	183 + — + — = 183.	2LW-8	
☒ 3 (2)	379 + 371 + — = 750.	3LW-8A+B	
☒ 4 (1)	182 + — + — = 182.	4LW-8	
☒ 5 (1)	495 + — + — = 495.	5LW-8	
☐ 7 ( )	___ + ___ + ___ = ___.		
☐ 8 ( )	___ + ___ + ___ = ___.		
☐ 9 ( )	___ + ___ + ___ = ___.		
☐ 10 ( )	___ + ___ + ___ = ___.		
☐ 11 ( )	___ + ___ + ___ = ___.		

Filters:

Cont. ID/(#)	Filter ID(s)		
☐ 1A ( )			
☐ 1B ( )			
☐ 12A ( )			
☒ 12B (1)	FILTER 88 QH46		

JDP 12/4/

Notes:

Checked By: SGJ

Date:

TestAmerica

Mercury Sample Train Receipt Record

Client ID
WESTERN RESOURCES, INC.
LAWRENCE ENERGY CENTER
LAWRENCE, KS

Location ID/Run #
UNIT 4
SOUTH SCRUBBER INLET DUCT
RUN #1

Solutions:

Cont. ID/(#)	Volumes (mL)	TestAmerica ID(s)	Comments
☒ 2 (1)	75 + — + — = 75.	2LW-3	
☒ 3 (2)	493 + 272 + — = 765.	3LW-3A+B	
☒ 4 (1)	179 + — + — = 179.	4LW-3	
☒ 5 (1)	475 + — + — = 475.	5LW-3	
☐ 7 ( )	___ + ___ + ___ = ___.		
☐ 8 ( )	___ + ___ + ___ = ___.		
☐ 9 ( )	___ + ___ + ___ = ___.		
☐ 10 ( )	___ + ___ + ___ = ___.		
☐ 11 ( )	___ + ___ + ___ = ___.		

Filters:

Cont. ID/(#)	Filter ID(s)		
☐ 1A ( )			
☐ 1B ( )			
☒ 12A (1) THIMBLE	Q63		
☒ 12B (1) Filter	Q74		

JAM 12/20

Notes:

Checked By: SGS/

Date:

TestAmerica

Mercury Sample Train Receipt Record

Client ID
~~LAW~~ WESTERN RESOURCES, INC.
LAWRENCE ENERGY CENTER
LAWRENCE, KS

Location ID/Run #
UNIT 4
SOUTH SCRUBBER INLET DUCT
RUN # 2

Solutions:

Cont. ID/(#)	Volumes (mL)	TestAmerica ID(s)	Comments
☒ 2 (1)	96 + — + — = 96.	2LW-5	
☒ 3 (2)	452 + 247 + — = 699.	3LW-5A+B	
☒ 4 (1)	180 + — + — = 180.	4LW-5	
☒ 5 (1)	498 + — + — = 498.	5LW-5	
☐ 7 ( )	___ + ___ + ___ = ___.		
☐ 8 ( )	___ + ___ + ___ = ___.		
☐ 9 ( )	___ + ___ + ___ = ___.		
☐ 10 ( )	___ + ___ + ___ = ___.		
☐ 11 ( )	___ + ___ + ___ = ___.		

Filters:

Cont. ID/(#)	Filter ID(s)		
☐ 1A ( )			
☐ 1B ( )			
☒ 12A (1) THIMBLE	Q64		
☒ 12B (1) Filter	Q75		

JAD 12/10

Notes:

Checked By: SGS/

Date:

TestAmerica

Mercury Sample Train Receipt Record

Client ID
WESTERN RESOURCES, INC.
LAWRENCE ENERGY CENTER
LAWRENCE, KS

Location ID/Run #
UNIT 4
SOUTH SCRUBBER INLET DUCT
RUN #4

Solutions:

Cont. ID/(#)	Volumes (mL)	TestAmerica ID(s)	Comments
☒ 2 (1)	110 + — + — = 110.	2LW-7	
☒ 3 (2)	502 + 248 + — = 750.	3LW-7A+B	
☒ 4 (1)	184 + — + — = 184.	4LW-7	
☒ 5 (1)	495 + — + — = 495.	5LW-7	
☐ 7 ( )	___ + ___ + ___ = ___.		
☐ 8 ( )	___ + ___ + ___ = ___.		
☐ 9 ( )	___ + ___ + ___ = ___.		
☐ 10 ( )	___ + ___ + ___ = ___.		
☐ 11 ( )	___ + ___ + ___ = ___.		

Filters:

Cont. ID/(#)	Filter ID(s)		
☐ 1A ( )			
☐ 1B ( )			
☒ 12A (1) THIMBLE	Q66		
☒ 12B (1) FILTER	47281		

JDD 12/20

Notes:

Checked By: SGS

Date:

TestAmerica

Mercury Sample Train Receipt Record

Client ID
WESTERN RESOURCES, INC.
LAWRENCE ENERGY CENTER
LAWRENCE, KS

Location ID/Run #
UNIT 4
SOUTH STACK

BLANK TRAIN

Solutions:

Cont. ID/(#)	Volumes (mL)	TestAmerica ID(s)	Comments
☐ 2 ( )	___ + ___ + ___ = ___.		
☒ 3 (1)	480 + — + — = 480.	3LW-2	
☒ 4 (1)	168 + — + — = 168.	4LW-2	
☒ 5 (1)	458 + — + — = 458.	5LW-2	
☐ 7 ( )	___ + ___ + ___ = ___.		
☐ 8 ( )	___ + ___ + ___ = ___.		
☐ 9 ( )	___ + ___ + ___ = ___.		
☐ 10 ( )	___ + ___ + ___ = ___.		
☐ 11 ( )	___ + ___ + ___ = ___.		

Filters:

Cont. ID/(#)	Filter ID(s)		
☐ 1A ( )			
☐ 1B ( )			
☐ 12A ( )			
☐ 12B ( )			

Notes: _____

Checked By: SGS/

Date: _____

TestAmerica

Mercury Sample Train Receipt Record

Client ID
WESTERN RESOURCES INC.
LAWRENCE ENERGY CENTER
LAWRENCE, KS

Location ID/Run #
UNIT 4
SOUTH SCRUBBER INLET DUCT
BLANK TRAIN

Solutions:

Cont. ID/(#)	Volumes (mL)	TestAmerica ID(s)	Comments
☐ 2 ( )	~~444~~ + — + — = ~~444~~.		
☒ 3 (1)	444 + — + — = 444.	3LW-1	
☒ 4 (1)	150 + — + — = 150.	4LW-1	
☒ 5 (1)	481 + — + — = 481.	5LW-1	
☐ 7 ( )	___ + ___ + ___ = ___.		
☐ 8 ( )	___ + ___ + ___ = ___.		
☐ 9 ( )	___ + ___ + ___ = ___.		
☐ 10 ( )	___ + ___ + ___ = ___.		
☐ 11 ( )	___ + ___ + ___ = ___.		

Filters:

Cont. ID/(#)	Filter ID(s)		
☐ 1A ( )			
☐ 1B ( )			
☐ 12A ( )			
☐ 12B ( )			

Notes:

Checked By: SGS

Date:

TestAmerica

Mercury Sample Train Receipt Record

Client ID
WESTERN RESOURCES, INC.
LAWRENCE ENERGY CENTER
LAWRENCE, KS

Location ID/Run #
REAGENT BLANKS

Solutions:

Cont. ID/(#)	Volumes (mL)	TestAmerica ID(s)	Comments
☐ 2 ( )	___ + ___ + ___ = ___.		
☐ 3 ( )	___ + ___ + ___ = ___.		
☐ 4 ( )	___ + ___ + ___ = ___.		
☐ 5 ( )	___ + ___ + ___ = ___.		
☒ 7 (1)	50 + – + – = 50.	RBLW-7	
☒ 8 (1)	50 + – + – = 50.	RBLW-8	
☒ 9 (1)	49 + – + – = 49.	RBLW-9	
☒ 10 (1)	47 + – + – = 47.	RBLW-10	
☒ 11 (1)	101 + – + – = 101.	RBLW-11	

Filters:

Cont. ID/(#)	Filter ID(s)		
☐ 1A ( )			
☐ 1B ( )			
☒ 12A (3) THIMBLES	Q69, Q68, Q67		
☒ 12B (6) FILTERS	QH48, QH47, QH49 Q82, Q83, Q84		

Notes: _____

Checked By: SGS

Date: _____

TestAmerica

Sample Preparation Batch Sheets

AQUEOUS MERCURY BATCH SHEET

analyst: SGS/JPP date: 12-3-99 WATER BATH: start mid end

temp: 95°F 95°F

standard reference #: _____

time: 2000 2102

icv reference #: _____

sample # / client	prep info
BLANK	
MS	
MSD	
2LW-3 TRP 75	
2LW-4 SPK 135	
2LW-5 96	
2LW-6 215	
2LW-7 110	
2LW-8 135	
3LW-1 445	
3LW-2 430	
3LW-3 A+B 765	
3LW-4 A+B TRP 700	
3LW-5 A+B SPK 700	
3LW-6 A+B 730	
3LW-7 A+B 750	
3LW-8 A+B 750	
RBLW-8 50	

MB	ICV

MS	MSD

RPD	FLAG

SECONDARY DATA CHECK:

ANALYST:

DATE:

comments: H_2SO_4 = 65-38-9 / HNO_3 = 65-41-8 / $KMnO_4$ = 65-42-10 / $K_2S_2O_8$ = 65-48-12

AQUEOUS MERCURY BATCH SHEET

analyst: SGS/JPP date: 12-4-99 WATER BATH: start mid end

temp:

standard reference #: 65-41-17

time:

icv reference #: 65-41-18

sample # / client	prep info
BLANK	2.5mL
MS	
MSD	
4LW-1 150	
4LW-2 TRP 170	
4LW-3 SPK 180	
4LW-4 175	
4LW-5 180	
4LW-6 165	
4LW-7 185	
4LW-8 180	
DBLW-9 49	

MB	ICV

MS	MSD

RPD	FLAG

SECONDARY DATA CHECK:

ANALYST:

DATE:

comments: HCl = 65-35-4 / $KMnO_4$ = 65-42-10 / Hydrox. HCl = 65-41-3 / $SnCl_2$ 65-43-19

AQUEOUS MERCURY BATCH SHEET

analyst: SGS date: 12-4-99 WATER BATH: start mid end

temp:

standard reference #: 65-41-17

time:

icv reference #: 65-41-18

sample # / client		prep info
BLANK		5.0 mL
MS		
MSD		
SLW-1	480	
SLW-2 TRP	460	
SLW-3 ~~BULSPK~~	475	
SLW-4	480	
SLW-5	500	
SLW-6	505	
SLW-7	495	
SLW-8	495	
ICBLW-10	47	
ICBLW-7		
ICBLW-11		

MB	ICV

MS	MSD

RPD	FLAG

SECONDARY DATA CHECK:

ANALYST:

DATE:

comments: Hydrox. HCl = 65-50-11 /

SnCl2 65-43-19

(11) WRI Lawrence, KS
(10) SHAWNEE PADUCAH, KY

FILTERS

NONAQUEOUS MERCURY BATCH SHEET

weigh: 12/6/99

Analyst: BBP Date: Run: 12/7/99 Prep: 12/7/99 Water Bath: start mid end

Standard Reference: 65-4717 temp:

ICV Reference: 65-41-18 date:

AS pos.	Sample # / Client	Weight	MS	MSD
12	BLANK			
11	NIST 1633 b	0.5170	96.71	
10	Q63 TRP (Lawrence)	0.5240		
9	Q74 SPK			
8	88Q H43			
7	Q64	0.5494		
6	Q75			
5	88Q H44			
4	Q66 TRP	0.5126		
3	47Q81 SPK			
2	88Q H46 ~~TRP~~			
1	QH 49 ~~SPK~~			

MB

ICV

MS

MSD

RPD

FLAG

HCl-65-44-10
HNO_3-65-44-15
HF-653777
Boric Acid 6545-2
$SnCl_2$-65-45-3

SECONDARY DATA CHECK: analyst:
date:

Comments:

LAWRENCE, KS
PADUCAH, KY FILTERS

NONAQUEOUS MERCURY BATCH SHEET

weigh: 12/6/99

Analyst: DRP Date: RUN: 12/8/99 Water Bath: start mid end

Prep: 12/7/99

Standard Reference: 65-41-17 temp:

ICV Reference: 65-41-18 date:

Crucible #	Sample # / Client	Weight	MS	MSD
12	NIST 1633b	0.5167	96.77	
11	~~47Q82~~ (Lawrence)			
10	Q70 (Paducah)	0.5116		MB
9	~~47Q86~~ TRP			
8	47Q85 spk			
7	Q71	0.5260		
6	47Q88			ICV
5	47Q89			
4	Q72	0.5265		
3	47Q90			
2	47Q87 TRP			MS
1	Q91 spk			
				MSD
				RPD
				FLAG

HCl-65-44-10
HNO_3-65-44-15
HF 65-37-17
BORIC ACID-65-45-2
$SnCl_2$-65-45-10

SECONDARY DATA CHECK: analyst:
date:

Comments:

12/4/99 Analytical Run

```
Protocol: SYSTEST
                    Rev: 3.001   Time: 13:18:56  04 Dec 1999
Folder: DEC99A      Seq: 392                     Print: On
User:   --          Batch:_          Id: lw4_blk    Cup: 1 01 Gas:    0.23 LPM
State: Idle                                         Xmit: Off Autosampler: On

AUTOSAMPLER:  Rack entry   Rack 120499a
Cup Id          Extended id          Weight Volume Macro check Help
 1 icb                               1.00000 1.00000
 2 lw4 blk                           1.00000 1.00000
 3 lw4blkcup                         1.00000 1.00000
 4 4lw 1                             1.00000 1.00000
 5 4lw 1 dup                         1.00000 1.00000
 6 4lw 2                             1.00000 1.00000
 7 4lw 2 cup                         1.00000 1.00000
 8 4lw 2 trp                         1.00000 1.00000
 9 4lw 3                             1.00000 1.00000
10 4lw 3 dup                         1.00000 1.00000
11 4lw 3 spk                         1.00000 1.00000
12 4lw 4                             1.00000 1.00000
13 4lw 4 dup                         1.00000 1.00000
14 4lw 5                             1.00000 1.00000
15 4lw 5 dup                         1.00000 1.00000
                                                                          PgDn

Cup 1  ID: icb                                  Cell entry, Ins to switch
                                                              201 9  12
```

```
Protocol: SYSTEST
                        Rev: 3.001   Time: 13:19:41  04 Dec 1999
Folder: DEC99A          Seq: 392                     Print: On
User:   --              Batch: _          Id: lw4_blk    Cup: 1 01 Gas:    0.23 LPM
State: Idle                                              Xmit: Off Autosampler: On

AUTOSAMPLER:  Rack entry   Rack 120499a                                        PgUp
Cup Id          Extended id          Weight Volume Macro check Help
16 4lw 6                             1.00000 1.00000
17 4lw 6 dup                         1.00000 1.00000
18 4lw 7                             1.00000 1.00000
19 4lw 7 dup                         1.00000 1.00000
20 4lw 8                             1.00000 1.00000
21 4lw 8 dup                         1.00000 1.00000
22 ccb                               1.00000 1.00000
23 ccv                               1.00000 1.00000
24 rblw 9                            1.00000 1.00000
25 rblw 9 dup                        1.00000 1.00000
26 lw5 blk                           1.00000 1.00000
27 lw5blkdup                         1.00000 1.00000
28 5lw 1                             1.00000 1.00000
29 5lw 1 dup                         1.00000 1.00000
30 5lw 2                             1.00000 1.00000
                                                                               PgDn
Cup 16 ID: 4lw 6                          Cell entry, Ins to switch
                                                              201 9  12
```

```
Protocol: SYSTEST
                        Rev: 3.001   Time: 13:19:43  04 Dec 1999
Folder: DED99A          Seq: 392                     Print: On
User:    --             Batch: _          Id: lw4_blk    Cup: 1 01 Gas:    0.23 LPM
State: Idle                                             Xmit: Off Autosampler: On
```

```
AUTOSAMPLER:  Rack entry   Rack 120499a                                        PgUp
Cup Id        Extended id          Weight Volume Macro check Help
31 Slw 2 cup                       1.00000 1.00000
32 Slw 2 trp                       1.00000 1.00000
33 Slw 3 probemissed cup 1st sample 1.00000 1.00000
34 Slw 3 cup                       1.00000 1.00000
35 Slw 3 spk                       1.00000 1.00000
36 Slw 4                           1.00000 1.00000
37 Slw 4 cup                       1.00000 1.00000
38 Slw 5                           1.00000 1.00000
39 Slw 5 cup                       1.00000 1.00000
40 Slw 6                           1.00000 1.00000
41 Slw 6 cup                       1.00000 1.00000
42 Slw 7                           1.00000 1.00000
43 Slw 7 cup                       1.00000 1.00000
44 Slw 8                           1.00000 1.00000

                                                                               PgDn
```

```
Cup 31 ID: Slw 2 cup                          Cell entry, Ins to switch
                                                              201 9  12
```

```
Protocol: SYSTEST
                        Rev: 3.001   Time: 15:36:26  04 Dec 1999
Folder: DEC99A          Seq: 440                    Print: On
User:                   Batch:          Id: 5lw 8     Cup: 1 44 Gas:    0.23 LPM
State: Idle                                          Xmit: Off Autosampler: On

AUTOSAMPLER:  Rack entry   Rack 120499a
cup Id          Extended id          Weight Volume Macro check Help
 1 5lw 8 dup                         1.0000 1.0000
 2 ccb                               1.0000 1.0000
 3 ccv                               1.0000 1.0000
 4 rblw 10                           1.0000 1.0000
 5 rblw10dup                         1.0000 1.0000
 6 rblw 7                            1.0000 1.0000
 7 rblw 7 dup                        1.0000 1.0000
 8 rblw 11                           1.0000 1.0000
 9 rblw11dup                         1.0000 1.0000
10 pd4 blk                           1.0000 1.0000
11 pd4blkdup                         1.0000 1.0000
12 4pd 1                             1.0000 1.0000
13 4pd 1 dup                         1.0000 1.0000
14 4pd 2                             1.0000 1.0000
15 4pd 2 dup                         1.0000 1.0000
                                                                          PgDn

Cup 1  ID: 5lw 8 dup                          Cell entry, Ins to switch
                                                                149 9  12
```

```
Protocol: SYSTEST
                    Rev: 3.001   Time: 15:36:30  04 Dec 1999
Folder: DEC99A      Seq: 440                    Print: On
User:               Batch:          Id: 5lw 8   Cup: 1 44 Gas:   0.23 LPM
State: Idle                                     Xmit: Off Autosampler: On

AUTOSAMPLER:  Rack entry   Rack 120499a                                PgUp
cup Id          Extended id          Weight Volume Macro check Help
16 4pd 2 trp                         1.0000 1.0000
17 4pd 3                             1.0000 1.0000
18 4pd 3 dup                         1.0000 1.0000
19 4pd 3 spk                         1.0000 1.0000
20 4pd 4                             1.0000 1.0000
21 4pd 4 dup                         1.0000 1.0000
22 4pd 5                             1.0000 1.0000
23 4pd 5 dup                         1.0000 1.0000
24 4pd 6                             1.0000 1.0000
25 4pd 6 dup                         1.0000 1.0000
26 ccb                               1.0000 1.0000
27 ccv                               1.0000 1.0000
28 4pd 7                             1.0000 1.0000
29 4pd 7 dup                         1.0000 1.0000
30 4pd 7 trp                         1.0000 1.0000
                                                                      PgDn

Cup 16 ID: 4pd 2 trp                 Cell entry, Ins to switch
                                                        149 9  12
```

*** Standard: 1 Rep: 1 Seq: 384 12:44:41 04 Dec 1999 HG

Hg .000 ug/L 107
Ave. Int. = 107 S. D. = 0

*** Standard: 2 Rep: 1 Seq: 385 12:47:03 04 Dec 1999 HG

Hg .200 ug/L 8258
Ave. Int. = 8258 S. D. = 0

*** Standard: 3 Rep: 1 Seq: 386 12:49:25 04 Dec 1999 HG

Hg .500 ug/L 20040
Ave. Int. = 20040 S. D. = 0

*** Standard: 4 Rep: 1 Seq: 387 12:51:48 04 Dec 1999 HG

Hg 1.00 ug/L 39816
Ave. Int. = 39816 S. D. = 0

*** Standard: 5 Rep: 1 Seq: 388 12:54:12 04 Dec 1999 HG

Hg 2.00 ug/L 79699
Ave. Int. = 79699 S. D. = 0

*** Standard: 6 Rep: 1 Seq: 389 12:58:23 04 Dec 1999 HG

Hg 3.00 ug/L 116274
Ave. Int. = 116274 S. D. = 0

Protocol: SYSTEST

Rev: 3.001 Time: 12:58:45 04 Dec 1999

Folder: DEC99A Seq: 390 Print: On

User: Batch: Id: Std6Rep1 Cup: 1 29 Gas: 0.23 LPM

State: Idle Xmit: Off Autosampler: On

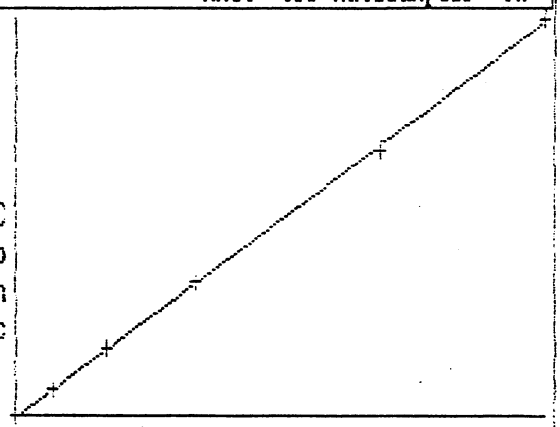
CALIBRATION: Line Calibration

Line: Hg

	Conc.	Calc.	Dev.	Accepted LiNear	
S1	.000	-.013	-.013	Quadratic	
S2	.200	.197	-.003	WtdLinear	
S3	.500	.500	-.000		C
S4	1.00	1.01	.000	Accept	o
S5	2.00	2.03	.034		n
S6	3.00	2.97	-.026	StdAdd	c

A .0000000 r .999850

B 2.57141e-5 C -1.55846e-2



Relative Absorbance

	Mean	%RSD	
S1	107	0	107
S2	8258	0	8258
S3	20040	0	20040
S4	39816	0	39816
S5	79699	0	79699
S6	116274	0	116274

33?

New calibration coefficients stored 149 2 5

Line	Conc.	Units	SD/RSD	1	2	3	4	5

*** Check Standard: 2 Ck2 Seq: 392 13:21:55 04 Dec 1999 HG

Line	Flag	%Rcv.	Found	True	Units	SD/RSD
Hg		107.	.647	.604	ug/L	.000

*** Sample ID: icb Seq: 393 13:24:15 04 Dec 1999 HG

Hg -.021 ug/L .000 -.021 <0.2µg/L

*** Sample ID: lw4 blk Seq: 394 13:26:33 04 Dec 1999 HG

Hg -.008 ug/L .000 -.008 <0.2µg/L

*** Sample ID: lw4blkdup Seq: 395 13:28:51 04 Dec 1999 HG

Hg -.007 ug/L .000 -.007 <0.2µg/L

*** Sample ID: 41w 1 Seq: 396 13:31:09 04 Dec 1999 HG

Hg .002 ug/L .000 .002 <0.60µg

*** Sample ID: 41w 1 dup Seq: 397 13:33:27 04 Dec 1999 HG RPD-NA

Hg -.002 ug/L .000 -.002 <0.60µg

*** Sample ID: 41w 2 Seq: 398 13:35:45 04 Dec 1999 HG

Hg .007 ug/L .000 .007 <0.68µg

*** Sample ID: 41w 2 dup Seq: 399 13:38:03 04 Dec 1999 HG RPD-N/A

Hg .014 ug/L .000 .014 <0.68µg

*** Sample ID: 41w 2 trp Seq: 400 13:40:21 04 Dec 1999 HG RPD-N/A

Hg .009 ug/L .000 .009 <0.68µg

*** Sample ID: 41w 3 Seq: 401 13:42:39 04 Dec 1999 HG

Hg .016 ug/L .000 .016 <0.72µg

*** Sample ID: 41w 3 dup Seq: 402 13:44:58 04 Dec 1999 HG RPD-NA

Hg .018 ug/L .000 .018 <0.72µg

*** Sample ID: 41w 3 spk Seq: 403 13:47:16 04 Dec 1999 HG

Hg 1.08 ug/L .000 1.08 TV=1.0 108%

Line	Conc.	Units	SD/RSD	1	2	3	4	5
*** Sample ID: 41w 4					Seq: 404	13:49:38 04 Dec 1999 HG		
Hg	.008	ug/L	.000	.008			<0.70µg	
*** Sample ID: 41w 4 dup					Seq: 405	13:51:55 04 Dec 1999 HG	RPD-N/A	
Hg	.015	ug/L	.000	.015			<0.70µg	
*** Sample ID: 41w 5					Seq: 406	13:54:13 04 Dec 1999 HG		
Hg	.015	ug/L	.000	.015			<0.72µg	
*** Sample ID: 41w 5 dup					Seq: 407	13:56:31 04 Dec 1999 HG	RPD-N/A	
Hg	.012	ug/L	.000	.012			<0.72µg	
*** Sample ID: 41w 6					Seq: 408	13:58:49 04 Dec 1999 HG		
Hg	.017	ug/L	.000	.017			<0.66µg	
*** Sample ID: 41w 6 dup					Seq: 409	14:01:07 04 Dec 1999 HG	RPD-N/A	
Hg	.019	ug/L	.000	.019			<0.66µg	
*** Sample ID: 41w 7					Seq: 410	14:03:25 04 Dec 1999 HG		
Hg	.020	ug/L	.000	.020			<0.74µg	
*** Sample ID: 41w 7 dup					Seq: 411	14:05:43 04 Dec 1999 HG	RPD-N/A	
Hg	.021	ug/L	.000	.021			<0.74µg	
*** Sample ID: 41w 8					Seq: 412	14:08:01 04 Dec 1999 HG		
Hg	.021	ug/L	.000	.021			<0.72µg	
*** Sample ID: 41w 8 dup					Seq: 413	14:10:19 04 Dec 1999 HG	RPD-N/A	
Hg	.024	ug/L	.000	.024			<0.72µg	
*** Sample ID: ccb					Seq: 414	14:12:37 04 Dec 1999 HG		
Hg	-.021	ug/L	.000	-.021			<0.2µg/L	
*** Sample ID: ccv					Seq: 415	14:14:56 04 Dec 1999 HG		
Hg	2.07	ug/L	.000	2.07		TV=2.00	104%	

Line	Conc.	Units	SD/RSD	1	2	3	4	5
*** Sample ID: rolw 9					Seq: 416	14:17:27 04 Dec 1999 HG		
Hg	-.007	ug/L	.000	-.007			<4.0µg/L	
*** Sample ID: rolw 9 dup					Seq: 417	14:19:46 04 Dec 1999 HG RPD-N/A		
Hg	.004	ug/L	.000	.004			<4.0µg/L	
*** Sample ID: lw5 blk					Seq: 418	14:22:06 04 Dec 1999 HG		
Hg	-.019	ug/L	.000	-.019			<0.20µg/L	
*** Sample ID: lw5blkdup					Seq: 419	14:24:26 04 Dec 1999 HG		
Hg	-.016	ug/L	.000	-.016			<0.20µg/L	
*** Sample ID: 51w 1					Seq: 420	14:26:45 04 Dec 1999 HG		
Hg	-.011	ug/L	.000	-.011			<0.96µg	
*** Sample ID: 51w 1 dup					Seq: 421	14:29:04 04 Dec 1999 HG RPD-N/A		
Hg	-.016	ug/L	.000	-.016			<0.960µg	
*** Sample ID: 51w 2					Seq: 422	14:31:23 04 Dec 1999 HG		
Hg	-.012	ug/L	.000	-.012			<0.92µg	
*** Sample ID: 51w 2 dup					Seq: 423	14:33:42 04 Dec 1999 HG RPD-N/A		
Hg	-.014	ug/L	.000	-.014			<0.92µg	
*** Sample ID: 51w 2 tro					Seq: 424	14:36:01 04 Dec 1999 HG RPD-N/A		
Hg	-.014	ug/L	.000	-.014			<0.92µg	
*** Sample ID: 51w 3					Seq: 425	14:38:21 04 Dec 1999 HG		
Hg	-.015	ug/L	.000	-.015			NO DATA. PROBE NOT IN TUBE RPP 12/10/99	
*** Sample ID: 51w 3 dup					Seq: 426	14:40:42 04 Dec 1999 HG		
Hg	1.18	ug/L	.000	1.18			NO DATA RPP 12/10/99	
*** Sample ID: 51w 3 spk					Seq: 427	14:43:05 04 Dec 1999 HG		
Hg	2.17	ug/L	.000	2.17			NO DATA RPP 12/10/99	

Line	Conc.	Units	SD/RSD	1	2	3	4	5
*** Sample ID: Slw 3					Seq: 428	14:45:59 04 Dec 1999 HG		
Hg	1.13	ug/L	.000	1.13		5.37µg		
*** Sample ID: Slw 3 dup					Seq: 429	14:48:22 04 Dec 1999 HG	RPD=1.75%	
Hg	1.15	ug/L	.000	1.15		5.46µg		
*** Sample ID: Slw 3 spk					Seq: 430	14:50:48 04 Dec 1999 HG		
Hg	2.16	ug/L	.000	2.16		TV=1.00 103%		
*** Sample ID: Slw 4					Seq: 431	14:53:19 04 Dec 1999 HG		
Hg	1.89	ug/L	.000	1.89		9.07µg		
*** Sample ID: Slw 4 dup					Seq: 432	14:55:52 04 Dec 1999 HG	RPD=0.528%	
Hg	1.90	ug/L	.000	1.90		9.12µg		
*** Sample ID: Slw 5					Seq: 433	14:58:22 04 Dec 1999 HG		
Hg	.968	ug/L	.000	.968		4.84µg		
*** Sample ID: Slw 5 dup					Seq: 434	15:00:47 04 Dec 1999 HG	RPD=0.2100%	
Hg	.970	ug/L	.000	.970		4.85µg		
*** Sample ID: Slw 6					Seq: 435	15:03:14 04 Dec 1999 HG		
Hg	1.84	ug/L	.000	1.84		9.29µg		
*** Sample ID: Slw 6 dup					Seq: 436	15:05:45 04 Dec 1999 HG	RPD=0.542%	
Hg	1.85	ug/L	.000	1.85		9.34µg		
*** Sample ID: Slw 7					Seq: 437	15:08:17 04 Dec 1999 HG		
Hg	1.04	ug/L	.000	1.04		5.15µg		
*** Sample ID: Slw 7 dup					Seq: 438	15:10:39 04 Dec 1999 HG	RPD=0.957%	
Hg	1.05	ug/L	.000	1.05		5.20µg		
*** Sample ID: Slw 8					Seq: 439	15:13:05 04 Dec 1999 HG		
Hg	1.83	ug/L	.000	1.83		9.06µg		

*** Sample ID: 5lw 8 dup Seq: 441 15:47:32 04 Dec 1999 HG RPD = 1.65%

Hg 1.80 ug/L .000 1.80 8.9 µg

*** Sample ID: ccb Seq: 442 15:50:00 04 Dec 1999 HG

Hg -.026 ug/L .000 -.026 <0.2 µg/L

*** Sample ID: ccv Seq: 443 15:52:18 04 Dec 1999 HG

TV = 2.00

Hg 2.02 ug/L .000 2.02 101%

*** Sample ID: rblw 10 Seq: 444 15:54:46 04 Dec 1999 HG

Hg -.026 ug/L .000 -.026 <2.0 µg/L

*** Sample ID: rblw10dup Seq: 445 15:57:04 04 Dec 1999 HG RPD-N/A

Hg -.015 ug/L .000 -.015 <2.0 µg/L

*** Sample ID: rblw 7 Seq: 446 15:59:22 04 Dec 1999 HG

Hg -.017 ug/L .000 -.017 <0.2 µg/L ~~<2.0 µg/L~~ DRP 12/10/99

*** Sample ID: rblw 7 dup Seq: 447 16:01:40 04 Dec 1999 HG RPD-N/A

Hg -.017 ug/L .000 -.017 <0.2 µg/L ~~<2.0~~ DRP 12/10/99

*** Sample ID: rblw 11 Seq: 448 16:03:58 04 Dec 1999 HG

Hg -.013 ug/L .000 -.013 <0.20 µg/L

*** Sample ID: rblw11dup Seq: 449 16:06:16 04 Dec 1999 HG RPD-N/A

Hg -.017 ug/L .000 -.017 <0.20 µg/L

*** Sample ID: pd4 blk Seq: 450 16:08:34 04 Dec 1999 HG

Hg -.008 ug/L .000 -.008

*** Sample ID: pd4blkdup Seq: 451 16:10:53 04 Dec 1999 HG

Hg -.005 ug/L .000 -.005

Line	Conc.	Units	SD/RSD	1	2	3	4	5

*** Sample ID: 4pd 1 Seq: 452 16:13:10 04 Dec 1999 HG

Hg .002 ug/L .000 .002

*** Sample ID: 4pd 1 dup Seq: 453 16:15:27 04 Dec 1999 HG

Hg .004 ug/L .000 .004

*** Sample ID: 4pd 2 Seq: 454 16:17:44 04 Dec 1999 HG

Hg .012 ug/L .000 .012

*** Sample ID: 4pd 2 dup Seq: 455 16:20:02 04 Dec 1999 HG

Hg .008 ug/L .000 .008

*** Sample ID: 4pd 2 trp Seq: 456 16:22:20 04 Dec 1999 HG

Hg .010 ug/L .000 .010

NODATA JRP 12/10/99

*** Sample ID: 4pd 3 Seq: 457 16:24:38 04 Dec 1999 HG

Hg .020 ug/L .000 .020

*** Sample ID: 4pd 3 dup Seq: 458 16:26:56 04 Dec 1999 HG

Hg .016 ug/L .000 .016

*** Sample ID: 4pd 3 spk Seq: 459 16:29:14 04 Dec 1999 HG

Hg .915 ug/L .000 .915

*** Sample ID: 4pd 4 Seq: 460 16:31:34 04 Dec 1999 HG

Hg .007 ug/L .000 .007

*** Sample ID: 4pd 4 dup Seq: 461 16:33:52 04 Dec 1999 HG

Hg .014 ug/L .000 .014

*** Sample ID: 4pd 5 Seq: 462 16:36:10 04 Dec 1999 HG

Hg .014 ug/L .000 .014

*** Sample ID: 4pd 5 dup Seq: 463 16:38:28 04 Dec 1999 HG

Hg .012 ug/L .000 .012

Line	Conc.	Units	SD/RSD	1	2	3	4	5

*** Sample ID: 4pd 6 Seq: 464 16:40:47 04 Dec 1999 HG

Hg .013 ug/L .000 .013

JRP

*** Sample ID: 4pd 6 dup Seq: 465 16:43:06 04 Dec 1999 HG

Hg .018 ug/L .000 .018 NODATA 12/10/99 -

*** Sample ID: ccb Seq: 466 16:45:25 04 Dec 1999 HG

Hg -.021 ug/L .000 -.021 <0.2ug/L

*** Sample ID: ccv Seq: 467 16:47:44 04 Dec 1999 HG

Hg 2.02 ug/L .000 2.02 TV=2.00 101%

*** Sample ID: 4pd 7 Seq: 468 16:50:14 04 Dec 1999 HG

Hg -.002 ug/L .000 -.002

*** Sample ID: 4pd 7 dup Seq: 469 16:52:33 04 Dec 1999 HG

Hg .015 ug/L .000 .015

*** Sample ID: 4pd 7 trp Seq: 470 16:54:52 04 Dec 1999 HG

Hg .013 ug/L .000 .013

*** Sample ID: 4pd 8 Seq: 471 16:57:11 04 Dec 1999 HG

Hg .013 ug/L .000 .013 NODATA JRP 12/10/99

*** Sample ID: 4pd 8 dup Seq: 472 16:59:30 04 Dec 1999 HG

Hg .012 ug/L .000 .012

*** Sample ID: 4pd 8 spk Seq: 473 17:01:49 04 Dec 1999 HG

Hg 1.00 ug/L .000 1.00

*** Sample ID: rbpd 9 Seq: 474 17:04:13 04 Dec 1999 HG

Hg -.014 ug/L .000 -.014

*** Sample ID: rbpd 9 dup Seq: 475 17:06:33 04 Dec 1999 HG

Hg -.004 ug/L .000 -.004

12/6/99 Analytical Run

```
Protocol: SYSTEST
                    Rev: 3.001    Time: 13:21:43  06 Dec 1999
Folder: DEC99A      Seq: 512                      Print: On
User:               Batch:              Id: Std6Rep1   Cup: 1 21 Gas:    0.23 LPM
State: Idle                                        Xmit: Off Autosampler: On

AUTOSAMPLER:  Rack entry   Rack 120699a
cup Id          Extended id          Weight Volume Macro check Help
 1 icc                               1.0000 1.0000
 2 lw2blk                            1.0000 1.0000
 3 lw2blkdup                         1.0000 1.0000
 4 2lw 3                             1.0000 1.0000
 5 2lw 3 dup                         1.0000 1.0000
 6 2lw 3 trp                         1.0000 1.0000
 7 2lw 4                             1.0000 1.0000
 8 2lw 4 dup                         1.0000 1.0000
 9 2lw 4 spk                         1.0000 1.0000
10 2lw 5                             1.0000 1.0000
11 2lw 5 dup                         1.0000 1.0000
12 2lw 6                             1.0000 1.0000
13 2lw 6 dup                         1.0000 1.0000
14 2lw 7                             1.0000 1.0000
15 2lw 7 dup                         1.0000 1.0000
                                                                          PgDn

Cup 1  ID: icc                                   Call entry, Ins to switch
                                                                149 %  12
```

```
Protocol: SYSTEST
                    Rev: 3.001   Time: 13:21:4c  06 Dec 1999
Folder: DEC99A      Seq: 312                     Print: On
User:               Batch:            Id: Std&Recl   Cup: 1 21 Gas:    0.22 LPM
State: Idle                                          Emit: Off Autosampler: On
```

```
AUTOSAMPLER:  Rack entry   Rack 120699a                                    PgUp
cup Id          Extended id          Weight Volume Macro check Help
16 21w 8                             1.00000 1.00000
17 21w 8 dup                         1.00000 1.00000
18 31w 1                             1.00000 1.00000
19 31w 1 dup                         1.00000 1.00000
20 31w 2                             1.00000 1.00000
21 31w 2 dup                         1.00000 1.00000
22 31w 3                             1.00000 1.00000
23 31w 3 dup                         1.00000 1.00000
24 ccb                               1.00000 1.00000
25 ccv                               1.00000 1.00000
26 31w 4                             1.00000 1.00000
27 31w 4 dup                         1.00000 1.00000
28 31w 4 trp                         1.00000 1.00000
29 31w 5                             1.00000 1.00000
30 31w 5 dup                         1.00000 1.00000
                                                                           PgDn
```

```
Cup 16 ID: 21w 8                          Call entry, Ins to switch
                                                          149 9  12
```

```
Protocol: SYSTEST
                    Rev: 3.001   Time: 13:24:34  06 Dec 1999
Folder: DEC99A      Seq: 513                    Print: On
User:               Batch:          Id: CK2        Cup: 1 21 Gas:    0.23 LPM
State: Idle                                        Xmit: Off Autosampler: On
```

```
AUTOSAMPLER:  Rack entry   Rack 120699a                                    PgUp
cup Id        Extended id          Weight Volume Macro check Help
31 3lw 5 spk                       1.0000 1.0000
32 3lw 6                           1.0000 1.0000
33 3lw 6 dup                       1.0000 1.0000
34 3lw 7                           1.0000 1.0000
35 3lw 7 dup                       1.0000 1.0000
36 3lw 8                           1.0000 1.0000
37 3lw 8 dup                       1.0000 1.0000
38 rblw 8                          1.0000 1.0000
39 rblw 8 dup                      1.0000 1.0000
40 ccb                             1.0000 1.0000
41 ccv                             1.0000 1.0000
42                                 1.0000 1.0000
43                                 1.0000 1.0000
44                                 1.0000 1.0000

                                                                           PgDn
```

```
Cup 42 ID:                                   Call entry, Ins to switch
                                                          129 9  12
```

*** Standard: 1 Rep: 1 Seq: 506 12:22:58 06 Dec 1999 HG

Hg .000 ug/L -307
Ave. Int. = -307 S. D. = 0

*** Standard: 2 Rep: 1 Seq: 507 12:25:20 06 Dec 1999 HG

Hg .200 ug/L 8015
Ave. Int. = 8015 S. D. = 0

Line	Conc.	Units	SD/RSD	1	2	3	4	5

*** Standard: 3 Rep: 1 Seq: 508 12:27:43 06 Dec 1999 HG

Hg .500 ug/L 19671
Ave. Int. = 19671 S. D. = 0

*** Standard: 4 Rep: 1 Seq: 509 12:30:07 06 Dec 1999 HG

Hg 1.00 ug/L 39586
Ave. Int. = 39586 S. D. = 0

*** Standard: 5 Rep: 1 Seq: 510 12:32:34 06 Dec 1999 HG

Hg 2.00 ug/L 79872
Ave. Int. = 79872 S. D. = 0

*** Standard: 6 Rep: 1 Seq: 511 13:13:17 06 Dec 1999 HG

Hg 3.00 ug/L 112164
Ave. Int. = 112164 S. D. = 0

Protocol: SYSTEST

Rev: 3.001 Time: 13:13:40 06 Dec 1999

Folder: DEC99A Seq: 512 Print: On

User: Batch: Id: Std6Rep1 Cup: 1 21 Gas: 0.23 LPM

State: Idle Xmit: Off Autosampler: On

CALIBRATION: Line Calibration

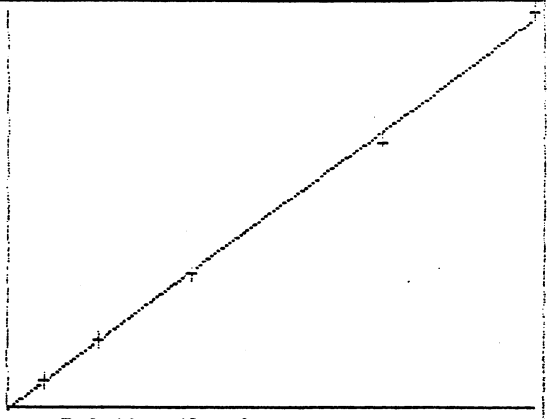
Line: Hg

	Conc.	Calc.	Dev.	Accepted
S1	.000	-.028	-.028	LiNear
S2	.200	.191	-.009	Quadratic
S3	.500	.498	-.002	WtdLinear
S4	1.00	1.02	.022	Accept
S5	2.00	2.08	.083	
S6	3.00	2.93	-.066	StdAdd

Conc

A .0000000 r .999066

B 2.63352e-5 C -2.01423e-2



Relative Absorbance

	Mean	%RSD	
S1	-307	0	-307
S2	8015	0	8015
S3	19671	0	19671
S4	39586	0	39586
S5	79872	0	79872
S6	112164	0	112164

33?

New calibration coefficients stored 149 2 5

Line	Conc.	Units	SD/RSD	1	2	3	4	5

** Check Standard: 2 Ck2 Seq: 512 13:23:14 06 Dec 1999 HG

Line	Flag	%Rcv.	Found	True	Units	SD/RSD
Hg		100.	.607	.604	ug/L	.000

*** Sample ID: icb Seq: 514 13:28:32 06 Dec 1999 HG

Hg -.026 ug/L .000 -.026 <0.0002 mg/L

*** Sample ID: lw2blk Seq: 515 13:30:49 06 Dec 1999 HG

Hg -.013 ug/L .000 -.013 <0.2 µg/L

*** Sample ID: lw2blkdup Seq: 516 13:33:07 06 Dec 1999 HG

Hg -.012 ug/L .000 -.012 <0.2 µg/L

*** Sample ID: 21w 3 Seq: 517 13:35:25 06 Dec 1999 HG

Hg -.005 ug/L .000 -.005 <0.15 µg

*** Sample ID: 21w 3 dup Seq: 518 13:37:43 06 Dec 1999 HG RPD-N/A

Hg -.007 ug/L .000 -.007 <0.15 µg

*** Sample ID: 21w 3 tro Seq: 519 13:40:01 06 Dec 1999 HG RPD-N/A

Hg -.005 ug/L .000 -.005 <0.15 µg

*** Sample ID: 21w 4 Seq: 520 13:42:19 06 Dec 1999 HG

Hg .051 ug/L .000 .051 <0.27 µg

*** Sample ID: 21w 4 dup Seq: 521 13:44:37 06 Dec 1999 HG RPD-N/A

Hg .051 ug/L .000 .051 <0.27 µg

*** Sample ID: 21w 4 spk Seq: 522 13:46:55 06 Dec 1999 HG

Hg .974 ug/L .000 .974 97%

*** Sample ID: 21w 5 Seq: 523 13:49:17 06 Dec 1999 HG

Hg -.012 ug/L .000 -.012 <0.19 µg

*** Sample ID: 21w 5 dup Seq: 524 13:51:35 06 Dec 1999 HG RPD-N/A

Hg -.001 ug/L .000 -.001 <0.19 µg

Folder: DEC99A Page 8I

13:53:52 06 Dec 1999 Protocol: SYSTEST

Line	Conc.	Units	SD/RSD	1	2	3	4	5

*** Sample ID: 21w 6 Seq: 525 13:53:52 06 Dec 1999 HG

Hg .005 ug/L .000 .005 <0.43µg

*** Sample ID: 21w 6 dup Seq: 526 13:56:09 06 Dec 1999 HG RPD-N/A

Hg .004 ug/L .000 .004 <0.43µg

*** Sample ID: 21w 7 Seq: 527 13:58:26 06 Dec 1999 HG

Hg -.007 ug/L .000 -.007 <0.22µg

*** Sample ID: 21w 7 dup Seq: 528 14:00:44 06 Dec 1999 HG RPD-N/A

Hg -.005 ug/L .000 -.005 <0.22µg

*** Sample ID: 21w 8 Seq: 529 14:03:02 06 Dec 1999 HG

Hg .037 ug/L .000 .037 <0.37µg

*** Sample ID: 21w 8 dup Seq: 530 14:05:20 06 Dec 1999 HG RPD-N/A

Hg .038 ug/L .000 .038 <0.37µg

*** Sample ID: 31w 1 Seq: 531 14:07:38 06 Dec 1999 HG

Hg -.011 ug/L .000 -.011 <0.89µg

*** Sample ID: 31w 1 dup Seq: 532 14:09:56 06 Dec 1999 HG RPD-NA

Hg -.009 ug/L .000 -.009 <0.89µg

*** Sample ID: 31w 2 Seq: 533 14:12:14 06 Dec 1999 HG

Hg .010 ug/L .000 .010 <0.86µg

*** Sample ID: 31w 2 dup Seq: 534 14:14:32 06 Dec 1999 HG RPD-N/A

Hg -.007 ug/L .000 -.007 <0.86µg

*** Sample ID: 31w 3 Seq: 535 14:16:50 06 Dec 1999 HG

Hg .233 ug/L .000 .233 1.78µg

*** Sample ID: 31w 3 dup Seq: 536 14:19:08 06 Dec 1999 HG RPD=3.94%

Hg .224 ug/L .000 .224 1.71µg

Line	Conc.	Units	SD/RSD	1	2	3	4	5
*** Sample ID: ccb					Seq: 537	14:21:26 06 Dec 1999 HG		
Hg	-.027	ug/L	.000	-.027			<0.2 µg/L	
*** Sample ID: ccv					Seq: 538	14:23:46 06 Dec 1999 HG		
Hg	1.95	ug/L	.000	1.95			98%	
*** Sample ID: 31w 4					Seq: 539	14:26:16 06 Dec 1999 HG		
Hg	.058	ug/L	.000	.058			<1.4 µg	
*** Sample ID: 31w 4 dup					Seq: 540	14:28:35 06 Dec 1999 HG	RPD-N/A	
Hg	.061	ug/L	.000	.061			<1.4 µg	
*** Sample ID: 31w 4 trp					Seq: 541	14:30:54 06 Dec 1999 HG	RPD-N/A	
Hg	.065	ug/L	.000	.065			<1.4 µg	
*** Sample ID: 31w 5					Seq: 542	14:33:13 06 Dec 1999 HG		
Hg	.141	ug/L	.000	.141			<1.4 µg	
*** Sample ID: 31w 5 dup					Seq: 543	14:35:33 06 Dec 1999 HG	RPD-N/A	
Hg	.141	ug/L	.000	.141			<1.4 µg	
*** Sample ID: 31w 5 spk					Seq: 544	14:37:52 06 Dec 1999 HG		
Hg	1.11	ug/L	.000	1.11			111%	
*** Sample ID: 31w 6					Seq: 545	14:40:17 06 Dec 1999 HG		
Hg	.032	ug/L	.000	.032			<1.46 µg	
*** Sample ID: 31w 6 dup					Seq: 546	14:42:36 06 Dec 1999 HG		
Hg	.038	ug/L	.000	.038			<1.46 µg	
*** Sample ID: 31w 7					Seq: 547	14:44:56 06 Dec 1999 HG		
Hg	.088	ug/L	.000	.088			<1.50 µg	
*** Sample ID: 31w 7 dup					Seq: 548	14:47:17 06 Dec 1999 HG	RPD-N/A	
Hg	.085	ug/L	.000	.085			<1.50 µg	

Line	Conc.	Units	SD/RSD	1	2	3	4	5
*** Sample ID: 3lw 8					Seq: 549	14:49:38 06 Dec 1999 HG		
								<1.50µg
Hg	.045	ug/L	.000	.045				
*** Sample ID: 3lw 8 dup					Seq: 550	14:51:59 06 Dec 1999 HG		RPD-N/A
								<1.50µg
Hg	.045	ug/L	.000	.045				
*** Sample ID: rblw 8					Seq: 551	14:54:21 06 Dec 1999 HG		
								<2.0µg/L
Hg	-.009	ug/L	.000	-.009				
*** Sample ID: rblw 8 dup					Seq: 552	14:56:43 06 Dec 1999 HG		
								<2.0µg/L
Hg	-.010	ug/L	.000	-.010				
*** Sample ID: ccb					Seq: 553	14:59:04 06 Dec 1999 HG		
								<0.2µg/L
Hg	-.022	ug/L	.000	-.022				
*** Sample ID: ccv					Seq: 554	15:01:25 06 Dec 1999 HG		
								97%
Hg	1.94	ug/L	.000	1.94				

12/7/99 Analytical Run

```
Protocol: SYSTEST
                        Rev: 3.001   Time: 19:01:19  07 Dec 1999
Folder: DEC99A          Seq: 685                        Print: On
User:                   Batch:-            Id: Std6Real  Cup: 1 29 Gas:    0.23 LPM
State: Idle                                              Xmit: Off Autosampler: On

AUTOSAMPLER:  Rack entry   Rack 120799b
Cup Id          Extended id          Weight Volume Macro check Help
 1 icb                               1.00000 1.00000
 2 lwclk                             1.00000 1.00000
 3 lwblkdup                          1.00000 1.00000
 4 1633b                             1.00000 1.00000
 5 1633bdup                          1.00000 1.00000
 6 Q63                               1.00000 1.00000
 7 Q63dup                            1.00000 1.00000
 8 Q63trp                            1.00000 1.00000
 9 Q74                               1.00000 1.00000
10 Q74dup                            1.00000 1.00000
11 Q74spk                            1.00000 1.00000
12 S80H43                            1.00000 1.00000
13 S80H43dup                         1.00000 1.00000
14 Q64                               1.00000 1.00000
15 Q64dup                            1.00000 1.00000
                                                                              PgDn

Cup 1  ID: icb                                  Cell entry, Ins to switch
                                                                 149 9  12
```

```
Protocol: SYSTEST
                        Rev: 3.001    Time: 19:01:22  07 Dec 1999
Folder: DEC99A          Seq: 685                          Print: On
User:                   Batch: -            Id: Sta6Rep1  Cup: 1 29 Gas:    0.23 LPM
State: Idle                                               Xmit: Off Autosampler: On
```

```
AUTOSAMPLER:  Rack entry   Rack 120799b                                        PgUp
cup Id          Extended id          Weight Volume Macro check Help
16 Q75                               1.00000 1.00000
17 Q75dup                            1.00000 1.00000
18 88QH44                            1.00000 1.00000
19 88QH44dup                         1.00000 1.00000
20 ccb                               1.00000 1.00000
21 ccv                               1.00000 1.00000
22 Q66                               1.00000 1.00000
23 Q66dup                            1.00000 1.00000
24 Q66trp                            1.00000 1.00000
25 47Q81                             1.00000 1.00000
26 47Q81dup                          1.00000 1.00000
27 47Q81spk                          1.00000 1.00000
28 88QH46                            1.00000 1.00000
29 88QH46dup                         1.00000 1.00000
30 QH49                              1.00000 1.00000
                                                                               PgDn
```

```
Cup 16 ID: Q75                                  Call entry, Ins to switch
                                                                149 9  12
```

```
Protocol: SYSTEST
                    Rev: 3.001   Time: 19:01:25  07 Dec 1999
Folder: DEC99A      Seq: 685                     Print: On
User:               Batch: -          Id: StdGRep1  Cup: 1 29 Gas:    0.23 LPM
State: Idle                                        Xmit: Off Autosampler: On

AUTOSAMPLER:  Rack entry   Rack 120799b                                    PgUp
Cup Id          Extended id          Weight Volume Macro check Help
31 GH49cup                           1.00000 1.00000
32 ccc                               1.00000 1.00000
33 ccv                               1.00000 1.00000
34                                   1.00000 1.00000
35                                   1.00000 1.00000
36                                   1.00000 1.00000
37                                   1.00000 1.00000
38                                   1.00000 1.00000
39                                   1.00000 1.00000
40                                   1.00000 1.00000
41                                   1.00000 1.00000
42                                   1.00000 1.00000
43                                   1.00000 1.00000
44                                   1.00000 1.00000

                                                                          PgDn
Cup 31 ID: GH49cup                          Cell entry, Ins to switch
                                                              149 9  12
```

*** Standard: 1 Rep: 1 Seq: 679 18:40:59 07 Dec 1999 HG

Hg .000 ug/L 97
Ave. Int. = 97 S. D. = 0

*** Standard: 2 Rep: 1 Seq: 680 18:43:21 07 Dec 1999 HG

Hg .200 ug/L 7428
Ave. Int. = 7428 S. D. = 0

*** Standard: 3 Rep: 1 Seq: 681 18:45:43 07 Dec 1999 HG

Hg .500 ug/L 17436
Ave. Int. = 17436 S. D. = 0

Folder: DEC99A Page 99
18:48:07 07 Dec 1999 Protocol: SYSTEST

Line	Conc.	Units	SD/RSD	1	2	3	4	5

*** Standard: 4 Rep: 1 Seq: 682 18:48:07 07 Dec 1999 HG

Hg 1.00 ug/L 34166
Ave. Int. = 34166 S. D. = 0

*** Standard: 5 Rep: 1 Seq: 683 18:50:31 07 Dec 1999 HG

Hg 2.00 ug/L 67744
Ave. Int. = 67744 S. D. = 0

*** Standard: 6 Rep: 1 Seq: 684 18:55:37 07 Dec 1999 HG

Hg 3.00 ug/L 101039
Ave. Int. = 101039 S. D. = 0

Protocol: SYSTEST

Rev: 3.001 Time: 18:55:58 07 Dec 1999

Folder: DEC99A Seq: 685 Print: On

User: Batch: Id: Std6Rep1 Cup: 1 29 Gas: 8.23 LPM

State: Idle Xmit: Off Autosampler: On

CALIBRATION: Line Calibration

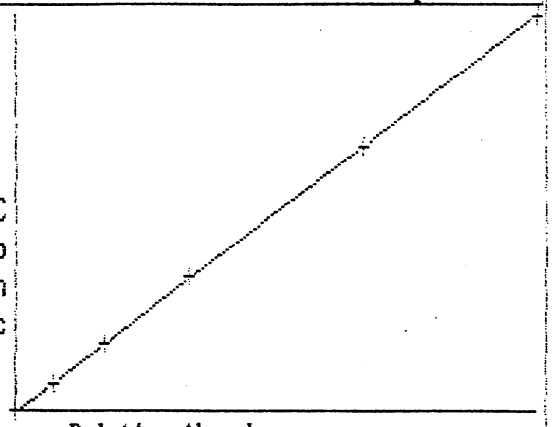
Line: Hg

	Conc.	Calc.	Dev.	Accepted
S1	.000	-.012	-.012	LiNear
S2	.200	.206	.006	Quadratic
S3	.500	.504	.004	WtdLinear
S4	1.00	1.00	.003	Accept
S5	2.00	2.00	.003	
S6	3.00	3.00	-.004	StdAdd

Conc

A .0000000 r .999982

B 2.97979e-5 C -1.52078e-2



Relative Absorbance

	Mean	%RSD	
S1	97	0	97
S2	7428	0	7428
S3	17436	0	17436
S4	34166	0	34166
S5	67744	0	67744
S6	101039	0	101039

33?

New calibration coefficients stored 149 2 5

*** Check Standard: 2 Ck2 Seq: 687 19:08:59 07 Dec 1999 HG

Line	Flag	%Rcv.	Found	True	Units	SD/RSD
Hg	H	111.	.672	.604	ug/L	.000

*** Check Standard: 2 Ck2 Seq: 688 19:11:19 07 Dec 1999 HG

Line	Flag	%Rcv.	Found	True	Units	SD/RSD
Hg		104.	.626	.604	ug/L	.000

*** Sample ID: icb Seq: 689 19:13:38 07 Dec 1999 HG

Hg -.026 ug/L .000 -.026 ~~<.020~~ 2000/12/13 MG <0.2 ug/L

*** Sample ID: lwblk Seq: 690 19:15:56 07 Dec 1999 HG

Hg .029 ug/L .000 .029 <0.2 ug/L

*** Sample ID: lwblkduo Seq: 691 19:18:14 07 Dec 1999 HG

Hg .024 ug/L .000 .024 <0.2 ug/L

*** Sample ID: 1633o Seq: 692 19:20:32 07 Dec 1999 HG

Hg 1.68 ug/L .000 1.68 TV=0.141 ±0.019 0.142 ug/g Seedophiat

*** Sample ID: 1633oduo Seq: 693 19:23:00 07 Dec 1999 HG RPD=1.2%

Hg 1.66 ug/L .000 1.66 TV=0.141 ±0.019 0.160 ug/g

*** Sample ID: Q63 Seq: 694 19:25:28 07 Dec 1999 HG

Hg .763 ug/L .000 .763 0.242 ug

*** Sample ID: Q63duo Seq: 695 19:27:46 07 Dec 1999 HG RPD=0.53%

Hg .759 ug/L .000 .759 0.241 ug

*** Sample ID: Q63trp Seq: 696 19:30:04 07 Dec 1999 HG RPD<1.2%

Hg .754 ug/L .000 .754 0.240 ug

19:32:22 07 Dec 1999 Folder: DEC99A Protocol: SYSTEST Page 101

Line	Conc.	Units	SD/RSD	1	2	3	4	5

*** Sample ID: G74 Seq: 697 19:32:22 07 Dec 1999 HG

Hg .046 ug/L .000 .046 <0.01 ug

*** Sample ID: Q74dup Seq: 698 19:34:40 07 Dec 1999 HG RPD-N/A

Hg .055 ug/L .000 .055 <0.01 µg

*** Sample ID: Q74spk Seq: 699 19:36:58 07 Dec 1999 HG

Hg 1.11 ug/L .000 1.11 TV=1.0 111%

*** Sample ID: 88GH43 Seq: 700 19:39:18 07 Dec 1999 HG

Hg .514 ug/L .000 .514 0.026 µg

*** Sample ID: 88GH43dup Seq: 701 19:41:36 07 Dec 1999 HG RPD-2.76%

Hg .500 ug/L .000 .500 0.025 µg

*** Sample ID: Q64 Seq: 702 19:43:54 07 Dec 1999 HG

Hg 1.23 ug/L .000 1.23 0.580 µg

*** Sample ID: Q64dup Seq: 703 19:46:12 07 Dec 1999 HG RPD=0.81%

Hg 1.24 ug/L .000 1.24 0.585 µg

*** Sample ID: Q75 Seq: 704 19:48:33 07 Dec 1999 HG

Hg .020 ug/L .000 .020 <0.01 µg

*** Sample ID: Q75dup Seq: 705 19:50:51 07 Dec 1999 HG RPD-N/A

Hg .029 ug/L .000 .029 <0.01 µg

*** Sample ID: 88GH44 Seq: 706 19:53:09 07 Dec 1999 HG

Hg 2.22 ug/L .000 2.22 0.111 µg

*** Sample ID: 88GH44dup Seq: 707 19:55:37 07 Dec 1999 HG RPD=1.82%

Hg 2.18 ug/L .000 2.18 0.109 µg

*** Sample ID: ccb Seq: 708 19:58:06 07 Dec 1999 HG

Hg -.028 ug/L .000 -.028 <0.2 µg/L

Line	Conc.	Units	SD/RSD	1	2	3	4	5

*** Sample ID: ccv Seq: 709 20:00:24 07 Dec 1999 HG

Hg 1.94 ug/L .000 1.94 TV=2.0 97%

*** Sample ID: Q66 Seq: 710 20:02:54 07 Dec 1999 HG

Hg 1.71 ug/L .000 1.71 0.250 µg

*** Sample ID: Q66dup Seq: 711 20:05:17 07 Dec 1999 HG RPD-N/A

Hg 1.71 ug/L .000 1.71 0.250 µg

*** Sample_ID: Q66trp Seq: 712 20:07:46 07 Dec 1999 HG RPD=0.583%

Hg 1.72 ug/L .000 1.72 0.252 µg

*** Sample ID: 47G81 Seq: 713 20:10:06 07 Dec 1999 HG

Hg .026 ug/L .000 .026 <0.01 µg

*** Sample ID: 47G81dup Seq: 714 20:12:26 07 Dec 1999 HG RPD-NA

Hg .034 ug/L .000 .034 <0.01 µg

*** Sample ID: 47G81spk Seq: 715 20:14:45 07 Dec 1999 HG

TV=1.0 µg/L

Hg 1.18 ug/L .000 1.18 118%

*** Sample ID: 88GH46 Seq: 716 20:17:05 07 Dec 1999 HG

Hg 2.76 ug/L .000 2.76 0.138 µg

*** Sample ID: 88GH46dup Seq: 717 20:19:34 07 Dec 1999 HG RPD=1.1%

Hg 2.73 ug/L .000 2.73 0.137 µg

*** Sample ID: GH49 Seq: 718 20:22:03 07 Dec 1999 HG

Hg .030 ug/L .000 .030 <0.01 µg

*** Sample ID: GH49dup Seq: 719 20:24:23 07 Dec 1999 HG RPD-NA

Hg .040 ug/L .000 .040 <0.01 µg

*** Sample ID: ccb Seq: 720 20:26:43 07 Dec 1999 HG

Hg -.018 ug/L .000 -.018 <0.2 µg/L

Folder: DEC99A Page 103

20:29:02 07 Dec 1999 Protocol: SYSTEST

Line	Conc.	Units	SD/RSD	1	2	3	4	5

*** Sample ID: ccv Seq: 721 20:29:02 07 Dec 1999 HG

TV=2.0 µg/L

Hg 1.97 ug/L .000 1.97 99%

12/8/99 Analytical Run

Protocol: SYSTEST

Rev: 3.001 Time: 16:12:47 08 Dec 1999

Folder: DEC99A Seq: 771 Print: On

User: Batch: Id: St06Rep1 Cup: 1 29 Gas: 0.23 LPM

State: Idle Xmit: Off Autosampler: On

AUTOSAMPLER: Rack entry Rack 120699b

cup	Id	Extended id	Weight	Volume	Macro	check	Help
1	icb		1.0000	1.0000			
2	nist1633b		1.0000	1.0000			
3	1633bdup		1.0000	1.0000			
4	47Q82		1.0000	1.0000			
5	47Q82dup		1.0000	1.0000			
6	Q70 1:10		1.0000	1.0000			
7	Q70dup 1:10		1.0000	1.0000			
8	47Q86		1.0000	1.0000			
9	47Q86dup		1.0000	1.0000			
10	47Q86trp		1.0000	1.0000			
11	47Q85		1.0000	1.0000			
12	47Q85dup		1.0000	1.0000			
13	47Q85spk		1.0000	1.0000			
14	Q71 1:10		1.0000	1.0000			
15	Q71dup 1:10		1.0000	1.0000			

PgDn

Cup 1 ID: icb Cell entry, Ins to switch

149 9 12

Line	Conc.	Units	SD/RSD	1	2	3	4	5

*** Standard: 1 Rep: 1 Seq: 765 15:56:27 08 Dec 1999 HG

Hg .000 ug/L -162
Ave. Int. = -162 S. D. = 0

*** Standard: 2 Rep: 1 Seq: 766 15:58:50 08 Dec 1999 HG

Hg .200 ug/L 6893
Ave. Int. = 6893 S. D. = 0

*** Standard: 3 Rep: 1 Seq: 767 16:01:13 08 Dec 1999 HG

Hg .500 ug/L 18173
Ave. Int. = 18173 S. D. = 0

*** Standard: 4 Rep: 1 Seq: 768 16:03:36 08 Dec 1999 HG

Hg 1.00 ug/L 33794
Ave. Int. = 33794 S. D. = 0

*** Standard: 5 Rep: 1 Seq: 769 16:06:00 08 Dec 1999 HG

Hg 2.00 ug/L 70339
Ave. Int. = 70339 S. D. = 0

*** Standard: 6 Rep: 1 Seq: 770 16:08:34 08 Dec 1999 HG

Hg 3.00 ug/L 104311
Ave. Int. = 104311 S. D. = 0

Protocol: SYSTEST

Rev: 3.001 Time: 16:09:02 08 Dec 1999

Folder: DEC99A Seq: 771 Print: On

User: Batch: Id: Std6Rep1 Cup: 1 29 Gas: 0.23 LPM

State: Idle Xmit: Off Autosampler: On

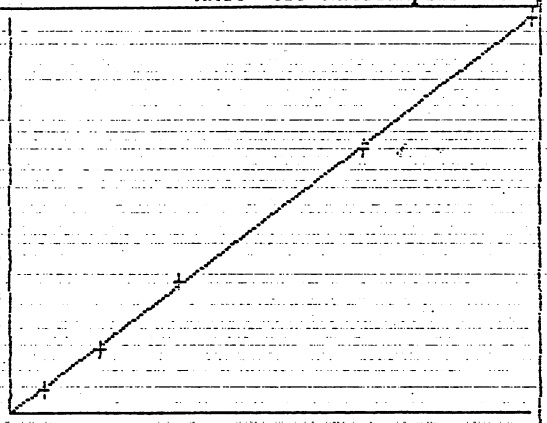
CALIBRATION: Line Calibration

Line: Hg

	Conc.	Calc.	Dev.	Accepted LiNear	
S1	.000	-.004	-.004	Quadratic	
S2	.200	.199	-.001	WtdLinear	
S3	.500	.522	.022		C
S4	1.00	.970	-.030	Accept	o
S5	2.00	2.02	.019		n
S6	3.00	2.99	-.007	StdAdd	c

A .0000000 r .999869

B 2.06835e-5 C 1.12597e-3



Relative Absorbance

	Mean	%RSD	
S1	-162	0	-162
S2	6893	0	6893
S3	18173	0	18173
S4	33794	0	33794
S5	70339	0	70339
S6	104311	0	104311

33?

New calibration coefficients stored 149 2 5

Line	Conc.	Units	SD/RSD	1	2	3	4	5

*** Check Standard: 2 Ck2 Seq: 771 16:15:13 08 Dec 1999 HG

Line	Flag	%Rcv.	Found	True	Units	SD/RSD
Hg		109.	.656	.604	ug/L	.000

*** Sample ID: icb Seq: 772 16:17:32 08 Dec 1999 HG

Hg	-.009	ug/L	.000	-.009	<0.2ug/L

*** Sample ID: nist1633b Seq: 773 16:19:50 08 Dec 1999 HG

Hg	1.64	ug/L	.000	1.64	TV=0.141 ±0.019 0.158ug/g

*** Sample ID: 1633bdup Seq: 774 16:22:18 08 Dec 1999 HG RPD=5.64%

Hg	1.55	ug/L	.000	1.55	TV=0.141 ±0.019 0.150ug/g

*** Sample ID: ~~47Q82~~ Seq: 775 16:24:48 08 Dec 1999 HG

Hg	.041	ug/L	.000	.041	<0.0ug

*** Sample ID: ~~47Q82~~dup Seq: 776 16:27:06 08 Dec 1999 HG RPD=NA

Hg	.053	ug/L	.000	.053	<0.0ug

*** Sample ID: Q70 Seq: 777 16:29:24 08 Dec 1999 HG

Hg	8.45	ug/L	.000	8.45

*** Sample ID: Q70dup Seq: 778 16:32:03 08 Dec 1999 HG

Hg	8.53	ug/L	.000	8.53

*** Sample ID: 47Q86 Seq: 779 16:34:42 08 Dec 1999 HG

Hg	.043	ug/L	.000	.043

*** Sample ID: 47Q86dup Seq: 780 16:37:00 08 Dec 1999 HG

Hg	.052	ug/L	.000	.052

*** Sample ID: 47Q86trp Seq: 781 16:39:18 08 Dec 1999 HG

Hg	.063	ug/L	.000	.063

*** Sample ID: 47Q85 Seq: 782 16:41:37 08 Dec 1999 HG

Hg	.417	ug/L	.000	.417

Line	Conc.	Units	SD/RSD	1	2	3	4	5
*** Sample ID: Q72					Seq: 807	17:42:37 08 Dec 1999 HG		
Hg	.973	ug/L	.000	.973				
*** Sample ID: Q72dup					Seq: 808	17:45:06 08 Dec 1999 HG		
Hg	.944	ug/L	.000	.944				
*** Sample ID: ccb					Seq: 809	17:47:26 08 Dec 1999 HG		
Hg	-.018	ug/L	.000	-.018				
*** Sample ID: ccv					Seq: 810	17:49:45 08 Dec 1999 HG		
Hg	2.09	ug/L	.000	2.09				

<0.2ug/L

TV=2.0ug/L 105%

METCO Particulate Analysis Record

METCO Environmental

Particulate Analysis EPA Method 17

Thimbles and Backup Filters

Job Number 99-95LAW4

Job Name EPRI

Location Lawrence, Ks.

Unit Tested #4 Scrubber Inlet

Desiccator Time In	11/1				
Desiccator Time Out	1405 11/3	820 11/4			

Run No. 1	Thimble No. Q63		Filter No. Q74		
Thimble Final Weight (g)	6.6188	6.6190	✓		
Thimble Initial Weight (g)	3.2893	3.2893			
Particulate (g)	3.3295 ✓	3.3297	✓		
Filter & Particulate + Tare Weight (g)					
Tare Weight (g)					
Filter & Particulate (g)	0.0933	0.0931	✓		

Filter and Particulate Average (g) 0.0932 ✓

Initial Filter Weight (g) 0.1065 ✓

Filter Particulate Average (mg) 0 ✓

Thimble Particulate Average (mg) 3,329.6 ✓

Total Particulate (mg) 3,329.6 ✓

Run No. 2	Thimble No. Q64		Filter No. Q75		
Thimble Final Weight (g)	8.3016	8.3014	✓		
Thimble Initial Weight (g)	3.1225	3.1225			
Particulate (g)	5.1791 ✓	5.1789	✓		
Filter & Particulate + Tare Weight (g)					
Tare Weight (g)					
Filter & Particulate (g)	0.1051	0.1051	✓		

Filter and Particulate Average (g) 0.1051 ✓

Initial Filter Weight (g) 0.1078 ✓

Filter Particulate Average (mg) 0 ✓

Thimble Particulate Average (mg) 5179.0 ✓

Total Particulate (mg) 5179.0 ✓

Run No. 4	Thimble No. Q66		Filter No. 47Q81		
Thimble Final Weight (g)	5.3143	5.3142	✓		
Thimble Initial Weight (g)	3.8226	3.8226			
Particulate (g)	1.4917 ✓	1.4916	✓		
Filter & Particulate + Tare Weight (g)					
Tare Weight (g)					
Filter & Particulate (g)	0.1055	0.1054	✓		

Filter and Particulate Average (g) 0.1055 ✓

Initial Filter Weight (g) 0.1075 ✓

Filter Particulate Average (mg) 0 ✓

Thimble Particulate Average (mg) 1,491.7 ✓

Total Particulate (mg) 1,491.7 ✓

mk

Analyst

METCO Environmental

Particulate Analysis EPA Method 5

Stack Filters

Job Number 99-95 LAW4 Location Lawrence, Ka.

Job Name EPRI Unit Tested Unit 4 Stack

Desiccator Time In	930 11/1				
Desiccator Time Out	1128 11/3	900 11/4			

Run No. _____ Filter No. _____					
Filter & Particulate + Tare Weight (g)					
Tare Weight (g)					
Filter & Particulate (g)					

Filter & Particulate Average (g) _____

Initial Filter Weight (g) _____

Total Particulate (mg) [ ]

Run No. 2 Filter No. 88Q H44					
Filter & Particulate + Tare Weight (g)					
Tare Weight (g)					
Filter & Particulate (g)	0.6775	0.6775	✓		

.5106
166.9

Filter & Particulate Average (g) 0.6775 ✓

Initial Filter Weight (g) 0.5106

Total Particulate (mg) [166.9] ✓

Run No. 4 Filter No. 88Q H46					
Filter & Particulate + Tare Weight (g)					
Tare Weight (g)					
Filter & Particulate (g)	0.7059	0.7061	✓		

.5070
199.0

Filter & Particulate Average (g) 0.7060 ✓

Initial Filter Weight (g) 0.5070 ✓

Total Particulate (mg) [199.0] ✓

MK

Analyst

PHILIP
ANALYTICAL SERVICES

INDUSTRIAL HYGIENE ENVIRONMENTAL TESTING

• EPA/NVLAP 101262-0
• AIHA ACCREDITATION NO. 100439
• NY DOH 10903
• PA DER 06-353
• NJ DEP 77678

ANALYTICAL REPORT

Client: METCO Environmental

Report to: Doug Saathoff
METCO Environmental
P. O. Box 598
Addison TX 75001

Project: 188429
Received: 24-NOV-99
Reported: 16-DEC-99

PURCHASE ORDER: 99-95-LAW4

Project Description: Law. Energy Center-Unit #4

	AS RECEIVED BASIS	DRY BASIS	UNITS	METHOD	DATE	ANALYST
Run 1 Coal Sample (Lawrence Energy Ctr.)						
Lab Sample: 1384792						
sampled: 25-OCT-99						
Moisture, Total	16.9		%	D 3302	01-DEC-99	GLB
SHORT PROX - COAL						
Ash	7.16	8.62	%	D 3174	08-DEC-99	VJO
Sulfur	0.48	0.58	%	D 4239	08-DEC-99	VJO
Heating Value	10200	12280	BTU/lb	D 3286	02-DEC-99	VJO
Chloride, Total	0.03	0.04	%	E776/300.0	14-DEC-99	DRK
Run 2 Coal Sample (Lawrence Energy Ctr.)						
Lab Sample: 1384793						
sampled: 26-OCT-99						
Moisture, Total	18.3		%	D 3302	01-DEC-99	GLB
SHORT PROX - COAL						
Ash	5.74	7.03	%	D 3174	08-DEC-99	VJO
Sulfur	0.37	0.45	%	D 4239	08-DEC-99	VJO
Heating Value	10020	12260	BTU/lb	D 3286	02-DEC-99	VJO
Chloride, Total	0.02	0.02	%	E776/300.0	14-DEC-99	DRK
Run 3 Coal Sample (Lawrence Energy Ctr.)						
Lab Sample: 1384794						
sampled: 26-OCT-99						
Moisture, Total	17.5		%	D 3302	01-DEC-99	GLB
SHORT PROX - COAL						
Ash	5.51	6.68	%	D 3174	08-DEC-99	VJO
Sulfur	0.36	0.44	%	D 4239	08-DEC-99	VJO
Heating Value	10180	12340	BTU/lb	D 3286	02-DEC-99	VJO

PHILIP
ANALYTICAL SERVICES

INDUSTRIAL HYGIENE ENVIRONMENTAL TESTING

• EPA/NVLAP 101262-0
• AIHA ACCREDITATION NO. 100439
• NY DOH 10903
• PA DER 06-353
• NJ DEP 77678

Client: METCO Environmental
Project: 188429

	AS RECEIVED BASIS	DRY BASIS	UNITS	METHOD	DATE	ANALYST
Run 3 Coal Sample (Lawrence Energy Ctr.)						
Lab Sample: 1384794 - continued						
Chloride, Total	0.02	0.02	%	E776/300.0	14-DEC-99	DRK

< Indicates less than the limit of quantitation.

4418 POTTSVILLE PIKE, READING, PENNSYLVANIA 19605 610-921-8833 FAX 610-921-9667

Philip Analytical Services
Quality Assurance Protocol

PAS Sample#: All Projects Listed

Client Name: Metco

PAS Project#:188433,188435,188427,188429,188431

Job ID :

Units: %, BTU/lb

O1 SUMMARY FORM

Sample # & Parameter	Matrix Spike				Matrix Spike Duplicate				Laboratory Control Sample		
	Sample Conc.	Spike Conc.	Matrix Spike Conc.	Recovery	Matrix Spike Dup Conc.	Recovery	Precision RPD	Method Blank	Spikes Conc.	Found Conc.	Recovery

Sample # & Parameter	Matrix Spike				Duplicate			Laboratory Control Sample			Method Blank	Detection Limits
	Sample Conc.	Spike Conc.	Matrix Spike Conc.	Recovery	Sample Conc.	Sample Duplicate Conc.	Precision RPD	Spikes Conc.	Found Conc.	Recovery		
1384796-Ash					12.2	12.0	1.7	11.8	11.9	101	N/A	0.01
1384797-Sulfur					4.52	4.58	1.32	1.78	1.77	99	N/A	0.01
1384797-Heating Value					13710	13686	0.17	13350	13410	100	N/A	50
1384797-Chlorine					0.07	0.08	13	2.00	1.87	94	0.01	0.01

Matrix Spike	75 - 125
Laboratory Control Sample	80 - 120
Duplicate	0 - 20

PHILIP ANALYTICAL SERVICES

Chain of Custody Record

4418 Pottsville Pike Reading, PA 19605
phone: (610) 921-8833 fax: (610) 921-9667

Sample Container Information												
Bottle Type (G P H)												
# of Containers												
Preserved? (Y/N)												

Report Results To:
PO #99-95-LAW4 Job ID LAW. ENERGY CEN. - UNIT #4
Name DOUG SAOTHOFF
Company METCO ENVIRONMENTAL
Mailing Address P.O. BOX 598
City ADDISON State TX Zip 75025
Telephone # 972/931/7127 Fax # 972/931/3398

Send Invoice To:
Name SAME Telephone #
Company Dept.
Mailing Address
City State Zip
Credit Card # Exp. Date

Analysis Requested 1884/29

Page 1 of 1
PAS Quote#

Sampled by: SAMPLE DESCRIPTION	Air Vol. (L or min)	Matrix Type	Date Sampled	Time Sampled	BTU CONTENT ASTM-D-3286	FLY ASH ASTM-D-3174	SULFUR ASTM-D-5016	CHLORIDE ASTM-?
1. RUN1 COAL SAMP.			10/25/99		X	X	X	X
2 RUN2 COAL SAMP.			10/26/99		X	X	X	X
3 RUN3. COAL SAMP.			10/26/99		X	X	X	X
4								
5								
6 *SEE ATTACHED								
7 INSTRUCTIONS								
8 →								
9								
10								

Comments/Hazards/Location Details
ATTN: CHRIS WEATHINGTON
TEST AMERICA, INC.
3601 S. DIXIE DRIVE
DAYTON, OH 45439
PH: 1-800-572-9839
* AFTER SAMPLE HAS BEEN PREPPED, PLEASE RETURN A 4 oz. JAR SAMPLE TO TEST AMERICA AT THE ABOVE ADDRESS! THANK YOU!

Special Instructions (including Data Deliverables and Turn Around Time):

Samples relinquished to shipper or courier by: [signature] Date 11-19-99 Time 1600
Samples received by: Date Time

Samples Relinquished by: Samples Relinquished to: Date Time
Samples Relinquished by: Samples Relinquished to Laboratory: [signature] Date 11/24/ Time 1000

Method of Shipment/Delivery: UPS FED-EX PAS Courier Client drop off Other

Samples Rec'd. on ice? (Y N n/a) Temp. Blank — Sample Temp. —
Samples rec'd intact? (Y N) Custody seals intact? (Y N n/a) ID on samples match COC? (Y N)
VOC Samples have zero headspace? (Y N n/a) Samples properly preserved? (Y N n/a)

Notes:

Bags labelled Lawrence Energy Ctr. 109 11.24.9

-1999 11:18 FROM
TOTAL P.06

TestAmerica
INCORPORATED

Sample ID: **Western Resouces Inc.**
Lawrence Energy Center
Lawrence, Kansas
Coal Samples

Hg Analysis
ASTM D6414-99

Collected On: 10/25/99 for Run 1, 10/26/99 for Run 2 and Run 3 Composites
Collected By: METCO

	Digestion Date	Analysis Date	Analyst	Results	Duplicate Result	RPD	Units	Dry Weight (%)	Flags	Notes
Run 1 Composite	12/20/99	12/24/99	jpp	0.052	0.052	<1.0	ug/g	95.1		
Run 2 Composite	12/20/99	12/24/99	jpp	0.044	0.045	1.6	ug/g	94.1		
Run 3 Composite	12/20/99	12/24/99	jpp	0.047	0.047	<1.0	ug/g	96.0		

Notes:

3601 SOUTH DIXIE DRIVE / DAYTON, OH 45439 / 937-294-6856 / FAX: 937-294-7816

Sample Receipt Record

Chain of Custody Provided? Yes ☐ No ☒ Job #: _____

If no Chain of Custody is provided, the following section should be completed.

Client: METCO
Received by: James A Davis Date: 12/6/99 Time: 9 AM
Samples Shipped UPS FEDEX US Mail Other _____
Custody Seal(s) Intact ~~Yes ☐ No ☐~~
Containers Provided by TestAmerica Yes ☐ No ☒
Cooler Temperature _____ °C Ice Ambient Cool Packs

Deviations Noted

- None ☐
- Insufficient Volume ☐
- Samples Broken ☐
- Incorrect Containers/ Preservatives ☐
- Volatile Headspace ☐
- Holding Time Exceeeded upon receipt ☐
- Insufficient sample information ☐
- COC and sample labels disagree ☐

Comments

FROM PHILIP ANAL.
COAL FROM:
OWENSVILLE, EAST CHINA, COLSTRIP
WEST TERRE HAUTE, STEVENSON,
SHIPPINGPORT, STRATTON, BREMOND
PADUCAH, LAWRENCE, FAIRFIELD

Other _____ Initials _____ Date _____

Issues to Clarify with Client

Corrective Action

Client Contacted by: N/A Date: N/A

TestAmerica INCORPORATED

Job# 99 Unit Tested Unit 4

CHAIN OF CUSTODY RECORD

Page # 1/1

Facility Name/Location
Western Resources, Inc
Lawrence Energy Center
Lawrence, KS

Collected By/Company
Western Resources, Inc

SAMPLE I.D.	DATE	TIME	AIR	SOLID	COMP	GRAB	# OF CONTAINERS	RECOVERED BY	HCl	PART.	SO2	SO3	PCDD/PCDF	SEMI-VOC	F-Y ~~ASH~~ PCHC's	B ~~&~~ 4 ~~METALS~~	Hg	Cl2	SULFUR	REMARKS (Specific Compounds/Methods)
Run 1 (*TA) (1) Coal Sample	10/25/99				X		II	DF							X	X	X	X	X	Ship one container to EERC for Trace Metals Analysis
Run 2 (*TA) (1) Coal Sample	10/26/99				X		II	DF							X	X	X	X	X	↓
Run 4 (*TA) (1) Coal Sample	10/26/99				X		II	DF							X	X	X	X	X	↓
Run 1 (1) Slurry Sample	10/25/99					X	I	E.D.												Ship to EERC for Trace Metals analysis
Run 2 (1) Slurry Sample	10/26/99					X	I	E.D.												↓
Run 3 (1) Slurry Sample	10/26/99					X	I	E.D.												↓

Received by:	Date:	Time:	Transported by:	Date:	Time:	Received at Lab by:	Date:	Time:
Jason Conway	10/29/99		Jason Brown	11/6/99	2300	John Pellegrini	11/8/99	1300
Analyzed by:	**Date:**	**Time:**	**Data Reviewed by:**	**Date:**	**Time:**	**Remarks:**		

Ship to: TestAmerica / METCO / EERC
Coal — Slurry + Coal

(*TA) 3 Coal Samples only
(1) 3 coal & 3 Slurry to EERC

METCO ENVIRONMENTAL
DRSaalbach 11/15/99

PHILIP
ANALYTICAL SERVICES

Chain of Custody Record

4418 Pottsville Pike Reading, PA 19605
phone: (610) 921-8833 fax: (610) 921-9667

Sample Container Information

Bottle Type (G P H)												
# of Containers												
Preserved? (Y/N)												

Report Results To:
PO #99-95-LAW4 Job ID LAW. ENERGY CEN. - UNIT #4
Name DOUG SAOTHOFF
Company METCO ENVIRONMENTAL
Mailing Address P.O. BOX 598
City ADDISON State TX Zip 75025
Telephone # 972/931/7127 Fax # 972/931/3398

Send Invoice To:
Name SAME Telephone #
Company Dept.
Mailing Address
City State Zip
Credit Card # Exp. Date

Page 1 of 1
PAS Quote#

Sampled by:

	SAMPLE DESCRIPTION	Air Vol. (L or min)	Matrix Type	Date Sampled	Time Sampled	BTU CONTENT	FLY ASH	SULFUR	CHLORIDE	ASTM-D-3286	ASTM-D-3174	ASTM-D-5016	ASTM-?	Comments/Hazards/Location Details
1.	RUN 1 COAL SAMP.			10/25/99		X	X	X	X					ATTN: CHRIS WEATHINGTON
2	RUN 2 COAL SAMP.			10/26/99		X	X	X	X					TEST AMERICA, INC.
3	RUN 3. COAL SAMP.			10/26/99		X	X	X	X					3601 S. DIXIE DRIVE
4														DAYTON, OH 45439
5														PH: 1-800-572-9839
6	* SEE ATTACHED													* AFTER SAMPLE HAS BEEN
7	INSTRUCTIONS													PREPPED. PLEASE RETURN A
8	→													4 oz. JAR SAMPLE TO TEST
9														AMERICA AT THE ABOVE
10														ADDRESS! THANK YOU!

Analysis Requested

Special Instructions (including Data Deliverables and Turn Around Time):

Samples relinquished to shipper or courier by:	Date 11-19-99	Time 1600	
Samples received by:	Date	Time	

Samples Relinquished by:	Samples Relinquished to:	Date	Time
Samples Relinquished by:	Samples Relinquished to Laboratory:	Date	Time

Method of Shipment/Delivery: UPS FED-EX PAS Courier Client drop off Other _____

Samples Rec'd. on ice? (Y N n/a) Temp. Blank _____ Sample Temp. _____
Samples rec'd intact?(Y N) . Custody seals intact?(Y N n/a) ID on samples match COC?(Y N)
VOC Samples have zero headspace?(Y N n/a) Samples properly preserved? (Y N n/a)

Notes:

NONAQUEOUS MERCURY BATCH SHEET

Analyst: JRP Date: 12/20/09 12/24/09 Water Bath: start mid end

Standard Reference: 65-447 temp:

ICV Reference: 65-41-18 date:

% DW		Sample # / Client	Weight	MS	MSD
83.1	3	1383831 [redacted]	1.0083 g		
82.6	4	1383832	1.0242 g		
83.7	5	1383833	1.0469 g		MB
95.1	6	1384792 Law-Energy	1.0235 g		
94.1	7	1384793	1.0080 g		
96.0	8	1384794	1.0522 g		
93.7	9	1384812 TRP [redacted]	1.0296 g		ICV
93.7	10	1384813 SPK	1.0235 g		
94.5	11	1384814	1.0070 g		
95.3	12	1384777 [redacted]	1.0644 g		
95.4	13	1384778	1.0445 g		MS
95.5	14	1384779	1.0288 g		
98.2	15	1384806 [redacted]	1.0170 g		
98.9	16	1384807	1.0099 g		
98.9	17	1384808	1.0222 g		MSD
90.3	18	1384771 [redacted]	1.0139 g		
89.8	19	1384772 TRP	1.0105 g		
90.1	20	1384773 SPK	1.0365 g		
	2	NIST 1630 A	1.0390 g	=0.077 mg/kg	RPD
	1	Blank			

HNO3 65-48-14
HCl 65-46-1
KMnO4 - 65-33-1
~~SnCl2 65-50-6~~
SnCl2 - 66-31-19

FLAG

SECONDARY DATA CHECK: analyst:
date:

Comments: V_F = 50mL NIST 1630A = 0.106 ± ~~0.023~~ 0.032 mg/kg JAO 1/6

Protocol: SYSTEST

Rev: 1.001 Time: 17:51:24 24 Dec 1990

Folder: DEF990 Seq: 241 Print: On

User: Batch: Id: ccv Cup: 1 37 Gas: 0.23 LPM

State: Idle Xmit: Off Autosampler: On

AUTOSAMPLER: Rack entry Rack 122499a

cup	id	Extended id	Weight	Volume	Macro check	Halo
1	ice		1.0000	1.0000		
2	blk		1.0000	1.0000		
3	blk cup		1.0000	1.0000		
4	nist1630a		1.0000	1.0000		
5	nist cup		1.0000	1.0000		
6	831 ~~1.5~~ NODIL		1.0000	1.0000		
7	831 cup		1.0000	1.0000		
8	832		1.0000	1.0000		
9	832 cup		1.0000	1.0000		
10	833		1.0000	1.0000		
11	833 cup		1.0000	1.0000		
12	792		1.0000	1.0000		
13	792 cup		1.0000	1.0000		
14	793		1.0000	1.0000		
15	793 cup		1.0000	1.0000		

Page

Lt: 1 ID: ...

Cell entry, Ins to switch

109 9 12

```
Protocol: SYSTEST
                        Rev: 3.001   Time: 17:53:37  24 Dec 1999
Folder: DEC99C          Seq: 343                     Print: On
User:                   Batch:              Id: 100        Dur: 1 39 Gas:    0.23 LPM
State: Idle                                                Init: Off Autosampler: On

AUTOSAMPLER:  Rack entry   Rack 122499a  Range  1-44 Clear sa0 Lnop exit   Pgup
cup Id        Extended id          Weight Volume Macro check Help
16 794                             1.0000 1.0000
17 794 cup                         1.0000 1.0000
18 812                             1.0000 1.0000
19 812 cup                         1.0000 1.0000
20 812 tmc                         1.0000 1.0000
21 813                             1.0000 1.0000
22 813 cup                         1.0000 1.0000
23 813 sck                         1.0000 1.0000
24 ccb                             1.0000 1.0000
25 ccv                             1.0000 1.0000
26 814                             1.0000 1.0000
27 814 cuc                         1.0000 1.0000
28 777                             1.0000 1.0000
29 777 cup                         1.0000 1.0000
30 778                             1.0000 1.0000
                                                                              PgDn

                                          Column entry, Ins to switch
                                                                 Dil # 3
```

```
Protocol: SYSTEST
                        Rev: 3.001    Time: 17:53:39   24 Dec 1999
Folder: DEC99C          Seq: 343                       Print: On
User:                   Batch:              Id: icb        Cup: 1 39 Gas:    0.23 LPM
State: Idle                                                Mnit: Off Autosampler: On
```

```
AUTOSAMPLER:  Rack entry    Rack 123459a  Range  1-44 Clear seq Lnoc exit    Pgup
cup Id          Extended Id              Weight Volume Macro check Help
31 778 cup                               1.0000 1.0000
32 779                                   1.0000 1.0000
33 779 cup                               1.0000 1.0000
34 806                                   1.0000 1.0000
35 806 cup                               1.0000 1.0000
36 807                                   1.0000 1.0000
37 807 cup                               1.0000 1.0000
38 808                                   1.0000 1.0000
39 808 cup                               1.0000 1.0000
40 771                                   1.0000 1.0000
41 771 cup                               1.0000 1.0000
42 772                                   1.0000 1.0000
43 772 cup                               1.0000 1.0000
44 772 tro                               1.0000 1.0000

                                                                          Pgdn
```

```
                                                Column entry, Tab to enter
                                                                   Ln: 5   1
```

*** Standard: 1 Rep: 1 Seq: 292 15:35:21 24 Dec 1999 HG

Hg .000 ug/L 172
Ave. Int. = 172 S. D. = 0

Folder: DEC99C Page 258
15:37:43 24 Dec 1999 Protocol: SYSTEST

Line	Conc.	Units	SD/RSD	1	2	3	4	5

*** Standard: 2 Rep: 1 Seq: 293 15:37:43 24 Dec 1999 HG

Hg .200 ug/L 8051
Ave. Int. = 8051 S. D. = 0

*** Standard: 3 Rep: 1 Seq: 294 15:40:05 24 Dec 1999 HG

Hg .500 ug/L 20347
Ave. Int. = 20347 S. D. = 0

*** Standard: 4 Rep: 1 Seq: 295 15:42:27 24 Dec 1999 HG

Hg 1.00 ug/L 40126
Ave. Int. = 40126 S. D. = 0

*** Standard: 5 Rep: 1 Seq: 296 15:44:54 24 Dec 1999 HG

Hg 2.00 ug/L 81928
Ave. Int. = 81928 S. D. = 0

*** Standard: 6 Rep: 1 Seq: 297 15:47:23 24 Dec 1999 HG

Hg 3.00 ug/L 120049
Ave. Int. = 120049 S. D. = 0

Protocol: SYSTEST

Rev: 3.001 Time: 15:48:16 24 Dec 1999

Folder: DEC99C Seq: 298 Print: On

User: Batch: Id: Std6Rep1 Cup: 1 29 Gas: 0.23 LPM

State: Idle Xmit: Off Autosampler: On

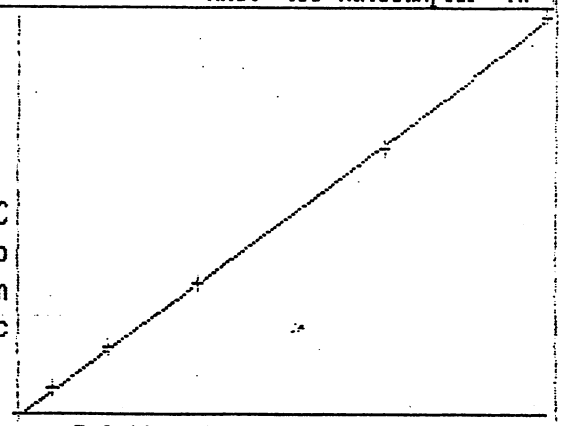
CALIBRATION: Line Calibration

Line: Hg

	Conc.	Calc.	Dev.	Accepted LiNear	
S1	.000	-.001	-.001	Quadratic	
S2	.200	.195	-.005	UtdLinear	
S3	.500	.501	.001		C
S4	1.00	.993	-.007	Accept	o
S5	2.00	2.03	.032		n
S6	3.00	2.98	-.019	StdAdd	c

A .0000000 r .999889

B 2.48732e-5 C -5.41651e-3



Relative Absorbance

	Mean	%RSD	
S1	172	0	172
S2	8051	0	8051
S3	20347	0	20347
S4	40126	0	40126
S5	81928	0	81928
S6	120049	0	120049

33?

New calibration coefficients stored 149 2 5

Line	Conc.	units	SD/RSD	1	2	3	4	5
*** Sample ID: 1cm					Seq: 343	17:55:12 24 Dec 1999 HG		
Hg	-.006	ug/L	.000	-.006			<0.2µg/L	
*** Sample ID: blk					Seq: 344	17:58:12 24 Dec 1999 HG		
Hg	.010	ug/L	.000	.010			<0.2µg/L	
*** Sample ID: blk dup					Seq: 345	18:00:44 24 Dec 1999 HG		
Hg	.009	ug/L	.000	.009			<0.2µg/L	
*** Sample ID: mistiaÑa					Seq: 346	18:03:02 24 Dec 1999 HG		
Hg	1.60	ug/L	.000	1.60			TV = 0.106 ± ~~0.023~~ mg/kg 0.032 JAD 1/6	0.078 mg/kg
*** Sample ID: mist dup					Seq: 347	18:05:25 24 Dec 1999 HG	RPD = <1.0%	
Hg	1.60	ug/L	.000	1.60				0.078 mg/kg
*** Sample ID: 87					Seq: 348	18:07:48 24 Dec 1999 HG		
Hg	.178	ug/L	.000	.178			NO DATA	
*** Sample ID: 831					Seq: 349	18:11:05 24 Dec 1999 HG		
Hg	1.01	ug/L	.000	1.01			0.060 µg/g	
*** Sample ID: 831 dup					Seq: 350	18:13:25 24 Dec 1999 HG	RPD = <1.0%	
Hg	1.02	ug/L	.000	1.02			0.061 µg/g	
*** Sample ID: 832					Seq: 351	18:15:45 24 Dec 1999 HG		
Hg	.938	ug/L	.000	.938			0.055 µg/g	
*** Sample ID: 832 dup					Seq: 352	18:18:04 24 Dec 1999 HG	RPD = 2.3%	
Hg	.917	ug/L	.000	.917			0.054 µg/g	
*** Sample ID: 833					Seq: 353	18:20:22 24 Dec 1999 HG		
Hg	1.21	ug/L	.000	1.21			0.069 µg/g	
*** Sample ID: 833 dup					Seq: 354	18:22:44 24 Dec 1999 HG	RPD = <1.0%	
Hg	1.20	ug/L	.000	1.20			0.068 µg/g	

Line	Conc.	Units	SD/RSD	1	2	3	4	5
*** Sample ID: 792 LAWRENCE					Seq: 355	18:25:04 24 Dec 1999 HG		
Hg	1.02	ug/L	.000	1.02			0.052 µg/g	
*** Sample ID: 792 dup					Seq: 356	18:27:24 24 Dec 1999 HG	RPD = <1.0%	
Hg	1.02	ug/L	.000	1.02			0.052 µg/g	
*** Sample ID: 793					Seq: 357	18:29:44 24 Dec 1999 HG		
Hg	.844	ug/L	.000	.844			0.044 µg/g	
*** Sample ID: 793 dup					Seq: 358	18:32:03 24 Dec 1999 HG	RPD = 1.6%	
Hg	.858	ug/L	.000	.858			0.045 µg/g	
*** Sample ID: 794					Seq: 359	18:34:22 24 Dec 1999 HG		
Hg	.947	ug/L	.000	.947			0.047 µg/g	
*** Sample ID: 794 dup					Seq: 360	18:36:41 24 Dec 1999 HG	RPD = <1.0%	
Hg	.950	ug/L	.000	.950			0.047 µg/g ~~0.048 µg/g~~ MP 12/28/99	
*** Sample ID: 812					Seq: 361	[illegible]		
Hg	1.21	ug/L	.000	1.21			0.063 µg/g	
*** Sample ID: 812 dup					Seq: 362	18:41:19 24 Dec 1999 HG	RPD = <1.0%	
Hg	1.20	ug/L	.000	1.20			0.062 µg/g	
*** Sample ID: 812 trp					Seq: 363	18:43:38 24 Dec 1999 HG	RPD = 2.5%	
Hg	1.18	ug/L	.000	1.18			0.061 µg/g	
*** Sample ID: 813					Seq: 364	18:46:57 24 Dec 1999 HG		
Hg	1.26	ug/L	.000	1.26			0.066 µg/g	
*** Sample ID: 813 dup					Seq: 365	18:48:21 24 Dec 1999 HG	RPD = 2.4%	
Hg	1.29	ug/L	.000	1.29			0.067 µg/g	
*** Sample ID: 813 spk					Seq: 366	18:50:41 24 Dec 1999 HG		
Hg	2.16	ug/L	.000	2.16			~~RV = 2.0~~ MP 12/28/99	90%

Line	Conc.	Units	SD/RSD	1	2	3	4	5	
*** Sample ID: ccb					Seq: 367	18:53:12 24 Dec 1999 HG			
Hg	-.029	ug/L	.000	-.029					<0.2µg/L
*** Sample ID: ccv					Seq: 368	18:55:31 24 Dec 1999 HG			
Hg	2.06	ug/L	.000	2.06					TV=2.0 103%
*** Sample ID: 814					Seq: 369	18:58:01 24 Dec 1999 HG			
Hg	1.28	ug/L	.000	1.28					0.067µg/g
*** Sample ID: 814 dup					Seq: 370	19:00:21 24 Dec 1999 HG			RPD=<1.0%
Hg	1.28	ug/L	.000	1.28					0.067µg/g
*** Sample ID: 777					Seq: 371	19:02:41 24 Dec 1999 HG			
Hg	.598	ug/L	.000	.598					0.029µg/g
*** Sample ID: 777 dup					Seq: 372	19:05:00 24 Dec 1999 HG			RPD=1.3%
Hg	.590	ug/L	.000	.590					0.029µg/g
*** Sample ID: 778					Seq: 373	19:07:19 24 Dec 1999 HG			
Hg	.484	ug/L	.000	.484					0.024µg/g
*** Sample ID: 778 dup					Seq: 374	19:09:39 24 Dec 1999 HG			RPD=<1.0%
Hg	.487	ug/L	.000	.487					0.024µg/g
*** Sample ID: 779					Seq: 375	19:11:58 24 Dec 1999 HG			
Hg	.404	ug/L	.000	.404					0.021µg/g
*** Sample ID: 779 dup					Seq: 376	19:14:17 24 Dec 1999 HG			RPD=1.9%
Hg	.412	ug/L	.000	.412					0.021µg/g
*** Sample ID: 806					Seq: 377	19:16:37 24 Dec 1999 HG			
Hg	1.62	ug/L	.000	1.62					0.081µg/g
*** Sample ID: 806 dup					Seq: 378	19:19:02 24 Dec 1999 HG			RPD=<1.0%
Hg	1.61	ug/L	.000	1.61					0.081µg/g

Line	Conc.	Units	SD/RSD	1	2	3	4	5	
*** Sample ID: 807									
Hg	2.39	ug/L	.000	2.39					0.120 µg/g
*** Sample ID: 807 dup					Seq: 380	19:22:52 24 Dec 1999 HG			RPD = 1.2%
Hg	2.42	ug/L	.000	2.42					0.121 µg/g
*** Sample ID: 808					Seq: 381	19:26:24 24 Dec 1999 HG			
Hg	2.37	ug/L	.000	2.37					0.117 µg/g
*** Sample ID: 808 dup					Seq: 382	19:28:51 24 Dec 1999 HG			RPD = <1.0%
Hg	2.36	ug/L	.000	2.36					0.117 µg/g
*** Sample ID: 771					Seq: 383	19:31:18 24 Dec 1999 HG			
Hg	1.19	ug/L	.000	1.19					0.065 µg/g
*** Sample ID: 771 dup					Seq: 384	19:33:45 24 Dec 1999 HG			RPD = 1.7%
Hg	1.21	ug/L	.000	1.21					0.066 µg/g ~~0.067~~
*** Sample ID: 772					Seq: 385	19:36:09 24 Dec 1999 HG			
Hg	1.23	ug/L	.000	1.23					0.068 µg/g
*** Sample ID: 772 dup					Seq: 386	19:38:32 24 Dec 1999 HG			RPD = <1.0%
Hg	1.24	ug/L	.000	1.24					0.068 µg/g
*** Sample ID: 772 trp					Seq: 387	19:40:54 24 Dec 1999 HG			RPD = 3.2%
Hg	1.27	ug/L	.000	1.27					0.070 µg/g
*** Sample ID: 773					Seq: 388	19:44:42 24 Dec 1999 HG			
Hg	1.31	ug/L	.000	1.31					0.070 µg/g
*** Sample ID: 773 dup					Seq: 389	19:47:01 24 Dec 1999 HG			RPD = <1.0%
Hg	1.30	ug/L	.000	1.30					0.069 µg/g
*** Sample ID: 773 spk					Seq: 390	19:49:22 24 Dec 1999 HG			
Hg	2.28	ug/L	.000	2.28					

TV = 1.0

97%

Analyte	Conc.	Units	SD/RSD	1	2	3	4	5
*** Sample ID: ccc					Seq: 391	19:51:45 24 Dec 1999 HG		
Hg	-.025	ug/L	.000	-.025				
*** Sample ID: ccv					Seq: 392	19:54:03 24 Dec 1999 HG		
Hg	2.05	ug/L	.000	2.05				

<0.2µg/L

TV=2.0

103%

Dry Weight(DW)/Total Volatile Solids (TVS) Notebook # 6

Sample Number/ Test (DW/TVS)	1384792	1384793	1384794	[illegible]	[illegible]	[illegible]
Client/Pan #	LAWRENCE 17 R1	18 R2	19 R3	MICHIGAN 20 R1	21 dup R1	22 R2
Wt of Pan + Sample	8.9951	9.2612	8.5994	9.1860	10.0610	[illegible].7108
Wt after Drying	8.5997	8.7743	8.2963	7.7995	8.5[illegible]	7.3689
Wt of Pan or Wt After Ignition	0.9808	0.9770	0.9805	0.9772	0.[illegible]7776	0.9794
Difference	7.6189	7.7973	7.3158	6.822[illegible]	7.5498	6.3895
Sample amount g	8.0143	8.2842	7.6189	8.[illegible]088	9.0834	7.7314
Result	95.1%	94.1%	96.0%	[illegible]	[illegible]	[illegible]

Sample Number/ Test (DW/TVS)	[illegible]	[illegible]	1384909	1384910	1384[illegible]	[illegible]
Client/Pan #	MICHIGAN 23 R3	LACKANE 24 R1	25 R2	26 R3	BMP HG 27 [illegible]	28 R2
Wt of Pan + Sample	11.1414	8.6880	8.6140	8.6[illegible]	6.3006	9.2582
Wt after Drying	9.4832	7.4730	7.752[illegible]	7.7375	6.3018	9.2572
Wt of Pan or Wt After Ignition	0.9827	0.980[illegible]	0.9778	0.9789	0.9820	0.9842
Difference	8.5005	[illegible].4930	6.7743	6.7586	5.3198	8.2730
Sample amount g	10.[illegible]587	7.7080	7.6362	7.6236	5.3186	8.2740
Result	83.7%	8[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Sample Number/ Test (DW/TVS)	[illegible]	1384771	1384771	[illegible]
Client/Pan #	BMP HG 29 R3	CINERGY 30 R1	31 dup R1	3[illegible] R2
Wt of Pan + Sample	8.2005	9.0194	8.7[illegible]5	7.3404
Wt after Drying	8.1950	8.3329	7.9414	6.693[illegible]
Wt of Pan or Wt After Ignition	0.9863	0.9[illegible]540	0.9868	0.9865
Difference	7.2087	7.3489	6.9546	5.7071
Sample amount g	7.2[illegible]12	8.0354	7.8057	6.3539
Result	99.[illegible]%	[illegible]%	89.[illegible]%	[illegible]%

Batch Number —
TVS -
DW - 3595

Note:
METCO COALS
- CONTD -

TestAmerica INCORPORATED

Analyst: RP Date: 12/21/99

APPENDIX E

Unit Operational Data

Date	Time	Unit Load MW gross	Steam Flow klbs/hr	Mills In Service	Coal Flow tons/hr				Scrubber Exit Temp. °F		ID Fan Amps		FD Fan Amps	
					401	402	403	404	401	402	401	402	401	402
10/25/99	1700	99	782	401,402,403,404	12	12	12	13	147	154	143	150	53	54
10/25/99	1715	100	782	401,402,403,404	12	12	12	12	147	154	142	148	53	54
10/25/99	1730	100	782	401,402,403,404	12	12	12	12	147	154	138	149	52	53
10/25/99	1745	100	773	401,402,403,404	12	12	12	12	148	155	136	144	51	53
10/25/99	1800	100	783	401,402,403,404	12	12	12	12	148	154	136	148	52	54
10/25/99	1815	100	787	401,402,403,404	12	12	12	12	147	154	136	145	52	54
10/25/99	1830	100	781	401,402,403,404	12	12	12	12	148	154	140	150	52	54
10/25/99	1845	100	783	401,402,403,404	12	12	12	12	148	154	138	150	53	54
10/25/99	1900	100	783	401,402,403,404	12	12	12	12	148	154	143	150	53	54
10/25/99	1915	100	786	401,402,403,404	12	12	12	12	148	154	143	150	53	54
10/25/99	1930	100	784	401,402,403,404	12	12	12	12	148	154	145	152	53	54
10/25/99	1945	100	783	401,402,403,404	12	12	12	12	148	154	143	152	53	54
10/25/99	2000	100	781	401,402,403,404	12	12	12	12	148	155	140	148	53	54

782

48 ~~12~~ tons/hr

24,000 lbs/hr

Avg 154°F

Avg 148

Date	Time	Unit Load MW gross	Steam Flow klbs/hr	Mills In Service	Coal Flow tons/hr				Scrubber Exit Temp. °F		ID Fan Amps		FD Fan Amps	
					401	402	403	404	401	402	401	402	401	402
10/26/99	0900	100	791	401,402,403,404	13	13	13	13	144	152	137	145	53	54
10/26/99	0915	100	792	401,402,403,404	13	13	13	13	144	152	143	141	54	54
10/26/99	0930	100	792	401,402,403,404	13	13	13	13	143	152	143	141	53	54
10/26/99	0945	100	792	401,402,403,404	13	13	13	13	144	153	143	144	53	54
10/26/99	1000	100	791	401,402,403,404	13	13	13	13	144	152	141	143	53	54
10/26/99	1015	100	791	401,402,403,404	13	13	13	13	145	153	144	142	54	54
10/26/99	1030	100	791	401,402,403,404	13	13	13	13	145	153	145	148	54	54
10/26/99	1045	100	792	401,402,403,404	13	13	13	13	146	154	143	145	54	54
10/26/99	1100	100	795	401,402,403,404	13	13	13	13	145	153	141	143	53	53

792

13 tons/hr
26,000 lbs/hr

Avg 153°F

Avg 144°F

Date	Time	Unit Load MW gross	Steam Flow klbs/hr	Mills In Service	Coal Flow tons/hr				Scrubber Exit Temp. °F		ID Fan Amps		FD Fan Amps	
					401	402	403	404	401	402	401	402	401	402
10/26/99	1345	100	794	401,402,403,404	13	13	13	13	148	154	142	147	52	53
10/26/99	1400	100	793	401,402,403,404	13	13	13	13	147	154	137	143	52	53
10/26/99	1415	100	798	401,402,403,404	13	13	13	13	148	154	139	143	51	53
10/26/99	1430	100	794	401,402,403,404	13	13	13	13	147	154	136	145	51	53
10/26/99	1445	100	794	401,402,403,404	13	13	13	13	148	153	139	146	51	53
10/26/99	1500	100	792	401,402,403,404	13	13	13	13	148	154	137	145	51	53
10/26/99	1730	100	792	401,402,403,404	13	13	13	13	149	154	140	147	51	52
10/26/99	1745	100	790	401,402,403,404	12	12	13	13	148	154	139	144	51	53
10/26/99	1800	100	790	401,402,403,404	12	12	13	13	148	154	142	145	51	53
10/26/99	1815	100	792	401,402,403,404	12	12	13	13	148	154	140	147	51	53
10/26/99	1830	100	793	401,402,403,404	13	13	13	13	148	154	140	148	51	53
10/26/99	1845	100	793	401,402,403,404	13	12	13	13	148	154	140	144	51	53
10/26/99	1900	101	799	401,402,403,404	12	12	13	13	148	154	144	150	51	53
10/26/99	1915	101	799	401,402,403,404	13	12	13	13	148	154	140	147	51	53
10/26/99	1930	101	797	401,402,403,404	13	13	13	13	148	154	141	147	51	53
10/26/99	1945	102	799	401,402,403,404	13	13	13	13	148	154	139	149	51	53
10/26/99	2000	101	800	401,402,403,404	12	12	13	13	148	154	135	147	50	52

795

Avg = ~~13~~ 12.7

26,000 lbs/hr

Avg 154 °F

148 °F

		Scrubber pH		Scrubber Solids		Rod Section ΔP		Reheat ΔP		Demister ΔP	
Date	Time	North	South	North	South	North	South	North	South	North	South
10/25/99	1700	4.99	5.09	9.5	8.5	10.8	9.0	0.67	1.41	0.04	0.16
10/25/99	1715					10.7	8.9	0.66	1.40	0.05	0.16
10/25/99	1730					10.7	9.1	0.66	1.41	0.05	0.15
10/25/99	1745			9.5	9.75	10.5	9.0	0.65	1.39	0.05	0.15
10/25/99	1800	6.2	6.2			10.7	9.2	0.68	1.42	0.05	0.16
10/25/99	1815					10.6	8.9	0.66	1.42	0.05	0.15
10/25/99	1830					10.6	8.9	0.66	1.41	0.05	0.15
10/25/99	1845					10.9	9.0	0.66	1.44	0.04	0.15
10/25/99	1900	5.9	5.9	9.5	10.0	10.8	9.1	0.67	1.47	0.05	0.15
10/25/99	1915					10.9	9.1	0.66	1.45	0.05	0.16
10/25/99	1930					10.9	9.1	0.66	1.50	0.05	0.16
10/25/99	1945					10.9	9.1	0.67	1.49	0.04	0.16
10/25/99	2000	5.3	5.7	10.25	10.0	10.8	8.9	0.67	1.46	0.04	0.15

		Scrubber pH		Scrubber Solids		Rod Section ΔP		Reheat ΔP		Demister ΔP	
Date	Time	North	South	North	South	North	South	North	South	North	South
10/26/99	0900	6.42	6.32	8.9	9.8	9.9	9.2	0.66	1.62	0.02	0.15
10/26/99	0915					9.9	9.0	0.67	1.61	0.03	0.15
10/26/99	0930					9.8	9.1	0.69	1.65	0.04	0.14
10/26/99	0945					9.9	9.1	0.68	1.69	0.03	0.15
10/26/99	1000	6.15	6.16	8.6	9.5	10.0	9.1	0.68	1.67	0.02	0.15
10/26/99	1015					9.8	8.9	0.65	1.63	0.02	0.15
10/26/99	1030					10.1	9.2	0.63	1.69	0.04	0.15
10/26/99	1045					10.2	9.0	0.64	1.46	0.03	0.16
10/26/99	1100	5.82	5.61	10.3	10.4	9.8	8.7	0.62	1.40	0.03	0.15

		Scrubber pH		Scrubber Solids		Rod Section ΔP		Reheat ΔP		Demister ΔP	
Date	Time	North	South	North	South	North	South	North	South	North	South
10/26/99	1345	6.3	6.3	9.2	9.7	10.6	9.2	0.68	1.51	0.05	0.16
10/26/99	1400	6.3	6.3	9.2	9.0	10.3	9.0	0.66	1.50	0.05	0.16
10/26/99	1415					10.3	9.0	0.66	1.47	0.04	0.16
10/26/99	1430					10.1	8.9	0.64	1.48	0.05	0.15
10/26/99	1445					10.2	8.8	0.68	1.51	0.04	0.17
10/26/99	1500					10.2	9.0	0.64	1.47	0.05	0.15
10/26/99	1730	5.3	5.3	9.0	9.3	10.5	9.1	0.66	1.55	0.05	0.15
10/26/99	1745					10.5	9.1	0.66	1.55	0.06	0.17
10/26/99	1800	5.9	6.3	8.25	9.75	10.6	9.2	0.68	1.58	0.05	0.17
10/26/99	1815					10.3	8.9	0.66	1.52	0.04	0.16
10/26/99	1830					10.4	8.9	0.66	1.54	0.04	0.17
10/26/99	1845					10.3	8.9	0.65	1.55	0.04	0.16
10/26/99	1900	6.3	6.4	9.5	9.0	10.4	9.0	0.66	1.59	0.05	0.17
10/26/99	1915					10.5	9.0	0.67	1.58	0.05	0.17
10/26/99	1930					10.3	9.0	0.66	1.58	0.05	0.16
10/26/99	1945					10.5	8.9	0.67	1.59	0.05	0.17
10/26/99	2000	5.9	6.0	10.25	9.0	10.3	8.9	0.66	1.54	0.05	0.16

Run Number 1 Fuel Sample Times 10/25/99			
Mill #401	Mill #402	Mill #403	Mill #404
1735-1739	1740-1745	1746-1749	1750-1753
1816-1819	1813-1815	1808-1812	1802-1807
1831-1837	1838-1843	1844-1847	1848-1852
1919-1923	1914-1918	1908-1913	1902-1907
1931-1938	1939-1944	1945-1950	1951-1956

Run Number 2 Fuel Sample Times 10/26/99			
Mill #401	Mill #402	Mill #403	Mill #404
0901-0907	0908-0912	0913-0917	0918-0922
0949-0953	0944-0948	0938-0943	0931-0937
1002-1007	1008-1014	1015-1020	1021-1025
1051-1055	1046-1050	1040-1045	1033-1039

Run Number 4 Fuel Sample Times 10/26/99			
Mill #401	Mill #402	Mill #403	Mill #404
1740-1743	1744-1747	1747-1750	1751-1755
1830-1835	1825-1829	1820-1824	1815-1848
1858-1902	1904-0907	1908-1912	1914-1917
1954-1957	1948-1952	1944-1947	1937-1941

ANALOG DATA LISTING
Western Resources, Inc.
Lawrence Energy Center
Unit 4 Hg Test Number 1

LEC4_Hg_Test_Data

Point	L4N_Stk-_Temp_43	L4N_Stk-Flw_43	L4S_Stk-_Temp_45	L4S_Stk-Flw_45	L4_Load-_48
Units	Deg(F)	Kscfm	Deg(F)	Kscfm	MWatts
Full Scale	500	350.0	500	350.0	150.0
10/25/99 16:30	145	184.6!	157	174.8!	101.0
10/25/99 16:45	146	182.7!	158	171.7!	99.0
10/25/99 17:00	146	183.2!	157	172.7!	99.0
10/25/99 17:15	146	182.7!	157	174.7!	100.0
10/25/99 17:30	145	184.1!	157	176.1!	100.0
10/25/99 17:45	144	182.0!	156	177.1!	100.0
10/25/99 18:00	145	182.9!	156	178.2!	100.0
10/25/99 18:15	144	184.6!	156	178.0!	100.0
10/25/99 18:30	145	186.2!	156	178.9!	101.0
10/25/99 18:45	145	186.4!	157	179.2!	100.0
10/25/99 19:00	145	185.0!	156	177.8!	101.0
Average	145	184.0	157	176.3	100.1
Minimum	144	182.0	156	171.7	99.0
Maximum	146	186.4	158	179.2	101.0
Missing (%)	0.00	0.00	0.00	0.00	0.00
Invalid (%)	0.00	0.00	0.00	0.00	0.00
O O Cal (%)	0.00	0.00	0.00	0.00	0.00
In Cal (%)	0.00	0.00	0.00	0.00	0.00
Valid (%)	100.00	100.00	100.00	100.00	100.00
Available(%)	NA	NA	NA	NA	NA

M MissingData	F PowerFailure	P InPurge	f DiscreteMissing
D Downed	C InCalibration	O Part60-OOC	O Part75-OOC
B NoSamples	< TooFewSamples	r Reserved_1	u Reserved_2
A HighAlarm	a LowAlarm	m EPA_MinCO2MaxO2	G EPA_AppG_CO2
> EnoughSamples	E Edited	S StackOffline	! PrimaryMonitor
@ BackupMonitor	# Alternate	$ ReferenceMethod	% Parametric
^ Average_HB_HA	& Init_QA_Hrs_Avg	* 90thPercentile	(95thPercentile
) BinMaximum	- BinAverage	+ MaxPotential	¦ Other

Western Resources, Inc.
Lawrence Energy Center
Unit 4 Hg Test Number 1

Point	L4N_CO2-_16	L4N_SO2-_16	L4N_NOx-ppm_16	L4S_CO2-_16	L4S_SO2-_16
Units	%	ppm	ppm	%	ppm
Full Scale	30.0	700.0	700.0	20.0	700.0
10/25/99 16:30	11.1!	8.4!	167.6!	11.4!	14.8!
10/25/99 16:45	11.0!	8.8!	166.9!	10.8!	13.6!
10/25/99 17:00	10.8!	9.7!	164.6!	10.8!	13.9!
10/25/99 17:15	10.9!	10.3!	166.3!	10.8!	14.5!
10/25/99 17:30	10.8!	12.8!	165.6!	11.1!	17.3!
10/25/99 17:45	10.9!	14.7!	166.9!	11.6!	20.1!
10/25/99 18:00	11.0!	17.5!	166.8!	11.5!	21.9!
10/25/99 18:15	10.8!	20.0!	166.7!	11.5!	23.2!
10/25/99 18:30	10.8!	23.7!	166.0!	11.4!	24.3!
10/25/99 18:45	10.7!	23.0!	168.3!	11.7!	22.9!
10/25/99 19:00	10.8!	22.2!	167.4!	11.9!	24.0!
Average	10.9	15.6	166.6	11.3	19.1
Minimum	10.7	8.4	164.6	10.8	13.6
Maximum	11.1	23.7	168.3	11.9	24.3
Missing (%)	0.00	0.00	0.00	0.00	0.00
Invalid (%)	0.00	0.00	0.00	0.00	0.00
O O Cal (%)	0.00	0.00	0.00	0.00	0.00
In Cal (%)	0.00	0.00	0.00	0.00	0.00
Valid (%)	100.00	100.00	100.00	100.00	100.00
Available(%)	NA	NA	NA	NA	NA

M MissingData	F PowerFailure	P InPurge	f DiscreteMissing
D Downed	C InCalibration	O Part60-OOC	O Part75-OOC
B NoSamples	< TooFewSamples	r Reserved_1	u Reserved_2
A HighAlarm	a LowAlarm	m EPA_MinCO2MaxO2	G EPA_AppG_CO2
> EnoughSamples	E Edited	S StackOffline	! PrimaryMonitor
@ BackupMonitor	# Alternate	$ ReferenceMethod	% Parametric
^ Average_HB_HA	& Init_QA_Hrs_Avg	* 90thPercentile	(95thPercentile
) BinMaximum	- BinAverage	+ MaxPotential	¦ Other

Western Resources, Inc.
Lawrence Energy Center
Unit 4 Hg Test Number 1

Point	L4S_NOx-ppm_16
Units	ppm
Full Scale	700.0
10/25/99 16:30	191.0!
10/25/99 16:45	177.4!
10/25/99 17:00	174.9!
10/25/99 17:15	175.6!
10/25/99 17:30	181.8!
10/25/99 17:45	189.4!
10/25/99 18:00	188.3!
10/25/99 18:15	186.3!
10/25/99 18:30	186.3!
10/25/99 18:45	189.1!
10/25/99 19:00	190.6!
Average	184.6
Minimum	174.9
Maximum	191.0
Missing (%)	0.00
Invalid (%)	0.00
O O Cal (%)	0.00
In Cal (%)	0.00
Valid (%)	100.00
Available(%)	NA

M MissingData	F PowerFailure	P InPurge	f DiscreteMissing
D Downed	C InCalibration	O Part60-OOC	O Part75-OOC
B NoSamples	< TooFewSamples	r Reserved_1	u Reserved_2
A HighAlarm	a LowAlarm	m EPA_MinCO2MaxO2	G EPA_AppG_CO2
> EnoughSamples	E Edited	S StackOffline	! PrimaryMonitor
@ BackupMonitor	# Alternate	$ ReferenceMethod	% Parametric
^ Average_HB_HA	& Init_QA_Hrs_Avg	* 90thPercentile	(95thPercentile
) BinMaximum	- BinAverage	+ MaxPotential	| Other

Western Resources, Inc.
Lawrence Energy Center
Unit 4 Hg Test Number 2

Point	L4N_Stk-_Temp_43	L4N_Stk-Flw_43	L4S_Stk-_Temp_45	L4S_Stk-Flw_45	L4_Load-_48
Units	Deg(F)	Kscfm	Deg(F)	Kscfm	MWatts
Full Scale	500	350.0	500	350.0	150.0
10/26/99 08:00	131	180.3!	146	175.5!	100.0
10/26/99 08:15	133	179.7!	147	176.2!	100.0
10/26/99 08:30	133	181.8!	147	178.3!	101.0
10/26/99 08:45	133	182.5!	148	176.1!	101.0
10/26/99 09:00	134	182.5!	148	176.6!	101.0
10/26/99 09:15	136	183.1!	149	175.0!	102.0
10/26/99 09:30	137	183.4>!	150	175.5!	101.0
10/26/99 09:45	138	183.9>!	151	176.9!	102.0
10/26/99 10:00	138	180.3!	151	177.1!	101.0
10/26/99 10:15	139	182.2!	152	176.2!	100.0
Average	135	182.0	149	176.3	100.9
Minimum	131	179.7	146	175.0	100.0
Maximum	139	183.9	152	178.3	102.0
Missing (%)	0.00	0.00	0.00	0.00	0.00
Invalid (%)	0.00	0.00	0.00	0.00	0.00
O O Cal (%)	0.00	0.00	0.00	0.00	0.00
In Cal (%)	0.00	0.00	0.00	0.00	0.00
Valid (%)	100.00	100.00	100.00	100.00	100.00
Available(%)	NA	NA	NA	NA	NA

M MissingData	F PowerFailure	P InPurge	f DiscreteMissing
D Downed	C InCalibration	O Part60-OOC	O Part75-OOC
B NoSamples	< TooFewSamples	r Reserved_1	u Reserved_2
A HighAlarm	a LowAlarm	m EPA_MinCO2MaxO2	G EPA_AppG_CO2
> EnoughSamples	E Edited	S StackOffline	! PrimaryMonitor
@ BackupMonitor	# Alternate	$ ReferenceMethod	% Parametric
^ Average_HB_HA	& Init_QA_Hrs_Avg	* 90thPercentile	(95thPercentile
) BinMaximum	- BinAverage	+ MaxPotential	¦ Other

Western Resources, Inc.
Lawrence Energy Center
Unit 4 Hg Test Number 2

Point	L4N_CO2-_16	L4N_SO2-_16	L4N_NOx-ppm_16	L4S_CO2-_16	L4S_SO2-_16
Units	%	ppm	ppm	%	ppm
Full Scale	30.0	700.0	700.0	20.0	700.0
10/26/99 08:00	10.8!	5.0!	161.1!	10.5!	9.9!
10/26/99 08:15	10.7!	5.1!	163.6!	10.5!	9.7!
10/26/99 08:30	10.8!	5.7!	162.6!	10.8!	10.6!
10/26/99 08:45	10.8!	6.1!	164.2!	11.6!	11.5!
10/26/99 09:00	10.7!	7.1!	163.5!	10.8!	13.0!
10/26/99 09:15	10.7!	7.9!	164.9!	11.3!	14.5!
10/26/99 09:30	10.6!	10.0!	167.1!	10.8!	17.3!
10/26/99 09:45	10.6!	11.4!	165.9!	10.8!	20.9!
10/26/99 10:00	10.7!	13.3!	166.6!	10.6!	24.1!
10/26/99 10:15	10.7!	13.2!	169.5!	10.7!	24.1!
Average	10.7	8.5	164.9	10.8	15.6
Minimum	10.6	5.0	161.1	10.5	9.7
Maximum	10.8	13.3	169.5	11.6	24.1
Missing (%)	0.00	0.00	0.00	0.00	0.00
Invalid (%)	0.00	0.00	0.00	0.00	0.00
O O Cal (%)	0.00	0.00	0.00	0.00	0.00
In Cal (%)	0.00	0.00	0.00	0.00	0.00
Valid (%)	100.00	100.00	100.00	100.00	100.00
Available(%)	NA	NA	NA	NA	NA

M MissingData	F PowerFailure	P InPurge	f DiscreteMissing
D Downed	C InCalibration	O Part60-OOC	O Part75-OOC
B NoSamples	< TooFewSamples	r Reserved_1	u Reserved_2
A HighAlarm	a LowAlarm	m EPA_MinCO2MaxO2	G EPA_AppG_CO2
> EnoughSamples	E Edited	S StackOffline	! PrimaryMonitor
@ BackupMonitor	# Alternate	$ ReferenceMethod	% Parametric
^ Average_HB_HA	& Init_QA_Hrs_Avg	* 90thPercentile	(95thPercentile
) BinMaximum	- BinAverage	+ MaxPotential	¦ Other

Western Resources, Inc.
Lawrence Energy Center
Unit 4 Hg Test Number 2

Point	L4S_NOx-ppm_16
Units	ppm
Full Scale	700.0
10/26/99 08:00	176.4!
10/26/99 08:15	177.5!
10/26/99 08:30	179.8!
10/26/99 08:45	200.1!
10/26/99 09:00	195.3!
10/26/99 09:15	195.1!
10/26/99 09:30	186.1!
10/26/99 09:45	186.3!
10/26/99 10:00	180.4!
10/26/99 10:15	178.6!
Average	185.6
Minimum	176.4
Maximum	200.1
Missing (%)	0.00
Invalid (%)	0.00
O O Cal (%)	0.00
In Cal (%)	0.00
Valid (%)	100.00
Available(%)	NA

M MissingData	F PowerFailure	P InPurge	f DiscreteMissing
D Downed	C InCalibration	O Part60-OOC	O Part75-OOC
B NoSamples	< TooFewSamples	r Reserved_1	u Reserved_2
A HighAlarm	a LowAlarm	m EPA_MinCO2MaxO2	G EPA_AppG_CO2
> EnoughSamples	E Edited	S StackOffline	! PrimaryMonitor
@ BackupMonitor	# Alternate	$ ReferenceMethod	% Parametric
^ Average_HB_HA	& Init_QA_Hrs_Avg	* 90thPercentile	(95thPercentile
) BinMaximum	- BinAverage	+ MaxPotential	¦ Other

Western Resources, Inc.
Lawrence Energy Center
Unit 4 Hg Test Number 3

Point	L4N_Stk-_Temp_43	L4N_Stk-Flw_43	L4S_Stk-_Temp_45	L4S_Stk-Flw_45	L4_Load-_48
Units	Deg(F)	Kscfm	Deg(F)	Kscfm	MWatts
Full Scale	500	350.0	500	350.0	150.0
10/26/99 16:30	146	182.9!	159	175.9!	101.0
10/26/99 16:45	146	182.7!	159	178.3!	102.0
10/26/99 17:00	144	183.4!	158	177.1!	101.0
10/26/99 17:15	144	181.7!	158	178.3!	101.0
10/26/99 17:30	144	182.3!	157	178.7!	101.0
10/26/99 17:45	144	183.1!	157	179.0!	102.0
10/26/99 18:00	143	185.0!	157	177.5!	102.0
10/26/99 18:15	144	182.4!	157	177.1!	102.0
10/26/99 18:30	145	181.7!	157	177.1!	102.0
10/26/99 18:45	144	182.5!	157	178.5!	102.0
10/26/99 19:00	144	181.1!	157	175.9!	101.0
Average	144	182.6	158	177.6	101.5
Minimum	143	181.1	157	175.9	101.0
Maximum	146	185.0	159	179.0	102.0
Missing (%)	0.00	0.00	0.00	0.00	0.00
Invalid (%)	0.00	0.00	0.00	0.00	0.00
O O Cal (%)	0.00	0.00	0.00	0.00	0.00
In Cal (%)	0.00	0.00	0.00	0.00	0.00
Valid (%)	100.00	100.00	100.00	100.00	100.00
Available(%)	NA	NA	NA	NA	NA

M MissingData	F PowerFailure	P InPurge	f DiscreteMissing
D Downed	C InCalibration	O Part60-OOC	O Part75-OOC
B NoSamples	< TooFewSamples	r Reserved_1	u Reserved_2
A HighAlarm	a LowAlarm	m EPA_MinCO2MaxO2	G EPA_AppG_CO2
> EnoughSamples	E Edited	S StackOffline	! PrimaryMonitor
@ BackupMonitor	# Alternate	$ ReferenceMethod	% Parametric
^ Average_HB_HA	& Init_QA_Hrs_Avg	* 90thPercentile	(95thPercentile
) BinMaximum	- BinAverage	+ MaxPotential	| Other

Western Resources, Inc.
Lawrence Energy Center
Unit 4 Hg Test Number 3

Point	L4N_CO2-_16	L4N_SO2-_16	L4N_NOx-ppm_16	L4S_CO2-_16	L4S_SO2-_16
Units	%	ppm	ppm	%	ppm
Full Scale	30.0	700.0	700.0	20.0	700.0
10/26/99 16:30	11.2!	15.9!	162.3!	11.2!	27.0!
10/26/99 16:45	11.1!	16.2!	160.7!	11.2!	27.1!
10/26/99 17:00	10.8!	15.2!	162.9!	11.2!	24.9!
10/26/99 17:15	10.8!	5.4!	161.9!	11.1!	10.8!
10/26/99 17:30	10.8!	4.3!	163.0!	11.0!	8.9!
10/26/99 17:45	10.8!	4.5!	165.2!	10.9!	9.4!
10/26/99 18:00	10.8!	5.0!	164.9!	11.3!	10.0!
10/26/99 18:15	10.8!	5.5!	165.7!	11.4!	11.1!
10/26/99 18:30	10.8!	6.5!	164.9!	11.0!	11.9!
10/26/99 18:45	10.8!	7.8!	166.3!	10.9!	13.3!
10/26/99 19:00	10.7!	10.9!	165.5!	11.0!	15.0!
Average	10.9	8.8	163.9	11.1	15.4
Minimum	10.7	4.3	160.7	10.9	8.9
Maximum	11.2	16.2	166.3	11.4	27.1
Missing (%)	0.00	0.00	0.00	0.00	0.00
Invalid (%)	0.00	0.00	0.00	0.00	0.00
O O Cal (%)	0.00	0.00	0.00	0.00	0.00
In Cal (%)	0.00	0.00	0.00	0.00	0.00
Valid (%)	100.00	100.00	100.00	100.00	100.00
Available(%)	NA	NA	NA	NA	NA

M MissingData	F PowerFailure	P InPurge	f DiscreteMissing
D Downed	C InCalibration	O Part60-OOC	O Part75-OOC
B NoSamples	< TooFewSamples	r Reserved_1	u Reserved_2
A HighAlarm	a LowAlarm	m EPA_MinCO2MaxO2	G EPA_AppG_CO2
> EnoughSamples	E Edited	S StackOffline	! PrimaryMonitor
@ BackupMonitor	# Alternate	$ ReferenceMethod	% Parametric
^ Average_HB_HA	& Init_QA_Hrs_Avg	* 90thPercentile	(95thPercentile
) BinMaximum	- BinAverage	+ MaxPotential	¦ Other

Western Resources, Inc.
Lawrence Energy Center
Unit 4 Hg Test Number 3

Point	L4S_NOx-ppm_16
Units	ppm
Full Scale	700.0
10/26/99 16:30	179.4!
10/26/99 16:45	176.8!
10/26/99 17:00	178.2!
10/26/99 17:15	176.8!
10/26/99 17:30	174.7!
10/26/99 17:45	175.7!
10/26/99 18:00	178.0!
10/26/99 18:15	181.3!
10/26/99 18:30	179.5!
10/26/99 18:45	181.1!
10/26/99 19:00	182.9!
Average	178.6
Minimum	174.7
Maximum	182.9
Missing (%)	0.00
Invalid (%)	0.00
O O Cal (%)	0.00
In Cal (%)	0.00
Valid (%)	100.00
Available(%)	NA

M MissingData	F PowerFailure	P InPurge	f DiscreteMissing
D Downed	C InCalibration	O Part60-OOC	O Part75-OOC
B NoSamples	< TooFewSamples	r Reserved_1	u Reserved_2
A HighAlarm	a LowAlarm	m EPA_MinCO2MaxO2	G EPA_AppG_CO2
> EnoughSamples	E Edited	S StackOffline	! PrimaryMonitor
@ BackupMonitor	# Alternate	$ ReferenceMethod	% Parametric
^ Average_HB_HA	& Init_QA_Hrs_Avg	* 90thPercentile	(95thPercentile
) BinMaximum	- BinAverage	+ MaxPotential	¦ Other

APPENDIX F

Chain of Custody Records

Job# 99-95LAW4 Unit Tested Unit 4

CHAIN OF CUSTODY RECORD

Page # 1/1

Facility Name/Location
Western Resources, Inc.
Lawrence Energy Center
Lawrence, KS

Collected By/Company
METCO Environmental

Unit 4 South Scrubber Inlet Duct SAMPLE I.D. Run1	DATE	TIME	AIR	SOLID	COMP	GRAB	# OF CONTAINERS	RECOVERED BY	HCl	PART.	SO2	SO3	PCDD/PCDF	SEMI-VOC	POHC's	METALS	Hg			REMARKS (Specific Compounds/Methods)
Container 1 Filter	10/25/99	2044	X				II	BH									X			Ship to METCO for weight. Filter #: Q74 Thimble #: Q63
Container 2 0.1 N HNO_3 F.W.	10/25/99	2046	X				I	BH									X			Container 2A not recovered.
Container 3 10% HNO_3 Rinse Imp 1,2,3	10/25/99	2056	X				II	BH									X			
Container 4 0.1 N HNO_3 Rinse Imp 4	10/25/99	2100	X				I	BH									X			
Container 5 0.1 N HNO_3 Rinse Imp 5,6,7	10/25/99	2111	X				I	BH									X			Used Hydroxylamine Sulfate / Sodium Chloride.

Received by:	Date:	Time:	Transported by:	Date:	Time:	Received at Lab by:	Date:	Time:
Joann Camerg	10-29-99					Michael H. Russell	10/30	6:09
Analyzed by:	**Date:**	**Time:**	**Data Reviewed by:**	**Date:**	**Time:**	**Remarks:**		
			JRh	02/08/00				

Ship to: TestAmerica

METCO ENVIRONMENTAL

Job# 99-95LAW4 Unit Tested Unit 4

CHAIN OF CUSTODY RECORD

Page # 1/1

Facility Name/Location
Western Resources, Inc.
Lawrence Energy Center
Lawrence, KS

Collected By/Company
METCO Environmental

Unit 4 South Scrubber Inlet Duct SAMPLE I.D. Run 2	DATE	TIME	AIR	SOLID	COMP	GRAB	# OF CONTAINERS	RECOVERED BY	HCl	PART.	SO2	SO3	PCDD/PCDF	SEMI-VOC	POHC's	METALS	Hg			REMARKS (Specific Compounds/Methods)
																				Analyze according to the Ontario Hydro Method.
Container 1 Filter	10/26/99	1434	X				II	BH									X			Ship to METCO for weight. Filter Q75 Thimble Q64
Container 2 0.1 N HNO_3 F.W.	10/26/99	1436	X				I	BH									X			Container 2A not recovered.
Container 3 10% HNO_3 Rinse Imp 1,2,3	10/26/99	1446	X				II	BH									X			
Container 4 0.1 N HNO_3 Rinse Imp 4	10/26/99	1450	X				I	BH									X			
Container 5 0.1 N HNO_3 Rinse Imp 5,6,7	10/26/99	1575	X				I	BH									X			Used Hydroxylamine Sulfate / Sodium Chloride

Received by:	Date:	Time:	Transported by:	Date:	Time:	Received at Lab by:	Date:	Time:
Joan Camaz	10/29/99					Michael H. Roselot	10/30	6:09

Analyzed by:	Date:	Time:	Data Reviewed by:	Date:	Time:	Remarks:
			JCM	02/08/00		

Ship to: TestAmerica

METCO ENVIRONMENTAL

Job# 99-95LAW4 Unit Tested Unit 4

CHAIN OF CUSTODY RECORD

Page # 1/1

Facility Name/Location
Western Resources, Inc
Lawrence Energy Center
Lawrence, KS

Collected By/Company
METCO Environmental

Unit 4 South Scrubber Inlet Duct

SAMPLE I.D. Run 4	DATE	TIME	AIR	SOLID	COMP	GRAB	# OF CONTAINERS	RECOVERED BY	HCl	PART.	SO2	SO3	PCDD/PCDF	SEMI-VOC	POHC's	METALS	Hg			REMARKS (Specific Compounds/Methods)
																				Analyze according to the Ontario Hydro method.
1 Filter	10/26/99	2108					II	BH									✓			Shipped to METCO for weight Thimble Q66 Filter 47081
2 0.1 N HNO_3 F/W ~~Rmp. 1,2+3~~	10/26/99	2109	✓				1	BH									✓			Container 2A NOT Recovered
3 10% HNO_3 Rmp. 1,2+3 Rinse	10/26/99	2116	✓				II	BH									✓			
4 0.1 N HNO_3 Rmp. 4 Rinse	10/26/99	2121	✓				1	BH									✓			
5 0.1 N HNO_3 Rmp. 5,6+7 Rinse	10/26/99	2123	✓				1	BH									✓			
																				Used Hydroxylamine Sulfate · Sodium Chloride

Received by:	Date:	Time:	Transported by:	Date:	Time:	Received at Lab by:	Date:	Time:
Jason Conway	10/29/99					Michael H. Rinehart	10/30	6:10
Analyzed by:	**Date:**	**Time:**	**Data Reviewed by:**	**Date:**	**Time:**	**Remarks:**		
			JRH	02/08/00				

Ship to: TestAmerica

METCO ENVIRONMENTAL

Job# 99-95 LAW4 Unit Tested Unit 4

CHAIN OF CUSTODY RECORD

Page # 1/1

Facility Name/Location
Western Resources, Inc.
Lawrence Energy Center.
Lawrence, KS

Collected By/Company
METCO Environmental

Unit 4 South Stack

SAMPLE I.D. Run 1	DATE	TIME	AIR	SOLID	COMP	GRAB	# OF CONTAINERS	RECOVERED BY	HCl	PART.	SO2	SO3	PCDD/PCDF	SEMI-VOC	POHC's	METALS	Hg			REMARKS (Specific Compounds/Methods)
																				Analyze according to the Ontario Hydro Method.
Container 1 Filter	10/25/99	2145 ~~2030~~	X				I	BH									X			Ship to METCO for weight. Filter: 88Q H43
Container 2 0.1 N HNO_3 F.W.	10/25/99	2030	X				I	BH									X			Container 2A not recovered.
Container 3 10% HNO_3 Rinse Imp 1,2,3	10/25/99	2129	X				II	BH									X			
Container 4 0.1 N HNO_3 Rinse Imp 4	10/25/99	2121	X				I	BH									X			
Container 5 0.1 N HNO_3 Rinse Imp 5,6,7	10/25/99	2142	X				I	BH									X			Used Hydroxylamine Sulfate / Sodium Chloride.

Received by: Jason Conway	Date: 10/29/99	Time:	Transported by:	Date:	Time:	Received at Lab by: Michael H. Ramsey	Date: 10/30	Time: 6:10
Analyzed by:	Date:	Time:	Data Reviewed by: JRM	Date: 02/08/00	Time:	Remarks:		

Ship to: TestAmerica

METCO ENVIRONMENTAL

Job# 99-954LW4 Unit Tested Unit 4

CHAIN OF CUSTODY RECORD

Page # 1/1

Facility Name/Location
Western Resources, Inc.
Lawrence Energy Center.
Lawrence, KS

Collected By/Company
METCO Environmental

Unit 4 South Stack

SAMPLE I.D. Run 2	DATE	TIME	AIR	SOLID	COMP	GRAB	# OF CONTAINERS	RECOVERED BY	HCl	PART.	SO2	SO3	PCDD/PCDF	SEMI-VOC	POHC's	METALS	Hg			REMARKS (Specific Compounds/Methods)
Container 1 Filter	10/26/99	1350	X				I	BH									X			Ship to METCO for weight Filter 88QH44
Container 2 0.1 N HNO3 F.W.	10/26/99	1358	X				I	BH									X			Container 2A not recovered.
Container 3 10% HNO3 Rinse Imp 1,2,3	10/26/99	1408	X				II	BH									X			
Container 4 0.1 N HNO3 Rinse Imp 4	10/26/99	1413	X				I	BH									X			
Container 5 0.1 N HNO3 Rinse Imp 5,6,7	10/26/99	1427	X				I	BH									X			Used Hydroxylamine Sulfate / Sodium Chloride.

Analyze according to to Ontario Hydro method

Received by:	Date:	Time:	Transported by:	Date:	Time:	Received at Lab by:	Date:	Time:
Jason Conway	10/29/99					Michael A Russell	10/30	0:10
Analyzed by:	**Date:**	**Time:**	**Data Reviewed by:**	**Date:**	**Time:**	**Remarks:**		
			Jam	02/08/00				

Ship to: TestAmerica

METCO ENVIRONMENTAL

Job# 99-952PW4 Unit Tested Unit 4

CHAIN OF CUSTODY RECORD

Page # 1/1

Facility Name/Location: Western Resources, Inc Lawrence Energy center Lawrence, KS

Collected By/Company: METCO Environmental

SAMPLE I.D. Unit 4 South Stack Run 4	DATE	TIME	AIR	SOLID	COMP	GRAB	# OF CONTAINERS	RECOVERED BY	HCl	PART.	SO2	SO3	PCDD/PCDF	SEMI-VOC	POHC's	METALS	H2S			REMARKS (Specific Compounds/Methods)
Container 1 Filter	10/26/99	2139					1	BH									✓			Shipped to METCO for weight. Filter 88Q H 46
2 0.1 N HNO_3 F/W	10/26/99	2140	✓				1	BH									✓			Container 2A Not Recovered
3 10% HNO_3 Rinse Bmp. 1,2+3	10/26/99	2148	✓				11	BH									✓			
4 0.1 N HNO_3 Rinse Bmp. 4	10/26/99	2152	✓				1	BH									✓			
5 0.1 N HNO_3 Rinse Bmp. 5,6+7	10/26/99	2159	✓				1	BH									✓			Used Hydroxylamine Sulfat. Sodium Chloride

SAMPLE ANALYSIS REQUIRED

Received by: Jason Cassidy	Date: 10/29/99	Time:	Transported by:	Date:	Time:	Received at Lab by: Michael H. Rosebet	Date: 10/30	Time: 610
Analyzed by:	Date:	Time:	Data Reviewed by: JRM	Date: 02/08/07	Time:	Remarks:		

Ship to: TestAmerica

METCO ENVIRONMENTAL

Job# 99-95LAW4 Unit Tested Unit 4

CHAIN OF CUSTODY RECORD

Page # 1/1

Facility Name/Location
Western Resources, Inc.
Lawrence Energy Center
Lawrence, KS

Collected By/Company
METCO Environmental

Unit 4 South Scrubber Inlet Duct SAMPLE I.D. Blank Train	DATE	TIME	AIR	SOLID	COMP	GRAB	# OF CONTAINERS	RECOVERED BY	HCl	PART.	SO2	SO3	PCDD/PCDF	SEMI-VOC	POHC's	METALS	Hg			REMARKS (Specific Compounds/Methods)
Container 3 10% HNO_3 Rinse Imp 1,2,3	10/26/99	1820	X				I	BH									X			Analyze according to the Ontario Hydro method. Containers 1, 2, and 2A not recovered.
Container 4 0.1 N HNO_3 Rinse Imp 4	10/26/99	1828	X				I	BH									X			
Container 5 0.1 N HNO_3 Rinse Imp 5,6,7	10/26/99	1840	X				I	BH									X			Used Hydroxylamine Sulfate / Sodium Chloride

Received by: [signature]	Date: 10/29/99	Time:	Transported by:	Date:	Time:	Received at Lab by: Michael A. Rosellet	Date: 10/30	Time: 6:10
Analyzed by:	Date:	Time:	Data Reviewed by: [signature]	Date: 02/08/01	Time:	Remarks:		

Ship to: TestAmerica

METCO ENVIRONMENTAL

Job# 99-95 LAW4 Unit Tested Unit 4

CHAIN OF CUSTODY RECORD

Page # 1/1

Facility Name/Location
Western Resources, Inc.
Lawrence Energy Center
Lawrence, KS

Collected By/Company
METCO Environmental

Unit 4. South Stack Blank Train SAMPLE I.D.	DATE	TIME	AIR	SOLID	COMP	GRAB	# OF CONTAINERS	RECOVERED BY	HCl	PART.	SO2	SO3	PCDD/PCDF	SEMI-VOC	POHC's	METALS		Hg		REMARKS (Specific Compounds/Methods)
Container 3 10% HNO_3 Rinse Imp 1,2,3	10/26/99	1727	X				I	BH										X		Containers 1, 2, and 2A not recovered.
Container 4 0.1 N HNO_3 Rinse Imp 4	10/26/99	1732	X				I	BH										X		
Container 5 0.1 N HNO_3 Rinse Imp 5,6,7	10/26/99	1745	X				I	BH										X		Used Hydroxy lamine Sulfate / Sodium Chloride

SAMPLE ANALYSIS REQUIRED

REMARKS: Analyze according to the Ontario Hydro Method.

Run Time: 0830-1030 10/26/99

Received by: Jason Lowry	Date: 10/27/99	Time:	Transported by:	Date:	Time:	Received at Lab by: Michael H. Roselet	Date: 10/32	Time: 6:11
Analyzed by:	Date:	Time:	Data Reviewed by: RM	Date: 02/09/00	Time:	Remarks:		

Ship to: TestAmerica

METCO ENVIRONMENTAL

Job# 99-95LAW4 Unit Tested Unit 4

CHAIN OF CUSTODY RECORD

Page # 1/1

Facility Name/Location
Western Resources, Inc.
Lawrence Energy Center
Lawrence, KS

Collected By/Company
METCO Environmental

SAMPLE I.D.	DATE	TIME	AIR	SOLID	COMP	GRAB	# OF CONTAINERS	RECOVERED BY	HCl	PART.	SO2	SO3	PCDD/PCDF	SEMI-VOC	POHC's	METALS	Hg			REMARKS (Specific Compounds/Methods)
Reagent Blanks																				Analyze according to the Ontario Hydro method.
Container 7 0.1 N HNO_3 Blank	10/26/99	0951	X				I	BH									X			Vol. = 50 ml
Container 8 1m KCl Blank	10/26/99	0952	X				I	BH									X			Vol. = 48 ml
Container 9 5% HNO_3 - 10% H_2O_2 Blank	10/26/99	0954	X				I	BH									X			Vol = 48 ml
Container 10 $KMnO_4$ - H_2SO_4 Blank	10/26/99	0955	X				I	BH									X			Vol. = 50 ml
Container 11 $NH_2OH \cdot H_2SO_4$ Blank	10/26/99	0957	X				I	BH									X			Vol. = 100 ml
Container 12 Filter Blank	10/26/99	2012	X				IV	BH									X			47 mm Filters: 47Q82, 47Q83, 47Q84 88 mm Filters: 88QH47, 88QH48, 88QH49 Thimbles: Q67, Q68, Q69

Received by:	Date:	Time:	Transported by:	Date:	Time:	Received at Lab by:	Date:	Time:
Jason Conway	10/29/99					Michael H. Russell	10/30	6:11
Analyzed by:	Date:	Time:	Data Reviewed by: RM	Date: 02/08/00	Time:	Remarks:		

Ship to: TestAmerica

METCO ENVIRONMENTAL

F-10

APPENDIX G

Resumes

METCO ENVIRONMENTAL

BILLY J. MULLINS, JR.; President

Education	Post Graduate Study Environmental Engineering at Southern Methodist University; Dallas, Texas 1970. M.S. 1969, New York University; New York, New York, in Civil Engineering (Air Resources). B.S. 1968, Texas Tech University; Lubbock, Texas, in Civil Engr. (Water Resources). Studies in Engineering at U.S. Naval Academy; Annapolis, Maryland, 1963-1964.
Professional Training Courses	Attended Short Course on Air Pollution Engineering at the University of Texas at Austin, February 1970. Attended four-week management course presented by the American Management Association, 1976.
Certification	Registered Professional Engineer Certified Visible Emissions Evaluator Licensed Private Pilot (Multi-Engine-Land, Instrument) Diplomat in the American Academy of Environmental Engineers Inductee into the Stack Sampling Hall of Fame Certified as Qualified Environmental Professional (QEP)
Professional Memberships	**Air & Waste Management Association** - Past Chairman, Past Vice Chairman, and Past Board of Directors of North Texas Chapter and Southwest Section; Past Chairman, Consultants Committee; Past Chairman, Source Measurement Committee **Source Evaluation Society** - Past President, Past Board of Directors **American Management Association**

MULLINS

Publications

Authored "Real World Experience with USEPA's New Sampling and Analytical Methods for Conducting Risk Burn," - May 1998.

Co-authored "Sulfur Compound Emissions of the Petroleum Production Industry," December 1974.

Co-authored "Field Procedure for Stabilizing Hydrogen Sulfide Samples to be Analyzed Using Modified Methylene Blue Technique," presented at the Conference on Ambient Air Quality Measurements, Austin, Texas, March 1975.

Co-authored "Atmospheric Emissions Survey of the Sour Gas Industry," October 1975.

Co-authored "Technique for Insuring the Validity of Samples for High Concentrations of Sulfur Dioxide Using the EPA Method 5 Sampling Train," presented at the Third National Conference on Energy and the Environment, College Corner, Ohio, September 1975.

Teaching Experience

Conducted training seminars on sampling methods periodically since 1974 to present.

Conducted a one-day seminar on Part 75 Testing over ten times in 1993 and 1994.

Served as a lecturer in the Environmental Protection Agency's training course number 450, "Source Sampling for Particulate Pollutants," for two years from January 1974 to October 1975 and in March, 1992.

Conducted a two-day training course entitled "Technical Assistance in Source Sampling" at Iowa State University, Ames, Iowa, for the Environmental Protection Agency, October 1974.

MULLINS

Teaching Experience (Cont'd)

Conducted EPA's training course number 450, "Source Sampling for Particulate Pollutants," for the EPA at Research Triangle Park, North Carolina, September 1975.

Conducted a two-day short course entitled "Performing and Observing Source Sampling" at Dallas, Texas; July 1976, May 1977, October 1977, November 1987 and November 1988; at Lake Charles, Louisiana, May 1977; at Casper, Wyoming, May 1977; and at Point Comfort, Texas, November 1992.

Served as a lecturer in the Environmental Protection Agency's two-day seminar entitled "Asphalt Industry Environmental Solutions," presented in Dallas, Texas, on March 21 and 22, 1979.

Conducted a two-day short course entitled "Performing and Observing Source Sampling" in Phoenix, Arizona in August, 1990 for the State of Arizona, Department of Environmental Quality; in Lincoln, Nebraska, in March 1980 for the State of Nebraska, Air Quality Control Division.

Technical Experience

Directed and performed stack sampling on over 2000 sources of which over 500 were sampled simultaneously using more than one sampling train at several points in the flue gas stream; 1972-present.

Directed and performed over 200 short-term ambient air studies using mobile sampling vans and various ambient air sampling equipment; 1972-present.

Designed, directed and operated over 20 permanent ambient air networks of various size and duration for a variety of parameters; 1972-present.

Designed surface and underground drainage systems for residential subdivisions, public works projects, and shopping centers; 1969-1972.

MULLINS

Designed several residential subdivisions including lot layout, street design, drainage design, and utility design; 1969-1972.

Research Projects

Supervised and conducted a study made by the Hawaiian Sugar Planters' Association to characterize the emissions for several bagasse-fired boilers. April-May 1976.

Supervised and conducted a study made by the Rio Grande Valley Sugar Growers, Inc. to determine the area affected by the burning of sugarcane fields prior to harvesting. November 1974-April 1975.

Supervised and conducted a study by a lightweight aggregate manufacturer to develop a material balance around the process through sampling and analysis of several parameters. November 1973.

Conducted a study in New York City to attempt to develop a correlation in the ambient air between carbon dioxide and sulfur dioxide to provide a tool for predicting air pollution episodes. January-May 1969.

Related Projects

Served as Chairman of the Engineering Foundation Conference on Stack Sampling and Source Evaluation in Santa Barbara, California, 1985.

Served as Session Chairman at the Engineering Foundation Conference on Stack Sampling and Source Evaluation in Hershey, Pennsylvania, 1984; in San Diego, California, 1993; and in Palm Coast, Florida, 1994.

BILLY L. HEFLEY; Project Supervisor II

Education	B.S. 1991, East Central University; Ada, Oklahoma, in Environmental Science with a concentration in Environmental Management.
Professional Training Course	Attended 40-hour Occupational and Environmental Training Program on Hazardous Materials (CFR 1910.120) Dallas, Texas, April 1993. Also attended an 8-hour refresher course January 1994, February 1995, and January 1996. Attended 8-hour Safe Hazardous Materials Transportation Training Program (HM-126F and HM-181) Dallas, Texas, October 1994. Attended Bill Mullins' Performing and Observing Source Sampling Short Course; Dallas, Texas, January 1995.
Certification	Certified Visible Emissions Evaluator
Technical Experience	Participated in the sampling of over 150 sources, including several of which were sampled simultaneously using more than one sampling train. Thoroughly trained in all EPA testing procedures, 1992-present. Participated in an auditing program for a permanent eight-station sulfur dioxide ambient air network in East Texas. 1992-1993. Participated in a semi-monthly ambient air monitoring survey for organic compounds at a petrochemical facility located in South Texas. 1992-1993.

HEFLEY

Thoroughly trained in all EPA testing procedures, 1991 - Present

Experienced in the analysis of commercial calibration gas cylinders for CO_2, O_2, NO_x, and SO_2.

Experienced with calibration techniques for all field testing equipment.

Thoroughly trained in the operation and routine maintenance of the following:

Thermo Environmental Model 10AR Oxides of Nitrogen Analyzer

Thermo Environmental Model 48 Carbon Monoxide Analyzer

Teledyne Model 326 Oxygen Analyzer

Western Research Model 721A Sulfur Dioxide Analyzer

Anarad Model AR880 Oxides of Nitrogen Analyzer

Anarad Model AR23 Oxygen Analyzer

Anarad Model AR30C2 Sulfur Dioxide Analyzer

Anarad Model AR50-C Carbon Dioxide Analyzer

SHANE LEE; Environmental Technician II

Education	B. S. - Environmental Science-Biology, December 20, 1997; Sul Ross State University; Alpine, Texas.
Technical Experience	Participated in the sampling of over 50 sources, including several of which were sampled simultaneously using more than one sampling train. Thoroughly trained in all EPA testing procedures, 1998-Present.

MICHAEL BASS; Environmental Technician II

Education	B. S. Geography, August 1998; Texas A&M University, College Station, Texas
Technical Experience	Participated in the sampling of over 50 sources, including several of which were sampled simultaneously using more than one sampling train. Thoroughly trained in all EPA testing procedures, 1998-Present.

SCOTT HART; Environmental Technician I

Education	Associate Degree-Environmental Science, March 1999; Texas State Technical College, Breckenridge, Texas
Technical Experience	Participated in the sampling of over 25 sources, including several of which were sampled simultaneously using more than one sampling train. Thoroughly trained in all EPA procedures, 1999-Present.

JASON CONWAY; Environmental Technician I

Education	B.S. Biology, July 1999; Southeastern Oklahoma State University; Durant, Oklahoma.
Technical Experience	Participated in the sampling of over 25 sources, including several of which were sampled simultaneously using more than one sampling train. Thoroughly trained in all EPA testing procedures, 1999-Present.

JASON BROWN; Environmental Technician I

Education	B. S. in Zoology, 1995; University of Oklahoma, Norman, Oklahoma.
Technical Experience	Participated in the sampling of over 25 sources, including several of which were sampled simultaneously using more than one sampling train. Thoroughly trained in all EPA testing procedures, 1999-Present.