7 APPENDICES

A. Source Emissions Calculations

B. Field Data

C. Calibration Data

D. Analytical Data

E. Unit Operational Data

F. Chain of Custody Records

G. Resumes

APPENDIX A

Nomenclature and Equations
for
Calculation of Source Emissions

METCO ENVIRONMENTAL

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)

METCO ENVIRONMENTAL

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.

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

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.

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

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

$$V_s = fpm \times 0.00508 = m/sec$$

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.

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

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

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

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:	99-166
JOB NAME:	MONTANA POWER COMPANY
LOCATION:	COLSTRIP, MONTANA
UNIT TESTED:	UNIT NUMBER 3-6 SCRUBBER INLET DUCT

SOURCE EMISSION CALCULATIONS

SYMBOL	DESCRIPTION	UNITS			
RUN #			1	2	3
DATE			09/29/99	09/29/99	09/30/99
BEGIN TIME			0908	1330	0815
END TIME			1116	1550	1025
P(b)	BAROMETRIC PRESSURE	"Hg Abs. (mm Hg)	26.05 (662)	26.05 (662)	26.32 (669)
P(m)	ORIFICE PRESSURE DROP	"H2O (mm H2O)	0.669 (17.0)	0.678 (17.2)	0.690 (17.5)
V(m)	VOLUME DRY GAS SAMPLED @ METER CONDITIONS	ft.^3 (m^3)	60.494 (1.713)	61.051 (1.729)	60.431 (1.711)
T(m)	AVERAGE GAS METER TEMPERATURE	DEG.F (DEG.C)	72 (22.00)	71 (22.00)	54 (12.00)
V(m[std])*	VOLUME DRY GAS SAMPLED @ STANDARD CONDITIONS*	DSCF (DSCM)	52.381 (1.483)	52.964 (1.500)	54.722 (1.550)
V(w)	TOTAL WATER COLLECTED, IMPINGERS & SILICA GEL	ml	117.6	118.4	139.1
V(w[gas])	VOLUME WATER VAPOR COLLECTED @ STANDARD CONDITIONS*	SCF (SCM)	5.551 (0.157)	5.588 (0.158)	6.566 (0.186)
%M	MOISTURE IN STACK GAS BY VOLUME	%	9.58	9.54	10.71

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

SOURCE EMISSION CALCULATIONS

MONTANA POWER COMPANY
COLSTRIP, MONTANA
UNIT NUMBER 3-6 SCRUBBER INLET DUCT

SYMBOL	DESCRIPTION	UNITS			
Md	MOL FRACTION OF DRY GAS		0.9042	0.9046	0.8929
CO2		%	14.8	14.6	14.4
O2		%	4.6	4.6	4.8
CO		%	0.0	0.0	0.0
N2		%	80.6	80.8	80.8
%EA	EXCESS AIR @ SAMPLING POINT	%	27.4	27.4	28.9
MWd	MOLECULAR WEIGHT OF DRY STACK GAS	LB/LB-MOLE (g/g-MOLE)	30.55 (30.55)	30.52 (30.52)	30.50 (30.50)
MW	MOLECULAR WEIGHT OF STACK GAS	LB/LB-MOLE (g/g-MOLE)	29.35 (29.35)	29.33 (29.33)	29.16 (29.16)
DELTA P	VELOCITY HEAD OF STACK GAS	"H2O (mm H20)	0.841 (21.4)	0.850 (21.6)	0.868 (22.0)
Ts	STACK TEMPERATURE	DEG. F (DEG. C)	284 (140)	287 (142)	277 (136)
Ps	STACK PRESSURE	"Hg Abs. (mm Hg)	24.59 (625)	24.58 (624)	24.87 (632)
Vs	STACK VELOCITY @ STACK CONDITIONS	FPM (m/SEC.)	3,809 (19.35)	3,857 (19.59)	3,866 (19.64)
As	STACK AREA	(SQ.INCHES) (SQ.METERS)	17,671 (11.40)	17,671 (11.40)	17,671 (11.40)
Qs	DRY STACK GAS VOLUME @ STANDARD CONDITIONS*	DSCFM (DSCM/HR)	247,416 (420,360)	249,536 (423,962)	253,186 (430,163)
Qa	ACTUAL STACK GAS VOLUME @ STACK CONDITIONS	ACFM (m^3/HR)	467,463 (794,220)	473,326 (804,181)	474,406 (806,016)

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

SOURCE EMISSION CALCULATIONS

MONTANA POWER COMPANY
COLSTRIP, MONTANA
UNIT NUMBER 3-6 SCRUBBER INLET DUCT

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	%	99.6	99.9	101.7
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:	99-166
JOB NAME:	MONTANA POWER COMPANY
LOCATION:	COLSTRIP, MONTANA
UNIT TESTED:	UNIT NUMBER 3 STACK

SOURCE EMISSION CALCULATIONS

SYMBOL	DESCRIPTION	UNITS			
RUN #			1	2	3
DATE			09/29/99	09/29/99	09/30/99
BEGIN TIME			0830	1330	0815
END TIME			1220	1603	1049
P(b)	BAROMETRIC PRESSURE	"Hg Abs. (mm Hg)	26.07 (662)	26.07 (662)	26.35 (669)
P(m)	ORIFICE PRESSURE DROP	"H2O (mm H2O)	1.625 (41.3)	1.717 (43.6)	1.992 (50.6)
V(m)	VOLUME DRY GAS SAMPLED @ METER CONDITIONS	ft.^3 (m^3)	88.363 (2.502)	91.114 (2.580)	95.280 (2.698)
T(m)	AVERAGE GAS METER TEMPERATURE	DEG.F (DEG.C)	76 (24.00)	84 (29.00)	73 (23.00)
V(m[std])*	VOLUME DRY GAS SAMPLED @ STANDARD CONDITIONS*	DSCF (DSCM)	76.204 (2.158)	77.441 (2.193)	83.600 (2.367)
V(w)	TOTAL WATER COLLECTED, IMPINGERS & SILICA GEL	ml	298.4	310.5	327.7
V(w[gas])	VOLUME WATER VAPOR COLLECTED @ STANDARD CONDITIONS*	SCF (SCM)	14.084 (0.399)	14.656 (0.415)	15.467 (0.438)
%M	MOISTURE IN STACK GAS BY VOLUME	%	15.60	15.91	15.61

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

SOURCE EMISSION CALCULATIONS

MONTANA POWER COMPANY
COLSTRIP, MONTANA
UNIT NUMBER 3 STACK

SYMBOL	DESCRIPTION	UNITS			
Md	MOL FRACTION OF DRY GAS		0.8440	0.8409	0.8439
CO2		%	13.6	13.4	13.2
O2		%	6.2	6.2	6.2
CO		%	0.0	0.0	0.0
N2		%	80.2	80.4	80.6
%EA	EXCESS AIR @ SAMPLING POINT	%	41.2	41.0	40.9
MWd	MOLECULAR WEIGHT OF DRY STACK GAS	LB/LB-MOLE (g/g-MOLE)	30.42 (30.42)	30.39 (30.39)	30.36 (30.36)
MW	MOLECULAR WEIGHT OF STACK GAS	LB/LB-MOLE (g/g-MOLE)	28.49 (28.49)	28.42 (28.42)	28.43 (28.43)
DELTA P	VELOCITY HEAD OF STACK GAS	"H2O (mm H20)	3.163 (80.3)	3.146 (79.9)	3.148 (80.0)
Ts	STACK TEMPERATURE	DEG. F (DEG. C)	193 (89)	193 (89)	193 (89)
Ps	STACK PRESSURE	"Hg Abs. (mm Hg)	25.81 (656)	25.81 (656)	26.11 (663)
Vs	STACK VELOCITY @ STACK CONDITIONS	FPM (m/SEC.)	6,921 (35.16)	6,906 (35.08)	6,873 (34.91)
As	STACK AREA	(SQ.INCHES) (SQ.METERS)	65,144 (42.03)	65,144 (42.03)	65,144 (42.03)
Qs	DRY STACK GAS VOLUME @ STANDARD CONDITIONS*	DSCFM (DSCM/HR)	1,849,974 (3,143,106)	1,839,184 (3,124,774)	1,858,277 (3,157,213)
Qa	ACTUAL STACK GAS VOLUME @ STACK CONDITIONS	ACFM (m^3/HR)	3,131,017 (5,319,598)	3,124,268 (5,308,131)	3,109,234 (5,282,589)

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

SOURCE EMISSION CALCULATIONS

MONTANA POWER COMPANY
COLSTRIP, MONTANA
UNIT NUMBER 3 STACK

SYMBOL	DESCRIPTION	UNITS			
Tt	NET TIME OF TEST	MINUTES	120	120	120
Dn	SAMPLING NOZZLE DIAM.	IN. (m)	0.175 (0.004)	0.175 (0.004)	0.175 (0.004)
%I	PERCENT ISOKINETIC	%	93.3	95.4	101.9
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 99-164 ✓
Job Name ~~Effl~~ Montana Power ✓
Run Number 1 ✓
Unit #3-6 Scrubber Inlet ✓
Date 9-29-99 ✓
Operator Bass / Brown / 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 60
Assumed Moisture % 9
Probe Length 14'
C Factor 10 to 2.4 to reference
Initial Leak @ 15.00 "Hg = 0.001 cfm
Final Leak @ 15.00 "Hg = 0.002 cfm

Point	Clock Time	Dry Gas Meter, CF	"Pitot" ΔP_s "H_2O	Orifice ΔH "H_2O Desired	Orifice ΔH "H_2O Actual	Pump Vacuum P_m "Hg Guage	Stack Temp T_s °F	Probe Temp °F	Oven Temp °F	Effluent Temp °F	Dry Gas Temp. °F Inlet	Dry Gas Temp. °F Outlet	Heated Line °F	Remarks
	~~0843~~	~~331.748~~												inimble
~~Bi2~~ ~~A08~~	0908	333.591	0.40	0.32	0.32	7.00	296	250	301	852	69	67	291	Q13
11	0913	335.55	0.60	0.48	0.48	8.50	302	252	292	51	70	67	295	47Q34
10	0918	337.09	0.72	0.57	0.57	9.00	287	255	293	50	70	68	294	back-up filter
9	0923	339.86	0.80	0.64	0.64	9.50	292	252	295	49	70	68	292	int. or sat
8	0928	342.54	1.05	0.83	0.83	10.50	292	251	293	49	71	68	294	& MDT
7	0933	344.24	1.20	0.96	0.96	11.50	283	253	294	48	72	68	293	
6	0938	347.96	1.10	0.87	0.87	11.00	277	252	295	48	73	69	290	
5	0943	350.68	1.10	0.87	0.87	11.00	274	255	296	48	73	69	294	
4	0948	353.48	1.00	0.80	0.80	11.00	268	253	298	48	73	69	290	
3	0953	356.19	1.00	0.80	0.80	11.00	265	252	293	50	74	70	288	
2	0958	358.88	0.71	0.56	0.56	10.00	278	255	283	53	74	71	285	
1	1003	361.23	0.30	0.24	0.24	7.00	270	252	280	54	74	71	284	leak / good @ 1009
END	1008	362.986	—	—	—	—	—	—	—	—	—	—	—	leak / good @ 1014
A12	1016	363.224	0.38	0.30	0.30	7.00	289	251	277	58	74	73	288	0.238
11	1021	364.81	0.65	0.52	0.52	9.00	283	253	275	60	76	74	285	
10	1026	366.91	0.72	0.57	0.57	10.00	288	254	276	60	75	74	280	
9	1031	369.15	0.94	0.74	0.74	11.50	296	252	275	61	75	74	282	

Pitot Tube Calibration Factor C_p 0.810 ✓
Volume Collected V_m 60.494 ✓ ft³
Water Collected V_w 117.6 ✓ ml
Time of Test T_t 120 ✓ min.
Stack Pressure P_s −19.90 ✓ "H_2O

Pitot Tube No. M8 ✓
Baro. Press. P_b 26.05 ✓ "Hg
Probe Tip Dia. D_n 0.200 ✓ in.
% CO_2 14.8 ✓ % CO 0.0 ✓
% O_2 4.6 ✓ % N_2 80.6 ✓
Area Stack A_s 17.671 ✓ in²

Barometer No. ~~AL~~ Plant (BT) Probe Tip No. TFE1-7 ✓
Total Volume of Leak Checks After Start: 0.238 ft³
V_m = Dry Gas Meter Calibration Factor 57.027 X 1.029 ✓

[Dry Gas Meter Reading — ft³ - (T_t — min. X Leak Rate — cfm)]

Impinger Box No. Hg-1 ®

Impinger 1	Final Weight	793.9	Water Weight Gain	Impinger 1	38.4
	Initial Weight	755.5	Impinger 8 Final 976.2	Impinger 2	42.3
	Increase	38.4	Initial 963.8		
			12.4		
Impinger 2	Final Weight	774.6		Impinger 3	15.1
	Initial Weight	732.3			
	Increase	42.3		Impinger 4	7.9
			V_w =		
Impinger 3	Final Weight	755.6	g SO_2 = -	Impinger 5	1.7
	Initial Weight	740.5	V_w =		
	Increase	15.1		Impinger 6	0.1
Impinger 4	Final Weight	773.6		Impinger 7	-0.3
	Initial Weight	765.7		Impinger 8	12.4
	Increase	7.9		Total	117.6 = V_w
Impinger 5	Final Weight	653.9	P_b = 26.05	$\%CO_2$ =	14.8
	Initial Weight	652.2	V_m = ~~58~~ 60.494	$\%O_2$ =	4.6
	Increase	1.7	V_w = 117.6	%CO =	0.0
			P_m = 0.669	$\%N_2$ =	80.4
Impinger 6	Final Weight	754.6	Avg ΔP = 0.841	A_s =	17671
	Initial Weight	754.5		D_n =	0.200
	Increase	0.1	Avg$\sqrt{\Delta P}$ = 0.904	T_t =	120
			C_p = 0.810		
Impinger 7	Final Weight	753.6	P_s = -19.90 "H_2O	24.59 "Hg	
	Initial Weight	753.9	T_m = 72 °F	532 °R	
	Increase	-0.3	T_s = 284 °F	744 °R	

Moisture Content: %M = 9.58 M_d = 0.9042 MW_d = 30.552 MW = 29.35

$$Vm_{std} = 17.65\ Vm \left[\frac{P_b + \frac{P_m}{13.6}}{T_m + 460}\right] = 17.65 \times 60.494 \left[\frac{26.05 + \frac{0.669}{13.6}}{72 + 460}\right] = \frac{52.381 \text{ sft}^3}{0.437 \text{ scfm}}$$

Vw_{gas} = 0.0472 x Vw = 0.0472 x 117.6 = 5.551 sft^3

$$\%\ Moisture = \frac{Vw_{gas}}{Vm_{std} + Vw_{gas}} \times 100 = \frac{5.551}{52.381 + 5.551} \times 100 = 9.58\ \%$$

$$V_s = 5123.8 \times 0.810 \sqrt{\frac{744}{24.59 \times 29.35}} \times 0.904 = 3809 \text{ fpm}$$

$$\%I = \frac{1{,}039 \times 52.381 \times 744}{24.59 \times 0.9042 \times 3809 \times 120 \times (0.200)^2} = 99.6\ \%$$

467,463

~~467422~~ mB

ACFM: ~~74446690~~

SCFM: 247416

%EA: 27.4

METCO ENVIRONMENTAL

Job Number 99-166 ✓
Job Name Montana Power ✓
Run Number 2 ✓
Unit Unit 3-6 Scrubber Inlet Duct ✓
Date 9/29/99 ✓
Operator Bass, Brown, Conway, Heffley ✓
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 71
Assumed Moisture % 2-6 9.6
Probe Length 14'
C Factor 1.0 to 2.4 to reference
Initial Leak @ 15.00 "Hg = 0.001 cfm
Final Leak @ 20.00 "Hg = 0.001 cfm

Point	Clock Time	Dry Gas Meter, CF	"Pitot" "H2O	Orifice ΔH "H2O Desired	Orifice ΔH "H2O Actual	Pump Vacuum "Hg Guage	Stack Temp °F	Probe Temp °F	Oven Temp °F	Effluent Temp °F	Dry Gas Temp. °F Inlet	Dry Gas Temp. °F Outlet	Heated Line °F	Remarks
B~~A~~12	1330	396.988	0.40	0.34	0.34	8.00	289	255	278	68	71	71	293	thimble Q14
11	1335	398.89	0.65	0.52	0.62	9.00	294	254	289	66	72	71	289	Back-up 47Q35
10	1340	400.99	0.75	0.60	0.60	10.50	295	253	284	64	72	71	288	int. or set
9	1345	403.32	0.84	0.67	0.67	11.00	294	255	278	60	72	72	286	MDT
8	1350	405.77	1.00	0.80	0.80	12.00	293	254	270	57	69	71	286	
7	1355	408.42	1.10	0.87	0.87	12.00	297	252	263	55	70	71	284	
6	1400	411.23	1.15	0.92	0.92	13.00	286	251	267	54	71	71	284	
5	1405	414.11	1.15	0.92	0.92	13.00	283	253	268	54	72	71	286	
4	1410	417.00	1.05	0.83	0.83	13.00	280	253	267	54	72	71	286	
3	1415	419.80	0.95	0.75	0.75	12.50	276	254	265	54	72	71	286	
2	1420	422.46	0.64	0.51	0.51	10.00	270	254	263	55	73	71	286	
1	1425	425.02	0.60	0.48	0.48	9.50	271	253	263	55	72	71	285	
END	1430	426.995	—	—	—	—	—	—	—	—	—	—	—	leak ✓ good
A12	1440	427.267	0.38	0.31	0.31	8.50	284	253	269	67	71	70	292	leak ✓ good
11	1445	429.01	0.63	0.50	0.50	11.50	291	254	267	63	71	71	289	0.272
10	1450	431.12	0.74	0.58	0.58	13.00	294	254	265	60	71	70	288	
9	1455	433.40	0.90	0.72	0.72	15.00	290	255	269	58	71	70	287	
8	1500	435.713	—	—	—	—	—	—	—	—	—	—	—	change thimble

Pitot Tube Calibration Factor C_p 0.810 ✓
Volume Collected V_m 41.051 ✓ ft³
Water Collected V_w 118.4 ✓ ml
Time of Test T_t 120 ✓ min.
Stack Pressure P_s -20.00 ✓ "H_2O

Pitot Tube No. MB ✓
Baro. Press. P_b 26.05 ✓ "Hg
Probe Tip Dia. D_n 0.200 ✓ in.
% CO_2 14.6 ✓ % CO 0.0 ✓
% O_2 4.6 ✓ % N_2 80.8 ✓
Area Stack A_s 17671 ✓ in²

Barometer No. ~~19-2~~ Plant (BH) Probe Tip No. TFE1-7 ✓
Total Volume of Leak Checks After Start: 0.272 ft³
V_m = Dry Gas Meter Calibration Factor 59.602 X 1.029 ✓

[Dry Gas Meter Reading — ft³ - (T_t — min. X Leak Rate — cfm)]

Impinger Box No. Hg 3

			Water Weight Gain		
Impinger 1	Final Weight	825.8	Imp. 8	Impinger 1	73.0
	Initial Weight	752.8	Final 932.8	Impinger 2	21.2
	Increase	73.0	Int. 919.6	Impinger 3	4.6
Impinger 2	Final Weight	1,81.6	13.2	Impinger 4	4.6
	Initial Weight	160.4	V_w =	Impinger 5	0.1
	Increase	21.2	g SO_2 = -	Impinger 6	0.4
Impinger 3	Final Weight	759.3	V_w =	Impinger 7	1.3
	Initial Weight	754.7	Thimble Q 14	Impinger 8	13.2
	Increase	4.6	Backup 47035	Total	118.4 ✓ = V_w
Impinger 4	Final Weight	765.8			
	Initial Weight	761.2			
	Increase	4.6			
Impinger 5	Final Weight	749.2	P_b = 26.05 ✓	$\%CO_2$ = 14.6 ✓	
	Initial Weight	749.1	V_m = 61.051 ✓	$\%O_2$ = 4.6 ✓	
	Increase	0.1	V_w = 118.4 ✓	%CO = 0.0 ✓	
Impinger 6	Final Weight	758.3	P_m = 0.678 ✓	$\%N_2$ = 80.8 ✓	
	Initial Weight	757.9	Avg ΔP = 0.850 ✓	A_s = 17.671 ✓	
	Increase	0.4		D_n = 0.200 ✓	
			Avg $\sqrt{\Delta P}$ = 0.913 ✓	T_t = 120 ✓	
Impinger 7	Final Weight	755.0	C_p = 0.810 ✓		
	Initial Weight	753.7	P_s = -20.00 "H_2O	24.58 ✓	"Hg
	Increase	1.3	T_m = 71 ✓ °F	531 ✓	°R
			T_s = 287 ✓ °F	747 ✓	°R

Moisture Content: %M = 9.54 ✓ M_d = 0.9046 ✓ MW_d = 30.520 ✓ MW = 29.33 ✓

$$Vm_{std} = 17.65\ Vm \left[\frac{P_b + \frac{P_m}{13.6}}{T_m + 460}\right] = 17.65 \times 61.051 \left[\frac{26.05 + \frac{0.678}{13.6}}{71 + 460}\right] = \frac{52.964}{0.441} \checkmark \frac{sft^3}{scfm}$$

Vw_{gas} = 0.0472 x Vw = 0.0472 x 118.4 = 5.588 ✓ sft^3

% Moisture = $\frac{Vw_{gas}}{Vm_{std} + Vw_{gas}}$ x 100 = $\frac{5.588}{52.964 + 5.588}$ x 100 = 9.54 ✓ %

V_s = 5123.8 x $\frac{0.810}{\sqrt{\frac{747}{24.58 \times 29.33}}}$ x 0.913 = 3857 ✓ fpm

ACFM: 473326 ✓

SCFM: 249,536 ✓

%I = $\frac{1,039 \times 52.964 \times 747}{24.58 \times 0.9046 \times 3857 \times 120 \times (0.200)^2}$ = 99.9 ✓ %

%EA: 27.4 ✓

Run Number 2

Unit # 3-6 Scrubber Inlet Duct

Date 9-29-99

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
AB	1510	435.713	0.95	0.76	0.76	14.00	289	251	262	64	70	70	291	~~thimble~~
7	1515	438.30	1.10	0.87	0.87	14.50	293	253	261	58	70	70	289	
6	1520	~~440~~ 441.10	1.10	0.87	0.87	15.00	300	254	259	56	70	70	287	
5	1525	443.92	1.10	0.87	0.87	15.00	300	254	259	55	71	70	287	
4	1530	446.67	0.96	0.76	0.76	14.00	291	255	264	56	71	70	289	
3	1535	449.36	0.95	0.75	0.75	14.00	280	255	270	58	71	70	285	
2	1540	452.03	0.75	0.60	0.60	13.00	276	255	290	61	71	71	285	
1	1545	454.49	0.56	0.46	0.46	10.00	275	256	274	62	72	71	284	
END	1550	456.590	–	–	–	–	–	–	–	–	–	–	–	

Impinger Box No. Hg 1

Impinger 1	Final Weight	847.9
	Initial Weight	754.2
	Increase	93.7
Impinger 2	Final Weight	750.0
	Initial Weight	729.1
	Increase	20.9
Impinger 3	Final Weight	745.5
	Initial Weight	740.6
	Increase	4.9
Impinger 4	Final Weight	770.7
	Initial Weight	765.1
	Increase	5.6
Impinger 5	Final Weight	646.3
	Initial Weight	646.4
	Increase	-0.1
Impinger 6	Final Weight	751.0
	Initial Weight	750.5
	Increase	0.5
Impinger 7	Final Weight	756.5
	Initial Weight	756.2
	Increase	0.3

Water Weight Gain

Imp. 8
Final 989.6
Int. 976.3
13.3

V_w =
g SO_2 = -
V_w =

Impinger 1	93.7
Impinger 2	20.9
Impinger 3	4.9
Impinger 4	5.6
Impinger 5	-0.1
Impinger 6	0.5
Impinger 7	0.3
Impinger 8	13.3
Total	139.1 ✓ = V_w

P_b =	26.32 ✓	$\%CO_2$ =	14.4 ✓
V_m =	60.431 ✓	$\%O_2$ =	4.8 ✓
V_w =	139.1 ✓	%CO =	0.0 ✓
P_m =	0.690 ✓	$\%N_2$ =	80.8 ✓
Avg ΔP =	0.868 ✓	A_s =	17671 ✓
		D_n =	0.200 ✓
Avg $\sqrt{\Delta P}$ =	0.924 ✓	T_t =	120 ✓
C_p =	0.810 ✓		
P_s =	-19.70 ✓ H_2O		24.87 ✓ "Hg
T_m =	54 ✓ °F		514 ✓ °R
T_s =	277 ✓ °F		737 ✓ °R

Moisture Content: %M = 10.71 ✓ M_d = 0.8929 ✓ MW_d = 30.496 ✓ MW = 29.16 ✓

$$Vm_{std} = 17.65\ Vm \left[\frac{P_b + \frac{P_m}{13.6}}{T_m + 460}\right] = 17.65 \times 60.431 \left[\frac{26.32 + \frac{0.690}{13.6}}{54 + 460}\right] = \frac{54.722}{0.456} \frac{\text{sft}^3}{\text{scfm}} \checkmark$$

Vw_{gas} = 0.0472 x Vw = 0.0472 x 139.1 = 6.566 ✓ sft^3

% Moisture = $\frac{Vw_{gas}}{Vm_{std} + Vw_{gas}}$ x 100 = $\frac{6.566}{54.722 + 6.566}$ x 100 = 10.71 ✓ %

$$V_s = 5123.8 \times \frac{0.810}{\sqrt{\frac{737}{24.87 \times 29.16}}} \times 0.924 = 3866 \checkmark \text{ fpm}$$

ACFM: 474,406 ✓

SCFM: 253,186 ✓

$$\%I = \frac{1{,}039 \times 54.722 \times 737}{24.87 \times 0.8929 \times 3866 \times 120 \times (0.200)^2} = 101.7 \checkmark \%$$

%EA: 28.9 ✓

Run Number 11-166 — FIELD DATA

Unit Unit 3-6 Scrubber Inlet Duct

Date 9-30-99

			ΔP_s			P_m	T_s				T_m		
Point	Clock Time	Dry Gas Meter, CF	"Pitot" "H_2O	Orifice ΔH "H_2O Desired	Orifice ΔH "H_2O Actual	Pump Vacuum "Hg Guage	Stack Temp °F	Probe Temp °F	Oven Temp °F	Effluent Temp °F	Dry Gas Temp. °F Inlet	Dry Gas Temp. °F Outlet	Heated Line °F Remarks
A7	0950	533.98	~~1.20~~ 1.10	0.87	0.87	14.50	290	254	270	46	56	54	285
6	0955	536.68	1.10	0.87	0.87	14.50	290	255	270	46	57	55	284
5	1000	539.50	1.05	0.83	0.83	14.00	289	258	265	46	57	55	289
4	1005	542.06	0.96	0.76	0.76	13.50	279	257	268	48	57	55	289
3	1010	544.67	0.85	0.68	0.68	13.00	274	255	268	49	57	55	289
2	1015	547.17	0.76	0.60	0.60	13.00	270	256	266	49	57	55	289
1	1020	549.53	0.76	0.60	0.60	13.00	269	254	264	50	57	55	288
END	1025	551.671	–	–	–	–	–	–	–	–	–	–	–

METCO ENVIRONMENTAL

Job Number 99-95 & 99-166 ✓
Job Name Montana Power ✓
Run Number 1 ✓
Unit #3 Stack ✓
Date 9-29-99 ✓
Operator Lee / Hart / Heflay ✓
Sample Box No. Hg-2 Meter Box No. 8-2 ✓

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 63
Assumed Moisture % 17.5%
Probe Length 12'
C Factor 3.0 ⇒ 6.0 to reference
Initial Leak @ 18.2 "Hg = 0.000 cfm
Final Leak @ 15.0 "Hg = 0.000 cfm

Point	Clock Time	Dry Gas Meter, CF	"Pitot" "H2O	Orifice ΔH "H2O Desired	Orifice ΔH "H2O Actual	Pump Vacuum "Hg Guage	Stack Temp °F	Probe Temp °F	Oven Temp °F	Effluent Temp °F	Dry Gas Temp. °F Inlet	Dry Gas Temp. °F Outlet	Remarks
		ΔPs				Pm	Ts				Tm		
D 6	0830	30.708	3.40	1.75	1.75	9.5	193	251	267	57	70	70	Multi-Point
5	0835	34.31	3.40	1.75	1.75	9.5	193	253	268	52	72	70	Data Orsat
4	0840	38.05	3.30	1.70	1.70	9.0	194	254	272	51	74	70	
3	0845	41.79	3.15	1.60	1.60	8.5	193	260	272	50	74	71	MDT
2	0850	45.41	2.65	1.35	1.35	7.5	193	268	272	50	75	72	
1	0855	48.72	2.10	1.10	1.10	7.0	192	271	273	51	75	72	
End	0900	51.951	—	—	—	—	—	—	—	—	—	—	leak/to 52.072; 11.0 0.000
C 6	0910	52.187	3.35	1.70	1.70	9.0	192	257	272	53	74	72	leak/to 52.187; 15.0 0.000
5	0915	55.94	3.25	1.65	1.65	9.0	193	264	272	51	77	72	
4	0920	59.47	3.30	1.70	1.70	9.0	193	260	270	51	76	73	
3	0925	63.05	3.35	1.70	1.70	9.0	193	264	268	51	78	73	
2	0930	66.62	3.35	1.70	1.70	9.0	193	268	266	51	79	73	
1	0935	70.19	3.35	1.70	1.70	9.0	193	272	263	52	79	74	
End	0940	73.876	—	—	—	—	—	—	—	—	—	—	leak/to 74.149; 14.0 0.000
B 6	0950	74.392	3.30	1.70	1.70	10.0	192	260	266	55	78	74	leak/to 74.992; 15.0 0.000
5	0955	77.78	3.20	1.65	1.65	9.5	194	266	268	54	79	74	
4	1000	81.35	3.20	1.65	1.65	9.5	193	267	265	53	80	75	
3	1005	84.91	3.00	1.55	1.55	9.5	194	267	265	53	83	76	

Pitot Tube Calibration Factor C_p 0.808 ✓
Volume Collected V_m 88.363 ✓ ft³
Water Collected V_w 298.4 ✓ ml
Time of Test T_t 120 ✓ min.
Stack Pressure P_s -3.60 ✓ "H_2O

Pitot Tube No. M-2 ✓
Baro. Press. P_b 26.07 ✓ "Hg
Probe Tip Dia. D_n 0.175 ✓ in.
% CO_2 13.6 ✓ % CO 0 ✓
% O_2 6.2 ✓ % N_2 80.2 ✓
Area Stack A_s 65,144 ✓ in²

Barometer No. ~~#2~~ Plant ✓ Probe Tip No. TFE 2-6 ✓
Total Volume of Leak Checks After Start: 5166 ✓ ft³
V_m = Dry Gas Meter Calibration Factor 1.034 ✓ X 85.457

[Dry Gas Meter Reading — ft³ - (T_t — min. X Leak Rate — cfm)]

Impinger Box No. Hg-2

			Water Weight Gain		
Impinger 1	Final Weight	887.2	Impinger 8	Impinger 1	141.2
	Initial Weight	746.0	Final 969.9	Impinger 2	101.6
	Increase	141.2	Initial 954.0	Impinger 3	34.9
Impinger 2	Final Weight	851.0	15.9	Impinger 4	4.0
	Initial Weight	749.4	V_w =	Impinger 5	0.2
	Increase	101.6	g SO_2 = -	Impinger 6	0.5
Impinger 3	Final Weight	795.3	V_w =	Impinger 7	0.1
	Initial Weight	760.4		Impinger 8	15.4
	Increase	34.9		Total	298.4 ✓ = V_w
Impinger 4	Final Weight	750.3			
	Initial Weight	746.3			
	Increase	4.0			
Impinger 5	Final Weight	748.2	P_b = 26.07 ✓	%CO_2 = 13.6 ✓	
	Initial Weight	748.0	V_m = 88.363 ✓	%O_2 = 6.2 ✓	
	Increase	0.2	V_w = 298.4 ✓	%CO = 0 ✓	
			P_m = 1.625 ✓	%N_2 = 80.2 ✓	
Impinger 6	Final Weight	740.7	Avg ΔP = 3.163 ✓	A_s = 65.144 ✓	
	Initial Weight	740.2		D_n = 0.175 ✓	
	Increase	0.5	Avg$\sqrt{\Delta P}$ = 1.774 ✓	T_t = 120 ✓	
			C_p = 0.808 ✓		
Impinger 7	Final Weight	952.2	P_s = -3.60 ✓ "H_2O	25.81 ✓ "Hg	
	Initial Weight	752.1	T_m = 76 ✓ °F	536 ✓ °R	
	Increase	0.1	T_s = 193 ✓ °F	653 ✓ °R	

Moisture Content: %M = 15.60 ✓ M_d = 0.8440 ✓ MW_d = 30.424 ✓ MW = 28.49 ✓

$$Vm_{std} = 17.65\ Vm \left[\frac{P_b + \frac{P_m}{13.6}}{T_m + 460}\right] = 17.65 \times 88.363 \left[\frac{26.07 + \frac{1.625}{13.6}}{76 + 460}\right] = \frac{76.204}{0.635} \frac{\text{sft}^3}{\text{scfm}}$$ ✓

Vw_{gas} = 0.0472 x Vw = 0.0472 x 298.4 = 14.084 ✓ sft^3

% Moisture = $\frac{Vw_{gas}}{Vm_{std} + Vw_{gas}}$ x 100 = $\frac{14.084}{76.204 + 14.084}$ x 100 = 15.60 ✓ %

V_s = 5123.8 x 0.808 $\sqrt{\frac{653}{25.81 \times 28.49}}$ x 1.774 = 6921 ✓ fpm

ACFM: 313,017 ✓

SCFM: 1849974 ✓

%I = $\frac{1{,}039 \times 76.204 \times 653}{120 \times 0.8440 \times 25.81 \times 6921 \times (0.175)^2}$ = 93.3 ✓ %

%EA: 41.2 ✓

Run Number 1

Unit #3 Stack

Date 9-29-99

Hg FIELD DATA

			ΔP_s			P_m	T_s				T_m		
Point	Clock Time	Dry Gas Meter, CF	"Pitot" "H_2O	Orifice ΔH "H_2O Desired	Orifice ΔH "H_2O Actual	Pump Vacuum "Hg Guage	Stack Temp °F	Probe Temp °F	Oven Temp °F	Effluent Temp °F	Dry Gas Temp. °F Inlet	Dry Gas Temp. °F Outlet	Remarks
B2	1010	88.38	2.65	1.40	1.40	9.0	182	254	255	53	84	77	
i	1015	91.78	2.10	1.10	1.10	7.5	193	257	264	53	84	77	
End	1020	94.890	—	—	—	—	—	—	—	—	—	—	leak V to 95 180; 15.0 20.000
A6	1150	99.304	3.50	1.80	1.80	10.0	195	249	253	56	77	73	~~test to~~ SL Liner
5	1155	103.02	3.50	1.80	1.80	10.0	194	252	261	55	81	73	leak V to 99.304; 18.0 20.000
4	1200	106.72	3.60	1.85	1.85	10.5	194	256	269	54	87	75	
3	1205	110.45	3.60	1.85	1.85	10.5	194	255	271	55	88	76	
2	1210	114.21	3.60	1.85	1.85	10.5	194	254	268	54	88	76	
1	1215	117.88	2.70	1.40	1.40	9.5	194	252	269	54	89	78	
End	1220	121.331	—	—	—	—	—	—	—	—	—	—	

METCO ENVIRONMENTAL

Job Number 99-166 ✓
Job Name Montana Power ✓
Run Number 2 ✓
Unit Unit 3 Stack ✓
Date 9/29/99 ✓
Operator Lee, Hunt, Hefley ✓
Sample Box No. ~~Hg~~ 4 Meter Box No. S-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 74
Assumed Moisture % 17.5
Probe Length 12'
C Factor .309 6.5 to reference
Initial Leak @ 18.0 "Hg = 0.000 cfm
Final Leak @ 15.0 "Hg = 0.000 cfm

Point	Clock Time	Dry Gas Meter, CF	"Pitot" "H2O	Orifice ΔH "H2O Desired	Orifice ΔH "H2O Actual	Pump Vacuum "Hg Guage	Stack Temp °F	Probe Temp °F	Oven Temp °F	Effluent Temp °F	Dry Gas Temp. °F Inlet	Dry Gas Temp. °F Outlet	Remarks
		ΔPs			Pm		Ts				Tm		
A 6	1330	121.969	3.60	2.00	2.00	8.0	193	250	252	60	80	76	Multi-Point
5	1335	125.76	3.60	2.00	2.00	7.5	194	252	256	58	82	77	Into Orsat
4	1340	129.52	3.70	2.00	2.00	7.5	194	249	262	57	83	77	
3	1345	133.39	3.60	2.00	2.00	7.5	193	251	265	54	85	78	MDT
2	1350	137.27	3.60	2.00	2.00	7.5	194	255	270	55	86	79	
1	1355	141.11	2.70	1.50	1.50	6.5	193	253	271	56	88	79	
End	1400	144.643	—	—	—	—	—	—	—	—	—	—	leak √ to 144.878; 10.0 @ 0.000
B 6	1411	145.072	3.70	2.00	2.00	7.5	192	250	274	59	86	80	leak √ to 145.072; 10.0 @ 0.000
5	1416	148.93	3.20	1.75	1.75	7.0	193	252	274	56	87	81	
4	1421	152.72	3.20	1.75	1.75	7.0	194	254	272	57	86	81	
3	1426	156.46	3.05	1.65	1.65	7.0	194	251	271	57	86	81	
2	1431	160.09	2.90	1.60	1.60	6.5	193	253	271	57	87	82	
1	1436	163.66	2.15	1.15	1.15	6.0	193	252	270	57	86	82	
End	1441	166.844	—	—	—	—	—	—	—	—	—	—	leak √ to 167.033; 10.0 @ 0.000
C 6	1451	167.309	3.35	1.80	1.80	7.5	191	250	270	60	86	82	leak √ to 167.309; 12.0 @ 0.000
5	1456	171.04	3.30	1.80	1.80	7.5	192	253	271	57	87	82	
4	1501	174.83	3.35	1.80	1.80	7.5	191	255	270	57	87	83	
3	1506	178.62	3.35	1.80	1.80	7.5	192	254	271	56	88	83	

Pitot Tube Calibration Factor C_p 0.808 ✓
Volume Collected V_m ~~91.393~~ ft³ 91.114 ✓
Water Collected V_w 310.5 ✓ ml
Time of Test T_t 120 ✓ min.
Stack Pressure P_s ~~-2.80~~ -3.50 ✓ "H_2O

Pitot Tube No. M-2 ✓
Baro. Press. P_b 26.09 ✓ "Hg
Probe Tip Dia. D_n 0.175 ✓ in.
% CO_2 13.4 ✓ % CO 0 ✓
% O_2 6.2 ✓ % N_2 80.4 ✓
Area Stack A_s 65.144 ✓ in²

Barometer No. Plant Probe Tip No. TF-E 2-6 ✓
Total Volume of Leak Checks After Start: ~~1.160~~ ft³ 1.410 ✓
V_m = Dry Gas Meter Calibration Factor 1.034 ✓ X ~~88.368~~ 88.118 fm

[Dry Gas Meter Reading — ft³ - (T_t — min. X Leak Rate — cfm)]

Impinger Box No. Hg 4

			Water Weight Gain		
Impinger 1	Final Weight	947.2	Imp 8	Impinger 1	19.0
	Initial Weight	750.2	Final 985.6	Impinger 2	86.5
	Increase	197.0	Int. 969.0	Impinger 3	7.5
Impinger 2	Final Weight	844.9	16.6	Impinger 4	2.8
	Initial Weight	758.4	V_w =		
	Increase	86.5	g SO_2 = -	Impinger 5	0.3
Impinger 3	Final Weight	763.6	V_w =	Impinger 6	-0.5
	Initial Weight	756.1			
	Increase	7.5		Impinger 7	0.3
Impinger 4	Final Weight	739.0		Impinger 8	16.6
	Initial Weight	736.2		Total	310.5 = V_w
	Increase	2.8			
Impinger 5	Final Weight	656.3	P_b = 26.07 ✓	$\%CO_2$ = 13.4 ✓	
	Initial Weight	656.0	V_m = ~~91.373~~ 91.114	$\%O_2$ = 6.2 ✓	
	Increase	0.3	V_w = 310.5 ✓	%CO = 0 ✓	
Impinger 6	Final Weight	754.4	P_m = 1.717 ✓	$\%N_2$ = 80.4 ✓	
	Initial Weight	754.9	Avg ΔP = ~~3.15~~ 3.146	A_s = 65.144 ✓	
	Increase	-0.5	1.768	D_n = 0.175 ✓	
Impinger 7	Final Weight	659.8	Avg $\sqrt{\Delta P}$ = ~~1.769~~ ✓	T_t = 120 ✓	
	Initial Weight	659.5	C_p = 0.808 ✓		
	Increase	0.3	P_s = ~~2.80~~ 3.50 H_2O	25.81 ✓	"Hg
			T_m = 84 ✓ °F	544 ✓	°R
			T_s = 193 ✓ °F	653 ✓	°R

15.91 ✓ 0.8409 ✓

Moisture Content: %M = ~~15.88~~ M_d = ~~0.8412~~ MW_d = 30.392 ✓ MW = 28.42 ✓

$$Vm_{std} = 17.65\ Vm \left[\frac{P_b + \frac{P_m}{13.6}}{T_m + 460}\right] = 17.65 \times \text{~~91.373~~ } 91.114 \left[\frac{26.07 + \frac{1.717}{13.6}}{84 + 460}\right] = \frac{\text{~~77.661~~ } 77.441 \checkmark}{0.645} \text{ sft}^3 \text{ scfm}$$

Vw_{gas} = 0.0472 x Vw = 0.0472 x 310.5 = 14.656 ✓ sft^3

% Moisture = $\frac{Vw_{gas}}{Vm_{std} + Vw_{gas}}$ x 100 = $\frac{14.656}{77.661 + 14.656}$ x 100 = ~~15.88~~ 15.91 ✓ %

V_s = 5123.8 x 0.808 $\sqrt{\frac{653}{25.81 \times 28.42}}$ x ~~1.769~~ $\frac{1.768}{}$ = ~~6910~~ 6906 ✓ fpm

ACFM: ~~3,126,035~~ 3,124,268 ✓

SCFM: ~~1,840,906~~ 1,839,184 ✓

%I = $\frac{1{,}039 \times 77.661 \times 653}{120 \times 0.8412 \times 25.81 \times 6910 \times (0.175)^2}$ = ~~95.89~~ 95.4 ✓ %

%EA: 41.0 ✓

Run Number 2 — Hg — FIELD DATA

Unit Unit #3 Stack

Date 9-29-99

			ΔP_s			P_m	T_s				T_m		
Point	Clock Time	Dry Gas Meter, CF	"Pitot" "H₂O	Orifice ΔH "H₂O Desired	Orifice ΔH "H₂O Actual	Pump Vacuum "Hg Guage	Stack Temp °F	Probe Temp °F	Oven Temp °F	Effluent Temp °F	Dry Gas Temp. °F Inlet	Dry Gas Temp. °F Outlet	Remarks
C 2	1511	182.40	3.30	1.80	1.80	7.5	191	253	269	56	88	83	
1	1516	186.18	2.40	1.30	1.30	6.5	194	254	269	57	88	83	
End	1521	189.548	—	—	—	—	—	—	—	—	—	—	leak v/to 189.998, 12.0 @ .000
D 6	1533	190.064	3.30	1.80	1.80	8.0	192	255	271	59	87	84	leak v/to 190.064, 13.0 @ .000
5	1538	193.80	3.30	1.80	1.80	8.0	193	258	269	57	87	84	
4	1543	197.61	3.25	1.75	1.75	8.0	193	260	268	57	89	85	
3	1548	201.35	3.10	1.70	1.70	7.5	194	261	269	58	89	85	
2	1553	205.02	2.60	1.40	1.40	7.0	193	261	271	58	89	85	
1	1558	208.43	1.90	1.05	1.05	6.0	192	260	273	59	88	84	
End	1603	211.497	—	—	—	—	—	—	—	—	—	—	

METCO ENVIRONMENTAL

Hg Field Data

Job Number 99-166 ✓
Job Name Montana Power ✓
Run Number 3 ✓
Unit Unit 3 Stack ✓
Date 9-30-99 ✓
Operator Lee, Hart, Hefley ✓
Sample Box No. Hg 2 Meter Box No. S-2 ✓

Read and record at the start of each test point.

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

Ambient Temp. °F 66
Assumed Moisture % 17.5%
Probe Length 12'
C Factor 2.41 ⇒ 1.0 to reference
Initial Leak @ 16.0 "Hg = 0.006 cfm
Final Leak @ 15.0 "Hg = 0.005 cfm

Point	Clock Time	Dry Gas Meter, CF	"Pitot" "H2O	Orifice ΔH "H2O Desired	Orifice ΔH "H2O Actual	Pump Vacuum "Hg Guage	Stack Temp °F	Probe Temp °F	Oven Temp °F	Effluent Temp °F	Dry Gas Temp. °F Inlet	Dry Gas Temp. °F Outlet	Remarks
			ΔPs		Pm		Ts				Tm		
D 6	0815	224.065	3.40	2.15	2.15	6.0	193	251	273	58	71	72	Multi-Point
5	0820	228.05	3.50	2.20	2.20	6.0	193	251	272	52	71	72	Pitot Check
4	0825	232.09	3.30	2.10	2.10	6.0	193	249	271	52	71	70	
3	0830	236.01	3.05	1.90	1.90	5.5	192	250	271	53	72	69	MOT
2	0835	239.79	2.70	1.70	1.70	5.5	193	252	272	53	73	69	
1	0840	243.40	2.10	1.30	1.30	5.0	193	252	272	54	75	69	
End	0845	246.656	—	—	—	—	—	—	—	—	—	—	leak/to 246.999; 8.0 @ 0.004
C 6	0857	249.243	3.30	2.10	2.10	6.0	194	249	273	55	73	69	leak/to 247.243; 8.0 @ 0.004
5	0902	251.09	3.30	2.10	2.10	6.5	193	253	258	54	74	69	
4	0907	255.06	3.25	2.05	2.05	6.5	193	252	260	55	75	68	
3	0912	259.02	3.35	2.10	2.10	6.5	193	252	263	57	76	68	
2	0917	263.00	3.40	2.15	2.15	7.0	194	254	261	59	77	69	
1	0922	267.08	2.50	1.60	1.60	6.0	193	256	262	62	77	69	
End	0927	270.607	—	—	—	—	—	—	—	—	—	—	leak/to 271.145; 11.0 @ 0.005
D 6	0940	271.350	3.30	2.10	2.10	7.0	193	253	257	65	75	70	leak/to 271.350; 9.0 @ 0.004
5	0945	275.43	3.10	1.95	1.95	7.0	194	251	258	65	75	70	
4	0950	279.09	3.15	2.00	2.00	7.0	194	253	260	65	75	70	
3	0955	283.06	3.15	2.00	2.00	7.5	193	251	260	65	76	70	

Pitot Tube Calibration Factor C_p 0.808 ✓
Volume Collected V_m 95.290 ✓ ft³
Water Collected V_w 327.7 ✓ ml
Time of Test T_t 120 ✓ min.
Stack Pressure P_s −3.30 ✓ "H_2O

Pitot Tube No. M-2 ✓
Baro. Press. P_b 26.35 ✓ "Hg
Probe Tip Dia. D_n 0.175 ✓ in.
% CO_2 13.2 ✓ % CO & ✓
% O_2 6.2 ✓ % N_2 80.6 ✓
Area Stack A_s 65.144 ✓ in²

Barometer No. Plant Probe Tip No. T-C 2-6 ✓
Total Volume of Leak Checks After Start: 1.679 ✓ ft³
V_m = Dry Gas Meter Calibration Factor 1.034 ✓ X 92.147

[Dry Gas Meter Reading — ft³ - (T_t — min. X Leak Rate — cfm)]

Impinger Box No. Hg2

			Water Weight Gain		
Impinger 1	Final Weight	963.2	Imp8	Impinger 1	215.8
	Initial Weight	747.4	Final 990.6	Impinger 2	77.1
	Increase	215.8			
Impinger 2	Final Weight	824.9	Int. 970.1	Impinger 3	9.9
	Initial Weight	747.8	20.5	Impinger 4	4.7
	Increase	77.1	V_w =		
Impinger 3	Final Weight	768.8	g SO_2 = -	Impinger 5	0.0
	Initial Weight	758.9	V_w =	Impinger 6	0.1
	Increase	9.9			
Impinger 4	Final Weight	753.8		Impinger 7	-0.4
	Initial Weight	749.1		Impingers	20.5
	Increase	4.7		Total	327.7 = V_w
Impinger 5	Final Weight	745.3	P_b = 26.35	$\%CO_2$ = 13.2	
	Initial Weight	745.3	V_m = 95.280	$\%O_2$ = 6.2	
	Increase	0.0	V_w = 327.7	%CO = 0	
Impinger 6	Final Weight	748.0	P_m = 1.992	$\%N_2$ = 80.6	
	Initial Weight	747.9	Avg ΔP = 3.148	A_s = 65.144	
	Increase	0.1		D_n = 0.175	
			Avg$\sqrt{\Delta P}$ = 1.770	T_t = 120	
Impinger 7	Final Weight	756.4	C_p = 0.808		
	Initial Weight	756.8	P_s = -3.30 H_2O	24.11 "Hg	
	Increase	-0.4	T_m = 73 °F	533 °R	
			T_s = 193 °F	653 °R	

Moisture Content: %M = 15.61 M_d = 0.8439 MW_d = 30.360 MW = 28.43

$$Vm_{std} = 17.65\ Vm \left[\frac{P_b + \frac{P_m}{13.6}}{T_m + 460}\right] = 17.65 \times 95.280 \left[\frac{26.35 + \frac{1.992}{13.6}}{73 + 460}\right] = \frac{83.600}{0.697}\ \text{sft}^3/\text{scfm}$$

Vw_{gas} = 0.0472 x Vw = 0.0472 x 327.7 = 15.467 sft^3

% Moisture = $\frac{Vw_{gas}}{Vm_{std} + Vw_{gas}}$ x 100 = $\frac{15.467}{83.600 + 15.467}$ x 100 = 15.61 %

V_s = 5123.8 x 0.808 $\sqrt{\frac{653}{26.11 \times 28.43}}$ x 1.770 = 6873 fpm

ACFM: 3109.234

SCFM: 1858.277

%EA: 40.9

$$\%I = \frac{1{,}039 \times 83.600 \times 653}{120 \times 0.8439 \times 26.11 \times 6873 \times (0.175)^2} = 101.9\ \%$$

Run Number 2

Hg FIELD DATA

Unit Unit 3 Stack

Date 9-30-99

Point	Clock Time	Dry Gas Meter, CF	"Pitot" "H,O	Orifice ΔH "H,O Desired	Orifice ΔH "H,O Actual	Pump Vacuum "Hg Guage	Stack Temp °F	Probe Temp °F	Oven Temp °F	Effluent Temp °F	Dry Gas Temp. °F Inlet	Dry Gas Temp. °F Outlet	Remarks
			ΔP_s			P_m	T_s						T_m
B2	1000	286.81	2.80	1.80	1.80	7.5	193	254	260	64	77	71	
1	1005	290.52	2.20	1.40	1.40	6.5	194	253	261	65	77	71	
End	1010	293.901	—	—	—	—	—	—	—	—	—	—	leak rate 294.082; 10.0 to 0.04
A6	1019	294.250	3.50	2.20	2.20	8.5	194	254	262	61	75	72	leak rate 294.250; 10.0 to 0.0
5	1024	298.21	3.50	2.20	2.20	9.0	194	253	261	59	76	71	
4	1029	302.18	3.70	2.35	2.35	9.0	193	251	264	57	76	71	
3	1034	306.17	3.70	2.35	2.35	9.0	194	254	264	57	76	72	
2	1039	310.21	3.60	2.30	2.30	9.0	193	253	264	57	76	72	
1	1044	314.08	2.70	1.70	1.70	9.0	194	251	264	59	77	73	
End	1049	317.891	—	—	—	—	—	—	—	—	—	—	

PRELIMINARY VELOCITY TRAVERSE DATA
AND
SAMPLING LOCATION DATA

Job Number 99-166

Job Name Montana Power

Sampling Location Unit 3-6 Scrubber Inlet Duct

Stack Height 110 ft.

Sampling Port Height Above Ground 110 ft.

Date 9/28/95 Time 1630

	Port A	Port B	~~Port C~~	~~Port D~~	Average
Port & Inside Diameter (in.)	167 ✓	167 ✓			167 ✓
Port & Wall Thickness (in.)	17 ✓	17 ✓			17 ✓
Inside Stack Diameter (in.)	150 ✓	150 ✓			150 ✓

Sampling Ports are ~~16~~ 53 ✓ ft. ~~3~~ 0 ✓ in. (424 ✓ stack diameters) downstream from disturbance (inlet, constriction, bend, expansion)

Sampling Ports are ~~53~~ 16 ✓ ft. ~~0~~ 3 ✓ in. (1.30 ✓ 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	2.1 ✓	3.150 ✓	3 1/8 ✓	0.30/268/-2	0.54/270/0	/ /	/ /
2	6.7 ✓	10.050 ✓	10 1/16 ✓	0.47/274/0	1.20/269/-2	/ /	/ /
3	11.8 ✓	17.700 ✓	17 11/16 ✓	0.75/277/0	0.91/249/-8	/ /	/ /
4	17.7 ✓	26.550 ✓	26 9/16 ✓	0.84/261/5	0.81/269/-5	/ /	/ /
5	25.0 ✓	35.500 ✓	37 1/2 ✓	1.10/268/2	0.79/274/-10	/ /	/ /
6	35.6 ✓	53.400 ✓	53 3/8 ✓	1.00/234/9	0.97/277/-7	/ /	/ /
7	64.4 ✓	96.600 ✓	96 5/8 ✓	1.40/273/0	0.58/283/-5	/ /	/ /
8	75.0 ✓	112.500 ✓	112 1/2 ✓	1.40/274/0	0.68/283/-8	/ /	/ /
9	82.3 ✓	123.450 ✓	123 7/16 ✓	1.10/249/7	0.51/287/-5	/ /	/ /
10	88.2 ✓	132.300 ✓	132 5/16 ✓	1.20/279/-2	0.47/289/10	/ /	/ /
11	93.3 ✓	139.950 ✓	139 15/16 ✓	1.20/275/0	0.46/284/0	/ /	/ /
12	97.9 ✓	146.850 ✓	146 7/8 ✓	0.56/273/0	0.41/287/-5	/ /	/ /
13				/ /	/ /	/ /	/ /
14				/ /	/ /	/ /	/ /
15				/ /	/ /	/ /	/ /
16				/ /	/ /	/ /	/ /
17				/ /	/ /	/ /	/ /
18				/ /	/ /	/ /	/ /
19				/ /	/ /	/ /	/ /
20				/ /	/ /	/ /	/ /
21				/ /	/ /	/ /	/ /
22				/ /	/ /	/ /	/ /
23				/ /	/ /	/ /	/ /
24				/ /	/ /	/ /	/ /

Pitot Tube No. M-7 ✓

C_p = 0.811 ✓

P_b = ~~29~~ 26.95 "Hg

P_s = -20.10 "H_2O 25.47 "Hg ✓

A_s = 17.671 ✓ in.²

Average ΔP 0.819 ✓

Average $\Delta P^{1/2}$ 0.887 ✓

Average T_s 275 ✓ °F

Average α 3.4 ✓ degrees

PRELIMINARY VELOCITY TRAVERSE DATA
AND
SAMPLING LOCATION DATA

Job Number 99-166
Job Name Mantua Power
Sampling Location Unit 3 Stack
Date 9/28/99 Time 1700

Stack Height 692 ✓ ft.
Sampling Port Height Above Ground ~~692~~ ~~492~~ 379 ✓ ft.

	Port A	Port B	Port C	Port D	Average
Port & Inside Diameter (in.)	~~300 3/4~~	~~300 3/4~~	~~300 3/4~~	~~300 3/4~~	300 3/4 ✓
Port & Wall Thickness (in.)	~~12 3/4~~	~~12 3/4~~	~~12 3/4~~	~~12 3/4~~	12 3/4 ✓
Inside Stack Diameter (in.)	~~288~~	~~288~~	~~288~~	~~288~~	288" ✓

Sampling Ports are 200 ✓ ft. — in. (8.33 ✓ stack diameters) downstream from disturbance (inlet) constriction, bend, expansion)

Sampling Ports are 313 ✓ ft. — in. (13.04 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	2.1 ✓	6.048 ✓	6 1/16 ✓	2.501185+1	1.701187+9	2.201185+5	1.801182 0
2	6.7 ✓	19.296 ✓	19 5/16 ✓	3.251189 0	2.551186+9	3.101187+2	2.601184+3
3	11.8 ✓	33.984 ✓	34 ✓	3.651183+3	2.701192+5	3.101188 0	3.001188+1
4	17.7 ✓	50.976 ✓	51 ✓	3.501187+1	2.801194+0	3.051189+1	3.101188+3
5	25.0 ✓	72.000 ✓	72 ✓	3.351189+1	3.001189+8	3.101189+2	3.101188 0
6	35.6 ✓	102.528 ✓	102 1/2 ✓	3.201191+4	3.051189+3	3.101189 0	3.201188+4
7				/ /	/ /	/ /	/ /
8				/ /	/ /	/ /	/ /
9				/ /	/ /	/ /	/ /
10				/ /	/ /	/ /	/ /
11				/ /	/ /	/ /	/ /
12	* Calculated as 1/2			/ /	/ /	/ /	/ /
13	of a ~~twelve~~ point			/ /	/ /	/ /	/ /
14	Traverse.			/ /	/ /	/ /	/ /
15				/ /	/ /	/ /	/ /
16				/ /	/ /	/ /	/ /
17				/ /	/ /	/ /	/ /
18				/ /	/ /	/ /	/ /
19				/ /	/ /	/ /	/ /
20				/ /	/ /	/ /	/ /
21				/ /	/ /	/ /	/ /
22				/ /	/ /	/ /	/ /
23				/ /	/ /	/ /	/ /
24				/ /	/ /	/ /	/ /

Pitot Tube No. M-2 ✓
C_p = 0.808 ✓
P_b = 26.95 "Hg 26.69 ✓ (26.65)
P_s = -3.5 "H_2O ~~26.59~~ "Hg
A_s = 65.144 ✓ in.²

Average ΔP 2.904 ✓
Average $\Delta P^{1/2}$ 1.698 ✓
Average T_s 188 ✓ °F
Average α 3.5 ✓ degrees

METCO ENVIRONMENTAL

ORSAT ANALYSIS DATA FORM

Job Number: 99-166 Sample Location: Unit 3 & 4 Scrubber Inlet Duct

Job Name: Montana Power Analytical Method: EPA 3B

Location: Colstrip, MT Sample Type: Single point or Multi point; Grab or Integrated

Date: 9/29/99 & 9/30/99 Leak Check: Time: 9/29 X (min. 4 minutes) Rate: 0.000

Operator: Hefley Ambient Air Check: 9/30 X 0.000

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

Run Number 1 Run Time 0908-1116	Analysis 1	Analysis 2	Analysis 3	Average - % Vol.
CO_2 - % Vol.	14.8	14.8	14.8	14.8
O_2 - % Vol.	4.6	4.5	4.6	4.6
CO - % Vol.	0.0	0.0	0.0	0.0
N_2 - % Vol.	80.6	80.6	80.6	80.6

Run Number 2 Run Time 1330-1550	Analysis 1	Analysis 2	Analysis 3	Average - % Vol.
CO_2 - % Vol.	14.6	14.7	14.6	14.6
O_2 - % Vol.	4.6	4.6	4.6	4.6
CO - % Vol.	0.0	0.0	0.0	0.0
N_2 - % Vol.	80.8	80.8	80.8	80.8

Run Number 3 Run Time 0815-1025	Analysis 1	Analysis 2	Analysis 3	Average - % Vol.
CO_2 - % Vol.	14.4	14.4	14.3	14.4
O_2 - % Vol.	4.8	4.8	4.8	4.8
CO - % Vol.	0.0	0.0	0.0	0.0
N_2 - % Vol.	80.8	80.8	80.9	80.8

c:\win\wpwin\misc\orsatant.jp

METCO ENVIRONMENTAL

ORSAT ANALYSIS DATA FORM

Job Number: 99-166 Sample Location: Unit 3 Stack

Job Name: Montana Power Analytical Method: 33

Location: Colstrip, MT Sample Type: Single point or Multi point; Grab or Integrated

Date: 9/29/99 & 9/30/99 Leak Check: Time: 9/29 Δ (min. 4 minutes) Rate: 0.000
9/30 X 0.002

Operator: Hefley Ambient Air Check:

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

Run Number 1 Run Time 0830-1220	Analysis 1	Analysis 2	Analysis 3	Average - % Vol.
CO_2 - % Vol.	13.6	13.6	13.6	13.6
O_2 - % Vol.	6.1	6.2	6.2	6.2
CO - % Vol.	0.0	0.0	0.0	0.0
N_2 - % Vol.	80.3	80.2	80.2	80.2

Run Number 2 Run Time 1330-1603	Analysis 1	Analysis 2	Analysis 3	Average - % Vol.
CO_2 - % Vol.	13.4	13.4	13.4	13.4
O_2 - % Vol.	6.2	6.2	6.2	6.2
CO - % Vol.	0.0	0.0	0.0	0.0
N_2 - % Vol.	80.4	80.4	80.4	80.4

Run Number 3 Run Time 0815-1049	Analysis 1	Analysis 2	Analysis 3	Average - % Vol.
CO_2 - % Vol.	13.2	13.2	13.2	13.2
O_2 - % Vol.	6.2	6.2	6.2	6.2
CO - % Vol.	0.0	0.0	0.0	0.0
N_2 - % Vol.	80.6	80.6	80.6	80.6

c:\win\wpwin\misc\orsatanl.jp

METCO ENVIRONMENTAL

APPENDIX C

Calibration Data

Equipment	Calibration Factor	Calibration Date
Pitot Tube #M-2	0.808	09/14/99
Pitot Tube #M-7	0.811	09/15/99
Pitot Tube #M-8	0.810	09/15/99
Probe Tip #TFE-1-7	0.200	08/09/99
Probe Tip #TFE-2-6	0.175	08/09/99
Dry Gas Meter #8-2	1.034	09/02/99
Stack Unit Orifice #8-2		09/03/99
Digital Temperature Indicator #8-2		09/02/99
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

APPENDIX C

Post Test

Calibration Data

Equipment	Calibration Factor	Calibration Date
Pitot Tube #M-2	0.808	10/04/99
Pitot Tube #M-7	0.811	10/04/99
Pitot Tube #M-8	0.810	10/04/99
Probe Tip #TFE-1-7	0.200	10/04/99
Probe Tip #TFE-2-6	0.175	10/05/99
Dry Gas Meter #8-2	1.070	10/05/99
Stack Unit Orifice #8-2		10/06/99
Digital Temperature Indicator #8-2		10/05/99
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

PITOT TUBE CALIBRATION

Date: 9-14-99

Time: 1415

Pitot No.: M2 (new)

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			0.908

Summary of Results:

Normal high side calibration factor 0.809

variation + 0.00%

variation - 0.00%

Normal low side calibration factor 0.808

variation + 0.00%

variation - 0.00%

Calibrator: Mike Bass

Checked By: Jason Cannaday #273

PITOT TUBE CALIBRATION

Date: 9-15-99 Time: 1420

Pitot No.: M-7 (new) 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 ✓	015	0.387	0.808 ✓
14	30	0.22	0.22	0.469	0.32	0.566	0.821 ✓	0.32	0.566	0.821 ✓
20	40	0.34	0.34	0.583	0.50	0.707	0.816 ✓	0.50	0.707	0.816 ✓
28	50	0.54	0.55	0.738	0.81	0.900	0.812 ✓	0.81	0.900	0.812 ✓
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							0.811 ✓			0.811 ✓

Summary of Results:

Normal high side calibration factor 0.811 ✓

variation + 1.23% ✓

variation - 0.37%

Normal low side calibration factor 0.811 ✓

variation + 1.23% ✓

variation - 0.37% ✓

Calibrator: Jason Conway #273

Checked By: [signature] 9/27

PITOT TUBE CALIBRATION

Date: 4-15-99 Time: 1515

Pitot No.: M-8 (new) T_s: 74 °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	0.32	0.566	0.821	0.32	0566	0.821
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	1.14	1.95	1.396	0.808 ✓	1.95	1.396	0.808 ✓
62	90	1.60	1.60	1.26	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 + 1.36% ✓

variation - 0.25%

Normal low side calibration factor 0.810 ✓

variation + 1.36% ✓

variation - 0.25% ✓

Calibrator: Jason Conway #273

Checked By: #127

METCO ENVIRONMENTAL

NOZZLE CALIBRATION

Nozzle Set No. TFE-1 (New)

Date 8-09-99 Calibrator: Mike Bass

	_4	_6	_7	_8	_10	12
Reading 1	0.118	0.175	0.201	0.228	0.309	0.362
Reading 2	0.116	0.176	0.198	0.227	0.308	0.364
Reading 3	0.115	0.174	0.201	0.227	0.308	0.363
Reading 4	0.118	0.173	0.199	0.227	0.310	0.362
Reading 5	0.116	0.175	0.199	0.227	0.310	0.364
Reading 6	0.115	0.175	0.200	0.228	0.310	0.362
Reading 7	0.117	0.176	0.201	0.226	0.310	0.363
Reading 8	0.116	0.177	0.201	0.227	0.309	0.363
Reading 9	0.118	0.176	0.200	0.227	0.310	0.363
Reading 10	0.118	0.175	0.200	0.226	0.310	0.363
Average	0.117	0.175	0.200	0.227	0.309	0.363

	14	—	—	—	—	—
Reading 1	0.432					
Reading 2	0.434					
Reading 3	0.430					
Reading 4	0.434					
Reading 5	0.430					
Reading 6	0.434					
Reading 7	0.430					
Reading 8	0.430					
Reading 9	0.431					
Reading 10	0.432					
Average	0.432					

METCO ENVIRONMENTAL

NOZZLE CALIBRATION

Nozzle Set No. TFE 2

Date 8-09-99 (NEW) Calibrator: Mike Bass

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

Date: 9-2-99

ΔH ("H_2O)	C_{DG}
0.5	1.046
1.0	1.036
1.5	1.035
2.0	1.021
3.0	1.035
4.0	1.030
Average	1.034

Variation: + 1.16% ✓

- 1.24% ✓

Calibrator: Jason Chessher #275

Checked By: Mike Bass

C_{DG} @ 2 liters/min. = 1.043 ✓

METCO ENVIRONMENTAL

DRY GAS METER CALIBRATION

Meter Number: 8-2

Date: 9-2-99

Calibrator: Jason Chessher

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

Run No.: 1 @ 0.50" H_2O

P_b: 29.86 "Hg

Control Module Vacuum: 5.0 "Hg

Wet Test Meter (No. 3)

	Time	Meter Reading	Temp.	P_m
End	1431	5.271 cf	75 °F	-0.80 "H_2O
Start	1417	0.000 cf	75 °F	-0.80 "H_2O
Avg.	14 ✓	5.271 ✓ cf	75 ✓ °F	-0.80 ✓ "H_2O

Dry Gas Meter

	Meter Reading	Temp. In	Temp. Out	P_m
End	476.141 cf	75 °F	75 °F	0.50 "H_2O
Start	471.129 cf	72 °F	72 °F	0.50 "H_2O
Avg.	5.012 ✓ cf	74 ✓	°F	0.50 ✓ "H_2O

$$\text{Wet Test Meter } Vm_{std} = 17.65 \times 5.271 \left[\frac{29.86 + \frac{-0.80}{13.6}}{75 + 460}\right] \times 1.000\ (C_f) = 5.182 \checkmark \text{ dcsf}$$

$$\text{Dry Gas Meter } Vm_{std} = 17.65 \times 5.012 \left[\frac{29.86 + \frac{0.50}{13.6}}{74 + 460}\right] = 4.953 \checkmark \text{ dcsf}$$

$$C_{DG} = \frac{5.182}{4.953} = \boxed{1.046 \checkmark}$$

METCO ENVIRONMENTAL

DRY GAS METER CALIBRATION

Meter Number: 8-2

Calibrator: Jason Chessher

Date: 9-2-99

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

Run No.: 1 @ 1.0" H_2O

P_b: 29.86 "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	1446	5.218 cf	75 °F	-1.3 "H_2O	482.256 cf	73 °F	79 °F	1.00 "H_2O
Start	1437	0.000 cf	75 °F	-1.3 "H_2O	479.246 cf	73 °F	76 °F	1.00 "H_2O
Avg.	9	5.218 cf	75 °F	-1.3 "H_2O	5.010 cf	75 °F		1.00 "H_2O

$$\text{Wet Test Meter } Vm_{std} = 17.65 \times 5.218 \left[\frac{29.86 + \frac{-1.3}{13.6}}{75 + 460}\right] \times 1.000 \ (C_f) = 5.124 \text{ dcsf}$$

$$\text{Dry Gas Meter } Vm_{std} = 17.65 \times 5.010 \left[\frac{29.86 + \frac{1.00}{13.6}}{75 + 460}\right] = 4.948 \text{ dcsf}$$

$$C_{DG} = \frac{5.124}{4.948} = \boxed{1.036}$$

METCO ENVIRONMENTAL

DRY GAS METER CALIBRATION

Meter Number: 8-2-

Calibrator: Jason Chesshier

Date: 9-2-99

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

Run No.: 1 @ 3.0" H_2O

P_b: 29.86 "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	1536	10.399 cf	75 °F	-3.20 "H_2O	513.955 cf	76 °F	90 °F	3.00 "H_2O
Start	1525	0.000 cf	75 °F	-3.20 "H_2O	503.929 cf	75 °F	85 °F	3.00 "H_2O
Avg.	11 ✓	10.399 ✓ cf	75 ✓ °F	-3.20 "H_2O	10.026 ✓ cf	82 ✓	°F	3.00 ✓ "H_2O

$$\text{Wet Test Meter } Vm_{std} = 17.65 \times 10.399 \left[\frac{29.86 + \frac{-3.20}{13.6}}{75 + 460}\right] \times 1.000 \quad (C_f) = 10.163 \text{ dcsf}$$

$$\text{Dry Gas Meter } Vm_{std} = 17.65 \times 10.026 \left[\frac{29.86 + \frac{3.00}{13.6}}{82 + 460}\right] = 9.821 \text{ dcsf}$$

$$C_{DG} = \frac{10163}{9.821} = \boxed{1.035}$$

METCO ENVIRONMENTAL

DRY GAS METER CALIBRATION

Meter Number: 8-2

Date: 9-2-99

Calibrator: Jason Chessher

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

Run No.: 1 @ 4.0" H_2O

P_b: 29.86 "Hg

Control Module Vacuum: 5.0 "Hg

Wet Test Meter (No. 3)

	Time	Meter Reading	Temp.	P_m
End	1551	10.820 cf	75 °F	-3.90 "H_2O
Start	1540	0.000 cf	75 °F	-3.90 "H_2O
Avg.	11	10.820 cf	75 °F	-3.90 "H_2O

Dry Gas Meter

	Meter Reading	Temp. In	Temp. Out	P_m
End	525.120 cf	87 °F	76 °F	4.00 "H_2O
Start	514.703 cf	85 °F	76 °F	4.00 "H_2O
Avg.	10.417 cf	81 °F		4.00 "H_2O

$$\text{Wet Test Meter } Vm_{std} = 17.65 \times 10.820 \left[\frac{29.86 + \frac{-3.90}{13.6}}{75 + 460}\right] \times 1.000 \ (C_f) = 10.556 \text{ dcsf}$$

$$\text{Dry Gas Meter } Vm_{std} = 17.65 \times 10.417 \left[\frac{29.86 + \frac{4.00}{13.6}}{81 + 460}\right] = 10.248 \text{ dcsf}$$

$$C_{DG} = \frac{10.556}{10.248} = \boxed{\cancel{10.030}\ 1.030}$$

METCO ENVIRONMENTAL

DRY GAS METER CALIBRATION

Meter Number: 8-2

Date: 9-2-99

Calibrator: Jason Chessher

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

Run No.: 1 @ 2 L/min

P_b: 29.86 "Hg

Control Module Vacuum: 2.0 "Hg

Wet Test Meter (No. 1)

	Time	Meter Reading	Temp.	P_m
End	1646	2.073 cf	74 °F	-0.70 "H_2O
Start	1615	0.000 cf	74 °F	-0.70 "H_2O
Avg.	31 ✓	2.073 ✓ cf	74 ✓ °F	-0.70 ✓ "H_2O

Dry Gas Meter

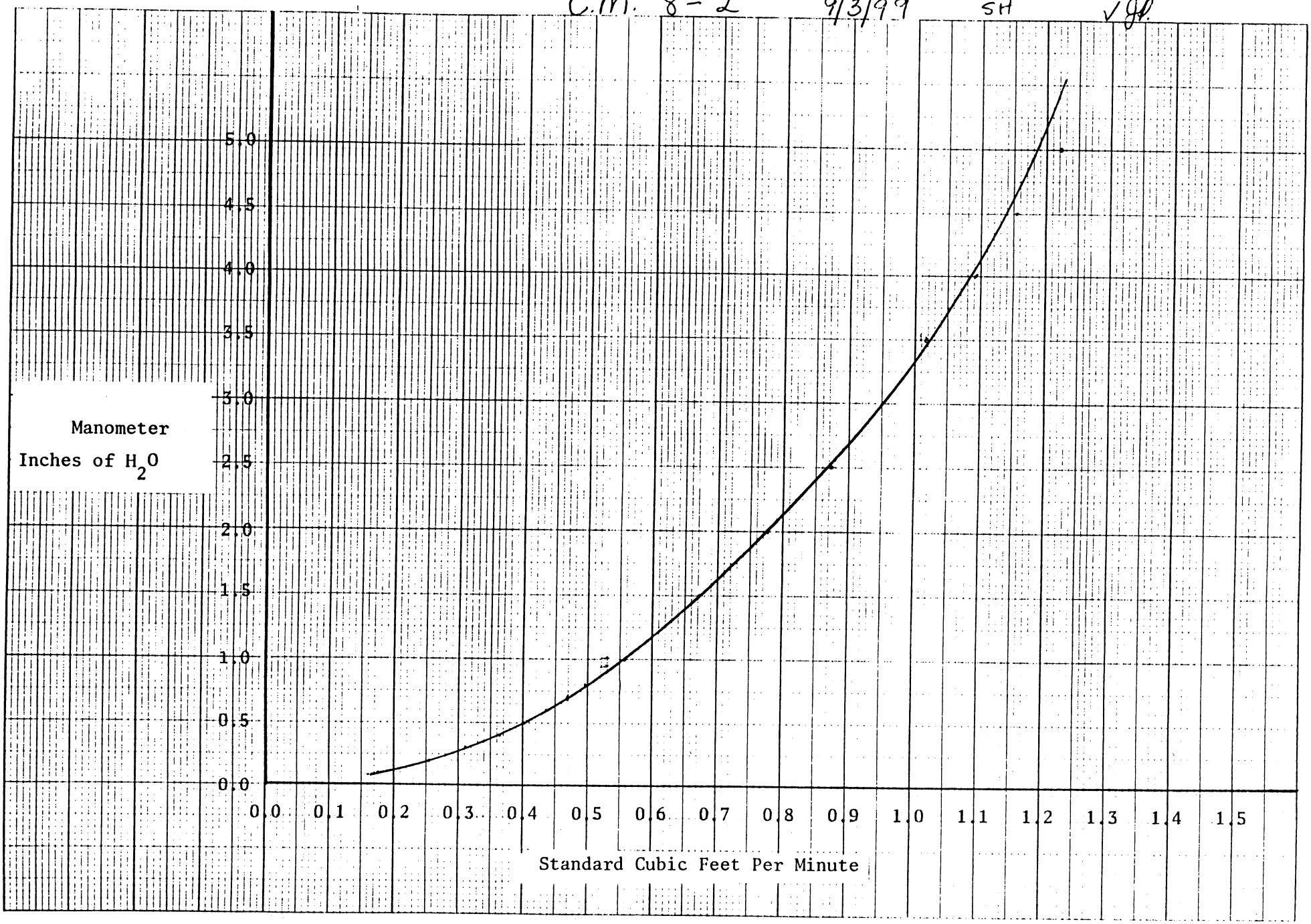
	Meter Reading	Temp. In	Temp. Out	P_m
End	528.148 cf	75 °F	75 °F	0.01 "H_2O
Start	526.144 cf	77 °F	76 °F	0.01 "H_2O
Avg.	2.004 ✓ cf	76 ✓	°F	0.01 ✓ "H_2O

$$\text{Wet Test Meter } Vm_{std} = 17.65 \times 2.073 \left[\frac{29.86 + \frac{-0.70}{13.6}}{74 + 460}\right] \times 1.006 \quad (C_f) = \cancel{2.042}\ 2.055 \text{ dcsf}$$ ✓

$$\text{Dry Gas Meter } Vm_{std} = 17.65 \times 2.004 \left[\frac{29.86 + \frac{0.01}{13.6}}{76 + 460}\right] = 1.971 \text{ dcsf}$$ ✓

$$C_{DG} = \frac{\cancel{2.042}\ 2.055}{1.971} = \boxed{\cancel{1.036}\ 1.043}$$ ✓

C.M. 8-2 9/3/99 SH ✓ JP



METCO ENVIRONMENTAL

DIGITAL TEMPERATURE INDICATOR NO. 8-2

CALIBRATION DATA

Date: 9-2-99

Media	Time	Mercury Temperature (°F)	DTI (°F)
Ambient Air	1120	75	72
Ice Bath	1127	37	36
Boiling Water	1135	212	212
Oven	1320	250	252
Oven	1325	300	302
Oven	1329	350	350
Oven	1335	375	377

Meter Adjusted? Yes _____ No /

Calibrator: Jason Chessher #295

Checked By: Mike Bass

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 Calibrator: Shane Lee

Date: 8-13-99

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

Run No.: 1 @ 0.5" H.O 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	1512	5.315 cf	73 °F	-1.20 "H_2O	312.440 cf	73 °F	73 °F	0.50 "H_2O
Start	1500	0.000 cf	73 °F	-1.20 "H_2O	307.333 cf	72 °F	72 °F	0.50 "H_2O
Avg.	12	5.315 cf	73 °F	-1.20 "H_2O	5.107 cf		73 °F	0.50 "H_2O

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

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

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

METCO ENVIRONMENTAL

DRY GAS METER CALIBRATION

Meter Number: 27-2

Calibrator: Shane Lee

Date: 8-13-99

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

Run No.: 1 @ 1.0 "H_2O

P_b: 29.20 "Hg

Control Module Vacuum: 5 o "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
	307.007 cf	73 °F	72 °F	1.00 "H_2O
	301.998 cf	72 °F	71 °F	1.00 "H_2O
	5.009 cf	72 °F		1.00 "H_2O

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

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

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

METCO ENVIRONMENTAL

DRY GAS METER CALIBRATION

Meter Number: 27-2

Calibrator: Shane Lee

Date: 8-13-99

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

Run No.: 1 @ 1.5 "H_2O

P_b: 29.20 "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

Calibrator: Shane Lee

Date: 8-13-99

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

Run No.: 1 @ 20"/1.0

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	1605	10.514 cf	73 °F	-2.60 "H_2O	343.568 cf	80 °F	76 °F	2.00 "H_2O
Start	1552	0.000 cf	73 °F	-2.60 "H_2O	333.427 cf	77 °F	73 °F	2.00 "H_2O
Avg.	13	10.514 cf	73 °F	-2.60 "H_2O	10.141 cf	77 °F		2.00 "H_2O

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

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

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

METCO ENVIRONMENTAL

DRY GAS METER CALIBRATION

Meter Number: 27-2

Calibrator: Shane Lee

Date: 8-13-99

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

Run No.: 1 @ 30" H_2O

P_b: 29.20 "Hg

Control Module Vacuum: 5 o "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

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

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

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

METCO ENVIRONMENTAL

DRY GAS METER CALIBRATION

Meter Number: 27-2 Calibrator: Shane Lee

Date: 8-13-99

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

Run No.: 1 @ 4.0" H2O P_b: 29.20 "Hg

Control Module Vacuum: 5.0 "Hg

	Wet Test Meter (No. 3)				Dry Gas Meter			
	Time	Meter Reading	Temp.	P_m	Meter Reading	Temp. In	Temp. Out	P_m
End	1630	10.708 cf	93 °F	-4.30 "H_2O	366.588 cf	84 °F	95 °F	4.00 "H_2O
Start	1620	0.000 cf	93 °F	-4.30 "H_2O	356.234 cf	81 °F	95 °F	4.00 "H_2O
Avg.	10	10.708 cf	93 °F	-4.30 "H_2O	10.354 cf	79 °F		4.00 "H_2O

$$\text{Wet Test Meter } Vm_{std} = 17.65 \times 10.708 \left[\frac{29.20 + \frac{-4.30}{13.6}}{93 + 460} \right] \times 1.000 \quad (C_f) = 10.242 \text{ dcsf}$$

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

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

METCO ENVIRONMENTAL

DRY GAS METER CALIBRATION

Meter Number: 27-2

Calibrator: Shane Lee

Date: 8-13-99

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

Run No.: 1 @ 2.0 l/min.

P_b: 29.20 "Hg

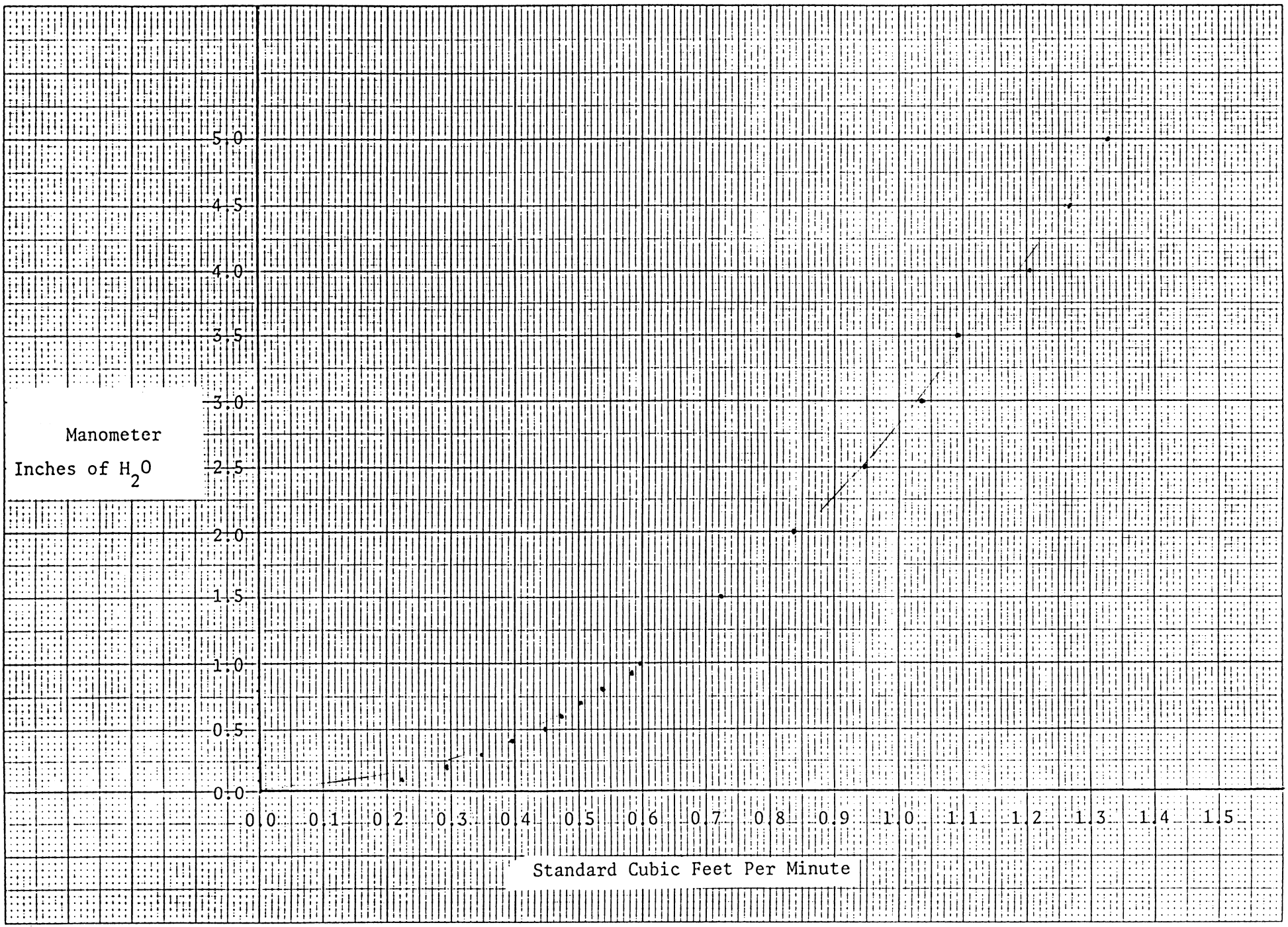
Control Module Vacuum: 5.0 "Hg

	Wet Test Meter (No. 3)				Dry Gas Meter			
	Time	Meter Reading	Temp.	P_m	Meter Reading	Temp. In	Temp. Out	P_m
End	1711	2.700 cf	73 °F	-0.20 "H_2O	369.641 cf	73 °F	72 °F	0.02 "H_2O
Start	1636	0.000 cf	73 °F	-0.20 "H_2O	367.018 cf	79 °F	75 °F	0.02 "H_2O
Avg.	35	2.700 cf	73 °F	-0.20 "H_2O	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

PITOT TUBE CALIBRATION

Date: 10-4-99 Time: 1030

Pitot No.: M2 T_s: 72 °F

Pitot Dimensions: 3/8" hps 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: 1430

Pitot No.: M7 T_s: 72 °F

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

Motor Setting	fps mark	Calibration Standard Start	Calibration Standard End	$\sqrt{\text{Standard Average}}$	High	$\sqrt{\text{High}}$	Cal. Factor	Low	$\sqrt{\text{Low}}$	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	0.32	0.566	0.821	0.32	0.566	0.821
20	40	0.34	0.34	0.583	0.50	0.707	0.816	0.50	0.707	0.816
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							0.811			0.811

Summary of Results:

Normal high side calibration factor 0.811

variation + 1.23%

variation - 0.37%

Normal low side calibration factor 0.811

variation + 1.23%

variation - 0.37%

Calibrator: [illegible] 274

Checked By: Jason Conway # 273

PITOT TUBE CALIBRATION

Date: 10-4-99 Time: 1450

Pitot No.: M8 T_s: 72 °F

Pitot Dimensions: 3/8" hp's 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	0.32	0.566	0.821	0.32	0.566	0.821
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							0.810			0.810

Summary of Results:

Normal high side calibration factor 0.810

variation + 1.36%

variation - 0.25%

Normal low side calibration factor 0.810

variation + 1.36%

variation - 0.25%

Calibrator: Jason Brown 274

Checked By: Jason Corning #273

METCO ENVIRONMENTAL

✓ AM107

NOZZLE CALIBRATION

Nozzle Set No. TFE-1

Date 10-4-99 Calibrator: Jason Brown 374

	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

√ 154 107

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.: 8-2

Date: 10/5/99

ΔH ("H_2O)	C_{DG}
0.5	1.078
1.0	1.065
1.5	1.065
2.0	1.070
3.0	1.071
4.0	1.068
Average	1.070 ✓

Variation: + 0.75% ✓

- 0.47% ✓

Calibrator: Shane Lee 261

Checked By: Scott Hunt #268

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

METCO ENVIRONMENTAL

DRY GAS METER CALIBRATION

Meter Number: 8-2

Date: 10-5-99

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: 29.76 "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	1596	5.317 cf	75 °F	−0.90 "H_2O	328.475 cf	83 °F	82 °F	0.50 "H_2O
Start	1531	0.000 cf	75 °F	−0.90 "H_2O	323.494 cf	82 °F	81 °F	0.50 "H_2O
Avg.	15✓	5.317✓ cf	75✓ °F	−0.90✓ "H_2O	4.981✓ cf	82✓ °F		0.50✓ "H_2O

$$Vm_{std} = 17.65 \times 5.317 \left[\frac{29.76 + \frac{-0.90}{13.6}}{75 + 460}\right] \times 1.000\ (C_f) = 5.209\text{✓ dcsf}$$

$$Vm_{std} = 17.65 \times 4.981 \left[\frac{29.76 + \frac{0.50}{13.6}}{82 + 460}\right] = 4.833\text{✓ dcsf}$$

$$C_{DG} = \frac{5.209}{4.833} = \boxed{1.078\text{✓}}$$

METCO ENVIRONMENTAL

DRY GAS METER CALIBRATION

Meter Number: 8-2

Date: 10-5-99

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: 29.76 "Hg

Control Module Vacuum: 5.0 "Hg

Wet Test Meter (No. 3)

	Time	Meter Reading	Temp.	P_m
End	1553	5.460 cf	75 °F	-1.40 "H_2O
Start	1548	0000 cf	75 °F	-1.40 "H_2O
Avg.	9 ✓	5.460 ✓ cf	75 ✓ °F	-1.40 ✓ "H_2O

Dry Gas Meter

	Meter Reading	Temp. In	Temp. Out	P_m
End	333.976 cf	88 °F	82 °F	1.00 "H_2O
Start	328.794 cf	84 °F	82 °F	1.00 "H_2O
Avg.	5.182 ✓ cf	84 ✓ °F		1.00 ✓ "H_2O

$$\text{Wet Test Meter } Vm_{std} = 17.65 \times 5.460 \left[\frac{29.76 + \frac{-1.40}{13.6}}{75 + 460} \right] \times 1.000 \ (C_f) = 5.342 \text{ ✓ dcsf}$$

$$\text{Dry Gas Meter } Vm_{std} = 17.65 \times 5.182 \left[\frac{29.76 + \frac{1.00}{13.6}}{84 + 460} \right] = 5.016 \text{ ✓ dcsf}$$

$$C_{DG} = \frac{5.342}{5.016} = \boxed{1.065 \text{ ✓}}$$

METCO ENVIRONMENTAL

DRY GAS METER CALIBRATION

Meter Number: 8-2

Calibrator: Shane Lee

Date: 10-5-99

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

Run No.: 1 @ 1.5" H_2O

P_b: 29.76 "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	1611	12.002 cf	75 °F	-2.00 "H_2O	345.691 cf	93 °F	83 °F	1.50 "H_2O
Start	1559	0.000 cf	75 °F	-1.80 "H_2O	334.272 cf	87 °F	82 °F	1.50 "H_2O
Avg.	17 ✓	12.002 ✓ cf	75 ✓ °F	-1.90 ✓ "H_2O	11.425 ✓ cf	87 ✓ °F		1.50 ✓ "H_2O

$$\text{Wet Test Meter } Vm_{std} = 17.65 \times 12.002 \left[\frac{29.76 + \frac{-1.90}{13.6}}{75 + 460} \right] \times 1.000 \quad (C_f) = 11.728 \checkmark \text{ dcsf}$$

$$\text{Dry Gas Meter } Vm_{std} = 17.65 \times 11.425 \left[\frac{29.76 + \frac{1.50}{13.6}}{87 + 460} \right] = 11.012 \checkmark \text{ dcsf}$$

$$C_{DG} = \frac{11.728}{11.012} = \boxed{1.065 \checkmark}$$

METCO ENVIRONMENTAL

DRY GAS METER CALIBRATION

Meter Number: 8-2

Calibrator: Shane Lee

Date: 10-5-99

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

Run No.: 1 @ 2.0" H_2O

P_b: 29.76 "Hg

Control Module Vacuum: 5.0 "Hg

Wet Test Meter (No. 3)

	Time	Meter Reading		Temp.		P_m	
End	1647	10.812	cf	75	°F	-2.60	"H_2O
Start	1633	0.000	cf	75	°F	-2.60	"H_2O
Avg.	14 ✓	10.812 ✓	cf	75 ✓	°F	-2.60 ✓	"H_2O

Dry Gas Meter

	Meter Reading		Temp. In		Temp. Out		P_m	
End	357.542	cf	96	°F	84	°F	2.00	"H_2O
Start	347.309	cf	87	°F	83	°F	2.00	"H_2O
Avg.	10.233 ✓	cf	88 ✓		°F		2.00 ✓	"H_2O

$$Wet\ Test\ Meter\ Vm_{std} = 17.65 \times 10.812 \left[\frac{29.76 + \frac{-2.60}{13.6}}{75 + 460} \right] \times 1.000\ (C_f) = 10.547 \checkmark\ dcsf$$

$$Dry\ Gas\ Meter\ Vm_{std} = 17.65 \times 10.233 \left[\frac{29.76 + \frac{2.00}{13.6}}{88 + 460} \right] = 9.857 \checkmark\ dcsf$$

$$C_{DG} = \frac{10.547}{9.857} = \boxed{1.070 \checkmark}$$

METCO ENVIRONMENTAL

DRY GAS METER CALIBRATION

Meter Number: 8-2

Calibrator: Shane Lee

Date: 10-5-99

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

Run No.: 1 @ 3.0" H2O

P_b: 29.76 "Hg

Control Module Vacuum: 5.0 "Hg

Wet Test Meter (No. 3)

	Time	Meter Reading	Temp.	P_m
End	1700	11.024 cf	75 °F	-3.20 "H_2O
Start	1649	0.000 cf	75 °F	-3.20 "H_2O
Avg.	11 ✓	11.024 ✓ cf	75 ✓ °F	-3.20 ✓ "H_2O

Dry Gas Meter

	Meter Reading	Temp. In	Temp. Out	P_m
End	368.291 cf	100 °F	85 °F	3.00 "H_2O
Start	352.851 cf	94 °F	84 °F	3.00 "H_2O
Avg.	10.440 ✓ cf	91 ✓ °F		3.00 ✓ "H_2O

$$\text{Wet Test Meter } Vm_{std} = 17.65 \times 11.024 \left[\frac{2976 \quad +\frac{-3.20}{13.6}}{75 + 460} \right] \times 1.000 \quad (C_f) = 10.738 \text{ ✓ dcsf}$$

$$\text{Dry Gas Meter } Vm_{std} = 17.65 \times 10.440 \left[\frac{29.76 \quad +\frac{3.00}{13.6}}{91 + 460} \right] = 10.026 \text{ ✓ dcsf}$$

$$C_{DG} = \frac{10.738}{10.026} = \boxed{1.071 \text{ ✓}}$$

METCO ENVIRONMENTAL

DRY GAS METER CALIBRATION

Meter Number: S-2

Calibrator: Shane Lee

Date: 10-5-99

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

Run No.: 1 @ 4.0" H.O

P_b: 29.76 "Hg

Control Module Vacuum: 5.0 "Hg

Wet Test Meter (No. 3)

	Time	Meter Reading		Temp.		P_m	
End	1716	12.705	cf	75	°F	-4.00	"H_2O
Start	1704	0.000	cf	75	°F	-4.00	"H_2O
Avg.	12✓	12.705✓	cf	75✓	°F	-4.00✓	"H_2O

Dry Gas Meter

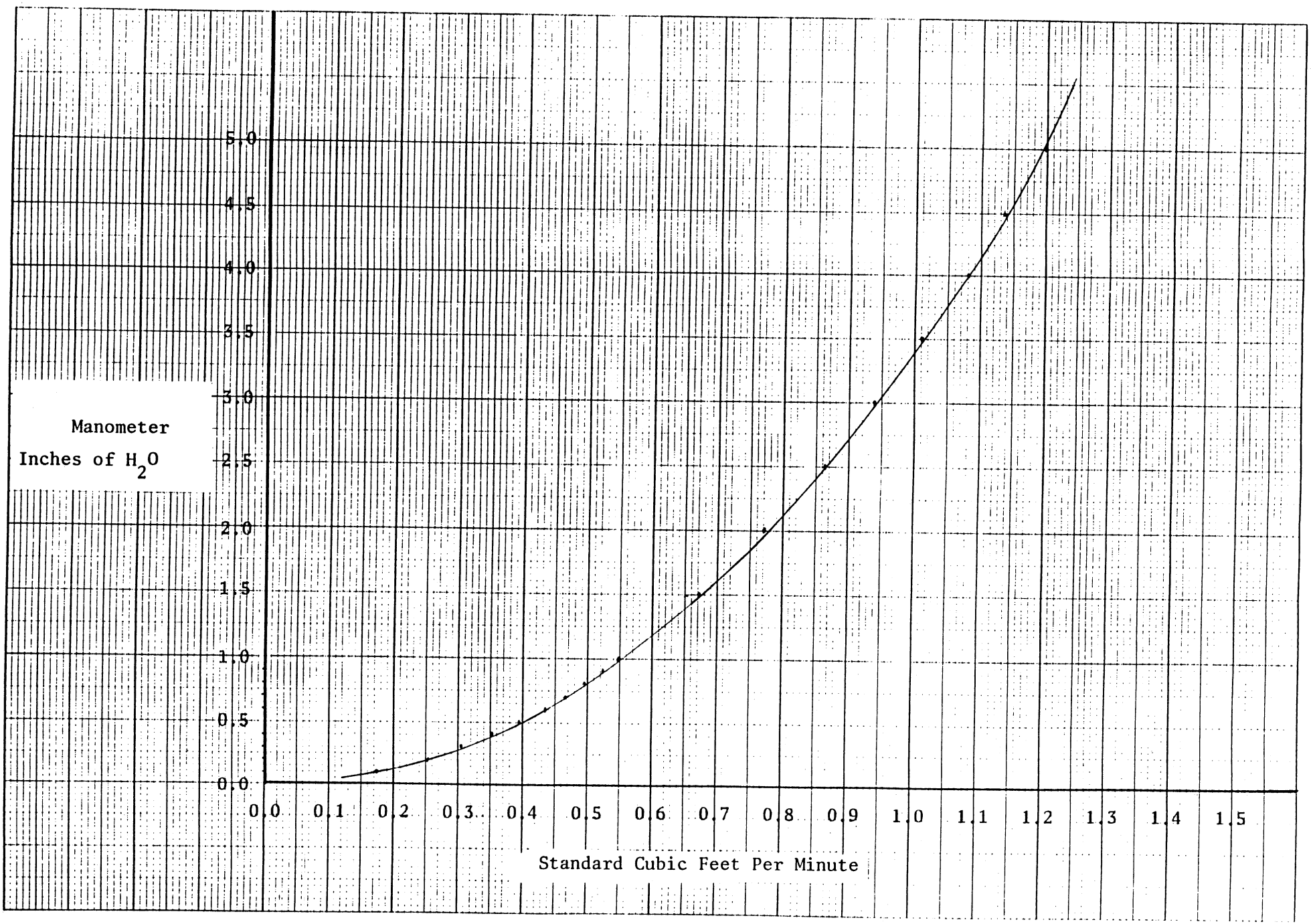
	Meter Reading		Temp. In		Temp. Out		P_m	
End	380.752	cf	102	°F	86	°F	4.00	"H_2O
Start	368.719	cf	94	°F	85	°F	4.00	"H_2O
Avg.	12.033✓	cf	92✓		°F		4.00✓	"H_2O

$$Vm_{std} = 17.65 \times 12.705 \left[\frac{29.76 + \frac{-4.00}{13.6}}{75 + 460} \right] \times 1.000 \quad (C_f) = 12.351^{\checkmark} \text{ dcsf}$$

$$\text{Dry Gas Meter } Vm_{std} = 17.65 \times 12.033 \left[\frac{29.76 + \frac{4.00}{13.6}}{92 + 460} \right] = 11.563^{\checkmark} \text{ dcsf}$$

$$C_{DG} = \frac{12.351}{11.563} = \boxed{1.068^{\checkmark}}$$

CM 8-2
1.070


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. S-2

CALIBRATION DATA

Date: 10/5/99

Media	Time	Mercury Temperature (°F)	DTI (°F)
Ambient Air	1355	80	80
Ice Bath	1357	32	32
Boiling Water	1402	212	212
Oven	1405	250	250
Oven	1407	300	301
Oven	1410	350	351
Oven	1411	375	375

Meter Adjusted? Yes _____ No ✓

Calibrator: Shane Lee

Checked By: Scott Hart #268

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: Sam 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
	577.407 cf	78 °F	77 °F	1.00 "H_2O
	572.377 cf	77 °F	76 °F	1.00 "H_2O
	5.030 cf	77 °F		1.000 "H_2O

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

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

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

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)				Dry Gas Meter			
	Time	Meter Reading	Temp.	P_m	Meter Reading	Temp. In	Temp. Out	P_m
End	1341	10.295 cf	74 °F	-1.60 "H_2O	587.724 cf	82 °F	77 °F	1.50 "H_2O
Start	1324	0.000 cf	74 °F	-1.60 "H_2O	577.653 cf	78 °F	76 °F	1.50 "H_2O
Avg.	15	10.295 cf	74 °F	-1.600 "H_2O	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)

	Time	Meter Reading		Temp.		P_m	
End	1356	10.300	cf	74	°F	-2.50	"H_2O
Start	1344	0.000	cf	74	°F	-2.50	"H_2O
Avg.	12	10.300	cf ✓	74	°F ✓	-2.500	"H_2O ✓

Dry Gas Meter

	Meter Reading		Temp. In		Temp. Out		P_m	
	598.026	cf	86	°F	78	°F	2.00	"H_2O
	587.902	cf	81	°F	77	°F	2.00	"H_2O
	10.124	cf ✓	81	°F ✓			2.000	"H_2O ✓

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

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

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

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)				Dry Gas Meter			
	Time	Meter Reading	Temp.	P_m	Meter Reading	Temp. In	Temp. Out	P_m
End	1409	10.330 cf	74 °F	-2.40 "H_2O	608.602 cf	89 °F	79 °F	3.00 "H_2O
Start	1358	0.000 cf	74 °F	-2.40 "H_2O	598.364 cf	85 °F	78 °F	3.00 "H_2O
Avg.	10	10.330 cf ✓	74 °F ✓	-2.900 "H_2O ✓	10.238 cf ✓	83 °F ✓		3.000 "H_2O ✓

$$\text{Wet Test Meter } Vm_{std} = 17.65 \times 10.330 \left[\frac{29.32 + \frac{-2.40}{13.6}}{74 + 460}\right] \times 1.000\ (C_f) = 9.938 \text{ dcsf} \checkmark$$

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

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

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

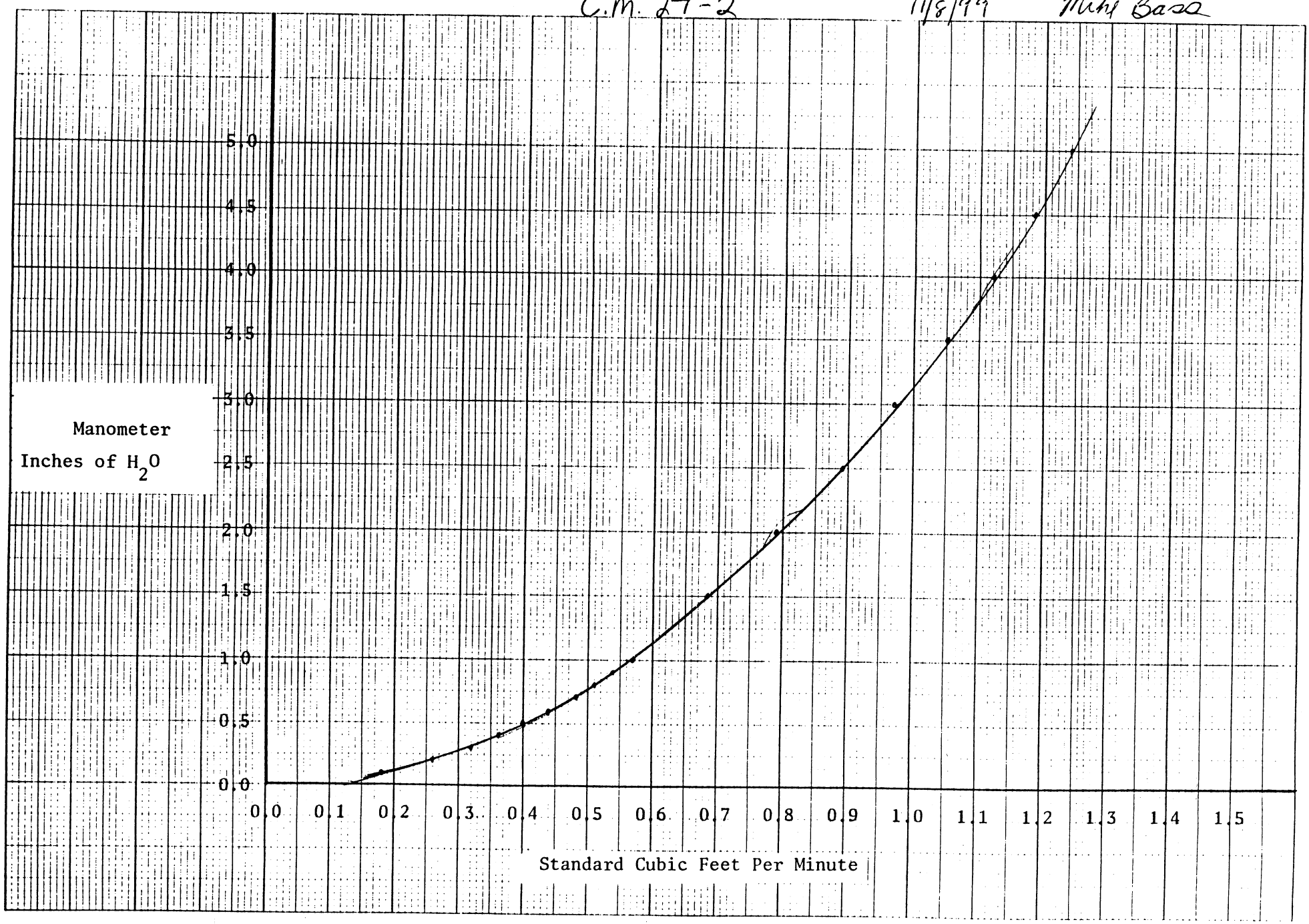
	Wet Test Meter (No. 3)				Dry Gas Meter			
	Time	Meter Reading	Temp.	P_m	Meter Reading	Temp. In	Temp. Out	P_m
End	1419	10.130 cf	74 °F	-3.70 "H_2O	619.031 cf	91 °F	80 °F	4.00 "H_2O
Start	1410	0.000 cf	74 °F	-3.70 "H_2O	608.926 cf	87 °F	79 °F	4.00 "H_2O
Avg.	9	10.130 cf ✓	74 °F ✓	-3.700 "H_2O ✓	10.105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

$$Vm_{std} = 17.65 \times 10.130 \left[\frac{29.32 + \frac{-3.700}{13.6}}{74 + 460}\right] \times 1.000 \quad (C_f) = 9.726 \text{ dcsf} \checkmark$$

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

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

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



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: Jon Brown

APPENDIX D

Analytical Data

TestAmerica
INCORPORATED

December 6, 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 Montana Power Company samples submitted to TestAmerica for analysis. The samples were analyzed following the SOPs based on the Ontario-Hydro Method and ASTM 6414-99.

Case Narrative

TestAmerica unpacked the samples on November 9, 1999. All samples were intact when received.

No problems were noted during analysis. 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

TestAmerica
INCORPORATED

Sample ID: Montana Power Company
Colstrip Power Plant
Colstrip, Montana

Hg Analysis
Ontario Hydro Method

Summary Report

	Unit 3 Stack Run 1	Unit 3 Stack Run 2	Unit 3 Stack Run 3	Unit 3-6 Scrubber Inlet Duct Run 1	Unit 3-6 Scrubber Inlet Duct Run 2	Unit 3-6 Scrubber Inlet Duct Run 3
Particle Bound Hg (ug)	0.090	0.050	0.040	2.41	2.66	2.28
Oxidized Hg (ug)	0.00	0.00	0.00	3.10	3.24	3.98
Elemental Hg (ug)	16.20	19.90	4.15	1.45	8.70	7.52
Total Hg (ug)	16.29	19.95	4.19	6.96	14.60	13.78

	Unit 3 Stack Blank Train	Unit 3-6 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 # 12B (ug)	<0.01
Container # 12C (ug)	<0.01

TestAmerica
INCORPORATED

Sample ID: Montana Power Company
Colstrip Power Plant
Colstrip, Montana

Hg Analysis
Ontario Hydro Method

Duplicate Summary Report

	Unit 3 Stack Run 1	Unit 3 Stack Run 2	Unit 3 Stack Run 3	Unit 3-6 Scrubber Inlet Duct Run 1	Unit 3-6 Scrubber Inlet Duct Run 2	Unit 3-6 Scrubber Inlet Duct Run 3
Particle Bound Hg (ug)	0.090	0.050	0.040	2.47	2.66	2.28
Oxidized Hg (ug)	0.00	0.00	0.00	3.02	3.21	3.98
Elemental Hg (ug)	16.30	19.90	4.12	1.45	8.66	7.32
Total Hg (ug)	16.39	19.95	4.16	6.94	14.53	13.58

	Unit 3 Stack Blank Train	Unit 3-6 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 # 12B (ug)	<0.01
Container # 12C (ug)	<0.01

TestAmerica
INCORPORATED

Sample ID: **Montana Power Company**
Colstrip Power Plant
Colstrip, Montana
Unit 3-6 Scrubber Inlet Duct Run 2

Hg Analysis
Ontario Hydro Method

Collected On: 9/29/99
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	MTF-15	11/12/99	11/12/99	jpp	2.65	2.65	0	—	—	ug	*1	(Q14&Q21)
Container # 1B	MTF-16	11/12/99	11/12/99	jpp	0.011	0.011	1.3	—	—	ug		(47Q35)
Container # 2	2MT-22	11/12/99	11/12/99	jpp	<0.130	<0.130	0	—	—	ug		
Container # 3	3MT-28	11/12/99	11/12/99	jpp	3.24	3.21	0.9	—	—	ug		
Container # 4	4MT-34	11/13/99	11/13/99	jpp	<0.600	<0.600	0	—	—	ug		
Container # 5	5MT-40	11/13/99	11/13/99	jpp	8.70	8.66	0.6	—	—	ug		

Particle Bound Hg (ug) **2.66**
(Containers 1A, 1B, and 2)

Oxidized Hg (ug) **3.24**
(Containers 3)

Elemental Hg (ug) **8.70**
(Containers 4 and 5)

Total Hg (ug) **14.60**
(Containers 1A, 1B, 2, 3, 4, and 5)

Dup. Part. Bound Hg (ug) **2.66**
(Containers 1A, 1B, and 2)

Dup. Oxidized Hg (ug) **3.21**
(Containers 3)

Dup. Elemental Hg (ug) **8.66**
(Containers 4 and 5)

Dup. Total Hg (ug) **14.53**
(Containers 1A, 1B, 2, 3, 4, and 5)

Notes: *1 - Particulate from Filters Q14 and Q21 were composited prior to removing an aliquot for analysis.

TestAmerica
INCORPORATED

Sample ID: **Montana Power Company**
Colstrip Power Plant
Colstrip, Montana
Unit 3-6 Scrubber Inlet Duct Run 3

Hg Analysis
Ontario Hydro Method

Collected On: 9/30/99
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	MTF-17	11/12/99	11/12/99	jpp	2.25	2.250	0	—	—	ug		(Q15)
Container # 1B	MTF-18	11/13/99	11/15/99	99	0.030	0.030	0	—	—	ug		(47Q36)
Container # 2	2MT-23	11/12/99	11/12/99	jpp	<0.130	<0.130	0	—	—	ug		
Container # 3	3MT-29	11/12/99	11/12/99	jpp	3.98	3.98	0	—	—	ug		
Container # 4	4MT-35	11/13/99	11/13/99	jpp	<0.80	<0.80	0	—	—	ug		
Container # 5	5MT-41	11/13/99	11/13/99	jpp	7.52	7.32	2.7	—	—	ug		

Particle Bound Hg (ug) **2.28**
(Containers 1A, 1B, and 2)

Oxidized Hg (ug) **3.98**
(Containers 3)

Elemental Hg (ug) **7.52**
(Containers 4 and 5)

Total Hg (ug) **13.78**
(Containers 1A, 1B, 2, 3, 4, and 5)

Dup. Part. Bound Hg (ug) **2.28**
(Containers 1A, 1B, and 2)

Dup. Oxidized Hg (ug) **3.98**
(Containers 3)

Dup. Elemental Hg (ug) **7.32**
(Containers 4 and 5)

Dup. Total Hg (ug) **13.58**
(Containers 1A, 1B, 2, 3, 4, and 5)

Notes:

TestAmerica
INCORPORATED

Sample ID: **Montana Power Company**
Colstrip Power Plant
Colstrip, Montana
Unit 3 Stack Run 1

Hg Analysis
Ontario Hydro Method

Collected On: 9/29/99
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	MTF-10	11/12/99	11/12/99	jpp	0.090	0.090	0.6	—	—	ug		(88QH37)
Container # 1B		Not Provided		jpp	—	—	—	—	—	ug		
Container # 2	2MT-18	11/12/99	11/12/99	jpp	<0.310	<0.310	0	—	—	ug		
Container # 3	3MT-24	11/12/99	11/12/99	jpp	<1.48	<1.48	0	—	—	ug		
Container # 4	4MT-30	11/13/99	11/13/99	jpp	<0.66	<0.66	0	—	—	ug		
Container # 5	5MT-36	11/13/99	11/13/99	jpp	16.2	16.30	0.8	—	—	ug		

Particle Bound Hg (ug) **0.090**
(Containers 1A, 1B, and 2)

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

Elemental Hg (ug) **16.20**
(Containers 4 and 5)

Total Hg (ug) **16.29**
(Containers 1A, 1B, 2, 3, 4, and 5)

Dup. Part. Bound Hg (ug) **0.090**
(Containers 1A, 1B, and 2)

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

Dup. Elemental Hg (ug) **16.30**
(Containers 4 and 5)

Dup. Total Hg (ug) **16.39**
(Containers 1A, 1B, 2, 3, 4, and 5)

Notes:

TestAmerica
INCORPORATED

Sample ID: **Montana Power Company**
Colstrip Power Plant
Colstrip, Montana
Unit 3 Stack Run 2

Hg Analysis
Ontario Hydro Method

Collected On: 9/29/99
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	MTF-11	11/12/99	11/12/99	jpp	0.05	0.05	0	—	—	ug		(88QH38)
Container # 1B		Not Provided		jpp	—	—	—	—	—	ug		
Container # 2	2MT-19	11/12/99	11/12/99	jpp	<0.390	<0.390	0	—	—	ug		
Container # 3	3MT-25	11/12/99	11/12/99	jpp	<1.64	<1.64	0	—	—	ug		
Container # 4	4MT-31	11/13/99	11/13/99	jpp	<0.740	<0.740	0	—	—	ug		
Container # 5	5MT-37	11/13/99	11/13/99	jpp	19.9	19.9	0.1	—	—	ug		

Particle Bound Hg (ug) **0.050**
(Containers 1A, 1B, and 2)

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

Elemental Hg (ug) **19.90**
(Containers 4 and 5)

Total Hg (ug) **19.95**
(Containers 1A, 1B, 2, 3, 4, and 5)

Dup. Part. Bound Hg (ug) **0.050**
(Containers 1A, 1B, and 2)

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

Dup. Elemental Hg (ug) **19.90**
(Containers 4 and 5)

Dup. Total Hg (ug) **19.95**
(Containers 1A, 1B, 2, 3, 4, and 5)

TestAmerica
INCORPORATED

Sample ID: **Montana Power Company**
Colstrip Power Plant
Colstrip, Montana
Unit 3 Stack Run 3

Hg Analysis
Ontario Hydro Method

Collected On: 9/30/99
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	MTF-12	11/12/99	11/12/99	jpp	0.040	0.040	0.1			ug		(88QH39)
Container # 1B		Not Provided		jpp	—					ug		
Container # 2	2MT-20	11/12/99	11/12/99	jpp	<0.270	<0.270	0			ug		
Container # 3	3MT-26	11/12/99	11/12/99	jpp	<1.52	<1.52	0			ug		
Container # 4	4MT-32	11/13/99	11/13/99	jpp	<0.660	<0.660	0			ug		
Container # 5	5MT-38	11/13/99	11/13/99	jpp	4.15	4.12	0.6			ug		

Particle Bound Hg (ug) **0.040**
(Containers 1A, 1B, and 2)

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

Elemental Hg (ug) **4.15**
(Containers 4 and 5)

Total Hg (ug) **4.19**
(Containers 1A, 1B, 2, 3, 4, and 5)

Dup. Part. Bound Hg (ug) **0.040**
(Containers 1A, 1B, and 2)

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

Dup. Elemental Hg (ug) **4.12**
(Containers 4 and 5)

Dup. Total Hg (ug) **4.16**
(Containers 1A, 1B, 2, 3, 4, and 5)

Notes:

TestAmerica
INCORPORATED

Sample ID: **Montana Power Company**
Colstrip Power Plant
Colstrip, Montana
Unit 3 Stack Blank Train

Hg Analysis
Ontario Hydro Method

Collected On: 9/30/99
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	3MT-15	11/12/99	11/12/99	jpp	<1.00	<1.00	0	—	—	ug		
Container # 4	4MT-16	11/13/99	11/13/99	jpp	<0.560	<0.560	0	—	—	ug		
Container # 5	5MT-17	11/13/99	11/13/99	jpp	<0.980	<0.98	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) **0.00**
(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) **0.00**
(Containers 1A, 1B, 2, 3, 4, and 5)

Notes:

TestAmerica
INCORPORATED

Sample ID: **Montana Power Company**
Colstrip Power Plant
Colstrip, Montana
Unit 3-6 Scrubber Inlet Duct Blank Train

Hg Analysis
Ontario Hydro Method

Collected On: 9/30/99
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	3MT-12	11/12/99	11/12/99	jpp	<1.00	<1.00	0	—	—	ug		
Container # 4	4MT-13	11/13/99	11/13/99	jpp	<0.640	<0.640	0	—	—	ug		
Container # 5	5MT-14	11/13/99	11/13/99	jpp	<0.960	<0.960	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) **0.00**
(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) **0.00**
(Containers 1A, 1B, 2, 3, 4, and 5)

Notes:

TestAmerica
INCORPORATED

Sample ID: **Montana Power Company**
Colstrip Power Plant
Colstrip, Montana
Reagent Blanks

Hg Analysis
Ontario Hydro Method

Collected On: 9/30/99
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	7MT-1	—	11/13/99	jpp	<0.2	<0.2	0	—	—	ug/L		
Container # 8	8MT-2	11/12/99	11/12/99	jpp	<2.0	<2.0	0	—	—	ug/L		
Container # 9	9MT-3	11/13/99	11/13/99	jpp	<4.0	<4.0	0	<4.0	0	ug/L		
Container # 10	10MT-4	11/13/99	11/13/99	jpp	<2.0	<2.0	0	<2.0	0	ug/L		
Container # 11	11MT-5	—	11/13/99	jpp	<0.2	<0.2	0	—	—	ug/L		
Container # 12B	MTF-4	11/12/99	11/12/99	jpp	<0.01	<0.01	0	—	—	ug		(88QH40)
Container # 12C	MTF-7	11/12/99	11/12/99	jpp	<0.01	<0.01	0	—	—	ug		(47Q37)

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

Mercury Sample Train Receipt

Mercury Sample Train Receipt Record

Client ID
MONTANA POWER CO.
COLSTRIP POWER PLANT
COLSTRIP, MT

Location ID/Run #
UNIT 3
STACK
REAGENT BLANKS

Solutions:

Cont. ID/(#)	Volumes (mL)	TestAmerica ID(s)	Comments
☐ 2 ( )	___ + ___ + ___ = ___.		*1 mp 11/9
☐ 3 ( )	___ + ___ + ___ = ___.		
☐ 4 ( )	___ + ___ + ___ = ___.		
☐ 5 ( )	___ + ___ + ___ = ___.		
☑ 7 (1)	49 + ~ + ~ = 49.	(7) MT-1	mL
☑ 8 (1)	51 + ~ + ~ = 51.	(8) MT-2	mL
☑ 9 (1)	50 + ~ + ~ = 50.	(9) MT-3	mL
☑ 10 (1)	47 + ~ + ~ = 47.	(10) MT-4	mL / *RESIDUE
☑ 11 (1)	97 + ___ + ___ = 97.	(11) MT-5	mL

Filters:

Cont. ID/(#)	Filter ID(s)		
☐ 1A ( )			*1 mp 11/9
☐ 1B ( )			
☑ 12A (3)	Q17, Q18, Q19	MTF-1,2,3	
☑ 12B (3)	88Q40, 88QH41,	MTF-4,5,6	
☑ 12C (3)	88QH42		*2

Notes: 47Q37, 47Q38, 47Q39 MTF-7,8,9
*1 ~~not received for LOC~~ mp 11/9

*2 introduced new container ID for additional filters received

Checked By: mp
Date: 11/9/99

TestAmerica

Mercury Sample Train Receipt Record

Client ID	Location ID/Run #
MT Power	Unit 3
Colstrip Power Plant	Stack
Colstrip, MT	Blank Train

Solutions:

Cont. ID/(#)	Volumes (mL)	TestAmerica ID(s)	Comments
☐ 2 ( )	___ + ___ + ___ = ___.		*1
☑ 3 (1)	495 + – + – = 495.	3MT15	
☑ 4 (1)	140 + – + – = 140.	4MT16	
☑ 5 (1)	490 + – + – = 490.	5MT-17	
☐ 7 ( )	___ + ___ + ___ = ___.		
☐ 8 ( )	___ + ___ + ___ = ___.		
☐ 9 ( )	___ + ___ + ___ = ___.		
☐ 10 ( )	___ + ___ + ___ = ___.		
☐ 11 ( )	___ + ___ + ___ = ___.		

Filters:

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

Notes: *1 container #2 not recovered per C.O.C.; ALSO container 1A, 1B

Checked By: [illegible]

Date: 11/9/99

TestAmerica

Mercury Sample Train Receipt Record

Client ID
MONTANA POWER CO.
COLSTRIP POWER PLANT
COLSTRIP, MT

Location ID/Run #
UNIT 3
STACK
RUN #1

Solutions:

Cont. ID/(#)	Volumes (mL)	TestAmerica ID(s)	Comments
☑ 2 (1)	155 + — + — = 155.	2MT-18	mL
☑ 3 (2)	484 + 256 + — = 740.	3MT 24 A+B	mL
☑ 4 (1)	165 + — + — = 165.	4MT 30	mL
☑ 5 (1)	505 + — + — = 505.	5MT 36	mL/*+RESIDUE
☐ 7 ( )	___ + ___ + ___ = ___.		
☐ 8 ( )	___ + ___ + ___ = ___.		
☐ 9 ( )	___ + ___ + ___ = ___.		
☐ 10 ( )	___ + ___ + ___ = ___.		
☐ 11 ( )	___ + ___ + ___ = ___.		

Filters:

Cont. ID/(#)	Filter ID(s)		
☑ 1A (1)	88QM37	MTF-10	
☐ 1B ( )			
☐ 12A ( )			
☐ 12B ( )			

Notes: _____

Checked By: MB
Date: 11/9/99

TestAmerica

Mercury Sample Train Receipt Record

Client ID
Montana
Colstrip Power
Colstrip, MT

Location ID/Run #
Unit 3
STACK
RUN #2

Solutions:

Cont. ID/(#)	Volumes (mL)	TestAmerica ID(s)	Comments
☑ 2 (1)	195 + — + — = 195.	2MT19	
☑ 3 (2)	465 + 360 + — = 825.	3MT25 AtB	
☑ 4 (1)	185 + — + — = 185.	4MT31	
☑ 5 (1)	505 + — + — = 505.	5MT37	
☐ 7 ( )	___ + ___ + ___ = ___.		
☐ 8 ( )	___ + ___ + ___ = ___.		
☐ 9 ( )	___ + ___ + ___ = ___.		
☐ 10 ( )	___ + ___ + ___ = ___.		
☐ 11 ( )	___ + ___ + ___ = ___.		

Filters:

Cont. ID/(#)	Filter ID(s)		
☑ 1A (1)	886H38	MTF-11	
☐ 1B ( )			
☐ 12A ( )			
☐ 12B ( )			

Notes: _____

Checked By: HBP
Date: 11/9/99

TestAmerica

Mercury Sample Train Receipt Record

Client ID
Montana
Colstrip Power
Colstrip, MT

Location ID/Run #
Unit 3
STACK
RUN #3

Solutions:

Cont. ID/(#)	Volumes (mL)	TestAmerica ID(s)	Comments
☑ 2 (1)	135 + — + — = 135.	2MT20	
☑ 3 (2)	495 + 265 + — = 760.	3MT26ATB	
☑ 4 (1)	165 + — + — = 165.	4MT32	
☑ 5 (1)	510 + — + — = 510.	5MT38	
☐ 7 ( )	___ + ___ + ___ = ___.		
☐ 8 ( )	___ + ___ + ___ = ___.		
☐ 9 ( )	___ + ___ + ___ = ___.		
☐ 10 ( )	___ + ___ + ___ = ___.		
☐ 11 ( )	___ + ___ + ___ = ___.		

Filters:

Cont. ID/(#)	Filter ID(s)		
☑ 1A (1)	88QH3T	MTF-12	
☐ 1B ( )			
☐ 12A ( )			
☐ 12B ( )			

Notes: _____

Checked By: DBC

Date: 11/9/99

TestAmerica

Mercury Sample Train Receipt Record

Client ID
MT Power
Colstrip Power Plant
Colstrip, MT

Location ID/Run #
Unit 3-6
Scrubber Inlet Duct
Run #3
Blank Train

Solutions:

Cont. ID/(#)	Volumes (mL)	TestAmerica ID(s)	Comments
☐ 2 ( )	___ + ___ + ___ = ___.		* 1
☑ 3 ( )	500 + ___ + ___ = 500.	3mt-12	
☑ 4 ( )	160 + ___ + ___ = 160.	4mt-13	
☑ 5 ( )	480 + ___ + ___ = 480.	5mt-14	
☐ 7 ( )	___ + ___ + ___ = ___.		
☐ 8 ( )	___ + ___ + ___ = ___.		
☐ 9 ( )	___ + ___ + ___ = ___.		
☐ 10 ( )	___ + ___ + ___ = ___.		
☐ 11 ( )	___ + ___ + ___ = ___.		

Filters:

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

Notes: * 1 - container # 2 not recovered per C.O.C.
also container 1A, 1B not recovered.

Checked By: JRC
Date: 4/9/98

TestAmerica

Mercury Sample Train Receipt Record

Client ID
MONTANA POWER
COLSTRIP POWER PLANT
COLSTRIP, MT

Location ID/Run #
UNIT 3-6 SCRUBBER INLET
RUN #1

Solutions:

Cont. ID/(#)	Volumes (mL)	TestAmerica ID(s)	Comments
☑ 2 (1)	107 + — + — = 107.	2MT-21	mL
☑ 3 (2)	501 + 219 + — = 720.	3MT27A+B	mL
☑ 4 (1)	150 + — + — = 150.	4MT33	mL
☑ 5 (1)	470 + — + — = 470.	5MT39	mL/* + RESIDUE
☐ 7 ( )	___ + ___ + ___ = ___.		
☐ 8 ( )	___ + ___ + ___ = ___.		
☐ 9 ( )	___ + ___ + ___ = ___.		
☐ 10 ( )	___ + ___ + ___ = ___.		
☐ 11 ( )	___ + ___ + ___ = ___.		

Filters:

Cont. ID/(#)	Filter ID(s)		
☑ 1A (1)	Thimble Q13	MTF-13	
☑ 1B (1)	Backup 47Q34	MTF-14	
☐ 12A ( )			
☐ 12B ( )			

Notes: _____

Checked By: DBP
Date: 11/2/99

TestAmerica

Mercury Sample Train Receipt Record

Client ID
Montana
Colstrip Power
Colstrip, MT

Location ID/Run #
Unit 3-4
Scrubber Inlet
Run #2

Solutions:

Cont. ID/(#)	Volumes (mL)	TestAmerica ID(s)	Comments
☑2 (1)	63 + — + — = 63.	2MT22	
☑3 (2)	485 + 215 + — = 700.	3MT23 ATB	
☑4 (1)	150 + — + — = 150.	4MT34	
☑5 (1)	495 + — + — = 495.	4MT40	
☐ 7 ( )	___ + ___ + ___ = ___.		
☐ 8 ( )	___ + ___ + ___ = ___.		
☐ 9 ( )	___ + ___ + ___ = ___.		
☐ 10 ( )	___ + ___ + ___ = ___.		
☐ 11 ( )	___ + ___ + ___ = ___.		

Filters:

Cont. ID/(#)	Filter ID(s)		
☑1A (2)	Q14,221	MTF15 ATB	
☑1B (1)	47Q35	MTF-16	
☐ 12A ( )			
☐ 12B ( )			

Notes: _____

Checked By: JBP

Date: 11/9/09

TestAmerica

Mercury Sample Train Receipt Record

Client ID
Montana Power
Colstrip Power Plant
Colstrip, MT

Location ID/Run #
Unit 3-6
Scrubber Inlet Duct
Run #3

Solutions:

Cont. ID/(#)	Volumes (mL)	TestAmerica ID(s)	Comments
☑ 2 (1)	65 + — + — = 65.	2MT23	
☑ 3 (4)	505 + 315 + — = 820.	3MT29 A+B	
☑ 4 (1)	200 + — + — = 200.	4MT35	
☑ 5 (1)	505 + — + — = 505.	4MT41	
☐ 7 ( )	___ + ___ + ___ = ___.		
☐ 8 ( )	___ + ___ + ___ = ___.		
☐ 9 ( )	___ + ___ + ___ = ___.		
☐ 10 ( )	___ + ___ + ___ = ___.		
☐ 11 ( )	___ + ___ + ___ = ___.		

Filters:

Cont. ID/(#)	Filter ID(s)		
☑ 1A (1)	Q15	MTF17	
☑ 1B (1)	47Q36	MTF-18	
☐ 12A ( )			
☐ 12B ( )			

Notes: _____

Checked By: [illegible]
Date: 11/9/09

TestAmerica

Sample Preparation Batch Sheet

COALS

NONAQUEOUS MERCURY BATCH SHEET

Analyst: JMP Date: 11/11/99 Water Bath: start mid end

Standard Reference: 6532-9 temp: _____

ICV Reference: 6532-10 date: _____

	Sample # / Client	Weight	MS	MSD
	BLANK			
1	LCS			
* 2	NIST 1630A	1.2942	38.63	MB
** 3	NIST 1630A	1.0265	48.71	
4	MT1	1.1525	43.38	
5	MT2	1.0163	49.20	
* 6	MT3	1.0116	49.43	ICV
* 7	TXNM1	1.0416	48.00	
8	TXNM2	1.0679	46.82	
9	TXNM3	1.0477	47.72	
				MS
				MSD
				RPD
				FLAG

HNO3 - 65-35-15
HCl 65-34-2
KMnO4 65-34-1
NH2OH - 65-30-11
SnCl2 - 65-36-15

SECONDARY DATA CHECK: analyst:
date:

Comments: ~~**~~ NIST 1630A USED IN RUN BOTH

TX · NM | MT FILTERS / ASH

NONAQUEOUS MERCURY BATCH SHEET

Analyst: [illegible] Date: 11/12/99 Water Bath: start mid end

Standard Reference: 65-32-9 11/13/99 temp: _____

ICV Reference: 65-32-10 date: _____

Carousel Position #

		Sample # / Client	Weight	MS	MSD
*	1	BLANK			
*	2	NIST 1633 B	0.5372	93.08	
	3	MTF-4 (88QH40)			MB
	4	MTF-7 (47Q37)			
	5	MTF-10 (88QH37)			
11/12/99	6	MTF-11 (88QH38)			
	7	MTF-12 (88QH39)			ICV
	8	MTF-13 (Q13)	0.5641	88.64	
	9	MTF-14 (47Q34)			
	10	MTF-15 (Q14,Q21)	0.5684	87.97	
	11	MTF-16 (47Q35)			MS
	12	MTF-17 (Q15)	0.5836	85.68	
1	13	MTF-18 (47Q36)			
2	14	ST-44 (47Q32)			
3	15	FBTX-2A (47Q48)			MSD
11/15/99 4	16	FBTX-1A+B (Q23,24)	0.5175	94.62	
5	17	FTX-2 (47Q42)			
6	18	FTX-3A+B (Q25,26)	0.5137	97.33	
** 7	19	FTX-4 (47Q45)			RPD
8	20	FTX-5A+B (Q27,28)	0.5279	94.71	
9	21	FTX-6 (47Q47)			
10	22	FTX-7 (47Q40)			
11		NIST 1633B	0.5266	94.95	FLAG

SECONDARY DATA CHECK: analyst:

12 BLANK date:

HNO3 65-35-15

HCl 65-34-2

HF-65-27-17

11/12 BORIC ACID - 65-36-5

$SnCl_2$ - 65-36-14

$SnCl_2$ - 65-36-17

11/13 BORIC ACID - 65-36-15

Comments: * Reversed positions of Blank + NIST for pressure valve placement with actual sample present.

** 47045 some sample lost out of container loose ash

*** MUST STILL DIGEST MTF 8, 9

FILTERS

NONAQUEOUS MERCURY BATCH SHEET

Analyst: BBP Date: 11/19/99 Water Bath: start mid end

Standard Reference: 65-32-9 temp: _____

ICV Reference: 65-32-10 date: _____

	Sample # / Client		Weight	MS	MSD
12	BLANK				
11	NIST 1633B		0.5000	~~50.00~~ 100	
1	FTX8	47Q43			MB
2	FTX9	47Q46			
3	WB 1A	47Q53			
4	WB-2	47Q51			
5	WB-3	47Q52			ICV
6	WB-4	47Q56		97.83	
7	GB-5	Q 39	0.5111	~~49.61~~	
8	GB-2	Q 33	0.5468	~~45.72~~ 91.44	
9	GB-3	Q 34	0.5976	83.67	MS
10	GB-6	Q 40	0.5543	90.20	
					MSD
					RPD
					FLAG

HF 65-27-17
HNO_3 65-39-12
HCl 65-37-11
$SnCl_2$ 65-39-13
Boric Acid 65-39-14
65-39-15

SECONDARY DATA CHECK: analyst:
date:

Comments: _____

Mercury in Flue Gas
Aqueous Preparation Batch Log

Analyst(s) DBP Preparation Date 11/13/97

Reagent Reference #'s

HCl	65-34-2	$SnCl_2$	65-36-17
$NH_2OH*HCl$	65-32-11	Calibration Standards	65-32-9
$KMnO_4$	65-34-17	ICV Standard	65-32-10
HNO_3	65-35-15		

Lab ID	Cont. #	Sample Description	Init Cont Vol (mL)	Init Prep Vol (mL)	Final Vol (mL)
MT3	9	REAGENT BLANK	50	2.5	50
MT13	4	INLET RUN#3 BLANK TRAIN	160	2.5	50
MT33	4	INLET RUN#1	150	2.5	50
MT34	4	INLET RUN# 2	150	2.5	50
MT35	4	INLET RUN#3	200	2.5	50
MT16	4	STACK BLANK TRAIN	140	2.5	50
MT30	4	STACK RUN#1	165	2.5	50
MT31	4	STACK RUN#2	185	2.5	50
MT32	4	STACK RUN #3	165	2.5	50
RBTX3	9	REAGENT BLANK	50	2.5	50
TX1	4	BLANK TRAIN INLET RUN#3	135	2.5	50
TX2	4	INLET RUN#1	145	2.5	50
TX3	4	INLET RUN#2	175	2.5	50
TX4	4	INLET RUN#3	170	2.5	50
TX5	4	STACK BLANK TRAIN	140	2.5	50
TX6	4	STACK RUN#1	140	2.5	50
TX7	4	STACK RUN#2	150	2.5	50
TX8	4	STACK RUN#3	160	2.5	50
[illegible]	BLK				
MT1	7	REAGENT BLANK		—	—

Lab ID	Cont. #	Sample Description	Init Cont Vol (mL)	Init Prep Vol (mL)	Final Vol (mL)
MT5	11	REAGENT BLANK			
RBTX1	7	REAGENT BLANK	49		
RBTX5	11	REAGENT BLANK	93		

NOTES Containers 7+11 not digested, analyzed straight

Mercury in Flue Gas
Aqueous Preparation Batch Log

Analyst(s) [illegible] Preparation Date 11/13/99

Reagent Reference #'s

HCl	65-34-2	$SnCl_2$	65-36-17
$NH_2OH*HCl$	65-32-11	Calibration Standards	65-32-9
$KMnO_4$	65-34-17	ICV Standard	65-32-10
HNO_3	65-35-15		

Lab ID	Cont. #	Sample Description	Init Cont Vol (mL)	Init Prep Vol (mL)	Final Vol (mL)
MT4	10	Reagent Blank	47	5.0	50
MT14	5	Blank Train Inlet Run #3	480	5.0	50
MT17	5	Blank CT train stack	490	5.0	50
MT36	5	STACK RUN #1	505	5.0	50
MT37	5	STACK RUN #2	505	5.0	50
MT38	5	STACK RUN #3	510	5.0	50
MT39	5	INLET RUN #1	470	5.0	50
MT40	5	INLET RUN #2	495	5.0	50
MT41	5	INLET RUN #3	505	5.0	50
~~MT~~					
RBTX4	10	REAGENT BLANK	49	5.0	50
TX1	5	BLANK TRAIN RUN #3 INLET	455	5.0	50
TX2	5	INLET RUN #1	510	5.0	50
TX3	5	INLET RUN #2	500	5.0	50
TX4	5	INLET RUN #3	505	5.0	50
TX5	5	STACK BLANK TRAIN	485	5.0	50
TX6	5	STACK RUN #1	510	5.0	50
TX7	5	STACK RUN #2	505	5.0	50
TX8	5	STACK RUN #3	510	5.0	50

Lab ID	Cont. #	Sample Description	Init Cont Vol (mL)	Init Prep Vol (mL)	Final Vol (mL)
~~MT36~~	~~5~~				
~~MT37~~	12/12				
~~MT~~					

NOTES

Mercury in Flue Gas
Aqueous Preparation Batch Log

Analyst(s) BRP Preparation Date 11/12/99

Reagent Reference #'s

HCl	65-34-2	$SnCl_2$	14 65-36-15 BRP 12/3/99
$NH_2OH*HCl$	65-32-11	Calibration Standards	65-32-9
$KMnO_4$	65-34-17	ICV Standard	65-32-10
HNO_3	65-35-15		

Lab ID	Cont. #	Sample Description	Init Cont Vol (mL)	Init Prep Vol (mL)	Final Vol (mL)
MT18	2	STACK RUN #1	155	5.0	50
MT19	2	STACK RUN #2	195	5.0	50
MT20	2	STACK RUN #3	135	5.0	50
MT21	2	INLET #1	107	5.0	50
MT22	2	INLET #2	63	5.0	50
MT23	2	INLET #3	65	5.0	50
TX1	2	INLET #1	135	5.0	50
TX2	2	TRP INLET #2	160	5.0	50
TX3	2	SPK INLET #3	73	5.0	50
TX4	2	STACK RUN #1	44	5.0	50
TX5	2	STACK RUN #2	33	5.0	50
TX6	2	STACK RUN #3	34	5.0	50
MT12	3	BLANK TRAIN SCRUB. WHET #3	500	5.0	50
MT15	3	STACK BLANK TRAIN	495	5.0	50
MT24	3	STACK RUN #1 A+B	740	5.0	50
MT25	3	STACK RUN #2 A+B	820	5.0	50
MT26	3	STACK RUN #3 A+B	760	5.0	50
MT27	3	INLET RUN #1 A+B TRP	720	5.0	50
MT28	3	INLET #2 A+B SPK	700	5.0	50
MT29	3	INLET #3 A+B	820	5.0	50

Lab ID	Cont. #	Sample Description	Init Cont Vol (mL)	Init Prep Vol (mL)	Final Vol (mL)
TX1	3	BLANK TRAIN INLET RUN #3	465	5.0	50
TX2	3	INLET RUN #1 A+B	765	5.0	50
TX3	3	INLET RUN #2 A+B	760	5.0	50
TX4	3	INLET RUN #3 A+B	785	5.0	50
TX5	3	BLANK TRAIN STACK	420	5.0	50
TX6	3	STACK RUN #1 A+B	810	5.0	50
TX7	3	STACK RUN #2 A+B	780	5.0	50
TX8	3	STACK RUN #3 A+B	730	5.0	50
MT2	8	REAGENT BLANK	51	5.0	50
RBTX2	8	REAGENT BLANK	54	5.0	50

NOTES

11/15/99 Analytical Run

Protocol: SYSTEST

Rev: 3.001 Time: 14:21:07 15 Nov 1999

Folder: NOV99B Seq: 102 Print: On

User: Batch: Id: Std6Rep1 Cup: 1 18 Gas: 0.23 LPM

State: Idle Xmit: Off Autosampler: On

AUTOSAMPLER: Rack entry Rack 111599a

cup	Id	Extended id	Weight	Volume	Macro check	Help
1	icb		1.0000	1.0000		
2	filblk		1.0000	1.0000		
3	filblkdup		1.0000	1.0000		
4	1630b		1.0000	1.0000		
5	1630bdup		1.0000	1.0000		
6	47Q36		1.0000	1.0000		
7	47Q36DUP		1.0000	1.0000		
8	47Q32		1.0000	1.0000		
9	47Q32DUP		1.0000	1.0000		
10	47Q48		1.0000	1.0000		
11	47Q48DUP		1.0000	1.0000		
12	Q23,Q24	~~1:5~~ 1:10	1.0000	1.0000		
13	Q23Q24DUP	~~1:5~~ 1:10	1.0000	1.0000		
14	47Q42		1.0000	1.0000		
15	47Q42DUP		1.0000	1.0000		

PgDn

Cup 1 ID: icb Cell entry, Ins to switch

Protocol: SYSTEST

Rev: 3.001 Time: 14:21:14 15 Nov 1999

Folder: NOV99B Seq: 102 Print: On

User: Batch: Ic: Sto6Repl Cup: 1 16 Gas: 0.20 LPM

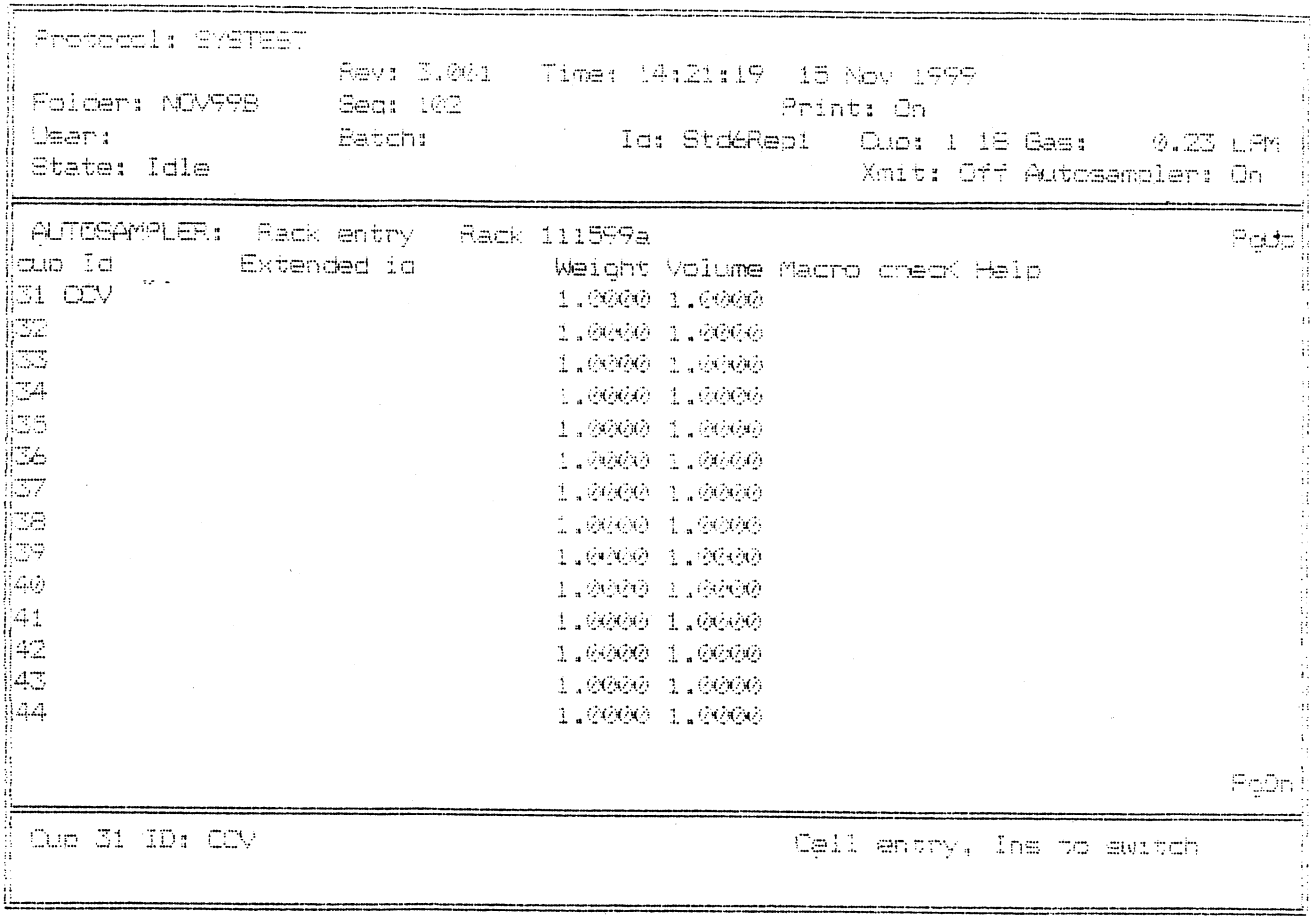
State: Idle Xmit: Off Autosampler: On

AUTOSAMPLER: Rack entry Rack 111995 PgUp

Cup	Id	Extended id	Weight	Volume	Macro check	Help
16	025,026	1:10	1.0000	1.0000		
17	025,026DUP	1:10	1.0000	1.0000		
18	47045		1.0000	1.0000		
19	47045DUP		1.0000	1.0000		
20	47045TRP	1:10	1.0000	1.0000		
21	027,029		1.0000	1.0000		
22	027,029DUP	1:10	1.0000	1.0000		
23	027,029SPK	1:10	1.0000	1.0000		
24	OCS		1.0000	1.0000		
25	ODV		1.0000	1.0000		
26	47047		1.0000	1.0000		
27	47047DUP		1.0000	1.0000		
28	47040		1.0000	1.0000		
29	47040DUP		1.0000	1.0000		
30	OCB		1.0000	1.0000		

PgDn

Cup 16 ID: 025,026 Cell entry, Ins to switch


Protocol: SYSTEST
Rev: 3.001 Time: 14:21:19 15 Nov 1999
Folder: NOV99B Seq: 102 Print: On
User: Batch: Id: Std&Repl Cup: 1 18 Gas: 0.23 LPM
State: Idle Xmit: Off Autosampler: On
AUTOSAMPLER: Rack entry Rack 111599a PgUp
Cup Id Extended id Weight Volume Macro check Help
31 CCV 1.0000 1.0000
32 1.0000 1.0000
33 1.0000 1.0000
34 1.0000 1.0000
35 1.0000 1.0000
36 1.0000 1.0000
37 1.0000 1.0000
38 1.0000 1.0000
39 1.0000 1.0000
40 1.0000 1.0000
41 1.0000 1.0000
42 1.0000 1.0000
43 1.0000 1.0000
44 1.0000 1.0000
PgDn
Cup 31 ID: CCV
Cell entry, Ins to switch

*** Standard: 1 Rep: 1 Seq: 96 13:53:10 15 Nov 1999 HG

Hg .000 ug/L -367
Ave. Int. = -367 S. D. = 0

*** Standard: 2 Rep: 1 Seq: 97 13:55:31 15 Nov 1999 HG

Hg .200 ug/L 9703
Ave. Int. = 9703 S. D. = 0

*** Standard: 3 Rep: 1 Seq: 98 13:57:53 15 Nov 1999 HG

Hg .500 ug/L 21512
Ave. Int. = 21512 S. D. = 0

*** Standard: 4 Rep: 1 Seq: 99 14:00:15 15 Nov 1999 HG

Hg 1.00 ug/L 44241
Ave. Int. = 44241 S. D. = 0

*** Standard: 5 Rep: 1 Seq: 100 14:02:39 15 Nov 1999 HG

Hg 2.00 ug/L 87339
Ave. Int. = 87339 S. D. = 0

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

*** Standard: 6 Rep: 1 Seq: 101 14:10:28 15 Nov 1999 HG

Hg 3.00 ug/L 133413
Ave. Int. = 133413 S. D. = 0

Protocol: SYSTEST

Rev: 3.001 Time: 14:12:16 15 Nov 1999

Folder: NOV99B Seq: 102 Print: On

User: Batch: Id: Std6Rep1 Cup: 1 18 Gas: 0.23 LPM

State: Idle Xmit: Off Autosampler: On

CALIBRATION: Line Calibration

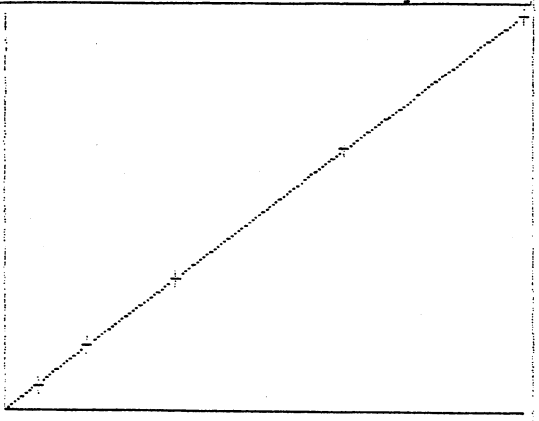
Line: Hg

	Conc.	Calc.	Dev.	Accepted LiNear
S1	.000	.002	.002	Quadratic
S2	.200	.206	.006	WtdLinear
S3	.500	.495	-.005	C
S4	1.00	1.01	.006	Accept o
S5	2.00	1.98	-.023	n
S6	3.00	3.01	.014	StdAdd c

A .0000000 r .999937

B 2.25104e-5 C 1.05038e-2

	Mean	%RSD	
S1	-367	0	-367
S2	8703	0	8703
S3	21512	0	21512
S4	44241	0	44241
S5	87339	0	87339
S6	133413	0	133413



Relative Absorbance

33?

New calibration coefficients stored

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

*** Check Standard: 2 Ck2 Seq: 102 14:37:47 15 Nov 1999 HG

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

*** Sample ID: icb Seq: 103 14:40:15 15 Nov 1999 HG

Hg	.004	ug/L	.000	.004	< 0.2 ng/L

*** Sample ID: filblk Seq: 104 14:42:32 15 Nov 1999 HG

Hg	.061	ug/L	.000	.061	< 0.2 ng/L

*** Sample ID: filblkdup Seq: 105 14:44:49 15 Nov 1999 HG RPD - N/A

Hg	.061	ug/L	.000	.061	< 0.2 ng/L

*** Sample ID: ~~1633B~~ 1633B Seq: 106 14:47:06 15 Nov 1999 HG

Hg	1.60	ug/L	.000	1.60	TV 0.141 ug/g 0.152 ng/g 108%

*** Sample ID: ~~1633BDUP~~ 1633B DUP Seq: 107 14:49:[illegible] 15 Nov 1999 HG RPD - N/A

Hg	1.60	ug/L	.000	1.60	TV 0.141 ug/g 0.152 ng/g 108%

*** Sample ID: 47036 MTF18 Seq: 108 14:51:42 15 Nov 1999 HG

Hg	.601	ug/L	.000	.601	~~JAD 12/16 Fe 0144 ug/g~~ 0.03 ng

*** Sample ID: 47036DUP MTF18DUP Seq: 109 14:54:00 15 Nov 1999 HG RPD - N/A

Hg	.601	ug/L	.000	.601	0.03 ng

~~*** Sample ID: 47032 ST44 Seq: 110 14:56:17 15 Nov 1999 HG~~

Hg	.139	ug/L	.000	.139	< 0.01 ng

*** Sample ID: 47032DUP ST44DUP Seq: 111 14:58:34 15 Nov 1999 HG RPD: ~~0.72%~~ N/A

Hg	.140	ug/L	.000	.140	< 0.01 ng

*** Sample ID: 47048 FBTX-2A Seq: 112 15:00:52 15 Nov 1999 HG

Hg	.097	ug/L	.000	.097	< 0.01 ng

*** Sample ID: 47048DUP FBTX2ADUP Seq: 113 15:03:11 15 Nov 1999 HG RPD - N/A

Hg	.094	ug/L	.000	.094	< 0.01 ng

Line	Conc.	Units	SD/RSD	1	2	3	4	5	
*** Sample ID: 023,024 FIX-1				Seq: 114		15:05:28 15 Nov 1999 HG			
Hg	4.45	ug/L	.000	4.45					NO DATA, >RL
*** Sample ID: 023024DUP				Seq: 115		15:07:58 15 Nov 1999 HG			
Hg	4.49	ug/L	.000	4.49					NO DATA, >RL
*** Sample ID: 47042 FIX-2				Seq: 116		15:10:22 15 Nov 1999 HG			
Hg	.443	ug/L	.000	.443					0.022 ug
*** Sample ID: 47042DUP				Seq: 117		15:12:40 15 Nov 1999 HG			RPD = 2.45%
Hg	.454	ug/L	.000	.454					0.023 ug
*** Sample ID: 025,026 FIX-3				Seq: 118		15:14:57 15 Nov 1999 HG			
Hg	3.52	ug/L	.000	3.52					NODATA >RL
*** Sample ID: 025,026DUP				Seq: 119		15:17:24 15 Nov 1999 HG			
Hg	3.56	ug/L	.000	3.56					NO DATA >LR
*** Sample ID: 47045 FIX-4				Seq: 120		15:19:46 15 Nov 1999 HG			
Hg	1.30	ug/L	.000	1.30					0.065 ug
*** Sample ID: 47045DUP				Seq: 121		15:22:08 15 Nov 1999 HG			RPD - N/A
Hg	1.30	ug/L	.000	1.30					0.065 ug
*** Sample ID: 47045TRP				Seq: 122		15:24:24 15 Nov 1999 HG			RPD = 0.77%
Hg	1.31	ug/L	.000	1.31					0.066 ug
*** Sample ID: 027,028 FIX-5				Seq: 123		15:26:43 15 Nov 1999 HG			
Hg	6.66	ug/L	.000	6.66					NO DATA >LR
*** Sample ID: 027,028DUP				Seq: 124		15:29:14 15 Nov 1999 HG			
Hg	6.62	ug/L	.000	6.62					NO DATA >LR
*** Sample ID: 027,028SPK				Seq: 125		15:31:43 15 Nov 1999 HG			
Hg	7.54	ug/L	.000	7.54					NO DATA, >LR

Line	Conc.	Units	SD/RSD	1	2	3	4	5	
*** Sample ID: CCB					Seq: 126	15:34:16 15 Nov 1999 HB			
Hg	.001	ug/L	.000	.001					< 0.2 ng IL
*** Sample ID: CCV					Seq: 127	15:36:34 15 Nov 1999 HB			
Hg	1.94	ug/L	.000	1.94					97%
~~*** Sample ID: 47047~~ FTX-6					Seq: 128	~~15:38:57 15 Nov 1999 HB~~			
Hg	1.05	ug/L	.000	1.05					0.053 ng
*** Sample ID: 47047DUP FTX6DUP					Seq: 129	15:41:17 15 Nov 1999 HB			RPD = 1.92%
Hg	1.03	ug/L	.000	1.03					0.052 ng
*** Sample ID: 47040 FTX7					Seq: 130	15:43:36 15 Nov 1999 HB			
Hg	1.05	ug/L	.000	1.05					0.053 ng
*** Sample ID: 47040DUP FTX7DUP					Seq: 131	15:45:56 15 Nov 1999 HB			RPD = 0.96%
Hg	1.04	ug/L	.000	1.04					0.052 ng
*** Sample ID: 023,024 1:10 FTX1					Seq: 132	15:49:37 15 Nov 1999 HB			
Hg	.463	ug/L	.000	.463					28.4 ng
*** Sample ID: 023024DUP 1:10 FTX1					Seq: 133	15:51:53 15 Nov 1999 HB			RPD = 0.22%
Hg	.462	ug/L	.000	.462					28.3 ng
*** Sample ID: 025,026 FTX3 1:10					Seq: 134	15:59:02 15 Nov 1999 HB			
Hg	.370	ug/L	.000	.370					14.0 ~~13.95 ng~~ JAO 12/4
*** Sample ID: 025,026DUP FTX3 1:10					Seq: 135	16:01:19 15 Nov 1999 HB			RPD = 1.36%
Hg	.365	ug/L	.000	.365					13.76 ng
*** Sample ID: 027,028 FTX5 1:10					Seq: 136	16:03:36 15 Nov 1999 HB			
Hg	.709	ug/L	.000	.709					38.5 ~~38.52 ng~~ JAO 12/4
*** Sample ID: 027,028DUP FTX5 1:10					Seq: 137	16:05:54 15 Nov 1999 HB			RPD = 1.99%
Hg	.695	ug/L	.000	~~.695~~					~~37.76 ng~~

Line	Conc.	Units	SD/RSD	1	2	3	4	5
*** ~~Sample ID: 027,W28SPK~~ FTXS 1:10				Seq: 138		16:08:12 15 Nov 1999 HG		
~~Hg .810 ug/L .000 .810~~ 101%								
*** Sample ID: CCB				Seq: 139		16:10:31 15 Nov 1999 HG		
Hg	.007	ug/L	.000	.007		<0.2 ug/L		
*** Sample ID: CCV				Seq: 140		16:12:49 15 Nov 1999 HG		
Hg	1.95	ug/L	.000	1.95		98%		

11/12/99 Analytical Run

Protocol: SYSTEST

Rev: 3.001 Time: 16:16:09 12 Nov 1999

Folder: NOVA99 Seq: 806 Print: On

User: Batch: Id: Std6Rep1 Cup: 1 06 Gas: 0.23 LPM

State: Idle Xmit: Off Autosampler: On

AUTOSAMPLER: Rack entry Rack 111299a

cup	Id	Extended id	Weight	Volume	Macro check	Help
1	icb metco		1.0000	1.0000		
2	mb		1.0000	1.0000		
3	mb dup		1.0000	1.0000		
4	2 mt 18		1.0000	1.0000		
5	2 mt 18dup		1.0000	1.0000		
6	2 mt 19		1.0000	1.0000		
7	2 mt 19dup		1.0000	1.0000		
8	2 mt 20		1.0000	1.0000		
9	2 mt 20dup		1.0000	1.0000		
10	2 mt 21		1.0000	1.0000		
11	2 mt 21dup		1.0000	1.0000		
12	2 mt 22		1.0000	1.0000		
13	2 mt 22dup		1.0000	1.0000		
14	2 mt 23		1.0000	1.0000		
15	2 mt 23dup		1.0000	1.0000		

PgDn

Cup 1 ID: icb metco Cell entry, Ins to switch

Protocol: SYSTEST

Rev: 3.001 Time: 16:16:14 12 Nov 1999

Folder: NOVA99 Seq: 806 Print: On

User: Batch: Id: StockPeol Cup: 1 06 Gas: 0.23 LPM

State: Idle Xmit: Off Autosampler: On

AUTOSAMPLER: Rack entry Rack 111299a PgUp

Cup Id	Extended id	Weight	Volume	Macro check	Help
16 2 tx 1		1.0000	1.0000		
17 2 tx 1dup		1.0000	1.0000		
18 2 tx 2		1.0000	1.0000		
19 2 tx 2dup		1.0000	1.0000		
20 2 tx 2trp		1.0000	1.0000		
21 2 tx 3		1.0000	1.0000		
22 2 tx 3dup		1.0000	1.0000		
23 2 tx 3spk		1.0000	1.0000		
24 ccb		1.0000	1.0000		
25 ccv		1.0000	1.0000		
26 2 tx 4		1.0000	1.0000		
27 2 tx 4dup		1.0000	1.0000		
28 2 tx 5		1.0000	1.0000		
29 2 tx 5dup		1.0000	1.0000		
30 2 tx 6		1.0000	1.0000		

PgDn

Cup 16 ID: 2 tx 1 Cell entry, Ins to switch

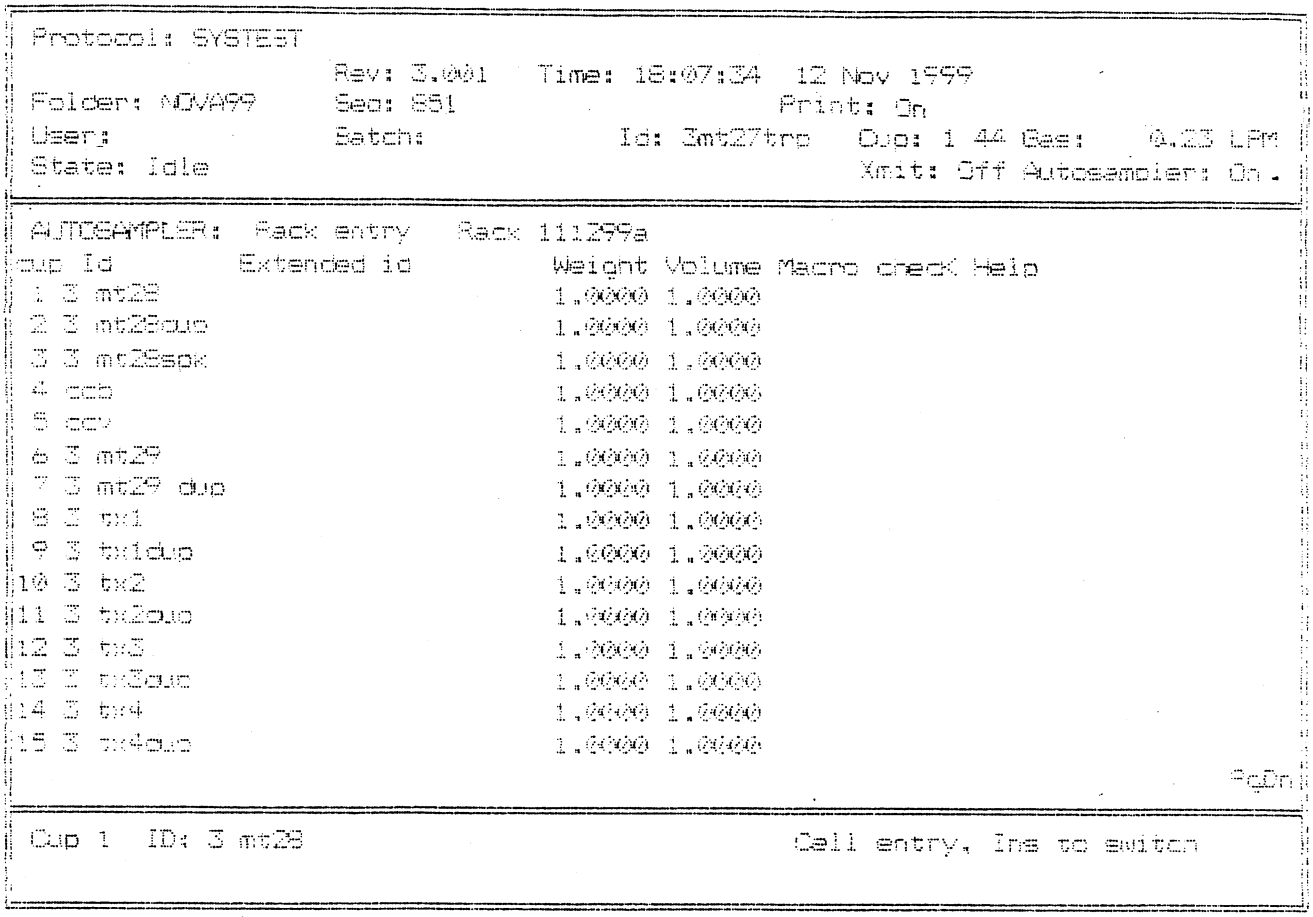
```
Protocol: SYSTEST
                    Rev: 3.001   Time: 16:16:16  12 Nov 1999
Folder: NOVA99      Seq: 806                    Print: On
User:               Batch:            Id: Std6Rep1   Cup: 1 06 Gas:    0.23 LPM
State: Idle                                          Xmit: Off Autosampler: On
```

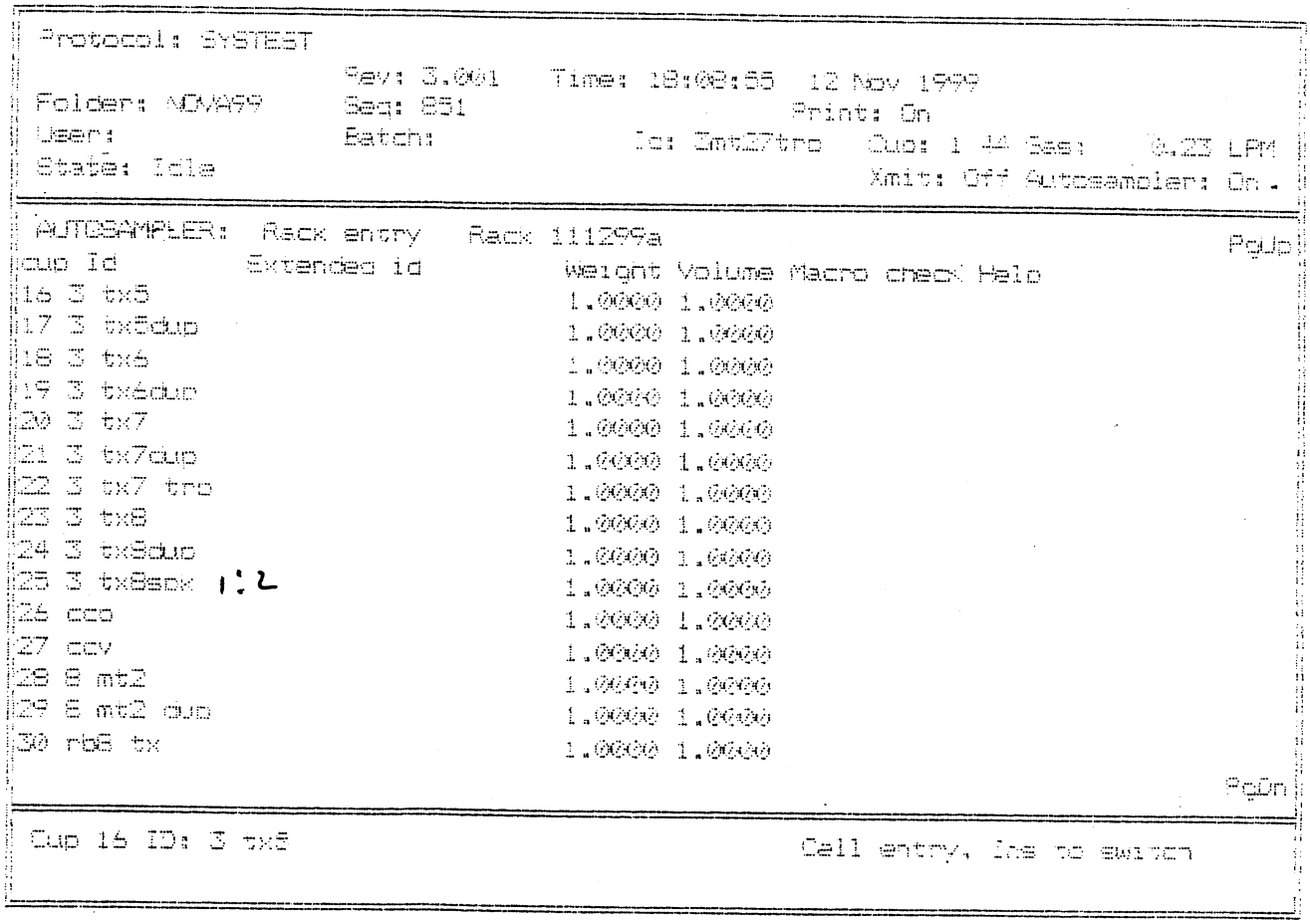
AUTOSAMPLER: Rack entry Rack 111299a PgUp

cup Id	Extended id	Weight	Volume	Macro check	Help
31 2 tx 6cup		1.0000	1.0000		
32 3 mt 12		1.0000	1.0000		
33 3 mt12cup		1.0000	1.0000		
34 3 mt15		1.0000	1.0000		
35 3mt15cup		1.0000	1.0000		
36 3mt24		1.0000	1.0000		
37 3mt24cup		1.0000	1.0000		
38 3mt25		1.0000	1.0000		
39 3mt25cup		1.0000	1.0000		
40 3mt26		1.0000	1.0000		
41 3mt26cup		1.0000	1.0000		
42 3mt27		1.0000	1.0000		
43 3mt27cup		1.0000	1.0000		
44 3mt27trp		1.0000	1.0000		

PgDn

Cup 31 ID: 2 tx 6cup Cell entry, Ins to switch


Protocol: SYSTEST
Rev: 3.001 Time: 18:07:34 12 Nov 1999
Folder: NOVA99 Seq: 851 Print: On
User: Batch: Id: 3mt27trp Cup: 1 44 Gas: 0.23 LPM
State: Idle Xmit: Off Autosampler: On
AUTOSAMPLER: Rack entry Rack 111Z99a
Cup Id Extended id Weight Volume Macro Check Help
1 3 mt28 1.0000 1.0000
2 3 mt28cup 1.0000 1.0000
3 3 mt28spk 1.0000 1.0000
4 ccb 1.0000 1.0000
5 ccv 1.0000 1.0000
6 3 mt29 1.0000 1.0000
7 3 mt29 dup 1.0000 1.0000
8 3 tx1 1.0000 1.0000
9 3 tx1dup 1.0000 1.0000
10 3 tx2 1.0000 1.0000
11 3 tx2cup 1.0000 1.0000
12 3 tx3 1.0000 1.0000
13 3 tx3cup 1.0000 1.0000
14 3 tx4 1.0000 1.0000
15 3 tx4cup 1.0000 1.0000
PgDn
Cup 1 ID: 3 mt28
Cell entry, Ins to switch

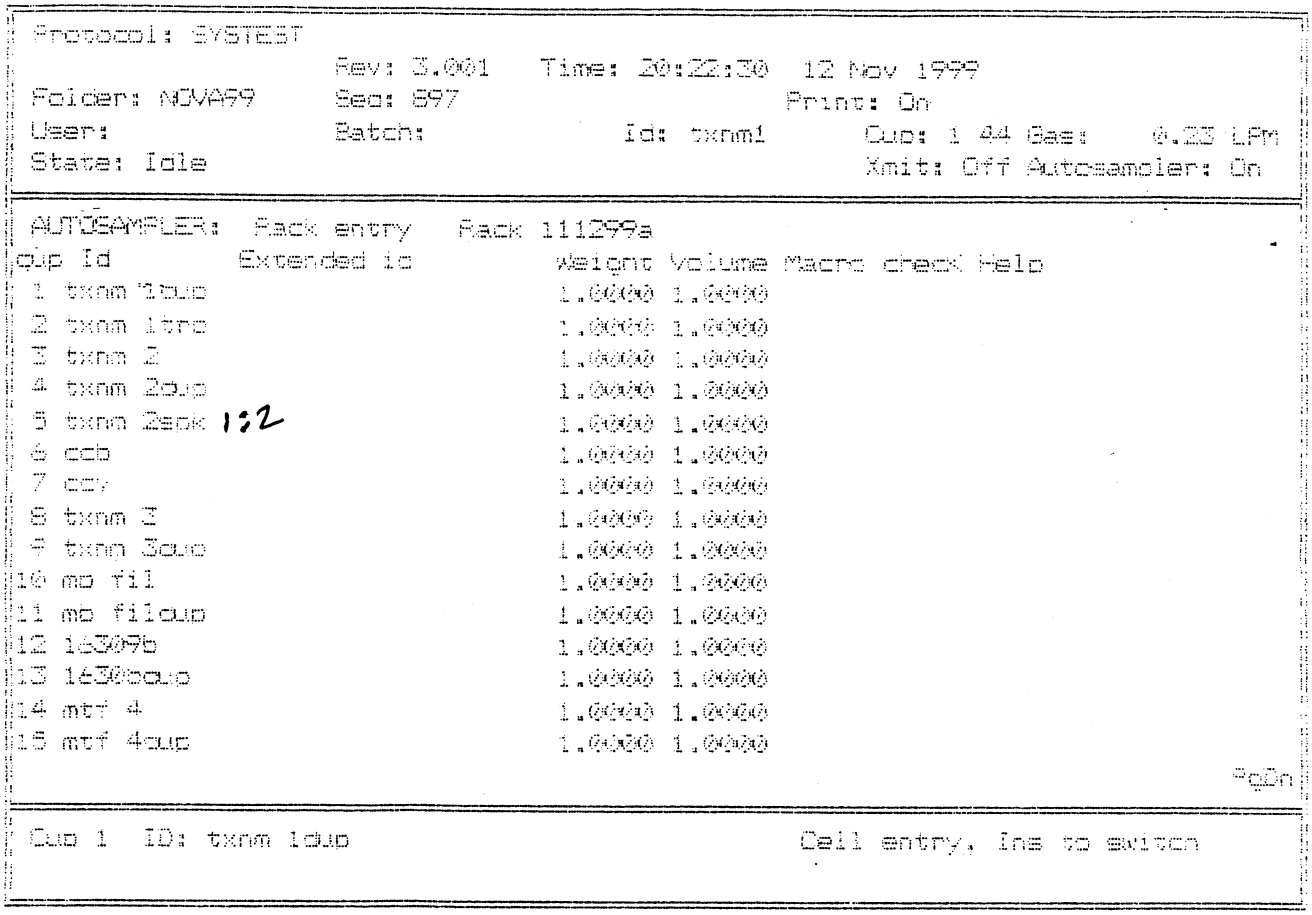

Protocol: SYSTEST
Rev: 3.001 Time: 18:02:55 12 Nov 1999
Folder: NOVA99 Seq: 851 Print: On
User: Batch: Ic: Cmt27tro Cup: 1 44 Sec: 0.23 LPM
State: Idle Xmit: Off Autosampler: On
AUTOSAMPLER: Rack entry Rack 111299a PgUp
Cup Id Extended id Weight Volume Macro check Help
16 3 tx5 1.00000 1.00000
17 3 tx5dup 1.00000 1.00000
18 3 tx6 1.00000 1.00000
19 3 tx6dup 1.00000 1.00000
20 3 tx7 1.00000 1.00000
21 3 tx7dup 1.00000 1.00000
22 3 tx7 tro 1.00000 1.00000
23 3 tx8 1.00000 1.00000
24 3 tx8dup 1.00000 1.00000
25 3 tx8sox 1.00000 1.00000
26 cco 1.00000 1.00000
27 ccv 1.00000 1.00000
28 8 mt2 1.00000 1.00000
29 8 mt2 dup 1.00000 1.00000
30 rb8 tx 1.00000 1.00000
PgDn
Cup 16 ID: 3 tx5
Cell entry, Ins to switch

```
Protocol: SYSTEST
                    Rev: 3.001   Time: 18:09:02  12 Nov 1999
Folder: NOVA99      Seq: 851                    Print: On
User:               Batch:            Id: 3mt27tro   Cup: 1 44 Gas:    0.23 LPM
State: Idle                                          Xmit: Off Autosampler: On.
```

```
AUTOSAMPLER:  Rack entry   Rack 111299a                                    PgUp
cup Id          Extended id          Weight Volume Macro check Help
31 rb8 txcup                         1.0000 1.0000
32 mb coal                           1.0000 1.0000
33 mb coaldup                        1.0000 1.0000
34 lcs coal                          1.0000 1.0000
35 lcs coaldu                        1.0000 1.0000
36 1630a                             1.0000 1.0000
37 1630a dup                         1.0000 1.0000
38 mt1                               1.0000 1.0000
39 mt1 dup                           1.0000 1.0000
40 mt2                               1.0000 1.0000
41 mt2 dup                           1.0000 1.0000
42 mt3                               1.0000 1.0000
43 mt3 dup                           1.0000 1.0000
44 txnm1                             1.0000 1.0000

                                                                           PgDn
```

```
Cup 31 ID: rb8 txcup                          Cell entry, Ins to switch
```


Protocol: SYSTEST
Rev: 3.001 Time: 20:22:30 12 Nov 1999
Folder: NOVA99 Seq: 897 Print: On
User: Batch: Id: txnm1 Cup: 1 44 Gas: 0.23 LPM
State: Idle Xmit: Off Autosampler: On
AUTOSAMPLER: Rack entry Rack 111299a
Cup Id Extended id Weight Volume Macro check Help
1 txnm 1cup 1.00000 1.00000
2 txnm 1tra 1.00000 1.00000
3 txnm 2 1.00000 1.00000
4 txnm 2cup 1.00000 1.00000
5 txnm 2sok 1:2 1.00000 1.00000
6 ccb 1.00000 1.00000
7 ccv 1.00000 1.00000
8 txnm 3 1.00000 1.00000
9 txnm 3cup 1.00000 1.00000
10 mb fil 1.00000 1.00000
11 mb filcup 1.00000 1.00000
12 1630mb 1.00000 1.00000
13 1630cup 1.00000 1.00000
14 mtf 4 1.00000 1.00000
15 mtf 4cup 1.00000 1.00000
PgDn
Cup 1 ID: txnm 1cup Cell entry, Ins to switch

Protocol: SYSTEST

Rev: 3.001 Time: 20:22:35 12 Nov 1999

Folder: NOVA99 Seq: 897 Print: On

User: Batch: Id: txnml Cup: 1 44 Gas: 0.23 LPM

State: Idle Xmit: Off Autosampler: On

AUTOSAMPLER: Rack entry Rack 111299a PgUp

cup Id	Extended id	Weight	Volume	Macro check	Help
16 mtf 7		1.0000	1.0000		
17 mtf 7dup		1.0000	1.0000		
18 mtf 10		1.0000	1.0000		
19 mtf 10dup		1.0000	1.0000		
20 mtf 11		1.0000	1.0000		
21 mtf 11dup		1.0000	1.0000		
22 mtf 12		1.0000	1.0000		
23 mtf 12dup		1.0000	1.0000		
24 mtf 13		1.0000	1.0000		
25 mtf 13dup		1.0000	1.0000		
26 mtf 13trp		1.0000	1.0000		
27 mtf 14		1.0000	1.0000		
28 mtf 14dup		1.0000	1.0000		
29 mtf 14spk		1.0000	1.0000		
30 ccb		1.0000	1.0000		

PgDn

Cup 16 ID: mtf 7 Cell entry, Ins to switch

Protocol: SYSTEST

Rev: 3.001 Time: 20:22:38 12 Nov 1999

Folder: NOVA99 Seq: 897 Print: On

User: Batch: Id: txnm1 Cup: 1 44 Gas: 0.23 LPM

State: Idle Xmit: Off Autosampler: On

AUTOSAMPLER: Rack entry Rack 111299a PgUp

cup Id	Extended id	Weight	Volume	Macro check	Help
31 ccv		1.0000	1.0000		
32 mtf 15		1.0000	1.0000		
33 mtf 15dup		1.0000	1.0000		
34 mtf 16		1.0000	1.0000		
35 mtf 16dup		1.0000	1.0000		
36 mtf 17		1.0000	1.0000		
37 mtf 17dup		1.0000	1.0000		
38 ccp	< 3+x8 SPK #1 NODATA wrong sample	1.0000	1.0000		
39 ccv	3+x8 SPK 1/2 #2 USE	1.0000	1.0000		
40		1.0000	1.0000		
41		1.0000	1.0000		
42		1.0000	1.0000		
43		1.0000	1.0000		
44		1.0000	1.0000		

PgDn

Cup 31 ID: ccv Cell entry, Ins to switch

*** Standard: 1 Rep: 1 Sec: 800 15:47:36 12 Nov 1999 HG

Hg .000 ug/L -169
Ave. Int. = -169 S. D. = 0

*** Standard: 2 Rep: 1 Sec: 801 15:49:58 12 Nov 1999 HG

Hg .200 ug/L 9251
Ave. Int. = 9251 S. D. = 0

*** Standard: 3 Rep: 1 Sec: 802 15:52:20 12 Nov 1999 HG

Hg .500 ug/L 22985
Ave. Int. = 22985 S. D. = 0

*** Standard: 4 Rep: 1 Sec: 803 15:54:42 12 Nov 1999 HG

Hg 1.00 ug/L 46504
Ave. Int. = 46504 S. D. = 0

*** Standard: 5 Rep: 1 Sec: 804 15:57:06 12 Nov 1999 HG

Hg 2.00 ug/L 92331
Ave. Int. = 92331 S. D. = 0

*** Standard: 6 Rep: 1 Sec: 805 15:59:34 12 Nov 1999 HG

Hg 3.00 ug/L 135357
Ave. Int. = 135357 S. D. = 0

Protocol: SYSTEST

Rev: 3.001 Time: 16:00:18 12 Nov 1999

Folder: NOVA99 Seq: 806 Print: On

User: Batch: Id: Std6Rep1 Cup: 1 06 Gas: 0.23 LPM

State: Idle Xmit: Off Autosampler: On

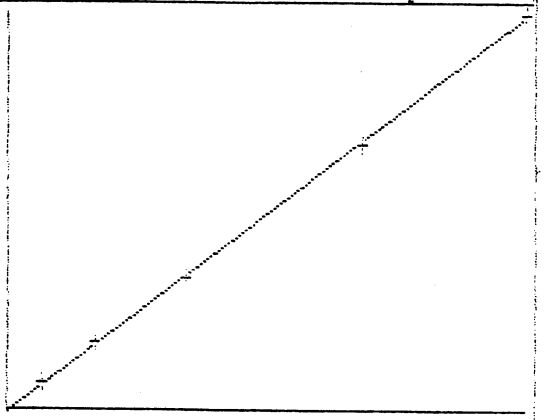
CALIBRATION: Line Calibration

Line: Hg

	Conc.	Calc.	Dev.	Accepted LiNear
S1	.000	-.013	-.013	Quadratic
S2	.200	.195	-.005	WtdLinear
S3	.500	.498	-.002	
S4	1.00	1.02	.017	Accept
S5	2.00	2.03	.027	
S6	3.00	2.98	-.024	StdAdd

A .0000000 r .999869

B 2.20569e-5 C -9.18828e-3



	Mean	%RSD	
S1	-169	0	-169
S2	9251	0	9251
S3	22985	0	22985
S4	46504	0	46504
S5	92331	0	92331
S6	135357	0	135357

33?

New calibration coefficients stored

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

*** Check Standard: 2 Ck2 Seq: 806 16:17:50 12 Nov 1999 HG

Line	Flag	%Rcv.	Found	True	Units	SD/RSD
Hg		96.4	.582	.604	ug/L	.000

*** Sample ID: icb metco Seq: 807 16:20:29 12 Nov 1999 HG

Hg -.014 ug/L .000 -.014 <0.2 ug

*** Sample ID: mb Seq: 808 16:22:46 12 Nov 1999 HG

Hg .008 ug/L .000 .008 <0.2ug

*** Sample ID: mb dup Seq: 809 16:25:03 12 Nov 1999 HG

Hg .006 ug/L .000 .006 <0.2ug

105mL *** Sample ID: 2 mt 18 Seq: 810 16:27:20 12 Nov 1999 HG

Hg .055 ug/L .000 .055 <0.31ug

*** Sample ID: 2 mt 18dup Seq: 811 16:29:37 12 Nov 1999 HG RPD- N/A

Hg .055 ug/L .000 .055 <0.31ug

195mL *** Sample ID: 2 mt 19 Seq: 812 16:31:54 12 Nov 1999 HG

Hg .068 ug/L .000 .068 <0.39ug

*** Sample ID: 2 mt 19dup Seq: 813 16:34:11 12 Nov 1999 HG RPD- NIA

Hg .068 ug/L .000 .068 <0.39ug

175mL *** Sample ID: 2 mt 20 Seq: 814 16:36:28 12 Nov 1999 HG

Hg .008 ug/L .000 .008 <0.27ug

*** Sample ID: 2 mt 20dup Seq: 815 16:38:46 12 Nov 1999 HG RPD N/A

Hg .007 ug/L .000 .007 <0.27ug

110mL *** Sample ID: 2 mt 21 Seq: 816 16:41:04 12 Nov 1999 HG

Hg .018 ug/L .000 .018 <0.220 <0.214ug
JAS 1/4

*** Sample ID: 2 mt 21dup Seq: 817 16:43:22 12 Nov 1999 HG RPD- N/A

Hg .018 ug/L .000 .018 <0.220 <0.214 ug
JAS 1/4

	Line	Conc.	Units	SD/RSD	1	2	3	4	5	
65mL	*** Sample ID: 2 mt 22				Seq: 818	16:45:39 12 Nov 1999 HG				
	Hg	.059	ug/L	.000	.059					<0.13 ~~<0.126~~ ug JAD 12/4
	*** Sample ID: 2 mt 22dup				Seq: 819	16:47:55 12 Nov 1999 HG				RPD-N/A
	Hg	.060	ug/L	.000	.060					<0.13 ~~<0.126~~ ug JAD 12/4
65mL	*** Sample ID: 2 mt 23				Seq: 820	16:50:12 12 Nov 1999 HG				
	Hg	.012	ug/L	.000	.012					<0.13 ug
	*** Sample ID: 2 mt 23dup				Seq: 821	16:52:29 12 Nov 1999 HG				RPD-N/A
	Hg	.010	ug/L	.000	.010					<0.13 ug
135mL	*** Sample ID: 2 tx 1				Seq: 822	16:54:46 12 Nov 1999 HG				
	Hg	.025	ug/L	.000	.025					<0.27 ug
	*** Sample ID: 2 tx 1dup				Seq: 823	16:57:03 12 Nov 1999 HG				RPD-N/A
	Hg	.025	ug/L	.000	.025					<0.27 ug
160mL	*** Sample ID: 2 tx 2				Seq: 824	16:59:20 12 Nov 1999 HG				
	Hg	.060	ug/L	.000	.060					<0.32 ug
	*** Sample ID: 2 tx 2dup				Seq: 825	17:01:38 12 Nov 1999 HG				RPD-N/A
	Hg	.061	ug/L	.000	.061					<0.32 ug
	*** Sample ID: 2 tx 2trp				Seq: 826	17:03:56 12 Nov 1999 HG				RPD-N/A
	Hg	.059	ug/L	.000	.059					<0.32 ug ~~<0.146 ug~~ JAD 12/2/99
73mL	*** Sample ID: 2 tx 3				Seq: 827	17:06:14 12 Nov 1999 HG				
	Hg	.040	ug/L	.000	.040					<0.146 ug
	*** Sample ID: 2 tx 3dup				Seq: 828	17:08:32 12 Nov 1999 HG				
	Hg	.039	ug/L	.000	.039					<0.146 ug
	*** Sample ID: 2 tx 3spk				Seq: 829	17:10:50 12 Nov 1999 HG				
	Hg	.966	ug/L	.000	.966					97%

Line	Conc.	Units	SD/RSD	1	2	3	4	5	
*** Sample ID: ccb					Seq: 830	17:13:14 12 Nov 1999 HG			
Hg	-.019	ug/L	.000	-.019					<0.20ug
*** Sample ID: ccv					Seq: 831	17:15:32 12 Nov 1999 HG			
Hg	1.89	ug/L	.000	1.89					95%
1.4mL *** Sample ID: 2 tx 4					Seq: 832	17:18:02 12 Nov 1999 HG			
Hg	.009	ug/L	.000	.009					<0.088ug
*** Sample ID: 2 tx 4dup					Seq: 833	17:20:20 12 Nov 1999 HG			RPD=N/A
Hg	.013	ug/L	.000	.013					<0.088ug
3mL *** Sample ID: 2 tx 5					Seq: 834	17:22:38 12 Nov 1999 HG			
Hg	.017	ug/L	.000	.017					<0.066ug
*** Sample ID: 2 tx 5dup					Seq: 835	17:24:56 12 Nov 1999 HG			RPD=N/A
Hg	.015	ug/L	.000	.015					<0.066ug
34mL *** Sample ID: 2 tx 6					Seq: 836	17:27:14 12 Nov 1999 HG			
Hg	.029	ug/L	.000	.029					<0.068ug
*** Sample ID: 2 tx 6dup					Seq: 837	17:29:32 12 Nov 1999 HG			RPD=N/A
Hg	.027	ug/L	.000	.027					<0.068ug
270mL *** Sample ID: 3 mt 12					Seq: 838	17:31:51 12 Nov 1999 HG			
Hg	.009	ug/L	.000	.009					<1.0ug
*** Sample ID: 3 mt12dup					Seq: 839	17:34:10 12 Nov 1999 HG			RPD=N/A
Hg	.011	ug/L	.000	.011					<1.0ug
495mL *** Sample ID: 3 mt15					Seq: 840	17:36:30 12 Nov 1999 HG			
Hg	-.003	ug/L	.000	-.003					<1.0ug
*** Sample ID: 3mt15dup					Seq: 841	17:38:50 12 Nov 1999 HG			RPD=N/A
Hg	-.001	ug/L	.000	-.001					<1.0ug

Line	Conc.	Units	SD/RSD	1	2	3	4	5	
740mL	*** Sample ID: 3mt24				Seq: 842	17:41:10 12 Nov 1999 HG			
	Hg .052	ug/L	.000	.052					< 1.48 ug
	*** Sample ID: 3mt24dup				Seq: 843	17:43:30 12 Nov 1999 HG			RPD- N/A
	Hg .052	ug/L	.000	.052					< 1.48 ug
820mL	*** Sample ID: 3mt25				Seq: 844	17:45:50 12 Nov 1999 HG			
	Hg .007	ug/L	.000	.007					< 1.64 ug
	*** Sample ID: 3mt25dup				Seq: 845	17:48:10 12 Nov 1999 HG			RPD- N/A
	Hg .005	ug/L	.000	.005					< 1.64 ug
760mL	*** Sample ID: 3mt26				Seq: 846	17:50:30 12 Nov 1999 HG			
	Hg .021	ug/L	.000	.021					< 1.52 ug
	*** Sample ID: 3mt26dup				Seq: 847	17:52:50 12 Nov 1999 HG			RPD - N/A
	Hg .022	ug/L	.000	.022					< 1.52 ug
720mL	*** Sample ID: 3mt27				Seq: 848	17:55:10 12 Nov 1999 HG			
	Hg .430	ug/L	.000	.430					3.10 ug
	*** Sample ID: 3mt27dup				Seq: 849	17:57:30 12 Nov 1999 HG			RPD = 2.35 %
	Hg .420	ug/L	.000	.420					3.02 ug
	*** Sample ID: 3mt27trp				Seq: 850	17:59:50 12 Nov 1999 HG			RPD = 2.11 %
	Hg .421	ug/L	.000	.421					3.03 ug

Line	Conc.	Units	SD/FED	1	2	3	4	5	
700mL	*** Sample ID: 3 mt28				Seq: 851	18:10:34 12 Nov 1999 HG			
	Hg .463	ug/L	.000	.463		3.24ug			
	*** Sample ID: 3 mt28dup				Seq: 852	18:12:51 12 Nov 1999 HG			RPD = 0.87%
	Hg .459	ug/L	.000	.460		3.21ug			
	*** Sample ID: 3 mt28bdk				Seq: 853	18:15:08 12 Nov 1999 HG			
	Hg 1.34	ug/L	.000	1.34		88%			
	*** Sample ID: ccb				Seq: 854	18:17:31 12 Nov 1999 HG			
	Hg -.020	ug/L	.000	-.020		<0.2 ug			
	*** Sample ID: ccv				Seq: 855	18:19:48 12 Nov 1999 HG			
	Hg 1.89	ug/L	.000	1.89		95%			
320mL	*** Sample ID: 3 mt29				Seq: 856	18:22:15 12 Nov 1999 HG			
	Hg .486	ug/L	.000	.486		3.98ug			
	*** Sample ID: 3 mt29 dup				Seq: 857	18:24:33 12 Nov 1999 HG			RPD = N/A
	Hg .486	ug/L	.000	.486		3.98ug			
165mL	*** Sample ID: 3 tx1				Seq: 858	18:26:50 12 Nov 1999 HG			
	Hg -.003	ug/L	.000	-.003		<0.93ug			
	*** Sample ID: 3 tx1dup				Seq: 859	18:29:08 12 Nov 1999 HG			RPD = N/A
	Hg -.001	ug/L	.000	-.001		<0.93ug			
765mL	*** Sample ID: 3 tx2				Seq: 860	18:31:26 12 Nov 1999 HG			
	Hg 1.49	ug/L	.000	1.49		11.40ug			
	*** Sample ID: 3 tx2dup				Seq: 861	18:33:45 12 Nov 1999 HG			RPD = 2.03%
	Hg 1.46	ug/L	.000	1.46		11.17ug			
760mL	*** Sample ID: 3 tx3				Seq: 862	18:36:09 12 Nov 1999 HG			
	Hg .784	ug/L	.000	.784		5.96ug			

18:38:27 12 Nov 1999 Folder: NOVA99 Protocol: SYSTEST Page 123

	Line	Conc.	Units	SD/RSD	1	2	3	4	5	
	*** Sample ID: 3 tx3dup				Seq: 863	18:38:27 12 Nov 1999 HG				RPD = 0.51 %
	Hg	.788	ug/L	.000	.788			5.99 ug		
-85mL	*** Sample ID: 3 tx4				Seq: 864	18:40:44 12 Nov 1999 HG				
	Hg	2.41	ug/L	.000	2.41			18.9 ~~18.92~~ ug JAO 12/4		
	*** Sample ID: 3 tx4dup				Seq: 865	18:43:12 12 Nov 1999 HG				RPD = 0.83%
	Hg	2.43	ug/L	.000	2.43			19.10 ug		
420mL	*** Sample ID: 3 tx5				Seq: 866	18:45:40 12 Nov 1999 HG				
	Hg	-.009	ug/L	.000	-.009			<0.84 ug		
	*** Sample ID: 3 tx5dup				Seq: 867	18:47:57 12 Nov 1999 HG				RPD = N/A
	Hg	-.002	ug/L	.000	-.002			<0.84 ug		
810mL	*** Sample ID: 3 tx6				Seq: 868	18:50:15 12 Nov 1999 HG				
	Hg	2.06	ug/L	.000	2.06			16.7 ~~16.69~~ ug JAO 12/4		
	*** Sample ID: 3 tx6dup				Seq: 869	18:52:43 12 Nov 1999 HG				RPD = 0.97%
	Hg	2.04	ug/L	.000	2.04			16.52 ug		
-80mL	*** Sample ID: 3 tx7				Seq: 870	18:55:13 12 Nov 1999 HG				
	Hg	1.23	ug/L	.000	1.23			9.59 ug		
	*** Sample ID: 3 tx7dup				Seq: 871	18:57:36 12 Nov 1999 HG				RPD = 0.81%
	Hg	1.24	ug/L	.000	1.24			9.67 ug		
~~730mL~~ 11/12/99	*** Sample ID: 3 tx7 trp				Seq: 872	18:59:58 12 Nov 1999 HG				RPD = N/A
	Hg	1.23	ug/L	.000	1.23			9.59 ug		
730mL	*** Sample ID: 3 tx8				Seq: 873	19:02:19 12 Nov 1999 HG				
	Hg	2.57	ug/L	.000	2.57			21.0 ~~20.95~~ ug JAO 12/4		
	*** Sample ID: 3 tx8dup				Seq: 874	19:04:45 12 Nov 1999 HG				RPD = 0.347%
	Hg	~~2.55~~	~~ug/L~~	~~.000~~	~~2.55~~			~~21.02 ug~~		

Line	Conc.	Units	SD/RSD	1	2	3	4	5
*** Sample ID: 5 tx6sok				Sec: 875	19:07:17 12 Nov 1999 HG			
Hg	7.56	ug/L	.000	3.80	NO DATA, SEE PG 129 2x DIL.			
*** Sample ID: ccb				Sec: 876	19:09:49 12 Nov 1999 HG			
Hg	-.024	ug/L	.000	-.024	< 0.20 ug			
*** Sample ID: ccv				Sec: 877	19:12:07 12 Nov 1999 HG			
Hg	1.84	ug/L	.000	1.84	92%			
*** Sample ID: 8 mt2				Sec: 878	19:14:33 12 Nov 1999 HG			
Hg	-.016	ug/L	.000	-.016	< 2.0 ng/L			
*** Sample ID: 8 mt2 dup				Sec: 879	19:16:53 12 Nov 1999 HG	RPD-N/A		
Hg	-.008	ug/L	.000	-.008	< 2.0 ng/L			
*** Sample ID: rb2 Tx				Sec: 880	19:19:11 12 Nov 1999 HG			
Hg	.006	ug/L	.000	.006	< 2.0 ng/L			
*** Sample ID: rb2Tx dup				Sec: 881	19:21:29 12 Nov 1999 HG	RPD-N/A		
Hg	.006	ug/L	.000	.006	< 2.0 ng/L			
*** Sample ID: mo coal				Sec: 882	19:23:48 12 Nov 1999 HG			
Hg	.040	ug/L	.000	.040	< 0.2 ng/L			
*** Sample ID: mo coalduo				Sec: 883	19:26:07 12 Nov 1999 HG			
Hg	.042	ug/L	.000	.042	< 0.2 ng/L			
*** Sample ID: lcs coal				Sec: 884	19:28:27 12 Nov 1999 HG			
Hg	.957	ug/L	.000	.957	96%			
*** Sample ID: lcs coalou				Sec: 885	19:30:48 12 Nov 1999 HG	RPD=1.58%		
Hg	.942	ug/L	.000	.942	94%			
*** Sample ID: 1630a				Sec: 886	19:33:11 12 Nov 1999 HG			
Hg	1.98	ug/L	.000	1.98	0.076 ng/g wet			
					0.077 ng/g D.W.			

Line	Conc.	Units	SD/RSD	1	2	3	4	5
*** Sample ID: 1630a dup				Seq: 887	19:35:41 12 Nov 1999 HG			
Hg	1.97	ug/L	.000	1.97				
*** Sample ID: 1630a				Seq: 888	19:41:33 12 Nov 1999 HG			
Hg	1.64	ug/L	.000	1.64				
*** Sample ID: 1630a dup				Seq: 889	19:44:03 12 Nov 1999 HG			
Hg	1.63	ug/L	.000	1.63				
*** Sample ID: mt1				Seq: 890	19:46:28 12 Nov 1999 HG			
Hg	1.33	ug/L	.000	1.33				
*** Sample ID: mt1 dup				Seq: 891	19:48:51 12 Nov 1999 HG			
Hg	1.34	ug/L	.000	1.34				
*** Sample ID: mt2				Seq: 892	19:51:13 12 Nov 1999 HG			
Hg	1.14	ug/L	.000	1.14				
*** Sample ID: mt2 dup				Seq: 893	19:53:34 12 Nov 1999 HG			
Hg	1.14	ug/L	.000	1.14				
*** Sample ID: mt3				Seq: 894	19:55:55 12 Nov 1999 HG			
Hg	1.15	ug/L	.000	1.15				
*** Sample ID: mt3 dup				Seq: 895	19:58:16 12 Nov 1999 HG			
Hg	1.15	ug/L	.000	1.15				
~~*** Sample ID: mtem1~~				Seq: 896	20:00:37 12 Nov 1999 HG			
Hg	1.67	ug/L	.000	1.67				

RPD = 0.506

0.076 mg/g w.w.
0.077 mg/g D.W.

0.080 mg/g ww
~~NO DATA~~ 0.081 DW mg/g

0.081 mg/g D.W. 0.080 mg/g ww
~~NO DATA~~

RPD = 0.611%

0.065 mg DW. 0.058 mg/g ww

0.065 mg DW 0.058 mg/g w.w.

RPD = 0.740%

0.064 mg/g DW
0.056 mg/g ww

RPD = N/A

0.064 mg/g D.W. 0.056 mg/g
~~0.057 mg/g~~

0.064 mg/g D.W. 0.057 mg/g W.W.

RPD = N/A

0.064 mg/g D.W. 0.057 mg/g W.W.

0.080 mg/g w.w.

0.115 mg/g D.W.

Line	Conc.	Units	SD/RSD	1	2	3	4	5
*** Sample ID: txnm 1dup				Seq: 897	20:24:18 12 Nov 1999 HG			
Hg	1.67	ug/L	.000	1.67				
*** Sample ID: txnm 1trp				Seq: 898	20:26:45 12 Nov 1999 HG			
Hg	1.66	ug/L	.000	1.66				
*** Sample ID: txnm 2				Seq: 899	20:29:07 12 Nov 1999 HG			
Hg	2.14	ug/L	.000	2.14				
*** Sample ID: txnm 2dup				Seq: 900	20:31:35 12 Nov 1999 HG			
Hg	2.13	ug/L	.000	2.13				
*** Sample ID: txnm 2spx 1:2				Seq: 901	20:34:03 12 Nov 1999 HG			
Hg	1.54	ug/L	.000	1.54				
*** Sample ID: ccb				Seq: 902	20:36:25 12 Nov 1999 HG			
Hg	-.022	ug/L	.000	-.022				
*** Sample ID: ccv				Seq: 903	20:38:43 12 Nov 1999 HG			
Hg	1.82	ug/L	.000	1.82				
*** Sample ID: txnm 3				Seq: 904	20:41:10 12 Nov 1999 HG			
Hg	2.32	ug/L	.000	2.32				
*** Sample ID: txnm 3dup				Seq: 905	20:43:41 12 Nov 1999 HG			
Hg	2.38	ug/L	.000	2.38				
*** Sample ID: mp fil				Seq: 906	20:46:10 12 Nov 1999 HG			
Hg	.068	ug/L	.000	.068				
*** Sample ID: mp fildup				Seq: 907	20:48:28 12 Nov 1999 HG			
Hg	.070	ug/L	.000	.070				
*** Sample ID: ~~1620fb~~ NIST 1633B JPP 12/3/99				Seq: 908	20:50:45 12 Nov 1999 HG			
Hg	1.30	ug/L	.000	1.30				

~~RPD = N/A~~
0.115 ug/g D.W.
0.080 ug/g W.W.

RPD = 0.60%
0.115 ug/g D.W.
0.080 ug/g W.W.

0.142 ug/g DW
0.100 ug/g W.W.

RPD = 0.47%
0.142 ug/g D.W.
0.100 ug/g W.W.

94%

<0.2 ug/L

91%

~~0.157 ug/g D.W.~~
0.111 ug/g W.W.

RPD = 2.55%
0.161 ug/g D.W.
~~0.114 ug/g W.W.~~

<0.2 ug/L

<0.2 ug/L

SEE 2ND NIST SAMPLE PREPPED WITH THIS BATCH RUN ON 11/15/99 14:47

0.121 ug/g JPP 12/3 WET WT.
0.121 ug/g DRY WT.

Line	Conc.	Units	SD/RSD	1	2	3	4	5	
*** Sample ID: ~~1630000~~ NIST1633B DUP				Seq: 909		20:53:12 12 Nov 1999 HG			RPD=2.33%
Hg	1.27	ug/L	.000	1.27					0.118 ug ~~Xg~~ 12/3 ppp WT.WT 0.119 ug ~~Xg~~ DRY WT.
*** Sample ID: mtf 4				Seq: 910		20:55:39 12 Nov 1999 HG			
Hg	.077	ug/L	.000	.077					<0.01 ug ~~Xg~~ 12/3 ppp
*** Sample ID: mtf 4dup				Seq: 911		20:57:56 12 Nov 1999 HG			RPD-N/A
Hg	.086	ug/L	.000	.086					<0.01 ug ~~Xg~~ 12/3 ppp
*** Sample ID: mtf 7				Seq: 912		21:00:13 12 Nov 1999 HG			RPD-N/A
Hg	.042	ug/L	.000	.042					<0.01 ug ~~Xg~~ 12/3 ppp
*** Sample ID: mtf 7dup				Seq: 913		21:02:30 12 Nov 1999 HG			RPD-N/A
Hg	.042	ug/L	.000	.042					<0.01 ug ~~Xg~~ 12/3 ppp
*** Sample ID: mtf 10				Seq: 914		21:04:47 12 Nov 1999 HG			
Hg	1.71	ug/L	.000	1.71					0.09 ug ~~Xg~~ 12/3 ppp
*** Sample ID: mtf 10dup				Seq: 915		21:07:15 12 Nov 1999 HG			RPD=0.583%
Hg	1.72	ug/L	.000	1.72					0.09 ug ~~Xg~~ 12/3 ppp
*** Sample ID: mtf 11				Seq: 916		21:09:37 12 Nov 1999 HG			
Hg	.934	ug/L	.000	.934					0.050 ug ~~Xg~~ 12/3 ppp
*** Sample ID: mtf 11dup				Seq: 917		21:11:56 12 Nov 1999 HG			RPD-N/A
Hg	.934	ug/L	.000	.934					0.050 ug ~~Xg~~ 12/3 ppp
*** Sample ID: mtf 12				Seq: 918		21:14:15 12 Nov 1999 HG			
Hg	.708	ug/L	.000	.708					0.04 ug ~~Xg~~ 12/3 ppp
*** Sample ID: mtf 12dup				Seq: 919		21:16:34 12 Nov 1999 HG			RPD=0.14%
Hg	.707	ug/L	.000	.707					0.04 ug ~~Xg~~ 12/3 ppp
*** Sample ID: mtf 13				Seq: 920		21:18:53 12 Nov 1999 HG			
Hg	1.73	ug/L	.000	1.73					~~2.47 ug Xg~~ ppp 12/3 kg 2.41 ug ~~Xg~~ 12/3 ppp

Line	Conc.	units	SD/RSD	1	2	3	4	5
*** Sample ID: mtf 13duo				Seq: 921	21:21:15 12 Nov 1999 HG			
Hg	1.77	ug/L	.000	1.77				
*** Sample ID: mtf 13tro				Seq: 922	21:25:39 12 Nov 1999 HG			
Hg	1.79	ug/L	.000	1.79				
*** Sample ID: mtf 14				Seq: 923	21:26:03 12 Nov 1999 HG			
Hg	.182	ug/L	.000	.182				
*** Sample ID: mtf 14duo				Seq: 924	21:28:21 12 Nov 1999 HG			
Hg	.189	ug/L	.000	.189				
*** Sample ID: mtf 14spk				Seq: 925	21:30:39 12 Nov 1999 HG			
Hg	1.14	ug/L	.000	1.14				
*** Sample ID: ccb				Seq: 926	21:32:57 12 Nov 1999 HG			
Hg	-.020	ug/L	.000	-.020				
*** Sample ID: ccv				Seq: 927	21:35:13 12 Nov 1999 HG			
Hg	1.80	ug/L	.000	1.80				
*** Sample ID: mtf 15				Seq: 928	21:37:48 12 Nov 1999 HG			
Hg	2.25	ug/L	.000	2.25				
*** Sample ID: mtf 15duo				Seq: 929	21:40:10 12 Nov 1999 HG			
Hg	2.25	ug/L	.000	2.25				
*** Sample ID: mtf 16				Seq: 930	21:42:49 12 Nov 1999 HG			
Hg	.224	ug/L	.000	.224				
*** Sample ID: mtf 16duo				Seq: 931	21:45:09 12 Nov 1999 HG			
Hg	.227	ug/L	.000	.227				
*** Sample ID: mtf 17				Seq: 932	21:47:29 12 Nov 1999 HG			
Hg	1.64	ug/L	.000	1.54				

RPD = 2.3%

2.47 mg/kg dup 1213

RPD = 3.4%

2.50 mg/kg dup 1213

< 0.01 mg/kg dup 1213

RPD = N/A

< 0.01 mg/kg dup 1213

~~144%~~ 96%

< 0.2 mg/L

90%

2.65 mg/kg dup 1213

RPD - N/A

2.65 mg/kg dup 1213

0.011 mg/kg dup 1213

RPD = 1.33%

0.011 mg/kg dup 1213

2.25 mg

Line	Conc.	Units	SD/RSD	1	2	3	4	5
*** Sample ID: mrf 17dup				Seq: 933		21:49:55 12 Nov 1999 HG		
Hg	1.64	ug/L	.000	1.64				
*** Sample ID: 3 tx5sok				Seq: 934		21:52:55 12 Nov 1999 HG		
Hg	1.63	ug/L	.000	1.63				
*** Sample ID: 3 tx5sok				Seq: 935		21:55:20 12 Nov 1999 HG		
Hg	2.33	ug/L	.000	2.33				
*** Sample ID: ccb				Seq: 936		21:57:50 12 Nov 1999 HG		
Hg	-.022	ug/L	.000	-.022				
*** Sample ID: ccv				Seq: 937		22:00:10 12 Nov 1999 HG		
Hg	1.81	ug/L	.000	1.81				

RPD-N/A

2.25 ug

NO DATA, WRONG SAMPLE

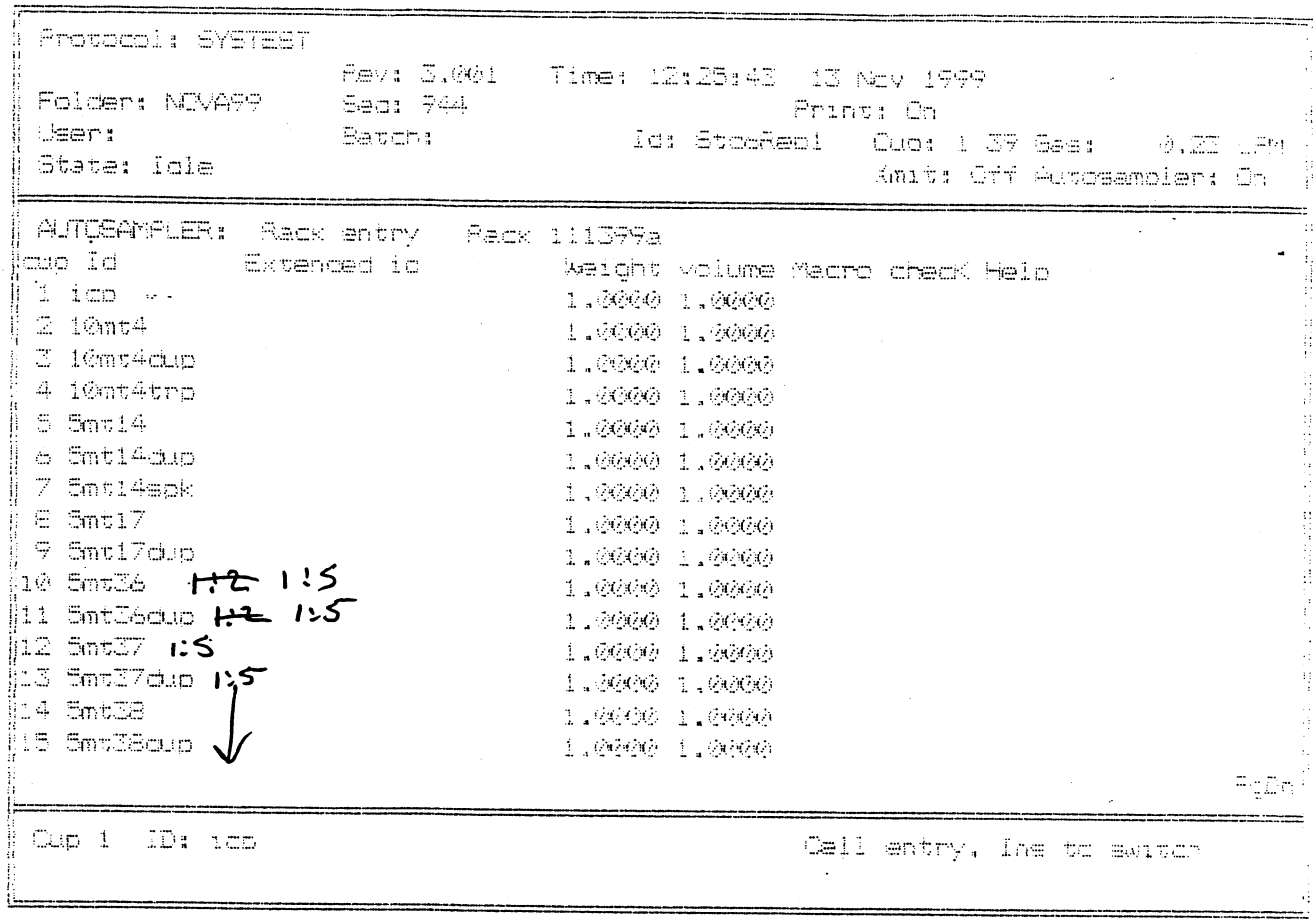
1:2

89%

<0.2 ug/L

91%

11/13/99 Analytical Run


Protocol: SYSTEST
Rev: 3.001 Time: 12:25:43 13 Nov 1999
Folder: NOVA99 Seq: 944 Print: On
User: Batch: Id: StosRecl Cup: 1 37 Sec: 0.22 LPM
State: Idle Amit: Off Autosampler: On
AUTOSAMPLER: Rack entry Rack 111399a
Cup Id Extended id Weight Volume Macro check Help
1 ica 1.0000 1.0000
2 10mt4 1.0000 1.0000
3 10mt4dup 1.0000 1.0000
4 10mt4trp 1.0000 1.0000
5 5mt14 1.0000 1.0000
6 5mt14dup 1.0000 1.0000
7 5mt14spk 1.0000 1.0000
8 5mt17 1.0000 1.0000
9 5mt17dup 1.0000 1.0000
10 5mtC6 1:2 1:5 1.0000 1.0000
11 5mtC6dup 1:2 1:5 1.0000 1.0000
12 5mtC7 1:5 1.0000 1.0000
13 5mtC7dup 1:5 1.0000 1.0000
14 5mtC8 1.0000 1.0000
15 5mtC8dup 1.0000 1.0000
Cup 1 ID: ica
Cell entry, Ins to switch

Protocol: SYSTEST

Rev: 3.001 Time: 12:25:45 13 Nov 1999

Folder: NOVA99 Seq: 944 Print: On

User: Batch: Id: Std6Rep1 Cup: 1 39 Gas: 0.23 LPM

State: Idle Xmit: Off Autosampler: On

AUTOSAMPLER: Rack entry Rack 111399a PgUp

cup	Id	Extended id	Weight	Volume	Macro check	Help
16	5mt39	NO DIL	1.0000	1.0000		
17	5mt39dup	NO DIL	1.0000	1.0000		
18	5mt40		1.0000	1.0000		
19	5mt40dup		1.0000	1.0000		
20	5mt41		1.0000	1.0000		
21	5mt41dup		1.0000	1.0000		
22	rbtx4		1.0000	1.0000		
23	rbtx4dup		1.0000	1.0000		
24	ccb		1.0000	1.0000		
25	ccv		1.0000	1.0000		
26	5tx1		1.0000	1.0000		
27	5tx1dup		1.0000	1.0000		
28	5tx1trp		1.0000	1.0000		
29	5tx2		1.0000	1.0000		
30	5tx2dup		1.0000	1.0000		

PgDn

Cup 16 ID: 5mt39 Cell entry, Ins to switch

Protocol: SYSTEST

Rev: 3.001 Time: 12:25:47 13 Nov 1999

Folder: NOVA99 Seq: 944 Print: On

User: Batch: Id: Sto6Rep1 Cup: 1 39 Gas: 0.23 LPM

State: Idle Xmit: Off Autosampler: On

AUTOSAMPLER: Rack entry Rack 111399a PgUp

cup	Id	Extended id	Weight	Volume	Macro check	Help
31	5tx2spk		1.0000	1.0000		
32	5tx3		1.0000	1.0000		
33	5tx3dup		1.0000	1.0000		
34	5tx4		1.0000	1.0000		
35	5tx4dup		1.0000	1.0000		
36	5tx5		1.0000	1.0000		
37	5tx5dup		1.0000	1.0000		
38	5tx6		1.0000	1.0000		
39	rtx6dup		1.0000	1.0000		
40	5tx7		1.0000	1.0000		
41	5tx7dup		1.0000	1.0000		
42	5tx8		1.0000	1.0000		
43	5tx8dup		1.0000	1.0000		
44			1.0000	1.0000		

PgDn

Cup 31 ID: 5tx2spk Cell entry, Ins to switch

Protocol: SYSTEST

Rev: 3.001 Time: 14:24:55 13 Nov 1999

Folder: NOV99B Seq: 33 Print: On

User: Batch: Id: 5tx8dup Cup: 1 43 Gas: 0.23 LPM

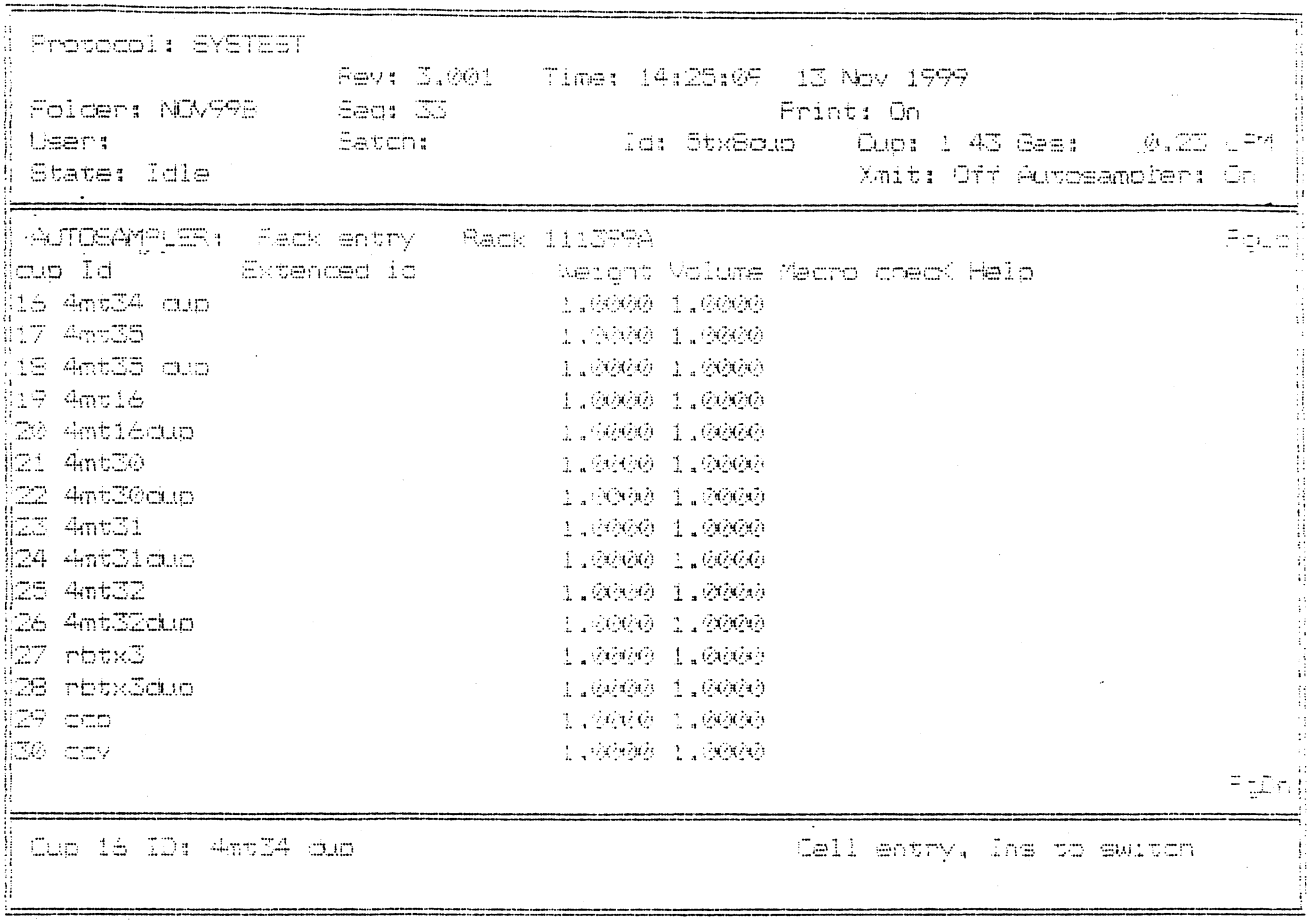
State: Idle Xmit: Off Autosampler: On

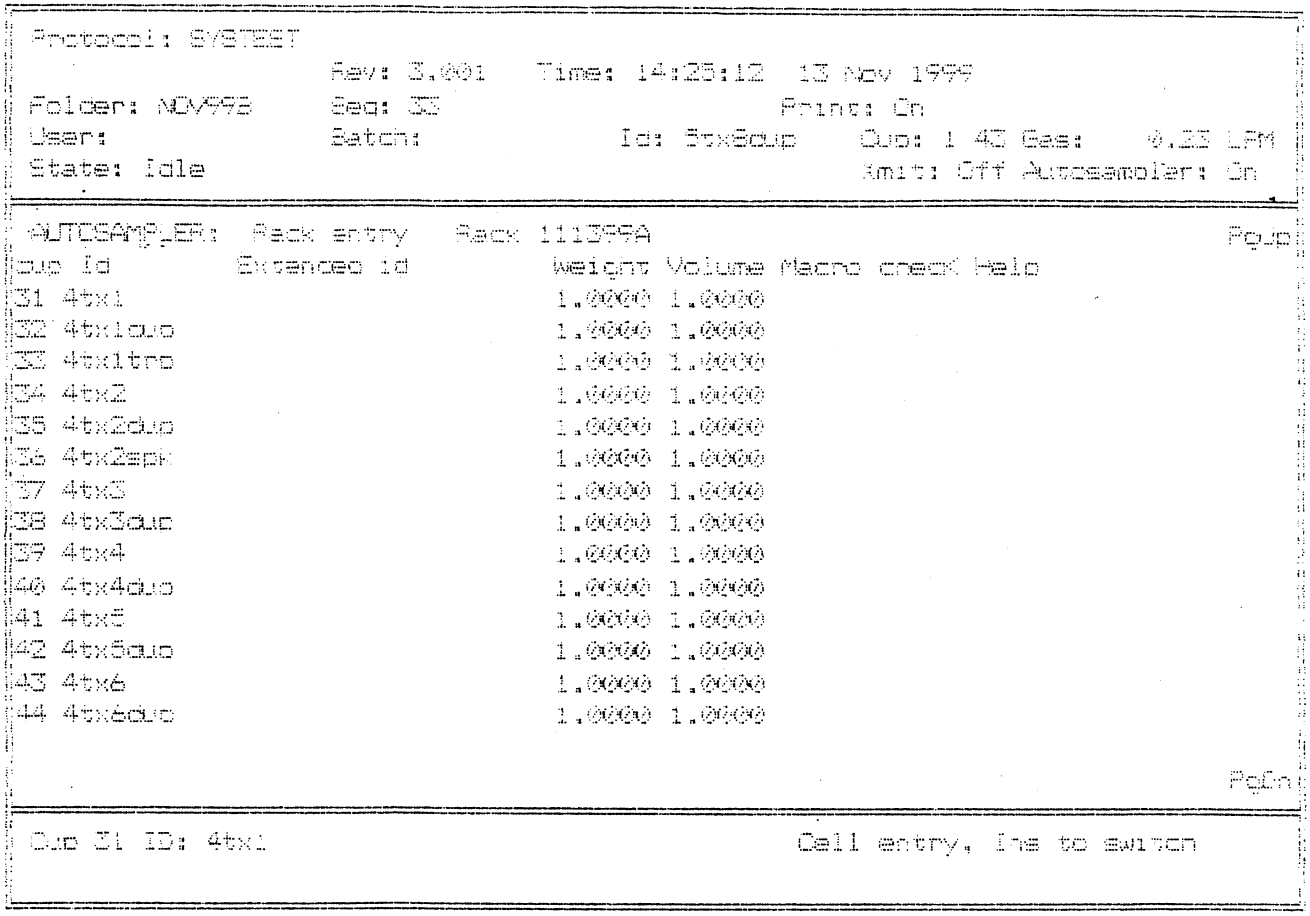
AUTOSAMPLER: Rack entry Rack 111399A

cup	Id	Extended id	Weight	Volume	Macro check	Help
1	5mt36	:5	1.0000	1.0000		
2	5mt36dup	:5	1.0000	1.0000		
3	5mt37	:5	1.0000	1.0000		
4	5mt37dup	:5	1.0000	1.0000		
5	ccb		1.0000	1.0000		
6	ccv		1.0000	1.0000		
7	9mt3		1.0000	1.0000		
8	9mt3 dup		1.0000	1.0000		
9	9mt3 trp		1.0000	1.0000		
10	4mt13		1.0000	1.0000		
11	4mt13dup		1.0000	1.0000		
12	4mt13spk		1.0000	1.0000		
13	4mt33		1.0000	1.0000		
14	4mt33 dup		1.0000	1.0000		
15	4 mt34		1.0000	1.0000		

PgDn

Cup 1 ID: 5mt36 Cell entry, Ins to switch


Protocol: SYSTEST
Rev: 3.001 Time: 14:25:09 13 Nov 1999
Folder: NOV99B Seq: 33 Print: On
User: Batch: Id: 5tx8cup Cup: 1 43 Sec: 0.23 LPM
State: Idle Xmit: Off Autosampler: On
AUTOSAMPLER: Rack entry Rack 111299A Figure
Cup Id Extended id Weight Volume Macro check Help
16 4mt34 cup 1.0000 1.0000
17 4mt35 1.0000 1.0000
18 4mt35 cup 1.0000 1.0000
19 4mt16 1.0000 1.0000
20 4mt16cup 1.0000 1.0000
21 4mt30 1.0000 1.0000
22 4mt30cup 1.0000 1.0000
23 4mt31 1.0000 1.0000
24 4mt31cup 1.0000 1.0000
25 4mt32 1.0000 1.0000
26 4mt32cup 1.0000 1.0000
27 rbtx3 1.0000 1.0000
28 rbtx3cup 1.0000 1.0000
29 ccb 1.0000 1.0000
30 ccv 1.0000 1.0000
Cup 16 ID: 4mt34 cup Call entry, Ins to switch


Protocol: SYSTEST
Rev: 3.001 Time: 14:25:12 13 Nov 1999
Folder: NOV99S Seq: 33 Print: On
User: Batch: Id: 5tx5oup Cup: 1 40 Gas: 0.25 LPM
State: Idle Xmit: Off Autosampler: On
AUTOSAMPLER: Pack entry Pack 1113F9A Popup
Cup Id Extended Id Weight Volume Macro check Help
31 4tx1 1.0000 1.0000
32 4tx1cup 1.0000 1.0000
33 4tx1tro 1.0000 1.0000
34 4tx2 1.0000 1.0000
35 4tx2cup 1.0000 1.0000
36 4tx2epk 1.0000 1.0000
37 4tx3 1.0000 1.0000
38 4tx3cup 1.0000 1.0000
39 4tx4 1.0000 1.0000
40 4tx4cup 1.0000 1.0000
41 4tx5 1.0000 1.0000
42 4tx5cup 1.0000 1.0000
43 4tx6 1.0000 1.0000
44 4tx6cup 1.0000 1.0000
PgDn
Cup 31 ID: 4tx1
Cell entry, Ins to switch

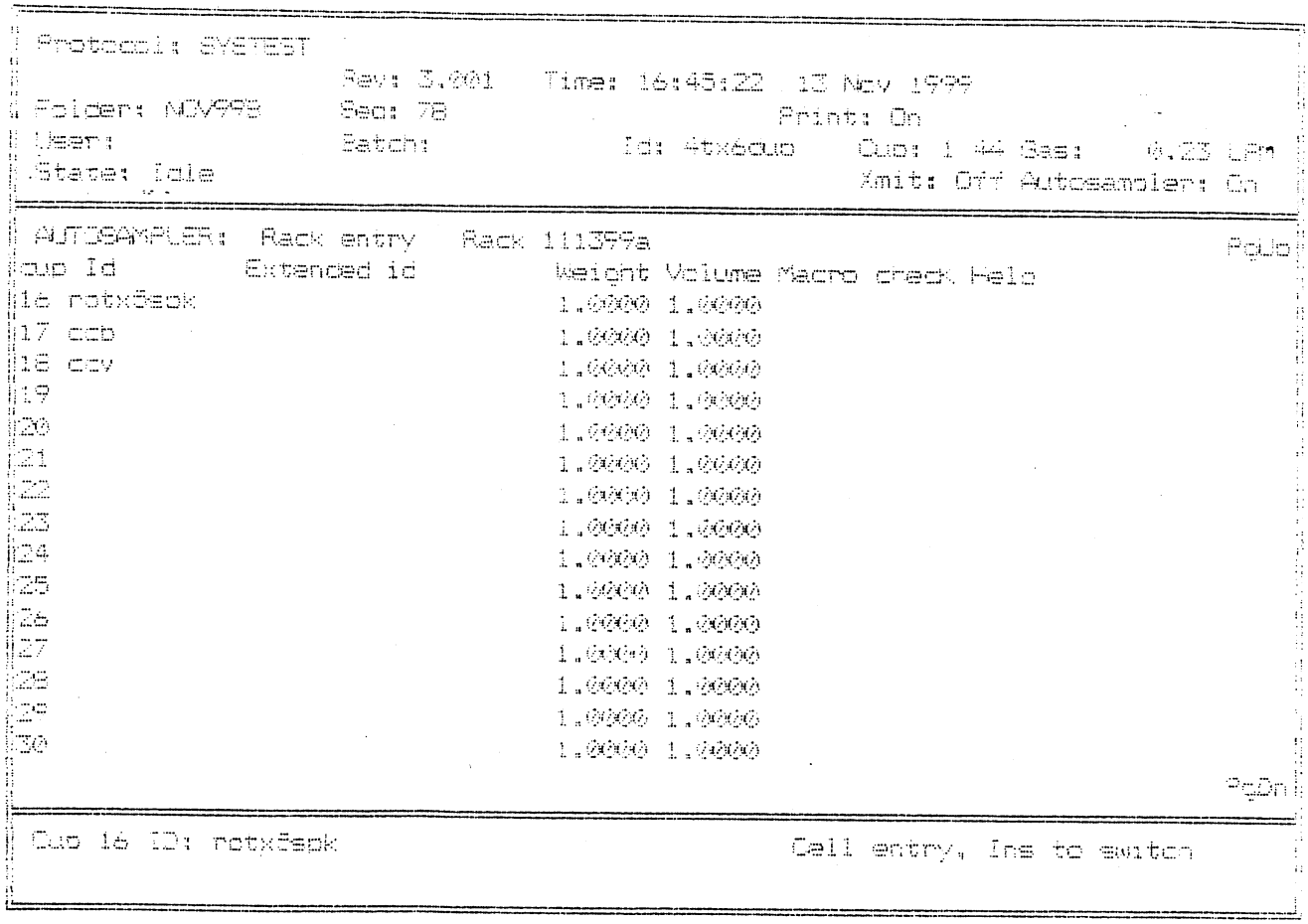
```
Protocol: SYSTEST
                    Rev: 3.001    Time: 16:45:18  13 Nov 1999
Folder: NOV99B      Seq: 78                      Print: On
User:               Batch:            Id: 4tx6dup    Cup: 1 44 Gas:    0.23 LPM
State: Idle                                          Xmit: Off Autosampler: On
```

AUTOSAMPLER: Rack entry Rack 111399a

cup	Id	Extended id	Weight	Volume	Macro check	Help
1	4tx7		1.0000	1.0000		
2	4tx7dup		1.0000	1.0000		
3	4tx8		1.0000	1.0000		
4	4tx8dup		1.0000	1.0000		
5	7mt1		1.0000	1.0000		
6	7mt1dup		1.0000	1.0000		
7	11mt5		1.0000	1.0000		
8	11mt5dup		1.0000	1.0000		
9	ccb		1.0000	1.0000		
10	ccv		1.0000	1.0000		
11	rbtx1		1.0000	1.0000		
12	rbtx1dup		1.0000	1.0000		
13	rbtx1trp		1.0000	1.0000		
14	rbtx5		1.0000	1.0000		
15	rbtx5dup		1.0000	1.0000		

PgDn

Cup 1 ID: 4tx7 Cell entry, Ins to switch


Protocol: SYSTEST
Rev: 3.001 Time: 16:45:22 13 Nov 1999
Folder: NOV99 Seq: 78 Print: On
User: Batch: Id: 4tx6cuo Cuo: 1 44 Sas: 4.23 LPM
State: Idle Xmit: Off Autosampler: On
AUTOSAMPLER: Rack entry Rack 111399a Pguo
Cuo Id Extended id Weight Volume Macro check Help
16 rotx5sok 1.0000 1.0000
17 ccb 1.0000 1.0000
18 ccv 1.0000 1.0000
19 1.0000 1.0000
20 1.0000 1.0000
21 1.0000 1.0000
22 1.0000 1.0000
23 1.0000 1.0000
24 1.0000 1.0000
25 1.0000 1.0000
26 1.0000 1.0000
27 1.0000 1.0000
28 1.0000 1.0000
29 1.0000 1.0000
30 1.0000 1.0000
PgDn
Cuo 16 ID: rotx5sok
Cell entry, Ins to switch

*** Standard: 1 Rep: 1 Seq: 938 12:02:30 13 Nov 1999 HG

Hg .000 ug/L 89
Ave. Int. = 89 S. D. = 0

*** Standard: 2 Rep: 1 Seq: 939 12:05:12 13 Nov 1999 HG

Hg .200 ug/L 9337
Ave. Int. = 9337 S. D. = 0

*** Standard: 3 Rep: 1 Seq: 940 12:07:34 13 Nov 1999 HG

Hg .500 ug/L 23136
Ave. Int. = 23136 S. D. = 0

*** Standard: 4 Rep: 1 Seq: 941 12:09:56 13 Nov 1999 HG

Hg 1.00 ug/L 45262
Ave. Int. = 45262 S. D. = 0

*** Standard: 5 Rep: 1 Seq: 942 12:12:18 13 Nov 1999 HG

Hg 2.00 ug/L 91316
Ave. Int. = 91316 S. D. = 0

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

*** Standard: 6 Rep: 1 Seq: 943 12:19:27 13 Nov 1999 HG

Hg 3.00 ug/L 134786
Ave. Int. = 134786 S. D. = 0

Protocol: SYSTEST

Rev: 3.001 Time: 12:19:48 13 Nov 1999

Folder: NOVA99 Seq: 944 Print: On

User: Batch: Id: Std6Rep1 Cup: 1 39 Gas: 0.23 LPM

State: Idle Xmit: Off Autosampler: On

CALIBRATION: Line Calibration

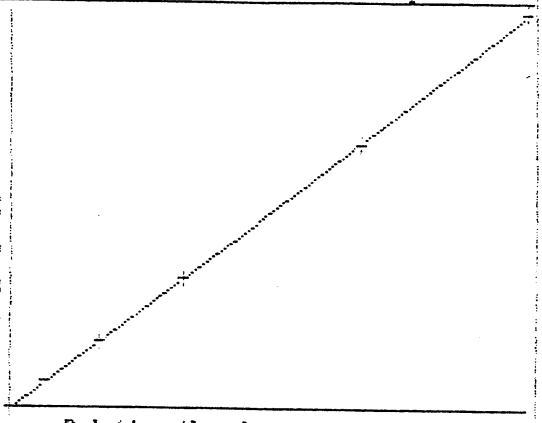
Line: Hg

	Conc.	Calc.	Dev.	Accepted LiNear
S1	.000	-.007	-.007	Quadratic
S2	.200	.198	-.002	WtdLinear
S3	.500	.505	.005	
S4	1.00	.997	-.003	Accept
S5	2.00	2.02	.020	
S6	3.00	2.99	-.013	StdAdd

A .0000000 r .999950

B 2.22252e-5 C -9.13483e-3

Concentration



Relative Absorbance

	Mean	%RSD	
S1	89	0	89
S2	9337	0	9337
S3	23136	0	23136
S4	45262	0	45262
S5	91316	0	91316
S6	134786	0	134786

33?

New calibration coefficients stored

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

*** Check Standard: 2 CK2 Seq: 944 12:27:13 13 Nov 1999 HG

Line	Flag	%Rcv.	Found	True	Units	SD/RSD
Hg		102.	.514	.504	ug/L	.000

*** Sample ID: icb Seq: 945 12:29:33 13 Nov 1999 HG

Hg -.018 ug/L .000 -.018 < 0.2 ng/L

*** Sample ID: 10mt4 Seq: 946 12:31:50 13 Nov 1999 HG

Hg -.001 ug/L .000 -.001 < 2.0 ng/L SPP12/13

*** Sample ID: 10mt4dup Seq: 947 12:34:07 13 Nov 1999 HG RPD-N/A

Hg -.000 ug/L .000 -.000 < 2.0 ng/L SPP12/13

*** Sample ID: 10mt4trp Seq: 948 12:36:49 13 Nov 1999 HG RPD-N/A

Hg -.003 ug/L .000 -.003 < 2.0 ng/L SPP12/13

*** Sample ID: 5mt14 Seq: 949 12:39:06 13 Nov 1999 HG

Hg -.001 ug/L .000 -.001 < 0.96 ng/L SPP12/13

*** Sample ID: 5mt14dup Seq: 950 12:41:23 13 Nov 1999 HG RPD-N/A

Hg -.003 ug/L .000 -.003 < 0.96 ng/L SPP12/13

*** Sample ID: 5mt14spk Seq: 951 12:43:40 13 Nov 1999 HG

Hg .996 ug/L .000 .995 100%

*** Sample ID: 5mt17 Seq: 952 12:46:01 13 Nov 1999 HG

Hg .024 ug/L .000 .024 < 0.98 ng/L SPP12/13

*** Sample ID: 5mt17dup Seq: 953 12:48:19 13 Nov 1999 HG RPD-N/A

Hg .029 ug/L .000 .029 < 0.98 ng/L SPP12/13

*** Sample ID: 5mt36 Seq: 954 12:50:37 13 Nov 1999 HG

Hg 3.28 ug/L .000 3.28 SEEPA 136
NO DATA, > LR

*** Sample ID: 5mt36dup Seq: 955 12:53:10 13 Nov 1999 HG

Hg 3.30 ug/L .000 3.30 NO DATA, > LR

Line	Conc.	Units	SD/RSD	1	2	3	4	5	
*** Sample ID: Smt37					Seq: 0		12:56:50 13 Nov 1999 HG		
Hg	4.02	ug/L	.000	4.02					NO DATA, SEE PG 135
*** Sample ID: Smt37dup					Seq: 1		12:59:31 13 Nov 1999 HG		
Hg	4.03	ug/L	.000	4.03					NO DATA, SEE PG 135
*** Sample ID: Smt38					Seq: 2		13:01:51 13 Nov 1999 HG		
Hg	.813	ug/L	.000	.813					4.15 ug/L 1213
*** Sample ID: Smt38dup					Seq: 3		13:04:13 13 Nov 1999 HG		RPD = 0.617%
Hg	.808	ug/L	.000	.808					4.12 ug/L 1213
*** Sample ID: Smt39					Seq: 4		13:06:31 13 Nov 1999 HG		
Hg	.048	ug/L	.000	.048					NO DATA, MISSED TUBE 1213/99 888
*** Sample ID: Smt39					Seq: 5		13:08:48 13 Nov 1999 HG		
Hg	.309	ug/L	.000	.309					1.45 ug/L 1213
*** Sample ID: Smt39dup					Seq: 6		13:11:08 13 Nov 1999 HG		RPD = 0.324%
Hg	.308	ug/L	.000	.308					1.45 ug/L 1213
*** Sample ID: Smt40					Seq: 7		13:13:22 13 Nov 1999 HG		
Hg	1.76	ug/L	.000	1.76					8.70 ug/L 1213
*** Sample ID: Smt40dup					Seq: 8		13:15:45 13 Nov 1999 HG		RPD = 0.57%
Hg	1.75	ug/L	.000	1.75					8.66 ug/L 1213
*** Sample ID: Smt41					Seq: 9		13:18:08 13 Nov 1999 HG		
Hg	1.49	ug/L	.000	1.49					7.52 ug/L 1213
*** Sample ID: Smt41dup					Seq: 10		13:20:32 13 Nov 1999 HG		RPD = 2.72%
Hg	1.45	ug/L	.000	1.45					7.32 ug/L 1213
*** Sample ID: Rbtx4					Seq: 11		13:22:54 13 Nov 1999 HG		
Hg	-.017	ug/L	.000	-.017					<2.0 ug/L 1213

Line	Conc.	Units	SD/RSD	1	2	3	4	5	
~~*** Sample ID: rstx4dup~~				~~Seq:~~	~~12~~	~~13:25:12 13 Nov 1999 HG~~			RPD-N/A
~~Hg~~	~~-.006~~	~~ug/L~~	~~.000~~	~~-.006~~					~~<2.0 ug/L~~ ppp 12/3/99
*** Sample ID: ccb				Seq:	13	13:27:30 13 Nov 1999 HG			
Hg	-.014	ug/L	.000	-.014					<0.2 ug/L ppp 12/3/99
*** Sample ID: ccv				Seq:	14	13:29:48 13 Nov 1999 HG			
Hg	2.03	ug/L	.000	2.03					101%
~~*** Sample ID: 5tx1~~				~~Seq:~~	~~15~~	~~13:32:17 13 Nov 1999 HG~~			
Hg	-.010	ug/L	.000	-.010					<0.91 ug/L ppp 12/3
*** Sample ID: 5tx1dup				Seq:	16	13:34:35 13 Nov 1999 HG			RPD-N/A
Hg	.004	ug/L	.000	.004					<0.91 ug/L ppp 12/3
*** Sample ID: 5tx1trp				Seq:	17	13:36:53 13 Nov 1999 HG			RPD-N/A
Hg	-.002	ug/L	.000	-.002					<0.91 ug/L ppp 12/3
*** Sample ID: 5tx2				Seq:	18	13:39:11 13 Nov 1999 HG			
Hg	1.91	ug/L	.000	1.91					9.74 ug/L ppp 12/3
*** Sample ID: 5tx2dup				Seq:	19	13:41:40 13 Nov 1999 HG			RPD-1.04%
Hg	1.93	ug/L	.000	1.93					9.84 ug/L ppp 12/3
*** Sample ID: 5tx2spk				Seq:	20	13:44:04 13 Nov 1999 HG			
Hg	2.69	ug/L	.000	2.69					78%
*** Sample ID: 5tx3				Seq:	21	13:46:34 13 Nov 1999 HG			
Hg	1.61	ug/L	.000	1.61					8.05 ug
*** Sample ID: 5tx3dup				Seq:	22	13:48:55 13 Nov 1999 HG			RPD = 3.8%
Hg	1.55	ug/L	.000	1.55					7.75 ug
*** Sample ID: 5tx4				Seq:	23	13:51:20 13 Nov 1999 HG			
~~Hg~~	~~1.91~~	~~ug/L~~	~~.000~~	~~1.91~~					~~9.65 ug~~

Line	Conc.	Units	SD/RSD	1	2	3	4	5
*** Sample ID: 5tx4dup				Seq: 24	13:53:46 13 Nov 1999 HG			
Hg	1.92	ug/L	.000	1.92				
*** Sample ID: 5tx5				Seq: 25	13:56:11 13 Nov 1999 HG			
Hg	-.020	ug/L	.000	-.020				
*** Sample ID: 5tx5dup				Seq: 26	13:58:31 13 Nov 1999 HG			
Hg	-.005	ug/L	.000	-.005				
*** Sample ID: 5tx6				Seq: 27	14:00:51 13 Nov 1999 HG			
Hg	1.28	ug/L	.000	1.28				
*** Sample ID: 5tx6dup				Seq: 28	14:03:14 13 Nov 1999 HG			
Hg	1.28	ug/L	.000	1.28				
*** Sample ID: 5tx7				Seq: 29	14:05:35 13 Nov 1999 HG			
Hg	.824	ug/L	.000	.824				
*** Sample ID: 5tx7dup				Seq: 30	14:07:57 13 Nov 1999 HG			
Hg	.830	ug/L	.000	.830				
*** Sample ID: 5tx8				Seq: 31	14:10:18 13 Nov 1999 HG			
Hg	1.54	ug/L	.000	1.54				
*** Sample ID: 5tx8dup				Seq: 32	14:12:42 13 Nov 1999 HG			
Hg	1.53	ug/L	.000	1.53				

RPD = 0.522%

9.70 ug

< 0.97 ug

RPD - N/A

< 0.97 ug

6.53 ug

RPD - N/A

6.53 ug

4.16 ug

RPD = 0.726%

4.19 ug

7.85 ug

RPD = 0.65%

7.80 ug

DDP 11/17/99 5tx6

*** Sample ID: 5mt36 Seq: 34 14:39:21 13 Nov 1999 HG

			:5		
Hg	.642	ug/L	.000	.642	16.2 16.21 ug/L

*** Sample ID: 5mt36dup Seq: 35 14:41:38 13 Nov 1999 HG RPD=0.775%

			:5		
Hg	.647	ug/L	.000	.647	16.34 ug/L

*** Sample ID: 5mt37 Seq: 36 14:43:55 13 Nov 1999 HG

			:5		
Hg	.789	ug/L	.000	.789	19.9 19.92 ug/L

*** Sample ID: 5mt37dup Seq: 37 14:46:13 13 Nov 1999 HG RPD=0.127%

			:5		
Hg	.788	ug/L	.000	.788	19.90 ug/L

*** Sample ID: ccb Seq: 38 14:48:31 13 Nov 1999 HG

Hg	-.020	ug/L	.000	-.020	<0.2 ug/L

*** Sample ID: ccv Seq: 39 14:50:48 13 Nov 1999 HG

Hg	2.04	ug/L	.000	2.04	102%

*** Sample ID: 5mt3 Seq: 40 14:53:16 13 Nov 1999 HG

Hg	-.007	ug/L	.000	-.007	<4.0 ug/L

*** Sample ID: 5mt3 dup Seq: 41 14:55:33 13 Nov 1999 HG RPD-N/A

Hg	.000	ug/L	.000	.000	<4.0 ug/L

*** Sample ID: 5mt3 trp Seq: 42 14:57:50 13 Nov 1999 HG RPD-N/A

Hg	.003	ug/L	.000	.003	<4.0 ug/L

*** Sample ID: 4mt13 Seq: 43 15:00:08 13 Nov 1999 HG

Hg	-.000	ug/L	.000	-.000	<0.64 ug

*** Sample ID: 4mt13dup Seq: 44 15:02:25 13 Nov 1999 HG RPD-N/A

Hg	-.002	ug/L	.000	-.002	<0.64 ug

*** Sample ID: 4mt13sox Seq: 45 15:04:43 13 Nov 1999 HG

Hg 1.04 ug/L .000 1.04 104%

*** Sample ID: 4mt33 Seq: 46 15:07:01 13 Nov 1999 HG

Hg .014 ug/L .000 .014 <0.60 ug

*** Sample ID: 4mt33 dup Seq: 47 15:09:18 13 Nov 1999 HG RPD-N/A

Hg .019 ug/L .000 .019 <0.60 ug

*** Sample ID: 4 mt34 Seq: 48 15:11:35 13 Nov 1999 HG

Hg .024 ug/L .000 .024 <0.60 ug

*** Sample ID: 4mt34 dup Seq: 49 15:13:52 13 Nov 1999 HG RPD-N/A

Hg .024 ug/L .000 .024 <0.60 ug

*** Sample ID: 4mt35 Seq: 50 15:16:09 13 Nov 1999 HG

Hg .023 ug/L .000 .023 <0.80 ug

*** Sample ID: 4mt35 dup Seq: 51 15:18:26 13 Nov 1999 HG RPD-N/A

Hg .019 ug/L .000 .019 <0.80 ug

*** Sample ID: 4mt16 Seq: 52 15:20:44 13 Nov 1999 HG

Hg .002 ug/L .000 .002 <0.56 ug

*** Sample ID: 4mt16dup Seq: 53 15:23:01 13 Nov 1999 HG RPD-N/A

Hg .001 ug/L .000 .001 <0.56 ug

*** Sample ID: 4mt30 Seq: 54 15:25:19 13 Nov 1999 HG

Hg .005 ug/L .000 .005 <0.66 ug

*** Sample ID: 4mt30dup Seq: 55 15:27:37 13 Nov 1999 HG RPD

Hg -.003 ug/L .000 -.003 <0.66 ug

*** Sample ID: 4mt31 Seq: 56 15:29:55 13 Nov 1999 HG

Hg -.004 ug/L .000 -.004 <0.74 ug

*** Sample ID: 4mt31duc Seq: 57 15:32:13 13 Nov 1999 HG RPD-N/A

Hg .002 ug/L .000 .002 <0.74 ug

*** Sample ID: 4mt32 Seq: 58 15:34:31 13 Nov 1999 HG

Hg .058 ug/L .000 .058 <0.66 ug

*** Sample ID: 4mt32duc Seq: 59 15:36:49 13 Nov 1999 HG

Hg .058 ug/L .000 .058 <0.66 ug

~~*** Sample ID: rbtx3 Seq: 60 15:39:07 13 Nov 1999 HG~~

~~Hg -.001 ug/L .000 -.001~~ <4.0 ~~<2.0~~ ug/L JDD 12/4

~~*** Sample ID: rbtx3duc Seq: 61 15:41:25 13 Nov 1999 HG~~ RPD-N/A

~~Hg .001 ug/L .000 .001~~ <4.0 ~~<2.0~~ ug/L JDD 12/4

*** Sample ID: ccb Seq: 62 15:43:43 13 Nov 1999 HG

Hg -.009 ug/L .000 -.009 <0.2 ug/L

*** Sample ID: ccv Seq: 63 15:46:01 13 Nov 1999 HG

Hg 2.04 ug/L .000 2.04 102%

~~*** Sample ID: 4tx1 Seq: 64 15:48:30 13 Nov 1999 HG~~

Hg -.010 ug/L .000 -.010 <0.54 ug ~~<0.27 ug x2~~ = JDD 12/1/99

*** Sample ID: 4tx1duc Seq: 65 15:50:48 13 Nov 1999 HG RPD-N/A

Hg -.009 ug/L .000 -.009 <0.54 ug ~~<0.27 ug~~ JDD 12/3/99

*** Sample ID: 4tx1trc Seq: 66 15:53:07 13 Nov 1999 HG RPD-N/A

Hg -.001 ug/L .000 -.001 <0.54 ug ~~<0.27 ug~~ JDD 12/3/99

*** Sample ID: 4tx2 Seq: 67 15:55:27 13 Nov 1999 HG

Hg .016 ug/L .000 .016 <0.58 ug ~~<0.29 ug~~ JDD 12/3/99

*** Sample ID: 4tx2duc Seq: 68 15:57:47 13 Nov 1999 HG RPD-N/A

~~Hg .020 ug/L .000 .020~~ <0.58 ug ~~<0.29 ug~~ JDD 12/3/99

*** Sample ID: 4tx2ssk Seq: 69 16:00:07 13 Nov 1999 HG

~~Hg .943 ug/L .000 .963~~ 96%

*** Sample ID: 4tx3 Seq: 70 16:02:32 13 Nov 1999 HG

Hg .003 ug/L .000 .003 <0.70ug ~~<0.35ug~~ 12/13/99

*** Sample ID: 4tx3dup Seq: 71 16:04:53 13 Nov 1999 HG RPD N/A

Hg .006 ug/L .000 .006 <0.70ug ~~<0.35ug~~ 12/13/99

*** Sample ID: 4tx4 Seq: 72 16:07:13 13 Nov 1999 HG

Hg .029 ug/L .000 .029 <0.68ug ~~<0.34ug~~ 12/13/99

*** Sample ID: 4tx4dup Seq: 73 16:09:33 13 Nov 1999 HG RPD N/A

Hg .030 ug/L .000 .030 <0.68ug ~~<0.34ug~~ 12/13/99

*** Sample ID: 4tx5 Seq: 74 16:11:53 13 Nov 1999 HG

Hg -.004 ug/L .000 -.004 <0.56ug ~~<0.28ug~~ 12/13/99

*** Sample ID: 4tx5dup Seq: 75 16:14:13 13 Nov 1999 HG RPD N/A

Hg -.004 ug/L .000 -.004 <0.56ug ~~<0.28ug~~ 12/13/99

*** Sample ID: 4tx6 Seq: 76 16:16:33 13 Nov 1999 HG

Hg .032 ug/L .000 .032 <0.56ug ~~<0.28ug~~ 12/13/99

*** Sample ID: 4tx6dup Seq: 77 16:18:53 13 Nov 1999 HG RPD N/A

Hg .031 ug/L .000 .031 <0.56ug ~~<0.28ug~~ 12/13/99

Line	Conc.	Units	SD/RSD	1	2	3	4	5
*** Sample ID: 4tx7				Seq: 78	16:48:51 13 Nov 1999 HG			
Hg	.021	ug/L	.000	.021				
*** Sample ID: 4tx7duo				Seq: 79	16:51:03 13 Nov 1999 HG			
Hg	.019	ug/L	.000	.019				
*** Sample ID: 4tx8				Seq: 80	16:53:25 13 Nov 1999 HG			
Hg	.058	ug/L	.000	.058				
*** Sample ID: 4tx8duo				Seq: 81	16:55:42 13 Nov 1999 HG			
Hg	.056	ug/L	.000	.056				
*** Sample ID: 7mt1				Seq: 82	16:57:59 13 Nov 1999 HG			
Hg	-.010	ug/L	.000	-.010				
*** Sample ID: 7mt1duo				Seq: 83	17:00:16 13 Nov 1999 HG			
Hg	-.012	ug/L	.000	-.012				
*** Sample ID: 11mt5				Seq: 84	17:02:33 13 Nov 1999 HG			
Hg	-.004	ug/L	.000	-.004				
*** Sample ID: 11mt5duo				Seq: 85	17:04:50 13 Nov 1999 HG			
Hg	-.003	ug/L	.000	-.003				
*** Sample ID: ccb				Seq: 86	17:07:07 13 Nov 1999 HG			
Hg	-.003	ug/L	.000	-.003				
*** Sample ID: ccv				Seq: 87	17:09:25 13 Nov 1999 HG			
Hg	2.06	ug/L	.000	2.06				
*** Sample ID: rbtx1				Seq: 88	17:11:54 13 Nov 1999 HG			
Hg	-.021	ug/L	.000	-.021				
*** Sample ID: rbtx1duo				Seq: 89	17:14:11 13 Nov 1999 HG			
Hg	-.015	ug/L	.000	-.015				

Line	Conc.	Units	SD/RSD	1	2	3	4	5
~~*** Sample ID: rbtx1trb~~				~~Seq: 90~~	~~17:18:02 13 Nov 1999 HG~~			RPD N 17
Hg	-.007	ug/L	.000	-.007				<0.2 ug/L
*** Sample ID: rbtx5				Seq: 91	17:20:19 13 Nov 1999 HG			
Hg	-.001	ug/L	.000	-.001				<0.2 ug/L
*** Sample ID: rbtx5cup				Seq: 92	17:22:36 13 Nov 1999 HG			
Hg	-.007	ug/L	.000	-.007				<0.2 ug/L
*** Sample ID: rbtx5spk				Seq: 93	17:24:53 13 Nov 1999 HG			
~~Hg~~	~~1.02~~	~~ug/L~~	~~.000~~	~~1.02~~				~~102%~~
*** Sample ID: ccb				Seq: 94	17:27:15 13 Nov 1999 HG			
Hg	-.021	ug/L	.000	-.021				<0.2 ug/L
*** Sample ID: ccv				Seq: 95	17:29:32 13 Nov 1999 HG			
Hg	2.08	ug/L	.000	2.08				104%

Dry Weight Results

Dry Weight/Total Volatile Solids (TVS) Notebook # 5

Sample Number	572238	572213	572216	572128	572292	572293
Client/Pan #	[redacted]	[redacted]	[redacted]	[redacted]	26	[redacted]
Wt of Pan + Sample	25.5232	24.2557	22.3020	25.6168	24.0367	22.4923
Wt after Drying	22.7840	22.8400	16.9488	21.4937	21.8974	19.8317
Wt of Pan or Wt After Ignition	1.0043	1.0050	1.0055	1.0035	0.9979	1.0047
Difference	21.7797	21.8350	15.9431	20.4902	20.8995	18.8270
Sample amount g	24.5189	23.2507	21.2965	24.6125	23.0388	21.4876
Result	88.8%	93.9%	74.9%	83.3%	90.7%	87.6%

Sample Number	572294	I.D. RUN1	RUN2	RUN3	RUN3	
Client/Pan #	28	MT POWER 29 RUN1	MT POWER 30 RUN2	MT POWER 11-11-99 CC ~~31~~ DUP 3	M.T. POWER 11-11-99 CC RUN3 ~~DUP (3)~~ 31	EPRI - 1 32
Wt of Pan + Sample	23.1603	21.8601	22.5004	10.2193	22.0079	21.5485
Wt after Drying	20.4049	19.4433	19.8475	9.0985	19.6366	18.9178
Wt of Pan or Wt After Ignition	1.0080	1.0027	0.9999	0.9970	0.9966	0.9983
Difference	19.3969	18.4406	18.8476	8.1015	18.6400	17.9195
Sample amount g	21.1523	20.8574	21.5005 ~~21.5005~~ 11-11-99 CC	9.2223	21.0113	21.5502
Result	87.6%	88.4%	87.7%	87.8%	88.7%	86.7%

Sample Number					Batch Number:
Client/Pan #	EPRI - 2 33	EPRI - 3 34	TMP - 1 35	TMP - 2 36	
Wt of Pan + Sample	21.1665	23.6819	21.3736	21.9284	Note:
Wt after Drying	18.5963	20.7818	15.2255	15.7792	Cont
Wt of Pan or Wt After Ignition	0.9969	0.9929	0.9882	0.9867	
Difference	17.5994	19.7889	14.2373	14.7925	
Sample amount g	20.1696	22.6890	20.3854	20.9417	
Result	87.2%	87.2%	69.8% ~~71.9%~~ QB	70.6%	

11/12

Analyst: CDC Date: 11-11-99

TestAmerica

METCO Particulate Analysis Record

METCO Environmental

Particulate Analysis EPA Method 5

Stack Filters

Job Number 99-166 Location Colstrip, Montana

Job Name Montana Power Co. Unit Tested Unit 3 Stack

Desiccator Time In	10/7				
Desiccator Time Out	1517 10/11	1122 10/12			

Run No. 1	Filter No. 88@H37				
Filter & Particulate + Tare Weight (g)					
Tare Weight (g)					
Filter & Particulate (g)	0.6264	0.6262	✓		

Filter & Particulate Average (g) 0.6263

Initial Filter Weight (g) 0.5210

Total Particulate (mg) 105.3

Run No. 2	Filter No. 88@H38				
Filter & Particulate + Tare Weight (g)					
Tare Weight (g)					
Filter & Particulate (g)	0.6120	0.6119	✓		

Filter & Particulate Average (g) 0.6120

Initial Filter Weight (g) 0.5229

Total Particulate (mg) 89.1

Run No. 3	Filter No. 88@H39				
Filter & Particulate + Tare Weight (g)					
Tare Weight (g)					
Filter & Particulate (g)	0.6160	0.6160	✓		

Filter & Particulate Average (g) 0.6160

Initial Filter Weight (g) 0.5226

Total Particulate (mg) 93.4

DPB 10/15/99

MG

Analyst

METCO Environmental

Particulate Analysis EPA Method 17

Thimbles and Backup Filters

Job Number 97-166 Location Colstrip, Montana

Job Name Montana Power Co. Unit Tested 3 & 4 Scrubber Outlet Duct

Desiccator Time In	10/7				
Desiccator Time Out	1502 10/11	1109 10/12			

Run No. 1	Thimble No. Q13		Filter No. 47034		
Thimble Final Weight (g)	18.7562	18.7540	✓ <1%		
Thimble Initial Weight (g)	3.0182	3.0182			
Particulate (g)	15.7380	15.7358	✓		
Filter & Particulate + Tare Weight (g)					
Tare Weight (g)			✓		
Filter & Particulate (g)	0.1055	0.1056	✓		

Filter and Particulate Average (g) 0.1056 ✓

Initial Filter Weight (g) 0.1057 ✓

Filter Particulate Average (mg) 0 ✓

Thimble Particulate Average (mg) 15,736.9 ✓

Total Particulate (mg) 15,736.9 ✓

1 of 2

Run No. 2	Thimble No. Q14		Filter No. 47035		
Thimble Final Weight (g)	12.2331	12.2277	✓ <1%		
Thimble Initial Weight (g)	3.1687	3.1687			
Particulate (g)	9.0644	9.0590			
Filter & Particulate + Tare Weight (g)					
Tare Weight (g)					
Filter & Particulate (g)	0.1018	0.1021	✓		

Filter and Particulate Average (g) 0.1020 ✓

Initial Filter Weight (g) 0.1048 ✓

Filter Particulate Average (mg) 0 ✓

Thimble Particulate Average (mg) 9,061.7 ✓

Total Particulate (mg) ———

2 of 2

Run No. 2 / 1	Thimble No. Q21		Filter No. ———		
Thimble Final Weight (g)	7.7848	7.7844	✓		
Thimble Initial Weight (g)	3.3465	3.3465			
Particulate (g)	4.4383	4.4379			
Filter & Particulate + Tare Weight (g)					
Tare Weight (g)					
Filter & Particulate (g)					

Filter and Particulate Average (g) ———

Initial Filter Weight (g) ———

Filter Particulate Average (mg) ———

Thimble Particulate Average (mg) 4,438.1 ✓

Total Particulate (mg) 13,499.8 ✓

DPB

MK

Analyst

METCO Environmental

Particulate Analysis EPA Method 17

Thimbles and Backup Filters

Job Number 99-166 Location Colstrip, Montana

Job Name Montana Power Unit Tested 3-6 Scrubber Inlet

Desiccator Time In					
Desiccator Time Out	1502 10/11	1115 10/12			

Run No. 3	Thimble No. 015		Filter No. 47036		
Thimble Final Weight (g)	19.2824	19.2814	✓ <1%		
Thimble Initial Weight (g)	3.2840	3.2840			
Particulate (g)	15.9984	15.9974			
Filter & Particulate + Tare Weight (g)					
Tare Weight (g)					
Filter & Particulate (g)	0.0970	0.0973	✓ ✓		

Filter and Particulate Average (g) 0.0972 ✓

Initial Filter Weight (g) 0.1040 ✓

Filter Particulate Average (mg) 0 ✓

Thimble Particulate Average (mg) 15,997.9 ✓

Total Particulate (mg) 15,997.9 ✓

Run No. _____	Thimble No. _____		Filter No. _____		
Thimble Final Weight (g)					
Thimble Initial Weight (g)					
Particulate (g)					
Filter & Particulate + Tare Weight (g)					
Tare Weight (g)					
Filter & Particulate (g)					

Filter and Particulate Average (g) _____

Initial Filter Weight (g) _____

Filter Particulate Average (mg) _____

Thimble Particulate Average (mg) _____

Total Particulate (mg) _____

Run No. _____	Thimble No. _____		Filter No. _____		
Thimble Final Weight (g)					
Thimble Initial Weight (g)					
Particulate (g)					
Filter & Particulate + Tare Weight (g)					
Tare Weight (g)					
Filter & Particulate (g)					

Filter and Particulate Average (g) _____

Initial Filter Weight (g) _____

Filter Particulate Average (mg) _____

Thimble Particulate Average (mg) _____

Total Particulate (mg) _____

OPS

Analyst

PHILIP ANALYTICAL SERVICES

INDUSTRIAL HYGIENE ENVIRONMENTAL TESTING

• EPA/NVLAP 101262-0 • NY DOH 10903 • NJ DEP 77678
• AIHA ACCREDITATION NO. 100439 • PA DER 06-353

ANALYTICAL REPORT

Client: METCO Environmental

Report to: Doug Saathoff
METCO Environmental
P. O. Box 598
Addison TX 75001

Project: 188437
Received: 24-NOV-99
Reported: 16-DEC-99

PURCHASE ORDER: 99-166

Project Description: Mt Power Co. #3 Unit

	AS RECEIVED BASIS	DRY BASIS	UNITS	METHOD	DATE	ANALYST
Run 1 Composite (Unit 3 Mil Composite)						
Lab Sample: 1384812						
sampled: 29-SEP-99 12:30						
Moisture, Total	11.4		%	D 3302	01-DEC-99	GLB
SHORT PROX - COAL						
Ash	14.9	16.8	%	D 3174	08-DEC-99	VJO
Sulfur	0.64	0.72	%	D 4239	08-DEC-99	VJO
Heating Value	9550	10780	BTU/lb	D 3286	07-DEC-99	VJO
Chloride, Total	< 0.01	< 0.01	%	E776/300.0	14-DEC-99	DRK
Run 2 Composite (Unit 3 Mil Composite)						
Lab Sample: 1384813						
sampled: 29-SEP-99 16:30						
Moisture, Total	12.0		%	D 3302	01-DEC-99	GLB
SHORT PROX - COAL						
Ash	15.8	18.0	%	D 3174	08-DEC-99	VJO
Sulfur	0.65	0.74	%	D 4239	08-DEC-99	VJO
Heating Value	9300	10570	BTU/lb	D 3286	07-DEC-99	VJO
Chloride, Total	< 0.01	< 0.01	%	E776/300.0	14-DEC-99	DRK
Run 3 Composite (Unit 3 Mil Composite)						
Lab Sample: 1384814						
sampled: 30-SEP-99 11:30						
Moisture, Total	11.4		%	D 3302	01-DEC-99	GLB
SHORT PROX - COAL						
Ash	15.3	17.3	%	D 3174	08-DEC-99	VJO
Sulfur	0.67	0.76	%	D 4239	08-DEC-99	VJO
Heating Value	9470	10690	BTU/lb	D 3286	07-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: 188437

	AS RECEIVED BASIS	DRY BASIS	UNITS	METHOD	DATE	ANALYST
Run 3 Composite (Unit 3 Mil Composite)						
Lab Sample: 1384814 - continued						
Chloride, Total	0.01	0.01	'	E776/300.0	14-DEC-99	DRK

< Indicates less than the limit of quantitation.

Philip Analytical Services
Quality Assurance Protocol

PAS Sample#: All Projects Listed

Client Name: Metco

PAS Project#:188437,188461

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.	Matrix Spike Recovery	Matrix Spike Dup Conc.	Matrix Spike Dup 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.	Matrix Spike Recovery	Sample Conc.	Sample Duplicate Conc.	Precision RPD	Spikes Conc.	Found Conc.	Recovery		
1384814-Ash					16.4	16.4	0	11.8	11.9	101	N/A	0.01
1384814-Sulfur					0.72	0.69	4.3	1.78	1.77	99	N/A	0.01
1384814 Heating Value					10160	10160	0	13350	13400	100	N/A	50
1384814-Chlorine					0.01	0.01	0	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 # 99-166 Job ID MT POWER CO. #3 UNIT
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 ⇨ 188437

BTU CONTENT ASTM-D-3286
FLY ASH ASTM-D-3174
SULFUR ASTM-D-5016
CHLORIDE ASTM-?

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
1.	RUN 1 COMPOSITE			9/29/99	0830-1230	X	X	X	X
2	RUN 2 COMPOSITE			9/29/99	1330-1630	X	X	X	X
3	RUN 3. COMPOSITE			9/30/99	0815-1130	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):

		Date	Time
Samples relinquished to shipper or courier by:	[signature]	11-19-99	1600
Samples received by:			

		Date	Time
Samples Relinquished by:	Samples Relinquished to:		
Samples Relinquished by:	Samples Relinquished to Laboratory: [signature]	11/24	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 "Unit 3 Mil Composite" [signature] 11-24-99

^ 12/13/99 + page 1

Meter 188437
FF 1384812

SAMPLE ID:		INPUT AIR DRY	AS RECEIVED	DRY BASIS
AIR DRY LOSS:	%	5.71	5.71	****
MOISTURE:	%	6.05	5.70 711.4	****
VOLATILE MATTER:	%	0.00	0.00	0.00
FIXED CARBON:	%	****	73.69	83.18
ASH:	%	15.80	14.90	16.82
PROXIMATE TOTAL:	%	****	100.00	100.00
HEATING VALUE:	BTU/LB	10127	9550	10780
SULFUR:	%	0.68	0.64	0.72
CARBON:	%	0.00	0.00	0.00
HYDROGEN EXCL WATER:	%	0.00	-0.64	-0.72
HYDROGEN INCL WATER:	%	0.00	0.64	****
NITROGEN:	%	0.00	0.00	0.00
CHLORINE:	%	0.00	0.00	0.00
OXYGEN EXCL WATER:	%	****	73.68	83.18
OXYGEN INCL WATER:	%	83.52	83.82	****
ULT TOTAL EXCL WATER:	%	****	100.00	100.00
ULT TOTAL INCL WATER:	%	100.00	100.00	****

^ 12/13/99 + page 1

Miller
188437
#1384813

SAMPLE ID:		INPUT AIR DRY	AS RECEIVED	DRY BASIS
AIR DRY LOSS:	%	6.16	6.16 > 12.0	****
MOISTURE:	%	6.27	5.88	****
VOLATILE MATTER:	%	0.00	0.00	0.00
FIXED CARBON:	%	****	72.19	82.08
ASH:	%	16.80	15.77	17.92
PROXIMATE TOTAL:	%	****	100.00	100.00
HEATING VALUE:	BTU/LB	9908	9300	10570
SULFUR:	%	0.69	0.65	0.74
CARBON:	%	0.00	0.00	0.00
HYDROGEN EXCL WATER:	%	0.00	-0.66	-0.75
HYDROGEN INCL WATER:	%	0.00	0.69	****
NITROGEN:	%	0.00	0.00	0.00
CHLORINE:	%	0.00	0.00	0.00
OXYGEN EXCL WATER:	%	****	72.20	82.09
OXYGEN INCL WATER:	%	82.51	82.90	****
ULT TOTAL EXCL WATER:	%	****	100.00	100.00
ULT TOTAL INCL WATER:	%	100.00	100.00	****

^ 12/13/99 + page 1

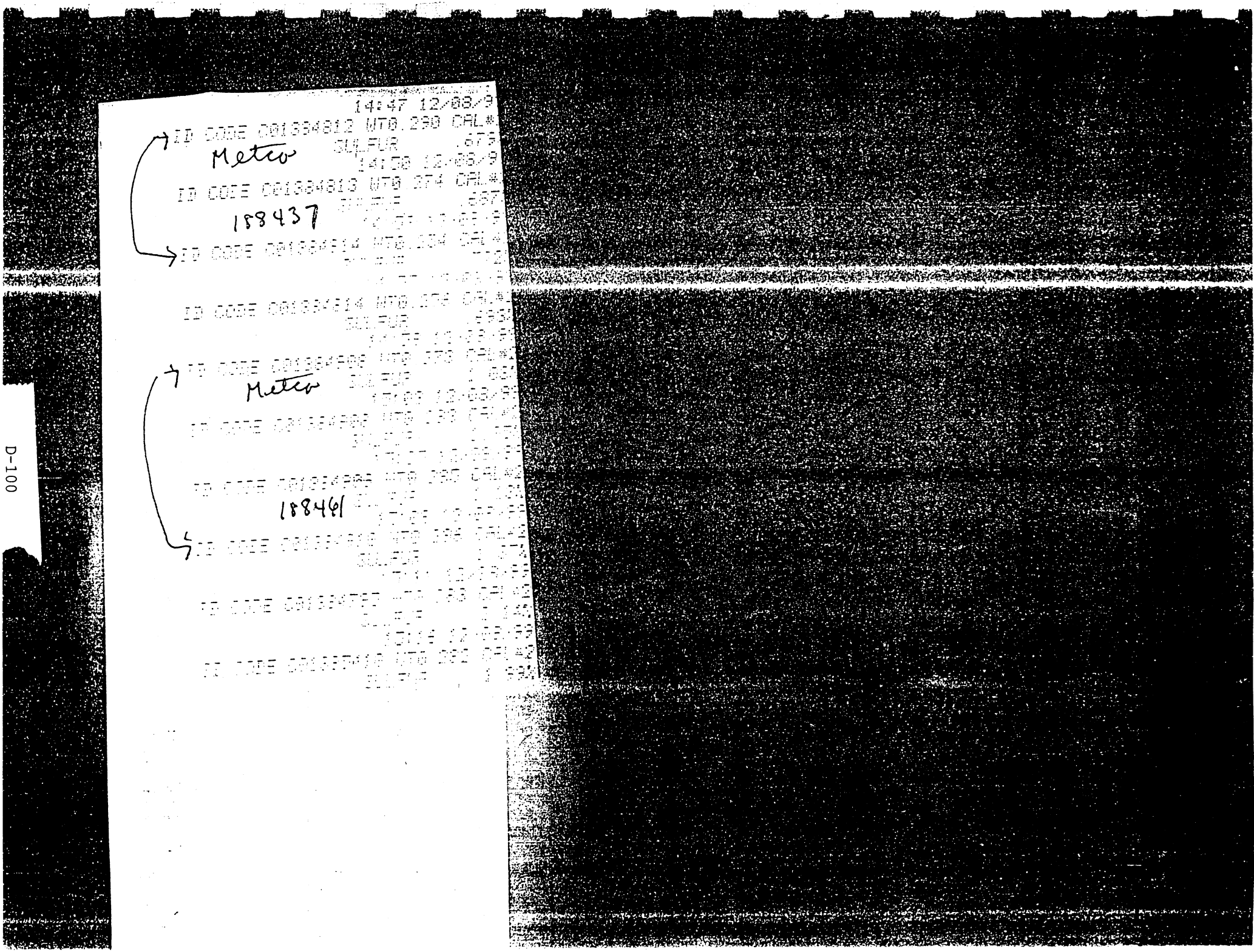
Metco
1384814
PN 18843

SAMPLE ID:		INPUT AIR DRY	AS RECEIVED	DRY BASIS
AIR DRY LOSS:	%	6.58	6.58	****
MOISTURE:	%	5.11	4.77 > 11.4	****
VOLATILE MATTER:	%	0.00	0.00	0.00
FIXED CARBON:	%	****	73.33	82.72
ASH:	%	16.40	15.32	17.28
PROXIMATE TOTAL:	%	****	100.00	100.00
HEATING VALUE:	BTU/LB	10139	9470	10690
SULFUR:	%	0.72	0.67	0.76
CARBON:	%	0.00	0.00	0.00
HYDROGEN EXCL WATER:	%	0.00	-0.53	-0.60
HYDROGEN INCL WATER:	%	0.00	0.74	****
NITROGEN:	%	0.00	0.00	0.00
CHLORINE:	%	0.00	0.00	0.00
OXYGEN EXCL WATER:	%	****	73.19	82.56
OXYGEN INCL WATER:	%	82.88	83.27	****
ULT TOTAL EXCL WATER:	%	****	100.00	100.00
ULT TOTAL INCL WATER:	%	100.00	100.00	****

Moisture

rev 1.0 - 3/10/99

Sample #	Tare wt. of Dish (g)	Wet Wt. Sample + Dish (g)	Dry Wt. Sample + Dish	% Moisture	
1384806	428.9	1259.9	1231.8	3.38	
1384807	421.5	1442.6	1407	3.49	12/1/99
1384808	428	1475.3	1437.7	3.59	
1384812	461.7	773.3	755.5	5.71	
1384813	434.3	811	787.8	6.16	12/1/99
1384814	433.1	676.4	660.4	6.58	
1384787	431.1	1792	1692.6	7.30	
1384788	428.9	1792.6	1660.7	9.67	12/1/99
1384789	428.1	1564	1459.4	9.21	
1384908	423.3	1618.1	1479.4	11.6	
1384909	436.4	1520.5	1383.4	12.6	12/2/99
1384910	427.1	1380.4	1248.4	13.8	


Metco
188437
Metco
188461

Coal/RDF Proximate Analysis

DATE: 12/9/99

Signature: V. O'Neill

CLIENT	control	Mitco						
Laboratory Number	98	1384808	1384812	1384813	1384814	1384814 (Dup)	1384908	1384909
all weights in grams								
% Air-dry Loss		3.57	5.71	6.16	6.58		11.6	12.6
Weight of Crucible and Sample	23.0274	19.2332	22.9165	18.6722	21.2167	20.4690	21.6760	18.3184
Weight of Crucible	21.7890	18.3099	21.9169	17.6813	20.2533	19.3785	20.6199	17.1620
Weight of Sample	1.2384	.9233	.9996	.9909	.9634	1.0905	1.0561	1.1564
Weight of Crucible and Sample	23.0274	19.2332	22.9165	18.6722	21.2167	20.4690	21.6760 21.5105	18.3184
Weight after 105 deg. C	23.0157	19.2222	22.8560	18.6101	21.1675	20.4135	~~21.5098~~	18.1588
Weight loss (moisture)	.0117	.0110	.0605	.0621	.0492	.0555	.1655	.1596
% Residual Moisture	0.94	1.19 ~~11.9~~	6.05 ~~3.15~~	6.27	5.11	5.09	15.7	13.8
Weight of Crucible and Sample								
Weight of Crucible								
Weight of Sample								
Weight of Crucible and Sample								
Weight after 950 deg. C for 7 min.								
Weight loss (Volatiles)								
% Volatiles								
% Residual Moisture								
% Volatile Matter								
Weight after 750 deg. C	21.9369	18.3996	22.0758	17.8480	20.4111	19.5569	20.7217	17.2787
Weight of Crucible	21.7890	18.3099	21.9169	17.6813	20.2533	19.3785	20.6199	17.1620
Weight of Ash	.1479	.0897	.1589	.1667	.1578	.1784	.1018	.1167
% Ash	11.9	9.72	15.8 ~~8.26~~	16.8	16.4	16.4	9.64	10.1
% Sulfur		1.41	0.68	0.69	0.72		1.03	1.13
BTU per pound		13407	10143	9924	10155		9970	10142
BTU sulfur correction		32	16	16	16		24	26
BTU per pound, corrected		13375	10127	9908	10139		9946	10116
BTU per pound, Moisture Ash Free								
		188435		188437			18846	

D-101

Date	Lab No.	Client	BTU/Lbs	BTU/Lbs Sulfur	BTU/Gals	Remarks	Oper.
12/2/99	1384789	Metco	12330			188427	MD
	1384792	"	11562			"	
	1384793	"	11524			188429	
	1384794	"	11843			"	
	1384796	"	13184			188431	
	1384797	"	13712			"	
Dup.	1384797	"	13686			"	
	1384798	"	13281			"	
	1384795	Kimberly C	09200			188430	
	1384801	Metco	09107			188433	
12/7/99							
	1384755	CER	7240			188418	RM
	1384756	"	7736			"	
	1384757	"	7493			"	
	1384694	Lehigh Univ	18348	18327		188398	
	1384695	"	18437	18418		"	
	1384802	Metco	7523	7523		188433	
	1384803	"	6855			"	
(Dup)	1384803	"	6822			"	
	1384806	"	11971			188435	
	1384807	"	13451			"	
	1384808	"	13407			"	
	1384812	"	10143			188437	
	1384813	"	9924			"	
	1384814	"	10155			"	
(Dup)	1384814	"	10155			"	
	1384908	"	9970			188461	
	1384909	"	10141			"	
	1384910	"	10516			"	
	1384815	Raytheon	Raytheon	8776		188437	
(Dup)	1384910	~~Raytheon~~	10535			188461	
	1384816	Raytheon	18772			188429	
	1384817	"	19556			"	
	1384818	"	19602			"	
	1384819	"	18617			"	
	1385280	Maine Env.	18813			188536	
	1385377	Merck	19399			188553	
	1385401	Budd Co.	Kimberly	18723		188541	
	1385416	Kimberly Cl.	9257			188565	
(Dup)	1385280	Maine Env.	18398			188536	

CHLORINE, BOMBING TITRATION

DATE/ TIME	SAMPLE #	SAMPLE WT. (g)	ANALYST	DATE/ TIME	$AgNO_3$ (ml)	mv readings	1st DERIVATIVE	2nd DERIVATIVE	END POINT (ml)	NORMALITY of $AgNO_3$ and Standardization Reference	BLANK CORRECT	% CHLORINE	ANALYST
12/9/99	1384807 188435	50/0.5444	RHD		12.081 mg/l × 50/0.5444 × .0001 = 0.11% Chlorine								
	1384808	50/0.5234			11.564 mg/l × 50/0.5234 × .0001 = 0.11% Chlorine								
	1384812 188437	50/0.4925			< 1.000 mg/l × 50/0.4925 × .0001 = < 0.01% Chlorine								
	1384813	50/0.4708			< 1.000 mg/l × 50/0.4708 × .0001 = < 0.01% Chlorine								
	1384814	50/0.5594			1.375 mg/l × 50/0.5594 × .0001 = 0.01% Chlorine								

D-103

0098

TestAmerica
INCORPORATED

Sample ID: **Montana Power Company**
Colstrip Power Plant
Colstrip Montana
Coal Samples

Hg Analysis
ASTM D6414-99

Collected On: 9/29/99 for Run 1 and Run 2, 9/30/99 for Run 3 Composite
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	0.063	0.062	<1.0	ug/g	93.7	*1	
Run 2 Composite	12/20/99	12/24/99	jpp	0.066	0.067	2.4	ug/g	93.7		
Run 3 Composite	12/20/99	12/24/99	jpp	0.067	0.067	<1.0	ug/g	94.5		

Notes: *1 - Sample was analyzed in triplicate. The triplicate result was 0.061 ug/g with an RPD of 2.5 %.

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 Davis Date: 12/6/09 Time: 9:30 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, STRAITON, 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# 99-166 Unit Tested Unit 3

CHAIN OF CUSTODY RECORD

Facility Name/Location
Montana Power Company
Colstrip Power Plant
Colstrip, Montana

Collected By/Company
Montana Power Company

SAMPLE I.D.	DATE	TIME	AIR	SOLID	COMP	GRAB	# OF CONTAINERS	RECOVERED BY	Chloride	PART.	SO2	SO3	PCDD/PCDF	SEMI-VOC	POHC's	METALS	Hg	Fly Ash	Btu	REMARKS (Specific Compounds/Methods)
Fuel & Slurry Samples																				Analyze according to ASTM D6414-99 A, D-3286, D-5016, D-3174
Run 1 Composite	9/29/99	0830-1230			X		I	mc	X								X	X	X	0830-1230
Run 2 Composite	9/29/99	1330-1630			X		I	mc	X								X	X	X	1330-1630
Run 3 Composite	9/30/99	0815-1130			X		I	mc	X								X	X	X	0815-1130
SCR6 Slurry	9/29/99					X	I													Archive to Analyze if high Hg in Fuel.
																				→ Archived @ Metco DRB

Received by:	Date:	Time:	Transported by:	Date: 9-30-99	Time: 1315	Received at Lab by:	Date: 10/4/99	Time: 1100
Analyzed by:	Date:	Time:	Data Reviewed by:	Date: 11/9/99	Time:	Remarks:		

Ship to: TestAmerica

METCO ENVIRONMENTAL

D-106

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 IH) ⇨
# of Containers ⇨
Preserved? (Y/N) ⇨

Report Results To:

PO # 99-166 Job ID MT POWER CO. #3 UNIT
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: BIO CONTENT (ASTM-D-3286), FLY ASH (ASTM-D-3174), SULFUR (ASTM-D-3016), CHLORIDE (ASTM-?)

Page 1 of 1
PAS Quote#

Sampled by: SAMPLE DESCRIPTION	Air Vol (L or min)	Matrix Type	Date Sampled	Time Sampled					Comments/Hazards/Location Details
1. RUN1 COMPOSITE			9/29/99	0930-1630	X	X	X	X	ATTN: CHRIS WEATHINGTON
2 RUN2 COMPOSITE			9/29/99	1330-1630	X	X	X	X	TEST AMERICA, INC.
3 RUN3. COMPOSITE			9/30/99	0815-1130	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!

Special Instructions (including Data Deliverables and Turn Around Time):

Samples relinquished to shipper or courier by:	Date	Time
Samples received by:	11-19-99	1600
	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:

D-107
TOTAL P.05
NOV-15-1999 11:18 FROM

NONAQUEOUS MERCURY BATCH SHEET

Analyst: JRP Date: 12/20/19 12/24/19 Water Bath: start mid end

Standard Reference: 65-417 temp: _____

ICV Reference: 65-41-18 date: _____

%DDW		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		
95.1	6	1384792 [redacted]	1.0235 g		
94.1	7	1384793	1.0080 g		
96.0	8	1384794	1.0522 g		
93.7	9	1384812 TRP Montana Power	1.0296 g		
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		
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		
90.3	18	1384771 [redacted]	1.0139 g		
89.8	19	1384772 TRP	1.0105 g		
90.1	20	1384773 SPK	.0365 g		
	2	NIST 1630 A	1.0390 g	=0.077 mg/kg	
	1	Blank			

MB

ICV

MS

MSD

RPD

FLAG

HNO3 65-48-14

HCl 65-46-1

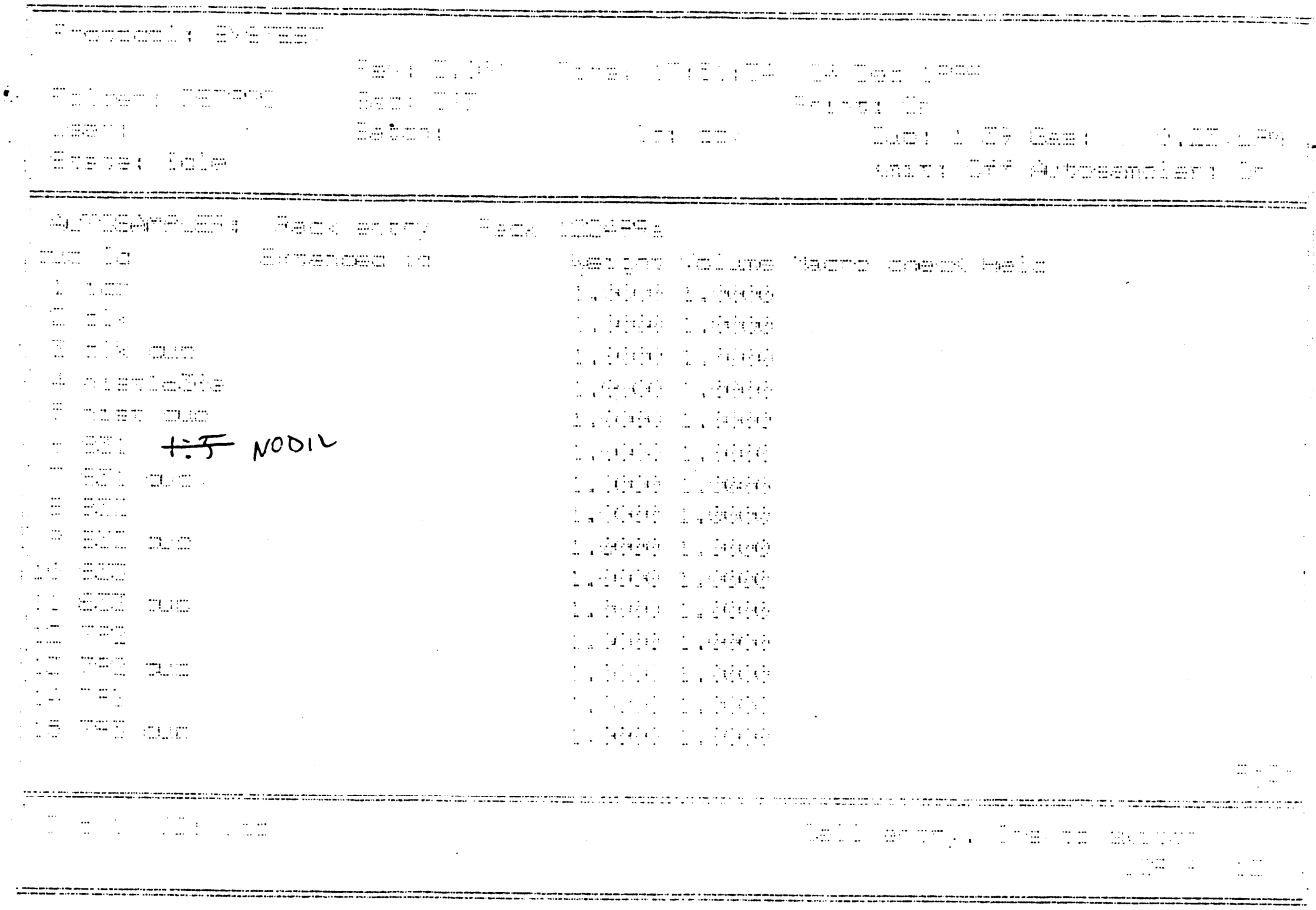
KMnO4 -65-33-1

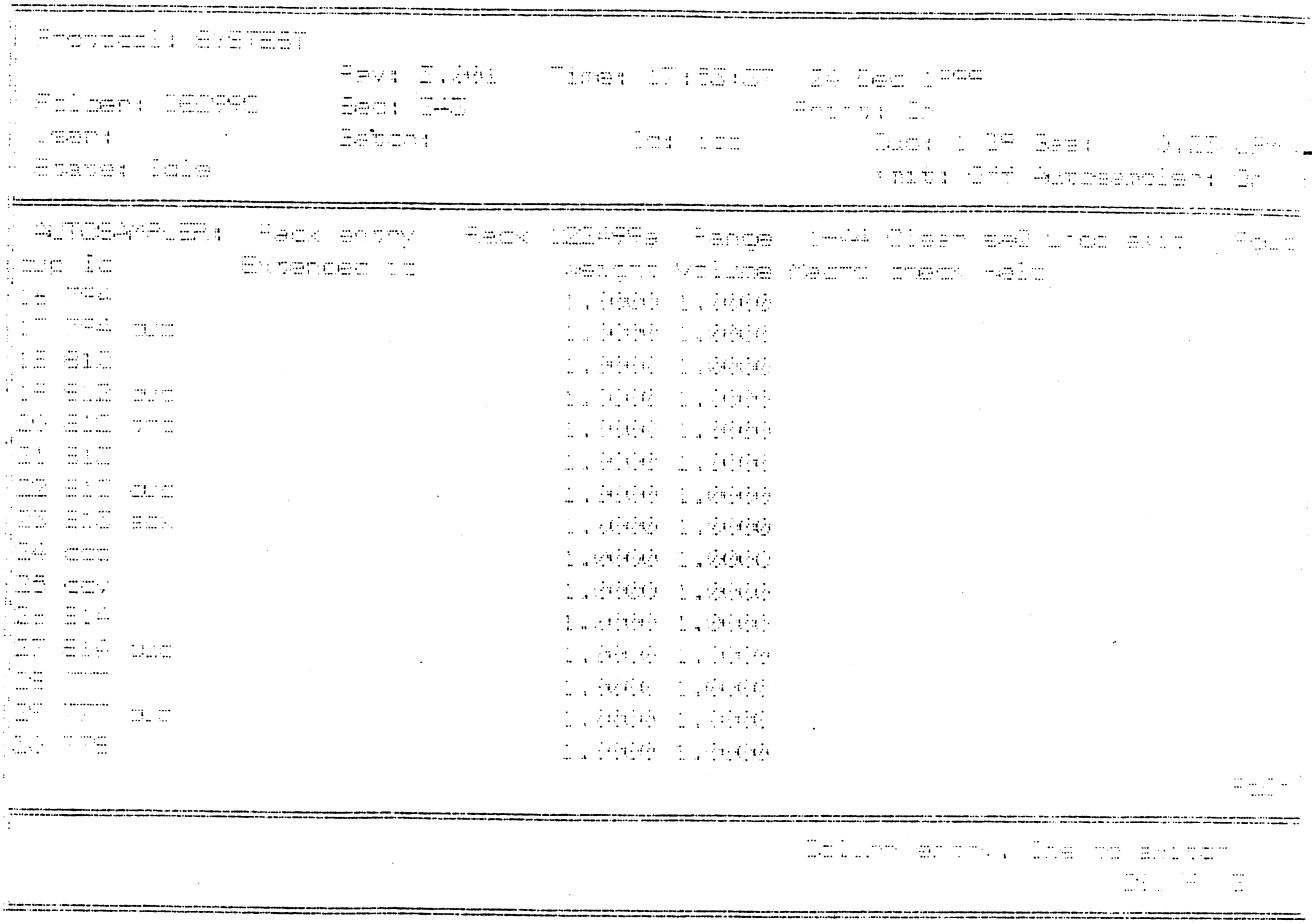
~~SnCl2 65-50-6~~

SnCl2 - 66-31-19

SECONDARY DATA CHECK: analyst:
date:

Comments: V_F = 50mL NIST 1630A = 0.106 ± ~~0.023~~ 0.032 mg/kg ~~JRP 4/6~~





*** 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/PSD	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

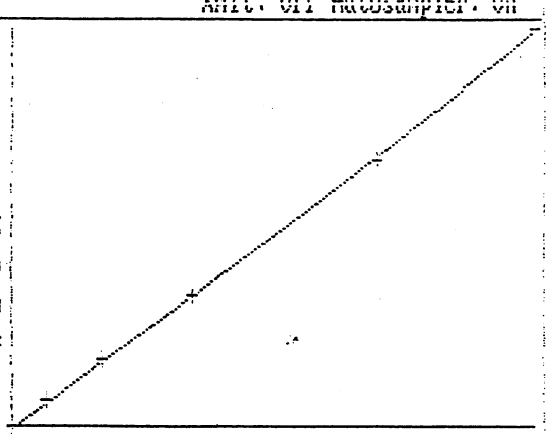
Protocol: SYSTEST
Rev: 3.001 Time: 15:48:16 24 Dec 1999
Folder: DEC99C Seq: 298 Print: On
User: Batch: Id: Std6Rep1 Cup: 1 29 Gas: 0.23 LPM
State: Idle Xmit: Off Autosampler: On

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

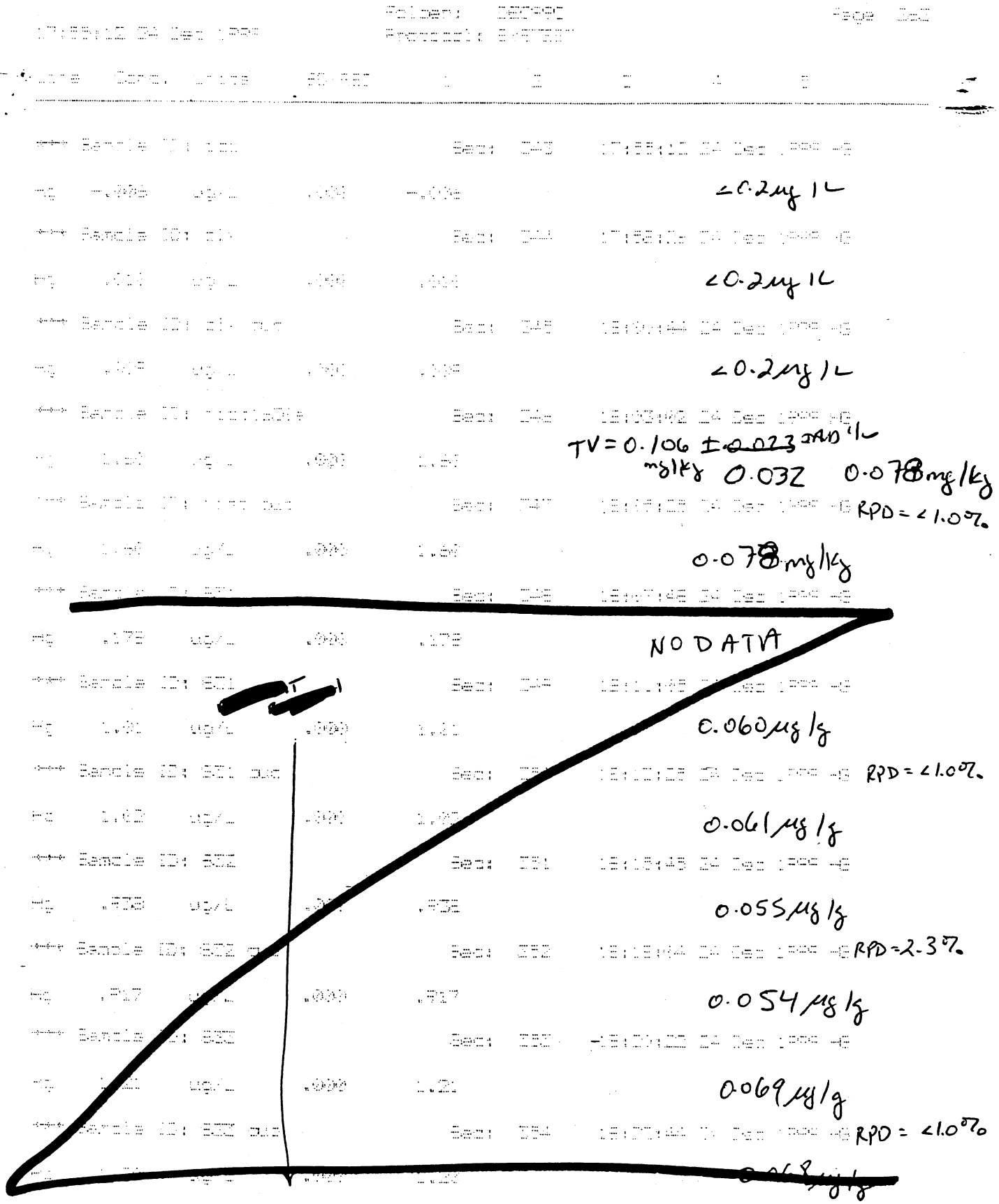
A .0000000 r .999889
B 2.48732e-5 C -5.41651e-3

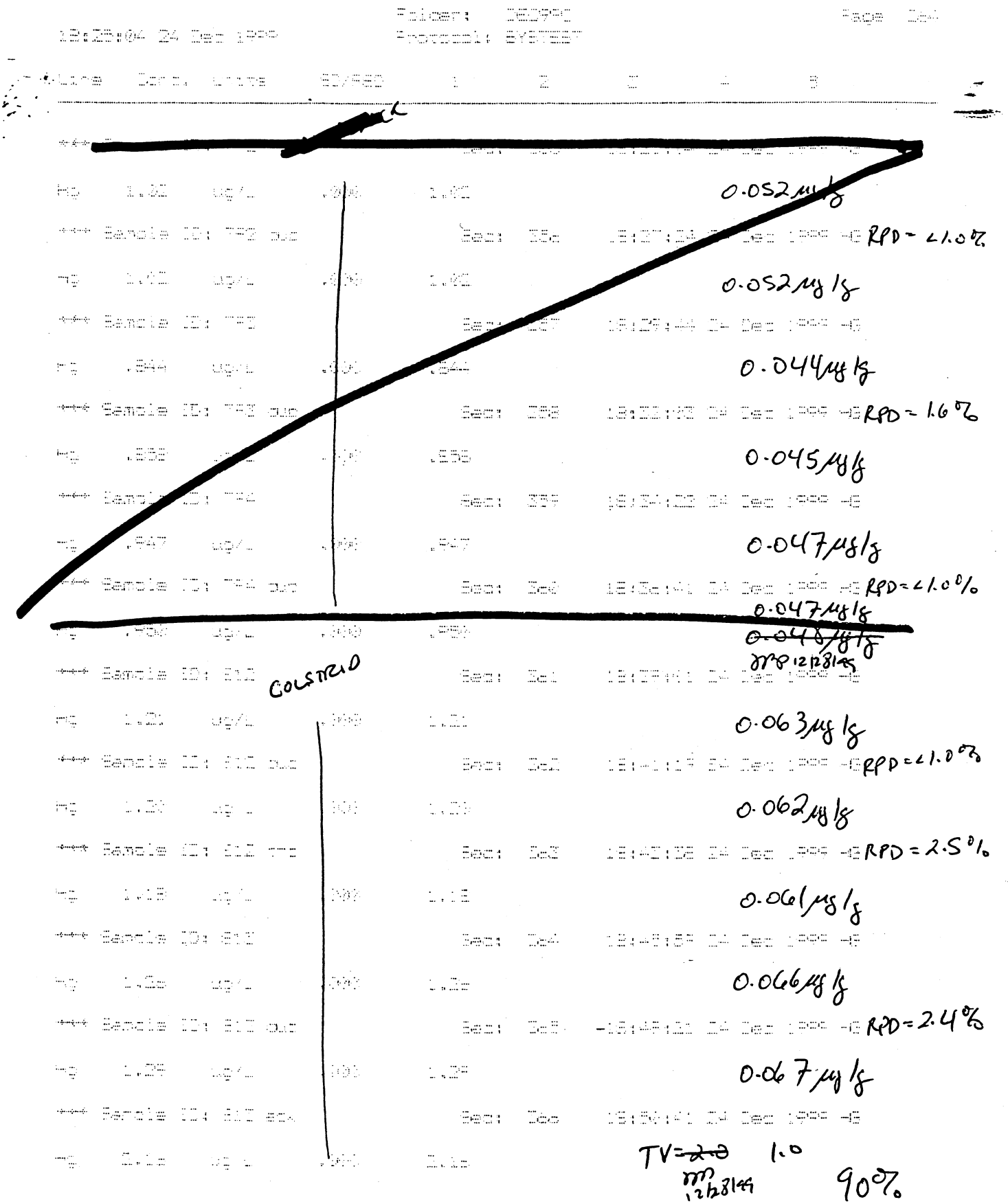


	Mean	%RSD	
S1	172	0	172
S2	8051	0	8051
S3	20347	0	20347
S4	40126	0	40126
S5	81928	0	81928
S6	120049	0	120049

33?

New calibration coefficients stored 149 2 5

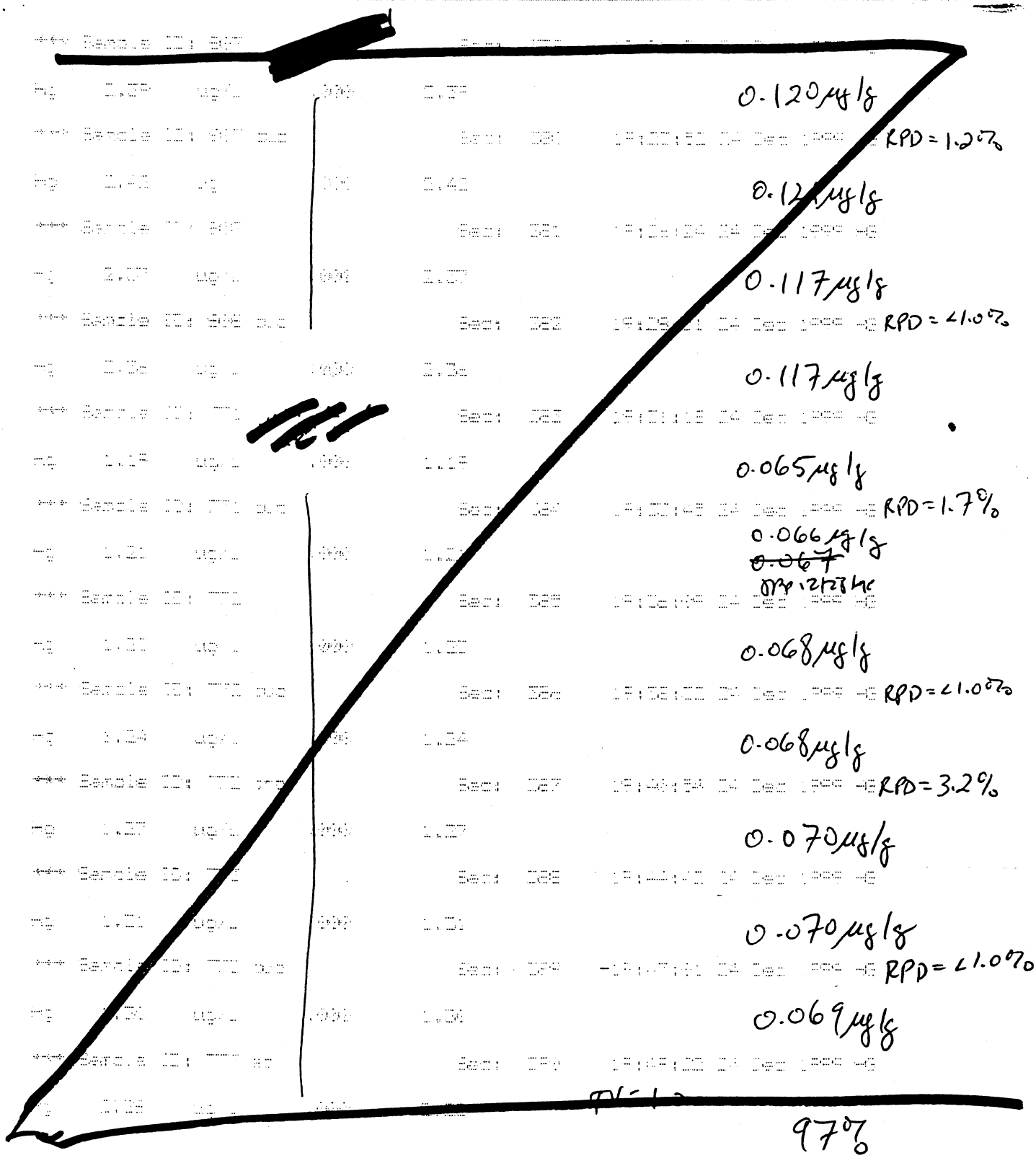

< 0.2 µg/L
< 0.2 µg/L
< 0.2 µg/L
TV = 0.106 ± 0.023 mg/kg
0.032 0.078 mg/kg
RPD = < 1.0%
0.078 mg/kg
NO DATA
0.060 µg/g
RPD = < 1.0%
0.061 µg/g
0.055 µg/g
RPD = 2.3%
0.054 µg/g
0.069 µg/g
RPD = < 1.0%


0.052 µg/g
RPD = 21.0%
0.052 µg/g
0.044 µg/g
RPD = 1.6%
0.045 µg/g
0.047 µg/g
RPD = 21.0%
0.047 µg/g
0.048 µg/g
0.063 µg/g
RPD = 21.0%
0.062 µg/g
RPD = 2.5%
0.061 µg/g
0.066 µg/g
RPD = 2.4%
0.067 µg/g
TV = 1.0
90%

18:53:12 24 Dec 1999 Folder: DEC99C Page 265
Protocol: SYSTEST

Line	Conc.	Units	SD/RSD	1	2	3	4	5	
*** Sample ID: ccb				Sec: 367	18:53:12 24 Dec 1999 HG				
Hg	-.029	ug/L	.000	-.029					<0.2 µg/L
*** Sample ID: ccv				Sec: 368	18:55:31 24 Dec 1999 HG				
Hg	2.06	ug/L	.000	2.06					TV = 2.0 103%
*** Sample ID: 814				Sec: 369	18:58:01 24 Dec 1999 HG				
Hg	1.28	ug/L	.000	1.28					0.067 µg/g
*** Sample ID: 814 dup				Sec: 370	19:00:21 24 Dec 1999 HG				RPD = <1.0%
Hg	1.28	ug/L	.000	1.28					0.067 µg/g
*** [illegible]				Sec: [illegible]	[illegible]				
Hg	.595	ug/L	.000	.595					0.029 µg/g
*** Sample ID: 777 dup				Sec: 372	19:05:00 24 Dec 1999 HG				RPD = 1.3%
Hg	.590	ug/L	.000	.590					0.029 µg/g
*** Sample ID: 778				Sec: 373	19:07:19 24 Dec 1999 HG				
Hg	.484	ug/L	.000	.484					0.024 µg/g
*** Sample ID: 778 dup				Sec: 374	19:09:39 24 Dec 1999 HG				RPD = <1.0%
Hg	.487	ug/L	.000	[illegible]					0.024 µg/g
*** Sample ID: 779				Sec: 375	19:11:58 24 Dec 1999 HG				
Hg	.404	ug/L	.000	.404					0.021 µg/g
*** Sample ID: 779 dup				Sec: 376	19:14:17 24 Dec 1999 HG				RPD = 1.9%
Hg	.412	ug/L	.000	.412					0.021 µg/g
*** Sample ID: 806				Sec: 377	19:16:37 24 Dec 1999 HG				
Hg	1.62	ug/L	.000	1.62					0.081 µg/g
*** Sample ID: 806 dup				Sec: 378	19:19:00 24 Dec 1999 HG				RPD = <1.0%
Hg	[illegible]	ug/L	.000	[illegible]					0.081 µg/g

COLSTRIP


0.120 µg/g
RPD = 1.2%
0.117 µg/g
RPD = <1.0%
0.117 µg/g
0.065 µg/g
RPD = 1.7%
0.066 µg/g
0.068 µg/g
RPD = <1.0%
0.068 µg/g
RPD = 3.2%
0.070 µg/g
0.070 µg/g
RPD = <1.0%
0.069 µg/g
97%

19:51:45 24 Dec 1999 Folder: DEC99C Page 267
Protocol: SYSTEST

Line	Conc.	Units	SD/REC	1	2	3	4	5
*** Sample ID: ccc				Sec: 291	19:51:45 24 Dec 1999 HG			
Hg	-.028	ug/L	.000	-.028				
*** Sample ID: cc.				Sec: 292	19:54:03 24 Dec 1999 HG			
Hg	2.05	ug/L	.000	2.05				

<0.2 µg/L

TV=2.0

103%

Dry Weight(DW)/Total Volatile Solids (TVS) Notebook # 6

Sample Number/ Test (DW/TVS)	[illegible]	1386555	1386556	1384774	1384775	1384776
Client/Pan #	BB R1 1	BB R2 2	BB R3 3	GIBSON R1 4	GIBSON R2 5	GIBSON R3 6
Wt of Pan + Sample	6.6673	8.1660	5.8079	9.8969	10.9249	11.7093
Wt after Drying	5.9013	6.9834	5.0069	9.2599	10.3443	11.0886
Wt of Pan or Wt After Ignition	0.9782	0.9820	0.9836	0.9649	0.9842	0.9783
Difference	4.9231	6.0014	4.0233	8.2750	9.3601	10.1103
Sample amount g	5.6891	7.1840	4.8233	8.9120	9.9807	10.7310
Result	86.5%	83.5%	83.4%	92.9%	93.8%	94.2%

Sample Number/ Test (DW/TVS)	1384806	1384807	1384808	1384777	1384777	1384778
Client/Pan #	JANNIS R1 7	—— R2 8	—— R3 9	WINDOWS CRK 10 R1	DUP 11 R1	→ 12 R2
Wt of Pan + Sample	10.1893	8.7766	9.8541	7.6504	6.6912	11.7089
Wt after Drying	10.025	8.6516	9.7607	6.7662	6.4253	11.2141
Wt of Pan or Wt After Ignition	0.9782	0.9775	0.9737	0.9801	0.9801	0.9784
Difference	9.0476	7.6741	8.7870	5.7861	5.4452	10.2357
Sample amount g	9.2111	7.7571	8.8804	6.0703	5.7111	10.7305
Result	98.2%	98.9%	98.9%	95.3%	95.3%	95.4%

Sample Number/ Test (DW/TVS)	[illegible]	1384812	1384813	1384814
Client/Pan #	WINDOWS CRK 13 R3	MONTANA 14 R1	→ 15 R2	→ 16 R3
Wt of Pan + Sample	7.2461	8.0743	7.7099	6.3980
Wt after Drying	6.2648	7.6309	7.2845	6.0976
Wt of Pan or Wt After Ignition	0.9778	0.9804	0.9812	0.9779
Difference	5.9870	6.6507	6.2033	5.1197
Sample amount g	6.2683	7.0941	6.7287	5.4201
Result	95.5%	93.7%	93.7%	94.5%

Batch Number ——
TVS -
DW - 3395

Note:
METCO COALS
CONTD -

Analyst: LO Date: 12/21/99

TestAmerica INCORPORATED

APPENDIX E

Unit Operational Data

Enertec NTDAHS®
Average Values Report
01/03/00 14:18

Company: Montana Power Company
Plant: Colstrip Generating Station
City/St: Colstrip, MT 59323
Source: unit_3_stack

Period Start: 09/29/99 06:00
Period End: 09/29/99 18:00
Validation Type: 1/15 min
Averaging Period: 15 min
Type: Block Avg

Period Start	Average 3 SO2 ppm ppm	Average 3 NOx ppm ppm	Average 3 CO2 %	Average 3 Opacity %	Average 3 Stk Flow kscfm	Average 3 Stk Temp deg F	Average 3 UnitLoad MWG
09/29/99 06:00	49.83	248.3	11.91	22.1	2071.9	177.1	809.1
09/29/99 06:15	48.91	246.9	11.85	20.5	2087.2	178.6	803.0
09/29/99 06:30	44.94	244.0	11.96	18.0	2036.6	189.5	803.2
09/29/99 06:45	43.38	245.5	11.98	17.0	2030.5	189.5	805.4
09/29/99 07:00	42.25	245.7	12.01	16.5	1535.4	196.1	807.1
09/29/99 07:15	43.51	245.0	11.97	16.8	2039.7	189.9	803.2
09/29/99 07:30	41.69	245.6	11.90	17.1	2046.0	189.8	806.9
09/29/99 07:45	40.58	247.1	11.92	17.5	2032.4	189.9	804.4
09/29/99 08:00	40.10	245.7	11.95	16.5	2031.5	189.9	805.3
09/29/99 08:15	39.25	243.9	11.96	16.4	2032.8	190.0	804.7
09/29/99 08:30	37.59	243.0	11.96	16.3	2033.4	189.8	803.8
09/29/99 08:45	36.83	243.0	12.02	16.1	2024.9	190.0	806.6
09/29/99 09:00	36.78	244.8	12.01	16.5	2025.4	190.1	806.2
09/29/99 09:15	36.67	245.9	11.96	16.4	2042.7	190.1	806.6
09/29/99 09:30	35.44	240.0	11.90	15.9	2059.4	189.5	807.4
09/29/99 09:45	35.17	243.2	11.89	18.0	2064.1	189.1	805.3
09/29/99 10:00	35.97	238.3	11.90	18.1	2078.0	189.2	803.4
09/29/99 10:15	35.01	238.8	11.90	16.1	2062.0	189.9	805.1
09/29/99 10:30	35.12	238.4	11.95	15.2	2049.3	190.1	807.6
09/29/99 10:45	35.72	239.2	11.92	14.9	2053.0	190.0	805.9
09/29/99 11:00	35.74	242.1	11.91	15.0	2043.4	190.0	805.2
09/29/99 11:15	34.45	242.4	11.90	14.3	2052.6	190.0	804.8
09/29/99 11:30	34.86	237.7	11.88	15.5	2055.7	190.0	804.2
09/29/99 11:45	34.59	237.6	11.93	14.6	2039.9	190.0	804.1
09/29/99 12:00	38.06	235.2	11.94	14.2	2032.4	190.0	800.5
09/29/99 12:15	43.24	237.1	11.95	14.0	2039.1	190.1	803.4
09/29/99 12:30	N/A	N/A	N/A	15.3	N/A	N/A	N/A
09/29/99 12:45	43.74	235.1	12.00	15.8	2047.0	189.8	806.2
09/29/99 13:00	42.68	239.8	11.94	15.7	2056.7	190.0	802.6
09/29/99 13:15	44.27	234.1	11.95	14.7	2048.0	189.9	803.6
09/29/99 13:30	44.07	235.2	11.95	14.6	2051.2	190.8	804.2
09/29/99 13:45	44.91	235.2	11.94	14.0	2041.5	192.8	804.1
09/29/99 14:00	45.32	234.8	11.95	15.0	2047.4	192.5	801.7
09/29/99 14:15	45.16	232.3	12.01	15.8	2032.5	192.7	802.4
09/29/99 14:30	45.59	233.0	12.06	15.3	2030.9	192.7	802.8
09/29/99 14:45	45.75	236.1	12.04	14.6	2025.8	192.6	803.7
09/29/99 15:00	45.71	235.0	12.07	15.1	2021.6	192.6	803.9
09/29/99 15:15	46.48	234.0	12.03	15.8	2029.8	192.6	804.2
09/29/99 15:30	46.42	234.0	12.05	14.8	2027.3	192.6	805.0
09/29/99 15:45	47.26	230.5	11.96	15.4	2047.8	192.8	803.7
09/29/99 16:00	43.52	233.0	11.97	14.0	2033.4	192.5	807.1
09/29/99 16:15	42.29	232.5	12.03	14.8	2034.2	192.7	805.5
09/29/99 16:30	43.63	232.3	11.99	14.6	2037.3	192.9	805.5
09/29/99 16:45	43.43	230.7	12.00	13.9	2026.2	192.6	803.2
09/29/99 17:00	43.32	229.2	12.05	14.1	1947.9	192.8	802.9
09/29/99 17:15	43.66	227.0	12.06	14.9	2031.5	192.8	803.7
09/29/99 17:30	43.80	230.7	12.06	14.6	2029.7	192.7	804.3
09/29/99 17:45	43.97	229.3	12.12	15.1	2016.7	192.8	808.3
09/29/99 18:00	43.66	232.7	12.10	15.2	2025.1	192.7	807.9
Final Average*	**41.55**	**238.1**	**11.97**	**15.8**	**2028.9**	**190.6**	**804.8**
Maximum*	49.83	248.3	12.12	22.1	2087.2	196.1	809.1
Minimum*	34.45	227.0	11.85	13.9	1535.4	177.1	800.5

Run 1
Avg = 36.33
Avg = 240.4
Avg = 11.93
Avg = 15.7
Avg = 2047.3
Avg = 189.9

Run 2
Avg = 45.47
Avg = 233.9
Avg = 12.00
Avg = 14.9
Avg = 2035.4
Avg = 192.5

*Does not include Invalid Averaging Periods ("N/A")

Enertec NTDAHS®
Average Values Report
01/03/00 14:22

Company: Montana Power Company
Plant: Colstrip Generating Station
City/St: Colstrip, MT 59323
Source: unit_3_stack

Period Start: 09/30/99 06:00
Period End: 09/30/99 18:00
Validation Type: 1/15 min
Averaging Period: 15 min
Type: Block Avg

Period Start	Average 3 SO2 ppm ppm	Average 3 NOx ppm ppm	Average 3 CO2 %	Average 3 Opacity %	Average 3 Stk Flow kscfm	Average 3 Stk Temp deg F	Average 3 UnitLoad MWG
09/30/99 06:00	31.69	247.2	12.05	16.9	2043.1	193.6	811.4
09/30/99 06:15	29.38	252.1	11.94	15.8	2058.2	193.2	809.4
09/30/99 06:30	28.58	249.5	11.95	16.3	2055.9	193.3	806.7
09/30/99 06:45	28.90	247.8	11.97	16.8	2010.6	193.4	807.6
09/30/99 07:00	30.31	244.9	11.97	16.9	2060.7	193.3	809.0
09/30/99 07:15	30.28	245.8	11.94	16.3	2056.0	193.2	810.7
09/30/99 07:30	30.56	249.6	11.96	16.6	2044.7	193.4	809.5
09/30/99 07:45	31.30	247.3	11.96	16.8	2043.9	193.4	808.6
09/30/99 08:00	31.51	245.6	11.95	16.8	2062.3	193.3	809.5
09/30/99 08:15	32.70	248.2	11.92	16.6	2059.4	193.5	809.2
09/30/99 08:30	34.59	240.3	11.98	17.4	2066.5	193.0	804.1
09/30/99 08:45	36.21	242.4	11.93	18.4	2074.3	189.8	807.4
09/30/99 09:00	35.25	245.2	11.96	17.4	2052.5	192.7	806.7
09/30/99 09:15	36.33	246.5	11.97	19.5	2061.5	187.8	807.2
09/30/99 09:30	35.35	247.9	11.98	16.3	2045.1	193.2	808.8
09/30/99 09:45	35.97	248.6	11.99	16.8	1886.2	194.0	807.9
09/30/99 10:00	35.12	250.2	11.97	18.1	2058.1	190.3	812.3
09/30/99 10:15	35.78	249.7	11.96	17.9	2054.3	188.7	811.0
09/30/99 10:30	34.16	249.6	11.91	16.3	2044.5	194.4	809.1
09/30/99 10:45	34.20	248.8	11.93	18.9	2043.9	193.9	807.4
09/30/99 11:00	34.22	250.0	11.87	17.5	2053.8	194.1	805.7
09/30/99 11:15	34.64	249.9	11.97	17.9	2041.4	194.1	807.9
09/30/99 11:30	33.65	250.6	11.94	18.2	2046.2	194.2	805.5
09/30/99 11:45	33.33	248.4	11.96	18.3	2038.6	194.2	806.7
09/30/99 12:00	33.79	251.3	11.99	18.7	2043.2	193.2	807.5
09/30/99 12:15	33.13	250.0	12.07	19.1	2035.6	193.5	809.7
09/30/99 12:30	33.85	252.1	12.02	17.5	2038.7	194.3	810.6
09/30/99 12:45	37.55	250.6	11.97	17.5	2042.2	194.3	810.0
09/30/99 13:00	36.76	245.0	11.98	17.5	2054.3	194.2	809.9
09/30/99 13:15	38.81	238.6	11.86	19.3	1653.4	199.3	808.4
09/30/99 13:30	40.55	239.9	11.89	21.1	2050.2	189.7	807.7
09/30/99 13:45	38.73	239.6	11.94	19.4	2056.4	190.5	803.6
09/30/99 14:00	38.82	240.4	11.94	18.5	2050.6	191.8	805.2
09/30/99 14:15	41.01	239.5	12.01	22.2	2061.7	188.9	807.5
09/30/99 14:30	41.52	242.1	12.00	18.6	2060.9	192.1	806.7
09/30/99 14:45	41.01	243.6	11.94	18.4	2050.3	193.6	806.7
09/30/99 15:00	41.91	244.6	11.98	18.0	2053.3	193.5	807.5
09/30/99 15:15	42.45	246.5	11.99	19.0	2061.5	193.4	809.7
09/30/99 15:30	42.35	246.8	12.00	19.2	2059.1	193.5	810.2
09/30/99 15:45	43.58	244.5	11.96	17.4	2054.3	193.5	808.9
09/30/99 16:00	44.12	243.6	11.95	17.4	2053.8	193.6	808.6
09/30/99 16:15	43.57	244.3	11.92	16.0	2051.4	193.3	804.1
09/30/99 16:30	42.31	242.1	11.95	16.3	2054.0	193.4	804.1
09/30/99 16:45	42.17	241.9	11.96	16.0	2039.9	193.6	807.4
09/30/99 17:00	41.23	241.8	12.01	16.8	2040.6	193.5	807.2
09/30/99 17:15	40.62	243.3	11.98	17.8	2045.5	193.4	807.7
09/30/99 17:30	40.33	246.1	12.03	16.5	2027.1	193.6	807.3
09/30/99 17:45	41.05	249.1	12.06	16.5	2029.9	193.6	810.2
09/30/99 18:00	41.98	248.9	11.83	16.5	2064.9	193.5	811.0
Final Average*	**36.68**	**246.2**	**11.96**	**17.7**	**2038.7**	**193.0**	**808.1**
Maximum*	44.12	252.1	12.07	22.2	2074.3	199.3	812.3
Minimum*	28.58	238.6	11.83	15.8	1653.4	187.8	803.6

*Does not include Invalid Averaging Periods ("N/A")

COLSTRIP UNIT 3 DAILY GENERATION LOG

DATE: 9-29-99

TIME	S/U MWHR	S/U INTER	REASON FOR DERATE	MW EST CAP.	MW DIS REC.	GROSS INTER MWHR	GROSS MW	AUX MW	NET MW	NET TOTAL MWHR
0100						63706	800	65	734	734
0200						63786	800	64	736	1470
0300						63866	800	66	737	2207
0400						63946	800	64	734	2941
0500						64027	810	65	742	3683
0600						64108	810	66	746	4429
0700						64189	810	65	749	5178
0800				746mw	Run 1	64269	800	65	746	5924
0900						64350	810	66	746	6670
1000						64431	810	65	745	7415
1100						64513	820	66	746	8161
1200				744mw		64593	800	62	745	8906
1300					Run 2	64674	810	66	744	9650
1400						64755	810	66	744	10394
1500						64836	810	66	743	11137
1600						64916	800	65	743	11880
1700						64997	810	65	745	12625
1800						65078	810	66	745	13370
1900						65159	810	65	745	14115
2000						65240	810	66	748	14863
2100						65321	810	65	744	15607
2200						65402	810	67	749	16356
2300						65483	810	66	747	17103
2400						65565	820	65	749	17852

OPERATORS:

NIGHT: Whitaker

DAYS: Shahan

NIGHT: Whitaker

COAL BELT SCALES

SCALE 60	577376
SCALE 70	144215
SCALE 81	7300
SCALE 91	50175

HYDROGEN BANKS

PRESSURE		TEMP
A	1860	41°F
B	260	41°F

FUEL OIL TANK

LEVEL	TEMP
21.9	61.1

ATR: 240 2

Daily Prev.	16282
Daily Total	0
Month Prev.	480
Month Total	480

Gross Daily Prev.	63626
Gross Daily Total	19390
Gross Month Prev.	469570
Gross Month Total	488960

Net Month Prev.	431587
Net Month Total	449439
Net MW Avg	743.833
Net MW Peak	749

Previous Day Generation

MWHR Net	17836
MW Net Ave.	743.166
MW Net Peak	748

NIGHT Whitten

DAY Shahan

NIGHT: Whitten

CRO LOG

COLSTRIP UNIT 3

DATE: 9-29-99

Time	A Super Heat Temp at Boiler	B Super Heat Temp at Boiler	A Hot Reheat Temp at Boiler	B Hot Reheat Temp at Boiler	Net Heat Rate	Calculated Fuel Flow	Excess Air	A Backpress	Cold End Average	Gen Volts	Gen Vars Net	CPD Dissolved O_2	CPD Sodium	Boiler Blowdown pH
Limts	1005	1005	1005	1005		945	3 0-3 5	7 in. Hg	155			20 ppb	2 ppb	9-9 55
0100	988	988	985	985	10736	923	3.3	3.5	177	27.2	113	10.4	.5	8.99
0300	1004	985	999	987	10778	928	3.2	3.5	177	27.2	92	12.9	.4	9.13
0500	999	990	1004	1000	10928	945	3.2	3.7	182	27.2	79	24.2	.4	9.29
0700	996	1014	996	1001	10760	942	3.22	3.60	183	27.2	85	14.5	.4	9.11
0900	1005	1010	1001	1001	10602	931	3.25	3.63	184.8	27.2	75	12.1	.4	9.32
1100	990	991	989	985	10715	937	3.19	4.14	193.9	27.2	60	9.2	.5	9.36
1300	1002	1001	999	993	10765	941	3.23	4.29	197.1	27.2	83	12.6	.5	9.31
1500	990	986	998	990	10818	946	3.35	4.31	198.4	27.2	86	14.6	.3	9.22
1700	1008	1008	1005	999	10802	945	3.22	4.15	197.3	27.2	86	13.7	.5	9.28
1900	998	1003	1007	1003	10633	940	3.3	4.0	192	27.2	91	12.4	.3	9.17
2100	1001	1000	1002	997	10436	915	3.1	4.0	193	27.2	91	14.2	.5	9.21
2300	985	989	993	989	10841	945	3.2	4.0	191	27.2	84	23.7	.3	9.21

Scrubber Wet Tests

12-16% Range

Vessel	1	2	3	4	5	6	7	8
Prev 2100	13.5	13.3	–	15.7	18.8	13.2	11.7	13.8
0900	13.4	11.2	–	12.6	19.7	10.6	14.1	11.0
2100	15.6	12.6	–	20.0	20.2	12.6	15.2	13.2

Condenser Air Inleakage

40 cfm Limit

0100	

#'s SO_2 Rolling 30 Day Ave.

0100

F-5

NIGHT Cadwell

DAY Hansel

NIGHT

COLSTRIP UNIT 3
Scrubber Log
MC# 6519422

DATE: 9-29-99

	3-1 __ Vent. Seal H2O GPM	3-1 Vent. STR Δ P	3-1 __ Absorp. Seal H2O GPM	3-1 Absorp. STR Δ P	3-2 __ Vent. Seal H2O GPM	3-2 Vent. STR Δ P	3-2 __ Absorp. Seal H2O GPM	3-2 Absorp. STR Δ P	3-3 __ Vent. Seal H2O GPM	3-3 Vent. STR Δ P	3-3 __ Absorp. Seal H2O GPM	3-3 Absorp. STR Δ P	3-4 __ Vent. Seal H2O GPM	3-4 Vent. STR Δ P	3-4 __ Absorp. Seal H2O GPM	3-4 Absorp. STR Δ P	3-1 __ W.T. Seal H2O GPM	3-1 W.T. STR Δ P	3-1 __ Eff. Seal H2O GPM	3-2 __ W.T. Seal H2O GPM	3-2 W.T. STR Δ P	3-2 __ Eff. Seal H2O GPM	W.T. Bleed Seal H2O GPM	P.R.S.T. Seal H2O GPM	3-1 I.D. Fan L.O. Res. Temp.	3-1 I.D. Fan L.O. Res. Level	3-2 I.D. Fan L.O. Res. Temp.	3-2 I.D. Fan L.O. Res. Level	3-3 I.D. Fan L.O. Res. Temp.	3-3 I.D. Fan L.O. Res. Level	3-4 I.D. Fan L.O. Res. Temp.	3-4 I.D. Fan L.O. Res. Level	D.C. Sump Seal H2O GPM	U-3 H2O - Oil Main. Plt. Sump Ck.	3-1 __ Common Eff. Pp Seal H2O GPM	3-1 __ Common Eff. Pp Seal H2O GPM	3-1 __ Common Eff. Pp Seal H2O GPM
0300	✓		✓		✓		✓						✓		✓								6	137	✓	121	✓			1:12	✓	8	✓	✓	6	6
0700	✓		✓		✓		✓						✓		✓								6	135	✓	132	✓			1:14	✓	8	✓	4	4	4
1100																																					
1500	✓		✓		✓		✓						✓		✓								6	134	✓	126	✓			1:46	✓	8	✓	6	6	6
1900	✓		✓		✓		✓						✓		✓								6	136	✓	126	✓			1:05	✓	5	✓	6	6	6
2300																																					

	3-5 __ Vent. Seal H2O GPM	3-5 Vent STR Δ P	3-5 __ Absorp. Seal H2O GPM	3-5 Absorp. STR Δ P	3-6 __ Vent. Seal H2O GPM	3-6 Vent. STR Δ P	3-6 __ Absorp. Seal H2O GPM	3-6 Absorp. STR Δ P	3-7 __ Vent. Seal H2O GPM	3-7 Vent. STR Δ P	3-7 __ Absorp. Seal H2O GPM	3-7 Absorp. STR Δ P	3-8 __ Vent. Seal H2O GPM	3-8 Vent. STR Δ P	3-8 __ Absorp. Seal H2O GPM	3-8 Absorp. STR Δ P	3-3 __ W.T. Seal H2O GPM	3-3 W.T. STR Δ P	3-4 __ W.T. Seal H2O GPM	3-4 W.T. STR Δ P	3-5 I.D. Fan L.O. Res. Temp.	3-5 I.D. Fan L.O. Res. Level	3-6 I.D. Fan L.O. Res. Temp.	3-6 I.D. Fan L.O. Res. Level	3-7 I.D. Fan L.O. Res. Temp.	3-7 I.D. Fan L.O. Res. Level	3-8 I.D. Fan L.O. Res. Temp.	3-8 I.D. Fan L.O. Res. Level	3-1 Seal H2O Dist.	3-1 Eff. Holding Tank Flow	3-2 Eff. Holding Tank Flow	4-1 Eff. Holding Tank Flow	4-2 Eff. Holding Tank Flow
0300	✓		✓		✓		✓		✓		✓		✓						136	✓	137	✓	133	✓	137	✓	165							
0700	✓		✓		✓		✓		✓		✓		✓						135	✓	131	✓	133	✓	137	✓	156							
1100																																		
1500	✓		✓		✓		✓		✓		✓		✓						140	✓	135	✓	134	✓	138	✓	162							
1900	✓		✓		✓		✓		✓		✓		✓						136	✓	135	✓	135	✓	135	✓	166							
2300																																		

	Scrubber Chiller	3-2 Mixed Air Fan	3-2 Roof Exh. Fan	3-4 Mixed Air Fan	3-4 Roof Exh. Fan	3-1 Mixed Air Fan	3-1 Roof Exh. Fan	3-3 Mixed Air Fan	3-3 Roof Exh. Fan	3-1 I.D. Fan Vibr. (Highest)	3-2 I.D. Fan Vibr. (Highest)	3-3 I.D. Fan Vibr. (Highest)	3-4 I.D. Fan Vibr. (Highest)	3-5 I.D. Fan Vibr. (Highest)	3-6 I.D. Fan Vibr. (Highest)	3-7 I.D. Fan Vibr. (Highest)	3-8 I.D. Fan Vibr. (Highest)	Lime Loop Recirc. GPM	Lime Loop Recirc. Pressure	Relay Room HVAC	Battery Room Amps	Battery Room Volts	Battery Room D.C. Ground
07	✓								2.7	3.7	—	1.6	2.5	1.6	1.5	1.7	520	—	✓	60	135	✓
19	✓								2.5	3.7	—	1.6	2.5	1.5	1.6	1.7	480	—	✓	1.0	136	✓

	0600 Vent. Spray Pipe Temp. Check	1800 Vent. Spray Pipe Temp. Check
3-1	✓	3-1 ✓
3-2	✓	3-2 ✓
3-3	1	3-3 ✓
3-4	✓	3-4 ✓
3-5	✓	3-5 ✓
3-6	✓	3-6 ✓
3-7	✓	3-7 ✓
3-8	✓	3-8 ✓

NIGHT Fritz
DAY
NIGHT Fritz

COLSTRIP UNIT ___
ASH SYSTEM, DIESEL GENERATORS
COAL PULVERIZER & FANS
MC #6519487

DATE 9-24-99

TIME	UNIT 3 ONLY A DIESEL GEN BATT VOLTS	UNIT 3 ONLY B DIESEL GEN BATT VOLTS	UNIT 3 ONLY C DIESEL GEN BATT VOLTS	UNIT 3 ONLY D DIESEL GEN BATT VOLTS	A MILL HYD OIL TEMP	A MILL HYD OIL PSI	A MILL LUBE OIL TEMP	A MILL LUBE OIL PSI	B MILL HYD OIL TEMP	B MILL HYD OIL PSI	B MILL LUBE OIL TEMP	B MILL LUBE OIL PSI	C MILL HYD OIL TEMP	C MILL HYD OIL PSI	C MILL LUBE OIL TEMP	C MILL LUBE OIL PSI	D MILL HYD OIL TEMP	D MILL HYD OIL PSI	D MILL LUBE OIL TEMP	D MILL LUBE OIL PSI	E MILL HYD OIL TEMP	E MILL HYD OIL PSI	E MILL LUBE OIL TEMP	E MILL LUBE OIL PSI	F MILL HYD OIL TEMP	F MILL HYD OIL PSI	F MILL LUBE OIL TEMP	F MILL LUBE OIL PSI	G MILL HYD OIL TEMP	G MILL HYD OIL PSI	G MILL LUBE OIL TEMP	G MILL LUBE OIL PSI	H MILL HYD OIL TEMP	H MILL HYD OIL PSI	H MILL LUBE OIL TEMP	H MILL LUBE OIL PSI	A FD FAN OIL TEMP	A FD FAN OIL HDR PSI	B FD FAN OIL TEMP	B FD FAN OIL HDR PSI	A PA FAN OIL TEMP	A PA FAN OIL HDR PSI	B PA FAN OIL TEMP	B PA FAN OIL HDR PSI	GLYCOL APH PRESSURE
0100																																												
0300	31	31	29	31	75	100	105	50			90	700	105	60	95	900	100	41	85	800	110	68	90	600	95	78	90	600	103	55	90	600	105	50	110	53	104	64	130	25	130	24	92
0500																																												
0700	31	31	29	31	75	80	58	51			80	700	88	61	25	850	100	41	85	800	112	68	80	650	100	78	85	700	98	56	85	600	98	82	102	58	100	64	132	26	134	24	92
0900																																												
1100																																												
1300																																												
1500							Busy with ash system																																					
1700																																												
1900	31	31	29	31	70	90	100	50			90	600	110	60	80	900	105	41	75	900	114	65	80	600	105	78	80	700	104	54	85	600	96	80	123	58	163	135	25	130	24	92
2100																																												
2300																																												

Check Both B.A. Wall Cooling Spray Controllers.

To Be Set At 70%. N_2 - 800 psi at 1900 HRS.

	MAIN TRANSFORMERS												AUX TRANS						START-UP TRANSFORMERS							
	A PHASE				B PHASE				C PHASE				TRANSFORMER				X TAP	Y TAP	TRANSFORMER				X TAP		Y TAP	
TIME	N_2 BOTTLE PRESS	TRANS N_2 PRESS	TRANS OIL LEVEL	WINDING TEMP	N_2 BOTTLE PRESS	TRANS N_2 PRESS	TRANS OIL LEVEL	WINDING TEMP	N_2 BOTTLE PRESS	TRANS N_2 PRESS	TRANS OIL LEVEL	WINDING TEMP	N_2 BOTTLE PRESS	TRANS N_2 PRESS	TRANS OIL LEVEL	WINDING TEMP	OIL LEVEL	OIL LEVEL	N_2 BOTTLE PRESS	TRANS N_2 PRESS	TRANS OIL LEVEL	WINDING TEMP	PRESSURE	OIL LEVEL	PRESSURE	OIL LEVEL
0700		1.8	OK	78		.8	OK	60		1.2	OK	60		1.2	OK	80	OK	OK			OK	60	.1	OK	0	OK
1900				75						4						70				2		40	0		0	

	125VDC GRD TEST #1	125VDC GRD TEST #2	250VDC GRD TEST	125VDC CHRG IN SERVICE 1	125VDC CHRG IN SERVICE 2	250VDC CHRG IN SERVICE
0700	OK	OK	OK	11	11	13
1500						
1900	✓	✓	✓	11	11	13

00 EACH DAY
ECORD HOUR METER READINGS

1-P-2073-2074-A1 & 2
1-P-2079-2080-B1 & 2
RUSHER JM-S-2046-A1
USHER JM-S-2045-B1
USHER JM-S-2044-C1
USHER JM-S-2049-1A2
USHER JM-S-2048-B-2
USHER JM-S-2047-C-2

BOSS Printing Glendive MT VP15 MPAshUnit (Rev 11-96)

UNIT 3
BOILER TURBINE GENERATOR
JOURNEYMAN / SYSTEM OPERATOR LOG
M.C. #6519460

DATE 4-29-99

NIGHT SHIFT Fritz
DAY SHIFT [illegible]
NIGHT SHIFT Fritz

TIME	A BWCP MOTOR CAVITY TEMP	B BWCP MOTOR CAVITY TEMP	C BWCP MOTOR CAVITY TEMP	D BWCP MOTOR CAVITY TEMP	TURB BRG OIL PRESS	TURB BRG 1 OIL TEMP	TURB BRG 2 OIL TEMP	TURB BRG 3 OIL TEMP	TURB BRG 4 OIL TEMP	TURB BRG 5 OIL TEMP	TURB BRG 6 OIL TEMP	TURB BRG 7 OIL TEMP	TURB BRG 8 OIL TEMP	TURB BRG 9 OIL TEMP	TURB BRG 10 OIL TEMP	TURB BRG 11 OIL TEMP	EHC LEVEL	EHC TEMPERATURE	EHC PRESSURE	TURBINE LUBE OIL LEVEL	CONDENSATE HDR PRESS	SERVICE WATER PRESS	HYDROGEN PURITY	AIR SIDE SEAL PRESSURE	SEAL OIL Δ P EXCITER END	SEAL OIL Δ P GOVENOR END	STATOR WATER PRESSURE	CCW HI OUT TEMP	CCW PRESSURE	A AUX TURB OIL TEMP	A AUX TURB BRG OIL PSI	B AUX TURB OIL TEMP	B AUX TURB BRG OIL PSI	VAC PMP SEAL WTR TANK LVL	CONDENSER AIR IN LEAKAGE
0100																																				
0300	103	105	112	107	16	138	150	160	150	155	160	146	160	157	168	138	✓	114	420	2	285	110	-	105	25	-12	46	15	46	116	23	103	23	✓	16
0500																																				
0700	108	104	114	109	16.5	138	160	160	150	156	160	148 158	160	158	168		3/4	116	420	2	285	107		104	25	15	96	78	102	108	23.5	111	23.5	ok	18
0900																																				
1100																																				
1300																																				
1500					Busy with ash system																															
1700																																				
1900	112	110	120	110	16	138	160	160	150	156	160	146	160	156	168	140	✓	118	420	-	280	54	-	96	25	-13	18	21	92	110	23	103	23	✓	20
2100																																				
2300																																				

TIME	GEN H2 DEW POINT	CK I/S AIR COMPRESSOR A	CK I/S AIR COMPRESSOR B	CK I/S AIR COMPRESSOR C	CK I/S AIR COMPRESSOR D	CK I/S AIR COMPRESSOR E	3 A SERV WATER PP & MOTOR	3 B SERV WATER PP & MOTOR	3 C SERV WATER PP & MOTOR	3 A SUCT STR Δ P	3 B SUCT STR Δ P	3 C SUCT STR Δ P	FUEL OIL HDR PSI
0300	+17	✓	✓	✓	✓	✓		✓	✓		.5	.7	250
0700		✓	✓	✓	✓	✓		✓	✓		.9	1.0	250
1100													
1500													
1900	+18			✓	✓	✓		✓	✓		.7	.7	250
2300													

FIRST OF SHIFT CHECKS

0700 _____ FT. WEST L.O.STORAGE TANK LEVEL _____ FT. EAST L.O. STORAGE TANK LEVEL
0700 ✓ mls Tom CHECK GENERATOR LIQUID LEAK DETECTORS AND
1900 _____ mls _____ LOG AMOUNT DRAINED IN JOURNAL, REPORT SAME TO S / S.
UNIT #3 BUILDING HEATING SYS. PSI 18 UNIT #3 GLYCOL PUMP SUCT. PSI 2
CHECK FOR LEAKING SAFETY VALVES SH, RH, AUX. STEAM 0700 ✓ 1900 ✓
DRUM LEVEL 0700 N ✓ S ✓ 1900 N ✓ S ✓ (COMPARE WITH CR
APH BEARING GUIDE OIL TEMP 0700 A 108 B 110 1900 A 116 B 114
APH SUPPORT BEARING TEMP 0700 A 86 B 86 1900 A 92 B 96
CHECK OVERFIRE AIR NOZZLE POSITIONS (ALL SHOULD BE IN THE SAME POSITION)
CHECK IN SERVICE SCANNER AIR FAN ✓. CHECK IN SERVICE IGNITOR AIR FAN ✓
CHECK BURNER TILT POSITION (COMPARE WITH CONTROL BOARD INDICATION)
CHECK TILT ASSEMBLY FOR SHEARED PINS OR WARPED LINKAGE.
H2 GAS VENT METER FI-110 0700 177 1900 176
CCW HEAD TANK LEVEL 0700 OK 1900 ✓
STATER COOLING WATER MAKEUP METER 0700 81561 1900 81561
GEN H2 GAS MAKEUP TOTALIZERS 0700 N 30146 L S 50[illegible] 1900 N [illegible]

COLSTRIP UNITS 3 & 4
LIME SLAKER BUILDING DAILY LOG
MC #6519412

TIME	3-1A SLAKER Torque Valve G.P.M.	Cut Off Spray Water G.P.M.	Grit Removal Water G.P.M.	% Solids Out of Unit	Lime Feed Rate	3-1B SLAKER / MIXER Torque Valve G.P.M.	Cut Off Spray Water G.P.M.	Grit Removal Water G.P.M.	% Solids Out of Unit	Lime Feed Rate	3-1C MIXER Torque Valve G.P.M.	Cut Off Spray Water G.P.M.	Grit Removal Water G.P.M.	% Solids Out of Unit	Lime Feed Rate
0100	40	40	5	12	MAN						40	40	5	12	MAN
0300	[illegible]										11	11	11	11	11
0500															
0700											40	40	50	12	11
0900											40	40	5	12	11
1100	40	40	5	12	11						40	40	5	12	11
1300	40	40	5	12							40	40	5	12	11
1500	40	40	5	12	11						40	40	5	12	11
1700	40	40	5	12	11						40	40	5	12	11
1900	11	11	11	11	11						11	11	11	11	11
2100	11	11	11	11	11						11	11	11	11	11
2300	11	11	11	11	11						11	11	11	11	11

TIME	3-2A SLAKER Torque Valve G.P.M.	Cut Off Spray Water G.P.M.	Grit Removal Water G.P.M.	% Solids Out of Unit	Lime Feed Rate	3-2B SLAKER / MIXER Torque Valve G.P.M.	Cut Off Spray Water G.P.M.	Grit Removal Water G.P.M.	% Solids Out of Unit	Lime Feed Rate	3-2C MIXER Torque Valve G.P.M.	Cut Off Spray Water G.P.M.	Grit Removal Water G.P.M.	% Solids Out of Unit	Lime Feed Rate	3-1 Storage Tank Level	4-1 Storage Tank Level	3-A / 3-B Grit Conveyor	Fugitive Dust Collection Sys.
0100	40	40	15	10	MAN						40	40	15	10	MAN	28	30	A	✓
0300	11	11	11	11	11											28.5	29.5	A	—
0500	40																		
0700	40	40	15	12	11											28.5	25	A	—
0900	40	40	15	11	11											25.5	26.5	A	—
1100	40	40	15	12	11											25	25	A	—
1300	40	40	15	12	11	40	40	15	12	11						25	25	A	—
1500	40	40	15	12	11	40	40	15	12	11						25	25	A	—
1700	40	40	15	12	11	40	40	15	12	11						26	26	A	—
1900	11	11	11	11	11	11	11	11	11	11						26	28	A	—
2100	11	11	11	11	11	11	11	11	11	11						24	24.5	11	S
2300	11	11	11	11	11	11	11	11	11	11						26	23.5	11	

Date 9-29-99
Night C. Vogel
Day _____
Night C. Vogel

	0700	1900
U-3 Storage Tank % Solids		
U-4 Storage Tank % Solids		

	2400 N	2400 S
Hydrate Silo 3-1 Level	22.5	33.2
Hi-Cal Silo 3-1 Level	39.6	54.1
Hi-Cal Silo 3-2 Level	28.9	33.6
Hydrate Silo 3-2 Level	16.8	34.9

BOSS Printing, Glendive, MT / MP4-6519412 (Rev. 4-94)

COMMENTS:

Storage and Retrieval
Hourly Average Report
10/25/1999

Data Retrieval For 09/29/1999 unit3

1. SA255 SCRUB 6 INLET GAS TEMP ✓
2. SA256 SCRUB 6 INLET GAS PRESS
3. SA257 MIST ELM 6 DIFF PRESS
4. SA258 WASH TRAY 6 DIFF PRESS
5. SA259 PLUMB BOB 6 DIFF PRESS
6. SA262 SCRUB 6 TRAIN DIFF PRESS

Hour	1 SA255 DEG F	2 SA256 INWC	3 SA257 INWC	4 SA258 INWC	5 SA259 INWC	6 SA262 INWC
0	269	-16.9	0.00	2.27	19.5	23.5
1	268	-16.9	0.00	2.26	19.5	23.4
2	269	-17.1	0.00	2.27	19.5	23.5
3	271	-17.3	0.00	2.30	19.6	23.5
4	277	-18.5	0.00	2.39	20.1	24.2
5	279	-18.3	0.00	2.36	20.1	24.2
6	278	-18.1	0.00	2.28	20.2	24.1
7	275	-18.2	0.00	2.27	20.5	24.4
8	278	-18.0	0.00	2.19	20.6	24.3
9	278	-18.0	0.00	2.17	20.6	24.2
10	283	-18.2	0.00	2.24	20.6	24.5
11	287	-18.5	0.00	2.30	20.6	24.6
12	287	-18.3	0.00	2.28	20.6	24.7
13	287	-18.2	0.00	2.24	20.6	24.4
14	288	-18.4	0.00	2.27	20.7	24.4
15	289	-18.2	0.00	2.24	20.6	24.4
16	290	-18.2	0.00	2.25	20.7	24.5
17	287	-18.2	0.00	2.24	20.6	24.4
18	283	-18.1	0.00	2.23	20.6	24.4
19	282	-18.1	0.00	2.21	20.6	24.3
20	284	-18.2	0.00	2.27	20.6	24.6
21	280	-18.2	0.00	2.28	20.6	24.5
22	279	-18.2	0.00	2.25	20.6	24.4
23	280	-18.4	0.00	2.27	20.6	24.5
Summary						
DayMin	267 @01:48	-19.6 @05:33	0.00 @00:00	2.03 @08:55	19.1 @00:55	22.1 @01:46
DayMax	291 @16:07	-16.1 @01:30	0.01 @12:23	2.64 @07:24	21.6 @13:14	25.9 @18:37
DayAvg	280	-18.0	0.00	2.26	20.4	24.2

Run 1 283°F
Run 2 288°F

Storage and Retrieval
Hourly Average Report
10/25/1999

Data Retrieval For 09/29/1999 unit3

1. SA263 SCRUB 6 OUTLET GAS TEMP
2. SA264 RHTR 6 GAS DIFF PRESS
3. SA265 ID FAN 6 INLET GAS PRESS
4. SA266 ID FAN 6 INLET GAS TEMP
5. SA268 SCRUB 6 OUTLET SO2
6. SA269 ID FAN 6 OUTLET TEMP
7. SA271 ID FAN 6 OUTLET GAS PRES

Hour	1 SA263 DEG F	2 SA264 INWC	3 SA265 INWC	4 SA266 DEG F	5 SA268 PPM	6 SA269 DEG F	7 SA271 INWC
0	130	1.10	-41.0	149	13.17	191	1.8
1	130	1.09	-40.9	149	12.52	191	1.7
2	130	1.10	-41.2	149	12.29	191	1.8
3	130	1.11	-41.5	149	14.31	191	1.7
4	130	1.14	-43.4	148	46.67	191	1.8
5	130	1.13	-43.0	148	89.36	191	1.8
6	130	1.10	-42.8	149	115.7	191	1.9
7	130	1.09	-43.3	148	114.3	191	2.0
8	130	1.06	-43.0	149	70.86	191	1.9
9	130	1.06	-42.8	149	63.16	191	2.0
10	131	1.08	-43.1	149	63.16	191	2.1
11	132	1.10	-43.6	149	63.16	191	2.1
12	131	1.09	-43.4	149	63.16	191	2.2
13	131	1.08	-43.2	149	63.16	191	2.2
14	131	1.08	-43.5	149	43.63	191	2.1
15	131	1.07	-43.2	149	19.23	191	2.2
16	132	1.07	-43.2	149	21.53	191	2.1
17	132	1.06	-43.2	149	31.50	191	2.1
18	132	1.07	-42.9	149	38.60	191	2.1
19	131	1.06	-43.0	149	39.97	191	2.0
20	133	1.08	-43.3	150	48.69	191	2.0
21	132	1.09	-43.3	149	40.50	191	2.0
22	131	1.09	-43.3	149	34.12	191	2.0
23	131	1.09	-43.5	149	26.41	191	2.0
Summary							
DayMin	129 @01:44	0.85 @17:51	-45.2 @19:58	147 @07:25	10.20 @02:54	189 @02:27	1.4 @00:24
DayMax	133 @16:53	1.27 @05:20	-39.5 @02:34	151 @17:52	143.0 @07:23	192 @17:49	2.7 @11:23
DayAvg	131	1.09	-42.9	149	47.88	191	2.0

Run 1 131°F 149°F 64.70
Run 2 131°F 149°F 42.01

GROUP NO 43 LP F.W. HEATERS

1	HEATER 3 EXTRACTION FLO	6	HTR 3 TERM TEMP DIFF	11	HTR 2B DRAIN COOLER APPR
2	HEATER 2A EXTRACTION FLO	7	HTR 3 DRAIN COOLER APPR	12	HTR 1A TERM TEMP DIFF
3	HEATER 2B EXTRACTION FLO	8	HTR 2A TERM TEMP DIFF	13	HTR 1A DRAIN COOLER APPR
4	HEATER 1A EXTRACTION FLO	9	HTR 2A DRAIN COOLER APPR	14	HTR 1B TERM TEMP DIFF
5	HEATER 1B EXTRACTION FLO	10	HTR 2B TERM TEMP DIFF	15	HTR 1B DRAIN COOLER APPR

TIME	1 AF822 KLB/H	2 AF823 KLB/H	3 AF824 KLB/H	4 AF825 KLB/H	5 AF826 KLB/H	6 AF876 DEGF	7 AF885 DEGF	8 AF877 DEGF	9 AF886 DEGF	10 AF878 DEGF	11 AF887 DEGF	12 AF879 DEGF	13 AF888 DEGF	14 AF880 DEGF	15 AF889 DEGF
07:04:05	220.6	109.9	105.3	104.3	112.2	-4.3	14.4	-10.2	33.9	-8.2	16.9	0.6	6.6	-15.6	10.7
08:04:05	221.8	110.4	105.6	104.1	111.8	-4.6	14.3	-10.5	33.6	-8.6	17.1	0.5	6.3	-15.5	10.5
09:04:05	217.7	111.4	105.0	102.6	111.3	-4.1	14.1	-10.8	34.0	-8.3	17.1	0.8	6.3	-15.7	10.5
10:04:06	216.5	110.7	104.6	102.1	110.2	-4.1	14.0	-10.8	33.8	-8.3	17.3	0.9	6.3	-15.5	10.5
11:04:05	220.9	110.3	106.0	99.7	107.2	-4.1	14.3	-10.1	33.8	-8.2	16.9	0.5	4.9	-14.8	9.3
12:04:05	222.3	110.9	106.3	95.4	103.3	-4.5	14.3	-10.5	33.9	-8.6	17.0	0.7	4.0	-15.1	8.6
13:04:06	216.3	110.0	105.7	95.5	102.7	-3.8	14.2	-10.9	33.8	-8.7	17.2	0.4	4.0	-15.1	8.6
14:04:06	215.2	110.2	106.1	95.6	102.4	-3.5	14.2	-10.8	33.7	-8.6	17.4	0.2	4.0	-15.1	8.6
15:04:07	216.8	110.4	106.0	97.9	104.4	-3.7	13.9	-10.8	33.9	-8.4	17.3	0.1	7.4	-14.4	11.3
16:04:06	215.9	111.2	105.7	97.4	104.1	-3.8	13.9	-11.5	34.2	-8.5	17.7	-0.1	7.4	-14.1	11.5
17:04:05	216.9	111.6	105.1	95.3	102.6	-3.8	14.0	-11.5	34.0	-8.3	17.6	0.2	6.5	-14.6	10.5
18:04:06	220.7	113.2	104.8	91.8	100.4	-4.1	14.4	-11.6	33.9	-8.2	16.6	0.6	4.7	-15.1	9.0
SUMMARY															
MIN	215.2	109.9	104.6	91.8	100.4	-4.6	13.9	-11.6	33.6	-8.7	16.6	-0.1	4.0	-15.7	8.6
MAX	222.3	113.2	106.3	104.3	112.2	-3.5	14.4	-10.1	34.2	-8.2	17.7	0.9	7.4	-14.1	11.5
AVG	218.5	110.8	105.5	98.5	106.0	-4.0	14.1	-10.8	33.9	-8.4	17.2	0.4	5.7	-15.1	10.0

GROUP NO 44 STEAM CYCLE

1	CONDENSATE TO DA FLOW	6	FLW TO AIR HTR STM COILS	11	CURRENT SHIFT
2	CALC. CONDENSATE FLOW	7	LP1 TURBINE BLADE LOADIN	12	WET BULB TEMPERATURE
3	COND IN FWH 4	8	LP2 TURBINE BLADE LOADIN	13	RHTR 1 GAS DIFF PRESS
4	AUX TURB 3A LP STM FLOW	9	LP1 TURBINE EXHAUST FLOW	14	RHTR 2 GAS DIFF PRESS
5	AUX TURB 3B LP STM FLOW	10	LP 2 TURBINE EXHAUST FLO	15	RHTR 3 GAS DIFF PRESS

TIME	1 AD064 MLBH	2 AD834 MLBH	3 AD065 DEG F	4 FC001 KLBH	5 FC101 KLBH	6 FH800 KLB/H	7 AC828 LB/HFT	8 AC829 LB/HFT	9 AC806 KLB/H	10 AC827 KLB/H	11 M0200 CREW	12 M0400	13 SA014 INWC	14 SA064 INWC	15 SA114 INWC
07:04:05	4.868	4.784	269.2	140	145	42.3	13947	14090	1852	1871	1	35	1.38	8.55	0.00
08:04:05	4.866	4.794	269.3	141	146	42.0	13973	14120	1856	1875	1	35	1.42	8.94	0.00
09:04:05	4.852	4.785	268.6	141	145	38.5	13921	14117	1849	1875	1	38	1.43	9.30	0.00
10:04:06	4.828	4.765	268.6	140	145	37.2	13911	14099	1847	1872	1	40	1.44	9.40	0.00
11:04:05	4.885	4.828	269.1	144	150	33.4	14125	14290	1876	1898	1	46	1.47	9.40	0.00
12:04:05	4.905	4.843	269.3	148	152	33.6	14113	14276	1874	1896	1	47	1.50	6.92	0.00
13:04:06	4.885	4.809	268.5	146	152	35.0	14011	14237	1861	1891	1	47	1.50	6.95	0.00
14:04:06	4.887	4.803	268.4	148	153	32.6	14032	14241	1863	1891	1	48	1.50	7.11	0.00
15:04:07	4.891	4.844	268.6	149	153	33.2	14182	14376	1883	1909	1	48	1.51	7.26	0.00
16:04:06	4.876	4.826	268.7	148	152	32.6	14117	14325	1875	1902	1	48	1.49	7.29	0.00
17:04:05	4.891	4.813	268.7	147	152	37.2	14037	14243	1864	1891	1	45	1.50	7.52	0.00
18:04:06	4.891	4.813	268.8	147	152	38.0	14050	14238	1866	1891	1	45	1.50	7.74	0.00
SUMMARY															
MIN	4.828	4.765	268.4	140	145	32.6	13911	14090	1847	1871	1	35	1.38	6.92	0.00
MAX	4.905	4.844	269.3	149	153	42.3	14182	14376	1883	1909	1	48	1.51	9.40	0.00
AVG	4.877	4.809	268.8	145	150	36.3	14035	14221	1864	1889	1	44	1.47	8.03	0.00

GROUP NO 49 GAS REHEATER DP

1	RHTR 4 GAS DIFF PRESS	6	CALC. FEEDWATER FLOW	11	
2	RHTR 5 GAS DIFF PRESS	7		12	
3	RHTR 6 GAS DIFF PRESS	8		13	
4	RHTR 7 GAS DIFF PRESS	9		14	
5	RHTR 8 GAS DIFF PRESS	10		15	

TIME	1 SA164 INWC	2 SA214 INWC	3 SA264 INWC	4 SA314 INWC	5 SA364 INWC	6 AE814 MLBH	7	8	9	10	11	12	13	14	15
07:04:05	1.29	5.59	1.10	0.38	5.76	5.987									
08:04:05	1.35	4.29	1.09	0.36	5.56	6.019									
09:04:05	1.35	4.19	1.06	0.36	5.75	6.001									
10:04:06	1.35	4.30	1.06	0.36	5.61	5.973									
11:04:05	1.40	4.39	1.08	0.36	5.62	6.062									
12:04:05	1.44	4.44	1.10	0.38	5.74	6.086									
13:04:06	1.41	4.56	1.09	0.39	5.86	6.040									
14:04:06	1.39	4.60	1.08	0.37	6.01	6.034									
15:04:07	1.41	4.67	1.08	0.38	6.03	6.076									
16:04:06	1.40	4.70	1.07	0.38	6.08	6.054									
17:04:05	1.42	4.81	1.07	0.40	6.16	6.039									
18:04:06	1.42	4.91	1.06	0.40	6.26	6.042									
SUMMARY															
MIN	1.29	4.19	1.06	0.36	5.56	5.973									
MAX	1.44	5.59	1.10	0.40	6.26	6.086									
AVG	1.39	4.62	1.08	0.38	5.87	6.034									

GROUP NO 55 PAR RISES & AVGS #1

1 MAIN STEAM FLOW ✓
2 FWH 1A TEMP RISE
3 FWH 1B TEMP RISE
4 FWH 2A TEMP RISE
5 FWH 2B TEMP RISE
6 FWH 3 TEMP RISE
7 DA TEMP RISE
8 FWH 5 TEMP RISE
9 FWH 6 TEMP RISE
10 FWH 7 TEMP RISE
11 AUX STM INTERTIE 1&2 FLW
12 AUX STEAM FROM BLR DRUM
13 AUX STEAM HDR FLOW
14 AUX STM COMMON HDR FLOW
15 AVG A APH HG TEMP IN

TIME	1 AC019 MLBH	2 AD835 DEGF	3 AD836 DEGF	4 AD837 DEGF	5 AD838 DEGF	6 AD839 DEGF	7 AE815 DEGF	8 AE816 DEGF	9 AE817 DEGF	10 AE818 DEGF	11 FB024 KLBH	12 FB001 KLBH	13 FB027 KLBH	14 FB025 KLBH	15 BA824 DEGF
07:04:05	5.901	52.3	52.5	46.6	46.2	46.7	53.6	50.6	62.0	60.0	-5.2	21.6	21.5	14.1	754.6
08:04:05	5.909	52.1	52.2	46.6	46.2	46.8	53.7	50.2	61.6	59.4	-5.1	21.2	22.1	13.5	745.8
09:04:05	5.901	51.6	52.1	47.2	46.1	46.1	54.3	50.2	60.8	59.3	-6.0	21.3	21.7	13.2	745.4
10:04:06	5.894	51.6	51.8	47.1	46.1	46.0	54.0	50.2	61.4	59.4	-4.5	21.1	21.9	12.8	743.6
11:04:05	5.917	49.4	49.5	46.4	46.1	46.4	53.8	50.1	61.9	59.7	-1.9	20.6	21.8	11.8	748.9
12:04:05	5.939	47.7	47.8	46.4	46.0	46.4	53.9	50.1	62.2	59.1	-1.5	20.6	21.7	11.3	743.0
13:04:06	5.936	48.0	47.9	46.3	46.0	45.4	54.7	50.2	61.6	59.3	-1.5	19.9	22.0	11.1	739.2
14:04:06	5.932	48.0	47.7	46.4	46.2	45.3	53.8	49.2	62.2	60.3	-1.5	19.4	22.1	10.9	740.3
15:04:07	5.937	48.3	48.1	46.2	45.8	45.2	53.4	50.0	61.2	59.2	-1.5	19.6	22.1	10.9	744.4
16:04:06	5.926	48.3	48.1	46.6	45.8	45.2	53.5	50.1	61.3	58.9	-1.5	19.1	22.2	10.6	746.9
17:04:05	5.928	47.5	47.4	46.9	45.6	45.5	53.6	50.0	61.4	59.5	-1.5	20.1	22.0	10.8	745.3
18:04:06	5.935	46.2	46.6	47.7	45.7	46.4	53.9	49.5	62.2	60.5	-1.5	21.1	22.4	11.5	740.6
SUMMARY															
MIN	5.894	46.2	46.6	46.2	45.6	45.2	53.4	49.2	60.8	58.9	-6.0	19.1	21.5	10.6	739.2
MAX	5.939	52.3	52.5	47.7	46.2	46.8	54.7	50.6	62.2	60.5	-1.5	21.6	22.4	14.1	754.6
AVG	5.921	49.2	49.3	46.7	46.0	46.0	53.8	50.0	61.7	59.6	-2.8	20.5	22.0	11.9	744.8

Run 1 5.913
Run 2 5.932

1	AVG B APH HG TEMP IN				6					11				
2	BCP DIFF PRESSURE				7					12				
3	BAROMETRIC PRESSURE				8					13				
4	TOTAL GOOD PAR MINUTES				9					14				
5					10					15				

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
TIME	BA825 DEGF	AA313 PSID	RO001 INHG	WSM120 MINUTE											
07:04:05	779.2	33	26.83	60											
08:04:05	772.2	33	26.81	60											
09:04:05	772.3	34	26.79	60											
10:04:06	770.7	34	26.78	60											
11:04:05	774.8	33	26.75	60											
12:04:05	767.3	33	26.73	60											
13:04:06	762.9	33	26.71	60											
14:04:06	764.2	33	26.69	60											
15:04:07	767.6	33	26.67	60											
16:04:06	769.6	33	26.67	60											
17:04:05	771.3	33	26.68	60											
18:04:06	765.0	33	26.71	60											
SUMMARY															
MIN	762.9	33	26.67	60											
MAX	779.2	34	26.83	60											
AVG	769.8	33	26.73	60											

29 SEP 1999 LOG 19 UNIT 3 PAR DOWNLOAD 18:02:08

GROUP NO 38 PLANT PERFORMANCE PAGE 1

1 MAIN GEN GROSS MEGAWATTS
2 AUX XFMR 3X2 MEGAWATTS
3 NET UNIT 3 HEAT RATE
4 STEAM CYCLE HEAT RATE
5 TOTAL FUEL FLOW ✓
6 CALCULATED FUEL FLOW
7 AVG BLR SH OUTLET TEMP
8 MAIN TURB THROTTLE PRESS
9 MTURB FIRST STAGE PRESS
10 AVG COLD RHT STEAM PRESS
11 AVG COLD RHT STEAM TEMP
12 AVG HOT RHT STEAM TEMP
13 AVG HOT RHT STEAM PRESS
14 16 STG EXT TO FWH5 TEMP
15 16 STG EXT TO FWH5 PRESS

TIME	1 MA009 MW	2 MA004 MW	3 AA801 BTU/KW	4 AA800 BTU/KW	5 JA206 KLBH	6 JL815 KLBS/H	7 AB800 DEG F	8 AB014 PSIG	9 AC020 PSIG	10 AB801 PSIG	11 AB802 DEG F	12 AB803 DEG F	13 AB804 PSIG	14 AF021 DEG F	15 AF246 PSIA
07:02:06	810	65.2	10662	8483	925	939.8	994.1	2485	1789	690.2	670.8	996.0	650.9	666.7	186.7
08:02:06	808	65.8	10717	8522	906	937.7	991.4	2488	1790	688.9	668.6	987.2	649.3	661.7	185.9
09:02:05	809	66.0	10685	8505	895	937.7	997.8	2486	1789	688.8	673.8	995.3	649.3	666.8	185.6
10:02:07	808	65.5	10646	8482	910	934.0	999.4	2482	1788	687.5	675.8	996.9	648.5	667.9	185.5
11:02:05	810	66.3	10731	8557	937	943.1	988.5	2491	1795	692.7	667.6	996.1	653.6	666.3	187.0
12:02:05	809	66.8	10782	8589	948	944.9	989.4	2500	1801	694.5	666.1	991.7	654.9	664.4	186.6
13:02:05	808	66.5	10729	8555	944	940.0	998.1	2498	1798	692.5	674.6	995.0	652.8	666.0	186.1
14:02:05	807	66.0	10706	8545	944	937.3	992.7	2499	1799	692.7	670.4	993.7	653.0	665.1	186.2
15:02:05	807	66.1	10758	8596	934	943.3	987.3	2498	1799	695.2	665.9	993.8	656.0	664.6	186.7
16:02:04	806	65.8	10758	8584	930	940.6	987.4	2494	1797	693.5	665.4	993.1	654.3	663.4	186.1
17:02:05	808	65.8	10707	8540	939	939.5	988.1	2495	1797	694.6	666.6	995.4	655.0	664.9	186.4
18:02:07	809	66.2	10736	8554	936	942.5	995.8	2498	1799	692.7	672.2	995.9	652.8	665.3	186.0
SUMMARY															
MIN	806	65.2	10646	8482	895	934.0	987.3	2482	1788	687.5	665.4	987.2	648.5	661.7	185.5
MAX	810	66.8	10782	8596	948	944.9	999.4	2500	1801	695.2	675.8	996.9	656.0	667.9	187.0
AVG	808	66.0	10718	8543	929	940.0	992.5	2493	1795	692.0	669.8	994.2	652.5	665.3	186.2

1 BOILER EFFICIENCY
2 AVG BOILER EXIT OXYGEN
3 FRONT STEAM DRUM PRESS
4 BFP DISCHARGE PRESS
5 FW TO ECONOMIZER FLOW
6 FW TO ECON IN HDR TEMP
7 SH SPRAY WATER FLOW
8 AIR HTR A EFFICIENCY
9 A APH X RATIO
10 AVG BOILER A EXIT TEMP
11 AIR HTR B EFFICIENCY
12 B APH X RATIO
13 AVG BOILER B EXIT TEMP
14 APH 3A GAS SIDE DP
15 APH 3B GAS SIDE DP

TIME	1 BA808 PERCNT	2 BA821 %	3 AA202 PSIG	4 AE135 PSIG	5 AE151 MLBH	6 AA101 DEG F	7 AA040 KLBH	8 BA810 PERCNT	9 BA822 FRACTI	10 BA819 DEG F	11 BA812 PERCNT	12 BA823 FRACTI	13 BA820 DEG F	14 BA195 INWC	15 BA196 INWC
07:02:06	86.5	3.30	2820	3015	5.935	502.0	34	69.6	0.75	285.6	70.4	0.78	287.7	9.67	9.17
08:02:06	86.6	3.36	2824	3020	5.958	501.9	23	69.9	0.76	281.4	70.4	0.78	285.6	9.72	9.20
09:02:05	86.7	3.24	2821	3015	5.935	502.3	22	69.7	0.76	283.6	70.5	0.78	286.8	9.69	9.16
10:02:07	86.7	3.24	2816	3010	5.916	502.4	22	69.9	0.76	284.1	70.6	0.79	287.0	9.61	9.08
11:02:05	86.9	3.22	2828	3024	6.007	502.4	22	70.3	0.76	288.1	70.9	0.79	291.4	9.83	9.24
12:02:05	86.9	3.20	2837	3033	6.027	502.4	21	69.7	0.76	292.9	70.3	0.78	295.8	9.95	9.34
13:02:05	86.9	3.23	2835	3029	5.994	502.4	20	69.7	0.75	293.0	70.3	0.78	296.0	9.83	9.25
14:02:05	86.9	3.22	2836	3030	6.010	502.4	20	69.9	0.76	293.0	70.6	0.79	295.6	9.77	9.19
15:02:05	86.9	3.20	2836	3029	6.008	502.4	19	70.1	0.76	293.5	70.6	0.79	296.6	9.81	9.24
16:02:04	86.9	3.27	2833	3027	6.002	502.4	19	70.0	0.76	294.9	70.5	0.79	298.1	9.72	9.18
17:02:05	86.8	3.20	2834	3028	6.010	502.4	21	69.8	0.76	295.0	70.4	0.78	298.8	9.76	9.22
18:02:07	86.8	3.23	2836	3030	6.006	502.4	22	69.8	0.76	291.5	70.1	0.78	296.8	9.73	9.15
SUMMARY															
MIN	86.5	3.20	2816	3010	5.916	501.9	19	69.6	0.75	281.4	70.1	0.78	285.6	9.61	9.08
MAX	86.9	3.36	2837	3033	6.027	502.4	34	70.3	0.76	295.0	70.9	0.79	298.8	9.95	9.34
AVG	86.8	3.24	2830	3024	5.984	502.3	22	69.9	0.76	289.7	70.5	0.78	293.0	9.76	9.20

GROUP NO 40 TURBINE PERFORMANCE

1 H.P.TURB EFFICIENCY
2 I.P.TURB EFFICIENCY
3 LPA (HP) TURB EFFICIENCY
4 LPB (LP) TURB EFFICIENCY
5 GOV STAGE PRESSURE RATIO
6 HP TURBINE PRESS RATIO
7 IP1 TURB PRESS RATIO
8 IP2 TURB PRESS RATIO
9 LPA-1 TURB PRESS RATIO
10 LPA-2 TURB PRESS RATIO
11 LPA-3 TURB PRESS RATIO
12 LPA-4 TURB PRESS RATIO
13 OUTSIDE AIR TEMPERATURE
14 TARGET HEAT RATE
15 REHEAT SPRAY FLOW

TIME	1 AC815 PERCNT	2 AC816 PERCNT	3 AC817 PERCNT	4 AC825 PERCEN	5 AC842 FRACTI	6 AC830 FRACTI	7 AC831 FRACTI	8 AC835 FRACTI	9 AC832 FRACTI	10 AC833 FRACTI	11 AC836 FRACTI	12 AC837 FRACTI	13 M0100	14 AA803 BTU/KW	15 AB085 KLBH
07:02:06	81.7	90.4	81.1	82.1	1.39	2.56	1.77	2.01	1.93	6.50	2.08	4.04	45.6	10819	76
08:02:06	81.4	89.7	80.8	81.8	1.39	2.57	1.76	2.02	1.93	6.49	2.08	4.02	47.1	10825	76
09:02:05	81.6	90.2	80.6	81.6	1.39	2.57	1.77	2.02	1.93	6.50	2.07	4.00	51.5	10824	76
10:02:07	81.4	90.3	80.9	81.9	1.39	2.57	1.77	2.02	1.93	6.51	2.07	3.92	55.3	10823	76
11:02:05	81.2	90.4	80.3	81.5	1.39	2.56	1.77	2.02	1.93	6.47	2.08	3.71	65.2	10823	76
12:02:05	81.9	90.0	80.3	81.7	1.39	2.56	1.77	2.02	1.93	6.47	2.06	3.52	68.8	10826	76
13:02:05	81.4	90.1	80.8	82.2	1.39	2.57	1.77	2.02	1.93	6.49	2.05	3.45	69.3	10827	76
14:02:05	81.2	90.1	81.3	82.7	1.39	2.57	1.77	2.03	1.93	6.47	2.06	3.40	72.3	10829	76
15:02:05	81.4	90.2	80.0	81.5	1.39	2.56	1.77	2.03	1.93	6.48	2.06	3.36	72.5	10829	76
16:02:04	81.6	90.4	79.9	81.5	1.38	2.56	1.77	2.03	1.93	6.50	2.05	3.39	72.9	10829	76
17:02:05	81.4	90.5	81.2	82.6	1.39	2.56	1.77	2.03	1.93	6.50	2.05	3.46	66.2	10826	76
18:02:07	81.5	90.4	80.5	81.9	1.39	2.57	1.77	2.03	1.93	6.48	2.07	3.53	62.6	10824	76
SUMMARY															
MIN	81.2	89.7	79.9	81.5	1.38	2.56	1.76	2.01	1.93	6.47	2.05	3.36	45.6	10819	76
MAX	81.9	90.5	81.3	82.7	1.39	2.57	1.77	2.03	1.93	6.51	2.08	4.04	72.9	10829	76
AVG	81.5	90.2	80.6	81.9	1.39	2.56	1.77	2.02	1.93	6.49	2.06	3.65	62.4	10825	76

1 LPB-1 TURB PRESS RATIO
2 LPB-2 TURB PRESS RATIO
3 LPB-3 TURB PRESS RATIO
4 LPB-4 TURB PRESS RATIO
5 CONDENSR 3A BACKPRESSURE
6 CONDENSR 3B BACKPRESSURE
7 COND PP DISCH HDR PRESS
8 CONDENSER HOTWELL DISCH
9 DA STORAGE TANK OUT TEMP
10 CIRC WTR TO LP COND 3B-E
11 CIRC WTR TO LP COND 3B-W
12 CIRC WTR TO HP COND 3A-E
13 CIRC WTR TO HP COND 3A-W
14 CIR WTR FRM HP COND 3A-E
15 CIR WTR FRM HP COND 3A-W

TIME	1 AC838 FRACTI	2 AC839 FRACTI	3 AC840 FRACTI	4 AC841 FRACTI	5 AF250 INHG	6 AF314 INHG	7 AD020 PSIG	8 AD001 DEG F	9 AE013 DEG F	10 DA023 DEG F	11 DA022 DEG F	12 DA039 DEG F	13 DA043 DEG F	14 DA052 DEG F	15 DA051 DEG F
07:02:06	4.76	2.55	3.05	3.28	3.602	3.135	271.9	122.0	322.8	74.8	74.8	90.3	92.2	105.1	105.0
08:02:06	4.75	2.56	3.01	3.29	3.610	3.137	271.9	122.0	322.9	74.8	74.8	90.5	92.2	105.2	105.1
09:02:05	4.76	2.55	3.04	3.26	3.628	3.148	272.8	122.3	322.9	74.8	74.8	90.9	92.2	105.8	105.7
10:02:07	4.76	2.56	3.03	3.21	3.705	3.189	273.3	123.3	322.6	74.8	74.8	91.0	93.4	106.9	106.9
11:02:05	4.75	2.55	2.98	3.18	3.973	3.324	270.9	125.0	322.9	76.6	76.6	93.2	94.9	108.8	109.1
12:02:05	4.76	2.54	2.98	3.06	4.200	3.444	270.2	126.5	323.2	78.3	78.5	95.5	97.6	111.0	111.2
13:02:05	4.75	2.55	2.97	3.03	4.276	3.478	271.2	126.5	323.2	80.8	80.7	95.5	97.8	112.8	112.9
14:02:05	4.75	2.54	2.99	3.00	4.346	3.511	270.7	126.7	322.1	81.0	81.0	95.5	98.4	112.8	112.9
15:02:05	4.75	2.54	2.93	3.03	4.390	3.542	270.4	129.6	322.0	81.5	81.4	95.5	98.4	112.9	113.1
16:02:04	4.74	2.54	2.91	3.08	4.353	3.506	271.4	129.7	322.2	81.4	81.4	95.5	98.4	113.0	113.4
17:02:05	4.75	2.54	2.93	3.09	4.247	3.453	270.8	129.1	322.4	80.8	80.8	96.0	98.6	113.0	112.8
18:02:07	4.75	2.54	2.98	3.10	4.129	3.392	271.2	127.9	322.7	79.6	79.6	96.6	98.6	111.4	111.3
SUMMARY															
MIN	4.74	2.54	2.91	3.00	3.602	3.135	270.2	122.0	322.0	74.8	74.8	90.3	92.2	105.1	105.0
MAX	4.76	2.56	3.05	3.29	4.390	3.542	273.3	129.7	323.2	81.5	81.4	96.6	98.6	113.0	113.4
AVG	4.75	2.55	2.98	3.13	4.038	3.355	271.4	125.9	322.7	78.3	78.3	93.8	96.1	109.9	109.9

1 LPI COND CLEANLINESS
2 LPO COND CLEANLINESS
3 HPO COND CLEANLINESS
4 HPI COND CLEANLINESS
5 HTR 7 TERM TEMP DIFF
6 HTR 7 DRAIN COOLER APPR
7 HTR 6 TERM TEMP DIFF
8 HTR 6 DRAIN COOLER APPR
9 HTR 5 TERM TEMP DIFF
10 HTR 5 DRAIN COOLER APPR
11 HEATER 7 EXTRACTION FLO
12 HEATER 6 EXTRACTION FLO
13 HEATER 5 EXTRACTION FLO
14 HEATER 4 EXTRACTION FLO
15 COND DUTY

TIME	1 AD812 FRACTI	2 AD819 FRACTI	3 AD829 FRACTI	4 AD824 FRACTI	5 AF872 DEGF	6 AF881 DEGF	7 AF873 DEGF	8 AF882 DEGF	9 AF874 DEGF	10 AF883 DEGF	11 AF818 KLB/H	12 AF819 KLB/H	13 AF820 KLB/H	14 AF821 KLB/H	15 AD813 MBTU/H
07:02:06	0.52	0.60	0.51	0.58	-1.7	18.0	0.4	22.3	0.4	17.5	440.5	322.8	242.3	242.8	3453
08:02:06	0.53	0.60	0.52	0.57	-1.8	17.4	1.0	22.0	0.4	17.6	443.3	322.6	241.8	244.3	3463
09:02:05	0.54	0.60	0.54	0.59	-2.3	17.0	1.2	21.1	-0.2	17.1	442.0	315.1	241.2	246.2	3527
10:02:07	0.54	0.65	0.56	0.63	-2.5	16.7	0.4	21.6	-0.4	16.7	437.6	317.3	238.9	243.5	3662
11:02:05	0.56	0.65	0.57	0.61	-1.7	17.6	0.6	22.2	0.3	17.1	449.0	325.6	241.8	246.0	3703
12:02:05	0.59	0.70	0.55	0.59	-1.4	18.1	0.4	21.5	0.2	17.3	451.0	328.6	243.9	247.3	3718
13:02:05	0.52	0.63	0.62	0.69	-1.8	17.6	0.6	21.3	-0.2	17.3	443.9	322.2	242.9	249.3	3667
14:02:05	0.51	0.65	0.59	0.67	-1.7	18.3	1.1	22.4	0.8	16.3	452.6	325.5	234.4	245.5	3634
15:02:05	0.49	0.63	0.59	0.66	-1.3	17.2	1.4	21.6	0.0	15.7	446.9	322.3	241.2	244.6	3602
16:02:04	0.50	0.64	0.62	0.68	-1.6	16.8	1.0	21.5	-0.3	15.8	443.2	322.1	241.4	244.8	3625
17:02:05	0.55	0.68	0.60	0.69	-1.4	17.3	1.1	21.7	0.0	15.9	443.7	321.5	240.0	244.9	3675
18:02:07	0.62	0.73	0.55	0.61	-1.7	17.9	0.6	22.3	0.1	16.5	447.4	325.2	237.2	245.9	3630
SUMMARY															
MIN	0.49	0.60	0.51	0.57	-2.5	16.7	0.4	21.1	-0.4	15.7	437.6	315.1	234.4	242.8	3453
MAX	0.62	0.73	0.62	0.69	-1.3	18.3	1.4	22.4	0.8	17.6	452.6	328.6	243.9	249.3	3718
AVG	0.54	0.65	0.57	0.63	-1.8	17.5	0.8	21.8	0.1	16.7	445.1	322.6	240.6	245.4	3613

COLSTRIP UNIT 3 DAILY GENERATION LOG

DATE: 9-30-99

TIME	S/U MWHR	S/U INTER	REASON FOR DERATE	MW EST CAP.	MW DIS REC.	GROSS INTER MWHR	GROSS MW	AUX MW	NET MW	NET TOTAL MWHR
0100						65646	810	66	750	750
0200						65727	810	66	747	1497
0300						65808	810	66	747	2244
0400						65890	820	66	752	2996
0500						65971	810	66	750	3746
0600						66052	810	66	744	4490
0700						66133	810	66	752	5242
0800					748 MW	66215	820	65	748	5990
0900						66296	810	66	750	6740
1000						66378	820	66	747	7487
1100						66459	810	66	748	8235
1200						66540	810	66	750	8985
1300						66621	810	66	747	9732
1400						66702	810	65	750	10482
1500						66783	810	65	747	11229
1600						66864	810	67	746	11975
1700						66946	820	66	749	12724
1800						67026	800	66	745	13469
1900						67108	820	66	748	14217
2000						67189	810	67	747	14964
2100						67270	810	66	743	15707
2200						67351	810	66	746	16453
2300						67431	800	65	742	17195
2400						67512	810	66	748	17943

OPERATORS:

NIGHT: White

DAYS: Shahnn

NIGHT: White

COAL BELT SCALES

SCALE 60	
SCALE 70	
SCALE 81	
SCALE 91	

HYDROGEN BANKS

PRESSURE		TEMP
A		
B		

FUEL OIL TANK

LEVEL	TEMP

ATR: 2402

Daily Prev.	16282
Daily Total	
Month Prev.	480
Month Total	

Gross Daily Prev.	65565
Gross Daily Total	19470
Gross Month Prev.	488960
Gross Month Total	508430

Net Month Prev.	449439
Net Month Total	467382
Net MW Avg	747.625
Net MW Peak	752

Previous Day Generation

MWHR Net	17852
MW Net Ave.	743.833
MW Net Peak	749

E-22

NIGHT: [signature]

DAY: [signature]

NIGHT: [signature]

CRO LOG

REV 4 8/13/98

COLSTRIP UNIT 3

DATE: 9-30-99

Time	A Super Heat Temp at Boiler	B Super Heat Temp at Boiler	A Hot Reheat Temp at Boiler	B Hot Reheat Temp at Boiler	Net Heat Rate	Calculated Fuel Flow	Excess Air	A Backpress	Cold End Average	Gen Volts	Gen Vars Net	CPD Dissolved O_2	CPD Sodium	Boiler Blowdown pH
Limts	1005	1005	1005	1005		945	3.0-3.5	7 in. Hg	155			20 ppb	2 ppb	9-9.55
0100	993	988	1001	992	10767	945	3.1	4.0	187	27.2	112	16.0	.5	9.24
0300	988	988	988	989	10669	931	3.2	3.8	187	27.2	114	16.3	.3	9.22
0500	990	986	1002	995	10853	945	3.3	3.6	184	27.2	104	15.0	.5	9.33
0700	1000	1002	1006	1003	10920	934	3.13	3.58	1799	27.2	81	14.8	.5	9.30
0900	996	989	999	989	10662	937	3.26	3.62	178.5	27.2	59	14.0	.4	9.28
1100	995	994	999	996	10552	925	3.25	3.67	181.5	27.2	73	13.3	.4	9.30
1300	981	989	999	1003	10724	941	3.15	3.49	182.7	27.2	77	14.3	.4	9.28
1500	991	1003	991	990	10491	925	3.22	3.75	183.8	27.2	71	13.1	.5	9.22
1700	996	999	1003	995	10561	930	3.18	3.74	184.8	27.2	62	13.3	.5	9.23
1900	987	1004	999	1003	10621	933	3.1	3.6	184	27.2	64	12.3	.3	9.17
2100	993	1002	1002	1002	10850	945	3.1	3.5	179	27.2	85	14.2	.3	9.24
2300	992	985	988	989	10853	945	3.2	3.5	177	27.2	96	13.9	.3	9.23

Scrubber Wet Tests

12-16% Range

Vessel	1	2	3	4	5	6	7	8
Prev 2100	15.6	12.6	—	20.0	20.2	12.6	15.2	13.2
0900	14.1	10.5	—	23.4	17.0	12.4	17.1	11.2
2100	16.0	12.6	—	19.4	19.4	13.6	13.6	15.2

Condenser Air Inleakage

40 cfm Limit

0100	

#'s SO_2 Rolling 30 Day Ave.

0100:

NIGHT Cockwell
DAY Hansel
NIGHT Cockwell

COLSTRIP UNIT 3
Scrubber Log
MC# 6519422

DATE: 9-30-99

	3-1 Vent. Seal H2O GPM	3-1 Vent. STR Δ P	3-1 Absorp. Seal H2O GPM	3-1 Absorp. STR Δ P	3-2 Vent. Seal H2O GPM	3-2 Vent. STR Δ P	3-2 Absorp. Seal H2O GPM	3-2 Absorp. STR Δ P	3-3 Vent. Seal H2O GPM	3-3 Vent. STR Δ P	3-3 Absorp. Seal H2O GPM	3-3 Absorp. STR Δ P	3-4 Vent. Seal H2O GPM	3-4 Vent. STR Δ P	3-4 Absorp. Seal H2O GPM	3-4 Absorp. STR Δ P	3-1 W.T. Seal H2O GPM	3-1 W.T. STR Δ P	3-1 Eff. Seal H2O GPM	3-2 W.T. Seal H2O GPM	3-2 W.T. STR Δ P	3-2 Eff. Seal H2O GPM	W.T. Bleed Seal H2O GPM	P.R.S.T. Seal H2O GPM	3-1 I.D. Fan L.O. Res. Temp.	3-1 I.D. Fan L.O. Res. Level	3-2 I.D. Fan L.O. Res. Temp.	3-2 I.D. Fan L.O. Res. Level	3-3 I.D. Fan L.O. Res. Temp.	3-3 I.D. Fan L.O. Res. Level	3-4 I.D. Fan L.O. Res. Temp.	3-4 I.D. Fan L.O. Res. Level	D.C. Sump Seal H2O GPM	U-3 H2O - Oil Main Prt. Sump Ck	3-1 Common Eff. Pp Seal H2O GPM	3-1 Common Eff. Pp Seal H2O GPM	3-1 Common Eff. Pp Seal H2O GPM
0300	✓		✓		✓		✓						✓		✓								6	134	✓	126	✓			140	✓	8	✓	6	6	6
0700	✓		✓		✓		✓						✓		✓								6	134	✓	128	✓			142	–	8	–	4	6	6
1100																																				
1500	✓		✓		✓		✓						✓		✓								6	134	✓	130	✓			142	✓	8	✓	4	4	4
1900	✓		✓		✓		✓						✓		✓								6	134	✓	128	✓			144	✓	5	✓	6	6	6
2300																																				

	3-5 Vent. Seal H2O GPM	3-5 Vent STR Δ P	3-5 Absorp. Seal H2O GPM	3-5 Absorp. STR Δ P	3-6 Vent. Seal H2O GPM	3-6 Vent. STR Δ P	3-6 Absorp. Seal H2O GPM	3-6 Absorp. STR Δ P	3-7 Vent. Seal H2O GPM	3-7 Vent. STR Δ P	3-7 Absorp. Seal H2O GPM	3-7 Absorp. STR Δ P	3-8 Vent. Seal H2O GPM	3-8 Vent. STR Δ P	3-8 Absorp. Seal H2O GPM	3-8 Absorp. STR Δ P	3-3 W.T. Seal H2O GPM	3-3 W.T. STR Δ P	3-4 W.T. Seal H2O GPM	3-4 W.T. STR Δ P	3-5 I.D. Fan L.O. Res. Temp.	3-5 I.D. Fan L.O. Res. Level	3-6 I.D. Fan L.O. Res. Temp.	3-6 I.D. Fan L.O. Res. Level	3-7 I.D. Fan L.O. Res. Temp.	3-7 I.D. Fan L.O. Res. Level	3-8 I.D. Fan L.O. Res. Temp.	3-8 I.D. Fan L.O. Res. Level	3-1 Δ Seal H2O Dist.	3-1 Eff. Holding Tank Flow	3-2 Eff. Holding Tank Flow	4-1 Eff. Holding Tank Flow	4-2 Eff. Holding Tank Flow
0300	✓		✓		✓		✓		✓		✓		✓								136	✓	134	✓	134	✓	135	✓	144					
0700	✓		✓		✓		✓		✓		✓		✓								137	✓	138	✓	134	✓	138	✓	140					
1100																																		
1500	✓		✓		✓		✓		✓		✓		✓								136	✓	138	✓	134	✓	139	✓	142					
1900	✓		✓		✓		✓		✓		✓		✓								136	✓	138	✓	132	✓	135	✓	158					
2300																																		

	Scrubber Chiller	3-2 Mixed Air Fan	3-2 Roof Exh. Fan	3-4 Mixed Air Fan	3-4 Roof Exh. Fan	3-1 Mixed Air Fan	3-1 Roof Exh. Fan	3-3 Mixed Air Fan	3-3 Roof Exh. Fan	3-1 I.D. Fan Vibr. (Highest)	3-2 I.D. Fan Vibr. (Highest)	3-3 I.D. Fan Vibr. (Highest)	3-4 I.D. Fan Vibr. (Highest)	3-5 I.D. Fan Vibr. (Highest)	3-6 I.D. Fan Vibr. (Highest)	3-7 I.D. Fan Vibr. (Highest)	3-8 I.D. Fan Vibr. (Highest)	Lime Loop Recirc. GPM	Lime Loop Recirc. Pressure	Relay Room HVAC	Battery Room Amps	Battery Room Volts	Battery Room D.C. Ground
07	✓								2.5	3.4	0/5	1.6	2.5	1.5	1.4	3.2	50	–	✓	60	137	✓	
19	✓								2.5	3.4		1.7	2.7	1.5	1.5	3.2	54	–	✓	60	135	✓	

0600 Vent. Spray Pipe Temp. Check		1800 Vent. Spray Pipe Temp. Check	
3-1	✓	3-1	✓
3-2	✓	3-2	✓
3-3	0/5	3-3	0/5
3-4	✓	3-4	✓
3-5	✓	3-5	✓
3-6	~	3-6	✓
3-7	✓	3-7	✓
3-8	✓	3-8	✓

NIGHT Faily
DAY Curtis
NIGHT Fritz

COLSTRIP UNIT ____
ASH SYSTEM, DIESEL GENERATORS
COAL PULVERIZER & FANS
MC #6519487

DATE 9-30-99

TIME	UNIT 3 ONLY A DIESEL GEN BATT VOLTS	UNIT 3 ONLY B DIESEL GEN BATT VOLTS	UNIT 3 ONLY C DIESEL GEN BATT VOLTS	UNIT 3 ONLY D DIESEL GEN BATT VOLTS	A MILL HYD OIL TEMP	A MILL HYD OIL PSI	A MILL LUBE OIL TEMP	A MILL LUBE OIL PSI	B MILL HYD OIL TEMP	B MILL HYD OIL PSI	B MILL LUBE OIL TEMP	B MILL LUBE OIL PSI	C MILL HYD OIL TEMP	C MILL HYD OIL PSI	C MILL LUBE OIL TEMP	C MILL LUBE OIL PSI	D MILL HYD OIL TEMP	D MILL HYD OIL PSI	D MILL LUBE OIL TEMP	D MILL LUBE OIL PSI	E MILL HYD OIL TEMP	E MILL HYD OIL PSI	E MILL LUBE OIL TEMP	E MILL LUBE OIL PSI	F MILL HYD OIL TEMP	F MILL HYD OIL PSI	F MILL LUBE OIL TEMP	F MILL LUBE OIL PSI	G MILL HYD OIL TEMP	G MILL HYD OIL PSI	G MILL LUBE OIL TEMP	G MILL LUBE OIL PSI	H MILL HYD OIL TEMP	H MILL HYD OIL PSI	H MILL LUBE OIL TEMP	H MILL LUBE OIL PSI	A FD FAN OIL TEMP	A FD FAN OIL HDR PSI	B FD FAN OIL TEMP	B FD FAN OIL HDR PSI	A PA FAN OIL TEMP	A PA FAN OIL HDR PSI	B PA FAN OIL TEMP	B PA FAN OIL HDR PSI	GLYCOL APH PRESSURE
0100	31	31	29	31	88	100	110	50					90	100	110	60	80	100	110	41	95	100	112	67	90	100	110	78	95	100	114	54	100	100	96	90	117	58	112	63	132	25	130	24	92
0300																																													
0500																																													
0700	31	31	29	31	88	100	110	51					80	80	110	60	85	80	104	40	90	80	110	67	85	100	112	78	90	100	100	54	80	100	96	82	110	58	106	63	132	26	100	24	92
0900																																													
1100																																													
1300																																													
1500				Busy with ash																																									
1700																																													
1900	31	31	29	31	88	100	110	50					80	100	110	60	80	100	105	41	95	100	112	67	80	100	1,080	85	100	54	100	100	96	80	113	58	108	63	132	25	135	25	90
2100																																													
2300																																													

Check Both B.A. Wall Cooling Spray Controllers.

To Be Set At 70%. N_2 - 500 PSI at 1900 hrs

MAIN TRANSFORMERS													AUX TRANS						START-UP TRANSFORMERS						
	A PHASE				B PHASE				C PHASE				TRANSFORMER				X TAP	Y TAP	TRANSFORMER				X TAP		Y TAP
TIME	N_2 BOTTLE PRESS	TRANS N_2 PRESS	TRANS OIL LEVEL	WINDING TEMP	N_2 BOTTLE PRESS	TRANS N_2 PRESS	TRANS OIL LEVEL	WINDING TEMP	N_2 BOTTLE PRESS	TRANS N_2 PRESS	TRANS OIL LEVEL	WINDING TEMP	N_2 BOTTLE PRESS	TRANS N_2 PRESS	TRANS OIL LEVEL	WINDING TEMP	OIL LEVEL	OIL LEVEL	N_2 BOTTLE PRESS	TRANS N_2 PRESS	TRANS OIL LEVEL	WINDING TEMP	PRESSURE	OIL LEVEL	PRESSURE	OIL LEVEL
0700		4.4	OK	80		.8	OK	80		5.0	OK	78		4.4	OK	60	OK	OK		1.4	OK	28	1.4	OK	Ø	OK
1900		3	✓	84		1	✓	84		5	✓	90		3	✓	100	✓	✓		1.4	✓	35	0	✓	0	✓

	125VDC GRD TEST #1	125VDC GRD TEST #2	250VDC GRD TEST	125VDC CHRG IN SERVICE 1	125VDC CHRG IN SERVICE 2	250VDC CHRG IN SERVICE
0700	OK	OK	OK	11	21	3
1500						
1900	✓	✓	✓	11	21	53

00 EACH DAY
ECORD HOUR METER READINGS

A-P-2073-2074-A1 & 2
A-P-2079-2080-B1 & 2
RUSHER JM-S-2046-A1
RUSHER JM-S-2045-B1
RUSHER JM-S-2044-C1
RUSHER JM-S-2049-1A2
RUSHER JM-S-2048-B-2
RUSHER JM-S-2047-C-2

BOSS Printing. Glendive. MTMP15-MPAshUnit (Rev. 11-96)

UNIT 3
BOILER TURBINE GENERATOR
JOURNEYMAN / SYSTEM OPERATOR LOG
M.C. #6519460

DATE 9-30-99

NIGHT SHIFT Fritz
DAY SHIFT Curtis
NIGHT SHIFT Fritz

TIME	A BWCP MOTOR CAVITY TEMP	B BWCP MOTOR CAVITY TEMP	C BWCP MOTOR CAVITY TEMP	D BWCP MOTOR CAVITY TEMP	TURB BRG OIL PRESS	TURB BRG 1 OIL TEMP	TURB BRG 2 OIL TEMP	TURB BRG 3 OIL TEMP	TURB BRG 4 OIL TEMP	TURB BRG 5 OIL TEMP	TURB BRG 6 OIL TEMP	TURB BRG 7 OIL TEMP	TURB BRG 8 OIL TEMP	TURB BRG 9 OIL TEMP	TURB BRG 10 OIL TEMP	TURB BRG 11 OIL TEMP	EHC LEVEL	EHC TEMPERATURE	EHC PRESSURE	TURBINE LUBE OIL LEVEL	CONDENSATE HDR PRESS	SERVICE WATER PRESS	HYDROGEN PURITY	AIR SIDE SEAL PRESSURE	SEAL OIL Δ P EXCITER END	SEAL OIL Δ P GOVENOR END	STATOR WATER PRESSURE	CCW HI OUT TEMP	CCW PRESSURE	A AUX TURB OIL TEMP	A AUX TURB BRG OIL PSI	B AUX TURB OIL TEMP	B AUX TURB BRG OIL PSI	VAC PMP SEAL WTR TANK LVL	CONDENSER AIR IN LEAKAGE
0100	110	105	115	103	16	138	160	160	148	155	160	176	160	156	168	138	✓	114	120	2	285	48	—	105	-25	-12	71	78	93	108	23	167	23	✓	ok
0300																																				
0500																																				
0700	109	109	114	106	164	140	160	160	150	154	160	148	160	158	168		3/4	116	120	2	280	78		102	25	10	68	78	100	106	23.8	109	23.2	ok	14
0900																																				
1100																																				
1300																																				
1500						Busy with ash																														
1700																																				
1900	110	105	112	108	16	138	160	160	146	155	160	176	160	156	168	132	✓	112	120	2	285	108	—	95	-5	-1	100	78	93	106	25	164	23	✓	20
2100																																				
2300																																				

TIME	GEN H2 DEW POINT	CK I/S AIR COMPRESSOR A	CK I/S AIR COMPRESSOR B	CK I/S AIR COMPRESSOR C	CK I/S AIR COMPRESSOR D	CK I/S AIR COMPRESSOR E	3 A SERV WATER PP & MOTOR	3 B SERV WATER PP & MOTOR	3 C SERV WATER PP & MOTOR	3 A SUCT STR Δ P	3 B SUCT STR Δ P	3 C SUCT STR Δ P	FUEL OIL HDR PSI
0300	-18	✓	✓	✓	✓	✓		✓	✓		1.5	1.5	250
0700	-18	✓	✓	✓	✓	✓		✓	✓		1.0	.9	250
1100													
1500													
1900	-18	✓	✓	✓	✓			✓	✓		.8	.7	250
2300													

FIRST OF SHIFT CHECKS

0700 _____ FT. WEST L.O.STORAGE TANK LEVEL _____ FT. EAST L.O. STORAGE TANK LEVE
0700 ✓ mls _____ CHECK GENERATOR LIQUID LEAK DETECTORS AND
1900 _____ mls _____ LOG AMOUNT DRAINED IN JOURNAL, REPORT SAME TO S / S.
UNIT #3 BUILDING HEATING SYS. PSI 24 UNIT #3 GLYCOL PUMP SUCT. PSI 18
CHECK FOR LEAKING SAFETY VALVES SH, RH, AUX. STEAM 0700 ✓ 1900 ✓
DRUM LEVEL 0700 N ✓ S ✓ 1900 N — S — (COMPARE WITH C
APH BEARING GUIDE OIL TEMP 0700 A 112 B 110 1900 A — B —
APH SUPPORT BEARING TEMP 0700 A 86 B 90 1900 A — B —
CHECK OVERFIRE AIR NOZZLE POSITIONS (ALL SHOULD BE IN THE SAME POSITION)
CHECK IN SERVICE SCANNER AIR FAN ✓. CHECK IN SERVICE IGNITOR AIR FAN ✓
CHECK BURNER TILT POSITION (COMPARE WITH CONTROL BOARD INDICATION)
CHECK TILT ASSEMBLY FOR SHEARED PINS OR WARPED LINKAGE.
H2 GAS VENT METER FI-110 0700 177 1900 177
CCW HEAD TANK LEVEL 0700 OK 1900 ✓
STATER COOLING WATER MAKEUP METER 0700 81561 1900 81561
GEN H2 GAS MAKEUP TOTALIZERS 0700 N 303411 S 510036.1 1900 N 303628 S 510126.4

Storage and Retrieval
Hourly Average Report
10/25/1999

Data Retrieval For 09/30/1999 unit3

1. SA255 SCRUB 6 INLET GAS TEMP ✓
2. SA256 SCRUB 6 INLET GAS PRESS
3. SA257 MIST ELM 6 DIFF PRESS
4. SA258 WASH TRAY 6 DIFF PRESS
5. SA259 PLUMB BOB 6 DIFF PRESS
6. SA262 SCRUB 6 TRAIN DIFF PRESS

Hour	1 SA255 DEG F	2 SA256 INWC	3 SA257 INWC	4 SA258 INWC	5 SA259 INWC	6 SA262 INWC
0	279	-18.4	0.00	2.29	20.6	24.5
1	279	-18.5	0.00	2.24	20.6	24.4
2	279	-18.6	0.00	2.28	20.6	24.5
3	279	-18.6	0.00	2.24	19.9	23.9
4	276	-18.5	0.00	2.20	19.9	23.7
5	275	-18.6	0.00	2.23	20.0	23.7
6	273	-18.2	0.00	2.19	20.0	23.7
7	271	-18.6	0.00	2.24	19.9	23.8
8	269	-18.4	0.00	2.26	19.9	24.0
9	269	-18.5	0.00	2.24	19.9	23.8
10	269	-18.4	0.00	2.21	20.0	23.8
11	271	-18.5	0.00	2.25	20.0	23.8
12	272	-18.6	0.00	2.32	19.9	23.9
13	273	-18.4	0.00	2.26	20.0	24.0
14	275	-18.6	0.00	2.36	20.0	24.0
15	274	-18.6	0.00	2.36	19.9	24.1
16	275	-18.8	0.00	2.41	19.9	24.1
17	275	-18.7	0.00	2.45	19.9	24.2
18	275	-18.3	0.00	2.36	20.0	24.2
19	275	-18.7	0.00	2.56	20.0	24.4
20	274	-18.6	0.00	2.46	19.9	24.2
21	271	-18.3	0.00	2.46	20.0	24.3
22	269	-18.0	0.00	2.40	19.9	24.2
23	268	-17.8	0.00	2.27	20.0	23.8
Summary						
DayMin	267 @10:26	-19.6 @14:12	0.00 @00:00	1.89 @23:32	19.1 @22:59	22.1 @20:19
DayMax	280 @02:02	-17.0 @23:57	0.01 @01:53	2.71 @14:12	21.6 @00:14	25.8 @20:05
DayAvg	274	-18.5	0.00	2.31	20.0	24.0

Run 3 269°F

Storage and Retrieval
Hourly Average Report
10/25/1999

Data Retrieval For 09/30/1999 unit3

1. SA263 SCRUB 6 OUTLET GAS TEMP
2. SA264 RHTR 6 GAS DIFF PRESS
3. SA265 ID FAN 6 INLET GAS PRESS
4. SA266 ID FAN 6 INLET GAS TEMP
5. SA268 SCRUB 6 OUTLET SO2
6. SA269 ID FAN 6 OUTLET TEMP
7. SA271 ID FAN 6 OUTLET GAS PRES

Hour	1 SA263 DEG F	2 SA264 INWC	3 SA265 INWC	4 SA266 DEG F	5 SA268 PPM	6 SA269 DEG F	7 SA271 INWC
0	131	1.09	-43.6	149	19.63	191	2.0
1	131	1.09	-43.6	149	16.98	191	2.0
2	131	1.10	-43.5	149	14.01	191	2.1
3	131	1.08	-42.9	149	14.92	191	1.9
4	130	1.08	-42.8	149	13.32	191	1.9
5	130	1.09	-43.1	150	10.85	192	1.9
6	130	1.09	-42.5	153	8.19	196	1.9
7	130	1.11	-43.0	153	7.11	196	1.9
8	130	1.11	-42.9	153	6.86	196	2.0
9	130	1.11	-43.0	152	9.24	196	2.0
10	130	1.10	-42.8	152	17.88	196	2.1
11	130	1.11	-42.9	152	19.70	196	2.0
12	130	1.14	-43.1	152	23.28	196	2.0
13	130	1.12	-43.0	152	26.42	196	2.0
14	131	1.15	-43.4	152	35.75	196	2.1
15	131	1.14	-43.2	152	43.89	196	2.0
16	130	1.16	-43.5	152	55.97	196	2.0
17	131	1.17	-43.6	152	66.87	196	2.0
18	130	1.15	-43.0	152	60.61	196	1.9
19	130	1.22	-43.8	152	68.84	196	2.2
20	131	1.19	-43.4	152	76.19	196	1.9
21	130	1.18	-43.2	152	90.43	196	1.8
22	130	1.17	-42.7	152	94.79	196	1.8
23	130	1.12	-42.2	153	94.38	196	1.7
Summary							
DayMin	128 @10:48	0.92 @04:23	-45.3 @14:12	148 @02:16	6.08 @07:39	190 @04:39	1.3 @21:17
DayMax	132 @06:03	1.33 @19:37	-40.5 @23:32	154 @07:12	100.9 @21:39	197 @05:56	2.5 @19:37
DayAvg	130	1.13	-43.1	152	37.34	195	2.0

GROUP NO 38 PLANT PERFORMANCE

1 MAIN GEN GROSS MEGAWATTS
2 AUX XFMR 3X2 MEGAWATTS
3 NET UNIT 3 HEAT RATE
4 STEAM CYCLE HEAT RATE
5 TOTAL FUEL FLOW
6 CALCULATED FUEL FLOW
7 AVG BLR SH OUTLET TEMP
8 MAIN TURB THROTTLE PRESS
9 MTURB FIRST STAGE PRESS
10 AVG COLD RHT STEAM PRESS
11 AVG COLD RHT STEAM TEMP
12 AVG HOT RHT STEAM TEMP
13 AVG HOT RHT STEAM PRESS
14 16 STG EXT TO FWH5 TEMP
15 16 STG EXT TO FWH5 PRESS

TIME	1 MA009 MW	2 MA004 MW	3 AA801 BTU/KW	4 AA800 BTU/KW	5 JA206 KLBH	6 JL815 KLBS/H	7 AB800 DEG F	8 AB014 PSIG	9 AC020 PSIG	10 AB801 PSIG	11 AB802 DEG F	12 AB803 DEG F	13 AB804 PSIG	14 AF021 DEG F	15 AF246 PSIA
07:02:05	809	66.4	10841	8595	932	942.1	996.8	2499	1799	692.8	673.4	997.5	653.1	668.8	186.5
08:02:06	811	66.5	10760	8540	925	943.2	984.6	2496	1796	693.4	664.7	993.4	654.4	664.9	186.6
09:02:07	811	66.1	10721	8523	914	945.8	992.5	2500	1799	693.0	669.9	993.7	653.4	664.6	186.3
10:02:06	811	66.2	10703	8512	899	941.6	988.6	2496	1796	691.9	666.4	994.4	652.1	664.1	185.9
11:02:06	811	66.1	10670	8490	901	939.1	992.5	2493	1794	691.0	670.4	995.9	651.7	664.1	185.9
12:02:05	810	66.3	10644	8467	909	936.5	1000	2498	1796	690.8	677.6	1003	651.2	669.7	186.0
13:02:07	810	66.3	10671	8491	923	937.7	990.1	2494	1795	691.1	667.8	991.3	651.8	662.3	185.9
14:02:06	811	65.7	10695	8521	942	940.8	989.8	2497	1798	692.8	667.6	995.8	653.7	667.5	186.5
15:02:04	809	66.0	10661	8496	942	939.8	993.5	2499	1799	691.3	670.6	992.6	652.1	663.4	186.2
16:02:04	810	66.3	10737	8548	949	943.4	990.8	2495	1797	690.8	667.5	991.2	651.2	661.7	185.8
17:02:05	812	66.4	10662	8487	951	939.6	993.4	2499	1799	692.8	669.7	997.3	652.9	667.2	186.3
18:02:06	809	66.8	10739	8537	944	942.6	987.9	2496	1797	692.2	665.5	990.4	652.3	661.5	185.9
SUMMARY															
MIN	809	65.7	10644	8467	899	936.5	984.6	2493	1794	690.8	664.7	990.4	651.2	661.5	185.8
MAX	812	66.8	10841	8595	951	945.8	1000	2500	1799	693.4	677.6	1003	654.4	669.7	186.6
AVG	810	66.2	10709	8517	928	941.0	991.8	2497	1797	692.0	669.3	994.7	652.5	665.0	186.2

1 BOILER EFFICIENCY
2 AVG BOILER EXIT OXYGEN
3 FRONT STEAM DRUM PRESS
4 BFP DISCHARGE PRESS
5 FW TO ECONOMIZER FLOW
6 FW TO ECON IN HDR TEMP
7 SH SPRAY WATER FLOW
8 AIR HTR A EFFICIENCY
9 A APH X RATIO
10 AVG BOILER A EXIT TEMP
11 AIR HTR B EFFICIENCY
12 B APH X RATIO
13 AVG BOILER B EXIT TEMP
14 APH 3A GAS SIDE DP
15 APH 3B GAS SIDE DP

TIME	1 BA808 PERCNT	2 BA821 %	3 AA202 PSIG	4 AE135 PSIG	5 AE151 MLBH	6 AA101 DEG F	7 AA040 KLBH	8 BA810 PERCNT	9 BA822 FRACTI	10 BA819 DEG F	11 BA812 PERCNT	12 BA823 FRACTI	13 BA820 DEG F	14 BA195 INWC	15 BA196 INWC
07:02:05	86.5	3.27	2835	3030	5.947	502.5	35	69.5	0.75	285.3	70.3	0.78	284.5	9.68	9.14
08:02:06	86.5	3.27	2834	3033	5.998	502.5	36	69.7	0.75	281.9	70.3	0.78	282.0	9.84	9.29
09:02:07	86.5	3.27	2836	3032	5.968	502.5	35	69.6	0.75	280.2	70.3	0.78	280.6	9.82	9.22
10:02:06	86.6	3.29	2832	3029	5.998	502.5	22	69.7	0.75	279.9	70.3	0.78	280.2	9.82	9.23
11:02:06	86.6	3.29	2827	3022	5.942	502.5	21	69.9	0.76	280.4	70.4	0.78	280.2	9.73	9.16
12:02:05	86.6	3.27	2833	3028	5.941	502.5	21	69.9	0.76	281.4	70.3	0.78	282.2	9.77	9.19
13:02:07	86.7	3.25	2832	3028	5.976	502.5	20	70.0	0.76	281.6	70.4	0.79	282.5	9.72	9.14
14:02:06	86.7	3.21	2834	3030	5.973	502.5	20	70.3	0.77	281.9	70.5	0.79	282.5	9.71	9.13
15:02:04	86.7	3.21	2836	3032	5.977	502.5	20	69.8	0.76	284.9	70.1	0.78	285.2	9.82	9.23
16:02:04	86.7	3.22	2831	3030	5.973	502.5	20	70.0	0.76	284.0	70.3	0.78	284.6	9.69	9.16
17:02:05	86.7	3.20	2835	3031	5.978	502.5	19	70.3	0.76	284.3	70.6	0.79	284.7	9.77	9.21
18:02:06	86.6	3.23	2833	3032	5.998	502.5	19	70.4	0.76	284.4	70.6	0.79	285.4	9.80	9.27
SUMMARY															
MIN	86.5	3.20	2827	3022	5.941	502.5	19	69.5	0.75	279.9	70.1	0.78	280.2	9.68	9.13
MAX	86.7	3.29	2836	3033	5.998	502.5	36	70.4	0.77	285.3	70.6	0.79	285.4	9.84	9.29
AVG	86.6	3.25	2833	3030	5.972	502.5	24	69.9	0.76	282.5	70.4	0.78	282.9	9.76	9.20

GROUP NO 40 TURBINE PERFORMANCE

1 H.P.TURB EFFICIENCY
2 I.P.TURB EFFICIENCY
3 LPA (HP) TURB EFFICIENCY
4 LPB (LP) TURB EFFICIENCY
5 GOV STAGE PRESSURE RATIO
6 HP TURBINE PRESS RATIO
7 IP1 TURB PRESS RATIO
8 IP2 TURB PRESS RATIO
9 LPA-1 TURB PRESS RATIO
10 LPA-2 TURB PRESS RATIO
11 LPA-3 TURB PRESS RATIO
12 LPA-4 TURB PRESS RATIO
13 OUTSIDE AIR TEMPERATURE
14 TARGET HEAT RATE
15 REHEAT SPRAY FLOW

TIME	1 AC815 PERCNT	2 AC816 PERCNT	3 AC817 PERCNT	4 AC825 PERCEN	5 AC842 FRACTI	6 AC830 FRACTI	7 AC831 FRACTI	8 AC835 FRACTI	9 AC832 FRACTI	10 AC833 FRACTI	11 AC836 FRACTI	12 AC837 FRACTI	13 M0100	14 AA803 BTU/KW	15 AB085 KLBH
07:02:05	81.5	90.3	78.8	79.9	1.39	2.57	1.77	2.02	1.93	6.47	2.07	4.07	40.3	10822	76
08:02:06	80.8	90.0	80.8	81.8	1.39	2.56	1.77	2.02	1.93	6.48	2.07	4.10	39.9	10823	76
09:02:07	81.3	90.2	80.6	81.7	1.39	2.57	1.77	2.02	1.93	6.48	2.06	4.10	43.5	10818	76
10:02:06	81.4	90.5	81.0	82.0	1.39	2.57	1.77	2.02	1.93	6.50	2.06	4.00	47.3	10820	67
11:02:06	81.1	91.1	80.9	81.9	1.39	2.57	1.77	2.02	1.93	6.48	2.06	4.03	48.9	10820	67
12:02:05	80.9	91.0	81.2	82.3	1.39	2.57	1.77	2.02	1.93	6.47	2.08	3.98	49.5	10820	67
13:02:07	81.3	90.4	81.1	82.3	1.39	2.57	1.77	2.02	1.93	6.47	2.07	3.98	51.3	10822	67
14:02:06	81.4	90.1	80.2	81.4	1.39	2.57	1.77	2.02	1.93	6.47	2.07	3.96	53.0	10816	67
15:02:04	81.2	90.2	81.0	82.2	1.39	2.57	1.77	2.02	1.93	6.49	2.07	3.92	54.7	10821	67
16:02:04	81.6	90.5	79.9	81.1	1.39	2.57	1.77	2.03	1.93	6.46	2.07	3.89	53.4	10822	67
17:02:05	81.7	90.4	81.0	82.2	1.39	2.57	1.77	2.02	1.93	6.46	2.08	3.86	51.7	10819	67
18:02:06	81.5	90.1	80.3	81.5	1.39	2.57	1.77	2.03	1.93	6.48	2.08	3.88	50.5	10825	67
SUMMARY															
MIN	80.8	90.0	78.8	79.9	1.39	2.56	1.77	2.02	1.93	6.46	2.06	3.86	39.9	10816	67
MAX	81.7	91.1	81.2	82.3	1.39	2.57	1.77	2.03	1.93	6.50	2.08	4.10	54.7	10825	76
AVG	81.3	90.4	80.6	81.7	1.39	2.57	1.77	2.02	1.93	6.48	2.07	3.98	48.7	10821	69

GROUP NO 41 TURBINE/COND PERF

1	LPB-1 TURB PRESS RATIO	6	CONDENSR 3B BACKPRESSURE	11	CIRC WTR TO LP COND 3B-W
2	LPB-2 TURB PRESS RATIO	7	COND PP DISCH HDR PRESS	12	CIRC WTR TO HP COND 3A-E
3	LPB-3 TURB PRESS RATIO	8	CONDENSER HOTWELL DISCH	13	CIRC WTR TO HP COND 3A-W
4	LPB-4 TURB PRESS RATIO	9	DA STORAGE TANK OUT TEMP	14	CIR WTR FRM HP COND 3A-E
5	CONDENSR 3A BACKPRESSURE	10	CIRC WTR TO LP COND 3B-E	15	CIR WTR FRM HP COND 3A-W

TIME	1 AC838 FRACTI	2 AC839 FRACTI	3 AC840 FRACTI	4 AC841 FRACTI	5 AF250 INHG	6 AF314 INHG	7 AD020 PSIG	8 AD001 DEG F	9 AE013 DEG F	10 DA023 DEG F	11 DA022 DEG F	12 DA039 DEG F	13 DA043 DEG F	14 DA052 DEG F	15 DA051 DEG F
07:02:05	4.75	2.56	3.00	3.33	3.601	3.131	272.3	123.5	322.5	76.5	77.5	93.2	98.6	106.8	106.3
08:02:06	4.76	2.56	2.99	3.34	3.574	3.120	271.0	123.5	322.5	76.5	77.5	93.2	98.6	106.0	106.3
09:02:07	4.76	2.55	3.00	3.34	3.587	3.126	271.5	123.1	323.3	76.5	77.5	91.7	98.6	105.2	105.1
10:02:06	4.76	2.56	2.99	3.31	3.659	3.153	271.2	122.5	323.2	75.5	75.5	91.0	93.1	105.3	105.3
11:02:06	4.76	2.56	2.98	3.31	3.645	3.153	272.2	122.5	323.1	75.4	75.3	91.0	92.9	105.3	105.3
12:02:05	4.76	2.56	2.99	3.32	3.665	3.133	272.9	122.5	323.1	75.4	75.3	91.0	92.9	105.3	105.2
13:02:07	4.75	2.55	3.00	3.31	3.686	3.152	272.3	122.7	323.0	75.4	75.3	91.0	93.0	105.9	106.0
14:02:06	4.74	2.55	3.02	3.29	3.706	3.159	272.2	123.0	323.0	75.4	75.3	91.3	93.4	106.2	106.2
15:02:04	4.75	2.55	3.01	3.28	3.731	3.168	271.7	123.1	322.4	75.4	75.3	91.7	93.7	106.4	106.5
16:02:04	4.75	2.55	3.02	3.25	3.756	3.183	272.0	123.6	322.4	75.4	75.3	92.2	94.0	106.6	106.8
17:02:05	4.75	2.55	3.03	3.23	3.782	3.198	272.2	123.8	322.7	75.4	75.3	92.2	94.0	106.6	107.1
18:02:06	4.75	2.55	3.03	3.24	3.757	3.185	271.3	123.6	322.6	75.4	75.3	92.2	94.0	106.6	107.2
SUMMARY															
MIN	4.74	2.55	2.98	3.23	3.574	3.120	271.0	122.5	322.4	75.4	75.3	91.0	92.9	105.2	105.1
MAX	4.76	2.56	3.03	3.34	3.782	3.198	272.9	123.8	323.3	76.5	77.5	93.2	98.6	106.8	107.2
AVG	4.75	2.55	3.01	3.29	3.679	3.155	271.9	123.1	322.8	75.7	75.8	91.8	94.7	106.0	106.1

GROUP NO 42 CONDENSER/FWH PERF

1 LPI COND CLEANLINESS
2 LPO COND CLEANLINESS
3 HPO COND CLEANLINESS
4 HPI COND CLEANLINESS
5 HTR 7 TERM TEMP DIFF
6 HTR 7 DRAIN COOLER APPR
7 HTR 6 TERM TEMP DIFF
8 HTR 6 DRAIN COOLER APPR
9 HTR 5 TERM TEMP DIFF
10 HTR 5 DRAIN COOLER APPR
11 HEATER 7 EXTRACTION FLO
12 HEATER 6 EXTRACTION FLO
13 HEATER 5 EXTRACTION FLO
14 HEATER 4 EXTRACTION FLO
15 COND DUTY

TIME	1 AD812 FRACTI	2 AD819 FRACTI	3 AD829 FRACTI	4 AD824 FRACTI	5 AF872 DEGF	6 AF881 DEGF	7 AF873 DEGF	8 AF882 DEGF	9 AF874 DEGF	10 AF883 DEGF	11 AF818 KLB/H	12 AF819 KLB/H	13 AF820 KLB/H	14 AF821 KLB/H	15 AD813 MBTU/H
07:02:05	0.59	0.89	0.37	0.58	-1.8	17.7	0.7	22.8	0.9	15.9	446.2	326.7	229.9	243.3	3374
08:02:06	0.59	0.89	0.37	0.55	-1.7	17.3	0.7	21.7	0.0	16.2	447.8	324.4	240.8	247.6	3331
09:02:07	0.53	0.89	0.30	0.54	-1.7	16.9	0.4	21.2	-0.1	16.4	445.8	326.0	242.9	252.8	3213
10:02:06	0.53	0.64	0.48	0.56	-1.9	17.1	0.6	21.2	-0.1	16.4	448.5	323.0	241.2	253.2	3403
11:02:06	0.53	0.62	0.50	0.56	-2.0	16.8	0.0	21.1	-0.2	16.6	443.9	324.3	241.6	250.8	3424
12:02:05	0.54	0.62	0.49	0.55	-2.1	16.7	0.2	22.2	-0.1	16.5	439.3	320.7	237.8	249.0	3417
13:02:07	0.53	0.62	0.52	0.57	-2.0	16.8	0.1	21.5	-0.4	16.4	446.3	324.2	241.2	250.3	3484
14:02:06	0.54	0.64	0.52	0.58	-1.8	16.7	0.4	21.4	-0.2	16.1	443.7	323.5	240.0	249.0	3527
15:02:04	0.56	0.65	0.52	0.57	-2.0	16.8	0.6	21.4	-0.3	16.0	444.1	321.3	239.9	246.7	3549
16:02:04	0.58	0.66	0.52	0.57	-2.1	17.8	0.7	22.3	0.5	15.8	454.8	328.0	233.2	246.6	3580
17:02:05	0.57	0.66	0.53	0.56	-1.8	17.8	0.5	22.7	0.8	16.0	450.7	327.0	230.6	244.5	3600
18:02:06	0.58	0.66	0.54	0.57	-1.9	17.6	0.7	22.5	0.4	15.9	453.6	327.1	234.2	245.9	3605
SUMMARY															
MIN	0.53	0.62	0.30	0.54	-2.1	16.7	0.0	21.1	-0.4	15.8	439.3	320.7	229.9	243.3	3213
MAX	0.59	0.89	0.54	0.58	-1.7	17.8	0.7	22.8	0.9	16.6	454.8	328.0	242.9	253.2	3605
AVG	0.56	0.70	0.47	0.56	-1.9	17.2	0.5	21.8	0.1	16.2	447.1	324.7	237.8	248.3	3459

GROUP NO 43 LP F.W. HEATERS

1	HEATER 3 EXTRACTION FLO	6	HTR 3 TERM TEMP DIFF	11	HTR 2B DRAIN COOLER APPR
2	HEATER 2A EXTRACTION FLO	7	HTR 3 DRAIN COOLER APPR	12	HTR 1A TERM TEMP DIFF
3	HEATER 2B EXTRACTION FLO	8	HTR 2A TERM TEMP DIFF	13	HTR 1A DRAIN COOLER APPR
4	HEATER 1A EXTRACTION FLO	9	HTR 2A DRAIN COOLER APPR	14	HTR 1B TERM TEMP DIFF
5	HEATER 1B EXTRACTION FLO	10	HTR 2B TERM TEMP DIFF	15	HTR 1B DRAIN COOLER APPR

TIME	1 AF822 KLB/H	2 AF823 KLB/H	3 AF824 KLB/H	4 AF825 KLB/H	5 AF826 KLB/H	6 AF876 DEGF	7 AF885 DEGF	8 AF877 DEGF	9 AF886 DEGF	10 AF878 DEGF	11 AF887 DEGF	12 AF879 DEGF	13 AF888 DEGF	14 AF880 DEGF	15 AF889 DEGF
07:04:07	218.1	109.5	105.0	95.6	102.0	-3.9	14.1	-9.7	34.2	-8.1	17.1	1.3	6.6	-14.7	7.1
08:04:06	216.7	112.3	106.2	96.3	103.3	-3.5	13.7	-10.2	34.5	-8.2	17.1	1.5	6.6	-14.7	6.6
09:04:06	215.3	113.3	106.1	96.9	103.9	-3.5	14.3	-10.7	34.8	-8.1	17.1	1.5	6.9	-14.7	6.5
10:04:06	213.8	112.6	105.9	102.2	109.8	-3.3	14.4	-10.7	34.9	-8.2	17.1	1.3	7.8	-14.7	9.1
11:04:04	212.8	111.8	105.3	101.2	109.1	-3.2	14.3	-10.5	34.8	-8.2	17.1	1.5	6.5	-14.7	9.1
12:04:06	211.4	111.4	104.7	100.7	108.7	-3.3	14.3	-10.6	34.7	-8.3	17.1	1.2	6.3	-14.8	9.1
13:04:05	213.3	112.5	105.3	101.2	109.4	-3.4	14.3	-10.5	34.8	-7.9	17.1	1.4	6.1	-14.7	9.1
14:04:05	214.2	112.8	103.6	100.1	108.5	-3.3	14.3	-10.6	34.9	-7.0	17.1	1.5	5.8	-14.8	9.2
15:04:04	215.3	113.5	105.4	100.2	108.2	-3.6	14.3	-11.0	34.7	-7.7	17.1	1.4	5.6	-14.7	9.1
16:04:05	220.1	109.3	105.7	100.6	107.9	-3.7	14.3	-9.5	34.1	-7.9	17.0	0.9	5.3	-15.1	9.1
17:04:05	219.7	108.5	104.8	99.5	107.1	-3.9	14.4	-9.4	34.1	-7.9	17.0	0.9	5.1	-15.3	8.8
18:04:06	221.5	109.4	106.0	100.0	107.4	-4.0	14.4	-9.5	34.0	-8.2	17.1	0.8	5.0	-15.3	8.7
SUMMARY															
MIN	211.4	108.5	103.6	95.6	102.0	-4.0	13.7	-11.0	34.0	-8.3	17.0	0.8	5.0	-15.3	6.5
MAX	221.5	113.5	106.2	102.2	109.8	-3.2	14.4	-9.4	34.9	-7.0	17.1	1.5	7.8	-14.7	9.2
AVG	216.0	111.4	105.3	99.5	107.1	-3.5	14.2	-10.2	34.5	-8.0	17.1	1.3	6.1	-14.9	8.4

GROUP NO 44 STEAM CYCLE

1	CONDENSATE TO DA FLOW	6	FLW TO AIR HTR STM COILS	11	CURRENT SHIFT
2	CALC. CONDENSATE FLOW	7	LP1 TURBINE BLADE LOADIN	12	WET BULB TEMPERATURE
3	COND IN FWH 4	8	LP2 TURBINE BLADE LOADIN	13	RHTR 1 GAS DIFF PRESS
4	AUX TURB 3A LP STM FLOW	9	LP1 TURBINE EXHAUST FLOW	14	RHTR 2 GAS DIFF PRESS
5	AUX TURB 3B LP STM FLOW	10	LP 2 TURBINE EXHAUST FLO	15	RHTR 3 GAS DIFF PRESS

TIME	1 AD064 MLBH	2 AD834 MLBH	3 AD065 DEG F	4 FC001 KLBH	5 FC101 KLBH	6 FH800 KLB/H	7 AC828 LB/HFT	8 AC829 LB/HFT	9 AC806 KLB/H	10 AC827 KLB/H	11 M0200 CREW	12 M0400	13 SA014 INWC	14 SA064 INWC	15 SA114 INWC
07:04:07	4.859	4.788	268.7	141	146	44.6	13999	14174	1859	1882	1	34	1.46	9.99	0.00
08:04:06	4.897	4.815	268.3	143	148	42.2	14017	14243	1861	1891	1	34	1.49	10.00	0.00
09:04:06	4.888	4.816	268.2	143	147	38.6	14005	14288	1860	1897	1	36	1.48	10.00	0.00
10:04:06	4.885	4.798	267.9	143	149	35.2	13895	14186	1845	1884	1	38	1.47	10.00	0.00
11:04:04	4.854	4.773	268.0	142	147	34.5	13897	14172	1846	1882	1	39	1.47	9.99	0.00
12:04:06	4.854	4.751	268.0	142	147	35.2	13814	14087	1834	1871	1	39	1.48	9.99	0.00
13:04:05	4.864	4.784	268.1	142	147	34.5	13927	14199	1850	1886	1	40	1.41	9.99	0.00
14:04:05	4.858	4.793	268.3	142	147	33.6	14020	14288	1862	1897	1	40	1.41	9.87	0.00
15:04:04	4.881	4.802	268.3	143	148	32.3	13997	14233	1859	1890	1	41	1.44	9.86	0.00
16:04:05	4.869	4.815	268.4	143	148	35.4	14077	14250	1869	1892	1	41	1.45	9.43	0.00
17:04:05	4.862	4.781	268.8	143	148	37.5	13999	14157	1859	1880	1	40	1.46	9.65	0.00
18:04:06	4.872	4.816	268.8	144	149	37.3	14078	14231	1870	1890	1	38	1.47	9.93	0.00
SUMMARY															
MIN	4.854	4.751	267.9	141	146	32.3	13814	14087	1834	1871	1	34	1.41	9.43	0.00
MAX	4.897	4.816	268.8	144	149	44.6	14078	14288	1870	1897	1	41	1.49	10.00	0.00
AVG	4.870	4.794	268.3	143	148	36.7	13977	14209	1856	1887	1	38	1.46	9.89	0.00

GROUP NO 49 GAS REHEATER DP

1	RHTR 4 GAS DIFF PRESS	6	CALC. FEEDWATER FLOW	11	
2	RHTR 5 GAS DIFF PRESS	7		12	
3	RHTR 6 GAS DIFF PRESS	8		13	
4	RHTR 7 GAS DIFF PRESS	9		14	
5	RHTR 8 GAS DIFF PRESS	10		15	

TIME	1 SA164 INWC	2 SA214 INWC	3 SA264 INWC	4 SA314 INWC	5 SA364 INWC	6 AE814 MLBH	7	8	9	10	11	12	13	14	15
07:04:07	1.45	6.03	1.09	0.43	7.86	5.999									
08:04:06	1.53	6.07	1.11	0.45	7.99	6.040									
09:04:06	1.53	6.20	1.11	0.46	8.24	6.048									
10:04:06	1.54	6.25	1.11	0.46	8.53	6.052									
11:04:04	1.48	6.39	1.10	0.44	8.39	6.025									
12:04:06	1.49	6.50	1.11	0.45	8.36	5.986									
13:04:05	1.62	6.64	1.14	0.45	8.02	6.034									
14:04:05	1.58	6.75	1.12	0.43	8.07	6.039									
15:04:04	1.44	6.91	1.15	0.45	8.07	6.041									
16:04:05	1.38	6.36	1.14	0.45	8.39	6.070									
17:04:05	1.42	6.05	1.16	0.45	8.38	6.023									
18:04:06	1.45	5.99	1.17	0.46	8.54	6.067									
SUMMARY															
MIN	1.38	5.99	1.09	0.43	7.86	5.986									
MAX	1.62	6.91	1.17	0.46	8.54	6.070									
AVG	1.49	6.34	1.13	0.45	8.24	6.035									

1 MAIN STEAM FLOW
2 FWH 1A TEMP RISE
3 FWH 1B TEMP RISE
4 FWH 2A TEMP RISE
5 FWH 2B TEMP RISE
6 FWH 3 TEMP RISE
7 DA TEMP RISE
8 FWH 5 TEMP RISE
9 FWH 6 TEMP RISE
10 FWH 7 TEMP RISE
11 AUX STM INTERTIE 1&2 FLW
12 AUX STEAM FROM BLR DRUM
13 AUX STEAM HDR FLOW
14 AUX STM COMMON HDR FLOW
15 AVG A APH HG TEMP IN

TIME	1 AC019 MLBH	2 AD835 DEGF	3 AD836 DEGF	4 AD837 DEGF	5 AD838 DEGF	6 AD839 DEGF	7 AE815 DEGF	8 AE816 DEGF	9 AE817 DEGF	10 AE818 DEGF	11 FB024 KLBH	12 FB001 KLBH	13 FB027 KLBH	14 FB025 KLBH	15 BA824 DEGF
07:04:07	5.930	48.3	48.4	46.6	46.2	46.3	53.8	48.6	62.7	60.7	-7.7	21.6	22.1	15.1	755.3
08:04:06	5.928	48.1	48.5	47.3	46.2	45.5	54.3	49.9	61.8	59.7	-7.9	21.9	22.5	15.4	753.5
09:04:06	5.932	48.4	48.8	47.6	46.2	45.3	55.0	50.2	62.0	59.8	-8.0	22.0	22.3	16.0	746.5
10:04:06	5.924	51.0	51.3	47.4	46.2	45.1	55.3	50.0	61.7	59.6	-6.8	22.3	21.8	15.5	745.3
11:04:04	5.920	51.0	51.3	47.4	46.2	45.1	55.1	50.3	62.1	59.3	-6.3	22.1	21.7	15.3	746.3
12:04:06	5.925	51.0	51.3	47.5	46.2	45.1	55.1	50.2	62.0	59.3	-6.5	21.9	21.8	15.5	747.7
13:04:05	5.923	50.9	51.2	47.6	46.1	45.0	54.9	50.1	62.0	59.0	-6.5	21.7	22.4	14.5	747.5
14:04:05	5.928	50.5	50.8	47.8	45.5	45.3	54.6	50.0	61.9	59.2	-6.1	21.7	22.3	14.5	754.9
15:04:04	5.932	50.3	50.5	47.8	46.1	45.3	54.1	49.9	61.5	58.8	-4.1	22.1	22.4	14.5	751.2
16:04:05	5.926	50.4	50.4	46.1	46.0	46.3	54.0	48.8	62.4	59.5	-1.6	21.7	22.7	14.2	749.3
17:04:05	5.930	50.2	50.3	46.1	46.1	46.5	54.0	48.8	62.8	59.5	-3.5	21.1	22.2	14.4	755.2
18:04:06	5.928	50.1	50.1	46.1	46.2	46.5	53.8	49.0	62.1	59.3	-4.7	21.4	22.4	14.4	758.9
SUMMARY															
MIN	5.920	48.1	48.4	46.1	45.5	45.0	53.8	48.6	61.5	58.8	-8.0	21.1	21.7	14.2	745.3
MAX	5.932	51.0	51.3	47.8	46.2	46.5	55.3	50.3	62.8	60.7	-1.6	22.3	22.7	16.0	758.9
AVG	5.927	50.0	50.3	47.1	46.1	45.6	54.5	49.7	62.1	59.5	-5.8	21.8	22.2	14.9	751.0

1 AVG B APH HG TEMP IN
2 BCP DIFF PRESSURE
3 BAROMETRIC PRESSURE
4 TOTAL GOOD PAR MINUTES
5
6
7
8
9
10
11
12
13
14
15

TIME	1 BA825 DEGF	2 AA313 PSID	3 RO001 INHG	4 WSM120 MINUTE	5	6	7	8	9	10	11	12	13	14	15
07:04:07	768.6	33	26.97	60											
08:04:06	765.1	33	26.99	60											
09:04:06	760.2	33	27.00	60											
10:04:06	758.7	33	27.00	60											
11:04:04	758.5	33	27.00	60											
12:04:06	760.4	33	26.98	60											
13:04:05	759.8	33	26.97	60											
14:04:05	763.0	33	26.94	60											
15:04:04	761.4	33	26.90	60											
16:04:05	760.3	33	26.87	60											
17:04:05	765.8	33	26.85	60											
18:04:06	768.8	33	26.83	60											
SUMMARY															
MIN	758.5	33	26.83	60											
MAX	768.8	33	27.00	60											
AVG	762.6	33	26.94	60											

APPENDIX F

Chain of Custody Records

Job# 99-166 Unit Tested Unit 3-6 Scrubber Inlet Duct **CHAIN OF CUSTODY RECORD** Page # 1/1

Facility Name/Location
Montana Power Company
Colstrip Power Plant
Colstrip, Montana

Collected By/Company
METCO Environmental

Unit 3-6 Scrubber Inlet Duct SAMPLE I.D. Run 1	DATE	TIME	AIR	SOLID	COMP	GRAB	# OF CONTAINERS	SAMPLE ANALYSIS REQUIRED: RECOVERED BY	HCl	PART.	SO2	SO3	PCDD/PCDF	SEMI-VOC	POHC's	METALS	Hg			REMARKS (Specific Compounds/Methods)
Container 1 Filter	9/29/99	1219	X				II	BH									X			Thimble Q13 Back up filter 47Q34
Container 2 0.1 N HNO_3 F.W.	9/29/99	1222	X				I	BH									X			Container 2A not recovered.
Container 3 10% HNO_3 Rinse Imp. 1,2,3	9/29/99	1234	X				II	BH									X			
Container 4 0.1 N HNO_3 Rinse Imp 4	9/29/99	1236	X				I	BH									X			
Container 5 0.1 N HNO_3 Rinse Imp 5,6,7	9/29/99	1254	X				I	BH									X			Used Hydroxylamine Sulfate / Sodium Chloride.

Analyze according to procedures outlined in the Ontario Hydro method.

PM Metco ✓

Received by:	Date:	Time:	Transported by:	Date:	Time:	Received at Lab by:	Date:	Time:
			Shane Lee	9/30/99	1315	[signature]	10/4/99	1100
Analyzed by:	**Date:**	**Time:**	**Data Reviewed by:**	**Date:**	**Time:**	**Remarks:**		
			DRP	11/9/99	1815	PM Metco M. Ganter 10/15/99		

Ship to: TestAmerica

METCO ENVIRONMENTAL

F-2

Job# 99-166 Unit Tested Number 3-6 Scrubber Inlet Duct **CHAIN OF CUSTODY RECORD** Page # 1/1

Facility Name/Location: Montana Power Company, Colstrip, MT

Collected By/Company: METCO Environmental

Unit 3-6 Scrubber Inlet Duct Run 2 SAMPLE I.D.	DATE	TIME	AIR	SOLID	COMP	GRAB	# OF CONTAINERS	SAMPLE ANALYSIS REQUIRED: RECOVERED BY	HCl	PART.	SO2	SO3	PCDD/PCDF	SEMI-VOC	POHC's	METALS	Hg			REMARKS (Specific Compounds/Methods)
																				Analyze according to procedures outlined in the Ontario Hydro method. PM Metco ✓
Container 1 Filter	9/29/99	1647	X				III	MB									X			Thimbles Q14, Q21 Backup Filter 47Q35
Container 2 0.1 N HNO_3 F.W.	9/29/99	1654	X				I	MB									X			Container 2A not recovered.
Container 3 10% HNO_3 Rinse Imp. 1,2,3	9/29/99	1713	X				II	MB									X			
Container 4 0.1 N HNO_3 Rinse Imp. 4	9/29/99	1716	X				I										X			
Container 5 0.1 N HNO_3 Rinse Imp 5,6,7	9/29/99	1733	X				I										X			Used Hydroxylamine sulfate / sodium Chloride

Received by:	Date:	Time:	Transported by:	Date:	Time:	Received at Lab by:	Date:	Time:
			Shane Lee	9/30/99	1315	[illegible]	10/4/99	1100
Analyzed by:	**Date:**	**Time:**	**Data Reviewed by:** 11/9/99	**Date:**	**Time:**	**Remarks:** PM/Metco M. Granier 10/15/99		

Ship to: TestAmerica

METCO ENVIRONMENTAL

F-3

Job# 99-166 Unit Tested Unit 3-6 Scrubber Inlet Duct **CHAIN OF CUSTODY RECORD** Page # 1/1

Facility Name/Location	# OF CONTAINERS	SAMPLE ANALYSIS REQUIRED													REMARKS (Specific Compounds/Methods)
Montana Power Company Colstrip Power Plant Colstrip Montana		RECOVERED BY	HCl	PART.	SO2	SO3	PCDD/PCDF	SEMI-VOC	POHC's	METALS	Hg				Analyze according to procedures outlined in the Ontario Hydro Method ~~Filter will be shipped after analysis at METRO.~~ BH
Collected By/Company: METCO Environmental															
Unit 3-6 Scrubber Inlet Duct SAMPLE I.D. Run 3	DATE / TIME / AIR / SOLID / COMP / GRAB														
Container 1 Filter	9/30/99 / 1146 / X	II	BH								X				PM Metco ✓ Thimble Q15 Backup Filter 47 Q36
Container 2 0.1 N HNO_3 F.W.	9/30/99 / 1148 / X	I	BH								X				Container 2A not recovered.
Container 3 10% HNO_3 Rinse Imp 1,2,3	9/30/99 / 1201 / X	II	BH								X				
Container 4 0.1 N HNO_3 Rinse Imp 4	9/30/99 / 1204 / X	I	MB								X				
Container 5 0.1 N HNO_3 Rinse Imp 5,6,7	9/30/99 / 1227 / X	I	MB								X				Used Hydroxylamine Sulfate / Sodium Chloride

Received by:	Date:	Time:	Transported by:	Date:	Time:	Received at Lab by:	Date:	Time:
			Shane Lee	9/30/99	1315	[signature]	10/4/99	1100
Analyzed by:	**Date:**	**Time:**	**Data Reviewed by:**	**Date:**	**Time:**	**Remarks:**		
			BH	11/9/99		PM/Metco M. Granier 10/15/99		

Ship to: TestAmerica

METCO ENVIRONMENTAL

F-4

Job# 99-166 Unit Tested Unit 3-6 Scrubber Inlet Duct **CHAIN OF CUSTODY RECORD** Page # 1/1

Facility Name/Location: Montana Power Company, Colstrip Power Plant, Colstrip, Montana	# OF CONTAINERS	SAMPLE ANALYSIS REQUIRED													REMARKS (Specific Compounds/Methods)
Collected By/Company: METCO Environmental		RECOVERED BY	HCl	PART.	SO2	SO3	PCDD/PCDF	SEMI-VOC	POHC's	METALS	Hg				
Unit 3-6 Scrubber Inlet Duct Blank Train SAMPLE I.D. / DATE / TIME / AIR / SOLID / COMP / GRAB															Analyse according to Procedures outlined in the Ontario Hydro method Sample Time = 0730 to 0915 9/30/99.
Container 1 Filter — 9/30/99 — AIR X															Not Recovered.
Container 2 0.1 N HNO_3 F.W. — 9/30/99 — AIR X															Not Recovered.
Container 2A Acetone F.W. — 9/30/99 — AIR X															Not Recovered.
Container 3 10% HNO_3 Rinse Imp 1, 2, 3 — 9/30/99 — 0922 — AIR X	I	BH									Hg X				
Container 4 0.1 N HNO_3 Rinse Imp 4 — 9/30/99 — 0927 — AIR X	I	BH									Hg X				
Container 5 0.1 N HNO_3 Rinse Imp 5, 6, 7 — 9/30/99 — 0940 — AIR X	I	BH									Hg X				Used Hydroxylamine Sulfate / Sodium Chloride

Received by:	Date:	Time:	Transported by: Steve Lee	Date: 9/30/99	Time: 1315	Received at Lab by:	Date: 10/4/99	Time: 1100
Analyzed by:	Date:	Time:	Data Reviewed by:	Date: 11/9/99	Time:	Remarks:		

Ship to: TestAmerica

METCO ENVIRONMENTAL

F-5

Job# 99-166 Unit Tested Unit 3 Stack — **CHAIN OF CUSTODY RECORD** — Page # 1/1

Facility Name/Location: Montana Power Company, Colstrip Power Plant, Colstrip, Montana

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)
Unit 3 Stack Run 1																				Analyze according to procedures outlined in the Ontario Hydro method. PM Metco ✓
✓ Container 1 Filter	9/29/99	1325	X				I	BH									X			Filter 88Q H37
✓ Container 2 0.1 N HNO_3 F.W.	9/29/99	1327	X				I	BH									X			Container 2A not recovered.
✓ Container 3 10% HNO_3 Rinse Imp 1,2,3	9/29/99	1337	X				II	BH									X			
✓ Container 4 0.1 N HNO_3 Rinse Imp 4	9/29/99	1345	X				I	BH									X			
✓ Container 5 0.1 N HNO_3 Rinse Imp 5,6,7	9/29/99	1404	X				I	BH									X			Used Hydroxylamine Sulfate / Sodium Chloride

Received by:	Date:	Time:	Transported by: Steve Lee	Date: 9/30/99	Time: 1315	Received at Lab by:	Date: 10/4/99	Time: 1100
Analyzed by:	Date:	Time:	Data Reviewed by:	Date: 11/9/99	Time:	Remarks: PM/Metco		

Ship to: TestAmerica

E-6

METCO ENVIRONMENTAL

Job# 99-166 Unit Tested Unit 3 Stack — **CHAIN OF CUSTODY RECORD** — Page # 1/1

Facility Name/Location: Montana Power Company, Colstrip Power Plant, Colstrip, Montana

Collected By/Company: METCO Environmental

Unit 3 Stack SAMPLE I.D. Run 2	DATE	TIME	AIR	SOLID	COMP	GRAB	# OF CONTAINERS	SAMPLE ANALYSIS REQUIRED: RECOVERED BY	HCl	PART.	SO2	SO3	PCDD/PCDF	SEMI-VOC	POHC's	METALS	Hg			REMARKS (Specific Compounds/Methods)
Container 1 Filter	9/29/99	1738	X				I	SL									X			Filter 88Q H3&
Container 2 0.1 N HNO_3 F.W.	9/29/99	1744	X				I	SL									X			Container 2A not recovered.
Container 3 10% HNO_3 Rinse Imp. 1, 2, 3	9/29/99	1803	X				II	SL									X			
Container 4 0.1 N HNO_3 Rinse Imp. 4	9/29/99	1809	X				I	SL									X			
Container 5 0.1 N HNO_3 Rinse Imp 5, 6, 7	9/29/99	1827	X				I	SL									X			Used Hydroxylamine Sulfate / Sodium Chloride

Received by:	Date:	Time:	Transported by:	Date:	Time:	Received at Lab by:	Date:	Time:
			[signature]	9/30/99	1315	[signature]	10/4/99	1100
Analyzed by:	**Date:**	**Time:**	**Data Reviewed by:**	**Date:**	**Time:**	**Remarks:**		
			[signature]	11/9/99		PM Metco M. Bowler 10/15/99		

Ship to: TestAmerica

METCO ENVIRONMENTAL

F-7

Job# 99-166 Unit Tested Unit 3 Stack **CHAIN OF CUSTODY RECORD** Page # 1/1

Facility Name/Location
Montana Power Company
Colstrip Power Plant
Colstrip, Montana

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)
Unit 3 Stack Run 3																				Analyse according to procedures outlined in the Ontario Hydro Method. ~~FILTER WILL BE SHIPPED AFTER ANALYSIS AT METCO~~ 10/4/99
Container 1 Filter	9/30/99	1255	X				I	SL									X			PM Metco ✓ Filter 88Q H39
Container 2 0.1 N HNO_3 F.W.	9/30/99	1236	X				I	SL									X			Container 2A not recovered.
Container 3 10% HNO_3 Rinse Imp 1, 2, 3	9/30/99	1250	X				II	SL									X			
Container 4 0.1 N HNO_3 Rinse Imp 4	9/30/99	1253	X				I	SL									X			
Container 5 0.1 N HNO_3 Rinse Imp 5, 6, 7	9/30/99	1326	X				I	SL									X			Used Hydroxylamine Sulfate / Sodium Chloride

Received by:	Date:	Time:	Transported by: Shane Lee	Date: 9/30/99	Time: 1325	Received at Lab by:	Date: 10/4/99	Time: 1100
Analyzed by:	Date:	Time:	Data Reviewed by: mg	Date: 11/9/99	Time:	Remarks: PM/Metco M. Hunter 10/15/99		

Ship to: TestAmerica

METCO ENVIRONMENTAL

F-8

Job# 99-166 Unit Tested Unit 3

CHAIN OF CUSTODY RECORD

Facility Name/Location
Montana Power Company
Colstrip Power Plant
Colstrip, Montana

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)
Blank Train Unit 3 Stack																				Analyze according to procedures outlined in the Ontario hydro method. ~~Filter~~ Sample Time = 0900 to 1000 9/30/99
Container 1 Filter	9/30/99																			not recovered.
Container 2 0.1 N HNO_3 F.W.	9/30/99																			not recovered
Container 2A Acetone F.W.	9/30/99																			not recovered
Container 3 10% HNO_3 Rinse Imp 1,2,3	9/30/99	1008	X				I	BH									X			
Container 4 0.1 N HNO_3 Rinse Imp 4	9/30/99	1011	X				I	BH									X			
Container 5 0.1 N HNO_3 Rinse Imp 5,6,7	9/30/99	1021	X				I	BH									X			Used Hydroxylamine Sulfate / Sodium Chloride

Received by:	Date:	Time:	Transported by:	Date:	Time:	Received at Lab by:	Date:	Time:
			Shane Lee	9/30/99	1315	[illegible]	10/4/99	1100
Analyzed by:	Date:	Time:	Data Reviewed by:	Date:	Time:	Remarks:		
			[illegible]	11/9/99		PM/Metco M. Gantes 10/15/99		

Ship to: TestAmerica

METCO ENVIRONMENTAL

Job# 99-166 Unit Tested Unit 3

CHAIN OF CUSTODY RECORD

Page # 1/1

Facility Name/Location: Montana Power Company, Colstrip Power Plant, Colstrip, Montana

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 Ontario Hydro Method
Container 7 0.1 N HNO_3	9/30/99	0900	X				I	BH									X			
Container 8 1.0M KCl	9/30/99	0903	X				I	BH									X			
Container 9 5% HNO_3 / 10% H_2O_2	9/30/99	0906	X				I	BH									X			
Container 10 H_2SO_4 - $KMnO_4$	9/30/99	0911	X				I	BH									X			
Container 11 Hydroxylamine Sulfate / Sodium Chloride	9/30/99	0913	X				I	BH									X			
Container 12 Filters	9/30/99	0920	X				II	BH									X			Thimble: Q16, Q18, Q19 47mm Filters: 47Q37, 47Q38, 47Q34 88 mm Filters: 88QH40, 88QH41, 88QH42

Received by:	Date:	Time:	Transported by:	Date:	Time:	Received at Lab by:	Date:	Time:
			[signature]	9/30/99	1315	[signature]	10/4/99	1100
Analyzed by:	Date:	Time:	Data Reviewed by:	Date:	Time:	Remarks:		
			[signature]	11/9/99				

Ship to: Test America

F-10

METCO ENVIRONMENTAL

Job# 99-166 Unit Tested Unit 3

CHAIN OF CUSTODY RECORD

Facility Name/Location
Montana Power Company
Colstrip Power Plant
Colstrip, Montana

Collected By/Company
Montana Power Company

SAMPLE I.D.	DATE	TIME	AIR	SOLID	COMP	GRAB	# OF CONTAINERS	RECOVERED BY	Chloride	PART.	SO2	SO3	PCDD/PCDF	SEMI-VOC	POHC's	METALS	Hg	Fly Ash	Btu	REMARKS (Specific Compounds/Methods)
Fuel & Slurry Samples																				Analyze according to ASTM D6414-99 A, D-3284, D-5016, D-3174
Run 1 Composite	9/29/99	0830-1230			X		I	mc	X								X	X	X	0830-1230
Run 2 Composite	9/29/99	1330-1630			X		I	mc	X								X	X	X	1330-1630
Run 3 Composite	9/30/99	0815-1130			X		I	mc	X								X	X	X	0815-1130
SCR6 Slurry	9/29/99					X	I													Archive for Analyze if high Hg in Fuel.
																				→ Archived @ Metco DRS

Received by:	Date:	Time:	Transported by:	Date: 9-30-99	Time: 1315	Received at Lab by:	Date: 10/4/99	Time: 1100
Analyzed by:	Date:	Time:	Data Reviewed by:	Date: 11/9/99	Time:	Remarks:		

Ship to: TestAmerica

METCO ENVIRONMENTAL

F-11

APPENDIX G

Resumes

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

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.