APPENDIX A
DETAILED TEST DATA AND TEST RESULTS

TABLE A-1
BIRCHWOOD POWER
SUMMARY OF MERCURY SPECIATION TEST DATA AND TEST RESULTS
UNIT NO. 1 INLET

TEST DATA:						
Test run number	2	3		4		
Location		Unit No. 1 Inlet				
Test date	9/15/99	9/15/99		9/15/99		
Test time period	0742-1109	1218-1529		1646-1955		
PROCESS DATA:						
Unit Load, MW	236	236		236		
Coal feed rate, lb/hr.	179700	177500		177400		
Coal Btu content, Btu/lb.	11920	11810		11760		
Heat Input, 10^6 Btu/hr	2142	2096		2086		
SAMPLING DATA:						
Sampling duration, min.	140.0	140.0		140.0		
Nozzle diameter, in.	0.191	0.195		0.191		
Cross sectional nozzle area, sq.ft.	0.000199	0.000207		0.000199		
Barometric pressure, in. Hg	30.14	30.14		30.14		
Avg. orifice press. diff., in H_2O	0.48	0.52		0.47		
Avg. dry gas meter temp., deg F	89.6	89.3		86.4		
Avg. abs. dry gas meter temp., deg. R	550	549		546		
Total liquid collected by train, ml	103.8	114.2		114.4		
Std. vol. of H_2O vapor coll., cu.ft.	4.9	5.4		5.4		
Dry gas meter calibration factor	1.0098	1.0098		1.0098		
Sample vol. at meter cond., dcf	52.681	55.932		52.762		
Sample vol. at std. cond., dscf (1)	51.522	54.736		51.902		
Percent of isokinetic sampling	101.2	104.9		105.9		
Sample vol. at std. cond., dscm (1)	1.459	1.550		1.470		
GAS STREAM COMPOSITION DATA:						
CO_2, % by volume, dry basis	13.1	13.1		13.4		
O_2, % by volume, dry basis	5.9	5.8		5.7		
N_2, % by volume, dry basis	81.0	81.1		80.9		
Molecular wt. of dry gas, lb/lb mole	30.33	30.33		30.37		
H_20 vapor in gas stream, prop. by vol.	0.087	0.089		0.094		
Mole fraction of dry gas	0.913	0.911		0.906		
Molecular wt. of wet gas, lb/lb mole	29.26	29.23		29.21		
GAS STREAM VELOCITY AND VOLUMETRIC FLOW DATA:						
Static pressure, in. H_2O	-9.20	-9.20		-9.20		
Absolute pressure, in. Hg	29.46	29.46		29.46		
Avg. temperature, deg. F	273	270		277		
Avg. absolute temperature, deg.R	733	730		737		
Pitot tube coefficient	0.84	0.84		0.84		
Total number of traverse points	35	35		35		
Avg. gas stream velocity, ft./sec.	47.0	46.2		45.9		AVERAGE
Stack/duct cross sectional area, sq.ft.	250.000	250.000		250.000		
Avg. gas stream volumetric flow, wacf/min.	705363	692483		688669		695505
Avg. gas stream volumetric flow, dscf/min. (1)	457124	449238		440054		448805
MERCURY LABORATORY REPORT DATA:						
Particulate bound, ug	16.5000	12.4000		15.0000		
Oxidized, ug	0.3700	0.3200		0.3100		
Elemental, ug	0.1800	0.2400	<	0.4000		
Total catch, ug(3)	17.0500	12.9600		15.7100		
PARTICULATE BOUND MERCURY EMISSIONS:						
Conc., ug/m^3	11.31	8.00		10.21		9.839
Conc., ug/Nm^3 (2)	12.13	8.58		10.95		10.556
Emission rate, lbs/10^{12} Btu.	9.04	6.42		8.06		7.84
Emission rate, lbs/hr	1.94E-02	1.35E-02		1.68E-02		1.65E-02
OXIDIZED MERCURY EMISSIONS:						
Conc., ug/m^3	0.25	0.21		0.21		0.22
Conc., ug/Nm^3 (2)	0.27	0.22		0.23		0.24
Emission rate, lbs/10^{12} Btu.	0.20	0.17		0.17		0.18
Emission rate, lbs/hr	4.34E-04	3.47E-04		3.48E-04		3.76E-04
ELEMENTAL MERCURY EMISSIONS:						
Conc., ug/m^3	0.12	0.15	<	0.27	<=	0.18
Conc., ug/Nm^3 (2)	0.13	0.17	<	0.29	<=	0.20
Emission rate, lbs/10^{12} Btu.	0.10	0.12	<	0.22	<=	0.15
Emission rate, lbs/hr	2.11E-04	2.61E-04	<	4.49E-04	<=	3.07E-04
TOTAL MERCURY EMISSIONS: (3)						
Conc., ug/m^3	11.69	8.36		10.69		10.25
Conc., ug/Nm^3 (2)	12.54	8.97		11.47		10.99
Emission rate, lbs/10^{12} Btu.	9.34	6.71		8.45		8.17
Emission rate, lbs/hr	2.00E-02	1.41E-02		1.76E-02		1.72E-02

(1) Standard conditions = 68 deg. F. (20 deg. C.) and 29.92 inches Hg (760mm Hg).
(2) Nm3 = Normal cubic meter (32 deg. F. (0 deg. C.) and 29.92 inches Hg (760mm Hg)).
(3) Non-detects included in total mercury catch value.

TABLE A-2
BIRCHWOOD POWER
SUMMARY OF MERCURY SPECIATION TEST DATA AND TEST RESULTS
UNIT NO. 1 OUTLET

TEST DATA:							
Test run number	2		3		4		
Location			Unit No. 1 Outlet				
Test date	9/15/99		9/15/99		9/15/99		
Test time period	0742-1109		1218-1533		1645-1948		
PROCESS DATA:							
Unit Load, MW	236		236		236		
Coal feed rate, lb/hr.	179700		177500		177400		
Coal Btu content, Btu/lb.(as received)	11920		11810		11760		
Heat Input, 10^6 Btu/hr	2142		2096		2086		
SAMPLING DATA:							
Sampling duration, min.	144.0		144.0		144.0		
Nozzle diameter, in.	0.193		0.193		0.193		
Cross sectional nozzle area, sq.ft.	0.000203		0.000203		0.000203		
Barometric pressure, in. Hg	30.14		30.14		30.14		
Avg. orifice press. diff., in H_2O	1.07		1.08		1.12		
Avg. dry gas meter temp., deg F	94.3		90.6		89.8		
Avg. abs. dry gas meter temp., deg. R	554		551		550		
Total liquid collected by train, ml	241.1		246.8		248.5		
Std. vol. of H_2O vapor coll., cu.ft.	11.3		11.6		11.7		
Dry gas meter calibration factor	1.0072		1.0072		1.0072		
Sample vol. at meter cond., dcf	81.239		79.890		82.422		
Sample vol. at std. cond., dscf (1)	78.689		77.903		80.498		
Percent of isokinetic sampling	101.5		100.8		101.7		
Sample vol. at std. cond., dscm (1)	2.228		2.206		2.279		
GAS STREAM COMPOSITION DATA:							
CO_2, % by volume, dry basis	12.8		12.7		13.2		
O_2, % by volume, dry basis	6.0		6.2		5.9		
N_2, % by volume, dry basis	81.2		81.1		80.9		
Molecular wt. of dry gas, lb/lb mole	30.29		30.28		30.34		
H_20 vapor in gas stream, prop. by vol.	0.126		0.130		0.127		
Mole fraction of dry gas	0.874		0.870		0.873		
Molecular wt. of wet gas, lb/lb mole	28.74		28.69		28.78		
GAS STREAM VELOCITY AND VOLUMETRIC FLOW DATA:							
Static pressure, in. H_2O	-0.98		-1.00		-1.00		
Absolute pressure, in. Hg	30.07		30.07		30.07		
Avg. temperature, deg. F	194		194		194		
Avg. absolute temperature, deg.R	654		654		654		
Pitot tube coefficient	0.84		0.84		0.84		
Total number of traverse points	12		12		12		
Avg. gas stream velocity, ft./sec.	62.3		62.4		63.7		AVERAGE
Stack/duct cross sectional area, sq.ft.	188.690		188.690		188.690		
Avg. gas stream volumetric flow, wacf/min.	705558		706902		721437		711299
Avg. gas stream volumetric flow, dscf/min. (1)	499936		498798		510592		503109
MERCURY LABORATORY REPORT DATA:							
Particulate bound, ug	0.0210		0.0230		0.0300		
Oxidized, ug	0.6200	<	0.3000	<	0.3000		
Elemental, ug	0.2400		0.2100	<	0.4000		
Total catch, ug(3)	0.8810		0.5330		0.7300		
PARTICULATE BOUND MERCURY EMISSIONS:							
Conc., ug/m^3	0.009		0.010		0.013		0.011
Conc., ug/Nm^3 (2)	0.010		0.011		0.014		0.012
Emission rate, lbs/10^{12} Btu.	8.24E-03		9.29E-03		1.21E-02		9.87E-03
Emission rate, lbs/hr	1.76E-05		1.95E-05		2.52E-05		2.08E-05
OXIDIZED MERCURY EMISSIONS:							
Conc., ug/m^3	0.28	<	0.14	<	0.13	<=	0.18
Conc., ug/Nm^3 (2)	0.30	<	0.15	<	0.14	<=	0.20
Emission rate, lbs/10^{12} Btu.	0.24	<	0.12	<	0.12	<=	0.16
Emission rate, lbs/hr	5.21E-04	<	2.54E-04	<	2.52E-04	<=	3.42E-04
ELEMENTAL MERCURY EMISSIONS:							
Conc., ug/m^3	0.11		0.10	<	0.18	<=	0.13
Conc., ug/Nm^3 (2)	0.12		0.10	<	0.19	<=	0.14
Emission rate, lbs/10^{12} Btu.	0.09		0.08	<	0.16	<=	0.11
Emission rate, lbs/hr	2.02E-04		1.78E-04	<	3.36E-04	<=	2.38E-04
TOTAL MERCURY EMISSIONS: (3)							
Conc., ug/m^3	0.40		0.24		0.32		0.32
Conc., ug/Nm^3 (2)	0.42		0.26		0.34		0.34
Emission rate, lbs/10^{12} Btu.	0.35		0.22		0.29		0.28
Emission rate, lbs/hr	7.40E-04		4.51E-04		6.12E-04		6.01E-04
TOTAL MERCURY REMOVAL EFFICIENCY:	96.24%		96.73%		96.38%		96.45%

(1) Standard conditions = 68 deg. F. (20 deg. C.) and 29.92 inches Hg (760mm Hg).
(2) Nm3 = Normal cubic meter (32 deg. F. (0 deg. C.) and 29.92 inches Hg (760mm Hg)).
(3) Non-detects included in total mercury catch value.

APPENDIX B
PROCESS OPERATIONS, FACILITY CEMS AND FGD/BAGHOUSE DATA

RUN 2

9/15/99	Critical Measurement											Ave.
	DCS Time		7:42	8:12	8:42	9:12	9:42	10:12	10:42	11:09		
	CEMS Time		6:33	7:03	7:33	8:03	8:33	9:03	9:33	10:03		
	Baghouse											
Baghouse Total Pressure Drop			3.6	3.1	3.5	3.5	3.8	4.4	4.4	4.7		3.9
	SCR/FGD											
*	Lime slurry injection rate (GPM)		133	123	121	128	128	117	119	68		117.
	Ammonia Injection rate (PPH)		88	88	88	88	89	89	89	89		88.5
	Boiler											
**	Fuel feed flow (TONS)		306820.1	306865.1	306910.1	306956.1	307001	307046	307090	307130		309.9
	Main steam flow (KPPH)		1597	1562	1569	1568	1560	1573	1565	1564		1570
	Main steam temperature (DEG F)		1008	1008	1008	1008	1008	1008	1008	1008		1008
	Main steam pressure		2401	2397	2397	2390	2394	2398	2392	2397		2396
	Generator											
	Gross generation		236.7	234.6	235.9	235.7	236	236.6	236	235.7		236
	Net generation		218.8	216.9	218	217.6	218	218.8	218.2	218.2		218
	CEMS											
	Gas flow (SCFH)		30602526	29067824	28706945	28120545	28207471	29441796	28335394	28200817		2800000
	SO2 inlet (PPM)		526	558	554	564	570	579	564	567		560
	SO2 outlet (PPM)		97	33	35	48	57	53	37	32		49
	CO2 inlet (%)		12.7	13.8	13.7	13.8	13.9	14.1	13.9	14		13.7
	CO2 outlet (%)		12.52	12.97	12.99	12.98	13.11	12.51	13.05	13.09		12.9
	Opacity (%)		5.2	5.4	5.5	6.6	6.3	7.5	6.1	7.1		6.2
	NOX outlet (PPM)		67	53	52	52	48	46	50	51		52.4
* Total lime slurry (sum of all atomizers)			#### CEMS time is 1hr. 9 min. behind DCS ####									
** Total coal burned												

RUN 3
9/15/99

9/15/99	Critical Measurement											
		DCS Time	12:18	12:48	13:18	13:48	14:18	14:48	15:18	15:35	
		CEMS Time	11:09	11:39	12:09	12:39	13:09	13:39	14:09	14:26	
	Baghouse										
	Baghouse Total Pressure Drop		4.5	4.4	4.2	3.9	4	4.6	4.2	4.4	4.2
	SCR/FGD										
*	Lime slurry injection rate (GPM)		116	122	122	121	126	119	127	119	122
	Ammonia Injection rate (PPH)		89	89	89	89	89	89	89	89	89
	Boiler										
**	Fuel feed flow (TONS)		307232	307276	307321	307365	307409.1	307453.1	307498.1	307523.1	291.1
	Main steam flow (KPPH)		1554	1557	1570	1563	1559	1562	1534	1559	1557
	Main steam temperature (DEG F)		1008	1008	1008	1008	1008	1008	1008	1005	1008
	Main steam pressure		2393	2394	2395	2397	2398	2395	2402	2398	2397
	Generator										
	Gross generation		236.1	236.2	236.6	236	235.9	235.7	234.8	236	236
	Net generation		217.8	218.4	218.8	218	218	217.7	216.7	217.7	217.9
	CEMS										
	Gas flow (SCFH)		28072061	28232459	28231196	27888588	28352512	29409673	28075489	29649923	28500000
	SO2 inlet (PPM)		568	568	566	566	567	567	566	549	564
	SO2 outlet (PPM)		26	27	41	27	26	64	33	47	36
	CO2 inlet (%)		14	14	13.9	13.8	13.9	13.9	13.9	13.8	13.9
	CO2 outlet (%)		13.09	13.05	13.04	13.04	12.97	12.39	12.96	12.7	12.9
	Opacity (%)		7.2	6.8	6.7	7.8	6.9	6.7	6.6	7.3	7
	NOX outlet (PPM)		49	49	50	51	50	47	49	48	49
* Total lime slurry (sum of all atomizers)			#### CEMS time is 1hr. 9 min. behind DCS ####								
** Total coal burned											

4th RUN
9/15/99

	Critical Measurement										
		DCS Time	16:45	17:15	17:45	18:15	18:45	19:15	19:45	19:55	
		CEMS Time	15:36	16:06	16:36	17:06	17:36	18:06	18:36	18:46	
	Baghouse										
	Baghouse Total Pressure Drop		4.5	4.2	4.7	5.1	5.5	5	4.7	5	4.8
	SCR/FGD										
*	Lime slurry injection rate (GPM)		120	126	129	126	126	122	127	133	126
	Ammonia Injection rate (PPH)		89	89	88	88	84	84	84	84	86.3
	Boiler										
**	Fuel feed flow (TONS)		307626	307670	307715.1	307759.1	307803.1	307848.1	307892.1	307907.1	281.1
	Main steam flow (KPPH)		1559	1560	1578	1567	1545	1552	1552	1556	1558
	Main steam temperature (DEG F)		1005	1005	1005	1005	1005	1005	1005	1005	1005
	Main steam pressure		2394	2399	2393	2393	2394	2397	2392	2397	2395
	Generator										
	Gross generation		235.6	236.4	236.6	236.1	236.6	235.9	236.1	236.2	236.2
	Net generation		217.6	218.5	218.7	218.5	218.4	217.9	218	218.3	218.2
	CEMS										
	Gas flow (SCFH)		28233020	28318357	29493256	29076778	29054404	29102828	29311394	29138702	289
	SO2 inlet (PPM)		567	579	546	548	547	544	550	551	554
	SO2 outlet (PPM)		38	63	61	38	46	41	35	39	45
	CO2 inlet (%)		13.8	14	13.5	13.6	13.7	13.4	13.4	13.5	13.6
	CO2 outlet (%)		12.95	13.01	12.48	12.73	12.51	12.38	12.16	12.4	12.6
	Opacity (%)		7.2	6.6	7.6	7.9	8.2	7.8	7.4	8.5	7.7
	NOX outlet (PPM)		49	48	54	48	48	47	49	46	48.6
* Total lime slurry (sum of all atomizers)				#### CEMS time is 1hr. 9 min. behind DCS ####							
** Total coal burned											

APPENDIX C
RAW TEST DATA

TABLE A-1
BIRCHWOOD POWER
ONTARIO HYDRO METHOD DATA INPUTS
UNIT NO. 1 INLET

Test Data				
Run number	2	3		4
Location		Unit No. 1 Inlet		
Date	9/15/99	9/15/99		9/15/99
Time period	0742-1109	1218-1529		1646-1955
Operator	JC/KA	JC/KA		JC/KA
Process Data				
Unit Load, MW	236	236		236
Coal feed rate, lb/hr.	179700	177500		177400
Coal Btu content, Btu/lb.(as received)	11920	11810		11760
Heat Input, 10^6 Btu/hr	2142	2096		2086
Inputs For Calcs.				
Sq. rt. delta P	0.710390	0.69846		0.69092
Delta H	0.48343	0.51714		0.46657
Stack temp. (deg.F)	272.50	269.50		276.90
Meter temp. (deg.F)	89.60	89.30		86.40
Sample volume (act.)	52.681	55.932		52.762
Barometric press. (in.Hg)	30.14	30.14		30.14
Volume H_2O imp. (ml)	91.2	100.6		100.0
Weight chnge sil. gel (g)	12.6	13.6		14.4
% CO_2	13.1	13.1		13.4
% O_2	5.9	5.8		5.7
% N	81.0	81.1		80.9
Area of stack (sq.ft.)	250.00	250.00		250.00
Sample time (min.)	140.00	140.00		140.00
Static pressure (in.H_2O)	-9.20	-9.20		-9.20
Nozzle dia. (in.)	0.191	0.195		0.191
Meter box cal.	1.0098	1.0098		1.0098
Cp of pitot tube	0.84	0.84		0.84
Traverse points	35	35		35
Mercury Laboratory Report Data				
Particulate bound, ug	16.5000	12.4000		15.0000
Oxidized, ug	0.3700	0.3200		0.3100
Elemental, ug	0.1800	0.2400	<	0.4000
Total mercury catch, ug	17.0500	12.9600		15.7100

Note: Non-detects included in total mercury catch value.

TABLE A-2
BIRCHWOOD POWER
ONTARIO HYDRO METHOD DATA INPUTS
UNIT NO. 1 OUTLET

Test Data					
Run number	2		3		4
Location			Unit No. 1 Outlet		
Date	9/15/99		9/15/99		9/15/99
Time period	0742-1109		1218-1533		1645-1948
Operator	JP		JP		JP
Process Data					
Unit Load, MW	236		236		236
Coal feed rate, lb/hr.	179700		177500		177400
Coal Btu content, Btu/lb.(as received)	11920		11810		11760
Heat Input, 10^6 Btu/hr	2142		2096		2086
Inputs For Calcs.					
Sq. rt. delta P	0.997410		0.99851		1.02044
Delta H	1.07194		1.07944		1.12167
Stack temp. (deg.F)	194.19		194.10		194.30
Meter temp. (deg.F)	94.30		90.60		89.80
Sample volume (act.)	81.239		79.890		82.422
Barometric press. (in.Hg)	30.14		30.14		30.14
Volume H_2O imp. (ml)	225.0		229.7		231.6
Weight chnge sil. gel (g)	16.1		17.1		16.9
% CO_2	12.8		12.7		13.2
% O_2	6.0		6.2		5.9
% N	81.2		81.1		80.9
Area of stack (sq.ft.)	188.69		188.69		188.69
Sample time (min.)	144.00		144.00		144.00
Static pressure (in.H_2O)	-0.98		-1.00		-1.00
Nozzle dia. (in.)	0.193		0.193		0.193
Meter box cal.	1.0072		1.0072		1.0072
Cp of pitot tube	0.84		0.84		0.84
Traverse points	12		12		12
Mercury Laboratory Report Data					
Particulate bound, ug	0.0210		0.0230		0.0300
Oxidized, ug	0.6200	<	0.3000	<	0.3000
Elemental, ug	0.2400		0.2100	<	0.4000
Total mercury catch, ug	0.8810		0.5330		0.7300

Note: Non-detects included in total mercury catch value.

Sample and Velocity Traverse Point Data Sheet - Method 1

Client: Birchwood Power
Loaction/Plant: King George, VA
Source: Inlet

Operator: JC / KA
Date: 9/13/99
W.O. Number:

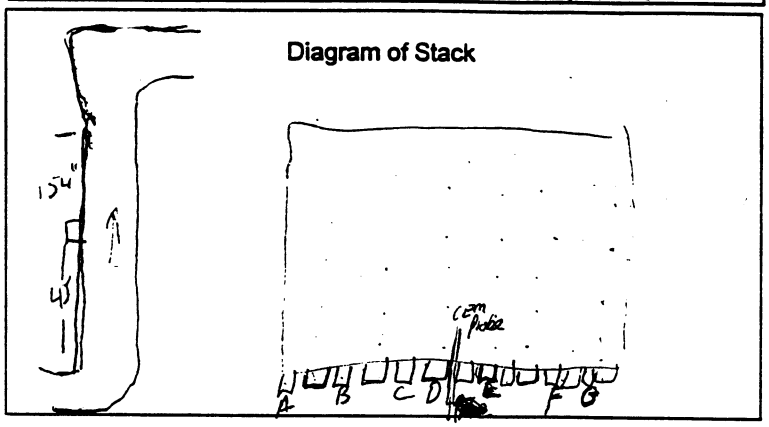
Duct Type	☐ Circular	☑ Rectangular Duct	Indicate appropriate type
Traverse Type	☐ Particulate Traverse	☑ Velocity Traverse	

Distance from far wall to outside of port (in.) = C	89.75
Port Depth (in.) = D	19
Depth of Duct, diameter (in.) = C-D	70.75
Area of Duct (ft^2) 70.75" x 500"	245.66
Total Traverse Points	35
Total Traverse Points per Port	5

Rectangular Ducts Only	
Width of Duct, rectangular duct only (in.)	500
Total Ports (rectangular duct only)	7

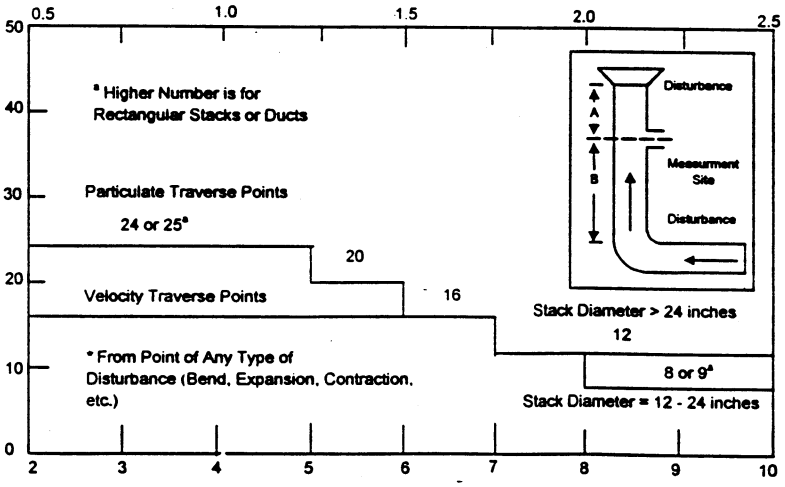
Flow Disturbances	
Upstream - A (ft)	12.8
Downstream - B (ft)	43
Upstream - A (duct diameters)	2.1
Downstream - B (duct diameters)	7.2

Diagram of Stack



Traverse Point Locations

Traverse Point	% of Duct	Distance from Inside Duct Wall (in)	Distance from Outside of Port (in)
1	10	~~70.75~~ 7.075	26 1/8
2	30	21.25	40 1/4
3	50	35.35	54 3/8
4	70	49.5	68 1/2
5	50	63.65	82 5/8
6			
7			
8			
9			
10			
11			
12			



Equivalent Diameter = (2*L*W)/(L+W)

Traverse Point Location Percent of Stack -Circular

Velocity Traverse Point	Number of Traverse Points: 1	2	3	4	5	6	7	8	9	10	11	12
1		14.6		6.7		4.4		3.2		2.6		2.1
2		85.4		25		14.6		10.5		8.2		6.7
3				75		29.6		19.4		14.6		11.8
4				93.3		70.4		32.3		22.6		17.7
5						85.4		67.7		34.2		25
6						95.6		80.6		65.8		35.6
7								89.5		77.4		64.4
8								96.8		85.4		75
9										91.8		82.3
10										97.4		88.2
11												93.3
12												97.9

Traverse Point Location Percent of Stack -Rectangular

Velocity Traverse Point	Number of Traverse Points: 1	2	3	4	5	6	7	8	9	10	11	12
1		25.0	16.7	12.5	10.0	8.3	7.1	6.3	5.6	5.0	4.5	4.2
2		75.0	50.0	37.5	30.0	25.0	21.4	18.8	16.7	15.0	13.6	12.5
3			83.3	62.5	50.0	41.7	35.7	31.3	27.8	25.0	22.7	20.8
4				87.5	70.0	58.3	50.0	43.8	38.9	35.0	31.8	29.2
5					90.0	75.0	64.3	56.3	50.0	45.0	40.9	37.5
6						91.7	78.6	68.8	61.1	55.0	50.0	45.8
7							92.9	81.3	72.2	65.0	59.1	54.2
8								93.8	83.3	75.0	68.2	62.5
9									94.4	85.0	77.3	70.8
10										95.0	86.4	79.2
11											95.5	87.5
12												95.8

Rectangular Stack Points & Matrix
9 - 3 x 3
12 - 4 x 3
16 - 4 x 4
20 - 5 x 4
25 - 5 x 5
30 - 6 x 5
36 - 6 x 6
42 - 7 x 6
49 - 7 x 7

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Determination of Stack Gas Velocity - Method 2

Client: Birchwood Power
Location/Plant: King George, VA
Source: Inlet
Operator: JL/KA
Date: 9/13/99
W.O. Number:
Pitot Coeff (Cp):
Stack Area, ft² (As):
Pitot Tube/Thermo ID:

Run Number	Prelim		
Time	1619		
Barometric Press, in Hg (Pb)	30.22		
Static Press, in H_20 (Pstatic)	-9.2		
Source Moisture, % (BWS)	6.92		
O_2, %			
CO_2, %			

Cyclonic Flow Determination		Traverse Location		Leak Check good ? Y / N		Leak Check good ? Y / N			Leak Check good ? Y / N	
Delta P at 0°	Angle yeilding zero Delta P	Port	Point	Delta P	Source Temp, F° (Ts)	Port	Delta P	Source Temp, F° (Ts)	Delta P @ 0°	Source Temp, F° (Ts)
		1	1	0.46	280	6 1	0.55	262		
			2	0.55	298	2	0.63	265	0	0
0	0		3	0.63	300	3	0.67	267		
			4	0.58	300	4	0.57	270		
			5	0.40	296	5	0.39	271		
		2	1	0.45	292	7 1	0.37	260		
			2	0.54	297	2	0.49	265		
			3	0.62	298	3	0.54	266		
			4	0.47	297	4	0.54	267	0	0
			5	0.32	295	5	0.45	267		
0	0	3	1	0.68	290					
			2	0.64	293					
			3	0.52	292					
			4	0.54	292					
			5	0.44	292					
		4	1	0.57	290					
			2	0.63	292					
0	0		3	0.64	291					
			4	0.56	290					
			5	0.33	287					
		5	1	0.43	280					
			2	0.54	277					
			3	0.52	278					
			4	0.52	276					
0	0		5	0.45	270					
Avg Angle		Avg Delta P & Temp		0.52086	283					
		avg $\sqrt{DeltaP}$		.71866						
Average gas stream velocity, ft/sec.										
Vol. flow rate @ actual conditions, wacf/min										
Vol. flow rate at standard conditions, dscf/min										

$$MWd = (0.32 * O_2) + (0.44 * CO_2) + (0.28 * (100 - (CO_2 + O_2)))$$

$$MWs = (MWd * (1 - (BWS/100))) + (18 * (BWS/100))$$

$$Tsa = Ts + 460$$

$$Ps = Pb + (Pstatic/13.6)$$

$$Vs = 85.49 * Cp * avg\sqrt{DeltaP} * \sqrt{Tsa/(Ps * MWs)}$$

$$Qs(act) = 60 * Vs * As$$

$$Qs(std) = 17.64 * (1 - (BWS/100)) * (Ps/Tsa) * Qs(act)$$

Comments _____

where:
MWd = Dry molecular weight source gas, lb/lb-mole.
MWs = Wet molecular weight source gas, lb/lb-mole.
Tsa = Source Temperature, absolute(oR)
Ps = Absolute stack static pressure, inches Hg.
Vs = Average gas stream velocity, ft/sec.
Qs(act) = Volumetric flow rate of wet stack gas at actual,
Qs(std) = Volumetric flow rate of dry stack gas at standard conditions, dscf/min

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Determination of Moisture Content in Stack Gases - Method 4

Client: Birchwood Power
Location/Plant: King George, Va
Source: Inlet
W.O. Number:
Operator: JC/KA
Meter Box ID: 14
Temperature °C or °F: F
Date: 9/13/99
Meter Box Y: 1.008
Sample Volume, ft³ or L: ft

Run Number		Sample Time (min)	Meter Volume, Vm	Meter Temp (or ambient temp for rotometer)		Meter Press, Delta H (in H_2O)	Impinger Volume, ml	Silica Gel Weight, g	Corrected Volume, Vm(std)	Leak Rate Check
1				Inlet	Outlet				22.36	Initial .0880 @ 10
	End Test	36	752.621	85	80	1.4	118	3173		Final .0050 @ 15
Baro Press., Pb (in Hg)	Start Test	0	730.118	80	80	1.4 gr ~~1.5~~	100	300	Moisture Volume, Vw(std)	Percent Moisture (%), BWS
30.22	Avg. or Total	36	22.403	81.25					1.66	6.92

Run Number		Sample Time (min)	Meter Volume, Vm	Meter Temp (or ambient temp for rotometer)		Meter Press, Delta H (in H_2O)	Impinger Volume, ml	Silica Gel Weight, g	Corrected Volume, Vm(std)	Leak Rate Check
				Inlet	Outlet					Initial
	End Test									Final
Baro Press., Pb (in Hg)	Start Test								Moisture Volume, Vw(std)	Percent Moisture (%), BWS
	Avg. or Total									

Run Number		Sample Time (min)	Meter Volume, Vm	Meter Temp (or ambient temp for rotometer)		Meter Press, Delta H (in H_2O)	Impinger Volume, ml	Silica Gel Weight, g	Corrected Volume, Vm(std)	Leak Rate Check
				Inlet	Outlet					Initial
	End Test									Final
Baro Press., Pb (in Hg)	Start Test								Moisture Volume, Vw(std)	Percent Moisture, %
	Avg. or Total									

$$Vm(std) = \frac{17.64 * Y * Vm * (Pb + (deltaH/13.6))}{(Tm + 460)}$$

if Tm is C° than $Tm = (Tmc * 1.8) + 32$

if Vm is liters than $Vm = Vml * 28.32$

$$Vw(std) = (0.04707 * Vwc) + (0.04715 * Wwsg)$$

$$BWS = \left(\frac{Vw(std)}{Vw(std) + Vm(std)}\right) * 100$$

WHERE:
Vm(std)= Sample volume corrected to standard temp and pressure, scf or L
Vm= Actual sample volume, calculated, scf
Vml= Actual sample volume, calculated, Liters
Y= Dry gas meter calibration factor.
Pb= Barometric pressure, in. Hg
delta H= Meter pressure, in H2O
Tm= Average temperature of meter (DGM is used) or rotomter, degrees °F
Tmc= Average temperature of meter (DGM is used) or rotomter, degrees °C
Vw(std)= Volume of water vapor at standard conditions, scf or L
Vwc= Volume of water condensed, mL
Wwsg= Weight of Silica Gel, g
Bws= Water vapor in gas stream, percent

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Use either ft³ or liters in calculations. DO NOT MIX CUBIC FEET AND LITERS IN ANY CALCULATION.

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ISOKINETIC FIELD DATA SHEET — Ontario Hydro Method - Mercury

		Stack Conditions	Assumed	Actual					
Client	BIRCHWOOD POWER				Meter Box ID	WL 14		K Factor	.96
W.O.#	12255-001-001				Meter Box Y	1.0098			
Project ID	BP	% Moisture	5.5		Meter Box Del H	1.9408	**Leak Checks**	Initial	Mid-Point / Final
Mode/Source ID	BH	Impinger Vol (ml)		91.2	Probe ID / Length	P136 / 8ft	Sample Train (ft^3)	.014	.015
Samp. Loc. ID	IN	Silica gel (g)		12.6	Probe Material	Boro	Leak Check @ (in Hg)	15	15
Run No.ID	2	CO2, % by Vol	13.5	13.07	Pitot / Thermocouple ID	P108	Pitot good	yes / no	yes / no / yes / no
Test Method ID	OHM	O2, % by Vol	6	5.90	Pitot Coefficient	0.84	Orsat good	yes / no	yes / no / yes / no
Date ID	13SEP1999	Temperature (°F)	270		Nozzle ID	1.91	**Temp Check**	Pre-Test Set	Post-Test Set
Source/Location	BagHouse Inlet	Meter Temp (°F)	84		Avg Nozzle Dia (in)	0.1.91	Meter Box Temp	81	88
Sample Date	13 Sep 99	Static Press (in H_2O)	-9.2	-9.2	Area of Stack (ft^2)	250	Reference Temp	80	80
Baro. Press (in Hg)	30.14				Sample Time	40	Pass/Fail (+/- 2°)	Pass / Fail	Pass / Fail
Operator	JC / KA	Ambient Temp (°F)	75		Total Traverse Pts	35	Temp Change Respon	yes / no	yes / no

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft^3)	STACK TEMP (°F)	DGM INLET TEMP (°F)	DGM OUTLET TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (F)	IMPING EXIT TEMP (°F)	SAMPLE TRAIN VAC (in Hg)		COMMENTS
	0	7:42			817.008									
1 1	4		0.64	0.61	818.7	280	82	78	256	254	68	3.0		filter #7
2	8		0.62	0.60	820.5	283	83	78	240	244	65	3.0		Leak ✓ .005
3	12		0.73	0.70	822.2	277	87	80	243	250	65	3.5		@10 inHg
4	16		0.63	0.60	823.6	276	89	82	246	252	63	3.5		
5	20	802	0.52	0.50	825.287	279	90	83	240	247	63	3.0		
	—	—	—	—	—	—	—	—	—	—	—	—	—	—
			—	—	825.402	—	—	—	—	—	—	—	—	—
2 1	24	805	0.40	0.38	826.9	280	88	82	242	250	63	3.0		Leak ✓ .05
2	28		0.54	0.52	828.4	288	92	85	241	249	63	3.5		@10 inHg
3	32		0.55	0.53	830.1	291	91	85	250	250	63	3.5		
4	36		0.49	0.47	831.5	290	92	85	250	252	62	3.5		
5	40	825	0.32	0.31	832.638	286	93	86	242	250	62	3.0		
	—	—	—	—	—	—	—	—	—	—	—	—	—	—
~~3 3~~	—	828	—	—	832.767	—	—	—	—	—	—	—	—	—
3 1	44	~~0.55~~	0.55	0.53	834.1	275	91	86	238	248	63	4.0		Leak ✓ .05
2	48		0.67	0.64	835.9	277	93	87	240	243	63	4.5		@10 in Hg
3	52		0.61	0.59	837.5	284	94	88	246	249	64	4.5		
4	56		0.47	0.45	839.3	283	96	89	243	249	63	4.0		
5	60	848	0.32	0.31	840.395	265	95	88	243	245	63	4.0		
			Avg Sqrt Delta P	Avg Delta H	Total Volume	Avg Ts	Avg Tm	Min/Max	Min/Max	Max Temp	Max Vac	Max Temp		
			.71039	.48343	52.68	272.5	89.6	240/256	79/256	68	5.5			
				Avg Sqrt Del H .69118	Comments:									

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Ontario Hydro Method

ISOKINETIC FIELD DATA SHEET Ontario Hydro Method - Mercury

Client: BIRCHWOOD POWER | Operator: JC / KA
Source: BagHouse | Run No.: 2
Sample Loc.: Inlet | Date: 15 Sept 97 | K Factor: .96

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft³)	STACK TEMP (°F)	DGM INLET TEMP (°F)	DGM OUTLET TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (F)	IMPING EXIT TEMP (°F)	SAMPLE TRAIN VAC (in Hg)		COMMENTS
	0	857			840.479									
4 1	64		0.54	0.53	842.6	260	90	87	242	247	67	5.0		Leak ✓ 0.00
2	68		0.53	0.51	843.9	273	94	89	242	245	66	5.0		@10 in Hg
3	72		0.46	0.44	845.7	275	95	89	240	242	66	5.0		
4	76		0.44	0.42	846.9	275	95	89	245	242	66	5.0		
5	80	917	0.38	0.36	848.044	274	95	89	244	244	66	5.0		
	—	—	—	—	—	—	—	—	—	—	—	—	—	—
		0955	—	—	848.385	—	—	—	—	—	—	—	—	—
5 1	84		0.49	0.47	849.6	265	90	88	240	250	68	5.0		Leak ✓ 0.011
2	88		0.52	0.50	851.0	269	94	89	243	245	68	5.5		@10 in Hg
3	92		0.54	0.52	852.5	272	93	88	243	241	67	5.5		
4	96		0.45	0.43	854.4	273	94	88	242	239	67	5.5		
5	100	1015	0.39	0.37	855.592	260	94	89	243	250	66	5.5		
	—	—	—	—	—	—	—	—	—	—	—	—	—	—
		1020	—	—	855.735	—	—	—	—	—	—	—		
6 1	104		0.55	0.53	857.2	250	91	88	241	253	67	5.0		Leak ✓ .015
2	108		0.69	0.66	858.9	256	93	88	241	247	65	5.5		@10 in Hg
3	112		0.65	0.62	860.6	262	94	88	245	241	65	5.5		
4	116		0.55	0.53	862.2	263	95	90	244	249	66	5.5		
5	120	1040	0.37	0.36	863.64	256	97	89	243	247	66	5.0		
	—	—	—	—	—	—	—	—	—	—	—	—	—	—
		1049	—	—	864.881	—	—	—	—	—	—	—	—	—
7 1	124		0.42	0.40	865.9	250	91	87	244	256	65	4.0		Leak ✓ .010
2	128		0.51	0.49	867.8	257	95	89	246	253	67	4.0		@12 in Hg
3	132		0.48	0.46	869.5	260	97	89	245	250	66	4.5		
4	136		0.45	0.43	870.16	260	98	89	242	246	65	4.0		
5	140	1109	0.36	0.35	871.844	260	98	89	240	250	66	4.0		
			Avg Sqrt Delta P	Avg Delta H	Total Volume	Avg Ts	Avg Tm		Min/Max	Min/Max	Max Temp	Max Vac	Max Temp	
				Avg Sqrt Del H	Comments:									

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ISOKINETIC FIELD DATA SHEET — Ontario Hydro Method - Mercury

Client	BIRCHWOOD POWER
W.O.#	12255-001-001
Project ID	BP
Mode/Source ID	BH
Samp. Loc. ID	IN
Run No.ID	3
Test Method ID	OHM
Date ID	13SEP1999
Source/Location	BagHouse Inlet
Sample Date	15 Sep 1999
Baro. Press (in Hg)	30.14
Operator	JCK/TB

Stack Conditions

	Assumed	Actual
% Moisture	9.5	
Impinger Vol (ml)		100.6
Silica gel (g)		13.6
CO2, % by Vol	13.5	13.10
O2, % by Vol	6	5.83
Temperature (°F)	220	
Meter Temp (°F)	87	
Static Press (in H_2O)	-9.2	-9.2
Ambient Temp (°F)	80	

Meter Box ID	1X14
Meter Box Y	1.0098
Meter Box Del H	1.9408
Probe ID / Length	P129 / 8ft
Probe Material	Boro
Pitot / Thermocouple ID	
Pitot Coefficient	0.84
Nozzle ID	
Avg Nozzle Dia (in)	.195
Area of Stack (ft^2)	250
Sample Time	140
Total Traverse Pts	35

K Factor 1.05

Leak Checks	Initial	Mid-Point	Final
Sample Train (ft^3)	0.010		0.010
Leak Check @ (in Hg)	15		12
Pitot good	yes / no	yes / no	yes / no
Orsat good	yes / no	yes / no	yes / no

Temp Check	Pre-Test Set	Post-Test Set
Meter Box Temp	87	86
Reference Temp	87	85
Pass/Fail (+/- 2°)	Pass / Fail	Pass / Fail
Temp Change Respon	yes / no	yes / no

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft^3)	STACK TEMP (°F)	DGM INLET TEMP (°F)	DGM OUTLET TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (F)	IMPINGER EXIT TEMP (°F)	SAMPLE TRAIN VAC (In Hg)		COMMENTS
	0	1218			872.217									
1 1	4		0.43	0.43	873.7	240	89	86	240	250	68	3.0		
2	8		0.58	0.61	875.7	258	90	86	241	243	68	3.0		
3	12		0.63	0.66	877.3	260	90	87	248	250	67	3.0		Leak @ 0.00
4	16		0.55	0.58	879.0	261	92	87	249	249	66	3.0		@ 15 in Hg
5	20	1238	0.38	0.40	880.758	260	93	87	246	252	66	3.0		
	—	—	—	—	—	—	—	—	—	—	—	—	—	
	—	~~1247~~	—	882.491	~~880.888~~	—	—	—	—	—	—	—	—	
2 1	24	1313	0.59	0.62	884.1	229	89	86	240	257	66	3.0		Leak @ 0.008
2	28		0.51	0.54	885.6	257	90	86	243	251	63	3.0		@ 10 in Hg
3	32		0.74	0.78	887.7	261	90	87	240	248	63	4.0		
4	36		0.61	0.64	889.7	263	92	88	246	255	62	3.5		
5	40	1333	0.43	0.45	891.094	262	92	86	253	247	60	3.5		
	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	—	1335	—	—	891.105	—	—	—	—	—	—	—	—	—
3 1	44		0.41	0.43	892.5	257	90	85	250	240	62	3.5		
2	48		0.46	0.48	894.0	263	91	86	257	248	62	3.5		Leak @ 0.00
3	52		0.54	0.57	895.7	270	92	87	253	251	62	4.0		@ 10 in Hg
4	56		0.45	0.47	897.2	275	93	87	250	248	62	3.1		
5	60	1355	0.38	0.40	898.541	270	93	87	243	250	62	3.5		

Avg Sqrt Delta P	Avg Delta H	Total Volume	Avg Ts	Avg Tm	Min/Max	Min/Max	Max Temp	Max Vac	Max Temp
.69846	.51714	55.932	269.5	89.3	237/258	240/259	68	6	

Avg Sqrt Del H .71606

Comments:

Ontario Hydro Method

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ISOKINETIC FIELD DATA SHEET Ontario Hydro Method - Mercury

Client: BIRCHWOOD POWER Operator: JC/KA/CB
Source: BagHouse Run No.: 3
Sample Loc.: Inlet Date: 15 Sept 1999 K Factor: 1.05

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft³)	STACK TEMP (°F)	DGM INLET TEMP (°F)	DGM OUTLET TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (F)	IMPING EXIT TEMP (°F)	SAMPLE TRAIN VAC (in Hg)		COMMENTS
	0	1358			898.601									
4 1	64		0.40	0.42	900.3	260	93	88	240	259	64	4.0		Leak ✓ 0.04
2	68		0.53	0.56	901.3	271	94	89	248	249	63	4.0		@ 10 in Hg
3	72		0.48	0.50	903.1	275	94	89	242	257	63	5.0		
4	76		0.44	0.46	904.7	274	93	88	252	258	63	5.0		
5	80	1418	0.35	0.37	905.793	270	94	89	247	251	64	4.0		
	—	—	—	—		—		—	—	—	—	—	—	—
	—	1423	—	906.020	906.020	—	—	—	—	—	—	—	—	—
5 1	84		0.39	0.41	907.6	259	90	87	239	241	64	4.0		
2	88		0.42	0.44	908.9	275	91	87	237	248	61	4.0		Leak ✓ 0.12
3	92		0.55	0.58	910.4	280	91	87	241	247	60	4.0		@ 10 in Hg
4	96		0.55	0.58	912.1	281	91	87	243	251	60	4.0		
5	100	1443	0.57	0.60	913.712	280	91	86	243	248	61	4.0		
	—	—	—	—		—		—	—	—	—	—	—	—
	—	1446	—	—	913.800	—	—	—	—	—	—	—	—	—
6 1	104		0.36	0.38	915.3	265	91	87	241	252	65	4.0		
2	108		0.53	0.56	916.9	282	91	88	250	243	64	5.0		Leak ✓
3	112		0.56	0.59	918.5	280	92	89	258	247	64	5.0		@ in Hg
4	116		0.54	0.57	920.0	289	93	89	251	256	64	5.0		
5	120	1506	0.42	0.44	921.789	290	90	88	280	248	65	5.0		
	—		—	—	—	—	—	—	—	—	—	—	—	—
	—		—	—	921.839	—	—	—	—	—	—	—	—	—
7 1	124	1509	0.39	0.41	923.7	271	89	87	253	247	65	5.0		Leak ✓ 0.010
2	128		0.49	0.51	925.5	284	91	86	242	253	65	5.0		@ 12
3	132		0.61	0.64	927.1	291	92	87	250	248	65	5.5		
4	136		0.56	0.59	928.9	287	93	87	244	251	64	6.0		
5	140	1529	0.41	0.43	930.354	290	93	87	250	240	65	5.5		
			Avg Sqrt Delta P	Avg Delta H	Total Volume	Avg Ts	Avg Tm		Min/Max	Min/Max	Max Temp	Max Vac	Max Temp	
				Avg Sqrt Del H	Comments:									

WESTON MANAGERS DESIGNERS/CONSULTANTS

ISOKINETIC FIELD DATA SHEET — Ontario Hydro Method - Mercury

Client	BIRCHWOOD POWER
W.O.#	12255-001-001
Project ID	BP
Mode/Source ID	BH
Samp. Loc. ID	STK
Run No.ID	~~3~~ 4
Test Method ID	OHM
Date ID	13SEP1999
Source/Location	BagHouse ~~Stack~~ Pilot
Sample Date	15 Sept 99
Baro. Press (in Hg)	30.14
Operator	JCI KA TB

Stack Conditions

	Assumed	Actual
% Moisture	9.5	
Impinger Vol (ml)		100.0
Silica gel (g)		14.4
CO2, % by Vol	13.5	13.40
O2, % by Vol	6	5.73
Temperature (°F)	270	
Meter Temp (°F)	88	
Static Press (in H_2O)	-	-9.2
Ambient Temp (°F)	70	

Meter Box ID	WC 14
Meter Box Y	1.0098
Meter Box Del H	1.9408
Probe ID / Length	P136 8 ft
Probe Material	Boro
Pitot / Thermocouple ID	
Pitot Coefficient	0.84
Nozzle ID	
Avg Nozzle Dia (in)	.191
Area of Stack (ft^2)	250
Sample Time	140
Total Traverse Pts	35

K Factor 0.97

Leak Checks	Initial	Mid-Point	Final
Sample Train (ft^3)	.013		.015
Leak Check @ (in Hg)	16		12
Pitot good	yes / no	yes / no	yes / no
Orsat good	yes / no	yes / no	yes / no

Temp Check	Pre-Test Set	Post-Test Set
Meter Box Temp	85	84
Reference Temp	84	83
Pass/Fail (+/- 2°)	Pass / Fail	Pass / Fail
Temp Change Respon	yes / no	yes / no

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft^3)	STACK TEMP (°F)	DGM INLET TEMP (°F)	DGM OUTLET TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (F)	IMPINGER EXIT TEMP (°F)	SAMPLE TRAIN VAC (In Hg)		COMMENTS
	0	1646			933.442									
1 1	4		.42	.41	934.9	267	86	88	241	252	62	3.0		
2	8		.48	.47	936.4	287	86	83	253	255	60	3.0		Leak J .010
3	12		.56	.54	938.1	293	88	84	250	248	60	3.5		@10 in Hg
4	16		.51	.49	939.5	291	88	83	245	254	55	3.0		
5	20	1700	.36	.35	940.689	293	88	83	241	253	56	3.0		
	—	—	—	—	—	—	—	—	—	—	—	—	—	
	—	1708	—	—	940.774	—	—	—	—	—	—	—	—	
2 1	24	1710	0.37	0.36	942.1	260	86	82	241	250	58	3.0		Leak J 0.015
2	28		0.47	0.46	943.8	280	87	83	253	246	57	3.5		@12
3	32		0.61	0.59	945.4	293	89	84	250	253	56	3.5		
4	36		0.53	0.51	947.0	293	88	86	243	254	55	3.5		
5	40	1728	0.39	0.38	948.118	281	88	86	251	249	55	3.5		
	—	—	—	—	—	—	—	—	—	—	—	—		
	—	1730	—	—	948.290	—	—	—	—	—	—	—		
3 1	44	~~0.39~~	0.39	0.38	949.7	268	88	83	249	253	56	3.5		Leak J
2	48		0.48	0.47	951.1	278	89	84	246	251	56	3.5		@ in Hg
3	52		0.53	0.51	952.6	286	88	83	250	249	55	4.0		
4	56		0.51	0.46	954.5	288	90	83	247	253	57	4.0		
5	60	1750	0.40	0.39	955.611	289	90	84	250	246	58	4.0		
	Avg Sqrt Delta P .69092		Avg Delta H .46657	Avg Sqrt Del H .68087	Total Volume 52.768	Avg Ts 276.9	Avg Tm 86.3		Min/Max 240/257	Min/Max 239/256	Max Temp 64	Max Vac 5	Max Temp	

Comments:

Ontario Hydro Method

WESTON MANAGERS DESIGNERS/CONSULTANTS

ISOKINETIC FIELD DATA SHEET Ontario Hydro Method - Mercury

Client: BIRCHWOOD POWER
Operator: JC | KA | TB3
Source: BagHouse
Run No.: 3-4
Sample Loc.: 2nd ~~Stack~~
Date: 15 Sept 99
K Factor: .97

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft³)	STACK TEMP (°F)	DGM INLET TEMP (°F)	DGM OUTLET TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (F)	IMPING EXIT TEMP (°F)	SAMPLE TRAIN VAC (in Hg)		COMMENTS
	0	1756			955.972									
4 1	64		0.42	0.41	957.4	267	88	83	240	242	60	4.0		Leak ✓0.008
2	68		0.49	0.48	958.8	278	88	83	251	248	60	5.0		@10 in Hg
3	72		0.51	0.49	960.4	281	88	84	249	243	61	5.0		
4	76		0.49	0.48	962.1	281	89	83	253	251	60	5.0		
5	80	1816	0.52	0.50	963.414	282	89	84	250	241	57	5.0		
	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	—	1841	—	—	963.587	—	—	—	—	—	—	—	—	—
5 1	84		0.35	0.34	965.1	270	85	82	251	225	64	4.0		Leak ✓.009
2	88		0.46	0.45	966.2	278	87	84	243	245	60	4.5		@10 in Hg
3	92		0.50	0.49	967.8	280	89	84	251	247	60	4.5		
4	96		0.51	0.50	969.6	280	90	85	242	246	61	4.5		
5	100	1901	0.39	0.38	970.951	280	90	89	249	250	57	4.5		
	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	—	1912	—	—	971.972	—	—	—	—	—	—	—	—	—
6 1	104		0.37	0.36	973.3	261	87	84	250	241	62	4.0		Leak ✓.010
2	108		0.58	0.56	974.5	269	88	85	257	253	60	5.0		@10 in Hg
3	112		0.66	0.64	976.7	268	89	84	251	256	60	5.0		
4	116		0.62	0.60	978.8	269	88	86	248	241	59	5.0		
5	120	1932	0.47	0.46	980.051	268	92	87	246	249	59	5.0		
	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	—	1935	—	—	980.220	—	—	—	—	—	—	—	—	—
7 1	124		0.38	0.37	918.63	260	87	85	251	241	60	4.0		Leak ✓.015
2	128		0.54	0.52	983.24	267	90	84	248	247	59	4		@10 in Hg
3	132		.55	.53	984.77	268	91	84	247	252	59	5		
4	136		.55	.53	986.3	268	91	85	253	246	59	5		
5	140	1955	0.45	.44	988.190	268	91	85	250	249	59	5.0		
			Avg Sqrt Delta P	Avg Delta H	Total Volume	Avg Ts	Avg Tm		Min/Max	Min/Max	Max Temp	Max Vac	Max Temp	
				Avg Sqrt Del H	Comments:									

WESTON MANAGERS DESIGNERS/CONSULTANTS

SAMPLE RECOVERY FIELD DATA

Ontario Hydro Method - Mercury

Client: BIRCHWOOD POWER W.O. #: 12255-001-001

Location/Plant: King George VA Source & Location: BagHouse Inlet

Run No. 1 Sample Date 9/14/99 Recovery Date 9/14/99

Sample I.D BP - BH - IN - 1 - OHM - 13SEP1999 Analyst ____ Filter Number ____

	Impinger									
	1	2	3	4	5	6	7	mp.Tota	8	Total
Contents	KCl	KCl	KCl	HNO3/H2O	KMnO4	KMnO4	KMnO4		Silica Gel	
Final	760.5	694.6	741.8	686.4	762.5	696.9	699.8		314.7	
Initial	676.3 100	684.7 100	738.3 100	683.3 100	762.5 100	695.4 100	699.8 100		300	
Gain	84.2	9.9	3.5	3.1	0	1.5	0	100.2	14.7	

Impinger Color 1-4 clear ~~colorless~~ Labeled? ✓

Silica Gel Condition 1/2 Blue Sealed? ✓

Run No. 2 Sample Date 9/15/99 Recovery Date 9/15/99

Sample I.D BP - BH - IN - 2 - OHM - 13SEP1999 Analyst ____ Filter Number ____

	Impinger									
	1	2	3	4	5	6	7	mp.Tota	8	Total
Contents	KCl	KCl	KCl	HNO3/H2O	KMnO4	KMnO4	KMnO4		Silica Gel	
Final	758.6	715.4	732.5	697.6	100	100	98		312.6	
Initial	686.0 100	699.3 100	730.7 100	694.9 100	100	100	100		300	
Gain	72.6	16.1	1.8	2.7	0	0	-2	91.2	12.6	

Impinger Color 1-4 clear colorless Labeled? ✓

Silica Gel Condition 1/2 Blue Sealed? ✓

Run No. 3 Sample Date 9/15/99 Recovery Date 9/15/99

Sample I.D BP - BH - IN - 3 - OHM - 13SEP1999 Analyst ____ Filter Number ____

	Impinger									
	1	2	3	4	5	6	7	mp.Tota	8	Total
Contents	KCl	KCl	KCl	HNO3/H2O	KMnO4	KMnO4	KMnO4		Silica Gel	
Final	777.7	691.3	747.5	695.1	720.8	679.2	705.7		313.6	
Initial	685.0 100	688.0 100	746.3 100	692.0 100	720.7 100	679.2 100	705.5 100		300	
Gain	92.7	3.3	1.2	3.1	0.1	0	0.2	100.6	13.6	

Impinger Color 1-4 clear colorless Labeled? ✓

Silica Gel Condition 1/2 Blue Sealed? ✓

Check COC for Sample IDs of Media Blanks

WESTON MANAGERS DESIGNERS/CONSULTANTS

SAMPLE RECOVERY FIELD DATA

Ontario Hydro Method - Mercury

Client: BIRCHWOOD POWER W.O. #: 12255-001-001

Location/Plant: King George VA Source & Loaction: BagHouse Inlet

Run No. BT Sample Date 9-15-99 Recovery Date 9-15-99

Sample I.D BP - BH - IN - BT - OHM - 13SEP1999 Analyst JM Filter Number

	Impinger									
	1	2	3	4	5	6	7	Imp.Tota	8	Total
Contents	KCl	KCl	KCl	HNO3/H2O	KMnO4	KMnO4	KMnO4		Silica Gel	
Final	677.2	676.1	685.8	593.6	601.9	675.5	690.8		300	
Initial	572.1 100	676.0 100	685.8 100	593.6 100	601.8 100	675.3 100	690.8 100		300	
Gain									0	

Impinger Color 1-4 clear colorless Labeled? ✓

Silica Gel Condition 1/2 Blue Sealed? ✓

Run No. 4 Sample Date 9-15-99 Recovery Date 9-15-99

Sample I.D. BP-BH-IN-4-OHM-13SEP99 Analyst JM Filter Number 17

	Impinger									
	1	2	3	4	5	6	7	Imp.Tota	8	Total
Contents	KCl	KCl	KCl	HNO3/H2O	KMnO4	KMnO4	KMnO4		Silica Gel	
Final	693.9	711.9	736.6	701.8	620.4	~~620.4~~ 616.7	645.4		314.4	
Initial	683.8 100	701.1 100	734.0 100	698.1 100	619.9 100	615.5 100	641.3 100	✓	300	✓
Gain	10.1 ✓	10.8 ✓	2.6 ✓	3.7 ✓	0.5 ✓	~~4.9~~ 1.2	1.1 ✓	100	14.4	114.4

Impinger Color 1-4 clear colorless Labeled? ✓

Silica Gel Condition 1/2 Blue Sealed? ✓

Run No. ___ Sample Date ___ Recovery Date ___

Sample I.D. ___ Analyst ___ Filter Number ___

	Impinger									
	1	2	3	4	5	6	7	Imp.Tota	8	Total
Contents	KCl	KCl	KCl	HNO3/H2O	KMnO4	KMnO4	KMnO4		Silica Gel	
Final										
Initial	100	100	100	100	100	100	100		300	
Gain										

Impinger Color ___ Labeled? ___

Silica Gel Condition ___ Sealed? ___

Check COC for Sample IDs of Media Blanks

WESTON

Source Gas Analysis Data Sheet - Method 3

Client BWP

Analyst KH

Location/Plant King George, VA

Date 9/14 - 9/15/99

Source Unit 1 Inlet

Analytical Method (circle one) CMSM

Run Number 1

Leak Check Good? (circle one) Yes No

Analysis Number	Analysis Time	Percent CO_2 (A)	Percent Total (B)	Percent O_2 (B - A)	Percent N_2 (100 - B)
1	1700	13.0	19.0	6.0	
2		13.0	19.0	6.0	
3		13.0	19.0	6.0	
	Average	13.0		6.0	

Run Number 2

Leak Check Good? (circle one) Yes No

Analysis Number	Analysis Time	Percent CO_2 (A)	Percent Total (B)	Percent O_2 (B - A)	Percent N_2 (100 - B)
1	2030	13.0	18.9	5.9	
2		13.1	19.0	5.9	
3		13.1	19.0	5.9	
	Average	13.07 ✓		5.90 ✓	

Run Number 3

Leak Check Good? (circle one) Yes No

Analysis Number	Analysis Time	Percent CO_2 (A)	Percent Total (B)	Percent O_2 (B - A)	Percent N_2 (100 - B)
1	2030	13.1	19.0	5.9	
2		13.1	18.9	5.8	
3		13.1 ✓	18.9	5.8 ✓	
	Average	13.10 ✓		5.83 ✓	

Acceptable differences for repeat analysis:

if CO_2 > 4% than +/- 0.3%

if CO_2 < or = 4% than +/- 0.2%

if O_2 > or = 15% than +/- 0.2%

if O_2 < 15% than +/- 0.3%

Ambient Check

Oxygen 20.9

Carbon Dioxide 0.0

Report all values to the nearest 0.1 percent

Comments

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Method3

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Source Gas Analysis Data Sheet - Method 3

Client BWP

Analyst KW

Location/Plant KING GEORGE, VA

Date 9/14 - 9/15/98

Source UNIT 1 INLET

Analytical Method (circle one) ONSITE

Run Number 4

Leak Check Good? (circle one) Yes No

Analysis Number	Analysis Time	Percent CO_2 (A)	Percent Total (B)	Percent O_2 (B - A)	Percent N_2 (100 - B)
1	2030	13.4	19.2	5.8	
2		13.4	19.1	5.7	
3		13.4	19.1	5.7	
	Average	13.40 ✓		5.73 ✓	

Run Number _____

Leak Check Good? (circle one) Yes No

Analysis Number	Analysis Time	Percent CO_2 (A)	Percent Total (B)	Percent O_2 (B - A)	Percent N_2 (100 - B)
1					
2					
3					
	Average				

Run Number _____

Leak Check Good? (circle one) Yes No

Analysis Number	Analysis Time	Percent CO_2 (A)	Percent Total (B)	Percent O_2 (B - A)	Percent N_2 (100 - B)
1					
2					
3					
	Average				

Acceptable differences for repeat analysis:

if CO_2 > 4% than +/- 0.3%

if CO_2 < or = 4% than +/- 0.2%

if O_2 > or = 15% than +/- 0.2%

if O_2 < 15% than +/- 0.3%

Ambient Check

Oxygen 20.9

Carbon Dioxide 0.0

Report all values to the nearest 0.1 percent

Comments _____

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Method3

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Sample and Velocity Traverse Point Data Sheet - Method 1

Client: BWP
Loaction/Plant: King George, VA
Source: Unit #1 Stack

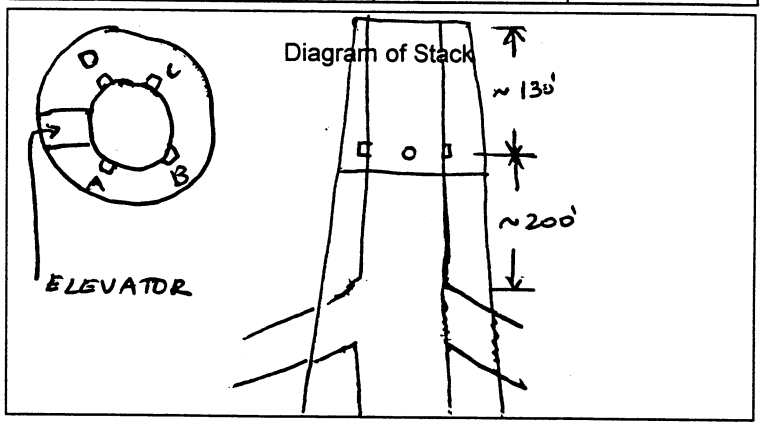
Operator: KW JP
Date: 9/13/98
W.O. Number:

Duct Type	☒ Circular	☐ Rectangular Duct	Indicate appropriate type
Traverse Type	☒ Particulate Traverse	☐ Velocity Traverse	

Distance from far wall to outside of port (in.) = C	198.5
Port Depth (in.) = D	12.5
Depth of Duct, diameter (in.) = C-D	186
Area of Duct (ft^2)	188.69
Total Traverse Points	12
Total Traverse Points per Port	3

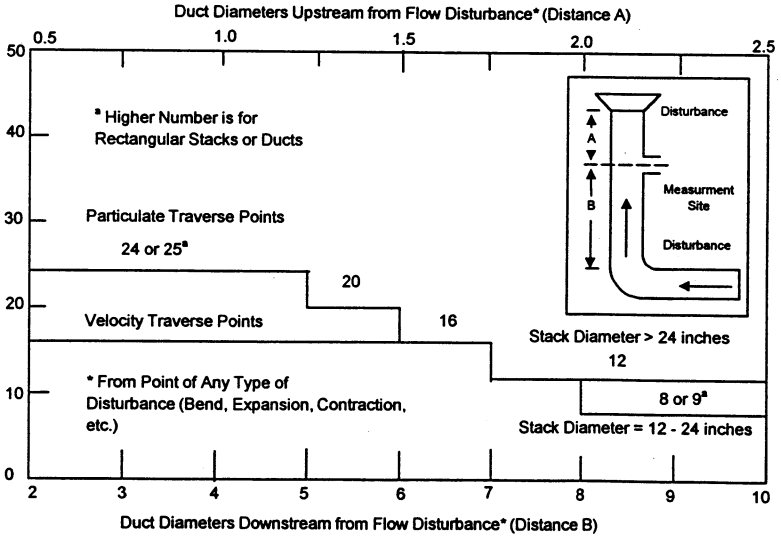
Rectangular Ducts Only	
Width of Duct, rectangular duct only (in.)	
Total Ports (rectangular duct only)	

Flow Disturbances	
Upstream - A (ft)	~130
Downstream - B (ft)	~200'
Upstream - A (duct diameters)	8.38
Downstream - B (duct diameters)	12.90



Traverse Point Locations

Traverse Point	% of Duct	Distance from Inside Duct Wall (in)	Distance from Outside of Port (in)
1	.044	8.18	20 5/8
2	.146	27.15	39 5/8
3	.296	55.05	67
4			
5			
6			
7			
8			
9			
10			
11			
12			



Equivalent Diameter = (2*L*W)/(L+W)

Traverse Point Location Percent of Stack -Circular

Traverse Location Point	1	2	3	4	5	6	7	8	9	10	11	12
1		14.6		6.7		4.4		3.2		2.6		2.1
2		85.4		25		14.6		10.5		8.2		6.7
3				75		29.6		19.4		14.6		11.8
4				93.3		70.4		32.3		22.6		17.7
5						85.4		67.7		34.2		25
6						95.6		80.6		65.8		35.6
7								89.5		77.4		64.4
8								96.8		85.4		75
9										91.8		82.3
10										97.4		88.2
11												93.3
12												97.9

Traverse Point Location Percent of Stack -Rectangular

Traverse Location Point	1	2	3	4	5	6	7	8	9	10	11	12
1		25.0	16.7	12.5	10.0	8.3	7.1	6.3	5.6	5.0	4.5	4.2
2		75.0	50.0	37.5	30.0	25.0	21.4	18.8	16.7	15.0	13.6	12.5
3			83.3	62.5	50.0	41.7	35.7	31.3	27.8	25.0	22.7	20.8
4				87.5	70.0	58.3	50.0	43.8	38.9	35.0	31.8	29.2
5					90.0	75.0	64.3	56.3	50.0	45.0	40.9	37.5
6						91.7	78.6	68.8	61.1	55.0	50.0	45.8
7							92.9	81.3	72.2	65.0	59.1	54.2
8								93.8	83.3	75.0	68.2	62.5
9									94.4	85.0	77.3	70.8
10										95.0	86.4	79.2
11											95.5	87.5
12												95.8

Rectangular Stack Points & Matrix
9 - 3 x 3
12 - 4 x 3
16 - 4 x 4
20 - 5 x 4
25 - 5 x 5
30 - 6 x 5
36 - 6 x 6
42 - 7 x 6
49 - 7 x 7

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Method1.xls

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Determination of Stack Gas Velocity - Method 2

Client: BWP
Location/Plant: BG, VA
Source: UNIT 1 STACK
Operator: KK
Date: 9/17/99
Pitot Tube/Thermo ID: P
Pitot Coeff (Cp): .84
Stack Area, ft² (As):

Run Number	PRE		
Time	~1700		
Barometric Press, in Hg (Pb)	30.22		
Static Press, in H_2O (Pstatic)	-.23		
Source Moisture, % (BWS)			
O_2, %			
CO_2, %			

Cyclonic Flow Determination		Traverse Location		Leak Check good ? Y / N		Leak Check good ? Y / N		Leak Check good ? Y / N	
Delta P at 0°	Angle yelding zero Delta P	Port	Point	Delta P	Source Temp, F° (Ts)	Delta P	Source Temp, F° (Ts)	Delta P	Source Temp, F° (Ts)
.03	<5	D	1	.56	175				
.05	5		2	.69	178				
.20	10		3	.73	183				
0	—	C	1	.36	175				
.03	<5		2	.52	180				
.14	8		3	.52	183				
0	—	B	1	.39	185				
0	—		2	.48	188				
.0	—		3	.48	188				
.06	<5	A	1	.37	184				
.08	5		2	.45	184				
.09	5		3	.45	184				
				Nozzle ~.244					

Avg Angle		Avg Delta P & Temp	0.5	~185		
		avg $\sqrt{DeltaP}$				
		Average gas stream velocity, ft/sec.				
		Vol. flow rate @ actual conditions, wacf/min				
		Vol. flow rate at standard conditions, dscf/min				

$$MWd = (0.32 * O_2) + (0.44 * CO_2) + (0.28 * (100 - (CO_2 + O_2)))$$

$$MWs = (MWd * (1 - (BWS/100))) + (18 * (BWS/100))$$

$$Tsa = Ts + 460$$

$$Ps = Pb + (Pstatic/13.6)$$

$$Vs = 85.49 * Cp * avg\sqrt{DeltaP} * \sqrt{Tsa/(Ps * MWs)}$$

$$Qs(act) = 60 * Vs * As$$

$$Qs(std) = 17.64 * (1 - (BWS/100)) * (Ps/Tsa) * Qs(act)$$

where:
MWd = Dry molecular weight source gas, lb/lb-mole.
MWs = Wet molecular weight source gas, lb/lb-mole.
Tsa = Source Temperature, absolute(oR)
Ps = Absolute stack static pressure, inches Hg.
Vs = Average gas stream velocity, ft/sec.
Qs(act) = Volumetric flow rate of wet stack gas at actual.
Qs(std) = Volumetric flow rate of dry stack gas at standard conditions, dscf/min

Comments

WESTON MANAGERS DESIGNERS/CONSULTANTS

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Determination of Moisture Content in Stack Gases - Method 4

Client: BWP
Location/Plant: KG, VA
Source: UNIT #1 STACK
Operator: KH
Meter Box ID: 9 ΔH@ 1.8932
Temperature C° or F°: ~85
Date: 9/13/99
Meter Box Y: 1.0072
Sample Volume, ft³ or L:

Run Number		Sample Time (min)	Meter Volume, Vm	Meter Temp (or ambient temp for rotometer) Inlet	Meter Temp Outlet	Meter Press, Delta H (in H_2O)	Impinger Volume, ml	Silica Gel Weight, g	Corrected Volume, Vm(std)	Leak Rate Check
PRE									16.263	Initial ✓
	End Test	~1730	350.551	102	91	1.5	140	307.6		Final ✓
Baro Press., Pb (in Hg)	Start Test	~1700	333.832	92	91	1.5	100 ~~200~~	300	Moisture Volume, Vw(std)	Percent Moisture (%), BWS
30.22	Avg. or Total		16.719	94		1.5	40	7.6	2.241	12.1

Run Number		Sample Time (min)	Meter Volume, Vm	Meter Temp (or ambient temp for rotometer) Inlet	Meter Temp Outlet	Meter Press, Delta H (in H_2O)	Impinger Volume, ml	Silica Gel Weight, g	Corrected Volume, Vm(std)	Leak Rate Check
										Initial
	End Test									Final
Baro Press., Pb (in Hg)	Start Test								Moisture Volume, Vw(std)	Percent Moisture (%), BWS
	Avg. or Total									

Run Number		Sample Time (min)	Meter Volume, Vm	Meter Temp (or ambient temp for rotometer) Inlet	Meter Temp Outlet	Meter Press, Delta H (in H_2O)	Impinger Volume, ml	Silica Gel Weight, g	Corrected Volume, Vm(std)	Leak Rate Check
										Initial
	End Test									Final
Baro Press., Pb (in Hg)	Start Test								Moisture Volume, Vw(std)	Percent Moisture (%), BWS
	Avg. or Total									

$$Vm(std) = \frac{17.64 * Y * Vm * (Pb + (deltaH/13.6))}{(Tm + 460)}$$

if Tm is C° than $Tm = (Tmc * 1.8) + 32$

if Vm is liters than $Vm = Vml * 28.32$

$$Vw(std) = (0.04707 * Vwc) + (0.04715 * Wwsg)$$

$$BWS = \left(\frac{Vw(std)}{Vw(std) + Vm(std)}\right) * 100$$

WHERE:
Vm(std)= Sample volume corrected to standard temp and pressure, scf or L
Vm= Actual sample volume, calculated, scf
Vml= Actual sample volume, calculated, Liters
Y= Dry gas meter calibration factor.
Pb= Barometric pressure, in. Hg
delta H= Meter pressure, in H2O
Tm= Average temperature of meter (DGM is used) or rotomter, degrees °
Tmc= Average temperature of meter (DGM is used) or rotomter, degrees °
Vw(std)= Volume of water vapor at standard conditions, scf or L
Vwc= Volume of water condensed, mL
Wwsg= Weight of Silica Gel, g
Bws= Water vapor in gas stream, percer

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Use either ft³ or liters in calculations. DO NOT MIX CUBIC FEET AND LITERS IN ANY CALCULATION.

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ISOKINETIC FIELD DATA SHEET

Ontario Hydro Method - Mercury

Client	BIRCHWOOD POWER
W.O.#	12255-001-001
Project ID	BP
Mode/Source ID	BH
Samp. Loc. ID	STK
Run No.ID	2
Test Method ID	OHM
Date ID	13SEP1999
Source/Location	BagHouse Stack
Sample Date	9/15/99
Baro. Press (in Hg)	30.14
Operator	JP KH

Stack Conditions

	Assumed	Actual
% Moisture	12	
Impinger Vol (ml)		225
Silica gel (g)		16.1
CO2, % by Vol	12½	12.80
O2, % by Vol	7	6.0
Temperature (°F)	195	
Meter Temp (°F)	95	
Static Press (in H_2O)	-.73	-.98
Ambient Temp (°F)	78	

Meter Box ID	9
Meter Box Y	1.0072
Meter Box Del H	1.8932
Probe ID / Length	7'
Probe Material	Boro
Pitot / Thermocouple ID	P137
Pitot Coefficient	0.84
Nozzle ID	6.193
Avg Nozzle Dia (in)	.193
Area of Stack (ft^2)	188.69
Sample Time	144
Total Traverse Pts	12

K Factor 1.08

Leak Checks	Initial	Mid-Point	Final
Sample Train (ft^3)	.012		.008
Leak Check @ (in Hg)	15		7
Pitot good	(yes) / no	yes / no	(yes) / no
Orsat good	(yes) / no	yes / no	(yes) / no

Temp Check	Pre-Test Set	Post-Test Set
Meter Box Temp	79	78 @ 1P
Reference Temp	77.3	76.0
Pass/Fail (+/- 2°)	(Pass) / Fail	(Pass) Fail
Temp Change Respon	(yes) no	(yes) no

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft^3)	STACK TEMP (°F)	DGM INLET TEMP (°F)	DGM OUTLET TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (F)	IMPING EXIT TEMP (°F)	PUMP VAC (in Hg)		COMMENTS
	0	0742			456.383									
	4		~~1.4~~ .96	~~1.18~~ 1.03	458.6	199	88	85	230	226	64	2.5	131	
	8		.92	.99	460.8	198	91	86	230	228	58	2.5		
2	12		.95	1.02	463.0	197	94	87	228	240	57	2.5	131	
	16		1.1	~~1.03~~ 1.18	465.4	196	95	87	228	234	55	3.0		
	20		1.1	1.18	467.7	195	96	87	229	234	54	2.5	131	
3	24		1.1	1.18	470.0	197	97	88	230	234	54	3.0		
	28		1.1	1.18	472.4	195	98	88	228	230	54	3.0	131	
	32		1.1	1.18	474.8	194	99	89	230	236	55	3.0	131	
	36	0818	1.1	1.18	477.197	193	100	90	228	234	56	3.0		
							L.C. good @ 7in Hg							
B 1	0	0848			479.789									
	4		.85	.91	481.8	191	93	90	247	238	65	2.5	131	
	8		.85	.91	484.0	192	96	89	235	236	56	2.5		
2	12		.85	.91	486.0	192	96	89	230	237	54	2.5	131	
	16		1.2	1.29	488.5	192	98	90	230	227	54	2.5		
	20		1.0	1.08	490.8	194	100	91	231	233	55	2.5	131	
3	24		1.1	1.18	493.1	194	101	92	231	241	56	3.0		
	28		1.1	1.18	495.5	192	101	91	232	244	56	3.0	131	
	32		1.1	1.18	497.9	192	102	92	234	248	57	3.0		
	36	0924	1.1	1.18	500.253	193	102	93	233	239	58	3.0	131	
							L.C. good @ 7in Hg							
			Avg Sqrt Delta P	Avg Delta H	Total Volume	Avg Ts	Avg Tm 9		Min/Max	Min/Max	Max Temp	Max Vac	Max Temp	
				Avg Sqrt Del H										

WESTON MANAGERS DESIGNERS/CONSULTANTS

Comments:

Ontario Hydro Method

ISOKINETIC FIELD DATA SHEET Ontario Hydro Method - Mercury

Client: BIRCHWOOD POWER | Operator: JP KH
Source: BagHouse | Run No.: 2
Sample Loc.: Stack | Date: 9/15/99 | K Factor: 1.08

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft³)	STACK TEMP (°F)	DGM INLET TEMP (°F)	DGM OUTLET TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (F)	IMPING EXIT TEMP (°F)	SAMPLE TRAIN VAC (in Hg)		COMMENTS
	0	0945			500.363									
C JPK	4		.85	.91	502.4	191	93	90	231	241	64	2.5	131	
	8		.82	.88	504.5	193	96	91	241	252	59	2.5	131	
2	12		.80	.86	506.7	196	98	90	231	248	57	3.0		
JP2	16		.85	.91	508.6	197	99	91	231	237	56	3.0	131	
	20		1.1	1.18	511.0	196	100	91	235	240	56	3.0		
3	24		1.1	1.18	513.3	196	101	91	232	236	56	3.0	131	
JP3	28		1.1	1.18	515.7	195	102	92	232	230	57	3.0		
	32		1.1	1.18	518.1	194	102	92	~~224~~ JP 233	235	58	3.0	131	
	36		1.1	1.18	520.474	194	103	93	235	235	59	3.0		
						L.L good @ 7in Hg								
D 1	0	1033	.		520.612									
	4		.86	.92	522.6	187	95	92	231	232	68	3.0	131	
	8		.78	.84	524.6	191	97	92	230	231	65	3.0		
2	12		.78	.84	526.7	194	98	92	229	243	61	3.0	131	
	16		1.0	1.08	528.9	195	99	92	230	232	60	3.0		
	20		.95	1.02	531.1	195	100	92	230	231	61	3.0	131	
3	24		.98	1.05	533.4	194	100	92	235	235	61	3.0		
	28		1.0	1.08	535.7	194	100	92	230	238	62	3.0	131	
	32	JP	1.1	1.18	538.0	197	101	93	235	250	63	3.0		
	36	~~1110~~ 1109	1.1	1.18	540.462	196	102	93	230	244	64	3.0	131	

Avg Sqrt Delta	Avg Delta H	Total Volume	Avg Ts	Avg Tm	Min/Max	Min/Max	Max Temp	Max Vac	Max Temp
.9974	1.07194	81.239	194.14	94.3	228/244	228/252	68	3.0	131

Avg Sqrt Del H: 1.03339

Comments:

WESTON MANAGERS DESIGNERS/CONSULTANTS

ISOKINETIC FIELD DATA SHEET — Ontario Hydro Method - Mercury

Client	BIRCHWOOD POWER
W.O.#	12255-001-001
Project ID	BP
Mode/Source ID	BH
Samp. Loc. ID	STK
Run No.ID	3
Test Method ID	OHM
Date ID	13SEP1999
Source/Location	BagHouse Stack
Sample Date	9/13/99
Baro. Press (in Hg)	30.14
Operator	JP RH

Stack Conditions

	Assumed	Actual
% Moisture	12	
Impinger Vol (ml)		225.5
Silica gel (g)		339.7
CO2, % by Vol	12 1/2	12.73
O2, % by Vol	7	6.23
Temperature (°F)	795	
Meter Temp (°F)	95	
Static Press (in H_2O)	-.58	-1.0
Ambient Temp (°F)	76	

Meter Box ID	9
Meter Box Y	1.0072
Meter Box Del H	1.8932
Probe ID / Length	7'
Probe Material	Boro
Pitot / Thermocouple ID	P137
Pitot Coefficient	0.84
Nozzle ID	0.193
Avg Nozzle Dia (in)	.193
Area of Stack (ft^2)	188.69
Sample Time	144
Total Traverse Pts	12

K Factor 1.08

Leak Checks	Initial	Mid-Point	Final
Sample Train (ft^3)	.008		.012
Leak Check @ (in Hg)	15		8
Pitot good	yes / no	yes / no	yes / no
Orsat good	yes / no	yes / no	yes / no

Temp Check	Pre-Test Set	Post-Test Set
Meter Box Temp	74	75
Reference Temp	72.5	73.6
Pass/Fail (+/- 2°)	Pass / Fail	Pass / Fail
Temp Change Respon	yes / no	yes / no

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft^3)	STACK TEMP (°F)	DGM INLET TEMP (°F)	DGM OUTLET TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (F)	IMPINGER EXIT TEMP (°F)	SAMPLE TRAIN VAC (in Hg)		COMMENTS
	0	1218			540.645									
D	4		.75	.81	542.6	195	88	87	232	228	68	2.5	130	
	8		.75	.81	544.6	199	90	87	230	238	65	2.5	1?	
2	12		.78	.84	546.6	206	93	87	229	239	61	2.5	130	
	16		1.0	1.08	548.9	205	94	87	230	230	60	3.0		
	20		1.0	1.07	551.1	202	95	87	229	234	59	3.0	130	new K factor 1.07
3	24		1.0	1.07	553.4	199	95	87	235	236	58	3.0		
	28		1.1	1.17	556.0	197	95	88	228	236	59	3.0	130	
	32		1.1	1.17	558.1	196	95	88	231	240	59	3.0		
	36	1254	1.1	1.17	560.327	196	95	88	231	240	59	3.0	130	19.682
						L C good @ 7 in Hg								
C 1	0	1312			560.462									
	4		.77	.82	562.3	195	89	88	230	239	68	2.5	130	K factor chng 1.08
	8		.75	.81	564.4	195	92	88	237	244	65	2.5		
2	12		.75	.81	566.3	194	93	87	233	238	63	2.5	130	
	16		1.1	1.18	568.7	194	93	87	232	237	62	3.0		
	~~16~~ 20		1.0	1.18	571.0	194	96	88	233	242	61	3.0	130	
3	24		1.0	1.18	573.3	194	96	86	233	242	61	3.0		
	28		1.2	1.29	575.6	193	96	88	233	238	61	3.0	130	
	32		1.1	1.18	578.0	193	96	88	233	241	62	3.0		
	36	1348	1.1	1.18	580.792	193	98	88	234	241	62	3.0	130	20.330
						L.C good @ 7 in Hg								
			Avg Sqrt Delta P	Avg Delta H	Total Volume	Avg Ts	Avg Tm		Min/Max	Min/Max	Max Temp	Max Vac	Max Temp	
				Avg Sqrt Del H										

WESTON MANAGERS DESIGNERS/CONSULTANTS

Comments:

Ontario Hydro Method

ISOKINETIC FIELD DATA SHEET Ontario Hydro Method - Mercury

Client: BIRCHWOOD POWER Operator: JP KH
Source: BagHouse Run No.: 3
Sample Loc.: Stack Date: 9/15/99 K Factor: 1.08

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft³)	STACK TEMP (°F)	DGM INLET TEMP (°F)	DGM OUTLET TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (F)	IMPING EXIT TEMP (°F)	SAMPLE TRAIN VAC (in Hg)		COMMENTS
	0	1412			580.961									
B	4		.90	.97	583.0	190	91	87	234	238	66	3.0	130	
	8		.90	.97	585.1	190	91	87	234	238	66	3.0		
2	12		.85	.91	587.2	190	92	87	231	233	63	3.0	130	
	16		1.1	1.18	589.5	190	93	87	232	226	62	3.0		
	20		1.1	1.18	591.9	190	94	87	234	229	62	3.0	130	
3	24		1.1	1.18	594.2	191	94	87	233	230	62	3.0		
	28		1.2	1.29	596.8	192	95	88	234	243	60	3.5	130	
	32		1.2	1.29	599.2	192	96	88	234	241	58	3.5		
	36	1448	1.1	1.18	601.608	192	96	88	234	237	57	3.5	130	20.647
		1457					L cgood @ 7 in Hg							
A 1	0	~~1457~~ JP			601.755									
	4		.83	.89	603.8	194	90	88	231	227	63	3.0	130	
	8		.83	.89	605.9	195	92	88	237	226	58	3.0		
2	12		.85	.91	607.9	193	93	88	232	221	57	3.0	130	
	16		1.0	1.08	610.1	193	93	87	233	235	56	3.0		
	20		1.1	1.18	612.4	192	93	87	233	231	55	3.0	130	
3	24		1.1	1.18	614.7	192	94	87	233	232	55	3.0		
	28		1.1	1.18	616.9	191	94	87	233	241	55	3.0	130	
	32	1533	1.2	1.29	619.5	190	95	87	233	240	56	3.0		
	36	~~1433~~ JP	1.2	1.29	620.986	190	95	87	233	240	56	3.0	130	19.231

Avg Sqrt Delta	Avg Delta H	Total Volume	Avg Ts	Avg Tm	Min/Max	Min/Max	Max Temp	Max Vac	Max Temp
.99851	1.07944	79.890	194.1	JP ~~79.~~ 90.6	229/237	221/244	68	3.5	

Avg Sqrt Del H: 1.03592

Comments:

WESTON MANAGERS DESIGNERS/CONSULTANTS

ISOKINETIC FIELD DATA SHEET — Ontario Hydro Method - Mercury

Client	BIRCHWOOD POWER
W.O.#	12255-001-001
Project ID	BP
Mode/Source ID	BH
Samp. Loc. ID	STK
Run No.ID	JP ~~-0~~ 4
Test Method ID	OHM
Date ID	13SEP1999
Source/Location	BagHouse Stack
Sample Date	9/15/99
Baro. Press (in Hg)	30.14
Operator	JP KH

Stack Conditions

	Assumed	Actual
% Moisture	12	
Impinger Vol (ml)		231.6
Silica gel (g)		16.9
CO2, % by Vol	12 1/2	13.17
O2, % by Vol	7	5.43
Temperature (°F)	195	
Meter Temp (°F)	95	
Static Press (in H_2O)	-1.0	-1.0
Ambient Temp (°F)	75	

Meter Box ID	9
Meter Box Y	1.0072
Meter Box Del H	1.8932
Probe ID / Length	71
Probe Material	Boro
Pitot / Thermocouple ID	P137
Pitot Coefficient	0.84
Nozzle ID	.193
Avg Nozzle Dia (in)	0.193
Area of Stack (ft^2)	188.69
Sample Time	144
Total Traverse Pts	12

K Factor 1.08

Leak Checks	Initial	Mid-Point	Final
Sample Train (ft^3)	.009		.006
Leak Check @ (in Hg)	15		8
Pitot good	yes / no	yes / no	yes / no
Orsat good	yes / no	yes / no	yes / no

Temp Check	Pre-Test Set	Post-Test Set
Meter Box Temp	75	75
Reference Temp	73.6	73.6
Pass/Fail (+/- 2°)	Pass / Fail	Pass / Fail
Temp Change Respon	yes / no	yes / no

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft^3)	STACK TEMP (°F)	DGM INLET TEMP (°F)	DGM OUTLET TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (F)	IMPINGER EXIT TEMP (°F)	SAMPLE TRAIN VAC (in Hg)		COMMENTS
	0	1645			622.050									
	4		.80	.86	624.2	191	89	87	241	242	66	2.5	131	
	8		.80	.86	626.1	191	92	87	231	242	61	2.5		
2	12		.78	.84	628.0	194	94	88	233	238	59	2.5	131	
	16		1.1	1.18	630.4	195	95	88	233	239	58	2.5		
	20		1.0	1.08	632.6	196	100	90	233	239	57	2.5	131	
3	24		1.1	1.18	635.1	196	101	91	233	240	57	2.5		
	28		1.2	1.29	637.5	195	101	92	233	241	56	3.0	131	
	32		1.1	1.18	639.8	195	101	92	233	241	55	3.0		
	36	1721	1.1	1.18	642.220	194	101	92	233	244	55	3.0	131	20.170
							L.C	good	@	7 in Hg				
B 1	0	1730			642.396									
	4		.95	1.02	644.6	194	90	89	229	237	61	3.0	131	
	8		.97	1.04	647.0	196	93	88	240	238	55	3.0		
2	12		1.0	1.08	649.0	195	94	88	234	234	54	3.0	131	
	16		1.2	1.29	651.5	195	94	88	233	238	54	3.0		
	20		1.2	1.29	653.9	195	94	88	233	237	54	3.0	131	
3	24		1.1	1.18	656.3	194	94	87	233	236	55	3.0		
	28		1.1	1.18	658.6	194	95	88	233	234	56	3.0	131	
	32		1.1	1.18	660.9	193	94	87	234	236	56	3.0		
	36	1806	1.2	1.29	663.333	193	92	85	236	238	56	3.0	131	20.937
							L.C	good	@	7 in Hg				
			Avg Sqrt Delta P	Avg Delta H	Total Volume	Avg Ts	Avg Tm		Min/Max	Min/Max	Max Temp	Max Vac	Max Temp	
				Avg Sqrt Del H										

WESTON MANAGERS DESIGNERS/CONSULTANTS

Comments:

Ontario Hydro Method

ISOKINETIC FIELD DATA SHEET Ontario Hydro Method - Mercury

Client: BIRCHWOOD POWER
Source: BagHouse
Sample Loc.: Stack
Operator: JP / KH
Run No.: 24
Date: 9/15/99
K Factor: 1.08

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft³)	STACK TEMP (°F)	DGM INLET TEMP (°F)	DGM OUTLET TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (F)	IMPING EXIT TEMP (°F)	SAMPLE TRAIN VAC (in Hg)		COMMENTS
	0	1827			663.529									
C	4		.90	.97	665.5	192	84	83	236	233	66	3.0	131	
	8		.87	.93	667.7	194	86	82	232	233	61	2.5		
2	12		.87	.93	669.8	193	87	83	232	228	59	2.5	131	
	16		1.1	1.18	672.1	194	88	83	234	234	59	2.5		
	20		1.1	1.18	674.5	194	90	82	234	233	58	2.5	131	
3	24		1.1	1.18	676.8	194	90	83	233	233	59	2.5		
	28		1.1	1.18	679.2	194	92	83	232	232	60	3.0	131	
	32		1.2	1.29	681.6	194	91	84	233	234	61	3.0		
	36	1903	1.1	1.18	684.107	194	92	84	233	236	62	3.0	131	20.578
		1912					LC good @ 7in Hg							
D 1	0	1911			684.253									
	4		.97	1.04	686.2	194	87	85	231	232	68	3.0	131	
	8		.95	1.02	688.7	196	92	86	236	239	63	3.0		
2	12		.95	1.02	690.9	196	92	85	227	231	62	3.0	131	
	16		1.1	1.18	693.2	196	93	86	228	227	63	3.0		
	20		1.1	1.18	695.6	196	94	86	228	226	63	3.0	131	
3	24		1.1	1.18	698.0	195	94	86	232	230	63	3.0		
	28		1.1	1.18	700.3	195	94	86	228	238	64	3.0	131	
	32		1.1	1.18	702.7	195	94	86	229	236	64	3.0		
	36	1948	1.1	1.18	705 704.990	194	96	86	232	246	66	3.0	131	20.737
			Avg Sqrt Delta 1.02041	Avg Delta H 1.12167	Total Volume 82.482	Avg Ts 194.3	Avg Tm 89.8		Min/Max	Min/Max	Max Temp	Max Vac	Max Temp	
				Avg Sqrt Del H 1.05735	Comments:									

WESTON MANAGERS DESIGNERS/CONSULTANTS

SAMPLE RECOVERY FIELD DATA

Ontario Hydro Method - Mercury

Client: BIRCHWOOD POWER W.O. #: 12255-001-001

Location/Plant: King George VA Source & Location: BagHouse Stack

Run No. 1 Sample Date 9/14/99 Recovery Date 9/14/99

Sample I.D BP - BH - STK - 1 - OHM - 13SEP1999 Analyst ____ Filter Number N/A

	Impinger									
	1	2	3	4	5	6	7	mp.Tota	8	Total
Contents	KCl	KCl	KCl	HNO3/H2O	KMnO4	KMnO4	KMnO4		Silica Gel	
Final	943.4	740.2	732.7	703.9	696.4	672.8	648.9		373.6	
Initial	729.8 100	696.1 100	721.1 100	701.1 100	697.4 100	100	100		300	
Gain	213.6	44.1	11.6	2.8	1.0	0	0	273.1	23.6	

Impinger Color 1-3 clear 4-yellow Labeled? ✓

Silica Gel Condition 1/2 Blue Sealed? ✓

Run No. 2 Sample Date 9/15/99 Recovery Date 9/15/99

Sample I.D BP - BH - STK - 2 - OHM - 13SEP1999 Analyst ____ Filter Number ~~9/15/99~~

	Impinger									
	1	2	3	4	5	6	7	mp.Tota	8	Total
Contents	KCl	KCl	KCl	HNO3/H2O	KMnO4	KMnO4	KMnO4		Silica Gel	
Final	870.5	758.0	741.3	708.6	104	100	100		316.1	
Initial	727.5 100	698.1 100	726.7 100	705.1 100	100	100	100		300	
Gain	143.0	59.9	14.6	3.5	4	0	0	225.0	16.1	

Impinger Color 1-4 clear Labeled? ✓

Silica Gel Condition 1/2 Blue Sealed? ✓

Run No. 3 Sample Date 9/15/99 Recovery Date 9/15/99

Sample I.D BP - BH - STK - 3 - OHM - 13SEP1999 Analyst ____ Filter Number ____

	Impinger									
	1	2	3	4	5	6	7	mp.Tota	8	Total
Contents	KCl	KCl	KCl	HNO3/H2O	KMnO4	KMnO4	KMnO4		Silica Gel	
Final	807.9	699.6	694.7	694.0	717.2	701.4	699.5		317.1	
Initial	606.7 100	677.4 100	691.5 100	692.8 100	715.9 100	701.1 100	699.2 100		300	
Gain	201.2	22.2	3.2	1.2	1.3	0.3	0.3	229.7	17.1	246.8

Impinger Color 1-4 clear Labeled? ✓

Silica Gel Condition 1/2 Blue Sealed? ✓

Check COC for Sample IDs of Media Blanks

WESTON MANAGERS DESIGNERS/CONSULTANTS

SAMPLE RECOVERY FIELD DATA

Ontario Hydro Method - Mercury

Client: BIRCHWOOD POWER W.O. #: 12255-001-001

Location/Plant: King George VA Source & Loaction: BagHouse Stack

Run No. BT Sample Date: ____ Recovery Date: ____

Sample I.D: BP - BH - STK - BT - OHM - 13SEP1999 Analyst: ____ Filter Number: ____

	Impinger									
	1	2	3	4	5	6	7	Imp.Tota	8	Total
Contents	KCl	KCl	KCl	HNO3/H2O	KMnO4	KMnO4	KMnO4		Silica Gel	
Final	669.7	690.4	689.6	596.9	602.0	684.1	702.9		300	
Initial	669.3 100	690.3 100	689.5 100	597.0 100	602.0 100	684.2 100	702.9 100		300	
Gain	0.4	0.1	0.1	-0.1	Ø	-0.1	Ø		Ø	0.4

Impinger Color: ____ Labeled? ✓

Silica Gel Condition: ____ Sealed? ✓

Run No. 4 Sample Date: 9-15-99 Recovery Date: 9-99-99

Sample I.D.: BP-BH-STK-4-OHM-13SEP1999 Analyst: ____ Filter Number: ____

	Impinger									
	1	2	3	4	5	6	7	Imp.Tota	8	Total
Contents	KCl	KCl	KCl	HNO3/H2O	KMnO4	KMnO4	KMnO4		Silica Gel	
Final	909.8 ~~661.7~~ TB	738.6	730.7	708.2	714.4	664.5	700.4		316.9	
Initial	731.1 100	698.1 100	724.0 100	706.3 100	712.9 100	663.4 100	698.2 100		300	
Gain	178.7	40.5	6.7	1.9	1.5	1.1	1.2	231.6	16.9	248.5

Impinger Color: 1-4 clear colorless Labeled? ✓

Silica Gel Condition: 1/2 Blue Sealed? ✓

Run No. ____ Sample Date: ____ Recovery Date: ____

Sample I.D.: ____ Analyst: ____ Filter Number: ____

	Impinger									
	1	2	3	4	5	6	7	Imp.Tota	8	Total
Contents	KCl	KCl	KCl	HNO3/H2O	KMnO4	KMnO4	KMnO4		Silica Gel	
Final										
Initial	100	100	100	100	100	100	100		300	
Gain										

Impinger Color: ____ Labeled? ____

Silica Gel Condition: ____ Sealed? ____

Check COC for Sample IDs of Media Blanks

WESTON MANAGERS DESIGNERS/CONSULTANTS

✓ 02

Source Gas Analysis Data Sheet - Method 3

Client BLP

Analyst KM

Location/Plant KING GEORGE, VA

Date 9/14 - 9/15/99

Source UNIT 1 STACK

Analytical Method (circle one) ONSITE

W.O. Number

Run Number 1

Leak Check Good? (circle one) Yes No

Analysis Number	Analysis Time	Percent CO_2 (A)	Percent Total (B)	Percent O_2 (B - A)	Percent N_2 (100 - B)
1	1700	12.5	19.5	7.0	
2		12.5	19.5	7.0	
3		12.4	19.5	7.1	
	Average	12.47		7.03	

Run Number 2

Leak Check Good? (circle one) Yes No

Analysis Number	Analysis Time	Percent CO_2 (A)	Percent Total (B)	Percent O_2 (B - A)	Percent N_2 (100 - B)
1	2030	12.8	18.8	6.0	
2		12.8	18.8	6.0	
3		12.8	18.8	6.0	
	Average	12.80		6.0	

Run Number 3

Leak Check Good? (circle one) Yes No

Analysis Number	Analysis Time	Percent CO_2 (A) KM	Percent Total (B)	Percent O_2 (B - A)	Percent N_2 (100 - B)
1	2030	12.7 ~~6.2~~	18.9	6.2	
2		12.7 ~~6.2~~	18.9	6.2	
3		12.8 ~~6.3~~	19.1	6.3	
	Average	12.73		6.23	

Acceptable differences for repeat analysis:

if CO_2 > 4% than +/- 0.3%

if CO_2 < or = 4% than +/- 0.2%

if O_2 > or = 15% than +/- 0.2%

if O_2 < 15% than +/- 0.3%

Ambient Check

Oxygen 20.9

Carbon Dioxide 0.0

Report all values to the nearest 0.1 percent

Comments

WESTON MANAGERS DESIGNERS/CONSULTANTS

Method3

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Source Gas Analysis Data Sheet - Method 3

Client: BWP

Analyst: KK

Location/Plant: KING GEORGE, VA

Date: 9/15/99

Source: UNIT # 1 STACK

Analytical Method (circle one): CMS MT

W.O. Number: _____

Run Number: 4

Leak Check Good? (circle one) Yes No

Analysis Number	Analysis Time	Percent CO_2 (A)	Percent Total (B)	Percent O_2 (B - A)	Percent N_2 (100 - B)
1	2030	13.2	19.1	5.9	
2		13.1	19.1	6.0	
3		13.2	19.1	5.9	
	Average	13.17		5.93	

Run Number: _____

Leak Check Good? (circle one) Yes No

Analysis Number	Analysis Time	Percent CO_2 (A)	Percent Total (B)	Percent O_2 (B - A)	Percent N_2 (100 - B)
1					
2					
3					
	Average				

Run Number: _____

Leak Check Good? (circle one) Yes No

Analysis Number	Analysis Time	Percent CO_2 (A)	Percent Total (B)	Percent O_2 (B - A)	Percent N_2 (100 - B)
1					
2					
3					
	Average				

Acceptable differences for repeat analysis:

if CO_2 > 4% than +/- 0.3%

if CO_2 < or = 4% than +/- 0.2%

if O_2 > or = 15% than +/- 0.2%

if O_2 < 15% than +/- 0.3%

Ambient Check

Oxygen: 20.9

Carbon Dioxide: 0.0

Report all values to the nearest 0.1 percent

Comments: _____

WESTON MANAGERS DESIGNERS/CONSULTANTS

Method3

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Figure 6-1
Example Sample Label

First Sample
9/15
✓ 7:45am

SAMPLE NO. 12A

CLIENT SEI BIRCHWOOD

PROJECT MERCURY TESTING

SOURCE COAL FEEDER

RUN NO. 2 DATE 9/15/99

SAMPLE TYPE Coal scoop

COLLECTION TIME 0745

COLLECTOR Bell ANALYST

COMMENTS

Figure 6-1
Example Sample Label

SAMPLE NO. 12 B

CLIENT SEI BIRCHWOOD

PROJECT MERCURY TESTING

SOURCE COAL FEEDER

RUN NO. 2 DATE 9/15/99

SAMPLE TYPE Coal scoop

COLLECTION TIME 0750

COLLECTOR Bell ANALYST

COMMENTS

Figure 6-1
Example Sample Label

SAMPLE NO. 12C

CLIENT SEI BIRCHWOOD

PROJECT MERCURY TESTING

SOURCE COAL FEEDER

RUN NO. 2 DATE 9/15/99

SAMPLE TYPE Coal scoop

COLLECTION TIME 0755

COLLECTOR Bell ANALYST

COMMENTS

Figure 6-1
Example Sample Label

SAMPLE NO. 19A

CLIENT SEI BIRCHWOOD

PROJECT MERCURY TESTING

SOURCE COAL FEEDER

RUN NO. 2 DATE 9/15/99

SAMPLE TYPE Coal scoop

COLLECTION TIME 1115

COLLECTOR Bell ANALYST

COMMENTS

Figure 6-1
Example Sample Label

SAMPLE NO. 19B

CLIENT SEI BIRCHWOOD

PROJECT MERCURY TESTING

SOURCE COAL FEEDER

RUN NO. 2 DATE 9/15/99

SAMPLE TYPE Coal SCOOP

COLLECTION TIME 1115

COLLECTOR Bell ANALYST

COMMENTS

Figure 6-1
Example Sample Label

SAMPLE NO. 19C

CLIENT SEI BIRCHWOOD

PROJECT MERCURY TESTING

SOURCE COAL FEEDER

RUN NO. 2 DATE 9/15/99

SAMPLE TYPE Coal SCOOP

COLLECTION TIME 1115

COLLECTOR Bell ANALYST

COMMENTS

Figure 6-1
Example Sample Label

SAMPLE NO. 13A

CLIENT SEI BIRCHWOOD

PROJECT MERCURY TESTING

SOURCE COAL FEEDER

RUN NO. 2 DATE 9/15/99

SAMPLE TYPE Coal SCOOP

COLLECTION TIME 0815

COLLECTOR James Bell ANALYST

COMMENTS

Figure 6-1
Example Sample Label

SAMPLE NO. 13B

CLIENT SEI BIRCHWOOD

PROJECT MERCURY TESTING

SOURCE COAL FEEDER

RUN NO. 2 DATE 9/15/99

SAMPLE TYPE Coal SCOOP

COLLECTION TIME 0815

COLLECTOR James Bell ANALYST

COMMENTS

Figure 6-1
Example Sample Label

SAMPLE NO. 13C

CLIENT SEI BIRCHWOOD

PROJECT MERCURY TESTING

SOURCE COAL FEEDER

RUN NO. 2 DATE 9/15/99

SAMPLE TYPE Coal SCOOP

COLLECTION TIME 0815

COLLECTOR James Bell ANALYST

COMMENTS

Figure 6-1
Example Sample Label

SAMPLE NO. 1HA

CLIENT SEI BIRCHWOOD

PROJECT MERCURY TESTING

SOURCE COAL FEEDER

RUN NO. 2 DATE 9/15/99

SAMPLE TYPE Coal SCOOP

COLLECTION TIME 0845

COLLECTOR James Bell ANALYST

COMMENTS

Figure 6-1
Example Sample Label

SAMPLE NO. 14 B

CLIENT SEI BIRCHWOOD

PROJECT MERCURY TESTING

SOURCE COAL FEEDER

RUN NO. 2 DATE 9/15/99

SAMPLE TYPE Coal SCOOP

COLLECTION TIME 0845

COLLECTOR James Bde ANALYST

COMMENTS

Figure 6-1
Example Sample Label

SAMPLE NO. 14C

CLIENT SEI BIRCHWOOD

PROJECT MERCURY TESTING

SOURCE COAL FEEDER

RUN NO. 2 DATE 9/15/99

SAMPLE TYPE Coal SCOOP

COLLECTION TIME 0845

COLLECTOR James Belf ANALYST

COMMENTS

Figure 6-1
Example Sample Label

SAMPLE NO. 15A

CLIENT SEI BIRCHWOOD

PROJECT MERCURY TESTING

SOURCE COAL FEEDER

RUN NO. 2 DATE 9/15/99

SAMPLE TYPE Coal SCOOP

COLLECTION TIME 0915

COLLECTOR Bell ANALYST

COMMENTS

Figure 6-1
Example Sample Label

SAMPLE NO. 15B

CLIENT SEI BIRCHWOOD

PROJECT MERCURY TESTING

SOURCE COAL FEEDER

RUN NO. 2 DATE 9/15/99

SAMPLE TYPE Coal SCOOP

COLLECTION TIME 0915

COLLECTOR Bell ANALYST

COMMENTS

Figure 6-1
Example Sample Label

SAMPLE NO. 15C

CLIENT SEI BIRCHWOOD

PROJECT MERCURY TESTING

SOURCE COAL FEEDER

RUN NO. 2 DATE 9/15/99

SAMPLE TYPE Coal scoop

COLLECTION TIME 0915

COLLECTOR Bell ANALYST

COMMENTS

Figure 6-1
Example Sample Label

SAMPLE NO. 16 A

CLIENT SEI BIRCHWOOD

PROJECT MERCURY TESTING

SOURCE COAL FEEDER

RUN NO. 2 DATE 9/15/99

SAMPLE TYPE Coal SCOOP

COLLECTION TIME 0945

COLLECTOR Wonders ANALYST

COMMENTS

Figure 6-1
Example Sample Label

SAMPLE NO. 16 B

CLIENT SEI BIRCHWOOD

PROJECT MERCURY TESTING

SOURCE COAL FEEDER

RUN NO. 2 DATE 9/15/99

SAMPLE TYPE Coal SCOOP

COLLECTION TIME 0945

COLLECTOR Wonders ANALYST

COMMENTS

Figure 6-1
Example Sample Label

SAMPLE NO. 16 C

CLIENT SEI BIRCHWOOD

PROJECT MERCURY TESTING

SOURCE COAL FEEDER

RUN NO. 2 DATE 9/15/99

SAMPLE TYPE Coal scoop

COLLECTION TIME 0945

COLLECTOR Wonderd ANALYST

COMMENTS

Figure 6-1
Example Sample Label

SAMPLE NO. 17A

CLIENT SEI BIRCHWOOD

PROJECT MERCURY TESTING

SOURCE COAL FEEDER

RUN NO. 2 DATE 9/15/99

SAMPLE TYPE Coal SCOOP

COLLECTION TIME 1015

COLLECTOR Robert Bon ANALYST

COMMENTS

Figure 6-1
Example Sample Label

SAMPLE NO. 17B

CLIENT SET BIRCHWOOD

PROJECT MERCURY TESTING

SOURCE COAL FEEDER

RUN NO. 2 DATE 9/15/99

SAMPLE TYPE Coal SCOOP

COLLECTION TIME 1015

COLLECTOR Robertson ANALYST

COMMENTS

Figure 6-1
Example Sample Label

SAMPLE NO. 17 C

CLIENT SEI BIRCHWOOD

PROJECT MERCURY TESTING

SOURCE COAL FEEDER

RUN NO. 2 DATE 9/15/99

SAMPLE TYPE Coal SCOOP

COLLECTION TIME 1015

COLLECTOR Robert Bor ANALYST

COMMENTS

Figure 6-1
Example Sample Label

SAMPLE NO. 18A

CLIENT SEI BIRCHWOOD

PROJECT MERCURY TESTING

SOURCE COAL FEEDER

RUN NO. 2 DATE 9/15/99

SAMPLE TYPE Coal SCOOP

COLLECTION TIME 1045

COLLECTOR Bell ANALYST

COMMENTS

Figure 6-1
Example Sample Label

SAMPLE NO. 18 B

CLIENT SET BIRCHWOOD

PROJECT MERCURY TESTING

SOURCE COAL FEEDER

RUN NO. 2 DATE 9/15/99

SAMPLE TYPE Coal SCOOP

COLLECTION TIME 1045

COLLECTOR Bell ANALYST

COMMENTS

Figure 6-1
Example Sample Label

SAMPLE NO. 18C

CLIENT SEI BIRCHWOOD

PROJECT MERCURY TESTING

SOURCE COAL FEEDER

RUN NO. 2 DATE 9/15/99

SAMPLE TYPE Coal SCOOP

COLLECTION TIME 1045

COLLECTOR Bell ANALYST

COMMENTS

Figure 6-1
Example Sample Label

SAMPLE NO. 20A

CLIENT SEI BIRCHWOOD

PROJECT MERCURY TESTING

SOURCE COAL FEEDER

RUN NO. 3 DATE 9/15/99

SAMPLE TYPE Coal scoop

COLLECTION TIME 1220

COLLECTOR Wonders ANALYST

COMMENTS

Figure 6-1
Example Sample Label

SAMPLE NO. 20B

CLIENT SEI BIRCHWOOD

PROJECT MERCURY TESTING

SOURCE COAL FEEDER

RUN NO. 3 DATE 9/15/99

SAMPLE TYPE Coal SCOOP

COLLECTION TIME 1220

COLLECTOR Wonders ANALYST

COMMENTS

Figure 6-1
Example Sample Label

SAMPLE NO. 20 C

CLIENT SEI BIRCHWOOD

PROJECT MERCURY TESTING

SOURCE COAL FEEDER

RUN NO. 3 DATE 9/15/99

SAMPLE TYPE Coal SCOOP

COLLECTION TIME 1220

COLLECTOR Wonders ANALYST

COMMENTS

Figure 6-1
Example Sample Label

SAMPLE NO. 21A

CLIENT SEI BIRCHWOOD

PROJECT MERCURY TESTING

SOURCE COAL FEEDER

RUN NO. 3 DATE 9/15/99

SAMPLE TYPE Coal scoop

COLLECTION TIME 1250

COLLECTOR Bell ANALYST

COMMENTS

Figure 6-1
Example Sample Label

SAMPLE NO. 21B

CLIENT SEI BIRCHWOOD

PROJECT MERCURY TESTING

SOURCE COAL FEEDER

RUN NO. 3 DATE 9/15/99

SAMPLE TYPE Coal scoop

COLLECTION TIME 1250

COLLECTOR Bell ANALYST

COMMENTS

Figure 6-1
Example Sample Label

SAMPLE NO. 21C

CLIENT SEI BIRCHWOOD

PROJECT MERCURY TESTING

SOURCE COAL FEEDER

RUN NO. 3 DATE 9/15/99

SAMPLE TYPE Coal scoop

COLLECTION TIME 1250

COLLECTOR Bell ANALYST

COMMENTS

Figure 6-1
Example Sample Label

SAMPLE NO. 22 A

CLIENT SEI BIRCHWOOD

PROJECT MERCURY TESTING

SOURCE COAL FEEDER

RUN NO. 3 DATE 9/15/99

SAMPLE TYPE Coal scoop

COLLECTION TIME 1320

COLLECTOR Wonders ANALYST

COMMENTS

Figure 6-1
Example Sample Label

SAMPLE NO. 22 B

CLIENT SEI BIRCHWOOD

PROJECT MERCURY TESTING

SOURCE COAL FEEDER

RUN NO. 3 DATE 9/15/99

SAMPLE TYPE Coal scoop

COLLECTION TIME 1320

COLLECTOR Wonders ANALYST

COMMENTS

Figure 6-1
Example Sample Label

SAMPLE NO. 22C

CLIENT SEI BIRCHWOOD

PROJECT MERCURY TESTING

SOURCE COAL FEEDER

RUN NO. 3 DATE 9/15/99

SAMPLE TYPE Coal SCOOP

COLLECTION TIME 1320

COLLECTOR Wonders ANALYST

COMMENTS

Figure 6-1
Example Sample Label

SAMPLE NO. 23A

CLIENT SET BIRCHWOOD

PROJECT MERCURY TESTING

SOURCE COAL FEEDER

RUN NO. 3 DATE 9/15/99

SAMPLE TYPE Coal SCOOP

COLLECTION TIME 1350

COLLECTOR Bell ANALYST

COMMENTS

Figure 6-1
Example Sample Label

SAMPLE NO. 23B

CLIENT SEI BIRCHWOOD

PROJECT MERCURY TESTING

SOURCE COAL FEEDER

RUN NO. 3 DATE 9/15/99

SAMPLE TYPE Coal scoop

COLLECTION TIME 1350

COLLECTOR Bell ANALYST

COMMENTS

Figure 6-1
Example Sample Label

SAMPLE NO. 23C

CLIENT SET BIRCHWOOD

PROJECT MERCURY TESTING

SOURCE COAL FEEDER

RUN NO. 3 DATE 9/15/99

SAMPLE TYPE Coal SCOOP

COLLECTION TIME 1350

COLLECTOR Bell ANALYST

COMMENTS

Figure 6-1
Example Sample Label

SAMPLE NO. 24A

CLIENT SEI BIRCHWOOD

PROJECT MERCURY TESTING

SOURCE COAL FEEDER

RUN NO. 3 DATE 9/15/99

SAMPLE TYPE Coal scoop

COLLECTION TIME 1420

COLLECTOR Robertson ANALYST

COMMENTS

Figure 6-1
Example Sample Label

SAMPLE NO. 24B

CLIENT SET BIRCHWOOD

PROJECT MERCURY TESTING

SOURCE COAL FEEDER

RUN NO. 3 DATE 9/15/99

SAMPLE TYPE Coal scoop

COLLECTION TIME 1420

COLLECTOR Robertson ANALYST

COMMENTS

Figure 6-1
Example Sample Label

SAMPLE NO. 24C

CLIENT SET BIRCHWOOD

PROJECT MERCURY TESTING

SOURCE COAL FEEDER

RUN NO. 3 DATE 9/15/99

SAMPLE TYPE Coal scoop

COLLECTION TIME 14:20

COLLECTOR Robertson ANALYST

COMMENTS

Figure 6-1
Example Sample Label

SAMPLE NO. 25 A

CLIENT SET BIRCHWOOD

PROJECT MERCURY TESTING

SOURCE COAL FEEDER

RUN NO. 3 DATE 9/15/99

SAMPLE TYPE Coal scoop

COLLECTION TIME 1450

COLLECTOR Robertson ANALYST

COMMENTS

Figure 6-1
Example Sample Label

SAMPLE NO. 25B

CLIENT SEI BIRCHWOOD

PROJECT MERCURY TESTING

SOURCE COAL FEEDER

RUN NO. 3 DATE 9/15/99

SAMPLE TYPE Coal SCOOP

COLLECTION TIME 1450

COLLECTOR Robertson ANALYST

COMMENTS

Figure 6-1
Example Sample Label

SAMPLE NO. 25C

CLIENT SEI BIRCHWOOD

PROJECT MERCURY TESTING

SOURCE COAL FEEDER

RUN NO. 3 DATE 9/15/99

SAMPLE TYPE Coal scoop

COLLECTION TIME 1450

COLLECTOR Robertson ANALYST

COMMENTS

Figure 6-1
Example Sample Label

SAMPLE NO. 26A

CLIENT SEI BIRCHWOOD

PROJECT MERCURY TESTING

SOURCE COAL FEEDER

RUN NO. 3 DATE 9/15/99

SAMPLE TYPE Coal scoop

COLLECTION TIME 1520

COLLECTOR Wonders ANALYST

COMMENTS

Figure 6-1
Example Sample Label

SAMPLE NO. 26B

CLIENT SEI BIRCHWOOD

PROJECT MERCURY TESTING

SOURCE COAL FEEDER

RUN NO. 3 DATE 9/15/99

SAMPLE TYPE Coal SCOOP

COLLECTION TIME 1520

COLLECTOR Wonders ANALYST

COMMENTS

Figure 6-1
Example Sample Label

SAMPLE NO. 26C

CLIENT SEI BIRCHWOOD

PROJECT MERCURY TESTING

SOURCE COAL FEEDER

RUN NO. 3 DATE 9/15/99

SAMPLE TYPE Coal SCOOP

COLLECTION TIME 1520

COLLECTOR Wonders ANALYST

COMMENTS

Figure 6-1
Example Sample Label

SAMPLE NO. 27A

CLIENT SEI BIRCHWOOD

PROJECT MERCURY TESTING

SOURCE COAL FEEDER

RUN NO. 4 DATE 9/15/99

SAMPLE TYPE Coal scoop

COLLECTION TIME 1645

COLLECTOR Bell ANALYST

COMMENTS

Figure 6-1
Example Sample Label

SAMPLE NO. 27B

CLIENT SEI BIRCHWOOD

PROJECT MERCURY TESTING

SOURCE COAL FEEDER

RUN NO. 4 DATE 9/15/99

SAMPLE TYPE Coal SCOOP

COLLECTION TIME 1645

COLLECTOR Bell ANALYST

COMMENTS

Figure 6-1
Example Sample Label

SAMPLE NO. 27C

CLIENT SEI BIRCHWOOD

PROJECT MERCURY TESTING

SOURCE COAL FEEDER

RUN NO. 4 DATE 9/15/99

SAMPLE TYPE Coal SCOOP

COLLECTION TIME 1645

COLLECTOR Bell ANALYST

COMMENTS

Figure 6-1
Example Sample Label

SAMPLE NO. 28 A

CLIENT SEI BIRCHWOOD

PROJECT MERCURY TESTING

SOURCE COAL FEEDER

RUN NO. 4 DATE 9/15/99

SAMPLE TYPE Coal SCOOP

COLLECTION TIME 1715

COLLECTOR Bell ANALYST

COMMENTS

Figure 6-1
Example Sample Label

SAMPLE NO. 28 B

CLIENT SEI BIRCHWOOD

PROJECT MERCURY TESTING

SOURCE COAL FEEDER

RUN NO. 4 DATE 9/15/99

SAMPLE TYPE Coal SCOOP

COLLECTION TIME 1715

COLLECTOR Bell ANALYST

COMMENTS

Figure 6-1
Example Sample Label

SAMPLE NO. 28 C

CLIENT SEI BIRCHWOOD

PROJECT MERCURY TESTING

SOURCE COAL FEEDER

RUN NO. 4 DATE 9/15/99

SAMPLE TYPE Coal SCOOP

COLLECTION TIME 1715

COLLECTOR Bell ANALYST

COMMENTS

Figure 6-1
Example Sample Label

SAMPLE NO. 29 A

CLIENT SEI BIRCHWOOD

PROJECT MERCURY TESTING

SOURCE COAL FEEDER

RUN NO. 4 DATE 9/15/99

SAMPLE TYPE Coal SCOOP

COLLECTION TIME _____

COLLECTOR _____ ANALYST _____

COMMENTS _____

Figure 6-1
Example Sample Label

SAMPLE NO. 29 B

CLIENT SEI BIRCHWOOD

PROJECT MERCURY TESTING

SOURCE COAL FEEDER

RUN NO. 4 DATE 9/15/99

SAMPLE TYPE Coal SCOOP

COLLECTION TIME

COLLECTOR ANALYST

COMMENTS

Figure 6-1
Example Sample Label

SAMPLE NO. 29C

CLIENT SEI BIRCHWOOD

PROJECT MERCURY TESTING

SOURCE COAL FEEDER

RUN NO. 4 DATE 9/15/99

SAMPLE TYPE Coal SCOOP

COLLECTION TIME

COLLECTOR ANALYST

COMMENTS

Figure 6-1
Example Sample Label

SAMPLE NO. 30A

CLIENT SEI BIRCHWOOD

PROJECT MERCURY TESTING

SOURCE COAL FEEDER

RUN NO. 4 DATE 9/15/99

SAMPLE TYPE Coal scoop

COLLECTION TIME 1745

COLLECTOR Bill ANALYST

COMMENTS

Figure 6-1
Example Sample Label

SAMPLE NO. 30B

CLIENT SEI BIRCHWOOD

PROJECT MERCURY TESTING

SOURCE COAL FEEDER

RUN NO. 4 DATE 9/15/99

SAMPLE TYPE Coal SCOOP

COLLECTION TIME 1745

COLLECTOR Bull ANALYST

COMMENTS

Figure 6-1
Example Sample Label

SAMPLE NO. 30C

CLIENT SEI BIRCHWOOD

PROJECT MERCURY TESTING

SOURCE COAL FEEDER

RUN NO. 4 DATE 9/15/99

SAMPLE TYPE Coal scoop

COLLECTION TIME 1745

COLLECTOR Bill ANALYST

COMMENTS

Figure 6-1
Example Sample Label

SAMPLE NO. 31 A

CLIENT SEI BIRCHWOOD

PROJECT MERCURY TESTING

SOURCE COAL FEEDER

RUN NO. 4 DATE 9/15/99

SAMPLE TYPE Coal SCOOP

COLLECTION TIME 1845

COLLECTOR Bell ANALYST

COMMENTS

Figure 6-1
Example Sample Label

SAMPLE NO. 31 B

CLIENT SEI BIRCHWOOD

PROJECT MERCURY TESTING

SOURCE COAL FEEDER

RUN NO. 4 DATE 9/15/99

SAMPLE TYPE Coal scoop

COLLECTION TIME 1845

COLLECTOR Bell ANALYST

COMMENTS

Figure 6-1
Example Sample Label

SAMPLE NO. 31C

CLIENT SEI BIRCHWOOD

PROJECT MERCURY TESTING

SOURCE COAL FEEDER

RUN NO. 4 DATE 9/15/99

SAMPLE TYPE Coal scoop

COLLECTION TIME 1845

COLLECTOR Bell ANALYST

COMMENTS

Figure 6-1
Example Sample Label

SAMPLE NO. 32 A

CLIENT SEI BIRCHWOOD

PROJECT MERCURY TESTING

SOURCE COAL FEEDER

RUN NO. 4 DATE 9/15/99

SAMPLE TYPE Coal scoop

COLLECTION TIME 1915

COLLECTOR Bell ANALYST

COMMENTS

Figure 6-1
Example Sample Label

SAMPLE NO. 32 B

CLIENT SEI BIRCHWOOD

PROJECT MERCURY TESTING

SOURCE COAL FEEDER

RUN NO. 4 DATE 9/15/99

SAMPLE TYPE Coal SCOOP

COLLECTION TIME 1915

COLLECTOR Bell ANALYST

COMMENTS

Figure 6-1
Example Sample Label

SAMPLE NO. 32 C

CLIENT SEI BIRCHWOOD

PROJECT MERCURY TESTING

SOURCE COAL FEEDER

RUN NO. 4 DATE 9/15/99

SAMPLE TYPE Coal SCOOP

COLLECTION TIME 1915

COLLECTOR Bell ANALYST

COMMENTS

Figure 6-1
Example Sample Label

SAMPLE NO. 33 A

CLIENT SEI BIRCHWOOD

PROJECT MERCURY TESTING

SOURCE COAL FEEDER

RUN NO. 4 DATE 9/15/99

SAMPLE TYPE Coal scoop

COLLECTION TIME 1945

COLLECTOR Bell ANALYST

COMMENTS

Figure 6-1
Example Sample Label

SAMPLE NO. 33B

CLIENT SEI BIRCHWOOD

PROJECT MERCURY TESTING

SOURCE COAL FEEDER

RUN NO. 4 DATE 9/15/99

SAMPLE TYPE Coal SCOOP

COLLECTION TIME 1945

COLLECTOR Bell ANALYST

COMMENTS

Figure 6-1
Example Sample Label

SAMPLE NO. 33C

CLIENT SEI BIRCHWOOD

PROJECT MERCURY TESTING

SOURCE COAL FEEDER

RUN NO. 4 DATE 9/15/99

SAMPLE TYPE Coal SCOOP

COLLECTION TIME 1945

COLLECTOR Bell ANALYST

COMMENTS

APPENDIX D
LABORATORY ANALYTICAL REPORTS

COAL SAMPLE ANALYTICAL REPORT

ANALYTICAL SERVICES

INDUSTRIAL HYGIENE ENVIRONMENTAL TESTING

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

October 12, 1999

Jeff O'Neill
Roy F. Weston, Inc.
One Weston Way
Bldg. 5-1
West Chester PA 19380

Laboratory Project: 186302
Client Reference: Birchwood Power/Clean Coal Feed
WO# 12255.0001.001

Dear Mr. O'Neill:

The samples which were logged in on 21-SEP-99 have been analyzed as requested. The analytical results are enclosed in the attached report.

Please note that any unused portion of the samples will be disposed after 03-NOV-99, unless you have requested otherwise.

Thank you for the opportunity to provide these services to you. If you have any questions concerning this report, please contact a Client Services representative at 610/921-8833.

Sincerely,

Fred Usbeck, CIH
Director, Laboratory Services

4418 POTTSVILLE PIKE, READING, PENNSYLVANIA 19605 610-921-8833 FAX 610-921-9667

PHILIP ANALYTICAL SERVICES

INDUSTRIAL HYGIENE ENVIRONMENTAL TESTING

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

ANALYTICAL REPORT

Client: Roy F. Weston, Inc.

Report to: Jeff O'Neill
Roy F. Weston, Inc.
One Weston Way
Bldg. 5-1
West Chester PA 19380

Project: 186302
Received: 20-SEP-99
Reported: 12-OCT-99

PURCHASE ORDER: 0006623

Project Description: Birchwood Power/Clean Coal Feed
WO# 12255.0001.001

	AS RECEIVED BASIS	DRY BASIS	UNITS	METHOD	DATE	ANALYS
BP-COAL-R4						
Lab Sample: 1375531						
Moisture, Total	5.47		%	D 3302	21-SEP-99	GLB
Mercury, Total	0.1	0.1	mg/kg	7471	28-SEP-99	SMW
Chlorine, Total	0.09	0.10	%	E776/300.0	02-OCT-99	DRK
SHORT PROX - COAL						
Ash	13.9	14.7	%	D 3174	27-SEP-99	VJO
Sulfur	0.78	0.83	%	D 4239	29-SEP-99	VJO
Heating Value	11760	12440	BTU/lb	D 3286	01-OCT-99	GLB
BP-COAL-R2						
Lab Sample: 1375532						
Moisture, Total	5.77		%	D 3302	21-SEP-99	GLB
Mercury, Total	0.1	0.1	mg/kg	7471	28-SEP-99	SMW
Chlorine, Total	0.08	0.09	%	E776/300.0	02-OCT-99	DRK
SHORT PROX - COAL						
Ash	12.6	13.4	%	D 3174	27-SEP-99	VJO
Sulfur	0.73	0.77	%	D 4239	29-SEP-99	VJO
Heating Value	11920	12650	BTU/lb	D 3286	01-OCT-99	GLB
BP-COAL-R3						
Lab Sample: 1375533						
Moisture, Total	6.05		%	D 3302	21-SEP-99	GLB
Mercury, Total	0.1	0.1	mg/kg	7471	28-SEP-99	SMW
Chlorine, Total	0.09	0.10	%	E776/300.0	02-OCT-99	DRK
SHORT PROX - COAL						
Ash	13.0	13.8	%	D 3174	27-SEP-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: Roy F. Weston, Inc.
Project: 186302

BP-COAL-R3
Lab Sample: 1375533 - continued

	AS RECEIVED BASIS	DRY BASIS	UNITS	METHOD	DATE	ANALYS
Sulfur	0.74	0.79	%	D 4239	29-SEP-99	VJO
Heating Value	11810	12570	BTU/lb	D 3286	01-OCT-99	GLB

< Indicates less than the limit of quantitation.

4418 POTTSVILLE PIKE, READING, PENNSYLVANIA 19605 610-921-8833 FAX 610-921-9667

Philip Quality Assurance Protocol - QA1 Sample/Duplicate

Philip #	1375531-5533
QC Batch #	1375533

Philip Report #	186302
Client Name	Roy F. Weston

	MATRIX SPIKE(mg/kg)				SAMPLE DUPLICATE(mg/kg)			METHOD BLANK	LABORATORY CONTROL SAMPLE(mg/L)		
Parameter	Sample Conc	Spike Conc	Matrix Conc	Spike Recovery %	Sample Conc	Duplicate Conc	Precision RPD %	mg/L	Spike Conc	Found Conc	Recovery %
Mercury	0.110	0.952	0.910	84	0.110	0.110	0	< 0.0002	0.0020	0.0018	91

Matrix Spike and Sample Duplicate Report

Philip Analytical Services
Quality Assurance Protocol

PAS Sample #: 1375533

Client Name: Weston

PAS Project #: 186302

Job ID : Birchwood Power/Clean Coal Feed
#12255.0001.001

Units: %

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
1375533-Chlorine	0.10	0.10	0.20	100	0.20	100		0.103	10.000	9.864	99

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		
1375533-Chlorine	0.10	0.10	0.20	100	0.10	0.09		2.05	2.09	102	0.103	1.00

Matrix Spike	75 - 125
Laboratory Control Sample	80 - 120
Duplicate	0 - 20

Philip Analytical Services
Quality Assurance Protocol

PAS Sample #: 1375533

Client Name: Weston

PAS Project #: 186302

Job ID : Birchwood Power/Clean Coal Feed
#12255.0001.001

Units: %,BTU/lb

O1 SUMMARY FORM

Sample # & Parameter	Matrix Spike				Matrix Spike Duplicate				Laboratory Control Sample		
	Sample Conc.	Spike Conc.	Matrix Spike Conc.	Recovery	Matrix Spike Dup Conc.	Recovery	Precision RPD	Method Blank	Spikes Conc.	Found Conc.	Recovery

Sample # & Parameter	Matrix Spike				Duplicate			Laboratory Control Sample			Method Blank	Detection Limits
	Sample Conc.	Spike Conc.	Matrix Spike Conc.	Recovery	Sample Conc.	Sample Duplicate Conc.	Precision RPD	Spikes Conc.	Found Conc.	Recovery		
1375533-Ash					13.6	13.6	0.0	12	11.9	99	NA	0.01
1375533-Sulfur					0.77	0.78	1.3	1.78	1.76	99	NA	0.01
1375533-Heating Value					12381	12412	0.25	13350	13372	100	NA	50

Matrix Spike	75 - 125
Laboratory Control Sample	80 - 120
Duplicate	0 - 20

Revised 9/23/99

186302

WESTON Analytics Use Only

Custody Transfer Record/Lab Work Request

WESTON

Page ____ of ____

Client Birchwood Power
Est. Final Proj. Sampling Date ____
Work Order # 12255-001-001
Project Contact/Phone # Jeff Orrill (610) 701 7201
AD Project Manager ____
QC ____ Del ____ TAT STD
Date Rec'd ____ Date Due ____
Account # ____

Refrigerator # ____
#/Type Container: Liquid / Solid
Volume: Liquid / Solid
Preservatives

ANALYSES REQUESTED →

MATRIX CODES:
S - Soil
SE - Sediment
SO - Solid
SL - Sludge
W - Water
O - Oil
A - Air
DS - Drum Solids
DL - Drum Liquids
L - EP/TCLP Leachate
WI - Wipe
X - Other
F - Fish

Lab ID	Client ID/Description	Matrix QC Chosen (✓) MS	MSD	Matrix	Date Collected	Time Collected	ORGANIC VOA	BNA	Pest/PCB	Herb				INDRG Metal	CN													
							WESTON Analytics Use Only																					
							BTU	ASH	Mercury EPA 7471		Chloride EPA 300		SULFUR															
	BP-COAL-R2				9/15/99		X	X	X		X		X															
	BP-COAL-R3						X	X	X		X		X															
	BP-COAL-R4						X	X	X		X		X															

FIELD PERSONNEL: COMPLETE ONLY SHADED AREAS

Special Instructions:

DATE/REVISIONS:
1. ____
2. ____
3. ____
4. ____
5. ____
6. ____

Relinquished by	Received by	Date	Time	Relinquished by	Received by	Date	Time
[signature]		9/23/99	11:15		J. Wong	9/23/99	0958

Discrepancies Between Samples Labels and COC Record? Y or N
NOTES:

WESTON Analytics Use Only

Samples were:
1) Shipped ___ or Hand Delivered ___ Airbill # ____
2) Ambient or Chilled
3) Received in Good Condition Y or N
4) Labels Indicate Properly Preserved Y or N
5) Received Within Holding Times Y or N

COC Tape was:
1) Present on Outer Package Y or N
2) Unbroken on Outer Package Y or N
3) Present on Sample Y or N
4) Unbroken on Sample Y or N

COC Record Present Upon Sample Rec't Y or N

RFW 21-21-001/A-7/91

____ L372 ____ L373 ____ L375 ____ L377 ____ L378 Ref# ____ Cooler# ____

381-596a

9-23-99 ; 9:51AM ; ROY F WESTON, INC5-1→ 610 921 8407;# 2/ 2

ONTARIO HYDRO SAMPLES ANALYTICAL REPORT

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

October 13, 1999

Jeff O'Neill
Roy F. Weston, Inc.
One Weston Way
Bldg. 5-1
West Chester PA 19380

Laboratory Project: 186391
Client Reference: Birchwood Power/Ontario Hydro Mercury Analysis
WO # 12255-001-001

Dear Mr. O'Neill:

The samples which were logged in on 23-SEP-99 have been analyzed as requested. The analytical results are enclosed in the attached report.

Please note that any unused portion of the samples will be disposed after 10-NOV-99, unless you have requested otherwise.

Thank you for the opportunity to provide these services to you. If you have any questions concerning this report, please contact a Client Services representative at 610/921-8833.

Sincerely,

Fred Usbeck, CIH
Director, Laboratory Services

4418 POTTSVILLE PIKE, READING, PENNSYLVANIA 19605 610-921-8833 FAX 610-921-9667

PHILIP ANALYTICAL SERVICES

INDUSTRIAL HYGIENE ENVIRONMENTAL TESTING

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

ANALYTICAL REPORT

Client: Roy F. Weston, Inc.

Report to: Jeff O'Neill
Roy F. Weston, Inc.
One Weston Way
Bldg. 5-1
West Chester PA 19380

Project: 186391
Received: 20-SEP-99
Reported: 13-OCT-99

PURCHASE ORDER: 0006623

Project Description: Birchwood Power/Ontario Hydro Mercury Analysis
WO # 12255-001-001

Sampled: 15-SEP-99

	RESULT	UNITS	METHOD	DATE	ANALYST
BP-BH-IN-2-OHM-13SEP1999-FHHNO3/FILT					
Lab Sample: 1375940					
Hg by Ont. Hydro Method, Draft	16.5	ug/sample	Ont Hydro	30-SEP-99	JLP
Result represents Total Particle-Bound HG.					
BP-BH-IN-2-OHM-13SEP1999-BHKCL					
Lab Sample: 1375941					
Hg by Ont. Hydro Method, Draft	0.37	ug/sample	Ont Hydro	30-SEP-99	JLP
Result represents Oxidized Hg.					
BP-BH-IN-2-OHM-13SEP1999-BHHNO3					
Lab Sample: 1375942					
Hg by Ont. Hydro Method, Draft	< 0.2	ug/sample	Ont Hydro	30-SEP-99	JLP
BP-BH-IN-2-OHM-13SEP1999-BHKMNO4					
Lab Sample: 1375943					
Hg by Ont. Hydro Method, Draft	0.18	ug/sample	Ont Hydro	30-SEP-99	JLP

** Note **
Total Elemental Mercury = HG in KMNO4 + HG in H2O2
0.18 ug Elemental HG

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

Client: Roy F. Weston, Inc.
Project: 186391

	RESULT	UNITS	METHOD	DATE	ANALYST
BP-BH-IN-3-OHM-13SEP1999-FHHNO3/FILT (#10 + 8)					
Lab Sample: 1375944					
Hg by Ont. Hydro Method, Draft	12.4	ug/sample	Ont Hydro	30-SEP-99	JLP
Results represents Total Particle-Bound HG.					
BP-BH-IN-3-OHM-13SEP1999-BHKCL					
Lab Sample: 1375945					
Hg by Ont. Hydro Method, Draft	0.32	ug/sample	Ont Hydro	30-SEP-99	JLP
Result represents Oxidized Hg.					
BP-BH-IN-3-OHM-13SEP1999-BHHNO3					
Lab Sample: 1375946					
Hg by Ont. Hydro Method, Draft	< 0.2	ug/sample	Ont Hydro	30-SEP-99	JLP
BP-BH-IN-3-OHM-13SEP1999-BHKMNO4					
Lab Sample: 1375947					
Hg by Ont. Hydro Method, Draft	0.24	ug/sample	Ont Hydro	30-SEP-99	JLP
** Note **					
Total Elemental Mercury = HG in KMNO4 + HG in H2O2					
0.24 ug Elemental HG					
BP-BH-IN-SB-OHM-13SEP1999-KCl					
Lab Sample: 1375948					
Hg by Ont. Hydro Method, Draft	< 0.2	ug/sample	Ont Hydro	30-SEP-99	JLP
Result represents Oxidized Hg.					
BP-BH-IN-SB-OHM-13SEP1999-HNO3 (0.1N) + 3 FILTERS					
Lab Sample: 1375949					
Hg by Ont. Hydro Method, Draft	< 0.03	ug/sample	Ont Hydro	30-SEP-99	JLP
BP-BH-IN-SB-OHM-13SEP1999-KMNO4					
Lab Sample: 1375950					
Hg by Ont. Hydro Method, Draft	< 0.2	ug/sample	Ont Hydro	30-SEP-99	JLP

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: Roy F. Weston, Inc.
Project: 186391

	RESULT	UNITS	METHOD	DATE	ANALYST
BP-BH-IN-SB-OHM-13SEP1999-HNO3/H2O2					
Lab Sample: 1375951					
Hg by Ont. Hydro Method, Draft	< 0.2	ug/sample	Ont Hydro	30-SEP-99	JLP
BP-BH-IN-SB-OHM-13SEP1999-10% HNO3					
Lab Sample: 1375952					
Hg by Ont. Hydro Method, Draft	< 0.02	ug/sample	Ont Hydro	30-SEP-99	JLP
BP-BH-IN-SB-OHM-13SEP1999-10% Hydroxylamine Sulfate					
Lab Sample: 1375953					
Hg by Ont. Hydro Method, Draft	< 0.02	ug/sample	Ont Hydro	30-SEP-99	JLP
BP-BH-IN-SB-OHM-13SEP1999-Thimble 1-3 (#15, 16 + 18)					
Lab Sample: 1375954					
Hg by Ont. Hydro Method, Draft	< 0.09	ug/sample	Ont Hydro	30-SEP-99	JLP
BP-BH-IN-BT-OHM-13SEP1999-FHHNO3/FILT (#13)					
Lab Sample: 1375955					
Hg by Ont. Hydro Method, Draft	< 0.08	ug/sample	Ont Hydro	30-SEP-99	JLP
Result represents Total Particle Bound HG.					
BP-BH-IN-BT-OHM-13SEP1999-BHKCl					
Lab Sample: 1375956					
Hg by Ont. Hydro Method, Draft	< 0.2	ug/sample	Ont Hydro	30-SEP-99	JLP
Result represents Oxidized Hg.					
BP-BH-IN-BT-OHM-13SEP1999-BHHNO3					
Lab Sample: 1375957					
Hg by Ont. Hydro Method, Draft	< 0.2	ug/sample	Ont Hydro	30-SEP-99	JLP

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: Roy F. Weston, Inc.
Project: 186391

	RESULT	UNITS	METHOD	DATE	ANALYST
BP-BH-IN-BT-OHM-13SEP1999-BHKMNO4					
Lab Sample: 1375958					
Hg by Ont. Hydro Method, Draft	0.19	ug/sample	Ont Hydro	30-SEP-99	JLP
** Note **					
Total Elemental Mercury = HG in KMNO4 + HG in H2O2					
0.190 ug Elemental HG					
BP-BH-IN-4-OHM-13SEP1999-FHHNO3/FILT (#17)					
Lab Sample: 1375959					
Hg by Ont. Hydro Method, Draft	15.0	ug/sample	Ont Hydro	30-SEP-99	JLP
Result represents Total Particle Bound HG.					
BP-BH-IN-4-OHM-13SEP1999-BHKCl					
Lab Sample: 1375960					
Hg by Ont. Hydro Method, Draft	0.31	ug/sample	Ont Hydro	30-SEP-99	JLP
Result represents Oxidized Hg.					
BP-BH-IN-4-OHM-13SEP1999-BHKMNO4					
Lab Sample: 1375961					
Hg by Ont. Hydro Method, Draft	< 0.2	ug/sample	Ont Hydro	30-SEP-99	JLP
** Note **					
Total Elemental Mercury = HG in KMNO4 + HG in H2O2					
< 0.15 ug Elemental HG					
BP-BH-IN-4-OHM-13SEP1999-BHHNO3					
Lab Sample: 1375962					
Hg by Ont. Hydro Method, Draft	< 0.2	ug/sample	Ont Hydro	30-SEP-99	JLP
BP-BH-STK-2-OHM-13SEP1999-FHHNO3/FILT					
Lab Sample: 1375963					
Hg by Ont. Hydro Method, Draft	0.021	ug/sample	Ont Hydro	30-SEP-99	JLP
Result represents Total Particle Bound HG.					

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

Client: Roy F. Weston, Inc.
Project: 186391

	RESULT	UNITS	METHOD	DATE	ANALYST
BP-BH-STK-2-OHM-13SEP1999-BHKCL					
Lab Sample: 1375964					
Hg by Ont. Hydro Method, Draft	0.62	ug/sample	Ont Hydro	30-SEP-99	JLP
Result represents Oxidized Hg.					
BP-BH-STK-2-OHM-13SEP1999-BHHNO3					
Lab Sample: 1375965					
Hg by Ont. Hydro Method, Draft	< 0.3	ug/sample	Ont Hydro	30-SEP-99	JLP
BP-BH-STK-2-OHM-13SEP1999-BHKMNO4					
Lab Sample: 1375966					
Hg by Ont. Hydro Method, Draft	0.24	ug/sample	Ont Hydro	30-SEP-99	JLP
** Note **					
Total Elemental Mercury = HG in KMNO4 + HG in H2O2					
0.240 ug Elemental HG					
BP-BH-STK-3-OHM-13SEP1999-FHHNO3/FILT					
Lab Sample: 1375967					
Hg by Ont. Hydro Method, Draft	0.023	ug/sample	Ont Hydro	30-SEP-99	JLP
Result represent Total Particle Bound HG.					
BP-BH-STK-3-OHM-13SEP1999-BHKCL					
Lab Sample: 1375968					
Hg by Ont. Hydro Method, Draft	< 0.3	ug/sample	Ont Hydro	30-SEP-99	JLP
Result represents Oxidized Hg.					
BP-BH-STK-3-OHM-13SEP1999-BHHNO3					
Lab Sample: 1375969					
Hg by Ont. Hydro Method, Draft	< 0.2	ug/sample	Ont Hydro	30-SEP-99	JLP
BP-BH-STK-3-OHM-13SEP1999-BHKMNO4					
Lab Sample: 1375970					
Hg by Ont. Hydro Method, Draft	0.21	ug/sample	Ont Hydro	30-SEP-99	JLP
** Note **					
Total Elemental Mercury = HG in KMNO4 + HG in H2O2					
0.206 ug Elemental HG					

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

Client: Roy F. Weston, Inc.
Project: 186391

	RESULT	UNITS	METHOD	DATE	ANALYST
BP-BH-STK-BT-OHM-13SEP1999-FHHNO3/FILT					
Lab Sample: 1375971					
Hg by Ont. Hydro Method, Draft	< 0.08	ug/sample	Ont Hydro	30-SEP-99	JLP
Results represent Total Particle Bound HG.					
BP-BH-STK-BT-OHM-13SEP1999-BHKCL					
Lab Sample: 1375972					
Hg by Ont. Hydro Method, Draft	< 0.2	ug/sample	Ont Hydro	30-SEP-99	JLP
Result represents Oxidized Hg.					
BP-BH-STK-BT-OHM-13SEP1999-BHHNO3					
Lab Sample: 1375973					
Hg by Ont. Hydro Method, Draft	< 0.3	ug/sample	Ont Hydro	30-SEP-99	JLP
BP-BH-STK-BT-OHM-13SEP1999-BHKMNO4					
Lab Sample: 1375974					
Hg by Ont. Hydro Method, Draft	< 0.15	ug/sample	Ont Hydro	30-SEP-99	JLP
** Note **					
Total Elemental Mercury = HG in KMNO4 + HG in H2O2					
< 0.15 ug Elemental HG					
BP-BH-STK-4-OHM-13SEP1999-FHHNO3/FILT					
Lab Sample: 1375975					
Hg by Ont. Hydro Method, Draft	0.030	ug/sample	Ont Hydro	30-SEP-99	JLP
Result represents Total Particle Bound HG.					
BP-BH-STK-4-OHM-13SEP1999-BHKCL					
Lab Sample: 1375976					
Hg by Ont. Hydro Method, Draft	< 0.3	ug/sample	Ont Hydro	30-SEP-99	JLP
Result represents Oxidized Hg.					
BP-BH-STK-4-OHM-13SEP1999-BHHNO3					
Lab Sample: 1375977					
Hg by Ont. Hydro Method, Draft	< 0.2	ug/sample	Ont Hydro	30-SEP-99	JLP

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: Roy F. Weston, Inc.
Project: 186391

	RESULT	UNITS	METHOD	DATE	ANALYST
BP-BH-STK-4-OHM-13SEP1999-BHKMNO4					
Lab Sample: 1375978					
Hg by Ont. Hydro Method, Draft	< 0.2	ug/sample	Ont Hydro	30-SEP-99	JLP

** Note **
Total Elemental Mercury = HG in KMNO4 + HG in H2O2
< 0.15 ug Elemental HG

< Indicates less than the limit of quantitation.

4418 POTTSVILLE PIKE, READING, PENNSYLVANIA 19605 610-921-8833 FAX 610-921-9667

Lab Tracking Number

Chain-of-Custody Record/Lab Work Request

WESTON

on hold → 186389
Others → 186391

Client	BIRCHWOOD POWER, King George VA		
Work Order Number	12255-001-001	Phone Number	610-701-7201
Contact Person	Jeff ONeill	Turn Around Tim	Standard

Analyses Requested/Other Info

Lab ID	Field Sample ID	Sample Collection Date	Analysis	Hold		Timbe #	Sample Check-off
	BP - BH - IN - 1 - OHM - 13SEP1999 - FHHNO3	9/14/99	OHM	X			✓
	BP - BH - IN - 1 - OHM - 13SEP1999 - FILT		OHM	X		2,3,4,5	✓
	BP - BH - IN - 1 - OHM - 13SEP1999 - BHKCL		OHM	X			✓
	BP - BH - IN - 1 - OHM - 13SEP1999 - BHHNO3		OHM	X			✓
	BP - BH - IN - 1 - OHM - 13SEP1999 - BHKMNO4		OHM	X			✓
	BP - BH - IN - 2 - OHM - 13SEP1999 - FHHNO3	9/15/99	OHM				✓
	BP - BH - IN - 2 - OHM - 13SEP1999 - FILT		OHM			7	✓
	BP - BH - IN - 2 - OHM - 13SEP1999 - BHKCL		OHM				✓
	BP - BH - IN - 2 - OHM - 13SEP1999 - BHHNO3		OHM				✓
	BP - BH - IN - 2 - OHM - 13SEP1999 - BHKMNO4		OHM				✓
	BP - BH - IN - 3 - OHM - 13SEP1999 - FHHNO3		OHM				✓
	BP - BH - IN - 3 - OHM - 13SEP1999 - FILT		OHM			10, 8	✓
	BP - BH - IN - 3 - OHM - 13SEP1999 - BHKCL		OHM				✓
	BP - BH - IN - 3 - OHM - 13SEP1999 - BHHNO3		OHM				✓
	BP - BH - IN - 3 - OHM - 13SEP1999 - BHKMNO4		OHM				✓
	BP - BH - IN - SB - OHM - 13SEP1999 - KCl		OHM				✓
	BP - BH - IN - SB - OHM - 13SEP1999 - FILT		OHM			(3,1,3)	✓
	BP - BH - IN - SB - OHM - 13SEP1999 - KMNO4		OHM				✓
	BP - BH - IN - SB - OHM - 13SEP1999 - HNO3/H2O2		OHM				✓
	BP - BH - IN - SB - OHM - 13SEP1999 - HNO3(0.1N)		OHM				✓
	BP - BH - IN - BT - OHM - 13SEP1999 - FHHNO3		OHM				✓
	BP - BH - IN - BT - OHM - 13SEP1999 - FILT		OHM			13	✓
	BP - BH - IN - BT - OHM - 13SEP1999 - BHKCL		OHM				✓
	BP - BH - IN - BT - OHM - 13SEP1999 - BHHNO3		OHM				✓
	BP - BH - IN - BT - OHM - 13SEP1999 - BHKMNO4		OHM				✓
		9/15/99					
	BP - BH - IN - 4 - OHM - 13Sept1999 - FHHNO3		OHM				✓
	BP - BH - IN - 4 - OHM - 13Sept1999 - FILT		OHM			17	✓
	BP - BH - IN - 4 - OHM - 13Sept1999 - BHKCl		OHM				✓
	BP - BH - IN - 4 - OHM - 13Sept1999 - BHKMNO4		OHM				✓
	BP - BH - IN - 4 - OHM - 13Sept1999 - BHHNO3		OHM				✓
	BP - BH - IN - SB - OHM - 13Sept1999 - 10% HNO3		OHM				✓
	BP - BH - IN - SB - OHM - 13Sept1999 - 10% Hydroxylamine SULFATE						✓

Notes: OHM - Speciated Mercury Analysis per Ontario Hydro Method

Relinquished By	Received By	Date	Time	Lab Use Only	
[signature]	[signature]	9-20-99	11:15	Shipper Courier	Air Bill #
	[signature]	9.20.99	1430	Opened By [illegible]	Date/Time
				Temp °C 23	Conditio
				Custody Seals: Yes No None (N/A)	

Laboratory Comments:

Copyright Roy F Weston Inc Jan 1999PV

Lab Tracking Number

Chain-of-Custody Record/Lab Work Request

WESTON

Client	BIRCHWOOD POWER, King George VA		
Work Order Number	12255-001-001	Phone Number	610-701-7201
Contact Person	Jeff ONeill	Turn Around Tim	Standard

all field → 186389
others → 186391

Lab ID	Field Sample ID	Sample Collection Date	Analysis	Hg		Thimble #	Sample Check-off
			Analyses Requested/Other Info				
	BP - BH - STK - 1 - OHM - 13SEP1999 - FHHNO3	9/14/99	OHM	X			✓
	BP - BH - STK - 1 - OHM - 13SEP1999 - FILT		OHM	X			✓
	BP - BH - STK - 1 - OHM - 13SEP1999 - BHKCL		OHM	X			✓
	BP - BH - STK - 1 - OHM - 13SEP1999 - BHHNO3		OHM	X			✓
	BP - BH - STK - 1 - OHM - 13SEP1999 - BHKMNO4		OHM	X			✓
	BP - BH - STK - 2 - OHM - 13SEP1999 - FHHNO3	9/15/99	OHM				✓
	BP - BH - STK - 2 - OHM - 13SEP1999 - FILT		OHM				✓
	BP - BH - STK - 2 - OHM - 13SEP1999 - BHKCL		OHM				✓
	BP - BH - STK - 2 - OHM - 13SEP1999 - BHHNO3		OHM				✓
	BP - BH - STK - 2 - OHM - 13SEP1999 - BHKMNO4		OHM				✓
	BP - BH - STK - 3 - OHM - 13SEP1999 - FHHNO3		OHM				✓
	BP - BH - STK - 3 - OHM - 13SEP1999 - FILT		OHM				✓
	BP - BH - STK - 3 - OHM - 13SEP1999 - BHKCL		OHM				✓
	BP - BH - STK - 3 - OHM - 13SEP1999 - BHHNO3		OHM				✓
	BP - BH - STK - 3 - OHM - 13SEP1999 - BHKMNO4		OHM				✓
	~~BP - BH - STK - SB - OHM - 13SEP1999 - KCl~~		~~OHM~~				
	~~BP - BH - STK - SB - OHM - 13SEP1999 - FILT~~		~~OHM~~				
	~~BP - BH - STK - SB - OHM - 13SEP1999 - KMNO4~~		~~OHM~~				
	~~BP - BH - STK - SB - OHM - 13SEP1999 - HNO3/H2O~~		~~OHM~~				
	~~BP - BH - STK - SB - OHM - 13SEP1999 - HNO3~~		~~OHM~~				
	~~BP - BH - STK - BT - OHM - 13SEP1999 - FHHNO3~~		~~OHM~~				
	BP - BH - STK - BT - OHM - 13SEP1999 - FILT	9/15/99	OHM				✓
	BP - BH - STK - BT - OHM - 13SEP1999 - BHKCL		OHM				✓
	BP - BH - STK - BT - OHM - 13SEP1999 - BHHNO3		OHM				✓
	BP - BH - STK - BT - OHM - 13SEP1999 - BHKMNO4		OHM				✓
	BP - BH - STK - BT - OHM - 13Sept 1999 - FHHNO3						✓
	BP - BH - STK - 4 - OHM - 13Sept 1999 - FHHNO3		OHM				✓
	BP - BH - STK - 4 - OHM - 13Sept 1999 - FILT		OHM				✓
	BP - BH - STK - 4 - OHM - 13Sept 1999 - BHKCL		OHM				✓
	BP - BH - STK - 4 - OHM - 13Sept 1999 - BHKMNO4		OHM				✓
	BP - BH - STK - 4 - OHM - 13Sept 1999 - BHHNO3		OHM				✓
	BP - BH - IN - SB - OHM - 13Sept 1999 - Thimble 1		OHM			15	✓
	BP - BH - IN - SB - OHM - 13Sept 1999 - Thimble 2		OHM			16	✓
	BP - BH - IN - SB - OHM - 13Sept 1999 - Thimble 3		OHM			18	✓

Notes: OHM - Speciated Mercury Analysis per Ontario Hydro Method

Relinquished By	Received By	Date	Time	Lab Use Only	
[signature]	[signature]	9-20-99	11:18	Shipper Courier	Air Bill #
	[signature]	9-20-99	1430	Opened By [illegible]	Date/Time
				Temp °C 23	Conditio
				Custody Seals: Yes No None N/A	

Laboratory Comments:

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Philip Analytical Quality Assurance Protocol - IH
Ontario Hydro Method

Philip Report # 186391 Client ID Roy F. Weston

Method Blank Results (ug/sample)	#1375949
Parameter	Blank Conc
Mercury	< 0.03

Method Blank Results (ug/sample)	#1375953
Parameter	Blank Conc
Mercury	< 0.02

Method Blank Results (ug/sample)	#1375952
Parameter	Blank Conc
Mercury	< 0.02

Philip Analytical Quality Assurance Protocol - IH
Ontario Hydro Method

Philip Report # 186391 Client ID Roy F. Weston

Method Blank Results (ug/sample)		
Parameter	Blank Conc	#1375951
Mercury	< 0.2	

Spike Result (ug/sample)			#1375951(H2O2)
Parameter	Found Conc	TRUE Conc	Percent Recovery
Mercury	1.62	1.80	90

Philip Analytical Quality Assurance Protocol - IH
Ontario Hydro Method

Philip Report # 186391 Client ID Roy F. Weston

Method Blank Results (ug/sample)		
Parameter	Blank Conc	#1375951
Mercury	< 0.2	

Spike Result (ug/sample)			#1375973(H2O2)
Parameter	Found Conc	TRUE Conc	Percent Recovery
Mercury	1.94	2.20	88

Philip Analytical Quality Assurance Protocol - IH
Ontario Hydro Method

Philip Report # 186391 Client ID Roy F. Weston

Method Blank Results (ug/sample)		
Parameter	Blank Conc	#1375951
Mercury	< 0.2	

Spike Result (ug/sample)			#1375965(H2O2)
Parameter	Found Conc	TRUE Conc	Percent Recovery
Mercury	1.93	2.08	93

Philip Analytical Quality Assurance Protocol - IH
Ontario Hydro Method

Philip Report # 186391 Client ID Roy F. Weston

Method Blank Results (ug/sample)		
Parameter	Blank Conc	#1375949
Mercury	< 0.03	

Spike Result (ug/sample)			#1375940(HNO3)
Parameter	Found Conc	TRUE Conc	Percent Recovery
Mercury	2.35	2.47	95

Philip Analytical Quality Assurance Protocol - IH
Ontario Hydro Method

Philip Report # 186391 Client ID Roy F. Weston

Method Blank Results (ug/sample)		
Parameter	Blank Conc	#1375948
Mercury	< 0.2	

Spike Result (ug/sample)			#1375960(KCL)
Parameter	Found Conc	TRUE Conc	Percent Recovery
Mercury	1.90	1.96	97

Philip Analytical Quality Assurance Protocol - IH
Ontario Hydro Method

Philip Report # 186391 Client ID Roy F. Weston

Method Blank Results (ug/sample)		
Parameter	Blank Conc	#1375950
Mercury	< 0.09	

Spike Result (ug/sample)			#1375958(KMNO4)
Parameter	Found Conc	TRUE Conc	Percent Recovery
Mercury	1.25	1.35	93

Philip Analytical Quality Assurance Protocol - IH
Ontario Hydro Method

Philip Report # 186391 Client ID Roy F. Weston

Method Blank Results (ug/sample)	#1375954
Parameter	Blank Conc
Mercury	< 0.08

Spike Result (ug/sample)			#1375959(Ash)
Parameter	Found Conc	TRUE Conc	Percent Recovery
Mercury	3.00	3.22	93

Philip Analytical Quality Assurance Protocol - IH
Ontario Hydro Method

Philip Report # 186391 Client ID Roy F. Weston

Method Blank Results (ug/sample)	#1375949
Parameter	Blank Conc
Mercury	< 0.02

Spike Result (ug/sample)			#1375971(filter)
Parameter	Found Conc	TRUE Conc	Percent Recovery
Mercury	0.208	0.200	104

186391-01
* Client wants copy of all data.

Data Package Cover Sheet for Atomic Absorption Spectroscopy by Automated Cold Vapor Analysis

Date of Analysis: 9/30/99	Element: HG
Analyst: JH	Time of Analysis: 0845
Data Validated by: V. Overall 10/13/99	Instrument: Leeman PS 200

Calibration Standard Preparation Records

Preparation Record is in Notebook #	Date of Preparation
360-19-1 to 6	9/30/99

Quality Control Sample Preparation Records

Name	Preparation is in Notebook #	Date of Preparation
QCS/ICV	360-19-9	9/30/99
IPC/CCV	360-19-8	9/30/99

I Certify that all QA/QC results were acceptable and that there were no problems except as noted.

Jennifer L. Pais 10/4/99
Signature of Analyst and Date

Case Narratives for the Ontario Hydro Method for Determining Mercury:
The Mercury Analysis Was Performed 9/30/99:

1. Equation # 5 for the 0.1N HNO3 Probe Rinse is incorrect. The analyst called the author, on Oct 8, 1999, and confirmed her findings. There should be a dilution factor that takes into account for the acids and reagents that are added on top of the sample volume. All results are calculated with the corrected equation.
2. It was mentioned in the conversation with the method's author (on 10/8/99) that an analysis of the CCB and CCV should be performed every 5 samples. This is not present in the QC section of this method. The CCV and CCB were analyzed every 10 samples. After every 5 samples will be performed in the future.
3. The 0.1 N HNO3 Probe Rinse data from this analysis was used to calculate the Total Particle Bound Mercury. See pages # 342 and 343 on the 10/5/99 analysis for all calculations and reported data.

Analyst and Date: JHP 10/11/99

Validated BY and Date:
V. Oyell 10/13/99

$$\left[V_m \quad (L_1 \quad L_a)\theta_1 \quad \sum_{i=1}^{n} (L_i \quad L_a)\theta_i \quad (L_p \quad L_a)\theta_p \right]$$

where:

θ_i = sampling time interval, from the beginning of a run until the first component change, min

and substitute only for those leakage rates (L_i or L_p) that exceed L_a.

14.2 *Volume of Water Vapor*—Calculate the volume of water vapor of the stack gas using Equation 2.

$$V_{w(std)} = \frac{W_{lc} \; R \; T_{std}}{M_w \; P_{std}} = K_2 \; W_{lc} \qquad \text{[Eq. 2]}$$

where:

M_w = molecular weight of water, 18.0 g/g-mole (18.0 lb/lb-mole)
R = ideal gas constant, 0.008314 kPa-m^3/K-g-mole (21.85 in. Hg-ft^3/°R-lb-mole)
W_{lc} = total mass of liquid collected in impingers and silica gel (refer to Figure 2), g
$V_{w(std)}$ = volume of water vapor in the gas sample, corrected to standard conditions, scm (scf)
K_2 = 0.001336 m^3/mL (0.04707 ft^3/mL)

14.3 *Volume of Moisture* Calculate the moisture content, B_{ws}, of the stack gas using Equation 3.

$$B_{ws} = \frac{V_{w(std)}}{V_{m(std)} + V_{w(std)}} \qquad \text{[Eq. 3]}$$

where:

B_{ws} = water vapor in the gas stream, proportion by volume

15. Calculations for Particle-Bound, Oxidized, Elemental, and Total Mercury Concentrations:

15.1 *Particle-Bound Mercury*

15.1.1 *Case 1: Amount of Ash on the Filter is Greater Than 0.5 g* Calculate the concentration of mercury in µg/g in the ash sample (Hg_{ash}) using Equation 4:

$$Hg_{ash}, \mu g/g = (IR)(DF) \qquad \text{[Eq. 4]}$$

where:
IR = instrument reading, µg/L
DF = dilution factor = (total digested volume, L)/(mass of ash digested, g)

Calculate the amount of mercury in the probe rinse (Hg_{pr}, Container 2) in µg using Equation 5:

$$Hg_{pr}, \mu g = (IR)(V_1)(DF) \qquad \text{[Eq. 5]}$$

where:
IR = instrument reading, µg/L
V_1 = total volume of probe rinse sample from which sample aliquot was taken, L.
DF = Dilution factor

Calculate the amount of mercury on the sample filter blank (Hg_{fb}) in the same way using Equation 6.

$$Hg_{fb}, \mu g = (IR)(V_2) \qquad \text{[Eq. 6]}$$

where:
IR = instrument reading, µg/L
V_2 = total volume of sample filter blank digest, L

The total amount of particle-bound mercury (Hg_{tp}) is then determined using Equation 7:

$$Hg\ (particle), \mu g = (Hg_{ash})(W_{ash}) - Hg_{fb} + Hg_{pr} \qquad \text{[Eq. 7]}$$

where:
W_{ash} = the total mass of ash on filter, g

The concentration of particle-bound mercury (µg/dscm) in the gas stream is then determined using Equation 8:

$$Hg^{tp}, \mu g/dscm = Hg\ (particle)/V_{m(std)} \qquad \text{[Eq. 8]}$$

where:
$V_{m(std)}$ = is the total volume of dry gas sampled at standard (normal) conditions, dscm

15.1.2 *Case 2: Amount of Ash on the Filter is Less Than 0.5 g*—The calculation is the same as in Case 1 except the entire sample (ash and filter) is digested; therefore, DF in Equation 4 is defined only by the total digested volume. Equations 5-7 remain the same.

15.2 *Oxidized Mercury*

15.2.1 *KCl Solution (Impingers 1-3)*—Calculate the concentration of mercury in µg/L in the KCl impinger solutions using Equation 9:

$$Hg_{KCl}, \mu g/L = (IR)(DF) \qquad \text{[Eq. 9]}$$

the DF for 9/29/99 prep is 1.4.

where:

IR = instrument reading, µg/L

DF = dilution factor, $\frac{V_D + V(H_2SO_4) + V(HNO_3) + V(KMnO_4) + V(K_2S_2O_8) + V(NH_2OH)}{V_D}$

V_D = total digested volume, 10 mL

$V(H_2SO_4)$ = volume of added concentrated H_2SO_4, 0.5 mL

$V(HNO_3)$ = volume of added concentrated HNO_3, 0.5 mL

$V(KMnO_4)$ = volume of added 5%$^{W}/_{V}$ $KMnO_4$, 1.5 mL

$V(K_2S_2O_8)$ = volume of added 5%$^{W}/_{V}$ $K_2S_2O_4$, 0.75 mL

$V(NH_2OH)$ = volume of added 10%$^{W}/_{V}$ hydroxylamine sulfate, 1.0 mL

The amount of mercury in the KCl solution blank is calculated in the same way.

15.2.2 *Total Oxidized Mercury (Hg_O)*—is defined by method as the mercury measured in the KCl sample minus the mercury measured in the KCl solution blanks, as shown in Equation 10:

$$Hg_O, \mu g = (Hg_{KCl})(V_3) - (Hg_{Ob})(V_3) \qquad \text{[Eq. 10]}$$

where:

Hg_{KCl} = Mercury concentration measured in KCl aliquot, µg/L

V_3 = Total volume of aqueous KCl from which sample aliquot was taken, L

Hg_{Ob} = Mercury concentration measured in KCl solution blank aliquot, µg/L

The concentration of Hg^{2+} (µg/dscm) in the gas stream is then determined using Equation 11:

$$Hg^{2+}, \mu g/dscm = Hg_O/V_{m(std)} \qquad \text{[Eq. 11]}$$

where:

$V_{m(std)}$ is the total volume of dry gas sampled at standard conditions, dscm

15.3 *Elemental Mercury*

15.3.1 *HNO_3/H_2O_2 Solution (Impinger 4)* - Calculate the concentration of mercury in µg/L in the HNO_3/H_2O_2 impinger solution using Equation 12:

$$Hg_{H2O2}, \mu g/L = (IR)(DF) \qquad \text{[Eq. 12]}$$

where:

IR = instrument reading, µg/L

DF = dilution factor, $\frac{V_D + V(HCl) + V(H_2SO_4) + V(KMnO_4) + V(K_2S_2O_8) + V(NH_2OH)}{V_D}$

V_D = total digested volume, 5 mL

$$Hg_{KCl}, \mu g/L = (IR)(DF) \qquad \text{[Eq. 9]}$$

where:

IR = instrument reading, µg/L

DF = dilution factor, $\frac{V_D + V(H_2SO_4) + V(HNO_3) + V(KMnO_4) + V(K_2S_2O_8) + V(NH_2OH)}{V_D}$

V_D = total digested volume, 10 mL

$V(H_2SO_4)$ = volume of added concentrated H_2SO_4, 0.5 mL

$V(HNO_3)$ = volume of added concentrated HNO_3, 0.5 mL

$V(KMnO_4)$ = volume of added 5%$^{W}/_{V}$ $KMnO_4$, 1.5 mL

$V(K_2S_2O_8)$ = volume of added 5%$^{W}/_{V}$ $K_2S_2O_4$, 0.75 mL

$V(NH_2OH)$ = volume of added 10%$^{W}/_{V}$ hydroxylamine sulfate, 1.0 mL

The amount of mercury in the KCl solution blank is calculated in the same way.

15.2.2 *Total Oxidized Mercury (Hg_O)*—is defined by method as the mercury measured in the KCl sample minus the mercury measured in the KCl solution blanks, as shown in Equation 10:

$$Hg_O, \mu g = (Hg_{KCl})(V_3) - (Hg_{Ob})(V_3) \qquad \text{[Eq. 10]}$$

where:

Hg_{KCl} = Mercury concentration measured in KCl aliquot, µg/L

V_3 = Total volume of aqueous KCl from which sample aliquot was taken, L

Hg_{Ob} = Mercury concentration measured in KCl solution blank aliquot, µg/L

The concentration of Hg^{2+} (µg/dscm) in the gas stream is then determined using Equation 11:

$$Hg^{2+}, \mu g/dscm = Hg_O/V_{m(std)} \qquad \text{[Eq. 11]}$$

where:

$V_{m(std)}$ is the total volume of dry gas sampled at standard conditions, dscm

15.3 *Elemental Mercury*

15.3.1 *HNO_3–H_2O_2 Solution (Impinger 4)*—Calculate the concentration of mercury in µg/L in the HNO_3–H_2O_2 impinger solution using Equation 12:

$$Hg_{H2O2}, \mu g/L = (IR)(DF) \qquad \text{[Eq. 12]}$$

where:

IR = instrument reading, µg/L

DF = dilution factor, $\frac{V_D + V(HCl) + V(H_2SO_4) + V(KMnO_4) + V(K_2S_2O_8) + V(NH_2OH)}{V_D}$

V_D = total digested volume, 5 mL

$V(HCl)$ = volume of added concentrated HCl, 0.25 mL

$V(H_2SO_4)$ = volume of added concentrated H_2SO_4, 0.5 mL

$V(KMnO_4)$ = volume of added saturated $KMnO_4$, mL (volume need to turn sample to a purple color)

$V(K_2S_2O_8)$ = volume of added 5%$^{W}/_{V}$ $K_2S_2O_4$, 0.75 mL (if used)

$V(NH_2OH$ = volume of added 10%$^{W}/_{V}$ hydroxylamine sulfate, 1.0 mL

The amount of mercury in the HNO_3–H_2O_2 solution blank is calculated in the same way.

15.3.2 *H_2SO_4–$KMnO_4$ Solution (Impingers 5–7)*—Calculate the concentration of mercury in µg/L in the H_2SO_4–$KMnO_4$ impinger solutions using Equation 13:

$$\text{Mercury, } \mu g/L = (IR)(DF) \qquad \text{[Eq. 13]}$$

where:

DF = dilution factor, $\frac{V_D + V(HNO_3) + V(KMnO_4) + V(K_2S_2O_8) + V(NH_2OH)}{V_D}$

IR = instrument reading, µg/L

V_D = total digested volume, 5 mL

$V(HNO_3)$ = volume of added concentrated HNO_3, 0.5 mL

$V(KMnO_4)$ = volume of added saturated $KMnO_4$, mL (volume need to turn sample to a purple color)

$V(K_2S_2O_8)$ = volume of added 5%$^{W}/_{V}$ $K_2S_2O_4$, 0.75 mL

The concentration of mercury in the H_2SO_4–$KMnO_4$ solution blank is calculated in the same way.

15.3.3 *Total Elemental Mercury (Hg_E)*—is defined by method as the mercury measured in the H_2SO_4–$KMnO_4$ impingers plus the mercury in the HNO_3–H_2O_2 impingers minus the solution blanks as shown in Equation 14:

$$Hg_E, \mu g = (Hg_{H2O2})(V_4) - (Hg_{Eb1})(V_4) + (Hg_{KMnO4})(V_5) - (H_{Eb2})(V_5) \qquad \text{[Eq. 14]}$$

where:

Hg_{H2O2} = Mercury concentration measured in HNO_3–H_2O_2 aliquot, µg/L

V_4 = Total volume of aqueous HNO_3–H_2O_2 from which sample aliquot was taken, L

Hg_{Eb1} = Mercury concentration measured in HNO_3–H_2O_2 solution blank aliquot, µg/L

Hg_{KMnO4} = Mercury concentration measured in H_2SO_4–$KMnO_4$ aliquot, µg/L

V_5 = Total volume of aqueous H_2SO_4–$KMnO_4$ from which sample aliquot was taken, L

Hg_{Eb2} = Mercury concentration measured in H_2SO_4–$KMnO_4$ solution blank aliquot, µg/L

The concentration of Hg^{2+} (µg/dscm) in the gas stream is then determined using Equation 15:

$$Hg^0, \mu g/dscm = Hg_E/V_{m(std)} \qquad \text{[Eq. 15]}$$

where:
$V_{m(std)}$ is the total volume of dry gas sampled at standard conditions, dscm

15.4 *Total Mercury*—Is defined by the method as the sum of the particulate bound mercury, oxidized mercury, and elemental mercury as shown in Equation 16:

$$Hg(total), \mu g/dscm = Hg^{tp} + Hg^{2+} + Hg^{0} \qquad [Eq. 16]$$

16. Precision and Bias

16.1 *Precision*

16.1.1 Formal evaluation of the Ontario Hydro method was completed with dynamic spiking of Hg^0 and $HgCl_2$ into a flue gas stream.[9] The results are shown in Table 1. The relative standard deviation for gaseous elemental mercury and oxidized mercury was found to be less than 11% for mercury concentrations greater than 3 $\mu g/Nm^3$ and less than 34% for mercury concentrations less than 3 $\mu g/Nm^3$. In all cases, the laboratory bias for these tests based on a calculated correction factor was not statistically significant. These values were within the acceptable range, based on the criteria established in EPA Method 301 (% RSD less than 50%).

16.1.2 The precision of particle-bound, oxidized, and elemental mercury sampling method data is influenced by many factors: flue gas concentration, source, procedural, and equipment variables. Strict adherence to the method is necessary to reduce the effect of these variables. Failure to assure a leak-free system, failure to accurately calibrate all indicated system components, failure to select a proper sampling location, failure to thoroughly clean all glassware, and failure to follow prescribed sample recovery, preparation, and analysis procedures can seriously affect the precision of the results.

16.2 *Bias*

16.2.1 Gaseous mercury species in flue gases that are capable of interacting with fly ash particles collected in the front half of the sampling train can produce a positive particle-bound mercury bias.

16.2.2 Particle-bound mercury existing in the flue gas may vaporize after collection in the front half of the sampling train because of continued exposure to the flue gas sample stream and reduced pressures during the sampling period. Such vaporization would result in a negative particle-bound mercury bias.

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[9] EPRI. "Evaluation of Flue Gas Mercury Speciation Methods," EPRI TR-108988, Electric Power Research Institute, Palo Alto, CA, Dec. 1997.

Table 1

Results from Formal EPA Method 301 Evaluation Tests for the Ontario Hydro Method*

Ontario Hydro Method**	Total Vapor-Phase Mercury			Oxidized Mercury			Elemental Mercury		
	Mean, μg/Nm^3	Std. Dev.	RSD, %	Mean, μg/Nm^3	Std. Dev.	RSD, %	Mean, μg/Nm^3	Std. Dev.	RSD, %
Baseline	23.35	2.05	8.79	21.24	2.13	10.02	2.11	0.65	30.69
Hg^0 Spike (15.0 μg/Nm^3)	38.89	2.00	5.13	23.32	2.08	8.94	15.57	1.09	6.97
$HgCl_2$ Spike (19.9 μg/Nm^3)	42.88	2.67	6.23	40.22	2.87	7.14	2.66	0.89	33.31

* For each mean result, there were 12 replicate samples (four quadtrains)

** The correction factor in all cases was not statically significant and is not shown.

17. **Keywords**—Air toxics, mercury, sampling, speciation

DRAFT

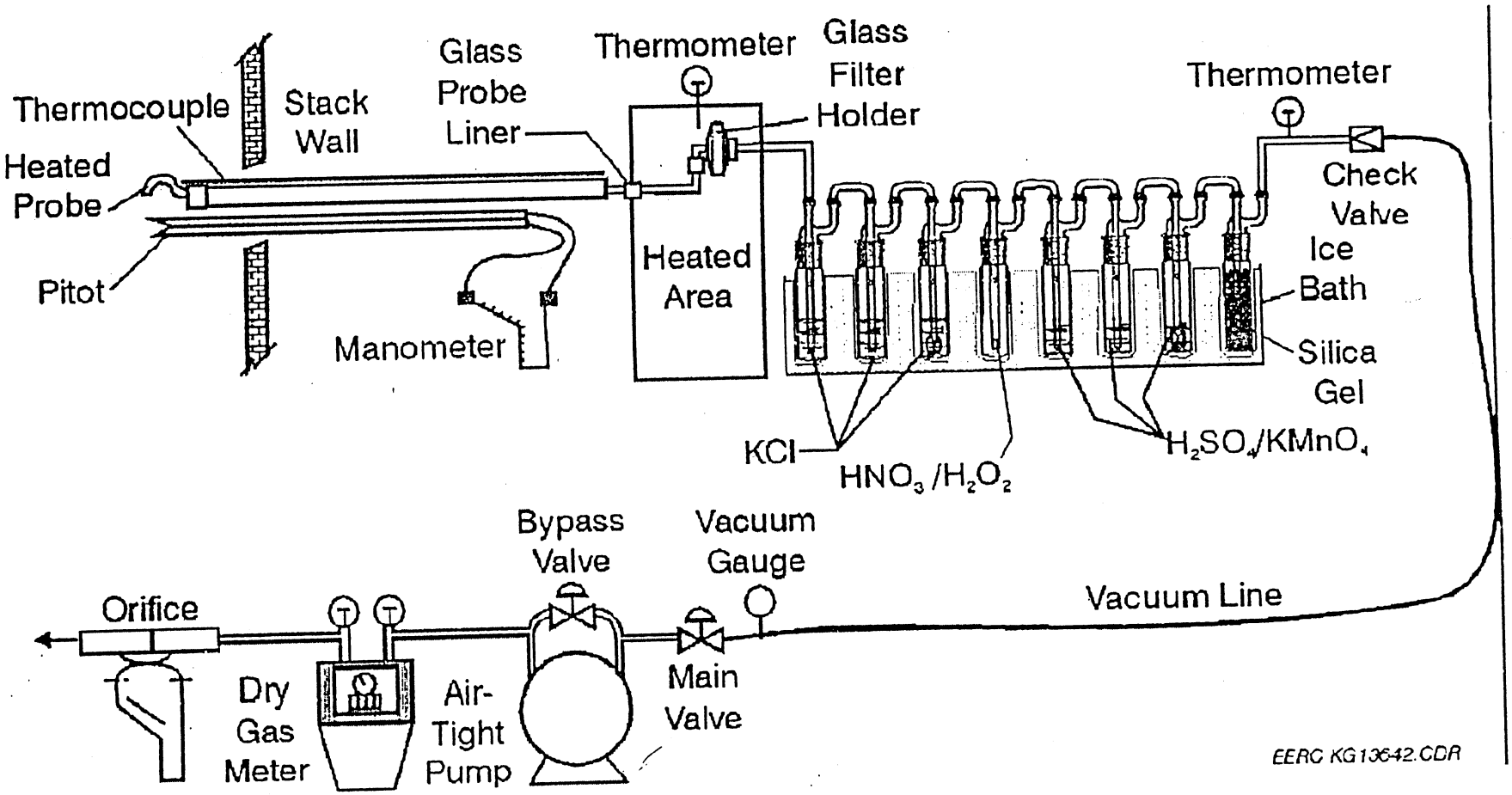
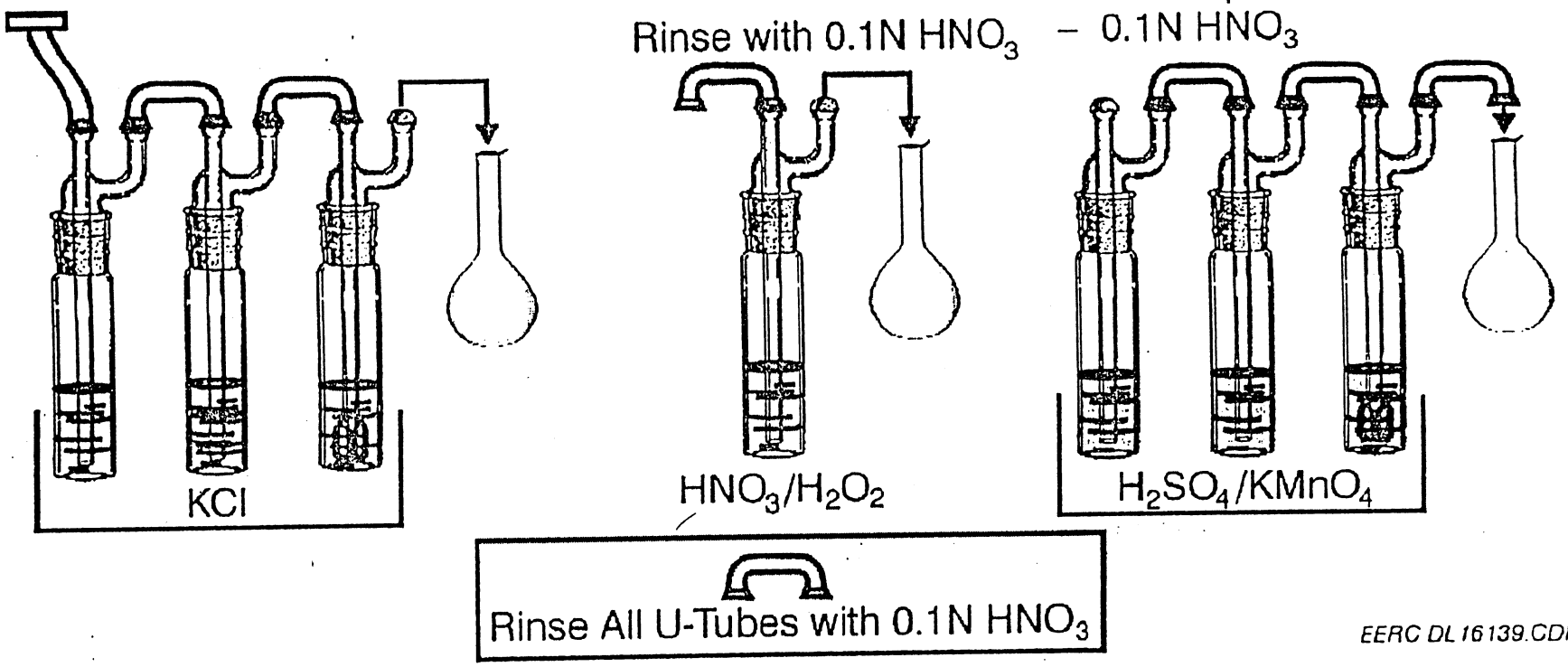


FIG. 1. Schematic of Mercury-Sampling Train in the Method 5 Configuration

DRAFT

1. Rinse filter holder and connector with 0.1N HNO_3.
2. Add 5% $^{w}/_{v}$ $KMnO_4$ to each impinger bottle until purple color remains.
3. Rinse with 10% $^{v}/_{v}$ HNO_3.
4. Rinse with a very small amount of 10% $^{w}/_{v}$ $NH_2OH{\cdot}H_2SO_4$ if brown residue remains.
5. Final rinse with 10% $^{v}/_{v}$ HNO_3.

Rinse Bottles Sparingly with
- 0.1N HNO_3
- 10% $^{w}/_{v}$ $NH_2OH{\cdot}H_2SO_4$
- 0.1N HNO_3



EERC DL 16139.CDR

FIG. 3. Sample Recovery Scheme for the Mercury-Sampling Train

Book #110

9/29/99

Ontario Hydro Method (9/1/99 Draft Method)

186391

Analyst, Start Date + Time	Sample ID.	Initial Sample volume (L)	Final volume acid digestate (L)	Total Digestate volume (ml)	Volume H_2SO_4 Added (ml)	Volume HNO_3 Added (ml)	Volume 5% $KMnO_4$ Added (ml)	Volume 5% $K_2S_2O_8$ Added (ml)	Volume 12% $K_2S_2O_8$ Added (ml)	Volume 0.1N KCl added (ml)	Total Chlor digested (g)	Comments
JKG 9/29/99 0130	(CW-IN-MS-2) 1375949 #7	0.120 L	—	—	—	—	—	—	—	—	—	0.1N KCL — No digestion required.
	(CW-IN-MS-1) 1375953 #11	0.100 L	—	—	—	—	—	—	—	—	—	
	1375952	0.100	—	—	—	—	—	—	—	—	—	
	(IN-S3) 1375948 (DUP)	Not required	0.500 L	30 ml	1.5	0.75	4.5	2.25	3.0 ml	—	—	0.1N KCL Perform Digestion Sec. 13.3.3
In 95°C water bath at 12:30. Out at 14:30	KCL Prep. (DE Lab Bench)		0.500							—	—	
	(IN-1) 1375932	(0.530)	0.530							—	—	
	(IN-2) 5941	(0.610)	0.610							—	—	
	(IN-3) 5945	(0.680)	0.680							—	—	
	(IN-4) 5960	(0.700)	0.700							—	—	
	(STK-4) 5936	(0.880)	0.880							—	—	
	(STK-2) 5964	(0.830)	0.830							—	—	
	(STK-3) 5968	(0.730)	0.730							—	—	
	(STK-4) 5976	0.760	0.760							—	—	
	(IN-BT) 5956	0.485	0.500							—	—	
	(STK-BT) 5972	0.460	0.500							—	—	
	0.1N HNO_3 1% H_2O_2 LRB (DE Lab)	—	—	30 ml	1.5	0.75	4.5	2.4	1.8	—	—	0.1N HNO_3, 1% H_2O_2 SW846 7470 method
	(IN-1) 1375931	0.750	—							—	—	
	(IN-2) 1375940	0.160	—							—	—	
	(IN-3) 5944	0.345	—							—	—	
	(IN-4) 5959	0.135	—							—	—	
	(STK-1) 5935	0.190	—							—	—	
	(STK-2) 5963	0.250	—							—	—	
	(STK-3) 5967	0.305	—							—	—	
	(STK-4) 5975	0.150	—							—	—	
	(IN-BT) 5955	0.110	—							—	—	
	(STK-BT) 5971	0.130	—							—	—	
Added equal volume of Lab water	In house reference 0.1N HNO_3 LFB - Prep. DI lab	—	—							—	—	
	LRB for HNO_3-H_2O_2		—	30 ml	1.5		4.5	4.5	3.0 ml	1.5	—	HNO_3-H_2O_2 Perform Section 13.3.4
	(IN-S0) 1375951 (DUP)	Not required 0.140	0.250	30 ml		—					—	
	(IN-1) 1375933	0.142				—					—	
	(IN-2) 5942	0.112				—					—	
	(IN-3) 5946	0.148				—					—	
	(IN-4) 5962	0.134				—					—	
	(STK-1) 5937	0.120				—					—	
	(STK-2) 5965	0.135				—					—	
	(STK-3) 5969	0.130				—					—	
	(STK-4) 5977	0.132				—					—	
	(IN-BT) 5957	0.134				—					—	
	(STK-BT) 5973	0.128				—					—	
Added equal volume of 10 ng/L Hg	In house reference LFB HNO_3-H_2O_2	—				—					—	

9/29/99 JKG

See pg 46

Hanna Additions for $KMnO_4$ perform 13.F

Book #118

186391 (continued)

Ontario Hydro Method (91.199 Draft)

9/24/99

Analyst, Date Time Started	Sample I.D.	Initial Sample Vol.* Received (L) o(g)	Final Volume Recd Portion was brought up to (L)*	Total Volume used for digestion (ml)	Volume conc. H_2SO_4 Added (ml)	Vol.* conc. HNO_3 (ml)	Vol.* 5% $KMnO_4$ (ml)	Vol.* 5% $K_2S_2O_8$ (ml)	Vol.* 12% Hydroxylamine (ml)	Volume KMnO4 rec'd (ml)	Wt of (g) Non-dig.	Comments
JHP 9/24/99 1145	For Hexavalent Digestion LRB-DI H_2O	—	0.250 l	10 ml	0.5 ml	—	5 x 0.5 ~~10 x 1.0~~ ~~20 x 0.5~~	1.5 ml	6 ml	0.5	—	Hexavalent Procedure section 13.3.4
	In house reference std LFB Added 2 ml of 1:10 dilution (JN-5B)	—				—			6 ml		—	
	1375951 (BLK)	0.140				—			3.0 ml		—	
	5933 (IN-1)	0.142				—					—	
	5942 (IN-2)	0.112				—					—	
	5946 (IN-3)	0.148				—					—	
	5962 (IN-4)	0.134				—					—	
	5937 (STK-1)	0.130				—	24.0				—	
	5965 (STK-2)	0.135				—	26.0				—	
	5969 (STK-3)	0.130				—	24.0				—	
	5977 (STK-4)	0.132				—					—	
	5957 (IN-BT)	0.134				—					—	
	5973 (STK-BT)	0.138				—	28.5					
JHP 9/24/99 Digest	For H_2SO_4 - Kanady Prep LRB-DI H_2O	—	0.500 l	30 ml	—	0.75	4.5	2.25	3.0	—	—	Hexavalent Kanady Prep section 13.3.5 Hg(6) Cu(7) Molybdenum Molybdenum blank
	In house reference std LFB	—	0.500 l		—					—	—	
	1375950 (BLK)	0.285	0.520 l		—					—	—	
	5939 (IN-1)	0.545	0.545 l		—					—	—	
	5943 (IN-2)	0.470	0.500 l		—					—	—	
	5947 (IN-3)	0.530	0.530 l		—					—	—	
	5961 (IN-4)	0.490	0.500 l		—					—	—	
	5938 (STK-1)	0.430	0.500 l		—					—	—	
	5966 (STK-2)	0.495	0.500 l		—					—	—	
	5970 (STK-3)	0.470			—		9.0			—	—	
	5978 (STK-4)	0.500			—		4.5			—	—	
	5958 (IN-BT)	0.460			—					—	—	
	5974 (STK-BT)	0.470			—					—	—	

$V(HCl)$ = volume of added concentrated HCl, 0.25 mL

$V(H_2SO_4)$ = **volume of added concentrated H_2SO_4, 0.5 mL**

$V(KMnO_4)$ = volume of added saturated $KMnO_4$, mL (volume need to turn sample to a purple color)

$V(K_2S_2O_8)$ = volume of added 5%$^{w}/_{v}$ $K_2S_2O_4$, 0.75 mL (if used)

$V(NH_2OH)$ = volume of added 10%$^{w}/_{v}$ hydroxylamine sulfate, 1.0 mL

The amount of mercury in the HNO_3-H_2O_2 solution blank is calculated in the same way.

15.3.2 *H_2SO_4-$KMnO_4$ Solution (Impingers 5-7)*--Calculate the concentration of mercury in µg/L in the H_2SO_4-$KMnO_4$ impinger solutions using Equation 13:

$$\text{Mercury, } \mu g/L = (IR)(DF) \qquad \text{[Eq. 13]}$$

where:

DF = dilution factor, $\frac{V_D + V(HNO_3) + V(KMnO_4) + V(K_2S_2O_8) + V(NH_2OH)}{V_D}$

IR = instrument reading, µg/L

V_D = total digested volume, 5 mL

$V(HNO_3)$ = volume of added concentrated HNO_3, 0.5 mL

$V(KMnO_4)$ = volume of added saturated $KMnO_4$, mL (volume need to turn sample to a purple color)

$V(K_2S_2O_8)$ = volume of added 5%$^{w}/_{v}$ $K_2S_2O_4$, 0.75 mL

The concentration of mercury in the H_2SO_4-$KMnO_4$ solution blank is calculated in the same way.

15.3.3 *Total Elemental Mercury (Hg_E)*---is defined by method as the mercury measured in the H_2SO_4-$KMnO_4$ impingers plus the mercury in the HNO_3-H_2O_2 impingers minus the solution blanks as shown in Equation 14:

$$Hg_E, \mu g = (Hg_{H2O2})(V_4) - (Hg_{Eb1})(V_4) + (Hg_{KMnO4})(V_5) - (Hg_{Eb2})(V_5) \qquad \text{[Eq. 14]}$$

where:

Hg_{H2O2} = Mercury concentration measured in HNO_3-H_2O_2 aliquot, µg/L

V_4 = Total volume of aqueous HNO_3-H_2O_2 from which sample aliquot was taken, L

Hg_{Eb1} = Mercury concentration measured in HNO_3-H_2O_2 solution blank aliquot, µg/L

Hg_{KMnO4} = Mercury concentration measured in H_2SO_4-$KMnO_4$ aliquot, µg/L

V_5 = Total volume of aqueous H_2SO_4-$KMnO_4$ from which sample aliquot was taken, L

Hg_{Eb2} = Mercury concentration measured in H_2SO_4-$KMnO_4$ solution blank aliquot, µg/L

The concentration of Hg^0 (µg/dscm) in the gas stream is then determined using Equation 15:

$$Hg^0, \mu g/dscm = Hg_E/V_{m(std)} \qquad \text{[Eq. 15]}$$

where:
$V_{m(std)}$ is the total volume of dry gas sampled at standard conditions, dscm

15.4 *Total Mercury* Is defined by the method as the sum of the particulate bound mercury, oxidized mercury, and elemental mercury as shown in Equation 16:

$$Hg(total),\ \mu g/dscm = Hg^{(p)} + Hg^{2+} + Hg^{0} \qquad \text{[Eq. 16]}$$

16. Precision and Bias

16.1 *Precision*

16.1.1 Formal evaluation of the Ontario Hydro method was completed with dynamic spiking of Hg^0 and $HgCl_2$ into a flue gas stream.[9] The results are shown in Table 1. The relative standard deviation for gaseous elemental mercury and oxidized mercury was found to be less than 11% for mercury concentrations greater than 3 µg/Nm^3 and less than 34% for mercury concentrations less than 3 µg/Nm^3. In all cases, the laboratory bias for these tests based on a calculated correction factor was not statistically significant. These values were within the acceptable range, based on the criteria established in EPA Method 301 (% RSD less than 50%).

16.1.2 The precision of particle-bound, oxidized, and elemental mercury sampling method data is influenced by many factors: flue gas concentration, source, procedural, and equipment variables. Strict adherence to the method is necessary to reduce the effect of these variables. Failure to assure a leak-free system, failure to accurately calibrate all indicated system components, failure to select a proper sampling location, failure to thoroughly clean all glassware, and failure to follow prescribed sample recovery, preparation, and analysis procedures can seriously affect the precision of the results.

16.2 *Bias*

16.2.1 Gaseous mercury species in flue gases that are capable of interacting with fly ash particles collected in the front half of the sampling train can produce a positive particle-bound mercury bias.

16.2.2 Particle-bound mercury existing in the flue gas may vaporize after collection in the front half of the sampling train because of continued exposure to the flue gas sample stream and reduced pressures during the sampling period. Such vaporization would result in a negative particle-bound mercury bias.

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[9] EPRI, "Evaluation of Flue Gas Mercury Speciation Methods," EPRI TR-108988, Electric Power Research Institute, Palo Alto, CA, Dec. 1997.

Reagents, QC, Standards Preparation Log # 360

Date/Time	Initials	Exp. Date	Solution	Vol/Wt of Reagents #	Vol/Wt of Reagents Units	Reagent SSM ID #	Reagent SSM ID # Conc.	Final Volume #	Final Volume Units	Dilution Matrix	Remarks
9/23/99 0835	SMW	9/24/99	ICV/QCS 5.0 ug/l	500	ul	360-17-19	1.00 mg/l	100	ml		
			ICB/CCB	—	—	—	—				
			Cal Blk	—	—	—	—				
9/29/99 0900	JHP	9/28/99	1.00 mg/l Hg stock std	100	ul	Hg-9951185019	1000 mg/l	100	ml	0.15% HNO_3	
			1.00 mg/l Hg QCS stock			Hg-99512300/	1000 mg/l				
			Cal Blk	—	—	—	—	50	ml	2.5 ml HNO_3 + 2.5 ml HCl	
			0.20 ug/l Hg std	10	ul	360-18-4	1.00 mg/l				
			0.50	25							
			1.00	50							
			2.00	100							
			5.00	250							
			IPC/CCV Hg 2.0 ug/l	100							
			ICV/QCS Hg 3.0 ug/l	150		360-18-5					
9/29/99 1055	JHP	—	Cal Blk	—	—	—	—	100	ml	Digest w/samples	
		—	0.50 ug/l Hg Std	50	ul	9/30/99 360-18-4	1.00 mg/l				
		—	1.00	100							
		—	2.00	200							
		—	5.00	500							
		—	10.0	1000							
		—	ICB/CCB	—	—	—					
		—	IPC/CCV 5.0 ug/l	500	ul	360-18-5					
		—	QCS/ICV 5.0 ug/l	500		360-18-5					
9/29/99 1220	JHP	9/30/99 1220	1.00 mg/l Hg Stock std	100	ul	Hg-9951185019	1000 mg/l	100	ml	0.15% HNO_3	
			1.00 mg/l Hg QCS stock std.			Hg-99512300/					
9/30/99 0815	JHP		Cal Blk 70 9/30/99								

Reagents, QC, Standards Preparation Log #360

Date/Time	Initials	Exp. Date	Solution	Vol/Wt of Reagents #	Vol/Wt of Reagents Units	Reagent SSM ID #	Reagent SSM ID # Conc.	Final Volume #	Final Volume Units	Dilution Matrix	Remarks
1) 9/30/99 OECS	JAP		Cal Blk	—	—	—	—	100	ml	10% HCl	Ontario Hydro method (9/1/99) Draft
2)			0.20 ug/l Hg Std	20	ul	360-18-23	1.00 mg/l Hg				
3)			0.50	50							
4)			2.00	200							
5)			5.00	500							
6)			10.0	1000							
7)			ICB/CCB	—	—	—	—				
8)			IPC/CCV 5.00 ug/l Hg	500	ul	360-18-23	1.00 mg/l				
9)			QCS/ICV 5.00 ug/l Hg	500		360-18-24					
10)											
11)											
12)											
13)											
14)											
15)											
16)											
17)											
18)											
19)											
20)											
21)											
22)											
23)											
24)											
25)											

Lab Tracking Number

Chain-of-Custody Record/Lab Work Request

WESTON.

on hold - others

Client	BIRCHWOOD POWER, King George VA		
Work Order Number	12255-001-001	Phone Number	610-701-7201
Contact Person	Jeff ONeill	Turn Around Tim	Standard

Analyses Requested/Other Info

Lab ID	Field Sample ID	Sample Collection Date	Analysis	Hold		Time #	Sample Check-off
	BP - BH - IN - 1 - OHM - 13SEP1999 - FHHNO3	9/14/99	OHM	X			✓
	BP - BH - IN - 1 - OHM - 13SEP1999 - FILT		OHM	X		2,3,4,5	✓
	BP - BH - IN - 1 - OHM - 13SEP1999 - BHKCL		OHM	X			✓
	BP - BH - IN - 1 - OHM - 13SEP1999 - BHHNO3		OHM	X			✓
	BP - BH - IN - 1 - OHM - 13SEP1999 - BHKMNO4		OHM	X			✓
	BP - BH - IN - 2 - OHM - 13SEP1999 - FHHNO3	9/15/99	OHM				✓
	BP - BH - IN - 2 - OHM - 13SEP1999 - FILT		OHM			7	✓
	BP - BH - IN - 2 - OHM - 13SEP1999 - BHKCL		OHM				✓
	BP - BH - IN - 2 - OHM - 13SEP1999 - BHHNO3		OHM				✓
	BP - BH - IN - 2 - OHM - 13SEP1999 - BHKMNO4		OHM				✓
	BP - BH - IN - 3 - OHM - 13SEP1999 - FHHNO3		OHM				✓
	BP - BH - IN - 3 - OHM - 13SEP1999 - FILT		OHM			10, 8	✓
	BP - BH - IN - 3 - OHM - 13SEP1999 - BHKCL		OHM				✓
	BP - BH - IN - 3 - OHM - 13SEP1999 - BHHNO3		OHM				✓
	BP - BH - IN - 3 - OHM - 13SEP1999 - BHKMNO4		OHM				✓
	BP - BH - IN - SB - OHM - 13SEP1999 - KCl		OHM				✓
	BP - BH - IN - SB - OHM - 13SEP1999 - FILT		OHM			(3,4,3)	✓
	BP - BH - IN - SB - OHM - 13SEP1999 - KMNO4		OHM				✓
	BP - BH - IN - SB - OHM - 13SEP1999 - HNO3/H2O2		OHM				✓
	BP - BH - IN - SB - OHM - 13SEP1999 - HNO3 (0.1N)		OHM				✓
	BP - BH - IN - BT - OHM - 13SEP1999 - FHHNO3		OHM				✓
	BP - BH - IN - BT - OHM - 13SEP1999 - FILT		OHM			13	✓
	BP - BH - IN - BT - OHM - 13SEP1999 - BHKCL		OHM				✓
	BP - BH - IN - BT - OHM - 13SEP1999 - BHHNO3		OHM				✓
	BP - BH - IN - BT - OHM - 13SEP1999 - BHKMNO4		OHM				✓
		9/15/99					
	BP-BH-IN-4-OHM-13Sept1999-FHHNO3		OHM				✓
	BP-BH-IN-4-OHM-13Sept1999-FILT		OHM			17	✓
	BP-BH-IN-4-OHM-13Sept1999-BHKCL		OHM				✓
	BP-BH-IN-4-OHM-13Sept1999-BHKMNO4		OHM				✓
	BP-BH-IN-4-OHM-13Sept1999-BHHNO3		OHM				✓
	BP-BH-IN-SB-OHM-13Sept1999-10% HNO3		OHM				✓
	BP-BH-IN-SB-OHM-13Sept1999-10% Hydroxylamine sulfate						✓

Notes: OHM - Speciated Mercury Analysis per Ontario Hydro Method

Relinquished By	Received By	Date	Time	Lab Use Only	
[illegible]	[illegible]	9.20.99	11:15	Shipper Courier	Air Bill #
	[illegible]	9.20.99	1430	Opened By [illegible]	Date/Time
				Temp °C 23	Conditio
				Custody Seals: Yes No None (N/A)	

Laboratory Comments:

Copyright Roy F Weston In

Lab Tracking Number

Chain-of-Custody Record/Lab Work Request

WESTON

Client	BIRCHWOOD POWER, King George VA		
Work Order Number	12255-001-001	Phone Number	610-701-7201
Contact Person	Jeff ONeill	Turn Around Tim	Standard

Oil Gold →
Other →

Lab ID	Field Sample ID	Sample Collection Date	Analysis	HLD		Thimble #	Sample Check-off
	BP - BH - STK - 1 - OHM - 13SEP1999 - FHHNO3	9/14/99	OHM	X			
	BP - BH - STK - 1 - OHM - 13SEP1999 - FILT		OHM	X			
	BP - BH - STK - 1 - OHM - 13SEP1999 - BHKCL		OHM	X			
	BP - BH - STK - 1 - OHM - 13SEP1999 - BHHNO3		OHM	X			
	BP - BH - STK - 1 - OHM - 13SEP1999 - BHKMNO4		OHM	X			
	BP - BH - STK - 2 - OHM - 13SEP1999 - FHHNO3	9/15/99	OHM				
	BP - BH - STK - 2 - OHM - 13SEP1999 - FILT		OHM				
	BP - BH - STK - 2 - OHM - 13SEP1999 - BHKCL		OHM				
	BP - BH - STK - 2 - OHM - 13SEP1999 - BHHNO3		OHM				
	BP - BH - STK - 2 - OHM - 13SEP1999 - BHKMNO4		OHM				
	BP - BH - STK - 3 - OHM - 13SEP1999 - FHHNO3		OHM				
	BP - BH - STK - 3 - OHM - 13SEP1999 - FILT		OHM				
	BP - BH - STK - 3 - OHM - 13SEP1999 - BHKCL		OHM				
	BP - BH - STK - 3 - OHM - 13SEP1999 - BHHNO3		OHM				
	BP - BH - STK - 3 - OHM - 13SEP1999 - BHKMNO4		OHM				
	~~BP - BH - STK - SB - OHM - 13SEP1999 - KCl~~		~~OHM~~				
	~~BP - BH - STK - SB - OHM - 13SEP1999 - FILT~~		~~OHM~~				
	~~BP - BH - STK - SB - OHM - 13SEP1999 - KMNO4~~		~~OHM~~				
	~~BP - BH - STK - SB - OHM - 13SEP1999 - HNO3/H2O~~		~~OHM~~				
	~~BP - BH - STK - SB - OHM - 13SEP1999 - HNO3~~		~~OHM~~				
	~~BP - BH - STK - BT - OHM - 13SEP1999 - FHHNO3~~		~~OHM~~				
	BP - BH - STK - BT - OHM - 13SEP1999 - FILT	9/15/99	OHM				
	BP - BH - STK - BT - OHM - 13SEP1999 - BHKCL		OHM				
	BP - BH - STK - BT - OHM - 13SEP1999 - BHHNO3		OHM				
	BP - BH - STK - BT - OHM - 13SEP1999 - BHKMNO4		OHM				
	BP-BH-STK-BT-OHM-13Sept1999-FHHNO3						
	BP-BH-STK-4-OHM-13Sept1999-FHHNO3		OHM				
	BP-BH-STK-4-OHM-13Sept1999-FILT		OHM				
	BP-BH-STK-4-OHM-13Sept1999-BHKCL		OHM				
	BP-BH-STK-4-OHM-13Sept1999-BHKMNO4		OHM				
	BP-BH-STK-4-OHM-13Sept1999-BHHNO3		OHM				
	BP-BH-in-SB-OHM-13Sept1999-Thimble 1		OHM			15	
	BP-BH-in-SB-OHM-13Sept1999-Thimble 2		OHM			16	
	BP-BH-in-SB-OHM-13Sept1999-Thimble 3		OHM			18	

Notes: OHM - Speciated Mercury Analysis per Ontario Hydro Method

Relinquished By	Received By	Date	Time	Lab Use Only	
[illegible]	[illegible]	9-20-99	11:18	Shipper Courier	Air Bill #
	[illegible]	9-20-99	1430	Opened By [illegible]	Date/Time
				Temp °C 23	Conditio
				Custody Seals: Yes No None N/A	

Laboratory Comments:

Copyright Roy F Weston Inc J

```
RunProt: ontario
RunFold: 093099HG Seq: 16   Batch:
                  Prnt: R/T On
                  Rev: 4.0    08:42:23 30 Sep 1999 Xmit: Off  Gas:    0.30 LPM
  Idle                                             User:             A/S: On
```

AUTOSAMPLER: Rack entry Rack RACK#1

cup	ID	Extended id	Weight	Volume	Macro
1	QCS/ICV	5.00UG/L 9/29	1.0000	1.0000	
2	1375949	0.1N HNO3 BLK	1.0000	1.0000	
3	1375953	10% HYDROX. BLK	1.0000	1.0000	
4	1375952	10% HNO3 BLK	1.0000	1.0000	
5	LRB KCL	9/29 KCL PREP	1.0000	1.0000	
6	~~LFB KCL~~	~~2.00 UG/L 9/29~~	1.0000	1.0000	
7	1375948	BLK	1.0000	1.0000	
8	1375932		1.0000	1.0000	
9	1375941		1.0000	1.0000	
10	1375945		1.0000	1.0000	
11	1375960		1.0000	1.0000	
12	1375960		1.0000	1.0000	
13	1375960	PS 2.00 UG/L	1.0000	1.0000	
14	1375936		1.0000	1.0000	
15	1375964		1.0000	1.0000	

PgDn

```
Cup 1  extended ID: 5.00UG/L 9/29                Cell entry down Ins to switch
```

```
RunProt: ontario
RunFold: 093099HG Seq: 16   Batch:
                  Prnt: R/T On
                  Rev: 4.0    08:42:24 30 Sep 1999 Xmit: Off  Gas:    0.30 LPM
  Idle                                             User:              A/S: On
```

AUTOSAMPLER: Rack entry Rack RACK#1 PgUp

cup	ID	Extended id	Weight	Volume	Macro
16	1375968		1.0000	1.0000	
17	1375976		1.0000	1.0000	
18	1375956		1.0000	1.0000	
19	1375972		1.0000	1.0000	
20	LRB HNO3	0.1N HNO3 PREP 9/29	1.0000	1.0000	
21	LFB HNO3	0.1N HNO3 2 UG/L	1.0000	1.0000	
22	1375931		1.0000	1.0000	
23	1375940		1.0000	1.0000	
24	1375940		1.0000	1.0000	
25	1375940	PS 2.00 UG/L	1.0000	1.0000	
26	1375944		1.0000	1.0000	
27	1375959		1.0000	1.0000	
28	1375935		1.0000	1.0000	
29	1375963		1.0000	1.0000	
30	1375967		1.0000	1.0000	

PgDn

```
Cup 16 extended ID:                          Cell entry down Ins to switch
```

```
RunProt: ontario
RunFold: 093099HG Seq: 16   Batch:
                  Prnt: R/T On
                  Rev: 4.0    08:42:25 30 Sep 1999 Xmit: Off  Gas:    0.30 LPM
  Idle                                              User:             A/S: On
```

AUTOSAMPLER: Rack entry Rack RACK#1 PgUp

cup	ID	Extended id	Weight	Volume	Macro
31	1375975		1.0000	1.0000	
32	1375955		1.0000	1.0000	
33	1375971		1.0000	1.0000	
34	LRB H2O2	HNO3-H2O2 PREP 9/29	1.0000	1.0000	
35	LFB H2O2	2.0 UG/L 9/29	1.0000	1.0000	
36	1375951	BLK	1.0000	1.0000	
37	1375951		1.0000	1.0000	
38	1375951	PS 2.00 UG/L	1.0000	1.0000	
39	1375933		1.0000	1.0000	
40	1375942		1.0000	1.0000	
41	1375946		1.0000	1.0000	
42	1375962		1.0000	1.0000	
43	1375937		1.0000	1.0000	
44	1375965		1.0000	1.0000	

PgDn

```
Cup 31 extended ID:                          Cell entry down Ins to switch
```

```
RunProt: ontario
RunFold: 093099HG Seq: 223  Batch:
                  Prnt: R/T On
                  Rev: 4.0    17:21:46 30 Sep 1999 Xmit: Off  Gas:    0.30 LPM
  Idle                                             User:              A/S: On
```

```
 AUTOSAMPLER:  Rack entry   Rack RACK#2   Range  1-44 Clear seQ Undo eXit
cup ID         Extended id          Weight Volume Macro
 1 1375969                          1.00000 1.00000
 2 1375977                          1.00000 1.00000
 3 1375957                          1.00000 1.00000
 4 1375973                          1.00000 1.00000
 5 1375973                          1.00000 1.00000
 6 1375973     PS 2.00 UG/L         1.00000 1.00000
 7 LRB KMN03   9/29                 1.00000 1.00000
 8 LFB KMN03   2.00 UG/L 9/29       1.00000 1.00000
 9 1375950                          1.00000 1.00000
10 1375934                          1.00000 1.00000
11 1375943                          1.00000 1.00000
12 1375947                          1.00000 1.00000
13 1375961                          1.00000 1.00000
14 1375938                          1.00000 1.00000
15 1375966                          1.00000 1.00000
                                                                    PgDn
```

```
                                          Full column entry Ins to switch
For help on <hotkey> press Shift <hotkey>
```

```
RunProt: ontario
RunFold: 093099HG Seq: 223  Batch:
                  Prnt: R/T On
                  Rev: 4.0    17:21:47 30 Sep 1999 Xmit: Off  Gas:    0.30 LPM
  Idle                                             User:              A/S: On
```

AUTOSAMPLER: Rack entry Rack RACK#2 Range 1-44 Clear seQ Undo eXit PgUp

cup	ID	Extended id	Weight	Volume	Macro
16	1375970		1.0000	1.0000	
17	1375978		1.0000	1.0000	
18	1375958		1.0000	1.0000	
19	1375958		1.0000	1.0000	
20	1375958	PS 2.00 UG/L	1.0000	1.0000	
21	1375974		1.0000	1.0000	
22	1375940	0.1N HNO3 1:5 DIL	1.0000	1.0000	
23	1375940 PS	0.1N HNO3 1:5 DIL	1.0000	1.0000	
24	1375959	0.1N HNO3 1:10 DIL	1.0000	1.0000	
25	1375933	HNO3-H2O2	1.0000	1.0000	
26	1375942	HNO3-H2O2	1.0000	1.0000	
27	1375946	HNO3-H2O2	1.0000	1.0000	
28	1375962	HNO3-H2O2	1.0000	1.0000	
29	1375937	HNO3-H2O2	1.0000	1.0000	
30	1375965	HNO3-H2O2	1.0000	1.0000	

PgDn

Full column entry Ins to switch

```
RunProt: ontario
RunFold: 093099HG Seq: 223  Batch:
                  Prnt: R/T On
                  Rev: 4.0    17:21:48 30 Sep 1999 Xmit: Off  Gas:    0.30 LPM
  Idle                                             User:             A/S: On
```

```
 AUTOSAMPLER:  Rack entry   Rack RACK#2   Range  1-44 Clear seQ Undo eXit   PgUp
cup ID        Extended id          Weight Volume Macro
31 1375965    HNO3+H2O2            1.0000 1.0000
32 1375965    PS  HNO3+H2O2        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
```

```
                                        Full column entry Ins to switch
```

```
RunProt: ontario
RunFold: 093099HG Seq: 0    Batch:
                  Prnt: R/T On
                  Rev: 4.0    07:58:01 30 Sep 1999 Xmit: Off  Gas:    0.30 LPM
  Idle                                             User:              A/S: On
```

INSTRUMENT: Scheduled Maintenance

		Uses left	Last service	Next service
replace:	Pump tubing	600	30-Sep-99	10-Oct-99
	Waste drain tubing	2225	24-Sep-99	08-Sep-00
	Liquid/gas separator	3970	07-Sep-99	11-Oct-00
	puMp head	10000	N/A	N/A
	Hg lamp	N/A	30-Aug-99	27-Jan-00
	Reductant bottle	400	30-Sep-99	28-Mar-00
	prOcess tubing	3970	N/A	N/A
Clean optical cell		600	N/A	N/A

* - needs maintenance

```
For help on <hotkey> press Shift <hotkey>
```

```
RunProt: ontario
RunFold: 093099HG Seq: 0    Batch:
                  Prnt: R/T On
                  Rev: 4.0    07:57:53 30 Sep 1999 Xmit: Off  Gas:    0.30 LPM
  Idle                                             User:              A/S: On
```

```
UTILITY:  Diagnostics  Tip X      0 1   99
Aper test              Tip Y      0 1    1
Test optic             Tip Z     95 1    6
Tip home               Gas      356
Out port                                        Smpl. intensity    1333619 } <10%di
In port                                         Ref. intensity     1340945 }
Run pcode
Cal A/S
```

```
Sensors on soLenoid Enter for test Ins for motor More tests
Pcode halt 0     @ 142
```

```
RunProt: ontario
RunFold: 093099HG Seq: 0    Batch:
                  Prnt: R/T On
                  Rev: 4.0    07:57:47 30 Sep 1999 Xmit: Off  Gas:    0.30 LPM
  Idle                                             User:              A/S: On
```

```
UTILITY:  Diagnostics  Tip X      0 1   99
Aper test              Tip Y      0 1    1
Test optic             Tip Z     95 1    6
Tip home               Gas      356
Out port
In port
Run pcode
Cal A/S
```

aperture 3

acceptable Range = -100 to +100

```
Sensors on soLenoid Enter for test Ins for motor More tests
Pcode halt 0     @ 344
```

Folder: 093099HG
08:45:19 30 Sep 1999 Protocol: ontario

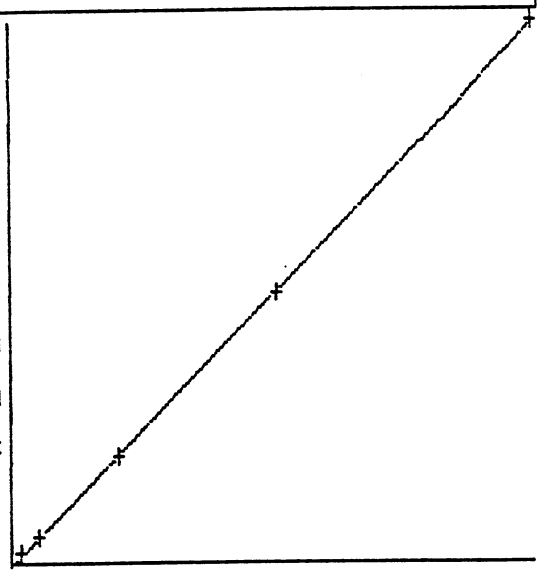
Line	Conc.	Units	SD/RSD	1	2	3	4	5
*** Standard: 1 Rep: 1				Seq:	16	08:45:19 30 Sep 1999 HG		
Hg	.000	ug/l	-520					
*** Standard: 1 Rep: 2				Seq:	17	08:47:27 30 Sep 1999 HG		
Hg	.000	ug/l	-375					
*** Standard: 2 Rep: 1				Seq:	18	08:49:36 30 Sep 1999 HG		
Hg	.200	ug/l	19751					
*** Standard: 2 Rep: 2				Seq:	19	08:51:47 30 Sep 1999 HG		
Hg	.200	ug/l	19629					
*** Standard: 3 Rep: 1				Seq:	20	08:53:56 30 Sep 1999 HG		
Hg	.500	ug/l	50159					
*** Standard: 3 Rep: 2				Seq:	21	08:56:07 30 Sep 1999 HG		
Hg	.500	ug/l	50016					
*** Standard: 4 Rep: 1				Seq:	22	08:58:16 30 Sep 1999 HG		
Hg	2.00	ug/l	198530					
*** Standard: 4 Rep: 2				Seq:	23	09:00:29 30 Sep 1999 HG		
Hg	2.00	ug/l	198583					
*** Standard: 5 Rep: 1				Seq:	24	09:02:42 30 Sep 1999 HG		
Hg	5.00	ug/l	492713					
*** Standard: 5 Rep: 2				Seq:	25	09:05:07 30 Sep 1999 HG		
Hg	5.00	ug/l	488755					
*** Standard: 6 Rep: 1				Seq:	26	09:07:31 30 Sep 1999 HG		
Hg	10.0	ug/l	962453					
*** Standard: 6 Rep: 2				Seq:	27	09:10:05 30 Sep 1999 HG		
Hg	10.0	ug/l	960179					

RunProt: ontario
RunFold: 093099HG Seq: 28 Batch:
Prnt: R/T On
Rev: 4.0 09:12:49 30 Sep 1999 Xmit: Off Gas: 0.30 LPM
Idle User: A/S: On

CALIBRATION: Line proto: ontario

	Hg Conc.	Calc.	Dev.	Accepted ->linear	
S1	.000	-.032	-.032	Quadratic	
S2	.200	.177	-.023	Wtdlinear	
S3	.500	.493	-.007		C
S4	2.00	2.03	.035	Accept	o
S5	5.00	5.07	.070		n
S6	10.0	9.96	-.042		c

A .0000000 r .999939
B 1.03874e-5 C -2.76202e-2



	Mean	%RSD		Relative Absorbance
S1	-447	-22.91	-520	-375
S2	19690	0.44	19751	19629
S3	50007	0.2	50159	50016
S4	198556	0.02	198530	198583
S5	490734	0.57	492713	488755
S6	961316	0.17	962453	960179

New cal coefficients stored

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

*** Check Standard: 4 Ck4IPC/CCV Seq: 28 09:15:34 30 Sep 1999 HG

Line	Flag	%Rcv.	Found	True	Units	SD/RSD
Hg		104.	5.18	5.00	ug/l	.000

$\bar{x}$ = 5.18 ug/l 104 %

*** Check Standard: 3 Ck3IPC/CCV Seq: 29 09:17:53 30 Sep 1999 HG

Line	Flag	%Rcv.	Found	True	Units	SD/RSD
Hg		103.	5.17	5.00	ug/l	.000

*** Check Standard: 2 Ck2ICB/CCB Seq: 30 09:20:13 30 Sep 1999 HG

Line	Flag	%Rcv.	Found	True	Units	SD/RSD
Hg		-37300	-.037	.000	ug/l	.000

$\bar{x}$ = <0.2 ug/l

*** Check Standard: 1 Ck1ICB/CCB Seq: 31 09:22:19 30 Sep 1999 HG

Line	Flag	Found	Range(+/-)	Units	SD/RSD
Hg		-.025	.200	ug/l	.000

*** Sample ID: QCS/ICV Seq: 32 09:24:25 30 Sep 1999 HG

5.00UG/L 9/29

Hg 5.10 ug/l .000 5.10 $\bar{x}$ = 5.03 ug/l 101%R

*** Sample ID: QCS/ICV Seq: 33 09:26:40 30 Sep 1999 HG

5.00UG/L 9/29

Hg 4.96 ug/l .000 4.96

*** Sample ID: 1375949 Seq: 34 09:28:58 30 Sep 1999 HG

0.1N HNO3 BLK

Hg -.034 ug/l .000 -.034 $\bar{x}$ = <0.2 ug/l x 0.120 l = <0.03 ug

*** Sample ID: 1375949 Seq: 35 09:31:02 30 Sep 1999 HG

0.1N HNO3 BLK

Hg -.030 ug/l .000 -.030

*** Sample ID: 1375953 Seq: 36 09:33:06 30 Sep 1999 HG

10% HYDROX. BLK

Hg -.027 ug/l .000 -.027 $\bar{x}$ = <0.2 ug/l x 0.100 l = <0.02 ug

*** Sample ID: 1375953 Seq: 37 09:35:11 30 Sep 1999 HG

10% HYDROX. BLK

Hg -.028 ug/l .000 -.028

*** Sample ID: 1375952 Seq: 38 09:37:15 30 Sep 1999 HG

10% HNO3 BLK

Hg -.030 ug/l .000 -.030 $\bar{x}$ = <0.2 ug/l x 0.100 l = <0.02 ug ~~x 0.100 l = <0.02 ug~~ 9/15

*** Sample ID: 1375952 Seq: 39 09:39:19 30 Sep 1999 HG

10% HNO3 BLK

Hg -.028 ug/l .000 -.028

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

DF = 1.4

*** Sample ID: LRB KCL Seq: 40 09:41:23 30 Sep 1999 HG

9/29 KCL PREP

Hg -.014 ug/l .000 -.014 $(<0.2\,ug/l)\left(\frac{30ml+1.5ml+0.75+4.5ml+2.25+3.0}{30ml}\right)$

Result = <0.3 ug/l

*** Sample ID: LRB KCL Seq: 41 09:43:27 30 Sep 1999 HG

9/29 KCL PREP

Hg -.011 ug/l .000 -.011

*** Sample ID: CCB Seq: 42 09:45:31 30 Sep 1999 HG

Hg -.018 ug/l .000 -.018 <0.2 ug/l

*** Sample ID: CCB Seq: 43 09:47:36 30 Sep 1999 HG

Hg -.018 ug/l .000 -.018

*** Sample ID: 1375948 KCL Seq: 44 09:49:42 30 Sep 1999 HG

BLK

Hg -.013 ug/l .000 -.013 $\bar{x} = (<0.2\,ug/l)(1.4) = <0.3\,ug/l\ Hg_{KCl}$

$= (<0.3\,ug/l\ Hg_{KCl})(0.530\,l) = <0.2\,ug\ Hg_{KCl}$ *

*** Sample ID: 1375948 Seq: 45 09:51:46 30 Sep 1999 HG

BLK

Hg -.014 ug/l .000 -.014

*** Sample ID: 1375932 KCl Seq: 46 09:53:53 30 Sep 1999 HG

$\bar{x}$

Hg .438 ug/l .000 .438

9/30/99 gl Tubing blewoff. Corrected.

*** Sample ID: 1375932 Seq: 47 09:55:59 30 Sep 1999 HG

Hg -.032 ug/l .000 -.032

9/30/99 gl sample on hold.

*** Sample ID: 1375932 KCl Seq: 48 10:01:24 30 Sep 1999 HG

$\bar{x} = (0.441\,ug/l)(1.4) = 0.617\,ug/l\ Hg_{KCl}$

Hg .441 ug/l .000 .441 $\therefore (0.617\,ug/l\ Hg_{KCl})(0.530\,l) - (<0.3\,ug/l\ Hg_{KCl})(0.530\,l)$

$= 0.327\,ug\ Hg_0$

*** Sample ID: 1375932 Seq: 49 10:03:29 30 Sep 1999 HG BLK (1375941)

Hg .441 ug/l .000 .441

*** Sample ID: 1375941 KCl Seq: 50 10:05:34 30 Sep 1999 HG

Hg .432 ug/l .000 .432

*** Sample ID: 1375941 Seq: 51 10:07:39 30 Sep 1999 HG D.L. = 0.2 ug

$\bar{x} = (0.429\,ug/l)(1.4) = 0.601\,ug/l\ Hg_{KCl}$

Hg .426 ug/l .000 .426

$\therefore$ Total oxidized Hg $= (0.601\,ug/l\ Hg_{KCl})(0.610\,l)$

$= 0.367\,ug\ Hg_0$

10:09:46 30 Sep 1999 Protocol: ontario

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

*** Sample ID: 1375945 KCl Seq: 52 10:09:46 30 Sep 1999 HG D.L = 0.2 µg

$\bar{x}$ = (0.340 µg/l)(1.4) = 0.476 µg/l Hg KCl

Total oxidized Hg = (0.476 µg/l Hg KCl)(0.68 l) = 0.324 µg Hgo

Hg .341 ug/l .000 .341

*** Sample ID: 1375945 Seq: 53 10:11:50 30 Sep 1999 HG

Hg .338 ug/l .000 .338

*** Sample ID: 1375960 KCl Seq: 54 10:13:57 30 Sep 1999 HG D.L = 0.2 µg

$\bar{x}$ = (0.321 µg/l)(1.4) = 0.449 µg/l Hg KCl

Total oxidized Hg = (0.449 µg/l Hg KCl)(0.700 l) = 0.314 µg Hgo

Hg .323 ug/l .000 .323

3 replicates

*** Sample ID: 1375960 Seq: 55 10:16:01 30 Sep 1999 HG

Hg .319 ug/l .000 .319

*** Sample ID: 1375960 Seq: 56 10:18:06 30 Sep 1999 HG

Hg .320 ug/l .000 .320

*** Sample ID: 1375960 Seq: 57 10:20:10 30 Sep 1999 HG

9/30/99 gR

Hg .320 ug/l .000 .320

*** Check Standard: 4 Ck4IPC/CCV Seq: 58 10:22:15 30 Sep 1999 HG

Line	Flag	%Rcv.	Found	True	Units	SD/RSD
Hg		103.	5.16	5.00	ug/l	.000

$\bar{x}$ = 5.14 µg/l 103 %R

*** Check Standard: 3 Ck3IPC/CCV Seq: 59 10:24:35 30 Sep 1999 HG

Line	Flag	%Rcv.	Found	True	Units	SD/RSD
Hg		103.	5.13	5.00	ug/l	.000

*** Check Standard: 2 Ck2ICB/CCB Seq: 60 10:26:53 30 Sep 1999 HG

Line	Flag	%Rcv.	Found	True	Units	SD/RSD
Hg		-30800	-.031	.000	ug/l	.000

$\bar{x}$ = <0.2 µg/l

*** Check Standard: 1 Ck1ICB/CCB Seq: 61 10:29:01 30 Sep 1999 HG

Line	Flag	Found	Range(+/-)	Units	SD/RSD
Hg		-.026	.200	ug/l	.000

*** Sample ID: 1375960 KCl Post Spk. Seq: 62 10:31:06 30 Sep 1999 HG

PS 2.00 UG/L

Post Spk T.V. = (2.00 µg)(1.4) = 2.8 µg Hg

$\bar{x}$ = (2.26 µg/l)(1.4) = 3.16 µg/l Hg KCl

oxidized Hg = (3.16 µg/l Hg KCl)(0.700 l) = 2.28 µg Hgo

97% R

Hg 2.24 ug/l .000 2.24

*** Sample ID: 1375960 KCl Post Spk. Seq: 63 10:33:16 30 Sep 1999 HG

PS 2.00 UG/L

Hg 2.27 ug/l .000 2.27

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

Sample on hold 9/30/99 JO

*** Sample ID: 1375936 Kcl Seq: 64 10:35:30 30 Sep 1999 HG D.L = 0.3ug

$\bar{x}$ = (0.784 ugle)(1.4) = 1.10 ugle Hg KCl

Hg .784 ug/l .000 .784 Oxidized Hg = (1.10 ugle)(0.880 l) = 0.968 ug Hgo

*** Sample ID: 1375936 Seq: 65 10:37:34 30 Sep 1999 HG

Hg .783 ug/l .000 .783

*** Sample ID: 1375964 Kcl Seq: 66 10:39:40 30 Sep 1999 HG D.L. = 0.3u

$\bar{x}$ = (0.534 ugle)(1.4) = 0.748 ugle Hg KCl

Hg .536 ug/l .000 .536 Oxidized Hg = (0.748 ugle Hg KCl)(0.830 l) = 0.621 ug Hgo

*** Sample ID: 1375964 Seq: 67 10:41:45 30 Sep 1999 HG

Hg .533 ug/l .000 .533

*** Sample ID: 1375968 Kcl Seq: 68 10:43:50 30 Sep 1999 HG

$\bar{x}$ = (0.199 ugle)(1.4) = 0.279 ugle Hg KCl = <0.3 ugle H

Hg .199 ug/l .000 .199 Oxidized Hg = (<0.3 ugle Hg KCl)(0.730 l) = <0.3 ug Hgo

*** Sample ID: 1375968 Seq: 69 10:45:54 30 Sep 1999 HG

Hg .199 ug/l .000 .199

*** Sample ID: 1375976 Kcl Seq: 70 10:48:00 30 Sep 1999 HG

$\bar{x}$ = (<0.2 ugle)(1.4) = <0.3 ugle Hg KCl

Hg .092 ug/l .000 .092 Oxidized Hg = (<0.3 ugle Hg KCl)(0.760 l) = <0.3 ug Hgo

*** Sample ID: 1375976 Seq: 71 10:50:06 30 Sep 1999 HG

Hg .095 ug/l .000 .095

*** Sample ID: 1375956 Kcl Seq: 72 10:52:10 30 Sep 1999 HG

$\bar{x}$ = (<0.2 ugle)(1.4) = <0.3 ugle Hg KCl

Hg .046 ug/l .000 .046 Oxidized Hg = (<0.3 ugle)(0.500 l) = <0.2 ug Hgo

*** Sample ID: 1375956 Seq: 73 10:54:27 30 Sep 1999 HG

Hg -.099 ug/l .000 -.099

*** Sample ID: 1375972 Kcl Seq: 74 10:56:42 30 Sep 1999 HG

$\bar{x}$ = (<0.2 ugle)(1.4) = <0.3 ugle Hg KCl

Hg -.201 ug/l .000 -.201 Oxidized Hg = (<0.3 ugle Hg KCl)(0.50 l) = <0.2 ug Hgo

*** Sample ID: 1375972 Seq: 75 10:59:11 30 Sep 1999 HG

Hg -.056 ug/l .000 -.056

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

*** Sample ID: LRB HNO3 Seq: 76 11:01:17 30 Sep 1999 HG
0.1N HNO3 PREP 9/29
Hg -.011 ug/l .000 -.011

Dil. Fact = 1.
$\bar{x} = (<0.2 ug/l)\frac{(30ml+1.5ml+0.75ml+4.5+2}{30ml}$
$= <0.27 ug/l$

*** Sample ID: LRB HNO3 Seq: 77 11:03:21 30 Sep 1999 HG
0.1N HNO3 PREP 9/29
Hg -.005 ug/l .000 -.005

*** Sample ID: LFB HNO3 Seq: 78 ~~11:05:26 30 Sep 1999~~ HG
0.1N HNO3 2 UG/L
Hg 1.38 ug/l .000 1.38

LFB T.V. = (2.00 ug/l) ~~(1.37) = 2.74 ug/l~~ 10/01/99 gp
$\bar{x} = (1.36 ug/l)(1.37) = 1.86 ug/l$ 93 %R

*** Sample ID: LFB HNO3 Seq: 79 11:07:41 30 Sep 1999 HG
0.1N HNO3 2 UG/L
Hg 1.34 ug/l .000 1.34

9/30/99 gp sample on hold

See lgs# 342 + 343 from 10/5/99's data for Total Particle-Bound Hg results

*** Sample ID: 1375931 0.1N HNO3 Seq: 80 11:09:59 30 Sep 1999 HG D.L. = 0.3 ug
Hg 1.25 ug/l .000 1.25

$\bar{x} = (1.26 ug/l)(1.37) = (1.73 ug/l)(0.75 l) = 1.29 ug$

*** Sample ID: 1375931 0.1 N HNO3 Seq: 81 11:12:15 30 Sep 1999 HG
Hg 1.27 ug/l .000 1.27

*** Check Standard: 4 Ck4IPC/CCV Seq: 82 11:14:26 30 Sep 1999 HG

Line	Flag	%Rcv.	Found	True	Units	SD/RSD
Hg		101.	5.04	5.00	ug/l	.000

$\bar{x} = 5.03 ug/l$ 101 %R

*** Check Standard: 3 Ck3IPC/CCV Seq: 83 11:16:46 30 Sep 1999 HG

Line	Flag	%Rcv.	Found	True	Units	SD/RSD
Hg		100.	5.02	5.00	ug/l	.000

*** Check Standard: 2 Ck2ICB/CCB Seq: 84 11:19:04 30 Sep 1999 HG

Line	Flag	%Rcv.	Found	True	Units	SD/RSD
Hg		-29500	-.029	.000	ug/l	.000

$\bar{x} = <0.2 ug/l$

*** Check Standard: 1 Ck1ICB/CCB Seq: 85 11:21:11 30 Sep 1999 HG

Line	Flag	Found	Range(+/-)	Units	SD/RSD
Hg		-.019	.200	ug/l	.000

*** Sample ID: 1375940 0.1N HNO3 Seq: 86 11:23:17 30 Sep 1999 HG
Hg 9.32 ug/l .000 9.32

$\bar{x} = (9.26 ug/l)(1.37)(0.180 l) = 2.28 ug/l$ Hg
The sample was diluted by 5. See pg. 317 for repo ~~316 .99~~ da 9/30
equired 3 replicates

*** Sample ID: 1375940 0.1N HNO3 Seq: 87 11:25:47 30 Sep 1999 HG
Hg 9.19 ug/l .000 9.19

Folder: 093099HG
Protocol: ontario

11:28:23 30 Sep 1999

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

e
:#342
+343
10/5/99 data
otal
ticle-
Bound
Hg
reported
results

*** Sample ID: 1375940 0.1N HNO_3 Seq: 88 11:28:23 30 Sep 1999 HG

Hg 9.28 ug/l .000 9.28

*** Sample ID: 1375940 0.1N HNO_3 Seq: 89 11:30:49 30 Sep 1999 HG

9/30/99 gp

Hg 9.25 ug/l .000 9.25

*** Sample ID: 1375940 0.1N HNO_3 Seq: 90 11:33:15 30 Sep 1999 HG

PS 2.00 UG/L

Hg 10.9 ug/l .000 10.9

9/30/99 gp - See dilution on pg. #317 ~~#316 gp~~ 9/30/99

*** Sample ID: 1375940 Seq: 91 11:35:49 30 Sep 1999 HG

PS 2.00 UG/L

Hg 11.0 ug/l .000 11.0

*** Sample ID: 1375944 0.1N HNO_3 Seq: 92 11:38:17 30 Sep 1999 HG D.L = 0.1 ug

Hg 8.70 ug/l .000 8.70 $\bar{x} = (8.71 ug/l)(1.37)(0.345 l) = 4.12 ug\ Hg_{pr}$

*** Sample ID: 1375944 0.1N HNO_3 Seq: 93 11:40:42 30 Sep 1999 HG

Hg 8.72 ug/l .000 8.72

*** Sample ID: 1375959 0.1N HNO_3 Seq: 94 11:43:02 30 Sep 1999 HG

Hg 17.0 ug/l .000 17.0

9/30/99 gp See dilution on pg #316.

*** Sample ID: 1375959 0.1N HNO_3 Seq: 95 11:45:57 30 Sep 1999 HG

Hg 17.0 ug/l .000 17.0

on hold 9/30/99 gp.

*** Sample ID: 1375935 0.1N HNO_3 Seq: 96 11:48:47 30 Sep 1999 HG

Hg .056 ug/l .000 .056 $\bar{x} = (<0.2 ug/l)(1.37)(0.190 l) = <0.05 ug\ Hg_{pr}$

*** Sample ID: 1375935 0.1N HNO_3 Seq: 97 11:50:52 30 Sep 1999 HG

Hg .077 ug/l .000 .077

*** Sample ID: 1375963 0.1N HNO_3 Seq: 98 11:52:57 30 Sep 1999 HG

Hg .027 ug/l .000 .027 $\bar{x} = (<0.2 ug/l)(1.37)(0.250 l) = <0.07 ug\ Hg_{pr}$

*** Sample ID: 1375963 0.1N HNO_3 Seq: 99 11:55:02 30 Sep 1999 HG

Hg .025 ug/l .000 .025

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

*** Sample ID: 1375967 Seq: 100 11:57:08 30 Sep 1999 HG

Hg .003 ug/l .000 .003

9/30/99 JP Tubing came off at the pump. Problem fixed.

*** Sample ID: 1375967 Seq: 101 11:59:13 30 Sep 1999 HG

Hg -.001 ug/l .000 -.001

*** Check Standard: 4 Ck4IPC/CCV Seq: 102 12:05:37 30 Sep 1999 HG

Line	Flag	%Rcv.	Found	True	Units	SD/RSD
Hg		98.4	4.92	5.00	ug/l	.000

$\bar{x}$ = 4.93 ug/l 98%R

*** Check Standard: 3 Ck3IPC/CCV Seq: 103 12:07:54 30 Sep 1999 HG

Line	Flag	%Rcv.	Found	True	Units	SD/RSD
Hg		98.6	4.93	5.00	ug/l	.000

*** Check Standard: 2 Ck2ICB/CCB Seq: 104 12:10:14 30 Sep 1999 HG

Line	Flag	%Rcv.	Found	True	Units	SD/RSD
Hg		-35900	-.036	.000	ug/l	.000

$\bar{x}$ = <0.2 ug/l

*** Check Standard: 1 Ck1ICB/CCB Seq: 105 12:12:20 30 Sep 1999 HG

Line	Flag	Found	Range(+/-)	Units	SD/RSD
Hg		-.031	.200	ug/l	.000

e pgs# 2+343 10/5/99's ta for lculation Total - ticle - und Hg results JP

*** Sample ID: 1375967 0.1N HNO_3 Seq: 106 12:14:26 30 Sep 1999 HG

Hg -.004 ug/l .000 -.004

$\bar{x}$ = (<0.2 ug/l)(1.37)(0.305 l) = <0.09 ug Hg pr

*** Sample ID: 1375967 0.1N HNO_3 Seq: 107 12:16:34 30 Sep 1999 HG

Hg -.027 ug/l .000 -.027

*** Sample ID: 1375975 0.1N HNO_3 Seq: 108 12:18:40 30 Sep 1999 HG

Hg .019 ug/l .000 .019

$\bar{x}$ = (<0.2 ug/l)(1.37)(0.150 l) = <0.05 ug Hg pr

*** Sample ID: 1375975 0.1N HNO_3 Seq: 109 12:20:45 30 Sep 1999 HG

Hg .017 ug/l .000 .017

*** Sample ID: 1375955 Seq: 110 12:22:50 30 Sep 1999 HG

Hg -.031 ug/l .000 -.031

9/30/99 JP Pump tubing came off. Put back on.

*** Sample ID: 1375955 Seq: 111 12:24:56 30 Sep 1999 HG

Hg -.028 ug/l .000 -.028

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

*** Check Standard: 4 Ck4IPC/CCV Seq: 112 12:30:15 30 Sep 1999 HG

Line	Flag	%Rcv.	Found	True	Units	SD/RSD
Hg	L	58.2	2.91	5.00	ug/l	.000

*** Check Standard: 3 Ck3IPC/CCV Seq: 113 12:38:56 30 Sep 1999 HG

Line	Flag	%Rcv.	Found	True	Units	SD/RSD
Hg		99.7	4.98	5.00	ug/l	.000

*** Sample ID: 1375955 Seq: 114 12:41:12 30 Sep 1999 HG

Sample pump tubing came off of instrument. Put back on.

Hg	-.035	ug/l	.000	-.035

*** Sample ID: 1375955 9/30/99 gp Seq: 115 12:43:19 30 Sep 1999 HG

Hg	-.033	ug/l	.000	-.033

*** Check Standard: 4 Ck4IPC/CCV Seq: 116 13:07:56 30 Sep 1999 HG

Line	Flag	%Rcv.	Found	True	Units	SD/RSD
Hg		99.2	4.96	5.00	ug/l	.000

4.96 ug/l 99%R

see pgs # 342-43 on 15/99's data - ~~Calculation~~ lculation f Total ticle-Bound Hg.

*** Sample ID: 1375955 0.1N HNO_3 Seq: 117 13:10:13 30 Sep 1999 HG

$\bar{x} = (<0.2 ug/l)(1.37)(0.110 l) = <0.03 ug$ Hg pr

Hg	.004	ug/l	.000	.004

*** Sample ID: 1375955 0.1N HNO_3 Seq: 118 13:12:19 30 Sep 1999 HG

Hg	.011	ug/l	.000	.011

*** Sample ID: 1375971 0.1N HNO_3 Seq: 119 13:14:25 30 Sep 1999 HG

Hg	-.025	ug/l	.000	-.025

$\bar{x} = <0.2 ug/l)(1.37)(0.13 l) = <0.04 ug$ Hg pr

*** Sample ID: 1375971 0.1N HNO_3 Seq: 120 13:16:31 30 Sep 1999 HG

Hg	-.024	ug/l	.000	-.024

*** Sample ID: LRB H2O2 Seq: 121 13:18:39 30 Sep 1999 HG

HNO2-H2O2 PREP 9/29

$\bar{x} = (<0.2 ug/l)\left(\frac{10 ml + 0.5 ml + 20.5 ml + 1.5 ml + 6 ml + c}{10 ml}\right)$

$= <0.08 ug/l$ Hg H_2O_2

Hg	-.009	ug/l	.000	-.009

*** Sample ID: LRB H2O2 Seq: 122 13:20:45 30 Sep 1999 HG

HNO2-H2O2 PREP 9/29

Hg	-.003	ug/l	.000	-.003

*** Sample ID: LFB H2O2 T.V. = 2.0 ug/l Seq: 123 13:22:53 30 Sep 1999 HG

2.0 UG/L 9/29

$\bar{x} = (0.515 ug/l)(3.9) = 2.01 ug/l$ Hg H_2O_2

Hg	.516	ug/l	.000	.516

100%R

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

*** Sample ID: LFB H2O2 Seq: 124 13:25:01 30 Sep 1999 HG
2.0 UG/L 9/29

Hg	.513	ug/l	.000	.513

*** Sample ID: 1375951 H_2O_2 Seq: 125 13:27:07 30 Sep 1999 HG D.F. = 3.6
BLK

$\bar{X} = (<0.2 ug/l)\left(\frac{10ml + 0.5ml + 0.5ml + 20.5ml + 1.5ml + 3.0ml}{10ml}\right)$
$= <0.8 ug/l\ Hg_{H_2O_2}$
10/5/99 gp ~~(<0.8 ug/l Hg H2O)(0.140 l)~~
∴ (<0.8 ug/l Hg H_2O_2)(0.25 l)
= <0.2 ug Hg H_2O_2 *

Required 3 replicates.

Hg	-.002	ug/l	.000	-.002

*** Sample ID: 1375951 Seq: 126 13:29:15 30 Sep 1999 HG
BLK

Hg	.001	ug/l	.000	.001

*** Sample ID: 1375951 Seq: 127 13:31:22 30 Sep 1999 HG

Hg	.001	ug/l	.000	.001

*** Sample ID: 1375951 Seq: 128 13:33:28 30 Sep 1999 HG
9/30/99 gp

Hg	.001	ug/l	.000	.001

*** Sample ID: 1375951 Post spk. Seq: 129 13:35:35 30 Sep 1999 HG
PS 2.00 UG/L

$\bar{X} = (1.80 ug/l)(3.6)$ ← D.F.
$= 6.48 ug/l\ Hg_{H_2O_2}$
∴ (6.48 ug/l)(0.25 l)
= 1.62 ug Hg H_2O_2 *

Post spk I.V. = (2.00 ug/l)(3.6
= 7.2 ug/l Hg
90%R

Hg	1.81	ug/l	.000	1.81

*** Sample ID: 1375951 Seq: 130 13:37:53 30 Sep 1999 HG
PS 2.00 UG/L

Hg	1.79	ug/l	.000	1.79

~~Samples gp 9/30/99 1375933 & 1375965~~

*** Sample ID: 1375969 HNO_3 - H_2O_2 Seq: 131 13:40:10 30 Sep 1999 HG

$\bar{X} = (<0.2 ug/l)\left(\frac{10ml + 0.5 + 0.5 + 24.0 + 1.5 + 3}{10}\right)$ ← D.F.
$= <0.8 ug/l\ Hg_{H_2O_2}$
∴ (<0.8 ug/l Hg H_2O_2)(0.2
= <0.2 ug Hg H_2O_2

Hg	-.002	ug/l	.000	-.002

*** Sample ID: 1375969 Seq: 132 13:42:19 30 Sep 1999 HG

Hg	.001	ug/l	.000	.001

*** Sample ID: 1375977 HNO_3 - H_2O_2 Seq: 133 13:44:27 30 Sep 1999 HG

$\bar{X} = (<0.2 ug/l)(3.95)$ ← D.F.
$= <0.8 ug/l\ Hg_{H_2O_2}$
∴ (<0.8 ug/l Hg H_2O_2)(0.
= <0.2 ug Hg H_2O_2

Hg	-.007	ug/l	.000	-.007

*** Sample ID: 1375977 Seq: 134 13:46:36 30 Sep 1999 HG

Hg	-.008	ug/l	.000	-.008

*** Sample ID: 1375957 HNO_3 - H_2O_2 Seq: 135 13:48:44 30 Sep 1999 HG

$\bar{X} = (<0.2 ug/l)(3.95)$ D.F.
$= <0.8 ug/l\ Hg_{H_2O_2}$
∴ (<0.8 ug/l Hg H_2O_2)(0
= <0.2 ug Hg H_2O_2

Hg	-.000	ug/l	.000	-.000

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

*** Sample ID: 1375957 Seq: 136 13:50:52 30 Sep 1999 HG

Hg -.003 ug/l .000 -.003

*** Check Standard: 4 Ck4IPC/CCV Seq: 137 13:53:00 30 Sep 1999 HG

Line	Flag	%Rcv.	Found	True	Units	SD/RSD
Hg		96.0	4.80	5.00	ug/l	.000

In house check

*** Sample ID: 1375973 $HNO_3-H_2O_2$ Seq: 138 13:55:26 30 Sep 1999 HG

$\bar{X} = (<0.2\,ug/l)\left(\frac{10ml + 0.5 + 0.5 + 28.5 + 1.5 + 3.0}{10}\right)$

Hg -.017 ug/l .000 -.017 $= <0.9\,ug/l\ Hg_{H_2O_2}$ $\therefore (<0.9\,ug/l\ Hg_{H_2O_2})(0.25\,l) = <0.3\,ug\ Hg_{H_2O_2}$ *

required 3 replicates

*** Sample ID: 1375973 Seq: 139 13:57:35 30 Sep 1999 HG

Hg -.008 ug/l .000 -.008

*** Sample ID: 1375973 Seq: 140 13:59:43 30 Sep 1999 HG

Hg -.012 ug/l .000 -.012

*** Sample ID: 1375973 Seq: 141 14:01:51 30 Sep 1999 HG

9/30/99 gr

Hg -.010 ug/l .000 -.010

*** Sample ID: 1375973 $HNO_3-H_2O_2$ Post spk Seq: 142 14:04:00 30 Sep 1999 HG

PS 2.00 UG/L $\bar{X} = (1.76\,ug/l)(4.4) = 7.74\,ug/l\ Hg_{H_2O_2}$

Hg 1.76 ug/l .000 1.76 $\therefore (7.74\,ug/l\ Hg_{H_2O_2})(0.25\,l) = 1.94\,ug\ Hg_{H_2O_2}$ *

Post spk T.V. = (2.00 ug/l)(4.4) (8.8)(0.25 l) = 2.2 ug $Hg_{H_2O_2}$

88% R

*** Sample ID: 1375973 Seq: 143 14:06:21 30 Sep 1999 HG

PS 2.00 UG/L

Hg 1.76 ug/l .000 1.76

See other $NO_3-H_2O_2$ samples on pg. 4

*** Sample ID: LRB KMNO4 Seq: 144 14:08:50 30 Sep 1999 HG

D.F = 1.35

9/29

$\bar{X} = (<0.2\,ug/l)\left(\frac{30ml + 0.75 + 4.5 + 2.25 + 3.0}{30ml}\right)$

Hg -.002 ug/l .000 -.002 $= <0.3\,ug/l\ Hg_{KMNO_4}$

*** Sample ID: LRB KMNO4 Seq: 145 14:10:58 30 Sep 1999 HG

9/29

Hg .001 ug/l .000 .001

*** Sample ID: LFB KMNO3 Seq: 146 14:13:07 30 Sep 1999 HG

2.00 UG/L 9/29

Hg -.005 ug/l .000 -.005

9/30/99 LRB In cup gr

*** Sample ID: LFB KMNO3 Seq: 147 14:15:18 30 Sep 1999 HG

2.00 UG/L 9/29

Hg -.028 ug/l .000 -.028

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

*** Check Standard: 4 Ck4IPC/CCV Seq: 148 14:25:02 30 Sep 1999 HG
Line Flag %Rcv. Found True Units SD/RSD $\bar{x}$ = 4.99 ug/l 100%R
Hg 99.6 4.98 5.00 ug/l .000

*** Check Standard: 3 Ck3IPC/CCV Seq: 149 14:27:25 30 Sep 1999 HG
Line Flag %Rcv. Found True Units SD/RSD
Hg 100. 5.00 5.00 ug/l .000

*** Check Standard: 2 Ck2ICB/CCB Seq: 150 14:29:47 30 Sep 1999 HG
Line Flag %Rcv. Found True Units SD/RSD $\bar{x}$ = <0.2 ug/l
Hg -40300 -.040 .000 ug/l .000

*** Check Standard: 1 Ck1ICB/CCB Seq: 151 14:31:54 30 Sep 1999 HG
Line Flag Found Range(+/-) Units SD/RSD
Hg -.030 .200 ug/l .000

*** Check Standard: 4 Ck4IPC/CCV Seq: 152 14:36:30 30 Sep 1999 HG
Line Flag %Rcv. Found True Units SD/RSD $\bar{x}$ = 4.97 ug/l 99%R
Hg 99.1 4.95 5.00 ug/l .000

*** Check Standard: 3 Ck3IPC/CCV Seq: 153 14:38:58 30 Sep 1999 HG
Line Flag %Rcv. Found True Units SD/RSD
Hg 99.8 4.99 5.00 ug/l .000

*** Check Standard: 2 Ck2ICB/CCB Seq: 154 14:41:26 30 Sep 1999 HG
Line Flag %Rcv. Found True Units SD/RSD $\bar{x}$ = <0.2 ug/l
Hg -36200 -.036 .000 ug/l .000

*** Check Standard: 1 Ck1ICB/CCB Seq: 155 14:43:32 30 Sep 1999 HG
Line Flag Found Range(+/-) Units SD/RSD
Hg -.027 .200 ug/l .000

*** Sample ID: LFB KMNO4 Seq: 156 14:45:39 30 Sep 1999 HG
2.00 UG/L 9/29 $\bar{x}$ = 1.41 ug (30 ml + 0.75 + 4.5 + 2.25 + 3.0 / 30 ml)
Hg 1.42 ug/l .000 1.42 = 1.90 ug/l Hg KMnO4 95%R

*** Sample ID: LFB KMNO4 Seq: 157 14:47:58 30 Sep 1999 HG
2.00 UG/L 9/29
Hg 1.40 ug/l .000 1.40

*** Sample ID: 1375950 H_2SO_4 - KMnO4 BLK Seq: 158 14:50:17 30 Sep 1999 HG
$\bar{x}$ = (<0.2 ug/l)(1.35)
Hg .047 ug/l .000 .047 = <0.3 ug/l Hg KMnO4 = (<0.3 ug/l)(0.520 l / ~~0.385 l~~) = <0.09 ug Hg KMnO4

*** Sample ID: 1375950 Seq: 159 14:52:26 30 Sep 1999 HG

Hg .050 ug/l .000 .050

14:54:35 30 Sep 1999 Protocol: ontario

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

on hold 9/30/99 JP → *** Sample ID: 1375934 H_2SO_4-$KMnO_4$ Seq: 160 14:54:35 30 Sep 1999 HG

$\bar{x}$ = (3.65 ug/l)(1.35) = 4.93 ug/l Hg KMnO4

Hg 3.65 ug/l .000 3.65 = (4.93 ug/l)(0.545 l) = 2.69 ug Hg KMnO4 *

*** Sample ID: 1375934 Seq: 161 14:57:06 30 Sep 1999 HG

Hg 3.65 ug/l .000 3.65

*** Sample ID: 1375943 H_2SO_4-$KMnO_4$ Seq: 162 14:59:37 30 Sep 1999 HG D.L = 0.14 ug

$\bar{x}$ = (0.265 ug/l)(1.35) = 0.358 ug/l Hg KMnO4

Hg .264 ug/l .000 .264 = (0.358 ug/l)(0.500 l) = 0.179 ug Hg KMnO4

*** Sample ID: 1375943 Seq: 163 15:01:46 30 Sep 1999 HG

Hg .266 ug/l .000 .266

*** Sample ID: 1375947 H_2SO_4-$KMnO_4$ Seq: 164 15:03:56 30 Sep 1999 HG D.L = 0.14 ug

$\bar{x}$ = (0.328 ug/l)(1.35) = 0.443 ug/l Hg KMnO4

Hg .330 ug/l .000 .330 = (0.443 ug/l Hg)(0.530 l) = 0.235 ug Hg KMnO4

*** Sample ID: 1375947 Seq: 165 15:06:06 30 Sep 1999 HG

Hg .322 ug/l .000 .322

*** Sample ID: 1375961 H_2SO_4-$KMnO_4$ Seq: 166 15:08:16 30 Sep 1999 HG

$\bar{x}$ = (<0.2 ug/l)(1.35) = <0.3 ug/l Hg KMnO4 *

Hg .090 ug/l .000 .090 = (<0.3 ug/l Hg KMnO4)(0.500 l) = <0.2 ug Hg KMnO4

*** Sample ID: 1375961 Seq: 167 15:10:26 30 Sep 1999 HG

Hg .088 ug/l .000 .088

Sample on hold 9/30/99 JP. → *** Sample ID: 1375938 H_2SO_4-$KMnO_4$ Seq: 168 15:12:36 30 Sep 1999 HG

$\bar{x}$ = (<0.2 ug/l)(1.35) = <0.3 ug/l Hg KMnO4

Hg 1.39 ug/l .000 1.39 = (<0.3 ug/l)(0.500 l) = <0.2 ug Hg KMnO4 *

*** Sample ID: 1375938 Seq: 169 15:14:56 30 Sep 1999 HG

Hg 1.39 ug/l .000 1.39

*** Sample ID: 1375966 H_2SO_4-$KMnO_4$ Seq: 170 15:17:13 30 Sep 1999 HG

$\bar{x}$ = (0.355 ug/l)(1.35) = 0.479 ug/l Hg KMnO4

Hg .355 ug/l .000 .355 = (0.479 ug/l Hg KMnO4)(0.50 l) = 0.240 ug Hg K

*** Sample ID: 1375966 Seq: 171 15:19:24 30 Sep 1999 HG

Hg .354 ug/l .000 .354

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

*** Sample ID: 1375970 H_2SO_4-Kmnoy Seq: 172 15:21:34 30 Sep 1999 HG

$\bar{X} = (0.274 ug/l)\left(\frac{30ml + 0.75ml + 9.0ml + 2.25ml + 3.0ml}{30ml}\right) = 0.411$ ug/l Hg Kmnoy

Hg .276 ug/l .000 .276

$= (0.411 ug/l)(0.50l) = 0.206 ug$ Hg Kmnoy *

*** Sample ID: 1375970 Seq: 173 15:23:44 30 Sep 1999 HG

Hg .273 ug/l .000 .273

*** Sample ID: 1375978 H_2SO_4-Kmnoy Seq: 174 15:25:54 30 Sep 1999 HG

$\bar{X} = (<0.2 ug/l)(1.35) = <0.3 ug/l$ Hg Kmnoy

Hg .116 ug/l .000 .116

$= (<0.3 ug/l)(0.50l) = <0.2 ug$ Hg Kmnoy *

*** Sample ID: 1375978 Seq: 175 15:28:05 30 Sep 1999 HG

Hg .120 ug/l .000 .120

*** Check Standard: 4 Ck4IPC/CCV Seq: 176 15:30:13 30 Sep 1999 HG

Line	Flag	%Rcv.	Found	True	Units	SD/RSD
Hg		103.	5.17	5.00	ug/l	.000

$\bar{X} = 5.12 ug/l$ 102% R

*** Check Standard: 3 Ck3IPC/CCV Seq: 177 15:32:33 30 Sep 1999 HG

Line	Flag	%Rcv.	Found	True	Units	SD/RSD
Hg		101.	5.06	5.00	ug/l	.000

*** Check Standard: 2 Ck2ICB/CCB Seq: 178 15:34:52 30 Sep 1999 HG

Line	Flag	%Rcv.	Found	True	Units	SD/RSD
Hg		-34300	-.034	.000	ug/l	.000

$\bar{X} = <0.2 ug/l$

*** Check Standard: 1 Ck1ICB/CCB Seq: 179 15:37:00 30 Sep 1999 HG

Line	Flag	Found	Range(+/-)	Units	SD/RSD
Hg		-.031	.200	ug/l	.000

*** Sample ID: 1375958 H_2SO_4-Kmnoy Seq: 180 15:39:08 30 Sep 1999 HG

$\bar{X} = (0.282 ug/l)(1.35) = 0.380 ug/l$ Hg Kmnoy

Required 3 replicates.

Hg .288 ug/l .000 .288

$= (0.380 ug/l)(0.50l) = 0.190 ug$ Hg Kmnoy *

*** Sample ID: 1375958 Seq: 181 15:41:18 30 Sep 1999 HG

Hg .278 ug/l .000 .278

*** Sample ID: 1375958 Seq: 182 15:43:29 30 Sep 1999 HG

Hg .279 ug/l .000 .279

*** Sample ID: 1375958 Seq: 183 15:45:39 30 Sep 1999 HG

Hg .276 ug/l .000 .276

9/30/99 gp

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

*** Sample ID: 1375958 Post Spk H_2SO_4-Kmno4 Seq: 184 15:47:49 30 Sep 1999 HG
PS 2.00 UG/L
Hg 2.12 ug/l .000 2.12

Post Spk T.V. = (2.00 ug/l)(1.35) = 2.7 ug

$\bar{x}$ = (2.13 ug/l)(1.35) = 2.88 ug/l Hg Kmno4
= (2.88 ug/l)(0.50 l) = 1.44 ug Hg Kmno4 93% R

*** Sample ID: 1375958 Seq: 185 15:50:11 30 Sep 1999 HG
PS 2.00 UG/L
Hg 2.13 ug/l .000 2.13

*** Sample ID: 1375974 H_2SO_4-Kmno4 Seq: 186 15:52:27 30 Sep 1999 HG
Hg .038 ug/l .000 .038

$\bar{x}$ = (<0.2 ug/l)(1.35) = <0.3 ug/l Hg Kmno4
= (<0.3 ug/l Hg Kmno4)(0.50 l) = <0.2 ug Hg Kmno4

*** Sample ID: 1375974 Seq: 187 15:54:38 30 Sep 1999 HG
Hg .045 ug/l .000 .045

*** Sample ID: 1375940 Seq: 188 15:56:49 30 Sep 1999 HG
0.1N HNO3 1:5 DIL
Hg 2.01 ug/l .000 2.01

*** Sample ID: 1375940 Seq: 189 15:59:02 30 Sep 1999 HG
0.1N HNO3 1:5 DIL
Hg .245 ug/l .000 .245

9/30/99 gf See next pg. Only made 5mls - Not enough for both replicates

*** Sample ID: 1375940 PS Seq: 190 16:01:13 30 Sep 1999 HG
0.1N HNO3 1:5 DIL
Hg 3.97 ug/l .000 3.97

*** Sample ID: 1375940 PS Seq: 191 16:03:30 30 Sep 1999 HG
0.1N HNO3 1:5 DIL
Hg 1.02 ug/l .000 1.02

Total - Particle found Hg calculated data is on 9/5/99 - pgs 342 + 343.

*** Sample ID: 1375959 Seq: 192 16:05:42 30 Sep 1999 HG
0.1N HNO3 1:10 DIL
Hg 1.93 ug/l .000 1.93

D.L = 0.3 ug

$\bar{x}$ = (1.93 ug/l)(1.37)(0.135 l) = 3.57 ug Hg (10)

*** Sample ID: 1375959 Seq: 193 16:07:53 30 Sep 1999 HG
0.1N HNO3 1:10 DIL
Hg 1.92 ug/l .000 1.92

*** Check Standard: 4 Ck4IPC/CCV Seq: 194 16:12:42 30 Sep 1999 HG

Line	Flag	%Rcv.	Found	True	Units	SD/RSD
Hg		101.	5.07	5.00	ug/l	.000

$\bar{x}$ = 5.07 ug/l 101% R

*** Check Standard: 3 Ck3IPC/CCV Seq: 195 16:15:01 30 Sep 1999 HG

Line	Flag	%Rcv.	Found	True	Units	SD/RSD
Hg		101.	5.06	5.00	ug/l	.000

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

*** Check Standard: 2 Ck2ICB/CCB Seq: 196 16:17:20 30 Sep 1999 HG

Line	Flag	%Rcv.	Found	True	Units	SD/RSD
Hg		-33100	-.033	.000	ug/l	.000

*** Check Standard: 1 Ck1ICB/CCB Seq: 197 16:19:27 30 Sep 1999 HG

Line	Flag	Found	Range(+/-)	Units	SD/RSD
Hg		-.030	.200	ug/l	.000

*** Sample ID: 1375940 Seq: 198 16:23:54 30 Sep 1999 HG
0.1N HNO3 1:5 DIL
Hg 2.01 ug/l .000 2.01
9/30/99 gp

*** Sample ID: 1375940 Seq: 199 16:26:07 30 Sep 1999 HG
not enough sample. 0.1N HNO3 1:5 DIL
Hg 1.59 ug/l .000 1.59

*** Sample ID: 1375940 PS Post Spk Seq: 200 16:28:21 30 Sep 1999 HG Post Spk T.V. = (2.00ug/l)(5)(1.37) = 2.47 ug Hg per
0.1N HNO3 1:5 DIL
Hg 3.94 ug/l .000 3.94 $\bar{X}$ = (3.92ug/l)(5)(1.37)(0.18l) = 4.83 ug Hg per (95%R)

*** Sample ID: 1375940 PS Seq: 201 16:30:42 30 Sep 1999 HG
0.1N HNO3 1:5 DIL
Hg 3.89 ug/l .000 3.89

ue 15/99 el Article- bond Hg calculations n pg 2 42 + 343. → *** Sample ID: 1375940 Seq: 202 16:33:04 30 Sep 1999 HG D.L = 0.04 ug
0.1N HNO3 1:5 DIL
Hg 2.01 ug/l .000 2.01 $\bar{X}$ = (2.01ug/l)(5)(1.37)(0.18l) = 2.48 ug Hg per.

*** Sample ID: 1375940 Seq: 203 16:35:16 30 Sep 1999 HG
0.1N HNO3 1:5 DIL
Hg 2.00 ug/l .000 2.00

mple hold 30/99 Hg → *** Sample ID: 1375933 Seq: 204 16:39:13 30 Sep 1999 HG
HNO3+H2O2 $\bar{X}$ = (<0.2ug/l)(10ml + 0.5ml + 0.5ml + 20.5ml + 1.5ml + 3.0ml / 10ml)
Hg .009 ug/l .000 .009 = (<0.8ug/l Hg H2O2) ∴ = (<0.8ug/l Hg H2O2)(0.25l) = (<0.2ug Hg H2O2) *

*** Sample ID: 1375933 Seq: 205 16:41:24 30 Sep 1999 HG
HNO3+H2O2
Hg .003 ug/l .000 .003

*** Sample ID: 1375942 Seq: 206 16:43:35 30 Sep 1999 HG
HNO3+H2O2 $\bar{X}$ = (<0.2ug/l)(3.6)
Hg .002 ug/l .000 .002 = (<0.8ug/l Hg H2O2) ∴ (<0.8ug/l Hg H2O2)(0.
= (<0.2ug Hg H2O2)

*** Sample ID: 1375942 Seq: 207 16:45:47 30 Sep 1999 HG
HNO3+H2O2
Hg .004 ug/l .000 .004

16:47:58 30 Sep 1999 Protocol: ontario

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

*** Sample ID: 1375946 Seq: 208 16:47:58 30 Sep 1999 HG

HNO3+H2O2

Hg .018 ug/l .000 .018

$\bar{x}$ = (<0.2ug/l)(3.6) = (<0.8ug Hg H_2O_2) ∴ (<0.8ug/l Hg H_2O_2)(0.25l) = (<0.2ug Hg H_2O_2) *

*** Sample ID: 1375946 Seq: 209 ~~16:50:10 30 Sep 1999 HG~~

HNO3+H2O2

Hg .016 ug/l .000 .016

*** Sample ID: 1375962 Seq: 210 16:52:22 30 Sep 1999 HG

HNO3+H2O2

Hg .002 ug/l .000 .002

$\bar{x}$ = (<0.2ug/l)(3.6) = (<0.8ug/l Hg H_2O_2) ∴ (<0.8ug/l Hg H_2O_2)(0.25 = (<0.2ug Hg H_2O_2) *

*** Sample ID: 1375962 Seq: 211 ~~16:54:34 30 Sep 1999 HG~~

HNO3+H2O2

Hg .009 ug/l .000 .009

Sample hold 1/30/99 gt!

*** Sample ID: 1375937 Seq: 212 16:56:46 30 Sep 1999 HG

HNO3+H2O2

Hg .012 ug/l .000 .012

$\bar{x}$ = (<0.2ug/l)(10ml + 0.5ml + 0.5ml + 24.0ml + 1.5 / 10ml) = (<0.8ug/l Hg H_2O_2) ∴ (<0.2ug Hg H_2O_2) *

*** Sample ID: 1375937 Seq: 213 ~~16:58:58 30 Sep 1999 HG~~

HNO3+H2O2

Hg .008 ug/l .000 .008

*** Sample ID: 1375965 Seq: 214 17:01:10 30 Sep 1999 HG

HNO3+H2O2

Hg -.001 ug/l .000 -.001

$\bar{x}$ = (<0.2ug/l)(10ml + 0.5ml + 0.5ml + 36.0ml + 1.5ml + 3. / 10ml) = (<0.9ug/l Hg H_2O_2) ∴ (<0.9ug/l)(0.25l) = (<0.3ug Hg *

Required 3 replicates.

*** Sample ID: 1375965 Seq: 215 17:03:22 30 Sep 1999 HG

HNO3+H2O2

Hg -.000 ug/l .000 -.000

*** Sample ID: 1375965 Seq: 216 17:05:34 30 Sep 1999 HG

HNO3+H2O2

Hg .001 ug/l .000 .001

*** Sample ID: 1375965 Post Spk Seq: 217 17:08:14 30 Sep 1999 HG

PS HNO3+H2O2

Hg 1.87 ug/l .000 1.87

$\bar{x}$ = (1.86ug/l Hg)(4.15) = (7.72ug/l Hg H_2O_2) ∴ (7.72)(0.25l) = (1.93ug Hg H_2O_2) *

Post Spk T.C. = (2.0ug/l)(4.15) = = 8.30ug/l = (8.30)(0.25 = 2.08ug

93%R

*** Sample ID: 1375965 Seq: 218 17:10:39 30 Sep 1999 HG

PS HNO3+H2O2

Hg 1.84 ug/l .000 1.84

*** Check Standard: 4 Ck4IPC/CCV Seq: 219 17:12:59 30 Sep 1999 HG

Line	Flag	%Rcv.	Found	True	Units	SD/RSD
Hg		101.	5.05	5.00	ug/l	.000

$\bar{x}$ = (5.03ug/l)

17:15:16 30 Sep 1999 Protocol: ontario

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

*** Check Standard: 3 Ck3IPC/CCV Seq: 220 17:15:16 30 Sep 1999 HG

Line	Flag	%Rcv.	Found	True	Units	SD/RSD
Hg		100.	5.01	5.00	ug/l	.000

*** Check Standard: 2 Ck2ICB/CCB Seq: 221 17:17:36 30 Sep 1999 HG

Line	Flag	%Rcv.	Found	True	Units	SD/RSD
Hg		-32800	-.033	.000	ug/l	.000

$\bar{x}$ = <0.2 ug/l

*** Check Standard: 1 Ck1ICB/CCB Seq: 222 17:19:43 30 Sep 1999 HG

Line	Flag	Found	Range(+/-)	Units	SD/RSD
Hg		-.034	.200	ug/l	.000

9/30/99
JHP

(1

Total Elemental Mercury (Hg_E) Calculations

Total elemental mercury is the Hg present in the H_2SO_4-$KMnO_4$ imingers and the mercury present in the HNO_3-H_2O_2 impinger solution. See method, equation #14, for calculation.

mple hold 1/30/99 →

(1) #1375933 & 1375934 (IN-1)

$(<0.8\,ug/l\ Hg_{H_2O_2})(0.250l) - (<0.8\,ug/l\ Hg_{H_2O_2\,Blk})(0.250l) + (4.93\,ug/l\ Hg_{KMnO_4})(0.500l) - (<0.3\,ug/l\ Hg_{KMnO_4})(0$

$= 2.47\,ug\ Hg_E$

(2) #1375942 + 1375943 (IN-2)

$(<0.8\,ug/l\ Hg_{H_2O_2})(0.250l) - (<0.8\,ug/l\ Hg_{H_2O_2\,Blk})(0.25l) + (0.358\,ug/l\ Hg_{KMnO_4})(0.5l) - (<0.3\,ug/l\ Hg_{KMnO_4})(0.5l$

$= 0.179\,ug\ Hg_E$

(3) #1375946 + 1375947 (IN-3)

$(<0.8\,ug/l\ Hg_{H_2O_2})(0.25l) - (<0.8\,ug/l\ Hg_{H_2O_2\,Blk})(0.25l) + (0.443\,ug/l\ Hg_{KMnO_4})(\overset{0.53l}{\cancel{0.5l}})_{gr\ 10/4/99} - (<0.3\,ug/l\ Hg_{KMnO_4})(0.5l)$

$= \overset{14''}{\cancel{0.222}}\,gr\ 0.235\,ug\ Hg_E$

(4) #1375962 + 1375961 (IN-4)

$(<0.8\,ug/l\ Hg_{H_2O_2})(0.25l) - (<0.8\,ug/l\ Hg_{H_2O_2\,Blk})(0.25l) + (<0.3\,ug/l\ Hg_{KMnO_4})(0.5l) - (<0.3\,ug/l\ Hg_{KMnO_4})(0.5l)$

$= \overset{<0.15}{\cancel{<0.2}}\,gr\ 10/4/99\,ug\ Hg_E$

ple on d 1/30/99 →

(5) #1375937 + 1375938 (STK-1)

$(<0.8\,ug/l\ Hg_{H_2O_2})(0.25l) - (<0.8\,ug/l\ Hg_{H_2O_2\,Blk})(0.25l) + (<0.3\,ug/l\ Hg_{KMnO_4})(0.5l) - (<0.3\,ug/l\ Hg_{KMnO_4})(0.5l)$

$= \overset{<0.15}{\cancel{<0.2}}\,gr\ 10/4/99\,ug\ Hg_E$

(6) #1375965 + 1375966 (STK-2)

$(\ldots)(\ldots) - (\ldots)(\ldots) + (\overset{0.479}{\ldots})(\ldots) - (\ldots)(\ldots)$

Dock 110

10/4/99

Ontario Hydro Method (9/1/99 Draft)

Ash + Filter Digestion:

Analyst, Date + Start Time	Sample ID	Sample we used for Digestion	HF (ml)	Aqua Regia Added (ml)	Boric Added Acid	Final Sample Volume (ml)	Comments
In 90°C water bath at 1745 [illegible] at 0710 — Sts 10/4/99 13:10	LRB	—	7 ml	5 mls	3.5g	100 ml	
	LFB	-					Added 200 ml of 1.00 mg/L Hg std.
	NIST #1633B Coal Fly Ash	0.50g					#9951455045 (As rec'd Basis)
	#1375954 N1/3	1.01g					Thimble SB #15 Site Blk. / Thimble wt = 3.39g
	#1375954 N1/3	0.83g					Thimble Site #16 SB Blk. Thimble wt = 3.30g
	#1375954 N1/3	0.82g					Thimble site # 18 Blk SB Thimble wt = 3.41g
	1375931	0.52g					IN-1 (Composite of Ash from 4 sites) (Thimbles 1 to 4)
	1375940	0.51g					IN-2 (Thimble #7)
	1375944	0.50g					IN-3 (Thimble #10) (Composite of 2 thimble's ash)
	1375959	0.53g					IN-4 (Thimble #17)
	1375955 N1/3	0.83g					BT-OHM Thimble total wt = 3.00g
	1375949	1 whole filter					Filter Blk #1 - Filter wt. = 403.6 mg
	1375949						Filter Blk #2 - Filter wt. = 391.3 mg
	1375949						Filter Blk #3 - Filter wt = 387.6 mg
	1375935						Filter Stk-1 Filter wt = 449.9 mg
	1375963						Filter Stk-2 Filter wt = 440.5 mg
	1375967						Filter Stk-3 Filter wt = 455.5 mg
	1375975						Filter Stk-4 Filter wt. = 409.5 mg
	1375971						Filter BT-OHM Filter wt = 268.7 mg

10/5/99 JP

```
RunProt: ONTARIO
RunFold: 100599HG Seq: 14   Batch:
                  Prnt: R/T On
                  Rev: 4.0    23:27:46 04 Oct 1999 Xmit: Off  Gas:    0.30 LPM
  Idle                                             User:             A/S: On
```

AUTOSAMPLER: Rack entry Rack RACK#1

cup	ID	Extended id	Weight	Volume	Macro
1	QCS/ICV	ONARIO 5 UG/L 10/4	1.0000	1.0000	
2	LRB-ASH	DIGEST 10/4/99	1.0000	1.0000	
3	LFB-ASH	2 UG/L 10/4	1.0000	1.0000	
4	NIST #	1633B COAL ASH 10/4	1.0000	1.0000	
5	1375954	3.39G/1.01G SB15	1.0000	1.0000	
6	1375954	3.30/0.83 SB 16	1.0000	1.0000	
7	1375954	3.41/0.82 SB 18	1.0000	1.0000	
8	1375931	COMP 0.52G/100	1.0000	1.0000	
9	1375940	0.51/100	1.0000	1.0000	
10	1375944	COMP 0.50/100	1.0000	1.0000	
11	1375959	0.53/100	1.0000	1.0000	
12	1375959	0.53/100	1.0000	1.0000	
13	1375959 PS	0.53/100 2 UG/L	1.0000	1.0000	
14	1375955	3.00/0.83 THIMBLE	1.0000	1.0000	
15	1375949	FILT BLK 1	1.0000	1.0000	

0.50g/100ml ← 4

PgDn

```
Cup 14 extended ID: 3.00/0.83 THIMBLE          Cell entry down Ins to switch
```

```
RunProt: ONTARIO
RunFold: 100599HG Seq: 14   Batch:
                  Prnt: R/T On
                  Rev: 4.0    23:27:48 04 Oct 1999 Xmit: Off  Gas:    0.30 LPM
  Idle                                             User:             A/S: On
```

AUTOSAMPLER: Rack entry Rack RACK#1 PgUp

cup	ID	Extended id	Weight	Volume	Macro
16	1375949	FILT BLK 2	1.0000	1.0000	
17	1375949	FILT BLK 3	1.0000	1.0000	
18	1375935	FILT/100	1.0000	1.0000	
19	1375963	FILT/100	1.0000	1.0000	
20	1375967	FILT/100	1.0000	1.0000	
21	1375975	FILT/100	1.0000	1.0000	
22	1375971	FILT/100	1.0000	1.0000	
23	1375971	FILT/100	1.0000	1.0000	
24	1375971	PS FILT/100 2 UG/L	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

```
Cup 16 extended ID: FILT BLK 2                    Cell entry down Ins to switch
```

RunProt: ONTARIO
RunFold: 100599HG Seq: 0 Batch:
Prnt: R/T On 10:00 05 Oct 1999
Rev: 4.0 ~~22:05:06 04 Oct 1999~~ 10/5/99 gm Xmit: Off Gas: LPM
Idle User: A/S: On

INSTRUMENT: Scheduled Maintenance

		Uses left	Last service	Next service
replace:	Pump tubing	219	30-Sep-99	10-Oct-99
	Waste drain tubing	1844	24-Sep-99	08-Sep-00
	Liquid/gas separator	3589	07-Sep-99	11-Oct-00
	puMp head	10000	N/A	N/A
	Hg lamp	N/A	30-Aug-99	27-Jan-00
	Reductant bottle	19	30-Sep-99	28-Mar-00
	prOcess tubing	3589	N/A	N/A
Clean optical cell		600	N/A	N/A

* - needs maintenance

For help on <hotkey> press Shift <hotkey>

```
RunProt: ONTARIO
RunFold: 100599HG Seq: 0    Batch:
                  Prnt: R/T On 10:10   05 Oct 1999
                  Rev: 4.0    ~~22:28:26 04 Oct 1999~~ Xmit: Off  Gas:    0.30 LPM
  Idle                                 10/5/99 ?        User:              A/S: On
```

UTILITY: Diagnostics	Tip X	0	1	0
Aper test	Tip Y	0	1	0
Test optic	Tip Z	95	1	0
Tip home	Gas	350		
Out port				
In port				
Run pcode				
Cal A/S				

aperture 18

acceptable Range:
-100 to +100

```
Sensors on soLenoid Enter for test Ins for motor More tests
Pcode halt 0     @ 344
```

```
RunProt: ONTARIO
RunFold: 100599HG Seq: 0    Batch:
                  Prnt: R/T On 10:10   05 Oct 1999
                  Rev: 4.0    ~~22:28:32 04 Oct 1999~~ Xmit: Off  Gas:    0.30 LPM
  Idle                                  gp. 10/5/99      User:              A/S: On
```

```
UTILITY:  Diagnostics  Tip X      0 1    0
Aper test              Tip Y      0 1    0
Test optic             Tip Z     95 1    0
Tip home               Gas      350
Out port                                        Smpl. intensity    1318213
In port                                         Ref. intensity     1325744
Run pcode
Cal A/S
```

} <10% Diffe

```
Sensors on soLenoid Enter for test Ins for motor More tests
Pcode halt 0     @ 142
```

10/5/99

~~22:34:16 04 Oct 1999~~ 10/5/99

Folder: 100599HG
Protocol: ONTARIO

Line	Conc.	Units	SD/RSD	1	2	3	4	5
*** Standard: 1 Rep: 1				Seq:	0	22:34:16 04 Oct 1999 HG		
Hg	.000	ug/l	-477					
*** Standard: 1 Rep: 2				Seq:	1	22:36:26 04 Oct 1999 HG		
Hg	.000	ug/l	-49					
*** Standard: 1 Rep: 1				Seq:	2	22:39:26 04 Oct 1999 HG		
Hg	.000	ug/l	-464					
*** Standard: 1 Rep: 2				Seq:	3	22:41:36 04 Oct 1999 HG		
Hg	.000	ug/l	-457					
*** Standard: 2 Rep: 1				Seq:	4	22:43:46 04 Oct 1999 HG		
Hg	.200	ug/l	25004					
*** Standard: 2 Rep: 2				Seq:	5	22:45:56 04 Oct 1999 HG		
Hg	.200	ug/l	24748					
*** Standard: 3 Rep: 1				Seq:	6	22:48:05 04 Oct 1999 HG		
Hg	.500	ug/l	63639					
*** Standard: 3 Rep: 2				Seq:	7	22:50:15 04 Oct 1999 HG		
Hg	.500	ug/l	63378					
*** Standard: 4 Rep: 1				Seq:	8	22:52:25 04 Oct 1999 HG		
Hg	2.00	ug/l	254824					
*** Standard: 4 Rep: 2				Seq:	9	22:54:35 04 Oct 1999 HG		
Hg	2.00	ug/l	255905					
*** Standard: 5 Rep: 1				Seq:	10	22:56:45 04 Oct 1999 HG		
Hg	5.00	ug/l	632465					
*** Standard: 5 Rep: 2				Seq:	11	22:59:05 04 Oct 1999 HG		
Hg	5.00	ug/l	632476					

Line	Conc.	Units	SD/RSD	1	2	3	4	5
*** Standard: 6 Rep: 1				Seq:	12	23:01:23 04 Oct 1999 HG		
Hg	10.0	ug/l	1238679					
*** Standard: 6 Rep: 2				Seq:	13	23:03:52 04 Oct 1999 HG		
Hg	10.0	ug/l	1247494					

RunProt: ONTARIO

RunFold: 100599AG Seq: 14 Batch:

Prnt: R/T On

Rev: 4.0 23:17:35 04 Oct 1999 Xmit: Off Gas: 0.30 LPM

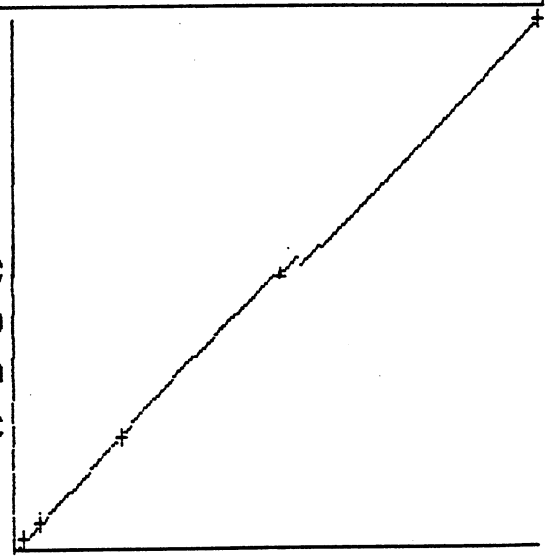
Idle User: A/S: On

CALIBRATION: Line proto: ONTARIO

	Hg Conc.	Calc.	Dev.	Accepted ->linear
S1	.000	-.024	-.024	Quadratic
S2	.200	.179	-.021	Wtdlinear
S3	.500	.490	-.010	C
S4	2.00	2.03	.031	Accept o
S5	5.00	5.06	.060	n
S6	10.0	9.96	-.036	c

A .0000000 r .999955

B 8.03204e-6 C -2.03102e-2



Relative Absorbance

	Mean	%RSD		
S1	-460	-1.07	-464	-457
S2	24876	0.73	25004	24748
S3	63500	0.29	63639	63370
S4	255364	0.3	254824	255905
S5	632470	0	632465	632476
S6	1243006	0.5	1238679	1247494

New cal coefficients stored

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

*** Check Standard: 4 Ck4IPC/CCV Seq: 14 23:30:02 04 Oct 1999 HG

Line	Flag	%Rcv.	Found	True	Units	SD/RSD
Hg		101.	5.06	5.00	ug/l	.000

$\bar{x}$ = 5.08 ug/l (102%R)

*** Check Standard: 3 Ck3IPC/CCV Seq: 15 23:32:21 04 Oct 1999 HG

Line	Flag	%Rcv.	Found	True	Units	SD/RSD
Hg		102.	5.10	5.00	ug/l	.000

*** Check Standard: 2 Ck2ICB/CCB Seq: 16 23:34:39 04 Oct 1999 HG

Line	Flag	%Rcv.	Found	True	Units	SD/RSD
Hg		-26000	-.026	.000	ug/l	.000

$\bar{x}$ = <0.0002 mg/l

*** Check Standard: 1 Ck1ICB/CCB Seq: 17 23:36:46 04 Oct 1999 HG

Line	Flag	Found	Range(+/-)	Units	SD/RSD
Hg		-.021	.200	ug/l	.000

*** Sample ID: QCS/ICV Seq: 18 23:38:51 04 Oct 1999 HG
ONARIO 5 UG/L 10/4

Hg 7.04 ug/l .000 7.04

10/5/99 gp

Reprepared *** Sample ID: QCS/ICV Seq: 19 23:44:25 04 Oct 1999 HG
ONARIO 5 UG/L 10/4

Hg 5.21 ug/l .000 5.21

$\bar{x}$ = 5.22 ug/l (104 %R)

*** Sample ID: QCS/ICV Seq: 20 23:46:43 04 Oct 1999 HG
ONARIO 5 UG/L 10/4

Hg 5.22 ug/l .000 5.22

*** Sample ID: LRB-ASH Seq: 21 23:48:59 04 Oct 1999 HG
DIGEST 10/4/99

Hg .063 ug/l .000 .063

$\bar{x}$ = <0.2 ug/l

*** Sample ID: LRB-ASH Seq: 22 23:51:02 04 Oct 1999 HG
DIGEST 10/4/99

Hg .070 ug/l .000 .070

*** Sample ID: LFB-ASH Seq: 23 23:53:07 04 Oct 1999 HG
2 UG/L 10/4

Hg 2.08 ug/l .000 2.08

$\bar{x}$ = 2.08 ug/l (104 %R)

*** Sample ID: LFB-ASH Seq: 24 23:55:11 04 Oct 1999 HG
2 UG/L 10/4

Hg 2.07 ug/l .000 2.07

*** Sample ID: NIST # Seq: 25 23:57:16 04 Oct 1999 HG
1633B COAL ASH 10/4 0.50g/100ml

Hg .722 ug/l .000 .722

True value = 0.141 ug/g ± 0.019

~~0.722 ug/l~~ 10/5/99

$$\frac{(0.721\ \text{ug/l})(0.100\ \text{l})}{0.50\ \text{g}} = 0.144\ \text{ug/g}\ Hg_{ash}$$

Line	Conc.	Units	SD/RSD	1	2	3	4	5
*** Sample ID: NIST #					Seq: 26	23:59:20 04 Oct 1999 HG		
				1633B COAL ASH 10/4				
Hg	.720	ug/l	.000	.720				
*** Sample ID: 1375954 Thimble Blk					Seq: 27	00:01:25 05 Oct 1999 HG		
				Final Vol = 0.1l 3.39G/1.01G SB15				
Hg	.055	ug/l	.000	.055				
*** Sample ID: 1375954					Seq: 28	00:03:28 05 Oct 1999 HG		
				3.39G/1.01G SB15				
Hg	.054	ug/l	.000	.054				
*** Sample ID: 1375954 Thimble Blk					Seq: 29	00:05:33 05 Oct 1999 HG		
				Final Vol = 0.1l 3.30/0.83 SB 16				
Hg	.047	ug/l	.000	.047				
*** Sample ID: 1375954					Seq: 30	00:07:37 05 Oct 1999 HG		
				3.30/0.83 SB 16				
Hg	.049	ug/l	.000	.049				
*** Sample ID: 1375954 Thimble Blk					Seq: 31	00:09:41 05 Oct 1999 HG		
				Final Vol = 0.1l 3.41/0.82 SB 18				
Hg	.027	ug/l	.000	.027				
*** Sample ID: 1375954					Seq: 32	00:11:46 05 Oct 1999 HG		
				3.41/0.82 SB 18				
Hg	.025	ug/l	.000	.025				
*** Sample ID: 1375931 Ash				Total Ash wt = 15.0282g	Seq: 33	00:13:51 05 Oct 1999 HG		
				COMP 0.52G/100ml				
Hg	5.00	ug/l	.000	5.00				
*** Sample ID: 1375931					Seq: 34	00:16:00 05 Oct 1999 HG		
				COMP 0.52G/100				
Hg	4.93	ug/l	.000	4.93				
*** Sample ID: 1375940 Ash				Total Ash = 11.8853g	Seq: 35	00:18:08 05 Oct 1999 HG		
				0.51/100ml				
Hg	5.98	ug/l	.000	5.98				
*** Sample ID: 1375940					Seq: 36	00:20:18 05 Oct 1999 HG		
				0.51/100				
Hg	6.05	ug/l	.000	6.05				
*** Sample ID: 1375944 Ash				Total Ash wt = 9.3282g	Seq: 37	00:22:25 05 Oct 1999 HG		
				COMP 0.50/100ml				
Hg	4.46	ug/l	.000	4.46				

nalyzed all three Blk thimbles separate.

$\bar{x} = <0.2\,ug/l \times \frac{3.39g\ total\ thimble}{1.01g\ thimble\ portion} \times 0.100l = <0.$ ug

$\bar{x} = (<0.2\,ug/l)(\frac{3.30}{0.83})(0.100l) = <0.08\,ug\ Hg_{fb}$

$\bar{x} = (<0.2\,ug/l)(\frac{3.41}{0.82})(0.10l) = <0.09\,ug\ Hg_{fb}$

See pg #342 for reported data. JAP.

$\bar{x} = (4.94\,ug/l)(\frac{0.10l}{0.52g}) = 0.95\,ug/g\ Hg$
$= (0.95\,ug/g\ Hg_{ash})(15.0282g) = 14.3\,ug\ Hg_{ash}$ *

$\bar{x} = (6.01\,ug/l)(\frac{0.10l}{0.51g}) = 1.18\,ug/g\ Hg_{ash}$ D.L = 0.5ug
$= (1.18\,ug/g\ Hg_{ash})(11.8853g) = 14.02\,ug\ Hg_{ash}$ *

$\bar{x} = (4.45\,ug/l)(\frac{0.10l}{0.50g}) = 0.89\,ug/g\ Hg_{ash}$ D.L = 0.4ug
$= (0.89\,ug/g\ Hg_{ash})(9.3282g) = 8.30\,ug\ Hg_{ash}$ *

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

*** Sample ID: 1375944 Seq: 38 00:24:34 05 Oct 1999 HG
COMP 0.50/100

Hg	4.43	ug/l	.000	4.43

*** Check Standard: 4 Ck4IPC/CCV Seq: 39 00:30:16 05 Oct 1999 HG

Line	Flag	%Rcv.	Found	True	Units	SD/RSD
Hg		101.	5.06	5.00	ug/l	.000

$\bar{x}$ = 5.07 ug/l
102%R

*** Check Standard: 3 Ck3IPC/CCV Seq: 40 00:32:37 05 Oct 1999 HG

Line	Flag	%Rcv.	Found	True	Units	SD/RSD
Hg		102.	5.08	5.00	ug/l	.000

*** Check Standard: 2 Ck2ICB/CCB Seq: 41 00:34:54 05 Oct 1999 HG

Line	Flag	%Rcv.	Found	True	Units	SD/RSD
Hg		-29900	-.030	.000	ug/l	.000

$\bar{X}$ = <0.2 ug/l

*** Check Standard: 1 Ck1ICB/CCB Seq: 42 00:37:01 05 Oct 1999 HG

Line	Flag	Found	Range(+/-)	Units	SD/RSD
Hg		-.023	.200	ug/l	.000

See pg #343 - For reported data.

Required 3 replicates.

*** Sample ID: 1375959 Ash Total Ash wt = 8.5367g Seq: 43 00:39:08 05 Oct 1999 HG D.L = 0.4
0.53/100

Hg	7.16	ug/l	.000	7.16

$\bar{x}$ = (7.11 ug/l)(0.10 l / 0.53 g) = 1.34 ug/g Hg ash
= (1.34 ug/g Hg ash)(8.5367 g) = 11.4 ug Hg ash

*** Sample ID: 1375959 Seq: 44 00:41:18 05 Oct 1999 HG
0.53/100

Hg	7.07	ug/l	.000	7.07

*** Sample ID: 1375959 Seq: 45 00:43:38 05 Oct 1999 HG
0.53/100

Hg	7.10	ug/l	.000	7.10

*** Sample ID: 1375959 Seq: 46 00:45:52 05 Oct 1999 HG
10/5/99 not enough sample 0.53/100

Hg	2.34	ug/l	.000	2.34

*** Sample ID: 1375959 PS Total Ash wt = 8.5367g Post Spk Seq: 47 00:47:56 05 Oct 1999 HG
0.53/100 2 UG/L

Hg	8.94	ug/l	.000	8.94

$\bar{x}$ = (8.96 ug/l)(0.100 l / 0.53 g)
= 1.69 ug/g Hg ash
= (1.69 ug Hg ash)(8.5367 g) = 14.4 ug Hg ash
93%R

Post Spk T.V. = (2.00 ug/l)(0.1 l / 0.53) = (0.377 ug/g Hg ash)

*** Sample ID: 1375959 PS Seq: 48 00:50:10 05 Oct 1999 HG
0.53/100 2 UG/L

Hg	8.97	ug/l	.000	8.97

*** Sample ID: 1375955 Thimble Seq: 49 00:52:26 05 Oct 1999 HG
Final vol = 0.1 l 3.00/0.83 THIMBLE

Hg	.033	ug/l	.000	.033

$\bar{x}$ = (<0.2 ug/l)(3.00 g total thimble wt / 0.83 g portion wt. of thimble digested)(0.10 l)
= <0.08 ug Hg

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

*** Sample ID: 1375955 Seq: 50 00:54:30 05 Oct 1999 HG
3.00/0.83 THIMBLE

Hg	.037	ug/l	.000	.037	

*** Sample ID: 1375949 Filter Seq: 51 00:56:34 05 Oct 1999 HG
FILT BLK 1 Final volume 0.1l

Hg	.063	ug/l	.000	.063	$\bar{x}$=(<0.2 ug/l)(0.10l) = <0.02 ug Hgf

*** Sample ID: 1375949 Seq: 52 00:58:38 05 Oct 1999 HG
FILT BLK 1

Hg	.063	ug/l	.000	.063	

*** Sample ID: 1375949 Seq: 53 01:00:42 05 Oct 1999 HG
FILT BLK 2 Final volume 0.1l

Hg	.030	ug/l	.000	.030	$\bar{x}$=(<0.2 ug/l)(0.10l) = <0.02 ug Hgf

*** Sample ID: 1375949 Seq: 54 01:02:48 05 Oct 1999 HG
FILT BLK 2

Hg	.028	ug/l	.000	.028	

*** Sample ID: 1375949 Seq: 55 01:04:52 05 Oct 1999 HG
FILT BLK 3 Final volume 0.1l

Hg	.048	ug/l	.000	.048	$\bar{x}$=(<0.2 ug/l)(0.10l) = <0.02 ug Hgf

*** Sample ID: 1375949 Seq: 56 01:06:56 05 Oct 1999 HG
FILT BLK 3

Hg	.047	ug/l	.000	.047	

ampleon hold 9/30/99 JP
ee g # 343 from 10/5/99 analysis for Total particle - Bound Hg results.

*** Sample ID: 1375935 Seq: 57 01:09:00 05 Oct 1999 HG
FILT/100ml

Hg	.333	ug/l	.000	.333	$\bar{x}$ = (0.332 ug/l)(0.10l) = 0.033 ug Hgf

*** Sample ID: 1375935 Seq: 58 01:11:05 05 Oct 1999 HG
FILT/100

Hg	.331	ug/l	.000	.331	

*** Sample ID: 1375963 Seq: 59 01:13:09 05 Oct 1999 HG
FILT/100ml

Hg	.209	ug/l	.000	.209	$\bar{x}$=(0.207 ug/l)(0.10l) = 0.0207 ug Hgf

*** Sample ID: 1375963 Seq: 60 01:15:14 05 Oct 1999 HG
FILT/100

Hg	.205	ug/l	.000	.205	

*** Sample ID: 1375967 Seq: 61 01:17:19 05 Oct 1999 HG
FILT/100ml

Hg	.234	ug/l	.000	.234	$\bar{x}$=(0.231 ug/l)(0.10l) = 0.0231 ug Hgf

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

*** Sample ID: 1375967 Seq: 62 01:19:24 05 Oct 1999 HG
FILT/100
Hg .228 ug/l .000 .228

*** Check Standard: 4 Ck4IPC/CCV Seq: 63 01:21:30 05 Oct 1999 HG
Line Flag %Rcv. Found True Units SD/RSD
Hg 101. 5.05 5.00 ug/l .000 $\bar{x}$ = 5.05 ug/l 101% R

*** Check Standard: 3 Ck3IPC/CCV Seq: 64 01:23:46 05 Oct 1999 HG
Line Flag %Rcv. Found True Units SD/RSD
Hg 101. 5.05 5.00 ug/l .000

*** Check Standard: 2 Ck2ICB/CCB Seq: 65 01:26:03 05 Oct 1999 HG
Line Flag %Rcv. Found True Units SD/RSD
Hg -26200 -.026 .000 ug/l .000 $\bar{x}$ = <0.2 ug/l

*** Check Standard: 1 Ck1ICB/CCB Seq: 66 01:28:10 05 Oct 1999 HG
Line Flag Found Range(+/-) Units SD/RSD
Hg -.025 .200 ug/l .000

ee js# 342 + 343 - total article-bound Hg calculations

*** Sample ID: 1375975 Seq: 67 01:30:16 05 Oct 1999 HG
FILT/100 ml
Hg .294 ug/l .000 .294 $\bar{x}$ = (0.297 ug/l)(0.10 l) = 0.0297 ug Hg f

*** Sample ID: 1375975 Seq: 68 01:32:21 05 Oct 1999 HG
FILT/100
Hg .299 ug/l .000 .299

*** Sample ID: 1375971 Seq: 69 01:34:26 05 Oct 1999 HG
FILT/100
Hg .036 ug/l .000 .036 $\bar{x}$ = (<0.2 ug/l)(0.10 l) = <0.02 ug Hg f

Required 3 replicates.

*** Sample ID: 1375971 Seq: 70 01:36:32 05 Oct 1999 HG
FILT/100
Hg .035 ug/l .000 .035

*** Sample ID: 1375971 Seq: 71 01:38:37 05 Oct 1999 HG
FILT/100
Hg .039 ug/l .000 .039

*** Sample ID: 1375971 Seq: 72 01:40:41 05 Oct 1999 HG
10/5/99 GR
FILT/100
Hg .028 ug/l .000 .028

*** Sample ID: 1375971 PS Post Spk Seq: 73 01:42:46 05 Oct 1999 HG
FILT/100 2 UG/L
Hg 2.06 ug/l .000 2.06 Post spk T.V. = (2.00 ug/l)(0.10 l) = 0.200 ug Hg f

Mistake of ~~Post Spk TV = 200 ug/l~~

$\bar{x}$ = (2.08 ug/l)(0.10 l) = 0.208 ug Hg f

104% R

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

*** Sample ID: 1375971 PS Seq: 74 01:44:52 05 Oct 1999 HG
FILT/100 2 UG/L

Hg	2.09	ug/l	.000	2.09

*** Check Standard: 4 Ck4IPC/CCV Seq: 75 01:46:59 05 Oct 1999 HG

Line	Flag	%Rcv.	Found	True	Units	SD/RSD
Hg		103.	5.14	5.00	ug/l	.000

$\bar{X}$ = 5.10 ug/l (102% R)

*** Check Standard: 3 Ck3IPC/CCV Seq: 76 01:49:16 05 Oct 1999 HG

Line	Flag	%Rcv.	Found	True	Units	SD/RSD
Hg		101.	5.06	5.00	ug/l	.000

*** Check Standard: 2 Ck2ICB/CCB Seq: 77 01:51:35 05 Oct 1999 HG

Line	Flag	%Rcv.	Found	True	Units	SD/RSD
Hg		-25000	-.025	.000	ug/l	.000

$\bar{X}$ = (0.2 ug/l)

*** Check Standard: 1 Ck1ICB/CCB Seq: 78 01:53:42 05 Oct 1999 HG

Line	Flag	Found	Range(+/-)	Units	SD/RSD
Hg		-.022	.200	ug/l	.000

1/1/99
[illegible]

Calculations for Total Amount of Particle-Bound Mercury (Hg_{tp}) by: (Eq. #7 in Method)

$$Hg_{(particle)}, \mu g = (Hg_{ash}) - Hg_{fb} + Hg_{pr}$$

where: Hg_{ash} = already calculated with weight factor, used data at run printout, µg

Hg_{fb} = Sample # 1375949 analyzed on 9/30/99. Result = <0.03µg

Hg_{pr} = Probe Rinse, 0.1N HNO_3 result performed on 9/30/99, µg

The Hg_{ash} and the Hg_{pr} portions have the same sample I.D. Numbers in LIMS. They represent different portions.

[illegible] on id 9/30/99 JP. →

#1375931 (IN-1)

$Hg_{(particle)}, \mu g = (14.3 \mu g\ Hg_{ash}) - (<0.03 \mu g\ Hg_{fb}) + (1.29 \mu g\ Hg_{pr})$

$Hg_{(particle)}, \mu g = 15.6 \mu g$

1375940 (IN-2) D.L = 0.5µg

$Hg_{(particle)}, \mu g = (14.02 \mu g\ Hg_{ash}) - (<0.03 \mu g\ Hg_{fb}) + (2.48 \mu g\ Hg_{pr})$

$Hg_{(particle)}, \mu g = 16.5 \mu g$

1375944 (IN-3) D.L = 0.4µg

$Hg_{(particle)}, \mu g = (8.30 \mu g\ Hg_{ash}) - (<0.03 \mu g\ Hg_{fb}) + (4.12 \mu g\ Hg_{pr}$

$= 12.42 \mu g\ Hg_{(particle)}$

→

10/11/99
JZP

Calculations for Total Particle-Bound Mercury (Con't)

1375959 (IN-4)

D.L = 0.4 µg

Hg (particle), µg = (11.4 µg Hg ash) − (<0.03 µg Hg fb) + (~~0.357~~ 3.57 µg Hg pr) JP 10/11/99

= ~~11.8~~ 15.0 µg Hg (particle) JP 10/11/99

Sample on hold 9/30/99 JP →

1375935 (STK-1)

Hg (particle), µg = (0.033 µg Hg f) − (<0.03 µg Hg fb) + (<0.05 µg Hg pr)

= 0.033 µg Hg (particle)

1375963 (STK-2)

D.L = 0.02 µg Hg particle

Hg (particle), µg = (0.0207 µg Hg f) − (<0.03 µg Hg fb) + (<0.07 µg Hg pr)

= ~~<0.~~ JP 10/11/99 0.0207 µg Hg (particle)

1375967 (STK-3)

D.L = 0.02 µg

Hg (particle), µg = (0.0231 µg Hg f) − (<0.03 µg Hg fb) + (<0.09 µg Hg pr)

= 0.023 µg Hg (particle)

1375975 (STK-4)

D.L = 0.02 µg

Hg (particle), µg = (0.0297 µg Hg f) − (<0.03 µg Hg fb) + (<0.05 µg Hg pr)

= 0.0297 µg Hg (particle)

1375955 (IN-BT)

Hg (particle), µg = (<0.08 µg Hg) − (<0.03 µg Hg fb) + (<0.03 µg Hg pr)

= <0.08 µg Hg (particle)

1375971 (STK-BT)

Hg (particle), µg = (<0.02 µg Hg f) − (<0.03 µg Hg fb) + (<0.04 µg Hg pr)

= <0.08 µg Hg particle

APPENDIX E
SAMPLE CALCULATIONS

SAMPLE CALCULATIONS FOR FLOW, MOISTURE AND ISO

Client: Birchwood Power
Test Number: Run 2
Test Location: Unit 1 Outlet

Plant: King George,VA
Test Date: 9/15/99
Test Period: 0742-1109

1. Volume of dry gas sampled at standard conditions (68 deg F, 29.92 in. Hg), dscf.

$$Vm(std) = \frac{17.64 \times Y \times Vm \times \left(Pb + \frac{delta\ H}{13.6} \right)}{(Tm + 460)}$$

$$Vm(std) = \frac{17.64 \times 1.0072 \times 81.239 \times \left(30.14 + \frac{1.072}{13.6} \right)}{94.30 + 460} = 78.689$$

Where:

Vm(std) =	Volume of gas sample measured by the dry gas meter, corrected to standard conditions, dscf.
Vm =	Volume of gas sample measured by the dry gas meter at meter conditions, dcf.
Pb =	Barometric Pressure, in Hg.
delt H =	Average pressure drop across the orifice meter, in H_2O
Tm =	Average dry gas meter temperature , deg F.
Y =	Dry gas meter calibration factor.
17.64 =	Factor that includes ratio of standard temperature (528 deg R) to standard pressure (29.92 in. Hg), deg R/in. Hg.
13.6 =	Specific gravity of mercury.

2. Volume of water vapor in the gas sample corrected to standard conditions, scf.

Vw(std) = (0.04707 x Vwc) + (0.04715 x Wwsg)

Vw(std) = (0.04707 x 225.0) + (0.04715 x 16.1) = 11.3

Where:

Vw(std) =	Volume of water vapor in the gas sample corrected to standard conditions, scf.
Vwc =	Volume of liquid condensed in impingers, ml.
Wwsg =	Weight of water vapor collected in silica gel, g.
0.04707 =	Factor which includes the density of water (0.002201 lb/ml), the molecular weight of water (18.0 lb/lb-mole), the ideal gas constant 21.85 (in. Hg) (ft^3)/lb-mole)(deg R); absolute temperature at standard conditions (528 deg R), absolute pressure at standard conditions (29.92 in. Hg), ft^3/ml.
0.04715 =	Factor which includes the molecular weight of water (18.0 lb/lb-mole), the ideal gas constant 21.85 (in. Hg) (ft^3)/lb-mole)(deg R); absolute temperature at standard conditions (528 deg R), absolute pressure at standard conditions (29.92 in. Hg), and 453.6 g/lb, ft^3/g.

3. Moisture content

$$bws = \frac{Vw(std)}{Vw(std) + Vm(std)}$$

$$bws = \frac{11.350}{11.350 + 78.689} = 0.126$$

Where:

bws =	Proportion of water vapor, by volume, in the gas stream, dimensionless.

4. Mole fraction of dry gas.

Md = 1 - bws

Md = 1 - 0.126 = 0.874

Where:

Md = Mole fraction of dry gas, dimensionless.

5. Dry molecular weight of gas stream, lb/lb-mole.

MWd = (0.440 x % CO_2) + (0.320 x % O_2) + (0.280 x (% N_2 + % CO))

MWd = (0.440 x 12.8) + (0.320 x 6.0) + (0.280 x (81.2 + 0.00))

= 30.29

Where:

MWd =	Dry molecular weight , lb/lb-mole.
% CO2 =	Percent carbon dioxide by volume, dry basis.
% O_2 =	Percent oxygen by volume, dry basis.
% N_2 =	Percent nitrogen by volume, dry basis.
% CO =	Percent carbon monoxide by volume, dry basis.
0.440 =	Molecular weight of carbon dioxide, divided by 100.
0.320 =	Molecular weight of oxygen, divided by 100.
0.280 =	Molecular weight of nitrogen or carbon monoxide, divided by 100.

6. Actual molecular weight of gas stream (wet basis), lb/lb-mole.

MWs = (MWd x Md) + (18 x (1 - Md))

MWs = (30.29 x 0.874) +(18 (1 - 0.874)) = 28.74

Where:

MWs =	Molecular weight of wet gas, lb/lb-mole.
18 =	Molecular weight of water, lb/lb-mole.

7. Average velocity of gas stream at actual conditions, ft/sec.

$$Vs = 85.49 \times Cp \times ((delt\ p)^{1/2})avg \times \left(\frac{Ts\ (avg)}{Ps \times MWs} \right)^{1/2}$$

$$Vs = 85.49 \times 0.84 \times 0.997410 \times \left(\frac{654}{30.07 \times 28.74} \right)^{\wedge}1/2 = 62.3$$

Where:

Vs =	Average gas stream velocity, ft/sec.
85.49 =	Pitot tube constant, ft/sec x $\frac{(lb/lb\text{-}mole)(in.\ Hg)^{1/2}}{(deg\ R)(in\ H_2O)}$
Cp =	Pitot tube coefficient, dimensionless.
Ts =	Absolute gas stream temperature, deg R = Ts, deg F + 460.
Ps =	Absolute gas stack pressure, in. Hg. = Pb + $\frac{P(static)}{13.6}$
delt p =	Velocity head of stack, in. H_2O

8. Average gas stream volumetric flowrate at actual conditions, wacf/min.

Qs(act) = 60 x Vs x As

Qs(act) = 60 x 62.32 x 188.69 = 705558

Where:

Qs(act) =	Volumetric flowrate of wet stack gas at actual conditions, wacf/min.
As =	Cross-sectional area of stack, ft^2.
60 =	Conversion factor from seconds to minutes.

9. Average gas stream dry volumetric flowrate at standard conditions, dscf/min.

$$Qs(std) = 17.64 \times Md \times \frac{Ps}{Ts} \times Qs(act)$$

$$Qs(std) = 17.64 \times 0.874 \times \frac{30.07}{654} \times 705558$$

$$= 499936$$

Where:

Qs(std) = Volumetric flowrate of dry stack gas at standard conditions, dscf/min.

Note: Volumetric flowrate from the unit 5 outlet (corrected to the Unit 5 inlet O_2 concentration) was used in the emission rate calculations. That value is 182,746 dscfm.

10. Isokinetic variation calculated from intermediate values, percent.

$$I = \frac{17.327 \times Ts \times Vm(std)}{Vs \times O \times Ps \times Md \times (Dn)^2}$$

$$I = \frac{17.327 \times 654 \times 78.689}{62.32 \times 144 \times 30.07 \times 0.874 \times (0.193)^2} = 101.5$$

Where:

I = Percent of isokinetic sampling.

O = Total sampling time, minutes.

Dn = Diameter of nozzle, inches.

17.327 = Factor which includes standard temperature (528 deg R), standard pressure (29.92 in. Hg), the formula for calculating area of circle $D^{2/4}$, conversion of square feet to square inches (144), conversion of seconds to minutes (60), and conversion to percent (100), $\frac{(in.\ Hg)(in^2)(min)}{(deg\ R)(ft^2)(sec)}$

SAMPLE CALCULATIONS FOR MERCURY

Client: Birchwood Power
Test Number: Run 2
Test Location: Unit 1 Outlet

Plant: King George,VA
Test Date: 9/15/99
Test Period: 0742-1109

1. Total Mercury concentration, lb/dscf.

$$C_1 = \frac{W \times 2.2046 \times 10E\text{-}9}{Vm_{(std)}}$$

$$C_1 = \frac{0.88 \times 2.2046 \times 10E\text{-}9}{78.689}$$

$$= 2.47E\text{-}11$$

Where:

W = Weight of Total Mercury collected in sample in ug.
C_1 = Total Mercury concentration, lb/dscf.
2.2046×10^{-9} = Conversion factor from ug to pounds.

2. Total Mercury concentration, ug/dscm

$$C_2 = \frac{W}{Vm_{(std)} \times 0.02832}$$

$$C_2 = \frac{0.881}{78.689 \times 0.02832}$$

$$= 0.40$$

Where:

C_2 = Total Mercury concentration, µg/dscm.
W = Total Mercury catch, µg.
0.02832 = Conversion factor from cubic feet to cubic meters.

3. Total Mercury concentration, ug/Nm3

$$C_3 = \frac{W}{Vm_{(std)} \times 0.02832 \times (16.44/17.64)}$$

$$C_3 = \frac{0.881}{2.08}$$

$$C_3 = 0.42$$

Where:

C_3	=	Total Mercury concentration, ug/Nm^3
W	=	Total Mercury catch, µg.
0.02832	=	Conversion factor from cubic feet to cubic meters.
16.44/17.64	=	Ratio of conversion factors for standard temperature and pressure and normal temperature.

4. Total Mercury mass emission rate, lbs/hr.

MR1 = C_1 x Qs(std) x 60

MR1 = 2.47E-11 x 499936 x 60

MR1 = 7.40E-04

Where:

MR1	=	Total Mercury mass emission rate, lbs/hr.
60	=	Conversion factor from minutes to hours.

5. Total Mercury mass emission rate, lbs/10E+12 Btu.

MR2 = MR1/F-Factor x 10E+6

MR2 = 7.40E-04 / 2142 x 10E+6

MR2 = 0.35

Where:

MR2	=	Total Mercury mass emission rate, lbs/10E+12 Btu.
Heat Input	=	2142 x 10^6 Btu/hr

APPENDIX F
EQUIPMENT CALIBRATION RECORDS

WESTON

NOZZLE CALIBRATION DATA FORM

Date 13 September 1999 Calibrated by JC

Nozzle Identification Number	Nozzle Diameter, Inches[1]			ΔD,[2]	D_{avg}[3]
	D_1	D_2	D_3		
6 .191	.190	.191	.192	.002	.191
6 .217	.217	.217	.217	.000	—
6 .193	.193	.192	.193	.001	.193

Where:

[1] $D_{1,2,3}$ = Three different nozzle diameters, inches; each diameter must be measured to nearest 0.001 in.

[2] ΔD = Maximum difference between any two diameters, inches. ΔD must be $\leq$0.004 in.

[3] D_{avg} = Nozzle diameter = average of D_1, D_2, and D_3.

nozzle.frm

WESTON

LONG/PRE DRY GAS METER CALIBRATION DATA FORM

Calibrator F. Mack

Date 4/19/99 **Meter Box Number** 9 **Plant** _____

Barometric pressure, P_b = 29.59 **in. Hg** **Dry Gas Meter Number** 6843913 **Comments** _____

Setting	Gas volume		Temperatures							
Orifice manometer	Wet test meter	Dry gas meter	Wet test meter	Dry gas meter						
(Δ H) in. H_2O	(V_w) ft^3	(V_d) ft^3	(t_w) °F	Inlet (td_i) °F	Outlet (td_o) °F	Avg (t_d) °F	Time (θ), min	Y_i	ΔH @$_i$ in. H_2O
0.5	5	689.126 684.040	66.5	77, 80	76, 77	77.5	12.7	1.0024	1.7822
1.0	5	694.195 689.126	66.5	80, 84	77, 78	80	9.2	1.0092	1.8619
1.5	10	704.405 694.195	67	85, 90	78, 89	85.5	15.4	1.0097	1.9403
2.0	10	714.659 704.405	67	90, 95	81, 83	87	13.4	1.0075	1.9534
3.0	10	724.945 714.659	67	94, 99	83, 85	90	10.4	1.0071	1.9282
							Avg	Y 1.0072	Δ H @ 1.8952

If there is only one thermometer on the dry gas meter, record the temperature under td_o.

(ΔH) in. H_2O	$\frac{\Delta H}{13.6}$	$Y_i = \frac{V_w P_b (t_d + 460)}{V_d \left(P_b + \frac{\Delta H}{13.6}\right)(t_w + 460)}$	$\Delta H@i = \frac{0.0317 \Delta H}{P_b (t_d + 460)} \left[\frac{(t_w + 460)\Theta}{V_w}\right]^2$
0.5	0.0368	$\frac{(5)(29.59)(77.5+460)}{(5.086)(29.59+.0368)(66.5+460)}$	$\frac{(.0317)(.5)}{(29.59)(77.5+460)}\left[\frac{(66.5+460)(12.7)}{5}\right]^2$
1.0	0.0735	$\frac{(5)(29.59)(80+460)}{(5.069)(29.59+.0735)(66.5+460)}$	$\frac{(.0317)(1.0)}{(29.59)(80+460)}\left[\frac{(66.5+460)(9.2)}{5}\right]^2$
1.5	0.110	$\frac{(10)(29.59)(85.5+460)}{(10.213)(29.59+.110)(67+460)}$	$\frac{(.0317)(1.5)}{(29.59)(85.5+460)}\left[\frac{(67+460)(15.4)}{10}\right]^2$
2.0	0.147	$\frac{(10)(29.59)(87+460)}{(10.251)(29.59+.147)(67+460)}$	$\frac{(.0317)(2.0)}{(29.59)(87+460)}\left[\frac{(67+460)(13.4)}{10}\right]^2$
3.0	0.221	$\frac{(10)(29.59)(90+460)}{(10.286)(29.59+.221)(67+460)}$	$\frac{(.0317)(3.0)}{(29.59)(90+460)}\left[\frac{(67+460)(10.9)}{10}\right]^2$

WESTON

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

DATE 4/19/99
AMBIENT TEMPERATURE 68
CALIBRATION [illegible]

POTENTIOMETER NUMBER 2010 #9
BAROMETRIC PRESSURE 29.59
REFERENCE: THERMOCOUPLE SIMULATOR
(ACCURACY ± 1°F)

REFERENCE TEMPERATURE °C	°F	TEMPERATURE READING FROM THERMOCOUPLE CHANNEL INPUT NUMBER 1	2	3	4	5	AVERAGE TEMPERATURE READING ①	TEMPERATURE DIFFERENCE ② (%)
0	32	31	31	31	31	31	31	1° - .20%
100	212	212	212	212	212	212	212	0° - 0%
500	932	932	932	932	932	932	932	0° - 0%
1000	1832	1830	1830	1830	1830	1830	1830	2° - .09%

COMMENTS

① AVERAGE TEMPERATURE READING = MEAN OF THE TEMPERATURE READINGS FOR THE THERMOCOUPLE CHANNELS

② THE CHANNEL READINGS MUST AGREE WITHIN ± 5°F OR 3°C

ACCEPTABLE TEMPERATURE DIFFERNCE ≤ 1.5 = $\left(\frac{(\text{REF TEMP}^\circ\text{F} + 460) - (\text{TEST TEMP}^\circ\text{F} + 460)}{(\text{REF TEMP}^\circ\text{F} + 460)}\right) \times 100$

WESTON

LONG/PRE DRY GAS METER CALIBRATION DATA FORM

Calibrator P. Mack

Date 3/30/99 **Meter Box Number** 14 **Plant** _____

Barometric pressure, P_b = 29.83 **in. Hg** **Dry Gas Meter Number** 6848169 **Comments** _____

Setting	Gas volume		Temperatures						
Orifice manometer	Wet test meter	Dry gas meter	Wet test meter	Dry gas meter					
(Δ H) in. H_2O	(V_w) ft^3	(V_d) ft^3	(t_w) °F	Inlet (td_i) °F	Outlet (td_o) °F	Avg (t_d) °F	Time (θ), min	Y_i	ΔH @$_i$ in. H_2O
0.5	5	638.464 633.449	69	77, 79	74, 75	76	13.0	1.0088	1.8753
1.0	5	943.481 938.464	69	80, 82	76, 76	78.5	9.2	1.0120	1.8697
1.5	10	953.563 943.481	69.5	82, 87	76, 78	81	15.7	1.0097	2.0362
2.0	10	963.665 953.563	69.5	85, 89	79, 80	83	13.4	1.0102	1.9705
3.0	10	973.740 963.665	69.5	85, 90	80, 81	84	10.9	1.0082	1.9521
							Avg	Y 1.0088	Δ H @ 1.9408

If there is only one thermometer on the dry gas meter, record the temperature under td_o.

(ΔH) in. H_2O	$\frac{\Delta H}{13.6}$	$Y_i = \frac{V_w P_b (t_d + 460)}{V_d \left(P_b + \frac{\Delta H}{13.6}\right)(t_w + 460)}$	$\Delta H@i = \frac{0.0317 \Delta H}{P_b (t_d + 460)} \left[\frac{(t_w + 460)\Theta}{V_w}\right]^2$
0.5	0.0368	$\frac{(5)(29.83)(76+460)}{(5.015)(29.83+.0368)(69+460)}$	$\frac{(.0317)(.5)}{(29.83)(76+460)}\left[\frac{(69+460)(13.0)}{5}\right]^2$
1.0	0.0735	$\frac{(5)(29.83)(78.5+460)}{(5.017)(29.83+.0735)(69+460)}$	$\frac{(.0317)(1.0)}{(29.83)(78.5+460)}\left[\frac{(69+460)(9.2)}{5}\right]^2$
1.5	0.110	$\frac{(10)(29.83)(81+460)}{(10.082)(29.83+.110)(69.5+460)}$	$\frac{(.0317)(1.5)}{(29.83)(81+460)}\left[\frac{(69.5+460)(15.7)}{10}\right]^2$
2.0	0.147	$\frac{(10)(29.83)(83+460)}{(10.102)(29.83+.147)(69.5+460)}$	$\frac{(.0317)(2.0)}{(29.83)(83+460)}\left[\frac{(69.5+460)(13.4)}{10}\right]^2$
3.0	0.221	$\frac{(10)(29.83)(84+460)}{(10.115)(29.83+.221)(69.5+460)}$	$\frac{(.0317)(3.0)}{(29.83)(84+460)}\left[\frac{(69.5+460)(10.9)}{\ldots}\right]^2$

WESTON

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

DATE 23 FEB 99
AMBIENT TEMPERATURE [illegible] 72
CALIBRATION GP

POTENTIOMETER NUMBER NOTEBOOK #14
BAROMETRIC PRESSURE 29.94
REFERENCE: THERMOCOUPLE SIMULATOR
(ACCURACY ± 1°F)

REFERENCE TEMPERATURE °C	°F	TEMPERATURE READING FROM THERMOCOUPLE CHANNEL INPUT NUMBER 1	2	3	4	5	AVERAGE TEMPERATURE READING ①	TEMPERATURE DIFFERENCE ② (%)
0	32	34	34	34	34	34	34	2° - .41
100	212	214	214	214	214	214	214	2° - .30%
500	932	934	934	934	934	93~~3~~4 GP	934	2° - .14%
1000	1832	1831	1831	1831	1831	183~~2~~1 GP	1831	1° - .04%

COMMENTS

① AVERAGE TEMPERATURE READING = MEAN OF THE TEMPERATURE READINGS FOR THE THERMOCOUPLE CHANNELS

② THE CHANNEL READINGS MUST AGREE WITHIN ± 5°F OR 3°C

ACCEPTABLE TEMPERATURE DIFFERNCE ≤ 1.5 = $\left(\frac{(\text{REF TEMP}^{\circ}\text{F} + 460) - (\text{TEST TEMP}^{\circ}\text{F} + 460)}{(\text{REF TEMP}^{\circ}\text{F} + 460)}\right) \times 100$

WESTON
MANAGERS DESIGNERS/CONSULTANTS

PITOT TUBE IDENTIFICATION NUMBER: P129

TYPE S PITOT TUBE INSPECTION DATA FORM

PITOT TUBE ASSEMBLY LEVEL? ✓ (YES) ____ (NO)

PITOT TUBE OPENINGS DAMAGED? ____ (YES-EXPLAIN BELOW) ✓ (NO)

α_1 = 0° (<10) α_2 = 0° (<10)

β_1 = 0° (<5) β_2 = 0° (<5)

γ = 1° θ = 0° A = .93 in.

z = A sin γ = .01 in.; (< 1/8 in.),

w = A sin θ = 0 in.; (< 1/32 in.),

P_a = .465 in. P_b = .465 in.

D_t = .38 in. $P_a = P_b$? ✓ (YES) ____ (NO)

COMMENTS ____

CALIBRATION REQUIRED? ____ (YES) ✓ (NO)

INSPECTOR Tom Bugg DATE 12-22-98

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WESTON
MANAGERS DESIGNERS/CONSULTANTS

PITOT TUBE IDENTIFICATION NUMBER: P136

TYPE S PITOT TUBE INSPECTION DATA FORM

PITOT TUBE ASSEMBLY LEVEL? ✓ (YES) ____ (NO)

PITOT TUBE OPENINGS DAMAGED? ____ (YES-EXPLAIN BELOW) ✓ (NO)

α_1 = 0° (<10) α_2 = 0° (<10)

β_1 = 0° (<5) β_2 = 0° (<5)

γ = 1° θ = 0° A = 92 in.

z = A sin γ = .01 in.; (< 1/8 in.),

w = A sin θ = 0 in.; (< 1/32 in.),

P_a = .46 in. P_b = .46 in.

D_t = .375 in. $P_a = P_b$? ✓ (YES) ____ (NO)

COMMENTS ____

CALIBRATION REQUIRED? ____ (YES) ✓ (NO)

INSPECTOR Tom Bugg DATE 12-22-98

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WESTON
MANAGERS DESIGNERS/CONSULTANTS

PITOT TUBE IDENTIFICATION NUMBER: P137

TYPE S PITOT TUBE INSPECTION DATA FORM

PITOT TUBE ASSEMBLY LEVEL? ✓ (YES) ____ (NO)

PITOT TUBE OPENINGS DAMAGED? ____ (YES-EXPLAIN BELOW) ✓ (NO)

α_1 = 0° (<10) α_2 = 0° (<10)

β_1 = 0° (<5) β_2 = 0° (<5)

γ = 1° θ = 0° A = .93 in.

z = A sin γ = .01 in.; (< 1/8 in.),

w = A sin θ = 0 in.; (< 1/32 in.),

P_a = .465 in. P_b = .465 in.

D_t = .38 in. $P_a = P_b$? ✓ (YES) ____ (NO)

COMMENTS ____

CALIBRATION REQUIRED? ____ (YES) ✓ (NO)

INSPECTOR Tom Bugg DATE 12-22-98

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APPENDIX G
TECHNICAL SYSTEM AUDIT

PROCEDURAL CHECKLIST
FOR EPA METHODS 1, 2, 3 AND 4

METHOD 1 DETERMINATIONS

Date 9/13/99 Time _____ Operator Costello/Pathapilli Observer Mills

Stack diameter properly determined? yes
Distance to nearest upstream disturbance properly determined? yes

Number of stack diameters? INLET ~ 7 OUTLET ~ 13

Distance of nearest downstream disturbance properly determined? yes

Number of sampling points properly selected? yes
Points properly marked on pitot tube? yes
Verification of cyclonic flow acceptable? yes

METHOD 2 SAMPLING

Date 9/14/99 Time _____ Operator JC/JP Observer Mills

Equipment identity matches pretest calibration list? yes

Pitot tube, lines, and manometer assembled correctly? yes

Pitot tube and components mounted interference-free manner? yes
Differential pressure gauge has correct sensitivity? yes

Differential pressure gauge leveled and zeroed? yes

Pretest leak check? yes Cyclonic flow checked? yes
Orientation of pitot tube correct during traverse? yes
Sampling port adequately sealed around pitot tube? yes
Process operating at correct conditions? yes
Stable reading taken at each traverse point? yes
Static pressure measured? yes Method used? Pitot tube rotated to null + 16 [illegible] from [illegible]
Moisture content determined? yes Method used? M4
Orsat samples taken? yes If not, explain why: _____

Post-test leak-check performed? yes Leak check results: Good <.02 CFM
Data recorded properly? yes Calculations correct? yes

PROCEDURAL CHECKLIST
FOR EPA METHODS 1, 2, 3 AND 4

METHOD 3 SAMPLING

Date 9/14/99 Time _____ Operator JC/DP Observer Mills

Method: Single-point grab _____ Single-point integrated _____
Multi-point integrated ✓
Is a filter used to remove particulate matter? NO
Sampling train leak checked? yes
Sampling train purged with stack gas prior to collecting the sample? yes

Sampling port properly sealed? yes

Sampling rate held constant? yes

METHOD 3 ANALYSIS

Molecular weight determination by Orsat: yes

Reagents at the proper level? yes Analyzer level? yes
Analyzer leak checked? yes Analyzed within 8 hours? yes
Sample line purged? yes Complete absorption of gases? yes
The analysis repeated until following analysis criteria met? yes

CO_2 - Any three analyses differ by:

a. $\leq 0.3\%$ when $CO_2 \geq 4.0\%$ NO

b. $\leq 0.2\%$ when $CO_2 \leq 4.0\%$ N/A

O_2 - Any three analyses differ by:

a. $\leq 0.3\%$ when $O_2 \geq 15.0\%$ N/A

b. $\leq 0.2\%$ when $O_2 \leq 14.0\%$ NO

All readings averaged and reported to nearest 0.1% yes

PROCEDURAL CHECKLIST
FOR EPA METHODS 1, 2, 3 AND 4

METHOD 4 SAMPLING

Date 7/14/99 Time _____ Operator JC/JP Observer MiHS

Method conducted in conjunction with pollutant emission test? (PeLim)
Impingers properly placed? yes

Impinger contents: 1st 100ml H_2O 2nd 100ml H_2O 3rd EMPTY
4th Silica Gel (300g) 5th NA 6th NA
Modifications? NONE
Cooling System: Crushed ice ✓ Other _____
Sampling time per point 36 Number of points 1

Probe heater on? N/A Temperature _____ Stable? _____
Filter heater on? N/A Temperature _____ Stable? _____

Crushed ice in ice bath around impingers? yes
Pretest leak check conducted? yes Leakage rate? <.02 cfm
Sampling rate constant? yes Isokinetic sampling? N/A
All data recorded properly? yes
Post-leak check conducted? yes Leakage rate? <.02 cfm
Analysis - Impinger Contents:
Method: Volumetric yes
Glassware cleaned following protocol for concurrent emission test? N/A
Gravimetric? Silica Gel Trip balance calibrated? yes

Measurement of silica gel? yes Balance? Triple Beam
Color of silica gel? 1/2 Blue Condition? OK
All analytical data recorded properly? yes

All readings averaged and reported to nearest 0.1%

TECHNICAL SYSTEM AUDIT CHECKLIST
TRACE METALS SAMPLING

Date 9/15/99 Time _____ Operator JC/JP Observer Mills

Equipment Setup

Equipment identity matches pretest calibration list? yes

Probe nozzle: _____ Glass yes

Button-hook yes Elbow _____ Size Inlet - 0.191 outlet 0.193

Cleaned according to sampling protocol? yes

Probe Liner: Borosilicate yes Quartz _____ Other _____

Cleaned according to sampling protocol? yes

Probe heating system: yes

Checked? ✓ Temperature ~250°F Stable? yes

Pitot Tube: Type S yes Other _____

Properly attached to probe (no interference to nozzle)? yes

Modifications: NONE

Pitot tube coefficient 0.84

Differential Pressure Gauge: Inclined manometers yes

Magnehelics NO Ranges 0-10 inches

thimble ~~Cylone~~ (inlet only): Borosilicate Glass yes Other _____

Cleaned according to sampling protocol? yes

Filter Holder: Borosilicate Glass yes Other _____

Frit material: Borosilicate Glass NO Stainless NO

Teflon yes Other _____

Gasket Material: Silicone _____ Other _____

Cleaned according to sampling protocol? yes

Filter Type(s): QUARTZ FIBER

Impinger train: Number of impingers 8

Cleaned according to sampling protocol? yes

Contents: 1st 0.1N KCl (100ml) 2nd 0.1N KCl (100ml) 3rd 0.1N KCl (100ml)

4th 5% HNO3/10% H2O2 5th 7th 4% KMnO4/10% H2SO4 ~~6th~~ 8th Silicabel

Impinger Weights recorded? yes

Cooling System ICE BATH

Proper connections? yes

Modifications HEATED Teflon

Silica Gel: Type INDICATING New? ✓ Used? _____

Barometer: Mercury _____ Aneroid _____ Other Electronic

Gas Density Determination: Temperature sensor yes

Pressure gauge MANOMETER

Temperature sensor properly attached to probe? yes

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TECHNICAL SYSTEM AUDIT CHECKLIST
TRACE METALS SAMPLING

Date 9/15/99 Time _____ Operator JC/JF Observer MJ/HS

Test Procedures

Recent Calibrations: Pitot tubes yes
Meter Box yes Thermocouples/thermometers yes
Filters checked visually for irregularities? yes
Filters properly centered? yes Labeled? ✓
Nozzle size properly selected? yes
All openings of sampling train plugged (pre-test and post-test) yes GLASS BALLS/CAPS-TFE
Impingers properly assembled? yes
Pitot lines checked for leaks and plugging? yes
Meter box leveled? yes Manometers zeroed? yes
Delta H from most recent calibration yes
Calculator ~~Nomograph~~ setup correctly? yes K factor Inlet ~0.96 outlet ~1.08
Pretest leak check conducted? yes Leakage rate? <0.02 CFM
Care taken to avoid scraping port or stack wall? yes
Effective seal around probe when in-stack? yes
Probe moved to traverse points at proper time? yes
Leak check conducted during port change? Before yes After? yes
Nozzle and pitot tubes kept parallel to stack at all times? yes
Filter(s) changed during run? outlet - NO Inlet - Sometimes
Any particulate lost during filter change? NO
Data forms completed and data recorded properly? yes
Calculator ~~Nomograph~~ setting changed with significant change in the stack temperature? yes
Velocity pressure and orifice pressure recorded accurately? yes
Post-test leak check conducted? yes Leakage rate <.02 CFM
at inches of mercury (> Highest VAC During Test)
Orsat analysis? yes Stack + Inlet Integrated yes
Approximate stack temperature Inlet ~270 outlet ~190 Gas sample volume _____
Percent isokinetic calculated yes all 100% ± 10%

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TECHNICAL SYSTEM AUDIT CHECKLIST
TRACE METALS SAMPLING

Date 9/13/95 Time _____ Operator JC/JP Observer Mills

Sample Recovery

Brushes: Nylon bristle NO Other TEFlon
Cleaned according to sampling protocol? yes
Wash Bottles: Glass _____ Polyethylene _____ Other TEFlon
Cleaned according to sampling protocol? yes
Storage containers: Borosilicate glass yes Other _____
Cleaned according to sampling protocol? yes
Cap material Teflon Leak free? ✓
Petri dishes: Borosilicate glass yes Other _____
Cleaned according to sampling protocol? yes
Graduated cylinder: Borosilicate glass yes Other _____
Subdivisions of graduated cylinder ≤ 2 ml? yes
Cleaned according to sampling protocol? yes
Balance type Electronic Calibrated? yes
Probe allowed to cool sufficiently? yes
Probe and sample train openings covered? yes
Clean-up area(s) used Weston Trailer
Silica gel: Color? Blue Condition? Good
Probe handling: Acetone rinse N/A 0.1 N Nitric rinse yes
Sample ~~Particulate~~ recovery: Probe nozzle ✓ Probe fitting ✓
Probe liner ✓ Front half of filter holder ✓
Blanks collected: Reagent(s) yes + Field Blank Trains
0.1 N Nitric + 10% nitric + 5% nitric/10% HCl Acetone NO
Impinger rinses: 0.1 N Nitric yes Other rinses yes as per Ontario Hydro Procedure
Recovery efficiency samples collected from this train? NO
Sample numbers: _____
Samples labeled and stored properly? yes
Liquid levels marked? yes
Filter handling: tweezers used? yes Surgical gloves? yes
Any particulate lost? NO
NOTE: The above TSA would also be applied to the EPA Method 12 test train. + Ontario Hydro Method

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