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Interpoll Laboratories, Inc.
4500 Ball Road N.E.
Circle Pines, Minnesota 55014-1819

TEL: (612) 786-6020
FAX: (612) 786-7854

RESULTS OF THE MARCH 15, 1990 DUST COLLECTOR PERFORMANCE TEST ON THE NO. 1 CRUSHER PRIMARY DUST COLLECTOR AT THE CYPRUS NORTHSHORE MINING FACILITY IN BABBITT, MINNESOTA

Submitted to:

CYPRUS NORTHSHORE MINING
10 Outer Drive
Silver Bay, Minnesota 55614

Attention: Dennis Wagner

Approved by:

Kathleen Eickstadt

Kathleen Eickstadt
Senior Data Analyst
Field Testing Division

Report Number 0-2995
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KE/prp

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ABBREVIATIONS

ACFM	actual cubic feet per minute
cc (ml)	cubic centimeter (milliliter)
DSCFM	standard cubic foot of dry gas per minute
DSML	dry standard milliliter
DEG-F (^{0}F)	degrees Fahrenheit
DIA.	diameter
FP	finished product for plant
FT/SEC	feet per second
g	gram
GPM	gallons per minute
GR/ACF	grains per actual cubic foot
GR/DSCF	grains per dry standard cubic foot
g/dscm	grams per dry standard cubic meter
HP	horsepower
HRS	hours
IN.	inches
IN.HG.	inches of mercury
IN.WC.	inches of water
LB	pound
LB/DSCF	pounds per dry standard cubic foot
LB/HR	pounds per hour
LB/10^6BTU	pounds per million British Thermal Units heat input
LB/MMBTU	pounds per million British Thermal Units heat input
LTPD	long tons per day
MW	megawatt
mg/Nm^3	milligrams per dry standard cubic meter
ug/Nm^3	micrograms per dry standard cubic meter
microns (um)	micrometer
MIN.	minutes
ng	nanograms
ohm-cm	ohm-centimeter
PM	particulate matter
PPH	pounds per hour
PPM	parts per million
ppmC	parts per million carbon
ppm,d	parts per million, dry
ppm,w	parts per million, wet
ppt	parts per trillion
PSI	pounds per square inch
SQ.FT.	square feet
TPD	tons per day
ug	micrograms
v/v	percent by volume
w/w	percent by weight
<	$\leq$ (when following a number)

Standard conditions are defined as 68 ^{0}F (20 ^{0}C) and 29.92 IN. of mercury pressure.

1 INTRODUCTION

On March 15, 1990, Interpoll Laboratories personnel conducted a dust collector performance test on the No. 1 Crusher Primary Dust Collector at the Cyprus Northshore Mining Facility located in Babbitt, Minnesota. On-site testing was performed by D. Smith and M. Kaehler. Coordination between testing activities and plant operation was provided by Pete Posticka of Cyprus Northshore Mining. The test was not witnessed by a member of the Minnesota Pollution Control Agency.

The Primary Dust Collector tested is a Allis Chalmers Model #70-9 dust collector equipped with a cyclone precleaner. The multiclone collects dust from the No. 1 Crusher which has a rated capacity of 3000 TON/HR.

Evaluations were performed in accordance with EPA Methods 1 - 5 CFR Title 40, Part 60, Appendix A (revised July 1, 1988). A preliminary determination of the gas linear velocity profile was made at each test site before the first particulate determination to allow selection of the appropriate nozzle diameter required for isokinetic sample withdrawal. Interpoll Labs sampling trains which meet or exceed specifications in the above-cited reference were used to extract particulate samples simultaneously at the dust collector inlet and outlet by means of heated glass-lined probes.

Testing on the dust collector inlet was conducted from a set of four test ports located 4'-11" downstream and 1'-9" upstream of any flow disturbances. A 24-point traverse was used to collect representative particulate samples. Each traverse point was sampled 2.5 minutes to give a total sampling time of 60 minutes per run.

Testing on the dust collector outlet was conducted from two test ports oriented at 90 degrees on the stack and located 3.4 stack diameters

downstream of any flow disturbance and 2.0 diameters upstream of the stack exit. A 24-point traverse was used to collect representative particulate samples. Each traverse point was sampled 2.5 minutes to give a total sampling time of 60 minutes per run.

A visible emission determination was unable to be performed due to rain.

The important results of the test are summarized in Section 2. Detailed results are presented in Section 3. Field data and all other supporting information are presented in the appendices.

2 SUMMARY AND DISCUSSION

The results of the dust collector performance test are summarized in Table 1. As will be noted, the particulate removal efficiency averaged 61.7%. A visible emission determination could not be performed due to rain.

No difficulties were encountered in the field or in the laboratory evaluation of the samples. On the basis of this fact and a complete review of the entire data and results, it is our opinion that the results reported herein are accurate and closely reflect the actual values which existed at the time the test was performed.

Table 1. Summary of the Results of the March 15, 1990 Dust Removal Performance Test on the No. 1 Crusher Primary Dust Collector at the Cyprus Northshore Mining Facility in Babbitt, Minnesota.

ITEM	RUN 1		RUN 2		RUN 3	
	Inlet	Stack	Inlet	Stack	Inlet	Stack
Date of Test	03-15-90	03-15-90	03-15-90	03-15-90	03-15-90	03-15-90
Time Runs Were Done (HRS)	0820-0920	0820-0923	0950-1050	0950-1054	1120-1220	1120-1223
Process Rate (TON/HR)		1379		1773		1172
Volumetric Flow						
Actual (ACFM)	34626	42751	34642	43522	34229	44028
Standard (DSCFM)	31775	39959	31790	40425	31364	40865
Gas Temperature (DEG-F)	58	56	58	57	58	59
Moisture Content (%V/V)	1.16	0.99	1.16	1.39	1.31	1.24
Gas Composition (%V/V,dry)						
Carbon Dioxide	0.03	0.03	0.03	0.03	0.03	0.03
Oxygen	20.90	20.90	20.90	20.90	20.90	20.90
Nitrogen	79.07	79.07	79.07	79.07	79.07	79.07
Isokinetic Variation (%)	100.1	100.0	100.1	100.3	100.2	100.2
Particulate Concentration						
Actual (GR/ACF)	0.477	0.138	0.495	0.156	0.462	0.141
Standard (GR/DSCF)	0.520	0.148	0.540	0.168	0.505	0.152
Part. Emission Rate (LB/HR)	141.5	50.54	147.2	58.19	135.7	53.19
Part. Removal Efficiency (%)		64.3		60.5		60.8

Note: Dry Catch Only

91.5

3 RESULTS

The results of all field and laboratory evaluations are presented in this section. Gas composition (Orsat and moisture) are presented first followed by the computer printout of the particulate and opacity results. An Orsat analysis was not performed on the exhaust gas, since only ambient air is exhausted from the process. The composition of the gas reported is the average geophysical composition of air. The moisture contents reported were measured as per EPA Method 4. Preliminary measurements including test port locations are given in the appendices.

The results have been calculated on a personal computer using programs written in Extended BASIC specifically for source testing calculations. EPA-published equations have been used as the basis of the calculation techniques in these programs. The particulate emission rate has been calculated using the product of the concentration times flow method.

3.1 Results of Orsat and Moisture Analyses

Test No. 1
No. 1 Crusher Primary Inlet

Results of Orsat & Moisture Analyses-----Methods 3 & 4(%v/v)

Date of run	Run 1 03-15-90	Run 2 03-15-90	Run 3 03-15-90
Dry basis (orsat)			
carbon dioxide.....	0.03	0.03	0.03
oxygen.....	20.90	20.90	20.90
carbon monoxide.....	0.00	0.00	0.00
nitrogen.....	79.07	79.07	79.07
Wet basis (orsat)			
carbon dioxide.....	0.03	0.03	0.03
oxygen.....	20.66	20.66	20.63
carbon monoxide.....	0.00	0.00	0.00
nitrogen.....	78.16	78.16	78.03
water vapor.....	1.16	1.16	1.31
Dry molecular weight.....	28.84	28.84	28.84
Wet molecular weight.....	28.72	28.72	28.70
Specific gravity.....	0.992	0.992	0.991
Water mass flow.....(LB/HR)	1043	1043	1171
FO	0.000	0.000	0.000

Test No. 1
No. 1 Crusher Primary Stack

Results of Orsat & Moisture Analyses-----Methods 3 & 4(%v/v)

	Run 1	Run 2	Run 3
Date of run	03-15-90	03-15-90	03-15-90
Dry basis (orsat)			
carbon dioxide.....	0.03	0.03	0.03
oxygen.....	20.90	20.90	20.90
carbon monoxide.....	0.00	0.00	0.00
nitrogen.....	79.07	79.07	79.07
Wet basis (orsat)			
carbon dioxide.....	0.03	0.03	0.03
oxygen.....	20.69	20.61	20.64
carbon monoxide.....	0.00	0.00	0.00
nitrogen.....	78.28	77.97	78.09
water vapor.....	0.99	1.39	1.24
Dry molecular weight.....	28.84	28.84	28.84
Wet molecular weight.....	28.73	28.69	28.71
Specific gravity.....	0.993	0.991	0.992
Water mass flow.....(LB/HR)	1126	1602	1443

3.2 Results of Particulate Loading Determinations

Test No. 1
No. 1 Crusher Primary Inlet

Results of Particulate Loading Determinations-------Method 5

	Run 1	Run 2	Run 3
Date of run	03-15-90	03-15-90	03-15-90
Time run start/end.....(HRS)	820/ 920	950/1050	1120/1220
Static pressure.....(IN.WC)	-4.50	-4.50	-4.50
Cross sectional area (SQ.FT)	12.39	12.39	12.39
Pitot tube coefficient.....	.840	.840	.840
Water in sample gas			
condenser.....(ML)	0.0	0.0	0.0
impingers.....(GRAMS)	0.0	0.0	0.0
desiccant.....(GRAMS)	8.0	8.0	9.0
total.....(GRAMS)	8.0	8.0	9.0
Total particulate material..			
.....collected(grams)	1.0857	1.1291	1.0422
Gas meter coefficient.....	1.0012	1.0012	1.0012
Barometric pressure..(IN.HG)	27.60	27.60	27.60
Avg. orif.pres.drop..(IN.WC)	1.04	1.05	1.04
Avg. gas meter temp..(DEF-F)	50.7	55.5	57.8
Volume through gas meter....			
at meter conditions...(CF)	33.68	34.02	33.76
standard conditions.(DSCF)	32.24	32.26	31.87
Total sampling time....(MIN)	60.00	60.00	60.00
Nozzle diameter.....(IN)	.196	.196	.196
Avg.stack gas temp ..(DEG-F)	58	58	58
Volumetric flow rate.....			
actual.....(ACFM)	34626	34642	34229
dry standard.....(DSCFM)	31775	31790	31364
Isokinetic variation.....(%)	100.1	100.1	100.2
Particulate concentration...			
actual.....(GR/ACF)	0.47670	0.49541	0.46217
dry standard.....(GR/DSCF)	0.51968	0.54007	0.50460
Particle mass rate...(LB/HR)	141.54	147.16	135.65

Test No. 1
No. 1 Crusher Primary Stack

Results of Particulate Loading Determinations-------Method 5

	Run 1	Run 2	Run 3
Date of run	03-15-90	03-15-90	03-15-90
Time run start/end.....(HRS)	820/ 923	950/1054	1120/1223
Static pressure.....(IN.WC)	0.22	0.22	0.22
Cross sectional area (SQ.FT)	14.05	14.05	14.05
Pitot tube coefficient.....	.840	.840	.840
Water in sample gas			
condenser.....(ML)	0.0	0.0	0.0
impingers.....(GRAMS)	0.0	0.0	0.0
desiccant.....(GRAMS)	7.0	10.0	9.0
total.....(GRAMS)	7.0	10.0	9.0
Total particulate material..			
.....collected(grams)	0.3143	0.3632	0.3317
Gas meter coefficient.....	0.9980	0.9980	0.9980
Barometric pressure..(IN.HG)	27.60	27.60	27.60
Avg. orif.pres.drop..(IN.WC)	1.06	1.10	1.12
Avg. gas meter temp..(DEF-F)	55.5	59.9	61.8
Volume through gas meter....			
at meter conditions...(CF)	34.77	35.60	36.09
standard conditions.(DSCF)	32.87	33.37	33.71
Total sampling time....(MIN)	60.00	60.00	60.00
Nozzle diameter.....(IN)	.188	.188	.188
Avg.stack gas temp ..(DEG-F)	56	57	59
Volumetric flow rate.....			
actual.....(ACFM)	42751	43522	44028
dry standard.....(DSCFM)	39959	40425	40865
Isokinetic variation.....(%)	100.0	100.3	100.2
Particulate concentration...			
actual.....(GR/ACF)	0.13787	0.15593	0.14088
dry standard.....(GR/DSCF)	0.14756	0.16795	0.15184
Particle mass rate...(LB/HR)	50.54	58.19	53.19

3.3 Results of Opacity Determinations

Interpoll Labs Report No. O-2995
Cyprus Northshore Mining
Silver Bay, Minnesota

Test No. 1
No. 1 Crusher Primary Dust Collector Stack

Results of Opacity Observations - EPA Method 9*

Percent Opacity	Optical Density	Relative Frequency(%)
0	.0000	
5	.0223	
10	.0458	
15	.0706	
20	.0969	
25	.1249	
30	.1549	
35	.1871	
40	.2219	
45	.2596	
50	.3010	
55	.3468	
60	.3979	
65	.4559	
70	.5229	
75	.6021	
80	.6990	
85	.8239	
90	1.0000	
95	1.3010	
99	2.0000	

Time Average

Observer: S. Bainville
Cert. Date: 10-18-89
Date of Observation: 3-15-90
Time of Observation: 0911/1011

* Unable to perform due to rain.

APPENDIX A

RESULTS OF PRELIMINARY VOLUMETRIC FLOW RATE DETERMINATIONS

Test No. 1
No. 1 Crusher Primary Inlet

Results of Volumetric Flow Rate Determination-------Method 2

Date of Determination.....	03-15-90
Time of Determination.....(HRS)	730
Barometric pressure.....(IN.HG)	29.6
Pitot tube coefficient.....	.84
Number of sampling ports.....	4
Total number of points.....	24
Shape of duct.....	Rectangular
Duct width.....(IN)	43
Duct length.....(IN)	41.5
Duct area.....(SQ.FT)	12.39
Direction of flow.....	UP
Static pressure.....(IN.WC)	-4.5
Avg. gas temp.....(DEG-F)	57
Moisture content.....(% V/V)	1.16
Avg. linear velocity.....(FT/SEC)	45.3
Gas density.....(LB/ACF)	.07451
Molecular weight.....(LB/LBMOLE)	28.84
Mass flow of gas.....(LB/HR)	150471
Volumetric flow rate.....	
actual.....(ACFM)	33660
dry standard.....(DSCFM)	33242

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Cyprus Northshore Mining Corporation
Babbit, Minnesota

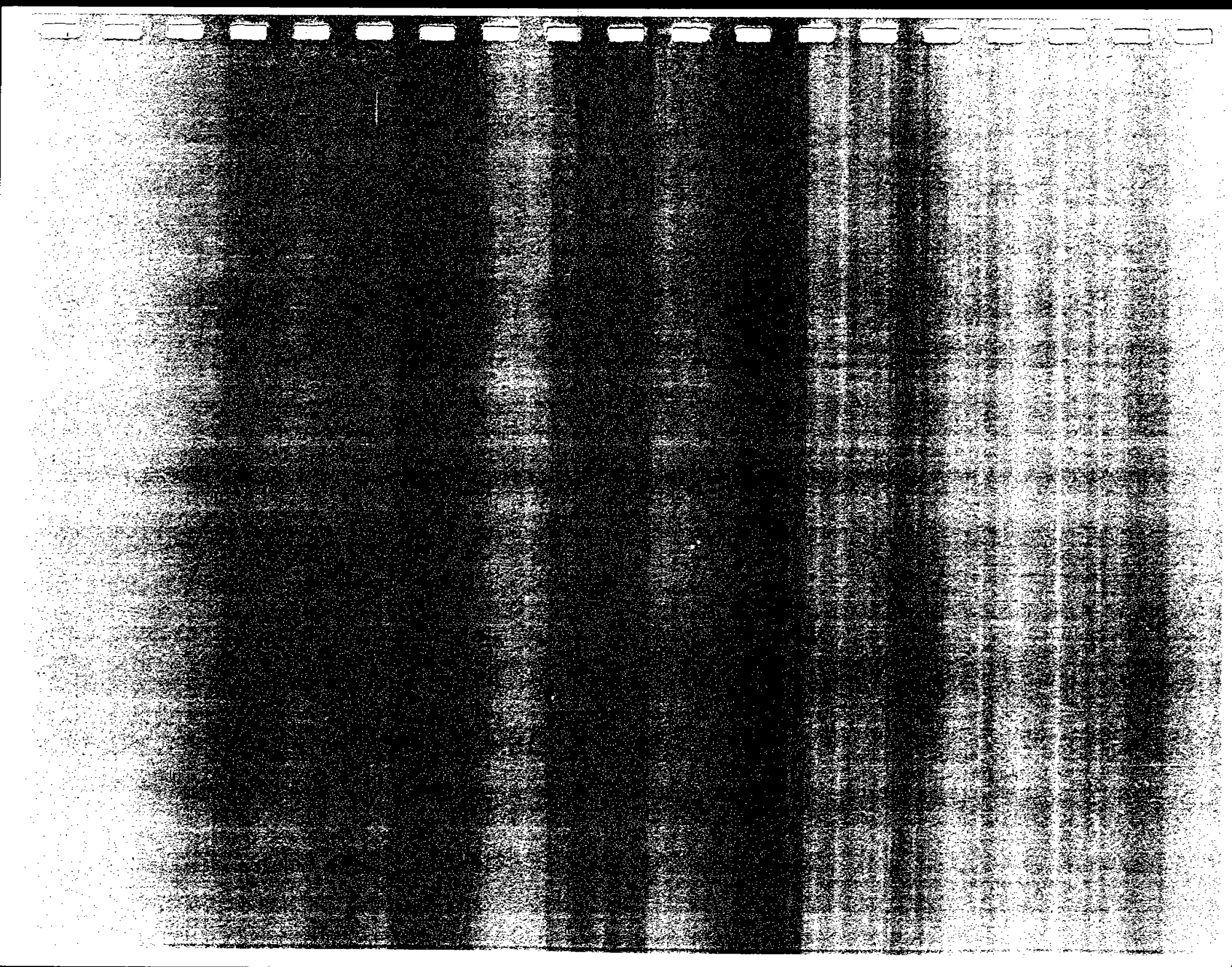
Test No. 1
No. 1 Crusher Primary Stack

Results of Volumetric Flow Rate Determination-------Method 2

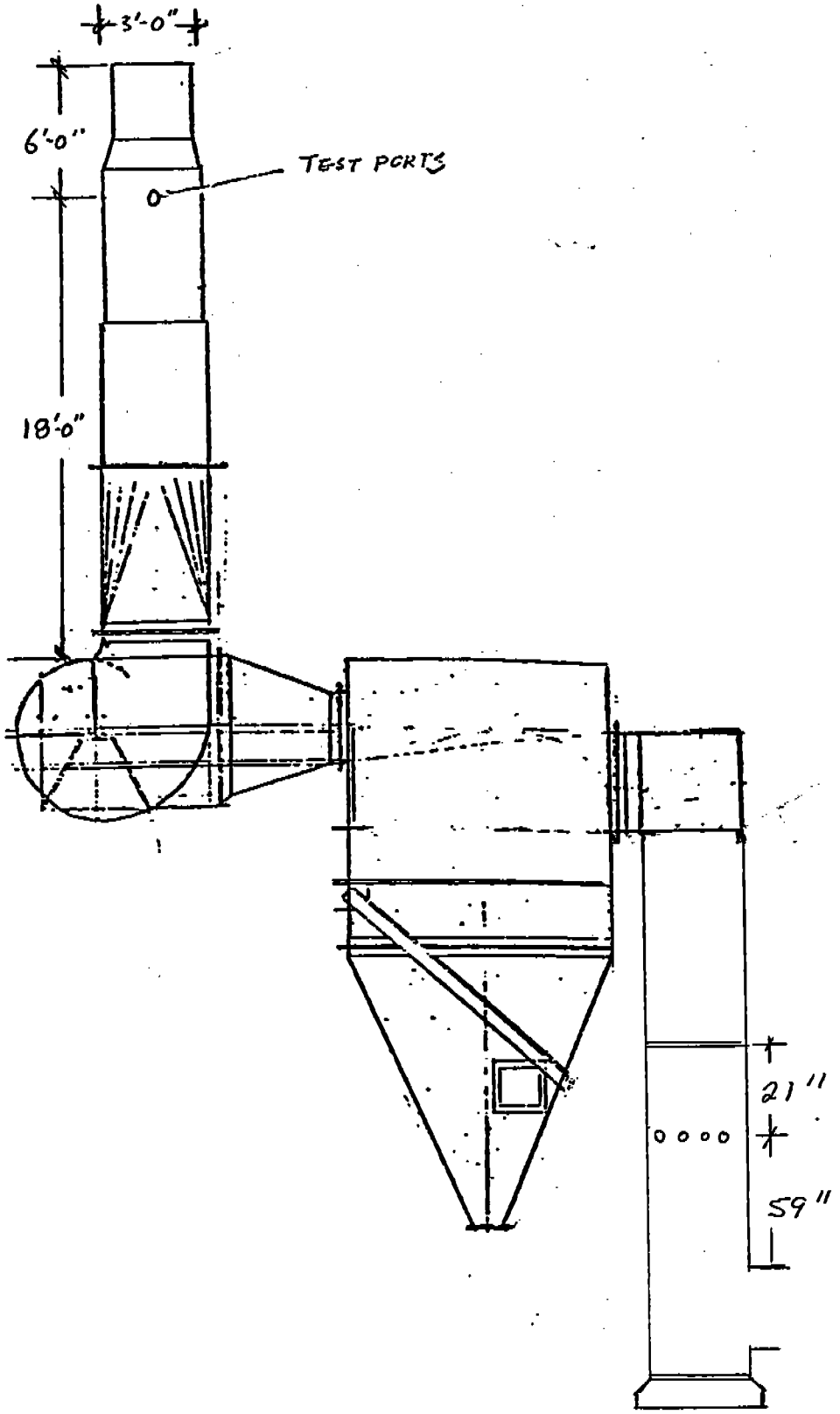
Date of Determination.....	03-15-90
Time of Determination.....(HRS)	1515
Barometric pressure.....(IN.HG)	27.81
Pitot tube coefficient.....	.84
Number of sampling ports.....	2
Total number of points.....	24
Shape of duct.....	Round
Stack diameter.....(IN)	50.75
Duct area.....(SQ.FT)	14.05
Direction of flow.....	UP
Static pressure.....(IN.WC)	.22
Avg. gas temp.....(DEG-F)	61
Moisture content.....(% V/V)	0.99
Avg. linear velocity.....(FT/SEC)	51.5
Gas density.....(LB/ACF)	.07036
Molecular weight.....(LB/LBMOLE)	28.84
Mass flow of gas.....(LB/HR)	183290
Volumetric flow rate.....	
actual.....(ACFM)	43417
dry standard.....(DSCFM)	40533

APPENDIX B

LOCATION OF TEST PORTS

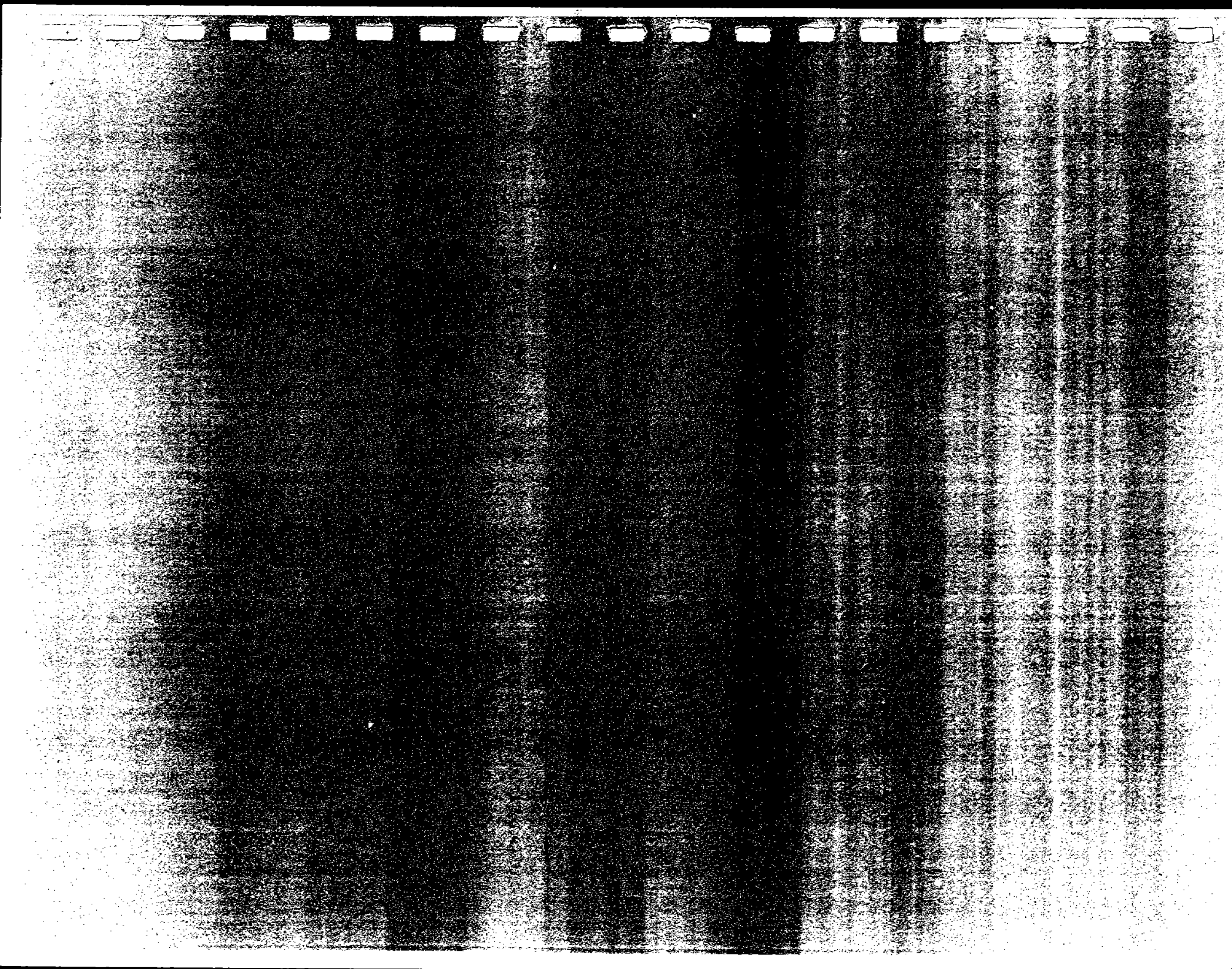


CYPRUS NORTHSHORE MINING
PRIMARY CRUSHER DUST COLLECTOR



APPENDIX C

METHODS 2 - 5 FIELD DATA SHEETS - INLET



INTERPOLL LABORATORIES EPA METHOD 2 FIELD DATA SHEET

Job CYPRESS N.S.M. / BABBIT

Source #1 CRUSHER PRIMARY INLET

Test 1 Run 1 Date 3-15-90

Stack dimen. 43 X 41.5 IN.

Dry bulb _____ °F Wet bulb _____ °F

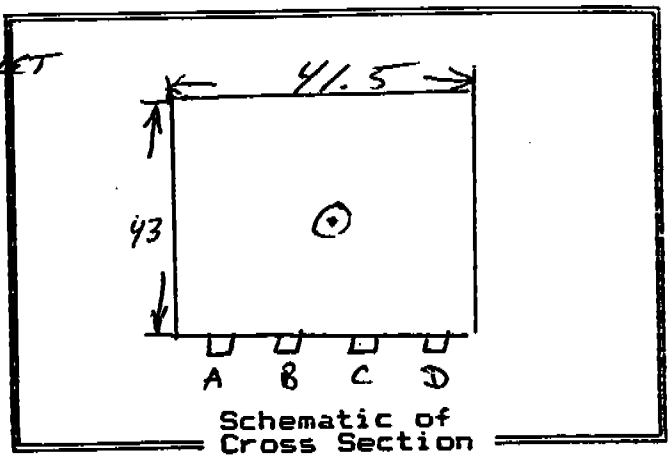
Manometer: ☒ Reg. ☐ Exp. ☐ Elec.

Barometric pressure 29.60 in Hg

Static pressure -4.5 in WC

Operators D.SMITH & M.KAEHLOR

Pitot No. 164-4 Cp .840



Schematic of Cross Section

Traverse Point No.	Fraction of Diameter	Distance from Stack Wall (in)	Distance from End of Port (in)	Velocity Pressure (in WC)	Temperature of gas (°F)
		Port length: 3.5 in.		Time start: 0730 hrs	
A - 1		3.58	7.08	0.98	57
2		10.75	14.25	1.05	57
3		17.92	21.42	0.64	57
4		25.09	28.59	0.45	57
5		32.26	35.76	0.36	57
6		39.43	42.93	0.31	57
B - 1				1.10	57
2				1.00	57
3				0.76	57
4				0.56	57
5				0.42	57
6				0.39	57
C - 1				0.89	58
2				0.99	57
3				0.77	57
4				0.59	56
5				0.47	56
6				0.36	56
D - 1				0.65	56
2				1.05	57
3				0.86	57
4				0.68	58
5				0.50	58
6				0.30	58

Temp. meas. tool & S/N: PDT-3 DIGITAL T/C | Time end: 0745 hrs

R or nothing= reg. manometer; S= expanded; E = electronic S-392.1

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job CYPRUS / BABBITT Date 3-15-90 Test 1 Run 1
Source #1 CRUSHER PRIMARY INLET No. of traverse points 24
Method 5 Filter holder: GLASS Filter type: 4" GLASS FIBER

Sample Train Leak Check:

Pretest: (0.02 cfm at 15 in. Hg. (vac)
Postest: 0.00 cfm at 5 in. Hg. (vac)

Particulate Catch Data:

No.s of filters used: #2059

Recovery solvent(s)
☒ acetone
☐ other(s)

No. of probe wash bottles: 1
Sample recovered by: DWAYNE A. SMITH

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2			
Impinger No. 3			
Condenser			
Desiccant	1310	1302	8
Total			8

Integrated Gas Sampling Data: N/A AMBIENT AIR

Bag Pump No. _____ Box No. _____ Bag No. _____

Bag Material: 5-layer Aluminized Tedlar Size: 44 L

Pretest leak check: _____ cc/min at _____ in. Hg.

Time start: _____ (HRS) Time end: _____ (HRS)

Sampling rate: _____ cc/min Operator: _____

S/N of O_2 Analyzer used to monitor train outlet: ___

CF-023

INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job CYPRUS / BABBITT
Source #1 CRUSHER PRIMARY INLET
Date 3-15-90 Test 1 Run 1

Operators D. SMITH
Meter Box No. 9 ΔH 1.87 IN WC
Calibration coeff. 1.0012

Pitot No. 164-4 Cp .840
Bar. Press. 22.60 inHg H2O 1.0 x
Nozzle No. S-3 Nozzle Dia .196 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dec. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas In	Gas Out	Oxygen (x v/v)
	0820	639.53											
D - 6	2.5	640.51	.31	0.48	0.50	1.0	57	- NOT	HEATED	D -	48	46	20.9
5	5	641.73	.50	0.78	1.74	1.0	57				46	46	20.9
4	7.5	643.15	.66	1.03	3.16	1.0	57				47	46	20.9
3	10	644.81	.87	1.37	4.79	1.0	57				47	46	20.9
2	12.5	646.60	1.07	1.68	6.60	1.0	57				46	46	20.9
1	15	648.12	.76	1.19	8.12	1.0	57				46	46	20.9
C - 6	17.5	649.17	.36	0.56	9.17	1.0	57				48	47	20.9
5	20	650.39	.48	0.75	0.39	1.0	57				50	47	20.9
4	22.5	651.70	.54	0.85	1.68	1.0	60				51	48	20.9
3	25	653.13	.69	1.08	3.13	1.0	60				52	48	20.9
2	27.5	654.81	.91	1.43	4.81	1.0	60				53	49	20.9
1	30	656.57	1.00	1.58	6.57	1.0	60				55	49	20.9
B - 6	32.5	657.65	.38	0.60	7.66	1.0	58				56	49	20.9
5	35	658.79	.40	0.63	8.78	1.0	58				55	50	20.9
4	37.5	660.05	.54	0.86	0.08	1.0	58				55	50	20.9
3	40	661.54	.72	1.14	1.58	1.0	58				55	50	20.9
2	42.5	663.32	.98	1.55	3.33	1.0	59				56	50	20.9
1	45	665.10	1.00	1.58	5.10	1.0	59				57	51	20.9
A - 6	47.5	666.18	.35	0.55	6.15	1.0	59				57	51	20.9
5	50	667.21	.37	0.59	7.22	1.0	59				56	51	20.9
4	52.5	668.40	.45	0.71	8.41	1.0	59				56	51	20.9
3	55	669.82	.65	1.03	9.84	1.0	59				56	51	20.9
2	57.5	671.53	.91	1.44	1.53	1.0	59				57	51	20.9
1	60	673.21	.90	1.43	3.21	1.0	59				58	52	20.9
	0920												
	θ = 60	Vm = 33.68		ΔH = 1.04							Avg. = 50.7		

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job CYPRUS / BABBITT
Source #1 CRUSHER PRIMARY INLET
Method 5 Filter holder: GLASS

Date 3-15-90 Test 1 Run 2
No. of traverse points 24
Filter type: 4" GLASS FIBER

Sample Train Leak Check:

Pretest: < 0.02 cfm at 15 in. Hg. (vac)
Postest: 0.00 cfm at 5 in. Hg. (vac)

Particulate Catch Data:

No.s of filters used: # 2060

Recovery solvent(s)
☒ acetone
☐ other(s)

No. of probe wash bottles: 1
Sample recovered by: DWAYNE A. SMITH

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Impinger No. 1	-		
Impinger No. 2			
Impinger No. 3			
Condenser			
Desiccant	1267	1259	8
Total			8

Integrated Gas Sampling Data: N/A *AMBIENT AIR

Bag Pump No. _____ Box No. _____ Bag No. _____

Bag Material: 5-layer Aluminized Tedlar Size: 44 L

Pretest leak check: _____ cc/min at _____ in. Hg.

Time start: _____ (HRS) Time end: _____ (HRS)

Sampling rate: _____ cc/min Operator: _____

S/N of O_2 Analyzer used to monitor train outlet: ___

CF-023

INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job CYPRUS / BABBITT
Source #1 CRUSHER PRIMARY INLET
Date 3-15-90 Test 1 Run 2

Operators D. SMITH
Meter Box No. 9 ΔH 1.87 ΔH WC
Coeffic. coeff. 1.00

Pitot No. 164-4 Cp .840
Bar. Press. 27.60 inHg H2O 10 x
Nozzle No. S-3 Nozzle Dia .196 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dgs. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas/In	Gas/Out	Oxygen (xv/v)
	(0950)	673.40											
A - 6	2.5	674.41	.32	0.50	4.39	1.0	59	— NOT	HEATED —		50	50	20.9
5	5	675.50	.38	0.60	5.48	1.0	59				51	50	20.9
4	7.5	676.69	.45	0.71	6.66	1.0	57				52	50	20.9
3	10	678.07	.63	1.00	8.06	1.0	57				53	50	20.9
2	12.5	679.83	1.00	1.59	9.83	1.0	57				54	51	20.9
1	15	681.58	.98	1.55	1.58	1.0	58				56	51	20.9
B - 6	17.5	682.72	.39	0.62	2.69	1.0	58				57	52	20.9
5	20	683.82	.41	0.65	3.82	1.0	58				57	52	20.9
4	22.5	685.12	.53	0.84	5.12	1.0	58				57	52	20.9
3	25	686.54	.68	1.08	6.58	1.0	58				58	53	20.9
2	27.5	688.30	.95	1.51	8.31	1.0	59				58	53	20.9
1	30	690.14	1.08	1.72	0.16	1.0	59				59	53	20.9
C - 6	32.5	691.18	.33	0.52	1.18	1.0	59				60	54	20.9
5	35	692.35	.44	0.70	2.36	1.0	59				59	54	20.9
4	37.5	693.64	.53	0.84	3.66	1.0	59				59	54	20.9
3	40	695.14	.71	1.13	5.16	1.0	58				60	54	20.9
2	42.5	696.91	.96	1.54	6.91	1.0	58				60	54	20.9
1	45	698.69	1.00	1.60	8.69	1.0	58				62	55	20.9
D - 6	47.5	699.73	.31	0.49	9.69	1.0	59				62	55	20.9
5	50	700.90	.47	0.75	0.91	1.0	58				61	55	20.9
4	52.5	702.31	.63	1.01	2.33	1.0	58				60	55	20.9
3	55	704.00	.87	1.40	4.00	1.0	57				62	56	20.9
2	57.5	705.84	1.05	1.69	5.83	1.0	58				62	56	20.9
1	60	707.42	.79	1.27	7.42	1.0	59				63	56	20.9
	(1050)												
	θ = 60	Vm = 34.02		ΔH = 1.05							Avg. = 55.5		

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job CYPRUS / BABBITT Date 3-15-90 Test 1 Run 3
Source #1 CRUSHER PRIMARY INLET No. of traverse points 24
Method 5 Filter holder: GLASS Filter type: 4" GLASS FIBER

Sample Train Leak Check:

Pretest: < 0.02 cfm at 15 in. Hg. (vac) ☑
Postest: 0.00 cfm at 5 in. Hg. (vac) ☑

Particulate Catch Data:

No.s of filters used: #2062

Recovery solvent(s)
☑ acetone
☐ other(s)

No. of probe wash bottles: 1
Sample recovered by: DWAYNE A. SMITH

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Impinger No. 1	-		
Impinger No. 2			
Impinger No. 3			
Condenser			
Desiccant	1319	1310	9
Total			9

Integrated Gas Sampling Data: N/A AMBIENT AIR

Bag Pump No. _____ Box No. _____ Bag No. _____

Bag Material: 5-layer Aluminized Tedlar Size: 44 L

Pretest leak check: _____ cc/min at _____ in. Hg.

Time start: _____ (HRS) Time end: _____ (HRS)

Sampling rate: _____ cc/min Operator: _____

S/N of O_2 Analyzer used to monitor train outlet: ___

CF-023

S-00468B

INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job CYPRUS / BABBITT
Source #1 CRUSHER
Date 3-15-90 Test 1 Run 3

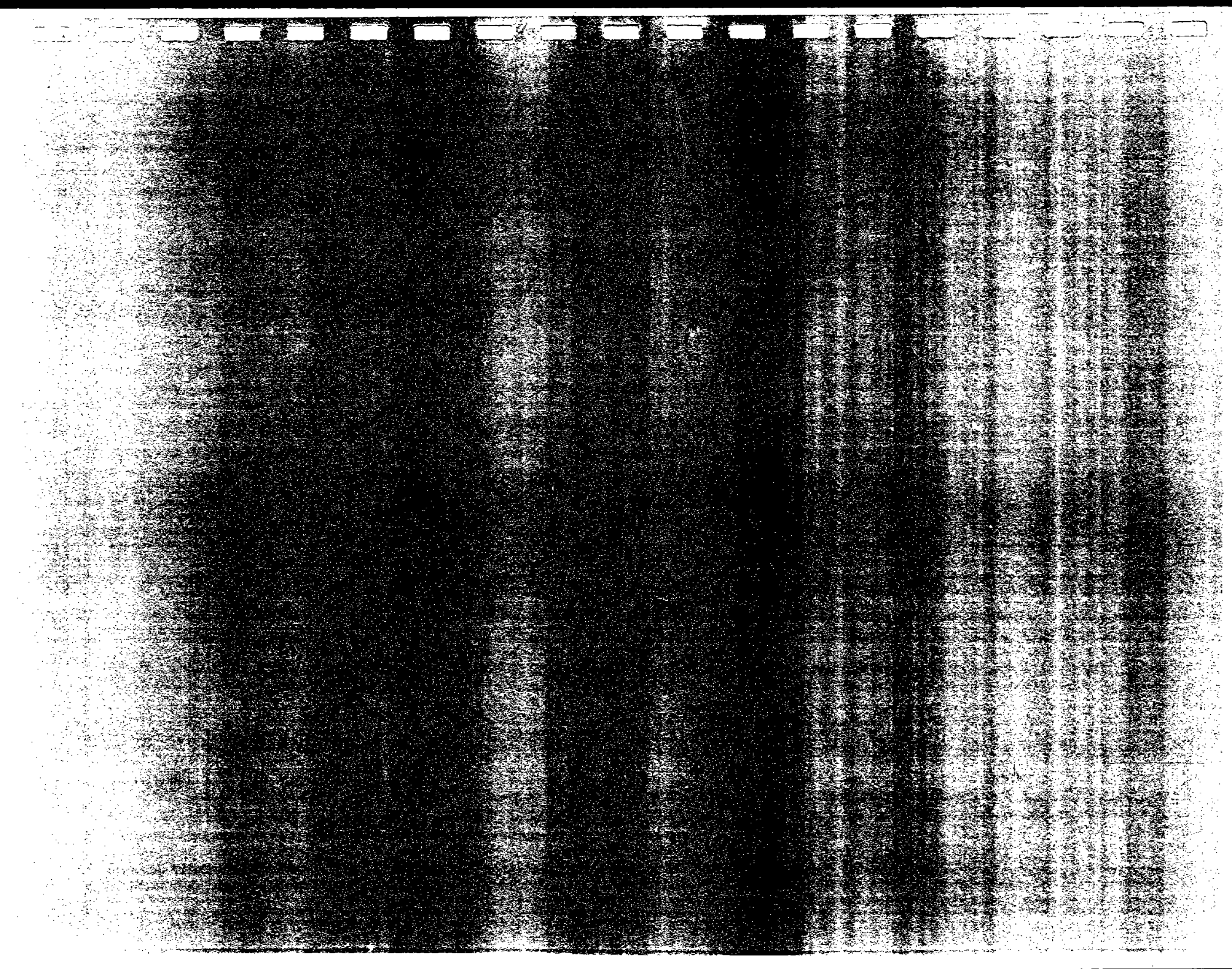
Operators D. SMITH
Meter Box No. 2 ΔH 1.87 IN WC
Coeffic. coeff.: 1.0013

Pitot No. 16F-4 Cp .840
Bar. Press. 27.60 inHg H2O 1.0 x
Nozzle No. S-3 Nozzle Dia .196 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dec. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas/In	Gas/Out	Oxygen (x v/v)
	(1120)	707.75											
D - 6	2.5	708.75	.32	0.51	8.75	1.0	57	- NOT	HEATED -		53	53	20.9
5	5	709.96	.48	0.76	9.98	1.0	57				54	53	20.9
4	7.5	711.39	.65	1.03	1.41	1.0	60				56	54	20.9
3	10	713.07	.86	1.37	3.05	1.0	60				57	54	20.9
2	12.5	714.88	1.06	1.68	4.88	1.0	60				59	55	20.9
1	15	716.47	.80	1.27	6.47	1.0	60				59	55	20.9
C - 6	17.5	717.51	.34	0.54	7.51	1.0	59				60	55	20.9
5	20	718.66	.41	0.65	8.66	1.0	59				59	55	20.9
4	22.5	719.89	.51	0.81	9.93	1.0	58				60	55	20.9
3	25	721.32	.62	0.99	1.34	1.0	58				60	55	20.9
2	27.5	723.02	.90	1.44	3.03	1.0	58				60	56	20.9
1	30	724.79	.98	1.57	4.80	1.0	58				61	56	20.9
B - 6	32.5	725.87	.37	0.59	5.89	1.0	58				62	56	20.9
5	35	726.96	.37	0.59	6.98	1.0	58				61	56	20.9
4	37.5	728.20	.48	0.77	8.22	1.0	57				61	56	20.9
3	40	729.71	.69	1.11	9.71	1.0	57				61	56	20.9
2	42.5	731.39	.85	1.36	1.36	1.0	58				62	57	20.9
1	45	733.24	1.08	1.74	3.22	1.0	58				62	57	20.9
A - 6	47.5	734.21	.30	0.48	4.20	1.0	58				63	57	20.9
5	50	735.26	.35	0.56	5.26	1.0	58				62	57	20.9
4	52.5	736.44	.43	0.69	6.44	1.0	58				62	57	20.9
3	55	737.93	.68	1.09	7.92	1.0	58				62	57	20.9
2	57.5	739.70	.99	1.59	9.70	1.0	58				62	58	20.9
1	60	741.51	1.02	1.64	1.51	1.0	58				63	58	20.9
	(1220)												
	θ = 60	Vs = 33.76		ΔH = 1.04							Avg. = 57.8		

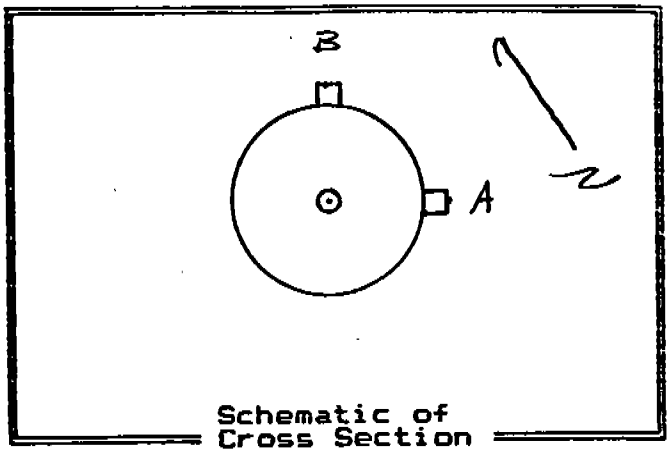
APPENDIX D

METHODS 2 - 5 FIELD DATA SHEETS - STACK



INTERPOLL LABORATORIES EPA METHOD 2 FIELD DATA SHEET

Job Cyprus / Babbitt
Source #1 Primary Crusher Stack
Test 1 Run 0 Date 3-14-90
Stack dimen. 50.75 IN.
Dry bulb 60 °F Wet bulb ____ °F
Manometer: ~~of~~ Reg. ☐ Exp. ☐ Elec.
Barometric pressure 27.81 in Hg
Static pressure +.22 in WC
Operators S. Bainvill M. Kahler
Pitot No. V16-6 Cp .840



Schematic of Cross Section

Traverse Point No.		Fraction of Diameter	Distance from Stack Wall (in)	Distance from End of Port (in)	Velocity Pressure (in WC)	Temperature of gas (°F)
			Port length: 3 in.		Time start: 1515 hrs	
A	1	.021	1.07	4.07	.79	60
	2	.067	3.40	6.40	.81	61
	3	.118	5.99	8.99	.84	60
	4	.177	8.97	11.97	.84	60
	5	.250	12.69	15.69	.84	60
	6	.356	18.07	21.07	.86	61
	7	.644	32.67	35.67	.86	61
	8	.750	38.05	41.05	.87	61
	9	.823	41.77	44.77	.87	60
	10	.882	44.75	47.75	.86	62
	11	.933	47.35	50.35	.85	62
	12	.979	49.67	52.67	.83	62
B	1				.63	61
	2				.72	61
	3				.77	60
	4				.78	60
	5				.75	60
	6				.77	60
	7				.77	61
	8				.76	61
	9				.76	61
	10				.75	61
	11				.71	61
	12				.70	61

Temp. meas. tool & S/N: PDT - 10
Time end: 1532 hrs

R or nothing= reg. manometer; S= expanded; E = electronic

S-392.1

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job CYPRUS / BABBIT Date 3·15·90 Test 1 Run 1
Source #1 PRIMARY CRUSHER STACK No. of traverse points 24
Method 5 Filter holder: GLASS Filter type: GLASS FIBER

Sample Train Leak Check:

Pretest: (0.02 cfm at 15 in. Hg. (vac)
Postest: 0.00 cfm at 5 in. Hg. (vac)

Particulate Catch Data:

No.s of filters used: 1878

Recovery solvent(s)
☒ acetone
☐ other(s)

No. of probe wash bottles: 1
Sample recovered by: SLB

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Impinger No. 1	-		
Impinger No. 2			
Impinger No. 3			
Condenser			
Desiccant	1515	1508	7
Total			7

Integrated Gas Sampling Data: N/A AMBIENT AIR

Bag Pump No. _____ Box No. _____ Bag No. _____

Bag Material: 5-layer Aluminized Tedlar Size: 44 L

Pretest leak check: _____ cc/min at _____ in. Hg.

Time start: _____ (HRS) Time end: _____ (HRS)

Sampling rate: _____ cc/min Operator: _____

S/N of O_2 Analyzer used to monitor train outlet: ___

CF-023

INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

CF-011

Job Cyprus/ Babbit
Source #1 PRIMARY CRUSHER
Date 2-15-90 Test 1 Run 1

Operators SLJ MK
Meter Box No. B ΔH 1.88 IN WC
Coeff. .9980

Pitot No. 116-5 Cp .840
Bar. Press. 27.60 inHg H2O ( ) x
Nozzle No. 4-3 Nozzle Dia .188 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dgs. Vol. (cf)	VAC. inHg	Temperatures (°F)						Oxygen
							Stack	Probe	Oven	Impg.	Gas/In	Gas/Out	(x v/v)
	(0820)	(183.05)											
B 12	2.5	184.51	.73	0.99	4.43	2	57	NOT	HEATED		47	46	20.9
11	5	185.92	.77	1.04	5.86	2	57				48	47	20.9
10	7.5	187.39	.78	1.06	7.30	2	58				50	48	20.9
9	10	188.81	.77	1.05	8.73	2	56				52	48	20.9
8	12.5	190.25	.78	1.06	0.18	2	56				54	49	20.9
7	15	191.65	.79	1.08	1.64	2	56				55	49	20.9
6	17.5	193.18	.77	1.06	3.08	2	56				57	50	20.9
5	20	194.52	.73	1.00	4.49	2	56				59	51	20.9
4	22.5	195.99	.74	1.02	5.91	2	56				60	52	20.9
3	25	197.39	.70	0.97	7.30	2	56				60	52	20.9
2	27.5	198.70	.67	0.92	8.66	2	56				60	52	20.9
1	30	200.01	.65	0.90	0.00	2	56				60	52	20.9
A 12	32.5	201.49	.80	1.10	1.48	2	56				61	53	20.9
11	35	202.99	.80	1.11	2.96	2	56				62	54	20.9
10	37.5	204.52	.81	1.12	4.46	2	57				63	54	20.9
9	40	205.98	.81	1.12	5.96	2	56				63	54	20.9
8	42.5	207.53	.80	1.11	7.45	2	56				63	54	20.9
7	45	208.92	.79	1.10	8.93	2	56				63	54	20.9
8	47.5	210.49	.78	1.08	0.40	2	56				63	55	20.9
5	50	211.93	.80	1.11	1.89	2	56				63	55	20.9
4	52.5	213.41	.82	1.14	3.40	2	56				63	55	20.9
3	55	214.90	.80	1.11	4.89	2	56				63	55	20.9
2	57.5	216.40	.78	1.08	6.36	2	56				63	55	20.9
1	60	217.82	.75	1.04	7.81	2	56				63	55	20.9
	(0923)												
	θ = 60	Vm = 34.77		ΔH 1.06							Avg. = 55.5		

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job CYPRUS / BABBIT Date 3-15-90 Test 1 Run 2
Source #1 PRIMARY CRUSHER No. of traverse points 24
Method 5 Filter holder: GLASS Filter type: GLASS FIBER

Sample Train Leak Check:

Pretest: < 0.02 cfm at 15 in. Hg. (vac) ☒
Postest: 0.00 cfm at 5 in. Hg. (vac) ☒

Particulate Catch Data:

No.s of filters used: 1879

Recovery solvent(s)
☒ acetone
☐ other(s)

No. of probe wash bottles: 1
Sample recovered by: SLB

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Impinger No. 1	-		
Impinger No. 2			
Impinger No. 3			
Condenser			
Desiccant	1445	1435	10
Total			10

Integrated Gas Sampling Data: AMBIENT AIR

Bag Pump No. _____ Box No. _____ Bag No. _____

Bag Material: 5-layer Aluminized Tedlar Size: 44 L

Pretest leak check: _____ cc/min at _____ in. Hg.

Time start: _____ (HRS) Time end: _____ (HRS)

Sampling rate: _____ cc/min Operator: _____

S/N of O_2 Analyzer used to monitor train outlet: ___

CF-023

INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job Cyprus / Rabbit
Source #1 PRIMARY CRUSHER
Date 3-15-90 Test 1 Run 2

Operators SLP & MK
Meter Box No. 3 ΔH 1.8 IN WC
Coeffic. coeff.: .9980

Pitot No. V16-5 Cp .940
Bar. Press. 27.60 inHg H2O 1 X
Nozzle No. 1-3 Nozzle Dia .188 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dec. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas/In	Gas/Out	Oxygen (v/v)
	(0950)	(220.23)											
A 12	2.5	221.64	.71	0.97	1.61	2	57	NOT HEATED			54	52	20.9
11	5	223.21	.82	1.13	3.10	2	56				56	53	20.9
10	7.5	224.73	.85	1.17	4.62	2	57				57	53	20.9
9	10	226.23	.84	1.16	6.14	2	57				59	54	20.9
8	12.5	227.66	.84	1.16	7.66	2	57				60	54	20.9
7	15	229.18	.82	1.13	9.16	2	57				61	55	20.9
6	17.5	230.71	.81	1.12	0.65	2	57				62	55	20.9
5	20	232.21	.80	1.11	2.14	2	57				63	55	20.9
4	22.5	233.63	.80	1.11	3.63	2	57				64	56	20.9
3	25	235.11	.79	1.10	5.11	2	57				64	56	20.9
2	27.5	236.59	.75	1.04	6.56	2	57				65	57	20.9
1	30	237.98	.72	1.00	7.98	2	57				65	57	20.9
B 12	32.5	239.57	.75	1.04	9.43	2	57				62	56	20.9
11	35	240.98	.84	1.16	0.95	2	57				64	57	20.9
10	37.5	242.52	.86	1.19	2.50	2	58				65	57	20.9
9	40	244.00	.86	1.19	4.05	2	58				66	58	20.9
8	42.5	245.51	.82	1.14	5.56	2	58				66	58	20.9
7	45	247.08	.79	1.10	7.05	2	58				67	58	20.9
6	47.5	248.59	.80	1.11	8.55	2	58				67	59	20.9
5	50	250.05	.78	1.09	0.03	2	58				67	59	20.9
4	52.5	251.54	.77	1.07	1.50	2	58				67	59	20.9
3	55	252.99	.78	1.09	2.98	2	58				67	59	20.9
2	57.5	254.42	.72	1.00	4.40	2	58				67	59	20.9
1	60	255.83	.70	0.98	5.81	2	58				67	59	20.9
	(1054)												
	θ = 60	Vm = 35.60		ΔH = 1.10							Avg. = 59.9		

D-5

S-0037R

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job CYPRUS / BABBIT Date 3-15-90 Test 1 Run 3
Source #1 PRIMARY CRUSHER No. of traverse points 24
Method 5 Filter holder: GLASS Filter type: GLASS FIBER

Sample Train Leak Check:

Pretest: ≤ 0.02 cfm at 15 in. Hg. (vac)
Postest: 0.00 cfm at 5 in. Hg. (vac)

Particulate Catch Data:

No.s of filters used: 1894

Recovery solvent(s)
☑ acetone
☐ other(s)

No. of probe wash bottles: 1
Sample recovered by: SCB

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2			
Impinger No. 3			
Condenser			
Desiccant	1526	1515	9
Total			9

Integrated Gas Sampling Data: AMBIENT AIR

Bag Pump No. _____ Box No. _____ Bag No. _____

Bag Material: 5-layer Aluminized Tedlar Size: 44 L

Pretest leak check: _____ cc/min at _____ in. Hg.

Time start: _____ (HRS) Time end: _____ (HRS)

Sampling rate: _____ cc/min Operator: _____

S/N of O_2 Analyzer used to monitor train outlet: ___

CF-023

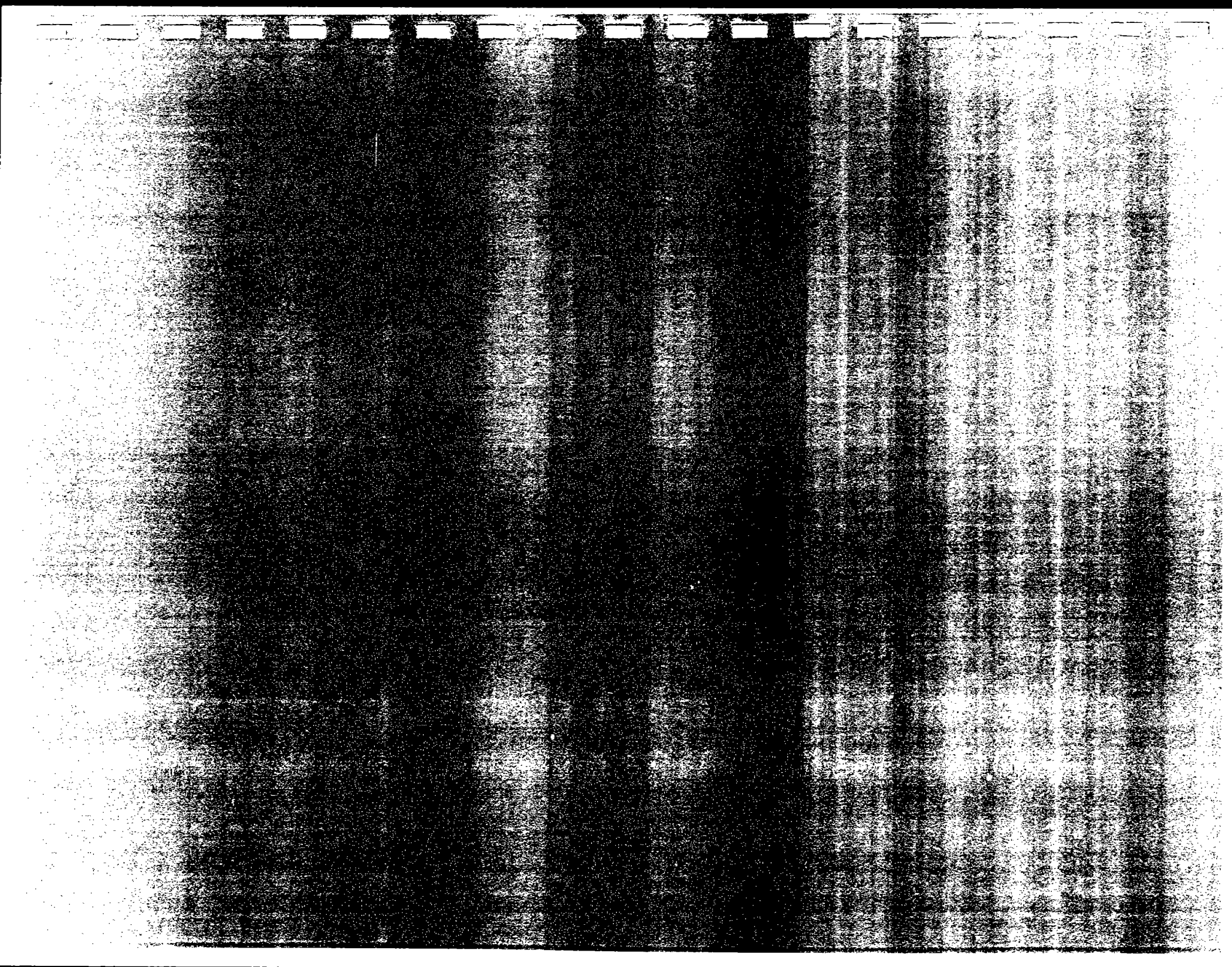
INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job: CYPRUS CABOT
Source: #1 PRIMARY CRUSHER
Date: 3-15-90 Test: 1 Run: 3
Operators: SLB + MK
Meter Box No.: 8 ΔH: 1.88 IN WC
Coeff.: .9980
Pitot No.: V16-5 Cp: .840
Bar. Press.: 27.60 inHg H2O / X
Nozzle No.: 4-3 Nozzle Dia: .188 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dec. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas/In	Gas/Out	Oxygen (x v/v)
	(1120)	(256.09)											
B 12	2.5	257.60	.75	1.04	7.53	2	58	NOT	HEATED		55	54	20.9
11	5	259.05	.85	1.17	9.05	2	58				57	55	20.9
10	7.5	260.63	.85	1.17	0.57	2	58				60	56	20.9
9	10	262.11	.84	1.16	2.10	2	59				61	56	20.9
8	12.5	263.63	.87	1.20	3.65	2	59				63	57	20.9
7	15	265.19	.83	1.15	5.16	2	59				64	57	20.9
6	17.5	266.69	.82	1.14	6.67	2	58				65	58	20.9
5	20	268.15	.79	1.10	8.16	2	58				65	58	20.9
4	22.5	269.57	.79	1.10	9.65	2	58				66	58	20.9
3	25	271.08	.77	1.07	1.12	2	58				66	59	20.9
2	27.5	272.66	.74	1.03	2.56	2	58				67	59	20.9
1	30	274.00	.74	1.03	4.00	2	58				67	59	20.9
A 12	32.5	275.55	.72	1.00	5.42	2	58				61	59	20.9
11	35	276.90	.83	1.15	6.94	2	58				66	59	20.9
10	37.5	278.52	.86	1.20	8.49	2	59				66	59	20.9
9	40	280.10	.86	1.20	0.04	2	59				67	60	20.9
8	42.5	281.54	.87	1.21	1.61	2	59				67	60	20.9
7	45	283.12	.85	1.18	3.15	2	59				68	60	20.9
6	47.5	284.72	.83	1.16	4.68	2	59				68	60	20.9
5	50	286.22	.83	1.16	6.21	2	59				68	60	20.9
4	52.5	287.73	.82	1.14	7.73	2	59				68	61	20.9
3	55	289.24	.80	1.12	9.23	2	59				68	61	20.9
2	57.5	290.72	.77	1.07	0.70	2	59				69	61	20.9
1	60	292.18	.75	1.05	2.16	2	59				69	61	20.9
	(1223)												
	θ = 60	Vm = 36.09		ΔH = 1.12							Avg. = 61.8		

APPENDIX E

METHOD 9 FIELD DATA SHEETS



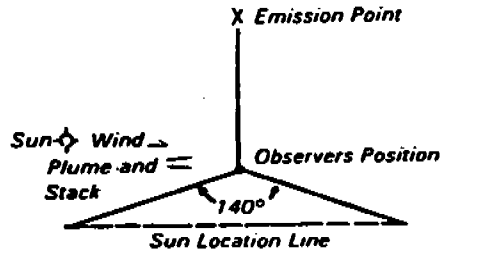
Interpoll Laboratories
(612)786-6020

Visible Emissions Form

SOURCE NAME: No. 1 Crusher Primary Collector	OBSERVATION DATE: 3-15-90	START TIME / STOP TIME
ADDRESS: Cyprus Northshore Mining		
CITY / STATE / ZIP		
PHONE / SOURCE ID NUMBER		
PROCESS EQUIPMENT / OPERATING MODE		
CONTROL EQUIPMENT / OPERATING MODE		
DESCRIBE EMISSION POINT — START / STOP		
HEIGHT ABOVE GROUND LEVEL — START / STOP	HEIGHT RELATIVE TO OBSERVER — START / STOP	
DISTANCE FROM OBSERVER — START / STOP	DIRECTION FROM OBSERVER — START / STOP	
DESCRIBE EMISSIONS — START / STOP		
EMISSION COLOR — START / STOP	PLUME TYPE: CONTINUOUS ☐ FUGITIVE ☐ INTERMITTENT ☐	
WATER DROPLETS PRESENT: NO ☐ YES ☐	IF WATER DROPLET PLUME: ATTACHED ☐ DETACHED ☐	
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED — START / STOP		
DESCRIBE BACKGROUND — START / STOP		
BACKGROUND COLOR — START / STOP	SKY CONDITIONS — START / STOP	
WIND SPEED — START / STOP	WIND DIRECTION — START / STOP	
AMBIENT TEMP. — START / STOP	WET BULB TEMP.	RH,percent

SEC / MIN	0	15	30	45	SEC / MIN	0	15	30	45
1					31				
2					32				
3					33				
4					34				
5					35				
6					36				
7					37				
8					38				
9					39				
10					40				
11					41				
12					42				
13					43				
14					44				
15					45				
16					46				
17					47				
18					48				
19					49				
20					50				
21					51				
22					52				
23					53				
24					54				
25					55				
26					56				
27					57				
28					58				
29					59				
30					60				

Source Layout Sketch — Draw North Arrow



AVERAGE OPACITY FOR HIGHEST PERIOD	NUMBER OF READINGS ABOVE % WERE
RANGE OF OPACITY READINGS — MINIMUM / MAXIMUM	
OBSERVER'S NAME (PRINT): Scott Bainville	
OBSERVER'S SIGNATURE: Scott Bainville	DATE: 3-15-90
ORGANIZATION	
CERTIFIED BY: MPCA	DATE: 10-18-89
VERIFIED BY	DATE

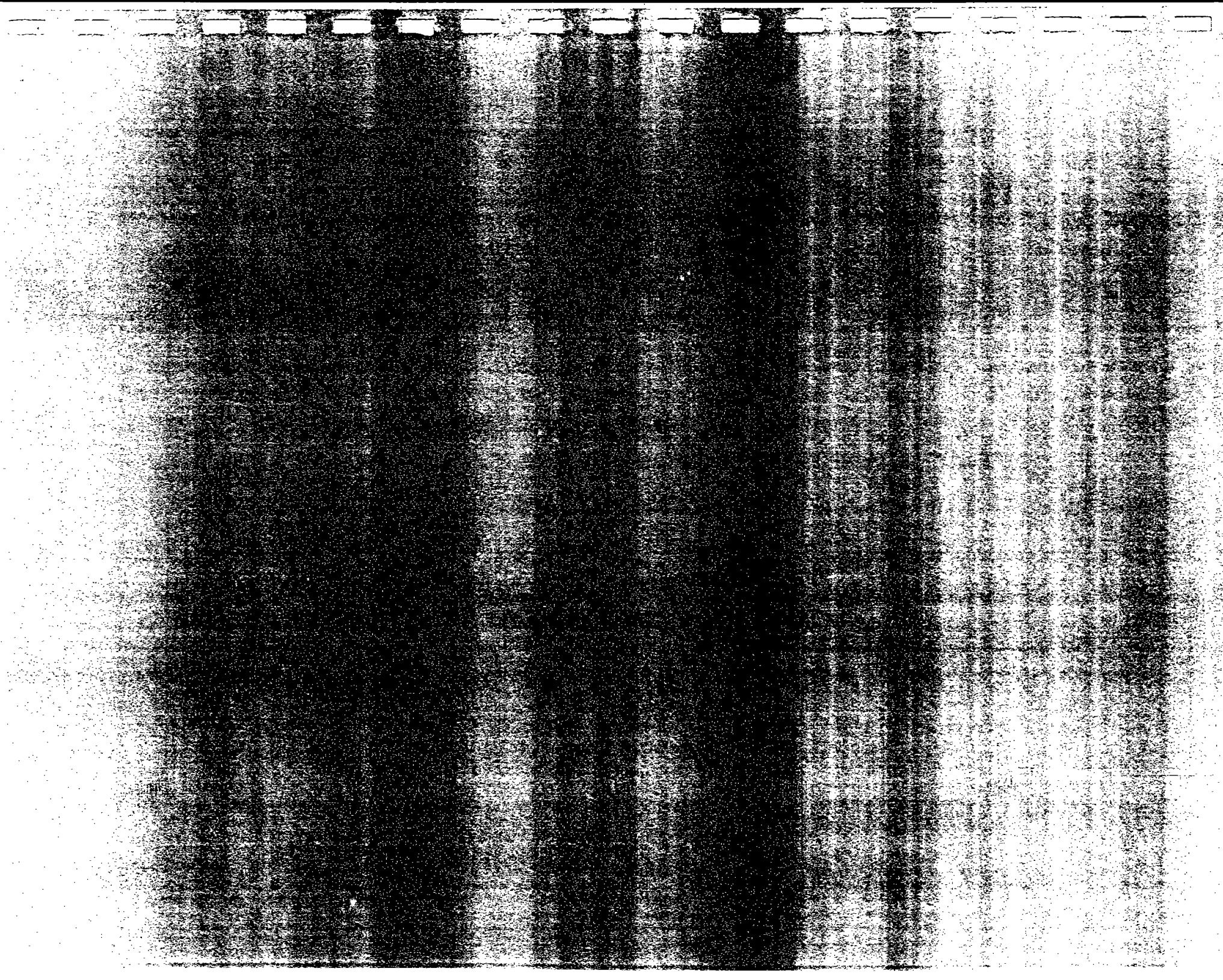
COMMENTS: Unable to perform due to Rain

I HAVE RECEIVED A COPY OF THESE OPACITY OBSERVATIONS
SIGNATURE / TITLE / DATE

S-0079R

APPENDIX F

LABORATORY DATA SHEETS



Interpoll Laboratories
(612) 786-6020

Chain of Custody
Sample Deposition Sheet

Job CYPRUS / BABBITT Source #1 CRUSHER
Team Leader DWAYNE A. SMITH Test Site PRIMARY INLET
Date Submitted 3-15-90 Date of Test 3-15-90
Test No. 1 No. of Runs Completed 3

No. of Samples	Type of Sample	Analysis Required	Comments
3	Probe Wash: ☒ Acetone ☐ D.I. Water	☒ As per EPA M-5 ☐ Other _____	BLANKS COMBINED WITH STACK
3	Filter: ☒ 4" G.F. ☐ S.S. Thimble ☐ 2.5" G.F. ☐ 47 mm G.F.	☒ As per EPA M-5 ☐ As per EPA M-17 ☐ Other _____	" "
—	Impinger Catch: ☐ D.I. Water ☐ 3% H_2O_2 ☐ 4M5 Hg Only ☐ 4M5 Metals ☐ 1.0 N NaOH ☐ Other _____	☐ MN Protocol ☐ WI Protocol ☐ EPA M-6 or 8 ☐ Acid Gases ☐ Formaldehyde ☐ Metals ☐ Other _____	
—	Integrated Gas sample	☐ As per EPA M-3 ☐ As per EPA M-10 ☐ Other _____	AMBIENT AIR
—	Oxides of Nitrogen (NO_x)	☐ As per EPA M-7A ☐ Other _____	Date _____ Time (HRS) _____
—	☐ Fuel Sample ☐ Aggregate	☐ Attached fuel Form #S-0163RRR	
—	Particle Size	☐ X-Ray Sedigraph ☐ Bahco Method ☐ Other _____	
—	Audit Samples ☐ Sulfur Dioxide ☐ Oxides of Nit. ☐ Other _____	☐ As per EPA M-6 ☐ As per EPA M-7A ☐ Other _____	

Source Information

1) Type of Source: ☐ Boiler ☐ Asphalt Plant ☐ Incinerator ☐ Dryer ☒ Other CRUSHER
2) Fuel: ☐ Coal ☐ Wood ☐ Gas ☐ Oil ☐ RDF ☒ Other ROCK (CORE)
3) Is sample combustible? ☒ No ☐ Yes
4) Does sample need special handling? ☒ No ☐ Yes If yes, explain

S-278RRRR

Interpoll Laboratories
(612) 786-6020

EPA Method 5 Data Reporting Sheet
Probe/Cyclone Wash

Job Cyprus Northshore Mining
Team Leader D.S.
Date Submitted 3-16-90
Test No. 1
Date of Analysis 3-16-90
Transport Leakage ☒ None ☐ _____ ml

Source #1 Crusher
Test Site primary inlet
Date of Test 3-15-90
No. of Runs Completed 3
Technician RP
Solvent acetone

0	Test ____ Run 0 Field Blank Log Number ____ Vol. of Solvent ____ ml *Solvent Residue 0.67 ug/ml	Dish No. ____ Dish Tare Wt. ____ g Dish+Sample Wt. ____ g Sample Wt. ____ g
1	Test 1 Run 1 Vol. of Solvent 75 ml Log Number 9181-09 Comments ____	Dish No. 99 Dish Tare Wt. 44.5328 g Dish+Sample Wt. 44.9709 g Sample Wt. 0.4381 g
2	Test 1 Run 2 Vol. of Solvent 70 ml Log Number 9181-11 Comments ____	Dish No. 110 Dish Tare Wt. 49.7386 g Dish+Sample Wt. 50.2689 g Sample Wt. 0.5303 g
3	Test 1 Run 3 Vol. of Solvent 70 ml Log Number 9181-13 Comments ____	Dish No. 118 Dish Tare Wt. 44.1971 g Dish+Sample Wt. 44.5807 g Sample Wt. 0.3836 g
4	Test ____ Run ____ Vol. of Solvent ____ ml Log Number ____ Comments ____	Dish No. ____ Dish Tare Wt. ____ g Dish+Sample Wt. ____ g Sample Wt. ____ g
5	Test ____ Run ____ Vol. of Solvent ____ ml Log Number ____ Comments ____	Dish No. ____ Dish Tare Wt. ____ g Dish+Sample Wt. ____ g Sample Wt. ____ g

*Solvent Residue 0.67 ug/ml = [(Sample Wt. 0.0001 g)(10^6)]/Vol. of Sol. 50 ml
EPA-M5 Acetone Residue Blank Spec. < 7.8 ug/ml

Results:

Field Blk.	Run 1	Run 2 F-2	Run 3	Run 4	Run 5
	0.4380	0.5303	0.3836		

LSC-01YR

Interpoll Laboratories
(612) 786-6020

EPA Method 5 Data Reporting Sheet
Filter Gravimetrics

Job Cyprus
Team Leader D.S.
Date Submitted 3-16-90
Test No. 1
Date of Analysis 3-16-90

Source #1 Crusher
Test Site primary inlet
Date of Test 3-15-90
No. of Runs Completed 3
Technician RE

0	Test 1 Run 0 Field Blank Log Number Comments	Filter No. Filter Type Filter Tare Wt. g Filter+Sample Wt. g Sample Wt. g
1	Test 1 Run 1 Log Number 9181-02 Comments	Filter No. 2059 Filter Type 4" GF Filter Tare Wt. .9249 g Filter+Sample Wt. 1.5696 g Sample Wt. 0.6447 g
2	Test 1 Run 2 Log Number 9181-04 Comments	Filter No. 2060 Filter Type 4" GF Filter Tare Wt. .9182 g Filter+Sample Wt. 1.5170 g Sample Wt. 0.5988 g
3	Test 1 Run 3 Log Number 9181-06 Comments	Filter No. 2062 Filter Type 4" GF Filter Tare Wt. .9297 g Filter+Sample Wt. 1.5883 g Sample Wt. 0.6586 g
4	Test Run Log Number Comments	Filter No. Filter Type Filter Tare Wt. g Filter+Sample Wt. g Sample Wt. g
5	Test Run Log Number Comments	Filter No. Filter Type Filter Tare Wt. g Filter+Sample Wt. g Sample Wt. g

Results:

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.6477	0.5988	0.6586		

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	1.0857	1.1291	1.0422		

LSC-02PR

Interpoll Laboratories
(612) 786-6020

Chain of Custody
Sample Deposition Sheet

Job CYPRUS / BABBIT
Team Leader S. BAINBRIDGE
Date Submitted 3-15-90
Test No. 1

Source #1 PRIMARY CRUSHER
Test Site STACK
Date of Test 3-15-90
No. of Runs Completed 3

No. of Samples	Type of Sample	Analysis Required	Comments
4	Probe Wash: ☒ Acetone ☐ D.I. Water	☒ As per EPA M-5 ☐ Other _____	+ BLANK
4	Filter: ☒ 4" G.F. ☐ S.S. Thimble ☐ 2.5" G.F. ☐ 47 mm G.F.	☒ As per EPA M-5 ☐ As per EPA M-17 ☐ Other _____	+ BLANK
N/A	Impinger Catch: ☐ D.I. Water ☐ 3% H_2O_2 ☐ 4M5 Hg Only ☐ 4M5 Metals ☐ 1.0 N NaOH ☐ Other _____	☐ MN Protocol ☐ WI Protocol ☐ EPA M-6 or 8 ☐ Acid Gases ☐ Formaldehyde ☐ Metals ☐ Other _____	
N/A	Integrated Gas sample	☐ As per EPA M-3 ☐ As per EPA M-10 ☐ Other _____	AMIENT AIR SOURCE
N/A	Oxides of Nitrogen (NO_x)	☐ As per EPA M-7A ☐ Other _____	Date _____ Time (HRS) _____
N/A	☐ Fuel Sample ☐ Aggregate	☐ Attached fuel Form #S-0163RRR	
N/A	Particle Size	☐ X-Ray Sedigraph ☐ Bahco Method ☐ Other _____	
N/A	Audit Samples ☐ Sulfur Dioxide ☐ Oxides of Nit. ☐ Other _____	☐ As per EPA M-6 ☐ As per EPA M-7A ☐ Other _____	

Source Information

1) Type of Source: ☐ Boiler ☐ Asphalt Plant ☐ Incinerator ☐ Dryer ☒ Other TACONITE CRUSHER
2) Fuel: ☐ Coal ☐ Wood ☐ Gas ☐ Oil ☐ RDF ☐ Other _____
3) Is sample combustible? ☒ No ☐ Yes
4) Does sample need special handling? ☒ No ☐ Yes If yes, explain _____

S-278RRRR

Interpoll Laboratories
(612) 786-6020

EPA Method 5 Data Reporting Sheet
Probe/Cyclone Wash

Job Cyprus
Team Leader SLR
Date Submitted 3-16-90
Test No. 1
Date of Analysis 3-16-90
Transport Leakage ☐ None ☒ ____ ml

Source #1 Primary crusher
Test Site Stack
Date of Test 3-15-90
No. of Runs Completed 3
Technician RE
Solvent acetone

0
Test 1 Run 0
Field Blank
Log Number 9181-07
Vol. of Solvent 150 ml
*Solvent Residue 0.67 ug/ml
Dish No. 211
Dish Tare Wt. 56.8263 g
Dish+Sample Wt. 56.8264 g
Sample Wt. 0.0001 g

1
Test 1 Run 1
Vol. of Solvent 165 ml
Log Number 9181-09
Comments
Dish No. 213
Dish Tare Wt. 50.5616 g
Dish+Sample Wt. 50.8039 g
Sample Wt. 0.2423 g

2
Test 1 Run 2
Vol. of Solvent 160 ml
Log Number 9181-11
Comments
Dish No. 214
Dish Tare Wt. 53.9850 g
Dish+Sample Wt. 54.2755 g
Sample Wt. 0.2905 g

3
Test 1 Run 3
Vol. of Solvent 160 ml
Log Number 9181-14
Comments
Dish No. 215
Dish Tare Wt. 47.9144 g
Dish+Sample Wt. 48.1760 g
Sample Wt. 0.2616 g

4
Test ____ Run ____
Vol. of Solvent ____ ml
Log Number
Comments
Dish No.
Dish Tare Wt. g
Dish+Sample Wt. g
Sample Wt. g

5
Test ____ Run ____
Vol. of Solvent ____ ml
Log Number
Comments
Dish No.
Dish Tare Wt. g
Dish+Sample Wt. g
Sample Wt. g

*Solvent Residue 0.67 ug/ml = [(Sample Wt. 0.0001 g)(10^6)]/Vol. of Sol. 150 ml
EPA-M5 Acetone Residue Blank Spec. < 7.8 ug/ml

Results:

Field Blk.	Run 1	Run 2 F-5	Run 3	Run 4	Run 5
	0.2422	0.2904	0.265		

LSC-01YR

Interpoll Laboratories
(612) 786-6020

EPA Method 5 Data Reporting Sheet
Filter Gravimetrics

Job Cyprus
Team Leader SLB
Date Submitted 3-16-90
Test No. 1
Date of Analysis 3-16-90

Source #1 primary crusher
Test Site Stack
Date of Test 3-15-90
No. of Runs Completed 3
Technician RE

0	Test 1 Run 0 Field Blank Log Number 9181-09 Comments	Filter No. 2041 Filter Type 4"GF Filter Tare Wt. .9256 g Filter+Sample Wt. .9256 g Sample Wt. 0.0000 g
1	Test 1 Run 1 Log Number 9181-10 Comments	Filter No. 1878 Filter Type 4"GF Filter Tare Wt. .9673 g Filter+Sample Wt. 1.0394 g Sample Wt. 0.0721 g
2	Test 1 Run 2 Log Number 9181-12 Comments	Filter No. 1879 Filter Type 4"GF Filter Tare Wt. .9732 g Filter+Sample Wt. 1.0460 g Sample Wt. 0.0728 g
3	Test 1 Run 3 Log Number 9181-14 Comments	Filter No. 1894 Filter Type 4"GF Filter Tare Wt. .9638 g Filter+Sample Wt. 1.0340 g Sample Wt. 0.0702 g
4	Test ____ Run ____ Log Number ____ Comments	Filter No. ____ Filter Type ____ Filter Tare Wt. ____ g Filter+Sample Wt. ____ g Sample Wt. ____ g
5	Test ____ Run ____ Log Number ____ Comments	Filter No. ____ Filter Type ____ Filter Tare Wt. ____ g Filter+Sample Wt. ____ g Sample Wt. ____ g

Results:

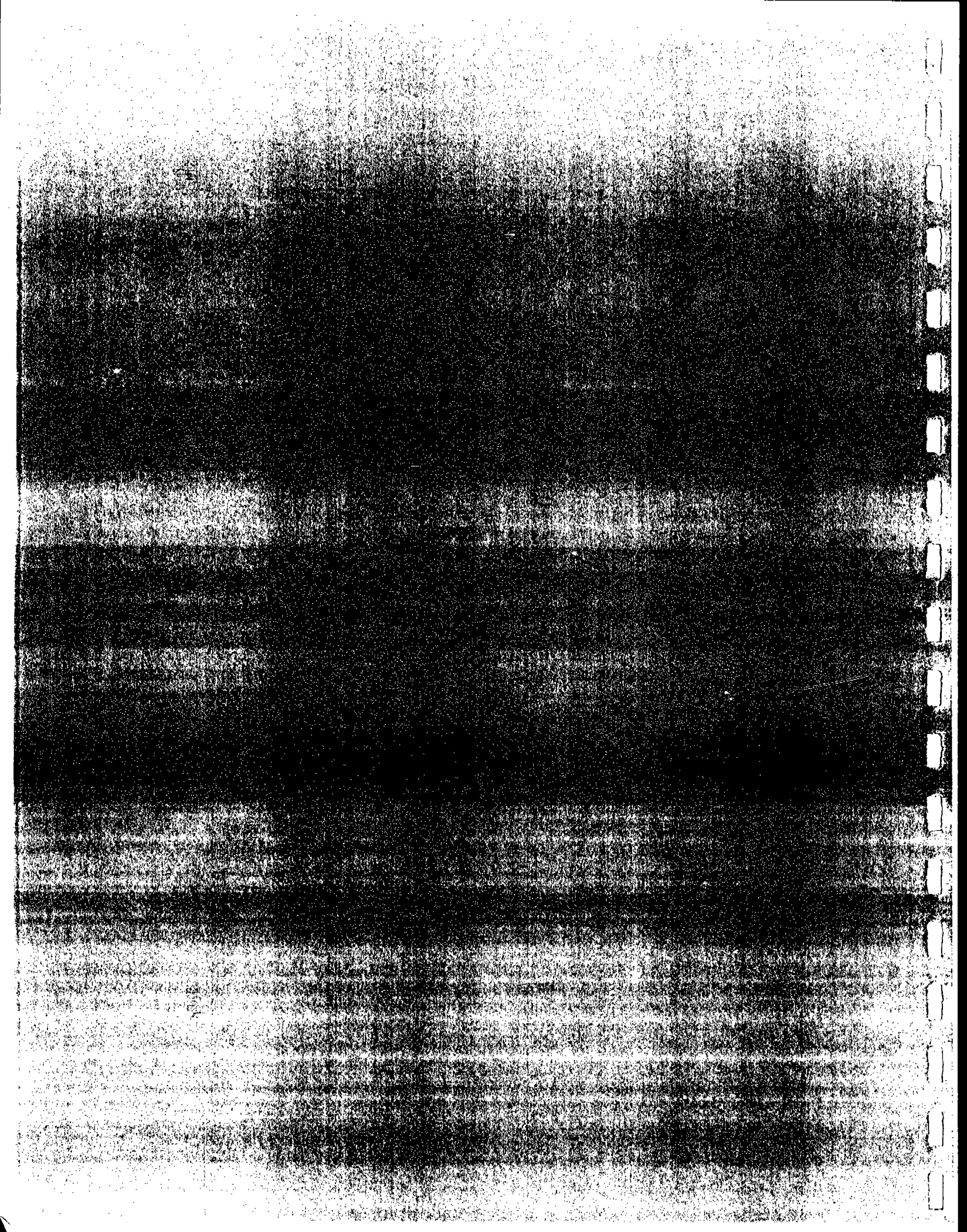
Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.0721	0.0728	0.0702		

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.3143	0.3632	0.3317		

LSC-02PR

APPENDIX G

MPCA EXHIBIT P



Interpoll Laboratories
(612)786-6020

MPCA Exhibit C for Process Emissions

JOB Cyprus Northshore - Babbitt
SOURCE #1 Crusher Primary Collector
DATE March 15, 1990

C. Equipment & Operating Data

1. Process Equip. No./Ident. Primary Crusher #1.
2. Process Equip. Description Multiclone with Cyclone Precleaner.
3. Process equipment operating under normal operating conditions:
   No ___. Yes X.

D. Instrument Data on Process Equipment

1. Include copy of production records or instrumentation which indicates rate of production or operation of the equipment, i.e. units per hour, lbs. per hour, pressure, air flow, etc.
   Production Record during test ATTACHED

E. Air Pollution Control Equipment

1. Type/model control equipment Allis Chalmers model 70-9.
2. Air pressure drop across the control equipment Not Applicable.
3. Air flow through the control equipment 32,000 ACFM.
4. Was the control equipment operating normally? Yes.
5. Data of last major maintenance/cleaning of control equipment
   Major Maintenance/Renovation During Reactivation 10 to 17.
   Emptied once per shift & Cleaned & Blown Down once per week.

F. Plant Manager's Certification

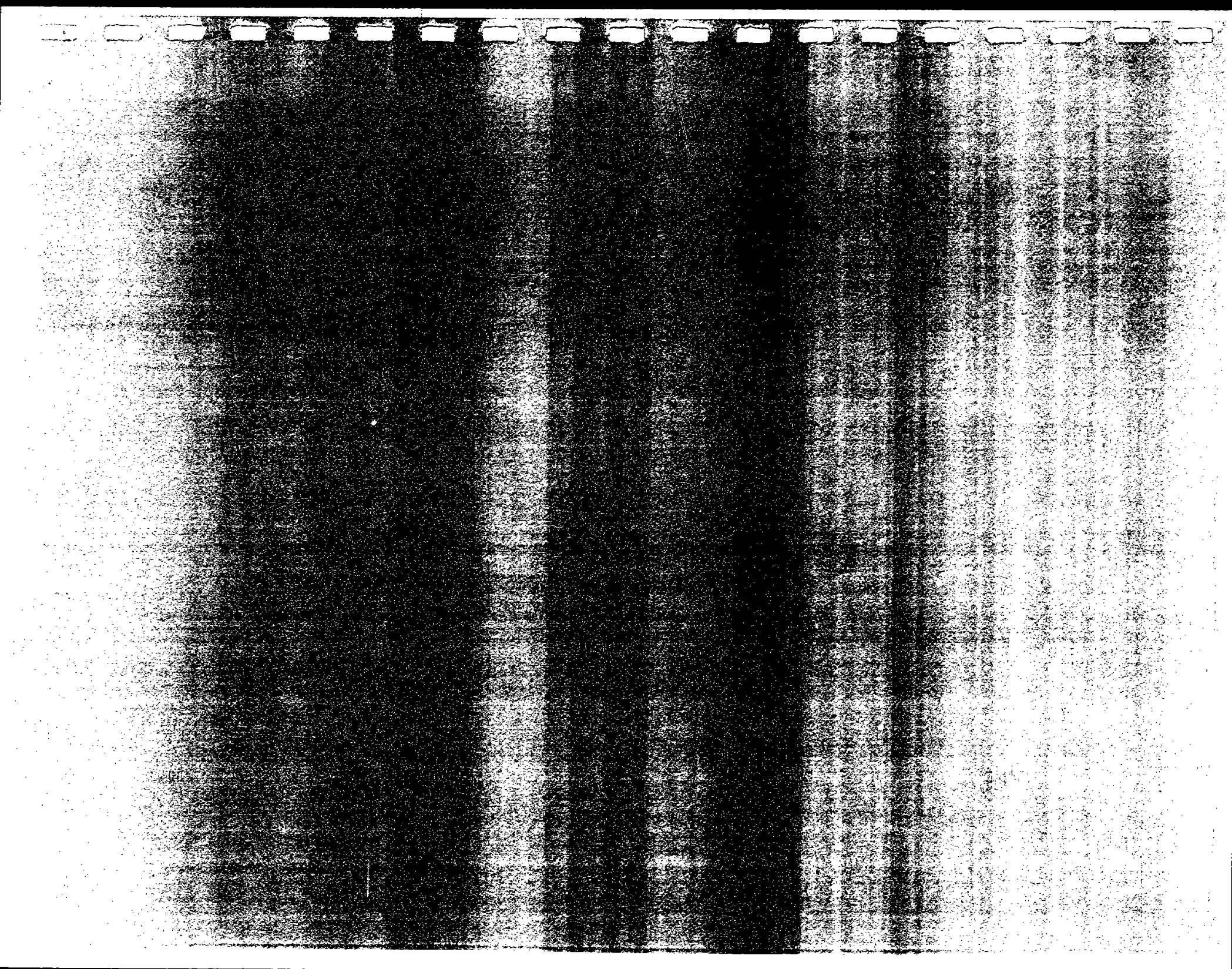
I certify that the information submitted herein is accurate and correct and that no information requested was withheld from MPCA, Division of Air Quality.

By Dennis M Wagner, Position Environmental Engineer

S-349R

APPENDIX H

PROCESS DATA



#1 CRUSHER

3-15 DATE 2:59 TIME

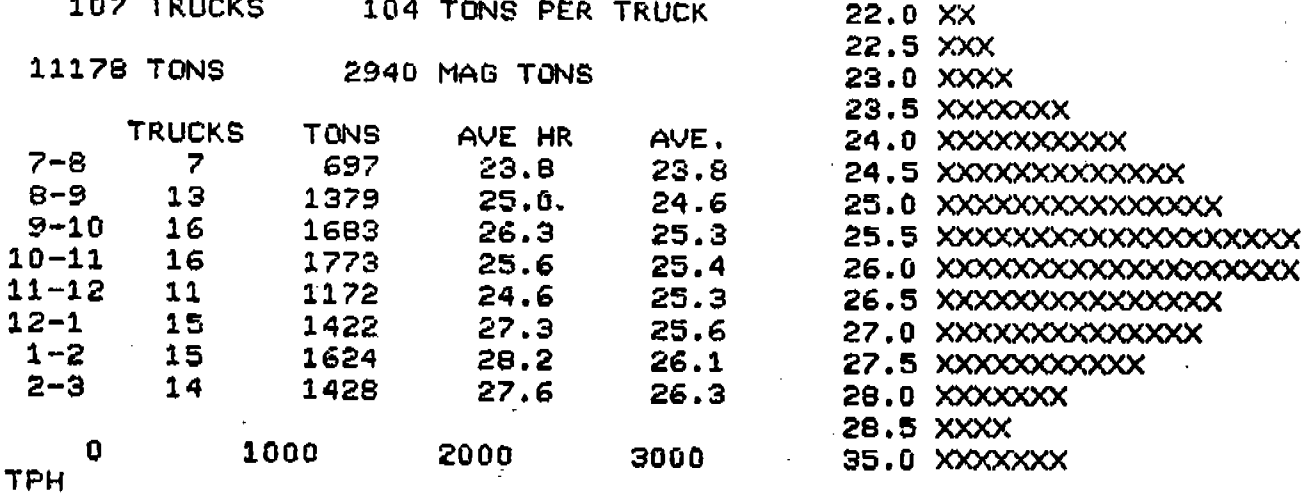
66540 TONS 302750 MAG TONS

7-3 SHIFT

107 TRUCKS 104 TONS PER TRUCK

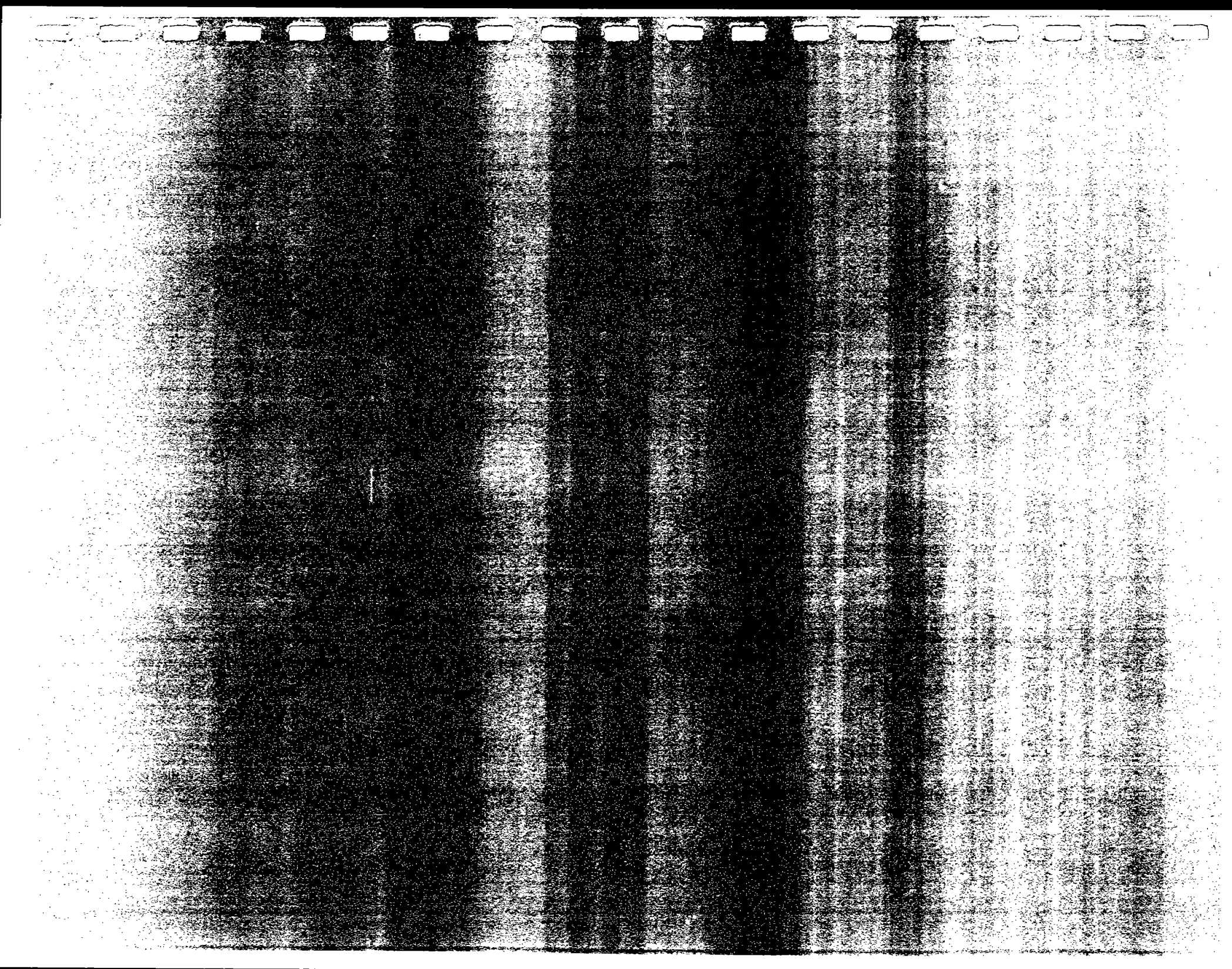
11178 TONS 2940 MAG TONS

	TRUCKS	TONS	AVE HR	AVE.
7-8	7	697	23.8	23.8
8-9	13	1379	25.6.	24.6
9-10	16	1683	26.3	25.3
10-11	16	1773	25.6	25.4
11-12	11	1172	24.6	25.3
12-1	15	1422	27.3	25.6
1-2	15	1624	28.2	26.1
2-3	14	1428	27.6	26.3



APPENDIX I

PROCEDURES



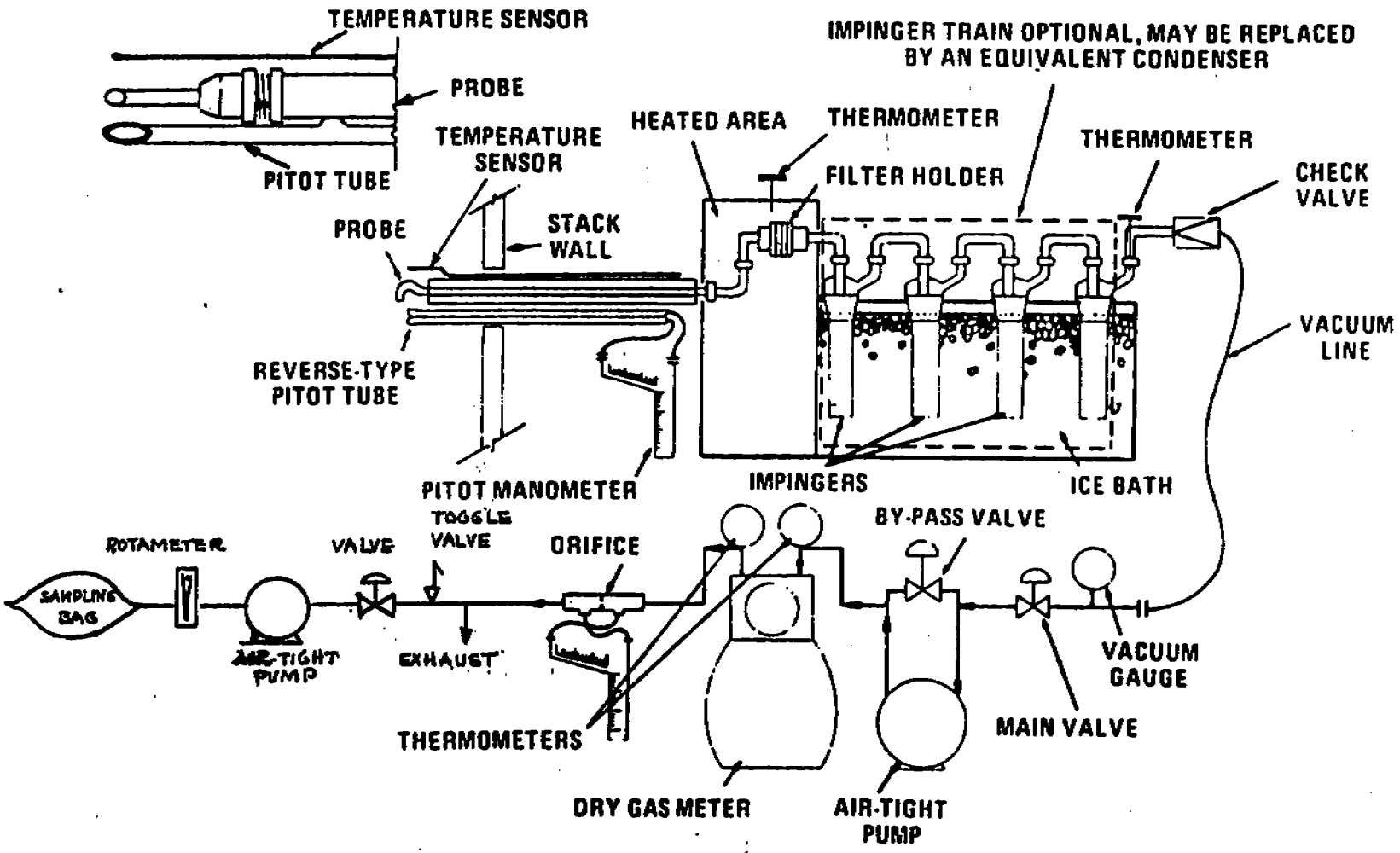
Particulate Loadings and Emission Rates

The particulate emission rates were determined per EPA Methods 1-5, CFR Title 40, Part 60, Appendix A (revised July 1, 1987). In this procedure, a preliminary velocity profile of the gases in the flue is obtained by means of a temperature and velocity traverse. On the basis of these values, sampling nozzles of appropriate diameter are selected to allow isokinetic sampling, a necessary prerequisite for obtaining a representative sample.

The sampling train consists of a heated glass-lined sampling probe equipped with a Type S pitot and a thermocouple. The probe is attached to a sampling module which houses the all-glass in line filter holder in a temperature controlled oven. In addition, the sampling module also houses the condenser case and a Drierite drying column. The sampling module is connected by means of an umbilical cord to the control module which houses the dry test gasmeter, the calibrated orifice, a leakless pump, two inclined manometers, and all controls required for operating the sampling train.

Particulate samples were collected as follows: The sample gas was drawn in through the sampling probe isokinetically and passed through a 4-inch diameter Gelman Type A/E glass fiber filter. The particulates were removed at this point and collected on the filter. The gases then passed through an ice-cooled condenser and a desiccant-packed drying column which quantitatively absorb all moisture from the sample gas stream after which the sample gas passes through the pump and the dry test gasmeter which integrates the sample gas flow throughout the course of the test. A calibrated orifice attached to the outlet of the gasmeter provides instantaneous flow rate data.

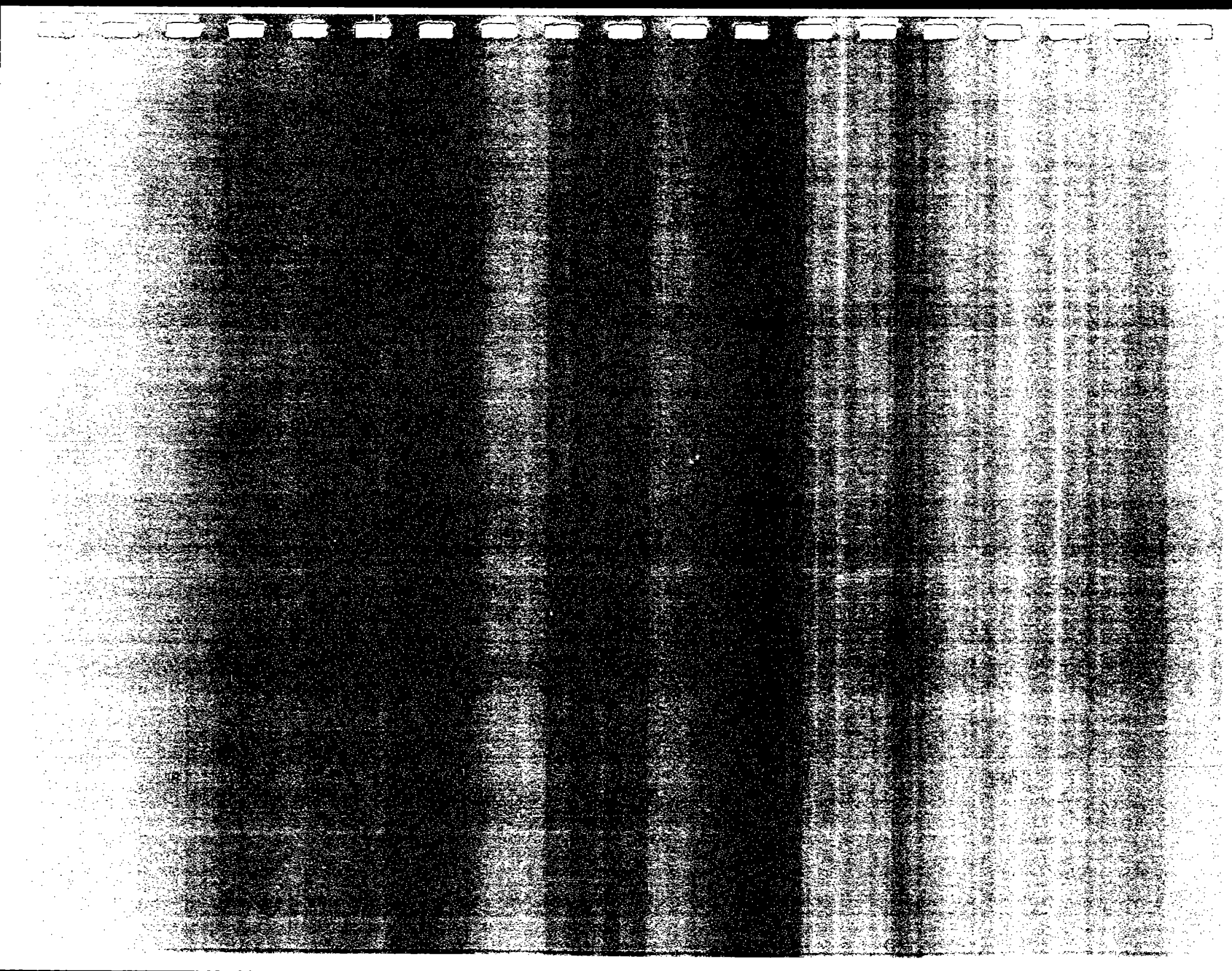
A representative particulate sample was acquired by sampling for equal periods of time at the centroid of a number of equal area regions in the duct. The sampling rate is adjusted at each site such that an isokinetic sampling condition prevails. Nomographs are used to aid in the rapid determination of the sampling rate.



Particulate-sampling train.

APPENDIX J

CALCULATION EQUATIONS



CALCULATION EQUATIONS

METHOD 2

$$\bar{V}_s = 85.48\ C_p\ (\sqrt{\Delta p})_{avg}\ \sqrt{\frac{T_{s(avg)}}{P_s\ M_s}}$$

$$Q_{s,d} = 60(1 - B_{ws})\ \bar{V}_s\ A\ \left(\frac{528}{T_{s(avg)}}\right)\ \left(\frac{P_s}{29.92}\right)$$

$$Q_a = 60\ \bar{V}_s\ A$$

$$\dot{m}_g = \frac{4.995\ Q_{s,d}\ G_d}{1 - B_{ws}}$$

$$RH^* = 100\ (vp_{twb}\ 0.0003641\ P_s\ (T_{db} - T_{wb}))/vp_{tdb}$$

$$B^*_{ws} = RH(vp_{tdb})/P_s$$

$$= \frac{4.585 \times 10^{-2}\ P_s M_s}{T_s\ (avg)}$$

*Alternate equations for calculating moisture content from wet bulb and dry buld data.

CALCULATION EQUATIONS

METHOD 3

$$\%EA = \frac{100(\%O_2 -).5\%\ CO)}{0.264\%\ N_2 - \%O_2 + 0.5\%\ CO}$$

$$M_d = 0.44(\%CO_2) + 0.32\ (\%O_2) + 0.28\ (\%N_2 + \%CO)$$

$$M_s = M_d\ (I - B_{ws}) + 0.18\ B_{ws}$$

$$B_{ws} = \frac{V_{w(std)}}{V_{w(std)} + V_{m(std)}}$$

CALCULATION EQUATIONS

METHOD 5

$$V_{m(std)} = 17.65\ V_m\ \gamma\ \left(\frac{P_{bar} + \overline{\Delta H}/13.6}{T_{m(avg)}}\right)$$

$$V_{w(std)} = 0.0472\ V_{Is}$$

$$B_{ws} = \frac{V_{w(std)}}{V_{w(std)} + V_{m(std)}}$$

$$I = 0.0944\ \left(\frac{T_{s(avg)}\ V_{m(std)}}{P_s\ V_s\ A_n\ \theta\ (1 - B_{ws})}\right)$$

$$C_s = \frac{15.43\ M_p}{V_{m(std)}}$$

$$C_a = \frac{272.3\ M_p\ P_s}{T_{s(avg)}\ (V_{w(std)} + V_{m(std)})}$$

$$(\dot{m}_p)_1 = 8.5714 \times 10^{-3}\ C_s\ Q_{s,d}$$

$$(\dot{m}_p)_2 = \frac{1.3228 \times 10^{-1}\ M_p\ A}{\theta\ A_n}$$

$$\dot{m}_p = \frac{(\dot{m}_p)_1 + (\dot{m}_p)_2}{2}$$

SYMBOLS

A = Cross sectional area of stack, SQ. FT.

A_n = Cross sectional area of nozzle, SQ. FT.

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

C_p = Pitot tube coefficient, dimensionless

C_a = Concentration of particulate matter in stack gas, wet basis, GR/ACF

C_s = Concentration of particulate matter in stack gas, dry basis, corrected to standard conditions, GR/DSCF

EA = Excess air, percent by volume

γ = Dry test meter correction factor, dimensionless

G_d = Specific gravity (relative to air), dimensionless

I = Isokinetic variation, percent by volume

M_d = Molecular weight of stack gas, dry basis, g/g - mole.

$\dot{m}_g$ = Mass flow of wet flue gas, LB/HR

$\dot{m}_p$ = Particulate mass flow, LB/HR

M_s = Molecular weight of stack gas, wet basis, g/g, mole.

M_p = Total amount of particulate matter collected, g

P_{bar} = Atmospheric pressure, IN. HG. (uncompensated)

P_g = Stack static gas pressure, IN. WC.

P_s = Absolute pressure of stack gas, IN.HG.

P_{std} = Standard absolute pressure, 29.92 IN. HG.

A_a = Actual volumetric stack gas flow rate, ACFM

$Q_{s,d}$ = Dry volumetric stack gas flow rate corrected to standard conditions, DSCFM

RH = Relative humidity, %

T_{db} = Dry bulb temperature of stack gas, ^{o}F

T_{wb} = Wet bulb temperature of stack gas, ^{o}F

$T_{m(avg)}$ = Absolute average dry gas meter temperature, ^{o}R

$T_{s(avg)}$ = Absolute average stack temperature, ^{o}F

T_{std} = Standard absolute temperature, 528 ^{o}F (68 ^{o}F)

θ = Total sampling time, min.

V_{lc} = Total volume of liquid collected in impingers and silica gel, ml

V_m = Volume of gas sample as measured by dry gas meter, CF

$V_{m(std)}$ = Volume of gas sample measured by the dry gas meter corrected to standard conditions, DSCF

$V_{w(std)}$ = Volume of water vapor in the gas sample corrected to standard conditions, SCF

$\bar{V}_s$ = Average actual stack gas velocity, FT/SEC

vp_{tdb} = Vapor pressure at T_{db}, IN. HG.

v_{Ptwb} = Vapor pressure at T_{wb}, IN. HG

$\overline{\Delta H}$ = Average pressure differential across the orifice meter, IN. WC.

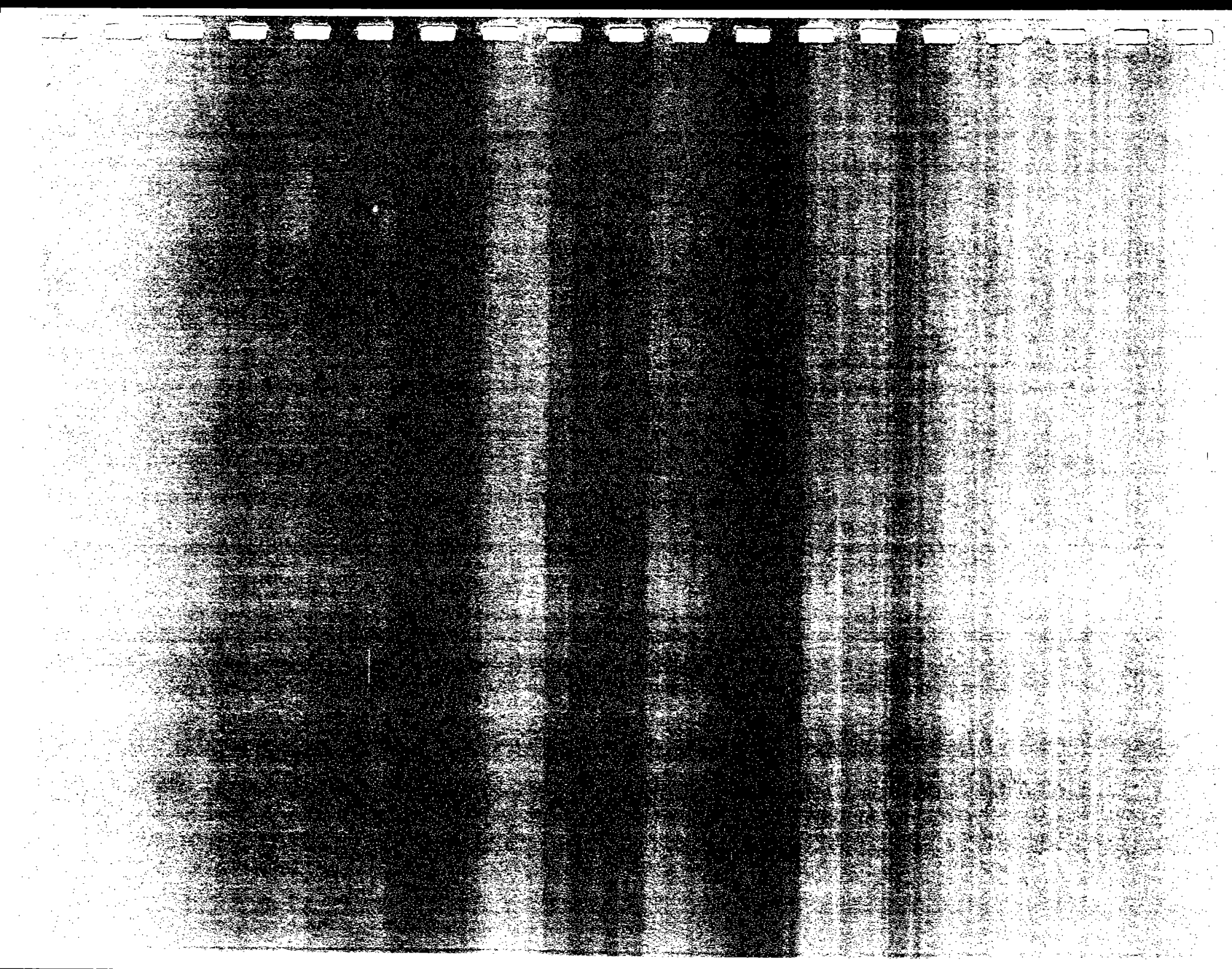
ΔP = Velocity pressure of stack gas, IN. WC.

γ = Dry test meter correction coefficient, dimensionless

ρ = Actual gas density, LB/ACF

APPENDIX K

SAMPLING TRAIN CALIBRATION DATA



Interpoll Laboratories, Inc.
(612) 786-6020

Meter Box Calibration and Usage Status

Date of Report: April 23, 1990

Meter Box No. : 8 (Rockwell Dry Test Meter Serial No. 964552)

Date of Last Calibration: March 7, 1990
Calibration Technician: D. Van Hoever
Wet Test Meter No.: American Meter AL-20

Date of Use	Report No.	Initial Meter Reading	Final Meter Reading	Volume/Job (cu. ft.)	Total Volume* (cu. ft.)
March 15, 1990	0-2995	175.17	292.18	117.01	117.01

* Total volume through meter since last calibration.

Date 3/7/90

Bar. Press. 29.56 in. Hg

INTERPOLL LABORATORIES, INC.
METER CALIBRATION SHEET
EPA METHOD 5

Control Module No. 8
Serial No. DTM 964.552
Wet Test Meter No. AL-20
Technician Terry Lawson

ΔH (in. WC)		Gas Volume Wet Test Meter (ft^3)	* Cal. Index Φ (%)	* Diff. Wet Test Meter ΔP_w (in.WC)	Gas Volume Dry test meter (ft^3)		Gas temperatures			Time θ (min/sec)	Meter Coeff. Y	Orifice Const. ΔHθ	C_f
nominal	actual				V_{d1}	V_{df}	Wet Test t_w (°F)	Dry Test t_{d1} (°F)	Dry Test t_{do} (°F)				
0.6	0.5	2	99.70	0.01	161.76	163.78	73.0	81	77	5/5.24	.9970	1.84	
1.2	1.2	~~5~~ 10.5	99.77	0.03	164.29	174.95	73.1	83	78	17/16.71	.9933	1.84	
2.0	2.0	3	99.87	0.05	141.20	144.21	73.6	79	75	3/5.40	.9966	1.87	
3.3	3.3	5	100.00	0.08	146.22	151.23	73.5	82	76	5/2.82	.9998	1.90	
4.7	4.7	5	100.20	0.11	152.22	157.22	73.3	84	77	4/17.27	1.1035	1.94	
		8	8	4	8	6	7	8	8	10	11/13	.9980	1.88

Meter was in tolerance ☒
Meter was not in tolerance ☐; readjusted linkage
Meter was not in tolerance ☐; changed dry test meters

Approved by Terry Lawson Date 3-15-90

* Based on AL-20 wet test meter calibration in August 1989 against Bell Prover (NBS Traceable) - Carl Poe Co.

S0102R 8/89

K-2

Interpoll Laboratories, Inc.
(612) 786-6020

Meter Box Calibration and Usage Status

Date of Report: April 23, 1990

Meter Box No. : 9 (Rockwell Dry Test Meter Serial No. 949230)

Date of Last Calibration: March 12, 1990
Calibration Technician: D. Van Hoever
Wet Test Meter No.: American Meter AL-20

Date of Use	Report No.	Initial Meter Reading	Final Meter Reading	Volume/Job (cu. ft.)	Total Volume* (cu. ft.)
March 15, 1990	0-2995	631.80	741.51	109.71	109.71

* Total volume through meter since last calibration.

Date 3/12/90

Bar. Press. 28.59 in. Hg

INTERPOLL LABORATORIES, INC.
METER CALIBRATION SHEET
EPA METHOD 5

Control Module No. 9
Serial No. DTM 949230
Wet Test Meter No. AL-20
Technician Duane Van Hoever

ΔH (in. WC)		Gas Volume Wet Test Meter (ft^3)	* Cal. Index ♦ (%)	* Diff. Wet Test Meter ΔP_w (in.WC)	Gas Volume Dry test meter (ft^3)		Gas temperatures			Time θ	Meter Coeff.	Orifice Const.	C_f
							Wet Test	Dry Test					
nominal	actual				V_{d1}	V_{df}	t_w (°F)	t_{d1} (°F)	t_{da} (°F)	(min/sec)	Y	ΔHθ	
0.5	0.5	2	99.70	0.01	629.215	631.230	72.5	79	76	5/2.96	.9976	1.88	
1.2	1.2	3	99.77	0.03	625.445	628.460	72.3	81	76	4/50.46	1.0011	1.83	
2.0	2.0	3	99.87	0.05	609.96	612.96	72.4	77	74	3/46.15	.9992	1.86	
3.3	3.3	5	100.00	0.08	613.46	618.45	72.3	80	75	4/54.82	1.0031	1.86	
4.7	4.7	5	100.20	0.11	619.45	624.44	72.0	82	76	4/10.34	1.0048	1.90	
	3	3	4	5	6	7	8	9	10	11/12	1.0012	1.866	

Meter was in tolerance ☒
Meter was not in tolerance ☐; readjusted linkage
Meter was not in tolerance ☐; changed dry test meters

Approved by Berry Lowe Date 3-19-90

* Based on AL-20 wet test meter calibration in August 1989 against Bell Prover (NBS Traceable) - Carl Poe Co.

S0102R 8/89

Interpoll Laboratories, Inc.
(612) 786-6020

Nozzle Calibration
Data Sheet

Date of Calibration: March 15, 1990 Nozzle Number 4-16
Technician: D. Smith

Nozzle rotated by 60 degree increments and diameter measured to nearest 0.001 inch. Observed readings and average:

Position	Diameter (inches)
1	0.196
2	0.197
3	0.196
Average:	0.196

Interpoll Laboratories, Inc.
(612) 786-6020

Nozzle Calibration
Data Sheet

Date of Calibration: March 15, 1990 Nozzle Number 6-16
Technician: S. Bainville

Nozzle rotated by 60 degree increments and diameter measured to nearest 0.001 inch. Observed readings and average:

Position	Diameter (inches)
1	0.187
2	0.188
3	0.189
Average:	0.188

Interpoll Laboratories
(612)786-6020

S-Type Pitot Tube Inspection Sheet

Pitobe No. 4-16

Pitot tube dimensions:

1. External tubing diameter (D_t) .316 IN.
2. Base to Side A opening plane (P_A) .461 IN.
3. Base to Side B opening plane (P_B) .460 IN.

Alignment:

4. α_1 <10° 0
5. α_2 <10° 0

6. B_1 < 5° 1
7. B_2 < 5° 1

8. Z <.125" .01
9. W <.0625" .02

Distance from Pitot to Probe Components:

10. Pitot to 0.500 IN. nozzle .760 IN.
11. Pitot to probe sheath 3.00 IN.
12. Pitot to thermocouple (parallel to probe) 3.00 IN.
13. Pitot to thermocouple (perpendicular to probe) .761 IN.

Date of Inspection: 12-20-89

Inspected by: E Terwilliger

S-348(1)

Interpoll Laboratories
(612)786-6020

S-Type Pitot Tube Inspection Sheet

Pitobe No. S-16

Pitot tube dimensions:

1. External tubing diameter (D_t) .316 IN.
2. Base to Side A opening plane (P_A) .459 IN.
3. Base to Side B opening plane (P_B) .460 IN.

Alignment:

4. α_1 <10° 0
5. α_2 <10° 0

6. B_1 < 5° 1
7. B_2 < 5° 1

8. Z <.125" .01
9. W <.0625" .02

Distance from Pitot to Probe Components:

10. Pitot to 0.500 IN. nozzle .760 IN.
11. Pitot to probe sheath 3.00 IN.
12. Pitot to thermocouple (parallel to probe) 3.00 IN.
13. Pitot to thermocouple (perpendicular to probe) .762 IN.

Date of Inspection: 12-8-89

Inspected by: [signature]

S-348(1)

Interpoll Laboratories
(612)786-6020

S-Type Pitot Tube Inspection Sheet

Pitobe No. C-16

Pitot tube dimensions:

1. External tubing diameter (D_t) .316 IN.
2. Base to Side A opening plane (P_A) .464 IN.
3. Base to Side B opening plane (P_B) .462 IN.

Alignment:

4. α_1 <10° 0
5. α_2 <10° 1

6. B_1 < 5° 1
7. B_2 < 5° 2

8. Z <.125" .02
9. W <.0625" .02

Distance from Pitot to Probe Components:

10. Pitot to 0.500 IN. nozzle .762 IN.
11. Pitot to probe sheath 3.00 IN.
12. Pitot to thermocouple (parallel to probe) 3.00 IN.
13. Pitot to thermocouple (perpendicular to probe) .762 IN.

Date of Inspection: 12-8-89

Inspected by: [signature]

S-348(1)

Interpoll Laboratories, Inc.
(612) 786-6060

EPA Method 5 Gas Metering System Quality Control Check Data Sheet

Job CYPRESS N.S.M. / BABBITT Date 3-14-90

Operator DWAYNE A. SMITH Module No. 9

Instructions: Operate the control module at a flow rate equal to ^H@ for 10 minutes before attaching the umbilical. Record the following data:

Bar press 27.81 in. Hg. γ = 1.0012 ^H@ 1.87 in. W.C.

Time (min)	Volume (CF)	Meter Temp. (°F)	
		Inlet	Outlet
[redacted]	(631.80)	[redacted]	
2.5	633.72	52	51
5.0	635.62	54	51
7.5	637.52	55	51
10	639.45	55	52
[redacted]	V_m= 7.65	Avg(t_m)= 52.6	°F

Calculate Y_{cn} as follows:

$$Y_{cn} = \frac{1.786}{\gamma\ V_m}\left[\frac{(t_m + 460)}{P_b}\right]^{0.5}$$

$$Y_{cn} = \frac{1.786}{(1.0012)(7.65)}\left[\frac{(52.6) + 460}{(27.81)}\right]^{0.5}$$

7.66

$$Y_{cn} = 1.001$$

If Y_{cn} is not within the range of 0.97 to 1.03, "the volume metering system should be investigated before beginning."

CFR Title 40, Part 60, Appendix A, Method 5, Section 4.4.1

S-432R

Interpoll Laboratories, Inc.

Temperature Measurement Device
Calibration Sheet

Unit under test:
Vendor ATKINS
Model 39658-K Serial Number POT-3
Range -112.0°F to +1999°F °F Thermocouple Type
Date of Calibration 2-5-90 Technician E TROWBRIDGE

Method of Calibration:

☐ Comparison against ASTM mercury in glass thermometer using a thermostatted and insulated aluminum block designed to provide uniform temperature. The temperature is adjusted by adjusting the voltage on the block heater cartridge.

☒ Omega Model CL-300 Type K Thermocouple Simulator which provides 22 precise temperature equivalent millivolt signals. The CL-300 is cold junction compensated. Calibration accuracy is ± 0.1% of span (2100 °F) ± 1 degree (for negative temperatures add ± 2 degrees. The CL-300 simulates exactly the millivoltage of a Type K thermocouple at the indicated temperature.

Desired Temp (°F) Nominal	Temperature of Standard or Simulated Temp (°F)	Response of Unit Under Test (°F)	Deviation Δt (°F)	Deviation (%)
0	0	3.0	3	.65
100	100	98	2	.35
200	200	200	—	—
300	300	299	1	.13
400	400	394	6	.69
500	500	493	7	.72
600	600	594	6	.56
700	700	694	6	.51
800	800	797	3	.23
900	900	898	2	.14
1000	1000	1001	1	.06
1100	1100	1104	4	.25
1200	1200	1207	7	.42
1300	1300	1306	6	.34
1400	1400	1409	9	.48
1500	1500	1505	5	.25
1600	1600	1604	4	.19
1700	1700	1697	3	.13
1800	1800	1794	6	.26
1900	1900	1885	15	.63
2000	2000	1978	22	.89
2100				
		Averages:		

OF = off scale response by unit under test (°F)
% dev = 100 Δt / (460 + t)

☒ Unit in tolerance
☐ Unit was not in tolerance; recalibrated - See new calibration sheet.

S-433

Interpoll Laboratories, Inc.

Temperature Measurement Device Calibration Sheet

Unit under test:

Vendor GORDON

Model 5310K — Serial Number PDT-10

Range -112°F TO 1999°F °F — Thermocouple Type K

Date of Calibration 3-5-90 — Technician S. BAINVILLE

Method of Calibration:

☐ Comparison against ASTM mercury in glass thermometer using a thermostatted and insulated aluminum block designed to provide uniform temperature. The temperature is adjusted by adjusting the voltage on the block heater cartridge.

☒ Omega Model CL-300 Type K Thermocouple Simulator which provides 22 precise temperature equivalent millivolt signals. The CL-300 is cold junction compensated. Calibration accuracy is ± 0.1% of span (2100 °F) ± 1 degree (for negative temperatures add ± 2 degrees. The CL-300 simulates exactly the millivoltage of a Type K thermocouple at the indicated temperature.

Desired Temp (°F) Nominal	Temperature of Standard or Simulated Temp (°F)	Response of Unit Under Test (°F)	Deviation Δt (°F)	Deviation (%)
0	0	.8	.8	.17
100	100	97.7	2.3	.41
200	200	201	1	.15
300	300	298	2	.26
400	400	395	5	.58
500	500	494	6	.62
600	600	596	4	.38
700	700	696	4	.34
800	800	800	0	—
900	900	901	1	.07
1000	1000	1004	4	.27
1100	1100	1106	6	.38
1200	1200	1211	11	.66
1300	1300	1310	10	.57
1400	1400	1413	13	.70
1500	1500	1509	9	.46
1600	1600	1608	8	.39
1700	1700	1702	2	.09
1800	1800	1798	2	.09
1900	1900	1889	11	.47
2000	2000	1983	17	.69
2100	2100	OF	OF	OF
		Averages:	6.0	.39%

OF = off scale response by unit under test (°F)

% dev = 100 Δt / (460 + t)

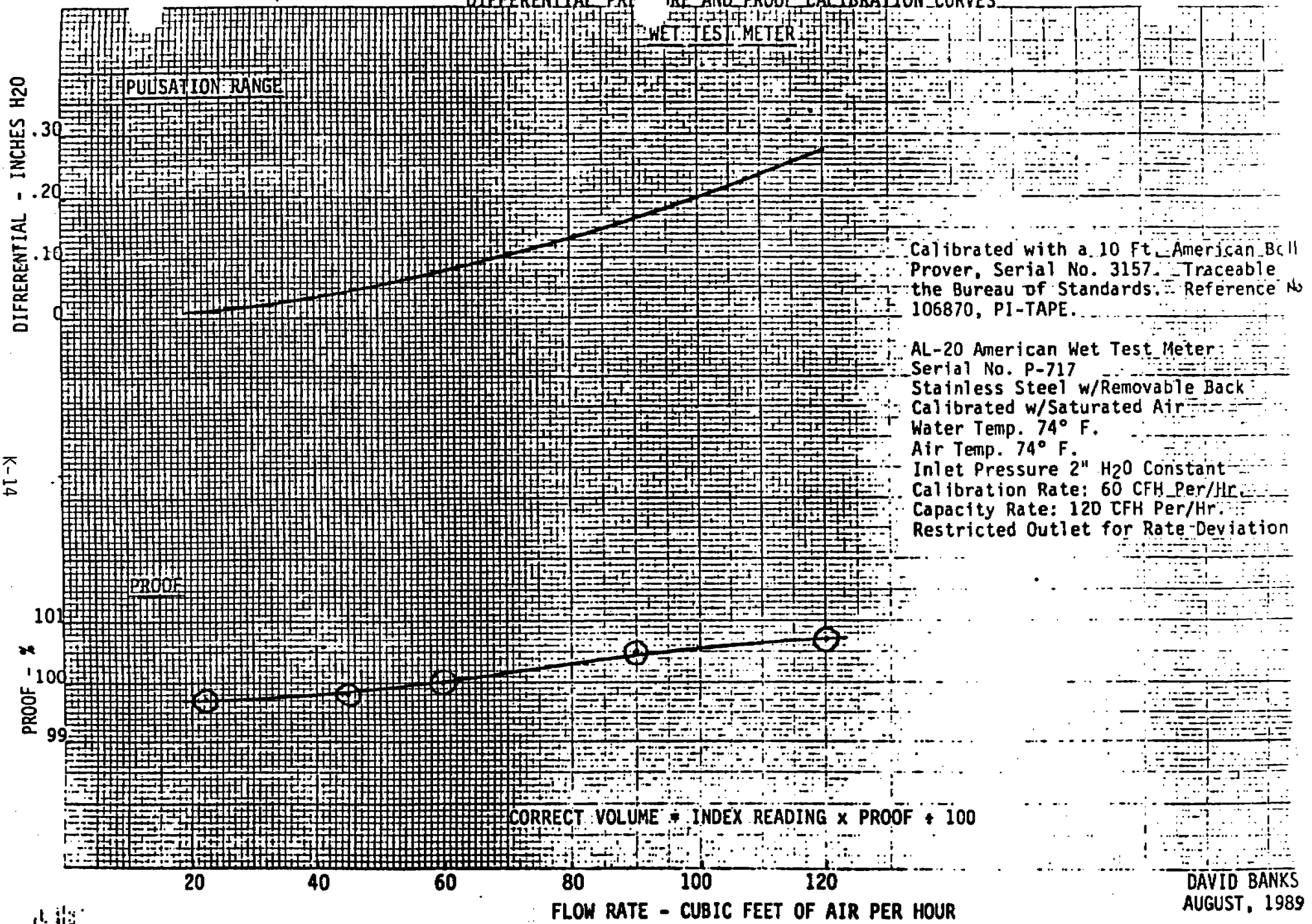
☒ Unit in tolerance

☐ Unit was not in tolerance; recalibrated - See new calibration sheet.

S-433

DIFFERENTIAL PRESSURE AND PROOF CALIBRATION CURVES

WET TEST METER



Calibrated with a 10 Ft. American Bell Prover, Serial No. 3157. Traceable to the Bureau of Standards. Reference No. 106870, PI-TAPE.

AL-20 American Wet Test Meter
Serial No. P-717
Stainless Steel w/Removable Back
Calibrated w/Saturated Air
Water Temp. 74° F.
Air Temp. 74° F.
Inlet Pressure 2" H_2O Constant
Calibration Rate: 60 CFH Per/Hr.
Capacity Rate: 120 CFH Per/Hr.
Restricted Outlet for Rate Deviation

CORRECT VOLUME = INDEX READING x PROOF ÷ 100

DAVID BANKS
AUGUST, 1989

TACON 9

Source category: Taconite ore processing
Plant name : Cyprus Northshore Mining
Test date : March 15, 1990
Process : Crusher

Date:
Location:
Ref. No.: (10)
Basis for process rate :

Source	Type of control	Pollutant	Run No.	Emission rate, lb/hr	Process rate, ton/hr	Emission factor kg/Mg	Emission factor lb/ton
Primary crusher	Cyclone and multi-cyclone	filt. PM	1	50.54	1379	0.018	0.037
		filt. PM	2	58.19	1773	0.016	0.033
		filt. PM	3	53.19	1172	0.023	0.045
				AVERAGE		0.019	0.038
		CO2	1	0.0	1379	0.0000	0.0000
		CO2	2	0.0	1773	0.000	0.000
		CO2	3	0.0	1172	0.000	0.000
				AVERAGE		0.0000	0.000
Primary crusher	Cyclone	filt. PM	1	141.50	1379	0.051	0.10
		filt. PM	2	147.20	1773	0.042	0.083
		filt. PM	3	135.70	1172	0.058	0.12
				AVERAGE		0.050	0.10
		CO2	1	0.0	1379	0.0000	0.0000
		CO2	2	0.0	1773	0.000	0.000
		CO2	3	0.0	1172	0.000	0.000
				AVERAGE		0.0000	0.000