0070993

ASARCO

Sent to Lowell on 2/26/85

1264371 - R8 SDMS

Department of Environmental Sciences

M. O. Varner
Director

February 19, 1985

ADMINISTRATIVE RECORD
SF FILE NUMBER
1070101

Mr. Gene Taylor
U.S. EPA, Region VIII
Montana Office-Federal Bldg.
301 S. Park, Drawer 10096
Helena, Mt. 59626

Dear Mr. Taylor:

Attached are the preliminary results of analysis and deliverables for the water samples received by the lab January 17, 1985.

The samples were digested in accordance to the approved procedure outlined in the analytical protocol packages submitted to yourself and Mr. Doug Skie.

Very truly yours,

John G. Hayes

John G. Hayes
Chemist

JGH/lb
Attach.

cc: MBotz (w/results only)
JCNickel (w/attach.)
MOVarner (w/results only)
DARobbins (w/attach.)

ENVIRONMENTAL PROTECTION AGENCY
FEB 22 1985
MONTANA OFFICE

0070994

ASARCO DEPARTMENT OF ENVIRONMENTAL SCIENCES

SAMPLE ANALYSIS REPORT

ANALYST John Hayes

DATE 2/14/85

SAMPLE NO. AEH-8501-101

Parameter	Sample Value (S)
Cond.	336. umhos
TDS	204. mg/l
TSS	1.0 mg/l
pH	7.9 pH units
As(T)	14. ppb
As(D)	6. ppb
Pb(T)	7. ppb
Pb(D)	5. ppb
Zn(T)	71. ppb
Zn(D)	53. ppb
Cd(T)	<1. ppb
Cd(D)	<1. ppb

Comments: (T) = Total (D) = Dissolved

0070995

ASARCO DEPARTMENT OF ENVIRONMENTAL SCIENCES

SAMPLE ANALYSIS REPORT

ANALYST John Hayes

DATE 2/14/85

SAMPLE NO. AEH-8501-102

Parameter	Sample Value (S)
Cond.	328 umhos
TDS	203. mg/l
TSS	20 mg/l
pH	7.7 pH units
As(T)	29. ppb
As(D)	6. ppb
Pb(T)	113. ppb
Pb(D)	<5. ppb
Zn(T)	210. ppb
Zn(D)	60. ppb
Cd(T)	15. ppb
Cd(D)	5. ppb

Comments: (T) = Total (D) = Dissolved

0070996

ASARCO DEPARTMENT OF ENVIRONMENTAL SCIENCES

SAMPLE ANALYSIS REPORT

ANALYST John Hayes

DATE 2/14/85

SAMPLE NO. AEH-8501-103

Parameter	Sample Value (S)
Cond.	340. umhos
TDS	205. mg/l
TSS	1.5 mg/l
pH	7.8 pH units
As(T)	35. ppb
As(D)	21. ppb
Pb(T)	10. ppb
Pb(D)	<5. ppb
Zn(T)	70. ppb
Zn(D)	49. ppb
Cd(T)	<1. ppb
Cd(D)	<1. ppb

Comments: (T) = Total (D) = Dissolved

ASARCO DEPARTMENT OF ENVIRONMENTAL SCIENCES

SAMPLE ANALYSIS REPORT

ANALYST John Hayes

DATE 2/14/85

SAMPLE NO. AEH-8501-104

Parameter	Sample Value (S)
Cond.	338. umhos
TDS	212. mg/l
TSS	<1.0 mg/l
pH	7.8 pH units
As(T)	35. ppb
As(D)	34. ppb
Pb(T)	9. ppb
Pb(D)	<5. ppb
Zn(T)	75. ppb
Zn(D)	60. ppb
Cd(T)	1. ppb
Cd(D)	<1. ppb

Comments: (T) = Total (D) = Dissolved

ASARCO DEPARTMENT OF ENVIRONMENTAL SCIENCES

SAMPLE ANALYSIS REPORT

ANALYST John Hayes

DATE 2/14/85

SAMPLE NO. AEH-8501-105

Parameter	Sample Value (S)
Cond.	340. umhos
TDS	216. mg/l
TSS	<1.0 mg/l
pH	7.9 pH units
As(T)	42. ppb
As(D)	29. ppb
Pb(T)	23. ppb
Pb(D)	<5. ppb
Zn(T)	89. ppb
Zn(D)	61. ppb
Cd(T)	3. ppb
Cd(D)	1. ppb

Comments: (T) = Total (D) = Dissolved

ASARCO DEPARTMENT OF ENVIRONMENTAL SCIENCES

SAMPLE ANALYSIS REPORT

ANALYST John Hayes

DATE 2/14/85

SAMPLE NO. AEH-8501-106

Parameter	Sample Value (S)
Cond.	340. umhos
TDS	204. mg/l
TSS	1.5 mg/l
pH	7.9 pH units
As(T)	33. ppb
As(D)	28. ppb
Pb(T)	11. ppb
Pb(D)	<5. ppb
Zn(T)	80. ppb
Zn(D)	63. ppb
Cd(T)	3. ppb
Cd(D)	1. ppb

Comments: (T) = Total (D) = Dissolved

ASARCO DEPARTMENT OF ENVIRONMENTAL SCIENCES

SAMPLE ANALYSIS REPORT

ANALYST John Hayes

DATE 2/14/85

SAMPLE NO. AEH-8501-107

Parameter	Sample Value (S)
Cond.	338. umhos
TDS	206. mg/l
TSS	2.1 mg/l
pH	7.8 pH units
As(T)	33. ppb
As(D)	32. ppb
Pb(T)	17. ppb
Pb(D)	<5. ppb
Zn(T)	120. ppb
Zn(D)	70. ppb
Cd(T)	3. ppb
Cd(D)	1. ppb

Comments: (T) = Total (D) = Dissolved

0071001

ASARCO DEPARTMENT OF ENVIRONMENTAL SCIENCES

SAMPLE ANALYSIS REPORT

ANALYST John Hayes

DATE 2/14/85

SAMPLE NO. AEH-8501-108

Parameter	Sample Value (S)
Cond.	336 umhos
TDS	202. mg/l
TSS	3.2 mg/l
pH	7.6 pH units
As(T)	36. ppb
As(D)	30. ppb
Pb(T)	12. ppb
Pb(D)	< 5. ppb
Zn(T)	80. ppb
Zn(D)	66. ppb
Cd(T)	1. ppb
Cd(D)	< 1. ppb

Comments: (T) = Total (D) = Dissolved

0071002

ASARCO DEPARTMENT OF ENVIRONMENTAL SCIENCES

SAMPLE ANALYSIS REPORT

ANALYST John G. Hayes

DATE 2/14/85

SAMPLE NO. AEH-8501-112

Parameter	Sample Value (S)
Cond.	338. umhos
TDS	206. mg/l
TSS	1.1 mg/l
pH	7.8 pH units
As(T)	36. ppb
As(D)	28. ppb
Pb(T)	8. ppb
Pb(D)	<5. ppb
Zn(T)	76. ppb
Zn(D)	64. ppb
Cd(T)	1. ppb
Cd(D)	<1. ppb

Comments: (T) = Total (D) = Dissolved

ASARCO DEPARTMENT OF ENVIRONMENTAL SCIENCES

SAMPLE ANALYSIS REPORT

ANALYST John Hayes

DATE 2/14/85

SAMPLE NO. AEH-8501-113

Parameter	Sample Value (S)
Cond.	333. umhos
TDS	193. mg/l
TSS	1.7 mg/l
pH	7.7 pH units
As(T)	7. ppb
As(D)	6. ppb
Pb(T)	6. ppb
Pb(D)	<5. ppb
Zn(T)	71. ppb
Zn(D)	55. ppb
Cd(T)	<1. ppb
Cd(D)	<1. ppb

Comments: (T) = Total (D) = Dissolved

ASARCO DEPARTMENT OF ENVIRONMENTAL SCIENCES

SAMPLE ANALYSIS REPORT

ANALYST John G. Hayes

DATE 2/14/85

SAMPLE NO. AEH-8501-114

Parameter	Sample Value (S)
As(D)	<4. ppb
PB(D)	<5. ppb
Zn(D)	8. ppb
Cd(D)	1. ppb

Comments: (D) = Dissolved

ASARCO DEPARTMENT OF ENVIRONMENTAL SCIENCES

SAMPLE ANALYSIS REPORT

ANALYST John Hayes

DATE 2/14/85

SAMPLE NO. AEH-8501-115

Parameter	Sample Value (S)
As(T)	<4. ppb
Pb(T)	<5. ppb
Zn(T)	<8. ppb
Cd(T)	1. ppb

Comments: (T) = Total

ASARCO DEPARTMENT OF ENVIRONMENTAL SCIENCES

SAMPLE ANALYSIS REPORT

ANALYST: John G. Hayes

DATE: 2/14/85

SAMPLE NO.: AEH-8501-135

Parameter	Sample Value (S)
As(T)	<4. ppb
As(D)	<4. ppb
Pb(T)	<5. ppb
Pb(D)	<5. ppb
Zn(T)	<8. ppb
Zn(D)	<8. ppb
Cd(T)	<1. ppb
Cd(D)	<1. ppb

Comments: (T) = Total (D) = Dissolved

ASARCO DEPARTMENT OF ENVIRONMENTAL SCIENCES

SAMPLE ANALYSIS REPORT

ANALYST: John Hayes

DATE: 2/14/85

SAMPLE NO.: AEH-8501-136

Parameter	Sample Value (S)
As(T)	<4. ppb
As(D)	<4. ppb
Pb(T)	<5. ppb
Pb(D)	<5. ppb
Zn(T)	<8. ppb
Zn(D)	<8. ppb
Cd(T)	<1. ppb
Cd(D)	<1. ppb

Comments: (T) = Total (D) = Dissolved

0071008

ASARCO DEPARTMENT OF ENVIRONMENTAL SCIENCES

INITIAL CALIBRATION VERIFICATION

ANALYST John Hayes

DATE 2/14/85

QC/SRM	Parameter	Result After Initial Calibration	Acceptable* or Certified Range	Within Range Y/N
WP475 #6	As	310. ppb	207.-393.ppb	Y
WP1178	Pb(furnace)	40. ppb	34.0-54.0ppb	Y
WP475 #6	Cd	65. ppb	54.4-76.8ppb	Y
QC #4	Zn	10.0 ppm	8.8-11.2 ppm	Y
WP475 #6	Pb(flame)	363. ppb	345.-453.ppb	Y

Comments:

* Acceptable range ±2 Standard Deviations

ASARCO Department of Environmental Sciences

Reference Sample Description: EPA WP475 #6 Trace Metals

Date of Analysis: 2/11/85, 2/14/85

Analyst: John Hayes

Parameter	Certificate Range	Units	Observed Value	Units	Within Range (Y on N)
Pb(furnace)	345-453	ppb	394.	ppb	Y
Cd	54.4-76.8	ppb	65.	ppb	Y
Zn	352-440	ppb	388.	ppb	Y
As	207-393	ppb	298.	ppb	Y

Comments: SRM (1)

ASARCO Department of Environmental Sciences

Reference Sample Description: EPA WP475 #6 Trace Metals

Date of Analysis: 2/11/85, 2/15/85

Analyst: John Hayes

Parameter	Certificate Range	Units	Observed Value	Units	Within Range (Y on N)
Pb(furnace)	345-453	ppb	438.	ppb	Y
Cd	54.4-76.8	ppb	64.	ppb	Y
Zn	352-440	ppb	375.	ppb	Y
As	207-393	ppb	310.	ppb	Y

Comments: SRM (2)

ASARCO Department of Environmental Sciences

Reference Sample Description: EPA WP1178 #1 Trace Metals

Date of Analysis: 2/11/85

Analyst: John Hayes

Parameter	Certificate Range	Units	Observed Value	Units	Within Range (Y on N)
Pb(furnace)	34.0-54.0	ppb	40.	ppb	Y
Pb(furnace)	34.0-54.0	ppb	36.	ppb	Y

Comments:

ASARCO Department of Environmental Sciences

Reference Sample Description: EPA WP782 #1 Residue Analysis

Date of Analysis: 1/14/85

Analyst: John G. Hayes

Parameter	Certificate Range	Units	Observed Value	Units	Within Range (Y on N)
TSS	26.0-34.6	mg/l	31.9	mg/l	Y
TSS	26.0-34.6	mg/l	27.2	mg/l	Y

Comments:

ASARCO Department of Environmental Sciences

Reference Sample Description: EPA WP882 #1 Minerals Analysis

Date of Analysis: 1/14/85, 1/15/85

Analyst: John G. Hayes

Parameter	Certificate Range	Units	Observed Value	Units	Within Range (Y on N)
TDS	280-373	mg/l	321.	mg/l	Y
Cond.	504-624	umhos	570.	umhos	Y
pH	5.58-5.82	pH units	5.8	pH units	Y

Comments:

ASARCO Department of Environmental Sciences

Reference Sample Description: EPA WP882 #2 Mineral Analysis

Date of Analysis: 1/14/85, 1/15/85

Analyst: John G. Hayes

Parameter	Certificate Range	Units	Observed Value	Units	Within Range (Y on N)
TDS	27.6-75.2	mg/l	55.	mg/l	Y
Cond.	95.2-119.	umhos	119.	umhos	Y
pH	7.64-7.96	pH units	7.7	pH units	Y

Comments:

ASARCO DEPARTMENT OF ENVIRONMENTAL SCIENCES 0071015

REAGENT BLANK ANALYSIS REPORT

ANALYST John Hayes

DATE 2/14/85

SAMPLE NO. Deionized Water Blank

Parameter	Reagent Blank Value
TSS	<1. mg/l
TSS	<1. mg/l
TDS	<1. mg/l
TDS	<1. mg/l

Comments:

ASARCO DEPARTMENT OF ENVIRONMENTAL SCIENCES

0071016

REAGENT BLANK ANALYSIS REPORT

ANALYST John Hayes

DATE 2/14/85

SAMPLE NO. Reagent Blank #1

Parameter	Reagent Blank* Value
As	<4. ppb
Pb	<5. ppb
Cd	<1. ppb
Zn	<8. ppb

Comments:

* 10 ml of 85/15 $HNO_3/HClO_4$ of the same stock used in the samples and Q.C. is digested to fume of $HClO_4$ then brought to volume with 5% HCl in the same manner as samples and Q.C.

ASARCO DEPARTMENT OF ENVIRONMENTAL SCIENCES 0071017

REAGENT BLANK ANALYSIS REPORT

ANALYST John Hayes

DATE 2/14/85

SAMPLE NO. Reagent Blank #2

Parameter	Reagent Blank* Value
As	<4. ppb
Pb	<5. ppb
Cd	<1. ppb
Zn	<8. ppb

Comments:

* 10 ml of 85/15 $HNO_3/HClO_4$ of the same stock used in the samples and Q.C. is digested to fume of $HClO_4$ then brought to volume with 5% HCl in the same manner as samples and Q.C.

ASARCO DEPARTMENT OF ENVIRONMENTAL SCIENCES 0071018

SPIKE SAMPLE RECOVERY

ANALYST John Hayes

DATE 2/14/85

SAMPLE NO. AEH-8501-102

Parameter Added	Spiked* Sample Result (SSR)	Sample Result (SR)	Spike Added (SA)	%R
As(T)	8.8 ppb	29. ppb	60. ppb	98.3
Pb(T)	363. ppb	113. ppb	250. ppb	100.0
Cd(T)	256. ppb	5. ppb	250. ppb	100.4
Zn(T)	450. ppb	210. ppb	250. ppb	96.0

Comments: (T) = Total metals

$\%R = \left(\frac{SSR - SR}{SA}\right) \times 100$ Control Limits ± 25%

* 5ml of in-house Q.C. is added to a duplicate aliquot of the sample prior to digestion. Sample and sample and spike are digested and brought to equal volumes.

ASARCO DEPARTMENT OF ENVIRONMENTAL SCIENCES

0071019

SPIKE SAMPLE RECOVERY

ANALYST John Hayes

DATE 2/14/85

SAMPLE NO. AEH-8501-102

Parameter Added	Spiked* Sample Result (SSR)	Sample Result (SR)	Spike Added (SA)	%R
As(D)	.66 ppb	6. ppb	60. ppb	100.0
Pb(D)	250. ppb	5. ppb	250. ppb	100.0
Cd(D)	256. ppb	5. ppb	250. ppb	100.4
Zn(D)	313. ppb	60. ppb	250. ppb	101.2

Comments: (D) = Dissolved metals

$\%R = \left(\frac{SSR - SR}{SA}\right) \times 100$ Control Limits $\pm$ 25%

* 5ml of in-house Q.C. is added to a duplicate aliquot of the sample prior to digestion. Sample and sample and spike are digested and brought to equal volumes.

ASARCO DEPARTMENT OF ENVIRONMENTAL SCIENCES

DUPLICATE SAMPLE ANALYSIS REPORT

ANALYST John Hayes

DATE 2/14/85

SAMPLE NO. AEH-8501-108

Parameter	Sample Value (S)	Duplicate Value (D)	RPD
TSS	3.2 mg/l	3.6 mg/l	-11.8
TDS	202. mg/l	212. mg/l	- 4.8

Comments:

$$RPD = \left(\frac{(S-D)}{\frac{S+D}{2}}\right) \times 100$$

ASARCO DEPARTMENT OF ENVIRONMENTAL SCIENCES

DUPLICATE SAMPLE ANALYSIS REPORT

ANALYST John Hayes

DATE 2/14/85

SAMPLE NO. AEH-8501-113

Parameter	Sample Value (S)	Duplicate Value (D)	RPD
TSS	1.7 mg/l	1.5 mg/l	12.5
TDS	193. mg/l	203. mg/l	-5.1

Comments:

$$RPD = \left(\frac{(S-D)}{\frac{S+D}{2}}\right) \times 100$$

2-15-85	Vol	aliq	Ad					
7	15							
	2				87²			
	5				70			
	10				48³			
	20				24²			
	30				69²	5.2		
	133.5	50	5		72²	4.6	46.0	O
	[illegible]		2		59²	7.4	145.0	O
	142		5		48	10.4	144.0	O
//	145.1		20		50	9.9	12.1	RO
	145.2		40		56²	[illegible]	[illegible]	O
	147.5		40		52²	[illegible]	11.5	O
	132 Hgo		20		37³	13.9	[illegible]	
	141 Hgo		5		19	23.0	220.0	
	[illegible]		10		34³	14.8	99.0	
	146 Hgo		40		92²	1.2	1.5	
–	147 Hgo		40		70'	5.0	1.3	O
	149 Hgo		40		69	5.3	1.6	O ✓
	46.0 2/25		15		98	<.5	<4 ppb	
// 4/25	SPIKE	↓	10		42	(2x)12.4	3.0 "	
	46.0 5/25		15		85	2.4	[illegible]	OK
	144	50	8		96	.7	1.4	
	163	50	1		98	<.5	<5.0	
	533T 800	25	15		89	1.7	14.	
	533T-dupl				90²	1.5	13. "	
	533-D				96	.7	6. "	
	533-D dupl				96	.7	6. "	
	530-T				78²	3.5	29. "	
Spike	534-T				47²	10.5	28.	
//	534-D				95²	.7	6.0	
Spike	534-D				57'	7.9	6.0	

2-15-85	Oil	Wing	oil	% T	[illegible]	[illegible]	[illegible]
H 535 T	25	15		74²	4.2	36.	[illegible]
535 D				84	2.5	21.	[illegible]
536 T				77²	4.2	35.	[illegible]
536 D				75	4.1	34.	[illegible]
537 T				78	3.6	30.	[illegible]
537 D				91	1.4	12.	[illegible]
538 T				76	3.9	33.	[illegible]
538 D				78²	2.4	28.	[illegible]
539 T				75²	4.0	33.	[illegible]
N 103	100	40		91	[illegible]	3.4	
539-D	[illegible]			76²	[illegible]	32.	[illegible]
540-T				74²	[illegible]	36	[illegible]
540-D				78	3.6	30	[illegible]
541-T				74²	[illegible]	36.	[illegible]
541-D				79	[illegible]	28.	[illegible]
542-T				94²	[illegible]	7.	[illegible]
542-D				96	[illegible]	6.	[illegible]
543-D				99	<.5	<4.	<.0042
544-T				98	<.5	<4.	
545-T				99	<.5	<4.	
545-D				97²	<.5	<4.	
546-T				97²	<.5	<4.	
546-D				97	<.5	<.4	
WF 242 T	50	25	15	99	<.5	.0056	<.01
242-T				36²	(2X) 14.4=28.8	116.0	
243-T				98	<.5	<.005	<.01
244-T				97	<.5		
245-T				99	<.5		
243-D				98²	<.5		
244-D				98²	<.5	<.005	<.01
242-D				98²			
245-D				98²			

2-15-85

Blks							
[illegible]	150/[illegible]		15	96[3]	[illegible]	[illegible]	✓
QC	25		2	74[3]	4.1	10.3	✓
Q1	150		2	75[2]	[illegible]	10.0	✓
Sp. 11323			15	65	[illegible]	.069	✓
Spike 11323				42 (4X) Not [illegible]		82.7	[illegible]
11324				58	[illegible]	[illegible]	✓
" 11325				50	[illegible]	11	✓
Sm N							
TD 837	1P	50	10	26	[illegible]	95.[illegible]	
838			20	63	[illegible]	16.5	
39			10	62	[illegible]	34.0	
40			10	56[2]	[illegible]	116.0	
[illegible]			10	75	[illegible]	20.5	
[illegible]			10	83	[illegible]	13.5	
[illegible]			30	82[2]	[illegible]	4.7	
[illegible]			30	78[2]	[illegible]	[illegible]	
[illegible]			[illegible]	68[3]	[illegible]	13.3	
" 923			5	54	4.8	88.0	

2-19-85

PB			97[100]		
5			88		
5			71		
10			49[3]		
80			25[2]		
Sm QC			69	5.4	
Sm H PB			99	1.5	14 ppb
537 T	wet	all	71	5.0	42 ppb
537 D	wet	all	78[2]	3.5	29 ppb
QC	Value not [illegible]	all	39 (2X)	13.[illegible]	276 ppb
Sm N 851		3			
852		3			
TD 924	1P	20			

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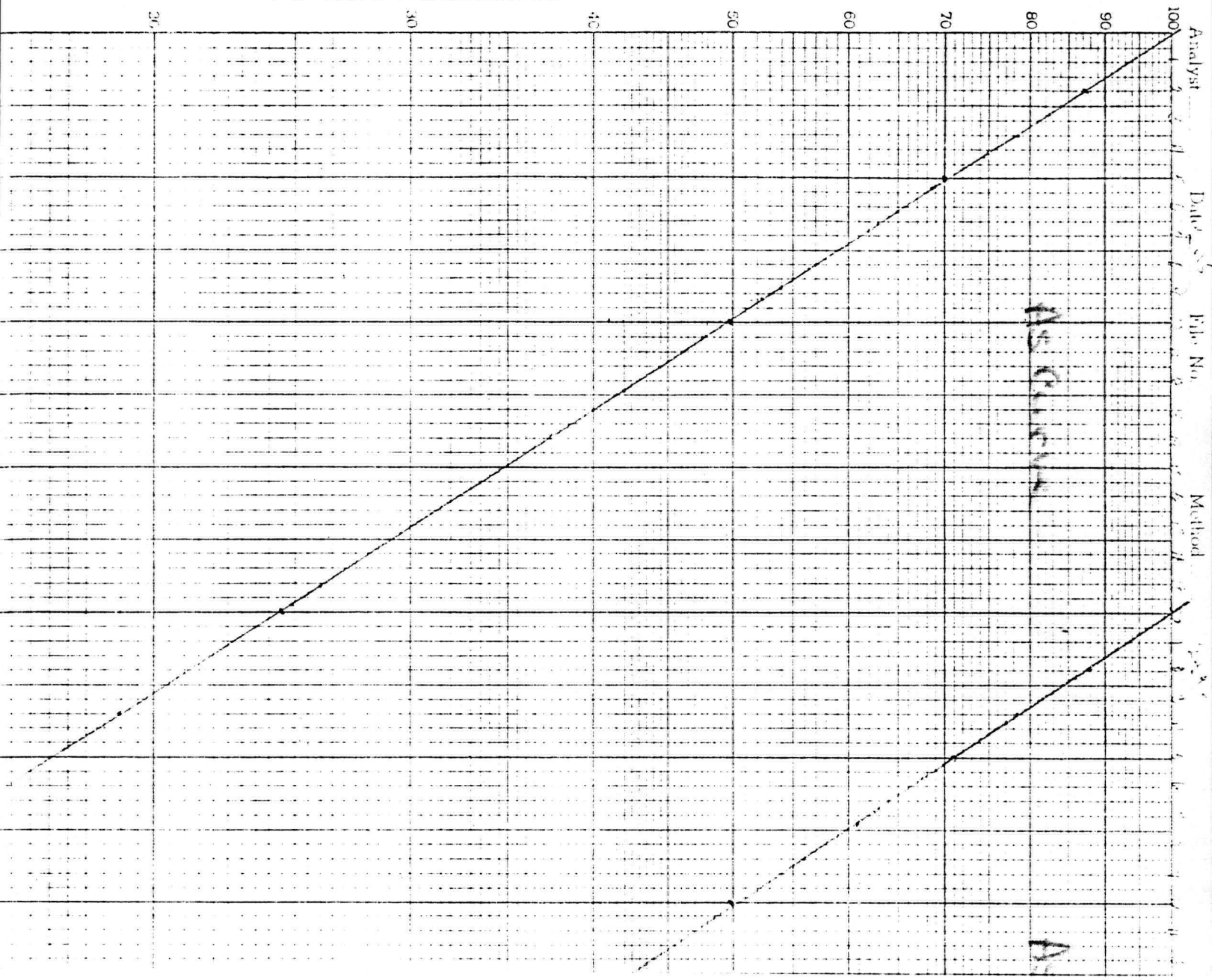
THE PERKIN-ELMER CORPORATION
OAK BROOK INSTRUMENT DIVISION
2000 York Road • Oak Brook, Illinois • 60521

0071025

Per Cent Transmittance



2

1/14/55

0071026

1/14/5

Fe Lamp: 15 ma 703
Flame: Air-Acetylene- lean blue
λ : 248.33nm
Bckgrd: OFF
slit : 3

(Flame AA) Pb Lamp: 8 ma 703
Flame: Air-Acetylene lean-blue
λ : 217.0 nm
Backgrd: D_2 on
Slit : 4

Cu Lamp: 18 ma 703
Flame: Air-Acetylene lean-blue
λ : 324.8 nm
Bckgrd: OFF
slit : 3

Cd Lamp: 8 ma 703
Flame: Air-Acetylene lean-blue
λ : 228.80 nm
Bckgrd: D_2 on
Slit . 4

1/14/55

Ba Lamp : 25 ma 703
Flame : ~~Air~~ N_2O-Acetylene red -
λ : 553.6 nm (2770 vis)
Bckgnd : OFF
Slit : 3

Cr Lamp: 25 ma 703
Flame: N_2O-Acetylene ~~rjet~~ red-
λ : 357.9 nm
Bckgnd: OFF
slit : 2

V Lamp:
Flame: N_2O - Acetylene
λ : 306.6 nm
Bckgnd: OFF
Slit : 3

N: Lamp: 25 ma 703
Flame: Air-Acetylene
λ : 232.0 nm
Bckgnd : D_2 ON
Slit : 4

4
1/14/85

Ag Lamp: 6 ma 703
Flame: Air-Acetylene lean-blue
λ : 328.1 nm
Bckgrd : D_2 on
Slit : 4

Mn Lamp: 25 ma 703
Flame: Air-Acetylene lean-blue
λ : 279.5 nm
Backgrd: OFF
Slit : ~~2~~ 3

(flameless) Pb Lamp: 8 ma 503 · Graphite Furnace
λ : 217.0 nm
Bckgrd: D_2 ON
Slit : 4

Program:

Dry Temp = 140°C
Ramp = 5 sec
Hold = 25 sec

Pre-char Temp = 300°C
Ramp : 10 s
Hold : 5 s

Char Temp 800°C
Ramp: 5 s
Hold : 30 s

Cool Temp: 30°C
Ramp: 1 s
Hold : 25 s

Atomize: 1800°C
Ramp : 0 s
Hold : 5 s

Aliquot : 20 µl
+ 5 µl of (200 µg PO_4 + 10 µg $Mg(NO_3)_2$)

Chart Rec Attn : 20
L'vov platform

1/14/85

Zn Lamp: 8 ma 703
Flame: Air-Acetylene lean-blue
λ : 213.9 nm
Bckgnd : D_2 ON
Slit : 4

Co Lamp: 25 ma 703
Flame : Air-Acetylene lean-blue
λ : 240.7 nm
Bckgnd : D_2 ON
Slit : 4

Sb Lamp : 6 watts (EDL)
Flame : Air-Acetylene
λ : 217.6 nm
Bckgnd : D_2 ON
Slit : 4

Ca Lamp : 25 ma
Flame : N_2O-acetylene red-flame
λ : 422.7 nm (211 Vis)
Bckgnd : OFF
Slit : 3
Burner head is turned 30° to decrease sensitivity and increase linearity

1/14/85

1/14/85

Mg

Lamp: 25ma
Flame: N_2O-Acetylene
λ : 285.2nm
Bckgrd: OFF
Slit : 3
Burner head is turned 30° to decrease sensitivity and increase linearity

Na

Atomic Emission
Flame: Air-Acetylene
λ : 589.0nm (295 Vis)
Slit: 3
Burner head is turned 30° to decrease sensitivity and increase linearity

Gain is adjusted to ~ .300 ABS/5.0µg/ml

K

Atomic Emission
Flame: Air-Acetylene
λ : 766.5nm (383 Vis)
Slit : 3
Burner head is turned 30° to decrease sensitivity and increase linearity

Gain is adjusted to ~ .300 ABS/5.0µg/ml

12/27/84

Fe Flame AA 1.0 ppm = .052 ABS 2.0 ppm = .105
~~1sec~~ 1 sec integration
ABS BLANK
.000, .000, .000, -.001, .000, .000, .000, -.001, .000, .000

Zn Flame AA 1.00 ppm = .279 ABS .10 ppm = .030 ABS
1 sec int
ABS BLANK
.001, -.001, -.001, .000, .000, .000, .000, -.001, -.001, .000

Co Flame AA 1.0 ppm = .019 ABS 5.0 ppm = .085 ABS
1 sec int
ABS BLANK
.000, .000, .000, .000, -.001, .000, -.001, .000, .000, .000

Ba Flame AA 2.0 ppm = .040 ABS 5.0 ppm = .102 ABS
1 sec int.
ABS BLANK
.000, .001, .000, .000, -.001, .000, .000, .000, -.001, .000

12/28/84
~~12/27/84~~

Ca Flame AA .50ppm = .074 ABS 2.0ppm = .290 ABS
1 sec int
ABS BLANK
.000, .000, .000, .000, .000, .000, .000, .000, .001, .000

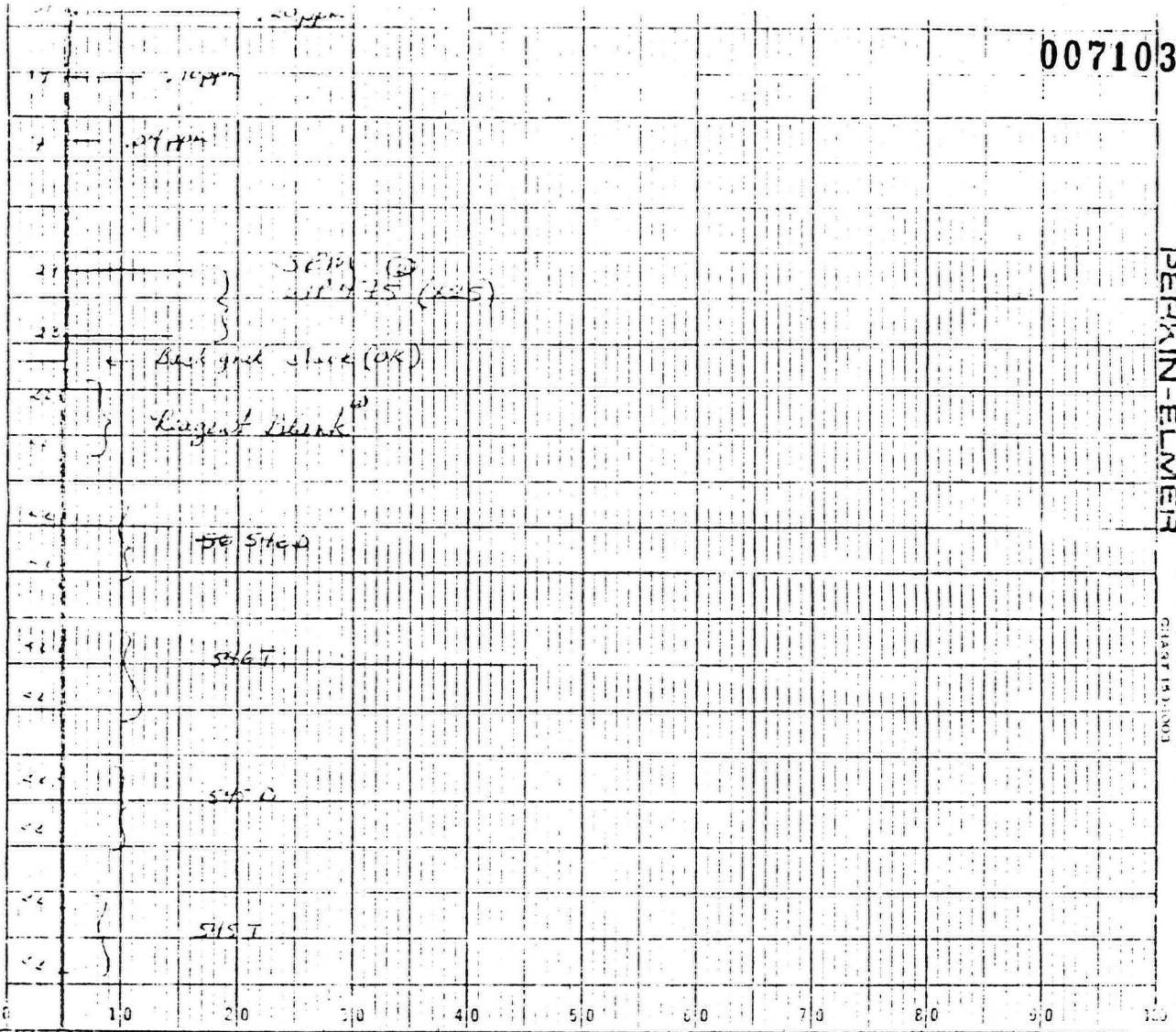
Mg Flame AA
1 sec int.
ABS BLANK
.000, .000, .000, .000, .000, .000, .000, .000, .000, .000, .000

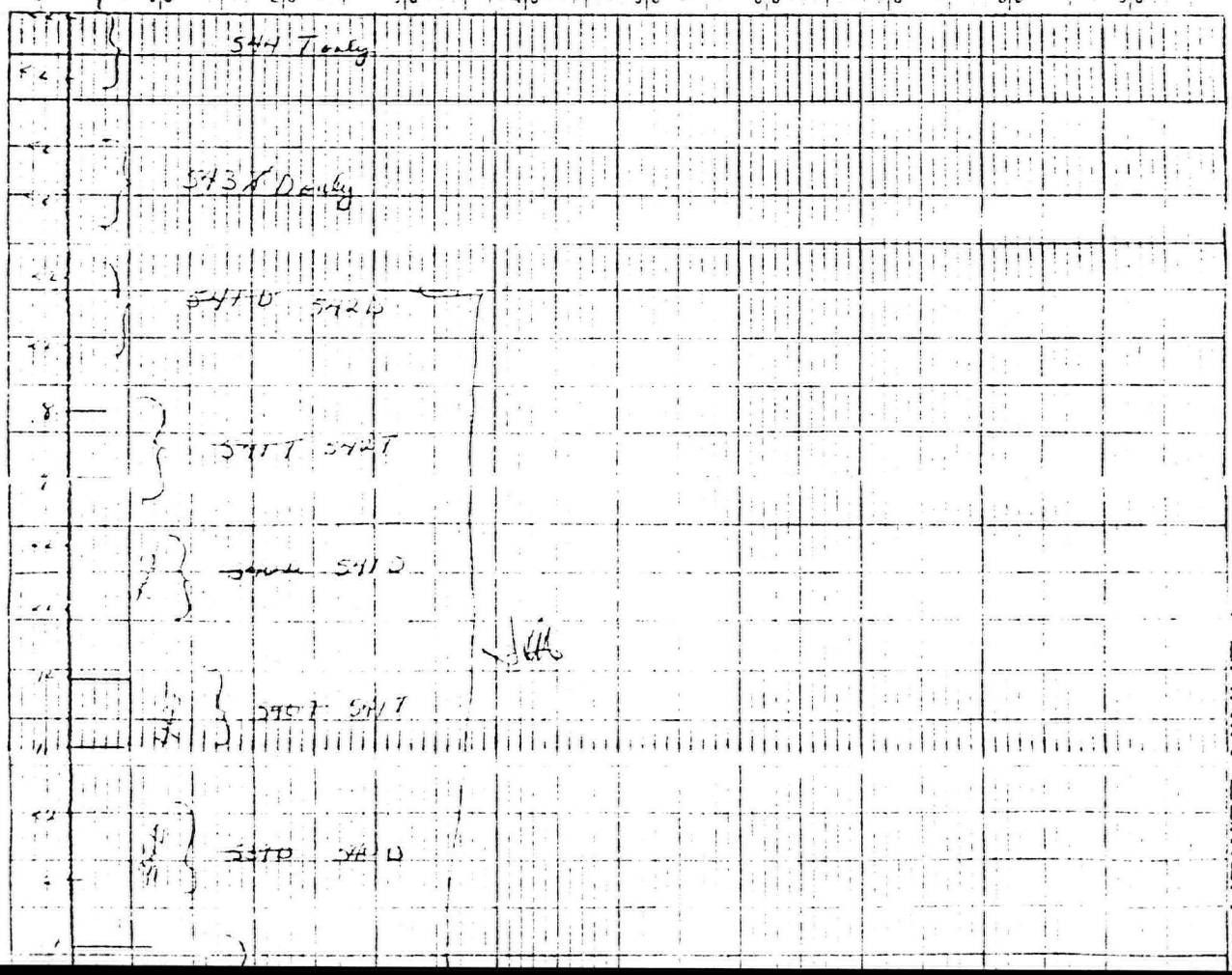
Na Flame AE Flame turned 30° Gain ~ .300 ABS/5.0 ppm
1 /sec int 5.0 = .318 ABS 2.0 ppm = .149
ABS BLANK
.003, -.001, .002, .000, .000, .000, .001, .001, -.001, -.002

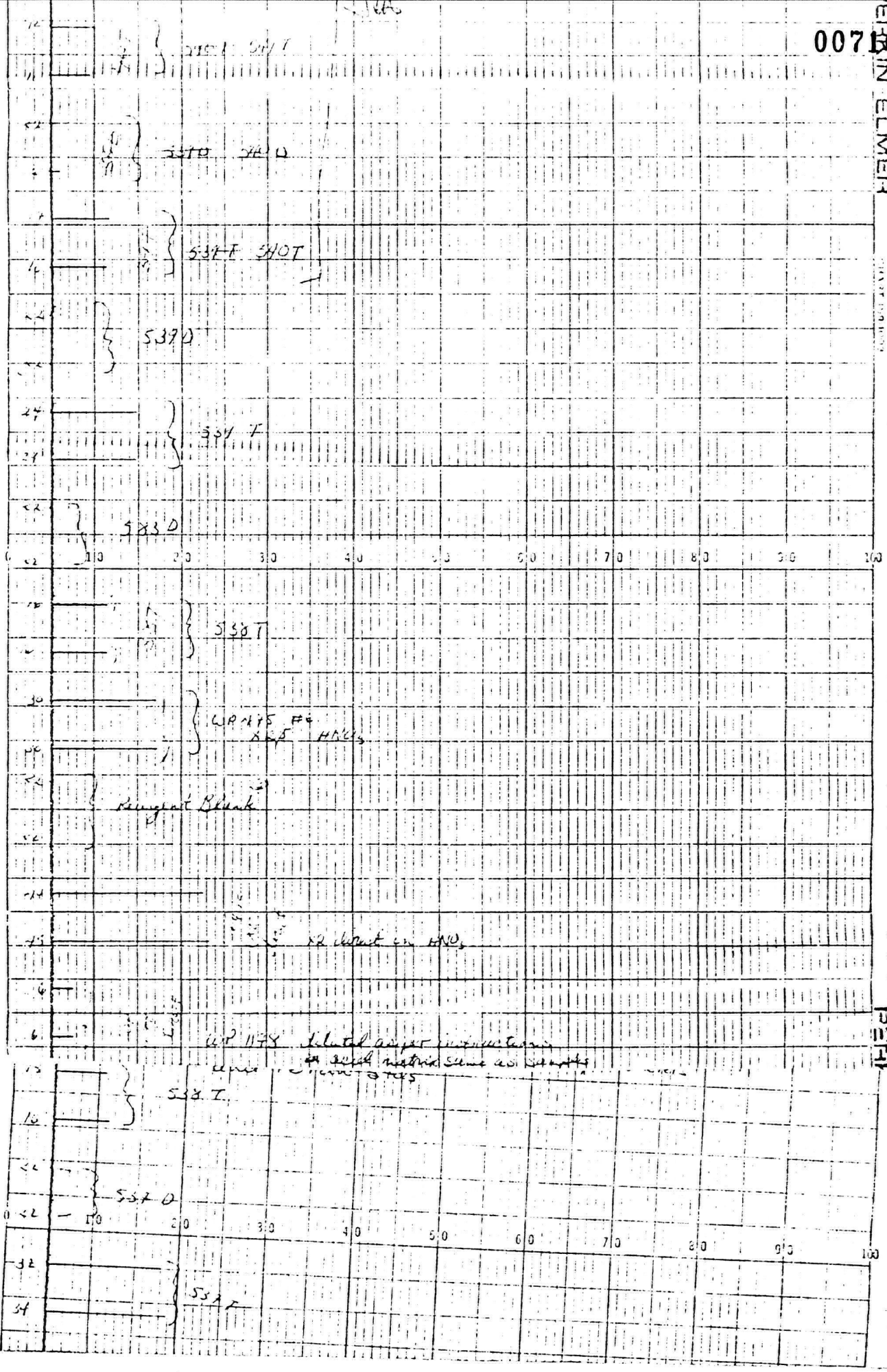
K Flame AE Flame turned 30° Gain ~ .300 ABS/50 ppm
1 sec int 2.0 ppm = .115 ABS 5.0 ppm = .304 ABS
ABS BLANK
.000, .000, .001, .000, .000, .000, .000, .000, .000, .000

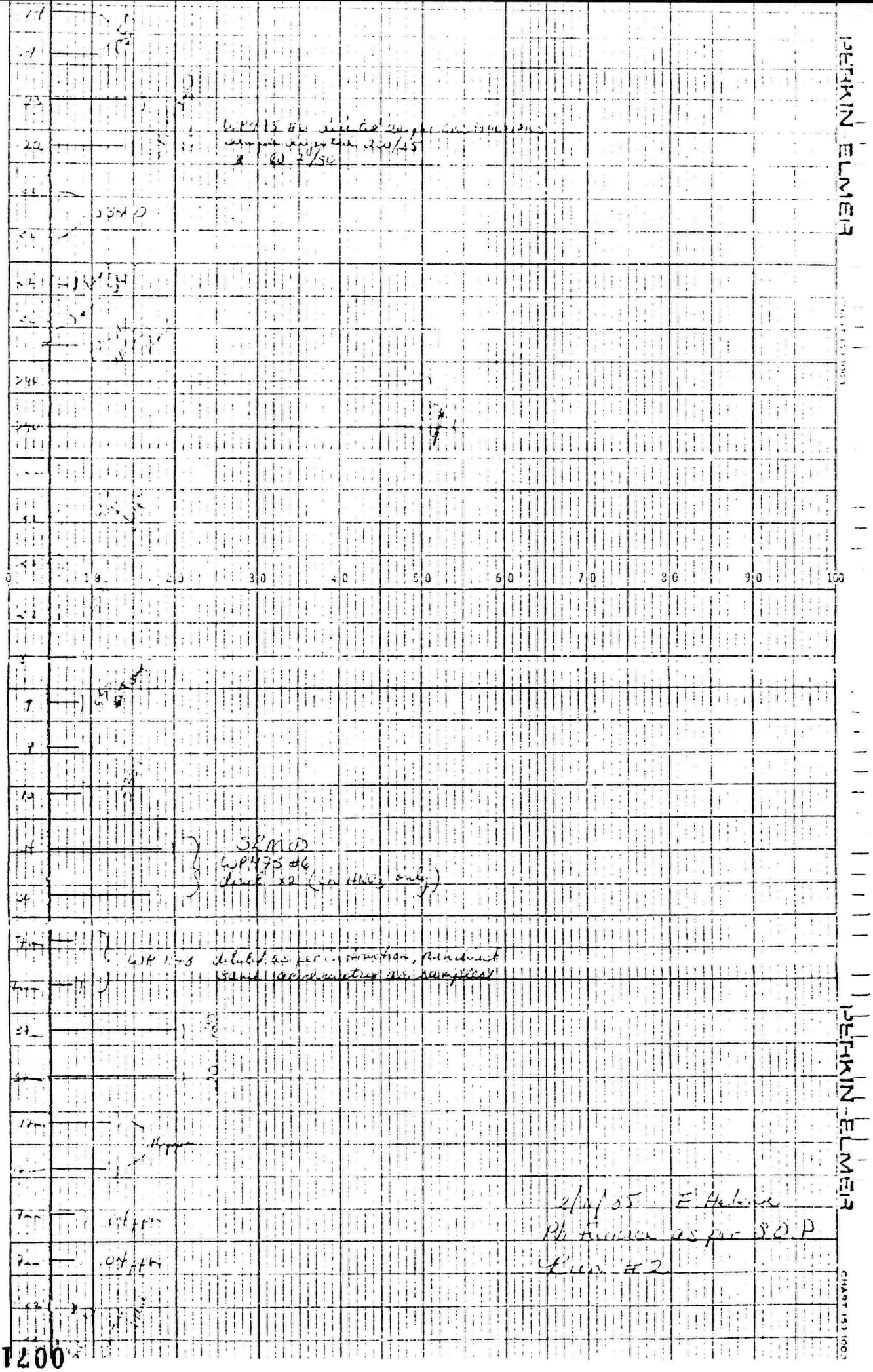
V Flame AA 5.0 ppm = .016 ABS 10.0 ppm = .032
1 sec int
ABS BLANK
.000, .000, .000, .000, .000, .000, -.001, -.001, .001, .000

0071033

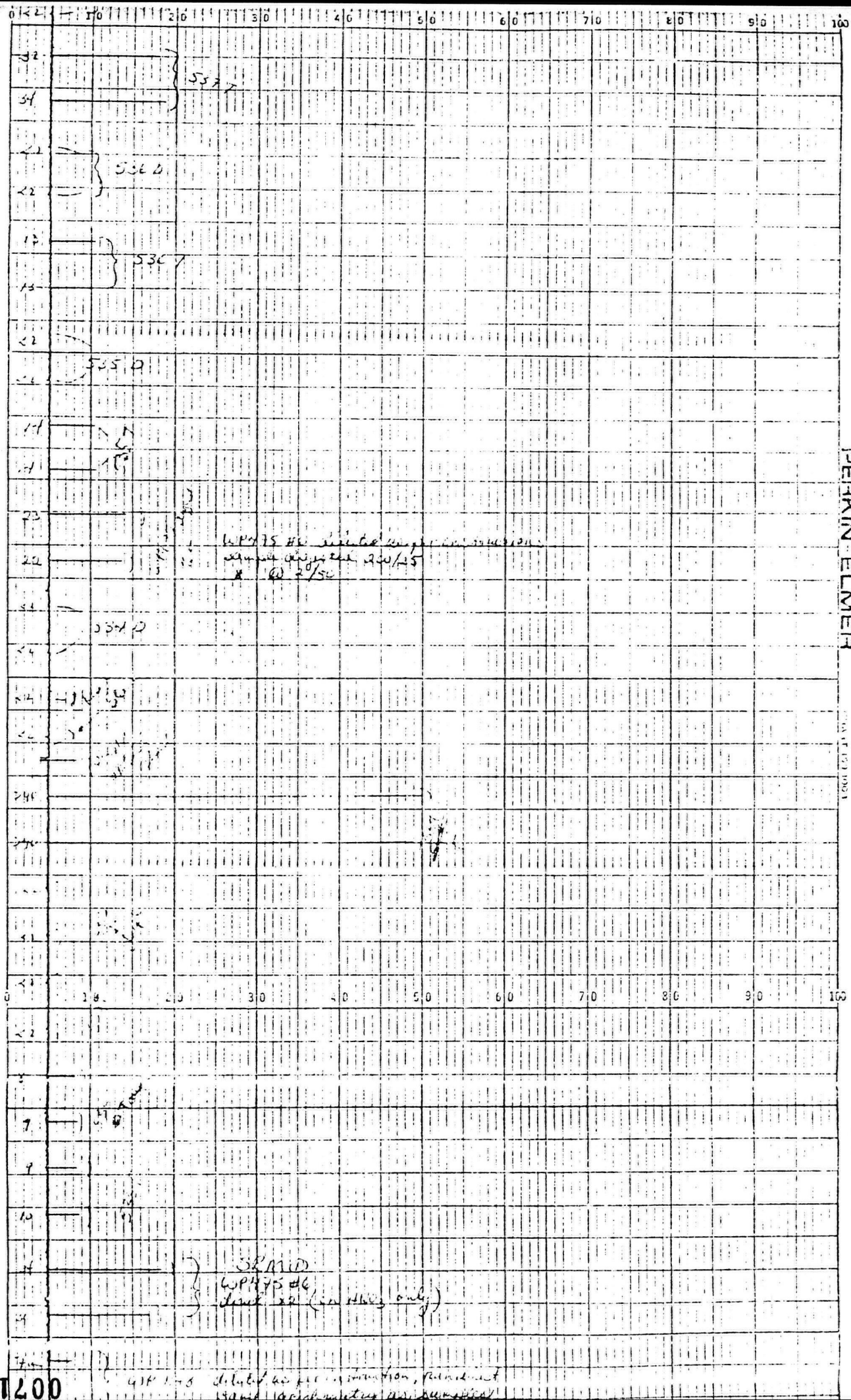

Back gnd glass (OK)
Largest blank
SHGD
SHGT
SHSD
SHST
0
10
20
30
40
50
60
70
80
90
100


SH4 Tonly
SH3 Dauly
SH1D SH2D
SH1T SH2T
SH1D
SH1T
SH1D


PERKIN ELMER
PERTH
SS8 T SHOT
SS8 D
SS8 T
SS8 D
SS8 T
WP 1175 F4
SS8 HRS
Reagent Blank
12 hrs in HNO3
WP 1178 Selected aspect instructions
SS8 T
SS8 D
SS8 T
0
10
20
30
40
50
60
70
80
90
100


PERKIN ELMER
0
10
20
30
40
50
60
70
80
90
100
SEMD
WP475 #6
Sand x2 (on HNO3 only)
2/4/85 E Helene
Pb Assay as per SOP
Lion #2
PERKIN-ELMER

0071035


PERKIN ELMER
SKMD
WP475 #6

1/10/85

Mn Flame AA 1.0ppm = .101 ABS 2.0ppm = .197 ABS
1sec int
ABS BLANK
.000, .000, -.001, .000, -.001, .001, -.001, .000, .000, .000

1/10/85 Recalculation of Instrumental Detection Limits

Example Calculation using Pb Flame AA

Deionized water blank ABS

12/27/84	1/2/85	1/8/85
-.001	.000	-.001
-.001	-.001	.000
-.001	.000	.000
.000	-.001	.000
.000	-.001	.000
-.002	-.001	.000
-.001	.000	.000
-.001	-.002	.000
.000	-.001	-.001
-.001	-.001	.000

1.0ppm = .030 ABS
.030 ABS/ppm

.50 = .014
.028 ABS/ppm

1.0 = .028
.028 ABS/ppm

.50 = .014
.028 ABS/ppm

1.0 = .028
.028 ABS/ppm

.50 = .013
.026 ABS/ppm

$\bar{X}_{n=6}$ $\frac{ABS}{ppm}$ = .028

$SD_{n=30}$ ABS = .00062 ABS $\quad \frac{.00062 ABS}{.028 \frac{ABS}{ppm}}$ = .022 ppm

$3 \times SD_{n=30}$ = 3 x .022 ppm = .067 ppm ≡ 67. ppb

67. ppb = Instrumental Detection Limit

All subsequent calculations will follow this format

1/10/85 Instrumental Detection Limits in ppb

Pb (Flame AA) = 67. ppb (P.E 703)

Pb (Furnace) = 6.8 ppb (P.E 503)
data from pages 23, 24, 25

Cd (Flame AA) = 1.3 ppb (P.E. 703)

Cu (Flame AA) = 28. ppb (P.E 703)

Ag (Flame AA) = 14. ppb (P.E 703)

Fe (Flame AA) = 23 ppb (P.E. 703)

Zn (Flame AA) = 5.8 ppb (P.E 703)

Co (Flame AA) = 63 ppb (P.E. 703)

Ba (Flame AA) = 72 ppb (P.E. 703)

V (Flame AA) = 510. ppb (P.E 703)

Sb (Flame AA) = 130 ppb (P.E 703)

Mn (Flame AA) = 19. ppb (P.E 703)

As (colorimetric) = 340. ~~ppb~~ ng (Evelyn)
data from pages 5, 9, 13

1/10/85 Instrumental Detection Limit (continued)

Hg (Flameless) = 20ng (P.E. 50A)

Ca (Flame AA) = 1.7 ppb (P.E 703)

Mg (Flame AA) = 5.1 ppb (P.E 703)

Na (Flame AA) = 71. ppb (P.E. 703)

K (Flame AA) = 23. ppb (P.E. 703)

ASARCO DEPARTMENT OF ENVIRONMENTAL SCIENCES
DUPLICATE SAMPLE ANALYSIS REPORT

ANALYST John Hayes

DATE 2/14/85

SAMPLE NO. AEH-8501-101

Parameter	Sample Value (S)	Duplicate Value (D)	RPD
Pb(D)	5. ppb	5. ppb	0.0
Cd(D)	1. ppb	1. ppb	0.0
Zn(D)	53. ppb	54. ppb	-1.9
As(D)	6. ppb	6. ppb	0.0

Comments: (D) = Dissolved metals

$$RPD = \left(\frac{(S-D)}{\frac{S+D}{2}}\right) \times 100$$

ASARCO DEPARTMENT OF ENVIRONMENTAL SCIENCES

DUPLICATE SAMPLE ANALYSIS REPORT

ANALYST John Hayes

DATE 2/14/85

SAMPLE NO. AEH-8501-101

Parameter	Sample Value (S)	Duplicate Value (D)	RPD
Pb(T)	7. ppb	6. ppb	15.
Cd(T)	1. ppb	1. ppb	0.0
Zn(T)	71. ppb	69. ppb	-2.9
As(T)	14. ppb	13. ppb	7.4

Comments: (T) = Total metals

$$RPD = \left(\frac{(S-D)}{\frac{S+D}{2}}\right) \times 100$$

ENVIRONMENTAL PROTECTION AGENCY
Environmental Services Division

CHAIN OF CUSTODY RECORD

REGION 8
1860 Lincoln Street
Denver, Colorado 80295

PROJ. NO.

PROJECT NAME: asarco E Helena

SAMPLERS: (Signature) Robert J. Miller

STAT. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	REMARKS
—	1-14-85	17:00	—	—	Hydrometrics, Helena	1	Cooler containing water samples
							LIST
							AEH-~~101~~ 8501-101; 3 Bottles
							AEH-8501-102; 3 Bottles
							AEH-8501-103; 3 Bottles
							AEH-8501-104; 3 Bottles
							AEH-8501-105; 3 Bottles
							AEH-8501-106; 3 Bottles
							AEH-8501-107; 3 Bottles
							AEH-8501-108; 3 Bottles HNO3, unfiltered portion capped cross threaded leak
							AEH-8501-112; 3 Bottles
							AEH-8501-113; 3 Bottles
							AEH-8501-114; 1 Bottle
							AEH-8501-115; 1 Bottle
							AEH-8501-135 2 Bottles
							AEH-8501-136 2 Bottles

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Robert J. Miller	1-14-85 17:00	John M. Hayes	John M. Hayes	1/17/85 9:00am	Linda Broussard
Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Linda Broussard	1-17-85 10:20	John M. Hayes			
Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time	Remarks	
				Air Bill # 017 3608 1435 Western Airlines Freight	

Split Samples: ☐ Accepted ☐ Declined Signature

Distribution: Original Accompanies Shipment; First Copy to Coordinator Field Files; Second Copy to Representative of Inspected Facility

0071043

8-0443

85-533 0071044

HYDROMETRICS HELENA, MONTANA

REQUEST FOR ANALYTICAL SERVICES

Sample sent to (laboratory): Assarco

Date sample taken: 1/14/85 Time sample taken: 1100
Number of bottles in sample: 3 List information in table below.

	Sample I. D. or Tag Number	Volume (cc)	Preservative Type	Filtered (yes or no)
1.	AGH-8501-101	1000	RAW	NO
2.	"	1000	HNO_3	YES
3.	"	1000	HNO_3	NO
4.				
5.				
6.				
7.				

ANALYSIS REQUIREMENTS

The parameters to be analyzed for are:
(1) Listed on the attached test schedule number: Partial Analysis
(2) Circled below.

PHYSICAL PARAMETERS

Specific Conductivity Total Susp. Solids (TSS) pH
Turbidity Total Diss. Solids (TDS) at 180 deg C
Other (specify):

MAJOR IONS

Calcium (Ca) Bicarbonate (HCO3) Alkalinity as CaCO3
Magnesium (Mg) Carbonate (CO3) Hardness as CaCO3
Sodium (Na) Sulfate (SO4) Acidity as CaCO3
Potassium (K) Chloride (Cl)
Other (specify):

NUTRIENTS

Total Kjeldahl Nitrogen (as N) Nitrate+Nitrite (as N)
Total Phosphorus (as P) Ammonium-NH4 (as N) Ortho-Phos. (PO4 as P)
Other (specify):

METALS & MINOR ELEMENTS (D=Dissolved,T=Total)

D,T Al D,T As D,T B D,T Cd D,T Cr D,T Cu D,T Fe
D,T Pb D,T Li D,T Mn D,T Hg D,T Mo D,T Ni D,T Se
D,T Va D,T Zn D,T F
Other (specify):

OTHER PARAMETERS

Sample collected by: RJM Person sending sample: DRS
Date sent: 1/14/85 Time sent: 1200hrs Carrier: Western Airlines
Site designation: AGH-8501-101
Site description:
Site location: T ___ R ___ S ___ Tract ___ This form completed by: DRS
Form Number RAS-9/84

TABLE 3. PARAMETERS TO BE MONITORED IN SURFACE WATER

COMPLETE ANALYSIS*

Specific Electrical Conductivity (field and lab)	Calcium (Ca)	Bicarbonate (HCO_3)
Total Dissolved Solids (TDS)	Magnesium (Mg)	Carbonate (CO_3)
Total Suspended Solids (TSS)	Sodium (Na)	Sulfate (SO_4)
Dissolved Oxygen	Potassium (K)	Chloride (Cl)
Temperature		
pH (field and lab)		
Flow and Stage		
Eh		

Arsenic (As)	Copper (Cu)	Lead (Pb)	Zinc (Zn)
Cadmium (Cd)	Iron (Fe)	Magnesium (Mn)	

PARTIAL ANALYSIS*

Specific Electrical Conductivity (field and lab)	Arsenic (As)
Total Dissolved Solids (TDS)	Lead (Pb)
Total Suspended Solids (TSS)	Zinc (Zn)
Dissolved Oxygen	Cadmium (Cd)
Temperature	
pH (field and lab)	
Flow and Stage	
Eh	

SPECIAL ANALYSIS*

Aluminum (Al)	Cobalt (Co)	Silver (Ag)
Antimony (Sb)	Manganese (Mn)	Tin (Sn)
Barium (Ba)	Mercury (Hg)	Thallium (Th)
Beryllium (Be)	Nickel (Ni)	Vanadium (V)
Chromium (Cr)	Selenium (Se)	

* All metals will be measured as both total and dissolved.

Date Rec.	Date Rcvd	Date Signed	Description	Lab #	Comments
1-[illegible]-85	1-17-85	1-14-85	AEH-8501-101 Cooler & Container Condition O.K.	85-535	1 l unp. + unf., 1 l pas. + filt. 1 l pas. + unf. Partial Analysis
[illegible]-85	1-17-85	1-14-85	AEH-8501-102 Cooler & Container Condition O.K.	85-534	1 l unp. + unf., 1 l pas. + filt., 1 l pas. + unf. Partial Analysis
[illegible]-85	1-17-85	1-11-85	AEH-8501-103 Cooler & Container Condition O.K.	85-535	1 l unp. + unf., 1 l pas. + filt. 1 l pas. + unf. Partial Analysis
[illegible]-85	1-17-85	1-11-85	AEH-8501-104 Cooler & Container Condition O.K.	85-536	1 l unp. + unf., 1 l pas. + filt., 1 l pas. + unf. Partial Analysis
[illegible]-85	1-17-85	1-11-85	AEH-8501-105 Cooler & Container Condition O.K.	85-537	1 l unp. + unf., 1 l pas. + filt. 1 l pas. + unf. Partial Analysis
[illegible]-85	1-17-85	1-11-85	AEH-8501-106 Cooler & Container Condition O.K.	85-538	1 l unp. + unf., 1 l pas. + filt., ~~[illegible]~~ 1 l pas. + unf. Partial Analysis
[illegible]-85	1-17-85	1-11-85	AEH-8501-107 Cooler & Container Condition O.K.	85-539	1 l unp + unf., 1 l pas. + filt., 1 l pas. + unf. Partial Analysis
[illegible]-85	1-17-85	1-11-85	AEH-8501-108 Cooler, ~~Container~~ Condition O.K. See note +	85-540 L.B.	1 l unp. + unf., 1 l pas + filt., 1 l ~~[illegible]~~ + unf. Partial Analysis + Cap on container L.B. 555 + minor partial leak 555 ml
[illegible]-85	1-17-85	1-11-85	AEH-8501-112 Cooler & Container Condition O.K.	85-541	1 l unp. + unf., 1 l pas + filt., 1 l pas. + unf. Partial Analyses
[illegible]-85	1-17-85	1-14-85	AEH-8501-113 Cooler & Container Condition O.K.	85-542	1 l unp. + unf., 1 l pas + filt., 1 l pas. + unf. Partial Analyses
[illegible]-85	1-17-85	1-10-85	AEH-8501-114 Cooler & Container Condition O.K.	85-543	1 l pas. + unf. Total Pb, As, Zn, Cd.

[illegible] 1-17-

12

Date Received	Date Entered	Date Sampled	Description	Lot #	Comments
1-16-85	1-17-85	1-10-85	AEH-8501-115 Cooler & Container Condition O.K.	85-544	1 L pres. + filt. Dissolved Pb, As, Zn, Cd
1-16-85	1-17-85	1-11-85	AEH-8501-135 Cooler & Container Condition O.K.	85-545	1 L pres. + unf. 1 L pres. + filt. Diss. + Total Pb, As, Zn, Cd.
1-16-85	1-17-85	1-14-85	AEH-8501-136 Cooler & Container Condition O.K.	85-546	1 L pres. + unf. 1 L pres. + filt. Diss. + Total Pb, As, Zn, Cd.

J.L. 1-17-85

2/11/85 (am)

Date	Element	Samples	Comments
2/11/85	Pb (furnace)	AEH-8501-101 thru -108, ~~-112 thru 115~~ -110 thru -115, -135, -136,	As per SOP 503, furnace
2/11/85	Zn	AEH-8501-110, -111	As per SOP, 703 flame turned 30° for SRM
2/11/85	Cd	as above	As per SOP, 703
2/11/85	Mn	as above	as above, 703 flame turned 30° for SRM
2/11/85	Cu	as above	as per SOP, 703
2/11/85	Fe	as above	as per SOP 703

2/11/85 (pm)

2/11/85	Cd	AEH-8501-101 → 108 -112 → 115, -135, 136	as per SOP 703
2/11/85	Zn	as above	as per SOP 703 ~~Flame~~ Flame turned 30° for spikes & SRM

2/12/85

Date	Element	Samples	Comments
2/12	Pb	AFH-8501-102(T)	As per SOP 703
		-104(D), -105(T)	Check spikes
		~~-103(T)~~, -102 D	

1/14/85

pH

calibration buffers pH 4.0, pH 7.0, pH 10.0

	pH
-101	7.9
-102	7.7
-103	7.8
-104	7.8
-105	7.9
-106	7.9
-107	7.8
-108	7.6
-112	7.8
-113	7.7
WP882 #1	5.8
WP882 #2	7.7

Conductivity

	Temp °C	µmhos	Cond @ 25° µmhos
-101	27	350.	336.
-102	28.5	353.	328.
-103	~~28~~ 28°	361.	340.
-104	28°	360.	338.
-105	28°	361.	340.
-106	28°	361.	340.
-107	28°	359.	338.
-108	27.5°	354.	336.
-112	27°	352	338.
-113	26.5	343.	333
WP882 #1	~~570~~ 28°	570	570.
WP882 #2	26°	119	117.
DI WATER		<10	<10

1/14/85 TSS

Samples/50ml aliquot, QC WP782 500ml & 400ml aliq

	#	Tare-gm	Wght-gm	diff-mg	TSS mg/l
-101	~~F~~	.08623	.08638	.15	1.0
-102	Z	.08149	.08444	2.95	19.7
-103	2	.08234	.08256	.22	1.5
-104	F	.08442	.08456	.14	.93 <1.0
-105	N	.08507	.08519	.12	.80 <1.0
-106	P	.08132	.08154	.22	1.5
-107	V	.08645	.08676	.31	2.1
-108	K	.08220	~~.08220~~ .08268	~~.08268~~ .48	~~.48~~ 3.2
-108 dupl	B	.08470	.08524	.54	3.6
BLK	Q	.08243	.08251	.08	~~.5~~ .53 <1.0
WP782 #1	A (500ml Aliqt)	.07934	.09529	15.95	31.9
-112	3	.08478	.08495	.17	1.1
-113	4	.08399	.08423	.25	1.7
-113 dupl	5	.08423	.08455	.22	1.5
BLNK	6	.08491	.08492	.01	<1.0
WP782 #~~2~~ 1	J (400ml Aliqt)	.07902	.08990	10.88	27.2

1/15/85 TDS @ 180°C

50 ml Aliquot

	Disk#	Tare-gm	Wght-gm	diff-mg	TDS mg/l
-101	5	35.43398	35.44417	10.19	203.8
-102	H	21.89672	21.90688	10.16	203.2
-103	G	21.92818	21.93841	10.23	204.6
-104	8	35.23590	35.24650	10.60	212.0
-105	2	35.14852	35.15931	10.79	215.8
-106	10	34.51821	34.52843	10.22	204.4
-107	9	34.81798	34.82829	10.31	206.2
-108	1	34.84120	34.85129	10.09	201.8
-108dupl	6	35.36064	35.37123	10.59	211.8
~~-113~~					
~~-113~~					
-113dupl					
WP882 #1	F	18.25509	18.27113	16.04	320.8
~~WP882 #2~~					
BLANK	I	29.00907	29.00910	.03	.60 <1.0

1/15/85 TDS - 50 ml Aliquot

	Dish#	Tare gm	Wght gm	diff mg	TDS mg/l
BLNK	1	34.34018	34.34022	.04	<1.0
-112	10	34.51881	34.52910	10.29	205.8
-113	8	35.23651	35.24614	9.63	192.6
-113dup	3	34.75251	34.7~~26~~62 66	10.15	203.0
WP882 #2	I	29.00907	29.01180	2.73	54.6

2/11/85 Cd as per SOP

STD'S .50 = .064

1.00 = .118

2.00 = .204

200/25	Cd µg/ml	Cd ppb
RB① (Az)	<.01	<1.
WP475 #6 SRM (Az)	.52	65.
Q.C.① #4 5/25 (Az)	2.00	
533 T (Az)	<.01	<1.
33 T dupl (Az)	<.01	<1.
533 D (Az)	<.01	<1.
33 D dup (Az)	<.01	<1.
534 T (Az)	.12	15

.10 STD = .10 obs

	Cd µg/ml	Cd ppb
~~534 D Az~~ 534 T spiked (Az) (5ml QC #4 / 25)	2.13 (−2.00) = .13	16.
	5.00 STD = 4.97 obs	
~~535 T~~	1.00 STD = 1.01 obs	
534 D (Az)	.04	5.
~~535 D~~		
534 D spike (Az) (5ml QC #4 / 25)	2.05 (−2.00) = .05	6.
~~536 T~~	2.00 STD = 2.00 obs	
~~536 D~~ 535 T (Az)	<.01	<1
~~537 T~~ 535 D (Az)	<.01	<1
~~537 D~~ 536 T (Az)	.01	1.
~~538 T~~ 536 D (Az)	<.01	<1
	.10 STD = .10 obs	
~~538 D~~		

2/11/85 Cd as per SOP continued
200/25

	Cd µg/ml	Cd ppb
537 T (A7)	.02	3.
537 D (A7)	.01	1.
538 T (A7)	.02	3.
538 D (A7)	.01	1.
539 T (A7)	.02	3.
539 D (A7)	.01	1
.10 STD = .10 abs	.50 STD = .51 abs	
540 T A7	.01	1
540 D A7	<.01	<1
541 T A7	.01	1.
541 D A7	<.01	<1.
542 T A7	<.01	<1.
~~542~~ 342D A7	<.01	<1.
543 D only A7	.01	1.
544 T only A7	.01	~~1~~. 1.
.10 STD = .10 abs		

2/11/85 Cd as per SOP
200/25

	Cd µg/ml	Cd ppb
545 T AZ	<.01	<1.
545 D AZ	<.01	<1.
546 T AZ	<.01	<1.
.10 STD = .10 obs, .50 STD = .50 obs, 1.00 STD = 1.00 obs		
546 D AZ	<.01	<1.
R.B (2) AZ	<.01	<1.
WP475 #6 SRM (2) AZ	.51	64.
5/25 Q.C. #4 (2) AZ	1.98	

STD .10 = .10 obs
.50 = .50 obs = .063 ABS
1.00 = 1.01 obs = .119 ABS
2.00 = 2.02 obs = .206 ABS

2/11/85 Zn as per SOP

.50 ppm = .115 ABS
1.00 " = .222 "
2.00 " = .405 "

200/25	~~Cd~~ Zn µg/ml	Zn ppb
RB[@] Az	<.06	<8.
5/25 QC[@] #4 Az	2.00	~~pg 116~~
WP475 #6 SRM[@] Az	>2.0	pg 116
533 T Az	.57	71.
533 Tdupl Az	.55	69.
533 D Az	.42	53.
533 Ddupl Az	.43	54.
.50 STD = .50 abs		
534 T Az	1.71	214. ≅ 210
534 Tspike Az (5ml Q.C. #4 / 25)	>2.00	pg 116
534 D Az	.48	60.
534 Dspike Az (5ml Q.C. #4 / 25)	>2.00	pg 116
535 T Az	.56	70.
535 D Az	.39	49.
536 T Az	.60	75.
.50 STD = .50 abs		

2/11/85 Zn cont.	Zn µg/ml	Zn ppb
200/25 536D AZ	.48	60.
537T AZ	.71	89
537D AZ	.49	61.
538T AZ	.64	80.
538D AZ	.50	63
2.00 STD = 2.00 obs	1.00 STD = 1.01 obs	.10 STD = .10 obs
539T AZ	.97	~~121~~ 120
539D AZ	.56	70.
540T AZ	.64	80.
540D AZ	.53	66.
541T AZ	.61	76.
541D AZ	.51	64.
	.50 STD = .50 obs	
542T AZ	.57	71.
542D AZ	.44	55.
543 Donly AZ	.06	8.
	.10 STD = .10 obs	
544 Tonly AZ	<.06 (~.04)	<8.

2/11/85 Zn continued

		Zn µg/ml	Zn ppb
200/25	545 T (AZ)	<.06 (~.04)	<8.
	~~545D~~ 545D (AZ)	<.06 (~.03)	<8.
	546 T (AZ)	<.06 (~.02)	<8.
	546 D (AZ)	<.06 (~.04)	<8.
	RB ② (AZ)	<.06 (<.02)	<8.
5/25	Q.C. ② #4 (AZ)	1.99	
		2.00 STD = 2.00 obs	
WP475 #6	SRM ② (AZ)	>2.0	

STD .50 = .50 = .116 AB
STD 1.00 = 1.01 = .226
STD 2.00 = 2.00 = .406
flame turned 30°
STD 2.0 = .042 ABS
STD 5.0 = .102 ABS
STD 10.0 = .192 ABS

	Zn µg/ml	Zn ppb
534 T spike AZ	3.6 (-2.0) = 1.6	200.
534 D spike AZ	2.5 (-2.0) = .5	63.
SRM ① AZ	3.1	388
SRM ② AZ	3.0	375.

2.0 STD = 2.0 obs = .042 ABS
5.0 STD = 5.0 obs = .227 "
10.0 STD = 10.2 obs = .412 "

2/11/85 (pm) Pb furnace as per SOP Run #2

		peak height/mm deflection		mg/ml Pb	conc'n Pb ppb
	Acid Blank	<2	<2	—	
	.04 ppm	7	7	—	
	.10 "	17	17		
	.20 "	37	37	—	
~~2/11/85~~	WP1178 ~~2→50 (x25)~~ direct	7	7	.040	40.
direct	WP475 #6 5→10 (x2) (HNO3)	34	30	.178 x2 = .356	356.
2/11/85	533T	10	9	~~.0413~~ .053	~~.007~~ 7.
	533Ø T dupl	9	8	.048	6.
	533 D	<2	<2	<.040	~~<.005~~ <5.
	533 D dupl	<2	<2	<.040	~~<.005~~ <5.
	534 T	>40	>40 (Flame AA)		
	RB ①	<2	<2	<.040	~~<.005~~ <5.
	534 D	<2	<2	<.040	~~<.005~~ <5.
	SRM ① WP475 @ 2→50 (x25)	22	23	.126 x25 = 3.15	394.
	535T	14	14	.078	10.
	535 D	<2	<2	<.040	<5.
	536T	13	13	.073	9.
	536 D	<2	<2	<.040	<5.
	537 T	34	32	.185	23.
	537D	<2	<2	<.040	<5
✓	538T	16	15	~~<.040~~ .087	~~<5~~ 11.
direct	WP1178	6	6	.036 (<.040)	36.
direct	WP475 ~~(x2)~~ 5→10 (x2) (HNO3)	44	45 (>37)		
~~2/11/85~~	Reagent Blank ②	<2	<2	<.040	<5.
~~2/11/85~~ *	~~SRM~~ direct (x2) (HNO3) WP475 #6 ~~2→50 (x25)~~	30	30	.168 x25 = 4.20	~~525~~
	538T	16	16	.089	11.
✓	538D	<2	<2	<.04	<5.

2/11/85 Pb Furnace as per S.O.P. Run #2
Continued

	Sample	mm/Calibration		µg/ml Pb	Conc. Pb ppb
200/25	539T	24	24	.134	17.
	539D	<2	<2	<.040	<5.
	540T	16	17	.092	12.
	540D	2	<2	<.040	<5.
	541T	12	12	.067	8.
	541D	<2	<2	<.040	<5.
	542T	9	8	.048	6.
	542D	<2	<2	<.040	<5.
	543 D only	<2	<2	<.040	<5.
	544T only	<2	<2	<.040	<5.
	545T	<2	<2	<.040	<5.
	545D	<2	<2	<.040	<5.
	546T	<2	<2	<.040	<5.
	546D	<2	<2	<.040	<5.
	Reagent Blank (2)	<2	<2	<.040	<5.
	~~STD's~~ WP475 (X25) Sem (2)	27	23	.140 X25=	438.
	.04	7			
	.10	17			
	.20	37			

2/12/85 Pb Flame as per SOP

2.0 ppm = .055 ABS
5.0 " = .135
10.0 " = .255

200/25	Pb µg/ml	Conc Pb ppb
R.B. ② (AZ)	<.1	~~<DT~~ <10. (<5. furnace)
5/25 Q.C. #4 ② (AZ)	2.0	
SRM WP475#6 (AZ)	~~3.9~~ 2.9	363. ppb
2.0 STD = 2.0 obs		
534 T (AZ)	.9	113.
(5 ml Q.C. #4 / 25 ml) 534 T spike (AZ)	2.9 (-2.0) = .9	less spike 113.
534 D (AZ)	<.1	<10. (<5. Furnace)
5 ml QC #4 / 25 ml 534 D spike (AZ)	2.0 (-2.0) <.1	<10. (<5. furnace)

STD 2.0 = 2.0 obs = .055 ABS
5.0 = 5.0 obs = .136 "
10.0 = 10.1 obs = .260 "

0071063

46 1510
K+E 10 X 10 TO THE CENTIMETER
KEUFFEL & ESSER CO. MADE IN U.S.A.

12/25/54

Sb Flame AA 10.0 ppm = .088 ABS 50 ppm = .043 ABS
~~1sec~~ 1sec int
ABS BLANK
.000, .000, -.001, .000, .000, .000, .000, .000, .000, -.001

Mn Flame AA 1.0 ppm = .103 ABS 2.0 ppm = .194
1sec int
ABS BLANK
.000, -.001, -.001, .000, .000, .000, .001, .000, .000, ~~-.000~~ -.001

1/2/85
~~11/7/84~~ JGA

Pb Flame AA 1.0ppm = .028 ABS .50ppm = .014 ABS
1 sec int
ABS BLANK
.000, -.001, 000, -.001, -.001, -.001, .000, -.002, -.001 -.001

Cu Flame AA ~~1.00~~ 2.00 JGA ppm = .119 ABS ~~1.00~~ 1.0 ppm = .060 ABS
1sec int
ABS BLANK
.000, .000, .000, .000, .000, .000, .000, -.001, .001, 001

Cd Flame AA 1.00ppm = .145 ABS .50ppm = ~~.15~~ .075 ABS
1sec int
ABS BLANK
-.001, .000, .001, .000, .000, .000, -.001, -.001, .000, .000

Zn Flame AA 1.0 ppm = .281 ABS .10 = .030
1sec int
ABS BLANK
-.001, -.001, -.001, .000, .000, -.001, .000, .000, .000, .000

Fe Flame AA 1.0 = .053 2.0 = .106
1 Sec int
ABS BLANK
.000, .000, .000, .000, -.001, .000 .000, -.001, .000, .000

1/2/85

Ag Flame AA 2.0 = .228 ABS .20 ppm = .023
1 sec int
ABS BLANK
.000, -.001, .001, .000, .000, .000, .000, -.001, .000, -.001

Co Flame AA 1.0 = .018 ABS 5.0 = .084
1 sec int
ABS BLANK
.000, .000, .000, -.001, .000, .000, .000, .000, .000, .000

Ba Flame AA 2.0 ppm = .040 5.0 ppm = .099 ABS
1 sec int
ABS BLANK
.000, -.001, .000, .000, .000, .000, -.001, .000, .001, .000

V Flame AA 5.0 ppm = .016 ABS 10.0 ppm = .032 ABS
1 sec int
ABS BLANK
.001, .001, .001, .000, .000, .000, .000, .000, .000, .000

1/4/85

Ca Flame AA .50 = .074 ABS 2.0ppm = ~~.290~~ .287 ABS
1 sec int
ABS BLANK
.000, .000, .000, .000, .000, .000, -000, .000, .000, .000

Mg Flame AA 2.0 = .291 ABS .50 = .075 ABS
1 sec int
ABS BLANK
.000, .000, .000, .000, .000, .000, .004, .000, .000, .000

Na Flame AE Gain ~ .300 ABS/5.0ppm Flame turned 30°
1 sec int 5.0ppm = .315 ABS 2.0ppm = .152 ABS
ABS BLANK
-.002, .000, .003, .003, -.001, -.001, .000, .001, -.003, -.001

K Flame AE Gain ~ .300 ABS/5.0ppm Flame turned 30°
1 sec int 5.0ppm = .302 ABS 2.0ppm = .112 ABS
ABS BLANK
.000, .000, .000, -.001, .000, .000, .000, .000, .000, -.001

1/4/85

Sb Flame AA 5.0ppm = .041 10.0 = .084
1 sec int
ABS BLANK
.000, .000, .000, .000, -.001, .000, .000, .000, .000, .000

Mn Flame AA 1.0 = .099 ABS 2.0ppm = .197 ABS
1 sec int
ABS BLANK
.000, .000, -.001, -.001, -.001, .000, -.001, .000, .001, .000

1/8/85

Ag Flame AA .20ppm = .023ABS 2.0ppm = .225
1 Sec int
ABS BLANK
.000, .000, .000, -.001, .000, .000, .000, .000, .000, -.001

Cd Flame AA 1.00ppm = .146 ABS .50 = .076
1 Sec int
ABS BLANK
.000, .001, .000, .000, -.001, .000, .000, .000, -.001, -.001

Pb Flame AA 1.0ppm = .028ABS .50ppm = .013ABS
1 sec int
ABS BLANK
-.001, .000, .000, .000, .000, .000, .000, .000, -.001, .000

Zn Flame AA 1.0 = .276 .10ppm = .030
1 sec int
ABS BLANK
.000, .000, -.001, -.001, .000, .000, -.001, -.001, .000, .000

~~Ag Flame~~

Cu Flame AA 2.00ppm = .120ABS 1.00ppm = .061ABS
1 sec int
ABS BLANK
.001, .001, .000, .000, .000, .000, .000, .000, .001, .000

1/8/85

Fe Flame AA 1.0ppm = .052 2.0ppm = .104 ABS
1sec int
ABS BLANK
-.001, .000, .000, .000, .000, .000, .000, .000, -.001, .000

Co Flame AA 5.0ppm = .083 ABS 1.0ppm = .019 ABS
1sec int
ABS BLANK
.000, .000, .000, .000, .000, -.001, .000, -.001, .000, .000

Ba Flame AA 2.0ppm = .042 ABS 5.0ppm = .100 ABS
1sec int
ABS BLANK
.000, .000, .000, .000, .000, -.001, .000, .000, .000, .000

V Flame AA 5.0ppm = .017 ABS 10.0ppm = .052 ABS
1sec int
ABS BLANK
.000, .001, .000, .000, .000, .001, -.001, .000, .000, .000

1/10/85

1/10/85

Ca Flame AA 2.0ppm = .286ABS .50ppm = .074 ABS
1sec int
ABS BLANK
.000, .000, .000, .000, .000, .000, .001, .000, .000, .000

Mg Flame AA 2.0ppm = .293 ABS .50ppm = .075 ABS
1sec int
ABS BLANK
.000, .000, .000, .000, .000, -.001, .000, .000, .000, .000

Na Flame AE Gain ~ .300ABS/50ppm Burner turned 30°
1sec int 5.0ppm = .321ABS 2.0ppm = .151ABS
ABS BLANK
.002, .001, .000, .000, -.003, .001, .002, -.001, -.001, -.001

K Flame AE Gain ~ .300ABS/50ppm Burner turned 30°
1sec int 5.0ppm = .307ABS 2.0 = .116ABS
ABS BLANK
-.001, .000, .000, .000, .000, .000, .000, -.001, .000, .000

Sb Flame AA 5.0ppm = .041 ABS 10.0ppm = .091
1sec int
ABS BLANK
.000, .001, .000, .000, .000, .000, .000, .000, .000, -.001