

February 5, 2004

Mr. Joel Ratner
Rentar Environmental Solutions, Inc.
11586 Pierson Road
West Palm Beach, FL 33414

Re: Effect of the Rentar device operation on the sulfate portion of exhaust particulate matter.

Dear Mr. Ratner,

This letter report and enclosure is our report on the referenced subject.

If you have questions please don't hesitate to call me.

Test Engine:

These samples were captured from a Cummins N-14 diesel engine used to power a 1994 Peterbilt Model 377 freightliner tractor with 1,062,760 odometer miles.

Sulfate Analysis Results:

Table 1 shows the results of sulfate analysis. It includes three testing cycles both baseline and after 100 hours with device. The results show that all three testing cycles have sulfate reduction after 100 hours with device operation. EPA Method 300 was used for the sulfate analysis and the analysis was performed by an outside independent laboratory (Truesdail Laboratories Inc., Tustin CA).



Table 1 Sulfate Analysis Results

Filter Number	Filter Description	Mass of SO ₄ µg	Total Particle Mass of Filter, grams	Percent Sulfate of Filter
1	UDDS Baseline	30.80	0.0730	0.042
2	NYCB Baseline	26.95	0.0602	0.045
3	Steady State Baseline	25.90	0.0731	0.035
4	UDDS Final	23.80	0.0730	0.033
5	NYCB Final	23.45	0.0717	0.033
6	Steady State Final	23.45	0.0709	0.033
7	Filter Blank	<12.50	N/A	N/A
Sulfate reduction at UDDS cycle after 100 hours with device operation: 22.7%				
Sulfate reduction at NYCB cycle after 100 hours with device operation: 13.0%				
Sulfate reduction at Steady State cycle after 100 hours with device operation: 9.5%				

Sincerely,


Donel R. Olson

Enclosure: Report

TRUESDAIL LABORATORIES, INC.

INDEPENDENT TESTING, FORENSIC SCIENCE, AND ENVIRONMENTAL ANALYSES



Established 1931

REPORT

14201 FRANKLIN AVENUE
TUSTIN, CALIFORNIA 92780-7008
(714) 730-6239 · FAX (714) 730-6462
www.truesdail.com

Emission Testing Services
1370 S. Acacia
Fullerton, Ca 92831
Attn: Don Olsen

Report: January 7, 2004

Received: December 19, 2003

Lab Number: 101501

Analysis: Sulfate by EPA Method 300

Seven filters were analyzed for sulfate content by Ion Chromatography according to EPA Method 300.

The results are as follows:

ETS

Lab Number 101501

At Field

Table i - Sulfate by EPA Method 300

Filter Number	Filter Description	Mass of SO ₄ , µg	Total Particulate Mass of Filter, ^c grams	Percent Sulfate of Filter
1	UDDS Baseline	30.80	0.0730	0.042
2	NYCOC Baseline	26.95	0.0602	0.045
3	Steady State Baseline	25.90	0.0731	0.035
4	UDDS Final	23.80	0.0730	0.033
5	NYCOC Final	23.45	0.0717	0.033
6	Steady State Final	23.45	0.0709	0.033
7	Filter Blank	<12.50	N/A	N/A

*Weight provided by client.

TRUESDAIL LABORATORIES, INC.

Mary Blasius
Air Testing
Environmental Services

Arkadiusz Piekartz
Air Testing
Environmental Services



ETS

Lab Number 101501

Table 1 - Sulfate by EPA Method 300

Filter Number	Filter Description	Mass of SO ₄ , μ g	Total Particulate Mass of Filter,* grams	Percent Sulfate of Filter
1	UDDS Baseline	30.80	0.0730	0.042
2	NYCBC Baseline	26.95	0.0602	0.045
3	Steady State Baseline	25.90	0.0731	0.035
4	UDDS Final	23.80	0.0730	0.033
5	NYCBC Final	23.45	0.0717	0.033
6	Steady State Final	23.45	0.0709	0.033
7	Filter Blank	<12.50	N/A	N/A

*Weight provided by client.

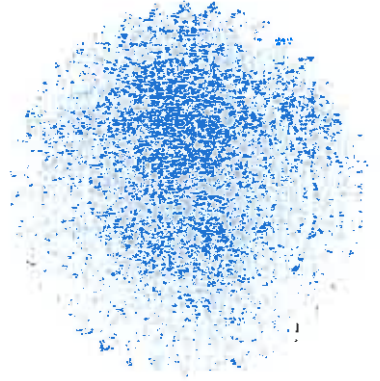
TRUESDAIL LABORATORIES, INC.

Mary E. Blasius

Mary Blasius
Air Testing
Environmental Services

Arkadiusz Piekarz

Arkadiusz Piekarz
Air Testing
Environmental Services





DAI LABORATORIES, INC.
 14 RANKLIN AVENUE · TUSTIN, CA 92780-7008
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 www.truesdail.com

CHAIN OF CUSTODY RECORD *SC 307* *Method 8100*
 TURNAROUND TIME _____ PAGE 1 OF 1
 DATE 1/19/03

COMPANY Emission Testing Services (Ecological)
 PROJECT NAME Sulfate Analysis
 PHONE (714) 774-3569 FAX _____
 ADDRESS 1370 South Assecia Avenue
Folletton, CA 92831
 P.O. NUMBER _____
 SAMPLERS (SIGNATURE) Contact: Alfred Ng.

SAMPLE I.D.	DATE	TIME	DESCRIPTION	METHODS										NUMBER OF CONTAINERS	COMMENTS		
				1	2	3	4	5	6	7	8	9	10			11	12
UDDS	—	—	Baseline	X												1	
NYC BC	—	—	Baseline	X												1	
Steady State	—	—	Baseline	X												1	
UDDS	—	—	Final	X												1	
NYC BC	—	—	Final	X												1	
Steady state	—	—	Final	X												1	
Blank 0.0699g																	

CHAIN OF CUSTODY SIGNATURE RECORD

Signature (Relinquished)	Printed Name	Company/ Agency	Date/ Time
Signature (Received)	<i>Arkadiusz Piekatz</i>	Company/ Agency	Date/ Time 12/19/03
Signature (Relinquished)		Company/ Agency	Date/ Time 11:30
Signature (Received)		Company/ Agency	Date/ Time
Signature (Relinquished)		Company/ Agency	Date/ Time
Signature (Received)		Company/ Agency	Date/ Time
Signature (Relinquished)		Company/ Agency	Date/ Time
Signature (Received)		Company/ Agency	Date/ Time
Signature (Relinquished)		Company/ Agency	Date/ Time
Signature (Received)		Company/ Agency	Date/ Time

TOTAL NUMBER OF CONTAINERS _____
 SAMPLE CONDITIONS
 RECEIVED COOL WARM °F
 CUSTODY SEALED YES NO
 SPECIAL REQUIREMENTS:

Truesdail Laboratories, Inc.
Sample Analysis Report EPA Method 300.0

Sample Name : 101501-1

Data File Name : C:\PEAKNET\DATA\122403_025.DXD

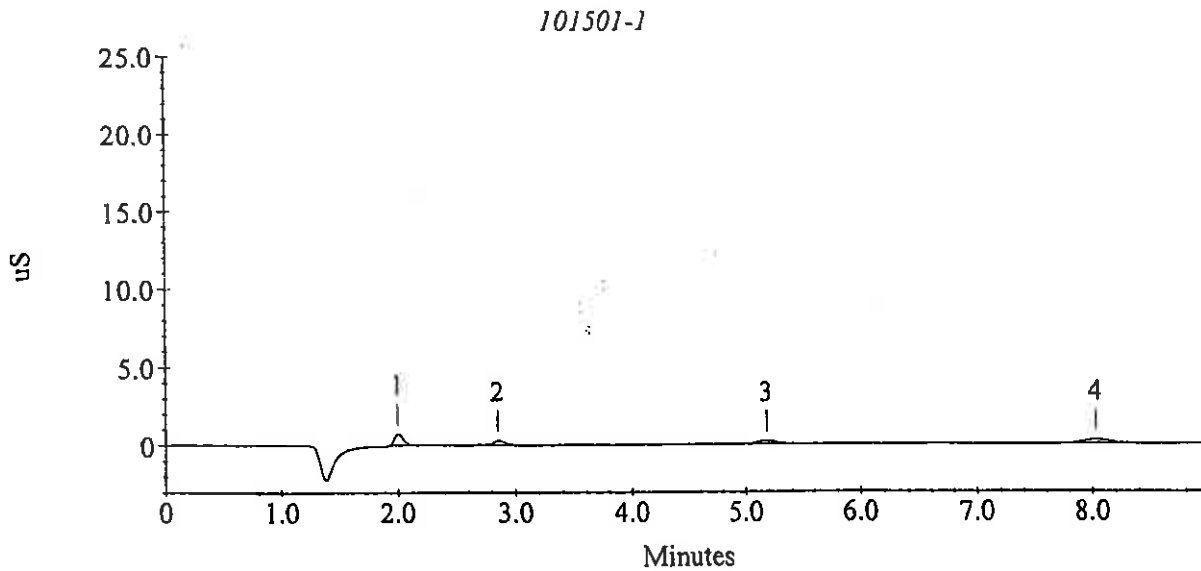
Method File Name : C:\PEAKNET\METHOD\As143.MET

Date Time Analyzed : 12/24/03 12:24:33 PM

System Operator: A. CHINN :

Peak Information : All Peaks

Peak #	Component Name	Retention Time (Minutes)	Peak Area	Final Result (PPM)
1	FLUORIDE	2.00	3853	0.21
2	CHLORIDE	2.85	1884	0.23
3	NITRATE-N	5.18	2315	0.22
4	SULFATE	8.03	4136	0.88



$$SO_4 = 0.88 \text{ ppm} \times 35 \text{ ml} = \text{[REDACTED]}$$



DAJ

Truesdail Laboratories, Inc.
Sample Analysis Report EPA Method 300.0

Sample Name : 101501-2

Data File Name : C:\PEAKNET\DATA\122403_026.DXD

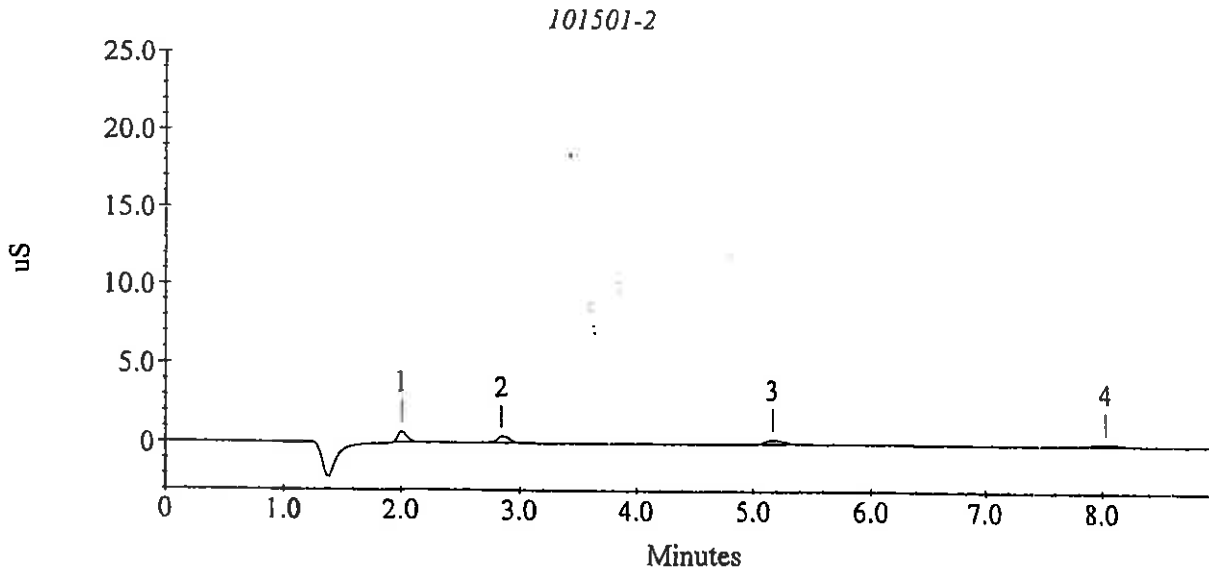
Method File Name : C:\PEAKNET\METHOD\As143.MET

Date Time Analyzed : 12/24/03 12:36:17 PM

System Operator: A. CHINN :

Peak Information : All Peaks

Peak #	Component Name	Retention Time (Minutes)	Peak Area	Final Result (PPM)
1	FLUORIDE	2.00	3516	0.20
2	CHLORIDE	2.85	2811	0.28
3	NITRATE-N	5.17	3266	0.24
4	SULFATE	8.03	2499	0.77



$$SO_4 = 0.77 \text{ ppm} \times 35 \text{ ml} = \text{[REDACTED]}$$



Truesdail Laboratories, Inc.
Sample Analysis Report EPA Method 300.0

Sample Name : 101501-3

Data File Name : C:\PEAKNET\DATA\122403_027.DXD

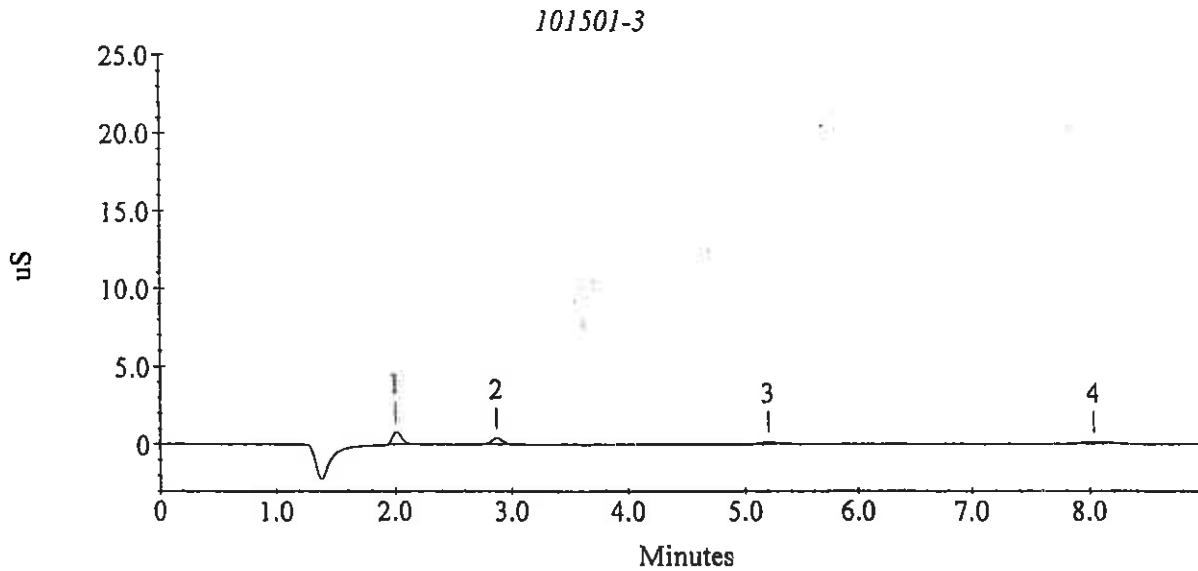
Method File Name : C:\PEAKNET\METHOD\As143.MET

Date Time Analyzed : 12/24/03 12:47:49 PM

System Operator: A. CHINN :

Peak Information : All Peaks

Peak #	Component Name	Retention Time (Minutes)	Peak Area	Final Result (PPM)
1	FLUORIDE	2.00	4079	0.22
2	CHLORIDE	2.87	2599	0.26
3	NITRATE-N	5.20	1436	0.20
4	SULFATE	8.03	2049	0.74



$$SO_4 = 0.74 \text{ ppm} \times 35 \text{ ml} = \text{[redacted]}$$



Truesdail Laboratories, Inc.
Sample Analysis Report EPA Method 300.0

Sample Name : 101501-4

Data File Name : C:\PEAKNET\DATA\122403_028.DXD

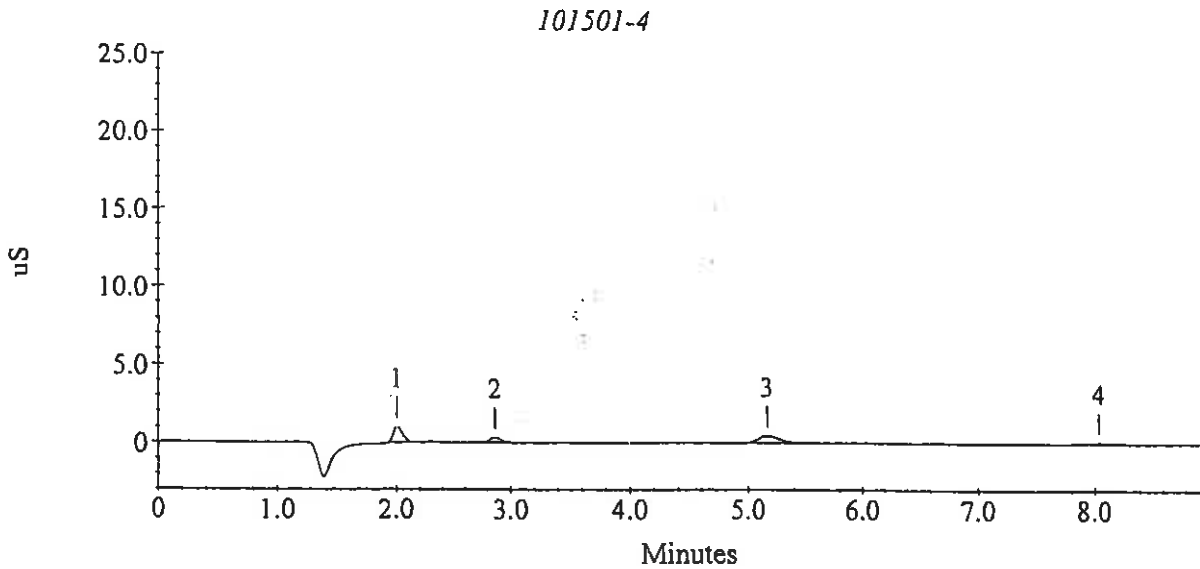
Method File Name : C:\PEAKNET\METHOD\As143.MET

Date Time Analyzed : 12/24/03 12:59:33 PM

System Operator: A. CHINN :

Peak Information : All Peaks

Peak #	Component Name	Retention Time (Minutes)	Peak Area	Final Result (PPM)
1	FLUORIDE	2.00	5431	0.26
2	CHLORIDE	2.87	2123	0.24
3	NITRATE-N	5.17	5911	0.29
4	SULFATE	8.03	1279	0.68



$$SO_4 = 0.68 \text{ ppm} \times 35 \text{ ml} = \text{[redacted]}$$



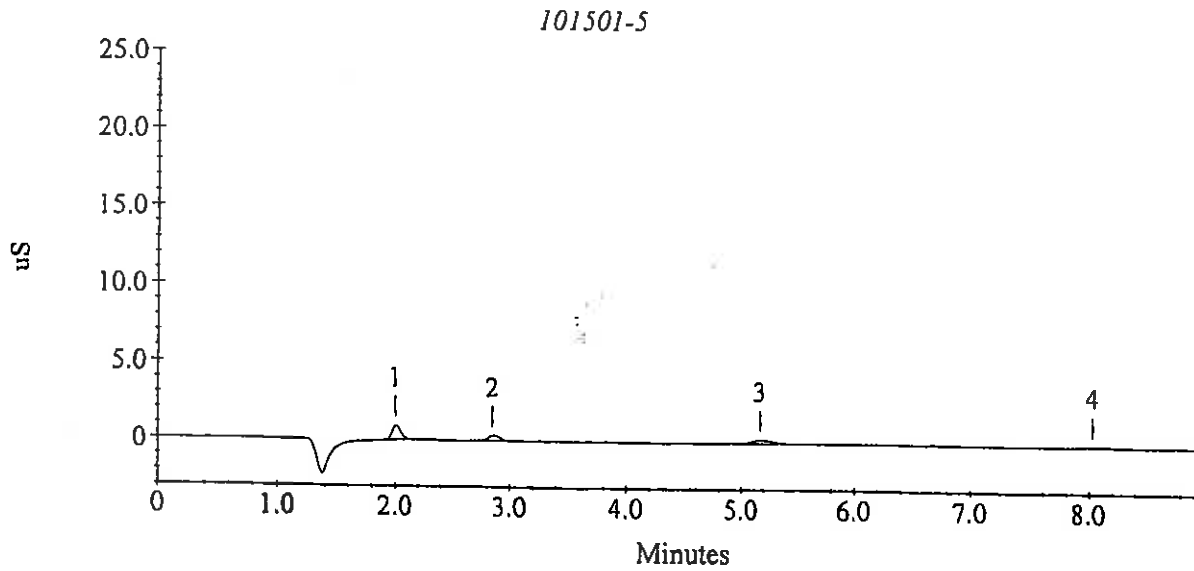
Truesdail Laboratories, Inc.
Sample Analysis Report EPA Method 300.0

Sample Name : 101501-5
 Data File Name : C:\PEAKNET\DATA\122403_029.DXD

Method File Name : C:\PEAKNET\METHOD\As143.MET
 Date Time Analyzed : 12/24/03 1:11:18 PM
 System Operator: A. CHINN :

Peak Information : All Peaks

Peak #	Component Name	Retention Time (Minutes)	Peak Area	Final Result (PPM)
1	FLUORIDE	2.00	4834	0.24
2	CHLORIDE	2.85	2522	0.26
3	NITRATE-N	5.17	3116	0.23
4	SULFATE	8.03	1150	0.67



$$SO_4 = 0.67 \text{ ppm} \times 35 \text{ ml} = \text{[REDACTED]}$$

5033

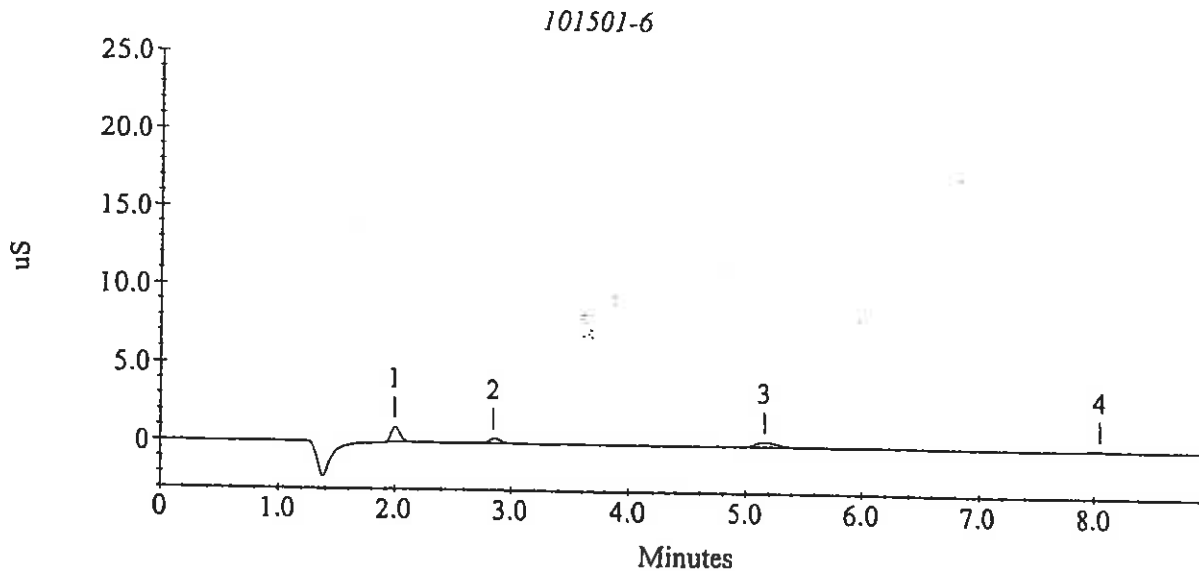
Truesdail Laboratories, Inc.
Sample Analysis Report EPA Method 300.0

Sample Name : 101501-6
 Data File Name : C:\PEAKNET\DATA\122403_030.DXD

Method File Name : C:\PEAKNET\METHOD\As143.MET
 Date Time Analyzed : 12/24/03 1:23:02 PM
 System Operator: A. CHINN :

Peak Information : All Peaks

Peak #	Component Name	Retention Time (Minutes)	Peak Area	Final Result (PPM)
1	FLUORIDE	2.00	5079	0.25
2	CHLORIDE	2.85	2210	0.24
3	NITRATE-N	5.17	4077	0.25
4	SULFATE	8.05	1072	0.67



$SO_4 = 0.67 \text{ ppm} \times 35 \text{ ml} = \text{[redacted]}$



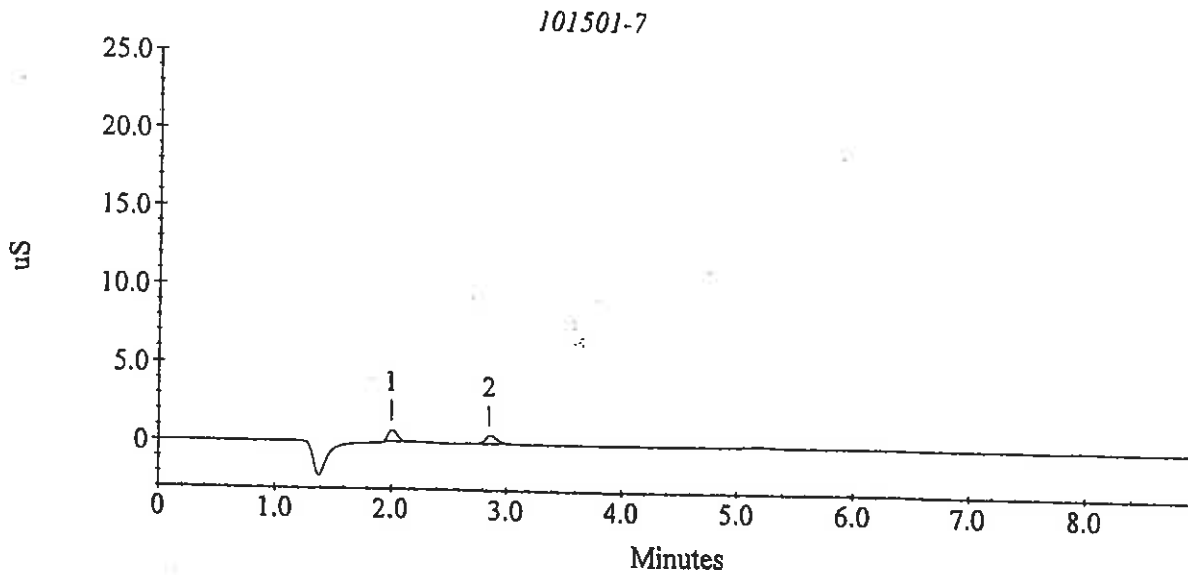
Truesdail Laboratories, Inc.
Sample Analysis Report EPA Method 300.0

Sample Name : 101501-7
Data File Name : C:\PEAKNET\DATA\122403_031.DXD

Method File Name : C:\PEAKNET\METHODS\143.MET
Date Time Analyzed : 12/24/03 1:34:46 PM
System Operator : A. CHINN :

Peak Information : All Peaks

Peak #	Component Name	Retention Time (Minutes)	Peak Area	Final Result (PPM)
1	FLUORIDE	2.00	3665	0.20
2	CHLORIDE	2.85	3655	0.32



~~0.50 ppm~~ 0.50 ppm x 35ml. ~~12/24/03~~ *AC*



Truesdail Laboratories, Inc.
Sample Analysis Report EPA Method 300.0

Sample Name : LCS

Data File Name : C:\PEAKNET\DATA\122403_022.DXD

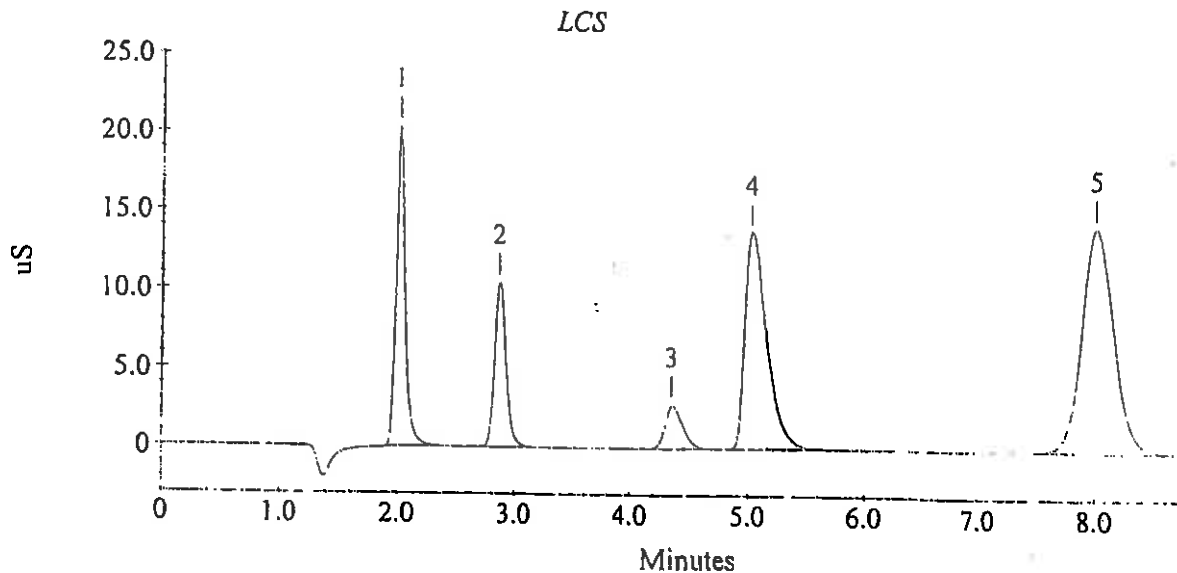
Method File Name : C:\PEAKNET\METHODS\143.MET

Date Time Analyzed : 12/24/03 11:49:20 AM

System Operator: A. CHINN :

Peak Information : All Peaks

Peak #	Component Name	Retention Time (Minutes)	Peak Area	Final Result (PPM)
1	FLUORIDE	2.02	109392	3.86
2	CHLORIDE	2.87	71656	3.96
3	BROMIDE	4.35	28155	3.85
4	NITRATE-N	5.03	177048	3.85
5	SULFATE	8.00	264414	19.01



DWJ

Truesdail Laboratories, Inc.
Sample Analysis Report EPA Method 300.0

Sample Name : LCSD

Data File Name : C:\PEAKNET\DATA\122403_023.DXD

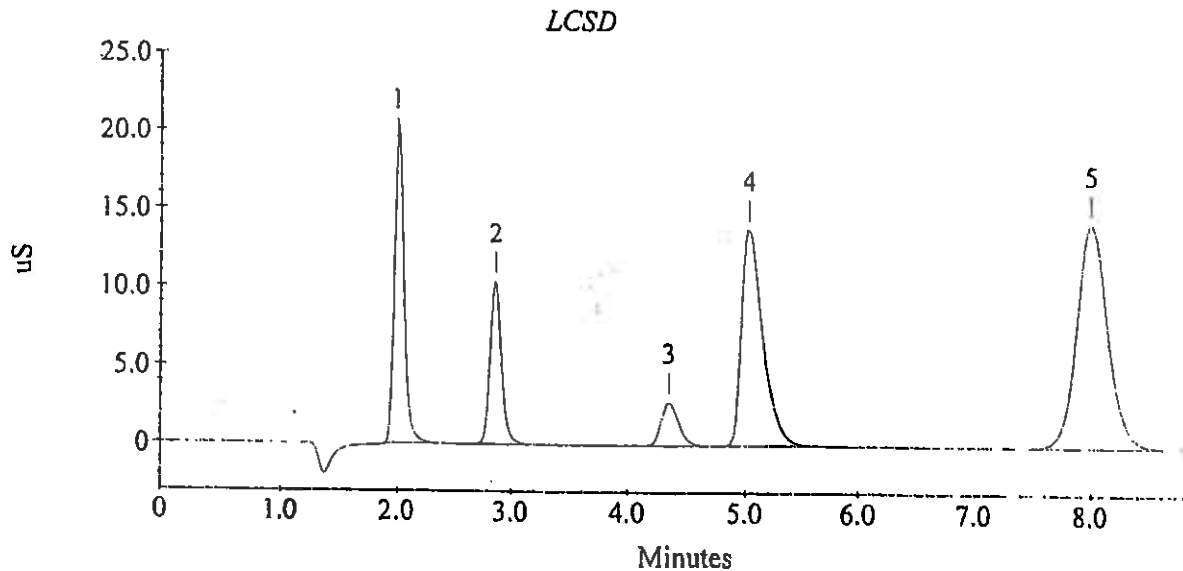
Method File Name : C:\PEAKNET\METHODS\143.MET

Date Time Analyzed : 12/24/03 12:01:04 PM

System Operator: A. CHINN :

Peak Information : All Peaks

Peak #	Component Name	Retention Time (Minutes)	Peak Area	Final Result (PPM)
1	FLUORIDE	2.00	108162	3.82
2	CHLORIDE	2.87	69033	3.82
3	BROMIDE	4.35	28195	3.86
4	NITRATE-N	5.03	175202	3.81
5	SULFATE	8.00	263823	18.97





QC/QA SUMMARY REPORT

Batch: 12AN03AA
Date: 12/24/03

Test: Sulfate by EPA 300.0

Blank Summary

All units are in ppm

Reporting Limit (RL)	QC Std I.D.	Measured Concentration	Acceptance Limits	QC Within Control
0.5	Method Blk	0.00	< 0.5	Yes
	Calib. Blk. #1	0.00	< 0.5	Yes
	Calib. Blk. #2	0.00	< 0.5	Yes

Mid Range Calibration Check Standard Verification Standard Summary

All units are in ppm

QC Std I.D.	Measured Concentration	Theoretical Concentration	Percent Recovery	Acceptance Limits	QC Within Control
MRCCS	18.91	20.00	95%	90% - 110%	Yes
MRCVS#1	18.01	15.00	93%	90% - 110%	Yes
MRCVS#2	13.83	15.00	92%	90% - 110%	Yes

Laboratory Control Sample (LCS/LCSD) Summary

All units are in ppm

QC Std I.D.	Measured Concentration	Theoretical Concentration	Percent Recovery	Acceptance Limits	QC Within Control	Relative Percent Difference	Acceptance Limits	QC Within Control
LCS	19.01	20.00	95.1%	90% - 110%	Yes	0.2%	≤20%	Yes
LCSD	18.97	20.00	94.9%	90% - 110%	Yes			

Duplicate Relative Percent Difference Summary

All units are in ppm

QC STD I.D.	Laboratory Number	Sample Conc.	Sample Duplicate Conc.	Relative Percent Difference	Acceptance limits	QC Within Control
DUP	925133	224.64	225.04	0.2%	≤20%	Yes

Sample Matrix Spike (MS/MSD) Summary

All units are in ppm

QC Std I.D.	Lab Number	Conc. of unspiked sample	Dilution Factor	Added Spike Conc.	MS/MSD Amount	Measured Conc. of spiked sample	Theoret. Conc. of spiked sample	MS/MSD% Recovery	Accept. Limits	QC In Control	Relative Percent Difference	Accept. Limits	QC Within Control
MS	925133	224.64	12.5	20.00	250.00	488.27	474.64	105.5%	75-125%	Yes	0.0%	≤20%	
MSD						#VALUE!			75-125%				

Calculation:

Relative Percent Difference

$$RPD = \left| \frac{R_1 - R_2}{\left(\frac{R_1 + R_2}{2} \right)} \right| \times 100$$

Spike Recovery

$$P = \left(\frac{S - R}{\left(\left(c \times \frac{a}{b} \right) + R \right) - R} \right) \times 100$$

LCS Recovery

$$P = \left(\frac{LC}{LT} \right) \times 100$$

Where:

- R₁ = First sample value.
- R₂ = Second sample value (duplicate).
- P = Percent recovery.
- S = Measured concentration of spike sample.
- R = Measured concentration of unspiked sample.

- c = Concentration of standard used to spike sample, ppm
- a = Amount of spike added to sample in mL.
- b = Total volume of sample used in mL.
- LC = Measured LCS concentration.
- LT = Theoretical LCS concentration where: $LT = c \times \frac{a}{b}$

Hoang Nguyen
Analyst Printed Name

Analyst Signature

Kevin Chew
Reviewer Printed Name

Reviewer Signature

v.1

Anions; EPA 300.0

Standard and Check Standards Preparation Logbook

Date: 12-24-03

STANDARD PREPARATION

Calibration Stock Standard (SSa)

Manufacturer:	Inorganic Ventures	
Catalog Number:	N/A	
Lot Number:	W-ION12045	
Expiration Date:	4/1/04	
Anions:	F, Cl, Br, NO ₃ -N	SO ₄
Concentration (ppm):	1000	5000
TLI I.D.:	SS a W-ION12045	

Primary Std:

Standard Used:	SS a W-ION12045	
Anions:	F, Cl, Br, NO ₃ -N	SO ₄
Stock Std. Conc. (ppm):	1000	5000
Amount Used (ml):	10	
Final Volume (ml):	100	
Primary Std. Conc. (ppm):	100	500

PS 1203B

Working Std. ppm:

Standard Used:	PS 1203B		PS		PS 1203B		PS 1203B		PS 1203B		PS 1203B	
Amt Used (ml):	1		1		2		6		10		16	
Final Volume (ml):	500		200		200		200		200		200	
Anions:	F, Cl, Br, NO ₃ -N	SO ₄	F, Cl, Br, NO ₃ -N	SO ₄	F, Cl, Br, NO ₃ -N	SO ₄	F, Cl, Br, NO ₃ -N	SO ₄	F, Cl, Br, NO ₃ -N	SO ₄	F, Cl, Br, NO ₃ -N	SO ₄
Std. Conc. (ppm):	100	500	100	500	100	500	100	500	100	500	100	500
WS (ppm):	0.2	1	0.5	2.5	1	5	3	15	5	25	8	40
TLI I.D.:	WS(1) 1203D		WS(2)		WS(3) 1203D		WS(4) 1203D		WS(5) 1203D		WS(6) 1203D	

MRCSS, MRCVS, LCS/LCSD, and MS/MSD STANDARD PREPARATION

Stock MRCSS Standard (SSb)

Manufacturer:	Inorganic Ventures	
Catalog Number:	N/A	
Lot Number:	W-ION12058	
Expiration Date:	4/1/04	
Anions:	F, Cl, Br, NO ₃ -N	SO ₄
Conc. (ppm):	1000	5000
TLI I.D.:	SS b W-ION12058	

MRCSS Conc. (ppm):

Standard Used:	MRCSS Primary		MRCSS Working	
Standard Used:	SS b W-ION12058		MC(p) 1203B	
Anions:	Cl, Br, NO ₃ -	SO ₄	F, Cl, Br, NO ₃ -N	SO ₄
Stock Standard Conc. (ppm):	1000	5000	100	500
Amount Used (ml):	10		8	
Final Volume (ml):	100		200	
MRCSS conc. (ppm):	100	500	4	20
TLI I.D.:	MC(p) 1203B		MC(w) 1203D	

Stock MRCVS Standard (SSa)

Manufacturer:	Inorganic Ventures	
Catalog Number:	N/A	
Lot Number:	W-ION12045	
Expiration Date:	4/1/04	
Anions:	F, Cl, Br, NO ₃ -N	SO ₄
Conc. (ppm):	1000	5000
TLI I.D.:	SS a W-ION12045	

MRCVS Conc. (ppm):

Standard Used:	MRCVS Primary		MRCVS Working	
Standard Used:	SS a W-ION12045		MV(p) 1203B	
Anions:	Cl, Br, NO ₃ -	SO ₄	F, Cl, Br, NO ₃ -N	SO ₄
Stock Standard Conc. (ppm):	1000	5000	100	500
Amount Used (ml):	10		6	
Final Volume (ml):	100		200	
MRCVS conc. (ppm):	100	500	3	15
TLI I.D.:	MV(p) 1203B		MV(w) 1203D	

Stock LCS/LCSD Standard (SSb)

Manufacturer:	Inorganic Ventures	
Catalog Number:	N/A	
Lot Number:	W-ION12058	
Expiration Date:	4/1/04	
Anions:	F, Cl, Br, NO ₃ -N	SO ₄
Conc. (ppm):	1000	5000
TLI I.D.:	SS b W-ION12058	

LCS/LCSD Conc. (ppm):

Standard Used:	LCS/LCSD Primary		LCS/LCSD Working	
Standard Used:	SS b W-ION12058		LCS, LCSD(p) 1203B	
Laboratory Control Stds.:	LCS, LCSD(p)		LCS, LCSD(w)	
Anions:	Cl, Br, NO ₃ -	SO ₄	F, Cl, Br, NO ₃ -N	SO ₄
Stock Standard Conc. (ppm):	1000	5,000	100	500
Amount Used (ml):	10		8	
Final volume (ml):	100		200	
LCS, LCSD conc. (ppm):	100	500	4	20
TLI I.D.:	LCS, LCSD(p) 1203B		LCS, LCSD(w) 1203D	

Stock MS/MSD Standard (MSSS) WORKING SO₄

Manufacturer:	EM SCIENCE	
Catalog Number:	190131	
Lot Number:	43073	
Expiration Date:	6-30-05	
Anions:	SO ₄	
Conc. (ppm):	1000	
TLI I.D.:	MSSS 43073	

MS/MSD Conc. (ppm):

Standard Used:	MS/MSD Working	
Standard Used:	MSSS 43073	
Matrix Spike Stds.:	MS, MSD(w)	
Anions:	SO ₄	
Stock Standard Conc. (ppm):	1000	
Amount Used (ml):	2	
Final volume (ml):	100	
MS, MSD conc. (ppm):	20	
TLI I.D.:	MS, MSD, 1203B	

Analyst Printed Name: Heather N. ...
 Analyst Signature: [Signature]

Reviewer: Kevin Chew
 Reviewer Signature: [Signature]

