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Schafer & Associates

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ADMINISTRATIVE RECORD

W.R. GRACE VERMICULITE MINE CLOSURE WATER QUALITY DATA REPORT NO. 3 JULY, 1992

Submitted to:

Montana Department of State Lands
Hard Rock Mining Bureau
Helena, Montana

Submitted by:

Schafer and Associates
Bozeman, Montana

November 6, 1992

Schafer

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P.O. Box 6186
Bozeman, MT 59715

November 9, 1991

Mr. Pat Plantenberg
Department of State Lands
Hardrock Mining Bureau
1625 Eleventh Avenue
Helena, Montana 59620

Dear Pat:

Enclosed are two copies of Water Quality Data Report No. 3 summarizing the results of the third round of water sampling at the W.R. Grace vermiculite mine near Libby. Data for this report was collected July 2, 1992. Please forward one copy to Tom Reid at the Water Quality Bureau.

We are late with this report because we have been trying to get the final design for the tailings impoundment completed. However, there is very little new information in the data. We continue to see the highest mass flows of asbestiform fibers originating below the tailings dam in Lower Rainy Creek indicating that mine reclamation efforts will probably have minimal impact toward reducing asbestos fiber counts. The fourth and final baseline sample was collected last month and we should be getting results back on it soon.

W.R. Grace has committed to annual sampling for a period of three years (longer if required) to assess post reclamation success. When Water Quality Data Report No. 4 is released, we should determine which time of year would be most appropriate for the annual sampling. I would also like to reevaluate whether all sites and parameters need to be sampled and analyzed. Each sampling event has resulted in expenditures of about $6,000 just for analytical tests. We would like to reduce this level of expenditure and concentrate on those sites and parameters which have the most significance.

If you have questions or comments please call.

Sincerely,

Tom Hudson

Tom Hudson
Project Manager

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1.0 BACKGROUND

The W.R. Grace vermiculite mine near Libby, Montana was closed in the fall of 1990. As part of the reclamation and closure, particularly as it applies to areas around the tailings impoundment, W.R. Grace submitted to the Water Quality Bureau a proposed Water Quality Monitoring Plan in September, 1991 (Schafer and Associates, 1991). The purpose of the Plan was to establish post-closure water quality data as a means of monitoring the performance of facility reclamation measures.

The plan calls for water sampling at several locations in the Rainy Creek drainage as shown on Figure 1.1. Contingent sampling on the Kootenai was proposed if initial data on Rainy Creek indicated any potential health concerns. Four sampling campaigns were proposed for the first year to assess seasonal variations in water quality. Additional annual sampling campaigns for a minimum of three years following closure were also proposed. The first sampling event took place in mid-November, 1991 and the second in late March, 1992. Results from these sampling events were reported in Water Quality Data Report No.1 and No. 2, respectively. This report presents the data from the third sampling event performed on July 2, 1992.

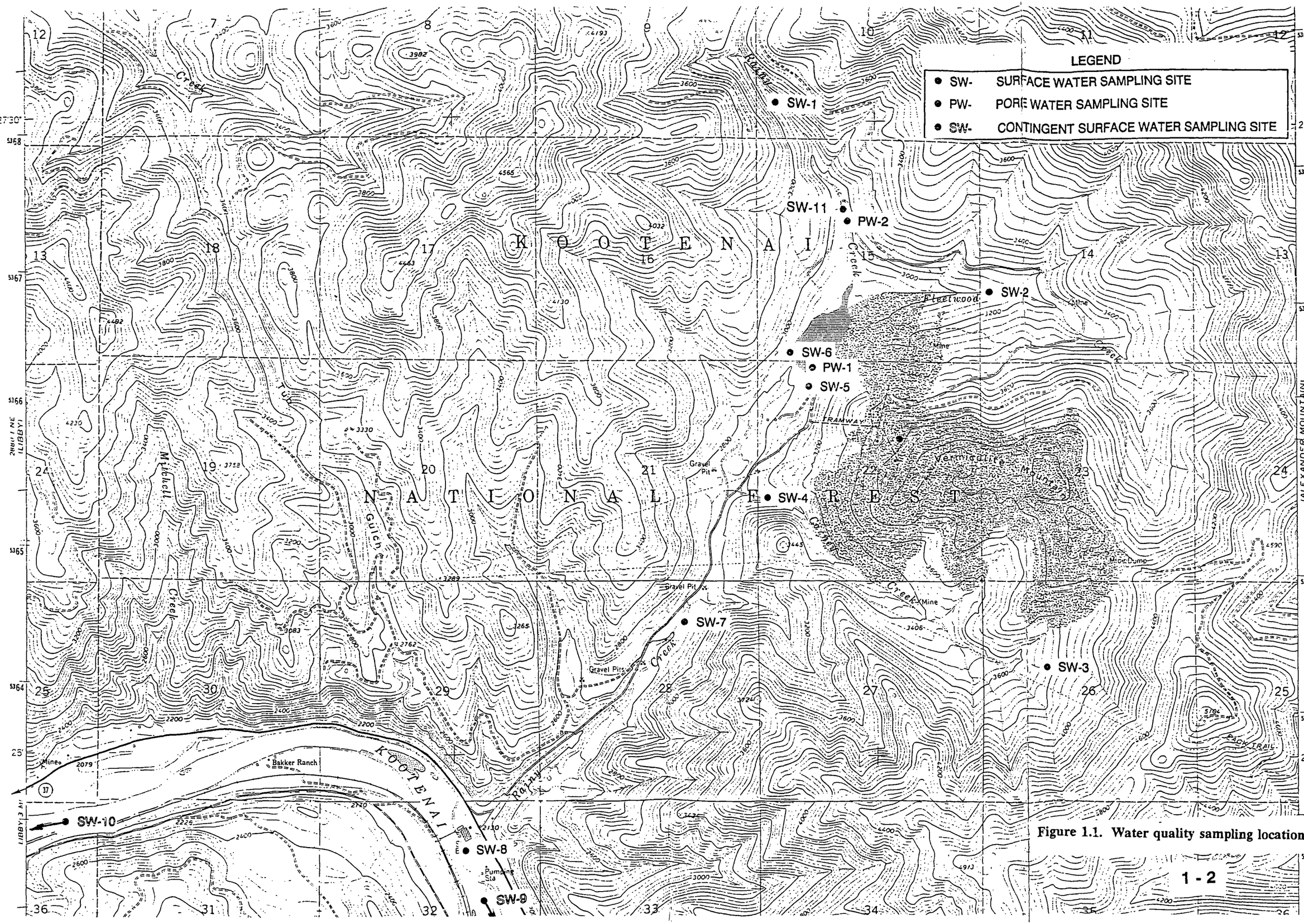

Figure 1.1. Water quality sampling location map.

2.0 METHODS

Conditions at the time of sampling were generally cloudy and relatively cool for this time of year with a high during the day of about 70° F. There were short periods of light intermittent rain throughout most of the day. The Rainy Creek diversion was not in use; all of Rainy Creek flowed in the natural drainage into the tailings pond. The tailing pond surface water was significantly lower than on previous sampling trips and no water had discharged from the decant tower since monitoring began.

Sampling methods were outlined in the Water Quality Monitoring Plan (Schafer and Associates, 1991) submitted in September, 1991 and modified slightly in the field as described in Water Quality Data Report No. 1 (Schafer and Associates, 1992). Once again Site SW-1, Upper Rainy Creek above the diversion dam, was not sampled because the entire Upper Rainy Creek flow could be sampled more effectively at SW-11.

The preservation techniques and analytical methods used are summarized in Table 2.1. All samples were stored and shipped on ice. Metals were analyzed as the "total recoverable" form according to procedures outlined in Standard Methods for Examination of Water and Wastewater (APHA, 1985).

Table 2.1. Summary of sampling and analytical methods for water samples.

Unpreserved Samples		Preserved Samples			Field Parameters	
Component	Analytical Method[1]	Component	Preservation/ Container[2]	Analytical Method[1]	Param.	Method
TDS	EPA 160.1	TPH	H_2SO_4/Glass	EPA 418.1	Flow	Pygmy current meter/ Baski
TSS	EPA 160.2	Cu	HNO_3/PE	EPA 220.1/200.7	pH	Field pH meter
Asbest. Fibers	EPA-600/4-83-043	Zn	HNO_3/PE	EPA 289.1/200.7	EC	Field EC meter
Hardness	EPA 130.2	Cd	HNO_3/PE	EPA 213.1/200.7	DO	Field D.O. meter
Alkalinity	EPA 310.1	Pb	HNO_3/PE	EPA 239.2/200.7	Temp.	Field meter
NO_3^-	EPA 353.2	Hg	HNO_3/PE	EPA 245.2		
SO_4^{-2}	EPA 375.3	Fe	HNO_3/PE	EPA 236.1/200.7		
Cl^-	EPA 325.3	As	HNO_3/PE	EPA 206.3		
F^-	EPA 340.2	Ni	HNO_3/PE	EPA 249.1/200.7		
Ca	EPA 215.1/200.7	Cr	HNO_3/PE	EPA 218.1/200.7		
Mg	EPA 242.1/200.7					
Na	EPA 273.1/200.7					
K	EPA 258.1/200.7					
CO_3^{-2}/HCO_3^-	EPA 310.1					

1 EPA procedures are described in 40 CFR Part 136, Table B. Procedures for asbestiform fibers are described in "Analytical Procedures for Determination of Asbestos Fibers in Water" (EPA-600/4-83-043).

2 Samples were acidified to a value less than 2.0. The TPH sample was collected in a 1 L glass bottle; metals were collected in 500 ml polyethylene (PE) bottles.

3.0 PRESENTATION OF DATA

Results of the July 2, 1992 sampling are summarized in tabular form as follows:

- Table 3.1 is a summary of field parameters including pH, electric conductivity (EC), temperature and flow.
- Table 3.2 is a summary of metal analyses including selected heavy metals and major cations.
- Table 3.3 is a summary of miscellaneous analyses for various anions, petroleum hydrocarbons, hardness, etc.
- Table 3.4 is a summary of asbestiform fiber analyses.

Raw analytical data from Energy Laboratories and EMS Laboratories used to prepare Tables 3.2, 3.3 and 3.4, are included in Appendix A and B, respectively.

Table 3.1. Field data summary.

SITE NO.	DESCRIPTION	pH[6] (su)	EC (mmhos/cm)	TEMP (°C)	FLOW (cfs)	D.O.[3] (ppm)
SW-1	Upper Rainy Creek above diversion dam	Not Sampled				
SW-2	Fleetwood Creek above coarse tails	8.32	0.48	9.5	0.30[1]	
SW-3	Upper Carney Creek at Zook's Dump	8.12	0.71	8.9	0.002	
SW-4	Lower Carney Creek above Rainy Creek	8.45	0.54	9.8	0.11[2]	
SW-5	Tailings dam toe drains	7.21	0.53	8.1	1.20[1]	
SW-6	Tailings pond outfall (surface water sample, only)	8.34	0.17	13.9	0.00	
SW-7	Lower Rainy Creek leaving mine property	7.97	0.54	11.6	1.30[1]	
SW-8	Lower Rainy Creek above Kootenai River	8.15	0.52	8.9	2.29[1]	
SW-9	Kootenai River above Rainy Creek	Not Sampled[4]				
SW-10	Kootenai River below Rainy Creek	Not Sampled[4]				
SW-11[5]	Rainy Creek flow into tailings pond	8.24	0.39	6.8	0.24[1]	
PW-1	Tailings Pond pore water	Not Sampled				
PW-2	Groundwater near SW-11	Not Sampled				

1 Flow measurement was made with a Pygmy current meter.
2 Flow measurement was made with a Baski cutthroat flume.
3 Dissolved oxygen was not measured.
4 Samples of the Kootenai River were not taken as discussed in the Water Quality Monitoring Plan.
5 The original Water Quality Monitoring Plan did not include this site. Rainy Creek reestablishes itself between the diversion dam and the tailings impoundment.
6 Field pH probe failed. Measurements were made in the lab one day later.

Table 3.2. Laboratory data summary for metals.

SITE NO.	DESCRIPTION	As (mg/l)	Cd (mg/l)	Cr (mg/l)	Cu (mg/l)	Fe (mg/l)	Pb (mg/l)	Hg (mg/l)	Ni (mg/l)	Zn (mg/l)	K (mg/l)	Na (mg/l)	Ca (mg/l)	Mg (mg/l)
SW-1	Upper Rainy Creek above diversion dam	Not Sampled												
SW-2	Fleetwood Creek above coarse tails	<0.001	<0.001	<0.01	<0.01	0.05	<0.01	<0.0001	<0.03	0.04	7	5	85	16
SW-3	Upper Carney Creek at Zook's Dump	0.001	<0.001	<0.01	<0.01	0.81	<0.01	<0.0001	<0.03	0.03	10	7	106	28
SW-4	Lower Carney Creek above Rainy Creek	<0.001	<0.001	<0.01	<0.01	0.04	<0.01	<0.0001	<0.03	0.03	11	9	89	28
SW-5	Tailings dam toe drains	0.005	<0.001	<0.01	<0.01	0.04	<0.01	<0.0001	<0.03	0.01	9	6	88	24
SW-6	Tailings pond surface water	0.002	<0.001	<0.01	<0.01	<0.03	<0.01	<0.0001	<0.03	<0.01	4	4	16	6
SW-7	Lower Rainy Creek leaving mine property	0.002	<0.001	<0.01	<0.01	0.19	<0.01	<0.0001	<0.03	0.03	9	6	77	24
SW-0	Blind Control (Replicate of SW-7)	0.002	<0.001	<0.01	<0.01	0.30	<0.01	<0.0001	<0.03	0.03	10	7	78	24
SW-8	Lower Rainy Creek above Kootenai River	0.002	<0.001	<0.01	<0.01	0.42	<0.01	<0.0001	<0.03	0.02	9	6	79	22
SW-9	Kootenai River above Rainy Creek	Not Sampled												
SW-10	Kootenai River below Rainy Creek	Not Sampled												
SW-11	Rainy Creek flow into tailings pond	0.001	<0.001	<0.01	<0.01	<0.03	<0.01	<0.0001	<0.03	0.03	4	3	66	11
PW-1	Pore water from tailings	Not Sampled												
PW-2	Groundwater near SW-11	Not Sampled												

Table 3.3. Laboratory data summary for miscellaneous constituents.

SITE NO.	DESCRIPTION	SO_4^{-2} (mg/l)	Cl^- (mg/l)	CO_3^{-2} (mg/l)	HCO_3^{-1} (mg/l)	TDS (mg/l)	TSS (mg/l)	Hardness (mg/l)	Alkalinity (mg/l)	NO_3^- (mg/l)	F^- (mg/l)	TPH (mg/l)
SW-1	Upper Rainy Creek above diversion dam	Not Sampled										
SW-2	Fleetwood Creek above coarse tails	15	4	0	353	335	<1	279	289	<0.05	0.22	<0.1
SW-3	Upper Carney Creek at Zook's Dump	8	2	0	513	423	2	381	420	<0.05	0.18	<0.1
SW-4	Lower Carney Creek above Rainy Creek	22	2	10	414	363	<1	335	356	0.29	0.18	<0.1
SW-5	Tailings dam toe drains	9	5	0	408	349	<1	320	334	<0.05	2.9	<0.1
SW-6	Tailings pond surface water	7	2	0	80	90	14	65	65	<0.05	0.33	<0.1
SW-7	Lower Rainy Creek leaving mine property	13	8	0	365	308	2	290	299	0.07	2.1	<0.1
SW-0	Blind Control (Replicate of SW-7)	12	8	0	346	280	<1	292	283	0.08	2.1	<0.1
SW-8	Lower Rainy Creek above Kootenai River	12	8	7	348	217	1	289	297	<0.05	1.7	<0.1
SW-9	Kootenai River above Rainy Creek	Not Sampled										
SW-10	Kootenai River below Rainy Creek	Not Sampled										
SW-11	Rainy Creek flow into tailings pond	5	<1	0	275	211	<1	211	225	<0.05	0.13	<0.1
PW-1	Pore water from tailings	Not Sampled										
PW-2	Groundwater near SW-11	Not Sampled										

Table 3.4. Laboratory data summary for asbestiform fibers.

SITE NO.	DESCRIPTION	DETECTION LIMIT (MFL)*	FIBERS <5μm (MFL)*	FIBERS >5μm (MFL)*	FIBERS >10μm (MFL)*	FIBER MASS (μg/l)
SW-1	Upper Rainy Creek above diversion dam	Not Sampled				
SW-2	Fleetwood Creek above coarse tails	0.4	26.8	6.3	3.1	52
SW-3	Upper Carney Creek at Zook's Dump	9.8	548	108	118	1600
SW-4	Lower Carney Creek above Rainy Creek	0.2	10.7	3.6	1.1	24
SW-5	Tailings dam toe drains	0.1	0.14	0.14	0	0.7
SW-6	Tailings pond surface water	2.5	267.5	32.5	27.5	550
SW-7	Lower Rainy Creek leaving mine property	1.5	64.5	19.5	10.5	420
SW-0	Blind Control (Replicate of SW-7)	0.6	45.0	10.0	7.5	280
SW-8	Lower Rainy Creek above Kootenai River	4.5	270	22.5	18	340
SW-9	Kootenai River above Rainy Creek	Not Sampled				
SW-10	Kootenai River below Rainy Creek	Not Sampled				
SW-11	Rainy Creek flow into tailings pond	0.1	0.1	0.1	0	0.3

* MFL = Million fibers per liter

4.0 DATA ANALYSIS

The significant findings of this sampling event are as follows:

- Streamflow was slightly less than in the spring. This is reflected in those sites subject to surface runoff by somewhat higher levels of dissolved solids. There is some indication that Fleetwood Creek may have less seasonal variation than Rainy Creek and Carney Creek.

- Zinc concentrations, although above detection limits at most sites, were all uniformly low. The November sampling had indicated potential areas of elevated zinc concentrations but we have not been able to reproduce this result since.

- Asbestiform fiber counts returned to the pattern measured in November, 1991 in which most fibers appear to originate in lower Rainy Creek. The Carney Creek fiber count is highly variable and is probably affected by runoff rates.

- The tailings pond surface water sample once again showed substantially different chemical properties than other samples. It has consistently had much lower dissolved solids content. We have speculated on the possibility of dilution through surface runoff or rainfall and on purification by freeze/thaw cycles. On this sampling round there was evidence of chemical precipitation in the form of a white sediment on the bottom of the pond in the area sampled. It appears that some mechanism other than dilution is at work.

- A mass flow schematic diagram for the sampling area is presented in Figure 4.1 for selected parameters.

- Table 4.1 compares measured water quality values to existing standards. These data show the same trends which have been noted in earlier reports.

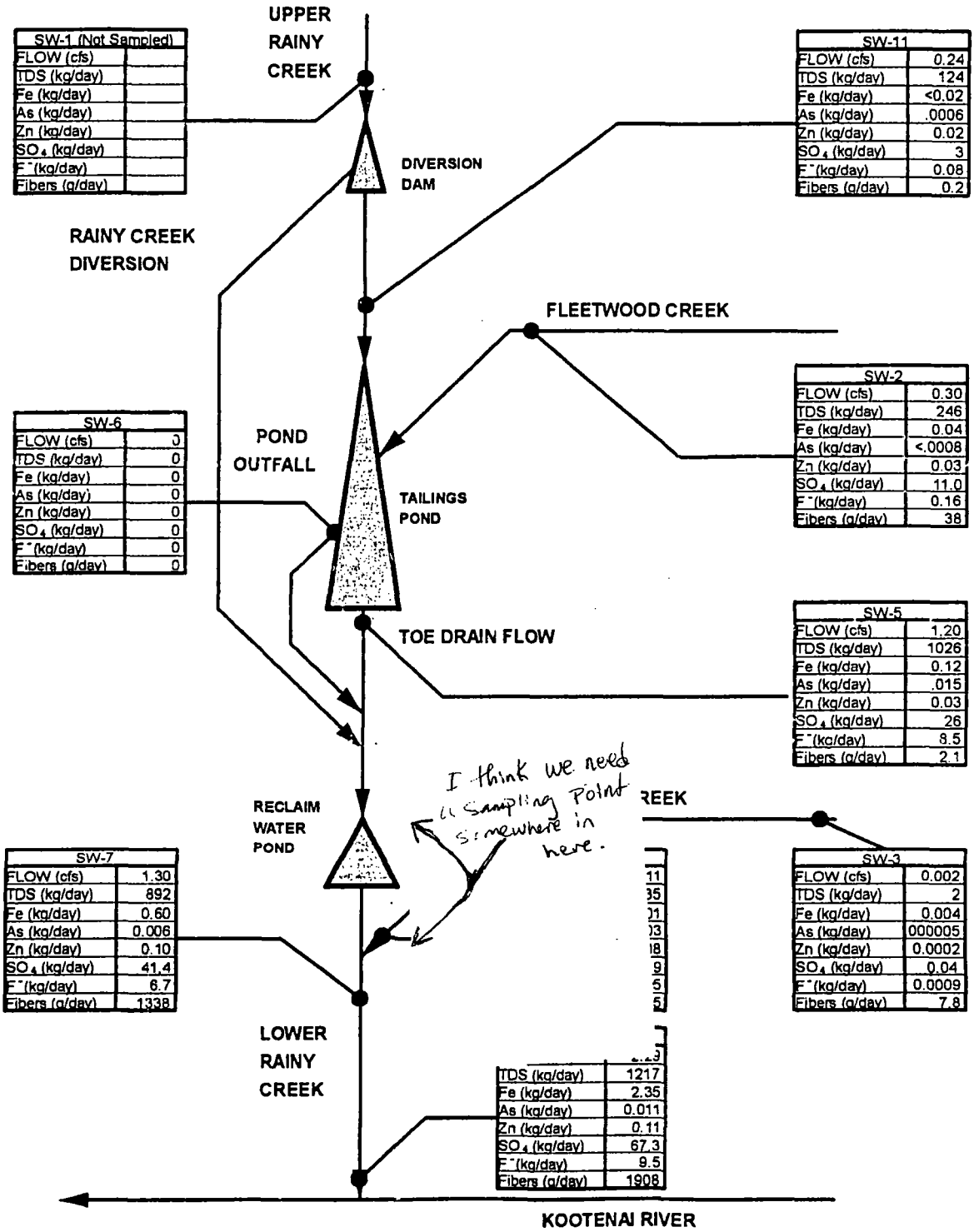

Figure 4.1 Schematic flow diagram of the Rainy Creek drainage with mass flow measurements for selected components.

Table 4.1 A comparison of measured water quality data with drinking water standards.

Constituent	Measured Concentration Range	Primary Drinking Water Standard	Secondary Drinking Water Standard	Location of Sample with Maximum Concentration
	(mg/l except as noted)			
As	<0.001 to 0.005	0.05		SW-5
Cd	<0.001	0.005[1]		All
Cr	<0.01	0.1[1]		All
Cu	<0.01		1.0	All
Fe	<0.03 to 0.81		0.3	SW-3
Pb	<0.01	0.05		All
Hg	<0.0001	0.005		All
Ni	<0.03			All
Zn	<0.01 to 0.04	5.0		SW-2
Asbestos (MFL)	<0.1 to 118	7.0[1,2]		SW-3
SO_4^{-2}	5 to 22		250.	SW-4
Cl^-	<1 to 8		250.	SW-7 and SW-8
NO_3^-	<0.05 to 0.29	10.0		SW-4
F^-	0.13 to 2.9		2.0	SW-5
pH (su)	7.21 to 8.45		6.5 to 8.5	SW-5(min); SW-4(max)
TDS	90 to 423		500.	SW-3

[1] These standards were added or revised effective July 1992.

[2] Fiber counts are based on fibers greater than 10 microns in length with an aspect ratio greater than 3:1.

REFERENCES

American Public Health Association, 1985. Standard Methods for the Examination of Water and Wastewater, Part 300: Determination of Metals.

Schafer and Associates, 1991. W.R. Grace Vermiculite Mine Closure Water Quality Monitoring Plan, submitted to Montana Department of Health and Environmental Sciences, Water Quality Bureau.

Schafer and Associates, 1992(a). W.R. Grace Vermiculite Mine Closure Water Quality Data Report No. 1, November 1991, submitted to Montana Department of State Lands, Hard Rock Mining Bureau.

Schafer and Associates, 1992(b). W.R. Grace Vermiculite Mine Closure Water Quality Data Report No. 1, March 1992, submitted to Montana Department of State Lands, Hard Rock Mining Bureau.

APPENDIX A

ENERGY LABORATORIES DATA REPORTS

ENERGY LABORATORIES

ENERGY LABORATORIES, INC.
P.O. BOX 30916 • 1107 SOUTH BROADWAY • BILLINGS, MT 59107-0916 • PHONE (406) 252-6325
FAX (406) 252-6069 • 1-800-735-4489

LABORATORY REPORT

TO: Tom Hudson
ADDRESS: Schafer & Associates
P.O. Box 6186
Bozeman, MT 59715

LAB NO.: 92-26055
DATE: 07/27/92 crp

WATER ANALYSIS

SW-0-1
Sampled 07/02/92
Submitted 07/07/92

Constituent	mg/l (ppm)
Potassium	10
Sodium	7
Calcium	78
Magnesium	24
Sulfate	12
Chloride	8
Carbonate	0
Bicarbonate	346
Total Dissolved Solids @ 180°C	280
Total Suspended Solids	<1
Total Hardness as $CaCO_3$	292
Total Alkalinity as $CaCO_3$	283
Nitrate plus Nitrite as N	0.08
Fluoride	2.1
Total Acidity as $CaCO_3$	N/A
Total Petroleum Hydrocarbons*	<0.1

Total Recoverable Metals

Arsenic	0.002
Cadmium	<0.001
Chromium	<0.01
Copper	<0.01
Iron	0.30
Lead	<0.01
Mercury	<0.0001
Nickel	<0.03
Zinc	0.03

* Analysis done by EPA method 418.1.

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LABORATORY REPORT

TO: Tom Hudson
ADDRESS: Schafer & Associates
P.O. Box 6186
Bozeman, MT 59715

LAB NO.: 92-26056
DATE: 07/27/92 crp

WATER ANALYSIS

SW-2-1
Sampled 07/02/92
Submitted 07/07/92

Constituent	mg/l (ppm)
Potassium	7
Sodium	5
Calcium	35
Magnesium	16
Sulfate	15
Chloride	4
Carbonate	0
Bicarbonate	353
Total Dissolved Solids @ 180°C	335
Total Suspended Solids	<1
Total Hardness as $CaCO_3$	279
Total Alkalinity as $CaCO_3$	289
Nitrate plus Nitrite as N	<0.05
Fluoride	0.22
Total Acidity as $CaCO_3$	N/A
Total Petroleum Hydrocarbons*	<0.1

Total Recoverable Metals

Arsenic	<0.001
Cadmium	<0.001
Chromium	<0.01
Copper	<0.01
Iron	0.05
Lead	<0.01
Mercury	<0.0001
Nickel	<0.03
Zinc	0.04

* Analysis done by EPA method 418.1.

ENERGY LABORATORIES

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FAX (406) 252-6069 • 1-800-735-4489

LABORATORY REPORT

TO: Tom Hudson
ADDRESS: Schafer & Associates
P.O. Box 6186
Bozeman, MT 59715

LAB NO.: 92-26057
DATE: 07/27/92 crp

WATER ANALYSIS

SW-3-1
Sampled 07/02/92
Submitted 07/07/92

Constituent	mg/l (ppm)
Potassium	10
Sodium	7
Calcium	106
Magnesium	28
Sulfate	8
Chloride	2
Carbonate	0
Bicarbonate	513
Total Dissolved Solids @ 180°C	423
Total Suspended Solids	2
Total Hardness as $CaCO_3$	381
Total Alkalinity as $CaCO_3$	420
Nitrate plus Nitrite as N	<0.05
Fluoride	0.18
Total Acidity as $CaCO_3$	N/A
Total Petroleum Hydrocarbons*	<0.1

Total Recoverable Metals

Arsenic	0.001
Cadmium	<0.001
Chromium	<0.01
Copper	<0.01
Iron	0.81
Lead	<0.01
Mercury	<0.0001
Nickel	<0.03
Zinc	0.03

* Analysis done by EPA method 418.1.

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LABORATORY REPORT

TO: Tom Hudson
ADDRESS: Schafer & Associates
P.O. Box 6186
Bozeman, MT 59715

LAB NO.: 92-26058
DATE: 07/27/92 crp

WATER ANALYSIS

SW-4-1
Sampled 07/02/92
Submitted 07/07/92

Constituent	mg/l (ppm)
Potassium	11
Sodium	9
Calcium	89
Magnesium	28
Sulfate	22
Chloride	2
Carbonate	10
Bicarbonate	414
Total Dissolved Solids @ 180°C	363
Total Suspended Solids	<1
Total Hardness as $CaCO_3$	335
Total Alkalinity as $CaCO_3$	356
Nitrate plus Nitrite as N	0.29
Fluoride	0.18
Total Acidity as $CaCO_3$	N/A
Total Petroleum Hydrocarbons*	<0.1

Total Recoverable Metals

Arsenic	<0.001
Cadmium	<0.001
Chromium	<0.01
Copper	<0.01
Iron	0.04
Lead	<0.01
Mercury	<0.0001
Nickel	<0.03
Zinc	0.03

* Analysis done by EPA method 418.1.

ENERGY LABORATORIES

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LABORATORY REPORT

TO: Tom Hudson
ADDRESS: Schafer & Associates
P.O. Box 6186
Bozeman, MT 59715

LAB NO.: 92-26059
DATE: 07/27/92 crp

WATER ANALYSIS

SW-5-1
Sampled 07/02/92
Submitted 07/07/92

Constituent	mg/l (ppm)
Potassium	9
Sodium	6
Calcium	88
Magnesium	24
Sulfate	9
Chloride	5
Carbonate	0
Bicarbonate	408
Total Dissolved Solids @ 180°C	349
Total Suspended Solids	<1
Total Hardness as $CaCO_3$	320
Total Alkalinity as $CaCO_3$	334
Nitrate plus Nitrite as N	<0.05
Fluoride	2.9
Total Acidity as $CaCO_3$	N/A
Total Petroleum Hydrocarbons*	<0.1

Total Recoverable Metals

Arsenic	0.005
Cadmium	<0.001
Chromium	<0.01
Copper	<0.01
Iron	0.04
Lead	<0.01
Mercury	<0.0001
Nickel	<0.03
Zinc	0.01

* Analysis done by EPA method 418.1.

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LABORATORY REPORT

TO: Tom Hudson
ADDRESS: Schafer & Associates
P.O. Box 6186
Bozeman, MT 59715

LAB NO.: 92-26060
DATE: 07/27/92 crp

WATER ANALYSIS

SW-6-1
Sampled 07/02/92
Submitted 07/07/92

Constituent	mg/l (ppm)
Potassium	4
Sodium	4
Calcium	16
Magnesium	6
Sulfate	7
Chloride	2
Carbonate	0
Bicarbonate	80
Total Dissolved Solids @ 180°C	90
Total Suspended Solids	14
Total Hardness as $CaCO_3$	65
Total Alkalinity as $CaCO_3$	65
Nitrate plus Nitrite as N	<0.05
Fluoride	0.33
Total Acidity as $CaCO_3$	N/A
Total Petroleum Hydrocarbons*	<0.1

Total Recoverable Metals

Arsenic	0.002
Cadmium	<0.001
Chromium	<0.01
Copper	<0.01
Iron	<0.03
Lead	<0.01
Mercury	<0.0001
Nickel	<0.03
Zinc	<0.01

* Analysis done by EPA method 418.1.

ENERGY LABORATORIES

ENERGY LABORATORIES, INC.
P.O. BOX 30916 • 1107 SOUTH BROADWAY • BILLINGS, MT 59107-0916 • PHONE (406) 252-6325
FAX (406) 252-6069 • 1-800-735-4489

LABORATORY REPORT

TO: Tom Hudson
ADDRESS: Schafer & Associates
P.O. Box 6186
Bozeman, MT 59715

LAB NO.: 92-26060 dup
DATE: 07/27/92 crp

QUALITY ASSURANCE - DUPLICATE ANALYSIS

SW-6-1
Sampled 07/02/92
Submitted 07/07/92

Constituent	mg/l (ppm)
Potassium	4
Sodium	4
Calcium	16
Magnesium	6
Sulfate	7
Chloride	2
Carbonate	0
Bicarbonate	83
Total Dissolved Solids @ 180°C	84
Total Suspended Solids	14
Total Hardness as $CaCO_3$	65
Total Alkalinity as $CaCO_3$	68
Nitrate plus Nitrite as N	<0.05
Fluoride	0.32
Total Acidity as $CaCO_3$	N/A
Total Petroleum Hydrocarbons*	N/A

Total Recoverable Metals

Arsenic	0.002
Cadmium	<0.001
Chromium	<0.01
Copper	<0.01
Iron	<0.03
Lead	<0.01
Mercury	<0.0001
Nickel	<0.03
Zinc	<0.01

* Analysis done by EPA method 418.1.

ENERGY LABORATORIES

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FAX (406) 252-6069 • 1-800-735-4489

LABORATORY REPORT

TO: Tom Hudson
ADDRESS: Schafer & Associates
P.O. Box 6186
Bozeman, MT 59715

LAB NO.: 92-26061
DATE: 07/27/92 crp

WATER ANALYSIS

SW-7-1
Sampled 07/02/92
Submitted 07/07/92

Constituent	mg/l (ppm)
Potassium	9
Sodium	6
Calcium	77
Magnesium	24
Sulfate	13
Chloride	8
Carbonate	0
Bicarbonate	365
Total Dissolved Solids @ 180°C	308
Total Suspended Solids	2
Total Hardness as $CaCO_3$	290
Total Alkalinity as $CaCO_3$	299
Nitrate plus Nitrite as N	0.07
Fluoride	2.1
Total Acidity as $CaCO_3$	N/A
Total Petroleum Hydrocarbons*	<0.1

Total Recoverable Metals

Arsenic	0.002
Cadmium	<0.001
Chromium	<0.01
Copper	<0.01
Iron	0.19
Lead	<0.01
Mercury	<0.0001
Nickel	<0.03
Zinc	0.03

* Analysis done by EPA method 418.1.

ENERGY LABORATORIES

ENERGY LABORATORIES, INC.
P.O. BOX 30916 • 1107 SOUTH BROADWAY • BILLINGS, MT 59107-0916 • PHONE (406) 252-6325
FAX (406) 252-6069 • 1-800-735-4489

LABORATORY REPORT

TO: Tom Hudson
ADDRESS: Schafer & Associates
P.O. Box 6186
Bozeman, MT 59715

LAB NO.: 92-26061 spi
DATE: 07/27/92 crp

QUALITY ASSURANCE - SPIKED ANALYSIS

SW-7-1
Sampled 07/02/92
Submitted 07/07/92

Constituent	% Recovery
Potassium	103
Sodium	95
Calcium	96
Magnesium	97
Sulfate	99
Chloride	103
Carbonate	N/A
Bicarbonate	N/A
Total Dissolved Solids @ 180°C	N/A
Total Suspended Solids	N/A
Total Hardness as $CaCO_3$	N/A
Total Alkalinity as $CaCO_3$	N/A
Nitrate plus Nitrite as N	96
Fluoride	107
Total Acidity as $CaCO_3$	N/A
Total Petroleum Hydrocarbons*	N/A
Total Recoverable Metals	
Arsenic	106
Cadmium	98
Chromium	94
Copper	97
Iron	95
Lead	94
Mercury	105
Nickel	95
Zinc	93

* Analysis done by EPA method 418.1.

ENERGY LABORATORIES

ENERGY LABORATORIES, INC.
P.O. BOX 30916 • 1107 SOUTH BROADWAY • BILLINGS, MT 59107-0916 • PHONE (406) 252-6325
FAX (406) 252-6069 • 1-800-735-4489

LABORATORY REPORT

TO: Tom Hudson
ADDRESS: Schafer & Associates
P.O. Box 6186
Bozeman, MT 59715

LAB NO.: 92-26062
DATE: 07/27/92 crp

WATER ANALYSIS

SW-8-1
Sampled 07/02/92
Submitted 07/07/92

Constituent	mg/l (ppm)
Potassium	9
Sodium	6
Calcium	79
Magnesium	22
Sulfate	12
Chloride	8
Carbonate	7
Bicarbonate	348
Total Dissolved Solids @ 180°C	217
Total Suspended Solids	1
Total Hardness as $CaCO_3$	289
Total Alkalinity as $CaCO_3$	297
Nitrate plus Nitrite as N	<0.05
Fluoride	1.7
Total Acidity as $CaCO_3$	N/A
Total Petroleum Hydrocarbons*	<0.1

Total Recoverable Metals

Arsenic	0.002
Cadmium	<0.001
Chromium	<0.01
Copper	<0.01
Iron	0.42
Lead	<0.01
Mercury	<0.0001
Nickel	<0.03
Zinc	0.02

* Analysis done by EPA method 418.1.

ENERGY LABORATORIES

ENERGY LABORATORIES, INC.
P.O. BOX 30916 • 1107 SOUTH BROADWAY • BILLINGS, MT 59107-0916 • PHONE (406) 252-6325
FAX (406) 252-6069 • 1-800-735-4489

LABORATORY REPORT

TO: Tom Hudson
ADDRESS: Schafer & Associates
P.O. Box 6186
Bozeman, MT 59715

LAB NO.: 92-26063
DATE: 07/27/92 crp

WATER ANALYSIS

SW-11-1
Sampled 07/02/92
Submitted 07/07/92

Constituent	mg/l (ppm)
Potassium	4
Sodium	3
Calcium	66
Magnesium	11
Sulfate	5
Chloride	<1
Carbonate	0
Bicarbonate	275
Total Dissolved Solids @ 180°C	211
Total Suspended Solids	<1
Total Hardness as $CaCO_3$	211
Total Alkalinity as $CaCO_3$	225
Nitrate plus Nitrite as N	<0.05
Fluoride	0.13
Total Acidity as $CaCO_3$	N/A
Total Petroleum Hydrocarbons*	<0.1

Total Recoverable Metals

Arsenic	0.001
Cadmium	<0.001
Chromium	<0.01
Copper	<0.01
Iron	<0.03
Lead	<0.01
Mercury	<0.0001
Nickel	<0.03
Zinc	0.03

* Analysis done by EPA method 418.1.

APPENDIX B

EMS LABORATORIES DATA REPORTS

DATE:	July 24, 1992
CLIENT:	SCHAFER & ASSOCIATES P. O. Box 6186 Bozeman, MT 59715
ATTENTION:	Thomas Hudson
REFERENCE:	Letter Dated July 6, 1992
REPORT NO:	25015
SUBJECT:	QUANTITATIVE ASBESTOS ANALYSIS OF WATER SAMPLES BY TRANSMISSION ELECTRON MICROSCOPY
ACCREDITED:	National Institute of Standards and Technology through NVLAP (Laboratory No. 1218) California Department of Health Services for Asbestos by TEM (Certification No. 1119)

Nine surface water samples were submitted for quantitative TEM analysis of asbestos structures. The samples came from the W. R. Grace mine near Libby, Montanta.

The sample were analyzed according to the U.S. EPA method (EPA-600/4-83-043).

The asbestiform which was present in the water samples was from the tremolite/actinolite group of amphiboles.

The results are as follows:

ASBESTOS FIBER LENGTH DISTRIBUTION (MFL)

Sample No.	<2.5 µm	2.5 to 4.9 µm	5.0 to 9.9 µm	>10 µm	D. L. µm
SW-0-4	29.4	15.6	10.0	7.5	0.6
SW-2-4	15.9	10.9	6.3	3.1	0.4
SW-3-4	372	176	108	118	9.8
SW-4-4	5.2	5.5	3.6	1.1	0.2
SW-5-4	0	0.14	0.14	0	0.1
SW-6-4	165	102.5	32.5	27.5	2.5

Schafer & Associates
Report No. 25015

SW-7-4	42	22.5	19.5	10.5	1.5
SW-8-4	180	90	22.5	18	4.5
SW-11-4	0.1	0	0.1	0	0.1

MFL - Millions of Fibers per Liter
D. L. - Detection Limit

The test reports are enclosed.

Respectfully submitted,

EMS LABORATORIES, INC.

B. M. Kolk
Laboratory Director

A U.S. Dept. of Commerce, National Institute of Standards and Technology accredited lab.
Airborne Asbestos
Asbestos Bulk Sample
Analyses
NVLAP
EMS Laboratories, Inc.
Lab Code: 1218

This report, from a NIST accredited laboratory through NVLAP, must not be used by the client to claim product endorsement by NVLAP or any agency of the Government.

Analysis of Water by Transmission Electron Microscopy
(EPA-600/4-83-043)

EMS No.	25015	Client	SCHAFER & ASSOC.
Sample No.	SW-0-4		
Date	7/15/92		

Total Asbestos Fibers	63	MFL
Chrysotile Fibers	*BDL	MFL
Amphibole Fibers	63	MFL
> 5 Micron length (chrysotile)	*BDL	MFL
> 5 Micron length (amphibole)	18	MFL
Mass (Chrysotile)	*BDL	µg/L
Mass (amphibole)	280	µg/L
More/Less than 5 Chrysotile Fibers in Sample	LESS	
More/Less than 5 Amphibole Fibers in Sample	MORE	
Poisson 95% Confidence Interval	51 to 76	MFL
Detection Limit	0.6	MFL

* BDL : Below Detection Limit; MFL: Million Fibers per Liter

Size Distribution (Chrysotile and Amphibole)

Particle Length - Microns

O -0.49	0.50 - 0.99	1.00 - 1.49	1.50 - 1.99	2.00 - 2.49	2.5 & UP
0	6	12	16	13	53

Particle Width - Microns

O - .04	.05 - .09	.1 - .14	.15 - .19	.2 - .24	.25 & UP
0	8	22	13	9	48

Aspect Ratio L/W

0 - 9.9	10 - 19.9	20 - 29.9	30 - 39.9	40 - 49.9	50 & UP
36	34	14	4	3	9

TEM ASBESTOS ANALYSIS

EMS Lab No. 25015
Client Schafer
Sample No. SW-0-4

RECEIVING

METHOD OF ANALYSIS: EPA Yamate Level I ☐ Level II ☑ Level III ☐ AHERA ☐

LENGTHS: All Sizes (EPA) ☐ (µm): ≥0.5 ☑ ≥1.0 ☐ ≥5.0 ☐ ≥10.0 ☐ PCM Range* ☐ (*≥0.25 µm width, ≥5.0 µm length)

ASPECT RATIO 3:1 ☑ 5:1 ☐

Approved By D Roth Date 7-12

FILTER TYPE/AREA (mm²): MCE/385 ☐ MCN/960 ☐ MCE/960 ☐ 1d7 Other ☑

TYPE OF SAMPLE: Air ☐ Water ☑ Soil ☐ Wipe ☐ Bulk ☐ Other ☐ Dust/Microvac ☐

PORE SIZE: 0.45 µm ☐ 0.8 µm ☐ .1 µm ☑ .22 µm ☐ Other ☐

G.O. Area (mm²) 0.0 065
No. of G.O. to Analyze 20
Filter Lot No.

PREP

DIRECT PREP ☑ INDIRECT PREP ☐

Volume ____ liters
Working Volume 25 ml
Weight ____ grams
Ashed Area ____ %

Prepared By FG

ANALYSIS

GRID: 1 ☑ 2 ☐ 3 ☐ 4 ☐

MICROSCOPE: 600A ☐ 600B ☑ HU11E ☐ HU125E ☐

Grid Address 1-A
Screen Magnification 19,100 x
Camera Constant 28.5
Accelerating Voltage 100 KV
Beam Current 10 µa

Analyst F.M. Date 7-12-92

A

Grid opening	Str #	Str	Dimensions (mm) Width	Length	NAM	TM	CM	CD	CO	CMO	CDO	UF	AD	AX	ADX	AQ	ADQ	AZQ	AZZ	Na	Mg	Si	Ca	Fe	Id	Comments
1	01	F	2	17												✓					2	10	2	1		EDS-Actinolite
	02	F	6	42												✓					3	10	2	1		EDS "
	03	F	5	44												✓					3	10	2	1		EDS "
	04	F	2	10												✓					3	10	2	1		EDS "
	05	F/D	5	45												✓					3	10	3	1		EDS "
	06	F	12	150												✓					2	10	1	2		EDS "
	07	F	3	35												✓										"
	08	F	3	57	✓																					"
	09	F	12	300												✓					3	10	1	2		EDS "
	10	F	1	22												✓										"
	11	F	2	50												✓										"
	12	F	4	52												✓										"
	13	F/D	5	75												✓					3	10	2	1		EDS, Photo # 4238
	14	F	4	110												✓										"
2	15	F	3	130												✓										"
	16	F	5	125												✓										"
	17	F	5	65												✓										"
	18	F	30	910												✓					3	10	2	1		EDS "
	19	F	2	45												✓										"
	20	F	2	220												✓										"
	21	F	2	32												✓										"
	22	F	2	140												✓										"
	23	F	10	90												✓					3	10	2	1		EDS
	24	F	5	370												✓										"

OBSERVATIONS:

Clean ☐
Debris: ☑ Very Light ☐ Light ☐ Moderate ☑ Heavy ☐ Very Heavy ☐
Gypsum: ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐
Other ☐

GM ASBESTOS ANALYSIS
IS Lab No. 25015

nple No. SW-0-4

Page 2

MICROSCOPE
600A ☐
600B ☐
HU11E ☐
HU125E ☐

A

ANALYSIS

GRID
1 ☐ 3 ☐
2 ☐ 4 ☐

Grid Address
Screen Magnification
Camera Constant
Accelerating Voltage 100 KV
Beam Current μa

Analyst

Date

Grid opening	Str #	Str	Dimensions (mm) Width	Length	NAM	TM	CM	CD	CO	CMO	CDO	LF	AD	AX	ADX	AO	ADO	AZO	AZZ	Na	Mg	Si	Ca	Fe	Id	Comments
2	25	F/D	2	34												✓										Tremolite-Actinolite
	26	F	1.5	15												✓										
	27	F/D	4	100												✓										
	28	F	5	110												✓										
	29	F/D	3	25												✓										
	30	F	2.5	30												✓					3	10	3	1		EDS
	31	F	1.5	24												✓										
3	32	F	3.5	23												✓										
	33	F	4	30												✓										
	34	F	1.5	42												✓										
	35	F	5	60												✓										
	36	F	1.5	13												✓										
	37	F/D	3	50												✓										
	38	F	7	58												✓					2	10	1	2		EDS
	39	F	2	20												✓										
	40	F	3	40												✓										
4	41	F	11	70												✓					3	10	2	1		EDS
	42	F	5	70												✓										
	43	F	3	20												✓										
	44	F	2	30												✓										
	45	F/D	5	83												✓										
	46	F	2.5	30												✓										
	47	F	8	52												✓										
	48	F	10	100												✓					2	10	1	1		EDS

OBSERVATIONS:

Clean ☐
Debris: ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐
Gypsum: ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐

EM ASBESTOS ANALYSIS

MS Lab No. 25015

mple No. SK-0-4

Page 3 of

MICROSCOPE
600A ☐
600B ☐
HU11E ☐
HU125E ☐

ANALYSIS

GRID
1 ☐ 3 ☐
2 ☐ 4 ☐

Grid Address _____
Screen Magnification _____ x
Camera Constant _____
Accelerating Voltage 100 KV
Beam Current _____ µa

Analyst _____ Date _____

Grid opening	Str #	Str	Dimensions (mm) Width	Length	Fiber Classification NAM	TM	CM	CD	CO	CMO	CDO	UF	AD	AX	ADX	AO	ADO	AZO	AZZ	EDS Analysis Na	Mg	Si	Ca	Fe	Id	Comments
4	49	F	5	90												✓										
	50	F	7	40												✓										
	51	F	5	140												✓										

OBSERVATIONS:

Clean ☐
Debris: ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐
Gypsum: ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐
Oil: ☐

12-Jul-1992 07:59:07

25015.4.A.401.FM Preset= 100 secs
Vert= 300 counts Disp= 1 Elapsed= 31 secs

Energy	Counts	X-Ray Lines
1.25	1786.	Mg K , Mg K , Mg K , As L , [illegible]
1.74	7200.	Si K , Si K
3.29	166.	K K , K K
3.70	1703.	Ca K , Ca K
3.94	184.	Ca K , Ca K
5.91	156.	Mn K , Mn K
6.40	911.	Fe K , Fe K
Quantex)	121.	Fe K , Fe K

0.000 Range= 10.230 keV 10.110
Integral 8 = 1083

12-Jul-1992 08:00:27

25015.4.A.402.FM Preset= 100 secs
Vert= 300 counts Disp= 1 Elapsed= 30 secs

Energy	Counts	X-Ray Lines
1.25	1821.	Mg K , Mg K , Mg K , As L , [illegible]
1.74	8745.	Si K , Si K
3.31	268.	K K , K K
3.69	1075.	Ca K , Ca K
4.03	129.	Ca K , Ca K
5.90	111.	Mn K , Mn K
6.41	754.	Fe K , Fe K
Quantex)	117.	Fe K , Fe K

0.000 Range= 10.230 keV 10.110
Integral 8 = 918

12-Jul-1992 08:01:31

25015.4.A.#03.FM Preset= 100 secs
Vert= 500 counts Disc= 1 Elapsed= 30 secs

Energy	Counts	X-Ray Lines
1.25	993.	Mg K , Mg K , Mg K , As L , As L
1.74	3700.	Si K , Si K
3.69	613.	Ca K , Ca K
4.02	110.	Ca K , Ca K
5.93	61.	Mn K
6.41	466.	Fe K , Fe K
7.05	100.	Fe K , Fe K

Quantex>
0.000 Range= 10.230 keV 10.110
Integral 8 = 594

12-Jul-1992 08:03:31

25015.4.A.#04.FM Preset= 100 secs
Vert= 500 counts Disc= 1 Elapsed= 32 secs

Energy	Counts	X-Ray Lines
1.23	365.	Mg K , Mg K , Mg K , As L , As L
1.73	1271.	Si K , Si K
3.69	293.	Ca K , Ca K
6.40	150.	Fe K , Fe K

Quantex>
0.000 Range= 10.230 keV 10.110
Integral 8 = 197

12-Jul-1992 08:09:21

25015,4,A,#05,FM Preset= 100 secs
Vert= 500 counts Disp= 1 Elapsed= 27 secs

Energy	Counts	X-Ray Lines
1.25	1871.	Mg K , Mg K , Mg K , As L , As L
1.74	6546.	Si K , Si K
3.69	2093.	Ca K , Ca K
4.02	190.	Ca K , Ca K
5.89	148.	Mn K , Mn K
6.40	528.	Fe K , Fe K
7.04	79.	Fe K , Fe K

Quantex)
0.000 Range= 10.230 keV 10.110
Integral 8 = 1066

12-Jul-1992 08:13:11 25015,4,A,#06,FM

ENERGY	COUNTS	X-RAY LINES
1.00	194.	Na KA1, Na KA2, Zn LA1, Zn LA2, Zn LB1, Zn LB1
1.25	3306.	Mg KA1, Mg KA2, Mg KB1, As LA1, As LA2
1.74	15958.	Si KA1, Si KA2
3.31	411.	K KA1, K KA2
3.70	965.	Ca KA1, Ca KA2
4.04	76.	Sc KA2, Ca KB1, Ca KB3
4.49	207.	Ti KA1, Ti KA2, Sc KB1, Sc KB3
4.95	74.	V KA1, V KA2, Ti KB1, Ti KB3
5.89	240.	Mn KA1, Mn KA2
6.40	3683.	Fe KA1, Fe KA2
7.07	401.	Fe KB1, Fe KB3

12-Jul-1992 08:23:03

25015,4,A,#06,FM Preset= 100 secs
Vert= 300 counts Disp= 1 Elapsed= 40 secs

Energy	Counts	X-Ray Lines
1.25	1398.	Mg K , Mg K , Mg K , As L , As L
1.74	6142.	Si K , Si K
3.31	184.	K K , K K
3.69	757.	Ca K , Ca K
5.88	130.	Mn K , Mn K
6.40	1160.	Fe K , Fe K
7.07	196.	Fe K , Fe K

Quantex)
0.000 Range= 10.230 keV 10.110
Integral 6 = 606

12-Jul-1992 08:36:16

25015,4,A,#13,FM Preset= 100 secs
Vert= 500 counts Disp= 1 Elapsed= 31 secs

Energy	Counts	X-Ray Lines
1.25	1502.	Mg K , Mg K , Mg K , As L , As L
1.74	5596.	Si K , Si K
3.32	151.	K K , K K
3.70	1145.	Ca K , Ca K
4.02	105.	Ca K , Ca K
5.88	110.	Mn K , Mn K
6.40	714.	Fe K , Fe K
Quantex)	105.	Fe K , Fe K

0.000 Range= 10.220 keV 10.110

Integral 8 = 814

12-Jul-1992 08:53:05 25015,4,A,#18,FM

ENERGY	COUNTS	X-RAY LINES
1.25	4617.	Mg KA1, Mg KA2, Mg KB1, As LA1, As LA2
1.74	16345.	Si KA1, Si KA2
2.62	85.	Cl KA1, Cl KA2
3.32	505.	K KA1, K KA2
3.69	3584.	Ca KA1, Ca KA2
4.02	397.	Ca KB1, Ca KB3
5.90	269.	Mn KA1, Mn KA2
6.40	2280.	Fe KA1, Fe KA2
7.05	283.	Fe KB1, Fe KB3

12-Jul-1992 09:01:58

25015,4,A,#23,FM Preset= 100 secs
Vert= 500 counts Disp= 1 Elapsed= 33 secs

Energy	Counts	X-Ray Lines
1.25	1014.	Mg K , Mg K , Mg K , As L , As L
1.73	3447.	Si K , Si K
3.69	759.	Ca K , Ca K
4.02	108.	Ca K , Ca K
6.38	326.	Fe K , Fe K

Quantex)
0.000 Range= 10.230 keV 10.110
Integral 8 = 508

12-Jul-1992 09:12:21

25015,4,A,#28,FM Preset= 100 secs
Vert= 500 counts Disp= 1 Elapsed= 32 secs

Energy	Counts	X-Ray Lines
1.24	1907.	Mg K , Mg K , As L , As L
1.74	5958.	Si K , Si K
3.29	105.	K K , K K
3.69	1922.	Ca K , Ca K
4.01	213.	Ca K , Ca K
5.90	100.	Mn K , Mn K
6.41	368.	Fe K , Fe K

Quantex>
0.000 Range= 10.230 keV 10.110
Integral 3 = 940

12-Jul-1992 09:41:20

25015.4.A,#38,FM Preset= 100 secs
Vert= 300 counts Disp= 1 Elapsed= 33 secs

Energy	Counts	X-Ray Lines
1.25	1023.	Mg K , Mg K , Mg K , As L , As L
1.74	4872.	Si K , Si K
3.30	198.	K K , K K
3.70	643.	Ca K , Ca K
6.39	795.	Fe K , Fe K
7.04	101.	Fe K , Fe K

Quantex>
0.000 Range= 10.230 keV 10.110
Integral 8 = 701

12-Jul-1992 09:45:12

25015.4,A,#41,FM Preset= 100 secs
Vert= 500 counts Disp= 1 Elapsed= 36 secs

Energy	Counts	X-Ray Lines
1.25	2030.	Mg K , Mg K , Mg K , As L , As L
1.73	7836.	Si K , Si K
3.31	284.	K K , K K
3.69	1405.	Ca K , Ca K
4.05	157.	Sc K , Sc K , Ca K , Ca K
5.90	104.	Mn K , Mn K
6.40	953.	Fe K , Fe K
Quantex>	143.	Fe K , Fe K

0.000 Range= 10.230 keV 10.110
Integral 8 = 1170

12-Jul-1992 09:54:25

25015.4,A,#48,FM Preset= 100 secs
Vert= 1000 counts Disp= 1 Elapsed= 40 secs

Energy	Counts	X-Ray Lines
1.25	2819.	Mg K , Mg K , Mg K . As L , As L
1.74	11830.	Si K , Si K
3.33	541.	K K , K K
3.69	1229.	Ca K , Ca K
4.04	135.	Sc K , Ca K , Ca K
4.52	102.	Ti K , Ti K
6.40	1232.	Fe K , Fe K
Quantex>	180.	Fe K , Fe K

0.000 Range= 10.230 keV 10.110
Integral 8 = 2010

EM ASBESTOS ANALYSIS

MS Lab No. 25015

mple No. SW-04

ANALYSIS

GRID
1 [1] 3 [ ]
2 [X] 4 [ ]

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MICROSCOPE
600A [X]
600B [ ]
HU11E [ ]
HU125E [ ]

Grid Address 1-B
Screen Magnification 19,300 x
Camera Constant 30.3
Accelerating Voltage 100 KV
Beam Current 10 µa

B

Analyst NM Date 7/12/92

Grid opening	Str #	Str	Dimensions (mm) Width	Length	NAM	TM	CM	CD	CO	CMO	CDO	UF	AD	AX	ADX	AO	ADO	AZO	AZZ	Na	Mg	Si	Ca	Fe	Id	Comments
1	1	F	2	300												✓	✓				3	10	2			EDS-1 (Tremolite)
	2	F	2.5	16	✓																					
	3	F	9	155		✓										✓	✓				3	10	1	1		EDS-3 (tremolite)
	4	F	4	25	✓																					EDS-4
	5	F	12	85												✓	✓				3	10	2	1		EDS-5 (tremolite)
2	6	F	8	280												✓	✓				3	10	2	1		EDS-6 (Tremolite)
	7	F	3	25		✓										✓	✓				3	10	1	1		EDS-7 (Tremolite)
	8	F	2	20	✓																					
	9	F	3	110												✓	✓				4	10	2	1		EDS-9 (Tremolite)
	10	F	5	270									✓													Tremolite
	11	F	2	30		✓							✓													Tremolite
	12	F	1	24	✓																					
	13	F	2	55									✓													Tremolite
	14	F	3	50												✓	✓				3	10	2	1		EDS-14 (Tremolite)
	15	F	5	85												✓	✓				3	10	2	1		EDS-15 (Tremolite)
	16	F	20	200												✓	✓				3	10	2	1		EDS-16 (Tremolite)
	17	F	7	150										✓												Trem.
	18	F	15	95										✓												Trem.
3	19	F	1	12	✓																					
	20	F	5	38										✓												Trem.
	21	F	2	25	✓																					
	22	F	1.5	20	✓																					
	23	F	5	140									✓													Trem.
	24	F	1	270												✓	✓				2	10	2	2		EDS-24 (Trem.)

OBSERVATIONS:

Clean [ ]

Debris: [X] Very Light [ ] Light [ ] Moderate [X] Heavy [ ] Very Heavy [ ]

Gypsum: [ ] Very Light [ ] Light [ ] Moderate [ ] Heavy [ ] Very Heavy [ ]

EM ASBESTOS ANALYSIS

MS Lab No. 25015

mple No. SW-04

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MICROSCOPE
600A [X]
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ANALYSIS

GRID
1 [1] 3 [ ]
2 [X] 4 [ ]

Grid Address 1-B
Screen Magnification 19,300 x
Camera Constant 30.3
Accelerating Voltage 900 KV
Beam Current 10 pa

B

Analyst NM Date 7/12/92

Grid opening	Str #	Str	Dimensions (mm) Width	Length	NAM	TM	CM	CD	CO	CMO	CDO	UF	AD	AX	ADX	AQ	ADQ	AZQ	AZZ	Na	Mg	Si	Ca	Fe	Id	Comments
Cont-3	25	F	3	60												✓	✓				2	10	1	2		EDS-25 (Trem.)
	26	F	5	34									✓													Trem.
4	27	F	6	97									✓													SAED # 4238 (Trem.)
	28	F	1	16	✓																					
	29	F	2	20									✓													Trem.
	30	F	25	34									✓													Trem.
	31	F	1	44									✓													Trem.
	32	F	2	29									✓													Trem.
	33	F	10	110									✓													Trem.
	34	F	14	180X									✓													Trem.
5	35	F	2	200X												✓	✓				3	10	3	1		EDS-35 (Trem.)
	36	F	2	32									✓													Trem.
	37	F	1	20	✓																					
	38	F	1	70									✓													Trem.
	39	F	6	60X									✓													Trem.
	40	F	5	34									✓													Trem.
	41	F	5	23									✓													Trem.
	42	F	3	58									✓													Trem.
	43	F	2	37									✓													Trem.
	44	F	5	40									✓													Trem.
	45	F	2	25	✓																					
	46	F	7	57												✓	✓				2	10	2	2		EDS-46 (Trem.)
	47	F	2	105									✓													Trem.
	48	F	5	41									✓													Trem.

OBSERVATIONS:

Clean [ ]
Debris: [ ] Very Light [ ] Light [ ] Moderate [ ] Heavy [ ] Very Heavy [ ]
Gypsum: [ ] Very Light [ ] Light [ ] Moderate [ ] Heavy [ ] Very Heavy [ ]

EM ASBESTOS ANALYSIS

MS Lab No. 25015

ample No. SW-04

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600A [X]
600B [ ]
HU11E [ ]
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ANALYSIS

GRID
1 [1] 3 [ ]
2 [X] 4 [ ]

Grid Address 1-B
Screen Magnification 19,200 x
Camera Constant 30.3
Accelerating Voltage 100 KV
Beam Current 10 pa

B

Analyst NM Date 7/12/92

Grid opening	Str #	Str	Dimensions (mm) Width	Length	Fiber Classification NAM	TM	CM	CD	CQ	CMQ	CDQ	UF	AD	AX	ADX	AQ	ADQ	AZQ	AZZ	EDS Analysis Na	Mg	Si	Ca	Fe	Id	Comments
Cont. 5	49	F	1	27	✓	✓																				
	50	F	1	18	✓	✓																				
	51	F	1	32	✓																					

OBSERVATIONS:

Clean [ ]
Debris: [ ] Very Light [ ] Light [ ] Moderate [ ] Heavy [ ] Very Heavy [ ]
Gypsum: [ ] Very Light [ ] Light [ ] Moderate [ ] Heavy [ ] Very Heavy [ ]

12-Jul-1992 16:49:30

25015,SW-0-4,B,01,NM Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 67 secs

Energy	Counts	X-Ray Lines
0.51	762.	O K , O K , V L , V L , V L , V L
1.25	537.	Mg K , Mg K , Mg K , As L , As L
1.73	1892.	Si K , Si K
3.69	454.	Ca K , Ca K

Quantex>
0.000 Range= 10.230 keV 10.110
Integral 0 = 12069

12-Jul-1992 16:53:25

25015,SW-0-4,B,03,NM Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 24 secs

Energy	Counts	X-Ray Lines
0.51	946.	O K , O K , V L , V L , V L , V L
1.01	73.	Na K , Na K , Zn L , Zn L , Zn L , Zn L
1.25	555.	Mg K , Mg K , Mg K , As L , As L
1.73	2298.	Si K , Si K
3.32	77.	K K , K K
3.69	312.	Ca K , Ca K
Quantex>	258.	Fe K , Fe K

0.000 Range= 10.230 keV 10.110
Integral 0 = 11086

12-Jul-1992 16:56:48

25015,SW-0-4,B,04,NM Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 35 secs

Energy	Counts	X-Ray Lines
0.51	376.	O K , O K , V L , V L , V L , V L
1.47	332.	Al K , Al K
1.74	606.	Si K , Si K
3.31	215.	K K , K K

Quantex)

0.000 Range= 10.230 keV 10.110

Integral 0 = 4904

12-Jul-1992 17:00:42

25015,SW-0-4,B,05,NM Preset= 100 secs

Vert= 200 counts Disp= 1 Elapsed= 23 secs

Energy	Counts	X-Ray Lines
0.51	1325.	O K , O K , V L , V L , V L , V L
1.25	1045.	Mg K , Mg K , Mg K , As L , As L
1.74	3408.	Si K , Si K
3.31	100.	K K , K K
3.70	739.	Ca K , Ca K
4.03	76.	Ca K , Ca K
6.40	295.	Fe K , Fe K

Quantex)

0.000 Range= 10.230 keV 10.110

Integral 0 = 5367

12-Jul-1992 17:17:33

25015,SW-0-4,B,06,NM Preset= 100 secs

Vert= 200 counts Disp= 1 Elapsed= 26 secs

Energy	Counts	X-Ray Lines
0.51	484.	O K , O K , V L , V L , V L , V L
1.25	384.	Mg K , Mg K , Mg K , As L , As L
1.74	1119.	Si K , Si K
3.70	253.	Ca K , Ca K
6.42	128.	Fe K , Fe K

Quantex)

0.000 Range= 10.230 keV 10.110

Integral 0 = 6684

12-Jul-1992 17:20:30

25015.BW-0-4,B,07.NM Preset= 100 secs
Vert= 200 counts Disc= 1 Elapsed= 38 secs

Energy	Counts	X-Ray Lines
0.50	379.	O K , O K , V L , V L , V L , V L
1.25	570.	Mg K , Mg K , Mg K , As L , As L
1.74	1731.	Si K , Si K
3.70	253.	Ca K , Ca K
6.40	141.	Fe K , Fe K

Quantex>
0.000 Range= 10.230 keV 10.110
Integral = 77.5

12-Jul-1992 17:23:32

25015.BW-0-4,B,08.NM Preset= 100 secs
Vert= 200 counts Disc= 1 Elapsed= 43 secs

Energy	Counts	X-Ray Lines
0.51	438.	O K , O K , V L , V L , V L , V L
1.23	483.	Mg K , Mg K , Mg K , As L , As L
1.74	1216.	Si K , Si K
3.70	303.	Ca K , Ca K
6.41	130.	Fe K , Fe K

Quantex>

0.000 Range= 10.230 keV 10.110

Integral O = 9566

12-Jul-1992 17:35:53

25015,SW-O-4,B,14,NM Preset= 100 secs

Vert= 200 counts Disp= 1 Elapsed= 62 secs

Energy	Counts	X-Ray Lines
0.51	661.	O K , O K , V L , V L , V L , V L
1.24	352.	Mg K , Mg K , As L , As L
1.73	1797.	Si K , Si K
3.67	318.	Ca K , Ca K
6.40	174.	Fe K , Fe K

Quantex>

0.000 Range= 10.230 keV 10.110

Integral O = 10098

12-Jul-1992 17:36:41

25015,SW-O-4,B,15,NM Preset= 100 secs

Vert= 200 counts Disp= 1 Elapsed= 28 secs

Energy	Counts	X-Ray Lines
0.51	838.	O K , O K , V L , V L , V L , V L
1.25	765.	Mg K , Mg K , Mg K , As L , As L
1.74	2328.	Si K , Si K
3.29	81.	K K , K K
3.69	486.	Ca K , Ca K
6.39	207.	Fe K , Fe K

Quantex>

0.000 Range= 10.230 keV 10.110

Integral O = 11652

12-Jul-1992 17:41:22 25015,SW-0-4,8,16,NM

ENERGY	COUNTS	X-RAY LINES
0.51	1062.	O KA1, O KA2, V LA1, V LA2, V LB1, V LG1
1.01	70.	Na KA1, Na KA2, Zn LA1, Zn LA2, Zn LB1, Zn LG1
1.25	802.	Mg KA1, Mg KA2, Mg KB1, As LA1, As LA2
1.74	2626.	Si KA1, Si KA2
2.64	38.	Cl KA1, Cl KA2
3.32	96.	K KA1, K KA2
3.70	406.	Ca KA1, Ca KA2
5.87	52.	Mn KA1, Mn KA2
6.41	517.	Fe KA1, Fe KA2
7.06	35.	Fe KB1, Fe KB3

13-Jul-1992 14:57:36

25015,0-4,B,#24,NM Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 47 secs

Energy	Counts	X-Ray Lines
1.24	368.	Mg K , Mg K , As L , As L
1.73	1660.	Si K , Si K
3.70	268.	Ca K , Ca K
6.38	337.	Fe K , Fe K

Quantex)
0.000 Range= 10.230 keV 10.110
Integral 8 = 220

13-Jul-1992 15:01:03 25015,0-4,B,#25,NM

ENERGY	COUNTS	X-RAY LINES
1.00	114.	Na KA1, Na KA2, Zn LA1, Zn LA2, Zn LB1, Zn LG1
1.26	1664.	Mg KA1, Mg KA2, Mg KB1, As LA1, As LA2
1.73	7101.	Si KA1, Si KA2
3.31	260.	K KA1, K KA2
3.69	1028.	Ca KA1, Ca KA2
5.87	95.	Mn KA1, Mn KA2
6.41	1384.	Fe KA1, Fe KA2
7.06	159.	Fe KB1, Fe KB3

13-Jul-1992 16:46:56

25015,0-4,B,#35,NM Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 41 secs

Energy	Counts	X-Ray Lines
1.25	806.	Mg K , Mg K , Mg K , As L , As L
1.73	2479.	Si K , Si K
3.69	746.	Ca K , Ca K
6.40	136.	Fe K , Fe K

Quantex>
0.000 Range= 10.230 keV 10.110
Integral 8 = 384

13-Jul-1992 16:56:01

25015.0-4.B.#46.NM Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 28 secs

Energy	Counts	X-Ray Lines
1.25	457.	Mg K , Mg K , Mg K , As L , As L
1.74	2168.	Si K , Si K
3.70	233.	Ca K , Ca K
5.87	75.	Mn K , Mn K
6.41	381.	Fe K , Fe K

EPA ASBESTOS ANALYSIS

MS Lab No. 25015

mple No. SW-0-4

Page 01

MICROSCOPE
600A [X]
600B [ ]
HU11E [ ]
HU125E [ ]

GRID
1 [ ] 3 [X]
2 [ ] 4 [ ]

Grid Address 1-C
Screen Magnification 1430x
Camera Constant 30.3
Accelerating Voltage 100 KV
Beam Current _____ µa

C

Analyst Radla Date 7/15

Grid opening	Str #	Str	Dimensions (mm) Width	Length	NAM	TM	CM	CD	CO	CMO	CDO	UF	AD	AX	ADX	AO	ADO	AZO	AZZ	Na	Mg	Si	Ca	Fe	Id	Comments
0	1	F	4	182	✓																					EDS
	2	F	4	30												✓					3	10	1	1		EDS Tremolite
	3	F	4	285												✓					4	10	3	1		EDS Tremolite
	4	F	3	45												✓					3	10	2	1		EDS Tremolite
	5	F	11	80												✓					3	10	3	1		EDS Tremolite
	6	F	6	44												✓										Confirmed by EDS ✓
	7	F	4	15	✓																					
	8	F	8	16	✓																					
	9	F	4	120												✓										Tremo
	10	F	3	22												✓										Tremolite
	11	F	5	45												✓										Tremolite
	12	F	4	22												✓										Tremolite
	13	F	4	12												✓										Tremolite
	14	F	4	16												✓										Tremolite
	15	F	4	25												✓										Tremolite

OBSERVATIONS:

Clean [ ]

Debris: [ ]	Very Light [ ]	Light [ ]	Moderate [X]	Heavy [ ]	Very Heavy [ ]
Gypsum: [ ]	Very Light [ ]	Light [ ]	Moderate [ ]	Heavy [ ]	Very Heavy [ ]

15-Jul-1992 13:19:26

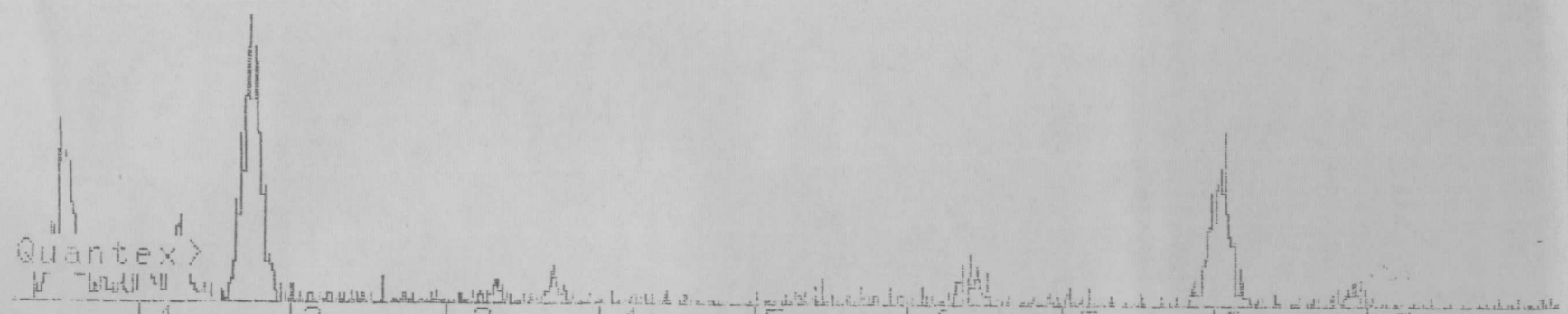
25015-0-4,C,#01,RS

Vert= 200 counts Disp= 1

Preset= 100 secs

Elapsed= 52 secs

Energy	Counts	X-Ray Lines
0.51	286.	O $K\alpha_1$, O $K\alpha_2$, V $L\alpha_1$, V $L\alpha_2$, V $L\beta_1$, V $L\gamma_1$
1.25	128.	Mg $K\alpha_1$, Mg $K\alpha_2$, Mg $K\beta_1$, As $L\alpha_1$, As $L\alpha_2$
1.74	568.	Si $K\alpha_1$, Si $K\alpha_2$



0.160 Range= 10.230 keV 10.230

Integral 0 = 3402

15-Jul-1992 13:22:36

25015-0-4,C,#02,RS Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 26 secs

Energy	Counts	X-Ray Lines
0.51	345.	O K , O K , V L , V L , V L , V L
1.25	234.	Mg K , Mg K , Mg K , As L , As L
1.74	868.	Si K , Si K
3.69	86.	Ca K , Ca K
6.42	127.	Fe K , Fe K

Quantex)
0.160 Range= 10.230 keV 10.230
Integral O = 4304

15-Jul-1992 13:24:15

25015-0-4,C,#03,RS Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 25 secs

Energy	Counts	X-Ray Lines
0.51	527.	O K , O K , V L , V L , V L , V L
1.26	365.	Mg K , Mg K , Mg K , As L , As L
1.74	981.	Si K , Si K
3.70	283.	Ca K , Ca K
6.37	71.	Fe K , Fe K

Quantex)
0.160 Range= 10.230 keV 10.230
Integral O = 4228

15-Jul-1992 13:26:59

25015-0-4,C,#04,RS Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 26 secs

Energy	Counts	X-Ray Lines
0.52	439.	O K , O K , V L , V L , V L , V L
1.26	263.	Mg K , Mg K , Mg K , As L , As L
1.74	840.	Si K , Si K
3.69	202.	Ca K , Ca K
6.42	84.	Fe K , Fe K

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 3670

15-Jul-1992 13:27:39

25015-0-4,C,#05,RS Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 23 secs

Energy	Counts	X-Ray Lines
0.51	435.	O K , O K , V L , V L , V L , V L
1.25	306.	Mg K , Mg K , Mg K , As L , As L
1.74	1000.	Si K , Si K
3.69	296.	Ca K , Ca K
6.39	98.	Fe K , Fe K

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 3868

15-Jul-1992 13:30:32

25015-0-4,C,#07,RS Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 30 secs

Energy	Counts	X-Ray Lines
0.52	383.	O K , O K , V L , V L , V L , V L
1.21	40.	Mg K , Mg K , Ge L , Ge L , Ge L , Ge L
1.47	365.	Al K , Al K
1.73	596.	Si K , Si K
3.70	424.	Ca K , Ca K
6.38	40.	Fe K , Fe K

Quantex)
0.160 Range= 10.230 keV 10.230
Integral 0 = 7132

TABLE 3. CLASSIFICATION OF FIBERS WITH TUBULAR MORPHOLOGY

TM	-	Tubular Morphology not sufficiently characteristic for classification as chrysotile
CM	-	Characteristic Chrysotile Morphology
CD	-	Chrysotile SAED pattern
CQ	-	Chrysotile composition by Quantitative EDXA
CMQ	-	Chrysotile Morphology and composition by Quantitative EDXA
CDQ	-	Chrysotile SAED pattern and composition by Quantitative EDXA
NAM	-	Non-Asbestos Mineral

TABLE 4. CLASSIFICATION OF FIBERS WITHOUT TUBULAR MORPHOLOGY

UF	-	Unidentified Fiber
AD	-	Amphibole by random orientation SAED (shows layer pattern of 0.53 nm spacing)
AX	-	Amphibole by qualitative EDXA. Spectrum has elemental components consistent with amphibole
ADX	-	Amphibole by random orientation SAED and Qualitative EDXA
AQ	-	Amphibole by Quantitative EDXA
AZ	-	Amphibole by one Zone Axis SAED
ADQ	-	Amphibole by random orientation SAED and Quantitative EDXA
AZQ	-	Amphibole by one Zone Axis SAED pattern and Quantitative EDXA
AZZ	-	Amphibole by two Zone Axis SAED patterns with consistent inter-axial angle
AZZQ	-	Amphibole by two Zone Axis SAED patterns, consistent inter-axial angle and Quantitative EDXA
NAM	-	Non-Asbestos Mineral

Analysis of Water by Transmission Electron Microscopy
(EPA-600/4-83-043)

EMS No.	25015	Client	SCHAFER & ASSOC.
Sample No.	SW-2-4		
Date	7/15/92		

Total Asbestos Fibers	36	MFL
Chrysotile Fibers	*BDL	MFL
Amphibole Fibers	36	MFL
> 5 Micron length (chrysotile)	*BDL	MFL
> 5 Micron length (amphibole)	9.4	MFL
Mass (Chrysotile)	*BDL	µg/L
Mass (amphibole)	52	µg/L
More/Less than 5 Chrysotile Fibers in Sample	LESS	
More/Less than 5 Amphibole Fibers in Sample	MORE	
Poisson 95% Confidence Interval	29 to 45	MFL
Detection Limit	0.4	MFL

* BDL : Below Detection Limit; MFL: Million Fibers per Liter

Size Distribution (Chrysotile and Amphibole)

Particle Length - Microns

O -0.49	0.50 - 0.99	1.00 - 1.49	1.50 - 1.99	2.00 - 2.49	2.5 & UP
0	11	12	6	11	53

Particle Width - Microns

O - .04	.05 - .09	.1 - .14	.15 - .19	.2 - .24	.25 & UP
0	3	11	20	10	49

Aspect Ratio L/W

0 - 9.9	10 - 19.9	20 - 29.9	30 - 39.9	40 - 49.9	50 & UP
42	26	12	2	4	7

EM ASBESTOS ANALYSIS

EMS Lab No. 25015
Client Schafer
Sample No. SW-2-4

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RECEIVING

METHOD OF ANALYSIS: EPA Yamate Level I ☐ Level II ☑ Level III ☐ AHERA ☐

LENGTHS: All Sizes (EPA) ☐ (µm): ≥0.5 ☑ ≥1.0 ☐ ≥5.0 ☐ ≥10.0 ☐ PCM Range* ☐ (*≥0.25 µm width, ≥5.0 µm length)

ASPECT RATIO 3:1 ☑ 5:1 ☐

Approved By B. Volk Date 7-12

PREP

FILTER TYPE/AREA (mm²): MCE/385 ☐ MCN/960 ☐ MCE/960 ☐ 10/7 Other ☑

TYPE OF SAMPLE: Air ☐ Water ☑ Soil ☐ Wipe ☐ Bulk ☐ Other ☐ Dust/Microvac ☐

PORE SIZE: 0.45 µm ☐ 0.8 µm ☐ .1 µm ☑ .22 µm ☐ Other ☐

G.O. Area (mm²) 0.0065
No. of G.O. to Analyze 20
Filter Lot No.

DIRECT PREP ☑ INDIRECT PREP ☐

Volume ____ liters
Working Volume 50 ml
Weight ____ grams
Ashed Area ____ %

Prepared By FG

ANALYSIS

GRID: 1 ☑ 2 ☐ 3 ☐ 4 ☐

MICROSCOPE: 600A ☐ 600B ☑ HU11E ☐ HU125E ☐

Grid Address 1-A
Screen Magnification 19,100 x
Camera Constant 285
Accelerating Voltage 100 KV
Beam Current 10 µa

Analyst F.M. Date 7-12-92

A

Grid opening	Str #	Str	Dimensions (mm) Width	Length	NAM	TM	CM	CD	CQ	CMQ	CDQ	UF	AD	AX	ADX	AQ	ADQ	AZQ	AZZ	Na	Mg	Si	Ca	Fe	Id	Comments
1	01	F	6	160												✓					3	10	2	1		EDS Tremolite
	02	F	2	30	✓																					
	03	F	5	90												✓					2	10	1	2		EDS Tremolite
	04	F	2	38	✓																					
	05	F	3	30												✓					3	10	3	1		EDS Tremolite
	06	F	5	40												✓					3	10	2	2		EDS "
	07	F	5	140												✓					2	10	2	2		EDS "
	08	F	2.5	35												✓										"
	09	F	4	40												✓										"
	10	F	2	43												✓										"
	11	F	15	100												✓										"
	12	F/C	7	90												✓										"
	13	F	5	50												✓										"
2	14	F	10	300												✓										"
	15	F	12	95												✓										"
	16	F	2	110												✓										"
	17	F	4	140												✓					3					"
	18	F	3	80												✓					3	10	1	1		EDS Tremolite
	19	F	2.5	16	✓																					
	20	F	8	700												✓					3	10	2	1		EDS Tremolite
	21	F	4	25												✓										"
	22	F	2	90												✓										"
	23	F	2.5	1100												✓										"
	24	F	3	22												✓										"

OBSERVATIONS:

Clean ☐
Debris: ☑ Very Light ☐ Light ☑ Moderate ☑ Heavy ☐ Very Heavy ☐
Gypsum: ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐
Other ☐

...M ASBESTOS ANALYSIS
S Lab No. 25015
...ple No. SW-2-4

Page 2 of

MICROSCOPE
600A ☐
600B ☐
HU11E ☐
HU125E ☐

ANALYSIS

GRID
1 ☐ 3 ☐
2 ☐ 4 ☐

Grid Address _____
Screen Magnification _____ x
Camera Constant _____
Accelerating Voltage 100 KV
Beam Current _____ μa

A

Analyst _____ Date _____

Grid opening	Str #	Str	Dimensions (mm) Width	Length	Fiber Classification NAM	TM	CM	CD	CO	CMO	CDO	UF	AD	AX	ADX	AO	ADO	AZO	AZZ	EDS Analysis Na	Mg	Si	Ca	Fe	Id	Comments
2	25	F	2	20												✓										Tremolite
	26	F/D	8	120												✓										"
	27	F/D	6	100												✓										"
	28	F	3	17												✓										"
3	29	F/D	4	80												✓										"
	30	F/D	7	280												✓					3	10	3	1		EDS Tremolite
	31	F/D	5	50												✓										"
	32	F	4	25												✓										"
	33	F	8	90												✓					3	10	3	1		EDS "
	34	F	2	16												✓										"
	35	F	1.5	25												✓										"
4	36	F/D	2.5	70												✓										"
	37	F	7	38												✓										"
	38	F/D	1.5	90												✓										"
	39	F	1.5	200												✓										"
	40	F	10	65												✓										"
	41	F	5	25												✓										"
	42	F	5	53												✓										"
	43	F	6	100												✓					3	10	3	1		EDS Tremolite
	44	F	5	30												✓										"
	45	F	8	45												✓										"
	46	F	2	30												✓										"
	47	F	3	22												✓										"

OBSERVATIONS:

Clean ☐
Debris: ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐
Gypsum: ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐

12-Jul-1992 10:50:04

25015,2-4,A,01,FM Preset= 100 secs
Vert= 1000 counts Disp= 1 Elapsed= 40 secs

Energy	Counts	X-Ray Lines
1.25	2420.	Mg K , Mg K , Mg K , As L , As L
1.74	9546.	Si K , Si K
3.34	170.	K K , K K
3.69	1960.	Ca K , Ca K
4.03	250.	Ca K , Ca K
5.87	215.	Mn K , Mn K
6.40	1260.	Fe K , Fe K
Quantex>	173	Fe K , Fe K

0.000 Range= 10.230 keV 10.110
Integral 8 = 1398

12-Jul-1992 10:56:28

25015,2-4,A,03,FM Preset= 100 secs
Vert= 1000 counts Disp= 1 Elapsed= 44 secs

Energy	Counts	X-Ray Lines
1.25	1228.	Mg K , Mg K , Mg K , As L , As L
1.74	5680.	Si K , Si K
3.32	138.	K K , K K
3.69	809.	Ca K , Ca K
6.40	1290.	Fe K , Fe K
7.05	155.	Fe K , Fe K

Quantex>

0.000 Range= 10.230 keV 10.110
Integral 8 = 859

12-Jul-1992 11:00:30

25015,2-4,A,05,FM Preset= 100 secs
Vert= 1000 counts Disp= 1 Elapsed= 37 secs

Energy	Counts	X-Ray Lines
1.25	1269.	Mg K , Mg K , Mg K , As L , As L
1.74	4916.	Si K , Si K
3.69	1633.	Ca K , Ca K
4.01	108.	Ca K , Ca K
6.40	588.	Fe K , Fe K

Quantex>
0.000 Range= 10.230 keV 10.110
Integral 8 = 770

12-Jul-1992 11:36:42 25015,2-4,A,06,FM

ENERGY	COUNTS	X-RAY LINES
0.95	65.	Cu LA1, Cu LA2, Cu LB1, Cu LG1
1.24	810.	Mg KA1, Mg KA2, As LA1, As LA2
1.74	3169.	Si KA1, Si KA2
2.30	300.	S KA1, S KA2
3.69	631.	Ca KA1, Ca KA2
4.04	92.	Sc KA2, Ca KB1, Ca KB3
5.89	115.	Mn KA1, Mn KA2
6.40	479.	Fe KA1, Fe KA2
8.04	2406.	Cu KA1, Cu KA2
8.91	302.	Cu KB1, Cu KB3

12-Jul-1992 11:43:09 25015,2-4,A,07,FM

ENERGY	COUNTS	X-RAY LINES
0.96	76.	Cu LA1, Cu LA2, Cu LB1, Cu LG1
1.25	923.	Mg KA1, Mg KA2, Mg KB1, As LA1, As LA2
1.74	3854.	Si KA1, Si KA2
3.32	116.	K KA1, K KA2
3.69	581.	Ca KA1, Ca KA2
5.90	82.	Mn KA1, Mn KA2
6.40	714.	Fe KA1, Fe KA2
7.06	143.	Fe KB1, Fe KB3
8.04	1762.	Cu KA1, Cu KA2
8.91	307.	Cu KB1, Cu KB3

12-Jul-1992 11:53:16

25015,2-4,A,18,FM Preset= 100 secs
Vert= 500 counts Disp= 1 Elapsed= 47 secs

Energy	Counts	X-Ray Lines
1.25	1466.	Mg K , Mg K , Mg K , As L , As L
1.74	5789.	Si K , Si K
3.31	360.	K K , K K
3.69	746.	Ca K , Ca K
6.39	690.	Fe K , Fe K
7.06	130.	Fe K , Fe K

Quantex)
0.000 Range= 10.230 keV 10.110
Integral 0 = 30452

12-Jul-1992 11:58:28

25015,2-4,A,20,FM Preset= 100 secs
Vert= 1000 counts Disp= 1 Elapsed= 36 secs

Energy	Counts	X-Ray Lines
1.25	3110.	Mg K , Mg K , Mg K , As L , As L
1.74	11901.	Si K , Si K
3.32	250.	K K , K K
3.69	2462.	Ca K , Ca K
4.04	235.	Sc K , Ca K , Ca K
5.89	191.	Mn K , Mn K
6.40	1222.	Fe K , Fe K
7.06	219.	Fe K , Fe K

Quantex)
0.000 Range= 10.230 keV 10.110
Integral 0 = 64185

12-Jul-1992 12:38:28

25015,2-4,A,30,FM Preset= 100 secs
Vert= 500 counts Disp= 1 Elapsed= 36 secs

Energy	Counts	X-Ray Lines
1.24	1822.	Mg K , Mg K , As L , As L
1.74	6029.	Si K , Si K
3.69	1681.	Ca K , Ca K
4.02	148.	Ca K , Ca K
5.88	89.	Mn K , Mn K
6.42	320.	Fe K , Fe K
8.04	2212.	Cu K , Cu K
Quantex)	350.	Cu K , Cu K

0.000 Range= 10.230 keV 10.110

Integral 0 = 31213

12-Jul-1992 12:40:58 25013,2-4,A,33,FM

ENERGY	COUNTS	X-RAY LINES
1.25	4637.	Mg KA1, Mg KA2, Mg KB1, As LA1, As LA2
1.74	16847.	Si KA1, Si KA2
2.30	108.	S KA1, S KA2
3.32	256.	K KA1, K KA2
3.70	4207.	Ca KA1, Ca KA2
4.02	459.	Ca KB1, Ca KB3
5.90	306.	Mn KA1, Mn KA2
6.40	1615.	Fe KA1, Fe KA2
7.05	238.	Fe KB1, Fe KB3
8.04	4352.	Cu KA1. Cu KA2
8.90	655.	Cu KB1, Cu KB3

12-Jul-1992 13:23:05

25015,2-4,A,43,FM Preset= 100 secs
Vert= 500 counts Disp= 1 Elapsed= 40 secs

Energy	Counts	X-Ray Lines
1.25	2442.	Mg K , Mg K , Mg K , As L , As L
1.74	8516.	Si K , Si K
3.69	2525.	Ca K , Ca K
4.03	276.	Ca K , Ca K
5.89	128.	Mn K , Mn K
6.40	998.	Fe K , Fe K
7.08	135.	Fe K , Fe K

Quantex>
0.000 Range= 10.230 keV 10.110
Integral 0 = 41642

EM ASBESTOS ANALYSIS

MS Lab No. 25015

mple No. SW-2-4

Page ___ of ___

MICROSCOPE
600A ☐
600B ☒
HU11E ☐
HU125E ☐

ANALYSIS

GRID
1 ☐ 3 ☐
2 ☒ 4 ☐

Grid Address 1-B
Screen Magnification 1930 x
Camera Constant 30.3
Accelerating Voltage 100 KV
Beam Current 10 μa

B

Analyst Radla Date 7/13/92

Grid opening	Str #	Str	Dimensions (mm) Width	Length	NAM	TM	CM	CD	CO	CMO	CDO	UF	AD	AX	ADX	AQ	ADQ	AZQ	AZZ	Na	Mg	Si	Ca	Fe	Id	Comments
1	1	F	4	64												✓					4	10	3	1		Tremolite
	2	F	6	22												✓					4	10	3	0		Tremolite
	3	F	6	50												✓					3	10	3	1		Tremolite
	4	F	4	20	✓																					
	5	F	6	25	✓																					
	6	F	2	55												✓										Tremolite
	7	MD	8	125												✓										Tremolite
	8	F	7	48	✓																					
	9	F	3	40	✓																					
	10	F	3	50												✓										Tremolite
	11	F	3	14												✓										Tremolite
	12	F	4	105												✓										Tremolite
	13	MD	12	52												✓										Tremolite
	14	F	3	15												✓										Tremolite
	15	F	3	55	✓																					
	16	F	3	25	✓																					
	17	F	3	35	✓																					
2	18	F	4	48												✓										Tremolite
	19	F	15	80												✓										Tremolite
	20	F	3	40												✓										Tremolite
	21	F	12	275												✓					4	10	3	2		Tremolite
	22	F	7	40												✓										Tremolite
	23	F	4	65												✓										Tremolite
	24	F	8	70	✓																					

OBSERVATIONS:

Clean ☐
Debris: ☐ Very Light ☐ Light ☐ Moderate ☒ Heavy ☐ Very Heavy ☐
Gypsum: ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐
[illegible] ☐ Each [illegible] Structure is checked by EDS

QM ASBESTOS ANALYSIS
IS Lab No. 25015

mple No. SW-2-4

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MICROSCOPE
600A ☐
600B ☐
HU11E ☐
HU125E ☐

ANALYSIS

GRID
1 ☐ 3 ☐
2 ☐ 4 ☐

Grid Address _____
Screen Magnification _____ x
Camera Constant _____
Accelerating Voltage 200 KV
Beam Current _____ pa

B

Analyst Radha Date 7-13-92

Grid opening	Str #	Str	Dimensions (mm) Width	Length	Fiber Classification NAM	TM	CM	CD	CO	CMO	CDO	UF	AD	AX	ADX	AO	ADO	AZO	AZZ	EDS Analysis Na	Mg	Si	Ca	Fe	Id	Comments
2	25	F	3	18												✓										Tremolite
	26	F	15	55												✓										Tremolite
	27	F	12	100												✓										Tremolite
	28	F	15	95												✓										Tremolite
	29	F	4	22	✓																					
3	30	F	5	18	✓																					
	31	F	6	25												✓										Tremolite
	32	F	5	18												✓										Tremolite
	33	F	3	15												✓										Tremolite
	34	F	8	25												✓										Tremolite
	35	F	3	15												✓										Tremolite
	36	F	12	25	✓																					
	37	F	3	170												✓										Tremolite
	38	MF	8	25												✓										Tremolite
	37	MF	8	42												✓										Tremolite
	38	F	5	110												✓										Tremolite
	39	F	9	130												✓										Tremolite
	40	F	3	40												✓										Tremolite
	41	F	3	22												✓										Tremolite
	42	F/MF	18	75	✓																					
	43	F	3	80												✓										Tremolite
	44	F	5	40												✓										Tremolite
	45	F	5	220												✓										Tremolite
	46	F	3	18												✓										Tremolite

OBSERVATIONS:

Clean ☐
Debris: ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐
Gypsum: ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐

EPA ASBESTOS ANALYSIS

IS Lab No. 25015

mple No. SW-2-4

ANALYSIS

GRID
1 ☐ 3 ☐
2 ☐ 4 ☐

MICROSCOPE
600A ☐
600B ☐
IRUIIE ☐
IRUI2SE ☐

Grid Address _____
Screen Magnification _____ x
Camera Constant _____
Accelerating Voltage 100 KV
Beam Current _____ pa

B

Analyst Radha Date 7-13-92

Grid opening	Str #	Str	Dimensions (mm) Width	Length	NAM	TM	CM	CD	CO	CMO	CDO	UF	AD	AX	ADX	AO	ADO	AZO	AZZ	Na	Mg	Si	Ca	Fe	Id	Comments
3	47	F	5	225												✓										Tremolite
	48	F	3	15												✓										Tremolite
	49	F	5	15												✓										Tremolite
	50	F	8	60												✓	✓				3	10	2	2		Tremolite
																										Tremolite

OBSERVATIONS:

Clean ☐
Debris: ☐ Very Light ☐ Light ☑ Moderate ☑ Heavy ☐ Very Heavy ☐
Gypsum: ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐

13-Jul-1992 07:42:54

25015,2-4,B,#01,RS Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 44 secs

Energy	Counts	X-Ray Lines
0.51	718.	O K , O K , V L , V L , V L , V L
1.25	565.	Mg K , Mg K , Mg K , As L , As L
1.74	1436.	Si K , Si K
3.69	431.	Ca K , Ca K
6.40	121.	Fe K , Fe K

Quantex>
0.000 Range= 10.230 keV 10.110
Integral 8 = 268

13-Jul-1992 07:44:49 LN Testing

25015,2-4,B,#02,RS Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 34 secs

Energy	Counts	X-Ray Lines
0.50	568.	O K , O K , V L , V L , V L , V L
1.24	420.	Mg K , Mg K , As L , As L
1.73	1186.	Si K , Si K
3.70	333.	Ca K , Ca K

Quantex>
0.000 Range= 10.230 keV 10.110
Integral 8 = 245

13-Jul-1992 07:45:58

25015,2-4,B,#03,RS Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 25 secs

Energy	Counts	X-Ray Lines
0.51	375.	O K , O K , V L , V L , V L , V L
1.24	273.	Mg K , Mg K , As L , As L
1.73	787.	Si K , Si K
3.69	248.	Ca K , Ca K
6.40	74.	Fe K , Fe K

Quantex>
0.000 Range= 10.230 keV 10.110
Integral B = 183

13-Jul-1992 07:47:24

25015,2-4,B,#04,RS Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 22 secs

Energy	Counts	X-Ray Lines
0.51	114.	O K , O K , V L , V L , V L , V L
1.74	297.	Si K , Si K

Quantex>
0.000 Range= 10.230 keV 10.110
Integral B = 29

13-Jul-1992 07:46:34

25015,2-4,B,#05,RS Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 25 secs

Energy	Counts	X-Ray Lines
0.51	240.	O K , O K , V L , V L , V L , V L
1.47	193.	Al K , Al K
1.73	331.	Si K , Si K

Quantex>
0.000 Range= 10.230 keV 10.110
Integral 8 = 59

13-Jul-1992 08:36:50

25015,2-4,B,#21,RS Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 24 secs

Energy	Counts	X-Ray Lines
0.51	690.	O K , O K , V L , V L , V L , V L
1.25	531.	Mg K , Mg K , Mg K , As L , As L
1.74	1339.	Si K , Si K
3.68	343.	Ca K , Ca K
6.41	152.	Fe K , Fe K

Quantex>
0.000 Range= 10.230 keV 10.110
Integral 8 = 252

13-Jul-1992 08:50:25

25015,2-4,B,#50,RS Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 46 secs

Energy	Counts	X-Ray Lines
0.51	603.	O K , O K , V L , V L , V L , O V L
1.25	388.	Mg K , Mg K , Mg K , As L , As L
1.74	1321.	Si K , Si K
3.70	270.	Ca K , Ca K
6.40	229.	Fe K , Fe K

Quantex>
0.000 Range= 10.230 keV 10.110
Integral 8 = 231

EM ASBESTOS ANALYSIS

MS Lab No. 25015

mple No. SW-2 4

ANALYSIS

GRID 1 ☐ 2 ☐ 3 ☑ 4 ☐

Grid Address 1C

Screen Magnification 19100 x

Camera Constant 28.4

Accelerating Voltage 100 KV

Beam Current 10 pa

Analyst S. Ahmed

Date 7/15/92

MICROSCOPE 600A ☐ 600B ☑ HU11E ☐ HU12SE ☐

C

Grid opening	Str #	Str	Dimensions (mm) Width	Length	Fiber Classification NAM	TM	CM	CD	CO	CMO	CDO	UF	AD	AX	ADX	AO	ADO	AZO	AZZ	EDS Analysis Na	Mg	Si	Ca	Fe	Id	Comments
1	1	F	6	60									✓	✓	✓	✓					2	10	2	2		EDS #1 Tremolite
	2	F	4	85									✓	✓	✓	✓					3	10	3	3		EDS #2 "
	3	F	9	56									✓	✓	✓											
	4	F	5	32									✓	✓	✓											
	5	F	25	500	✓																8	10				EDS #3
	6	F	3	40									✓	✓		✓										
	7	F	12.5	110									✓	✓	✓	✓					3	10	3	1		EDS #4 Tremolite
	8	F	6	52									✓	✓	✓	✓										"
	9	MD	7	50									✓	✓	✓	✓										"
	10	F	2	165									✓	✓	✓	✓										"
	11	F	3	15	✓																					

OBSERVATIONS: Clean ☐ Debris ☐ Gypsum ☐ Very Light ☐ Very Light ☐ Light ☐ Light ☐ Moderate ☑ Moderate ☐ Heavy ☐ Heavy ☐ Very Heavy ☐ Very Heavy ☐

All amphiboles are Tremolite.

13-Jul-1992 13:33:50

25015-2-4,C,#01,SA Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 11 secs

Energy	Counts	X-Ray Lines
1.25	534.	Mg K , Mg K , Mg K , As L , As L
1.74	2180.	Si K , Si K
3.33	77.	K K , K K
3.67	239.	Ca K , Ca K
6.41	295.	Fe K , Fe K
7.05	67.	Fe K , Fe K

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = .9543

13-Jul-1992 13:35:42

25015-2-4,L,#02,SA Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 19 secs

Energy	Counts	X-Ray Lines
1.25	119.	Mg K , Mg K , Mg K , As L , As L
1.73	420.	Si K , Si K
3.71	101.	Ca K , Ca K
6.40	73.	Fe K , Fe K

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 4419

15-Jul-1992 13:41:52 25015-2-4,C,#03,SA

ENERGY	COUNTS	X-RAY LINES
0.53	14.	O KA1, O KA2, V LA1, Cr LA1, V LA2, Cr LA2, V LB1, Cr LB1, V LB3, V LB4, V LG1, Cr LG1 Cr LN
1.25	1669.	Mg KA1, Mg KA2, Mg KB1, As LA1, As LA2
1.74	2117.	Si KA1, Si KA2
4.93	16.	V KA1, V KA2
5.85	21.	Mn KA1, Mn KA2
6.40	75.	Fe KA1, Fe KA2
7.02	20.	Fe KB1, Fe KB3
7.44	18.	Ni KA1, Ni KA2

15-Jul-1992 13:43:46

25015-2-4,C,#04,SA Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 15 secs

Energy	Counts	X-Ray Lines
1.23	375.	Mg K , Mg K , Mg K , As L , As L
1.73	1386.	Si K , Si K
3.70	342.	Ca K , Ca K
4.03	43.	Ca K , Ca K
6.38	117.	Fe K , Fe K

Quantex)
0.160 Range= 10.230 keV 10.230
Integral 0 = 10491

TABLE 3. CLASSIFICATION OF FIBERS WITH TUBULAR MORPHOLOGY

TM	-	Tubular Morphology not sufficiently characteristic for classification as chrysotile
CM	-	Characteristic Chrysotile Morphology
CD	-	Chrysotile SAED pattern
CQ	-	Chrysotile composition by Quantitative EDXA
CMQ	-	Chrysotile Morphology and composition by Quantitative EDXA
CDQ	-	Chrysotile SAED pattern and composition by Quantitative EDXA
NAM	-	Non-Asbestos Mineral

TABLE 4. CLASSIFICATION OF FIBERS WITHOUT TUBULAR MORPHOLOGY

UF	-	Unidentified Fiber
AD	-	Amphibole by random orientation SAED (shows layer pattern of 0.53 nm spacing)
AX	-	Amphibole by qualitative EDXA. Spectrum has elemental components consistent with amphibole
ADX	-	Amphibole by random orientation SAED and Qualitative EDXA
AQ	-	Amphibole by Quantitative EDXA
AZ	-	Amphibole by one Zone Axis SAED
ADQ	-	Amphibole by random orientation SAED and Quantitative EDXA
AZQ	-	Amphibole by one Zone Axis SAED pattern and Quantitative EDXA
AZZ	-	Amphibole by two Zone Axis SAED patterns with consistent inter-axial angle
AZZQ	-	Amphibole by two Zone Axis SAED patterns, consistent inter-axial angle and Quantitative EDXA
NAM	-	Non-Asbestos Mineral

Analysis of Water by Transmission Electron Microscopy
(EPA-600/4-83-043)

EMS No.	25015	Client	SCHAFER & ASSOC.
Sample No.	SW-3-4		
Date	7/16/92		

Total Asbestos Fibers	770	MFL
Chrysotile Fibers	*BDL	MFL
Amphibole Fibers	770	MFL
> 5 Micron length (chrysotile)	*BDL	MFL
> 5 Micron length (amphibole)	220	MFL
Mass (Chrysotile)	*BDL	µg/L
Mass (amphibole)	1600	µg/L
More/Less than 5 Chrysotile Fibers in Sample	LESS	
More/Less than 5 Amphibole Fibers in Sample	MORE	
Poisson 95% Confidence Interval	620 to 960	MFL
Detection Limit	9.8	MFL

* BDL : Below Detection Limit; MFL: Million Fibers per Liter

Size Distribution (Chrysotile and Amphibole)

Particle Length - Microns

O -0.49	0.50 - 0.99	1.00 - 1.49	1.50 - 1.99	2.00 - 2.49	2.5 & UP
0	6	13	12	5	43

Particle Width - Microns

O - .04	.05 - .09	.1 - .14	.15 - .19	.2 - .24	.25 & UP
0	6	14	17	6	36

Aspect Ratio L/W

0 - 9.9	10 - 19.9	20 - 29.9	30 - 39.9	40 - 49.9	50 & UP
29	21	14	3	4	8

TEM ASBESTOS ANALYSIS

EMS Lab No. 25015
Client Schafer
Sample No. SW-3-4

RECEIVING

METHOD OF ANALYSIS
EPA Yamate Level I ☐
Level II ☑
Level III ☐
AHERA ☐

ASPECT RATIO 3:1 ☐ 5:1 ☐

Approved By E. Radke Date 7-12

LENGTHS
All Sizes (EPA) ☑
(µm): ≥0.5 ☐
≥1.0 ☐
≥5.0 ☐
≥10.0 ☐
PCM Range* ☐
*(≥0.25 µm width, ≥5.0 µm length)

FILTER TYPE/AREA (mm²)
MCE/385 ☐
MCN/960 ☐
MCE/960 ☐
1017 Other ☑

TYPE OF SAMPLE
Air ☐ Water ☑
Soil ☐ Wipe ☐
Bulk ☐ Other ☐
Dust/Microvac ☐

PORE SIZE
0.45 µm ☐
0.8 µm ☐
.1 µm ☑
.22 µm ☐
Other ☐

G.O. Area (mm²) 0.065
No. of G.O. to Analyze 20
Filter Lot No.

PREP

DIRECT PREP ☑
INDIRECT PREP ☐

Volume ____ liters
Working Volume 2 ml
Weight ____ grams
Ashed Area ____ %

Prepared By FG

ANALYSIS

GRID
1 ☐ 3 ☐
2 ☐ 4 ☐

Grid Address 1-A
Screen Magnification 19300x
Camera Constant 30.3
Accelerating Voltage 100 KV
Beam Current 10 µa

Analyst Radke Date 7/12

MICROSCOPE
600A ☐
600B ☐
HU11E ☐
HU125E ☐

A

Grid opening	Str #	Str	Dimensions (mm) Width	Length	NAM	TM	CM	CD	CO	CMO	CDO	UF	AD	AX	ADX	AO	ADO	AZO	AZZ	EDS Analysis Na	Mg	Si	Ca	Fe	Id	Comments
1	1	F	3	38												✓					3	10	2	1		Tremolite EDS
	2	F	2.5	15												✓					1	10	4	3		Tremo EDS
	3	F	3	40												✓					3	10	2	0		Tremo EDS
	4	F	3	12	✓																					EDS
	5	F	1	10	✓																					EDS
	6	F	10	260												✓										Tremo EDS
	7	F	5	38												✓					3	10	3	1		Tremo EDS
	8	F	40	240	✓																					
	9	F	5	85	✓											✓										Tremolite
	10	F	6	20	✓																					
	11	F	3	18	✓																					
	12	F	3	105	✓																					
	13	F	5	160	✓																					
	14	F	7	130												✓										Tremolite
2	15	F	6	12	✓																					
	16	F	3	35												✓										Tremolite
	17	F	2	25	✓																					
	18	F	3	62												✓										Tremolite
	19	F	8	25												✓										Tremolite
	20	F	2.5	38	✓																					
	21	F	6	22												✓										Tremolite
	22	F	9	85												✓					4	10	2	1		EDS Tremolite
	23	F	6	32												✓										Tremolite
	24	F	3	22												✓										Tremolite

OBSERVATIONS:

Clean ☐
Debris: ☐ Very Light ☐ Light ☐ Moderate ☑ Heavy ☑ Very Heavy ☐
Gypsum: ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐
Other ☐

all amphiboles are tremolite.

TEM ASBESTOS ANALYSIS

MS Lab No. 25015
Client Schafer
Sample No. SV-3-4

FILTER TYPE/AREA (mm²)
MCE/385 ☐
MCN/960 ☐
MCE/960 ☐
10/7 Other ☑

MICROSCOPE
6000A ☐
600B ☐
HU11E ☐
HU125E ☐

RECEIVING

METHOD OF ANALYSIS
EPA Yamate Level I ☐
Level II ☐
Level III ☐
AHERA ☐

LENGTHS
All Sizes (EPA) ☐
(µm): ≥0.5 ☐
≥1.0 ☐
≥5.0 ☐
≥10.0 ☐
PCM Range* ☐
*(≥0.25 µm width, ≥5.0 µm length)

ASPECT RATIO 3:1 ☐ 5:1 ☐

Approved By _____ Date _____

TYPE OF SAMPLE
Air ☐ Water ☑
Soil ☐ Wipe ☐
Bulk ☐ Other ☐
Dust/Microvac ☐

PORE SIZE
0.45 µm ☐
0.8 µm ☐
.1 µm ☑
.22 µm ☐
Other ☐

G.O. Area (mm²) 0.0 065
No. of G.O. to Analyze 20
Filter Lot No. _____

PREP

DIRECT PREP ☑
INDIRECT PREP ☐

Volume _____ liters
Working Volume 2 ml
Weight _____ grams
Ashed Area _____ %
Prepared By FG

ANALYSIS

GRID
1 ☐ 3 ☐
2 ☐ 4 ☐

Grid Address 1-A
Screen Magnification 19300x
Camera Constant 36.3
Accelerating Voltage 100 KV
Beam Current 10 µa

Analyst Radha Date 7/13

A

Grid opening	Str #	Str	Dimensions (mm) Width	Length	NAM	TM	CM	CD	CO	CMO	CDO	UF	AD	AX	ADX	AO	ADO	AZO	AZZ	Na	Mg	Si	Ca	Fe	Id	Comments
2	25	F	10	58x												✓										Tremolite
	26	F	5	38												✓										Tremolite
	27	F	3	42												✓										Tremolite
	28x	F	9	45												✓										Tremolite
	29	F	15	90x	✓																					
	30	F	4	120x												✓										Tremolite
B	31	F	8	35												✓										Tremolite
	32	F	6	10	✓																					
	33	F	2	24												✓										Tremolite
	34	F	4	22												✓										Tremolite
	35	F	8	25												✓										Tremolite
	36	F	3	180x												✓										Tremolite
	37	F	6	55												✓										Tremolite
	38	F	8	125												✓					3	0	1	2		EDS Tremolite
	39	F	3	85												✓										Tremolite
	40	F	1	20	✓																					
	41	F	3	22												✓										Tremolite
	42	F	2	11												✓										Tremolite
	43	F	10	35	✓																					
	44	F	8	100												✓										Tremolite
	45	F	3	22												✓										Tremolite
	46	F	8	480x												✓										Tremolite
	47	F	20	460x												✓										Tremolite
	48	F	3	45												✓										Tremolite

OBSERVATIONS:

Clean ☐
Debris: ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐
Gypsum: ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐
Other ☐

TEM ASBESTOS ANALYSIS

[redacted] of [redacted]

EMS Lab No. 25015
Client Schafer
Sample No. SW-3-4

RECEIVING

METHOD OF ANALYSIS
EPA Yamate Level I ☐
Level II ☐
Level III ☐
AHERA ☐

LENGTHS
All Sizes (EPA) ☐
(µm): ≥0.5 ☐
≥1.0 ☐
≥5.0 ☐
≥10.0 ☐
PCM Range* ☐
*(≥0.25 µm width, ≥5.0 µm length)

ASPECT RATIO 3:1 ☐ 5:1 ☐

Approved By _____ Date _____

FILTER TYPE/AREA (mm²)
MCE/385 ☐
MCN/960 ☐
MCE/960 ☐
1017 Other ☑

TYPE OF SAMPLE
Air ☐ Water ☑
Soil ☐ Wipe ☐
Bulk ☐ Other ☐
Dust/Microvac ☐

PORE SIZE
0.45 µm ☐
0.8 µm ☐
.1 µm ☑
.22 µm ☐
Other ☐

G.O. Area (mm²) 0.0 065
No. of G.O. to Analyze 20
Filter Lot No. _____

PREP

DIRECT PREP ☑
INDIRECT PREP ☐

Volume _____ liters
Working Volume 2 ml
Weight _____ grams
Ashed Area _____ %
Prepared By FG

ANALYSIS

GRID
1 ☐ 3 ☐
2 ☐ 4 ☐

Grid Address 1-A
Screen Magnification 1930x
Camera Constant 3013
Accelerating Voltage 100 KV
Beam Current 10 µa

Analyst Radha Date 7/13

MICROSCOPE
600A ☐
600B ☐
HU11E ☐
HU125E ☐

A

Grid opening	Str #	Str	Dimensions (mm) Width	Length	NAM	TM	CM	CD	CQ	CMQ	CDQ	LF	AD	AX	ADX	AQ	ADQ	AZQ	AZZ	Na	Mg	Si	Ca	Fe	Id	Comments
3	49	F	5	20												✓										Tremolite
	50	F	8	40												✓										Tremolite
	51	F	3	25												✓										Tremolite

OBSERVATIONS:

Clean ☐
Debris: ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐
Gypsum: ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐
Other ☐

13-Jul-1992 12:55:00

25015,3-4,A,#01,RS Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 15 secs

Energy	Counts	X-Ray Lines
0.50	558.	O K , O K , V L , V L , V L , O V L
1.25	335.	Mg K , Mg K , Mg K , As L , As L
1.74	1153.	Si K , Si K
3.70	249.	Ca K , Ca K
5.89	49.	Mn K , Mn K
6.42	125.	Fe K , Fe K

Quantex>
0.000 Range= 10.230 keV 10.110
Integral 8 = 226

13-Jul-1992 12:56:06

25015,3-4,A,#02,RS Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 20 secs

Energy	Counts	X-Ray Lines
0.51	440.	O K , O K , V L , V L , V L , O V L
1.24	112.	Mg K , Mg K , As L , As L
1.74	1133.	Si K , Si K
3.70	509.	Ca K , Ca K
6.40	323.	Fe K , Fe K

Quantex>
0.000 Range= 10.230 keV 10.110
Integral 8 = 219

13-Jul-1992 12:58:35

25015,3-4,A,#03,RS Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 40 secs

Energy	Counts	X-Ray Lines
0.51	339.	O K , O K , V L , V L , V L , V L
1.24	230.	Mg K , Mg K , As L , As L
1.74	685.	Si K , Si K
3.71	110.	Ca K , Ca K

Quantex)
0.000 Range= 10.230 keV 10.110
Integral 8 = 141

13-Jul-1992 13:00:10

25015,3-4,A,#04,RS Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 32 secs

Energy	Counts	X-Ray Lines
0.51	130.	O K , O K , V L , V L , V L , V L
1.72	172.	Si K , Si K

Quantex)
0.000 Range= 10.230 keV 10.110
Integral 8 = 35

13-Jul-1992 13:01:54

25015,3-4,A,#04,RS Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 63 secs

Energy	Counts	X-Ray Lines
0.50	163.	O K , O K , V L , V L , V L , V L
1.74	375.	Si K , Si K

Quantex>
0.000 Range= 10.230 keV 10.110
Integral 8 = 41

13-Jul-1992 13:04:28

25015,3-4,A,#06,RS Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 15 secs

Energy	Counts	X-Ray Lines
0.51	550.	O K , O K , V L , V L , V L , V L
1.24	403.	Mg K , Mg K , As L , As L
1.73	1349.	Si K , Si K
3.69	327.	Ca K , Ca K
3.99	35.	Ca K , Ca K
6.39	181.	Fe K , Fe K

Quantex>
0.000 Range= 10.230 keV 10.110
Integral 8 = 319

13-Jul-1992 13:23:00

25015,3-4,A,#22,RS Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 20 secs

Energy	Counts	X-Ray Lines
0.51	643.	O K , O K , V L , V L , V L , V L
1.25	470.	Mg K , Mg K , Mg K , As L , As L
1.74	1318.	Si K , Si K
3.68	295.	Ca K , Ca K
6.39	160.	Fe K , Fe K

Quantex>
0.000 Range= 10.230 keV 10.110
Integral 8 = 252

13-Jul-1992 13:52:35

25015,3-4,A,#38,RS Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 30 secs

Energy	Counts	X-Ray Lines
0.51	528.	O K , O K , V L , V L , V L , V L
1.25	318.	Mg K , Mg K , Mg K , As L , As L
1.74	1135.	Si K , Si K
3.68	112.	Ca K , Ca K
6.39	192.	Fe K , Fe K

Quantex>
0.000 Range= 10.230 keV 10.110
Integral 8 = 229

...M ASBESTOS ANALYSIS
S Lab No. 25015
...ple No. SW-3-4

Page 2 of

MICROSCOPE
600A ☐
600B ☑
HU11E ☐
HU12SE ☐

ANALYSIS

GRID
1 ☐ 3 ☐
2 ☑ 4 ☐

Grid Address 1B
Screen Magnification 19100 x
Camera Constant 28.5
Accelerating Voltage 100 KV
Beam Current 10 µa

Analyst S. Ahmed Date 7/14/92

Grid opening	Str #	Str	Dimensions (mm) Width	Length	NAM	TM	CM	CD	CO	...ation AD	AX	ADX	AQ	ADQ	AZQ	AZZ	EDS Analysis Na	Mg	Si	Ca	Fe	Id	Comments
3	25	F	6	255						✓	✓	✓	✓										Tremolite
	26	MD	2.5	30						✓	✓	✓											"
	27	F	1.5	30						✓	✓	✓											"
	28	F	2	40	✓																		
	29	F	2	27	✓																		
4	30	F	2	12						✓	✓	✓	✓					2	10	2	1		EDS #29 Tremolite
	31	F	2	57						✓	✓	✓											Tremolite
	32	MD	10	75	✓																		
	33	F	1	25	✓																		
	34	MD	8	85						✓	✓	✓											Tremolite
	35	F	1.5	55						✓	✓	✓											"
	36	MD	2.5	110	✓																		
	37	F	2.5	49						✓	✓	✓											Tremolite
	38	F	1.5	221						✓	✓	✓											"
	39	F	2.5	195						✓	✓	✓	✓					3	10	2	1		EDS #39 Tremolite
	40	F	5	200						✓	✓	✓											Tremolite
	41	F	3	120						✓	✓	✓											Tremolite

OBSERVATIONS:

Clean ☐					
Debris: ☑	Very Light ☐	Light ☐	Moderate ☑	Heavy ☐	Very Heavy ☐
Gypsum: ☐	Very Light ☐	Light ☐	Moderate ☐	Heavy ☐	Very Heavy ☐

14-Jul-1992 11:23:14

25015,3-4,B,#01,SA Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 20 secs

Energy	Counts	X-Ray Lines
1.25	1080.	Mg K , Mg K , Mg K , As L , As L
1.74	3531.	Si K , Si K
3.32	64.	K K , K K
3.69	812.	Ca K , Ca K
4.00	57.	Ca K , Ca K
6.41	386.	Fe K , Fe K

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 501

EM ASBESTOS ANALYSIS

MS Lab No. 25015

mple No. SW-3-4

Page ___ of ___

MICROSCOPE
600A ☐
600B ☑
HU11E ☐
HU125E ☐

ANALYSIS

GRID
1 ☐ 3 ☐
2 ☑ 4 ☐

Grid Address 1B
Screen Magnification 19100 x
Camera Constant 75.5
Accelerating Voltage 100 KV
Beam Current 10 μa

B

Analyst S. Ahmed Date 7/14/92

Grid opening	Str #	Str	Dimensions (mm) Width	Length	NAM	TM	CM	CD	CQ	CMQ	CDQ	UF	AD	AX	ADX	AQ	ADQ	AZQ	AZZ	Na	Mg	Si	Ca	Fe	Id	Comments
1	1	F	3	33									✓	✓	✓	✓	✓				3	10	3	1		EDS #1 Tremolite
	2	F	1.5	14									✓	✓	✓						3	10	2	1		EDS #2 "
	3	F	7.5	33	✓																					
	4	F	5	220									✓	✓	✓	✓	✓				2	10	2	1		SAED4241, EDS#4
	5	F	12	85									✓	✓	✓	✓	✓				3	10	2	1		EDS #5 Tremolite
	6	F	5	60									✓	✓	✓	✓	✓				2	10	2	1		EDS #6 "
	7	MD	2.5	130									✓	✓	✓											Tremolite
	8	F	4	90									✓	✓	✓											"
	9	F	2.5	50									✓	✓	✓											"
	10	F	1.5	15									✓	✓	✓											"
2	11	F	3	35									✓	✓	✓											"
	12	F	10	250									✓	✓	✓						3	10	2	1		"
	13	F	12	180									✓	✓	✓	✓										EDS #12 Tremolite
	14	F	2	45									✓	✓	✓	✓										Tremolite
	15	F	1.5	15									✓	✓	✓											"
	16	F	2	30									✓	✓	✓											"
	17	F	5	25									✓	✓	✓											"
	18	MD	3.5	160									✓	✓	✓											"
	19	F	1.5	45	✓																					
	20	F	1.5	50	✓																					
3	21	F	4.5	520									✓	✓	✓	✓					3	10	3	2		EDS #21 Tremolite
	22	MD	4	300									✓	✓	✓											"
	23	MD	6	170									✓	✓	✓											"
	24	F	2	48									✓	✓	✓											"

OBSERVATIONS:

Clean ☐
Debris: ☐ Very Light ☐ Light ☐ Moderate ☑ Heavy ☑ Very Heavy ☐
Gypsum: ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐
Oil: ☐

All amphibole are Tremolite

14-Jul-1992 11:32:55

25015,3-4,B,#04,SA Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 24 secs

Energy	Counts	X-Ray Lines
1.24	387.	Mg K , Mg K , As L , As L
1.74	1658.	Si K , Si K
3.30	59.	K K , K K
3.69	271.	Ca K , Ca K
6.41	180.	Fe K , Fe K

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 8 = 284

14-Jul-1992 11:34:51

25015,3-4,B,#05,SA Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 28 secs

Energy	Counts	X-Ray Lines
1.25	689.	Mg K , Mg K , Mg K , As L , As L
1.73	2445.	Si K , Si K
3.31	74.	K K , K K
3.70	412.	Ca K , Ca K
6.41	253.	Fe K , Fe K

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 8 = 426

14-Jul-1992 11:35:08

25015,3-4,B,#02,SA

Preset= 100 secs
Elapsed= 88 secs

Vert= 200 counts Disp= 1

Energy	Counts	X-Ray Lines
1.25	904.	Mg K , Mg K , Mg K , As L , As L
1.73	3215.	Si K , Si K
3.31	90.	K K , K K
3.69	529.	Ca K , Ca K
6.40	348.	Fe K , Fe K

Quantex)
0.160 Range= 10.230 keV 10.230
Integral 5 = 416

14-Jul-1992 13:20:45

25015,3-4,B,#21 SA Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 11 secs

Energy	Counts	X-Ray Lines
1.23	314.	Mg K , Mg K , Mg K , As L , As L
1.74	1120.	Si K , Si K
3.70	284.	Ca K , Ca K
4.05	29.	Sc K , Sc K , Ca K , Ca K
6.41	184.	Fe K , Fe K

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 8 = 159

14-Jul-1992 13:54:46

25015,3-4,B,#29 SA Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 19 secs

Energy	Counts	X-Ray Lines
1.24	820.	Mg K , Mg K , As L , As L
1.74	3212.	Si K , Si K
3.31	56.	K K , K K
3.69	770.	Ca K , Ca K
4.05	84.	Sc K , Sc K , Ca K , Ca K
6.39	285.	Fe K , Fe K

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 8 = 481

14-Jul-1992 11:38:49

25015,3-4,B,#06,SA Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 25 secs

Energy	Counts	X-Ray Lines
1.24	544.	Mg K , Mg K , As L , As L
1.74	2030.	Si K , Si K
3.70	514.	Ca K , Ca K
4.01	75.	Ca K , Ca K
6.39	106.	Fe K , Fe K

Quantex)
0.160 Range= 10.230 keV 10.230
Integral 8 = 304

14-Jul-1992 13:14:39

25015,3-4,B,#12 SA Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 16 secs

Energy	Counts	X-Ray Lines
1.25	620.	Mg K , Mg K , Mg K , As L , As L
1.74	2456.	Si K , Si K
3.32	76.	K K , K K
3.69	366.	Ca K , Ca K
4.49	51.	Ti K , Ti K
5.90	70.	Mn K , Mn K
6.40	427.	Fe K , Fe K
Quantex)	46.	Fe K , Fe K

0.160 Range= 10.230 keV 10.230
Integral 8 = 347

14-Jul-1992 13:55:27

25015,3-4,B,#39 SA Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 14 secs

Energy	Counts	X-Ray Lines
1.25	650.	Mg K , Mg K , Mg K , As L , As L
1.73	2244.	Si K , Si K
3.70	554.	Ca K , Ca K
6.40	212.	Fe K , Fe K
7.07	43.	Fe K , Fe K

Quantex)
0.150 Range= 10.230 keV 10.230
Integral 3 = 343

EM ASBESTOS ANALYSIS

IS Lab No. 25015

mple No. SW-3-4

Page 01

MICROSCOPE
600A ☑
600B ☐
HU11E ☐
HU125E ☐

ANALYSIS

GRID
1 ☐ 3 ☑
2 ☐ 4 ☐

Grid Address 1-C
Screen Magnification 19,300x
Camera Constant 30.3
Accelerating Voltage 100 KV
Beam Current 10 μa

C

Analyst F.W. Date 7-16-92

Grid opening	Str #	Str	Dimensions (mm) Width	Length	NAM	TM	CM	CD	CO	CMO	CDO	UF	AD	AX	ADX	AO	ADO	AZO	AZZ	Na	Mg	Si	Ca	Fe	Id	Comments
1	01	F	5	22												✓					3	10	2	1		EDS Tremol.-actinol
	02	F	5	80												✓					4	10	2			EDS Tremolite
	03	F	10	55												✓					3	10	2			EDS " "
	04	F	3	80												✓					3	10	1	2		EDS
	05	F	16	230												✓				1	2	10		2		EDS (Crocidolite)
	06	F	4	80												✓										Tremolite
	07	F	7	60												✓										" "
	08	F/D	3	26												✓										" "
	09	F	10	80												✓										" "

OBSERVATIONS:

Clean ☐
Debris: ☑ Very Light ☐ Light ☑ Moderate ☐ Heavy ☐ Very Heavy ☐
Gypsum: ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐

16-Jul-1992 14:14:02

25015,3-4,C,01,FM Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 42 secs

Energy	Counts	X-Ray Lines
0.51	816.	O K , O K , V L , V L , V L , V L
1.25	539.	Mg K , Mg K , Mg K , As L , As L
1.74	1617.	Si K , Si K
3.71	327.	Ca K , Ca K
6.41	166.	Fe K , Fe K

Quantex>
0.320 Range= 10.230 keV 10.230
Integral 8 = 311

16-Jul-1992 14:19:44

25015.3-4,C,02,FM Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 37 secs

Energy	Counts	X-Ray Lines
0.51	725.	O K , O K , V L , V L , V L , V L
1.25	590.	Mg K , Mg K , Mg K , As L , As L
1.74	1414.	Si K , Si K
3.68	325.	Ca K , Ca K

Quantex>
0.320 Range= 10.230 keV 10.230
Integral 8 = 292

16-Jul-1992 14:22:53

25015,3-4,C,03,FM Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 46 secs

Energy	Counts	X-Ray Lines
0.31	341.	O K , O K , V L , V L , V L , V L
1.25	265.	Mg K , Mg K , Mg K , As L , As L
1.73	775.	Si K , Si K
3.69	143.	Ca K , Ca K

Quantex>
0.220 Range= 10.230 keV 10.230
Integral 8 = 158

16-Jul-1992 14:25:07

25015,3-4,C,04,FM Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 35 secs

Energy	Counts	X-Ray Lines
0.30	815.	O K , O K , V L , V L , V L , V L
1.25	519.	Mg K , Mg K , Mg K , As L , As L
1.74	1701.	Si K , Si K
3.31	81.	K K , K K
3.69	186.	Ca K , Ca K
6.40	284.	Fe K , Fe K

Quantex>
0.320 Range= 10.230 keV 10.230
Integral 8 = 366

16-Jul-1992 14:26:49

25015,3-4,C,05,FM Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 48 secs

Energy	Counts	X-Ray Lines
0.50	841.	O K , O K , V L , V L , V L , V L
1.01	144.	Na K , Na K , Zn L , Zn L , Zn L , Zn L
1.26	364.	Mg K , Mg K , Mg K , As L , As L
1.74	1761.	Si K , Si K
5.41	406.	Fe K , Fe K

Quantex)
0.320 Range= 10.230 keV 10.230
Integral 8 = 318

TABLE 3. CLASSIFICATION OF FIBERS WITH TUBULAR MORPHOLOGY

TM	-	Tubular Morphology not sufficiently characteristic for classification as chrysotile
CM	-	Characteristic Chrysotile Morphology
CD	-	Chrysotile SAED pattern
CQ	-	Chrysotile composition by Quantitative EDXA
CMQ	-	Chrysotile Morphology and composition by Quantitative EDXA
CDQ	-	Chrysotile SAED pattern and composition by Quantitative EDXA
NAM	-	Non-Asbestos Mineral

TABLE 4. CLASSIFICATION OF FIBERS WITHOUT TUBULAR MORPHOLOGY

UF	-	Unidentified Fiber
AD	-	Amphibole by random orientation SAED (shows layer pattern of 0.53 nm spacing)
AX	-	Amphibole by qualitative EDXA. Spectrum has elemental components consistent with amphibole
ADX	-	Amphibole by random orientation SAED and Qualitative EDXA
AQ	-	Amphibole by Quantitative EDXA
AZ	-	Amphibole by one Zone Axis SAED
ADQ	-	Amphibole by random orientation SAED and Quantitative EDXA
AZQ	-	Amphibole by one Zone Axis SAED pattern and Quantitative EDXA
AZZ	-	Amphibole by two Zone Axis SAED patterns with consistent inter-axial angle
AZZQ	-	Amphibole by two Zone Axis SAED patterns, consistent inter-axial angle and Quantitative EDXA
NAM	-	Non-Asbestos Mineral

Analysis of Water by Transmission Electron Microscopy
(EPA-600/4-83-043)

EMS No.	25015	Client	SCHAFER & ASSOC.
Sample No.	SW-4-4		
Date	7/15/92		

Total Asbestos Fibers	16	MFL
Chrysotile Fibers	0.2	MFL
Amphibole Fibers	15	MFL
> 5 Micron length (chrysotile)	*BDL	MFL
> 5 Micron length (amphibole)	4.7	MFL
Mass (Chrysotile)	0.001	µg/L
Mass (amphibole)	24	µg/L
More/Less than 5 Chrysotile Fibers in Sample	LESS	
More/Less than 5 Amphibole Fibers in Sample	MORE	
Poisson 95% Confidence Interval	12 to 20	MFL
Detection Limit	0.2	MFL

* BDL : Below Detection Limit; MFL: Million Fibers per Liter

Size Distribution (Chrysotile and Amphibole)

Particle Length - Microns

O -0.49	0.50 - 0.99	1.00 - 1.49	1.50 - 1.99	2.00 - 2.49	2.5 & UP
0	3	8	4	8	47

Particle Width - Microns

O - .04	.05 - .09	.1 - .14	.15 - .19	.2 - .24	.25 & UP
0	5	6	12	10	37

Aspect Ratio L/W

0 - 9.9	10 - 19.9	20 - 29.9	30 - 39.9	40 - 49.9	50 & UP
24	23	14	6	1	2

TEM ASBESTOS ANALYSIS

EMS Lab No. 25015
Client Schafer
Sample No. SW-4-4

FILTER TYPE/AREA (mm²)
MCE/385 ☐
MCN/960 ☐
MCE/960 ☐
1017 Other ☑

Page ☐ of ☐

MICROSCOPE
600A ☐
600B ☐
HU11E ☐
HU125E ☐

RECEIVING

METHOD OF ANALYSIS
EPA Yamate Level I ☐
Level II ☑
Level III ☐
AHERA ☑

LENGTHS
All Sizes (EPA) ☐
(µm):≥0.5 ☑
≥1.0 ☐
≥5.0 ☐
≥10.0 ☐
PCM Range* ☐
*(≥0.25 µm width, ≥5.0 µm length)

ASPECT RATIO 3:1 ☑ 5:1 ☐

Approved By B Koch Date 7/12

TYPE OF SAMPLE
Air ☐ Water ☑
Soil ☐ Wipe ☐
Bulk ☐ Other ☐
Dust/Microvac ☐

PORE SIZE
0.45 µm ☐
0.8 µm ☐
.1 µm ☑
.22 µm ☐
Other ☐

G.O. Area (mm²) 0.0 065
No. of G.O. to Analyze 20
Filter Lot No.

PREP

DIRECT PREP ☑
INDIRECT PREP ☐

Volume _____ liters
Working Volume 50 ml
Weight _____ grams
Ashed Area _____ %

Prepared By FG

ANALYSIS

GRID
1 ☐ 3 ☐
2 ☐ 4 ☐

Grid Address 1 A
Screen Magnification 14300 x
Camera Constant 30.3
Accelerating Voltage 100 KV
Beam Current 10 µa

Analyst Riddle Date 7/13

A

Grid opening	Str #	Str	Dimensions (mm) Width	Length	NAM	TM	CM	CD	CQ	CMQ	CDQ	UF	AD	AX	ADX	AQ	ADQ	AZQ	AZZ	Na	Mg	Si	Ca	Fe	Id	Comments
1	1	F	5	25												✓					3	10	2	1		Tremolite EDS
	2	F	4	125												✓					2	10	1	2		Tremolite EDS
	3	F	3	58												✓					2	10	1	3		Tremolite EDS
	4	F	3	25	✓																					EDS
	5	F	5	42												✓					3	10	2	0		Tremolite EDS
	6	F	3	22												✓										Tremolite
2	7	F	6	62												✓										Tremolite
	8	F	5	60*	✓																					
	9	F	5	100	✓											✓										Tremolite
	10	F	4	42	✓																					
	11	F	18	65												✓										Tremolite
	12	F	3	50												✓										Tremolite
	13	F	4	15	✓																					
	14	F	8	75												✓					3	10	1	1		EDS Tremolite
	15	F	7	24												✓										EDS Tremolite
	16	F	6	120*												✓										Tremolite
	17	F	4	60												✓										Tremolite
	18	F	5	75	✓																					
	19	F	4	18	✓																					
	20	F	3	240*	✓																					
3	21	F	4	45	✓																					
	22	F	6	150												✓										Tremolite
	23	F	2	44	✓																					
	24	F	4	48												✓										Tremolite

OBSERVATIONS:
Clean ☐
Debris: ☐ Very Light ☐ Light ☐ Moderate ☑ Heavy ☐ Very Heavy ☐
Gypsum: ☐ Very Light ☐ Light ☐ Moderate ☑ Heavy ☐ Very Heavy ☐
Other ☐

all amphibole one confirmed by EDS

TEM ASBESTOS ANALYSIS

EMS Lab No. 25015
Client Schafer
Sample No. SW-4-4

RECEIVING

METHOD OF ANALYSIS
- EPA Yamate Level I ☐
- Level II ☐
- Level III ☐
- AHERA ☐

ASPECT RATIO 3:1 ☐ 5:1 ☐

LENGTHS
- All Sizes (EPA) ☐
- (µm): ≥0.5 ☐
- ≥1.0 ☐
- ≥5.0 ☐
- ≥10.0 ☐
- PCM Range* ☐ (*≥0.25 µm width, ≥5.0 µm length)

Approved By _____ Date _____

FILTER TYPE/AREA (mm²)
- MCE/385 ☐
- MCN/960 ☐
- MCE/960 ☐
- Other 1017 ☑

TYPE OF SAMPLE
- Air ☐ Water ☑
- Soil ☐ Wipe ☐
- Bulk ☐ Other ☐
- Dust/Microvac ☐

PORE SIZE
- 0.45 µm ☐
- 0.8 µm ☐
- .1 µm ☑
- .22 µm ☐
- Other ☐

G.O. Area (mm²) 0.0065
No. of G.O. to Analyze 20
Filter Lot No. _____

PREP

- DIRECT PREP ☑
- INDIRECT PREP ☐

Volume _____ liters
Working Volume 50 ml
Weight _____ grams
Ashed Area _____ %
Prepared By FG

ANALYSIS

GRID
- 1 ☐ 3 ☐
- 2 ☐ 4 ☐

MICROSCOPE
- 600A ☐
- 600B ☐
- HU11E ☐
- HU125E ☐

Grid Address _____
Screen Magnification _____ x
Camera Constant _____
Accelerating Voltage 100 KV
Beam Current _____ µa

Analyst Radle Date _____

A

Grid opening	Str #	Str	Dimensions (mm) Width	Length	NAM	TM	CM	CD	CQ	CMQ	CDQ	UF	AD	AX	ADX	AQ	ADQ	AZQ	AZZ	Na	Mg	Si	Ca	Fe	Id	Comments
3	25	F	4	22	✓																					
	26	F	3	18	✓																					
4	27	F	2	10	✓																					
	28	F	6	65												✓										Tremo (confirmed)
	29	F	3	22	✓																					
	30	F	4	22												✓										Tremo (confirmed)
	31	F	1.5	20												✓										Tremolite
	32	F	2	18	✓																					
	33	F	12	52	✓																					
	34	F	3	12	✓																					
	35	F	3	20	✓																					
	36	F	1	20	✓																					
	37	F	18	100												✓										
	38	F	8	110												✓										Tremolite
	39	F	10	220												✓										Tremolite
	40	F	10	96												✓										Tremolite
	41	F	3	78												✓										Tremolite
	42	F	2	65												✓					3	10	1	1		EDS Tremolite
5	43	F	3	30	✓																					
	44	F	6	100X	✓																					
	45	F	3	22												✓										Tremolite
	46	F	6	75	✓																					
	47	F	1.5	10												✓										Tremolite
	48	F	5	25												✓										Tremolite

OBSERVATIONS:

Clean ☐
Debris: ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐
Gypsum: ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐
Other ☐

All tremolites are confirmed by EDS

TEM ASBESTOS ANALYSIS

EMS Lab No. 25015
Client Schafer
Sample No. SW-4-4

FILTER ... E/ARE... (mm²)
MCE/385 ☐
MCN/960 ☐
MCE/960 ☐
1017 Other ☑

MICROSCOPE
600A ☐
600B ☐
HU11E ☐
HU125E ☐

RECEIVING

METHOD OF ANALYSIS
EPA Yamate Level I ☐
Level II ☐
Level III ☐
AHERA ☐

LENGTHS
All Sizes (EPA) ☐
(µm):≥0.5 ☐
≥1.0 ☐
≥5.0 ☐
≥10.0 ☐
PCM Range* ☐
*(≥0.25 µm width, ≥5.0 µm length)

ASPECT RATIO 3:1 ☐ 5:1 ☐

Approved By _____ Date _____

TYPE OF SAMPLE
Air ☐ Water ☑
Soil ☐ Wipe ☐
Bulk ☐ Other ☐
Dust/Microvac ☐

PORE SIZE
0.45 µm ☐
0.8 µm ☐
.1 µm ☑
.22 µm ☐
Other ☐

G.O. Area (mm²) 0.0065
No. of G.O. to Analyze 20
Filter Lot No. _____

PREP

DIRECT PREP ☑
INDIRECT PREP ☐

Volume _____ liters
Working Volume 50 ml
Weight _____ grams
Ashed Area _____ %

Prepared By FG

ANALYSIS

GRID
1 ☐ 3 ☐
2 ☐ 4 ☐

Grid Address _____
Screen Magnification _____ x
Camera Constant _____
Accelerating Voltage 100 KV
Beam Current _____ µa

A

Analyst Radh Date _____

Grid opening	Str #	Str	Dimensions (mm) Width	Length	Fiber Classification NAM	TM	CM	CD	CQ	CMQ	CDQ	UF	AD	AX	ADX	AQ	ADQ	AZQ	AZZ	EDS Analysis Na	Mg	Si	Ca	Fe	Id	Comments
5	49	F	2	140	✓																					
6	50	F	9	270												✓					4	10	2	1		Tremolite
	51	F	12	52												✓										Tremolite
	52	F	4	62												✓										Tremolite
	53	F	5	40												✓										Tremolite
	51	F	5	165												✓										Tremolite
	52	F	6	55												✓										Tremolite
	53	F	5	50												✓										Tremolite
	54	F	4	50												✓										Tremolite
	54	F	3	170	✓																					

OBSERVATIONS:
Clean ☐
Debris: ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐
Gypsum: ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐
Other ☐

13-Jul-1992 09:33:45

25015,4-4,A,#01,RS Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 23 secs

Energy	Counts	X-Ray Lines
0.51	605.	O K , O K , V L , V L , V L , V L
1.25	370.	Mg K , Mg K , Mg K , As L , As L
1.73	1170.	Si K , Si K
3.69	231.	Ca K , Ca K
6.39	118.	Fe K , Fe K

Quantex>
0.000 Range= 10.230 keV 10.110
Integral 8 = 817

13-Jul-1992 09:36:29

25015,4-4,A,#02,RS Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 31 secs

Energy	Counts	X-Ray Lines
0.51	828.	O K , O K , V L , V L , V L , V L
1.24	109.	Mg K , Mg K , As L , As L
1.74	978.	Si K , Si K
3.31	74.	K K , K K
3.68	119.	Ca K , Ca K
6.40	202.	Fe K , Fe K

Quantex>
0.000 Range= 10.230 keV 10.110
Integral 8 = 247

13-Jul-1992 09:37:25

25015.4-4,A,#03,RS Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 26 secs

Energy	Counts	X-Ray Lines
0.51	487.	O K , O K , V L , V L , V L , V L
1.24	178.	Mo K , Mo K , As L , As L
1.74	1023.	Si K , Si K
3.68	125.	Ca K , Ca K
6.39	275.	Fe K , Fe K

Quantex>
0.000 Range= 10.230 keV 10.110
Integral 8 = 199

13-Jul-1992 09:40:16

25015.4-4,A,#04.RS Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 27 secs

Energy	Counts	X-Ray Lines
0.51	95.	O K , O K , V L , V L , V L , V L
1.73	263.	Si K , Si K

Quantex>
0.000 Range= 10.230 keV 10.110
Integral 8 = 32

13-Jul-1992 09:41:48

25015,4-4,A,#05,RS Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 44 secs

Energy	Counts	X-Ray Lines
0.51	270.	O K , O K , V L , V L , V L , V L
1.24	206.	Mg K , Mn K , As L , As L
1.73	639.	Si K , Si K
3.69	166.	Ca K , Ca K

Quantex>
0.000 Range= 10.230 keV 10.110
Integral 3 = 109

13-Jul-1992 09:50:05

25015,4-4,A,#14,RS Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 21 secs

Energy	Counts	X-Ray Lines
0.51	541.	O K , O K , V L , V L , V L , V L
1.25	362.	Mg K , Mg K , Mg K , As L , As L
1.73	1173.	Si K , Si K
3.69	151.	Ca K , Ca K
6.41	160.	Fe K , Fe K

Quantex>
0.000 Range= 10.230 keV 10.110
Integral 8 = 218

13-Jul-1992 09:53:41

25015,4-4,A,#18,RS Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 24 secs

Energy	Counts	X-Ray Lines
0.50	222.	O K , O K , V L , V L , V L , V L
1.74	359.	Si K , Si K
6.41	91.	Fe K , Fe K

Quantex>
0.000 Range= 10.230 keV 10.110
Integral 8 = 66

13-Jul-1992 10:42:43

25015,4-4,A,#42,RS Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 21 secs

Energy	Counts	X-Ray Lines
0.51	913.	O K , O K , V L , V L , V L , V L
1.25	722.	Mg K , Mg K , Mg K , As L , As L
1.74	2301.	Si K , Si K
3.33	95.	K K , K K
3.70	332.	Ca K , Ca K
6.40	203.	Fe K , Fe K

13-Jul-1992 10:48:38

25015,4-4,A,#50,RS Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 29 secs

Energy	Counts	X-Ray Lines
0.51	330.	O K , O K , V L , V L , V L , V L
1.24	266.	Mg K , Mg K , As L , As L
1.73	812.	Si K , Si K
3.71	102.	Ca K , Ca K
6.42	91.	Fe K , Fe K

Quantex)
0.000 Range= 10.230 keV 10.110
Integral 8 = (4)

GRID ASBESTOS ANALYSIS

AS Lab No. 25015

mple No. SW-4-4

ANALYSIS

GRID: 1 ☐ 3 ☐ 2 ☑ 4 ☐

Grid Address: 1B

Screen Magnification: 1910D

Camera Constant: 28.5

Accelerating Voltage: 100 KV

Beam Current: 10 pa

Analyst: S. Ahmed

Date: 7/14/92

MICROSCOPE: 600A ☐ 600B ☑ HU11E ☐ HU12SE ☐

B

Grid opening	Sb #	Str	Dimensions (mm) Width	Length	NAM	TM	CM	CD	CO	CMO	CDO	UF	AD	AX	ADX	AO	ADO	AZO	AZZ	Nu	Mg	Si	Ca	Fe	Id	Comments
	1	F	1	12	✓																					
2	NS																									
3	2	F	3	70											✓	✓	✓	✓		2	2	10	2	1		SAED# 4240, EDS #2
	3	F	4	40											✓	✓					3	10	2	1		EDS # 3
	4	F	3.5	20	✓																					
4	5	MD	3	50											✓	✓	✓				2	10	1	1		EDS #5
	6	MD	3	60											✓	✓	✓				2	10	4	1		EDS #6
	7	F	5	40											✓	✓	✓				3	10	5	2		EDS #7
	8	F	10	72											✓	✓										
	9	F	4	57											✓	✓										
	10	F	3	50	✓																					
5	11	F	4	130											✓	✓	✓				3	10	3	1		EDS #11
	12	F	4.5	130											✓	✓	✓									
	13	MD	8	85											✓	✓	✓									
	14	MD	7	35											✓	✓	✓									
	15	F	6	40	✓																					
	16	F	3	35											✓	✓	✓									
	17	F	5	42											✓	✓	✓				3	10	2	1		EDS #17
6	18	F	1	25											✓	✓										
	19	F	12	165											✓	✓	✓									
	20	F	15	155											✓	✓	✓									
	21	MD	7.5	60											✓	✓	✓									
	22	F	2.5	115											✓	✓	✓									
	23	F	3	250											✓	✓	✓									

OBSERVATIONS:

Clean ☐

Debris ☑ Very Light ☐ Light ☐ Moderate ☑ Heavy ☐ Very Heavy ☐

Gypsum: ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐

...ASBESTOS ANALYSIS

...Lab No. 25015

...ple No. SW-4-4

ANALYSIS

GRID 1 ☐ 2 ☑ 3 ☐ 4 ☐

Grid Address 1B

Screen Magnification 19100 x

Camera Constant 28.5

Accelerating Voltage 100 KV

Beam Current 10 μa

Analyst S. Ahmed

Date 7/14/92

MICROSCOPE: 600A ☐ 600B ☑ HU11E ☐ HU125E ☐

B

Grid opening	Str #	Str	Dimensions (mm) Width	Length	Fiber Classification NAM	TM	CM	CO	CO	CMO	CDO	UF	AD	AX	ADX	AO	ADO	AZO	AZZ	EDS Analysis Na	Mg	Si	Ca	Fe	Id	Comments
B	25	MD	5	145											✓	✓	✓									
	26	MD	3	85											✓	✓	✓									
	27	F	2.5	55											✓	✓	✓									
	28	F	1.5	25											✓	✓	✓									
	29	F	6	30											✓	✓	✓									EDS #29

OBSERVATIONS: Clean ☐ Debris ☑ Gypsum ☐ Very Light ☐ Very Light ☐ Light ☐ Light ☐ Moderate ☑ Moderate ☐ Heavy ☐ Heavy ☐ Very Heavy ☐ Very Heavy ☐

14-Jul-1992 09:30:20

25015.4-4,B,#02,SA Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 26 secs

Energy	Counts	X-Ray Lines
1.25	346.	Mg K , Mg K , Mg K , As L , As L
1.73	1407.	Si K , Si K
3.68	260.	Ca K , Ca K
6.40	153.	Fe K , Fe K

Quantex)
0.320 Range= 10.230 keV 10.230
Integral 8 = 293

14-Jul-1992 09:32:17

25015.4-4,B,#03,SA Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 15 secs

Energy	Counts	X-Ray Lines
1.25	375.	Mg K , Mg K , Mg K , As L , As L
1.74	1642.	Si K , Si K
3.31	86.	K K , K K
3.70	279.	Ca K , Ca K
4.04	60.	Sc K , Ca K , Ca K
6.39	144.	Fe K , Fe K

Quantex)
0.320 Range= 10.230 keV 10.230
Integral 8 = 245

14-Jul-1992 09:39:20

25015.4-4,B,#05,SA Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 44 secs

Energy	Counts	X-Ray Lines
1.25	203.	Mg K , Mg K , Mg K , As L , As L
1.74	854.	Si K , Si K
3.69	105.	Ca K , Ca K
6.40	80.	Fe K , Fe K

Quantex)
0.320 Range= 10.230 keV 10.230
Integral 8 = 197

14-Jul-1992 09:43:03

25013,4-4,B,#06,SA Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 16 secs

Energy	Counts	X-Ray Lines
1.24	279.	Mg K , Mg K , As L , As L
1.74	1160.	Si K , Si K
3.69	776.	Ca K , Ca K
4.02	85.	Ca K , Ca K
6.41	133.	Fe K , Fe K

Quantex)
0.320 Range= 10.230 keV 10.230
Integral 8 = 221

14-Jul-1992 09:44:49

25013,4-4,B,#07,SA Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 31 secs

Energy	Counts	X-Ray Lines
1.23	390.	Mg K , Mg K , Mg K , As L , As L
1.74	2060.	Si K , Si K
3.69	1203.	Ca K , Ca K
4.03	108.	Ca K , Ca K
6.42	223.	Fe K , Fe K

Quantex)
0.160 Range= 10.230 keV 10.230
Integral 8 = 348

14-Jul-1992 09:53:21

25015,4-4,B,#11,SA Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 22 secs

Energy	Counts	X-Ray Lines
1.24	353.	Mg K , Mg K , As L , As L
1.73	1139.	Si K , Si K
3.68	363.	Ca K , Ca K
6.41	77.	Fe K , Fe K

Quantex)
0.160 Range= 10.230 keV 10.230
Integral 8 = 152

14-Jul-1992 10:30:45

25015.4-4.B,#17,SA Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 12 secs

Energy	Counts	X-Ray Lines
1.25	903.	Mg K , Mg K , Mg K , As L , As L
1.74	3309.	Si K , Si K
3.29	108.	K K , K K
3.69	600.	Ca K , Ca K
4.04	66.	Sc K , Ca K , Ca K
5.88	39.	Mn K , Mn K
6.40	330.	Fe K , Fe K
Quantex)	55.	Fe K , Fe K

0.160 Range= 10.230 keV 10.230
Integral 8 = 482

14-Jul-1992 10:35:52

25015,4-4,B,#19,SA Preset= 100 secs
Vert= 200 counts Diso= 1 Elapsed= 13 secs

Energy	Counts	X-Ray Lines
1.25	1302.	Mo K , Mo K , Mg K , As L , As L
1.73	4635.	Si K , Si K
3.30	93.	K K , K K
3.69	1170.	Ca K , Ca K
4.01	70.	Ca K , Ca K
4.53	41.	Ti K , Ti K
6.39	382.	Fe K , Fe K
Quantex)	53.	Fe K , Fe K

0.160 Range= 10.230 keV 10.230
Integral 3 = 7.4

14-Jul-1992 10:55:26

25015.4-4.B,#29,5A

Preset= 100 secs

Vert= 200 counts Disp= 1

Elapsed= 29 secs

Energy	Counts	X-Ray Lines
1.24	594.	Mg K , Mg K , As L , As L
1.74	2121.	Si K . Si K
3.29	51.	K K , K K
3.69	533.	Ca K . Ca K
6.39	154.	Fe K , Fe K

Quantex)

0.150 Range= 10.230 keV

10.230

Integral 8 = 380

...ASBESTOS ANALYSIS
S Lab No. 25015

nple No. SW-4-4

ANALYSIS

GRID
1 ☐ 3 ☑
2 ☐ 4 ☐

Grid Address 1C
Screen Magnification 19100 x
Camera Constant 28.5
Accelerating Voltage 100 KV
Beam Current 10 pa

MICROSCOPE
600A ☐
600B ☑
HU11E ☐
HU125E ☐

C

Analyst S. Ahmed

Date 7/15/92

Grid opening	Str #	Str	Dimensions (mm) Width	Length	NAM	TM	CM	CD	CO	CMO	CDO	UF	AD	AX	ADX	AO	ADO	AZO	AZZ	Na	Mg	Si	Ca	Fe	Id	Comments
1	MD	1	7	75	✓																					
	MD	2	12	240									✓	✓	✓	✓										
	F	3	8	260									✓	✓	✓											EDS#1
	F	4	2.5	40									✓	✓	✓											
	F	5	11	160									✓	✓	✓											
	F	6	1.5	30	✓																					
	F	7	2	19									✓	✓	✓											
	F	8	1	12	✓																					
	F	9	1	18			✓	✓	✓																	
	F	10	1	11	✓																					SAED 4245, EDS#
	F	11	1	30	✓																					
	F	12	2	48									✓	✓	✓	✓										
2	F	13	4	34									✓	✓	✓	✓										EDS#3
	F	14	1	10	✓																					EDS#4
	F	15	1	35	✓																					
	F	16	1	22	✓																					
	F	17	6	55										✓	✓	✓										
	F	18	6	110										✓	✓	✓										EDS#5
	F	19	4	36	✓																					EDS#6
	MD	20	10	80									✓	✓	✓											
	F																									
	F																									

OBSERVATIONS:

Clean ☐					
Debris ☑	Very Light ☐	Light ☐	Moderate ☑	Heavy ☐	Very Heavy ☐
Gypsum ☐	Very Light ☐	Light ☐	Moderate ☐	Heavy ☐	Very Heavy ☐

15-Jul-1992 13:09:06

25015-4-4, C,#03, 5A Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 22 secs

Energy	Counts	X-Ray Lines
1.23	301.	Mg K , Mg K , Mg K , As L , As L
1.73	1251.	Si K , Si K
3.71	171.	Ca K , Ca K
6.41	205.	Fe K , Fe K

Quantex)
0.160 Range= 10.230 keV 10.230
Integral 0 = 9253

15-Jul-1992 13:11:34

25015-4-4, C,#04, 5A Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 12 secs

Energy	Counts	X-Ray Lines
1.25	413.	Mg K , Mg K , Mg K , As L , As L
1.74	1635.	Si K , Si K
3.27	44.	K K , K K
3.68	317.	Ca K , Ca K
4.07	42.	Sc K , Sc K
5.87	32.	Mn K , Mn K
6.39	140.	Fe K , Fe K

Quantex)
0.160 Range= 10.230 keV 10.230
Integral 0 = 8682

15-Jul-1992 12:49:57

2S015-4-4.C.#01.SA Preset= 100 secs
Vert= 300 counts Diso= 1 Elapsed= 18 secs

Energy	Counts	X-Ray Lines
1.26	362.	Mg K , Mg K , Mg K , Ag L , Ag L
1.74	1327.	Si K , Si K
2.63	24.	Cl K , Cl K
3.35	46.	K K , K K
3.69	275.	Ca K , Ca K
4.09	67.	Sc K , Sc K
5.40	140.	Fe K , Fe K

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 15512

15-Jul-1992 13:06:41

2S015-4-4.C.#02.SA Preset= 100 secs
Vert= 200 counts Diso= 1 Elapsed= 30 secs

Energy	Counts	X-Ray Lines
1.25	180.	Mg K , Mg K , Mg K , Ag L , Ag L
1.73	345.	Si K , Si K

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 6138

15-Jul-1992 13:15:23

25015-4-4,C,#05,SA Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 14 secs

Energy	Counts	X-Ray Lines
1.25	423.	Mg K , Mg K , Mg K , As L , As L
1.74	1695.	Si K , Si K
3.30	51.	K K , K K
3.69	361.	Ca K , Ca K
4.02	30.	Ca K , Ca K
6.40	224.	Fe K , Fe K

Quantex)
0.160 Range= 10.230 keV 10.230
Integral 0 = 10194

15-Jul-1992 13:16:22

25015-4-4,C,#06,SA Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 6 secs

Energy	Counts	X-Ray Lines
1.26	385.	Mg K , Mg K , Mg K , As L , As L
1.73	1437.	Si K , Si K
3.31	76.	K K , K K
3.68	202.	Ca K , Ca K
4.07	32.	Sc K , Sc K
5.37	26.	Cr K , Cr K
5.88	21.	Mn K , Mn K
Quantex)	173.	Fe K , Fe K

0.160 Range= 10.230 keV 10.230
Integral 0 = 6143

TABLE 3. CLASSIFICATION OF FIBERS WITH TUBULAR MORPHOLOGY

TM	-	Tubular Morphology not sufficiently characteristic for classification as chrysotile
CM	-	Characteristic Chrysotile Morphology
CD	-	Chrysotile SAED pattern
CQ	-	Chrysotile composition by Quantitative EDXA
CMQ	-	Chrysotile Morphology and composition by Quantitative EDXA
CDQ	-	Chrysotile SAED pattern and composition by Quantitative EDXA
NAM	-	Non-Asbestos Mineral

TABLE 4. CLASSIFICATION OF FIBERS WITHOUT TUBULAR MORPHOLOGY

UF	-	Unidentified Fiber
AD	-	Amphibole by random orientation SAED (shows layer pattern of 0.53 nm spacing)
AX	-	Amphibole by qualitative EDXA. Spectrum has elemental components consistent with amphibole
ADX	-	Amphibole by random orientation SAED and Qualitative EDXA
AQ	-	Amphibole by Quantitative EDXA
AZ	-	Amphibole by one Zone Axis SAED
ADQ	-	Amphibole by random orientation SAED and Quantitative EDXA
AZQ	-	Amphibole by one Zone Axis SAED pattern and Quantitative EDXA
AZZ	-	Amphibole by two Zone Axis SAED patterns with consistent inter-axial angle
AZZQ	-	Amphibole by two Zone Axis SAED patterns, consistent inter-axial angle and Quantitative EDXA
NAM	-	Non-Asbestos Mineral

Analysis of Water by Transmission Electron Microscopy
(EPA-600/4-83-043)

EMS No.	25015	Client	SCHAFER & ASSOC.
Sample No.	SW-5-4		
Date	7/14/92		

Total Asbestos Fibers	0.3	MFL
Chrysotile Fibers	*BDL	MFL
Amphibole Fibers	0.3	MFL
> 5 Micron length (chrysotile)	*BDL	MFL
> 5 Micron length (amphibole)	0.1	MFL
Mass (Chrysotile)	*BDL	µg/L
Mass (amphibole)	0.7	µg/L
More/Less than 5 Chrysotile Fibers in Sample	LESS	
More/Less than 5 Amphibole Fibers in Sample	LESS	
Poisson 95% Confidence Interval	0.03 to 1	MFL
Detection Limit	0.1	MFL

* BDL : Below Detection Limit; MFL: Million Fibers per Liter

Size Distribution (Chrysotile and Amphibole)

Particle Length - Microns

O -0.49	0.50 - 0.99	1.00 - 1.49	1.50 - 1.99	2.00 - 2.49	2.5 & UP
0	0	0	0	0	2

Particle Width - Microns

O - .04	.05 - .09	.1 - .14	.15 - .19	.2 - .24	.25 & UP
0	0	0	0	0	2

Aspect Ratio L/W

0 - 9.9	10 - 19.9	20 - 29.9	30 - 39.9	40 - 49.9	50 & UP
1	0	1	0	0	0

TEM ASBESTOS ANALYSIS

EMS Lab No. 25015
Client Schafer
Sample No. SW-5-4

RECEIVING

METHOD OF ANALYSIS
EPA Yamate Level I ☐
Level II ☐
Level III ☐
AHERA ☐

LENGTHS
All Sizes (EPA) ☐
(µm): ≥0.5 ☐
≥1.0 ☐
≥5.0 ☐
≥10.0 ☐
PCM Range* ☐
*(≥0.25 µm width, ≥5.0 µm length)

ASPECT RATIO 3:1 ☐ 5:1 ☐

Approved By _____ Date _____

PREP

FILTER TYPE/AREA (mm²)
MCE/385 ☐
MCN/960 ☐
MCE/960 ☐
1017 Other ☑

TYPE OF SAMPLE
Air ☐ Water ☑
Soil ☐ Wipe ☐
Bulk ☐ Other ☐
Dust/Microvac ☐

PORE SIZE
0.45 µm ☐
0.8 µm ☐
.1 µm ☑
.22 µm ☐
Other ☐

G.O. Area (mm²) 0.0 065
No. of G.O. to Analyze 20
Filter Lot No. _____

DIRECT PREP ☑
INDIRECT PREP ☐

Volume _____ liters
Working Volume 50 ml
Weight _____ grams
Ashed Area _____ %
Prepared By FG

ANALYSIS

GRID
1 ☒ 3 ☐
2 ☐ 4 ☐

Grid Address 1-A
Screen Magnification 19300 x
Camera Constant 30.3
Accelerating Voltage 100 KV
Beam Current 10 µa

Analyst Radla Date 7-14

MICROSCOPE
600A ☐
600B ☑
HU11E ☐
HU125E ☐

A

Grid opening	Str #	Str	Dimensions (mm) Width	Length	NAM	TM	CM	CD	CO	CMQ	CDQ	UF	AD	AX	ADX	AQ	ADQ	AZQ	AZZ	Na	Mg	Si	Ca	Fe	Id	Comments
1	1	F	8	70												✓					3	10	2	1		EDS Tremolite
2	NSD																									
3	NSD																									
4	NSD																									
5	NSD																									
6	NSD																									
7	NSD																									
8	NSD																									
9	NSD																									
10	NSD																									

OBSERVATIONS:

Clean ☐
Debris: ☐ Very Light ☐ Light ☐ Moderate ☑ Heavy ☐ Very Heavy ☐
Gypsum: ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐
Other ☐

14-Jul-1992 07:54:20

25015,5-4,A,#01,RS Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 23 secs

Energy	Counts	X-Ray Lines
0.51	471.	O K , O K , V L , V L , V L , V L
1.25	337.	Mg K , Mg K , Mg K , As L , As L
1.74	1004.	Si K , Si K
3.70	221.	Ca K , Ca K
6.39	85.	Fe K , Fe K
8.02	258.	Cu K , Cu K

Quantex>
0.000 Range= 10.230 keV 10.110
Integral S = 203

EM ASBESTOS ANALYSIS

IS Lab No. 25015

mple No. SW-5-4

MICROSCOPE

600A ☐
600B ☑
HU11E ☐
HU125E ☐

ANALYSIS

GRID

1 ☐ 3 ☐
2 ☑ 4 ☐

Grid Address 1B
Screen Magnification 19100x
Camera Constant 78.5
Accelerating Voltage 100 KV
Beam Current 10 μa

Analyst S. Ahmed

Date 7/14/92

Grid opening	Str #	Str	Dimensions (mm) Width	Length	Fiber Classification NAM	TM	CM	CD	CO	CMO	CDO	UF	AD	AX	ADX	AO	ADO	AZO	AZZ	EDS Analysis Na	Mg	Si	Ca	Fe	Id	Comments
1	NSD																									
2	NSD																									
3	NSD																									
4	NSD																									
5	1	F	7.5	185											✓	✓	✓				3	10	2	2		EDS # / Tremolite
6	NSD																									
7	NSD																									

OBSERVATIONS:

Clean ☐
Debris: ☑ Very Light ☐ Light ☐ Moderate ☑ Heavy ☐ Very Heavy ☐
Gypsum: ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐

14-Jul-1992 08:57:49

25015.5-4,B,#01,SA Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 24 secs

Energy	Counts	X-Ray Lines
1.26	381.	Mg K , Mg K , Mg K , As L , As L
1.74	1890.	Si K , Si K
3.35	68.	K K , K K
3.67	232.	Ca K , Ca K
6.39	267.	Fe K , Fe K

Quantex>
0.320 Range= 10.230 keV 10.230
Integral 8 = 279

14-Jul-1992 09:04:30

25015.5-4,A,#24,RS Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 38 secs

Energy	Counts	X-Ray Lines
0.51	596.	O K , O K , V L , V L , V L , V L
1.25	379.	Mg K , Mg K , Mg K , As L , As L
1.74	1904.	Si K , Si K
3.70	240.	Ca K , Ca K
6.42	133.	Fe K , Fe K

Quantex>
0.320 Range= 10.230 keV 10.230
Integral 8 = 195

QM ASBESTOS ANALYSIS

MS Lab No. 15015

ample No. SW-5-4 (150 ml)

RECEIVING

ANALYSIS

GRID
1 ☑ 3 ☐
2 ☐ 4 ☐

Grid Address C

Screen Magnification 19,100 x

Camera Constant 28.5

Accelerating Voltage 100 KV

Beam Current 10 µa

Analyst Kyeong Date 7/14/92

Page 01

MICROSCOPE
600A ☐
600B ☑
HU11E ☐
HU125E ☐

C

Grid opening	Str #	Str	Dimensions (mm) Width	Length	Fiber Classification NAM	TM	CM	CD	CO	CMO	CDO	UF	AD	AX	ADX	AO	ADO	AZO	AZZ	EDS Analysis Na	Mg	Si	Ca	Fe	Id	Comments
1	1	MD	10	35	✓																					EDS#1
2	NSD																									
3	NSD																									
4	NSD																									
5	NSD																									

OBSERVATIONS:

Clean ☐

Debris: ☒ Very Light ☐ Light ☐ Moderate ☒ Heavy ☐ Very Heavy ☐

Gypsum: ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐

14-Jul-1992 15:10:06

25015,5-4,C,#01,KC Preset= 100 secs
Vert= 500 counts Disp= 1 Elapsed= 25 secs

Energy	Counts	X-Ray Lines
1.24	421.	Mg K , Mg K , As L , As L
1.48	336.	Al K , Al K
1.74	1724.	Si K , Si K
3.32	326.	K K , K K
4.48	85.	Ti K , Ti K
5.91	58.	Mn K , Mn K
6.41	616.	Fe K , Fe K
Quantex>	96.	Fe K , Fe K

0.160 Range= 10.230 keV 10.230
Integral = 376

TABLE 3. CLASSIFICATION OF FIBERS WITH TUBULAR MORPHOLOGY

TM	-	Tubular Morphology not sufficiently characteristic for classification as chrysotile
CM	-	Characteristic Chrysotile Morphology
CD	-	Chrysotile SAED pattern
CQ	-	Chrysotile composition by Quantitative EDXA
CMQ	-	Chrysotile Morphology and composition by Quantitative EDXA
CDQ	-	Chrysotile SAED pattern and composition by Quantitative EDXA
NAM	-	Non-Asbestos Mineral

TABLE 4. CLASSIFICATION OF FIBERS WITHOUT TUBULAR MORPHOLOGY

UF	-	Unidentified Fiber
AD	-	Amphibole by random orientation SAED (shows layer pattern of 0.53 nm spacing)
AX	-	Amphibole by qualitative EDXA. Spectrum has elemental components consistent with amphibole
ADX	-	Amphibole by random orientation SAED and Qualitative EDXA
AQ	-	Amphibole by Quantitative EDXA
AZ	-	Amphibole by one Zone Axis SAED
ADQ	-	Amphibole by random orientation SAED and Quantitative EDXA
AZQ	-	Amphibole by one Zone Axis SAED pattern and Quantitative EDXA
AZZ	-	Amphibole by two Zone Axis SAED patterns with consistent inter-axial angle
AZZQ	-	Amphibole by two Zone Axis SAED patterns, consistent inter-axial angle and Quantitative EDXA
NAM	-	Non-Asbestos Mineral

Analysis of Water by Transmission Electron Microscopy
(EPA-600/4-83-043)

EMS No.	25015	Client	SCHAFER & ASSOC.
Sample No.	SW-6-4		
Date	7/17/92		

Total Asbestos Fibers	330	MFL
Chrysotile Fibers	*BDL	MFL
Amphibole Fibers	330	MFL
> 5 Micron length (chrysotile)	*BDL	MFL
> 5 Micron length (amphibole)	59	MFL
Mass (Chrysotile)	*BDL	µg/L
Mass (amphibole)	550	µg/L
More/Less than 5 Chrysotile Fibers in Sample	LESS	
More/Less than 5 Amphibole Fibers in Sample	MORE	
Poisson 95% Confidence Interval	270 to 380	MFL
Detection Limit	2.5	MFL

* BDL : Below Detection Limit; MFL: Million Fibers per Liter

Size Distribution (Chrysotile and Amphibole)

Particle Length - Microns

O -0.49	0.50 - 0.99	1.00 - 1.49	1.50 - 1.99	2.00 - 2.49	2.5 & UP
0	14	18	10	24	66

Particle Width - Microns

O - .04	.05 - .09	.1 - .14	.15 - .19	.2 - .24	.25 & UP
0	7	20	26	14	65

Aspect Ratio L/W

0 - 9.9	10 - 19.9	20 - 29.9	30 - 39.9	40 - 49.9	50 & UP
49	47	21	9	2	4

TEM ASBESTOS ANALYSIS

EMS Lab No. 25015
Client Schafer
Sample No. SW-6-4

FILTER TYPE/AREA (mm²)
MCE/385 ☐
MCN/960 ☐
MCE/960 ☐
1017 Other ☑

MICROSCOPE
600A ☑
600B ☑
HU11E ☐
HU125E ☐

RECEIVING

METHOD OF ANALYSIS
EPA Yamate Level I ☐
Level II ☑
Level III ☐
AHERA ☐

LENGTHS
All Sizes (EPA) ☐
(µm):≥0.5 ☑
≥1.0 ☐
≥5.0 ☐
≥10.0 ☐
PCM Range* ☐
*(≥0.25 µm width, ≥5.0 µm length)

ASPECT RATIO 3:1 ☑ 5:1 ☐

Approved By B Kolb Date 7/2

TYPE OF SAMPLE
Air ☐ Water ☑
Soil ☐ Wipe ☐
Bulk ☐ Other ☐
Dust/Microvac ☐

PORE SIZE
0.45 µm ☐
0.8 µm ☐
.1 µm ☑
.22 µm ☐
Other ☐

G.O. Area (mm²) 0.0 065
No. of G.O. to Analyze 20
Filter Lot No.

PREP

DIRECT PREP ☑
INDIRECT PREP ☐

Volume _____ liters
Working Volume 2 ml
Weight _____ grams
Ashed Area _____ %

Prepared By FG

ANALYSIS

GRID
1 ☒ 3 ☐
2 ☐ 4 ☐

Grid Address [illegible]
Screen Magnification 1930 x
Camera Constant 30.3
Accelerating Voltage 100 KV
Beam Current 10 µm

Analyst Radha Date 7/14

A

Grid opening	Str #	Str	Dimensions (mm) Width	Length	NAM	TM	CM	CD	CQ	CMQ	CDQ	UF	AD	AX	ADX	AQ	ADQ	AZQ	AZZ	Na	Mg	Si	Ca	Fe	Id	Comments
(1)	1	F	15	40												✓										Tremolite
	2	F	4	18												✓										"
	3	F	5	25	✓																					
	4	F	3	40												✓										Tremolite
	5	F	5	30												✓										Tremolite
	6	F	6	190	✓																					
	7	F	4	25	✓																					
	8	F	5	30												✓										Tremolite
	9	F	3	45												✓										Tremolite
	10	F	3	20												✓										Tremolite
	11	F	6	20												✓										Tremolite
	12	F	6	18												✓										Tremolite
	13	F	10	50												✓										Tremolite
	14	F	6	125												✓										Tremolite
	15	F	8	95												✓										Tremolite
	16	F	8	235												✓										Tremolite
	17	F	6	60												✓										Tremolite
	18	F	2	18												✓										Tremolite
	19	F	1	25	✓																					
	20	F	6	65												✓										Tremolite
	21	F	3	18												✓										Tremolite
	22	F	3	45												✓										Tremolite
	23	F	5	20												✓										Tremolite
	24	F	5	45												✓										Tremolite

OBSERVATIONS:
Clean ☐
Debris: ☐ Very Light ☐ Light ☐ Moderate ☒ Heavy ☒ Very Heavy ☐
Gypsum: ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐
Other ☐

all amphiboles are Tremolite

TEM ASBESTOS ANALYSIS

EMS Lab No. 25015
Client Schafer
Sample No. SW-6-4

FILTER TYPE/AREA (mm²)
MCE/385 ☐
MCN/960 ☐
MCE/960 ☐
1017 Other ☑

MICROSCOPE
600A ☑
600B ☑
HU11E ☐
HU125E ☐

RECEIVING

METHOD OF ANALYSIS
EPA Yamate Level I ☐
Level II ☐
Level III ☐
AHERA ☐

LENGTHS
All Sizes (EPA) ☐
(µm):≥0.5 ☐
≥1.0 ☐
≥5.0 ☐
≥10.0 ☐
PCM Range* ☐
*(≥0.25 µm width, ≥5.0 µm length)

ASPECT RATIO 3:1 ☐ 5:1 ☐

Approved By _____ Date _____

TYPE OF SAMPLE
Air ☐ Water ☑
Soil ☐ Wipe ☐
Bulk ☐ Other ☐
Dust/Microvac ☐

PORE SIZE
0.45 µm ☐
0.8 µm ☐
.1 µm ☑
.22 µm ☐
Other ☐

G.O. Area (mm²) 0.0065
No. of G.O. to Analyze 20
Filter Lot No. _____

PREP

DIRECT PREP ☑
INDIRECT PREP ☐

Volume _____ liters
Working Volume 2 ml
Weight _____ grams
Ashed Area _____ %
Prepared By FG

ANALYSIS

GRID
1 ☒ 3 ☐
2 ☐ 4 ☐

Grid Address 1A
Screen Magnification 1930 x
Camera Constant 30.3
Accelerating Voltage 100 KV
Beam Current 10 µm

A

Analyst Radha Date 7/14

Grid opening	Str #	Str	Dimensions (mm) Width	Length	NAM	TM	CM	CD	CQ	CMQ	CDQ	UF	AD	AX	ADX	AQ	ADQ	AZQ	AZZ	Na	Mg	Si	Ca	Fe	Id	Comments
1	25	F	8	22												✓										Tremolite
	26	F	4	18												✓										Tremolite
	27	F	5	55												✓										Tremolite
	28	F	3	70												✓										Tremolite
	29	F	5	65												✓										Tremolite
	30	F	6	40	✓																					
	31	F	5	15												✓										Tremolite
	32	F	3	30												✓										Tremolite
	33	F	2	12												✓										Tremolite
	34	F	15	45												✓										Tremolite
	35	F	2	50												✓										Tremolite
	36	F	8	45	✓																					
	37	F	2	12												✓										Tremolite
	38	F	4	50												✓										Tremolite
	39	F	8	42												✓										Tremolite
	40	F	2	40	✓																					
	41	F	15	42												✓										Tremolite
	42	F	2	42												✓										Tremolite
	43	F	3	52												✓										Tremolite
	44	F	5	80												✓										Tremolite
	45	F	8	200												✓										Tremolite
	46	F	6	80												✓										Tremolite
	47	F	15	75	✓																					
	48	F	5	65	✓																					

OBSERVATIONS:
Clean ☐
Debris: ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐
Gypsum: ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐
Other ☐

TEM ASBESTOS ANALYSIS

EMS Lab No. 25015
Client Schafer
Sample No. SW-6-4

LTER /ARE ²)
MCE/385 ☐
MCN/960 ☐
MCE/960 ☐
1017 Other ☑

MICROSCOPE
600A ☑
600B ☐
HU11E ☐
HU125E ☐

RECEIVING

METHOD OF ANALYSIS
EPA Yamate Level I ☐
Level II ☐
Level III ☐
AHERA ☐

LENGTHS
All Sizes (EPA) ☐
(µm):≥0.5 ☐
≥1.0 ☐
≥5.0 ☐
≥10.0 ☐
PCM Range* ☐
*(≥0.25 µm width, ≥5.0 µm length)

ASPECT RATIO 3:1 ☐ 5:1 ☐

Approved By _____ Date _____

TYPE OF SAMPLE
Air ☐ Water ☑
Soil ☐ Wipe ☐
Bulk ☐ Other ☐
Dust/Microvac ☐

PORE SIZE
0.45 µm ☐
0.8 µm ☐
.1 µm ☑
.22 µm ☐
Other ☐

G.O. Area (mm²) 0.0065
No. of G.O. to Analyze 20
Filter Lot No. _____

PREP

DIRECT PREP ☑
INDIRECT PREP ☐

Volume _____ liters
Working Volume 2 ml
Weight _____ grams
Ashed Area _____ %
Prepared By FG

ANALYSIS

GRID
1 ☒ 3 ☐
2 ☐ 4 ☐

Grid Address 1A
Screen Magnification 1930 x
Camera Constant 30.3
Accelerating Voltage 100 KV
Beam Current 10 µm

Analyst Radha Date 7/14

A

Grid opening	Str #	Str	Dimensions (mm) Width	Length	NAM	TM	CM	CD	CQ	CMQ	CDQ	UF	AD	AX	ADX	AQ	ADQ	AZQ	AZZ	Na	Mg	Si	Ca	Fe	Id	Comments
1	49	F	6	40												✓										Tremolite
	50	F	3	100												✓										Tremolite
	51	F	4	50												✓										Tremolite
	52	F	5	68												✓										Tremolite
	53	F	5	22												✓										Tremolite
	54	F	8	100												✓										Tremolite
	55	F	5	25												✓										Tremolite
	56	F	5	28												✓										Tremolite
	57	F	3	15												✓										Tremolite
	58	F	5	25												✓										Tremolite
	59	F	4	12												✓										Tremolite
	60	F	3	25												✓										Tremolite
	61	F	6	70												✓										Tremolite
	62	F	3	18												✓										Tremolite
	63	F	3	25	✓																					Tremolite
	64	F	4	18												✓										Tremolite
	65	F	6	78												✓										Tremolite
	66	F	8	42												✓										Tremolite
	67	F	5	70	✓																					
	68	F	8	200												✓										Tremolite
	69	F	5	22												✓										Tremolite
	70	F	3	50												✓										Tremolite
	71	F	10	110												✓										Tremolite

OBSERVATIONS:
Clean ☐
Debris: ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐
Gypsum: ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐
Other ☐

14-Jul-1992 08:49:45

25015.6-4.A.#01 Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 17 secs

Energy	Counts	X-Ray Lines
0.51	387.	O K , O K , V L , V L , V L , V L
1.25	327.	Mg K , Mg K , Mg K , As L , As L
1.74	934.	Si K , Si K
3.70	273.	Ca K , Ca K
4.03	37.	Ca K , Ca K
6.40	47.	Fe K , Fe K

Quantex>
0.320 Range= 10.230 keV 10.230
Integral 3 = 228

14-Jul-1992 08:50:43

25015.6-4.A.#02.RS Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 26 secs

Energy	Counts	X-Ray Lines
0.51	311.	O K , O K , V L , V L , V L , V L
1.22	147.	Mg K , Mg K , Ge L , Ge L , Ge L , Ge L
1.73	383.	Si K , Si K
3.68	86.	Ca K , Ca K
6.42	76.	Fe K , Fe K

Quantex>
0.320 Range= 10.230 keV 10.230
Integral 8 = 116

14-Jul-1992 08:52:31

25015,6-4,A,#03,RS Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 56 secs

Energy	Counts	X-Ray Lines
0.51	281.	O K , O K , V L , V L , V L , V L
1.25	194.	Mg K , Mg K , Mg K , As L , As L
1.73	672.	Si K , Si K

Quantex>
0.320 Range= 10.230 keV 10.230
Integral 8 = 104

14-Jul-1992 08:53:42

25015,6-4,A,#04,RS Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 38 secs

Energy	Counts	X-Ray Lines
0.51	497.	O K , O K , V L , V L , V L , V L
1.25	362.	Mg K , Mg K , Mg K , As L , As L
1.74	1017.	Si K , Si K
3.70	147.	Ca K , Ca K
6.38	113.	Fe K , Fe K

Quantex>
0.320 Range= 10.230 keV 10.230
Integral 8 = 196

14-Jul-1992 08:56:38

25015.6-4.A.#05.RS Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 28 secs

Energy	Counts	X-Ray Lines
0.51	752.	O K , O K , V L , V L , V L , V L
1.24	432.	Mg K , Mg K , As L , As L
1.73	1325.	Si K , Si K
3.67	88.	Ca K , Ca K
6.40	243.	Fe K , Fe K

Quantex)
0.320 Range= 10.230 keV 10.230
Integral 8 = 27=

14-Jul-1992 09:04:41

25015,6-4,A,#24,RS Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 38 secs

Energy	Counts	X-Ray Lines
0.51	596.	O K , O K , V L , V L , V L , V L
1.25	575.	Mg K , Mg K , Mg K , As L , As L
1.74	1084.	Si K , Si K
3.70	240.	Ca K , Ca K
6.42	153.	Fe K , Fe K

Quantex>
0.320 Range= 10.230 keV 10.230
Integral 6 = 133

14-Jul-1992 09:13:37

25015,6-4,A,#44,RS Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 42 secs

Energy	Counts	X-Ray Lines
0.51	404.	O K , O K , V L , V L , V L , V L
1.26	245.	Mg K , Mg K , Mg K , As L , As L
1.74	784.	Si K , Si K
3.69	97.	Ca K , Ca K
6.38	110.	Fe K , Fe K

Quantex>
0.320 Range= 10.230 keV 10.230
Integral 8 = 183

14-Jul-1992 09:21:26

25015,6-4,A,#66,RS Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 25 secs

Energy	Counts	X-Ray Lines
0.51	474.	O K , O K , V L , V L , V L , V L
1.25	323.	Mg K , Mg K , Mg K , As L , As L
1.74	880.	Si K , Si K
3.69	162.	Ca K , Ca K
5.39	94.	Fe K , Fe K

Quantex>
0.320 Range= 10.230 keV 10.230
Integral 0 = 164

EM ASBESTOS ANALYSIS

AS Lab No. 25015

mple No. SOC-6-4

Page 01

MICROSCOPE
600A ☑
600B ☐
HU11E ☐
HU125E ☐

ANALYSIS

GRID
1 ☐ 3 ☐
2 ☑ 4 ☐

Grid Address 1-B

Screen Magnification 19,300

Camera Constant 303

Accelerating Voltage 100 KV

Beam Current 60 µa

B

Analyst F.H. Date 7-16-92

Grid opening	Str #	Str	Dimensions (mm) Width	Length	NAM	TM	CM	CD	CO	CMO	CDO	UF	AD	AX	ADX	AO	ADO	AZO	AZZ	Na	Mg	Si	Ca	Fe	Id	Comments
1	01	F	3	130		✓										✓					3	10	2			EDS Tremolite
	02	FX	6	60	✓																					
	03	F	2	50												✓					4	10	2	2		EDS Trem.-Actinolite
	04	F	6	35												✓					4	10	3	1		EDS Trem.
	05	F	3	44												✓					3	10	2	2		EDS T-A.
	06	F	5	220												✓					4	10	3	1		EDS Tremolite
	07	F	1.5	30												✓										
	08	F/P	2	27												✓										
	09	F	1.5	15												✓										
	10	F	2.5	65												✓										
	11	F/P	3	28												✓										
	12	F	2.5	35												✓										
	13	F/P	5	175												✓					4	10	1	1		EDS Tremolite
	14	F	5	45												✓										
	15	F	5	170												✓										
	16	F	6	70												✓										
	17	F	20	135												✓					3	10	2	1		EDS-Trem-Act.
	18	F	4	25												✓										
	19	F	3	65												✓										
	20	F	12	175												✓					3	10	2	1		EDS Trem-Act.
	21	F	3	65												✓										
	22	F	6	55												✓										
	23	F	3	30												✓										
	24	F	3	55												✓										

OBSERVATIONS:

Clean ☐

Debris: ☑ Very Light ☐ Light ☐ Moderate ☑ Heavy ☐ Very Heavy ☐

Gypsum: ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐

ASBESTOS ANALYSIS

VS Lab No. 25016

mple No. SW-6-4

Page 2 of

MICROSCOPE
600A ☐
600B ☐
HU11E ☐
HU125E ☐

ANALYSIS

GRID
1 ☐ 3 ☐
2 ☐ 4 ☐

Grid Address _____
Screen Magnification _____ x
Camera Constant _____
Accelerating Voltage 100 KV
Beam Current _____ pa

Analyst _____ Date _____

Grid opening	Str #	Str	Dimensions (mm) Width	Length	NAM	TM	CM	CD	CO	CMO	CDO	UF	AD	AX	ADX	AO	ADO	AZO	AZZ	Na	Mg	Si	Ca	Fe	Id	Comments
1	25	F	5	65												✓										Tremolite
	26	F	6	67												✓										"
	27	F	14	450												✓					3	10	2	2		EDS Trem.-Actin.
	28	F	2.5	27												✓										"
	29	F	5	45												✓										"
	30	F	4	80												✓										Tremolite
	31	F	8	50												✓										"
	32	F	4	27												✓										"
	33	F	6	120												✓										"
	34	F	2.5	40												✓										"

OBSERVATIONS:

Clean ☐
Debris: ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐
Gypsum: ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐

16-Jul-1992 14:52:13

25015.6-4,B.01,FM Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 56 secs

Energy	Counts	X-Ray Lines
0.31	393.	O K , O K , V L , V L , V L , V L
1.24	277.	Mo K , Mo K , As L , As L
1.74	809.	Si K , Si K
3.69	186.	Ca K , Ca K

Quantex)
0.320 Range= 10.230 keV 10.230
Integral 8 = 138

16-Jul-1992 14:37:45

25015.6-4,B.03,FM Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 41 secs

Energy	Counts	X-Ray Lines
0.31	567.	O K , O K , V L , V L , V L , V L
1.25	453.	Mo K , Mo K , Mo K , As L , As L
1.74	1044.	Si K , Si K
3.69	232.	Ca K , Ca K
6.39	116.	Fe K , Fe K

Quantex)
0.320 Range= 10.230 keV 10.230
Integral 8 = 221

16-Jul-1992 14:39:40

25015,6-4,B,04,FM Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 41 secs

Energy	Counts	X-Ray Lines
0.51	663.	O K , O K , V L , V L , V L , V L
1.25	496.	Mg K , Mg K , Mg K , As L , As L
1.74	1392.	Si K , Si K
3.69	385.	Ca K , Ca K
6.40	172.	Fe K , Fe K

Quantex)
0.320 Range= 10.230 keV 10.230
Integral 8 = 316

16-Jul-1992 [illegible]

25015,6-4,B,05,FM Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 41 secs

Energy	Counts	X-Ray Lines
0.51	277.	O K , O K , V L , V L , V L , V L
1.24	176.	Mg K , Mg K , As L , As L
1.73	599.	Si K , Si K
3.69	108.	Ca K , Ca K
6.40	107.	Fe K , Fe K

Quantex)
0.320 Range= 10.230 keV 10.230
Integral 8 = 140

16-Jul-1992 15:04:13

25015,6-4,B,06,FM Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 43 secs

0.30	451.	O K , O K , V L , V L , V L , V L
1.25	319.	Mg K , Mg K , Mg K , As L , As L
1.74	329.	Si K , Si K
3.70	314.	Ca K , Ca K
6.40	98.	Fe K , Fe K

Quantex>
Quantex>
0.320 Range= 10.230 keV 10.230
Integral B = 207

16-Jul-1992 15:11:21

25015,6-4,B,13,FM Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 34 secs

Energy	Counts	X-Ray Lines
0.31	513.	O K , O K , V L , V L , V L , V L
1.25	430.	Mg K , Mg K , Mg K , As L , As L
1.73	1180.	Si K , Si K
3.68	149.	Ca K , Ca K
6.39	90.	Fe K , Fe K

Quantex>
0.320 Range= 10.230 keV 10.230
Integral B = 239

16-Jul-1992 15:18:06

25015,6-4,B,17,FM Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 38 secs

Energy	Counts	X-Ray Lines
0.51	1345.	O K , O K , V L , V L , V L , V L
1.25	653.	Mg K , Mg K , Mg K , As L , As L
1.74	2771.	Si K , Si K
2.70	367.	Ca K , Ca K
6.42	256.	Fe K , Fe K

Quantex)
0.320 Range= 10.230 keV 10.230
Integral 6 = 455

16-Jul-1992 15:46:50

25015,6-4,B,20,FM Preset= 100 secs
Vert= 1000 counts Disp= 1 Elapsed= 47 secs

Energy	Counts	X-Ray Lines
0.51	1500.	O K , O K , V L , V L , V L , V L
1.25	1398.	Mg K , Mg K , Mg K , As L , As L
1.74	4537.	Si K , Si K
3.70	1032.	Ca K , Ca K
6.41	284.	Fe K , Fe K

Quantex)
0.320 Range= 10.230 keV 10.230
Integral 8 = 754

16-Jul-1992 16:53:44 25013.6-4.8.27.FK

ENERGY	COUNTS	X-RAY LINES
0.51	3945.	O KA1, O KA2, V LA1, V LA2, V LB1, V LB2
1.00	392.	Na KA1, Na KA2, Zn LA1, Zn LA2, Zn LB1, Zn LB2
1.25	2606.	Mg KA1, Mg KA2, Mg KB1, As LA1, As LA2
1.74	3973.	Si KA1, Si KA2
2.33	665.	K KA1, K KA2
3.70	1361.	Ca KA1, Ca KA2
4.03	175.	Ca KB1, Ca KB3
6.40	1362.	Fe KA1, Fe KA2
7.04	220.	Fe KB1, Fe KB3

EM ASBESTOS ANALYSIS
IS Lab No. 25015

nple No. SW-6-4

2m

MICROSCOPE
600A ☐
600B ☐
HU11E ☐
HU12SE ☐

ANALYSIS

GRID
1 ☐ 3 ☑
2 ☐ 4 ☐

Grid Address 1C
Screen Magnification 9-300 x
Camera Constant 30.3
Accelerating Voltage 100 KV
Beam Current 10 pa

C

Analyst S. Ahmed Date 7/17/92

Grid opening	Str #	Str	Dimensions (mm) Width	Length	NAM	TM	CM	CD	CO	CMO	CDO	UF	AD	AX	ADX	AO	ADO	AZO	AZZ	Na	Mg	Si	Ca	Fe	Id	Comments
1	1	F	1	15										✓	✓	✓					3	10	2	1		EDS #1
	2	F	3	25	✓																					
	3	F	3	42										✓	✓	✓					3	10	2	1		EDS #2
	4	F	3.5	60										✓	✓	✓					3	10	1	2		EDS #3
	5	F	10	75										✓	✓	✓					3	10	3	1		EDS #4
	6	F	8	50										✓	✓	✓					3	10	1	2		EDS #5
	7	F	6	75										✓	✓	✓										
	8	F	5	70										✓	✓	✓										
	9	F	3	20	✓																					
	10	F	3	45	✓																					
	11	F	12	45	✓																					
	12	F	2.5	85										✓	✓	✓										
	13	F	11	660										✓	✓	✓										
	14	F	14	220										✓	✓	✓										
	15	MD	7	45	✓																					
	16	F	6.5	70										✓	✓	✓										
	17	F	4	70										✓	✓	✓										
	18	F	4.5	40										✓	✓	✓										
	19	F	4	35										✓	✓	✓										
	20	F	1.5	22	✓																					
	21	F	2	16	✓																					
	22	F	2	45										✓	✓	✓										
	23	F	1.5	40	✓																					
	24	F	2.5	45										✓	✓	✓										

OBSERVATIONS:
Clean ☐
Debris: ☑ Very Light ☐ Light ☐ Moderate ☑ Heavy ☐ Very Heavy ☐
Gypsum: ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐

All Amphiboles are Tremolite.

[illegible] ASBESTOS ANALYSIS

S Lab No. 25015

mple No: SW-6-4

2m

Page 2

MICROSCOPE: 600A ☑ 600B ☐ HU11E ☐ HU125E ☐

ANALYSIS

GRID: 1 ☐ 2 ☐ 3 ☑ 4 ☐

Grid Address: 1A

Screen Magnification: 19300x

Camera Constant: 30.3

Accelerating Voltage: 100 KV

Beam Current: 10 μa

Analyst: S. Ahmed

Date: 7/17/92

Grid opening	Str #	Str	Dimensions (mm) Width	Length	NAM	TM	CM	CD	CO	CMO	CDO	UF	AD	AX	ADX	AO	ADO	AZO	AZZ	Na	Mg	Si	Ca	Fe	Id	Comments
1	25	F	15	350									✓	✓	✓	✓										Tremolite
	26	F	6	75									✓	✓	✓	✓										"
	27	F	1.5	150									✓	✓	✓	✓										"
	28	F	7	525									✓	✓	✓	✓										"
	29	F	6.5	200									✓	✓	✓	✓										"
	30	F	6	43									✓	✓	✓	✓										"
	31	F	5	40									✓	✓	✓	✓										"
	32	MV	1.5	22	✓																					
	33	F	2	28									✓	✓	✓	✓										Tremolite
	34	F	3	27									✓	✓	✓	✓										"
	35	F	3	40	✓																					
	36	F	1	120									✓	✓	✓	✓										Tremolite
	37	F	4	55									✓	✓	✓	✓										"
	38	F	3	20									✓	✓	✓	✓										"
	39	F	2.5	95									✓	✓	✓	✓										"
	40	F	2.5	25	✓																					
	41	F	1	15	✓																					
	42	F	10	225									✓	✓	✓	✓										Tremolite
	43	F	4	85									✓	✓	✓	✓										"
	44	F	3	55									✓	✓	✓	✓										"
	45	F	3	17	✓																					
	46	F	2	42									✓	✓	✓	✓										Tremolite
	47	F	7	38									✓	✓	✓	✓										"
	48	F	2.5	42									✓	✓	✓	✓										"

OBSERVATIONS: Clean ☐

Debris: ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐

Gypsum: ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐

TEM ASBESTOS ANALYSIS

EMS Lab No. 28815

Client

Sample No. SW-6-4

RECEIVING

METHOD OF ANALYSIS
- EPA Yamate Level I ☐
- Level II ☐
- Level III ☐
- AHERA ☐

LENGTHS
- All Sizes (EPA) ☐
- (µm):≥0.5 ☐
- ≥1.0 ☐
- ≥5.0 ☐
- ≥10.0 ☐
- PCM Range* ☐ (*≥0.25 µm width, ≥5.0 µm length)

ASPECT RATIO 3:1 ☐ 5:1 ☐

Approved By _____ Date _____

FILTER TYPE/AREA (mm²)
- MCE/385 ☐
- MCN/960 ☐
- MCE/960 ☐
- Other ☐

TYPE OF SAMPLE
- Air ☐ Water ☐
- Soil ☐ Wipe ☐
- Bulk ☐ Other ☐
- Dust/Microvac ☐

PORE SIZE
- 0.45 µm ☐
- 0.8 µm ☐
- .1 µm ☐
- .22 µm ☐
- Other ☐

G.O. Area (mm²) 0.0 _____

No. of G.O. to Analyze _____

Filter Lot No. _____

PREP

DIRECT PREP ☐

INDIRECT PREP ☐

Volume _____ liters

Working Volume _____ ml

Weight _____ grams

Ashed Area _____ %

Prepared By _____

ANALYSIS

GRID
- 1 ☐ 3 ☑
- 2 ☐ 4 ☐

Grid Address _____

Screen Magnification _____ x

Camera Constant _____

Accelerating Voltage 100 KV

Beam Current _____ µa

MICROSCOPE
- 600A ☐
- 600B ☐
- HU11E ☐
- HU125E ☐

Analyst _____ Date _____

Grid opening	Str #	Str	Dimensions (mm) Width	Length	NAM	TM	CM	CD	CO	CMO	CDO	UF	AD	AX	ADX	AO	ADO	AZO	AZZ	Na	Mg	Si	Ca	Fe	Id	Comments
	49	F	3	110									✓	✓	✓	✓										
	50	F	2	55									✓	✓	✓	✓										
	51	F	3.5	48									✓	✓	✓	✓										
	52	F	1.5	55	✓																					
	53	F	3	40									✓	✓	✓	✓										
	54	F	2.5	35	✓																					
	55	F	1.5	40	✓																					

OBSERVATIONS:

Clean ☐

Debris: ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐

Gypsum: ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐

Other ☐

17-Jul-1992 13:30:49

25015-6-4.C,#05,SA Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 31 secs

Energy	Counts	X-Ray Lines
0.51	731.	O K , O K , V L , V L , V L , V L
1.24	357.	Mg K , Mg K , As L , As L
1.74	1421.	Si K , Si K
3.70	177.	Ca K , Ca K
6.40	229.	Fe K , Fe K

Quantex)
0.160 Range= 10.230 keV 10.230
Integral 6 = 289

17-Jul-1992 13:21:27

25015-6-4.C.#03.SA Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 43 secs

Energy	Counts	X-Ray Lines
0.31	1290.	O K , O K , V L , V L , V L , V L
1.24	912.	Mo K , Mo K , As L , As L
1.74	2743.	Si K , Si K
3.69	360.	Ca K , Ca K
6.40	274.	Fe K , Fe K

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 8 = 486

17-Jul-1992 13:26:53

25015-6-4.C.#04.SA Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 70 secs

Energy	Counts	X-Ray Lines
0.31	1233.	O K , O K , V L , V L , V L , V L
1.24	596.	Mo K , Mo K , As L , As L
1.74	2378.	Si K , Si K
3.70	240.	Ca K , Ca K
6.41	385.	Fe K , Fe K

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 8 = 441

17-Jul-1992 13:20:01

25015-6-4.C.#01.SA Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 25 secs

Energy	Counts	X-Ray Lines
0.51	690.	O K , O K , V L , V L , V L , V L
1.25	435.	Mo K , Mo K , Mo K , As L , As L
1.74	1499.	Si K , Si K
3.69	384.	Ca K , Ca K
4.00	48.	Ca K , Ca K
6.40	166.	Fe K , Fe K

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 8 = 385

17-Jul-1992 13:20:55

25015-6-4.C.#02.SA Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 43 secs

Energy	Counts	X-Ray Lines
0.51	675.	O K , O K , V L , V L , V L , V L
1.25	448.	Mo K , Mo K , Mo K , As L , As L
1.74	1306.	Si K , Si K
3.69	215.	Ca K , Ca K
4.02	56.	Ca K , Ca K
6.41	107.	Fe K , Fe K

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 8 = 479

TABLE 3. CLASSIFICATION OF FIBERS WITH TUBULAR MORPHOLOGY

TM	-	Tubular Morphology not sufficiently characteristic for classification as chrysotile
CM	-	Characteristic Chrysotile Morphology
CD	-	Chrysotile SAED pattern
CQ	-	Chrysotile composition by Quantitative EDXA
CMQ	-	Chrysotile Morphology and composition by Quantitative EDXA
CDQ	-	Chrysotile SAED pattern and composition by Quantitative EDXA
NAM	-	Non-Asbestos Mineral

TABLE 4. CLASSIFICATION OF FIBERS WITHOUT TUBULAR MORPHOLOGY

UF	-	Unidentified Fiber
AD	-	Amphibole by random orientation SAED (shows layer pattern of 0.53 nm spacing)
AX	-	Amphibole by qualitative EDXA. Spectrum has elemental components consistent with amphibole
ADX	-	Amphibole by random orientation SAED and Qualitative EDXA
AQ	-	Amphibole by Quantitative EDXA
AZ	-	Amphibole by one Zone Axis SAED
ADQ	-	Amphibole by random orientation SAED and Quantitative EDXA
AZQ	-	Amphibole by one Zone Axis SAED pattern and Quantitative EDXA
AZZ	-	Amphibole by two Zone Axis SAED patterns with consistent inter-axial angle
AZZQ	-	Amphibole by two Zone Axis SAED patterns, consistent inter-axial angle and Quantitative EDXA
NAM	-	Non-Asbestos Mineral

Analysis of Water by Transmission Electron Microscopy
(EPA-600/4-83-043)

EMS No.	25015	Client	SCHAFER & ASSOC.
Sample No.	SW-7-4		
Date	7/16/92		

Total Asbestos Fibers	94	MFL
Chrysotile Fibers	*BDL	MFL
Amphibole Fibers	94	MFL
> 5 Micron length (chrysotile)	*BDL	MFL
> 5 Micron length (amphibole)	30	MFL
Mass (Chrysotile)	*BDL	µg/L
Mass (amphibole)	420	µg/L
More/Less than 5 Chrysotile Fibers in Sample	LESS	
More/Less than 5 Amphibole Fibers in Sample	MORE	
Poisson 95% Confidence Interval	72 to 120	MFL
Detection Limit	1.5	MFL

* BDL : Below Detection Limit; MFL: Million Fibers per Liter

Size Distribution (Chrysotile and Amphibole)

Particle Length - Microns

O -0.49	0.50 - 0.99	1.00 - 1.49	1.50 - 1.99	2.00 - 2.49	2.5 & UP
0	5	12	5	6	35

Particle Width - Microns

O - .04	.05 - .09	.1 - .14	.15 - .19	.2 - .24	.25 & UP
0	4	12	4	9	34

Aspect Ratio L/W

0 - 9.9	10 - 19.9	20 - 29.9	30 - 39.9	40 - 49.9	50 & UP
24	20	14	1	1	3

TEM ASBESTOS ANALYSIS

EMS Lab No. 25015
Client Schafer
Sample No. SW-7-4

RECEIVING

METHOD OF ANALYSIS
EPA Yamate Level I ☐
Level II ☑
Level III ☐
AHERA ☐

ASPECT RATIO 3:1 ☑ 5:1 ☐

Approved By B Rick Date 7-12

LENGTHS
All Sizes (EPA) ☐
(µm): ≥0.5 ☑
≥1.0 ☐
≥5.0 ☐
≥10.0 ☐
PCM Range* ☐
*(≥0.25 µm width, ≥5.0 µm length)

FILTER TYPE/AREA (mm²)
MCE/385 ☐
MCN/960 ☐
MCE/960 ☐
Other ☑ 1017

TYPE OF SAMPLE
Air ☐ Water ☑
Soil ☐ Wipe ☐
Bulk ☐ Other ☐
Dust/Microvac ☐

PORE SIZE
0.45 µm ☐
0.8 µm ☐
.1 µm ☑
.22 µm ☐
Other ☐

G.O. Area (mm²) 0.0 065
No. of G.O. to Analyze 20
Filter Lot No.

PREP

DIRECT PREP ☑
INDIRECT PREP ☐

Volume _____ liters
Working Volume 5 ml
Weight _____ grams
Ashed Area _____ %

Prepared By FG

ANALYSIS

GRID
1 ☑ 3 ☐
2 ☐ 4 ☐

Grid Address 1-A
Screen Magnification 19,300 x
Camera Constant 3.23
Accelerating Voltage 100 KV
Beam Current 10 µa

Analyst F.M. Date 7-15-97

MICROSCOPE
600A ☑
600B ☐
HU11E ☐
HU12SE ☐

A

Grid opening	Str #	Str	Dimensions (mm) Width	Length	NAM	TM	CM	CD	CQ	CMQ	CDQ	UF	AD	AX	ADX	AQ	ADQ	AZQ	AZZ	Na	Mg	Si	Ca	Fe	Id	Comments
1	01	F	1	15	✓																					
	02	F	11	75												✓					3	10	1	1		EDS Tremolite
	03	F	4	35												✓					2	10	1	2		EDS "
	04	F/B	1.5	20									✓													
	05	F	4	60												✓					3	10	2	1		EDS Tremolite
2	06	F	1.5	18									✓													
	07	F	10	200												✓					3	10	2	1		EDS Tremolite
	08	F	4	105												✓					4	10	2	1		EDS "
3	09	F	2	45	✓																					
	10	F	2	18												✓										Tremolite
	11	F	3	28									✓			✓										"
	12	F	2.5	73												✓					3	10	1	1		EDS "
	13	F	5	115												✓										"
	14	F	16	240												✓					4	10	3			EDS Tremolite
	15	F	2.5	20												✓										"
	16	F	4	40												✓					3	10	2	1		"
4	17	F	2.5	16	✓																					"
	18	F/B	8	160									✓			✓					4	10	2	1		EDS, photo #400
	19	F/B	1.5	25	✓																					Tremolite
5	20	F	2	43												✓										"
	21	F	6	46												✓										"
	22	F	10	47												✓										"
	23	F	2.5	17									✓			✓										"
6	24	F	3	75												✓										"

OBSERVATIONS:

Clean ☐
Debris: ☑ Very Light ☐ Light ☑ Moderate ☐ Heavy ☐ Very Heavy ☐
Gypsum: ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐
Other ☐

EM ASBESTOS ANALYSIS

MS Lab No. 25015

mple No. SW-7-4

PAGE 2 OF

MICROSCOPE

600A ☐
600B ☐
HU11E ☐
HU125E ☐

ANALYSIS

GRID
1 ☐ 3 ☐
2 ☐ 4 ☐

Grid Address _____
Screen Magnification _____ x
Camera Constant _____
Accelerating Voltage 100 KV
Beam Current _____ µa

A

Analyst _____ Date _____

Grid opening	Str #	Str	Dimensions (mm) Width	Length	Fiber Classification NAM	TM	CM	CD	CO	CMO	CDO	UF	AD	AX	ADX	AO	ADO	AZO	AZZ	EDS Analysis Na	Mg	Si	Ca	Fe	Id	Comments
6	25	F	5	22												✓										Tremolite
	26	F	6	100												✓										— " —
	27	F	10	200												✓				1	2	10		2		EDS Crocidolite
7	28	F	12	270									✓			✓					3	10	2			EDS Tremolite
	29	F	4	135												✓										— " —
	30	F	8	80	✓																					

OBSERVATIONS:

Clean ☐
Debris: ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐
Gypsum: ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐

15-Jul-1992 16:14:33 25015,7-4,A,02,FM

ENERGY	COUNTS	X-RAY LINES
0.51	5429.	O KA1, O KA2, V LA1, V LA2, V LB1, V LG1
1.01	440.	Na KA1, Na KA2, Zn LA1, Zn LA2, Zn LB1, Zn LG1
1.25	4406.	Mg KA1, Mg KA2, Mg KB1, As LA1, As LA2
1.74	13713.	Si KA1, Si KA2
3.32	328.	K KA1, K KA2
3.69	1564.	Ca KA1, Ca KA2
4.04	195.	Sc KA2, Ca KB1, Ca KB3
5.43	243.	Cr KA1, Cr KA2
6.41	1685.	Fe KA1, Fe KA2
7.06	262.	Fe KB1, Fe KB3

15-Jul-1992 16:17:09

25015,7-4,A,03,FM Preset= 100 secs
Vert= 500 counts Disp= 1 Elapsed= 45 secs

Energy	Counts	X-Ray Lines
0.51	1336.	O K , O K , V L , V L , V L , V L
1.25	632.	Mg K , Mg K , Mg K , As L , As L
1.74	2610.	Si K , Si K
3.68	217.	Ca K , Ca K
6.41	612.	Fe K , Fe K

Quantex)
0.150 Range= 10.230 keV 10.230
Integral 0 = 14362

15-Jul-1992 16:25:00 25015,7-4,A,05,FM

ENERGY	COUNTS	X-RAY LINES
0.51	3826.	O KA1, O KA2, V LA1, V LA2, V LB1, V LG1
1.01	146.	Na KA1, Na KA2, Zn LA1, Zn LA2, Zn LB1, Zn LG1
1.25	2731.	Mg KA1, Mg KA2, Mg KB1, As LA1, As LA2
1.74	8670.	Si KA1, Si KA2
3.32	308.	K KA1, K KA2
3.69	1459.	Ca KA1, Ca KA2
4.02	167.	Ca KB1, Ca KB3
6.41	971.	Fe KA1, Fe KA2
7.06	123.	Fe KB1, Fe KB3

15-Jul-1992 16:33:09 25015,7-4,A,07,FM

ENERGY	COUNTS	X-RAY LINES
0.51	1920.	O KA1, O KA2, V LA1, V LA2, V LB1, V LG1
1.01	78.	Na KA1, Na KA2, Zn LA1, Zn LA2, Zn LB1, Zn LG1
1.25	1271.	Mg KA1, Mg KA2, Mg KB1, As LA1, As LA2
1.73	4245.	Si KA1, Si KA2
3.31	132.	K KA1, K KA2
3.68	577.	Ca KA1, Ca KA2
4.03	88.	Ca KB1, Ca KB3
6.40	366.	Fe KA1, Fe KA2

15-Jul-1992 16:37:58

25015,7-4,A,08,FM Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 33 secs

Energy	Counts	X-Ray Lines
0.51	533.	O K , O K , V L , V L , V L , V L
1.24	402.	Mg K , Mg K , As L , As L
1.74	1070.	Si K , Si K
3.69	231.	Ca K , Ca K
6.40	111.	Fe K , Fe K

Quantex)
0.160 Range= 10.230 keV 10.230
Integral 0 = .6877

15-Jul-1992 17:16:48

25015,7-4,A,12,FM Preset= 100 secs
Vert= 500 counts Disp= 1 Elapsed= 53 secs

Energy	Counts	X-Ray Lines
0.51	1886.	O K , O K , V L , V L , V L , V L
1.25	1183.	Mg K , Mg K , Mg K , As L , As L
1.74	4454.	Si K , Si K
3.30	133.	K K , K K
3.69	534.	Ca K , Ca K
6.41	503.	Fe K , Fe K

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 28397

15-Jul-1992 17:39:25

25015,7-4,A,14,FM Preset= 100 secs
Vert= 500 counts Disp= 1 Elapsed= 50 secs

Energy	Counts	X-Ray Lines
0.51	2583.	O K , O K , V L , V L , V L , V L
1.24	2325.	Mg K , Mg K , As L , As L
1.74	5899.	Si K , Si K
3.69	1871.	Ca K , Ca K
4.03	199.	Ca K , Ca K
6.40	168.	Fe K , Fe K

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 30245

15-Jul-1992 17:46:11

25015,7-4,A,16,FM Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 69 secs

Energy	Counts	X-Ray Lines
0.51	898.	O K , O K , V L , V L , V L , V L
1.25	601.	Mg K , Mg K , Mg K , As L , As L
1.74	1705.	Si K , Si K
3.69	334.	Ca K , Ca K
6.39	188.	Fe K , Fe K

Quantex)
0.160 Range= 10.230 keV 10.230
Integral 0 = 11351

15-Jul-1992 17:54:08

25015,7-4,A,18,FM Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 36 secs

Energy	Counts	X-Ray Lines
0.51	867.	O K , O K , V L , V L , V L , V L
1.25	552.	Mg K , Mg K , Mg K , As L , As L
1.74	1674.	Si K , Si K
3.69	362.	Ca K , Ca K
6.40	217.	Fe K , Fe K

Quantex)
0.160 Range= 10.230 keV 10.230
Integral 0 = 10065

15-Jul-1992 18:20:16

25015,7-4,A,27,FM Preset= 100 secs
Vert= 100 counts Disp= 1 Elapsed= 34 secs

Energy	Counts	X-Ray Lines
0.51	699.	O K , O K , V L , V L , V L , V L
1.03	107.	Na K , Na K , Na K , Zn L , Zn L , Zn L , Zn L
1.24	299.	Mg K , Mg K , As L , As L
1.74	1480.	Si K , Si K
6.41	358.	Fe K , Fe K

Quantex)
0.160 Range= 10.230 keV 10.230
Integral 0 = 6493

15-Jul-1992 18:25:37

25015.7-4,A,28,PM Preset= 100 secs
Vert= 100 counts Disp= 1 Elapsed= 36 secs

Energy	Counts	X-Ray Lines
0.51	732.	O K , O K , V L , V L , V L , V L
1.24	494.	Mg K , Mg K , As L , As L
1.74	1469.	Si K , Si K
3.69	310.	Ca K , Ca K

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 7010

EM ASBESTOS ANALYSIS

MS Lab No. 25015

ample No. SW-7-4

Page ___ of ___

MICROSCOPE

600A [X]
600B [ ]
HU11E [ ]
HU125E [ ]

ANALYSIS

GRID
1 [X] 3 [ ]
2 [X] 4 [ ]

Grid Address 1-B

Screen Magnification 19,300 x

Camera Constant 30-3

Accelerating Voltage 10 100 KV

Beam Current ___ µa

B

Analyst Radla Date 7/16/92

Grid opening	Str. #	Str	Dimensions (mm) Width	Length	NAM	TM	CM	CD	CQ	CMQ	CDQ	UF	AD	AX	ADX	AQ	ADQ	AZQ	AZZ	Na	Mg	Si	Ca	Fe	Id	Comments
1	1	F	3	12	✓																					
	2	F	9	30	✓																					
2	3	F	13	11	✓																					
	4	MD	9	38												✓					3	10	1	1		Tremolite
	5	F	6	120												✓					2	10	1	2		Tremolite
	6	F	5	75												✓					4	10	1	1		Tremolite
3	7	F	8	25												✓					3	10	1	0		Tremolite
	8	MD	3	24												✓					1					Tremolite
	9	F	2	18	✓																					
4	10	F	4	54												✓										Tremolite
	11	F	1	15	✓																					
	12	F	7	400												✓										Tremolite
	13	F	4	30												✓										Tremolite
	14	F	4	50	✓																					
	15	F	8	45	✓																					
5	16	F	8	55												✓										Tremolite
	17	F	7	60												✓										Tremolite
	18	F	2	20												✓										Tremolite
	19	MD	15	60	✓																					
6	20	MD	6	80												✓										Tremolite
	21	F	1.5	42												✓										Tremolite
7	22	F	6	30												✓										Tremolite
	23	F	1	16	✓																					
	24	F	4	25												✓										Tremolite

all amphiboles are Tremolite (Confirmed by EDS.)

OBSERVATIONS:

Clean [ ]
Debris: [ ] Very Light [ ] Light [X] Moderate [ ] Heavy [ ] Very Heavy [ ]
Gypsum: [ ] Very Light [ ] Light [ ] Moderate [ ] Heavy [ ] Very Heavy [ ]

16-Jul-1992 11:22:58

25015,7-4,B,#02,RS Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 66 secs

Energy	Counts	X-Ray Lines
0.51	348.	O K , O K , V L , V L , V L , V L
1.74	589.	Si K , Si K

Quantex)
0.160 Range= 10.230 keV 10.230
Integral 6 = 78

16-Jul-1992 11:26:27

25015,7-4,B,#04,RS Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 32 secs

Energy	Counts	X-Ray Lines
0.51	891.	O K , O K , V L , V L , V L , V L
1.24	519.	Mg K , Mg K , As L , As L
1.74	1679.	Si K , Si K
3.70	240.	Ca K , Ca K
6.41	229.	Fe K , Fe K

Quantex)
0.160 Range= 10.230 keV 10.230
Integral 6 = 344

16-Jul-1992 11:29:20

25015.7-4.B,#05,RS Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 30 secs

Energy	Counts	X-Ray Lines
0.51	581.	O K , O K , V L , V L , V L , V L
1.25	257.	Mg K , Mg K , Mg K , As L , As L
1.73	1055.	Si K , Si K
3.70	50.	Ca K , Ca K
6.40	206.	Fe K , Fe K

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 8 = 175

16-Jul-1992 11:30:24

25015.7-4.B,#06.RS Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 27 secs

Energy	Counts	X-Ray Lines
0.51	545.	O K , O K , V L , V L , V L , V L
1.26	426.	Mg K , Mg K , Mg K , As L , As L
1.74	1110.	Si K , Si K
3.68	148.	Ca K , Ca K
6.41	163.	Fe K , Fe K

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 8 = 257

16-Jul-1992 11:33:12

25015,7-4.B,#07,RS Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 100 secs

Energy	Counts	X-Ray Lines
0.51	932.	O K , O K , V L , V L , V L , V L
1.25	652.	Mg K , Mg K , Mg K , As L , As L
1.74	1989.	Si K , Si K
3.69	315.	Ca K , Ca K

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 8 = 313

EM ASBESTOS ANALYSIS

MS Lab No. 25015

ample No. SW-7-4

RECEIVING

ANALYSIS

GRID 1 ☐ 2 ☐ 3 ☑ 4 ☐

Grid Address 1C

Screen Magnification 19100x

Camera Constant 78.2

Accelerating Voltage 100 KV

Beam Current 10 pa

Analyst S. Ahmed Date 7/16/92

MICROSCOPE 600A ☐ 600B ☑ HU11E ☐ HU125E ☐

C

Grid opening	Str #	Str	Dimensions (mm) Width	Length	NAM	TM	CM	CD	CO	CMO	CDO	UF	AD	AX	ADX	AO	ADO	AZO	AZZ	Na	Mg	Si	Ca	Fe	Id	Comments
1	1	F	2	12	✓																					
	2	F	1	11		✓							✓	✓	✓	✓					2	10	2	1		EDS#1 Tremolite
	3	F	1.5	125	✓																					
2	4	F	6	45									✓	✓	✓	✓					3	10	2	1		EDS#2 Tremolite
	5	F	25	720									✓	✓	✓	✓					3	10	2	2		EDS#3 "
	6	F	5	52									✓	✓	✓	✓					1	10	4	4		EDS#4 "
	7	F	3	25									✓	✓	✓	✓					3	10	2	2		EDS#5 "
	8	F	7.5	54									✓	✓	✓	✓					3	10	1	1		EDS#6 "
3	9	F	1.5	16	✓																					
	10	F	1	14	✓																					
	11	F	5	84		✓							✓	✓	✓	✓										Tremolite
	12	F	7	220	✓																					
	13	F	12	112									✓	✓	✓	✓										Tremolite
	14	F	20	120		✓							✓	✓	✓	✓										Tremolite
	15	F	1.5	10	✓								✓	✓	✓	✓										
4	16	F	5	300									✓	✓	✓	✓										Tremolite
	17	F	5	70									✓	✓	✓	✓										Tremolite
	18	F	2.5	30									✓	✓	✓	✓										Tremolite
5	19	F	2.5	25		✓							✓	✓	✓	✓										"
	20	F	2.5	105	✓																3					
	21	✓	2	25									✓	✓	✓	✓					3	10	1	1		EDS#21 Tremolite
6	22	MN	11	110									✓	✓	✓	✓										Tremolite
	23	F	2	14									✓	✓	✓	✓										"
	24	F	20	165									✓	✓	✓	✓					3	10	2	2		EDS#24 Tremolite

OBSERVATIONS: Clean ☐ Debris: ☑ Gypsum: ☐ Very Light ☐ Very Light ☐ Light ☐ Light ☐ Moderate ☑ Moderate ☐ Heavy ☑ Heavy ☐ Very Heavy ☐ Very Heavy ☐

EM ASBESTOS ANALYSIS

MS Lab No. 25015

ample No. SW-7-4

RECEIVING

ANALYSIS

(2) Page of

MICROSCOPE
600A ☐
600B ☑
HU11E ☐
HU125E ☐

GRID
1 ☐ 3 ☑
2 ☐ 4 ☐

Grid Address 1C
Screen Magnification 19100 x
Camera Constant 28.2
Accelerating Voltage 100 KV
Beam Current 10 μa

Analyst S. Ahmed Date 7/16/92

Grid opening	Str #	Str	Dimensions (mm) Width	Length	Fiber Classification NAM	TM	CM	CD	CQ	CMQ	CDQ	UF	AD	AX	ADX	AQ	ADQ	AZQ	AZZ	EDS Analysis Na	Mg	Si	Ca	Fe	Id	Comments
6	F	25	5	35	✓																					
	F	26	5	110									✓	✓	✓	✓										Tremolite
7	F	27	5	20									✓	✓	✓	✓										"
	F	28	3	180									✓	✓	✓	✓										"
	F	29	4	175									✓	✓	✓	✓										"
	F	30	2	54									✓	✓	✓	✓										"
	F	[illegible]	1.5	65	✓																					
	F	32	2.5	25									✓	✓	✓	✓										Tremolite

OBSERVATIONS:

Clean ☐					
Debris: ☑	Very Light ☐	Light ☐	Moderate ☑	Heavy ☑	Very Heavy ☐
Gypsum: ☐	Very Light ☐	Light ☐	Moderate ☐	Heavy ☐	Very Heavy ☐

16-Jul-1992 12:50:29

25015.7-4.C.#01.SA Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 21 secs

Energy	Counts	X-Ray Lines
1.25	1030.	Mg K , Mg K , Mg K , As L , As L
1.74	4195.	Si K , Si K
3.69	699.	Ca K , Ca K
6.42	529.	Fe K , Fe K
7.07	58.	Fe K , Fe K

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 5 = 553

16-Jul-1992 12:51:13

25015.7-4.C.#02.SA Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 30 secs

Energy	Counts	X-Ray Lines
1.25	1441.	Mg K , Mg K , Mg K , As L , As L
1.74	5764.	Si K , Si K
3.69	954.	Ca K , Ca K
6.41	776.	Fe K , Fe K
7.04	83.	Fe K , Fe K

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 3 = 772

16-Jul-1992 12:55:11 23015.7-4.C.#03.SA

ENERGY	COUNTS	X-RAY LINES
0.71	40.	F KA1, F KA2, Fe LA1, Fe LA2, Fe LB1, Fe LG1
0.99	72.	Zn LA1, Zn LA2, Zn LB1
1.26	736.	Mo KA1, Mo KA2, Mo KB1, As LA1, As LA2
1.74	2634.	Si KA1, Si KA2
3.34	58.	K KA1, K KA2
3.71	484.	Ca KA1, Ca KA2
4.02	27.	Ca KB1, Ca KB2
6.35	321.	Fe KA1, Fe KA2

16-Jul-1992 13:01:46

25015.7-4.C.#04.SA Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 72 secs

Energy	Counts	X-Ray Lines
1.26	138.	Mo K , Mo K , Mo K , As L , As L
1.74	1120.	Si K , Si K
3.31	670.	Ca K , Ca K
6.40	501.	Fe K , Fe K

Quantex>
0.320 Range= 10.230 keV 10.230
Integral 8 = 263

16-Jul-1992 13:03:51

25015,7-4,C,#05,SA Preset= 100 secs
Vert= 200 counts Disc= 1 Elapsed= 13 secs

Energy	Counts	X-Ray Lines
1.25	393.	Mg K , Mg K , Mg K , As L , As L
1.74	1495.	Si K , Si K
3.32	55.	K K , K K
3.70	222.	Ca K , Ca K
6.40	261.	Fe K , Fe K
7.07	46.	Fe K , Fe K

Quantex)
0.320 Range= 10.230 keV 10.230
Integral 6 = 393

16-Jul-1992 13:07:32

25015.7-4.C.#06.SA Preset= 100 secs
Vert= 200 counts Disc= 1 Elapsed= 15 secs

Energy	Counts	X-Ray Lines
1.25	467.	Mg K , Mg K , Mg K , As L , As L
1.74	1475.	Si K , Si K
3.30	121.	K K , K K
3.69	191.	Ca K , Ca K
5.88	32.	Mn K , Mn K
6.41	113.	Fe K , Fe K

Quantex)
0.320 Range= 10.230 keV 10.230
Integral 6 = 287

16-Jul-1992 13:21:52

25015.7-4.C.#21.SA Preset= 100 secs
Vert= 200 counts Disc= 1 Elapsed= 14 secs

Energy	Counts	X-Ray Lines
1.24	134.	Mg K , Mg K , As L , As L

3.67	88.	Ca K , Ca K
4.07	21.	Sc K , Sc K
6.44	86.	Fe K

Quantex>
0.320 Range= 10.230 keV 10.230
Integral 8 = 142
16-Jul-1992 13:21:59

25015,7-4,C,#21,SA Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 14 secs

Energy	Counts	X-Ray Lines
1.24	154.	Mg K , Mg K , As L , As L
1.74	569.	Si K , Si K
3.67	88.	Ca K , Ca K
4.07	21.	Sc K , Sc K
6.44	86.	Fe K

Quantex>
0.320 Range= 10.230 keV 10.230
Integral 8 = 142

16-Jul-1992 13:25:02 25015,7-4,C,#24,SA

ENERGY	COUNTS	X-RAY LINES
1.01	54.	Na KA1, Na KA2, Zn LA1, Zn LA2, Zn LB1, Zn LG1
1.25	898.	Mg KA1, Mg KA2, Mg KB1, As LA1, As LA2
1.74	3358.	Si KA1, Si KA2
3.30	139.	K KA1, K KA2
3.69	413.	Ca KA1, Ca KA2
5.93	75.	Mn KA1
6.40	476.	Fe KA1, Fe KA2
7.06	75.	Fe KB1, Fe KB3

TABLE 3. CLASSIFICATION OF FIBERS WITH TUBULAR MORPHOLOGY

TM	-	Tubular Morphology not sufficiently characteristic for classification as chrysotile
CM	-	Characteristic Chrysotile Morphology
CD	-	Chrysotile SAED pattern
CQ	-	Chrysotile composition by Quantitative EDXA
CMQ	-	Chrysotile Morphology and composition by Quantitative EDXA
CDQ	-	Chrysotile SAED pattern and composition by Quantitative EDXA
NAM	-	Non-Asbestos Mineral

TABLE 4. CLASSIFICATION OF FIBERS WITHOUT TUBULAR MORPHOLOGY

UF	-	Unidentified Fiber
AD	-	Amphibole by random orientation SAED (shows layer pattern of 0.53 nm spacing)
AX	-	Amphibole by qualitative EDXA. Spectrum has elemental components consistent with amphibole
ADX	-	Amphibole by random orientation SAED and Qualitative EDXA
AQ	-	Amphibole by Quantitative EDXA
AZ	-	Amphibole by one Zone Axis SAED
ADQ	-	Amphibole by random orientation SAED and Quantitative EDXA
AZQ	-	Amphibole by one Zone Axis SAED pattern and Quantitative EDXA
AZZ	-	Amphibole by two Zone Axis SAED patterns with consistent inter-axial angle
AZZQ	-	Amphibole by two Zone Axis SAED patterns, consistent inter-axial angle and Quantitative EDXA
NAM	-	Non-Asbestos Mineral

Analysis of Water by Transmission Electron Microscopy
(EPA-600/4-83-043)

EMS No.	25015	Client	SCHAFER & ASSOC.
Sample No.	SW-8-4		
Date	7/17/92		

Total Asbestos Fibers	310	MFL
Chrysotile Fibers	*BDL	MFL
Amphibole Fibers	310	MFL
> 5 Micron length (chrysotile)	*BDL	MFL
> 5 Micron length (amphibole)	45	MFL
Mass (Chrysotile)	*BDL	µg/L
Mass (amphibole)	340	µg/L
More/Less than 5 Chrysotile Fibers in Sample	LESS	
More/Less than 5 Amphibole Fibers in Sample	MORE	
Poisson 95% Confidence Interval	240 to 390	MFL
Detection Limit	4.5	MFL

* BDL : Below Detection Limit; MFL: Million Fibers per Liter

Size Distribution (Chrysotile and Amphibole)

Particle Length - Microns

O -0.49	0.50 - 0.99	1.00 - 1.49	1.50 - 1.99	2.00 - 2.49	2.5 & UP
0	4	12	11	13	29

Particle Width - Microns

O - .04	.05 - .09	.1 - .14	.15 - .19	.2 - .24	.25 & UP
0	1	12	16	8	32

Aspect Ratio L/W

0 - 9.9	10 - 19.9	20 - 29.9	30 - 39.9	40 - 49.9	50 & UP
31	27	6	2	1	2

TEM ASBESTOS ANALYSIS

Page [redacted] of [redacted]

EMS Lab No. 25015
Client Schafer
Sample No. SW-8-4

RECEIVING

METHOD OF ANALYSIS
EPA Yamate Level I ☐
Level II ☑
Level III ☐
AHERA ☐

ASPECT RATIO 3:1 ☑ 5:1 ☐

LENGTHS
All Sizes (EPA) ☐
(µm): ≥0.5 ☑
≥1.0 ☐
≥5.0 ☐
≥10.0 ☐
PCM Range* ☐
*(≥0.25 µm width, ≥5.0 µm length)

Approved By B. Kolk Date 7-12

FILTER TYPE/AREA (mm²)
MCE/385 ☐
MCN/960 ☐
MCE/960 ☐
1017 Other ☑

TYPE OF SAMPLE
Air ☐ Water ☑
Soil ☐ Wipe ☐
Bulk ☐ Other ☐
Dust/Microvac ☐

PORE SIZE
0.45 µm ☐
0.8 µm ☐
.1 µm ☑
.22 µm ☐
Other ☐

G.O. Area (mm²) 0.0 065
No. of G.O. to Analyze 20
Filter Lot No.

PREP

DIRECT PREP ☑
INDIRECT PREP ☐

Volume _____ liters
Working Volume 5 ml
Weight _____ grams
Ashed Area _____ %

Prepared By FG

ANALYSIS

GRID
1 ☑ 3 ☐
2 ☐ 4 ☐

Grid Address 1-A
Screen Magnification 1930x
Camera Constant 36.3
Accelerating Voltage 100 KV
Beam Current 10 µa

Analyst Radka Date 7-14

MICROSCOPE
600A ☐
600B ☑
HU11E ☐
HU125E ☐

A

Grid opening	Str #	Str	Dimensions (mm) Width	Length	NAM	TM	CM	CD	CO	CMO	CDO	UF	AD	AX	ADX	AO	ADO	AZO	AZZ	Na	Mg	Si	Ca	Fe	Id	Comments
1	1	F	20	200		✓										✓					3	10	1	1		EDS Tremolite
	2	F	2	15	✓																					EDS
	3	F	1.5	30												✓										EDS Tremolite
	4	F	6	22		✓										✓					3	10	1	1		EDS
	5	F	1.5	80	✓																					EDS
	6	F	2	70		✓										✓										Tremolite
	7	F	3	45	✓																					
	8	F	5	40	✓																					
	9	F	4	22												✓										Tremolite
	10	F	3	65												✓										Tremolite
	11	F	8	72												✓										Tremolite
	12	F	4	40												✓										Tremolite
	13	F	2	15												✓										Tremolite
2	14	F	8	40												✓										Tremolite
	15	F	3	15	✓																					
	16	F	8	22	✓																					
	17	F	6	45												✓										Tremolite
	18	F	5	12												✓										Tremolite
	19	F	6	40												✓										Tremolite
	20	F	4	30												✓										Tremolite
	21	F	4	40												✓										Tremolite
	22	F	4	55												✓										Tremolite
	23	F	3	75												✓										Tremolite
3	24	F	6	60	✓																					

OBSERVATIONS:

Clean ☐
Debris: ☐ Very Light ☐ Light ☒ Moderate ☒ Heavy ☐ Very Heavy ☐
Gypsum: ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐
Other ☐

all amphiboles are Tremolite.

TEM ASBESTOS ANALYSIS

Page ___ of ___

EMS Lab No. 25015
Client Schafer
Sample No. SW-8-4

RECEIVING

METHOD OF ANALYSIS: EPA Yamate Level I ☐ Level II ☐ Level III ☐ AHERA ☐

LENGTHS: All Sizes (EPA) ☐ (µm): ≥0.5 ☐ ≥1.0 ☐ ≥5.0 ☐ ≥10.0 ☐ PCM Range* ☐ (*0.25 µm width, 25.0 µm length)

ASPECT RATIO 3:1 ☐ 5:1 ☐

Approved By _____ Date _____

FILTER TYPE/AREA (mm²): MCE/385 ☐ MCN/960 ☐ MCE/960 ☐ Other ☑ 1017

TYPE OF SAMPLE: Air ☐ Water ☑ Soil ☐ Wipe ☐ Bulk ☐ Other ☐ Dust/Microvac ☐

PORE SIZE: 0.45 µm ☐ 0.8 µm ☐ .1 µm ☑ .22 µm ☐ Other ☐

G.O. Area (mm²) 0.0065
No. of G.O. to Analyze 20
Filter Lot No. _____

PREP

DIRECT PREP ☑ INDIRECT PREP ☐

Volume _____ liters
Working Volume 5 ml
Weight _____ grams
Ashed Area _____ %
Prepared By FG

ANALYSIS

GRID: 1 ☑ 2 ☐ 3 ☐ 4 ☐

MICROSCOPE: 600A ☐ 600B ☑ HU11E ☐ HU125E ☐

Grid Address 1-A
Screen Magnification 19340x
Camera Constant 36.3
Accelerating Voltage 100 KV
Beam Current 10 µa

Analyst Radla Date 7-14

A

Grid opening	Str #	Str	Dimensions (mm) Width	Length	NAM	TM	CM	CD	CO	CMO	CDO	UF	AD	AX	ADX	AO	ADO	AZO	AZZ	Na	Mg	Si	Ca	Fe	Id	Comments
3	25	F	3	20	✓																					
	26	F	2	18	✓																					
	27	F	3	24												✓										Tremolite
	28	F	7	120												✓										Tremolite
	29	F	4	95	✓																					
	30	F	4	30	✓																					
	31	F	6	58												✓					3	10	2	0		EDS Tremo
	32	F	3	11	✓																					
	33	F	2	70												✓										
	34	F	4	20												✓					3	10	3	1		EDS Tremo
	35	F	1	18	✓																					
	36	F	5	20												✓										Tremolite
4	37	F	3	11												✓										Tremolite
	38	F	2	30																						Tremolite
	39	F	8	45																						Tremolite
	40	F	8	20	✓																					
	41	F	10	45												✓										Tremolite
	42	F	8	48												✓										Tremolite
	43	F	2	48												✓										Tremolite
	44	F	2	95	✓																					
	45	F	6	30												✓										Tremolite
	46	F	3	15	✓																					
	47	F	2	30	✓																					
	48	F	10	65	✓																					

OBSERVATIONS:

Clean ☐
Debris: ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐
Gypsum: ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐
Other ☐

TEM ASBESTOS ANALYSIS

Page ___ of ___

EMS Lab No. 25015
Client Schafer
Sample No. SW-8-4

RECEIVING

METHOD OF ANALYSIS
EPA Yamate Level I ☐
Level II ☐
Level III ☐
AHERA ☐

LENGTHS
All Sizes (EPA) ☐
(µm): ≥0.5 ☐
≥1.0 ☐
≥5.0 ☐
≥10.0 ☐
PCM Range* ☐
*(≥0.25 µm width, ≥5.0 µm length)

ASPECT RATIO 3:1 ☐ 5:1 ☐

Approved By _____ Date _____

FILTER TYPE/AREA (mm²)
MCE/385 ☐
MCN/960 ☐
MCE/960 ☐
Other ☑ 1017

TYPE OF SAMPLE
Air ☐ Water ☑
Soil ☐ Wipe ☐
Bulk ☐ Other ☐
Dust/Microvac ☐

PORE SIZE
0.45 µm ☐
0.8 µm ☐
.1 µm ☑
.22 µm ☐
Other ☐

G.O. Area (mm²) 0.0 0.65
No. of G.O. to Analyze 20
Filter Lot No. _____

PREP

DIRECT PREP ☑
INDIRECT PREP ☐

Volume _____ liters
Working Volume 5 ml
Weight _____ grams
Ashed Area _____ %

Prepared By FG

ANALYSIS

GRID
1 ☐ 3 ☐
2 ☐ 4 ☐

Grid Address 1-A
Screen Magnification 1930x
Camera Constant 30.3
Accelerating Voltage 100 KV
Beam Current 10 pa

Analyst Radka Date 7-14

MICROSCOPE
600A ☐
600B ☑
HU11E ☐
HU12SE ☐

A

Grid opening	Str #	Str	Dimensions (mm) Width	Dimensions (mm) Length	NAM	TM	CM	CD	CO	CMO	CDO	UF	AD	AX	ADX	AO	ADO	AZO	AZZ	Na	Mg	Si	Ca	Fe	Id	Comments
4	49	E	6	40	✓																					
	50	E	1.5	28	✓																					
	51	E	4	14	✓																					
	52	E	8	65												✓										Tremolite
	53	E	3	50	✓																					

OBSERVATIONS:

Clean ☐
Debris: ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐
Gypsum: ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐
Other ☐

14-Jul-1992 10:37:09

25015,8-4,A,#01,RS Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 15 secs

Energy	Counts	X-Ray Lines
0.51	589.	O K , O K , V L , V L , V L , V L
1.26	451.	Mg K , Mg K , Mg K , As L , As L
1.73	1502.	Si K , Si K
3.32	40.	K K , K K
3.69	208.	Ca K , Ca K
6.39	122.	Fe K , Fe K

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 8 = 247

14-Jul-1992 10:38:06

25015,8-4,A,#02,RS Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 30 secs

Energy	Counts	X-Ray Lines
0.51	107.	O K , O K , V L , V L , V L , V L
1.24	82.	Mg K , Mg K , As L , As L
1.49	68.	Al K , Al K
1.73	173.	Si K , Si K

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 8 = 37

14-Jul-1992 10:40:07

25015,8-4,A,#03,RS Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 62 secs

Energy	Counts	X-Ray Lines
0.51	198.	O K , O K , V L , V L , V L , V L
1.74	401.	Si K , Si K

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 8 = 47

14-Jul-1992 10:43:15

25015,8-4,A,#04,RS Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 39 secs

Energy	Counts	X-Ray Lines
0.51	594.	O K , O K , V L , V L , V L , V L
1.24	342.	Mg K , Mg K , As L , As L
1.74	1361.	Si K , Si K
3.67	107.	Ca K , Ca K
6.40	145.	Fe K , Fe K

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 8 = 222

14-Jul-1992 10:46:56

25015,8-4,A,#05,RS Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 46 secs

Energy	Counts	X-Ray Lines
0.50	656.	O K , O K , V L , V L , V L , V L
1.25	373.	Mg K , Mg K , Mg K , As L , As L
1.47	179.	Al K , Al K
1.73	1016.	Si K , Si K
3.31	157.	K K , K K
6.43	246.	Fe K , Fe K

Quantex)
0.160 Range= 10.230 keV 10.230
Integral 8 = 309

14-Jul-1992 11:31:57 -WARNING-

25015,8-4,A,#31,RS Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 45 secs

Energy	Counts	X-Ray Lines
0.51	340.	U K , U K , V L , V L , V L , U V L
1.25	199.	Mg K . Mg K . Mg K , As L , As L
1.74	705.	Si K . Si K
3.70	133.	Ca K . Ca K

Quantex)
0.160 Range= 10.230 keV 10.230
Integral 8 = 126

14-Jul-1992 11:37:55

25015,8-4,A,#3Ⅱ,RS Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 24 secs

Energy	Counts	X-Ray Lines
0.50	100.	O K , O K , V L , V L , V L , V L
1.25	111.	Mg K , Mg K , Mg K , As L , As L
1.74	326.	Si K , Si K
3.70	92.	Ca K , Ca K
6.41	33.	Fe K , Fe K

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 3 = 121

TEM ASBESTOS ANALYSIS

EMS Lab No. 25015
Client Scheter
Sample No. SW-8-4

FILTER TYPE/AREA (mm²)
MCE/385 ☐
MCN/960 ☐
MCE/960 ☐
Other ☐

MICROSCOPE
600A ☑
600B ☐
HU11E ☐
HU125E ☐

RECEIVING

METHOD OF ANALYSIS
EPA Yamate Level I ☐
Level II ☐
Level III ☐
AHERA ☐

LENGTHS
All Sizes (EPA) ☐
(µm):≥0.5 ☐
≥1.0 ☐
≥5.0 ☐
≥10.0 ☐
PCM Range* ☐
*(≥0.25 µm width, ≥5.0 µm length)

ASPECT RATIO 3:1 ☐ 5:1 ☐

Approved By _____ Date _____

TYPE OF SAMPLE
Air ☐ Water ☐
Soil ☐ Wipe ☐
Bulk ☐ Other ☐
Dust/Microvac ☐

PORE SIZE
0.45 µm ☐
0.8 µm ☐
.1 µm ☐
.22 µm ☐
Other ☐

G.O. Area (mm²) 0.0 _____
No. of G.O. to Analyze _____
Filter Lot No. _____

PREP

DIRECT PREP ☐
INDIRECT PREP ☐

Volume _____ liters
Working Volume _____ ml
Weight _____ grams
Ashed Area _____ %

Prepared By _____

ANALYSIS

GRID
1 ☐ 3 ☐
2 ☑ 4 ☐

Grid Address 1-B
Screen Magnification 19,300 x
Camera Constant 30.3
Accelerating Voltage 100 KV
Beam Current 10 µa

B

Analyst F.M. Date 7-16-92

Grid opening	Str #	Str	Dimensions (mm) Width	Length	NAM	TM	CM	CD	CQ	CMQ	CDQ	UF	AD	AX	ADX	AQ	ADQ	AZQ	AZZ	Na	Mg	Si	Ca	Fe	Id	Comments
1	01	F	23	200	✓																					
	02	F	17	60												✓					3	10	2	2		EDS Tremol.-acti
	03	F	5	50												✓					3	10	3	1		EDS "
	04	F	2.5	220												✓					3	10	2	2		EDS "
	05	F	15	100												✓					3	10	3			Tremolite
	06	F	3	33												✓					3	10	1	1		EDS "
	07	F	3	47												✓										"
	08	F	5	36												✓										"
	09	F	8	105												✓					4	10	3	1		EDS "
	10	F	5	90												✓										"
	11	F	5	45												✓					4	10				EDS Anthophyllite
	12	F	2	25												✓										"
	13	F	12	135												✓										"
	14	F	3	20												✓										Tremolite
	15	F	5	210												✓					3	10	1	1		EDS
	16	F	2.5	15												✓										"
	17	F	3	28												✓										"
	18	F	3	60												✓										"
2	19	F	5	60												✓										"
	20	F	2.5	35												✓										"
	21	F	3	47												✓										"
	22	F	7	57												✓										"
	23	F	5	65												✓										"
	24	F	3	20												✓										"

OBSERVATIONS:
Clean ☐
Debris: ☐ Very Light ☐ Light ☑ Moderate ☑ Heavy ☐ Very Heavy ☐
Gypsum: ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐
Other ☐

TEM ASBESTOS ANALYSIS

EMS Lab No. 25015
Client
Sample No. SW-8-4

RECEIVING

METHOD OF ANALYSIS
EPA Yamate Level I ☐
Level II ☐
Level III ☐
AHERA ☐

LENGTHS
All Sizes (EPA) ☐
(µm): ≥0.5 ☐
≥1.0 ☐
≥5.0 ☐
≥10.0 ☐
PCM Range* ☐
*(≥0.25 µm width, ≥5.0 µm length)

ASPECT RATIO 3:1 ☐ 5:1 ☐

Approved By _____ Date _____

FILTER/AREA (mm²)
MCE/385 ☐
MCN/960 ☐
MCE/960 ☐
Other ☐

TYPE OF SAMPLE
Air ☐ Water ☐
Soil ☐ Wipe ☐
Bulk ☐ Other ☐
Dust/Microvac ☐

PORE SIZE
0.45 µm ☐
0.8 µm ☐
.1 µm ☐
.22 µm ☐
Other ☐

G.O. Area (mm²) 0.0 _____
No. of G.O. to Analyze _____
Filter Lot No. _____

PREP

DIRECT PREP ☐
INDIRECT PREP ☐

Volume _____ liters
Working Volume _____ ml
Weight _____ grams
Ashed Area _____ %

Prepared By _____

ANALYSIS

GRID
1 ☐ 3 ☐
2 ☐ 4 ☐

Grid Address _____
Screen Magnification _____ x
Camera Constant _____
Accelerating Voltage 100 KV
Beam Current _____ µa

Analyst _____ Date _____

MICROSCOPE
600A ☐
600B ☐
HU11E ☐
HU125E ☐

B A

Grid opening	Str #	Str	Dimensions (mm) Width	Length	NAM	TM	CM	CD	CC	CMC	CDC	UF	AD	AX	ADX	AC	ADC	AZC	AZZ	Na	Mg	Si	Ca	Fe	Id	Comments
2	25	F	2	330												✓					3	10	2			EDS Tremolite
	26	F	2	25												✓										
	26	F	3	45												✓										
	27	F	4	50												✓										
	28	F	6	30												✓										

Fiber Classification — EDS Analysis

OBSERVATIONS:

Clean ☐
Debris: ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐
Gypsum: ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐
Other ☐

16-Jul-1992 17:34:21

25015,8-4,B,15,FM Preset= 100 secs
Vert= 500 counts Disp= 1 Elapsed= 37 secs

Energy	Counts	X-Ray Lines
0.51	1666.	O K , O K , V L , V L , V L , V L
1.25	1119.	Mg K , Mg K , Mg K , As L , As L
1.73	3771.	Si K , Si K
3.33	110.	K K , K K
3.70	385.	Ca K , Ca K
6.40	415.	Fe K , Fe K

Quantex)
0.320 Range= 10.230 keV 10.230
Integral 8 = 818

16-Jul-1992 17:46:00

25015,8-4,B,25,FM Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 56 secs

Energy	Counts	X-Ray Lines
0.52	395.	O K , O K , V L , V L , V L , V L
1.25	259.	Mg K , Mg K , Mg K , As L , As L
1.73	867.	Si K , Si K
3.70	147.	Ca K , Ca K

Quantex)
0.320 Range= 10.230 keV 10.230
Integral 8 = 149

16-Jul-1992 17:15:56

25015,8-4,B,09,FM Preset= 100 secs
Vert= 500 counts Disp= 1 Elapsed= 36 secs

Energy	Counts	X-Ray Lines
0.51	2205.	O K , O K , V L , V L , V L , V L
1.25	1716.	Mg K , Mg K , Mg K , As L , As L
1.74	4504.	Si K , Si K
3.65	1183.	Ca K , Ca K
4.04	179.	Sc K , Ca K , Ca K
6.40	315.	Fe K , Fe K

Quantex>
0.320 Range= 10.230 keV 10.230
Integral 8 = 1032

16-Jul-1992 17:24:32

25015,8-4,B,11,FM Preset= 100 secs
Vert= 200 counts Disp= 1 Elapsed= 51 secs

Energy	Counts	X-Ray Lines
0.51	364.	O K , O K , V L , V L , V L , V L
1.24	543.	Mg K , Mg K , As L , As L
1.74	1237.	Si K , Si K

Quantex>
0.320 Range= 10.230 keV 10.230
Integral 8 = 193

16-Jul-1992 17:07:51 25015,8-4,B,05,FM

ENERGY	COUNTS	X-RAY LINES
0.51	3024.	O KA1, O KA2, V LA1, V LA2, V LB1, V LB1
1.25	4123.	Mg KA1, Mg KA2, Mg KB1, As LA1, As LA2
1.74	12165.	Si KA1, Si KA2
2.30	92.	S KA1, S KA2
3.33	254.	K KA1, K KA2
3.70	3323.	Ca KA1, Ca KA2
4.03	364.	Ca KB1, Ca KB3
6.40	387.	Fe KA1, Fe KA2

16-Jul-1992 17:11:36

25015,8-4,B,06,FM Preset= 100 secs
Vert= 500 counts Disp= 1 Elapsed= 47 secs

Energy	Counts	X-Ray Lines
0.51	776.	O K , O K , V L , V L , V L , V L
1.24	457.	Mg K , Mg K , As L , As L
1.74	1620.	Si K , Si K
3.69	167.	Ca K , Ca K
6.40	177.	Fe K , Fe K

Quantex)
0.320 Range= 10.230 keV 10.230
Integral 8 = 287

16-Jul-1992 17:06:14

25015,8-4,B,04,FM
Vert= 500 counts Disp= 1

Preset= 100 secs
Elapsed= 37 secs

Energy	Counts	X-Ray Lines
0.51	695.	O K , O K , V L , V L , V L , V L
1.26	472.	Mg K , Mg K , Mg K , As L , As L
1.73	1456.	Si K , Si K
3.70	253.	Ca K , Ca K
6.41	288.	Fe K , Fe K

Quantex>
0.320 Range= 10.230 keV 10.230
Integral 8 = 344

16-Jul-1992 17:00:56 25015.8-4,B,02,FM

ENERGY	COUNTS	X-RAY LINES
0.51	4105.	O KA1, O KA2, V LA1, V LA2, V LB1, V LB1
1.41	123.	Na KA1, Na KA2, Zn LA1, Zn LA2, Zn LB1, Zn LB1
1.25	2866.	Mg KA1, Mg KA2, Mg KB1, As LA1, As LA2
1.74	9032.	Si KA1, Si KA2
3.33	189.	K KA1, K KA2
3.70	1208.	Ca KA1, Ca KA2
4.03	189.	Ca KB1, Ca KB3
6.41	1239.	Fe KA1, Fe KA2
7.05	164.	Fe KB1, Fe KB3

16-Jul-1992 17:04:04

25015.8-4,B,03,FM Preset= 100 secs
Vert= 500 counts Disp= 1 Elapsed= 62 secs

Energy	Counts	X-Ray Lines
0.51	3467.	O K , O K , V L , V L , V L , V L
1.25	2523.	Mg K , Mg K , Mg K , As L , As L
1.74	7360.	Si K , Si K
3.70	1907.	Ca K , Ca K
4.03	217.	Ca K , Ca K
6.41	749.	Fe K , Fe K

Quantex)
0.320 Range= 10.230 keV 10.230
Integral 8 = 1314

16-Jul-1992 16:59:04 25015,8-4,B,01,FM

ENERGY	COUNTS	X-RAY LINES
0.51	4941.	O KA1, O KA2, V LA1, V LA2, V LB1, V LG1
1.25	2982.	Mg KA1, Mg KA2, Mg KB1, As LA1, As LA2
1.48	1446.	Al KA1, Al KA2
1.74	7232.	Si KA1, Si KA2
3.32	1698.	K KA1, K KA2
3.65	197.	Ca KA1, Ca KA2
4.51	259.	Ti KA1, Ti KA2
6.40	1849.	Fe KA1, Fe KA2
7.03	250.	Fe KB1, Fe KB3

ASBESTOS ANALYSIS

S Lab No. 25015

ple No. SW -8-4'

ANALYSIS

GRID: 1 ☐ 2 ☐ 3 ☑ 4 ☐

MICROSCOPE: 600A ☐ 600B ☑ HU11E ☐ HU12SE ☐

Grid Address 16

Screen Magnification 19100D x

Camera Constant 78.2

Accelerating Voltage 100 KV

Beam Current 10 μa

Analyst S. Ahmed Date 7/17/92

C

Grid opening	Str #	Str	Dimensions (mm) Width	Length	NAM	TM	CM	CD	CO	CMO	CDO	UF	AD	AX	ADX	AO	ADO	AZO	AZZ	Na	Mg	Si	Ca	Fe	Id	Comments
1	1	F	1.5	140	✓	✓																				
	2		1	12	✓																					
	3		2.5	36									✓	✓	✓	✓					3	10	2	1		EDS #1 Tremolite
	4		3	40									✓	✓	✓	✓					2	10	2	1		EDS #2 "
	5		3	35										✓	✓	✓					2	10	2	1		EDS #3 "
	6		8	120										✓	✓	✓					3	10	2	1		EDS #4 "
	7	MD	4	50										✓	✓	✓					3	10	2	1		EDS #5 "
	8	F	12	110	✓	✓																				
	9		3	25	✓											✓										
	10		8	79									✓	✓	✓											Tremolite
	11		3	25									✓	✓	✓											"
	12		1	12	✓	✓																				
	13		3	20	✓																					
	14		1	20	✓	✓																				
	15	MD	1	110	✓																					
	16	F	6	20									✓	✓	✓	✓					3	10	3	1		EDS #16 Tremolite
	17		10	42									✓	✓	✓	✓										"
	18	MD	1.5	40	✓	✓																				
	19	F	3	30									✓	✓	✓	✓										Tremolite

OBSERVATIONS:

Clean ☐

Debris: ☑ Very Light ☐ Light ☐ Moderate ☑ Heavy ☑ Very Heavy ☐

Gypsum: ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐

17-Jul-1992 09:36:08

25015-8-4,C,#01,SA Preset= 100 secs
Vert= 500 counts Disc= 1 Elapsed= 29 secs

Energy	Counts	X-Ray Lines
1.25	1237.	Mg K , Mg K , Mg K , As L , As L
1.74	4612.	Si K , Si K
3.28	93.	K K , K K
3.68	967.	Ca K , Ca K
6.41	303.	Fe K , Fe K

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 8 = 606

17-Jul-1992 09:37:05

25015-8-4,C,#02,SA Preset= 100 secs
Vert= 500 counts Disc= 1 Elapsed= 15 secs

Energy	Counts	X-Ray Lines
1.25	653.	Mg K , Mg K , Mg K , As L , As L
1.74	2716.	Si K , Si K
3.35	78.	K K , K K
3.70	536.	Ca K , Ca K
6.40	184.	Fe K , Fe K
7.06	57.	Fe K , Fe K

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 8 = 603

17-Jul-1992 10:04:21

25015-8-4,C,#03,5A Preset= 100 secs
Vert= 500 counts Disp= 1 Elapsed= 21 secs

Energy	Counts	X-Ray Lines
1.25	372.	Mg K . Mg K , Mg K . As L , As L
1.74	1587.	Si K . Si K
3.33	66.	K K , K K
3.68	304.	Ca K , Ca K
4.01	33.	Ca K , Ca K
6.37	164.	Fe K . Fe K
7.04	45.	Fe K , Fe K

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 8 = 404

17-Jul-1992 10:08:42

25015-8-4,C,#04,5A Preset= 100 secs
Vert= 500 counts Disp= 1 Elapsed= 22 secs

Energy	Counts	X-Ray Lines
1.25	944.	Mg K , Mg K , Mg K , As L , As L
1.74	3712.	Si K , Si K
3.31	66.	K K , K K
3.68	681.	Ca K , Ca K
4.05	92.	Sc K , Sc K , Ca K , Ca K
6.40	421.	Fe K , Fe K

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 8 = 577

17-Jul-1992 10:07:01 25015-8-4,C,#05,SA

ENERGY	COUNTS	X-RAY LINES
0.97	59.	Zn LA1. Zn LA2
1.25	1531.	Mo KA1. Mo KA2, Mo KB1, As LA1, As LA2
1.74	5755.	Si KA1, Si KA2
2.34	43.	S KA1, S KA2
3.31	170.	K KA1, K KA2
3.69	834.	Ca KA1, Ca KA2
4.06	105.	Sc KA1, Sc KA2
4.53	38.	Ti KA1, Ti KA2
6.40	636.	Fe KA1, Fe KA2
7.06	86.	Fe KB1, Fe KB3

17-Jul-1992 10:08:06

25015-8-4,C,#16,SA Preset= 100 secs
Vert= 300 counts Disp= 1 Elapsed= 10 secs

Energy	Counts	X-Ray Lines
1.25	2389.	Mg K . Mg K , Mg K , As L , As L
1.74	6778.	Si K , Si K
3.29	61.	K K , K K
3.69	2241.	Ca K , Ca K
4.04	183.	Sc K , Ca K , Ca K
5.91	28.	Mn K , Mn K
6.42	366.	Fe K , Fe K

Quantex)
0.160 Range= 10.230 keV 10.230
Integral 8 = 1019

TABLE 3. CLASSIFICATION OF FIBERS WITH TUBULAR MORPHOLOGY

TM	-	Tubular Morphology not sufficiently characteristic for classification as chrysotile
CM	-	Characteristic Chrysotile Morphology
CD	-	Chrysotile SAED pattern
CQ	-	Chrysotile composition by Quantitative EDXA
CMQ	-	Chrysotile Morphology and composition by Quantitative EDXA
CDQ	-	Chrysotile SAED pattern and composition by Quantitative EDXA
NAM	-	Non-Asbestos Mineral

TABLE 4. CLASSIFICATION OF FIBERS WITHOUT TUBULAR MORPHOLOGY

UF	-	Unidentified Fiber
AD	-	Amphibole by random orientation SAED (shows layer pattern of 0.53 nm spacing)
AX	-	Amphibole by qualitative EDXA. Spectrum has elemental components consistent with amphibole
ADX	-	Amphibole by random orientation SAED and Qualitative EDXA
AQ	-	Amphibole by Quantitative EDXA
AZ	-	Amphibole by one Zone Axis SAED
ADQ	-	Amphibole by random orientation SAED and Quantitative EDXA
AZQ	-	Amphibole by one Zone Axis SAED pattern and Quantitative EDXA
AZZ	-	Amphibole by two Zone Axis SAED patterns with consistent inter-axial angle
AZZQ	-	Amphibole by two Zone Axis SAED patterns, consistent inter-axial angle and Quantitative EDXA
NAM	-	Non-Asbestos Mineral

Analysis of Water by Transmission Electron Microscopy
(EPA-600/4-83-043)

EMS No.	25015	Client	SCHAFER & ASSOC.
Sample No.	SW-11-4		
Date	7/17/92		

Total Asbestos Fibers	0.2	MFL
Chrysotile Fibers	*BDL	MFL
Amphibole Fibers	0.2	MFL
> 5 Micron length (chrysotile)	*BDL	MFL
> 5 Micron length (amphibole)	0.1	MFL
Mass (Chrysotile)	*BDL	µg/L
Mass (amphibole)	0.3	µg/L
More/Less than 5 Chrysotile Fibers in Sample	LESS	
More/Less than 5 Amphibole Fibers in Sample	LESS	
Poisson 95% Confidence Interval	0.02 to 0.8	MFL
Detection Limit	0.1	MFL

* BDL : Below Detection Limit; MFL: Million Fibers per Liter

Size Distribution (Chrysotile and Amphibole)

Particle Length - Microns

O -0.49	0.50 - 0.99	1.00 - 1.49	1.50 - 1.99	2.00 - 2.49	2.5 & UP
0	0	0	1	0	1

Particle Width - Microns

O - .04	.05 - .09	.1 - .14	.15 - .19	.2 - .24	.25 & UP
0	0	0	0	0	2

Aspect Ratio L/W

0 - 9.9	10 - 19.9	20 - 29.9	30 - 39.9	40 - 49.9	50 & UP
1	1	0	0	0	0

EM ASBESTOS ANALYSIS

Page ___ of ___

MS Lab No. 25015
ient Schafer
mple No. SW-11-4

FILTER TYPE/AREA (mm²)
MCE/385 ☐
MCN/960 ☐
MCE/960 ☐
Other ☑ 1017

METHOD OF ANALYSIS
EPA Yamate Level I ☐
Level II ☑
Level III ☐
AHERA ☐

LENGTHS
All Sizes (EPA) ☐
(µm): ≥0.5 ☑
≥1.0 ☐
≥5.0 ☐
≥10.0 ☐
PCM Range* ☐
*(≥0.25 µm width, ≥5.0 µm length)

ASPECT RATIO 3:1 ☑ 5:1 ☐

Approved By B Kolk Date 7-12

TYPE OF SAMPLE
Air ☐ Water ☑
Soil ☐ Wipe ☐
Bulk ☐ Other ☐
Dust/Microvac ☐

PORE SIZE
0.45 µm ☐
0.8 µm ☐
.1 µm ☑
.22 µm ☐
Other ☐

G.O. Area (mm²) 0.0 065
No. of G.O. to Analyze 20
Filter Lot No.

PREP

DIRECT PREP ☑
INDIRECT PREP ☐

Volume ___ liters
Working Volume 50 ml
Weight ___ grams
Ashed Area ___ %

Prepared By FG

ANALYSIS

GRID
1 ☑ 3 ☐
2 ☐ 4 ☐

Grid Address 1-A
Screen Magnification 1930
Camera Constant 303
Accelerating Voltage 100 KV
Beam Current 10 µa

Analyst Radha Date 7-17-92

MICROSCOPE
600A ☑
600B ☐
HU11E ☐
HU125E ☐

A

Grid opening	Str #	Str	Dimensions (mm) Width	Length	NAM	TM	CM	CD	CQ	CMQ	CDQ	UF	AD	AX	ADX	AQ	ADQ	AZQ	AZZ	Na	Mg	Si	Ca	Fe	Id	Comments
1	1	F	3	52	✓																					
2	2	F	5	35												✓					3	10	2	1		Tremolite
	3	F	3	20	✓																					
3	NSD																									
4	NSD																									
5	NSD																									
6	NSD																									
7	4	F	2	28	✓																					
	5	F	1	9	✓																					

OBSERVATIONS:

Clean ☐
Debris: ☐ Very Light ☐ Light ☐ Moderate ☑ Heavy ☐ Very Heavy ☐
Gypsum: ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐
Other ☐

EMS LABORATORIES

17-Jul-1992 07:53:34

[illegible] Preset [illegible]
Vaxis= 200 counts Disc= 1 Elapsed= 11 secs
Energy Counts X-Ray Lines

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

Quantitex:
0.250 Sample 10.250 keV 10.220
[illegible] 205

GRID ASBESTOS ANALYSIS

IS Lab No. 25015

nple No. SW-11-4

ANALYSIS

GRID: 1 ☐ 2 ☑ 3 ☐ 4 ☐

Grid Address 1B

Screen Magnification 19.3580

Camera Constant 30.3

Accelerating Voltage 100 KV

Beam Current 10 μa

Analyst S. Ahmed

Date 7/17/92

MICROSCOPE: 600A ☑ 600B ☐ HU11E ☐ HU12SE ☐

B

Grid opening	Str #	Str	Dimensions (mm) Width	Length	Fiber Classification NAM	TM	CM	CD	CD	CMD	CDD	UF	AD	AX	ADX	AO	ADO	AZO	AZZ	EDS Analysis Na	Mg	Si	Ca	Fe	Id	Comments
1	NSD																									
2	NSD																									
3	NSD																									
4	NSD																									
5	NSD																									
6	NSD																									
7	NSD																									

OBSERVATIONS:

Clean ☐

Debris: ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐

Gypsum: ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐

[illegible]

MS Lab No. 25015

mple No. SW-11-4

MICROSCOPE

600A [X]
600B [ ]
HU11E [ ]
HU125E [ ]

ANALYSIS

GRID
1 [ ] 3 [X]
2 [ ] 4 [ ]

Grid Address 1-C
Screen Magnification 19300 x
Camera Constant 303
Accelerating Voltage 100 KV
Beam Current 10 pa

Analyst Radha Date 7-17-92

Grid opening	Str #	Str	Dimensions (mm) Width	Length	Fiber Classification NAM	TM	CM	CD	CO	CMO	CDO	UF	AD	AX	ADX	AO	ADO	AZO	AZZ	EDS Analysis Na	Mg	Si	Ca	Fe	Id	Comments
1	1	F	6	22	✓																					
2	2	F	2	18	✓																					
3	3	F	4	15	✓																					
4	NSD																									
5	NSD																									
6	4	F	8	115												✓					3	10	2	1		Tremolite
7	NSD																									

OBSERVATIONS:

Clean [ ]
Debris: [ ] Very Light [ ] Light [ ] Moderate [X] Heavy [ ] Very Heavy [ ]
Gypsum: [ ] Very Light [ ] Light [ ] Moderate [ ] Heavy [ ] Very Heavy [ ]

17-Jul-1992 08:20:41

[illegible]-4.C.#04.NS Preset= [illegible] secs
Vert= 200 counts Disc= 1 Elapsed= 20 secs

Energy	Counts	X-Ray Lines
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]

Quantex)
0.180 Range= 10.230 Kev 10.230
Integrated = [illegible]

17-Jul-1992 08:10:52

25015.11-4.C.#01.RS Preset= 100 secs
vert= 200 counts Disp= 1 Elapsed= [illegible] secs
Energy Counts X-Ray Lines

0.[illegible] [illegible] [illegible]

[illegible] [illegible] [illegible]

[illegible] [illegible] [illegible]

[illegible] [illegible] [illegible]

[illegible] [illegible] Fe K , Fe K

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 8 = [illegible]

17-Jul-1992 [illegible]

25015.11-4.C.#02.RS Preset= 100 secs
vert= 200 counts Disp= 1 Elapsed= [illegible] secs
Energy Counts X-Ray Lines

[illegible] [illegible] [illegible]

1.73 208. Si K , Si K

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 8 = [illegible]

TABLE 3. CLASSIFICATION OF FIBERS WITH TUBULAR MORPHOLOGY

TM	-	Tubular Morphology not sufficiently characteristic for classification as chrysotile
CM	-	Characteristic Chrysotile Morphology
CD	-	Chrysotile SAED pattern
CQ	-	Chrysotile composition by Quantitative EDXA
CMQ	-	Chrysotile Morphology and composition by Quantitative EDXA
CDQ	-	Chrysotile SAED pattern and composition by Quantitative EDXA
NAM	-	Non-Asbestos Mineral

TABLE 4. CLASSIFICATION OF FIBERS WITHOUT TUBULAR MORPHOLOGY

UF	-	Unidentified Fiber
AD	-	Amphibole by random orientation SAED (shows layer pattern of 0.53 nm spacing)
AX	-	Amphibole by qualitative EDXA. Spectrum has elemental components consistent with amphibole
ADX	-	Amphibole by random orientation SAED and Qualitative EDXA
AQ	-	Amphibole by Quantitative EDXA
AZ	-	Amphibole by one Zone Axis SAED
ADQ	-	Amphibole by random orientation SAED and Quantitative EDXA
AZQ	-	Amphibole by one Zone Axis SAED pattern and Quantitative EDXA
AZZ	-	Amphibole by two Zone Axis SAED patterns with consistent inter-axial angle
AZZQ	-	Amphibole by two Zone Axis SAED patterns, consistent inter-axial angle and Quantitative EDXA
NAM	-	Non-Asbestos Mineral

Analysis of Water by Transmission Electron Microscopy
(EPA-600/4-83-043)

EMS No.	25015	Date Analyzed	7/13/92
Client	SCHAFER & ASSOC.		
Sample No.	EMS BLANK		

Fibers (chrysotile)	ND	MFL
> 5 Micron length (chrysotile)	ND	MFL
Mass (chrysotile)	0	ug/L
More/Less than 5 Fibers in Sample (chrysotile)	LESS	
Sensitivity Level	0.03	MFL

Particle Size Distribution (Chrysotile)

Particle Length - Microns

0 -0.49	0.50 - 0.99	1.00 - 1.49	1.50 - 1.99	2.00 - 2.49	2.5 & UP
0	0	0	0	0	0

Particle Width - Microns

0 - .04	.05 - .09	.1 - .14	.15 - .19	.2 - .24	.25 & UP
0	0	0	0	0	0

Aspect Ratio L/W

0 - 9.9	10 - 19.9	20 - 29.9	30 - 39.9	40 - 49.9	50 & UP
0	0	0	0	0	0

EM ASBESTOS ANALYSIS

Page [redacted] of [redacted]

:S Lab No. 25015
ent Ems Blank
nple No. 7-8-92

METHOD OF ANALYSIS
EPA Yamate Level I ☐
Level II ☑
Level III ☐
AHERA ☐

LENGTHS
All Sizes (EPA) ☑
(µm):≥0.5 ☐
≥1.0 ☐
≥5.0 ☐
≥10.0 ☐
PCM Range* ☐
*(≥0.25 µm width, ≥5.0 µm length)

ASPECT RATIO 3:1 ☐ 5:1 ☐

Approved By BK Date 7-12

FILTER TYPE/AREA (mm²)
MCE/385 ☐
MCE/314 ☐
MCE/1017 ☑
Other ☐

TYPE OF SAMPLE
Air ☐ Water ☑
Soil ☐ Wipe ☐
Bulk ☐ Other ☐
Dust/Microvac ☐

PORE SIZE
0.45 µm ☐
0.8 µm ☐
.1 µm ☑
.22 µm ☐
Other ☐

G.O. Area (mm²) 0.0065
No. of G.O. to Analyze 20
Filter Lot No.

PREP
DIRECT PREP ☑
INDIRECT PREP ☐
Volume ____ liters
Working Volume 200 ml
Weight ____ grams
Ashed Area ____ %
Date 7-11-92
Prepared By FG

ANALYSIS
GRID
1 ☒ 3 ☐
2 ☐ 4 ☐
Grid Address 1-A
Screen Magnification 19,300 x
Camera Constant 30.3
Accelerating Voltage 100 KV
Beam Current 10 µa
Analyst NM Date 7/13

MICROSCOPE
600A ☒
600B ☐
HU11E ☐
HU125E ☐

A

Grid Opening	Structure Number	Structure	Dimension(mm) Width	Length ≥5µm	Thickness	SAED Observation Chrysotile	Amphibole	Ambiguous	Non Asbestos	No Pattern	EDS Analysis Na	Mg	Si	Ca	Fe	Id	Comments
1	NSD																
2	NSD																
3	NSD																
4	NSD																
5	NSD																
6	NSD																
7	NSD																
8	NSD																
9	NSD																
10	NSD																

15 lines

OBSERVATIONS:
Clean ☑
Debris: ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐
Gypsum: ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐
Other ☐

EM ASBESTOS ANALYSIS

MS Lab No. 25015
ient EMS Blank
mple No. 7-8-92

Page ___ of ___

MICROSCOPE
600A [X]
600B [ ]
HU11E [ ]
HU125E [ ]

ANALYSIS

GRID
1 [ ] 3 [ ]
2 [X] 4 [ ]

Grid Address 1-B
Screen Magnification 19,300 x
Camera Constant 30.3
Accelerating Voltage 100 KV
Beam Current 10 µa

B

Analyst NM Date 7/12

Grid Opening	Structure Number	Structure	Dimension(mm) Width	Length >5um	Thickness	SAED Observation Chrysotile	Amphibole	Ambiguous	Non Asbestos	No Pattern	EDS Analysis Na	Mg	Si	Ca	Fe	Id	Comments
1	NSD																
2																	
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10	NSD																

15 lines

OBSERVATIONS:

Clean [X]
Debris: [ ] Very Light [ ] Light [ ] Moderate [ ] Heavy [ ] Very Heavy [ ]
Gypsum: [ ] Very Light [ ] Light [ ] Moderate [ ] Heavy [ ] Very Heavy [ ]
Other [ ]

Analysis of Water by Transmission Electron Microscopy
(EPA-600/4-83-043)

EMS No.	25015	Date Analyzed	7/12/92
Client	SCHAFER & ASSOC.		
Sample No.	EMS BLANK		

Fibers (chrysotile)	ND	MFL
> 5 Micron length (chrysotile)	ND	MFL
Mass (chrysotile)	0	ug/L
More/Less than 5 Fibers in Sample (chrysotile)	LESS	
Sensitivity Level	0.03	MFL

Particle Size Distribution (Chrysotile)

Particle Length - Microns

0 -0.49	0.50 - 0.99	1.00 - 1.49	1.50 - 1.99	2.00 - 2.49	2.5 & UP
0	0	0	0	0	0

Particle Width - Microns

0 - .04	.05 - .09	.1 - .14	.15 - .19	.2 - .24	.25 & UP
0	0	0	0	0	0

Aspect Ratio L/W

0 - 9.9	10 - 19.9	20 - 29.9	30 - 39.9	40 - 49.9	50 & UP
0	0	0	0	0	0

EM ASBESTOS ANALYSIS

MS Lab No. 25015
ient Ems Blank
mple No. 7-7-92

METHOD OF ANALYSIS
- EPA Yamate Level I ☐
- Level II ☑
- Level III ☐
- AHERA ☐

ASPECT RATIO 3:1 ☐ 5:1 ☐

Approved By B Krek Date 7/12

LENGTHS
- All Sizes (EPA) ☐
- (µm): ≥0.5 ☑
- ≥1.0 ☐
- ≥5.0 ☐
- ≥10.0 ☐
- PCM Range* ☐ *(≥0.25 µm width, ≥5.0 µm length)

FILTER TYPE/AREA (mm²)
- MCE/385 ☐
- MCE/314 ☐
- MCE/1017 ☑
- Other ☐

TYPE OF SAMPLE
- Air ☐ Water ☑
- Soil ☐ Wipe ☐
- Bulk ☐ Other ☐
- Dust/Microvac ☐

PORE SIZE
- 0.45 µm ☐
- 0.8 µm ☐
- .1 µm ☑
- .22 µm ☐
- Other ☐

G.O. Area (mm²) 0.0 065
No. of G.O. to Analyze 20
Filter Lot No.

PREP
- DIRECT PREP ☑
- INDIRECT PREP ☐
- Volume ____ liters
- Working Volume 200 ml
- Weight ____ grams
- Ashed Area ____ %
- Date 7-11-92
- Prepared By FB

ANALYSIS

GRID
- 1 ☒ 3 ☐
- 2 ☐ 4 ☐

MICROSCOPE
- 600A ☒
- 600B ☐
- HU11E ☐
- HU125E ☐

Grid Address 1-A
Screen Magnification 19,300 x
Camera Constant 30.3
Accelerating Voltage 100 KV
Beam Current 10 µa

Analyst NM Date 7/12/92

A

Grid Opening	Structure Number	Structure	Dimension (mm) Width	Length ≥5µm	Thickness	SAED Observation Chrysotile	Amphibole	Ambiguous	Non Asbestos	No Pattern	EDS Analysis Na	Mg	Si	Ca	Fe	Id	Comments
1	NSD																
2	NSD																
3	NSD																
4	NSD																
5	NSD																
6	NSD																
7	NSD																
8	NSD																
9	NSD																
10	NSD																

15 lines

OBSERVATIONS:
- Clean ☒
- Debris: ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐
- Gypsum: ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐
- Other ☐

TEM ASBESTOS ANALYSIS

EMS Lab No. 25015
Client EMS Blank
Sample No. 7-7-92

RECEIVING

Page [redacted] of [redacted]

ANALYSIS

GRID
1 ☐ 3 ☐
2 ☒ 4 ☐

MICROSCOPE
600A ☒
600B ☐
HU11E ☐
HU125E ☐

Grid Address 1-13
Screen Magnification 19,300x
Camera Constant 303
Accelerating Voltage 100 KV
Beam Current 10 µa

B

Analyst NM Date 7/12

Grid Opening	Structure Number	Structure	Dimension(mm) Width	Length ≥5um	Thickness	SAED Observation Chrysotile	Amphibole	Ambiguous	Non Asbestos	No Pattern	EDS Analysis Na	Mg	Si	Ca	Fe	Id	Comments
1	NS	O															
2	NS	O															
3	NS	O															
4	NS	O															
5	NS	O															
6	NS	O															
7	NS	O															
8	NS	O															
9	NS	O															
10	NS	O															

15 lines

OBSERVATIONS: Clean ☒

Debris: ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐
Gypsum: ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐
Other ☐

EMS LABORATORIES