EMSL Analytical, Inc.
200 Route 130 North
Cinnaminson, NJ 08077
856-303-2500
www.EMSL.com

Edward Surbrugg
Tetra Tech
303 Irene Street
Helena, MT 59601
Phone: 406-442-5588

Customer ID: MAXI57
Customer PO: NA
Received: 5/14/2014 9:30
Date Sampled: 5/13/2014
EMSL Order: 041413252
Report Date: 06/12/14

Project: NDOT NOA / 10353259

ISO 10312
International Standard for the Determination of Asbestos Fibers - Direct Transfer TEM - Modified for PCMe Analysis

Customer Sample Number:	BC-AA-01-00001		Air volume:	14422	Liters
EMSL Sample Number:	041413252-0001		Grid Opening Area:	0.0132	mm²
Minimum Level of analysis (chrysotile):	CD		Grid Openings Analyzed:	51	
Minimum Level of analysis (amphibole):	ADX				
Magnification used for fiber counting:	10,000				
Aspect ratio for fiber definition:	3:1				
Min Length/Max Width to be counted (µm):	>=5 / <=3				
Area of collection filter (mm²):	385		Analysis Date:	5/16/2014	
Result of Chi² Test:	N/A	N/A	Analyst:	P. Harrison	

Analytical Sensitivity: 0.000040 Structure/cc **Limit of Detection: 0.000119 Structure/cc**

Structure Class	Min ID Level	Primary Str.	Total Str.	Density Str/mm²	Concentration (Str/cc)	Poisson 95 % Confidence Interval LCL (Str/cc)	UCL (Str/cc)
PCMe Structures (Chrys)	CD	0	-	0.00	0.000000	0.000000 -	0.000119
PCMe Structures (Amph)	ADX	0	-	0.00	0.000000	0.000000 -	0.000119
PCMe Structures (NRA)	ADX	0	-	0.00	0.000000	0.000000 -	0.000119
Total PCMe Structures (Regulated)	**CD/ADX**	**0**	**-**	**0.00**	**0.000000**	**0.000000 -**	**0.000119**
Total PCMe Structures (All)	**CD/ADX**	**0**	-	**0.00**	**0.000000**	**0.000000 -**	**0.000119**
PCMe Fibers and Bundles (Chrys)	CD	-	0	0.00	0.000000	0.000000 -	0.000119
PCMe Fibers and Bundles (Amph)	ADX	-	0	0.00	0.000000	0.000000 -	0.000119
PCMe Fibers and Bundles (NRA)	ADX	-	0	0.00	0.000000	0.000000 -	0.000119
Total PCMe Fibers and Bundles (Regulated)	**CD/ADX**	**-**	**0**	**0.00**	**0.000000**	**0.000000 -**	**0.000119**
Total PCMe Fibers and Bundles (All)	**CD/ADX**	**-**	**0**	**0.00**	**0.000000**	**0.000000 -**	**0.000119**
Non Asbestos Mineral Structures	NAM	1	1	-	-	- -	-

Asbestiform Minerals Present: *None Detected*

Explanation of Results

NRA = Non-Regulated Amphibole. A suspected mineral fiber that is a member of the Amphibole group, but is currently not regulated by the Federal governement as asbestos.

PCMe structure = A Fibrous structure of aspect ratio > 3:1, longer than 5 um, and which has a diameter between 0.2 and 3.0 microns

PCMe Fiber or Bundle = A Fiber or Bundle of of aspect ratio > 3:1, longer than 5 um, and which has a diameter between 0.2 and 3.0 microns

Concentration (Regulated) = include all federally regulated asbestos types. Currently Chrysotile, Amosite, Actinolite, Tremolite, Anthophyllite and Crocidolite

Concentration (all) = include all federally regulated asbestos types (Chrysotile, Amosite, Actinolite, Tremolite, Anthophyllite and Crocidolite) and all Non-regulated Amphiboles

Min ID Level = the minimum level of analysis that must have been met to be included in the reportable structure count. If any fibrous structure did not meet the minimum ID level, it would not be included in the concentration.

NAM = Non Asbestos Mineral. A mineral fiber that has been rejected from being either Amphibole or Chrysotile

Comment: Samples collected on 0.8 um MCE filters

Robyn Denton
Approved Signatory

Tetra Tech BCBP PCMe Report Template Version: 1

ISO 10312

International Standard for the Determination of Asbestos Fibers-Direct Transfer Transmission Electron Microscopy

Bench Sheet Data

Client:	Tetra Tech			Scope:	JEOL 1200 EX (04-03)
EMSL Sample ID:	041413252-0001	GO area (mm²):	0.0132	Mag.	10,000
Customer Sample:	BC-AA-01-00001	Grid Box :	0414-Tetra Tech-001: A, D, E	Analyst(s):	P. Harrison
Chi² Test for Uniformity:	N/A	Pore Size (micron):	0.8	Analysis Date:	05/16/2014
Project ID:	NDOT NOA / 10353259			Particulate Loading:	20-25%

Grid ID	Grid Opening	Structure Type	Structure Number		Dimensions (µm)		Level of ID	Mineral Type	Image Number	Structure Comments
			Primary	Total	Length	Width				
E1	E9	None Detected								
E1	E7	None Detected								
E1	J5	None Detected								
E1	J3	None Detected								
E1	J1	None Detected								
E1	H1	None Detected								
E1	H3	None Detected								
E1	H7	None Detected								
E1	H9	None Detected								
E1	F9	None Detected								
E1	F7	None Detected								
E1	F5	None Detected								
E1	F3	None Detected								
E1	F1	None Detected								
E1	D1	None Detected								
E1	D3	None Detected								
E1	D5	None Detected								
E1	D7	None Detected								
E1	D9	None Detected								
E1	B9	None Detected								
E1	A7	None Detected								
E1	B5	None Detected								
E1	B3	None Detected								
E1	B1	None Detected								
A1	I1	None Detected								
A1	J3	None Detected								
A1	I5	None Detected								
A1	I7	None Detected								
A1	I9	None Detected								
A1	G9	None Detected								
A1	G7	None Detected								
A1	G5	F	1	1	13.5	1.1	NAM	Non Asb. Mineral	4349	
A1	G3	None Detected								
A1	G1	None Detected								
A1	E1	None Detected								
A1	E3	None Detected								
A1	E5	None Detected								
A1	E7	None Detected								

ISO 10312

International Standard for the Determination of Asbestos Fibers-Direct Transfer Transmission Electron Microscopy

Bench Sheet Data

Client:	Tetra Tech			Scope:	JEOL 1200 EX (04-03)
EMSL Sample ID:	041413252-0001	GO area (mm²):	0.0132	Mag.	10,000
Customer Sample:	BC-AA-01-00001	Grid Box :	0414-Tetra Tech-001: A, D, E	Analyst(s):	P. Harrison
Chi² Test for Uniformity:	N/A	Pore Size (micron):	0.8	Analysis Date:	05/16/2014
Project ID:	NDOT NOA / 10353259			Particulate Loading:	20-25%

Grid ID	Grid Opening	Structure Type	Structure Number		Dimensions (µm)		Level of ID	Mineral Type	Image Number	Structure Comments
			Primary	Total	Length	Width				
A1	E9	None Detected								
A1	C9	None Detected								
A1	C7	None Detected								
A1	C5	None Detected								
A1	C3	None Detected								
A1	C1	None Detected								
A1	A1	None Detected								
A1	A3	None Detected								
A1	A5	None Detected								
A1	A7	None Detected								
A1	A9	None Detected								
D1	I6	None Detected								
D1	I8	None Detected								

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ISO 10312

International Standard for the Determination of Asbestos Fibers-Direct Transfer Transmission Electron Microscopy

Structure Sketch Sheet for Direct Data Entry

EMSL Order ID: 041413252-0001 **Client:** Tetra Tech

Client Sample: *BC-AA-01-00001* Page 1 of 1

Primary Structure # 1 	Primary Structure #	Primary Structure #	Primary Structure #
Primary Structure #	Primary Structure #	Primary Structure #	Primary Structure #
Primary Structure #	Primary Structure #	Primary Structure #	Primary Structure #
Primary Structure #	Primary Structure #	Primary Structure #	Primary Structure #
Structure #	Structure #	Structure #	Structure #

Analyst: Date: 5/16/04 Scope: 04-03

Energy Dispersive X-Ray Analysis
Quantitative Spectra & Data

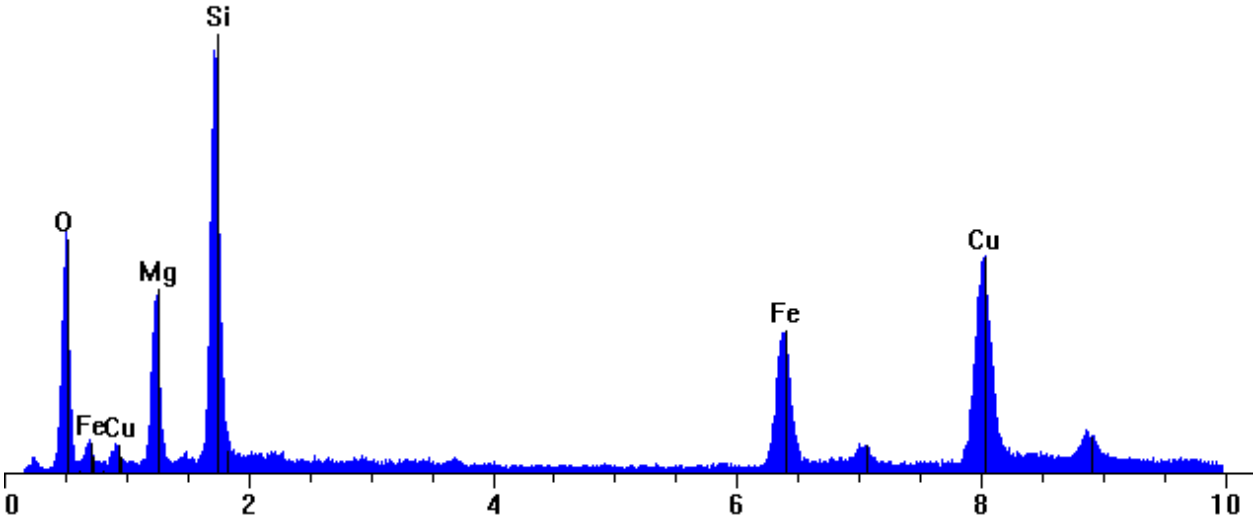
EMSL ANALYTICAL, INC.

File: L:\EDS Spe...pectra\Scope 04-03\2014\041413252-0001 A1 G5 0 NAM.pgt
Collected: May 16, 2014 07:57:44

Live Time:	12.41	Count Rate:	17609	Dead Time:	75.62 %
Beam Voltage:	20.00	Beam Current:	2.00	Takeoff Angle:	31.00
Thickness limit:	43791.43				

041413252-0001 A1 G5 0 NAM.pgt

FS: 2250



Element	Line	keV	CL Ratio	Wt%	At%	At Prop	Compound	Cmpd Wt%
Mg	KA1	1.254	1.4000	14.12	12.62	4.8	MgO	23.41
Si	KA1	1.740	1.0000	27.64	21.39	8.1	SiO2	59.12
Fe	KA1	6.403	0.9900	13.58	5.29	2.0	FeO	17.47
Cu	KA1	8.046	3.9296	0.00	0.00	0.0		
O	KA1	0.523	0.0000	44.67	60.70	23.0		
Total			**0.0000**	**100.00**	**100.00**	**37.9**	**Total**	**100.00**

Element	Line	Gross (cps)	BKG (cps)	Net (cps)	P:B Ratio
Mg	KA1	931.2	72.8	858.5	11.8
Si	KA1	2441.2	88.6	2352.6	26.5
Fe	KA1	1250.6	83.1	1167.5	14.1
Cu	KA1	2192.9	127.2	2065.7	16.2
O	KA1	1039.4	27.1	1012.2	37.4

AMPHIBOLE SAED INDEXING FORM

EMSL Order Number: 041413252 **Date:** May 16, 2014

Image Number: 04349

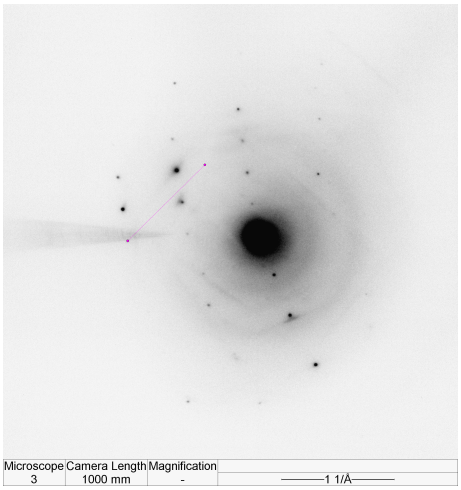
Reference / Sample Number: 0002

Preliminary ID: NAM

Camera Constant: 1.968e-003 **1/A Pixels**

Calibration Reference: 051214-04-03-04342_C

	Measured	Reference	-5%	+5%
Inter-row Spacing:	**5.214**	5.280	**5.016**	**5.544**
d2 or hk0 (Camera K/zero row dist.):	**N/A**	N/A	**-**	**-**
d1 or hkl (Camera K/slant vector dist.):	**N/A**	N/A	**-**	**-**
Ratio of hk0/hkl:	**N/A**	N/A	**-**	**-**
Vector Angle:	**N/A**	N/A	**-**	**-**



From SAED Reference Book, "unknown" diffraction pattern was found to be that of: **NAM**

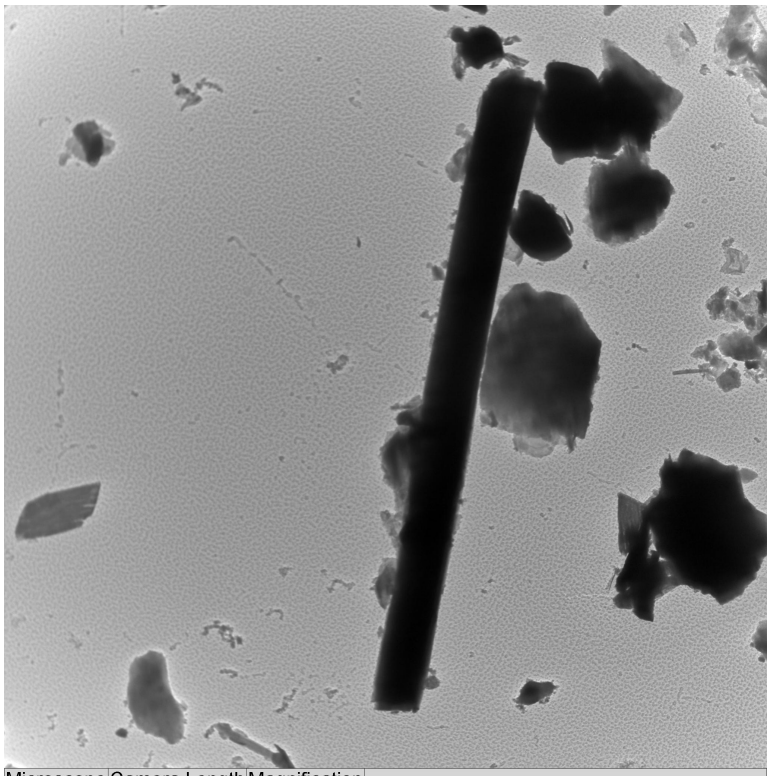
With a Zone Axis of: [**N/A**]

Preliminary Identification was:

X	CORRECT
	INCORRECT

EMSL Analytical, Inc.

Photomicrograph Report



Microscope	Camera Length	Magnification	
3	-	10000 x	—2 µm—

Micrograph Information

Sample ID:	0001
Order ID:	041413252
Image Number:	04350
Mineral Type:	NAM
Date:	5/16/2014
Magnification:	10000
Microscope:	3

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Tetra Tech
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Helena, MT 59601
Phone: 406-442-5588

Customer ID: MAXI57
Customer PO: NA
Received: 5/14/2014 9:30
Date Sampled: 5/13/2014
EMSL Order: 041413252
Report Date: 06/12/14

Project: NDOT NOA / 10353259

ISO 10312 International Standard for the Determination of Asbestos Fibers - Direct Transfer TEM - Modified for PCMe Analysis

Customer Sample Number:	BC-AA-02-00001		Air volume: 14422	Liters
EMSL Sample Number:	041413252-0002		Grid Opening Area: 0.0132	mm²
Minimum Level of analysis (chrysotile):	CD		Grid Openings Analyzed: 51	
Minimum Level of analysis (amphibole):	ADX			
Magnification used for fiber counting:	10,000			
Aspect ratio for fiber definition:	3:1			
Min Length/Max Width to be counted (µm):	>=5 / <=3			
Area of collection filter (mm²):	385		Analysis Date: 5/15/2014	
Result of Chi² Test:	N/A	N/A	Analyst: P. Harrison	

Analytical Sensitivity: 0.000040 Structure/cc **Limit of Detection: 0.000119 Structure/cc**

Structure Class	Min ID Level	Primary Str.	Total Str.	Density Str/mm²	Concentration (Str/cc)	Poisson 95 % Confidence Interval LCL (Str/cc)	UCL (Str/cc)
PCMe Structures (Chrys)	CD	0	-	0.00	0.000000	0.000000 -	0.000119
PCMe Structures (Amph)	ADX	0	-	0.00	0.000000	0.000000 -	0.000119
PCMe Structures (NRA)	ADX	0	-	0.00	0.000000	0.000000 -	0.000119
Total PCMe Structures (Regulated)	**CD/ADX**	**0**	**-**	**0.00**	**0.000000**	**0.000000 -**	**0.000119**
Total PCMe Structures (All)	**CD/ADX**	**0**	-	**0.00**	**0.000000**	**0.000000 -**	**0.000119**
PCMe Fibers and Bundles (Chrys)	CD	-	0	0.00	0.000000	0.000000 -	0.000119
PCMe Fibers and Bundles (Amph)	ADX	-	0	0.00	0.000000	0.000000 -	0.000119
PCMe Fibers and Bundles (NRA)	ADX	-	0	0.00	0.000000	0.000000 -	0.000119
Total PCMe Fibers and Bundles (Regulated)	**CD/ADX**	**-**	**0**	**0.00**	**0.000000**	**0.000000 -**	**0.000119**
Total PCMe Fibers and Bundles (All)	**CD/ADX**	**-**	**0**	**0.00**	**0.000000**	**0.000000 -**	**0.000119**
Non Asbestos Mineral Structures	NAM	2	2	-	-	- -	-

Asbestiform Minerals Present: *None Detected*

Explanation of Results

NRA = Non-Regulated Amphibole. A suspected mineral fiber that is a member of the Amphibole group, but is currently not regulated by the Federal governement as asbestos.

PCMe structure = A Fibrous structure of aspect ratio > 3:1, longer than 5 um, and which has a diameter between 0.2 and 3.0 microns

PCMe Fiber or Bundle = A Fiber or Bundle of of aspect ratio > 3:1, longer than 5 um, and which has a diameter between 0.2 and 3.0 microns

Concentration (Regulated) = include all federally regulated asbestos types. Currently Chrysotile, Amosite, Actinolite, Tremolite, Anthophyllite and Crocidolite

Concentration (all) = include all federally regulated asbestos types (Chrysotile, Amosite, Actinolite, Tremolite, Anthophyllite and Crocidolite) and all Non-regulated Amphiboles

Min ID Level = the minimum level of analysis that must have been met to be included in the reportable structure count. If any fibrous structure did not meet the minimum ID level, it would not be included in the concentration.

NAM = Non Asbestos Mineral. A mineral fiber that has been rejected from being either Amphibole or Chrysotile

Comment: Samples collected on 0.8 um MCE filters

Robyn Denton
Approved Signatory

Tetra Tech BCBP PCMe Report Template Version: 1

ISO 10312

International Standard for the Determination of Asbestos Fibers-Direct Transfer Transmission Electron Microscopy

Bench Sheet Data

Client:	Tetra Tech			Scope:	JEOL 1200 EX (04-03)
EMSL Sample ID:	041413252-0002	GO area (mm²):	0.0132	Mag.	10,000
Customer Sample:	BC-AA-02-00001	Grid Box :	0414-Tetra Tech-001: A	Analyst(s):	P. Harrison
Chi² Test for Uniformity:	N/A	Pore Size (micron):	0.8	Analysis Date:	05/15/2014
Project ID:	NDOT NOA / 10353259			Particulate Loading:	20-25%

Grid ID	Grid Opening	Structure Type	Structure Number		Dimensions (µm)		Level of ID	Mineral Type	Image Number	Structure Comments
			Primary	Total	Length	Width				
A7	A2	None Detected								
A7	A4	None Detected								
A7	A6	F	0	0	8.2	0.8	NAM	Non Asb. Mineral		
A7	A8	None Detected								
A7	C8	None Detected								
A7	C6	None Detected								
A7	C4	None Detected								
A7	C2	None Detected								
A7	E2	None Detected								
A7	E4	None Detected								
A7	E6	None Detected								
A7	E8	None Detected								
A7	G8	None Detected								
A7	G6	None Detected								
A7	G4	None Detected								
A7	G2	None Detected								
A7	I2	None Detected								
A7	I4	None Detected								
A7	I6	None Detected								
A7	I8	None Detected								
A8	A1	None Detected								
A8	A3	None Detected								
A8	A5	None Detected								
A8	A7	None Detected								
A8	C7	None Detected								
A8	C5	None Detected								
A8	C3	None Detected								
A8	C1	None Detected								
A8	E1	None Detected								
A8	E3	None Detected								
A8	E5	None Detected								
A8	E7	None Detected								
A8	E9	None Detected								
A8	G9	None Detected								
A8	G7	None Detected								
A8	G3	None Detected								
A8	G1	F	0	0	8.3	1	NAM	Non Asb. Mineral		
A8	I1	None Detected								

200 Route 130 North
Cinnaminson, NJ 08077

ISO 10312

International Standard for the Determination of Asbestos Fibers-Direct Transfer Transmission Electron Microscopy

Bench Sheet Data

Client:	Tetra Tech			Scope:	JEOL 1200 EX (04-03)
EMSL Sample ID:	041413252-0002	GO area (mm²):	0.0132	Mag.	10,000
Customer Sample:	BC-AA-02-00001	Grid Box :	0414-Tetra Tech-001: A	Analyst(s):	P. Harrison
Chi² Test for Uniformity:	N/A	Pore Size (micron):	0.8	Analysis Date:	05/15/2014
Project ID:	NDOT NOA / 10353259			Particulate Loading:	20-25%

Grid ID	Grid Opening	Structure Type	Structure Number		Dimensions (µm)		Level of ID	Mineral Type	Image Number	Structure Comments
			Primary	Total	Length	Width				
A8	J3	None Detected								
A8	J5	None Detected								
A8	I7	None Detected								
A8	I9	None Detected								
A9	J10	None Detected								
A9	J8	None Detected								
A9	J6	None Detected								
A9	J4	None Detected								
A9	J2	None Detected								
A9	H4	None Detected								
A9	H6	None Detected								
A9	H8	None Detected								
A9	H10	None Detected								

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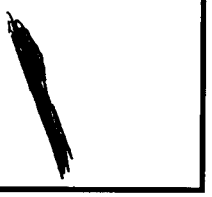
ISO 10312

International Standard for the Determination of Asbestos Fibers-Direct Transfer Transmission Electron Microscopy

Structure Sketch Sheet for Direct Data Entry

EMSL Order ID: 041413252-0002 **Client:** Tetra Tech

Client Sample: *BC-AA-02-00001* Page 1 of 1

Primary Structure # 0 	Primary Structure # 0 	Primary Structure #	Primary Structure #
Primary Structure #	Primary Structure #	Primary Structure #	Primary Structure #
Primary Structure #	Primary Structure #	Primary Structure #	Primary Structure #
Primary Structure #	Primary Structure #	Primary Structure #	Primary Structure #
Structure #	Structure #	Structure #	Structure #

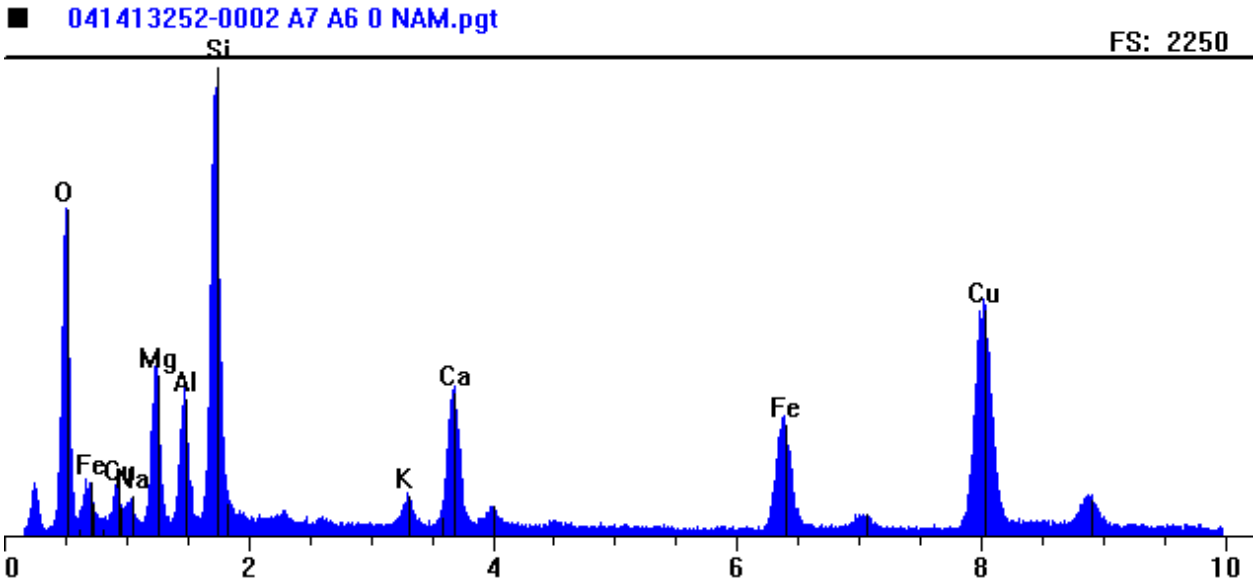
Analyst: Date: 5/15/14 Scope: 01-03

Energy Dispersive X-Ray Analysis
Quantitative Spectra & Data

EMSL ANALYTICAL, INC.

File: L:\EDS Spe...pectra\Scope 04-03\2014\041413252-0002 A7 A6 0 NAM.pgt
Collected: May 15, 2014 07:48:35

Live Time:	30.08	Count Rate:	9039	Dead Time:	54.75 %
Beam Voltage:	20.00	Beam Current:	2.00	Takeoff Angle:	31.00
Thickness limit:	36228.38				



Element	Line	keV	CL Ratio	Wt%	At%	At Prop	Compound	Cmpd Wt%
Mg	KA1	1.254	1.7800	10.74	9.97	4.0	MgO	17.81
Si	KA1	1.740	1.0000	18.85	15.15	6.0	SiO2	40.33
K	KA1	3.313	1.2100	1.10	0.64	0.3	K2O	1.33
Ca	KA1	3.691	1.2000	8.84	4.98	2.0	CaO	12.36
Fe	KA1	6.403	1.6100	12.10	4.89	1.9	FeO	15.56
Cu	KA1	8.046	0.0000	0.00	0.00	0.0		
Na	KA1	1.041	2.8800	2.33	2.29	0.9	Na2O	3.14
Al	KA1	1.487	0.9564	5.01	4.19	1.7	Al2O3	9.47
O	KA1	0.523	0.0000	41.03	57.89	23.0		
Total			**0.0000**	**100.00**	**100.00**	**39.7**	**Total**	**100.00**

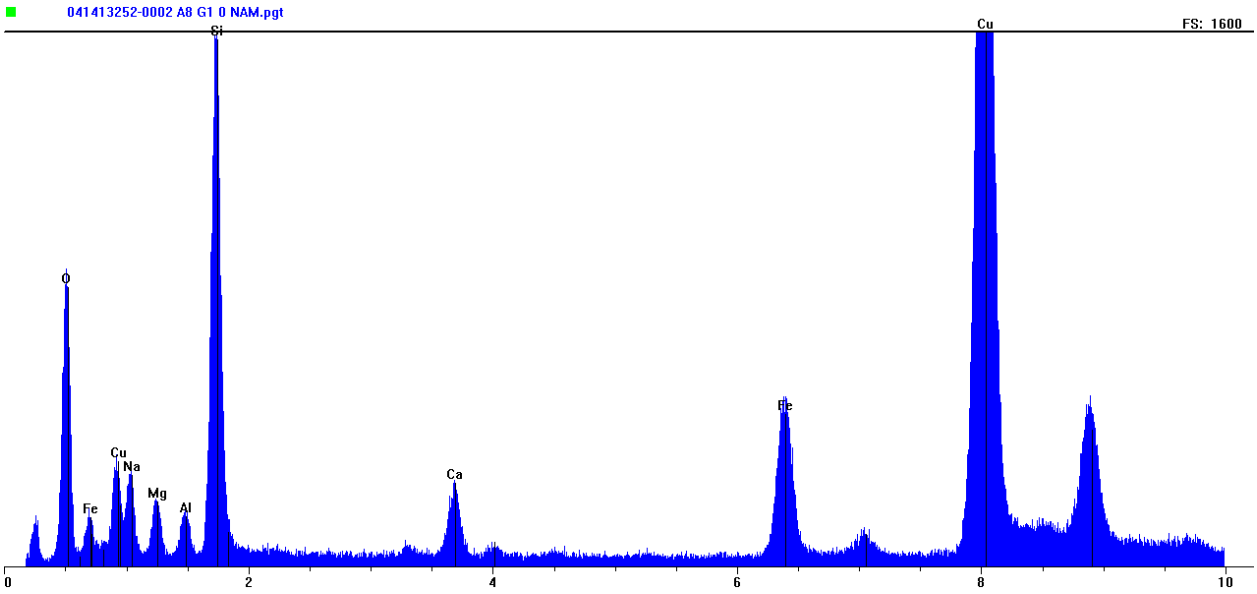
Element	Line	Gross (cps)	BKG (cps)	Net (cps)	P:B Ratio
Mg	KA1	370.7	45.5	325.2	7.1
Si	KA1	1066.2	50.2	1016.0	20.2
K	KA1	94.9	45.9	49.0	1.1
Ca	KA1	443.4	45.0	396.8	8.8
Fe	KA1	441.1	36.2	404.9	11.2
Cu	KA1	1001.7	43.1	958.6	22.3
Na	KA1	90.8	39.6	43.6	1.1
Al	KA1	335.0	52.7	282.4	5.4
O	KA1	639.3	21.0	618.1	29.4

Energy Dispersive X-Ray Analysis
Quantitative Spectra & Data

EMSL ANALYTICAL, INC.

File: L:\EDS Spe...pectra\Scope 04-03\2014\041413252-0002 A8 G1 0 NAM.pgt
Collected: May 15, 2014 12:46:50

Live Time:	22.39	Count Rate:	12516	Dead Time:	70.08 %
Beam Voltage:	20.00	Beam Current:	2.00	Takeoff Angle:	31.00
Thickness limit:	29228.15				



Element	Line	keV	CL Ratio	Wt%	At%	At Prop	Compound	Cmpd Wt%
Mg	KA1	1.254	1.4000	3.91	3.90	1.9	MgO	6.47
Si	KA1	1.740	1.0000	34.51	29.81	14.5	SiO	54.17
Ca	KA1	3.691	1.0500	5.39	3.27	1.6	CaO	7.55
Fe	KA1	6.403	0.9900	16.53	7.18	3.5	FeO	21.26
Cu	KA1	8.046	0.0000	0.00	0.00	0.0		
Na	KA1	1.041	1.3800	5.98	6.31	3.1	Na2O	8.06
Al	KA1	1.487	1.2000	2.48	2.23	1.1		
O	KA1	0.523	0.0000	31.20	47.31	23.0		
Total			**0.0000**	**100.00**	**100.00**	**48.6**	**Total**	**100.00**

Element	Line	Gross (cps)	BKG (cps)	Net (cps)	P:B Ratio
Mg	KA1	124.4	42.1	82.4	2.0
Si	KA1	1063.6	44.5	1019.1	22.9
Ca	KA1	195.3	43.5	151.7	3.5
Fe	KA1	549.7	56.7	493.1	8.7
Cu	KA1	3472.4	105.8	3366.6	31.8
Na	KA1	191.6	47.6	128.0	2.7
Al	KA1	106.9	45.8	61.1	1.3
O	KA1	490.2	28.8	461.3	16.0

AMPHIBOLE SAED INDEXING FORM

EMSL Order Number: 041413252 **Date:** May 15, 2014

Image Number: 04345

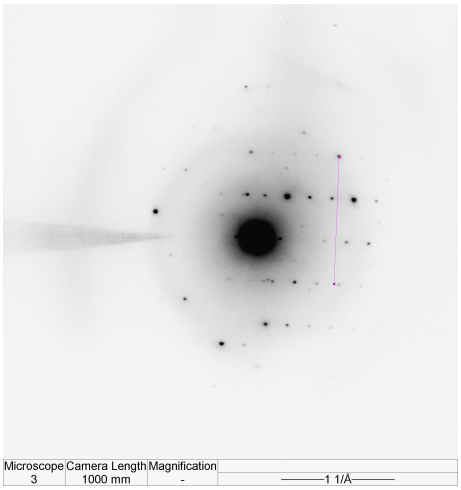
Reference / Sample Number: 0002

Preliminary ID: NAM

Camera Constant: 1.968e-003 **1/A Pixels**

Calibration Reference: 051214-04-03-04342_C

	Measured	Reference	-5%	+5%
Inter-row Spacing:	**2.654**	2.650	**2.517**	**2.783**
d2 or hk0 (Camera K/zero row dist.):	**N/A**	N/A	**-**	**-**
d1 or hkl (Camera K/slant vector dist.):	**N/A**	N/A	**-**	**-**
Ratio of hk0/hkl:	**N/A**	N/A	**-**	**-**
Vector Angle:	**N/A**	N/A	**-**	**-**



From SAED Reference Book, "unknown" diffraction pattern was found to be that of: **NAM**

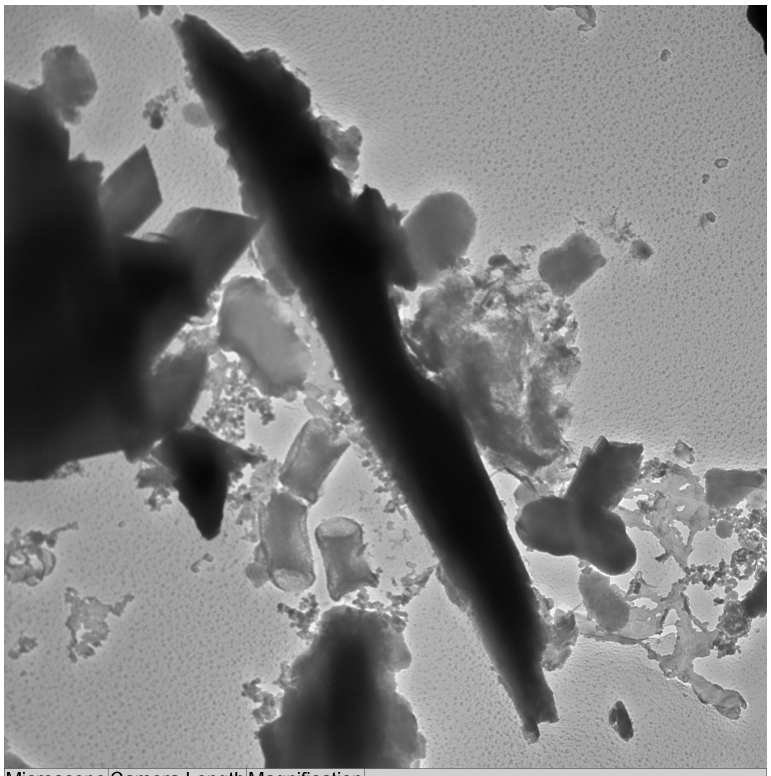
With a Zone Axis of: [**N/A**]

Preliminary Identification was:

X	CORRECT
	INCORRECT

EMSL Analytical, Inc.

Photomicrograph Report



Microscope	Camera Length	Magnification	
3	-	20000 x	2 µm

Micrograph Information

Sample ID:	0002
Order ID:	041413252
Image Number:	04346
Mineral Type:	NAM
Date:	5/15/2014
Magnification:	20000
Microscope:	3

EMSL Analytical, Inc.
200 Route 130 North
Cinnaminson, NJ 08077
856-303-2500
www.EMSL.com

Edward Surbrugg
Tetra Tech
303 Irene Street
Helena, MT 59601
Phone: 406-442-5588

Customer ID: MAXI57
Customer PO: NA
Received: 5/14/2014 9:30
Date Sampled: 5/13/2014
EMSL Order: 041413252
Report Date: 06/12/14

Project: NDOT NOA / 10353259

ISO 10312 International Standard for the Determination of Asbestos Fibers - Direct Transfer TEM - Modified for PCMe Analysis

Customer Sample Number:	BC-AA-03-00001	Air volume:	14422	Liters
EMSL Sample Number:	041413252-0003	Grid Opening Area:	0.0132	mm²
Minimum Level of analysis (chrysotile):	CD	Grid Openings Analyzed:	51	
Minimum Level of analysis (amphibole):	ADX			
Magnification used for fiber counting:	10,000			
Aspect ratio for fiber definition:	3:1			
Min Length/Max Width to be counted (µm):	>=5 / <=3			
Area of collection filter (mm²):	385	Analysis Date:	5/15/2014	
Result of Chi² Test:	50.00 Random	Analyst:	F. Craig	

Analytical Sensitivity: **0.000040** **Structure/cc** **Limit of Detection:** **0.000119** **Structure/cc**

Structure Class	Min ID Level	Primary Str.	Total Str.	Density Str/mm²	Concentration (Str/cc)	Poisson 95 % Confidence Interval LCL (Str/cc)	UCL (Str/cc)
PCMe Structures (Chrys)	CD	0	-	0.00	0.000000	0.000000 -	0.000119
PCMe Structures (Amph)	ADX	0	-	0.00	0.000000	0.000000 -	0.000119
PCMe Structures (NRA)	ADX	0	-	0.00	0.000000	0.000000 -	0.000119
Total PCMe Structures (Regulated)	**CD/ADX**	**0**	**-**	**0.00**	**0.000000**	**0.000000 -**	**0.000119**
Total PCMe Structures (All)	**CD/ADX**	**0**	-	**0.00**	**0.000000**	**0.000000 -**	**0.000119**
PCMe Fibers and Bundles (Chrys)	CD	-	0	0.00	0.000000	0.000000 -	0.000119
PCMe Fibers and Bundles (Amph)	ADX	-	0	0.00	0.000000	0.000000 -	0.000119
PCMe Fibers and Bundles (NRA)	ADX	-	0	0.00	0.000000	0.000000 -	0.000119
Total PCMe Fibers and Bundles (Regulated)	**CD/ADX**	**-**	**0**	**0.00**	**0.000000**	**0.000000 -**	**0.000119**
Total PCMe Fibers and Bundles (All)	**CD/ADX**	**-**	**0**	**0.00**	**0.000000**	**0.000000 -**	**0.000119**
Non Asbestos Mineral Structures	NAM	0	0	-	-	- -	-

Asbestiform Minerals Present: *Actinolite*

Explanation of Results

NRA = Non-Regulated Amphibole. A suspected mineral fiber that is a member of the Amphibole group, but is currently not regulated by the Federal governement as asbestos.

PCMe structure = A Fibrous structure of aspect ratio > 3:1, longer than 5 um, and which has a diameter between 0.2 and 3.0 microns

PCMe Fiber or Bundle = A Fiber or Bundle of of aspect ratio > 3:1, longer than 5 um, and which has a diameter between 0.2 and 3.0 microns

Concentration (Regulated) = include all federally regulated asbestos types. Currently Chrysotile, Amosite, Actinolite, Tremolite, Anthophyllite and Crocidolite

Concentration (all) = include all federally regulated asbestos types (Chrysotile, Amosite, Actinolite, Tremolite, Anthophyllite and Crocidolite) and all Non-regulated Amphiboles

Min ID Level = the minimum level of analysis that must have been met to be included in the reportable structure count. If any fibrous structure did not meet the minimum ID level, it would not be included in the concentration.

NAM = Non Asbestos Mineral. A mineral fiber that has been rejected from being either Amphibole or Chrysotile

Comment: Samples collected on 0.8 um MCE filters. A non-countable (size) Actinolite fiber was found.

Robyn Denton
Approved Signatory

Tetra Tech BCBP PCMe Report Template Version: 1

ISO 10312

International Standard for the Determination of Asbestos Fibers-Direct Transfer Transmission Electron Microscopy

Bench Sheet Data

Client:	Tetra Tech			Scope:	JEOL 100 CX II (04-01)
EMSL Sample ID:	041413252-0003	GO area (mm²):	0.0132	Mag.	10,000
Customer Sample:	BC-AA-03-00001	Grid Box :	0414-TetraTech-01: B	Analyst(s):	F. Craig
Chi² Test for Uniformity:	50-Random	Pore Size (micron):	0.8	Analysis Date:	05/15/2014
Project ID:	NDOT NOA / 10353259			Particulate Loading:	20-25%

Grid ID	Grid Opening	Structure Type	Structure Number		Dimensions (µm)		Level of ID	Mineral Type	Image Number	Structure Comments
			Primary	Total	Length	Width				
B2	A9	None Detected								
B2	A7	None Detected								
B2	A5	None Detected								
B2	A3	None Detected								
B2	A1	None Detected								
B2	C1	None Detected								
B2	C3	None Detected								
B2	C5	None Detected								
B2	C7	None Detected								
B2	C9	None Detected								
B2	E9	None Detected								
B2	E7	None Detected								
B2	E5	None Detected								
B2	E3	MC11	1	1	9.4	8	NAM	Non Asb. Mineral		
B2	E1	None Detected								
B2	G1	None Detected								
B2	G3	None Detected								
B2	G5	None Detected								
B2	G7	None Detected								
B2	G9	None Detected								
B2	I9	None Detected								
B2	I7	None Detected								
B2	I5	None Detected								
B2	I3	None Detected								
B2	I1	None Detected								
B3	J2	None Detected								
B3	J4	None Detected								
B3	J6	None Detected								
B3	J8	None Detected								
B3	J10	MD11	2		16	8.3	AX	Actinolite		
B3	J10	MF		2	13.1	0.96	AX	Actinolite		
B3	H10	None Detected								
B3	H8	None Detected								
B3	H6	None Detected								
B3	H4	None Detected								
B3	H2	None Detected								
B3	F2	None Detected								
B3	F4	None Detected								

200 Route 130 North
Cinnaminson, NJ 08077

ISO 10312

International Standard for the Determination of Asbestos Fibers-Direct Transfer Transmission Electron Microscopy

Bench Sheet Data

Client:	Tetra Tech			Scope:	JEOL 100 CX II (04-01)
EMSL Sample ID:	041413252-0003	GO area (mm²):	0.0132	Mag.	10,000
Customer Sample:	BC-AA-03-00001	Grid Box :	0414-TetraTech-01: B	Analyst(s):	F. Craig
Chi² Test for Uniformity:	50-Random	Pore Size (micron):	0.8	Analysis Date:	05/15/2014
Project ID:	NDOT NOA / 10353259			Particulate Loading:	20-25%

Grid ID	Grid Opening	Structure Type	Structure Number		Dimensions (µm)		Level of ID	Mineral Type	Image Number	Structure Comments
			Primary	Total	Length	Width				
B3	F6	None Detected								
B3	F8	None Detected								
B3	F10	None Detected								
B3	D10	None Detected								
B3	D8	None Detected								
B3	D6	None Detected								
B3	D4	None Detected								
B3	D2	None Detected								
B3	B2	None Detected								
B3	B4	None Detected								
B3	B5	None Detected								
B3	B8	None Detected								
B3	B10	None Detected								
B3	C7	None Detected								

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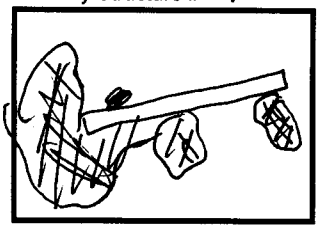
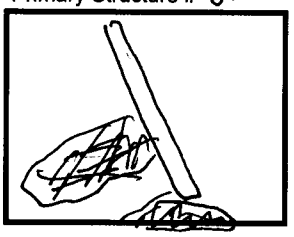
International Standard for the Determination of Asbestos Fibers-Direct Transfer Transmission Electron Microscopy

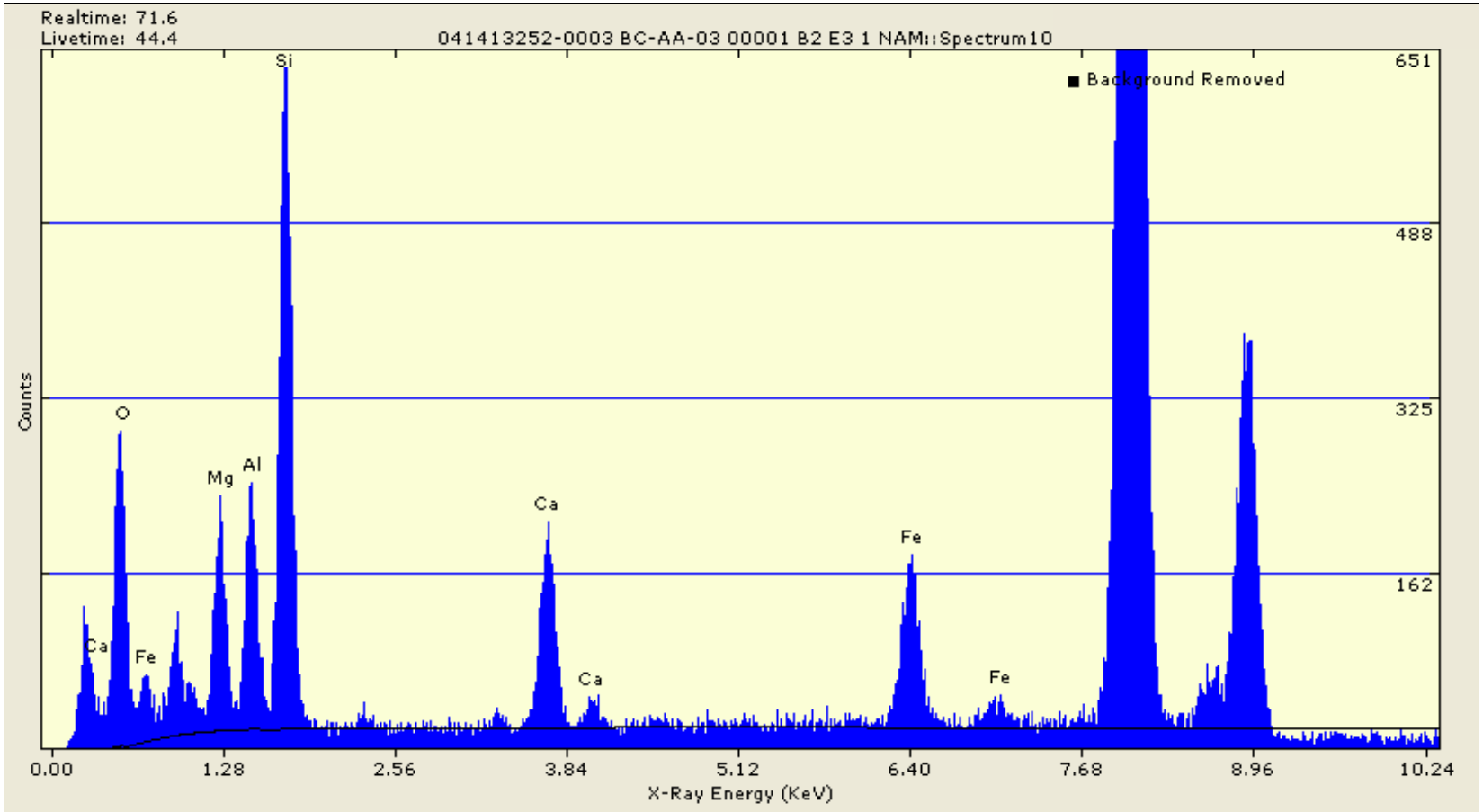
Structure Sketch Sheet for Direct Data Entry

EMSL Order ID: 041413252-0003 **Client:** Tetra Tech

Client Sample: *BC-AA-03-00001* Page 1 of 1

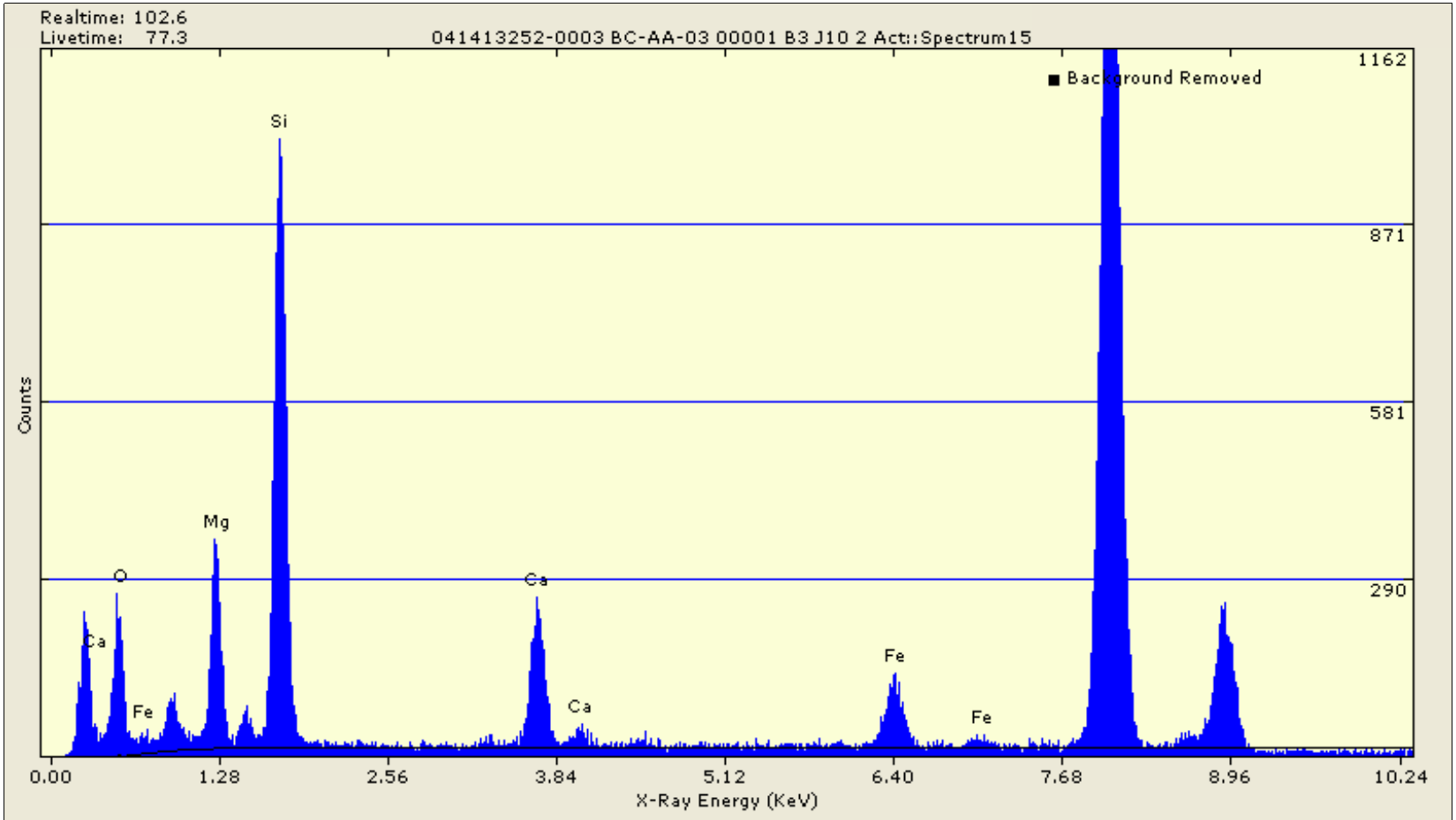
Primary Structure # 1 	Primary Structure # 2 	Primary Structure #	Primary Structure #
Primary Structure #	Primary Structure #	Primary Structure #	Primary Structure #
Primary Structure #	Primary Structure #	Primary Structure #	Primary Structure #
Primary Structure #	Primary Structure #	Primary Structure #	Primary Structure #
Structure #	Structure #	Structure #	Structure #

Analyst: FC Date: 5/15/14 Scope: 04 01



Quantitative Results for Spectrum10
Analysis: Thin Film Method: Standardless
Acquired 15-May-2014, 100.0 KeV @10 eV/channel

Element	Weight %	Std. Dev.	Atomic %	Oxide %		Cations	k-Ratio	Intensities	FWHM (eV)	ROI (net)
Oxygen	44.09	1.07	60.55	0.00		0.0000	0.0000	0.0	86.2	2335.83
Magnesium	7.86	0.11	7.11	13.04	(MgO)	2.6996	0.1294	1530.6	95.9	1586.39
Aluminum	8.06	0.11	6.56	15.23	(Al2O3)	2.4936	0.1339	1731.9	98.8	1895.09
Silicon	22.78	0.32	17.82	48.73	(SiO2)	6.7687	0.3459	5183.0	101.8	5275.75
Calcium	7.65	0.11	4.19	10.70	(CaO)	1.5925	0.0678	1806.3	122.5	1827.34
Iron	9.56	0.13	3.76	12.30	(FeO)	1.4287	0.0636	1793.5	146.4	1889.42
Total	100.00			100.00		14.9831				



Quantitative Results for Spectrum15
Analysis: Thin Film Method: Standardless
Acquired 15-May-2014, 100.0 KeV @10 eV/channel

Element	Weight %	Std. Dev.	Atomic %	Oxide %		Cations	k-Ratio	Intensities	FWHM (eV)	ROI (net)
Oxygen	46.04	1.31	61.53	0.00		0.0000	0.0000	0.0	86.2	1853.15
Magnesium	10.35	0.11	9.11	17.17	(MgO)	3.4046	0.1871	2383.5	95.9	2489.36
Silicon	30.29	0.34	23.06	64.80	(SiO2)	8.6200	0.5136	8150.0	101.8	8400.68
Calcium	7.94	0.09	4.24	11.11	(CaO)	1.5833	0.0780	2217.5	122.5	2320.85
Iron	5.38	0.06	2.06	6.93	(FeO)	0.7705	0.0437	1194.2	146.4	1356.66
Total	100.00			100.00		14.3785				

AMPHIBOLE SAED INDEXING FORM

EMSL Order Number:	041413252	**Date:**	May 15, 2014
Indexing of Image Number:	010162	**Scope #:**	04 - 01
Reference / Sample No:	0003-04-01	**By:**	F Craig
Preliminary ID:	NRA		
Using Camera Constant of:	2.945e-003 **1/A Pixels**		
Determined from Reference:	AuCal-051314_10156		

Measured Inter-Row Spacing: **63.98** Pixels

Mean Distance between spots on Center row (d2): **104.36** Pixels

Mean Distance between spots on slant vector (d1): **83.57** Pixels

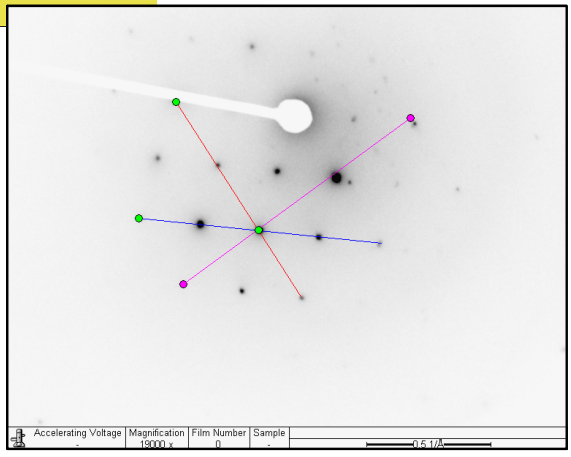
	Calculated	Ref	-5%	+5%
Inter-row Spacing (Angstroms):	5.316	**5.320**	*5.054*	*5.586*
d2 or hk0 (Camera K/zero row dist.):	3.259	**3.309**	*3.144*	*3.474*
d1 or hk1 (Camera K/slant vector dist.):	4.070	**3.930**	*3.733*	*4.127*
Ratio of hk0/hkl:	0.801	**0.842**	*0.800*	*0.884*
Angle of Slant Vector (Measured):	51.4	**51.870**	*49.276*	*54.463*

From SAED Reference Book, "unknown" diffraction pattern was found to be that of: Ferro-Hornblende **By:** F Craig

Miller Indice hk0: (**-2 4 0**)

Miller Indice hkl: (**-1 3 1**)

With a Zone Axis of: [**2 1 -1**]



Preliminary Identification was: X CORRECT

INCORRECT

Percent accuracy to date: 100 % (27/27)

EMSL Analytical, Inc.
200 Route 130 North
Cinnaminson, NJ 08077
856-303-2500
www.EMSL.com

Edward Surbrugg
Tetra Tech
303 Irene Street
Helena, MT 59601
Phone: 406-442-5588

Customer ID: MAXI57
Customer PO: NA
Received: 5/14/2014 9:30
Date Sampled: 5/13/2014
EMSL Order: 041413252
Report Date: 06/12/14

Project: NDOT NOA / 10353259

ISO 10312 International Standard for the Determination of Asbestos Fibers - Direct Transfer TEM - Modified for PCMe Analysis

Customer Sample Number:	BC-AA-04-00001		Air volume:	14422	Liters
EMSL Sample Number:	041413252-0004		Grid Opening Area:	0.0132	mm²
Minimum Level of analysis (chrysotile):	CD		Grid Openings Analyzed:	51	
Minimum Level of analysis (amphibole):	ADX				
Magnification used for fiber counting:	10,000				
Aspect ratio for fiber definition:	3:1				
Min Length/Max Width to be counted (µm):	>=5 / 3				
Area of collection filter (mm²):	385		Analysis Date:	5/16/2014	
Result of Chi² Test:	46.00	Random	Analyst:	F. Craig	

Analytical Sensitivity: **0.000040** **Structure/cc** **Limit of Detection:** **0.000119** **Structure/cc**

Structure Class	Min ID Level	Primary Str.	Total Str.	Density Str/mm²	Concentration (Str/cc)	Poisson 95 % Confidence Interval LCL (Str/cc)	UCL (Str/cc)
PCMe Structures (Chrys)	CD	0	-	0.00	0.000000	0.000000 -	0.000119
PCMe Structures (Amph)	ADX	0	-	0.00	0.000000	0.000000 -	0.000119
PCMe Structures (NRA)	ADX	0	-	0.00	0.000000	0.000000 -	0.000119
Total PCMe Structures (Regulated)	**CD/ADX**	**0**	**-**	**0.00**	**0.000000**	**0.000000 -**	**0.000119**
Total PCMe Structures (All)	**CD/ADX**	**0**	-	**0.00**	**0.000000**	**0.000000 -**	**0.000119**
PCMe Fibers and Bundles (Chrys)	CD	-	0	0.00	0.000000	0.000000 -	0.000119
PCMe Fibers and Bundles (Amph)	ADX	-	10	14.85	0.000397	0.000190 -	0.000729
PCMe Fibers and Bundles (NRA)	ADX	-	2	2.97	0.000079	0.000000 -	0.000250
Total PCMe Fibers and Bundles (Regulated)	**CD/ADX**	**-**	**10**	**14.85**	**0.000397**	**0.000190 -**	**0.000729**
Total PCMe Fibers and Bundles (All)	**CD/ADX**	**-**	**12**	**17.83**	**0.000476**	**0.000246 -**	**0.000831**
Non Asbestos Mineral Structures	NAM	0	0	-	-	- -	-

Asbestiform Minerals Present: *Actinolite, Non-Regulated Amphibole*

Explanation of Results

NRA = Non-Regulated Amphibole. A suspected mineral fiber that is a member of the Amphibole group, but is currently not regulated by the Federal governement as asbestos.

PCMe structure = A Fibrous structure of aspect ratio > 3:1, longer than 5 um, and which has a diameter between 0.2 and 3.0 microns

PCMe Fiber or Bundle = A Fiber or Bundle of of aspect ratio > 3:1, longer than 5 um, and which has a diameter between 0.2 and 3.0 microns

Concentration (Regulated) = include all federally regulated asbestos types. Currently Chrysotile, Amosite, Actinolite, Tremolite, Anthophyllite and Crocidolite

Concentration (all) = include all federally regulated asbestos types (Chrysotile, Amosite, Actinolite, Tremolite, Anthophyllite and Crocidolite) and all Non-regulated Amphiboles

Min ID Level = the minimum level of analysis that must have been met to be included in the reportable structure count. If any fibrous structure did not meet the minimum ID level, it would not be included in the concentration.

NAM = Non Asbestos Mineral. A mineral fiber that has been rejected from being either Amphibole or Chrysotile

Comment: Samples collected on 0.8 um MCE filters

Robyn Denton
Approved Signatory

Tetra Tech BCBP PCMe Report Template Version: 1

ISO 10312

International Standard for the Determination of Asbestos Fibers-Direct Transfer Transmission Electron Microscopy

Bench Sheet Data

Client:	Tetra Tech			Scope:	JEOL 100 CX II (04-01)
EMSL Sample ID:	041413252-0004	GO area (mm²):	0.0132	Mag.	10,000
Customer Sample:	BC-AA-04-00001	Grid Box :	0414-TetraTech-01: F	Analyst(s):	F. Craig
Chi² Test for Uniformity:	46-Random	Pore Size (micron):	0.8	Analysis Date:	05/16/2014 & 05/18/2014
Project ID:	NDOT NOA / 10353259			Particulate Loading:	20-25%

Grid ID	Grid Opening	Structure Type	Structure Number		Dimensions (µm)		Level of ID	Mineral Type	Image Number	Structure Comments
			Primary	Total	Length	Width				
F2	I1	None Detected								
F2	I3	None Detected								
F2	I5	MD11	1		12.2	8.3	ADX	Actinolite		
F2	I5	MB		1	9.4	1.92	ADX	Actinolite	010165D	
F2	I7	None Detected								
F2	I9	None Detected								
F2	G9	None Detected								
F2	G7	MD11	2		12	11.4	ADX	Actinolite		
F2	G7	MF		2	8.1	1.56	ADX	Actinolite		
F2	G5	None Detected								
F2	G3	None Detected								
F2	G1	MD11	3		23.8	14.3	ADX	Actinolite		
F2	G1	MF		3	14.3	0.5	ADX	Actinolite	010167M	
F2	G1	MD22	4		51.1	29.25	ADX	Non Reg.Amph.		
F2	G1	MB		4	18.3	1.2	ADX	Non Reg.Amph.		
F2	G1	MF		5	13.2	0.25	ADX	Non Reg.Amph.		
F2	E1	None Detected								
F2	E3	None Detected								
F2	E5	None Detected								
F2	E7	None Detected								
F2	E9	None Detected								
F2	C9	None Detected								
F2	C7	None Detected								
F2	C5	None Detected								
F2	C3	MD11	5		16.3	14.3	ADX	Actinolite		
F2	C3	MF		6	14.3	2.38	ADX	Actinolite		
F2	C1	None Detected								
F2	A1	None Detected								
F2	A3	None Detected								
F2	A5	MC11	6	7	21.4	13.3	ADX	Actinolite		
F2	A7	MD11	7		10.7	9.5	ADX	Actinolite		
F2	A7	MF		8	7.4	1.2	ADX	Actinolite		
F2	A7	MC11	8	9	47.5	40	AX	Actinolite		
F2	A9	None Detected								
F3	J2	None Detected								
F3	J4	MD11	9		11.9	9.6	ADX	Actinolite		
F3	J4	MF		10	13.3	0.72	ADX	Actinolite	010168D	
F3	J6	None Detected								

200 Route 130 North
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ISO 10312

International Standard for the Determination of Asbestos Fibers-Direct Transfer Transmission Electron Microscopy

Bench Sheet Data

Client:	Tetra Tech			Scope:	JEOL 100 CX II (04-01)
EMSL Sample ID:	041413252-0004	GO area (mm²):	0.0132	Mag.	10,000
Customer Sample:	BC-AA-04-00001	Grid Box :	0414-TetraTech-01: F	Analyst(s):	F. Craig
Chi² Test for Uniformity:	46-Random	Pore Size (micron):	0.8	Analysis Date:	05/16/2014 & 05/18/2014
Project ID:	NDOT NOA / 10353259			Particulate Loading:	20-25%

Grid ID	Grid Opening	Structure Type	Structure Number		Dimensions (µm)		Level of ID	Mineral Type	Image Number	Structure Comments
			Primary	Total	Length	Width				
F3	J8	MD11	10		32.2	21.4	ADX	Actinolite		
F3	J8	MF		11	21.5	0.84	ADX	Actinolite		
F3	J8	MD11	11		15.4	11	NAM	Non Asb. Mineral		
F3	J8	MF		12	15.4	3.56	NAM	Non Asb. Mineral		
F3	J10	None Detected								
F3	H10	None Detected								
F3	H8	MD11	12		33.3	9.5	ADX	Actinolite		
F3	H8	MF		13	33.3	2.38	ADX	Actinolite		
F3	H6	MD11	13		21.4	7.13	ADX	Actinolite		
F3	H6	MB		14	21.4	3.1	ADX	Actinolite		
F3	H4	MD11	14		31.2	29.76	AX	Actinolite		
F3	H4	MF		15	21.9	4.28	AX	Actinolite		
F3	H2	MD11	15		7.6	1.4	AX	Actinolite		
F3	H2	MF		16	7.6	0.9	AX	Actinolite		
F3	F2	None Detected								
F3	F4	None Detected								
F3	F6	None Detected								
F3	F8	None Detected								
F3	F10	MD11	16		8.3	4.8	ADX	Actinolite		
F3	F10	NMF		17	7.1	0.36	ADX	Actinolite		
F3	D10	None Detected								
F3	D8	MC11	17	18	48	38.24	AX	Actinolite		
F3	D6	None Detected								
F3	D4	None Detected								
F3	D2	None Detected								
F3	B2	MD11	18		9	7	ADX	Actinolite		
F3	B2	MF		19	7.6	0.35	ADX	Actinolite		
F3	B4	None Detected								
F3	B6	None Detected								
F3	B8	None Detected								
F3	B10	None Detected								
F3	C7	None Detected								

200 Route 130 North
Cinnaminson, NJ 08077

ISO 10312

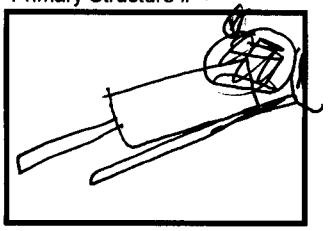
International Standard for the Determination of Asbestos Fibers-Direct Transfer Transmission Electron Microscopy

Structure Sketch Sheet for Direct Data Entry

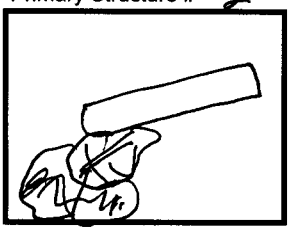
EMSL Order ID: 041413252-0004 **Client:** Tetra Tech

Client Sample: *BC-AA-04-00001* Page 1 of 1

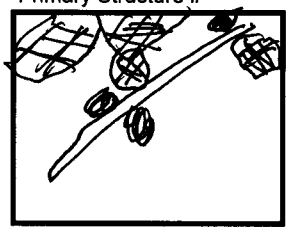
Primary Structure # 1



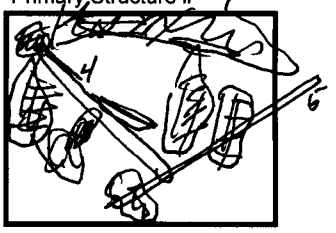
Primary Structure # 2



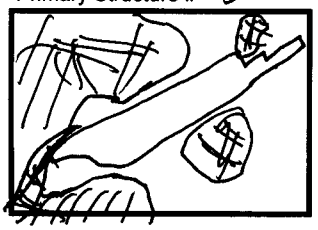
Primary Structure # 3



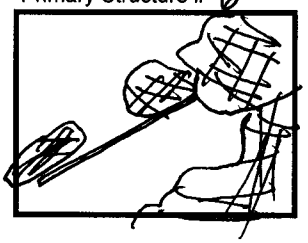
Primary Structure # 4



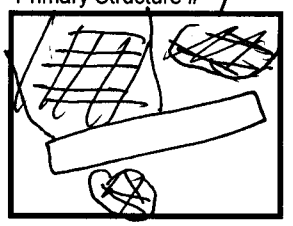
Primary Structure # 5



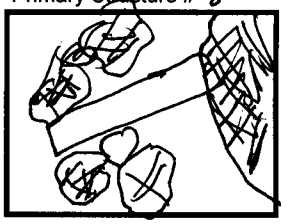
Primary Structure # 6



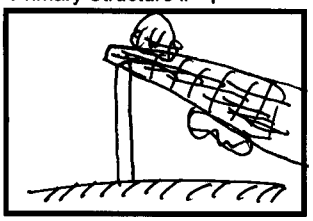
Primary Structure # 7



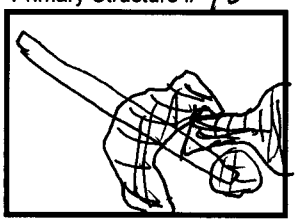
Primary Structure # 8



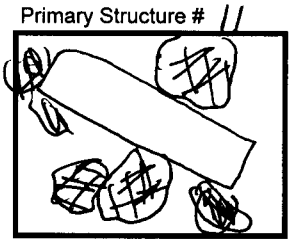
Primary Structure # 9



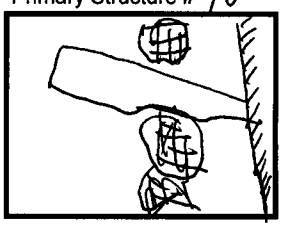
Primary Structure # 10



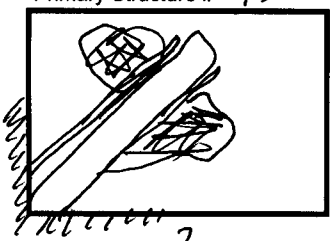
Primary Structure # 11



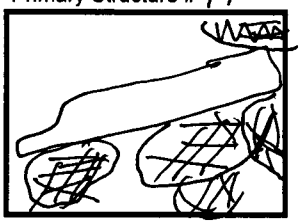
Primary Structure # 12



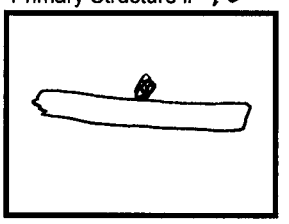
Primary Structure # 13



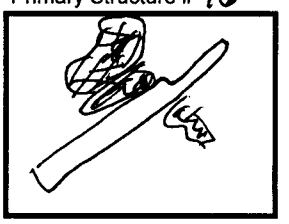
Primary Structure # 14



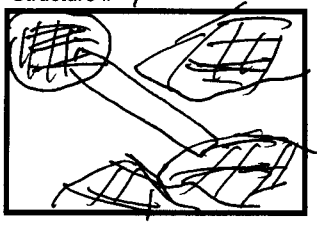
Primary Structure # 15



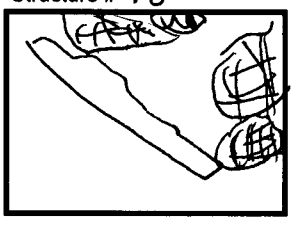
Primary Structure # 16



Structure # 17



Structure # 18



Structure #

Structure #

Analyst: PC Date: 5/18/14 Scope: 04 01

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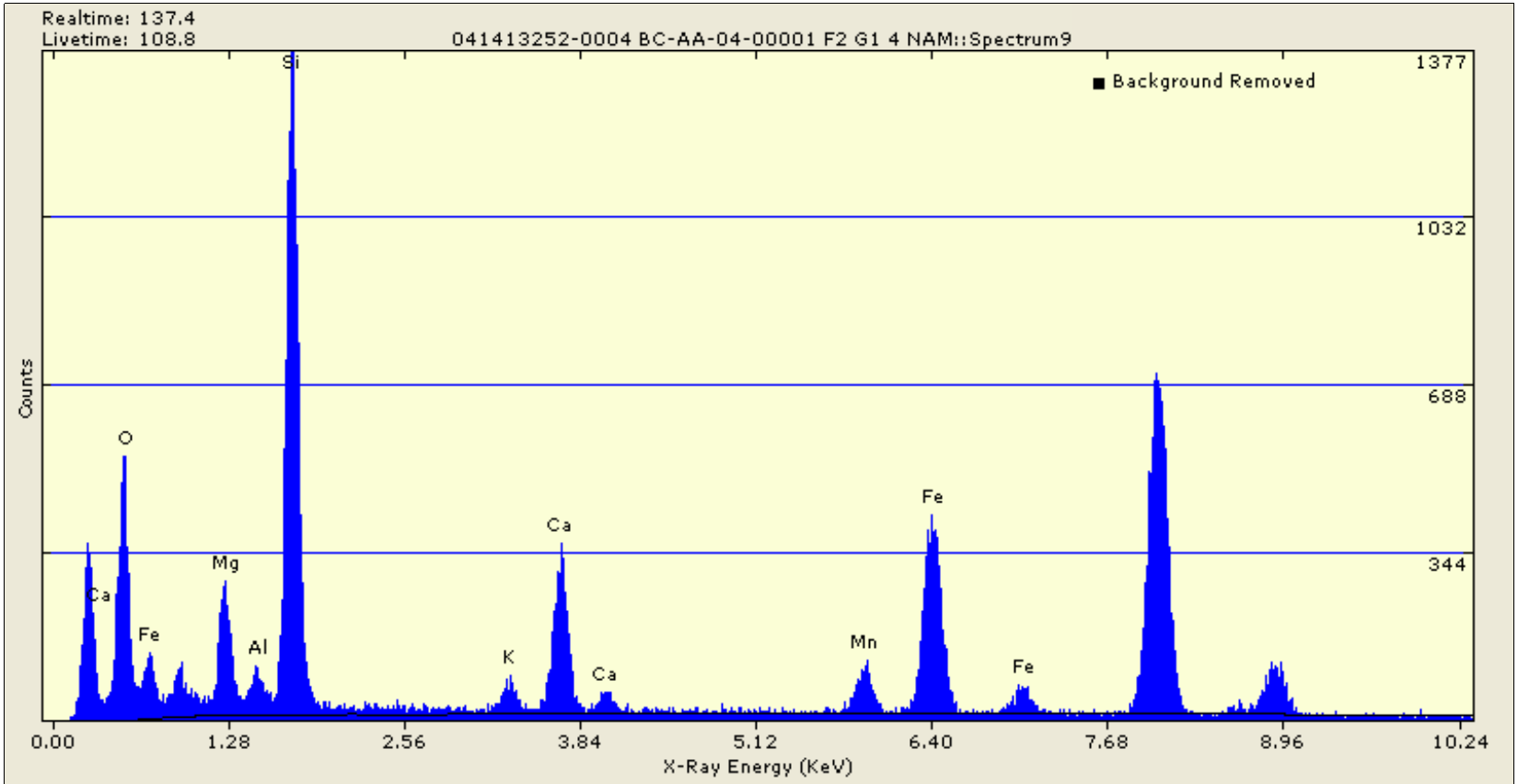
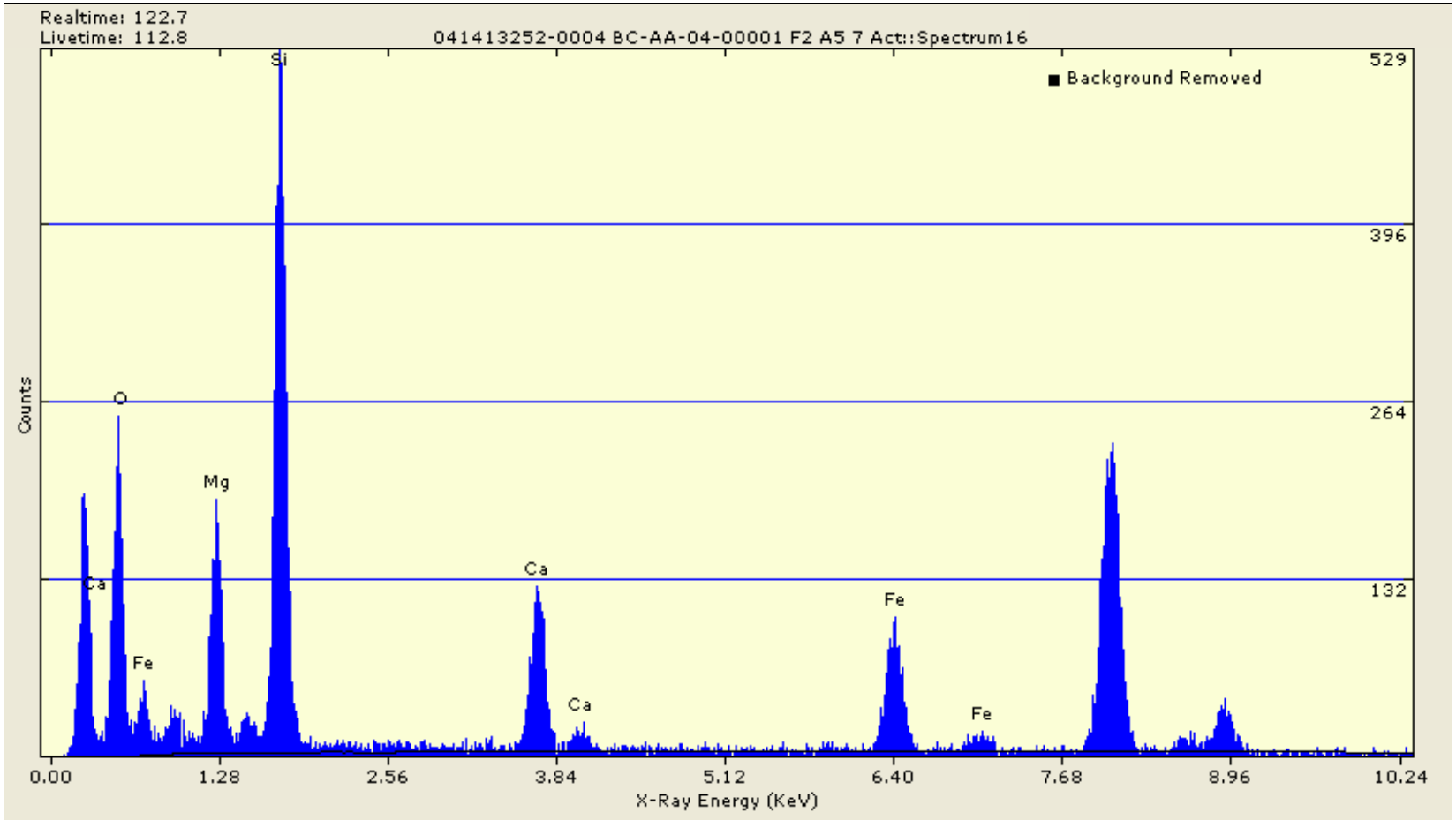


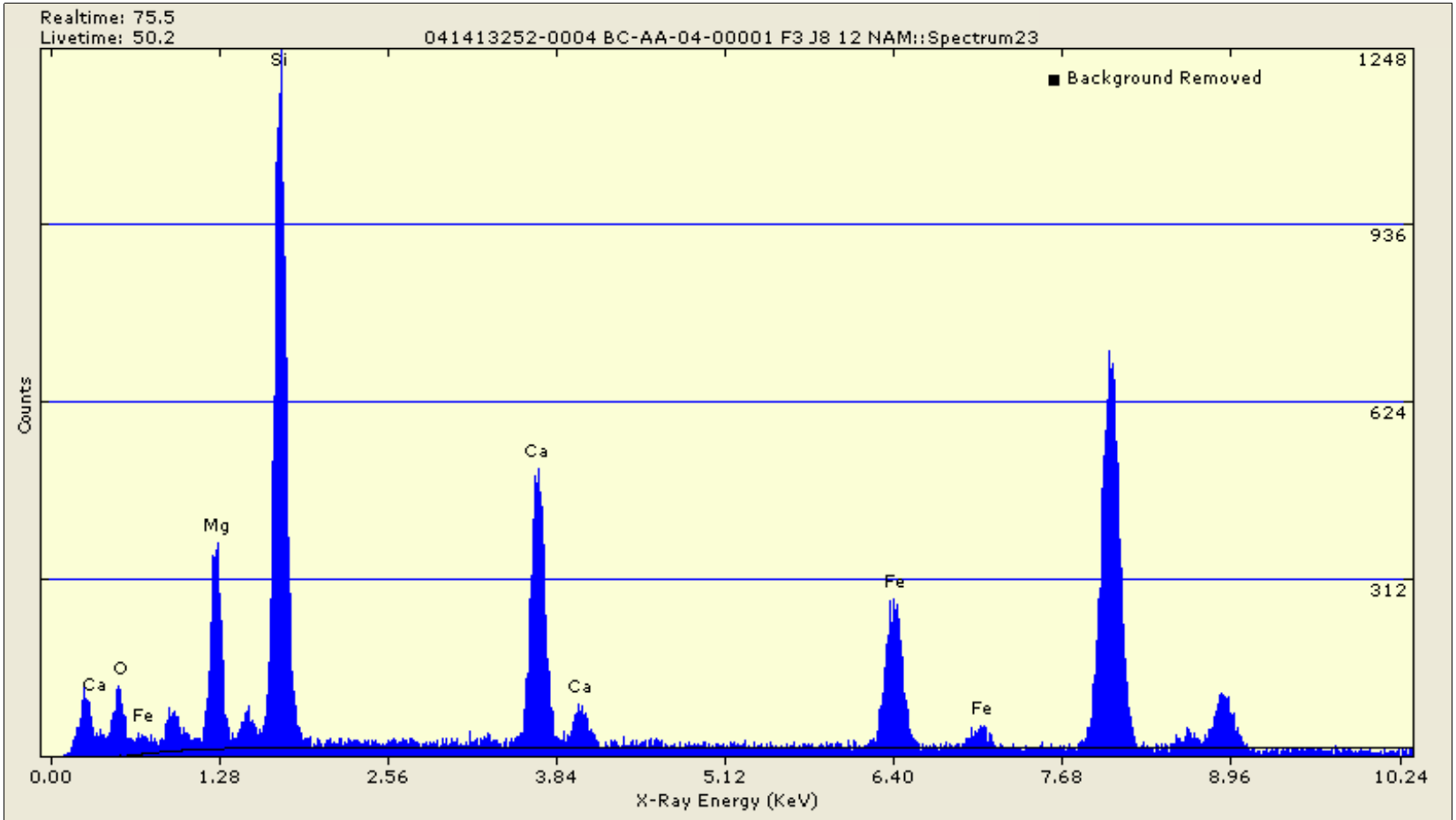
Quantitative Results for Spectrum9
Analysis: Thin Film Method: Standardless
Acquired 16-May-2014, 100.0 KeV @10 eV/channel

Element	Weight %	Std. Dev.	Atomic %	Oxide %		Cations	k-Ratio	Intensities	FWHM (eV)	ROI (net)
Oxygen	42.18	0.41	60.66	0.00		0.0000	0.0000	0.0	86.2	3963.57
Magnesium	5.52	0.05	5.22	9.15	(MgO)	1.9799	0.0927	1955.1	95.9	2152.65
Aluminum	1.45	0.01	1.24	2.74	(Al2O3)	0.4683	0.0248	566.4	98.7	770.84
Silicon	25.80	0.25	21.14	55.19	(SiO2)	8.0138	0.4023	10687.5	101.8	11354.80
Potassium	1.47	0.01	0.87	1.77	(K2O)	0.3283	0.0128	621.9	118.8	679.86
Calcium	7.04	0.07	4.04	9.85	(CaO)	1.5319	0.0620	3026.3	122.5	3188.22
Manganese	2.69	0.03	1.12	3.47	(MnO)	0.4264	0.0218	924.6	142.3	1107.50
Iron	13.87	0.13	5.71	17.84	(FeO)	2.1662	0.0962	4736.1	146.4	5073.05
Total	100.00			100.00		14.9148				



Quantitative Results for Spectrum16
Analysis: Thin Film Method: Standardless
Acquired 16-May-2014, 100.0 KeV @10 eV/channel

Element	Weight %	Std. Dev.	Atomic %	Oxide %		Cations	k-Ratio	Intensities	FWHM (eV)	ROI (net)
Oxygen	44.54	0.71	60.86	0.00		0.0000	0.0000	0.0	86.2	1734.81
Magnesium	10.67	0.17	9.60	17.69	(MgO)	3.6263	0.1649	1293.2	95.9	1373.17
Silicon	27.89	0.44	21.71	59.67	(SiO2)	8.2046	0.4032	3951.3	101.8	4196.07
Calcium	7.96	0.13	4.34	11.14	(CaO)	1.6408	0.0665	1170.5	122.5	1242.52
Iron	8.94	0.14	3.50	11.50	(FeO)	1.3223	0.0595	1044.0	146.4	1134.64
Total	100.00			100.00		14.7940				



Quantitative Results for Spectrum23
Analysis: Thin Film Method: Standardless
Acquired 18-May-2014, 100.0 KeV @10 eV/channel

Element	Weight %	Std. Dev.	Atomic %	Oxide %		Cations	k-Ratio	Intensities	FWHM (eV)	ROI (net)
Oxygen	43.26	0.44	60.49	0.00		0.0000	0.0000	0.0	86.3	956.29
Magnesium	8.43	0.09	7.76	13.99	(MgO)	2.9516	0.1090	2693.5	95.9	2785.40
Silicon	26.34	0.27	20.98	56.34	(SiO2)	7.9756	0.2461	9829.6	101.8	10165.74
Calcium	12.51	0.13	6.98	17.50	(CaO)	2.6550	0.1026	4847.1	122.5	5080.38
Iron	9.46	0.10	3.79	12.17	(FeO)	1.4407	0.0684	2910.8	146.4	3169.27
Total	100.00			100.00		15.0229				

AMPHIBOLE SAED INDEXING FORM

EMSL Order Number:	041413252	**Date:**	May 16, 2014
Indexing of Image Number:	010165	**Scope #:**	04 - 01
Reference / Sample No:	0004-04-01	**By:**	F Craig
Preliminary ID:	ACTINOLITE		
Using Camera Constant of:	2.945e-003 **1/A Pixels**		
Determined from Reference:	AuCal-051314_10156		

Measured Inter-Row Spacing:	**128.73**	Pixels
Mean Distance between spots on Center row (d2):	**37.49**	Pixels
Mean Distance between spots on slant vector (d1):	**128.68**	Pixels

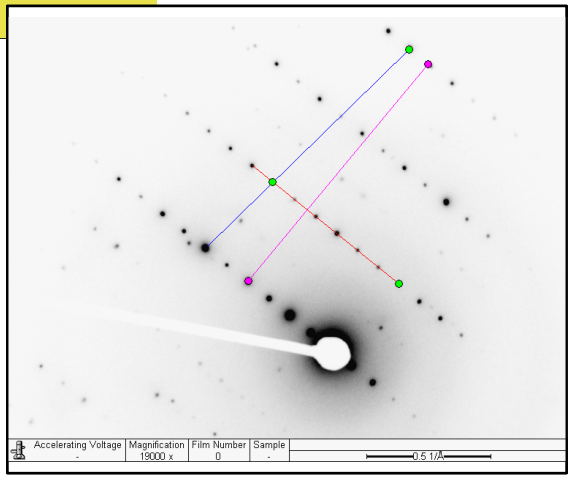
	Calculated	Ref	-5%	+5%
Inter-row Spacing (Angstroms):	2.642	**2.639**	*2.507*	*2.771*
d2 or hk0 (Camera K/zero row dist.):	9.071	**9.055**	*8.602*	*9.508*
d1 or hk1 (Camera K/slant vector dist.):	2.643	**2.641**	*2.509*	*2.773*
Ratio of hk0/hkl:	3.432	**3.429**	*3.258*	*3.600*
Angle of Slant Vector (Measured):	81.9	**81.560**	*77.482*	*85.638*

From SAED Reference Book, "unknown" diffraction pattern was found to be that of: Crystal Type **By:** F Craig

Miller Indice hk0: (**0 2 0**)

Miller Indice hkl: (**1 1 -2**)

With a Zone Axis of: [**-2 0 -1**]



Preliminary Identification was: X CORRECT

INCORRECT

Percent accuracy to date: 100 % (40/40)

AMPHIBOLE SAED INDEXING FORM

EMSL Order Number:	041413252	**Date:**	May 18, 2014
Indexing of Image Number:	010168	**Scope #:**	04 - 01
Reference / Sample No:	0004-04-01	**By:**	F Craig
Preliminary ID:	ACTINOLITE		
Using Camera Constant of:	2.945e-003 **1/A Pixels**		
Determined from Reference:	AuCal-051314_10156		

Measured Inter-Row Spacing:	**64.56**	Pixels
Mean Distance between spots on Center row (d2):	**166.31**	Pixels
Mean Distance between spots on slant vector (d1):	**87.05**	Pixels

	Calculated	Ref	-5%	+5%
Inter-row Spacing (Angstroms):	5.268	**5.278**	*5.014*	*5.542*
d2 or hk0 (Camera K/zero row dist.):	2.045	**1.965**	*1.867*	*2.063*
d1 or hk1 (Camera K/slant vector dist.):	3.907	**3.880**	*3.686*	*4.074*
Ratio of hk0/hkl:	0.523	**0.506**	*0.481*	*0.531*
Angle of Slant Vector (Measured):	48.4	**47.480**	*45.106*	*49.854*

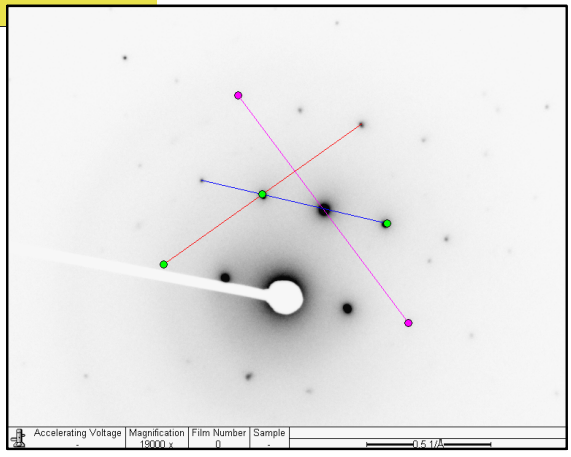
From SAED Reference Book, "unknown" diffraction pattern was found to be that of: Actinolite **By:** F Craig

Miller Indice hk0: (**-1 9 0**)

Miller Indice hkl: (**-1 3 1**)

With a Zone Axis of: [**9 1 6**]

Preliminary Identification was: [x] CORRECT [ ] INCORRECT



Percent accuracy to date: 100 % (32/32)

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200 Route 130 North
Cinnaminson, NJ 08077
856-303-2500
www.EMSL.com

Edward Surbrugg
Tetra Tech
303 Irene Street
Helena, MT 59601
Phone: 406-442-5588

Customer ID: MAXI57
Customer PO: NA
Received: 5/14/2014 9:30
Date Sampled: 5/13/2014
EMSL Order: 041413252
Report Date: 06/12/14

Project: NDOT NOA / 10353259

ISO 10312 International Standard for the Determination of Asbestos Fibers - Direct Transfer TEM - Modified for PCMe Analysis

Customer Sample Number:	FIELD BLANK-051314		Air volume: 0	Liters
EMSL Sample Number:	041413252-0005		Grid Opening Area: 0.0132	mm²
Minimum Level of analysis (chrysotile):	CD		Grid Openings Analyzed: 10	
Minimum Level of analysis (amphibole):	ADX			
Magnification used for fiber counting:	10,000			
Aspect ratio for fiber definition:	3:1			
Min Length/Max Width to be counted (µm):	>=5 / 3			
Area of collection filter (mm²):	385		Analysis Date: 5/15/2014	
Result of Chi² Test:	9.00	Random	Analyst: P. Harrison	

Analytical Sensitivity: 7.575758 Structure/ mm² **Limit of Detection: 22.65152 Structure/ mm²**

Structure Class	Min ID Level	Primary Str.	Total Str.	Density Str/mm²	Concentration Str/ mm²	Poisson 95 % Confidence Interval LCL Str/ mm²	UCL Str/ mm²
PCMe Structures (Chrys)	CD	0	-	0.00	NA	0.000000 -	22.651515
PCMe Structures (Amph)	ADX	0	-	0.00	NA	0.000000 -	22.651515
PCMe Structures (NRA)	ADX	0	-	0.00	NA	0.000000 -	22.651515
Total PCMe Structures (Regulated)	**CD/ADX**	**0**	**-**	**0.00**	**NA**	**0.000000 -**	**22.651515**
Total PCMe Structures (All)	**CD/ADX**	**0**	**-**	**0.00**	**NA**	**0.000000 -**	**22.651515**
PCMe Fibers and Bundles (Chrys)	CD	-	0	0.00	NA	0.000000 -	22.651515
PCMe Fibers and Bundles (Amph)	ADX	-	0	0.00	NA	0.000000 -	22.651515
PCMe Fibers and Bundles (NRA)	ADX	-	0	0.00	NA	0.000000 -	22.651515
Total PCMe Fibers and Bundles (Regulated)	**CD/ADX**	**-**	**0**	**0.00**	**NA**	**0.000000 -**	**22.651515**
Total PCMe Fibers and Bundles (All)	**CD/ADX**	**-**	**0**	**0.00**	**NA**	**0.000000 -**	**22.651515**
Non Asbestos Mineral Structures	NAM	0	0	-	-	- -	-

Asbestiform Minerals Present: *Actinolite*

Explanation of Results

NRA = Non-Regulated Amphibole. A suspected mineral fiber that is a member of the Amphibole group, but is currently not regulated by the Federal governement as asbestos.

PCMe structure = A Fibrous structure of aspect ratio > 3:1, longer than 5 um, and which has a diameter between 0.2 and 3.0 microns

PCMe Fiber or Bundle = A Fiber or Bundle of of aspect ratio > 3:1, longer than 5 um, and which has a diameter between 0.2 and 3.0 microns

Concentration (Regulated) = include all federally regulated asbestos types. Currently Chrysotile, Amosite, Actinolite, Tremolite, Anthophyllite and Crocidolite

Concentration (all) = include all federally regulated asbestos types (Chrysotile, Amosite, Actinolite, Tremolite, Anthophyllite and Crocidolite) and all Non-regulated Amphiboles

Min ID Level = the minimum level of analysis that must have been met to be included in the reportable structure count. If any fibrous structure did not meet the minimum ID level, it would not be included in the concentration.

NAM = Non Asbestos Mineral. A mineral fiber that has been rejected from being either Amphibole or Chrysotile

Comment: Samples collected on 0.8 um MCE filters. A non-countable (size) Actinolite fiber was found on Field blank.

Robyn Denton
Approved Signatory

Tetra Tech BCBP PCMe Report Template Version: 1

ISO 10312

International Standard for the Determination of Asbestos Fibers-Direct Transfer Transmission Electron Microscopy

Bench Sheet Data

Client:	Tetra Tech			Scope:	JEOL 1200 EX (04-03)
EMSL Sample ID:	041413252-0005	GO area (mm²):	0.0132	Mag.	10,000
Customer Sample:	FIELD BLANK-051314	Grid Box :	0414-TetraTech-01: C	Analyst(s):	P. Harrison
Chi² Test for Uniformity:	9-Random	Pore Size (micron):	0.8	Analysis Date:	05/15/2014
Project ID:	NDOT NOA / 10353259			Particulate Loading:	<1%

Grid ID	Grid Opening	Structure Type	Structure Number		Dimensions (µm)		Level of ID	Mineral Type	Image Number	Structure Comments
			Primary	Total	Length	Width				
C1	A5	F	1	1	4.1	0.4	ADX	Actinolite	4343	
C1	C7	None Detected								
C1	E4	None Detected								
C1	H6	None Detected								
C1	I7	None Detected								
C3	J4	None Detected								
C3	H6	None Detected								
C3	F4	None Detected								
C3	D7	None Detected								
C3	C5	None Detected								

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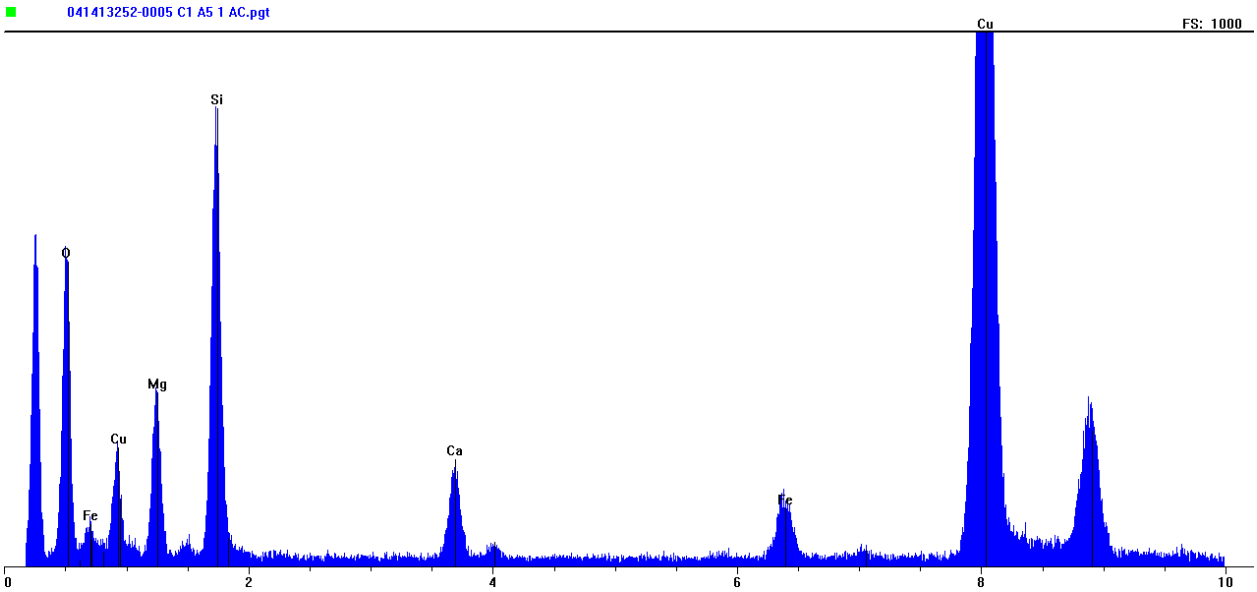
Cinnaminson, NJ 08077

Energy Dispersive X-Ray Analysis
Quantitative Spectra & Data

EMSL ANALYTICAL, INC.

File: L:\EDS Spe...Spectra\Scope 04-03\2014\041413252-0005 C1 A5 1 AC.pgt
Collected: May 15, 2014 07:48:35

Live Time:	42.20	Count Rate:	3844	Dead Time:	34.56 %
Beam Voltage:	20.00	Beam Current:	2.00	Takeoff Angle:	31.00
Thickness limit:	28270.46				



Element	Line	keV	CL Ratio	Wt%	At%	At Prop	Compound	Cmpd Wt%
Mg	KA1	1.254	1.4000	16.08	15.11	7.0	MgO	26.66
Si	KA1	1.740	1.0000	33.25	27.07	12.5	SiO	52.20
Ca	KA1	3.691	1.0500	8.74	4.99	2.3	CaO	12.23
Fe	KA1	6.403	0.9900	6.93	2.84	1.3	FeO	8.91
Cu	KA1	8.046	0.0000	0.00	0.00	0.0		
O	KA1	0.523	0.0000	35.00	50.00	23.0		
Total			**0.0000**	**100.00**	**100.00**	**46.0**	**Total**	**100.00**

Element	Line	Gross (cps)	BKG (cps)	Net (cps)	P:B Ratio
Mg	KA1	109.3	13.3	96.0	7.2
Si	KA1	290.6	12.6	278.0	22.1
Ca	KA1	80.9	11.3	69.6	6.2
Fe	KA1	72.5	14.0	58.5	4.2
Cu	KA1	1174.7	20.7	1154.0	55.7
O	KA1	168.5	8.4	160.0	19.0

AMPHIBOLE SAED INDEXING FORM

EMSL Order Number: 04143252 **Date:** May 15, 2014

Image Number: 04343

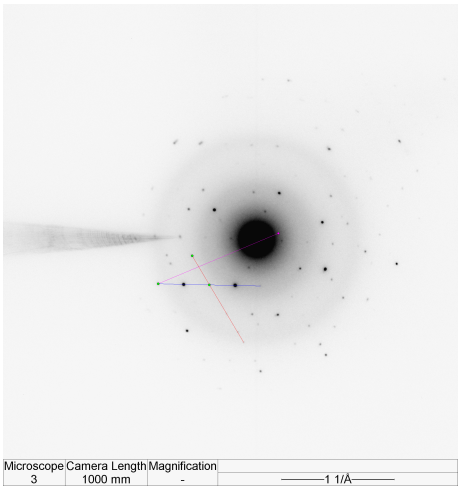
Reference / Sample Number: 0005

Preliminary ID: ACTINOLITE

Camera Constant: 1.968e-003 **1/A Pixels**

Calibration Reference: 051214-04-03-04342_C

	Measured	Reference	-5%	+5%
Inter-row Spacing:	**5.196**	5.278	**5.014**	**5.542**
d2 or hk0 (Camera K/zero row dist.):	**3.359**	3.385	**3.216**	**3.554**
d1 or hkl (Camera K/slant vector dist.):	**4.417**	4.482	**4.258**	**4.706**
Ratio of hk0/hkl:	**0.760**	0.755	**0.717**	**0.793**
Vector Angle:	**58.0**	57.000	**54.150**	**59.850**



From SAED Reference Book, "unknown" diffraction pattern was found to be that of: **ACTINOLITE**

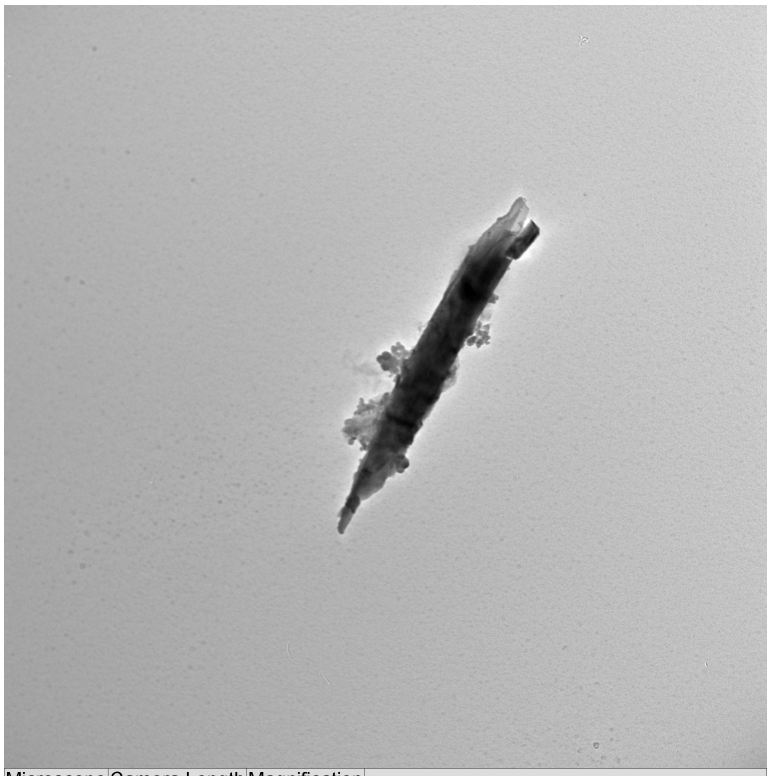
With a Zone Axis of: [**5-12**]

Preliminary Identification was:

X	CORRECT
	INCORRECT

EMSL Analytical, Inc.

Photomicrograph Report



Microscope	Camera Length	Magnification	
3	-	20000 x	2 µm

Micrograph Information

Sample ID:	0005
Order ID:	041413252
Image Number:	04344
Mineral Type:	ACTINOLITE
Date:	5/15/2014
Magnification:	20000
Microscope:	3

EMSL Analytical, Inc.
200 Route 130 North
Cinnaminson, NJ 08077
856-303-2500
www.EMSL.com

Edward Surbrugg
Tetra Tech
303 Irene Street
Helena, MT 59601
Phone: 406-442-5588

Customer ID: MAXI57
Customer PO: NA
Received: 5/14/2014 9:30
Date Sampled: 5/13/2014
EMSL Order: 041413252
Report Date: 06/12/14

Project: NDOT NOA / 10353259

ISO 10312 International Standard for the Determination of Asbestos Fibers - Direct Transfer TEM - Modified for PCMe Analysis

Customer Sample Number:	LOT BLANK-14330		Air volume: 0	Liters
EMSL Sample Number:	041413252-0006		Grid Opening Area: 0.0132	mm²
Minimum Level of analysis (chrysotile):	CD		Grid Openings Analyzed: 10	
Minimum Level of analysis (amphibole):	ADX			
Magnification used for fiber counting:	10,000			
Aspect ratio for fiber definition:	3:1			
Min Length/Max Width to be counted (µm):	>=5 / <=3			
Area of collection filter (mm²):	385		Analysis Date: 5/15/2014	
Result of Chi² Test:	N/A	N/A	Analyst: P. Harrison	

Analytical Sensitivity: 7.575758 Structure/ mm² **Limit of Detection: 22.65152 Structure/ mm²**

Structure Class	Min ID Level	Primary Str.	Total Str.	Density Str/mm²	Concentration Str/ mm²	Poisson 95 % Confidence Interval LCL Str/ mm²	UCL Str/ mm²
PCMe Structures (Chrys)	CD	0	-	0.00	NA	0.000000 -	22.651515
PCMe Structures (Amph)	ADX	0	-	0.00	NA	0.000000 -	22.651515
PCMe Structures (NRA)	ADX	0	-	0.00	NA	0.000000 -	22.651515
Total PCMe Structures (Regulated)	**CD/ADX**	**0**	**-**	**0.00**	**NA**	**0.000000 -**	**22.651515**
Total PCMe Structures (All)	**CD/ADX**	**0**	**-**	**0.00**	**NA**	**0.000000 -**	**22.651515**
PCMe Fibers and Bundles (Chrys)	CD	-	0	0.00	NA	0.000000 -	22.651515
PCMe Fibers and Bundles (Amph)	ADX	-	0	0.00	NA	0.000000 -	22.651515
PCMe Fibers and Bundles (NRA)	ADX	-	0	0.00	NA	0.000000 -	22.651515
Total PCMe Fibers and Bundles (Regulated)	**CD/ADX**	**-**	**0**	**0.00**	**NA**	**0.000000 -**	**22.651515**
Total PCMe Fibers and Bundles (All)	**CD/ADX**	**-**	**0**	**0.00**	**NA**	**0.000000 -**	**22.651515**
Non Asbestos Mineral Structures	NAM	0	0	-	-	- -	-

Asbestiform Minerals Present: *None Detected*

Explanation of Results

NRA = Non-Regulated Amphibole. A suspected mineral fiber that is a member of the Amphibole group, but is currently not regulated by the Federal governement as asbestos.

PCMe structure = A Fibrous structure of aspect ratio > 3:1, longer than 5 um, and which has a diameter between 0.2 and 3.0 microns

PCMe Fiber or Bundle = A Fiber or Bundle of of aspect ratio > 3:1, longer than 5 um, and which has a diameter between 0.2 and 3.0 microns

Concentration (Regulated) = include all federally regulated asbestos types. Currently Chrysotile, Amosite, Actinolite, Tremolite, Anthophyllite and Crocidolite

Concentration (all) = include all federally regulated asbestos types (Chrysotile, Amosite, Actinolite, Tremolite, Anthophyllite and Crocidolite) and all Non-regulated Amphiboles

Min ID Level = the minimum level of analysis that must have been met to be included in the reportable structure count. If any fibrous structure did not meet the minimum ID level, it would not be included in the concentration.

NAM = Non Asbestos Mineral. A mineral fiber that has been rejected from being either Amphibole or Chrysotile

Comment: Samples collected on 0.8 um MCE filters

Robyn Denton
Approved Signatory

Tetra Tech BCBP PCMe Report Template Version: 1

ISO 10312

International Standard for the Determination of Asbestos Fibers-Direct Transfer Transmission Electron Microscopy

Bench Sheet Data

Client:	Tetra Tech			Scope:	JEOL 1200 EX (04-03)
EMSL Sample ID:	041413252-0006	GO area (mm²):	0.0132	Mag.	10,000
Customer Sample:	LOT BLANK-14330-7DE-002	Grid Box :	0414-Tetra Tech-01: C	Analyst(s):	P.Harrison
Chi² Test for Uniformity:	N/A	Pore Size (micron):	0.8	Analysis Date:	05/15/2014
Project ID:	NDOT NOA / 10353259			Particulate Loading:	<1%

Grid ID	Grid Opening	Structure Type	Structure Number		Dimensions (µm)		Level of ID	Mineral Type	Image Number	Structure Comments
			Primary	Total	Length	Width				
C7	I4	None Detected								
C7	G5	None Detected								
C7	E4	None Detected								
C7	C6	None Detected								
C7	A5	None Detected								
C8	J6	None Detected								
C8	H7	None Detected								
C8	F7	None Detected								
C8	D9	None Detected								
C8	B7	None Detected								

200 Route 130 North
Cinnaminson, NJ 08077

OrderID: 041413252

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Asbestos Chain of Custody

EMSL Order Number (*Lab Use Only*): 041413252

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 786-5974

Company: TETRA TECH	EMSL-Bill to: ☒ Same ☐ Different If Bill to is Different note instructions in Comments**
Street: 7 West 6th AVENUE, STE 612	*Third Party Billing requires written authorization from third party*
City: HELENA State/Province: MT	Zip/Postal Code: 59601 Country: USA
Report To (Name): Ed SURBRUGG	Telephone #: 406-441-3296
Email Address: Edward.Surbrugg@TetraTech.com	Fax #: 406-442-7182 Purchase Order:
Project Name/Number: VDOT NOA / 10353259	Please Provide Results: ☐ Fax ☒ Email ☐ Mail
U.S. State Samples Taken: NA	Connecticut Samples: ☐ Commercial ☐ Residential

Turnaround Time (TAT) Options* – Please Check

☐ 3 Hour ☐ 6 Hour ☐ 24 Hour ☐ 48 Hour ☐ 72 Hour ☒ 96 Hour ☐ 1 Week ☐ 2 Week

**For TEM Air 3 hr through 6 hr, please call ahead to schedule.*There is a premium charge for 3 Hour TEM AHERA or EPA Level II TAT. You will be asked to sign an authorization form for this service. Analysis completed in accordance with EMSL's Terms and Conditions located in the Analytical Price Guide.*

PCM - Air ☐ Check if samples are from NY
- ☐ NIOSH 7400
- ☐ w/ OSHA 8hr. TWA

PLM - Bulk (reporting limit)
- ☐ PLM EPA 600/R-93/116 (<1%)
- ☐ PLM EPA NOB (<1%)

Point Count
- ☐ 400 (<0.25%) ☐ 1000 (<0.1%)

Point Count w/Gravimetric
- ☐ 400 (<0.25%) ☐ 1000 (<0.1%)
- ☐ NYS 198.1 (friable in NY)
- ☐ NYS 198.6 NOB (non-friable-NY)
- ☐ NIOSH 9002 (<1%)

TEM – Air ☐ 4-4.5hr TAT (AHERA only)
- ☐ AHERA 40 CFR, Part 763
- ☐ NIOSH 7402
- ☐ EPA Level II
- ☒ ISO 10312 Sensitivity to 0.000024

TEM - Bulk
- ☐ TEM EPA NOB
- ☐ NYS NOB 198.4 (non-friable-NY)
- ☐ Chatfield SOP
- ☐ TEM Mass Analysis-EPA 600 sec. 2.5

TEM – Water: EPA 100.2
- Fibers >10µm ☐ Waste ☐ Drinking
- All Fiber Sizes ☐ Waste ☐ Drinking

TEM- Dust
- ☐ Microvac - ASTM D 5755
- ☐ Wipe - ASTM D6480
- ☐ Carpet Sonication (EPA 600/J-93/167)

Soil/Rock/Vermiculite
- ☐ PLM CARB 435 - A (0.25% sensitivity)
- ☐ PLM CARB 435 - B (0.1% sensitivity)
- ☐ TEM CARB 435 - B (0.1% sensitivity)
- ☐ TEM CARB 435 - C (0.01% sensitivity)
- ☐ TEM Qual. via Filtration Technique
- ☐ TEM Qual. via Drop-Mount Technique

Other:
- ☐

☐ Check For Positive Stop – Clearly Identify Homogenous Group

Filter Pore Size (Air Samples): ☒ 0.8 µm ☐ 0.45 µm

Samplers Name: BECKI DANO Samplers Signature: [signature]

Sample #	Sample Description	Volume/Area (Air) HA # (Bulk)	Date/Time Sampled
BC-AA-01-00001	BC-AA-01	14,422 L	5/13/14 0816
BC-AA-02-00001	BC-AA-02	14,422 L	5/13/14 0842
BC-AA-03-00001	BC-AA-03	14,422 L	5/13/14 908
BC-AA-04-00001	BC-AA-04	14,422 L	5/13/14 925
Field Blank-051314	Field Blank	NA	5/13/14 940
Lot Blank 14330708E-002	Lot Blank	NA	5/13/14 940

Client Sample # (s): - Total # of Samples: 6

Relinquished (Client): Becki Dano Date: 5-13-14 Time: 1200

Received (Lab): [signature] Date: 5/14/14 Time: 9:30am

Comments/Special Instructions: