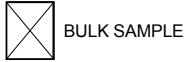


APPENDIX B

SAMPLE/SAMPLER TYPE GRAPHICS



BULK SAMPLE

GROUND WATER GRAPHICS

- WATER LEVEL (level where first observed)
- WATER LEVEL (level after exploration completion)
- WATER LEVEL (additional levels after exploration)
- OBSERVED SEEPAGE

NOTES

- The report and graphics key are an integral part of these logs. All data and interpretations in this log are subject to the explanations and limitations stated in the report.
- Lines separating strata on the logs represent approximate boundaries only. Actual transitions may be gradual or differ from those shown.
- No warranty is provided as to the continuity of soil or rock conditions between individual sample locations.
- Logs represent general soil or rock conditions observed at the point of exploration on the date indicated.
- In general, Unified Soil Classification System designations presented on the logs were based on visual classification in the field and were modified where appropriate based on gradation and index property testing.
- Fine grained soils that plot within the hatched area on the Plasticity Chart, and coarse grained soils with between 5% and 12% passing the No. 200 sieve require dual USCS symbols, i.e., GW-GM, GP-GM, GW-GC, GP-GC, GC-GM, SW-SM, SP-SM, SW-SC, SP-SC, SC-SM.
- If sampler is not able to be driven at least 6 inches a 3 inches diameter by 2.5 inches inch long 60 degree conical point driven with a 170 ±2 pound hammer dropped 24 ±0.5 inches.

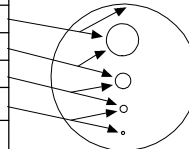
UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2487)

GRAVELS (More than half of coarse fraction is larger than the #200 sieve)	CLEAN GRAVEL WITH <5% FINES	Cu ≥4 and 1 ≤ Cc ≤3		GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES	
		Cu <4 and/or 1 > Cc >3		GP	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES	
	GRAVELS WITH 5% TO 12% FINES	Cu ≥4 and 1 ≤ Cc ≤3		GW-GM	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE FINES	
		Cu <4 and/or 1 > Cc >3		GP-GM	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE FINES	
	GRAVELS WITH > 12% FINES	Cu <4 and/or 1 > Cc >3		GP-GC	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE CLAY FINES	
				GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES	
			GC-GM	CLAYEY GRAVELS, GRAVEL-SAND-CLAY-SILT MIXTURES		
	COARSE GRAINED SOILS (More than half of coarse fraction is smaller than the #4 sieve)	CLEAN SANDS WITH <5% FINES	Cu ≥6 and 1 ≤ Cc ≤3		SW	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE OR NO FINES
			Cu <6 and/or 1 > Cc >3		SP	POORLY GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE OR NO FINES
		SANDS WITH 5% TO 12% FINES	Cu ≥6 and 1 ≤ Cc ≤3		SW-SM	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE FINES
			Cu <6 and/or 1 > Cc >3		SW-SC	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE CLAY FINES
		SANDS WITH > 12% FINES	Cu <6 and/or 1 > Cc >3		SP-SM	POORLY GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE FINES
				SP-SC	POORLY GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE CLAY FINES	
			SM	SILTY SANDS, SAND-GRAVEL-SILT MIXTURES		
FINE GRAINED SOILS (More than half of material is smaller than the #200 sieve)		SILTS AND CLAYS (Liquid Limit less than 50)		ML	INORGANIC SILTS AND VERY FINE SANDS, SILTY OR CLAYEY FINE SANDS, SILTS WITH SLIGHT PLASTICITY	
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS	
				CL-ML	INORGANIC CLAYS-SILTS OF LOW PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS	
SILTS AND CLAYS (Liquid Limit greater than 50)		SILTS AND CLAYS (Liquid Limit greater than 50)		OL	ORGANIC SILTS & ORGANIC SILTY CLAYS OF LOW PLASTICITY	
				MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILT	
			CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS		
			OH	ORGANIC CLAYS & ORGANIC SILTS OF MEDIUM-TO-HIGH PLASTICITY		

 KLEINFELDER <i>Bright People. Right Solutions.</i>	PROJECT NO.: 137120	GRAPHICS KEY Interstate 11 - Boulder City Bypass Phase 2 Design Build Project - Geologic Evaluation, Sampling, and Testing for Naturally Occurring Asbestos - Boulder City, Clark County, Nevada	PLATE
	DRAWN BY: CLB		B-1
CHECKED BY: JLS	DATE: 5/28/2014		
REvised: -			

GRAIN SIZE

DESCRIPTION	SIEVE SIZE	GRAIN SIZE	APPROXIMATE SIZE
Boulders	>12 in. (304.8 mm.)	>12 in. (304.8 mm.)	Larger than basketball-sized
Cobbles	3 - 12 in. (76.2 - 304.8 mm.)	3 - 12 in. (76.2 - 304.8 mm.)	Fist-sized to basketball-sized
Gravel	coarse 3/4 - 3 in. (19 - 76.2 mm.)	3/4 - 3 in. (19 - 76.2 mm.)	Thumb-sized to fist-sized
	fine #4 - 3/4 in. (#4 - 19 mm.)	0.19 - 0.75 in. (4.8 - 19 mm.)	Pea-sized to thumb-sized
Sand	coarse #10 - #4	0.079 - 0.19 in. (2 - 4.9 mm.)	Rock salt-sized to pea-sized
	medium #40 - #10	0.017 - 0.079 in. (0.43 - 2 mm.)	Sugar-sized to rock salt-sized
	fine #200 - #10	0.0029 - 0.017 in. (0.07 - 0.43 mm.)	Flour-sized to sugar-sized
Fines	Passing #200	<0.0029 in. (<0.07 mm.)	Flour-sized and smaller

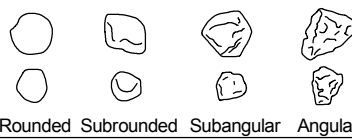


Munsell Color

NAME	ABBR
Red	R
Yellow Red	YR
Yellow	Y
Green Yellow	GY
Green	G
Blue Green	BG
Blue	B
Purple Blue	PB
Purple	P
Red Purple	RP
Black	N

ANGULARITY

DESCRIPTION	CRITERIA
Angular	Particles have sharp edges and relatively plane sides with unpolished surfaces
Subangular	Particles are similar to angular description but have rounded edges
Subrounded	Particles have nearly plane sides but have well-rounded corners and edges
Rounded	Particles have smoothly curved sides and no edges



PLASTICITY

DESCRIPTION	LL	FIELD TEST
Non-plastic	NP	A 1/8-in. (3 mm.) thread cannot be rolled at any water content.
Low (L)	< 30	The thread can barely be rolled and the lump or thread cannot be formed when drier than the plastic limit.
Medium (M)	30 - 50	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. The lump or thread crumbles when drier than the plastic limit
High (H)	> 50	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump or thread can be formed without crumbling when drier than the plastic limit

MOISTURE CONTENT

DESCRIPTION	FIELD TEST
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, usually soil is below water table

REACTION WITH HYDROCHLORIC ACID

DESCRIPTION	FIELD TEST
None	No visible reaction
Weak	Some reaction, with bubbles forming slowly
Strong	Violent reaction, with bubbles forming immediately

APPARENT / RELATIVE DENSITY - COARSE-GRAINED SOIL

APPARENT DENSITY	SPT-N ₆₀ (# blows/ft)	MODIFIED CA SAMPLER (# blows/ft)	CALIFORNIA SAMPLER (# blows/ft)	RELATIVE DENSITY (%)
Very Loose	<4	<4	<5	0 - 15
Loose	4 - 10	5 - 12	5 - 15	15 - 35
Medium Dense	10 - 30	12 - 35	15 - 40	35 - 65
Dense	30 - 50	35 - 60	40 - 70	65 - 85
Very Dense	>50	>60	>70	85 - 100

CONSISTENCY - FINE-GRAINED SOIL

CONSISTENCY	UNCONFINED COMPRESSIVE STRENGTH (q _u)(psf)	CRITERIA
Very Soft	< 1000	Thumb will penetrate soil more than 1 in. (25 mm.)
Soft	1000 - 2000	Thumb will penetrate soil about 1 in. (25 mm.)
Firm	2000 - 4000	Thumb will indent soil about 1/4-in. (6 mm.)
Hard	4000 - 8000	Thumb will not indent soil but readily indented with thumbnail
Very Hard	> 8000	Thumbnail will not indent soil

NOTE: AFTER TERZAGHI AND PECK, 1948

STRUCTURE

DESCRIPTION	CRITERIA
Stratified	Alternating layers of varying material or color with layers at least 1/4-in. thick, note thickness
Laminated	Alternating layers of varying material or color with the layer less than 1/4-in. thick, note thickness
Fissured	Breaks along definite planes of fracture with little resistance to fracturing
Slickensided	Fracture planes appear polished or glossy, sometimes striated
Blocky	Cohesive soil that can be broken down into small angular lumps which resist further breakdown
Lensed	Inclusion of small pockets of different soils, such as small lenses of sand scattered through a mass of clay; note thickness
Homogeneous	Same color and appearance throughout

CEMENTATION

DESCRIPTION	FIELD TEST
Weakly	Crumbles or breaks with handling or slight finger pressure
Moderately	Crumbles or breaks with considerable finger pressure
Strongly	Will not crumble or break with finger pressure

	PROJECT NO.: 137120	SOIL DESCRIPTION KEY Interstate 11 - Boulder City Bypass Phase 2 Design Build Project - Geologic Evaluation, Sampling, and Testing for Naturally Occurring Asbestos - Boulder City, Clark County, Nevada	PLATE
	DRAWN BY: CLB		B-2
	CHECKED BY: JLS		
	DATE: 5/28/2014		
	REVISED: -		

Date Begin - End: 3/24/2014 **Excavation Company:** Pearson Trenching
Logged By: M. Moncilovich **Excavation Crew:** R. Pearson & Helper
Hor.-Vert. Datum: Not Available **Excavation Equip.:** Case 580
Plunge: N/A **Excav. Dimensions:** 24" bucket in.
Weather: Sunny

Depth (feet)	Graphical Log	FIELD EXPLORATION		LABORATORY RESULTS							
		Lithologic Description		Sample Type	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)
		Sta. P 185+45 Offset 30 ft. Rt. Latitude: 35.95739° N Longitude: 114.90918° W Ground Surface Elevation Not Available									
		FILL Well-Graded GRAVEL with Silt and Sand (GW-GM): angular to subangular gravel, subangular to subround sand, cobbles, fine to coarse grained, non-plastic, light brown, slightly moist									
		FILL Well-Graded GRAVEL with Sand (GW-GM): angular, cobbles, fine to coarse grained, non-plastic, light gray, slightly moist									
5		The exploration was terminated at approximately 5 ft. below ground surface. The exploration was backfilled with spoils on March 24, 2014.									
		GENERAL NOTES: Bucket and shovel rinsed with water before excavation and after backfill. Coordinates obtained using handheld GPS unit. Station and offset obtained using GPS data plotted on alignment mapping.									





PROJECT NO.: 137120
 DRAWN BY: CLB
 CHECKED BY: JLS
 DATE: 5/28/2014
 REVISED: -

TEST PIT LOG TI-1
 Interstate 11 - Boulder City Bypass Phase 2 Design Build Project - Geologic Evaluation, Sampling, and Testing for Naturally Occurring Asbestos - Boulder City, Clark County, Nevada


PLATE
B-3
 PAGE: 1 of 1

Date Begin - End: 3/24/2014 **Excavation Company:** Pearson Trenching
Logged By: M. Moncilovich **Excavation Crew:** R. Pearson & Helper
Hor.-Vert. Datum: Not Available **Excavation Equip.:** Case 580
Plunge: N/A **Excav. Dimensions:** 24" bucket in.
Weather: Sunny

Depth (feet)	Graphical Log	FIELD EXPLORATION		LABORATORY RESULTS						
		Sta. P 186+40 Offset 20 ft. Rt. Latitude: 35.95712° N Longitude: 114.90990° W Ground Surface Elevation Not Available	Sample Type	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)
Lithologic Description										
		FILL Silty GRAVEL with Sand (GM): subangular to angular, roots, cobbles, and boulders, fine to coarse grained, non-plastic, slightly moist	X							
		Qoa Well-Graded GRAVEL with Sand (GW-GM): subangular to angular, cobbles, no cementation, fine to coarse grained, non-plastic, brown, slightly moist	X							
5			X							
			X							

The exploration was terminated at approximately 5 ft. below ground surface. The exploration was backfilled with spoils on March 24, 2014.

GENERAL NOTES:
 Bucket and shovel rinsed with water before excavation and after backfill. Coordinates obtained using handheld GPS unit. Station and offset obtained using GPS data plotted on alignment mapping.

 <p>KLEINFELDER Bright People. Right Solutions.</p>	PROJECT NO.: 137120	TEST PIT LOG TI-2	PLATE
	DRAWN BY: CLB		
CHECKED BY: JLS			B-4
DATE: 5/28/2014			
REVISED: -			
			PAGE: 1 of 1

PLOTTED: 08/28/2014 10:54 AM BY: clbeck

TEST PIT LOG Qoa1-1

Date Begin - End: 3/24/2014 **Excavation Company:** Pearson Trenching
Logged By: M. Moncilovich **Excavation Crew:** R. Pearson & Helper
Hor.-Vert. Datum: Not Available **Excavation Equip.:** Case 580
Plunge: N/A **Excav. Dimensions:** 24" bucket in.
Weather: Sunny

Depth (feet)	Graphical Log	FIELD EXPLORATION		LABORATORY RESULTS						
		Sta. P 187+65 Offset 40 ft. Rt. Latitude: 35.95681° N Longitude: 114.90987° W Ground Surface Elevation Not Available		Sample Type	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit
Lithologic Description										
5		Qoa Clayey GRAVEL with Sand (GC): subangular to subround gravel, subangular sand, cobbles, fine to coarse grained, low plasticity, light brown, slightly moist	X							
		Well-Graded GRAVEL with Sand (GW-GM): no cementation, fine to coarse grained, non-plastic, slightly moist	X							
The exploration was terminated at approximately 5 ft. below ground surface. The exploration was backfilled with spoils on March 24, 2014.		GENERAL NOTES: Bucket and shovel rinsed with water before excavation and after backfill. Coordinates obtained using handheld GPS unit. Station and offset obtained using GPS data plotted on alignment mapping.								

	PROJECT NO.: 137120	TEST PIT LOG Qoa1-1	PLATE B-5
	DRAWN BY: CLB		
CHECKED BY: JLS	DATE: 5/28/2014		
REvised: -			PAGE: 1 of 1


GINT FILE: I:\gint\projects\137120_boulder City Bypass - Noa.gpj
 GINT TEMPLATE: PROJECTWISE:KLF_STANDARD_GINT_LIBRARY_2014.GLB [KLF_BORING/TEST PIT SOIL LOG]


Date Begin - End: 3/24/2014 **Excavation Company:** Pearson Trenching
Logged By: M. Moncilovich **Excavation Crew:** R. Pearson & Helper
Hor.-Vert. Datum: Not Available **Excavation Equip.:** Case 580
Plunge: N/A **Excav. Dimensions:** 24" bucket in.
Weather: Sunny

Depth (feet)	Graphical Log	FIELD EXPLORATION		LABORATORY RESULTS							
		Lithologic Description		Sample Type	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)
		Sta. P 189+30 Offset 30 ft. Rt. Latitude: 35.95639° N Longitude: 114.90827° W Ground Surface Elevation Not Available									
		Qoa Silty GRAVEL with Sand (GM): angular to subangular gravel, subrounded sand, cobbles, fine to coarse grained, non-plastic, light brown, slightly moist		X							
		Well-Graded GRAVEL with Sand (GW-GM): subangular, weak cementation, fine to coarse grained, non-plastic, slightly moist		X							
		- moderate cementation below 2.5 feet		X							
		- no cementation below 4 feet		X							
5		The exploration was terminated at approximately 5 ft. below ground surface. The exploration was backfilled with spoils on March 24, 2014.									
		GENERAL NOTES: Bucket and shovel rinsed with water before excavation and after backfill. Coordinates obtained using handheld GPS unit. Station and offset obtained using GPS data plotted on alignment mapping.									

	PROJECT NO.: 137120	TEST PIT LOG Qoa1-2	PLATE
	DRAWN BY: CLB		Interstate 11 - Boulder City Bypass Phase 2 Design Build Project - Geologic Evaluation, Sampling, and Testing for Naturally Occurring Asbestos - Boulder City, Clark County, Nevada
CHECKED BY: JLS	DATE: 5/28/2014		
REvised: -			PAGE: 1 of 1

Date Begin - End: 3/24/2014 **Excavation Company:** Pearson Trenching
Logged By: M. Moncilovich **Excavation Crew:** R. Pearson & Helper
Hor.-Vert. Datum: Not Available **Excavation Equip.:** Case 580
Plunge: N/A **Excav. Dimensions:** 24" bucket in.
Weather: Sunny


Depth (feet)	Graphical Log	FIELD EXPLORATION		LABORATORY RESULTS						
		Sta. P 193+25 Offset 30 ft. Rt. Latitude: 35.95551° N Longitude: 114.90736° W Ground Surface Elevation Not Available	Sample Type	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)
Lithologic Description										
5	 <p>Qoa Silty SAND with Gravel (SM): subangular to angular, cobbles, fine to coarse grained, low plasticity, light brown, slightly moist</p> <p>- non-plastic below 1.5 feet</p>	X								
<p>The exploration was terminated at approximately 5 ft. below ground surface. The exploration was backfilled with spoils on March 24, 2014.</p>		<p>GENERAL NOTES: Bucket and shovel rinsed with water before excavation and after backfill. Coordinates obtained using handheld GPS unit. Station and offset obtained using GPS data plotted on alignment mapping.</p>								


	PROJECT NO.: 137120	TEST PIT LOG Qoa1-3	PLATE
	DRAWN BY: CLB		
CHECKED BY: JLS		B-7	
DATE: 5/28/2014			
REVISED: -			PAGE: 1 of 1

PLOTTED: 08/28/2014 10:54 AM BY: clbeck

TEST PIT LOG Qoa1-4

Date Begin - End: 3/24/2014 **Excavation Company:** Pearson Trenching
Logged By: M. Moncilovich **Excavation Crew:** R. Pearson & Helper
Hor.-Vert. Datum: Not Available **Excavation Equip.:** Case 580
Plunge: N/A **Excav. Dimensions:** 24" bucket in.
Weather: Sunny


Depth (feet)	Graphical Log	FIELD EXPLORATION		LABORATORY RESULTS							
		Lithologic Description		Sample Type	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)
		Sta. P 196+10 Offset 35 ft. Rt. Latitude: 35.95505° N Longitude: 114.90685° W Ground Surface Elevation Not Available									
5		Qoa Silty GRAVEL with Sand (GM): subangular to subrounded, cobbles and boulders, no cementation, fine to coarse grained, non-plastic, light brown, slightly moist - moderate cementation below 3 feet		X							
		The exploration was terminated at approximately 5 ft. below ground surface. The exploration was backfilled with spoils on March 24, 2014.		GENERAL NOTES: Bucket and shovel rinsed with water before excavation and after backfill. Coordinates obtained using handheld GPS unit. Station and offset obtained using GPS data plotted on alignment mapping.							

	PROJECT NO.: 137120	TEST PIT LOG Qoa1-4	PLATE B-8
	DRAWN BY: CLB		
CHECKED BY: JLS	DATE: 5/28/2014		
REvised: -			PAGE: 1 of 1

GINT FILE: I:\gint\projects\137120_boulder City Bypass - Noa.gpj
 GINT TEMPLATE: PROJECTWISE:KLF_STANDARD_GINT_LIBRARY_2014.GLB [KLF_BORING/TEST PIT SOIL LOG]

Date Begin - End: 3/24/2014 **Excavation Company:** Pearson Trenching
Logged By: M. Moncilovich **Excavation Crew:** R. Pearson & Helper
Hor.-Vert. Datum: Not Available **Excavation Equip.:** Case 580
Plunge: N/A **Excav. Dimensions:** 24" bucket in.
Weather: Sunny


Depth (feet)	Graphical Log	FIELD EXPLORATION		LABORATORY RESULTS							
		Lithologic Description		Sample Type	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)
		Sta. P 198+80 Offset 35 ft. Rt. Latitude: 35.95472° N Longitude: 114.90642° W Ground Surface Elevation Not Available									
		Tsmy Clayey GRAVEL with Sand (GC-GM): subangular to subround, weak cementation, fine to coarse grained, non-plastic, light brown, slightly moist - strong cementation below 2 feet									
5		The exploration was terminated because of practical backhoe refusal (↑) at approximately 3 ft. below ground surface. The exploration was backfilled with spoils on March 24, 2014.		GENERAL NOTES: Bucket and shovel rinsed with water before excavation and after backfill. Coordinates obtained using handheld GPS unit. Station and offset obtained using GPS data plotted on alignment mapping.							
10											

	PROJECT NO.: 137120	TEST PIT LOG TSMY-1	PLATE
	DRAWN BY: CLB		Interstate 11 - Boulder City Bypass Phase 2 Design Build Project - Geologic Evaluation, Sampling, and Testing for Naturally Occurring Asbestos - Boulder City, Clark County, Nevada
CHECKED BY: JLS	DATE: 5/28/2014		
REvised: -			PAGE: 1 of 1

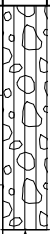
Date Begin - End: 3/24/2014 **Excavation Company:** Pearson Trenching
Logged By: M. Moncilovich **Excavation Crew:** R. Pearson & Helper
Hor.-Vert. Datum: Not Available **Excavation Equip.:** Case 580
Plunge: N/A **Excav. Dimensions:** 24" bucket in.
Weather: Sunny


Depth (feet)	Graphical Log	FIELD EXPLORATION		LABORATORY RESULTS							
		Lithologic Description		Sample Type	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)
		Sta. P 199+80 Offset 30 ft. Rt. Latitude: 35.95448° N Longitude: 114.90609° W Ground Surface Elevation Not Available									
		Tsmy Clayey GRAVEL with Sand (GC-GM): subangular to subround, weak cementation, fine to coarse grained, low plasticity, light grayish brown, slightly moist - strong cementation below 3 feet		X							
5		The exploration was terminated because of practical backhoe refusal (↑) at approximately 4 ft. below ground surface. The exploration was backfilled with spoils on March 24, 2014.									
10											

GENERAL NOTES:
 Bucket and shovel rinsed with water before excavation and after backfill. Coordinates obtained using handheld GPS unit. Station and offset obtained using GPS data plotted on alignment mapping.

	PROJECT NO.: 137120	TEST PIT LOG TSMY-2	PLATE
	DRAWN BY: CLB		Interstate 11 - Boulder City Bypass Phase 2 Design Build Project - Geologic Evaluation, Sampling, and Testing for Naturally Occurring Asbestos - Boulder City, Clark County, Nevada
CHECKED BY: JLS			
DATE: 5/28/2014			
REVISED: -			PAGE: 1 of 1

Date Begin - End: 3/24/2014 **Excavation Company:** Pearson Trenching
Logged By: M. Moncilovich **Excavation Crew:** R. Pearson & Helper
Hor.-Vert. Datum: Not Available **Excavation Equip.:** Case 580
Plunge: N/A **Excav. Dimensions:** 24" bucket in.
Weather: Sunny

Depth (feet)	Graphical Log	FIELD EXPLORATION		LABORATORY RESULTS							
		Lithologic Description		Sample Type	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)
		Sta. P 201+15 Offset 35 ft. Rt. Latitude: 35.95438° N Longitude: 114.90591° W Ground Surface Elevation Not Available									
		Tsmy Silty GRAVEL with Sand (GM): trace clay, subround to subangular, weak cementation, fine to coarse grained, non-plastic, light brown, slightly moist - strong cementation below 2 feet		X							
5		The exploration was terminated because of practical backhoe refusal (↑) at approximately 2.5 ft. below ground surface. The exploration was backfilled with spoils on March 24, 2014.		GENERAL NOTES: Bucket and shovel rinsed with water before excavation and after backfill. Coordinates obtained using handheld GPS unit. Station and offset obtained using GPS data plotted on alignment mapping.							
10											

	PROJECT NO.: 137120	TEST PIT LOG TSMY-3	PLATE
	DRAWN BY: CLB		Interstate 11 - Boulder City Bypass Phase 2 Design Build Project - Geologic Evaluation, Sampling, and Testing for Naturally Occurring Asbestos - Boulder City, Clark County, Nevada
CHECKED BY: JLS	DATE: 5/28/2014		
REvised: -			PAGE: 1 of 1

APPENDIX C

R-81
Total Depth Drilled: 31 feet
Core Recovery: 99%

10 feet-31.0 feet

Aliquot #	Depth	Weight (grams)
1	10.0	104
2	12.0	104
3	14.0	102
4	16.1	100
5	18.0	100
6	20.0	96
7	22.0	100
8	24.0	98
9	26.0	94
10	28.0	98
11	30.0	96

R-82
Total Depth Drilled: 44 feet
Core Recovery: 87%

5.5 feet-44 feet

Aliquot #	Depth	Weight (grams)
1	7.0	102
2	11.4	104
3	12.1	99
4	14.4	102
5	16.5	103
6	18.9	100
7	21.0	101
8	23.0	99
9	25.3	106
10	27.1	97
11	29.1	102
12	31.6	97
13	33.2	101
14	35.0	103
15	36.8	97
16	38.8	102
17	40.6	96
18	42.2	100
19	44.0	100

R-83A
Total Depth Drilled: 59 feet
Core Recovery: 97%

0 feet-10.6 feet

Aliquot #	Depth	Weight (grams)
1	0.0	110
2	1.0	100
3	2.0	96
4	2.9	104
5	4.0	100
6	4.8	92
7	5.8	102
8	6.0	100
9	7.3	98
10	8.9	94

21.7 feet-45 feet

Aliquot #	Depth	Weight (grams)
1	22.2	96
2	24.1	98
3	26.1	104
4	28.3	96
5	30.0	98
6	32.0	106
7	34.1	104
8	36.0	96
9	38.0	104
10	40.0	104
11	42.3	100
12	43.8	102
13	44.7	108

10.6 feet-21.7 feet

Aliquot #	Depth	Weight (grams)
1	10.8	93
2	11.8	98
3	12.6	99
4	13.5	93
5	14.0	99
6	15.3	93
7	16.0	103
8	17.2	101
9	18.5	98
10	21.0	103

45 feet-59feet

Aliquot #	Depth	Weight (grams)
1	45.0	100
2	47.0	96
3	48.9	99
4	51.1	95
5	53.5	103
6	56.4	100
7	58.9	102

R-84
Total Depth Drilled: 92.1 feet
Core Recovery: 98%

0 feet-12.8feet			12.8 feet-55.5 feet			55 feet-92.1 feet		
Aliquot #	Depth	Weight (grams)	Aliquot #	Depth	Weight (grams)	Aliquot #	Depth	Weight (grams)
1	1.0	96	1	13.3	100	1	57.2	93
2	1.9	104	2	15.0	103	2	59.5	109
3	2.9	96	3	17.0	101	3	61.4	95
4	3.9	108	4	19.1	98	4	63.4	99
5	4.9	110	5	21.5	103	5	65.7	100
6	5.9	96	6	22.6	95	6	67.6	98
7	7.0	106	7	23.8	102	7	69.6	99
8	7.9	102	8	25.9	99	8	71.9	98
9	8.0	98	9	28.4	100	9	74.1	100
10	10.3	110	10	30.7	102	10	75.8	99
11	11.8	108	11	32.8	102	11	78.7	NR
			12	34.2	102	12	80.7	98
			13	36.4	98	13	82.5	102
			14	38.4	99	14	84.1	100
			15	40.8	100	15	86.4	100
			16	42.6	101	16	88.2	106
			17	44.5	100	17	90.5	102
			18	46.2	102	18	92.1	98
			19	48.6	102			
			20	50.8	97			
			21	52.8	100			
			22	55.0	96			

NR = Not Recorded

R-85A
Total Depth Drilled: 51 feet
Core Recovery: 95%

0 feet-51 feet

Aliquot #	Depth	Weight (grams)
1	0.7	103
2	3.0	103
3	5.0	101
4	7.0	99
5	9.0	105
6	11.0	102
7	13.0	100
8	15.0	107
9	17.0	98
10	19.3	96
11	21.1	106
12	23.8	107
13	25.6	91
14	29.5	109
15	32.0	90
16	34.1	103
17	36.0	109
18	38.0	97
19	40.0	108
20	42.0	103
21	44.0	103
22	46.0	101
23	47.8	101
24	49.6	104

R-86
Total Depth Drilled: 45 feet
Core Recovery: 97%

0 feet-45 feet

Aliquot #	Depth	Weight (grams)
1	2.0	102
2	5.6	100
3	7.5	94
4	9.5	106
5	11.6	97
6	13.6	106
7	15.4	102
8	17.3	98
9	19.5	108
10	21.8	94
11	24.1	95
12	26.0	99
13	28.0	98
14	30.0	98
15	32.0	103
16	34.0	98
17	36.0	104
18	38.4	98
19	40.0	97
20	42.0	93
21	44.1	96

R-87
Total Depth Drilled: 52 feet
Core Recovery: 99%

2.5 feet-52 feet

Aliquot #	Depth	Weight (grams)
1	4.4	103
2	6.5	100
3	8.5	95
4	10.6	100
5	12.2	100
6	14.3	99
7	16.6	97
8	18.5	102
9	20.6	103
10	22.6	94
11	24.6	101
12	26.6	101
13	28.4	107
14	31.2	103
15	33.2	97
16	35.0	99
17	36.8	100
18	38.8	95
19	41.0	101
20	42.8	104
21	45.2	106
22	47.6	95
23	49.5	101
24	51.5	98

R-88
Total Depth Drilled: 85 feet
Core Recovery: 99%

9.5 feet-50 feet

Aliquot #	Depth	Weight (grams)
1	10.4	102
2	12.6	97
3	14.4	101
4	16.8	96
5	18.8	100
6	21.8	94
7	23.9	102
8	25.5	104
9	27.5	100
10	29.5	99
11	31.4	100
12	33.5	103
13	35.5	100
14	37.5	106
15	39.5	94
16	41.5	100
17	43.5	95
18	45.5	104
19	47.5	92
20	49.6	98

50 feet-85 feet

Aliquot #	Depth	Weight (grams)
1	51.6	95
2	53.8	102
3	55.5	99
4	57.5	90
5	59.7	102
6	61.6	102
7	63.8	99
8	65.5	105
9	67.5	96
10	69.5	100
11	72.3	102
12	74.4	97
13	76.0	98
14	78.0	96
15	79.9	106
16	82.0	99
17	84.0	97

R-89A
Total Depth Drilled: 96 feet
Core Recovery: 88%

0 feet-36 feet			36 feet-96 feet		
Aliquot #	Depth	Weight (grams)	Aliquot #	Depth	Weight (grams)
1	1.6	102	1	37.0	98
2	4.9	106	2	39.0	103
3	10.9	95	3	40.9	101
4	15.9	104	4	43.0	96
5	20.8	94	5	45.0	103
6	22.7	102	6	47.2	101
7	24.8	101	7	49.1	96
8	27.1	98	8	50.9	107
9	29.0	95	9	53.0	96
10	31.0	100	10	55.0	109
11	33.0	100	11	56.8	100
12	35.0	90	12	59.3	106
			13	61.0	96
			14	63.2	100
			15	65.1	96
			16	67.2	101
			17	69.3	101
			18	71.0	100
			19	73.1	94
			20	75.0	95
			21	77.0	96
			22	79.0	100
			23	81.0	102
			24	84.0	105
			25	86.0	96
			26	88.0	110
			27	90.0	110
			28	92.0	103
			29	93.8	94
			30	96.0	96

R-90
Total Depth Drilled: 146 feet
Weight Core Recovery: 93%

10 feet-35 feet

Aliquot #	Depth	Weight (grams)
1	10.0	103
2	12.0	90
3	14.0	107
4	15.9	94
5	18.0	107
6	20.0	94
7	22.0	96
8	25.0	98
9	26.7	98
10	28.2	101
11	29.4	99
12	32.9	111

66 feet-106 feet

Aliquot #	Depth	Weight (grams)
1	67.0	103
2	69.0	97
3	71.0	98
4	73.3	93
5	75.0	102
6	77.0	94
7	79.2	109
8	81.0	113
9	83.1	95
10	85.0	105
11	87.2	98
12	90.0	96
13	92.0	112
14	93.8	100
15	96.0	103
16	97.6	113
17	99.7	111
18	101.7	110
19	103.6	100
20	105.4	105

35 feet-66 feet

Aliquot #	Depth	Weight (grams)
1	36.1	100
2	38.5	101
3	41.0	105
4	42.0	96
5	45.1	103
6	46.9	101
7	48.9	100
8	50.7	95
9	52.9	100
10	54.8	98
11	56.8	103
12	58.7	102
13	60.9	107
14	62.9	102
15	64.9	99

106 feet-146 feet

Aliquot #	Depth	Weight (grams)
1	107.5	92
2	109.5	98
3	111.5	107
4	113.5	96
5	115.7	107
6	117.5	96
7	119.3	110
8	124.3	98
9	126.0	94
10	128.1	113
11	130.0	92
12	132.0	99
13	134.0	92
14	139.9	101
15	143.0	94
16	145.0	107

R-91
Total Depth Drilled: 116.5 feet
Core Recovery: 98%

12 feet-36.5 feet			36.5 feet-81.5 feet			81.5 feet-116.5 feet		
Aliquot #	Depth	Weight (grams)	Aliquot #	Depth	Weight (grams)	Aliquot #	Depth	Weight (grams)
1	12.0	102	1	36.6	101	1	83.5	107
2	14.0	100	2	38.4	100	2	85.5	103
3	16.1	100	3	40.3	98	3	87.6	96
4	18.1	102	4	42.3	100	4	89.5	104
5	20.2	100	5	44.3	102	5	91.5	105
6	22.0	99	6	46.3	100	6	93.5	101
7	25.0	103	7	48.4	99	7	95.5	98
8	27.0	110	8	50.3	102	8	97.5	98
9	29.0	106	9	51.5	101	9	99.4	105
10	31.0	102	10	52.5	104	10	101.4	96
11	33.0	101	11	54.4	102	11	103.6	105
12	35.0	102	12	56.4	99	12	105.3	101
			13	58.5	101	13	108.5	101
			14	60.4	101	14	110.9	105
			15	62.4	98	15	113.6	101
			16	64.3	100	16	115.6	105
			17	66.4	103			
			18	68.2	100			
			19	70.3	100			
			20	72.0	100			
			21	73.9	100			
			22	75.9	100			
			23	77.7	100			
			24	79.8	101			

R-92
Total Depth Drilled: 144 feet
Core Recovery: 93%

15 feet-66 feet			66 feet-126 feet			126 feet-139.5 feet		
Aliquot #	Depth	Weight (grams)	Aliquot #	Depth	Weight (grams)	Aliquot #	Depth	Weight (grams)
1	15.3	99	1	67.4	105	1	126.3	103
2	17.0	108	2	69.5	98	2	128.0	101
3	19.0	105	3	71.5	102	3	130.0	99
4	22.0	101	4	73.5	98	4	132.2	101
5	23.9	100	5	75.5	102	5	134.2	101
6	25.1	100	6	77.5	104	6	135.9	102
7	27.1	102	7	78.5	98	7	138.2	94
8	28.0	105	8	81.5	100	8	139.8	100
9	32.0	98	9	83.5	100	9	142.0	102
10	34.2	106	10	85.5	104	10	144.2	101
11	36.6	96	11	87.4	102			
12	37.2	99	12	89.4	98			
13	39.0	98	13	91.1	104			
14	42.2	102	14	93.1	100			
15	44.3	106	15	95.0	98			
16	46.8	104	16	97.5	102			
17	49.0	107	17	99.6	100			
18	50.5	103	18	101.1	104			
19	52.0	94	19	103.4	100			
20	54.1	99	20	105.4	102			
21	56.0	106	21	107.6	100			
22	58.1	102	22	109.4	100			
23	60.1	101	23	112.0	96			
24	62.1	104	24	113.9	100			
25	64.0	107	25	116.1	102			
26	66.0	106	26	118.1	105			
			27	119.1	104			
			28	122.1	98			
			29	124.1	98			
			30	125.9	102			

R-93
Total Depth Drilled: 190 feet
Core Recovery: 57%

7 feet-56 feet			56 feet-169.5 feet			169.5 feet-190.0 feet		
Aliquot #	Depth	Weight (grams)	Aliquot #	Depth	Weight (grams)	Aliquot #	Depth	Weight (grams)
1	7.2	101	1	56.5	101	1	174.0	101
2	8.9	102	2	60.0	100	2	175.5	99
3	11.0	100	3	62.0	103	3	179.0	106
4	13.1	103	4	65.6	107	4	180.0	98
5	14.9	104	5	67.5	100	5	181.0	100
6	16.9	98	6	69.4	98	6	182.0	104
7	19.0	99	7	71.0	100	7	183.0	107
8	25.0	104	8	72.9	95	8	184.0	107
9	27.6	103	9	74.9	102	9	185.2	99
10	32.6	99	10	76.9	100	10	186.0	97
11	34.6	101	11	79.0	94	11	188.0	103
12	37.4	97	12	81.0	105			
13	47.0	101	13	83.4	100			
14	48.4	100	14	89.5	97			
15	51.7	101	15	91.5	99			
16	52.6	104	16	93.4	98			
17	54.8	101	17	94.2	101			
			18	97.6	103			
			19	106.9	100			
			20	109.9	99			
			21	114.0	99			
			22	116.5	99			
			23	123.8	96			
			24	136.0	101			
			25	142.0	100			
			26	147.7	100			
			27	152.0	101			
			28	156.4	103			
			29	164.5	102			
			30	167.0	101			

R-94
 Total Depth Drilled: 265 feet
 Core Recovery: 73%

7 feet-28 feet

Aliquot #	Depth	Weight (grams)
1	8.9	106
2	9.9	93
3	11.8	98
4	15.5	106
5	16.4	98
6	17.5	103
7	18.8	106
8	21.2	98
9	25.0	101
10	26.3	108

128 feet-144 feet

Aliquot #	Depth	Weight (grams)
1	128.2	100
2	129.2	100
3	130.0	100
4	134.0	101
5	134.9	103
6	136.6	99
7	137.4	99
8	138.6	106
9	140.3	98
10	141.7	102
11	143.8	102

204 feet-265 feet

Aliquot #	Depth	Weight (grams)
1	205.6	99
2	207.5	101
3	210.0	95
4	212.4	107
5	214.5	106
6	216.5	105
7	217.9	101
8	221.6	102
9	223.4	106
10	226.2	103
11	228.3	103
12	230.2	102
13	232.0	107
14	234.1	105
15	235.0	100
16	238.8	108
17	240.2	93
18	242.0	106
19	244.4	101
20	246.0	106
21	247.9	102
22	250.0	100
23	252.0	96
24	254.0	102
25	256.0	96
26	258.0	99
27	259.4	103
28	261.5	102
29	263.7	103

28 feet-128 feet

Aliquot #	Depth	Weight (grams)
1	30.2	100
2	32.1	99
3	33.8	103
4	37.7	100
5	41.0	101
6	42.2	98
7	44.5	95
8	46.9	99
9	49.1	103
10	52.5	102
11	60.6	95
12	64.5	100
13	71.5	100
14	75.0	100
15	76.1	101
16	78.6	99
17	80.4	105
18	85.0	98
19	93.0	100
20	100.0	100
21	101.0	103
22	103.0	100
23	105.2	98
24	106.9	99
25	109.1	97
26	111.0	98
27	114.5	102
28	118.3	97
29	123.9	100
30	126.2	100

144 feet-204 feet

Aliquot #	Depth	Weight (grams)
1	144.2	100
2	145.8	94
3	148.0	99
4	149.8	96
5	152.3	94
6	154.6	95
7	156.0	94
8	158.0	94
9	160.4	102
10	162.0	96
11	164.5	96
12	166.4	94
13	168.4	98
14	170.0	101
15	172.0	109
16	173.4	107
17	175.4	107
18	178.0	96
19	179.3	104
20	181.7	101
21	183.7	96
22	185.6	107
23	188.0	97
24	190.0	112
25	192.2	109
26	193.5	90
27	195.5	100
28	198.0	95
29	199.9	96
30	202.0	105
31	203.9	107

R-95
 Total Depth Drilled: 249 feet
 Core Recovery: 65%

2.5 feet-29 feet			103 feet-207 feet			184.5 feet-227 feet		
Aliquot #	Depth	Weight (grams)	Aliquot #	Depth	Weight (grams)	Aliquot #	Depth	Weight (grams)
1	2.8	100	1	103.1	100	1	184.5	102
2	4.3	100	2	106.4	103	2	187.0	101
3	6.6	100	3	109.7	102	3	189.3	100
4	12.0	101	4	113.3	101	4	192.5	100
5	14.5	103	5	117.1	98	5	195.4	102
6	17.5	100	6	118.9	96	6	200.1	97
7	18.1	99	7	125.6	104	7	204.3	101
8	20.0	98	8	127.8	98	8	208.5	99
9	23.0	99	9	129.9	99	9	210.4	100
10	25.0	101	10	132.2	99	10	212.7	99
11	27.0	98	11	133.7	98	11	214.5	103
			12	144.8	100	12	217.1	98
			13	147.0	99	13	219.2	104
			14	153.4	100	14	220.7	100
			15	155.7	104	15	222.8	101
			16	157.3	100	16	225.1	96
			17	158.7	103	17	226.5	99
			18	163.4	101			
			19	165.3	101			
			20	166.9	98			
			21	168.7	98			
			22	174.1	103			
			23	176.9	103			
			24	179.6	98			
			25	181.6	97			
			26	183.2	100			
			27	185.4	98			
			28	188.8	100			
			29	190.9	101			
			30	194.7	98			
			31	196.8	103			
			32	203.4	101			
			33	205.5	103			
29 feet-103 feet						227 feet-249 feet		
Aliquot #	Depth	Weight (grams)				Aliquot #	Depth	Weight (grams)
1	30.4	98				1	227.7	98
2	33.5	100				2	228.4	100
3	34.5	102				3	229.5	99
4	37.1	101				4	231.7	97
5	38.5	100				5	234.0	100
6	41.1	103				6	235.9	100
7	42.6	98				7	238.3	103
8	46.0	99				8	240.6	98
9	47.9	102				9	243.5	99
10	49.2	98				10	245.6	100
11	56.0	102				11	247.7	101
12	59.0	104						
13	60.0	104						
14	62.0	98						
15	68.5	101						
16	69.0	98						
17	74.0	100						
18	76.5	101						
19	79.5	98						
20	81.2	102						
21	84.4	101						
22	86.5	99						
23	88.5	106						
24	90.4	106						
25	92.0	101						
26	94.6	100						
27	96.6	100						
28	98.7	94						
29	100.6	106						
30	102.2	101						

R-96A
Total Depth Drilled: 17 feet
Core Recovery: 54%

0 feet-17 feet

Aliquot #	Depth	Weight (grams)
1	0.7	102
2	1.7	100
3	2.8	104
4	4.5	103
5	7.0	98
6	8.4	100
7	9.3	95
8	10.8	100
9	13.0	102
10	14.5	95

R-96B
Total Depth Drilled: 165 feet
Core Recovery: 63%

0 feet-64.3 feet			64.3 feet-115 feet			115 feet-165 feet		
Aliquot #	Depth	Weight (grams)	Aliquot #	Depth	Weight (grams)	Aliquot #	Depth	Weight (grams)
1	7.4	98	1	64.4	103	1	116.3	98
2	12.7	99	2	68.2	101	2	118.7	100
3	16.7	99	3	73.9	104	3	122.4	105
4	17.8	101	4	83.3	103	4	124.4	103
5	22.2	101	5	85.1	98	5	126.2	101
6	24.8	96	6	94.4	100	6	127.2	101
7	26.5	99	7	97.0	102	7	128.9	105
8	32.2	100	8	99.0	100	8	133.5	98
9	41.0	102	9	101.4	99	9	135.5	101
10	45.7	99	10	103.6	104	10	137.2	100
11	49.5	100	11	106.1	98	11	139.1	98
12	54.5	98	12	108.1	101	12	141.0	100
13	58.9	100	13	110.4	104	13	143.0	96
14	64.0	99	14	112.5	101	14	144.9	96
			15	114.5	100	15	146.9	103
						16	149.0	103
						17	151.1	101
						18	153.0	97
						19	154.9	99
						20	157.0	99
						21	159.0	105
						22	161.0	103
						23	163.0	98
						24	164.9	98

R-97
Total Depth Drilled: 85 feet
Core Recovery: 100%

7.0 feet-46 feet

Aliquot #	Depth	Weight (grams)
1	8.0	100
2	9.6	101
3	11.0	98
4	13.0	105
5	15.1	103
6	17.0	103
7	18.9	101
8	21.0	99
9	22.8	101
10	24.8	101
11	27.3	103
12	28.9	104
13	31.0	105
14	33.0	101
15	35.0	100
16	36.9	98
17	39.0	100
18	40.9	98
19	43.0	103
20	44.9	103

46 feet-85 feet

Aliquot #	Depth	Weight (grams)
1	46.9	100
2	48.4	97
3	50.5	97
4	52.5	104
5	54.8	100
6	56.8	101
7	58.8	103
8	62.4	101
9	64.5	100
10	66.5	103
11	68.2	100
12	70.4	103
13	72.5	101
14	73.7	99
15	75.5	98
16	77.5	105
17	80.5	100
18	82.4	98
19	84.4	100

R-98
Total Depth Drilled: 147 feet
Core Recovery: 83%

0 feet-50 feet			50 feet-100 feet			100 feet-147 feet		
Aliquot #	Depth	Weight (grams)	Aliquot #	Depth	Weight (grams)	Aliquot #	Depth	Weight (grams)
1	2.0	104	1	50.3	96	1	100.5	99
2	4.0	100	2	52.3	95	2	102.5	100
3	5.8	104	3	58.0	102	3	104.5	100
4	7.9	100	4	60.0	100	4	106.3	101
5	10.0	98	5	61.7	102	5	108.3	104
6	12.1	100	6	63.6	100	6	110.7	103
7	14.2	104	7	65.6	99	7	112.8	102
8	21.5	100	8	67.6	100	8	114.9	100
9	23.7	105	9	69.5	98	9	117.0	100
10	26.5	104	10	71.7	97	10	118.9	105
11	28.5	103	11	73.7	103	11	120.9	105
12	31.2	101	12	75.3	105	12	123.0	100
13	33.2	96	13	77.3	100	13	125.0	105
14	35.0	97	14	78.9	102	14	127.8	103
15	37.1	100	15	80.8	102	15	129.6	100
16	39.2	100	16	82.8	98	16	131.0	101
17	41.1	101	17	84.9	104	17	136.7	103
18	43.9	96	18	87.8	103	18	138.0	98
19	45.6	101	19	89.7	105	19	140.0	98
			20	91.6	100	20	142.9	100
			21	93.4	97	21	145.9	102
			22	96.0	100			
			23	98.0	99			

R-99
 Total Depth Drilled: 141 feet
 Core Recovery: 95%

3.4 feet-51 feet			51 feet-91 feet			91 feet-134.7 feet		
Aliquot #	Depth	Weight (grams)	Aliquot #	Depth	Weight (grams)	Aliquot #	Depth	Weight (grams)
1	3.9	98	1	51.2	100	1	93.1	98
2	7.0	104	2	53.0	104	2	95.1	102
3	8.8	101	3	55.6	98	3	99.0	100
4	10.7	100	4	57.1	100	4	100.9	92
5	12.7	97	5	59.0	106	5	103.0	109
6	15.6	103	6	60.3	98	6	104.4	101
7	17.4	105	7	62.2	96	7	106.5	102
8	19.6	103	8	64.2	106	8	108.5	98
9	21.6	102	9	65.7	98	9	110.4	100
10	23.6	103	10	68.2	102	10	112.4	96
11	25.1	101	11	68.9	100	11	114.0	104
12	27.1	98	12	71.0	98	12	116.4	106
13	29.1	104	13	73.3	108	13	118.2	100
14	31.4	101	14	74.9	108	14	119.8	98
15	33.4	99	15	76.9	102	15	121.6	96
16	34.9	100	16	78.6	102	16	123.7	96
17	36.9	100	17	80.2	104	17	125.8	100
18	38.9	101	18	82.3	92	18	127.5	92
19	41.4	98	19	83.7	102	19	129.7	102
20	43.4	99	20	85.5	108	20	130.8	98
21	45.5	100	21	87.2	100	21	133.0	94
22	48.5	98	22	88.9	96	22	134.7	100
23	50.5	103	23	90.1	102			

134.7 feet-141 feet

Aliquot #	Depth	Weight (grams)
1	134.7	101
2	136.0	105
3	136.6	101
4	137.5	99
5	138.1	103
6	138.6	100
7	139.2	98
8	139.4	100
9	140.0	98
10	140.8	100

R-100A
Total Depth Drilled: 144 feet
Core Recovery: 91%

0 feet-28.5 feet

Aliquot #	Depth	Weight (grams)
1	1.1	106
2	3.2	100
3	4.7	105
4	6.5	100
5	8.4	92
6	10.6	105
7	12.4	99
8	14.6	102
9	16.6	102
10	19.0	100
11	20.5	99
12	22.6	97
13	24.7	98
14	26.5	100
15	28.4	98

71.7 feet-99.5 feet

Aliquot #	Depth	Weight (grams)
1	71.9	100
2	73.9	106
3	75.8	105
4	77.4	100
5	79.7	96
6	81.5	100
7	83.7	100
8	85.5	99
9	87.6	92
10	89.7	102
11	90.5	103
12	92.7	102
13	94.3	98
14	96.5	97
15	98.7	107

28.5 feet-71.7 feet

Aliquot #	Depth	Weight (grams)
1	30.4	98
2	32.4	98
3	34.4	102
4	36.5	100
5	38.4	103
6	40.4	100
7	42.5	103
8	44.4	96
9	46.4	101
10	48.5	97
11	50.7	101
12	52.7	105
13	54.2	105
14	56.4	101
15	57.7	101
16	59.6	101
17	61.5	100
18	64.6	101
19	66.2	101
20	68.7	101
21	70.1	98
22	71.7	98

99.5 feet-144.1 feet

Aliquot #	Depth	Weight (grams)
1	100.6	100
2	102.7	101
3	105.9	103
4	107.7	98
5	111.7	102
6	113.4	101
7	115.7	98
8	118.5	101
9	120.4	104
10	123.4	99
11	125.6	98
12	128.3	98
13	130.3	100
14	132.4	99
15	134.3	100
16	136.0	100
17	137.8	101
18	139.8	103
19	142.0	101
20	144.0	98

R-101
Total Depth Drilled: 143 feet
Core Recovery: 98%

0 feet-58.9 feet			58.9 feet-100 feet			100 feet-114.1 feet		
Aliquot #	Depth	Weight (grams)	Aliquot #	Depth	Weight (grams)	Aliquot #	Depth	Weight (grams)
1	1.4	98	1	60.9	102	1	100.5	96
2	5.5	105	2	62.6	98	2	101.5	94
3	7.5	92	3	63.9	102	3	102.5	100
4	9.6	97	4	65.9	100	4	103.7	99
5	11.5	99	5	68.0	102	5	105.7	109
6	12.9	106	6	70.2	106	6	106.9	98
7	15.0	100	7	72.0	100	7	107.9	98
8	17.1	99	8	74.1	94	8	108.9	102
9	19.1	96	9	76.0	95	9	110.4	104
10	21.0	98	10	77.8	103	10	112.4	100
11	23.1	99	11	80.0	104	11	113.4	103
12	25.0	96	12	81.7	102			
13	27.0	100	13	83.9	97			
14	29.0	98	14	85.8	98			
15	30.8	107	15	87.4	100			
16	33.1	98	16	89.7	106			
17	35.2	92	17	91.4	96			
18	37.0	101	18	93.3	90			
19	39.3	105	19	95.3	101			
20	40.8	96	20	97.3	103			
21	42.3	96	21	99.2	101			
22	44.1	97						
23	45.8	109						
24	47.7	101						
25	49.5	102						
26	51.2	98						
27	53.0	100						
28	55.2	105						
29	56.8	98						
30	58.9	106						

114.1 feet-143 feet		
Aliquot #	Depth	Weight (grams)
1	114.1	103
2	116.2	100
3	118.3	100
4	119.9	102
5	121.5	108
6	123.6	108
7	125.8	95
8	127.4	104
9	129.0	100
10	130.9	102
11	133.1	102
12	135.2	102
13	137.1	100
14	139.0	97
15	141.1	97
16	142.9	101

R-102
Total Depth Drilled: 115 feet
Core Recovery: 93%

0.5 feet-53.0 feet			53 feet-103.4 feet			103.4 feet-115 feet		
Aliquot #	Depth	Weight (grams)	Aliquot #	Depth	Weight (grams)	Aliquot #	Depth	Weight (grams)
1	1.3	101	1	54.9	95	1	104.5	105
2	3.9	99	2	56.9	106	2	105.3	104
3	6.0	100	3	58.8	102	3	106.4	100
4	7.9	99	4	61.0	96	4	107.4	102
5	15.5	99	5	63.1	106	5	108.8	103
6	17.8	98	6	65.0	99	6	109.8	101
7	19.5	97	7	67.1	102	7	111.1	104
8	21.5	100	8	69.0	98	8	112.0	96
9	23.5	101	9	70.9	103	9	113.3	98
10	25.8	99	10	72.8	99	10	114.2	104
11	28.1	98	11	74.8	98			
12	30.2	103	12	76.6	102			
13	32.2	102	13	78.7	100			
14	33.9	99	14	80.4	97			
15	35.8	101	15	82.3	98			
16	37.9	98	16	84.7	98			
17	40.0	100	17	87.1	104			
18	42.0	100	18	89.0	100			
19	44.2	100	19	91.1	96			
20	46.0	101	20	93.6	97			
21	47.9	100	21	95.3	100			
22	49.9	97	22	97.3	105			
23	51.9	99	23	99.3	106			
			24	101.3	100			
			25	103.4	103			

R-103
Total Depth Drilled: 97 feet
Core Recovery: 97%

1.7 feet-49 feet

Aliquot #	Depth	Weight (grams)
1	2.1	103
2	4.7	96
3	6.8	98
4	8.9	102
5	10.9	98
6	14.4	99
7	16.2	99
8	18.2	100
9	19.9	103
10	22.2	98
11	24.2	100
12	25.7	98
13	27.6	100
14	29.7	98
15	31.5	96
16	33.5	103
17	35.6	100
18	37.7	100
19	39.5	100
20	41.6	101
21	43.5	100
22	45.5	104
23	47.5	101

49 feet-97 feet

Aliquot #	Depth	Weight (grams)
1	49.1	97
2	51.6	98
3	53.5	98
4	55.6	102
5	57.5	101
6	59.6	100
7	61.3	101
8	63.5	100
9	65.5	101
10	68.2	104
11	70.2	99
12	72.3	98
13	74.4	101
14	76.3	101
15	78.0	101
16	80.2	100
17	82.0	96
18	84.0	100
19	85.8	101
20	88.2	100
21	90.8	100
22	92.8	98
23	95.0	103

R-104
 Total Depth Drilled: 145 feet
 Core Recovery: 93%

2.5 feet-50 feet			50 feet-98 feet			98 feet-145 feet		
Aliquot #	Depth	Weight (grams)	Aliquot #	Depth	Weight (grams)	Aliquot #	Depth	Weight (grams)
1	2.5	99	1	51.3	102	1	99.0	102
2	7.0	100	2	52.7	102	2	101.0	96
3	13.5	101	3	54.7	98	3	103.0	98
4	16.0	103	4	56.4	98	4	105.1	104
5	18.0	103	5	58.3	98	5	107.0	104
6	20.4	101	6	60.3	105	6	108.7	102
7	22.4	99	7	62.3	104	7	111.0	104
8	23.9	105	8	64.0	100	8	113.0	104
9	25.9	100	9	67.0	104	9	115.2	102
10	28.0	104	10	69.4	102	10	116.8	104
11	29.8	100	11	70.8	102	11	119.0	102
12	31.7	102	12	72.1	100	12	121.4	98
13	33.8	100	13	74.0	96	13	123.4	96
14	35.5	100	14	76.0	98	14	125.5	96
15	37.7	102	15	77.9	102	15	127.4	96
16	39.7	98	16	79.3	98	16	129.3	100
17	41.5	96	17	81.1	98	17	131.1	100
18	43.1	102	18	83.1	102	18	133.0	104
19	45.0	104	19	85.3	100	19	135.0	100
20	47.4	100	20	87.2	96	20	137.0	98
21	49.4	98	21	89.0	98	21	139.0	98
			22	91.0	98	22	140.6	104
			23	93.0	98	23	143.0	98
			24	95.0	98	24	144.8	102
			25	97.0	98			

R-105
 Total Depth Drilled: 180 feet
 Core Recovery: 96%

7 feet-51 feet

Aliquot #	Depth	Weight (grams)
1	8.8	100
2	11.0	100
3	13.0	100
4	15.0	101
5	16.9	100
6	18.9	101
7	21.4	98
8	23.5	101
9	27.7	100
10	30.5	98
11	32.6	100
12	34.5	100
13	36.5	105
14	38.6	98
15	41.2	102
16	43.3	99
17	48.2	100
18	51.0	98

95 feet-155 feet

Aliquot #	Depth	Weight (grams)
1	96.1	104
2	99.0	101
3	101.0	90
4	103.0	102
5	105.0	97
6	107.0	109
7	109.5	100
8	111.3	105
9	113.3	101
10	115.0	105
11	117.3	99
12	119.0	105
13	121.0	105
14	123.0	99
15	125.0	106
16	126.8	101
17	129.0	102
18	131.0	101
19	133.3	101
20	135.0	105
21	137.0	103
22	139.0	101
23	141.0	108
24	143.1	96
25	145.0	102
26	147.5	103
27	149.6	102
28	150.9	101
29	153.5	100
30	155.0	103

155 feet-180 feet

Aliquot #	Depth	Weight (grams)
1	156.0	99
2	158.3	101
3	159.9	98
4	162.1	99
5	164.1	97
6	166.0	98
7	168.0	98
8	169.9	97
9	172.0	101
10	174.0	100
11	176.0	103
12	177.9	98
13	179.9	101

51 feet-95 feet

Aliquot #	Depth	Weight (grams)
1	53.3	98
2	54.9	100
3	56.9	103
4	59.0	98
5	60.9	100
6	63.4	100
7	64.9	104
8	67.0	104
9	69.0	98
10	71.1	101
11	73.1	100
12	75.1	100
13	77.1	103
14	79.1	98
15	81.0	100
16	83.0	101
17	85.0	101
18	87.1	103
19	89.0	103
20	91.0	101
21	93.0	101
22	95.0	98

R-106
Total Depth Drilled: 90.8 feet
Core Recovery: 87%

2.5 feet-15.4 feet			15.4 feet-49 feet			49 feet-90.8 feet		
Aliquot #	Depth	Weight (grams)	Aliquot #	Depth	Weight (grams)	Aliquot #	Depth	Weight (grams)
1	4.9	100	1	15.4	95	1	50.9	102
2	6.5	101	2	16.9	103	2	53.0	102
3	7.5	100	3	19.4	101	3	55.0	98
4	8.7	103	4	21.4	99	4	56.8	100
5	10.0	105	5	22.9	103	5	58.9	100
6	11.2	105	6	29.3	102	6	61.0	100
7	12.0	98	7	31.8	99	7	63.1	96
8	13.0	97	8	33.9	103	8	65.2	104
9	14.2	101	9	35.7	102	9	67.5	98
10	15.1	96	10	37.9	105	10	69.3	96
			11	39.9	104	11	71.2	98
			12	41.8	106	12	72.1	102
			13	43.7	96	13	74.8	102
			14	45.8	105	14	76.5	96
			15	47.4	109	15	78.5	100
						16	80.4	104
						17	82.9	100
						18	87.8	98
						19	90.0	100

R-107
Total Depth Drilled: 103.6 feet
Core Recovery: 65%

0.5 feet-63.6 feet

Aliquot #	Depth	Weight (grams)
1	2.7	98
2	4.7	100
3	10.3	97
4	12.3	98
5	15.6	98
6	16.7	99
7	18.8	97
8	20.8	100
9	26.5	98
10	28.7	100
11	30.7	100
12	32.5	100
13	34.2	99
14	41.2	100
15	44.4	99
16	47.1	104
17	55.7	98
18	62.2	98

63.6 feet-103.6 feet

Aliquot #	Depth	Weight (grams)
1	65.5	101
2	67.4	100
3	70.8	101
4	72.5	100
5	80.5	100
6	82.1	99
7	84.7	97
8	88.1	99
9	90.4	98
10	94.7	100
11	98.1	99
12	100.6	101
13	102.8	98

R-108A
 Total Depth Drilled: 208.5 feet
 Core Recovery: 93%

2.5 feet-35 feet

Aliquot #	Depth	Weight (grams)
1	5.0	98
2	7.3	102
3	9.3	103
4	11.8	107
5	13.8	97
6	15.4	100
7	17.4	98
8	19.5	100
9	21.5	108
10	23.7	99
11	25.4	98
12	27.4	97
13	29.5	98
14	31.3	95
15	33.4	107
16	35.0	98

75 feet-86 feet

Aliquot #	Depth	Weight (grams)
1	77.0	99
2	78.0	100
3	79.3	103
4	80.0	101
5	81.9	101
6	82.1	98
7	83.8	100
8	85.0	101
9	85.7	101
10	86.0	99

142.5 feet-208.5 feet

Aliquot #	Depth	Weight (grams)
1	144.4	102
2	143.5	98
3	147.5	100
4	148.9	100
5	150.5	104
6	152.7	98
7	153.5	98
8	155.7	100
9	157.2	100
10	159.6	104
11	165.1	100
12	166.7	96
13	168.7	102
14	172.2	100
15	173.8	98
16	175.8	100
17	176.7	104
18	179.2	98
19	180.9	100
20	183.1	104
21	185.1	102
22	186.3	100
23	187.9	100
24	190.1	98
25	192.2	102
26	194.1	100
27	196.7	100
28	198.7	98
29	200.5	100
30	202.5	105
31	203.9	98
32	206.0	100
33	208.0	102

86 feet-142.5feet

Aliquot #	Depth	Weight (grams)
1	86.0	96
2	88.2	103
3	90.2	103
4	92.4	101
5	94.4	101
6	96.4	99
7	98.3	100
8	100.2	96
9	102.3	103
10	104.4	103
11	106.1	100
12	108.3	105
13	110.0	106
14	112.2	104
15	114.2	100
16	116.0	104
17	118.0	97
18	120.0	103
19	122.0	97
20	124.0	99
21	125.3	100
22	127.2	106
23	128.9	108
24	130.6	109
25	132.9	106
26	134.8	107
27	136.6	104
28	138.2	107
29	140.0	104
30	142.0	108

35 feet-75 feet

Aliquot #	Depth	Weight (grams)
1	37.2	101
2	39.0	104
3	41.0	103
4	42.9	102
5	45.0	107
6	46.9	104
7	49.0	99
8	51.0	105
9	53.0	108
10	55.0	106
11	57.0	108
12	58.9	105
13	61.0	97
14	63.4	97
15	65.0	100
16	67.2	102
17	69.2	107
18	71.2	108
19	73.2	105
20	75.0	102

R-109
Total Depth Drilled: 100 feet
Core Recovery: 67%

7 feet-59.1 feet

Aliquot #	Depth	Weight (grams)
1	27.8	96
2	32.4	98
3	34.0	104
4	41.8	102
5	43.4	96
6	45.2	102
7	47.4	102
8	49.4	98
9	51.0	102
10	52.9	100
11	54.6	102
12	56.4	98
13	58.5	98

59.1 feet-100.0 feet

Aliquot #	Depth	Weight (grams)
1	60.4	96
2	62.4	104
3	63.0	100
4	65.6	104
5	67.7	100
6	69.6	100
7	71.1	98
8	73.2	98
9	74.6	96
10	76.2	96
11	78.2	104
12	81.1	102
13	83.6	102
14	84.9	100
15	87.2	98
16	88.9	104
17	91.7	104
18	94.2	102
19	95.2	98
20	98.0	96
21	99.9	102

R-110
 Total Depth Drilled: 217 feet
 Core Recovery: 90%

5.0 feet-59.5 feet			59.5 feet-115.4 feet			115.4 feet-166.5 feet			166.5 feet-217.0 feet		
Aliquot #	Depth	Weight (grams)	Aliquot #	Depth	Weight (grams)	Aliquot #	Depth	Weight (grams)	Aliquot #	Depth	Weight (grams)
1	7.7	98	1	60.9	101	1	116.4	105	1	168.5	102
2	10.0	97	2	62.4	98	2	118.3	105	2	170.6	104
3	12.2	102	3	63.9	97	3	119.5	103	3	172.5	102
4	13.6	103	4	65.6	99	4	121.4	99	4	175.3	102
5	15.8	97	5	67.8	103	5	123.2	98	5	177.4	104
6	17.8	99	6	69.9	103	6	124.8	101	6	179.4	100
7	19.6	105	7	71.0	101	7	126.6	100	7	181.5	96
8	21.7	99	8	74.0	104	8	127.9	98	8	183.5	100
9	23.6	98	9	76.0	98	9	129.5	96	9	185.6	102
10	25.7	101	10	77.9	98	10	131.5	99	10	187.6	104
11	27.5	103	11	80.0	96	11	133.3	104	11	189.5	104
12	29.7	100	12	81.5	101	12	135.5	99	12	193.4	100
13	31.5	99	13	83.5	98	13	136.8	99	13	195.1	104
14	33.5	98	14	85.6	99	14	138.5	96	14	196.9	96
15	35.5	100	15	86.9	105	15	140.5	98	15	199.0	98
16	37.5	103	16	89.1	102	16	142.5	98	16	203.5	100
17	39.5	100	17	91.1	100	17	144.4	101	17	208.2	104
18	41.3	100	18	92.9	100	18	146.0	101	18	213.1	102
19	43.0	100	19	94.9	100	19	148.2	105			
20	45.0	95	20	96.6	99	20	150.2	97			
21	47.0	101	21	98.5	101	21	151.8	99			
22	49.0	105	22	100.4	103	22	153.7	100			
23	51.2	103	23	102.1	98	23	155.7	99			
24	53.0	98	24	104.1	101	24	157.7	100			
25	54.5	99	25	107.5	103	25	159.8	101			
26	56.4	104	26	109.4	96	26	161.8	101			
27	58.5	103	27	111.5	105	27	163.6	98			
			28	113.4	101	28	164.9	101			
			29	114.5	98	29	166.4	104			

R-111
Total Depth Drilled: 83.2 feet
Core Recovery: 80%

0.8 feet-53.0 feet

Aliquot #	Depth	Weight (grams)
1	3.9	96
2	9.2	100
3	11.6	102
4	18.5	98
5	22.5	104
6	25.9	104
7	27.0	98
8	29.0	100
9	30.6	104
10	33.2	104
11	35.5	95
12	37.4	105
13	38.6	100
14	40.3	96
15	42.2	100
16	43.8	102
17	45.8	105
18	47.8	98
19	50.0	102
20	52.1	100

53.0 feet-83.2feet

Aliquot #	Depth	Weight (grams)
1	54.1	99
2	56.0	105
3	57.8	103
4	60.0	101
5	63.0	103
6	66.5	102
7	69.0	102
8	71.0	100
9	73.0	98
10	74.9	101
11	77.0	102
12	79.0	99
13	81.0	101
14	82.0	105

R-112
 Total Depth Drilled: 185 feet
 Core Recovery: 69%

0 feet-60.0 feet			90 feet-149 feet			149.0 feet-185.0 feet		
Aliquot #	Depth	Weight (grams)	Aliquot #	Depth	Weight (grams)	Aliquot #	Depth	Weight (grams)
1	15.0	103	1	92.0	96	1	150.0	104
2	17.0	100	2	94.1	101	2	152.0	96
3	24.5	100	3	96.0	100	3	153.4	100
4	26.2	100	4	98.1	99	4	155.5	98
5	28.5	100	5	103.2	104	5	157.6	102
6	32.0	101	6	106.2	104	6	160.5	100
7	33.9	96	7	110.1	99	7	162.1	104
8	36.0	105	8	112.0	106	8	165.5	100
9	44.5	103	9	114.0	102	9	167.5	98
10	56.1	100	10	116.0	105	10	169.5	100
11	58.0	100	11	118.0	99	11	171.6	104
			12	119.5	102	12	173.4	104
			13	121.0	109	13	175.5	104
			14	122.7	107	14	177.4	104
			15	124.0	100	15	179.4	100
			16	125.9	104	16	181.4	98
			17	128.0	100	17	183.4	102
			18	132.4	109	18	184.9	102
			19	134.1	96			
			20	135.9	102			
			21	137.9	103			
			22	140.3	102			
			23	142.3	108			
			24	144.4	105			
			25	145.9	101			
			26	147.9	105			
60.0 feet-90.0 feet								
Aliquot #	Depth	Weight (grams)						
1	60.0	104						
2	62.0	103						
3	64.0	102						
4	66.0	101						
5	68.0	100						
6	70.4	104						
7	72.4	102						
8	74.5	102						
9	76.6	101						
10	78.6	100						
11	80.8	99						
12	82.8	99						
13	84.6	99						
14	86.8	104						
15	88.8	100						

P-1
Total Depth Drilled: 6.5. feet
Core Recovery: 100%

0 feet-36.6 feet

Aliquot #	Depth	Weight (grams)
1	2.1	95
2	4.1	100
3	5.5	104
4	6.9	102
5	11.6	100
6	13.5	104
7	15.3	102
8	17.3	100
9	18.9	100
10	20.8	104
11	22.7	98
12	24.6	100
13	25.7	100
14	27.7	104
15	29.8	100
16	31.8	104
17	34.6	100

36.5 feet-65.5 feet

Aliquot #	Depth	Weight (grams)
1	36.8	102
2	38.6	100
3	41.1	104
4	43.8	102
5	45.3	102
6	47.0	100
7	49.0	98
8	51.0	100
9	53.0	102
10	55.0	104
11	57.3	100
12	59.3	102
13	61.0	100
14	62.6	104
15	64.4	100

P-2
Total Depth Drilled: 205.3 feet
Core Recovery: 69%

0 feet-26.8 feet

Aliquot #	Depth	Weight (grams)
1	0.0	95
2	2.3	99
3	4.1	97
4	6.5	103
5	8.2	103
6	10.2	107
7	12.6	103
8	15.5	101
9	18.4	102
10	20.2	100

135.1 feet-170.2 feet

Aliquot #	Depth	Weight (grams)
1	135.8	108
2	137.4	104
3	139.1	108
4	141.2	110
5	142.4	102
6	144.8	96
7	146.5	98
8	148.4	96
9	150.5	106
10	152.5	104
11	154.5	102
12	160.3	98
13	162.3	104
14	164.4	102
15	166.4	106
16	168.4	96

81 feet-135.1 feet

Aliquot #	Depth	Weight (grams)
1	82.3	98
2	84.0	106
3	87.8	96
4	92.8	98
5	93.9	96
6	95.3	102
7	97.3	100
8	100.3	104
9	102.8	100
10	105.2	102
11	107.4	98
12	109.0	98
13	111.0	98
14	112.9	108
15	115.0	98
16	120.4	106
17	122.7	98
18	124.3	108
19	126.3	102
20	128.4	104
21	130.3	100
22	132.0	106
23	133.8	96

26.8 feet-81 feet

Aliquot #	Depth	Weight (grams)
1	26.9	108
2	29.9	110
3	33.3	103
4	37.8	104
5	40.3	100
6	42.8	109
7	45.3	97
8	50.3	104
9	52.3	95
10	54.3	105
11	57.3	105
12	58.5	107
13	65.3	103
14	70.3	95
15	72.4	98
16	74.4	108
17	76.3	99
18	78.0	102
19	80.3	108

170.2 feet-205.0 feet

Aliquot #	Depth	Weight (grams)
1	170.4	110
2	172.3	102
3	174.2	100
4	176.2	106
5	178.0	96
6	180.0	108
7	182.0	96
8	184.0	96
9	186.0	102
10	188.1	98
11	190.3	98
12	195.3	110
13	197.3	108
14	199.0	98
15	201.2	106
16	203.3	108
17	205.1	104

P-3
 Total Depth Drilled: 201 feet
 Core Recovery: 87%

0 feet-50.2 feet			93.2 feet-138.3 feet			138.3 feet-201.0 feet		
Aliquot #	Depth	Weight (grams)	Aliquot #	Depth	Weight (grams)	Aliquot #	Depth	Weight (grams)
1	0.9	104	1	95.0	100	1	139.0	100
2	4.0	100	2	96.9	104	2	141.1	104
3	11.0	104	3	99.0	100	3	143.0	100
4	15.1	98	4	101.0	102	4	145.0	98
5	20.9	100	5	103.0	104	5	147.0	102
6	23.0	100	6	105.0	100	6	149.0	100
7	25.0	100	7	106.8	100	7	151.0	102
8	27.3	100	8	108.8	102	8	156.1	104
9	29.7	100	9	110.8	100	9	158.2	102
10	31.0	98	10	114.3	100	10	160.0	100
11	33.0	102	11	116.2	96	11	162.0	100
12	35.6	102	12	118.0	102	12	164.0	102
13	37.3	98	13	120.0	104	13	166.1	100
14	39.8	104	14	122.0	98	14	168.0	100
15	47.3	98	15	124.0	104	15	170.3	102
16	49.3	100	16	126.0	98	16	172.1	102
			17	128.0	100	17	174.2	100
			18	130.0	98	18	175.9	102
			19	132.0	100	19	177.6	102
			20	134.0	98	20	179.5	104
			21	135.8	102	21	181.5	98
			22	137.0	102	22	183.5	98
						23	185.1	102
						24	194.0	98
						25	199.8	102
50.2 feet-93.2 feet								
Aliquot #	Depth	Weight (grams)						
1	51.2	102						
2	53.2	102						
3	55.0	104						
4	57.0	104						
5	59.0	100						
6	61.3	100						
7	63.4	104						
8	71.0	104						
9	74.3	102						
10	76.2	100						
11	78.1	104						
12	80.1	100						
13	86.5	98						
14	88.6	104						
15	90.6	100						

P-4
 Total Depth Drilled: 180 feet
 Core Recovery: 100%

0 feet-55.9 feet			55.9 feet-126.2 feet			126.2 feet-180.0 feet		
Aliquot #	Depth	Weight (grams)	Aliquot #	Depth	Weight (grams)	Aliquot #	Depth	Weight (grams)
1	1.9	104	1	58.3	98	1	127.2	101
2	5.9	102	2	60.1	104	2	129.1	98
3	7.8	100	3	62.1	102	3	130.9	105
4	10.5	100	4	64.1	100	4	132.5	103
5	12.4	100	5	65.8	96	5	134.5	99
6	14.4	100	6	68.0	102	6	136.3	99
7	16.6	100	7	69.8	100	7	138.1	98
8	18.8	100	8	71.7	104	8	139.1	105
9	20.4	98	9	73.5	100	9	141.4	101
10	22.3	100	10	75.2	100	10	143.3	98
11	25.5	100	11	77.2	104	11	145.1	97
12	27.5	98	12	79.2	104	12	147.0	100
13	29.3	98	13	80.1	98	13	149.0	96
14	31.0	102	14	82.3	98	14	150.1	100
15	33.0	100	15	84.2	104	15	152.1	98
16	35.4	100	16	86.0	100	16	153.7	96
17	37.9	100	17	88.0	104	17	155.3	100
18	39.9	100	18	89.9	102	18	157.3	100
19	42.0	100	19	91.3	100	19	159.2	105
20	45.1	98	20	93.3	104	20	160.5	105
21	47.0	100	21	95.3	104	21	162.4	101
22	49.0	104	22	96.8	100	22	164.3	105
23	50.6	98	23	98.8	96	23	165.8	104
24	52.4	98	24	100.0	104	24	167.7	103
25	54.4	98	25	101.8	100	25	169.6	101
			26	103.8	102	26	171.5	99
			27	105.1	100	27	173.3	96
			28	106.8	102	28	175.1	101
			29	108.7	100	29	177.1	98
						30	179.9	96

P-5
 Total Depth Drilled: 150.5 feet
 Core Recovery: 99%

0 feet-46.1 feet			46.1 feet-100.5 feet			100.5 feet-150.5 feet		
Aliquot #	Depth	Weight (grams)	Aliquot #	Depth	Weight (grams)	Aliquot #	Depth	Weight (grams)
1	1.0	100	1	48.0	100	1	102.2	103
2	2.0	100	2	50.8	100	2	104.2	98
3	5.3	101	3	52.8	102	3	105.7	100
4	6.4	100	4	54.8	100	4	107.6	98
5	8.1	103	5	57.1	98	5	110.6	98
6	10.3	98	6	59.1	100	6	112.1	100
7	12.3	95	7	60.5	100	7	113.6	101
8	14.2	103	8	62.5	100	8	115.9	100
9	15.9	100	9	64.5	100	9	117.9	101
10	17.8	98	10	66.4	100	10	119.6	97
11	19.7	103	11	68.3	98	11	121.2	105
12	21.4	99	12	70.5	102	12	122.9	101
13	23.3	98	13	72.5	100	13	124.6	96
14	25.5	98	14	74.9	100	14	126.3	98
15	26.5	96	15	76.7	98	15	128.4	101
16	30.3	101	16	78.7	102	16	130.3	98
17	33.2	101	17	80.9	100	17	132.2	100
18	35.0	105	18	83.9	96	18	133.2	98
19	36.3	100	19	86.0	100	19	135.2	101
			20	88.0	98	20	137.2	100
			21	90.0	102	21	139.1	105
			22	91.4	104	22	140.6	98
			23	93.3	100	23	142.4	97
			24	95.3	100	24	145.0	101
			25	97.3	102	25	146.8	104
			26	99.3	100	26	148.1	98
			27	100.4	102	27	150.1	100

P-6
 Documented Depth Drilled: 175* feet
 Documented Core Recovery: 95%

0 feet-46.5 feet			46.5 feet-101.0 feet			101 feet-156.4 feet		
Aliquot #	Depth	Weight (grams)	Aliquot #	Depth	Weight (grams)	Aliquot #	Depth	Weight (grams)
1	0.1	96	1	48.2	98	1	103.6	104
2	2.1	100	2	50.1	100	2	106.4	102
3	4.1	96	3	52.0	102	3	108.1	96
4	6.2	104	4	54.0	100	4	109.7	98
5	8.2	98	5	55.7	100	5	112.9	96
6	12.2	96	6	57.7	104	6	115.6	96
7	15.7	98	7	59.6	104	7	118.2	100
8	19.2	96	8	60.8	100	8	119.6	100
9	21.3	104	9	62.8	102	9	122.6	100
10	23.2	100	10	64.8	104	10	124.6	98
11	25.2	100	11	65.5	100	11	126.2	102
12	26.6	98	12	66.8	104	12	128.4	98
13	28.6	104	13	68.3	100	13	130.4	102
14	30.5	96	14	73.2	102	14	131.4	98
15	32.5	100	15	75.7	104	15	132.8	96
16	33.5	98	16	77.7	98	16	136.2	98
17	35.4	98	17	80.4	104	17	138.1	100
18	37.1	98	18	82.2	102	18	139.6	100
19	39.9	100	19	84.2	96	19	141.4	100
20	43.0	102	20	86.4	100	20	143.4	96
21	45.0	98	21	88.3	96	21	145.4	102
22	46.3	98	22	89.4	96	22	147.0	98
			23	92.6	102	23	148.5	100
			24	94.7	98	24	150.9	100
			25	96.2	104	25	152.9	98
			26	100.0	96	26	154.9	96
						27	155.5	104

156.4 feet-181.0 feet		
Aliquot #	Depth	Weight (grams)
1	157.4	104
2	159.0	104
3	160.7	100
4	164.0	100
5	166.0	100
6	167.7	100
7	169.5	100
8	171.5	100
9	173.5	98
10	176.1	96
11	178.2	96
12	180.2	96
13	181.5	102

* Complete log of Boring P-6 was not provided

BHB1-1
Total Depth Drilled: 41 feet
Core Recovery: 76%

4.4 feet-40.9 feet

Aliquot #	Depth	Weight (grams)
1	6.4	98
2	10.3	98
3	13.2	101
4	15.2	101
5	17.9	101
6	19.8	100
7	23.2	98
8	26.0	99
9	27.6	99
10	30.7	99
11	32.5	101
12	35.2	100
13	37.6	102
14	40.3	105

BHB1-2
Total Depth Drilled: 42.2 feet
Core Recovery: 51%

8.0 feet-42.2 feet

Aliquot #	Depth	Weight (grams)
1	15.5	98
2	22.2	104
3	26.0	98
4	31.8	101
5	33.5	101
6	35.2	99
7	36.0	103
8	36.9	101
9	37.7	100
10	41.1	96

BHB1-3
Total Depth Drilled: 41.3 feet
Core Recovery: 60%

1.6 feet-41.3 feet

Aliquot #	Depth	Weight (grams)
1	1.7	99
2	8.3	101
3	10.3	101
4	11.6	97
5	14.0	100
6	15.9	96
7	17.8	100
8	19.9	99
9	21.9	104
10	23.5	103
11	34.1	100
12	37.1	105
13	39.4	101

BHB1-4
Total Depth Drilled: 40 feet
Core Recovery: 91%

5.0 feet-40.0 feet

Aliquot #	Depth	Weight (grams)
1	5.5	98
2	7.6	99
3	9.5	101
4	11.4	98
5	13.1	104
6	15.4	97
7	17.3	100
8	19.2	101
9	22.0	97
10	24.1	103
11	26.4	101
12	28.3	98
13	30.0	98
14	32.0	100
15	34.3	98
16	37.0	98
17	39.0	101

BHB2-1
Total Depth Drilled: 40 feet
Core Recovery: 56%

0.6 feet-44.0 feet

Aliquot #	Depth	Weight (grams)
1	2.6	100
2	4.5	96
3	6.4	100
4	8.5	100
5	13.7	99
6	19.7	98
7	23.0	99
8	24.1	103
9	26.0	101
10	28.5	102
11	29.7	103
12	30.2	101
13	31.3	96
14	32.6	100
15	37.0	105
16	37.3	95
17	40.0	98
18	42.6	95
19	43.7	98

BHB2-2
Total Depth Drilled: 40.5 feet
Core Recovery: 71%

1.7 feet-40.5 feet

Aliquot #	Depth	Weight (grams)
1	1.7	96
2	4.0	99
3	10.8	98
4	12.6	101
5	14.6	100
6	18.4	98
7	19.8	103
8	23.2	102
9	25.1	101
10	27.3	101
11	29.2	98
12	31.3	100
13	33.5	98
14	35.4	100
15	39.1	103

BHB2-3
Total Depth Drilled: 40.5 feet
Core Recovery: 63%

5.9 feet-40.5 feet

Aliquot #	Depth	Weight (grams)
1	8.6	99
2	13.0	98
3	14.6	100
4	20.0	101
5	27.8	101
6	30.0	100
7	31.9	99
8	34.0	103
9	36.0	101
10	38.1	98
11	39.7	98

BHB2-4
Total Depth Drilled: 40.2 feet
Core Recovery: 92%

0 feet-40.2 feet

Aliquot #	Depth	Weight (grams)
1	2.2	103
2	4.1	99
3	7.8	105
4	9.7	101
5	12.1	99
6	14.1	98
7	15.7	100
8	18.3	96
9	20.1	102
10	22.8	98
11	25.0	103
12	27.0	100
13	29.0	100
14	30.9	103
15	32.9	97
16	34.6	102
17	37.8	101
18	39.6	100

BHB2-5
Total Depth Drilled: 40 feet
Core Recovery: 94%

1.0 feet-40.0 feet

Aliquot #	Depth	Weight (grams)
1	3.4	102
2	5.4	98
3	7.1	98
4	9.4	100
5	11.6	98
6	13.6	102
7	15.4	104
8	17.7	104
9	19.7	96
10	21.7	102
11	23.7	98
12	25.6	102
13	27.5	102
14	29.4	100
15	31.1	96
16	33.1	100
17	35.4	104
18	38.3	100

BHB2-6
Total Depth Drilled: 40 feet
Core Recovery: 78%

0.3 feet-40.0 feet

Aliquot #	Depth	Weight (grams)
1	3.2	104
2	5.7	102
3	7.7	104
4	14.2	100
5	16.4	100
6	21.6	100
7	23.6	100
8	25.4	100
9	27.6	98
10	29.5	102
11	31.3	104
12	33.1	105
13	35.0	100
14	37.1	102
15	39.2	100

BHB2-7
Total Depth Drilled: 40 feet
Core Recovery: 95%

0 feet-42.5 feet

Aliquot #	Depth	Weight (grams)
1	2.8	102
2	5.0	100
3	7.4	102
4	9.3	100
5	11.3	98
6	14.1	102
7	15.7	98
8	17.6	98
9	19.9	98
10	21.7	100
11	23.3	98
12	25.4	96
13	27.7	98
14	30.1	102
15	32.2	96
16	34.7	96
17	36.5	100
18	38.6	102
19	40.5	98

BHB2-8
Total Depth Drilled: 40 feet
Core Recovery: 89%

0 feet-40.0 feet

Aliquot #	Depth	Weight (grams)
1	2.4	98
2	4.4	100
3	6.5	104
4	8.5	102
5	10.9	96
6	12.6	102
7	14.9	102
8	16.5	102
9	21.8	102
10	23.4	100
11	25.6	104
12	27.5	102
13	29.8	104
14	32.1	98
15	34.2	100
16	35.5	100
17	37.9	104
18	39.7	100

BHB2-9
Total Depth Drilled: 40 feet
Core Recovery: 97%

0.5 feet-40.0 feet

Aliquot #	Depth	Weight (grams)
1	3.1	96
2	4.9	100
3	7.0	102
4	8.8	100
5	11.1	104
6	13.1	100
7	15.1	100
8	17.3	100
9	18.9	98
10	20.7	104
11	23.0	98
12	25.0	96
13	27.0	100
14	28.9	102
15	30.8	98
16	33.0	102
17	35.1	100
18	37.1	100
19	38.8	96

BHB3-1
Total Depth Drilled: 40.5 feet
Core Recovery: 95%

0.6 feet-40.5 feet

Aliquot #	Depth	Weight (grams)
1	4.9	101
2	7.2	103
3	9.1	98
4	11.2	98
5	12.9	98
6	14.9	98
7	16.5	100
8	18.6	102
9	20.6	98
10	22.4	99
11	24.1	97
12	26.0	99
13	28.4	101
14	30.1	100
15	32.9	105
16	33.6	101
17	35.4	99
18	37.4	98
19	39.5	98

BHB3-2
Total Depth Drilled: 40 feet
Core Recovery: 94%

0 feet-40.0 feet

Aliquot #	Depth	Weight (grams)
1	11.4	100
2	14.0	102
3	16.0	100
4	18.0	100
5	19.8	103
6	21.9	99
7	23.8	101
8	25.8	100
9	27.8	101
10	29.4	99
11	31.3	101
12	33.5	102
13	35.2	100
14	37.4	102
15	39.1	99

BHB3-3
Total Depth Drilled: 40 feet
Core Recovery: 98%

0.4 feet-40.0 feet

Aliquot #	Depth	Weight (grams)
1	2.6	100
2	4.6	96
3	6.6	104
4	8.6	104
5	10.6	98
6	12.1	104
7	14.4	100
8	16.3	100
9	18.2	102
10	20.0	100
11	21.6	102
12	22.9	100
13	24.7	96
14	26.7	96
15	28.7	100
16	31.1	98
17	33.1	96
18	34.9	104
19	37.0	98
20	39.0	100

BHB3-4
Total Depth Drilled: 40 feet
Core Recovery: 98%

0 feet-40.0 feet

Aliquot #	Depth	Weight (grams)
1	3.0	99
2	6.1	101
3	8.0	103
4	10.3	102
5	12.1	102
6	14.0	100
7	15.3	97
8	17.3	98
9	19.2	100
10	20.9	104
11	22.0	99
12	24.0	101
13	27.5	105
14	29.5	105
15	31.4	98
16	33.2	105
17	35.5	103
18	37.5	96
19	38.2	96
20	39.9	101

APPENDIX D



Asbestos TEM Laboratories, Inc.

**Sampling Handling and Analytical Protocols
Used During TEM and PLM Quantitative Bulk Sample Analysis of
Sand and Gravel (Alluvium/Colluvium) and Rock (Drill Core and Hand Samples)
from Boulder City, NV
(April 21, 2014)**

Sample Receipt/Login

Bulk sand & gravel and rock samples from the Boulder City, NV Project were received by Asbestos TEM Labs via courier from Kleinfelder, Las Vegas, starting in January, 2014 and continuing through April, 2014. The samples, suspected to contain Naturally Occurring Asbestos (NOA), were submitted for testing per an EPA/600/R-93/116 method, modified for Transmission Electron Microscopy (TEM) quantitative analysis, and a CARB 435 method for Polarized Light Microscopy (PLM) quantitative analysis. Samples were logged into Asbestos TEM Labs' Laboratory Information System (LIMS) following standard lab login protocols (see Appendix 1 – Login SOP 2014). Entered sample data was proofread by a second person prior to samples being taken to the sample preparation area with appropriate login paperwork.

Sample Preparation

Reduction of Bulk Samples to Analyzable Particle Size

The two types of samples received by the laboratory, 1) sand and gravel (alluvium/colluvium) and 2) rock (drill core and hand samples), each require a separate type of sample preparation procedure in order to reduce the mean particle dimensions to the fine particle size required for the stated test method:

Sand and Gravel

This material was prepared by drying and sieving the sample material to obtain a -200 mesh fine particle-size subsample following standard bulk soil/rock sieving protocols (See Appendix 2 – NOA Soil Sieving 2014). Sample sieving times were obtained by test sieving several of the first samples received and evaluating the optimal time needed to obtain the considerable majority of the fine portion of the sample.

Some very large samples (> 1-2 pints) required an incremental sample size reduction subsampling step prior to sieving in order to create a manageable sieve sample size. The mass of the original samples, as well as the -200 mesh sieved subsample, was also determined.

Rock

This material was dried, crushed and pulverized to a nominal 200 mesh fine particle-size using a jaw crusher and disc pulverizer following a modified CARB 435 test method per standard bulk soil/rock crushing and pulverizing protocols (See Appendix 3 – CARB 435 NOA Crushing Pulverizing 2014).



Generation of TEM Filters for Analysis

Emplacement of Sample Material onto Filter and Positioning onto TEM Grid

A small sample aliquot (~60 mg) was weighed and separated from the fine sample material prepared above. This material was suspended in 500 ml of purified water, ultrasonicated, and stirred. Immediately, an aliquot of solution was pipetted from the suspension and filtered onto a 0.22 μm pore size mixed cellulose ester (MCE) filter. The sample filter was then collapsed in acetone, plasma etched, carbon-coated and positioned onto TEM grids following standard TEM NOA Bulk Soil/Rock sample preparation protocols. (See Appendix 4 – Bulk TEM Method 2014).

TEM Sample Analysis

TEM sample analysis is performed following a tiered two-level counting approach using a modified EPA/600/R-93/116 counting protocol (See Appendix 4– Bulk TEM Method 2014). Modifications to the SOP were made including:

- Short (0.5 – 5.0 μm) fiber scanning tier:
 - 3 - 5 Grid Openings analyzed
 - Magnification – 15,000X
- Large ($\geq 5.0 \mu\text{m}$) fiber scanning tier:
 - 20 Grid Openings analyzed
 - Magnification – 10,000X
- Analytical sensitivity based on:
 - Chrysotile fiber with Length = 0.5 μm and width 0.01 μm
- Aspect ratio to determine asbestos fiber/structure
 - 3:1 (Length to width)

PLM Sample Analysis

PLM sample analysis was performed following a standard CARB 435 analytical method whereby 8 small aliquots (3-5mg) are emplaced onto microscope slides, mixed with an appropriate refractive index oil, and covered with a glass coverslip, followed by microscopical examination. (See Appendix 5 – CARB 435 2004). Modifications to the method include:

- Sand and gravel analysis – Sieving of samples to analyze -200 mesh (75 μm) only. No crushing and pulverizing of samples performed.
- Rock analysis - No modifications to the method were made.

Analytical Quality Assurance/Quality Control (QA/QC)

Asbestos TEM Labs follows QA/QC protocols which meet or exceed the standards set by NIST/NVLAP for TEM airborne asbestos fiber analysis, which have been extended to TEM bulk samples. These procedures include, but are not limited to the following activities:



QA – thorough review of data entry, fiber mineral identification, lab test result conclusions...

QC – equipment calibration, running of QC sample retests (minimum 5% of a combination of duplicate, replicate, and verified samples), lab blanks, analysis of standards...

This information is used to assess analyst and sample preparation performance, etc. The QA/QC procedures used by Asbestos TEM Labs when performing asbestos analysis are described in the Laboratory Quality Assurance Plan (See Appendix 6 - LQAP Berk 2013).

Sample Reporting

Bulk sample test results were presented in the following formats:

TEM Analysis Results

- Mass Concentration in Weight %
- Fiber/Structure Concentration in Fibers/Structures per gram

PLM Analysis Results

- 400 Particle Point Count %

All analytical data is thoroughly reviewed by Asbestos TEM Labs staff before release to the client. Bulk TEM and PLM sample analytical reports, which are sent to the client via electronic or hard copy format, include a wide range of data related to the analysis. Details as to protocols followed during report generation are described in the standard TEM Bulk analytical protocol (See Appendix 4 – Bulk TEM Method 2014) and PLM CARB 435 Protocol (See Appendix 5 – CARB 435 2004).

Asbestos TEM Labs goes to great lengths to ensure the precision and accuracy of the test results it provides to its clients. We are happy to discuss any questions you might have about any of our procedures discussed above. This concludes Asbestos TEM Labs' description of its NOA TEM Bulk and PLM CARB 435 sampling handling and analytical protocols.

Sincerely,

R. Mark Bailey, PG
President



APPENDIX 1
Login SOP 2014



1.0 Purpose

- 1.1 The purpose of this procedure is to document the ATEM login process from sample receipt through analyst proofreading.

2.0 Scope

- 2.1 This SOP is applies to all associates that work with customer samples and reports, primarily involving the following associates:
 - 2.1.1 ATEM Administration and Management
 - 2.1.2 TEM sample preparation
 - 2.1.3 Analyst
 - 2.1.4 Bookkeeping

3.0 Responsibility

- 3.1 It is the responsibility of the:
 - 3.1.1 Sales & Marketing Director to:
 - 3.1.1.1 Generate and provide current customer and price reference data to the customer
 - 3.1.1.2 Provide oversight and pricing for all ATEM custom testing
 - 3.1.2 Administration Associates, TEM sample preparation, analyst, and bookkeeping associates to:
 - 3.1.2.1 Proof-read login and report documentation per this procedure
 - 3.1.2.2 Comply with the provisions of this SOP
 - 3.1.2.3 Communicate all custom and non-routine work to ATEM Management
 - 3.1.3 Quality Assurance Manager to:
 - 3.1.3.1 Provide updated documentation procedures, lists, and forms
 - 3.1.3.2 Trend bookkeeping and customer discovered proofreading errors quarterly
 - 3.1.3.3 Trend customer satisfaction per survey feedback results
 - 3.1.3.4 Coordinate and document corrective action (CAR) from all applicable login, sample, and report issues
 - 3.1.4 Laboratory Manager to:
 - 3.1.4.1 Coordinate the volume and type of samples received with the available ATEM resources
 - 3.1.4.2 Login associate contact for sample documentation questions and proofreading
 - 3.1.4.3 Interface with ATEM customers on level 2 sample analysis, custom, and difficult customer requests



- 3.1.4.4 Interface with the administration associates, analysts, and service contractors to provide a balanced equipment/analyst ratio and ensure timely analysis results
- 3.1.4.5 Interface with the Sales & Marketing Director for custom work pricing and contact information

4.0 **Materials**

- 4.1 Calculator
- 4.2 Active Client List
- 4.3 Highlighter

5.0 **Equipment**

- 5.1 Computer with SuperBase
- 5.2 > 0.22 μ m fiber capture certified HEPA filtered safety hood

6.0 **Safety**

- 6.1 Use caution when handling customer pre analysis samples, due to the unknown nature of the hazard(s). Gloves should be used with any sample manipulations in the safety hood.
- 6.2 Sample packages should be opened in the login hood to prevent contamination in the event of a leaking sample container.
- 6.3 The Pullman-Holt certified HEPA vacuum should be used for any small to medium size asbestos spills at or near the login office.
- 6.4 The Quality Manager will perform contamination control quarterly to verify ATEM login associate safety while working with asbestos and lead minerals.

7.0 **Definitions**

- 7.1 Active Client List – A list containing current active clients of ATEM compiled by the Marketing Director and released approximately two times per month
- 7.2 Actual turn-around-time - Defined as the duration from date received to the date analysed
- 7.3 Change Order (CO) – A document received from an ATEM client requesting a change in one of the testing and/or reporting parameters
- 7.4 Chain of custody (C of C) - Chronological documentation showing the custody, control, transfer, analysis, and disposition of test sample(s).
- 7.5 Custom Work – Any combination of non-routine lab analysis, atypical new testing inquiries, and multiple analyses per sample.
- 7.6 Information on the upper right hand corner of the ATEM report
 - 7.6.1 Turn-Around-Time (TAT) – This report field lists the customer’s request for analysis completion date and report results due, based on the following workday schedule:
 - 7.6.1.1 Berkeley CA office an 8am to 5pm Berkeley



7.6.1.2 Sparks NV office: 8:30am – 5pm business day

7.6.2 RCVD – The date and time the TAT starts; also the start time for the sample

7.6.3 DUE: - The actual date the sample is due based the lab business days described in

7.6.3.1 above excluding holidays and weekends, unless after hours service is requested.

7.7 Procedure - A series of actions conducted in a certain order or manner

7.8 Proofread - To read in order to find errors and mark corrections

7.9 Rounding Rule for ATEM – Replacing or eliminating a number by another value that is approximately equal but has a shorter, simpler, or more explicit representation

7.10 Significant Figures - Each digit of a number sequence that are used to express the required degree of accuracy

7.11 Short term exposure limit (STEL) - Acceptable average exposure over a short 15 minute (usually 15 minute) period of time, as long as the TWA is not exceeded.

7.12 SuperBase – ATEM LIMS database used for sample login, analysis results, and customer reports

7.13 Time Weighted Average (TWA) – Method of reporting personal air sample which normalizes fiber concentrations over a “time weighted” 8-hour exposure period

$$7.13.1 \text{ TWA (1 sample)} = \frac{C_1 * T_1}{480 \text{ minutes}}$$

$$7.13.1 \text{ TWA (2 samples)} = \frac{(C_1 + C_2) * (T_1 + T_2)}{480 \text{ minutes}}$$

Where: C1 = Fiber concentration of Sample 1

C2 = Fiber concentration of Sample 2

T1 = Pump run time of Sample 1

T2 = Pump run time of Sample 2

7.14 Trend – A general direction in which something is developing or changing

7.15 Triage - A process for sorting samples into groups based on their need for or likely benefit from immediate login.

8.0 Operation

8.1 Sample Receipt

8.1.1 Customer samples arrive at ATEM by the following methods:

8.1.1.1 Outdoors sample drop box– Associate to check this box at the start of each shift

8.1.1.2 United States Postal Service (USPS) – Turn the safety hood on and open the package under the operational hood

8.1.1.3 FedEx / UPS – Sign and copy the shipping receipt

8.1.1.4 Courier – Sign receipt

8.1.1.5 Customer drop-off – Sign and date the COC and give the customer a copy



- 8.1.1.6 ATEM associate pickup – The time received starts when the COC and samples arrive at the lab
- 8.1.2 Login Office Sample Triage
 - 8.1.2.1 The samples shall be triaged by the Administrative Associate, with maximum hold timeframes, as follows:
 - 8.1.2.1.1 Test results due in four hours
 - 8.1.2.1.1.1 Immediate login
 - 8.1.2.1.2 Test results due in eight Hours
 - 8.1.2.1.2.1 Login within one hour
 - 8.1.2.1.3 Test results due in 24 Hours
 - 8.1.2.1.3.1 Login within two hours
 - 8.1.2.1.4 Test results due in 48 hours
 - 8.1.2.1.4.1 Login within 4 hours
 - 8.1.2.1.5 Test results due in 72 hours
 - 8.1.2.1.5.1 Login within 8 hours
 - 8.1.2.1.6 Test results due in five days
 - 8.1.2.1.6.1 Login within one day
 - 8.1.2.1.7 Test results due in ten days
 - 8.1.2.1.7 Login within one day
 - 8.1.3 Sign and date the COC; ATEM does not process ANY samples without a COC
 - 8.1.3.1 If no COC is not available, contact the customer
 - 8.1.3.1.1 Notify the customer by telephone and/or email
 - 8.1.3.2 Verify the physical sample quantity and correct sample numbers listed on the COC and the sample container(s)
 - 8.1.3.2.1 Foreign soil is excepted; notify the Quality Manager or designee immediately upon receipt of a foreign soil sample per USDA guidelines.
 - 8.1.3.3 Place the COC into the temporary folder storage based on the login due date
 - 8.1.3.3.1 Water samples are excepted; place the water samples into the refrigerator for temporary storage and log the water samples on the refrigerator log and make a note on the report comments section
- 8.2 Management Review and Approval for the following:
 - 8.2.1 Payment Information – Accounting dept. approval required
 - 8.2.1.1 Wave prepayment
 - 8.2.1.2 Custom pricing
 - 8.2.1.3 New customer account creation
 - 8.2.1.4 Reactivate customer account



- 8.2.1.5 Bad debt
- 8.2.1.6 Third party billing
- 8.2.2 Custom Preparation and Analysis – Lab Manager approval required
 - 8.2.2.1 Dual analysis
 - 8.2.2.2 AHERA outside sample analysis
 - 8.2.2.3 Special preparation
- 8.2.3 Laboratory Coordination and Time Management – Lab Manager approval required
 - 8.2.3.1 Equipment and analyst constraints to testing samples
- 8.2.4 Custom Reports – Lab Manager approval required
 - 8.2.4.1 Any reports other than the SB generated report
- 8.2.5 Foreign Soil – Lab Manager approval required
 - 8.2.5.1 Custom instructions, container, and special sticker requirements
- 8.2.6 Request for Work Outside Normal Business Hours – Lab Manager approval required
 - 8.2.6.1 Dry erase board reservation
- 8.3 SuperBase (SB) LIMS Customer Sample Entry –Reference Attachment #1 for ATEM numbering convention. Reference Attachment #2 for login information.
 - 8.3.1 Process for Administrative associate to log sample into SB
 - 8.3.1.1 Verify the following parameters before initiating the login procedure
 - 8.3.1.1.1 Client name is correct and customer is on the current Active Client List
 - 8.3.1.1.2 If new client, ask Marketing Director to set up Super Base (SB) account
 - 8.1.1.2 If debt risk, notify Sales Mgr. for collections
 - 8.1.1.3 If inactive client, ask Marketing Director to activate account
 - 8.1.1.4 Open SB and mouse click on the “Main Menu” highlighted area button on the computer screen
 - 8.1.1.5 Click on the login tab that corresponds to the sample type you are logging (“Lead or TEM, PLM, PCM”)
 - 8.1.1.6 Start the information transcription into SB (TAB = one press of the TAB computer keyboard button)
 - 8.1.1.6.1 Enter client #-TAB to populate lot #
 - 8.1.1.6.2 TAB to go to # of samples
 - 8.1.1.6.3 Enter # of samples TAB
 - 8.1.1.6.4 Enter Collection Date TAB
 - 8.1.1.6.5 Date-in is already populated TAB
 - 8.1.1.6.6 Time in (caps does not matter) TAB
 - 8.1.1.6.7 Analysis type (pick from dropdown menu) TAB



- 8.1.1.7 TAT per customer COC
- 8.1.1.8 Date Due (The actual date the sample is due based on lab standard business schedule per 7.6 above) TAB
- 8.1.1.9 Time Due (The actual time the sample is due based on lab standard business schedule per 7.6 above). The sample must be in-house by 10am to have the same day analysis results
- 8.1.1.10 Add PO # if applicable TAB
- 8.1.1.11 Delivered By (pick appropriate selection from drop-down menu, e.g. Client, FedEx, UPS...) TAB
- 8.1.1.12 If samples and sample containers are intact, click Excellent or Acceptable for sample condition TAB. If samples and sample containers are not intact, contact client immediately for instructions as to whether to accept the samples or not and be sure to document the condition of the samples and the clients instructions as to how to proceed. TAB
- 8.1.1.13 Add Reno Tracking #, if applicable TAB
- 8.1.1.14 Enter any applicable special instructions or comments about the samples in this field TAB
- 8.1.1.15 Enter Job # TAB
- 8.1.1.16 Enter Job Site TAB
- 8.1.1.17 Enter Contact Person TAB
- 8.1.1.18 Enter Login Associate Initials TAB
- 8.1.1.19 Check the requested method the client has indicated as to how to deliver test results (verbal, email, etc.) TAB
- 8.1.1.20 Select the appropriate test method (PLM - CARB, PCM-NIOSH 7400, TEM AIR-AHERA, TEM WATER – DRINKING WATER, etc.)
- 8.1.1.21 NOTE: << **AN SB SCREEN SWITCH OCCURS**>>
- 8.1.1.22 Air Samples
 - 8.1.1.22.1 Enter client sample # (TAB)
 - 8.1.1.22.2 {A Default Sample Date will already be entered} If necessary, input correct date TAB
 - 8.1.1.22.3 Enter Total Min TAB
 - 8.1.1.22.4 Enter Flow Rate (TAB)
 - 8.1.1.22.5 Enter Volume (TAB)
 - 8.1.1.22.6 Enter Sample Description (TAB)
- 8.1.1.23 Bulk Samples
 - 8.1.1.23.1 Enter client sample # (TAB)
 - 8.1.1.23.2 {A Default Sample Date will already be entered} If necessary, input correct date TAB



- 8.1.1.23.3 Enter Sample Description (TAB)
 - 8.1.1.24 Air Samples
 - 8.1.1.24.1 Enter client sample # (TAB)
 - 8.1.1.24.2 {A Default Sample Date will already be entered} If necessary, input correct date TAB
 - 8.1.1.24.3 Enter Approximate Sample Volume (TAB)
 - 8.1.1.24.4 Enter Sample Description (TAB)
 - 8.1.1.25 Press the two computer keyboard buttons simultaneously [CONTROL] [BREAK]
 - 8.1.1.26 Click on the "Login Report" button on the computer screen
 - 8.1.1.27 To Abandon Login, go to Main Menu→Browse Login→TEM Air→Data {DROP DOWN MENU} Remove Current (**NEVER SELECT REMOVE ALL**)
 - 8.1.1.28 Open SB Tracker, input the report number, and place the word abandoned in the special instructions, and a zero in the box on the upper right side.
- 8.2 Proofreading of sample login report by TEM Preparation and Analyst associate as follows:
- 8.2.1 Check information in sample login report is complete and accurate, per the list of proofreading parameters in Attachment #3
 - 8.2.2 For abandoned login report perform the following:
 - 8.2.2.1 Handwrite a note on login report
 - 8.2.2.2 Enter the date, time and initial the amended login report
 - 8.2.2.3 Enter SB Tracker invoice # as zero "0" and make a note of the abandoned report
 - 8.2.3 If errors are discovered, communicate (note, verbal, or email) with the associate who performed the login, document the errors at the bottom of the attachment table, and give them to the appropriate staff person to correct the data
- 8.3 Process for TEM Bookkeeping associate proofread of the customer report:
- 8.3.1 Verify that the information is complete and accurate, per the list of proofreading parameters in Attachment #3.
 - 8.3.2 If errors are discovered, communicate (note, verbal, or email) with the associate performing the login, and document the errors at the bottom of the Attachment #4. All errors must be corrected and the issues resolved before the report can be closed.
- 8.4 Dry Erase Sample Batch Tracking Board
- 8.4.1 Login associate to enter summary information on to the dry erase sample batch tracking board for the following sample types
 - 8.4.1.1 TEM Air
 - 8.4.1.2 PLM and/or TEM of Soil/Rock sample (CARB 435 & other methods)



Asbestos TEM Labs, Inc.

Standard Operating Procedure

ATEM Sample Login and Handling Procedure

Issue Date: 18 Apr 2014

Revision: 1

SOP#: SOP 3-2-1

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8.4.1.3 Special reservation and outside of business hours jobs

8.5 Sample Transfer to the PLM, TEM, PCM, and Lead Labs

8.5.1 Samples are transferred directly to the lab sample preparation areas from the login office, post SB login, with the following exceptions

8.5.1.1 Water samples – are placed into the water sample refrigerator

9.0 Revision History

Revision	Date	Revision Notes
0	01 Jul 2004	Login section in SOP 5-7-1, Handling of Test Items, Initial document publication
1	11 Oct 2005	Login section in SOP 5-7-1, Handling of Test Items, Revision for grammar
0	12 Sep 2008	Login section separated from Handling Test Items SOP, Initial publication as Login SOP 3-2-1
1	07 Oct 2009	Added provisions for USDA foreign soil requirements
2	23 Nov 2010	Annual update, deleted GFAA
0	06 Sep 2013	Initial Publication of rearranged login document SOP-3-2-1 combined with sample handling safety at the login step, and report proofreading documents
1	18 Apr 2014	Removed proofreading checkmark columns, Page 11 , 12

Laboratory Manager

18 Apr 14

Date

QA Manager

18 Apr 14

Date



ATEM Numbering Convention Attachment #1

ATEM Rounding Rules

If the first non-significant figure is a 5 followed by other non-zero digits, round up the last significant figure. Example: 1.2459 as the result of a calculation or measurement that only allows for 3 significant figures should be written 1.25

If the first non-significant figure is a 5 not followed by any other digits or followed only by zeros, rounding requires a tie breaking rule.

The tie-breaking method used at ATEM is the round half away from zero or round half towards infinity rule.

Example: 23.5 should be rounded to 24, and -23.5 gets rounded to -24. This method treats positive and negative values symmetrically, and therefore is free of overall bias if the original numbers are positive or negative with equal probability. However, this rule will still introduce a positive bias for positive numbers, and a negative bias for the negative ones.

Replace any non-significant figures by zeros.

Significant Figures

All non-zero digits are considered significant

Example: 91 has two significant figures, 123.45 has five significant figures

Zeros appearing anywhere between two non-zero digits are significant

Example: 101.12 has five significant figures

Leading zeros are not significant.

Example, 0.00052 has two significant figures

Trailing zeros in a number containing a decimal point are significant.

Example, 12.2300 has six significant figures...The number 0.000122300 still has only six significant figures... In addition, 120.00 has five significant figures...Stating a result as 12.2300 makes clear that it is precise to four decimal places

The number 0 has one significant figure

The significance of trailing zeros in a number not containing a decimal point can be ambiguous.

Example, it may not always be clear if a number like 1300 is precise to the nearest unit or if it is only shown to the nearest hundred due to rounding or uncertainty. Various conventions exist to address this issue:

A bar may be placed over the last significant figure...any trailing zeros following this are insignificant.

Example,...1360 has three significant figures

The last significant figure of a number may be underlined...Example, "2000" has two significant figures

A decimal point may be placed after the number...Example "100." indicates specifically that three significant figures are meant

By using a combination of a number and a unit of measurement, the ambiguity can be avoided.

Example: the number of significant figures in a mass specified as 1300 g is ambiguous, while in a mass of 1.3 kg is not ambiguous

The abbreviation s.f. is sometimes used:

Example "20 000 to 2 s.f." or "20 000 (2 s.f.)" or state the uncertainty separately and explicitly

Example: Specify 20 000 ± 1%, so that significant-figures rules do not apply



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Standard Operating Procedure

ATEM Sample Login and Handling Procedure

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Login Information Sheet Attachment #2

#	Item	Document Information	Information Detail
1	Currently the RCVD is defined as the date the sample enters ATEM with the COC	Document the START DATE on the report page in the notes box	The START date is the date that the sample login is completed
2	Add sufficient information to allow billing and marketing to make appropriate choices without constantly checking with the administration associates	Document information on the report page in the notes box	<ol style="list-style-type: none"> 1) Document any contact with the client and include the date, individual contacted, and the contact issue 2) Document any questions concerning the COC...what are the issues? 3) Document any changes to the login, report, and invoice
3	Closing reports where samples leave ATEM to a courier or customer pickup	Document the close of the report on the COC with ATEM AND customer signature	Samples leaving ATEM to our clients should be documented on the customers COC with an ATEM AND customer initials and date. Make a copy of the initialed/dated COC and place the copy with the ATEM report
4	Custom preparation	ATEM analyst to document soil processing information on the report page in the notes box	The analyst should document the specific work that was performed so billing can calculate the correct customer charges
5	Convert in ² → ft ²	1 ft ² = 144 in ²	Example: 35 in ² x 1/144 ft ² = 0.243 ft ²
6	Convert cm ² → ft ²	1 ft ² = 929.0304 cm ²	Example: 35 cm ² x 1/929.0304 cm ² = 0.0377 ft ²
10	Change order information	Document the change order in the special instructions box on the report page	The ATEM associate should document the Change Order in the special instructions box, as follows: received on " <u>date received</u> " and request a start of analysis by " <u>method</u> " + " <u>sensitivity level</u> " by " <u>due date</u> ". Amended the invoice, amended the login, and added a start " <u>date</u> "



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Administrative Associate Proofread

Attachment #3

#	Proofread Description
1	Is the client number A) Active and B) The correct number based on the company and location?
2	Does the Sample quantity match the A) COC and the B) Physical quantity
3	Is the client company name spelled correctly?
4	Does the date collected match the COC?
5	Is the date received correct?
6	Is the sample time in correct? Use the start (8am Berkeley; 8:30 am Sparks) of the next business day date if login occurs after hours
7	Is the job site and job number correct?
8	Does the analysis type match the COC? (Do not use the following roofing, ATEM Bulk Soil, XRD, Bulk ATEMM Quant, Other Job under Custom header)
9	Turn-around-time (TAT): Check that the TAT reflects the COC and if the time is shorter than 24 hours, that the Lab Manager gives their approval. If the TAT is different per a customer change order submission, place a note in the special instructions box on the report form
10	Determine date and time due based on the following. If a time (earlier or later) is requested by the customer and TAT requested. Consult the customer with conflicting time information; If a change order occurs, change the time due per client request. Use hours and minutes to be accurate. Exceptions to the above time rules exist: Example: A customer calls in on Monday morning at 8:05am, and selects the 24 hour TAT because a 48 hour TAT will make the ATEM results late. The customer specifies their test results be completed by noon on Tuesday, which allows the analyst almost four extra hours. A change occurs on the TAT entry, no change in the charge.
11	Is the PO# correct based on contract; Reference A) SuperBase marketing job and B) COC
12	Is the report level correct? 1=Regular; 2=Custom, and requires a Manager review
13	Inspect the client's login sample numbers against the COC for transcription errors, and correct the errors. Is the sample identification number (ID#) correct? Check the sample description.
14	Is the primary contact information A) spelled correctly and B) is the name the correct selection for the account listed on the COC?
15	Are additional email contacts listed from the A) COC and B) marketing
16	Were ALL special instructions listed? Verify that all requests on the COC were entered into the special instructions box at login: A) Soil sample volumes B) Custom preparation instructions C) Composite soil sample number D) Gravimetric reduction soil volumes E) UV ozone sample quantities F) Sensitivity level for B&V G) Any special report instructions H) Is the report an electronic delivered document (CA State) I) Quarantine (Foreign soil) J) Which sample numbers are combined on TWA & STEL calculations K) Is the pre-paid fee waived? L) PLM, stop at the 1 st positive structure M) Do not analyze blank samples N) Client request to not analyze any extra grid openings O) New client P) Bad debit client Q) Client not on the active list R) Change Order S) request for verbal communication T) Soil preparation only, do not analyze sample



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#	Proofread Description Attachment #3 (Continued)
17	Document the following CO information: Date; Administration associate that received the change order, CO contact name
18	Date and time received (RCVD) matches the time date stamp on COC
19	Are the sample air volume(s) or wipe area number(s) in agreement?
20	Methods of reporting and invoicing agree
21	Review notes on the login report for any changes or custom client instructions. Are the notes complete?
22	Verify that prepayment information is entered on the login report if the customer is a new or walk-in client (96 or 97)

Discrepancy Form Attachment #4

Initials:	COC Missing	<input type="checkbox"/>
Login #:	COC present but information missing on the COC	<input type="checkbox"/>
Date:	No Samples	<input type="checkbox"/>
Client:	Sample Missing	<input type="checkbox"/>
Project #:	Incorrect sample ID	<input type="checkbox"/>
	Damaged sample	<input type="checkbox"/>
Resolution:	Pre-payment not received	<input type="checkbox"/>
	No TAT specified:	<input type="checkbox"/>
	Hold testing for:	<input type="checkbox"/>
	Insufficient volume:	<input type="checkbox"/>
Date/Time:	Other:	<input type="checkbox"/>
	Comments:	
Contact Name:		



APPENDIX 2
NOA Soil Sieving 2014



Asbestos TEM Laboratories, Inc.

SOIL SAMPLE PROCESSING

Sieving & Splitting Operations Manual

(Revised February, 2014)

I. Introduction

On occasion, soil samples are submitted for analysis for which it is required that only the fine size fraction is to be prepared and analyzed without any crushing or pulverizing. This manual describes the process whereby soil samples are dried, weighed, split (if necessary due to a very large sample being submitted), re-weighed, sieved and stored.

II. Sample Drying (see section of the CARB 435 Method Manual)

III. Sample Splitting

Occasionally samples are submitted which are so large (> 1 quart) for which it is not possible to sieve entire sample. In this case it necessary to split the sample into a smaller subsample, and to do so in as representative a manner as possible. Two methods have been found to be effective (Note - weigh the entire dried sample before splitting):

1. Riffle splitting – see section IV of the CARB 435 Sample Preparation Manual
 - a. If the sample is very dusty, this method may not be optimal as the agitation which occurs when the sample is poured into the splitter may release a large number of fibers which are caught up in the draft of the HEPA filter hood in which the splitting is being performed and so may cause a loss of asbestos fibers.
2. Representative sampling – works best for fine gravel, sandy or silty materials (refer to EPA publication EPA/600/R-03/027, “Guidance for Obtaining Representative Laboratory Analytical Subsamples from Particulate Laboratory Samples”) and reduces loss of fines as occurs when riffle splitting
 - a. Protocol for Kleinfelder Boulder City Project
 - i. Pour the sample in a continuous line and collect multiple (at least 10) evenly spaced subsamples of the material.
 - ii. Combine the subsamples into one composite sample and then sieve the sample as below in Section IV.



Soil Sample Sieving and Splitting Manual

IV. Sample Sieving

1. Label a clean new ziplock sample bag with the appropriate Lab Sample ID
 2. Weigh the dried sample (or composite subsample)
 - a. Tare sample bag on the appropriate 0.1 gram analytical balance
 - b. Place the dried sample into the tared bag
 - c. Weigh the sample in the tared bag
 - d. Record the sample weight on the paper ledger
 3. Assemble a clean sieve stack
 - a. For the Kleinfelder Boulder City Project the following sieve sequence was used:
 - i. Top (Coarse): ASTM #16 (1/4")
 - ii. Middle (Medium): ASTM #80 (180 microns) or #100 (80 microns)
 - iii. Bottom (Fine): ASTM #200 (75 microns)
 - iv. Catch Pan which holds Extra Fine <75um material
 4. Place sample onto top sieve (~1Kg...between 1/2 & 3/4 full) and cover with a stainless cover
 5. Place the sieves into the shaker (Retsch Programmable AS-300 or CSC Scientific-18480)
 6. Secure sieves using the sieve shaker locking or screw-down mechanisms
 7. Set the following settings:
 - a. Retsch AS-300 Programmable
 - i. Proj set = on
 - ii. 0.75 = amplitude
 - iii. Blank = interval
 - iv. Run for 2 minutes
 - v. Remove top sieve (#16 or 1/4")
 - vi. Pour the Coarse material from top sieve into a new 2nd bag labeled coarse (IDH)
 - vii. Reload shaker with the two bottom sieves and lid/pan
 - viii. Run for 13 minutes
 - ix. Stop shaker
 - x. Remove all sieves
 - b. CSC Scientific-18480
 - i. See steps 7.a.iv. thru ix.
 8. Pour material on Medium and Fine sieves into the coarse bag
 9. Empty the Coarse bag into the original sample canister...para-filmed and duct taped
 10. Tare a new 3rd bag and label with <200 mesh and IDH#
 11. Pour final Extra Fine material present in pan into the tared bag
 12. Weigh bag with the fine soil and record the weight
 13. Place the fine soil bag into the box
 14. Gather with other samples in the batch and the appropriate paperwork and store in preparation for analysis.
-



Soil Sample Sieving and Splitting Manual

V. Sieve Cleaning

- 1 Before taking sieves out of the HEPA hood to clean them, it is critical to wet them so as to remove or lock down any residual dust.
 - a. Wet paper towel and wipe all exterior and interior surfaces of all used sieves (not including the screens) residual dust onto sieve surfaces.
 - b. Restack the sieves with base pan, but no lid.
 - c. Pour water through the sieves to wet all sieve screen surfaces
- 2 Move the sieves to the sink
- 3 Run more water into the sieve stack to completely drench them
- 4 Unstack the sieves
- 5 Place the sieves into the sieve cleaner/sonicator, one at a time, and sonicate for 5-10 minutes
- 6 Change the sieve sonicator water between each sample
- 7 Dry the sieves on the top shelf of the large drying oven



APPENDIX 3

CARB 435 NOA

Crushing Pulverizing 2014



Asbestos TEM Laboratories, Inc.

CARB 435

Drying, Crushing & Pulverizing Operations Manual

(Revised February, 2014)

I. Introduction

Soil and rock samples submitted for CARB 435 analysis must be reduced in particle size such that the material to be analyzed is a “nominal” 200 mesh particle size – i.e. when sieved with a 200-mesh screen, at least half of the material passes through the sieve openings. The soil treatment procedure typically requires a drying, crushing & pulverizing process, as described below.

II. Sample Drying

It is REQUIRED that all material from CARB 435 submitted samples are completely dried in the oven prior to pulverizing the sample(s) (An extra fee may be charged for treating large samples >1/2 gallon). Failure to thoroughly dry the samples **will result** in the pulverizer becoming clogged and the sample reduced to a mud ball. A wet or large amount of soil sample will require placing the sample into multiple drying trays.

1. Remove sample from original container and place into one or more disposable aluminum pans labeled with the appropriate sample ID number such that the top of the soil/rock material in the pan is below its top edge.
2. Take a paper towel and lay it over the sample and clip it to the four edges of the aluminum pan so that it is well covered and firmly secured.
3. Transport samples into the one of the drying ovens (For 1 or 2 samples, place into the small ~1 cu.ft. oven. For >2 samples or for large samples, place into the large refrigerator size drying oven.)
4. Turn on the oven and set to a temperature of 120 Deg. C. (If using the large oven, back it up to the fume hood and turn on the hood to exhaust the waste heat.)
5. Let run for 4-6 hours.
6. After drying is complete, turn off oven and fume hood, and remove samples and place into a negative pressure bulk sample HEPA hood.
7. Obtain a new clean ziplock bag of appropriate size and label it with the lab sample ID #.
8. Pour the sample into the ziplock bag and store in an appropriate place for testing with the other samples in the batch and the related paperwork.

III. Sample Crushing

Sample crushing is done with an industrial size Bico-Braun Chipmunk jaw crusher which can pulverize rocks up to ~3” in diameter. Samples with particle size $\leq \frac{3}{8}$ ” diameter can be run through the large pulverizer directly. (The equipment is operated only within a certified HEPA filtered negative pressure enclosure hood.)



CARB 435 Crushing & Pulverizing Manual

PRE-CRUSHING:

1. WEAR SAFETY GLASSES & HEARING PROTECTION
2. ROLL UP JAW CRUSHER VISQUEEN ON HEPA HOOD ENCLOSURE – Be sure Pulverizer Visqueen is rolled down and secured to maximize air flow in jaw crusher area.
3. POWER ON NEGATIVE AIR HEPA HOOD – Verify you can feel a draft of air being pulled into the hood.
4. CLEAN THE CRUSHER - HEPA vacuum and wet wipe the crushing jaws and sample receiving trays. Be sure all visible dust is removed from the crushing equipment to minimize possibility of sample contamination.
5. POWER ON CRUSHER AND GIVE IT A FEW SECONDS FOR THE FLYWHEEL TO GET UP TO A CONSTANT SPEED – Do not place sample into crusher until after the flywheel is running smoothly as binding of the crusher moving parts and burnout of the electric motor drive could occur.
6. POUR SAMPLE INTO CRUSHER. DO NOT LOOK INTO THE CRUSHER JAWS WHILE IT IS OPERATIONAL – Sample fragments may be ejected at high speed and could cause serious injury.
7. PERIODICALLY TURN OFF CRUSHER AND VERIFY THE SAMPLE RECEIVING TRAY IS NOT BEING OVERLOADED – If a pile is developing unevenly in the tray, shake the tray to level it out. If receiving tray appears to be filling up, remove the tray and immediately place it into the negative pressure sampling hood and pour material into an appropriate labelled sample container. Replace receiving tray back into crusher and continue crushing. Repeat this process, as necessary, until sample crushing is complete.
8. DOCUMENT ALL CRUSHED SAMPLES AS THEY ARE COMPLETED ON THE CRUSHER LOG SHEET and any unusual behavior of the sample or crusher.
9. TURN OFF CRUSHER IMMEDIATELY UPON COMPLETION OF CRUSHING & BEFORE RETRIEVING SAMPLE. – Usually, only one pass through the crusher is needed to adequately crush the sample. If additional crushing is required, pour the material through the crusher again as documented above, without re-cleaning.

POST CRUSHING:

1. REMOVE CRUSHED SAMPLE – Carefully place the pulverized sample into the negative pressure sampling hood and pour material into an appropriate sample container.
2. CLEAN UP ANY SPILLS OR DEBRIS. Place any waste into a hazardous waste disposal container.



CARB 435 Crushing & Pulverizing Manual

IV. Sample Splitting

Samples significantly larger than 1 pint in volume (>~ one quart) shall be reduced to 1 pint following the ASTM C-702-98 method which uses a riffle splitter, or equivalent. The riffle splitting method is described below:

1. Thoroughly clean riffle splitter using HEPA vacuuming and wet wiping of splitter & 3 trays, followed by a compressed air blast.
2. Place clean sample receiving trays into position in the splitter
3. Pour crushed sample onto the proper size riffle sample scoop and be sure the sample is evenly spread across the entire width of the scoop.
4. Line up scoop at top edge of one side of the splitter centered between the two ends.
5. Slowly pour sample into splitter
6. Remove receiving trays with split sample from splitter. Pour one tray into a storage container, place two empty trays into position and repeat step 3 through 5 until the amount of material remaining is a between one and two pints (Use a disposable 1 pint plastic cup to measure).
7. Pour the final one to two pint split sample into a Ziploc bag for storage until the pulverizer is ready for use. In cases where both crushing and pulverizing are being performed in immediate succession, no intermediate storage bag is required.

V. Sample Pulverizing

Sample pulverizing is performed with an industrial size Bico-Braun UA Disc Pulverizer for particles $\leq \frac{1}{2}$ " diameter. In almost all cases, except where the sample size is very small, use the large pulverizer. To check the possibility of sample cross contamination, run a known (asbestos negative) playground sand cleansing blank in between each client sample set. It is important to perform a thorough re-cleaning after each blank, and each sample.

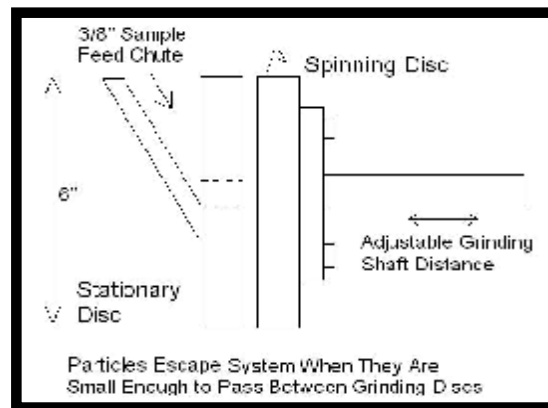


Fig. 1. Diagram of internal parts of a disc pulverizer



CARB 435 Crushing & Pulverizing Manual

PRE PULVERIZING:

1. WEAR SAFETY GLASSES & HEARING PROTECTION
2. ROLL UP PULVERIZER VISQUEEN ON HEPA HOOD ENCLOSURE – Be sure Jaw Crusher Visqueen is rolled down and secured to maximize air flow in pulverizer area.
3. TURN ON NEGATIVE AIR MACHINE - Verify you can feel a draft of air rate being pulled into the hood.
4. OPEN PULVERIZER SHROUD, HEPA VACCUM & WET WIPE PULVERIZER PLATES & SAMPLE RECEIVING TRAYS – Be sure all visible dust is removed from the pulverizing equipment to minimize possibility of sample contamination.
5. CLOSE PULVERIZER PLATES AND BE SURE THE LEFT IMMOVABLE PLATE IS LOCKED TIGHTLY IN PLACE. Tighten wing nuts by hand with the nut closest to the operator tightened first followed by the back farthest nut.
6. CHECK THAT PULVERIZER PLATES ARE NOT BOUND – You should be able to just rotate the pulverizer shaft by hand and only hear the slightest grinding between the plates before powering the equipment on.
 - a. If bound too tightly, on the far right side of the pulverizer, slightly loosen the set knob and back off the adjustment wing nut very slightly. Retighten the set knob and then check the plates to be just touching.
 - i. If OK, go to step 7.
 - ii. If too tight, redo step 6.a.
 - iii. If too loose, move to step 6.b.
 - b. If plates are not just touching, loosen the set knob and then tighten the adjustment wing nut until the plates just touch each other. Back off an eighth of a turn and tight set knob.
 - i. If OK, go to step 7.
 - ii. If too tight, redo step 6.a.
 - iii. If too loose, move to step 6.b.
7. CLOSE PULVERIZER SHROUD

PULVERIZER OPERATION:

1. TURN ON PULVERIZER (DO NOT PLACE THE SAMPLE INTO THE PULVERIZER UNTIL AFTER THE UNIT IS TURNED ON) – Binding of the pulverizer plates and burnout of the electric motor drive could occur.
2. CALIBRATE PULVERIZER (FOR FIRST SAMPLE OF THE DAY, OR ANYTIME AFTER OPENING THE PLATES)
 - a. Place a small amount of material to be milled into the pulverizer and pulverize it.
 - b. Turn off pulverizer
 - c. Retrieve pulverized mini-sample and pour it into a clean ASTM 200 mesh testing sieve with catch pan attached.
 - d. Cover with lid and shake either by hand or with a shaker assembly.
 - e. Check that sample is of acceptable grinding quality ($\geq 1/2$ of the pulverized sample material passes through the 200 mesh test sieve).
 - f. If the sample does not meet specification, then return to item 6. of the PRE-PULVERIZING section above and continue on from there.



CARB 435 Crushing & Pulverizing Manual

3. SLOWLY POUR SAMPLE INTO PULVERIZER –
 - a. Temporarily stop pouring material if:
 - i. Material backs up the into the fill chute
 - ii. The pulverizer begins to labor and/or drive belt begins to slip
 - b. If pulverizer chokes on sample and stops,
 - i. Use a long screw driver and dig into the backed up sample pile until it reaches the plates.
 - ii. Wiggle the screwdriver to try to unpack the sample material while working the plates back and forth by grabbing and pulling/pushing the belt pulley.
 - iii. Restart pulverizer.
 1. If OK and pulverizer plates spin, continue on.
 2. If plates do not spin
 - a. Try 3.b.i & ii. again
 - b. If no success in freeing plates, then
 - i. Pull out pulverized material sample receiving tray and take it to the HEPA hood and pour out material into appropriate container.
 - ii. Replace sample receiving tray.
 - iii. Lift the pulverizer shroud and open the plates
 - iv. Take the material that falls into the receiving try and pour it back into the container containing the crushed sample
 - v. Return to step 2. above.
 3. If plates spin, continue on.
4. TURN OFF PULVERIZER IMMEDIATELY UPON COMPLETION OF SAMPLE PULVERIZING,
5. RETRIEVE FINAL PULVERIZED SAMPLE ALIQUOT
 - a. Pull out pulverized material sample tray and take it to the HEPA hood and pour out material into an appropriate labelled container.
6. DOCUMENT ALL PULVERIZED SAMPLES AS THEY ARE COMPLETED ON THE PULVERIZER LOG SHEET and any unusual behavior of the sample or pulverizer.

POST PULVERIZING:

1. Clean pulverizer interior by HEPA vacuuming and wet wiping the interior of the machine, but DO NOT OPEN THE PLATES.
2. Clean plates by pulverizing 1 cup of play sand.
3. Clean up the pulverizer interior again by HEPA vacuuming the interior of the machine.
4. The unit is now ready to pulverize the next sample.

VI. Shut Down

1. Be sure to place all samples into sealed labelled containers before retrieving them from the negative air containment.
2. Power off the negative air safety hood, and HEPA vacuum the area only when all operations are completed.
3. Roll down Visqueen on HEPA hood enclosure in both jaw crusher and pulverizer areas.
4. Damp mop floors and wipe down all work areas.



APPENDIX 4
Bulk TEM Method 2014



Asbestos TEM Labs, Inc.

Standard Operating Procedure

Transmission Electron Microscopy Division

TEM Bulk Sample Analysis (Modified EPA 600/R-93/116)

Issue Date: 21 Apr 2014

Revision: 4

SOP#: 5-4-2-TEM-03

Page #: 1 of 25

1. Purpose

To outline the equipment and procedures used by Asbestos TEM Laboratories in the analysis of bulk asbestos by the technique of transmission electron microscopy following methodologies found in the EPA Analytical Electron Microscopy Bulk Asbestos EPA/600/R-93/116 analytical method, as well as the ISO 10312 method, with modifications. Its function is to ensure that the methods by which the analysis is performed conform to EPA procedures and to our own more rigorous and company-specific policies.

2. Scope / Field of Application

- 2.1. Bulk building materials
- 2.2. Rock/soil NOA materials
- 2.3. Other miscellaneous bulk submitted for testing.

3. Analytical Hardware Requirements

3.1. Apparatus for Sample Preparation

- 3.1.1. Negative Pressure HEPA Hoods
- 3.1.2. Muffle Furnace
- 3.1.3. Drying Oven
- 3.1.4. Jaw Crusher
- 3.1.5. Pulverizer
- 3.1.6. ASTM Sieves
- 3.1.7. Sieve Shaker
- 3.1.8. Chute Riffle Splitter
- 3.1.9. Rotary Riffle Splitter
- 3.1.10. 3D Schatz Turbula Mixer
- 3.1.11. Incremental Sampler
- 3.1.12. Analytical Balances
 - 3.1.12.1. 0.1 gram sensitivity
 - 3.1.12.2. 0.1 milligram sensitivity
 - 3.1.12.3. 0.001 milligram sensitivity
- 3.1.13. Ultrasonicator
- 3.1.14. Adjustable Pipettes
- 3.1.15. Vacuum Filtration Apparatus
- 3.1.16. Plasma Etcher
- 3.1.17. Carbon Evaporator

3.2. General Lab Supplies

- 3.2.1. Ziplock Storage Bags
- 3.2.2. Tweezers
- 3.2.3. Scalpel



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- 3.2.4. Razor Blade
- 3.2.5. Paper Towels
- 3.2.6. Porcelain Crucibles
- 3.2.7. Disposable Plastic Bottles
- 3.2.8. Blank MCE Filters
- 3.2.9. Disposable Filtration Cassettes
- 3.2.10. Disposable Pipette Tips
- 3.2.11. Petri Dishes
- 3.2.12. Aluminum Foil
- 3.2.13. Wick Washers
- 3.2.14. Carbon rods
- 3.2.15. Syringes
- 3.2.16. 200 Mesh Copper TEM Grids
- 3.2.17. Grid Storage Box

3.3. Reagents

- 3.3.1. Fiber-free water (Distilled, De-ionized, etc.)
- 3.3.2. Hydrochloric Acid
- 3.3.3. Formic Acid
- 3.3.4. Glacial Acetic Acid
- 3.3.5. Acetone
- 3.3.6. DMSO

3.4. Analytical Equipment

- 3.4.1. Transmission Electron Microscope w/
 - 3.4.1.1. EDX spectrometer
 - 3.4.1.2. Digital Camera
- 3.4.2. Computers

3.5. Analytical Standard Reference Materials

- 3.5.1. NIST Asbestos Standards
- 3.5.2. Internal Laboratory Asbestos Standards
- 3.5.3. NIST PLM/TEM Proficiency Testing Samples
- 3.5.4. NIST Thin Film EDX Calibration Standards

4. Sample Preparation Considerations - Discussion

The preparation of bulk samples is more involved than for air samples, but the goal is to evenly spread a known amount of bulk material over a filter and prepare that filter for analysis.

The four major errors to avoid are:



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Transmission Electron Microscopy Division

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4.1. Contamination

Never take a bulk sample into the TEM sample preparation area. Bulk samples can seriously contaminate the TEM sample preparation area. Take special precautions to avoid spilling the water that has sample material suspended in it when filter bulk samples. Sample contamination can come from or go into the air, the sample preparation areas, the hands of the person preparing the specimens, or in any place where prepared TEM grids may be exposed. Do not prep air samples on the same day if you have been handling bulk asbestos samples.

Important Note: When first prepping samples for weighing, it is important not to cross-contaminate the samples by scraping or including a different layer along with the original material. For example, if the client wishes to further analyze a Floor Tile layer (<1% asbestos) by TEM, it is important not to scrape any Mastic layer (>1% asbestos) in the initial prep procedures. This cross-contamination could very well influence the final results by TEM falsely leading to a higher asbestos percentage.

A laboratory blank is prepared along with each batch of samples, and because they go through all the same steps as the regular samples, any type of contamination will most likely show up on the blanks.

4.2. Loss of Sample Material

Be sure that the entire amount of material that you weigh makes it into the suspension water, and avoid losing some of it to settling (i.e. Stir the suspension when necessary). Once the filtration has been completed, the same ideas apply as with air samples – avoid losing particles from the filter or, at the end of the process, from the carbon film.

4.3. Sample Interchange

If two samples are mistaken for each other in any part of the sample prep process, huge problems can result. Label all beakers clearly and when preparing many samples, work in a logical order.

4.4. Improper Subsampling

Sometimes samples are heterogeneous. Look carefully to see if there are different layers, etc. Also be sure to sample from various areas on the submitted sample to get a representative sampling.

Important Note: Be careful in prepping samples such as sheetrock and joint compound. A representative amount of sheetrock and joint compound should reflect the actual amounts.

Quality versus Speed

The bulk prep process takes a while, and when you run several samples in a batch, concentration is the key. Label all samples and solutions.



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5. TEM Bulk Sample Preparation

5.1. Note on Safety considerations

- 5.1.1. Whenever you are working with a dry sample, you must work in one of the negative air HEPA hoods (step 4.1 through 4.4). Also, you should prepare a blank with each set of samples.

5.2. Building Materials for TEM Quantitative & Semi-Quantitative Bulk Testing

- 5.2.1. Look at the bulk sample using the stereoscope between 10x and 40x magnification.
 - 5.2.1.1. Place portions of the sample onto a clean piece of paper, or into a labeled disposable petri dish
 - 5.2.1.2. Attempt to identify any fibers and document the findings.
 - 5.2.1.3. Check for multiple layers, etc. If you find two different materials in the sample, then call the client if no prior sample instructions have been given.
 - 5.2.1.4. Assess if the material has an organic binder which can interfere with the analysis
- 5.2.2. If organic binder is found, a *gravimetric* muffle furnace treatment is necessary.
 - 5.2.2.1. Obtain a clean dry porcelain crucible of appropriate size
 - 5.2.2.2. Record the crucible # on the crucible bottom
 - 5.2.2.3. Weigh the crucible on a 0.1 mg analytical balance and record the weight on the sample test sheet
 - 5.2.2.4. Collect subsamples from several areas on the sample and place into crucible.
 - 5.2.2.4.1. With floor tiles and other similar materials containing large amounts of organic binder, it is best to make thin shavings.
 - 5.2.2.5. Weigh the crucible with contained subsample and record on sample test sheet
 - 5.2.2.6. Place the crucible covered with a porcelain lid into the muffle furnace.
 - 5.2.2.7. Heat for a minimum of 4 hours at 430-450 Deg C.
 - 5.2.2.7.1. Do not exceed 450 Deg C as chrysotile becomes unstable at 480 Deg C.
 - 5.2.2.8. Once cooled, remove crucible from furnace
 - 5.2.2.9. Remove porcelain lid
 - 5.2.2.10. Re-weigh crucible and record the weight.
 - 5.2.2.11. If sample appears likely to contain limestone or dolomite, such as in floor tiles and plasters,
 - 5.2.2.11.1. Treat with a small amount of dilute HCl until fizzing stops.
 - 5.2.2.11.2. Stir and grind the sample with a clean glass rod to break up any clumps so the acid can attack them.
 - 5.2.2.12. Pour sample and acid, if present, into a 50 ml plastic reagent tube.
 - 5.2.2.13. Rinse out crucible with a wash bottle containing fiber-free water so all sample material is transferred to the reagent tube.
 - 5.2.2.14. Fill reagent tube up to the 50 ml with fiber-free water
- 5.2.3. If no organic binder is found



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- 5.2.3.1. Grind the sample in a clean mortar and pestle until the material is a fine powder.
 - 5.2.3.1.1. Be careful not over grind the sample which can cause asbestos fibers to be destroyed
 - 5.2.3.2. Weigh the sample on glassine weighing paper on a 0.1mg analytical balance and record on the sample test sheet
 - 5.2.3.3. Place sample into a clean one liter Nalgene bottle
 - 5.2.3.3.1. If it seems likely that carbonate material or gypsum are present, treat with dilute HCl until fizzing stops.
 - 5.2.3.3.2. Stir and grind the sample with a clean glass rod to break up any clumps so the acid can attack them.
 - 5.2.3.3.3. Fill Nalgene bottle up to volume of 500 ml with fiber-free water
 - 5.2.4. Place lid on the sample bottle and take it, along with the appropriate paper work, to the TEM bulk/water sample filtration area.
 - 5.2.5. Place sample suspension bottle into the ultrasonicator and ultrasonicate for 5-15 minutes
 - 5.2.6. Prepare a disposable water filter cassette with a 0.22 μm MCE filter and set up in the vacuum filtration apparatus
 - 5.2.7. Wet the filter with a small squirt of fiber-free water
 - 5.2.8. Check the filter to be sure there are no bubbles of air (white spots) under the filter
 - 5.2.8.1. If there are bubbles, break the filtration cassette, reposition the filter and begin again at step 5.2.6
 - 5.2.9. Fill the filtration cassette with fiber-free water up almost to the top.
 - 5.2.10. Remove the sample suspension bottle from the ultrasonicator.
 - 5.2.11. Agitate the bottle by swirling.
 - 5.2.12. Remove the bottle lid and withdraw a 0.5ml aliquot of suspension solution
 - 5.2.13. Transfer the aliquot to the filtration cassette
 - 5.2.13.1. Submerge the tip in the fiber-free water, and run the pipette pump action up and down a few times to disperse the and mix the suspension into the fiber-free water
 - 5.2.14. Turn on the vacuum pump that is connected to the filtration apparatus and run until all the liquid is filtered.
 - 5.2.15. Remove the filter and place into a labeled small petri dish to dry.
 - 5.2.16. Dry the filters using a heat lamp or air dry overnight in preparation for TEM grid sample prep.
 - 5.2.17. Store sample suspension bottle for at least three months in case there are problems with the sample prep.
- 5.3. Chatfield Floor Tile Semi-Quantitative Bulk Prep Procedures**
- 5.3.1. Weigh 30-50 mg of the floor tile sample and ash in a muffle furnace for 4 to 8 hours (or overnight) at 430-450 Deg C in a crucible (for more details, see section 5.22. above).
 - 5.3.2. After ashing, cool the samples and reweigh the crucible with ashed sample.
 - 5.3.3. Note the weight onto the Chatfield/Gravimetric form.
 - 5.3.4. Place the entire ashed sample onto a 50ml plastic reagent tube.



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- 5.3.5. Add a squirt of diluted distilled water with soap. This will help suspend any asbestos fibers evenly throughout the entire water column.
- 5.3.6. Ultrasonicate the beaker for 10 to 15 minutes, or longer if necessary.
- 5.3.7. Pre-weigh a 0.4 μm PC (polycarbonate) filter
- 5.3.8. After ultrasonication, agitate the bottle.
- 5.3.9. Remove the sample lid and withdraw 0.5ml of solution onto a 0.22 μm MCE filter
- 5.3.10. Then filter remaining solution onto a 0.4 μm PC filter
- 5.3.11. Dry both filters using a heat lamp or air dry overnight.
- 5.3.12. Reweigh the 0.4 μm PC filter.
- 5.3.13. Prep the 0.1 MCE filter for TEM using the standard “air” filter technique found in SOP 5-04-2-TEM-01 “TEM Air Sample Analysis.”
- 5.3.14. Complete calculations for organic, acid-insoluble, and acid-soluble components on data sheet.
- 5.3.15. Dry filter in preparation for TEM grid sample prep.

5.4. Modified-Chatfield Prep Procedures (Qualitative “Drop Mount” Method)

5.4.1. Method 1

- 5.4.1.1. Weigh 30 mg of the sample and ash for approximately 3 to 4 hours
- 5.4.1.2. Place the entire ashed sample into a clean 500ml beaker and dilute to 500ml with fresh distilled water (it is **not** necessary to cool the sample)
- 5.4.1.3. Add 2 to 3 squirts (approximate amount ?) of diluted distilled water with soap. This will help suspend any asbestos fibers evenly throughout the entire water column
- 5.4.1.4. Ultrasonicate the beaker for 10 minutes. Longer if necessary
- 5.4.1.5. After ultrasonication, filter the entire 500 ml solution through a 0.4 μm PC filter
- 5.4.1.6. Dry the filters using a heat lamp for approximately 30 minutes or longer if necessary
- 5.4.1.7. Using the fine tweezers, carefully wipe a blank 0.5 μm MCE filter lightly over the 0.4 μm PC filter with the dried filtered residue
- 5.4.1.8. Carefully fold this prepped blank filter and place into a clean crucible and collapse it using acetone (approx. 0.5ml)
- 5.4.1.9. Use a clean micropipette (3 lambda) to apply one drop of acetone solution directly on a prepped TEST Lab Blank Grid (TLB) with carbon film side up
- 5.4.1.10. Quickly analyze this grid for TEM to detect the presence of asbestos/positive or negative (+/-)

5.4.2. Method 2

- 5.4.2.1. Weigh 30 mg of the sample and ash for approximately 3 to 4 hours
- 5.4.2.2. After ashing the sample, cool the samples and dilute it directly in the crucible with approximately 0.5 ml ethanol or acetone
- 5.4.2.3. Use a clean micropipette (3 lambda) to apply one drop of ethanol or acetone solution directly on a prepped Test lab Blank Grid (TLB) with the carbon side up



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5.4.2.4. Quickly analyze this grid for TEM to detect the presence of asbestos/positive or negative (+/-)

5.5. Modified EPA 600/R-93/116 for Quantitative NOA Analysis

- 5.5.1. Please refer to Special Standard Operating Procedure (SSOP-TEMNOA) for procedures to produce the fine powder sample ready for bulk TEM sample preparation.
- 5.5.2. Open bag containing the finely powdered NOA sample
- 5.5.3. Select a glassine weighing sheet and fold in half so it has well defined crease in the middle and place it onto the pan of a calibrated 0.1 mg analytical balance.
- 5.5.4. Weigh out approximately 60 mg of material by taking a series of at least 6 subsamples from different locations in the sample bag.
- 5.5.5. Record the sample weight to 0.1 mg.
- 5.5.6. Place sample into a clean one liter Nalgene bottle
- 5.5.7. Fill Nalgene bottle up to volume of 500 ml with fiber-free water
- 5.5.8. Place lid on the sample bottle and take it, along with the appropriate paper work, to the TEM bulk/water sample filtration area.
- 5.5.9. Place sample suspension bottle into the ultrasonicator and ultrasonicate for 5-15 minutes
- 5.5.10. Prepare a disposable water filter cassette with a 0.22 μm MCE filter and set up in the vacuum filtration apparatus
- 5.5.11. Wet filter with a small squirt of fiber-free water
- 5.5.12. Check the filter to be sure there are no bubbles of air (white spots) under the filter
 - 5.5.12.1. If there are bubbles, break the filtration cassette, reposition the filter and begin again at step 5.5.10.
- 5.5.13. Fill the filtration cassette with fiber-free water up almost to the top.
- 5.5.14. Remove the Nalgene sample suspension bottle from the ultrasonicator.
- 5.5.15. Shake the sample well by hand.
- 5.5.16. Remove the bottle lid and withdraw a 0.5ml aliquot of suspension solution
- 5.5.17. Transfer the aliquot to the filtration cassette
- 5.5.18. Submerge the tip in the fiber-free water and run the pipette pump action up and down a few times to disperse the and mix the suspension into the fiber-free water
- 5.5.19. Turn on the vacuum pump that is connected to the filtration apparatus and run until all the liquid is filtered.
- 5.5.20. Remove the filter and place into a labeled small petri dish to dry.
- 5.5.21. Dry the filters using a heat lamp or air dry overnight in preparation for TEM grid sample prep.
- 5.5.22. Store sample suspension bottle for at least three months in case there are problems with the sample prep.



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6. TEM Instrument Checks and Calibrations

Proper operation and calibration of the TEM/EDX system is imperative for accurate analytical results to be obtained. Therefore, it is necessary that the TEM/EDX system be regularly checked, aligned and calibrated as outlined below. A quarterly worksheet is used to maintain the required schedule; this worksheet is available as Appendix J to SOP 5-04-2-TEM-01 "TEM Air Sample Analysis."

6.1. System Check - Daily for every analyst.

6.1.1. Notation of proper system functioning should be done at least once per day per analyst before proceeding with analysis. These checks include, but are not limited to:

- 6.1.1.1. Water pressure
- 6.1.1.2. Vacuum level
- 6.1.1.3. Accelerating voltage
- 6.1.1.4. Image fluctuations
- 6.1.1.5. Unusual noises (i.e. popping noises due to arcing in filament housing, hissing due to vacuum leaks, etc.) The laboratory supervisor should be notified immediately if any problems occur which are not rectifiable before analysis can proceed.

6.2. Alignment check – Daily

- 6.2.1. Place a sample into the TEM
- 6.2.2. Check the system properly focusses
 - 6.2.2.1. If a problem exists, immediately inform the lab manager
- 6.2.3. Check the beam stays centered when changing between magnifications and spot sizes
 - 6.2.3.1. If a problem exists, immediately inform the lab manager

6.3. Magnification Calibration - Monthly, and/or after every maintenance operation involving the electron optical lenses, pole pieces, or electron gun.

- 6.3.1. For Magnification Calibration procedures - See Appendix A
 - 6.3.1.1. Compare calibration to last four calibrations- look for >1% variation.

6.4. Camera Constant Calibration - Monthly

- 6.4.1. For Camera Constant Calibration procedures, see Appendix B

6.5. Energy Dispersive X-ray Calibration

- 6.5.1. Proper peak alignment - Daily, if the unit is used
 - 6.5.1.1. Collect your first EDX spectra f the day
 - 6.5.1.2. Before continuing to do more work, verify that the copper K alpha peak, and L alpha peak occur within $\pm 10\text{eV}$ of the proper energy channels (Cu K-alpha=8.0415 KeV, and L-alpha=.928KeV) by using the "compute centroid" function under the ROI menu.
 - 6.5.1.3. See Appendix C if copper peaks are misaligned and inform the laboratory supervisor before proceeding with EDX analysis.



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6.5.2. Resolution Check – Annually

6.5.2.1. Check that the resolution of the EDX system is less than 175eV

6.5.2.1.1. If problem, immediately inform the lab manager

6.5.3. K-factors – Annually

6.5.3.1. Calculate EDX system k-Factors (See Appendix C)

6.5.3.1.1. If problem, immediately inform the lab manager

6.6. TEM Beam Dose/Chrysotile Damage Calibration - Annually

6.6.1. At least once each year, 10 chrysotile fibers on a laboratory known standard material (preferably an NIST standard) will be analyzed to calibrate the beam dose/damage to the chrysotile fibers. These fibers will be single chrysotile fibrils $\geq 1 \mu\text{m}$ in length. It is required that these fibers exhibit stable diffraction patterns while under the electron beam for at least 15 seconds.

6.6.1.1. Failure of the TEM system to attain such levels of diffraction pattern longevity shall result in modifications of the methods and/or TEM system so that the required level is met.

6.7. Spot Size Calibration – Semi-Annually

6.7.1. At least once every six months, the spot size will be calibrated at the maximum Condenser Lens 1 current to document the minimum TEM spot size. This is performed according to the procedures outlined in Appendix D and the included excerpt from D.B. Williams, "Practical Analytical Electron Microscopy in Materials Science", pgs. 34-35.

6.7.1.1. Failure of the TEM system to attain such levels of diffraction pattern longevity shall result in modifications of the methods and/or TEM system so that the required level is met.

6.8. Mechanical Stage Translational Reproducibility - Annually

6.8.1. At least once each year check the mechanical X-Y TEM sample holder translational motion. Do this by precisely locating a particle, then moving a large distance in the x direction, then exactly $5.0 \mu\text{m}$ in the y direction. Move back toward the starting area in the x direction, then move exactly $5.0 \mu\text{m}$ back to the starting point in the y direction. See how much drift has occurred in the y direction from this maneuver. Repeat with the x and y directions reversed, to test drift in the other direction.

6.8.1.1. Failure of the TEM system to attain such levels of diffraction pattern longevity shall result in modifications of the methods and/or TEM system so that the required level is met.



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7. Pre-analysis Data Recording

Before proceeding with the TEM analysis, be sure that the instrumentation checks and calibrations described above have been completed.

7.1. Review Log-In Sheet Data

7.1.1. Insure the data entered into it is the same as that on the Chain-of-Custody sheet.

7.2. Record all pertinent information onto sample analysis count sheet (paper or computer)

See Appendix H - Sample TEM Bulk Material Count Sheet) including:

7.2.1. Laboratory sample no.

7.2.2. Client sample no.

7.2.3. TEM instrument identification

7.2.4. Analytical operating magnification

7.2.5. TEM accelerating voltage

7.2.6. Filter type used (e.g. MCE, 0.22 μ m)

7.2.7. Filter area – area of filter upon which sample material was emplaced

7.2.8. Sample mass – mass of material suspended in fiber-free water (typically ~60mg)

7.2.9. Suspension volume – volume of water used to suspend sample

7.2.10. Aliquot volume – volume of water pipetted out of the original suspension volume and emplaced onto the filter

7.2.11. TEM grid opening area

7.2.12. Number of grid openings scanned & operating mag when scanning

7.2.12.1. Single level analysis

7.2.12.1.1. Grid openings scanned

7.2.12.1.2. Magnification

7.2.12.2. Tiered analysis

7.2.12.2.1. Large particle scan

7.2.12.2.1.1. Low Mag grid openings scanned

7.2.12.2.1.2. Magnification

7.2.12.2.1.3. Large particle minimum length

7.2.12.2.2. Small particle scan

7.2.12.2.2.1. High Mag grid openings scanned

7.2.12.2.2.2. Magnification

7.2.12.2.2.3. Small particle minimum length

7.2.13. Any pertinent comments or notations

7.2.14. Date of analysis



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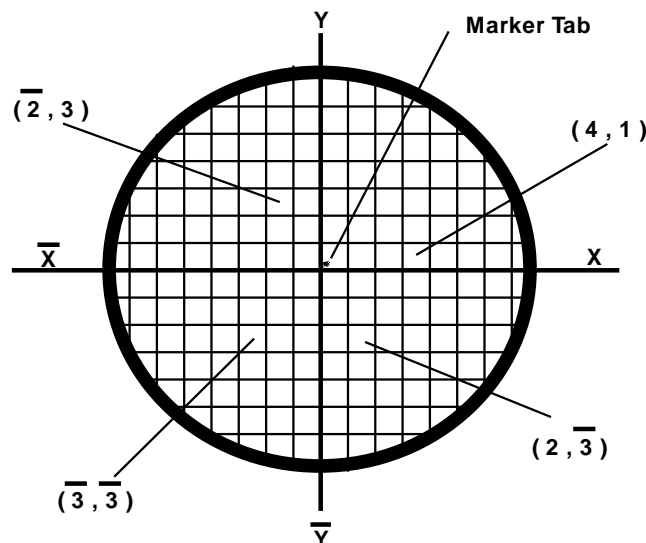
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8. Preliminary Grid Assessment Rules

- 8.1. Remove first TEM grid to be analyzed from grid box with tweezers being careful not to drop or destroy the grid.
- 8.2. Place the TEM grid into the single tilt sample holder such that the carbon coat and shiny side of the grid are facing down with respect to the sample holding clasp. In the TEM, the shiny side and carbon coat will then face upward. The rim of the grid has a mark punched into it; rotate the grid so that this mark is farthest away from you and the grid bars are parallel to the sides of the sample holder.
- 8.3. Place sample holder into TEM.
- 8.4. Perform initial grid assessment at Low Mag.
- 8.5. Cursorily scan grid. Accept grid for TEM analysis if the following criteria are met:
 - 8.5.1. Fraction of grid openings covered by the carbon coat replica (coherent or incoherent) is greater than approximately 50% of the total grid.
 - 8.5.2. Carbon coat replica is intact (without holes) in >50% of the grid openings.
 - 8.5.3. Carbon coat replica has <20% coverage with particulate matter
 - 8.5.4. Carbon coat replica has <10% fully obscured sections of undissolved filter material.
 - 8.5.4.1. Carbon coat is overlapping or folded in <50% of the intact grid squares.
 - 8.5.4.2. At least 20 grid squares have no overlapping or folded carbon coat replica. These same 20 grid openings have <5% holes and <5% opaque area due to incomplete filter dissolution.
- 8.6. If a grid appears acceptable for analysis, find the center mark.
 - 8.6.1. The center mark is asymmetrical, with a different tab shape sticking out into each quadrant of the grid. The large tab with the right angle should be in the upper right quadrant. With this orientation, the grid openings are identified in a simple X-Y coordinate system as shown below.



Illustrated TEM Grid Square Identification



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- 8.7. Choose a grid opening without regard to its loading (except that the loading cannot be much higher or lower than the average for the entire grid), record its X-Y coordinates, and then center it on the screen by means of the translation knobs.
- 8.8. Increase magnification to ~1,000X such that the whole grid opening fills the screen.
- 8.9. Cursorily scan grid opening. Accept grid opening for TEM analysis only if it has:
 - 8.9.1. <5% holes
 - 8.9.2. relatively uniform loading
 - 8.9.3. <10% coverage with particulate matter
 - 8.9.4. <5% fully obscured sections of undissolved filter material
- 8.10. If grid opening appears acceptable, increase mag and begin detailed analysis.

9. COUNTING RULES

- 9.1. Asbestos fibers/structures found on filters prepared as described above are most commonly found to be distributed in such a manner that there are far more small asbestos structures than large ones. This is thought to be due to fact that smaller fibers tend to stay suspended in air longer than large structures.

The manner in which a bulk sample fiber/structure counting is undertaken depends upon the goals of the client. These goals are typically one of the following:

 - 9.1.1. Determination of asbestos mass concentration (weight percent),
 - 9.1.2. Determination of asbestos fiber concentration (fibers/structures per gram),
 - 9.1.3. A combination of both mass and fiber concentrations.
- 9.2. To achieve these goals one of two basic counting strategies are used
 - 9.2.1. Single Level Asbestos Structure Counting - best used when only fiber concentrations are requested. However, if client is willing to pay extra money for a highly detailed analysis, this method can be used for both fiber and mass concentrations.
 - 9.2.1.1. Count all asbestos fibers/structures at one set, usually high (~15,000-20,000X), magnification.
 - 9.2.2. Tiered Level Asbestos Structure Counting – best used when mass or mass and fiber concentrations are requested. This method is more cost effective than 9.2.1. above.
 - 9.2.2.1. Counting of asbestos fibers/structures at two magnifications – typically 20 to 40 grid openings low mag and 2 to 4 grid openings at high mag.
 - 9.2.2.1.1. Low mag to count long (e.g. $\geq 5 \mu\text{m}$, $\geq 10 \mu\text{m}$, or $> 5 \mu\text{m}$ long and $> 0.25 \mu\text{m}$ – PCME) asbestos fibers/structures in many grid openings as they are much less common to find, but can contain most of the asbestos mass.
 - 9.2.2.1.2. High mag to count short $< 5 \mu\text{m}$ or $< 10 \mu\text{m}$ asbestos fibers/structures in a few grid openings
 - 9.2.3. Be sure to split the analysis across two TEM sample grids to be sure a more even sampling of the filter surface is obtained.
 - 9.3. When counting in this manner, analytical effort is to be focused on obtaining individual fiber and bundle lengths and widths so that accurate volume calculations can be made.



10. Detailed Grid Opening Analysis

- 10.1. Move to the lower left corner of the grid opening. Make sure the Objective Aperture is in to increase image contrast.
- 10.2. Make a series of parallel vertical traverses across the grid opening using the primary translational directions of the TEM stage as shown in (Fig. A) &/or (Fig. B) below. Always use just one translator when you move the stage so that motions will always be either parallel or 90° to each other. When moving from one scan row to the next, move in increments of 90% of one large scribed viewing area. Note that on some occasions, as shown in the second rows from the right and left in (Fig. B) below, it is necessary to move in both directions on the same traverse to insure no areas of the grid are missed.

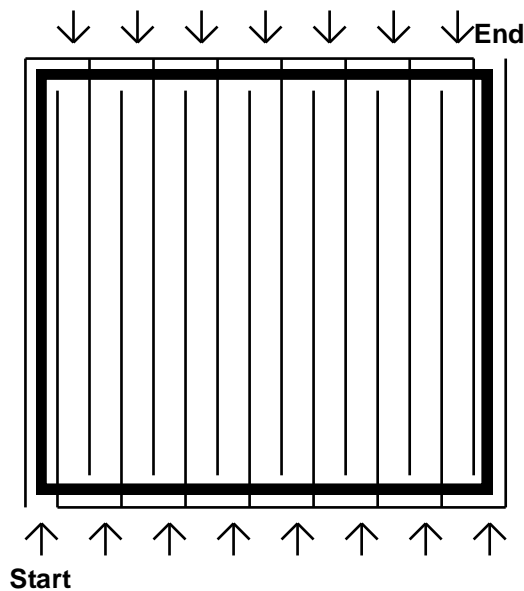


Figure A.

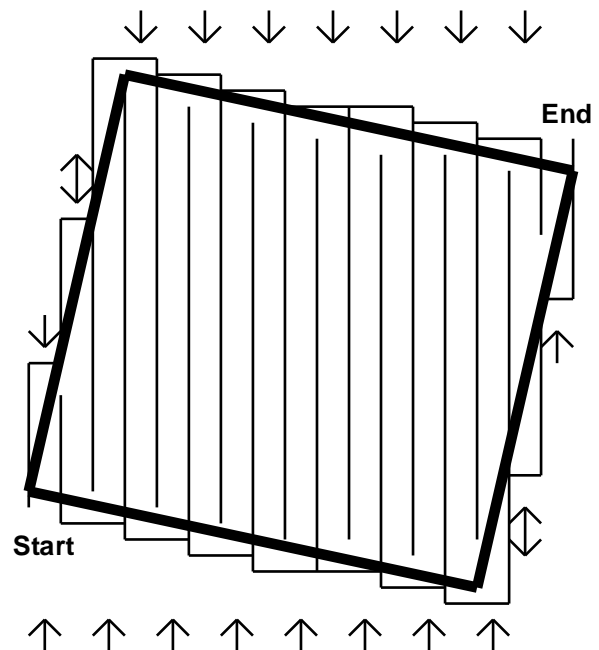


Figure B.

- 10.3. While traversing the grid opening watch for asbestiform structures. - (An "asbestiform structure" is any individual particle, or continuous grouping of particles, in which a fiber is detected having all of the following characteristics:
 - 10.3.1. aspect ratio greater than some length to width value (typically 3:1, although sometimes 5:1)
 - 10.3.2. length greater than 0.5 μm
 - 10.3.3. substantially parallel sides



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- 10.4. When such an asbestiform structure is observed, immediately defocus the electron beam to avoid destroying the ability of the fiber to give a good diffraction pattern.
- 10.5. Remember the screen location with respect to potential asbestiform structure and move the particle so that it is centered on the screen. THIS IS VERY IMPORTANT SO THAT WHEN YOU HAVE FINISHED LOOKING AT THE PARTICLE, YOU CAN GET BACK TO THE PROPER TRAVERSE ORIENTATION AND NOT MISS OR DUPLICATE ANY ASBESTIFORM STRUCTURE ANALYSES.
- 10.6. For most particles, it is quite obvious whether it meets the above criteria. However, in some cases when very short fibers approximately 0.5 μm in length are observed, or when a fiber is close to the 5 to 1 in aspect ratio (i.e. short amphiboles, gypsum), it is necessary to very carefully measure both the length and width of the fibers before proceeding with the analysis.
- 10.7. Use the scribed circles on the TEM viewing screen (At 18,000X the inner circle is 0.5 μm diam. and the outer circle is 5.0 μm) to assess whether the particle meets the above criteria. Save time, effort and accuracy by measuring questionable asbestos structures first rather than doing a detailed selected area diffraction and EDX analysis only to then measure the particle and find out it doesn't qualify as an asbestos structure.
- 10.8. Asbestiform Structure Classifications:
As much as possible, break down structures into their fiber and bundle components. Only count clusters if they are truly too dense to break out the fibers. For matrix structures, only count the visible fiber aspects (AHERA), or length through the entire matrix (ISO).
- 10.8.1. AHERA-type classification structure
- 10.8.1.1. Asbestiform structures are classified into one of the four following categories
- 10.8.1.2. **Fiber (F):** asbestiform structure with one of the following descriptions:
- 10.8.1.2.1. each that stands alone as an individual **Fiber**.
- 10.8.1.2.2. particle volume is defined as $L*W*W$.
- 10.8.1.3. **Bundle (B):** asbestiform structure having all the following characteristics:
- 10.8.1.3.1. Two or more recognized **Fibers**.
- 10.8.1.3.2. **Fibers** that are oriented parallel to each other.
- 10.8.1.3.3. particle volume is defined as $L*W*W$.
- 10.8.1.4. **Cluster (C):** asbestiform structure having:
- 10.8.1.4.1. Three or more recognized **Fibers**
- 10.8.1.4.2. Three or more **Fiber** intersections (fibers not parallel, but overlapping)
- 10.8.1.4.3. If a cluster is recognized and one or more **Fibers** or **Bundles** are seen separated from the cluster by >1 fiber diameter, count these **Fibers** as individual **Fibers** and/or **Bundles** and determine the particle volumes as described above.



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- 10.8.1.5. **Matrix (M):** asbestiform structure having:
 - 10.8.1.5.1. A recognized asbestiform structure, or structures, with one end embedded in to a clot of material, i.e. with the protruding end having the three qualities of an asbestiform structure.
 - 10.8.1.5.2. Count protruding **Fibers/Bundle** as individual **Fibers** and/or **Bundles** and determine the particle volumes as described above.
- 10.8.1.6. For mixed structures, go by the dominant fiber quality.
- 10.8.2. Make a notation on the count sheet regarding:
 - 10.8.2.1. The Structure Number - each structure found is given a unique sequential number starting at one
 - 10.8.2.2. The Type of Structure - Fiber, Bundle, Cluster or Matrix as indicated according to the Asbestiform Structure Classifications in Section IV. below.
 - 10.8.2.3. Measure Structure Length and Width and note these dimensions in the appropriate column on count sheet.
- 10.8.3. ISO-type classification structure
 - 10.8.3.1. Asbestiform structures are classified into one of the four following categories
 - 10.8.3.2. **Fiber (F):** asbestiform structure with one of the following descriptions:
 - 10.8.3.2.1. each that stands alone as an individual **Fiber**.
 - 10.8.3.3. **Bundle (B):** asbestiform structure having all the following characteristics:
 - 10.8.3.3.1. Two or more recognized **Fibers**.
 - 10.8.3.3.2. **Fibers** that are oriented parallel to each other.
 - 10.8.3.4. **Cluster (CD):** asbestiform structure having:
 - 10.8.3.4.1. Three or more recognized **Fibers**
 - 10.8.3.4.2. Three or more **Fiber** intersections (fibers not parallel, but overlapping)
 - 10.8.3.4.3. If a cluster disperse is recognized and one or more **Fibers** or **Bundles** are seen separated from the cluster by >1 fiber diameter, count these **Fibers** as individual **Fibers** and/or **Bundles** and determine the particle volumes as described above.
 - 10.8.3.5. **Cluster (CC):** asbestiform structure having:
 - 10.8.3.5.1. Many **Fibers** which cannot be separated



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- 10.8.3.6. **Matrix (MD):** asbestiform structure having:
- 10.8.3.6.1. a recognized asbestiform structure, or structures, with one end embedded in to a clot of material, i.e. with the protruding end having the three qualities of an asbestiform structure.
 - 10.8.3.6.2. Count protruding **Fibers/Bundle** as individual **Fibers** and/or **Bundles** and determine the particle volumes as described above
- 10.8.3.7. **Matrix (MC):** asbestiform structure having:
- 10.8.3.7.1. Count protruding **Fibers/Bundle** as individual **Fibers** and/or **Bundles** and determine the particle volumes as described above
- 10.8.3.8. For mixed structures, go by the dominant fiber quality.
- 10.8.4. Make a notation on the count sheet regarding:
- 10.8.4.1. The Structure Number - each structure found is given a unique sequential number starting at one
 - 10.8.4.2. The Type of Structure - Fiber, Bundle, Cluster or Matrix as indicated according to the Asbestiform Structure Classifications in Section IV. below.
 - 10.8.4.3. Measure Structure Length and Width and note these dimensions in the appropriate column on count sheet.
- 10.8.5. Perform a preliminary particle ID by viewing the morphology of the fiber - make a notation on the count sheet of your findings, if questionable, put in a question mark. It is often helpful to use the binocular microscope attachment to look closely at the fiber to look for fine scale detail.
- 10.8.5.1. Chrysotile asbestos - commonly has distinctive, though not entirely unique, central tubular canals. Single fibrils occur quite commonly with fiber widths of 0.1 to 0.05 μm in diameter, and with aspect ratios of 20 to 1 or greater.
 - 10.8.5.2. Amphibole asbestos - typically much thicker in diameter (0.2 to 0.5 μm) than chrysotile and also typically exhibits 20 to 1 or greater aspect ratios. It also commonly exhibits irregular, dark, criss-crossing thickness fringes cutting across the fiber. Twinning may also be observed.
 - 10.8.5.3. Gypsum - commonly of marginal aspect ratio, exhibits unusual parallel cleavage striations, has pinacoidal terminations as opposed to square terminations seen in amphiboles, and commonly has a desiccated anhydrite fringe.
 - 10.8.5.4. Fiberglass - often appears similar to amphibole asbestos, but without thickness fringes. One quick trick that can be used to tell if a fiber is crystalline (fiberglass is not), is to watch the structure for dark and light flashes as the crystal is tilted with the goniometer stage when the objective aperture is in).



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- 10.8.5.5. Organic structures - Commonly have irregular borders and distort severely under the electron beam.
- 10.8.5.6. Tubular clay minerals (i.e. Halloysite) - can appear similar to chrysotile and exhibit a tubular morphology. However, these materials are typically irregular tubes with portions of the tube structure severely disrupted. They also commonly exhibit lower contrast in the viewing mode.

10.9. Fiber Identification Rules

- 10.9.1.1. After classifying an asbestiform structure as described above, it is necessary to identify the structure to determine whether it is actually asbestos and, if so, what type of asbestos it is. If the asbestiform structure is asbestos, then it is called an asbestos structure, these two structures are not to be confused. An asbestiform structure is only potentially asbestos, an asbestos structure has been proven to be asbestos. Put down any unusual or notable observations about the observed fiber(s) in the comments section of the count sheet.
- 10.9.1.2. Until the concentration of asbestiform structures found exceeds 0.010 fibers/cc, asbestos structures are classified into the following categories by the criteria listed below:
 - 10.9.1.2.1. **Chrysotile** - positive visual ID of SAED pattern for each is REQUIRED, though EDX is allowed if other chrysotile fibers with SAED patterns are seen in the sample.
 - 10.9.1.2.2. **Amphibole** - positive visual ID of SAED pattern and confirmation by EDX spectral analysis REQUIRED
 - 10.9.1.2.3. **Non-Asbestos** - positive visual ID of SAED pattern as Non-Asbestos.
- 10.9.1.3. After 4 fibers have been counted, depending on instructions from client, a lower level of fiber ID may be used:
 - 10.9.1.3.1. **Chrysotile** - May be identified by either:
 - 10.9.1.3.1.1. Visual identification of SAED pattern alone.
 - 10.9.1.3.1.2. EDX spectral analysis alone.
 - 10.9.1.3.2. **Amphibole** - May be identified by either:
 - 10.9.1.3.2.1. Visual identification of SAED pattern alone.
 - 10.9.1.3.2.2. EDX spectral analysis alone.
 - 10.9.1.3.3. **Non-Asbestos** - Ambiguous or unidentifiable SAED patterns which also exhibit ambiguous or asbestos SAED spectra.
 - 10.9.1.3.3.1. (Must classify by EDX spectral analysis as **Non-Asbestos** if spectrum uncharacteristic of asbestos. If indicated as asbestos by EDX analysis, may classify as **Chrysotile** or **Amphibole**).



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10.10. Analysis of Electron Diffraction Patterns

10.10.1. To obtain a diffraction pattern of an asbestiform structure, refer to the standard procedures outlined in the TEM/EDX Operating Procedures Manual, Section VII.

10.10.2. Observe the diffraction pattern with a short camera length first, then go to the standard diffraction pattern measurement & photographic position and classify as outlined below (If a detailed quantitative analysis of a diffraction pattern is required, take a photograph and perform diffraction pattern indexing as described in Appendix E - Diffraction Pattern Indexing and Mineral Identification). Place a check mark in the appropriate column on the count sheet as to your findings upon completion of diffraction pattern analysis.

10.10.2.1. **Chrysotile** - When taking a diffraction pattern of chrysotile, make sure the goniometer tilt is at 0 degrees. If fiber is tilted, inter-layer distance measurements will not be accurate. The chrysotile asbestos pattern has characteristic streaks on the layer lines other than the central line and some streaking also on the central line. There will be spots of normal sharpness on the central layer line and on alternate lines (2nd, 4th, etc.). The repeat distance between layer lines is 0.53 nm and the center doublet is at 0.73 nm. The pattern should display (002), (110), (130) spots: distances and geometry should match a chrysotile pattern.

10.10.2.1.1. Semi-quantitative analysis of the inter-layer line distances shall be attempted by increasing the diffraction camera length to the standard diffraction pattern measurement setting (projector lens free control =16) such that the small scribed circle on the main viewing screen is 1.06 nm (twice the inter-layer spacing). The diffraction pattern may be adjusted to ensure that the main beam falls in the center of the small scribed circle. The edge of this circle allows measurement of the inter-layer row spacing on both sides of the beam.

10.10.2.2. **Amphibole Group** - Identification of amphibole asbestos is best performed by obtaining a zone axis diffraction pattern of the structure with the fiber c-axis (long axis) approximately perpendicular to the electron beam (For more information on how to obtain and index an amphibole asbestos diffraction pattern, see Appendix E - Diffraction Pattern Indexing and Mineral Identification). Amphibole asbestos fiber patterns typically show layer lines of very closely spaced dots caused by twinning and the common presence of numerous sub-fibers within a fiber. The repeat distance between layer lines is about 0.53 nm when the amphibole crystal is oriented with the c-axis perpendicular to the beam. Streaking in layer lines is occasionally present due to other crystal structure defects. Semi-quantitative analysis of the inter-layer lines,



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which are the same as those in chrysotile, are measured as described above. Diffraction pattern indexing of an SAED pattern of amphibole fibers is required for identification confirmation of at least the first amphibole structure, if possible within a sample

10.10.2.3. **Non-Asbestos** - Asbestiform structure diffraction patterns that are obviously non-asbestos. Asbestiform structures most commonly encountered include:

10.10.2.3.1.1. Gypsum - Diffraction pattern typically exhibits a high degree of symmetry (it is orthorhombic), has streaky line that might be mistaken for chrysotile, however, the inter-layer line spacing is different. Often appears to have alternating bright and dim streaky rows.

10.10.2.3.1.2. Tubular Clay Minerals (Halloysite) - Diffraction pattern, if visible, is usually weak, only revealing the spots closest to the central beam. These spots are usually arranged in a hexagonal arrangement.

10.10.2.3.1.3. Sepiolite, Attapulgite, Palygorskite - Diffraction patterns are very similar and can very easily be mistaken for chrysotile. The patterns exhibit inter-layer row spacings of 0.53 nm, the same as chrysotile, and the patterns are commonly streaked. However, the pattern of spots, when observed closely, is in roughly hexagonal, very unlike chrysotile. To see this difference, the operator must look closely at the outer layer lines (2nd, 3rd, & 4th).

10.10.2.3.1.4. Other Unknown Minerals - Diffraction patterns, if obtainable, do not exhibit asbestos-like patterns.

10.11. Collect Photographs

10.11.1. Photograph at least one SAED pattern, if possible, of each type of asbestos in each sample, and have patterns checked by the manager. Note photomicrograph number and magnification setting. Note only the number on the count sheet.

10.11.2. Depending on needs of the client, take one or more photographs of asbestos fibers/structures observed. Note photomicrograph number and magnification setting.

10.12. EDX Analysis

10.12.1. EDX analysis is of great use in asbestos analysis. It is often useful to obtain EDX spectra of chrysotile fibers to provide more complete documentation. Also, it is recommended that all Non-Asbestos Structures, and Negative ID Designated structures be confirmed by EDX analysis up until the point that the remaining such structures are below the 0.010 structures/cc limit. (See Appendix F - "Interpretation of EDX Spectra" for more details on EDX analysis).



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10.12.1.1. To obtain an EDX spectra of the asbestiform structure, follow the procedures described in the TEM/EDX Operators Manual.

10.12.1.2. Positive EDXA identification of an asbestiform structure as asbestos consists of semi-quantitative analysis of the spectra by normalizing all peak heights to Silicon which is arbitrarily given a value of ten. Results of the analysis should give the following combinations of peak heights for asbestos minerals. Some compositional solid solution may alter these values somewhat and introduce minor amounts of other chemical components, i.e. Al (Background peaks from the TEM grid and sample holder (Cu, Cr, & Zn) are ignored:

	Na	Mg	Si	Ca	Fe
10.12.1.2.1.					
10.12.1.2.2.	chrys 0	5-10	10	0	0
10.12.1.2.3.	trem 0	3-4	10	2-3	<1
10.12.1.2.4.	croc 1-2	1-2	10	0	5-6
10.12.1.2.5.	anth 0	2-4	10	0	1
10.12.1.2.6.	amos 0	1-5	10	0	7-8

10.12.1.2.7. Numerous other amphiboles can be identified in this manner. Please see Appendix F for details.

10.12.1.3. These estimated relative peak height values are written into the appropriate columns on the count sheet, as well as the indicated fiber identity, if possible. Use of K-factor corrections, as discussed in Appendix F, can also be helpful in determining chemical composition.

10.12.1.4. Record each spectra on computer disk*, identifying it by the laboratory sample #, the Structure #, and a notation as to Fiber Identification, if possible.

10.12.1.4.1. *If many structures of the same type are found on a sample, save only the first four spectra of each type.

10.12.1.5. Print out hard copies of at least one EDX spectrum of each type of asbestos fiber (chrysotile or amphibole) or one of the dominant type of non-asbestos fibers.

10.13. Data Integration

10.13.1. It is now important to integrate the data obtained above to make a determination whether the asbestiform structure is asbestos or not. Also, if the asbestiform structure exhibits a chrysotile morphology, has no discernible diffraction pattern, and at least four (4) other chrysotile fibers have been identified by SAED, circle the check mark in the ambiguous column and place a check mark in the Chrysotile Column.

10.14. Analysis of the asbestiform structure is now complete and should be classified in one of the four categories discussed above.

10.15. Continue traverse until the grid opening is completed.



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- 10.16. If the total number of grid openings in section 9. above have been completed, continue on to section 11. below.
- 10.17. If the total number of grid openings 9. above have not been completed, return to section 10. Above and repeat until the requisite number of grid openings on the TEM grid have been analyzed and analysis has been completed.
- 10.18. Remove sample when done.
- 10.19. Continue onto second grid of sample if you have not already done so.

11. Data Reduction & Report Generation

11.1. Compile Data

- 11.1.1. Review Count Sheet to insure it is completely filled out.
- 11.1.2. Sign and date all pages of report.
- 11.1.3. Total fibers on each page. Calculate the totals for the analysis.
- 11.1.4. Asbestos mass concentration calculation (if required)

11.1.4.1. Calculate the mass of each asbestos structure found on the sample using the following formulas

11.1.4.1.1. For chrysotile fibers and bundles, assume the structure is cylindrical:

$$\text{Mass} = \text{Length} * \pi * (\text{Width}/2)^2 * \text{Fiber Density}$$

11.1.4.1.2. For amphibole fibers and bundles, assume the structure is a parallelepiped with the widths in two dimensions and equal (all angles are orthogonal):

$$\text{Mass} = \text{Length} * \text{Width} * \text{Width} * \text{Fiber Density}$$

11.1.4.2. Single Level Analysis calculation

11.1.4.2.1. Sum the masses of all the fibers

11.1.4.2.2. Calculate the asbestos mass concentration in Weight% by using the following formula:

$$\text{Asbestos Weight \%} = \frac{\sum \text{Fiber Masses} * \text{Total Solution Volume} * \text{Filter Area}}{\text{Volume Filtered} * \text{Area Analyzed} * \text{Total Mass Suspended in Solution}}$$

11.1.4.3. Tiered Analysis calculation

11.1.4.3.1. Large fiber/Low Mag Analysis

11.1.4.3.1.1. Sum the masses of all the large fibers

11.1.4.3.1.2. Calculate the asbestos mass concentration in Weight% by using the following formula: Asbestos Weight % (Large Fibers) =

$$\frac{\sum \text{Large Fiber Masses} * \text{Total Solution Volume} * \text{Filter Area}}{\text{Volume Filtered} * \text{Area Analyzed (Large Fibers)} * \text{Total Mass Suspended in Solution}}$$

11.1.4.3.2. Small fiber/High Mag Analysis

11.1.4.3.2.1. Sum the masses of all the small fibers



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11.1.4.3.2.2. Calculate the asbestos mass concentration in Weight% by using the following formula: Asbestos Weight % (Small Fibers) %=

$$\frac{\sum \text{Small Fiber Masses} * \text{Total Solution Volume} * \text{Filter Area}}{\text{Volume Filtered} * \text{Area Analyzed (Small Fibers)} * \text{Total Mass Suspended in Solution}}$$

11.1.4.3.3. Total Weight % asbestos is obtained by summing the Large and Small Fiber Masses: Total Asbestos Weight % =

$$\text{Asbestos Weight \% (Large Fibers) \%} + \text{Asbestos Weight \% (Small Fibers) \%}$$

11.1.5. Asbestos fiber/structure concentration calculation (if required)

11.1.5.1. Single Level Analysis Calculation

11.1.5.1.1. Calculate the asbestos fiber/structure concentration in fibers/structure per gram by using the following formula: Asbestos Conc. (F/S per gram) =

$$\frac{\text{Total Fiber/structures Counted} * \text{Total Solution Volume} * \text{Filter Area}}{\text{Volume Filtered} * \text{Area Analyzed} * \text{Total Mass of Sample Suspended in Solution}}$$

11.1.5.2. Tiered Analysis Calculation

11.1.5.2.1. Calculate the large asbestos fiber/structure concentration in fibers/structure per gram using the following formula: Asbestos Conc. (F/S per gram) [Large Fibers]=

$$\frac{\text{Large Fiber/structures Counted} * \text{Total Solution Volume} * \text{Filter Area}}{\text{Volume Filtered} * \text{Area Analyzed (Large Fibers)} * \text{Total Mass of Sample Suspended}}$$

11.1.5.2.2. Calculate the small asbestos fiber/structure concentration in fibers/structure per gram by using the following formula: Asbestos Conc. (F/S per gram) [Small Fibers]=

$$\frac{\text{Small Fiber/structures Counted} * \text{Total Solution Volume} * \text{Filter Area}}{\text{Volume Filtered} * \text{Area Analyzed (Small Fibers)} * \text{Total Mass of Sample Suspended}}$$

11.1.5.2.3. Total Asbestos Concentration is obtained by summing the Large and Small Fiber Concentrations (F/S per gram): Total Asbestos Conc. (F/S per gram) =

$$\text{Asbestos Conc. (F/S per gram) [Large Fibers]} + \text{Asbestos Conc. (F/S per gram) [Small Fibers]}$$

11.2. Generate Report

11.2.1.1. Enter or confirm the following data in the SuperBase LabManager sample data entry screen (see Appendix G, "TEM Asbestos Analysis Calculation Formulas"):

11.2.1.1.1. Client name and contact person

11.2.1.1.2. Job site from which sample was taken

11.2.1.1.3. Date report generated

11.2.1.1.4. Date sample received

11.2.1.1.5. Total samples analyzed

11.2.1.1.6. Client sample number

11.2.1.1.7. Laboratory sample number

11.2.1.1.8. Sample location/description

11.2.1.1.9. Weighing, filtration, and fiber data as required by the method used



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- 11.2.1.2. Generate the report to be delivered to the client (See Appendix J, "Sample TEM Analytical Report"). Review the data before delivering the report.
- 11.2.1.3. Prepare a cover sheet for the analytical summary sheets that includes the following data (See Appendix I - Sample TEM Bulk Material Analytical Report, and Appendix G - TEM Asbestos Analysis Calculation Formulas):
 - 11.2.1.3.1.1. Date report generated
 - 11.2.1.3.1.2. Client name and contact person
 - 11.2.1.3.1.3. Job site from which sample was taken
 - 11.2.1.3.1.4. Client's sample numbers of the analyzed samples
 - 11.2.1.3.1.5. Total samples analyzed
 - 11.2.1.3.1.6. Sampling location/description
 - 11.2.1.3.1.7. Analytical Results as:
 - 11.2.1.3.1.7.1. Total asbestos fibers counted by type
 - 11.2.1.3.1.7.1.1.1. Concentration of Asbestos in wt.%
 - 11.2.1.3.1.8. Summary of analytical methods used and any deviations from the prescribed methods.

11.3. QA/QC Review

- 11.3.1. Review the report based on the "Report Level" on the Login Report.
 - 11.3.1.1. Level 1 is performed on every report by the analyst/authorized signatory, who then signs the report.
 - 11.3.1.2. Level 2 review is indicated for select clients or projects, and is conducted by both the analyst and laboratory management. Level 2 reports cannot be printed until the reviewer enters his password; the reviewer's signature is then added to the report.

12. Bibliography

- 12.1. The following references are available in the laboratory and are extremely useful as helps in asbestos analysis.
 - 12.1.1. Perkin, R.L. & Harvey, B.W., "EPA/600/R-93/116 Method for the Determination of Asbestos in Bulk Building Materials", EPA, 1993.
 - 12.1.2. 40 CFR Part 763, "Asbestos Containing Materials in Schools; Final Rule and Notice, Appendix A to Subpart E - Interim Transmission Electron Microscopy Analytical Methods -Mandatory and Non-Mandatory - And Mandatory Section to Determine the Completion of Response Actions", EPA, 1987.
 - 12.1.3. Yamate, G. et al, "Methodolgy for the Measurement of Airborne Asbestos by Electron Microscopy", EPA Draft Report, 1984.



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- 12.1.4. Bailey, R.M. and Hu, Meisheng, "Sludge, Crud and Fish Guts: Creative Approaches to Non-Standard Asbestos Water Sample Analysis", ASTM STP 1342, Advances in Environmental Measurement Methods for Asbestos, 1998
- 12.1.5. Thomas, G. & Goring, M.M., "Transmission Electron of Materials", John Wiley & Sons, 1979.
- 12.1.6. Wenk, H.R. et al, "Electron Microscopy in Mineralogy", Springer-Verlag, 1976.
- 12.1.7. Wicks, F.J. & O'Hanley, D.S., "Serpentine Minerals: Structures and Petrology", Reviews in Mineralogy, Mineralogical Society of America, 1988, Chap.5, p.91-167.
- 12.1.8. Gard, J.A., "The Electron Optical Investigation of Clays", Mineralogical Society, London, 1971.
- 12.1.9. Miller, J.L., "Identification of Selected Silicate Minerals and their Asbestiform Varieties by Electron Optical and X-ray Techniques", Norelco Reporter, Dec. 1976, Vol.25, No. 3.
- 12.1.10. Deer, W.A., Howie, R.A., & Zussman, J., "An Introduction to the Rock Forming Minerals", Longman, Hong Kong, 1966.

Revision History

Revision	Date	Revision Notes
1	19 Sep 2005	Format and Wording
2	06 Nov 2008	Add prep forms, fix spelling, sig. block
3	08 Nov 2010	Update
4	21 Apr 2014	Revision to current methods

Approved by:

ATEM President

21 Apr 14

Date

QA Manager

21 Apr 14

Date



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Appendix A: Magnification Calibration
(Refer to SOP# 5-4-2-TEM-01 Appendix A)

Appendix B: Camera Constant Calibration
(Refer to SOP# 5-4-2-TEM-01 Appendix B)

Appendix C: EDX Energy Calibration and Detector Efficiency Checks
(Refer to SOP# 5-4-2-TEM-01 Appendix C)

Appendix D: TEM Spot Size Measurement
(Refer to SOP# 5-4-2-TEM-01 Appendix D)

Appendix E: Diffraction Pattern Indexing & Mineral Identification
(Refer to SOP# 5-4-2-TEM-01 Appendix E)

Appendix F: Interpretation of EDX Spectra
(Refer to SOP# 5-4-2-TEM-01 Appendix F)

Appendix G: TEM Asbestos Analysis Calculation Formulas
(Refer to SOP# 5-4-2-TEM-01 Appendix G)

Appendix H: Sample TEM Bulk Material Count Sheet

Appendix I: Sample TEM Bulk Material Analytical Report

Appendix J: Sample TEM Bulk Material Prep Sheet

Appendix K: Ashing/Weighing Data Sheet



APPENDIX 5
CARB 435 2004



Asbestos TEM Labs, Inc.

Standard Operating Procedure

Polarized Light Microscopy Division

PLM Analysis - CAL ARB 435 Method

Issue Date: 2004/12/16

Revision: 0

SOP#: 5-4-2-PLM-02

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Purpose

To outline the equipment and procedures used by Asbestos TEM Laboratories in the analysis of bulk asbestos by the technique of polarized light microscopy which is based upon the ARB Method 435. This method also relies heavily upon the EPA "Interim Method for the Determination of Asbestos in Bulk Insulation Samples", and the EPA document, "Asbestos-Containing Materials in Schools; Final Rule and Notice", 40 CFR Part 763.

Scope / Field of Application

Serpentine aggregate material or other rock/soil material which is suitable and requested for analysis by a client to use CAL ARB 435 Method.

Serpentine Asbestos in California

The geologic processes that formed the area now covered by the State of California occurred in such a way that a large number of ultra-mafic serpentinite outcrops are present throughout it. In particular, the Coast Ranges and the Sierra Foothills are having an abundance of serpentinite present. So much asbestos is present in the State of California that is the official state rock. In a number of locales, in particular the area near Coalinga, large outcrops of serpentine asbestos (chrysotile) were mined for asbestos which was used in a variety of building and insulation materials.

Unfortunately, voluminous medical evidence has been gathered indicating that exposure to asbestos has the potential to cause cancer in humans. This has led to a widespread effort to document the location, amount, and condition of asbestos-materials in buildings and in the natural environment, where exposure to humans could lead to adverse health effects. It is the purpose of Asbestos TEM Laboratories to assist in this effort to document the presence of asbestos in buildings, soils, and other materials through the application of proven scientific asbestos analytical techniques.

The minerals which have been designated as asbestos by the EPA (Chrysotile serpentine and the amphiboles -amosite, anthophyllite, tremolite, actinolite, and crocidolite) are those minerals which Asbestos TEM Laboratories calls asbestos when found in laboratory samples. Other minerals exist which also have asbestiform habits and similar physical characteristics, but these are not covered by current regulatory requirements and are not considered asbestos, i.e. attapulgite, sepiolite, palygorskite.

Over the past several years the California Air Resources Board has developed a method to control emissions of serpentine asbestos from rock quarries and road-beds which were known to contain serpentine rock and, quite likely, serpentine asbestos. This method, outlined below, is a point counting method which, when applied correctly, should lead to a high degree of confidence as to whether the material being tested contains asbestos.



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Polarized Light Microscopy Division

PLM Analysis - CAL ARB 435 Method

Issue Date: **2004/12/16**

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Analytical Hardware Requirements

- A. Apparatus for Gross Examination
 - 1. Magnifying Lens, 10X
 - 2. Light Source: fluorescent and incandescent lights
 - 3. Hand Tools: tweezers, scalpel, razor blades, probes, etc.
 - 4. Petri Dish: clean glass plate

- B. Apparatus for Sample Preparation
 - 1. Filtered Ventilation System
 - 2. Microscope Slides
 - 3. Cover Slips
 - 4. Disposable Gloves
 - 5. Hand Tools
 - 6. Jaw Crusher
 - 7. Pulverizer
 - 8. Drying Oven

- C. Apparatus for Identification and Quantification
 - 1. Polarized Light Microscope
 - a. Polarizer
 - b. Analyzer
 - c. Port for Wave Retardation Plate
 - d. 360° Graduated Rotating Stage
 - e. Substage Condenser
 - f. Lamp
 - g. Lamp Iris
 - h. Condenser Diaphragm
 - i. Objective Lenses - 4X, 10X, 20X, 40X,
 - j. Dispersion Staining Objective Lens 10X
 - k. Ocular Reticle (10X) w/ Cross Hair
 - l. Retardation Plate - First Order Red, 550 nm

- D. Reagents for Sample Preparation
 - 1. Refractive Index Liquids: 1.490-1.570 and 1.590-1.720 in 0.002 or 0.004 Step Increments
 - 2. Distilled Water
 - 3. Mineral Oil
 - 4. Dilute HCl acid

- E. Analytical Standard Reference Materials



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1. U.C. Berkeley Mineral Collection Reference Standards
2. NIST Asbestos PAT Round Reference Sample Sets

Analytical Procedures

A. Sampling

The collection of bulk material that will be analyzed for asbestos content is beyond the scope of this method. The analyst must assume that the samples were taken according to the prescribed guidelines for sample collection described in the California Air Resources Board Method 435, Section 5. In the case of doubt as to the sampling procedures, the analyst will not proceed with the analysis until the client has been notified and the problem resolved.

B. Chain-of-Custody

Before accepting the sample(s) for analysis the sample coordinator must be sure that proper chain-of-custody procedures have been followed. The documentation is thoroughly reviewed, the samples are checked to see if they are damaged or if any chain-of-custody seals have been broken or tampered with. Also, all paperwork is reviewed to be sure that it is in order and contains the clients name, and signatures of all sample custodians and the date and time at which custody exchanges occurred. If any problems are found, the client is immediately notified and made aware of the situation and that the laboratory can not accept the samples. Only after the samples pass these checks, are the samples accepted by the laboratory and logged in to the computerized Laboratory Information System (LIMS).

C. Data Review and Transcription

Prior to sample analysis, all paperwork sent to the analyst after sample log-in (Covered in the QA/QC Manual) is reviewed by the analyst for accuracy. A sample is then chosen from the sample lot, and all relevant data concerning that sample is transcribed to the PLM Data Sheet (See Appendix A in section 5-4-2-PLM-01) to be used during the analysis. This information includes Laboratory Sample ID#, Client Sample ID#, Job Site, Location, and Description.

D. Initial Sample Preparation

If the submitted samples (minimum 1 pint material) have not been ground to a nominal 200-mesh particle size, and are in gross bulk form, it is necessary for the analyst to reduce the material to the correct grain size. First, check to be sure the material is dry. If not, place in a drying oven at 350 degrees F and dry overnight. Then, set up the jaw crusher in the HEPA hood, and crush the sample material to approximately 1/8" size fragments. Be careful to thoroughly clean the crusher between samples with a brush and alcohol. Also, be mindful not to jam the jaw crusher as you can burn up the motor if you are not careful.



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After crushing the material, the sample must be pulverized in the pulverizer to a nominal 200-mesh grain size (A nominal 200-mesh grain size is defined as a material that, when sieved with a Standard 200-mesh testing sieve, greater than 50% of the material passes through the screen). Set up the pulverizer in the HEPA hood and thoroughly clean the ceramic pulverizer plates and surrounding interior casing. Place the special plastic bags over the sample exit slot and fasten with a rubber band. Secure the removable facing, and dial in the pulverizer until a fairly stiff resistance is met. If the material is quite soft, as is the case with many serpentinites, the sample can be run in one pass. However, if the sample contains material such as included chert, grey-wacke, or other hard material, two passes are required. In this case, back off the pressure on the plates to allow a sand sized flow of particulate out of the unit, and then re-run at a tighter setting. Be careful not to over tighten the unit as the unit will then shatter the ceramic plates or burn up the motor. Check a portion of the sample to insure that the bulk of the material will pass through a 200-mesh sieve. Be sure to meticulously clean the unit between samples to prohibit the possibility of cross contamination. Also, between samples, flip the switch on the back of the unit to reverse the plate rotation direction to maximize pulverizer plate life.

After finishing the crushing and grinding, thoroughly clean the machines and the HEPA bench area as the work surfaces get very dusty and potentially covered with hazardous asbestos.

E. Gross Examination

Samples of serpentine aggregate taken for asbestos identification are first examined for homogeneity and preliminary fiber identification at low magnification with a binocular stereo-zoom microscope. An initial estimate of the gross asbestos concentration is made and recorded on the count sheet. Positive identification of suspect fibers is then made by polarized light microscopy.

Notes are made concerning the following:

- 1.Homogeneity - If sample is heterogeneous, briefly describe the different materials.
- 2.Texture - e.g. fibrous, matted, rubber, clotted, etc.
- 3.Color
- 4.Gross estimated percentage of asbestos.

The distinction between homogeneous and inhomogeneous material is subjective. A sample is considered to be inhomogeneous if discontinuities between material types are visually significant in hand specimen.



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F. Sample Preparation

1. General Cautionary Guidelines

Sample preparation should be carried out within general guidelines with the understanding that each analyst will develop working habits which are suited to him/her. The general guidelines should ensure that the individual's habits promote good workmanship and not detract from the work quality. Any sample preparation style should conform to the following basic rules:

- a. All samples shall be opened within the confines of a filtered ventilation system.
- b. All spills shall be cleaned immediately and the work area cleaned periodically, regardless of the absence of visible debris.
- c. The slides, coverslips and refractive index liquids shall be placed under the fume hood and covered at all times when not in use.
- d. All solutions used for cleaning and analysis should be covered and clearly labeled.
- e. A sealable bag should be used for all debris generated during preparation. This bag should be considered as hazardous waste and should be handled and disposed of as such. The debris bag should remain in hood prior to disposal.
- f. All preparation tools should be kept exceptionally clean. Tools should be wiped thoroughly between sample preparations. Due to constant cleaning of the tools, be aware of cellulose contamination in the samples, especially when using the mortar and pestle.
- g. Refractive index liquids are toxic and should be used with extreme caution. Any spills should be cleaned immediately. All trash generated should be placed in the fume hood debris bag. Skin contamination from the liquids should be cleansed thoroughly. The laboratory equipment, such as the microscopes, tools, telephone and doorknobs, should not be contaminated with soiled hands. The work area should not smell of refractive index liquids. Disposable gloves should be available to the analyst. The index liquid dispenser should be kept clean and free of residue.



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2. Sample Preparation Procedures

With application of the above guidelines, a basic outline for sample preparation is as follows:

- a. After a thorough gross examination of the material (see III.C.) select several homogeneous tweezerfuls of the sample and place a few drops of the desired refractive index liquid on a microscope slide labeled with the laboratory sample ID# and, if necessary, the refractive index of the mounting oil.
- b. Stir, chop or mash the sample, blending the material evenly throughout the liquid. The material should be distributed so that the liquid is not clouded. Light should be capable of passing through all sections of the liquid equally.
- c. Place a coverslip over the sample. Remove the air pockets with applied pressure to the coverslip. The refractive index liquid and the sample should be evenly distributed to the edges of the coverslip.

The analysis of the material on the slide is a representation of the entire homogeneous portion of the material. The relationship between the prepared slide and the submitted sample is known only by the microscopist and should be kept clearly in mind during the analysis. Each microscopist should prepare the slides which he/she intends to analyze. The amount of samples prepared will not exceed the amount in which the analyst can clearly remember, i.e No more than five at a time.

G. Fiber Identification

Fiber identification will be performed utilizing all of the available optical properties. As described in the "Interim Method for the Determination of Asbestos in Bulk Insulation Samples", all materials identified as an asbestiform mineral will be distinguished by the following optical properties (See V. below for detailed description of these properties and how they are measured):

1. Morphology
2. Color
3. Pleochroism
4. Refractive index parallel and perpendicular to the fiber elongation direction
5. Birefringence & interference colors
6. Extinction characteristics
7. Sign of elongation
8. Other properties used to characterize a material



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Natural variations in the conditions under which deposits of asbestiform minerals are formed will occasionally produce exceptions to the published values and differences from the UICC standards.

Personnel utilized for training in asbestos microscopy must have a minimum of a Master's or higher degree in the geological sciences. All data collected by the analyst will be entered onto the designated PLM Data Sheet and the laboratory database system.

H. Quantification of Sample Contents

The quantification of asbestos in bulk material samples will be performed by a point counting technique using a point counting technique. An ocular reticle (Chalkley 25-Point Array) is used to visually superimpose points on the microscope field of view. The microscope slide to be analyzed is positioned into an X-Y sample holder on the microscope stage. A field is chosen at random after checking for proper loading conditions (25%-50% open space). Each point on the Chalkley reticle is checked and counted as outlined below. The point counting rules are as follows.

1. Record the number of points positioned directly above each particle or fiber.
2. Record only one point if two points are positioned over the same particle.
3. Record the number of points positioned on the edge of a particle or fiber.
4. If an asbestos fiber and a matrix particle overlap so that a point is superimposed on their visual intersection, a point is scored for both categories.
5. If a test point lies over an ambiguous structure, no particle or fiber is recorded. Examples of ambiguous structures are:
 - a. fibers whose dispersion colors/refractive indices Becke lines are difficult to see
 - b. structures too small to categorize.
6. A fiber mat or bundle is counted as one fiber.

For the purpose of the method, "asbestos fibers" are defined as mineral fibers having an aspect ratio greater than 3:1 and being positively identified as one of six minerals: chrysotile, crocidolite (reibeckite), amosite (grunerite), tremolite, actinolite, anthophyllite.

After completion of analysis of the field, another random field is chosen, as long as it is not the previous field and has the correct loading level. Analysis of the slide continues until 50 points are counted in at least two fields. Each slide is analyzed for 50 points up to a total of 8 slides. A total of 400 points superimposed on either asbestos fibers or non-asbestos matrix materials must be counted over at least eight different preparations of representative subsamples.

For samples with mixtures of isotropic and anisotropic materials present, viewing the sample with slightly uncrossed polars or the addition of the compensator plate to the polarized light path will allow simultaneous discrimination of both particle types. Quantitation shall be



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performed at 100X magnification. Confirmation of the quantitative results shall be performed by reanalysis of the material by a second analyst as a quality control measure. Results must be within reasonable agreement or a reevaluation of the material must occur. All of the following optical properties shall be determined to positively identify asbestos:

- Morphology (3 to 1 minimum aspect ratio)
- Color and pleochroism
- Refractive indices (Becke Line or Dispersion Staining Methods) both parallel and perpendicular to the fiber axis
- Birefringence
- Extinction characteristics
- Sign of elongation

Exception I

If the sample is suspected of containing no asbestos a visual technique can be used to report that the sample does not contain asbestos. The rules are as follows:

1. Prepare three slide mounts as described above.
2. View 10 fields per preparation. Identify all fibers.
3. If all fibers are non-asbestos, report no asbestos fibers were found and that the visual technique was used.
4. If one fiber is determined to be asbestos, discontinue the visual method and perform the standard point counting technique as described above.

Calculations

The percent asbestos is calculated as follows:

% Asbestos = $(a/n) \times 100\%$ where

a = number of asbestos fiber counts

n = number of non-empty points counted (400)

If a = 0, report "No asbestos detected"

If a > 0, report the calculated value to the nearest 0.25%

If "no asbestos detected" is reported by the point counting technique, the analyst may report the observation of asbestos fibers in the non-counted portions of the sample.

Exception II

If the sample is suspected to have an asbestos content in excess of ten percent, a visual technique can be used to report that the sample contains greater than ten percent asbestos. The standard operating procedure of the visual technique allowed in the National Institute of Standards and Technology's (NIST) National Voluntary Accreditation Program, Bulk Asbestos Handbook, National Institute of Standards and Technology publication number NISTIR 88-3879 (October 1988), shall be followed.



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Data Review/Report Generation

Upon completion of the analysis, the analyst is required to review his material closely for errors, enter the date of analysis on the PLM Data Sheet, and then to sign his/her name to the report. Any deviations from the standard method are described in a statement to be added to the cover letter.

Data to be entered into all ARB Method 435 PLM reports includes, at a minimum, the following:

1. Client name and contact address
2. Date samples submitted
3. Date report completed
4. Total samples submitted
5. Total samples analyzed
6. Client sample ID number for each sample
7. Lab ID number for each sample
8. Total Chrysotile Asbestos Fibers Counted
9. Total Amphibole Asbestos Fibers Counted
10. Total Non-asbestos Fibers and other Non-Fibrous Particles Counted
11. Percentage of asbestos detected in the sample to 0.25%
12. Name of the two major non-asbestos fibrous materials (if two or more present)
13. Description &/or location of sample material (if given by client)
14. Gross Sample Color

After the quantitative results are confirmed by reanalyzing the material by a second analyst, the data is input to the laboratory database system. A draft of the report is completed and this preliminary report is then faxed or verbally reported to the client according to the clients' request on their COC form. The preliminary report is reviewed by a laboratory QC reviewer and if no errors are found, the final report is sent to the client by mail.



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Common Diagnostic Optical Tests and Related Principles Regarding PLM Analysis for Asbestos

Refer to the same section in SOP # 5-04-2-PLM-01 Pages 10 – 21.

Characteristic Optical Properties of the Six Asbestos Minerals

Refer to the same section in SOP # 5-04-2-PLM-01 Pages 23 – 29.

Characteristic Optical, Physical, & Chemical Properties of Common Asbestos Look-Alike Minerals & Materials

D. Silicates

ANTIGORITE

Refractive Indices: $\alpha = 1.558 - 1.567$

$\beta = \simeq 1.566$

$\gamma = 1.562 - 1.574$

Crystal System: Monoclinic

Birefringence: 0.004 - 0.007

Color and pleochroism: Green, green-blue, white. Colorless to pale green in thin section.

Extinction: Parallel

Elongation: Length - slow (+)

Optic Sign: (-); $2V = 37^\circ - 61^\circ$

Chemistry: $Mg_3[Si_2O_5](OH)_4$

Antigorite is a polymorph of the serpentine family of minerals, of which chrysotile is a member. Antigorite can be mistaken for asbestos if the analyst is not careful. Typically, antigorite is not seen in building materials. However, in soil and rock samples, particularly from



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the California coast ranges or foothills which often contain abundant serpentine minerals, it is quite common.

Distinguishing antigorite from chrysotile can best be done on the basis of two criteria, 1) fiber morphology and, 2) refractive index. While antigorite often occurs in a fibrous habit, it is not as well developed as in chrysotile which is often hairlike in form. However, when chrysotile is present in small fiber bundles and does not manifest the fine fibrous morphology, it can be difficult to distinguish between the two. The other technique for differentiating the two minerals is by refractive index. While the two are quite close in refractive index, antigorite is consistently higher than 1.55, whereas chrysotile is equal to or less than 1.55.



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TALC

Refractive Indices: $\alpha = 1.539 - 1.550$

$\beta = 1.589 - 1.594$

$\gamma = 1.589 - 1.600$

Crystal System: Monoclinic

Birefringence: 0.05

Color and pleochroism: Colorless, white, pale green, dark green, brown. Colorless in thin section.

Extinction: Parallel

Elongation: Length - slow (+)

Optic Sign: (-); $2V = 0^\circ - 30^\circ$

Chemistry: $Mg_6[Si_8O_{20}](OH)_4$

Talc is an asbestos look-alike mineral when it occurs in a fibrous morphology, which is not uncommon. Talc is a hydrous magnesium silicate mineral with composition and optical properties which can lead to its misidentification as chrysotile or anthophyllite if care is not taken. However, talc has a variety of features by which it can be uniquely identified. These properties include: 1) Morphology, 2) Refractive Index and, 3) Birefringence.

The morphology of talc can be highly fibrous. However, it usually appears stiffer than chrysotile, and more flexible than amphiboles. The refractive index of talc, can mimic chrysotile or amphibole if the analyst does not look at both the parallel and perpendicular vibration directions. The refractive indices of talc can be identical to chrysotile in the perpendicular direction, and approximately equal to anthophyllite the parallel direction. However, looking at talc in both 1.55 and 1.604 refractive index oil, and by looking at the fibers in both the parallel and perpendicular directions, can lead to its quick and easy identification. The birefringence of talc is typically higher than chrysotile and closer to amphiboles.

Talc, when seen in building materials, is most commonly observed in flooring mastics and glues.



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COMMON HORNBLENDE

Refractive Indices: $\alpha = 1.615 - 1.705$

$\beta = 1.618 - 1.714$

$\gamma = 1.632 - 1.730$

Crystal System: Monoclinic

Birefringence: 0.014 - 0.026

Color and pleochroism: Pale green, green, lt. yellow-brown to brown. Pleochroism variable in greens, yellow-green, bluish-green and brown.

Extinction: Commonly oblique, $13^\circ - 34^\circ$, though may show parallel extinction in certain sections.

Elongation: Length - slow

Optic Sign: (-); $2V = 95^\circ - 27^\circ$

Chemistry: $(\text{Na,K})_{0-1}\text{Ca}_2(\text{Mg,Fe}^{+2},\text{Fe}^{+3},\text{Al})_5$
 $[\text{Si}_{6-7}\text{Al}_{2-1}\text{O}_{22}](\text{OH,F})_2$

Common hornblende and other related non-asbestos amphibole minerals can, on occasion, be difficult to differentiate from asbestiform amphiboles when they occur with aspect ratios of 3:1 or greater. However, usually their aspect ratio is very close to 3:1, unlike the asbestiform amphiboles. The most easily recognizable differences are 1) the stronger pleochroism of the iron rich hornblende varieties, 2) the higher refractive indices of the iron rich varieties. Differentiation of the iron-poor hornblende minerals, if they occur with aspect ratios of $>3:1$, is difficult and best performed through a combination of refractive index tests with consultation of refractive index vs. composition charts found in Deer, Howie & Zussman, as well as notation of the subtle pleochroism differences.



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WOLLASTONITE

Refractive Indices: $\alpha = 1.616 - 1.640$

$\beta = 1.628 - 1.650$

$\gamma = 1.631 - 1.653$

Crystal System: Triclinic

Birefringence: 0.013 - 0.014

Color and pleochroism: Colorless in thin section.

Extinction: Commonly oblique, 39° , though may show parallel extinction in certain sections.

Elongation: Length - slow & Length - fast

Optic Sign: (-); $2V = 95^\circ - 27^\circ$

Chemistry: $\text{Ca}[\text{SiO}_3]$

Wollastonite is not commonly found in building materials, though it is occasionally present. Its morphology, when fibrous, is only weakly asbestiform (near 3:1 aspect ratio) however, on occasion it closely mimics tremolite/actinolite. It is distinguished from the amphibole forms of asbestos by its weaker birefringence, and its variable sign of elongation. To test the variable sign of elongation, view the sample with the retardation plate inserted and under crossed polars, and with a pair of tweezers, push on the coverslip and get the fiber to roll over. If it changes its sign of elongation, it is wollastonite and not tremolite/actinolite.



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QUARTZ

Refractive Indices: $\omega = 1.544$

$\varepsilon = 1.553$

Crystal System: TRIGONAL

Birefringence: 0.009

Color and pleochroism: Colorless in thin section.

Extinction: Irregular to to conchoidal fracture.

Elongation: Not applicable

Optic Sign: (+)

Chemistry: SiO_2

Quartz is commonly found in plasters, cementitious materials, and soils. It has no cleavage and commonly occurs as rounded grains. It is extremely hard and usually impossible to reduce in size. It has low birefringence and very constant refractive indices.



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ALKALI FELDSPARS

Refractive Indices: $\alpha = 1.518 - 1.529$

$\beta = 1.518 - 1.533$

$\gamma = 1.521 - 1.539$

Crystal System: Monoclinic & Triclinic

Birefringence: 0.006 - 0.010 (Low)

Color and pleochroism: Colorless in thin section.

Extinction: Commonly oblique to twinning and exsolution lamellae, though may be parallel in certain sections.

Elongation: Not Applicable

Optic Sign: (+ or -); $2V = 5^\circ - 20^\circ$

Chemistry: (K,Na)[AlSi₃O₈]

Alkali feldspars rarely appear as fibers (though sanidine may). They are generally present in building materials as rounded grains in cementitious materials with quartz. They are commonly distinguished from quartz by the presence of twinning and its lower refractive indices. It is not necessary to differentiate between the alkali and the plagioclase feldspars and the term feldspar may be used.



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PLAGIOCLASE FELDSPARS

Refractive Indices: $\alpha = 1.527 - 1.577$

$\beta = 1.532 - 1.585$

$\gamma = 1.534 - 1.590$

Crystal System: Triclinic

Birefringence: 0.007 - 0.013 (Low)

Color and pleochroism: Colorless in thin section.

Extinction: Commonly oblique to twinning and exsolution lamellae, though may be parallel in certain sections.

Elongation: Not Applicable

Optic Sign: (+ or -); $2V = 45^\circ - 78^\circ$

Chemistry: $\text{Na}[\text{AlSi}_3\text{O}_8] - \text{Ca}[\text{Al}_2\text{Si}_2\text{O}_8]$

Plagioclase feldspars do not appear as fibers. They are generally present in building materials as rounded grains in cementitious materials with quartz. They can commonly be distinguished from quartz by the presence of twinning and their lower refractive indices. It is not necessary to differentiate between the alkali and the plagioclase feldspars and the term feldspar may be used.



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CALCITE

Refractive Indices: $\omega = 1.486 - 1.550$

$\varepsilon = 1.658 - 1.740$

Crystal System: TRIGONAL

Birefringence: 0.172 - 0.190

Color and pleochroism: Colorless in thin section.

Extinction: Symmetrical

Elongation: Not applicable

Optic Sign: (-)

Chemistry: CaCO_3

Calcite is extremely common in building materials and may occur in floor tiles, ceiling tiles, spray-on ceilings, and in plasters and other cementitious materials. It does not occur as fibers, but often as rhombic sections. It is identified by its extremely high birefringence, and the common occurrence of twinning.

The presence of calcite can be easily tested by placing a portion of sample material into a drop of dilute acid, where it will vigorously fizz and dissolve.



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References

Deer, W.A., Howie, R.A., and Zussman, J., 1966, An Introduction to the rock forming minerals: Harlow, Longman, 528 p.

Kerr, P., 1977, Optical mineralogy, 4th ed.: New York, McGraw-Hill.

Mason and Berry, 1968, Elements of mineralogy, 2nd ed.: San Francisco, W.H. Freeman and Co. McCrone, W.C., 1987, Asbestos Identification: Chicago, McCrone Research Institute, 199 p.

National Institute of Standards and Technology, 1994, National Voluntary Laboratory Accreditation Program - Bulk Asbestos Analysis (NIST Handbook 150-3.

National Institute of Standards and Technology, 1988a, National Voluntary Laboratory Accreditation Program - Bulk Asbestos Handbook.

National Institute of Standards and Technology, 1988b, Certificate of Analysis, Standard Reference Material 1866: Bulk Asbestos - Common: Gaithersburg, MD, 5 p.

Skinner, H.C.W., Ross, M., and Frondel, C., 1988, Asbestos and other fibrous materials: New York, Oxford Press, 204 p.

U.S. Environmental Protection Agency, 1979, Asbestos containing materials in school buildings: A guidance document: EPA/OTS #C00090, Part 1.

U.S. Environmental Protection Agency, 1980, Asbestos containing materials in school buildings: Guidance for asbestos analytical programs: EPA #560/13-80-017A.

U.S. Environmental Protection Agency, 1982, Interim method for the determination of asbestos in bulk insulation samples: EPA 600/M4-82-020.

U.S. Environmental Protection Agency, 1985, Simplified sampling scheme for friable surfacing materials: EPA #560/5-85-030a.

U.S. Environmental Protection Agency, 1987, Asbestos-Containing Material in Schools: Final Rule and Notice; 40 CFR; Part 763.

Documentation

The following documents are managed:



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Required Record	Custodian
EPA: Interim Method for the Determination of Asbestos in Bulk Insulation Samples	Laboratory Manager
EPA: Asbestos-Containing Materials in Schools; Final Rule and Notice	Laboratory Manager
EPA: Method for the Determination of Asbestos in Bulk Building Materials	Laboratory Manager
CAL EPA - ARB: Method 435 Determination of Asbestos Content of Serpentine Aggregate	Laboratory Manager

Reference Procedures

SOP # 5-04-2-PLM-01

Revision History

Revision	Date	Revision Notes
1	Dec. 16, 2004	Format and Wording

Approval

Yanxia Xie

Reviewer

12 / 16 / 2004

Date

Yanxia Xie Init: _____

Quality Assurance Manager

12 / 16 / 2004

Date



Asbestos TEM Labs, Inc.

Standard Operating Procedure

Polarized Light Microscopy Division

PLM Analysis - CAL ARB 435 Method

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- APPENDIX -

Crushing & Pulverizing Operations Manual



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Standard Operating Procedure

Polarized Light Microscopy Division

PLM Analysis - CAL ARB 435 Method

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CAL ARB 435

Crushing & Pulverizing Operations Manual

Introduction

Soil and rock samples submitted for CAL ARB 435 analysis must be reduced in particle size such that the material to be analyzed is a 'nominal' 200 mesh particle size – i.e. when sieved with a 200-mesh screen, at least half of the material passes through. This typically requires a crushing & pulverizing procedure as described below.

Large Volume Samples (>1 Pint material)

If samples are large it may be necessary to split the sample into a smaller aliquot. If at all possible, do this before drying as the lab has a limited drying oven space. Sample splitting is best done by crushing the sample, then passing it through a sample splitter. The sample is placed into one tray then poured into the sample splitter which has two receiving trays below it where half the sample goes into each receiving tray. Split the sample until ~ 1 pint of material remains.

Sample Crushing

Asbestos TEM Labs has one small and one large jaw crusher. The large jaw crusher should be used for sample containing rock fragments >3/8" particle size, otherwise the samples can be run through the large pulverizer directly.

Before Crushing:

- Put on safety glasses & hearing protection
- Turn on negative air machine – Check to be sure air flow rate into sample crushing chamber is ≥ 100 ft./min.
- HEPA vacuum & wet wipe crushing jaws & sample receiving trays – Be sure all visible dust is removed from the crushing equipment to minimize possibility of sample contamination
- Connect HEPA vacuum to crusher exhaust port & turn on – This will greatly minimize the dust generated inside the chamber during crushing.
- Turn on crusher (Do not place sample into crusher until after unit is turned on) – Binding of crusher and burnout of the electric motor drive could occur.
- Pour sample into crusher. Do not look into crusher while it is crushing – Sample fragments may be ejected at high speed and could cause serious injury.
- Turn off crusher immediately upon completion of crushing & before retrieving sample. – Usually, only pass through the crusher is needed to adequately crush your sample. If further passes are need, run through again as documented above without re-cleaning.

After Crushing:



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- Clean up your mess.

Sample Drying

It is REQUIRED that all samples be dried in the drying oven for a minimum of 8-12 hours at 110-150°C prior to pulverizing. Failure to do so will result in the pulverizer becoming clogged and your sample reduced to a mud ball.

Sample Pulverizing

Asbestos TEM Laboratories has two sample pulverizers: a large one and a small one. In almost all cases, except where the sample size is very small, use the large pulverizer.

Before Pulverizing:

- Put on safety glasses & hearing protection
- Turn on negative air machine – Check to be sure air flow rate into sample crushing chamber is ≥ 100 ft./min.
- HEPA vacuum & wet wipe pulverizer plates & sample receiving trays – Be sure all visible dust is removed from the pulverizing equipment to minimize possibility of sample contamination.
- Connect HEPA vacuum to pulverizer exhaust port & turn on – This will greatly minimize the dust generated inside the chamber during pulverizing.
- Close up pulverizer and be sure left immovable plate is locked in place.
- Check pulverizer plates are not bound – You should be able to just rotate the pulverizer shaft by hand before turning on.
- Turn on pulverizer (Do not place sample into crusher until after unit is turned on) – Binding of pulverizer and burnout of the electric motor drive could occur.
- Pour sample into pulverizer – Adjust sample particle size output by tightening or releasing the plate tension using the right dial screw at end of pulverizer shaft.
- Turn off pulverizer immediately upon completion of pulverizing & before retrieving sample – Typically, three passes through the pulverizer are necessary to crush your sample to the required ‘nominal’ 200-mesh particle size. If the starting material is a clay or sand, fewer passes are needed. If the starting material is particularly hard, more may be needed. If further passes are needed, run through again as documented above without re-cleaning.

After Crushing:

- Clean up your mess.

Retrieving Samples From Crusher/Pulverizer Containment & Turning Off Negative Air & HEPA



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Vacuums

Be sure to place all samples into sealed containers before retrieving them from the negative air containment. Turn off negative air machine and HEPA vacuum only when you are completely done.



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Quality Assurance Manual

This Quality Assurance Manual follows the requirements of ISO 17025, AIHA-LAP, LLC Policy Documents, and NIST Handbook 150. This QA Manual is confidential.

Asbestos TEM Laboratories, Inc. (ATEM)
Quality Policy

It is the policy of Asbestos TEM Laboratories, Inc. to insure quality work through experienced analysts by following international standard ISO 17025:2005 testing guidelines, and providing accurate and timely services; and by ATEM Managements dedication to continuous improvement, to meet or exceed the expectations of our clients, in day-to-day-interactions.

R. Mark Bailey
President ATEM

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Introduction

Purpose

This Quality Assurance Manual contains all the requirements that our laboratory uses to demonstrate our quality system, technical competence, and valid results.

Section 4 specifies how we demonstrate sound management and maintain client satisfaction.

Section 5 specifies how we demonstrate technical competence in our laboratory.

In addition, this QA Manual outlines how we meet:

- Ø ISO 17025-2005 Requirements
- Ø AIHA-LAP, LLC Policy Documents Requirements
- Ø NVLAP Handbook 150 Requirements

All personnel are to take an active role in establishing, implementing, maintaining and constantly improving our quality management program. We do not separate quality from our daily business. Quality cannot be something that we do just to pass audits. Quality is involved in every facet of the decision-making process in the management of our laboratory and the science that we practice.

Distribution List

The Quality Assurance Manager maintains a distribution list for this Quality Assurance Manual.



1. Scope

This Quality Assurance Manual facilitates:

- Ø recognition of technical competence for standardized methods, non-routine methods, and laboratory-developed methods we perform
- Ø inspection and product certification capabilities and/or services we provide
- Ø total quality for our administrative and technical systems
- Ø audits by clients, regulatory authorities and accreditation bodies
- Ø meeting the requirements of ISO 17025, AIHA-LAP, LLC Policy Documents and NVLAP Handbook 150
- Ø client satisfaction

2. Normative References

Reference List

ISO 17025:2005 – General Requirements for the Competence of Testing and Calibration Laboratories. 28 pages

AIHA-LAP, LLC Policy Documents, 2010 Revision

NIST Handbook 150: Procedure and General Requirements. 2006 Edition, 65 pages (February 2006), CODEN: NIHAE2.

NIST Handbook 150-3: Bulk Asbestos Analysis. 2006 Edition, 65 pages (February 2006), CODEN: NIHAE2.

NIST Handbook 150-13: Airborne Asbestos Analysis. 2006 Edition, 65 pages (February 2006), CODEN: NIHAE2.

NIST Special publication 260-100: Handbook for SRM Users, 1993, 120 pages, CODEN: NSPUE2

NIST Technical Note 1297: Guidance for Evaluating and Expressing the Uncertainty for NIST Measurement Results, 1994 Edition, 20 pages. CODEN: NTNOEF

Cross-references

This manual is numerically aligned with the international standard ISO 17025 and NVLAP Handbook 150. It is expected that this will prove useful during accreditation audits and expedite the process.



For ease of use, each section starts with a brief summation of what the section addresses and a listing of the quality terminology and key words.

3. Terms and Definitions

For the purposes of this manual, the following relevant definitions apply: AIHA-LAP, LLC Module 9 and NIST Handbook 150.

Accreditation – formal recognition of a laboratory by an independent science-based organization that the laboratory is competent to perform specific tests.

Accuracy – the closeness of agreement between a test result and the accepted reference value

Calibration - a set of operations that establish, under specified conditions, the relationship between values of quantities indicated by a measuring instrument or measuring system or values represented by a material measure or a reference material, and the corresponding values realized by the standard.

Notes

1. The result of a calibration permits either the assignment of values or measurands to the indications or the determination of corrections with respect to indications.
2. A calibration may also determine other metrological properties such as the effect of influence quantities.
3. The result of a calibration may be recorded in a document sometimes called a calibration certificate or a calibration report.

Certification - procedure by which a third party gives written assurance that a product, process, or service conforms to specified requirements.

Certified Reference Material – a reference material, one or more of, whose property values are certified by a technically valid procedure, accompanied by or traceable to a certificate or other documentation which is issued by a certifying body.

Client – an entity (customer, agency, company, person, etc.) that receives a test result done according to specified requirements.

Competence – ability consisting of theoretical knowledge, practical skills, and attitudes.

Corrective Action – action taken to eliminate the causes of an existing nonconformity, defect, or other undesirable situation in order to prevent recurrence.

Holding Time – elapsed time between sample collection and either sample preparation or analyses, as appropriate.

Inspection - evaluation for conformity by measuring, observing, testing, or gauging the relevant characteristics (ISO/IEC Guide 2). Activity such as measuring, examining, testing or gauging one or more characteristics of an entity and comparing the results with specified requirements in order to establish whether conformity is achieved for each characteristic.



Inter-laboratory comparison – organization, performance and evaluation of tests on the same or similar items or materials by two or more laboratories in accordance with predetermined conditions.

Limit of Detection – the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero and is determined from the analysis of a sample in a given matrix containing the analyte. The mean value of the matrix blank readings plus 3 standard deviations of the mean, expressed in analyte concentration. For methods with less than 100% recovery the limit of detection should be corrected for recovery.

Limit of Quantification – lowest concentration of analyte that can be determined with an acceptable level of accuracy and precision. Determined by actual analysis of at least 6 fortified test samples per matrix. It is not determined by extrapolation.

Linearity – is determined by the analysis of samples with analyte concentrations spanning the claimed range of the method. The results are used to calculate a regression line against analyte calculation using the least squares method. It is convenient if a method is linear over a particular range but it is not an absolute requirement. Where linearity is unattainable for a particular procedure, a suitable algorithm for calculations should be determined.

Management system – system to establish policy and objectives and to achieve those objectives.

Nonconformity – noncompliance with any quality assurance policy, procedure, or specification. Nonconforming work result from an analysis event in which QC results are not within acceptance limits and/or method specifications are not met.

Precision – the closeness of agreement between repeated test results obtained under stipulated conditions; repeatability.

Preventive Action – action taken to eliminate the causes of a potential nonconformity, defect, or other undesirable situation in order to prevent occurrence.

Proficiency Testing – A measurement used to determine the degree to which an individual has mastered a particular skill.

Quality Assurance – all those planned and systematic actions necessary to provide adequate confidence that a product or service will satisfy given requirements for quality.

Quality Control – the operational techniques and activities that are used to fulfill requirements for quality.

Quality Manual – a document stating the quality policy, quality system, and quality practices of an organization.

Quality System – the organizational structure, responsibilities, procedures, processes, and resources for implementing quality management.



Range – the difference between the largest and smallest observed value of a quantitative characteristic. For quantitative analysis the working range for a method is determined by examining samples with different analyte concentrations and determining the concentration range for which acceptable accuracy and precision can be achieved. The working range is generally more extensive than the linear range. The working range is determined by the analysis of a number of samples of varying analyte concentrations and calculating the regression from the results, usually using the method of least squares. The relationship of analyte response to concentration does not have to be perfectly linear for a method to be effective.

Reference Material – a material or substance one or more properties of which are sufficiently well established to be used for the calibration of an apparatus, the assessment of a measurement method, or for assigning values to materials.

Reference Standard – a standard, generally of the highest metrological quality available at a given location, from which measurements made at that location are derived (VIM). Generally, this refers to national traceable standards such as those from the National Institute of Standards and Technology.

Repeatability (r) – precision under the *same conditions* (same method, same test item, same operator, same apparatus, same laboratory, short interval of time).

Reproducibility (R) – precision using the *same method* on identical items obtained by operators in different laboratories using different equipment.

Ruggedness – the ruggedness of a method is tested by deliberately introducing small changes to the method and examining the consequences. A large number of factors may need to be considered, but because most of these will have a negligible effect, it will normally be possible to vary several at once.

Selectivity – the extent that a specific analyte can be determined from a complex mixture without interference from the other components in the mixture. A method that is perfectly selective for an analyte or group of analytes is said to be specific. The applicability of the method should be studied using various samples, ranging from pure standards to mixtures with complex matrices. In each case the recovery of the analyte(s) of interest should be determined and the influences of suspected interference duly stated. Any restrictions in the applicability of the technique should be documented in the method.

Sensitivity – the difference in analyte concentration corresponding to the smallest difference in the response of the method that can be detected. It is represented by the slope of the calibration curve and can be determined by a least squares procedure, or experimentally, using samples containing various concentrations of the analyte.

Skill – ability to apply knowledge effectively and readily in performance.

Specific – see selectivity.

Standard Operating Procedure – a document that specifies or describes how an activity is to be performed. It may include methods to be used and sequence of operations.



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Test - technical operation that consists of the determination of one or more characteristics of a given product, process, or service according to a specified procedure.

Traceability – the property of a result of a measurement whereby it can be related to appropriate standards, generally international or national standards, through an unbroken chain of comparisons.

Trace Asbestos – Trace asbestos is defined as several asbestos fibers in repeatable microscope slide fields discovered during PLM analysis, which is near the limit of detection (LOD) for the method. The trace amount is reported as < 1% on the report, but the recovery may vary between 0.1% and 0.99%. However, in practicality, the smallest % of asbestos that can be detected is variable depending on the sample type, sample layers, analyst technique, and test method used.

Training – a process to provide and control competence to meet requirements.

Validation - confirmation by examination and provision of objective evidence that the particular requirements for a specific intended use are fulfilled.

Verification - confirmation by examination and provision of objective evidence that specified requirements has been fulfilled.

Uncertainty of Measurements– parameter, associated with result of a measurement, that characterizes the dispersion of the values that could reasonably be attributed to the measurand.

Uncertainty (evaluation of)– There are two types of evaluation of uncertainty. Type A is a method of evaluation of uncertainty by statistical analysis. Type B is a method of evaluation of uncertainty by means other than statistical analysis.



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4 Management Requirements

4.1 Organization

This section tells you our laboratory has:

1. Appointed a Quality Assurance Manager
2. Organized the workforce to achieve quality
3. Provided adequate resources to ensure quality

Key Words

Quality Assurance Manager
Organizational Chart
Authority
Resources
Confidential Information
Proprietary Rights
Responsibilities
Undue Pressure

Cross-references

ISO 17025:2005 Section 4.1
AIHA-LAP, LLC Policy Documents
NVLAP Handbook 150 Section 4.1



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4.1.1 Legal Identification / Registration

Asbestos TEM Laboratories, Incorporated
630 Bancroft Way, Berkeley, CA 94710
Voice: 510-704-8930
Fax: 510-704-8429

4.1.2 Laboratory Requirements

The divisions of Asbestos TEM Laboratories, Inc. have been organized to satisfy the needs of the client and regulatory authorities and to operate to the international standards ISO 17025, AIHA-LAP, LLC Policy Documents, and NVLAP Handbook 150. Asbestos TEM Laboratories, Inc. is composed of the following divisions:

- Ø President's Office
- Ø Administrative Division
- Ø TEM Analysis Division
- Ø PLM Analysis Division
- Ø PCM Analysis Division
- Ø AA Analysis Division

4.1.3 Scope of Management System

The management system covers activities in the laboratory's permanent facility. The fields of activities include the analysis of:

- Ø Air dust samples collected on filters
- Ø Paint chip samples
- Ø Dust wipe samples
- Ø Building material bulk samples
- Ø Soils samples
- Ø Water samples
- Ø Other samples

for the presence of:

- Ø asbestos
- Ø lead

By:

- Ø Transmission Electron Microscopy (TEM)
- Ø Polarized Light Microscopy (PLM)
- Ø Phase Contrast Microscopy (PCM)
- Ø and Atomic Absorption Spectrophotometry (AA)



The laboratory's scope of tests is listed in the Standard Operating Procedures maintained by the Laboratory Manager.

4.1.4 Potential Conflicts of Interest

The laboratory is not part of a larger organization and thus is not subject to conflicts of interest at the organizational level. Employees and management are subject to the guidelines of Section 4.1.5 (B) of this document regarding personal conflicts of interest.

4.1.5 Organization

A) Management and Technical Personnel

Policy:

The laboratory managerial and technical personnel have the necessary authority and resources needed to meet the mandates assigned to their areas irrespective of other responsibilities.

Details:

Responsibilities are detailed in 4.1.5 (F).

Implementation, maintenance and improvement of the management system are the responsibilities of the President.

Departures from the organizational and management policies in this manual can only be approved by the President.

Departures from quality system procedures can only be approved by the Quality Assurance Manager.

Departures from test methods or technical standard operating procedures (SOPs) can only be approved by the Laboratory Manager.

See also section 5.2.

B) Undue Pressure

Policy:

Management and personnel are to be free from any undue internal and external commercial, financial and other pressures that may adversely affect the quality of their work. The integrity of test results is the responsibility of all personnel. Management ensures that employees are never instructed or forced to alter or falsify data.



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Details:

The following list provides some guidelines on how employees avoid conflict of interest situations. Employees shall not:

- Ø falsify records, prepare fraudulent reports, or make false claims
- Ø seek or use privileged or confidential company information, or data from any client, for any purpose beyond the scope of employment
- Ø conduct non-laboratory business on laboratory time, or use company facilities or equipment to conduct outside interests in business, unless prior approval has been obtained
- Ø solicit business on their own behalf (rather than the laboratory) from a client
- Ø be employed by, or affiliated with, organizations whose products or services compete with laboratory products or services
- Ø have employment that negatively affects or interferes with their performance of laboratory duties
- Ø compete with the laboratory in the purchase, sale, or leasing of property or goods
- Ø allow association, family, or friends to influence business decisions to their benefit - decisions must be made on a strictly business basis, always in the best interest of the laboratory
- Ø make any decision that provides gains or benefits to the employee and/or others
- Ø have personal financial dealings with an individual or company that does business with the laboratory which might influence decisions made on the laboratory's behalf

Firm adherence to this code of values forms the foundation of our credibility. Personnel involved in dishonest activities are subject to a range of disciplinary action including dismissal.

Laboratory ethics training shall be required for all ATEM analysts.

C) Client Confidentiality

Policy:

It is the policy of our laboratory to protect the confidential information and proprietary rights of our client including the electronic storage and transmission of results. The procedures are out detailed in Section 4.13 Control of Records.

Details and Procedures:

All employees shall sign an Employee Confidentiality Agreement (see Figure 4.1.5). The signed agreement is retained in each employee's Human Resources file. All employees have read and understand the Quality Assurance Manual.

Test results are only released to the client. Release to someone other than the client requires the express permission of the client, except when made in response to a valid order from a State or Federal Court. The release of test results to anyone other than the client requires the permission of management. Laboratory reports are reviewed for accuracy prior to release.



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Electronic records are distributed to clients through email and/or FTP. The access to company emails and all electronic records is password-controlled login. Clients retrieve their records using unique user ID and password.

Figure 4.1.5. Confidentiality Agreement Form

Employee Confidentiality Agreement

As an employee of Asbestos TEM Labs, Inc., I agree not to disclose to any person, any confidential information or documentation that comes to my knowledge or into my possession through my employment or as required by law. I shall treat all information related to clients in a confidential manner.

Employee: _____

Employee's Signature: _____

Date: _____

President: _____

President's Signature: _____

Date: _____

HR-CONF Rev. 06-2011



D) Operational Integrity

Policy:

The laboratory will avoid involvement in any activities that would diminish confidence in its competence, impartiality, judgment, or operational integrity.

Details and Procedures:

To ensure confidence in laboratory operations a formal quality assurance program is implemented. Technical competence is ensured through check sample programs. Impartiality is assessed through audits and approvals. Judgment is ensured through the hiring of qualified personnel and by continuously refining, upgrading and improving his or her skills. Operational integrity is reviewed by management on a regular basis at management review meetings to ensure continued suitability and effectiveness of laboratory policies and procedures. Any problems are acted on immediately through corrective action procedures (see section 4.11).

E) Organizational Structure

Policy:

The organization and management structure of the laboratory and the relationships between management, technical operations, support services, and the quality system is defined through the aid of an organizational chart (see Table 4.1).

Details:

Senior management keeps the most current organizational chart on file. An organizational chart is available with this manual as a reference record and is considered the official record on the date it is marked.

F) Responsibility and Authority

President

- Ø develops primary goals, operating plans, policies, and short and long range objectives for the laboratory
- Ø directs and coordinates activities to achieve profit and return on capital
- Ø establishes organizational structure and delegating authority to subordinates
- Ø leads the laboratory towards objectives, meets with and advises other executives, and reviewing results of business operations
- Ø determines action plans
- Ø hires new personal
- Ø represents organization to major clients, government agencies, and the public



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Laboratory Manager

- Ø is knowledgeable of the scope of all processes under his or her supervision
- Ø provides the necessary resources (personnel, equipment, supplies) for the quality assurance program, in order to ensure confidence in the laboratory's results
- Ø ensures personnel are trained for the duties they perform - including substitutes when regular personnel are absent
- Ø maintains current job descriptions
- Ø orients new personnel
- Ø determines technical training needs of personnel
- Ø conducts employee performance reviews
- Ø coordinate vacation and coverage
- Ø ensures that all health and safety regulations are followed
- Ø ensures that all Human Rights Laws and Regulations are complied with
- Ø ensures equipment is maintained and calibrated, reporting all deficiencies (e.g., equipment malfunctions) in the appropriate manner
- Ø maintains records and manages all aspects of testing activities
- Ø coordinates research activities in the laboratories, including:
 - Ø provides vision and direction for research activities
 - Ø develops and reviews research proposals
 - Ø ensures adequate training is completed for research personnel
 - Ø monitors the progress of research projects
 - Ø reviews research reports for clients or publication
 - Ø ensures quality policies and procedures are followed
 - Ø controls the flow of communication between the client and the laboratory

Quality Assurance Manager

- Ø ensures that the Quality System is established, implemented and maintained in accordance with the ISO 17025, AIHA-LAP, LLC Policy Documents, and NVLAP Handbooks 150, 150-3, 150-13 standards
- Ø manages the internal audit program
- Ø coordinates laboratory accreditation activities
- Ø handles the maintenance and distribution of the Quality Assurance Manual and associated documents
- Ø maintains a master list of current versions of quality documentation
- Ø trains personnel on Quality System activities
- Ø monitors the Quality System
- Ø prepare Monthly QA Summaries for all departments
- Ø reports on the performance of the Quality System to senior management for review and as a basis for improvement of the Quality System
- Ø supervises the laboratory's inter- laboratory proficiency testing program
- Ø writes SOPs and test methods
- Ø review, track and signs off Corrective/Preventive Action reports
- Ø create Error Analysis report



Technical Manager/Senior Analysts

- Ø responds to client inquiries and provides professional advice
- Ø prioritizes workload
- Ø facilitates operational concerns in their area
- Ø ensures accurate and consistent testing procedures through the validation of all current procedures and by developing, validating and implementing new procedures
- Ø coordinates purchasing requests
- Ø ensures that the operational needs are within budget and advising management of and discrepancies
- Ø fills out quality control forms and perform statistical analysis of QC data
- Ø present QC data to QA Manager for Monthly Summary reports
- Ø maintains calibration and maintenance records
- Ø writes SOPs and test methods
- Ø signs reports when designated with signing authority
- Ø shall possess a bachelor's degree in an applicable basic or applies science; at least one year of nonacademic analytical experience; training in statistics or laboratory quality assurance/quality control
- Ø AA Division technical manager/senior analyst shall possess at least three years of nonacademic analytical chemistry experience, of which at least two years shall be metal analysis experience

Analysts

- Ø maintains records of all quality activities as documented in SOPs and test methods
- Ø handles samples and performs analyses according to SOPs and test methods
- Ø maintains and calibrates equipment
- Ø reports deficiencies or malfunction to the supervisor
- Ø identifies and records nonconformities on *Corrective Action Requests*
- Ø identifies and records potential nonconformities on *Preventive Action Requests*
- Ø corrects potential and actual causes of deficiencies
- Ø improves laboratory and/or quality activities on a continuous basis

Sample Coordinators and Administrative Personnel

- Ø performs work functions and keeping records as per approved SOPs and/or laboratory policies
- Ø identifies and records nonconformance events related to sample receipt, packaging, and Chain of Custody entries on *Sample Receipt/Login Checklist*
- Ø identifies and records potential nonconformance events related to sample receipt, packaging, and Chain of Custody entries on *Sample Receipt/Login Checklist*
- Ø corrects nonconformance events and potential nonconformance events related to sample receipt, packaging, and Chain of Custody entries
- Ø improves laboratory and/or quality activities on a continuous basis



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G) Laboratory Supervision

Policy:

Adequate supervision is provided in each area of the laboratory for all testing and calibration personnel, including trainees, by persons familiar with the methods and procedures.

Details:

Adequate supervision is ensured through designated supervisors as well as through documentation such as this Quality Assurance Manual, test methods and SOPs. A thorough orientation and training program is adhered to for all new employees. Ongoing training for regular personnel is required.

H) Technical Management

Policy:

A technical manager is assigned to each major division of the laboratory. They have overall responsibility for the technical operations and the provision of resources needed to ensure the required quality of laboratory operations.

Details:

While the technical manager may at times delegate duties to other personnel, the technical manager is accountable for any nonconforming activities.

I) Quality Assurance Management

Policy:

The Quality Assurance Manager is appointed by the highest level of management. The Quality Assurance Manager, who, irrespective of other duties and responsibilities, has defined responsibility and authority for ensuring that the quality system is implemented and followed. The Quality Assurance Manager has direct access to the highest level of management where decisions are taken on laboratory policy or resources.

Details:

This statement notifies all laboratory personnel that Tom Suess is the Quality Assurance Manager as authorized below by the President. Any change in this position requires the reissue of this section to all holders of controlled copies of the Quality Manual.



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J) Managerial Substitutions

Policy:

Deputies for key personnel are appointed to fulfill the key personnel's duties in their absence.

Details:

The Technical Manager/Senior Analyst in all Laboratory Divisions has authority to make temporary decisions in the absence of the Quality Assurance Manager.

In the event of an extended absence of the Quality Assurance Manager, the President will assume his/her responsibilities.

In the event of an extended absence of the Laboratory Manager, the President will assume his/her responsibilities.

Management is responsible for ensuring that current and/or increased workload requirements are met. This includes making adjustments as a result of employee absence.

Only fully trained employees are utilized to fulfill the duties of personnel who are absent.

If sufficient human resources are not available, management will identify the best possible solution to meet operational requirements.

K) Personnel Awareness

Policy and Details:

Staff meetings are held regularly to inform the laboratory personnel are aware of the relevance and importance of their activities and how they contribute to the achievement of the objectives of the management system.

4.1.6 Internal Communication

The President shall ensure that appropriate communication processes are established within the laboratory and that communication takes place regarding the effectiveness of the management system.

Asbestos TEM Laboratories, Inc.
Org Chart - Berkeley, CA and Sparks, NV

20 August 2014 Rev 9

Mark Bailey, PG
President

Pat Payne
Sales & Marketing Dir.

Stephanie Dunn
Laboratory Manager

Tom Suess
QA Manager

Jie (Jane) Zhang
Technical Pb Manager

Bookkeeping

Front Office

Electron Microscopy Lab

Polarized Light Microscopy Lab

Phase Contrast Microscopy Lab

Lead / Metals Lab

Dorothea Rastegar
Bookkeeper

Rose Yapching
Office Manager

Meisheng Hu
Senior TEM Analyst

JoAnn Huerto
Senior PLM Analyst

Yang Zhang
Senior PCM Analyst

JoAnn Huerto
AA Metals Analyst

Adam Laxton
Accountant - AR

Paul Roberts
Admin. Assistant

Yang Zhang
Senior TEM Analyst

Carl Martin
PLM Trainee

JoAnn Huerto
PCM Analyst

Carl Martin
AA Metals Trainee

Sue Ehrlich
NV Office Manager

Nina Borchowiec
TEM Analyst

Stephanie Dunn
Backup Analyst

Stephanie Dunn
PCM Analyst

Ming Zhang
TEM Analyst Contractor

Crystal Repogle
Asst. Lab Manager

Stephanie Dunn
Backup Analyst

Aaron Albright
TEM Air Sample Prep

Gabriel Matson
PCM Analyst

Liam Fu
TEM Analyst Contractor

Tyler Miller
TEM Analyst

Migeul Lopez
Senior Lab Technician

Rachel Abramson
TEM Air Sample Prep

Meisheng Hu
Backup Analyst

Shizhong Wang
TEM Analyst Contractor

Erin Rottacker
TEM Analyst

Jesus Lopez
Senior Lab Technician

Carl Martin
TEM Air Sample Prep

Carl Martin
PCM Analyst

Greg Hanes
NV Branch Manager

Regular Analyst
Backup Analyst



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4.2 Management System

This section tells you that our Management System is based on the premises:

1. Define your policy on quality
2. Say what you do (through documentation)
3. Do what you say (following your documentation)
4. Record what you did

Key Words

Establish, Implement, and Maintain
Policies, Systems, Processes, Programs, Procedures, Instructions
Communicate, Understand
Quality Policy Statement
Quality Assurance Manual
SOP
Test Method

Cross-references

ISO 17025:2005 Section 4.2
AIHA-LAP, LLC Policy Documents
NVLAP Handbook 150 Section 4.2



4.2.1 Policies and Procedures

Policy:

The Management System is established, implemented, and maintained by management. It is applicable to all the fields of testing and activities in which the laboratory is involved and undertakes. All policies, systems, programs, procedures and instructions are documented to the extent necessary to enable the laboratory to assure the quality of results generated. These documents are communicated to, understood by, available to, and implemented by the appropriate personnel.

Details:

The purpose of our Management System is to ensure that all services and products satisfy the client's requirements and have been designed, manufactured, and delivered under controlled conditions.

The effectiveness of the Management System is assessed in several ways:

- Ø by a program of planned internal audits, covering all aspects of the operation of the quality system
- Ø by regular management reviews of the suitability and effectiveness of the quality system
- Ø by analysis of potential and actual problems as shown by client complaints and supplier and subcontractor assessments
- Ø by other methods (frequency of Corrective action reports (CAR), analyst feedback, etc.) approved from time to time by the Laboratory Manager

This Quality Assurance Manual and associated documents (including procedures) and records serve as the quality plan for the laboratory. Other documents and records include:

- Ø standard operating procedures
- Ø quality control plans in test methods
- Ø organizational charts
- Ø proposals
- Ø project management schemes

4.2.2 Quality Policy Statement

Policy:

The policies and objectives for laboratory operations are documented in this Quality Assurance Manual. The overall objectives are set out in the Quality Policy Statement, and are reviewed during Management review. The Quality Policy Statement is issued under the authority of the President on the effective date.



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Quality Policy Statement:

It is the policy of Asbestos TEM Laboratories, Inc. to insure quality work through experienced analysts by following international standard ISO 17025:2005 testing guidelines, and providing accurate and timely services; and by ATEM Managements dedication to continuous improvement, to meet or exceed the expectations of our clients, in day-to-day-interactions.

a) Management is committed to good professional practice and providing the highest possible quality of services to the client and to continually improve the effectiveness of the management system: Tests and calibrations are always carried out in accordance with stated standardized methods and clients' requirements. Requests to perform tests that may jeopardize an objective result or have a low validity are rejected.

b) Standards of service include:

- Ø Client Satisfaction
- Ø Accuracy
- Ø Timeliness

c). Management promotes excellence in the workplace by providing all employees with the knowledge, training, and tools necessary to allow for the completion of accurate and timely work.

d) Personnel: Asbestos TEM Laboratories, Inc., staff is required to familiarize themselves with quality documentation and to implement the policies and procedures in their work.

e) Management is committed to complying with ISO 17025 international standards, AIHA-LAP, LLC Policy Documents, and NIST Handbooks 150, 150-3 and 150-13: the objective of this Quality Assurance Manual is to document the compliant policies and associated procedures that are integrated into our daily activities.

Additional objectives include:

- Ø to establish the level of the laboratory's performance
- Ø when possible, to make test method changes to improve performance
- Ø to participate in proficiency testing or quality evaluation programs with peer laboratories
- Ø to ensure that all personnel are trained to a level of familiarity with the quality system appropriate to the individual's degree of responsibility
- Ø to improve and validate laboratory methodologies by participation in method validation collaborative tests
- Ø to establish and report on quality savings



4.2.3 Commitment Evidence

Policy:

The President shall provide evidence of commitment to the development and implementation of the management system and to continually improving its effectiveness.

4.2.4 Customer/Regulatory Requirements

The President and the Laboratory Manager communicate to the laboratory staff the importance of meeting customer requirements as well as statutory and regulatory requirements.

4.2.5 Quality Assurance Manual

Policy:

This Quality Assurance Manual outlines the structure of the documentation used in the quality system. This QA Manual makes reference to supporting procedures including technical procedures and is maintained up to date.

Details:

This quality system is structured in three tiers of documentation. The tiers are as follows

- I. Quality Assurance Manual
- II. Standard Operating Procedures and Test Methods
- III. Records

For most clients, this Quality Manual and the associated documents form a general Quality Plan. If necessary, specific Quality Plans will be prepared on a 'per-client' basis. These Quality Plans will modify the general requirements stated in the Manual and associated documents.

All of the above documents are controlled documents under the custodianship of the Quality Assurance Manager. Only authorized copies are distributed within the laboratory.

The following records and directive documents are referenced in the Quality Assurance Manual, but maintained separately:

- Ø organizational chart (Section 4.1.5 (E), Table 4.1)
- Ø copies of the Quality Policy Statement posted in the laboratory (Section 4.2.2)
- Ø identification of resources and management review (Section 4.15)
- Ø job descriptions (Section 5.2.4)
- Ø statistical techniques (Section 5.9)
- Ø test reports (Section 4.13)



- Ø identification of the laboratory's approved signatures (Stephanie Dunn-Technical Manager; Tom Suess-Quality Manager) (Section 5.10.2)
- Ø laboratory's scope of tests (Section 4.1.3)
- Ø equipment inventory and records (Sections 5.5.4 and 5.5.5)
- Ø calibration status indicators (Section 5.5.8)
- Ø reference standards inventory (Section 5.6.3)
- Ø verification records (Section 5.9)
- Ø quality control plan / criteria for workmanship (Section 5.4.1)
- Ø corrective action records (Section 4.11)
- Ø preventive action records (Section 4.12)
- Ø client complaint records (Section 4.8)
- Ø audit schedule and records (Section 4.14.)
- Ø procurement and subcontracting records (Sections 4.6 and 4.5.4)
- Ø training records (Section 5.2.5)
- Ø master list of documentation (Section 4.3.2)
- Ø confidentiality agreements (Section 4.1.5 C)
- Ø contract review (Section 4.4.2)
- Ø validation of test methods (Section 5.4.5)
- Ø facility floor plan (Section 5.3.1)

4.2.6 Technical Management and the Quality Assurance Manager

The roles and responsibilities for technical management and the Quality Assurance Manager are outlined in section 4.1.4 (F) of this manual.

Laboratory Manager ensures that section 5 of this manual is implemented and maintained. The Quality Assurance Manager ensures that section 4 of this manual is implemented and maintained.

4.2.7 Management System

The President ensures that the integrity of the management system is maintained when changes to the management system are planned and implemented.



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4.3 Document Control

This section tells you that Document Control involves:

1. Writing good procedures
2. Getting them to the users
3. Keeping procedures good

Key Words

Controlled Document
Master List
Unique Identification
Revise
Revision Number
Effective Date
Review and Approval
Obsolete
Archive
Hand-written changes

Cross-references

ISO 17025:2005 Section 4.3
AIHA-LAP, LLC Policy Documents
NVLAP Handbook 150 Section 4.3



4.3.1 Policies and Procedures

Policy:

The SOP 4-3-1 is used to control all quality system documents (internally generated and from external sources). These include documents of external origin, such as regulations, standards, other normative documents, test and/or calibration methods, as well as drawings, specifications, instructions, and manuals.

Details:

Document means any information or instructions including policy statements, procedures, specifications, calibration tables, charts, textbooks, posters, notices, memoranda, software, drawings, and plans. These may be in various media, whether hard copy or electronic and they may be digital, analog, photographic or written.

The documents to be controlled include:

- Ø Quality Assurance Manual
- Ø Standard Operating Procedures and test methods
- Ø Forms
- Ø Records
- Ø Standards
- Ø Operational manuals
- Ø Certificates

The control of data related to testing is covered in section 5.4.7. The control of records is covered in section 4.13.

4.3.2 Document Approval and Issue

4.3.2.1 Review / Approval / Master List

Policy and Details:

All documents issued to personnel in the laboratory as part of the quality system are reviewed and approved for use by authorized personnel prior to issue (i.e., reviewed by personnel knowledgeable in the documented activity and then approved by management). A master list identifying the current revision status and distribution of documents in the quality system is readily available in order to preclude the use of invalid and/or obsolete documents (see SOP 4-3-1). A revision history of documents is also maintained. Documents are formally reviewed on an annual basis to ensure their continuing suitability.



4.3.2.2 Availability and Obsolete Documents

Policy and Details:

The master list shows the current status of all controlled documents. The master list document is organized with the following information:

- Ø Document #
- Ø Title
- Ø Revision #
- Ø Date of issue
- Ø Date of last review
- Ø Number of copies
- Ø Locations

Controlled documents are approved before issue.

The SOP 4-3-1 for document control ensures that:

- Ø authorized editions of appropriate documents are available at all locations where operations essential to the effective functioning of the laboratory are performed
- Ø documents are periodically reviewed and where necessary revised to ensure continuing suitability and compliance with applicable requirements
- Ø invalid or obsolete documents are promptly removed from all points of issue or use to assure against unintended use
- Ø obsolete documents retained for either legal or knowledge preservation purposes are suitably marked (i.e., stamped "OBSOLETE" and dated)

4.3.2.3 Identification

Policy and Details:

All quality system documentation is identified by:

- Ø date of issue and/or revision number
- Ø page numbering
- Ø total number of pages (e.g., page 5 of 5)
- Ø issuing authority (i.e., approval signature)



4.3.3 Document Changes

4.3.3.1 Review / Approval

Policy:

Changes to documents are reviewed and approved by the same function (i.e., personnel or position) that performed the original review.

Details:

Developments in policies and procedures require documents to be changed from time to time. Changes to documents receive the same level of review and approval as the originals.

The Quality Assurance Manual is reviewed annually by the Quality Assurance Manager. Records are kept of this review.

Test methods and SOPs are reviewed on an annual basis. Records are kept of this review. Procedures for test method review are outlined in SOP 4-3-1.

Obsolete documents are withdrawn, but are retained for archive purposes and clearly labeled as obsolete.

4.3.3.2 Identification of Changes

Policy:

The nature of document changes is identified in the document.

Details:

As outlined in SOP 4-3-1, the details of changes in documents are specified in a “Revision Changes” spreadsheet for this particular document, which is attached at the end of the document. Revision history is recorded at the end of the document.

4.3.3.3 Amendments by Hand

Policy and Details:

Hand-written amendments to documents are not permitted, however Analysts and Senior Analysts may make hand-written entries in printed copies of the QA Manual which indicate suggested revisions or improvements in the manual. Such hand-written entries do not become part of the approved text of the Manual until the document is formally revised and re- issued according to the procedures in SOP 4-3-1.



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4.3.3.4 Computerized Documents

Policy and Details:

The SOP 4-3-1 details how changes in documents maintained in computerized systems are made and controlled.



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4.4 Review of Requests, Tenders, and Contracts

This section tells you that we must:

1. Clearly understand client requirements

Key Words

Requirements
Subcontractor
Request
Tender
Contract
Review

Cross-references

ISO 17025:2005 Section 4.4
AIHA-LAP, LLC Policy Documents
NVLAP Handbook 150 Section 4.4



4.4.1 Policies and Procedures

Policy:

The SOP 4-4-1 is used to review requests, tenders, or contracts. This procedure ensures that:

- Ø the client requirements including the methods to be used are adequately defined, documented and understood (see section 5.4.2)
- Ø the laboratory has the capability and resources to meet the requirements
- Ø the appropriate test method(s) is(are) selected and capable of meeting the client's requirements (see section 5.4.2)

Any differences between the request or tender and the contract are resolved before any work commences. Each contract must be acceptable by both the laboratory and the client.

Details:

The request, tender and contract review is conducted in a practical and efficient manner, and the effect of financial, legal, and time schedule aspects are taken into account.

The review of capability establishes that the laboratory possesses the necessary physical, personnel, and information resources, and that the laboratory's personnel have the skills and expertise necessary for the performance of the tests in question. The review may also encompass results of earlier participation in inter-laboratory comparisons or proficiency testing and/or the running of trial test programs using samples or items of known value in order to determine uncertainties of measurement, limits of detection, and confidence limits.

The contract review ensures that each client's requirements are adequately defined and documented before the service or product is ordered or dispatched. This should ensure that any order, once accepted, can be completed without delay, and that the client's requirements including delivery date, technical specification, and cost can be met.

If the contract review highlights any ambiguities or uncertainties then the client will be contacted and the problem resolved before the order is accepted. All review notes and correspondence with the client will be documented.

The SOP 4-4-1 also describes the activities that take place should there be a subsequent amendment to a client's order.

Typical types of contracts include:

- Ø approved service quotations
- Ø confidentiality agreements
- Ø non-disclosure agreements
- Ø sample submission requests
- Ø memorandum of agreement
- Ø memorandum of understanding



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- Ø research proposals and contracts
- Ø verbal orders (oral agreements)
- Ø activity plans

4.4.2 Records of Review

Policy:

Records of request, tender and contract review, including significant changes, are maintained. Records of pertinent discussions with a client relating to the client's requirements or the work during the period of execution of the contract are also maintained.

Details:

For review of routine and other simple tasks, the date and the identification (e.g., initials) of the person in the laboratory responsible for carrying out the contracted work are considered adequate. For repetitive routine tasks, the review need be made only at the initial enquiry stage or on grant of the contract for on-going routine work performed under a general agreement with the client, provided that the client's requirements remain unchanged. For new, complex or advanced testing tasks, a more comprehensive record is maintained.

4.4.3 Review of Subcontracted Work

Policy:

Request, tender, and contract review also includes work that is subcontracted by the laboratory.

Details:

Subcontractor laboratories are reviewed as described in section 4.5.

4.4.4 Notification of Client

Policy and Details:

Clients are informed of deviations from the contract. This is typically communicated to the client prior to the performing the deviation.

4.4.5 Contract Amendment

Policy and Details:

If a contract needs to be amended after the work has commenced, the same contract review process is repeated and any amendments are communicated to all affected personnel.



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4.5 Subcontracting of Tests

This section tells you that we must:

1. Know what tests and calibrations need to be performed by another laboratory
2. Source and audit the other laboratories

Key Words

Competence
Register of Subcontractors
Assessment

Cross-references

ISO 17025:2005 Section 4.5
AIHA-LAP, LLC Policy Documents
NVLAP Handbook 150 Section 4.5



4.5.1 Subcontractor Competence

Policy:

Work that must be subcontracted due to:

- Ø equipment failure
- Ø workload
- Ø large contracts
- Ø contracts requiring some extra technical expertise
- Ø unforeseen circumstances

shall be subcontracted to a technically competent, AIHA accredited laboratory for lead analysis, and NVLAP accredited laboratory for identification of asbestos minerals using TEM, PCM, and PLM methods.

Details:

The subcontracted laboratory demonstrates technical competence by possession or receipt of one or more of the following:

- Ø accreditation by the NIST-NVLAP for the test methods used for the subcontracted work
- Ø accredited by AIHA for the subcontracted work
- Ø satisfactory performance of appropriate quality control check samples (certified reference material, in- house reference material or replicate analysis
- Ø audit of the subcontractor's quality system by our auditors

It is the responsibility of the Quality Assurance Manager to assess and approve the competence level of subcontractor laboratories by verification of audits and PAT testing results.

4.5.2 Client Approval

Policy:

Customers are advised of work (or any portion thereof) that is being subcontracted to another laboratory in writing and listing the subcontract lab, scope, and accrediting body. The customer approval is obtained (preferably in writing).

Details:

Clients are advised of subcontracted work through fee schedules or any type of contract listed in section 4.4.1.

4.5.3 Assurance of Subcontractor Competence

Policy:

The laboratory is responsible to the client for the subcontractor's work. Technical competence of subcontractor laboratories is demonstrated through various records.



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Note – there may be circumstances where the client specifies which subcontractor is to be used. In such cases we may not be able to demonstrate the competence of the subcontractor and therefore are not responsible for the results.

Details:

Records of subcontractor competence include, but are not limited to, the following:

- Ø accreditation certificates or documentation
- Ø registration certificates
- Ø check sample results
- Ø audit results
- Ø approval by the Quality Assurance Manager

Subcontracted test results will be received and reviewed by ATEM Management before customer contact is initiated. If no subcontractor report issues are observed, the test results shall be reported to the customer by ATEM.

4.5.4 Subcontractor Register

Policy:

A register of all subcontractors performing tests and calibrations will be maintained if subcontractors are used.

Details:

The approved register of subcontractors and all assessment records will be maintained by the Quality Assurance Manager.



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4.6 Purchasing Services and Supplies

This section tells you that we must:

1. Know what we want
2. Check out our suppliers

Key Words

Selection
Verify
Specifications
History

Cross-references

ISO 17025:2005 Section 4.6
AIHA-LAP, LLC Policy Documents
NVLAP Handbook 150 Section 4.6



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4.6.1 Policies and Procedures

Policy:

The SOP 4-6-1 is used to select and purchase services and supplies. The SOP 4-6-1 is used for procurement, reception, and storage of supplies.

Details:

Consumable materials are stored according to the appropriate test method, SOP, or work instruction.

4.6.2 Specifications

Policy:

Only services and supplies of the required quality are used. These quality requirements are detailed in laboratory SOPs under the “*Materials Required*” section and will identify the appropriate minimum specifications when necessary.

Details:

Packing slips are checked against package content labels and matched with the Request for Purchase or Purchase Order if accepted. Once accepted, the packing slip is dated and initialed as evidence of compliance. Certificates of analysis (COA) are maintained on file after the COA is checked to ensure the received item meets minimum specifications.

Chemicals are purchased with manufacturer’s certificates where possible. Uncertified chemicals are purchased from ISO 9000 registered companies. Whatever the source, the laboratory verifies the quality of the standards by comparing the new batch of standards to the old. Due regard is paid to the manufacturer’s recommendations on storage and shelf life.

Wherever possible, reagents are purchased from manufacturers who have a quality system based on ISO 9000. The grade of any reagent used (including water) is stated in the method together with guidance on any particular precautions to be observed in its preparation or use.

Where no independent assurance of the quality of procured goods or services is available or the supplier’s evidence is insufficient the laboratory ensures that purchased goods and services comply with specified requirements. Where possible and practical the laboratory ensures that goods are inspected, calibrated, or are otherwise in compliance with any standard specification relevant to the calibrations or tests concerned.



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4.6.3 Purchasing Documents

Policy:

Purchasing requests are recorded on the Request for Purchase form and contain data describing the product ordered. The Request for Purchase is reviewed and approved for technical content prior to release.

Details:

The description may include type, class, grade, precise identification, specifications, drawings, inspection instructions, other technical data including approval of test results, quality required and quality system standard under which they were produced.

The completion of the Request for Purchase is the responsibility of the originator, normally the Senior Analyst. They review the Request for Purchase for accuracy and approve the technical content prior to release with their signature and the date.

4.6.4 Approved Suppliers

Policy:

Suppliers of critical services are evaluated and approved before use. An approved supplier list is maintained.

Details:

Audits or tender evaluation is conducted to qualify suppliers of critical services prior to use. The criteria for evaluation may include, but is not limited to the following:

- Ø references
- Ø accreditation
- Ø formal recognition

The records are maintained by purchasing personnel.



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4.7 Service to the Customer

This section tells you that we must:

1. Facilitate clarification of the client's request
2. Give client access to relevant testing area
3. Maintain client contact
4. Inform client of delays or deviations
5. Utilize client surveys

Key Words

Clarification
Deviations
Delays
Client Satisfaction Survey
Advice

Cross-references

ISO 17025:2005 Section 4.7
AIHA-LAP, LLC Policy Documents
NVLAP Handbook 150 Section 4.7



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4.7.1 Services to the Client

Policy:

Client requests are clarified for the clients or their representatives. Furthermore the client or their representative will be afforded the right to monitor the performance of the laboratory in relation to the work performed.

Details and Procedures:

Service to the client includes:

- Ø Affording the client or the client's representative reasonable access to relevant areas of the laboratory for the witnessing of work performed for the client; it is understood that such access should not conflict with rules of confidentiality of work for other clients or with safety.
- Ø Preparing, packaging, and dispatching of test items needed by the client for verification purposes.
- Ø Maintaining of open contacts. The client values advice and guidance in technical matters, and opinions and interpretations based on results. Contact with the client, especially in large assignments, should be maintained throughout the work. The laboratory should inform the client of any delays or major deviations in the performance of the tests.

4.7.2 Customer Feedback

Policy and Details:

The laboratory obtains feedback from the client. Positive and negative feedback can be obtained passively through ongoing communications with the client or actively through client satisfaction surveys. The surveys are distributed by e-mail, listed on the company web site, and by hand in the lobby. The feedback is used to improve the quality system, testing activities, and client service.



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4.8 Complaints

This section tells you that we must:

1. Maintain records of Complaints
2. Maintain records of Corrective Action

Key Words

Resolving
Investigation
Corrective Action
Follow-up Verification
Root Cause

Cross-references

ISO 17025:2005 Section 4.8
AIHA-LAP, LLC Policy Documents
NVLAP Handbook 150 Section 4.8



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4.8.1 Policies and Procedures

Policy:

The SOP 4-8-1 is used for resolving complaints received from clients or other parties. Records are maintained of all complaints and follow-up.

Details:

Records of complaints include the following information:

- Ø details of the complaint
- Ø investigation
- Ø corrective action(s)
- Ø root cause analysis
- Ø follow-up verification

See also section 4.11.

All personnel are responsible for recording and responding to complaints.



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4.9 Control of Nonconforming Testing

This section tells you that we must:

1. Stop testing when nonconforming work is identified
2. Determine the cause of nonconforming work

Key Words

Nonconforming
Root Cause

Cross-references

ISO 17025:2005 Section 4.9
AIHA-LAP, LLC Policy Documents
NVLAP Handbook 150 Section 4.9



4.9.1 Procedures to Control Nonconforming Work

Policy:

The SOP 4-9-1 is used to control any aspect of testing work, or the results of this work, when they do not conform with the test methods or the agreed requirements of the client.

Details:

The procedure ensures that:

- Ø Responsibilities and authorities for the management of nonconforming work are designated and actions (including halting of work and withholding of test reports as necessary) are defined and taken into consideration when nonconforming work is identified
- Ø an evaluation of the significance of the nonconforming work is made
- Ø remedial actions are taken immediately, together with any decision about the acceptability of the nonconforming work
- Ø where necessary, the client is notified and the work is recalled
- Ø the responsibility for authorizing the resumption of work is defined

Identification of nonconforming work or problems with the quality system or with testing activities can occur at various locations within the quality system and technical operations such as:

- Ø client complaints
- Ø quality control
- Ø instrument calibration
- Ø checking of consumable materials
- Ø staff observations or supervision
- Ø test report checking
- Ø management reviews
- Ø internal or external audits

4.9.2 Root Cause Analysis

Policy:

Where evaluation indicates that nonconforming work could recur or that there is doubt about the compliance of the laboratory's operations with its own policies and procedures, the corrective action procedures, given in section 4.11, are followed to identify the root cause(s) of the problem and to eliminate this (these) cause(s).

Details:

The SOP 4-11-1 outlines recording the root cause analysis for investigating nonconforming work.

Situations warranting corrective action investigation include:



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- Ø failure to comply with test method including all applicable procedures necessary to ensure the integrity and representative nature of the sample
- Ø presentation of uncertain knowledge as to compliance with test methods including all applicable procedures necessary to ensure the integrity and representative nature of the sample
- Ø failure or suspected failure in method performance as demonstrated by results provided by quality control samples
- Ø lack of relevant evidence provided by quality audit, proficiency testing, or client feedback
- Ø lack of relevant evidence provided by data validation
- Ø neglect to check the inherent property of the sample that compromises the testing



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4.10 Improvement

This section tells you that we must:

1. Continually improve the effectiveness of our management system

Key Words

Improving
Management System

Cross-references

ISO 17025:2005 Section 4.10
AIHA-LAP, LLC Policy Documents
NVLAP Handbook 150 Section 4.10



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4.10 Policies and Procedures

Policy:

The laboratory shall continually improve the effectiveness of our management system.

Details:

Management system is continually improved through the use of the follows:

- Ø quality policy
- Ø quality objectives
- Ø audit results
- Ø analysis of data
- Ø corrective and preventive actions
- Ø management review



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4.11 Corrective Action

This section tells you that we must:

1. Identify problems
2. Determine why the problem occurred
3. Fix the cause of the problem
4. Verify that your changes worked

Key Words

Corrective Action Request
Root Cause
Monitor
Audit
Nonconforming work

Cross-references

ISO 17025:2005 Section 4.11
AIHA-LAP, LLC Policy Documents
NVLAP Handbook 150 Section 4.11



4.11.1 General

Policy:

The SOP 4-11-1 is utilized for implementing corrective action when nonconforming work or departures from policies and procedures in the quality system or technical operations have been identified. The procedure requires that appropriate authority be designated for the implementation of corrective actions. The procedure includes cause analysis, selection and implementation of corrective action, and monitoring of actions.

Details:

Problems with the quality system or technical operations of the laboratory may be identified through a variety of activities, such as control of nonconforming work, internal or external audits, management reviews, feed-back from clients, or staff observations.

Corrective action investigations are documented and required changes to operational procedures are implemented. The corrective action request (CAR), investigation and resolution are recorded on a CAR form.

4.11.2 Root Cause Analysis

Policy:

Corrective action always begins with an investigation to determine root cause(s) of the problem (SOP 4-11-1).

Details:

Potential causes of the problem could include client requirements, the samples, sample specifications, methods and procedures, personnel skills and training, consumable materials, or equipment and its calibration.

Root cause analysis is a method of problem solving that tries to identify the root causes of faults or problems. By focusing correction on root causes, problem recurrence can be prevented. Root cause analysis recognizes that complete prevention of recurrence by one corrective action is not always possible. Conversely, there may be several effective measures that address the root causes of a problem.

Root cause analysis is typically used as a reactive method of identifying event(s) causes, revealing problems and solving them. Analysis is done after an event has occurred. Root cause analysis is an iterative process and a tool of continuous improvement.

The primary aim of root cause analysis is to identify the factors that resulted in the nature, the magnitude, the location, and the timing of the harmful outcomes of one or more past events in order to identify what behaviors, actions, inactions, or conditions need to be changed to prevent



recurrence of similar harmful outcomes and to identify the lessons to be learned to achieve better results. For root cause analysis procedure, reference CAR SOP 4-11-1

4.11.3 Selection and Implementation of Corrective Actions

Policy and Details:

After determining the cause(s) of the problem, potential corrective actions are identified. The most likely action(s) (this includes practical and/or reasonable) are selected and implemented to eliminate the problem and to prevent recurrence. It should be noted that any corrective actions taken to eliminate the cause(s) of nonconformity or other departures are to an appropriate degree to address the magnitude of the problem and should be commensurate with the risks encountered. (Note – in plain language, this means determine whether the benefit outweighs the cost.) Controls are applied to prevent recurrence. The laboratory documents and implements the required changes resulting from corrective action investigations.

4.11.4 Monitoring of Corrective Action

Policy:

After implementing the corrective action(s), the laboratory monitors the results to ensure that the actions taken have been effective in overcoming the problems originally identified.

Details:

Monitoring is assigned to an appropriate individual such as the originator of the CAR or the originator's manager. Changes resulting from corrective action are documented.

4.11.5 Additional Audits

Policy:

Where the identification of nonconformities or departures casts doubts on compliance of policies, procedures, regulations, international quality standards, the appropriate areas of activity are promptly audited in accordance with section 4.14.

Details:

Special audits follow the implementation of corrective actions to confirm their effectiveness. A special audit is only necessary when a serious issue or risk to the business is identified. Special audits are carried out by trained and qualified personnel who are (whenever resources permit) independent of the activity to be audited. See section 4.14 for more details.



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4.12 Preventive Action

This section tells you that we must:

1. Identify potential problems
2. Determine why the problem could occur
3. Fix the cause of the potential problem
4. Verify that your changes worked

Key Words

Preventive Action Request
Potential Nonconformities
Action Plan

Cross-references

ISO 17025:2005 Section 4.12
AIHA-LAP, LLC Policy Documents
NVLAP Handbook 150 Section 4.12



4.12.1 Preventive Action Identification

Policy:

Opportunities for needed improvement and potential sources of nonconformities, either technical or with the quality system shall be identified. If action is required, action plans are developed, implemented and monitored, to reduce the likelihood of occurrence of such nonconforming events and to take advantage of the improvement opportunities.

Details:

Records of preventive action include the following information:

- Ø details of potential nonconformities
- Ø investigation
- Ø preventive action
- Ø follow-up verification

These records are maintained in the files of the Quality Assurance Manager.

4.12.2 Preventive Action Plans

Policy:

The preventive action procedure includes the initiation of such actions and application of controls to ensure that they are effective.

Details:

Preventive action may result from the review of operational procedures and analysis of data. Analysis of data includes trend analysis, analysis of proficiency testing results, and risk analysis.

The SOP 4-12-1 is utilized to implement opportunities for needed improvement and prevent potential sources of nonconformities.



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4.13 Control of Records

This section tells you that we must:

1. Identify the records to be kept
2. Keep identified records in a useful state
3. Destroy records when they are no longer needed

Key Words

Collection
Indexing
Access
Storage
Maintenance
Disposition
Legible
Traceable
Retrievable
Secure

Cross-references

ISO 17025:2005 Section 4.13
AIHA-LAP, LLC Policy Documents
NVLAP Handbook 150 Section 4.13



4.13.1 General

4.13.1.1 Procedures

Policy:

The SOP 4-13-1 is used to identify, collect, index, access, file, store, maintain, protect, backup, and dispose quality and technical records. Quality records include reports from internal audits and management reviews as well as corrective and preventive action records.

Details:

Records are available to demonstrate conformity to requirements and effective operation of the Quality System. Quality records from suppliers are also controlled.

All records, including test reports, are safely stored and held secure in locked areas, and in confidence to the client. Records are maintained in designated storage locations either on-site or off-site for a minimum of three years for PLM, PCM, and TEM, and five years for lead, beginning in September of 2012. Prior to this date, records management and retention practices were inconsistent. Older documents are available for varying periods but all records are now being retained for three years, except lead reports, which will be stored for five years.

The master list of records is organized with the following information:

- Ø Record No. / Form No.
- Ø Record Name
- Ø Filing Method (loose forms filed monthly, quarterly, semi-annual, annual or electronic)
- Ø Active Files (files referred to within the work area) / Retention Period / Location
- Ø Inactive Files (files referred to but not often and kept in storage) / Retention Period / Location
- Ø Persons / Positions Responsible / Users

The dating format for records is MM/DD/YYYY.

4.13.1.2 Record Integrity

Policy:

All records are to be legible and shall be retained in such a way that they are readily retrievable in facilities that provide a suitable environment to prevent damage or deterioration and to prevent loss.

Details:

The retention times for records are set at three years.



Records may be in the form of any type of media, such as hard copy or electronic media.

4.13.1.3 Record Security

Policy:

All records are held secure and in confidence.

Details:

Access to records is secured through locked rooms and filing cabinets.

4.13.1.4 Record Backup

Policy:

The SOP 4-13-1is followed to protect and backup data/records held on computers at all times and to prevent unauthorized access to or amendment of data/records on computers.

Details:

Data is password protected.

Backups ensure integrity and availability of data / information in the event of a system / power failure.

4.13.2 Technical Records

4.13.2.1 Record Information

Policy:

Original observations, calculations, derived data and sufficient information to establish an audit trail, calibration records, personnel records and a copy of each test report issued will be retained for three years, beginning in September of 2012. Prior to this date, records management and retention practices were inconsistent. Older documents are available for varying periods but all records are now being retained for three years.

The records for each test or calibration shall contain sufficient information to facilitate, if possible, identification of factors affecting the test uncertainty and to enable the test or calibration to be repeated under conditions as close as possible to the original. The records include the identity of personnel responsible for sampling, performing of each test and/or calibration and checking of results.

Details:



Technical records are accumulations of data (see section 5.4.7) and information that result from carrying out tests and/or calibrations and which indicate whether specified quality or process parameters are achieved. They may include forms, contracts, work sheets, work books, note books, instrument printouts, magnetic media, check sheets, work notes, control graphs, test reports, calibration certificates, client's notes, papers and feedback, and test reports to clients.

The records for each test contain sufficient information to permit its repetition. Records include:

- Ø date of sampling
- Ø sample receipt
- Ø sample handling, storage, and disposal
- Ø identification of personnel
- Ø analyst proficiency
- Ø equipment identification and performance
- Ø calibration records
- Ø media performance, where appropriate
- Ø test organism batch # or lot #, where appropriate
- Ø results
- Ø reports (mailed, faxed)
- Ø review

Note – the above records may be stored in separate locations. They are cross-referenced for easy retrieval.

4.13.2.2 Recording

Policy:

Observations, data, and calculations are clearly and permanently recorded and identifiable to the specific job at the time they are made.

Details:

Handwritten records must be legible and made with indelible ink immediately after an observation, after data is collected and/or after calculations are made.

4.13.2.3 Corrections to Records

Policy:

Changes to test data are made so as not to obscure or delete the previous data entry.

Details:

Mistakes are lined out with a single stroke and the correct value entered alongside. Mistakes are not erased, made illegible, or deleted. All alterations to records are signed or initialed and dated



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by the person making the correction. In the case of computer-collected data, similar measures are taken to avoid loss or change of original data.



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4.14 Internal Audits

This section tells you that:

1. Trained internal quality auditors examine our operations
2. Auditors report the results to the President
3. Observations will be remediated in a timely manner

Key Words

Schedule
Elements
Independent
Nonconformance
CAR

Cross-references

ISO 17025:2005 Section 4.14
AIHA-LAP, LLC Policy Documents
NVLAP Handbook 150 Section 4.14



4.14.1 Internal Audit Program

Policy:

The internal audit program involves periodic audits conducted according to a predetermined schedule for each year. This program is defined on an annual basis and conducted as outlined in this section with further details found in SOP 4-14-1. All elements of this Quality Assurance Manual will be audited each year and all relevant laboratory records are available to personnel conducting the audit. These audits are performed to verify operations continue to comply with the requirements of this QA Manual and are effective.

Details:

The QA Manual, test procedures, and laboratory results are verified for compliance. It is the responsibility of the Quality Assurance Manager to plan and organize audits as required by the schedule and requested by management. Audits are carried out by trained and qualified personnel. Personnel are not to audit their own activities except when it can be demonstrated that an effective audit will be carried out. Audits are performed through the aid of a checklist prepared in advance to minimize the possibility of overlooking any details during the audit.

Generally, the types of audits include:

- Ø quality management system
- Ø processes and procedures
- Ø products, services, and reports

4.14.2 Corrective Action

Policy:

When audit findings cast doubt on the effectiveness of the operations or on the correctness or validity of test or calibration results, timely corrective action is taken and clients are notified if investigations show that laboratory results were incorrect.

Details:

Nonconformities that can be resolved easily are to be corrected immediately, ideally during the audit. Records are made on the audit checklist. Nonconformities that require a more involved resolution are recorded on a CAR and resolved as described in section 4.11.

Corrective actions reports and client modifications must be kept on record for each audit deviation that casts doubt on test results as described in this section.

4.14.3 Records and Management



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Policy:

Records are made of the activity being audited, the audit findings, and corrective actions that arise. Management ensures that corrective actions are discharged within an appropriate and agreed timeline.

Details:

A report is prepared by the auditors and distributed to those audited and/or the area manager/supervisor within an appropriate and agreed timeline. The audit report may include the following sections, as appropriate:

- Ø audit objective and scope
- Ø area or section audited
- Ø personnel involved – auditors and auditees
- Ø date of audit
- Ø reference documents
- Ø observations including nonconformities and commendations
- Ø opening and closing meetings
- Ø recommendations
- Ø audit report distribution

The appropriate manager is responsible for ensuring that corrective actions are sufficiently recorded. Follow-up is performed by the auditor and recorded when corrective action is complete and deemed effective. The audit records are kept in the laboratory.

4.14.4 Follow-up Audits

Policy:

Follow-up audits are performed to verify and record the implementation and effectiveness of the corrective action taken.

Details:

The follow-up audit is performed at a mutually acceptable time between the area implementing corrective action and the auditor. This time is determined when the CAR is issued.



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4.15 Management Reviews

This section tells you that management must:

1. Periodically review technical competence and client satisfaction
2. Keep records of reviews
3. Ensure follow-up is executed
4. Measure progress

Key Words

Supervisor Reports
Audit Reports
CAR / PAR
Proficiency Results
Client Satisfaction Survey
Resources

Cross-references

ISO 17025:2005 Section 4.15
AIHA-LAP, LLC Policy Documents
NVLAP Handbook 150 Section 4.15



4.15.1 Review of Quality System and Testing

Policy:

Management periodically (at least annually) and in accordance with a predetermined schedule and SOP 4-15-1, conduct a review of the laboratory's quality system and testing activities to ensure their continuing suitability and effectiveness and to introduce any necessary changes or improvements.

Details:

The review takes account of:

- Ø suitability of policies and procedures
- Ø reports from managerial and supervisory personnel
- Ø the outcome of recent internal audits
- Ø corrective and preventive actions
- Ø assessments by external bodies
- Ø results of inter- laboratory comparisons or proficiency tests
- Ø changes in the volume and type of work undertaken
- Ø feedback from clients, including complaints and client satisfaction surveys
- Ø other relevant factors, such as quality control activities, resources and personnel training
- Ø recommendations for improvement
- Ø Uncertainty review

A minimum period for conducting a management review is once a year. Results of the review feed into the laboratory planning system and include goals, objectives and action plans for the coming year.

A management review can be supplemented by consideration of related subjects at regular management meetings.

4.15.2 Findings, Actions, and Records

Policy and Details:

Findings from management reviews and the actions that arise are recorded in the minutes of the meeting. Management will ensure that the actions are discharged within an appropriate and agreed timeline.



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5 Technical Requirements

5.1 General

This section informs you that:

1. Many factors contribute to the correctness and reliability of tests
2. The laboratory must account for these factors

Key Words

Correctness
Reliability
Uncertainty

Cross-references

ISO 17025:2005 Section 5.1
AIHA-LAP, LLC Policy Documents
NVLAP Handbook 150 Section 5.1



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5.1.1 Correctness and Reliability

Policy and Details:

Correctness and reliability of the tests performed have many contributing factors including:

- Ø human factors (see section 5.2)
- Ø accommodation and environmental conditions (see section 5.3)
- Ø test and calibration methods and method validation (see section 5.4)
- Ø equipment (see section 5.5)
- Ø measurement traceability (see section 5.6)
- Ø sampling (see section 5.7)
- Ø handling of test and calibration items (see section 5.7)

5.1.2 Measurement Uncertainty

Policy:

When developing test methods and procedures, total measurement uncertainty must be accounted for in the training and qualification of personnel, and in the selection and calibration of equipment.

Details:

See section 5.4.6 for more details.



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5.2 Personnel

This section tells you that management:

1. Analyzes training needs
2. Provides training to employees for them to do their jobs
3. Qualifies people performing specific tasks

Key Words

Competence
Qualification
Authorize
Training Needs
Job Description
Registry of Skills

Cross-references

ISO 17025:2005 Section 5.2
AIHA-LAP, LLC Policy Documents
NVLAP Handbook 150 Section 5.2



5.2.1 Competence and Qualification

Policy:

Management ensures the competency of all specific equipment operators; those performing tests, those evaluating results and sign test reports. Appropriate supervision is provided for employees undergoing training. Personnel performing specific tasks are qualified on the basis of appropriate education, training, experience and/or demonstrated skills, as required.

In addition, personnel responsible for the opinions and interpretations included in test reports also have:

- Ø relevant knowledge of the technology used for the manufacturing of the items, materials, products tested, or the way they are used or intended to be used and of the defects or degradation that may occur during or in service
- Ø knowledge of the general requirements expressed in the legislation and standards
- Ø an understanding of the significance of deviations found with regard to the normal use of the items, materials, or products concerned

Details:

Management defines the minimum levels of qualification and experience necessary for all posts within the laboratory.

Continued competence is monitored and where this is not achieved, the need to retrain personnel is considered. If a method or technique is not in regular use, verification of analyst performance, before they initiate testing, may be necessary.

5.2.2 Training Policies and Procedures

Policy:

Management will formulate the goals with respect to the education and the skills of the laboratory personnel. The training program is relevant to the present and anticipated tasks of the laboratory. SOP 5-2-1 is utilized to identify training needs and providing the necessary training for personnel.

Details:

The skills and knowledge are defined in the job description for each job function as described in section 5.2.4. Management compares the job description to the skills and knowledge of the new incumbent to determine the training needs. Reference the training matrix in SOP 5-2-1, Appendix "E" for specific training and trainer requirements, and training duration.

Training in the laboratory must include all methods or parts of methods and techniques that personnel are asked to perform. Minimally, the analyst must demonstrate competency by



observation by management and verification using replicate and/or check samples. For technicians who perform only parts of the method, confirmation of competency may be verified by observation only. Re-verification of all personnel must be performed annually on all methods or techniques pertinent to their job description. All ATEM associates handling or analyzing customer samples, or reporting test results shall read, understand, and be trained in this quality document (LQAP).

In some cases it may be appropriate to define competence related to a particular technique or instrument rather than methods. If so, it will be necessary to define for each method, the necessary technique-based competence required together with any additional requirements.

5.2.3 Employees

Policy:

Competent permanent or contractual employees are employed in the laboratory. The Laboratory Manager ensures that contractual, additional technical employees, and key support personnel are supervised and work in accordance to the policies and procedures of this QA Manual.

Details:

Testing must be either performed or supervised by an experienced person qualified to degree level. Personnel have relevant practical work experience and necessary training before being allowed to perform accredited work.

5.2.4 Job Descriptions

Policy:

Current job descriptions for managerial, technical and key support personnel involved in tests are maintained centrally in the administration area of the laboratory.

Details:

Minimum contents of job descriptions include:

- Ø the duty of performing tests
- Ø the act of planning tests and evaluation of results
- Ø the responsibility of developing and validating new methods as / when requested
- Ø expertise and experience
- Ø qualifications and training programs
- Ø managerial duties

Job descriptions are dated and signed to demonstrate that each incumbent has read it and is in agreement. They are maintained current in the personnel record.



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5.2.5 Authorized Personnel

Policy:

Management authorizes specific personnel to perform particular types of test, to issue test reports, to give opinions and interpretations and to operate particular types of equipment. Records of the relevant competence, educational and professional qualifications, training, skills and experience of all technical personnel and contracted personnel are maintained. This information is readily available and includes the date on which authorization and/or competence was confirmed and the criteria on which the authorization is based and the confirming authority.

Details:

The purpose of these records is to provide evidence that personnel have been adequately trained and their competence to perform particular tests has been assessed. In some cases it may be pertinent to state any particular limitations to competence. The records are maintained in a registry of skills and include:

- Ø academic and professional qualifications
- Ø external and internal courses attended
- Ø relevant on-the-job training and retraining as necessary (i.e., demonstration of competence)
- Ø skills and experience (i.e., resume)
- Ø relevant authorizations

Records are held centrally in the administration area.



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5.3 Accommodation and Environmental Conditions

This section tells you:

1. That laboratory facilities are suitable for attaining correct performance of tests
2. Critical environmental conditions are monitored, controlled and recorded
3. Incompatible activities are separated
4. Access to laboratories is controlled
5. Good housekeeping is practiced

Key Words

Incompatible activities
Prevent cross-contamination
Controlled access

Cross-references

ISO 17025:2005 Section 5.3
AIHA-LAP, LLC Policy Documents
NVLAP Handbook 150 Section 5.3



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5.3.1 Facility

Policy:

Laboratory facilities are appropriate to attain correct performance of tests. This may include, but not limited to, energy sources, lighting, heating, ventilation and any other environmental conditions.

Appropriate care is taken to ensure that the environment does not invalidate the results or adversely affect the required quality of any measurement. Particular care is taken when, tests are undertaken at sites other than a permanent laboratory facility. The technical requirements for accommodation and environmental conditions that can affect the results of tests are documented.

Details:

This section deals with the test areas in the laboratory and premises for support such as sample receipt and storage. Central laboratory supplies and services, such as water purification systems, air supply, vacuum source, and sample storage, are appropriate to facilitate proper performance of tests.

5.3.2 Monitoring

Policy:

Critical environmental conditions are monitored, controlled and recorded as required by the relevant specifications, methods, and procedures or where they may influence the quality of the results. Due attention is paid, for example, to dust and air quality as appropriate to the technical activities concerned. Tests are stopped when the environmental conditions jeopardize the results of the tests.

Details:

Bench tops and floors are made of impervious, smooth, easily cleaned materials. There is at least two linear meters workspace per analyst while working. Walls and ceilings are made of materials that are smooth and easily cleaned.

All work surfaces where samples are handled for login, preparation, and analysis are cleaned daily by wet wiping. In addition, wipe samples are taken and analyzed on a quarterly basis.



5.3.3 Separation of Incompatible Activities

Policy:

Effective separation between neighboring areas is made when the activities are incompatible. Measures are taken to prevent cross-contamination.

Details:

Reference materials and certified reference materials must be kept separated from samples (log-in and storage). Sample log-in and storage must be segregated, ideally in a separate area from the testing laboratory, and include proper sanitation to exclude the possibility of cross-contamination. Segregation of activities is achieved through time and space allocations.

An example of space segregation would be for a trace analysis. Physical separation of the trace analysis from high-level analysis is achieved through the use of separate rooms.

An example of time segregation would be the coordination of activities at different times. It may be appropriate to perform work on “cleaner” samples first before starting “dirtier” type samples.

5.3.4 Controlled Access

Policy:

Access to and use of areas affecting quality of the tests is defined and controlled.

Details:

Access to the laboratory is restricted to authorized personnel. The authorized personnel are made aware of the following items:

- Ø the intended use of the area
- Ø the restrictions imposed on working within such areas
- Ø the reasons for imposing the restrictions

5.3.5 Good Housekeeping

Policy:

Measures are taken to ensure good housekeeping in the laboratory. Special procedures are prepared when necessary.

Details:

Controlled use of cleaning and pest control materials is exercised. The laboratory complies with the local health and safety requirements.



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5.4 Tests and Methods and Method Validation

This section tells you:

1. Preference is given to the use of a standard method when selecting procedures
2. All methods must be validated before use
3. Measurement uncertainty is estimated
4. Data is controlled

Key Words

Standard Methods
Laboratory-Developed Methods
Non-standardized Methods
Validation
Uncertainty of Measurement
Data Checks

Cross-references

ISO 17025:2005 Section 5.4
AIHA-LAP, LLC Policy Documents
NVLAP Handbook 150 Section 5.4



5.4.1 General

Policy:

Methods and procedures used for all tests are appropriate as per:

- Ø sampling, handling, receipt, logging in, transport, storage, and preparation of items to be tested
- Ø an estimation of the measurement of uncertainty as well as statistical techniques for analysis of test and/or calibration data where appropriate

Instructions on the use and operation of all relevant equipment and on the handling and preparation of items for testing are available. All instructions, standards, manuals and reference data relevant to the work of the laboratory are maintained current and readily available to personnel. Deviation from test methods must be documented, technically justified, authorized, and accepted by the client.

Details:

There are SOPs for sampling, sample handling, transport, storage, preparation of test items, QA/QC procedures (media QC, incubation times and temperatures, equipment calibration and maintenance, process control QC), and standards for approving / rejecting results. These may be combined with or separate from the method. The content of a test method includes:

- Ø scope
- Ø description of test items
- Ø holding times
- Ø quantities to be tested
- Ø materials and equipment required
- Ø physical environmental conditions required (incubation times and temperatures, pH requirements)
- Ø description of procedures
- Ø sample identification
- Ø method of recording observations and results
- Ø safety measures
- Ø documentation
- Ø method for data analysis and presentation
- Ø sensitivity of method
- Ø quality control plan

International, national, or regional standards or other recognized specifications that contain sufficient and concise information on how to perform the tests and/or calibrations are not necessarily supplemented or rewritten as an internal procedure when they are written in a way that can be used as published by laboratory staff. Consideration may need to be given to providing additional documentation for optional steps in the method.



5.4.2 Selection of Methods

Policy:

Test methods, including methods for sampling, meet the needs of the client and are appropriate for the tests it undertakes. Preference is given to reference methods published as international, national, or regional standards. The laboratory ensures that the latest edition of a standard is used unless it is not appropriate or possible to do so. When necessary, the standard is supplemented with additional details to ensure consistent application.

Details:

Methods that have been published either in international, national, or regional standards, or by reputable technical organizations, or in relevant scientific texts or journals, or as specified by the manufacturer are selected when the client does not specify the method to be used. These methods may be adopted from the National Institute of Occupational Safety and Health (“NIOSH”), the Occupational Safety & Health Administration (“OSHA”), the Environmental Protection Agency (“EPA”), the California Air Resources Board (“CA ARB”), the American Society for Testing and Materials (“ASTM”), or other comparably recognized professional or regulatory bodies.

The ability of the laboratory to achieve satisfactory performance against documented performance characteristics is verified before samples are analyzed.

Laboratory-developed methods or methods adopted by the laboratory may also be used if they are appropriate for the intended use and if they are validated. The client is informed as to the method chosen. The laboratory confirms that it can properly operate standardized methods before introducing the tests or calibrations. If the standardized method changes, the confirmation is repeated.

The client is informed when the method proposed by the client is considered to be inappropriate or out of date.

5.4.3 Laboratory-Developed Methods

Policy:

Introduction of test methods developed internally is a planned activity and is assigned to qualified personnel equipped with adequate resources. Plans are updated as development proceeds and ensure effective communication amongst all personnel involved.

Details:

Methods developed in-house are validated and authorized before use. Where available, Certified Reference Materials (CRMs) are used to determine any systemic bias, or where possible results are compared with other techniques, preferably based on different principles of analysis. Determination of uncertainty must be part of this validation process and is essential for ongoing quality control.



5.4.4 Non-Standard Methods

Policy:

Utilization of non-standard methods is subject to agreement with the client and includes a clear specification of the client's requirements and the purpose of the test. The developed method is validated appropriately before use.

Details:

Discussion and agreement for the use of non-standard methods is recorded as part of contract review procedures (see section 4.4).

All non-standard and new tests are validated for their intended purpose. Qualitative test methods must be validated to demonstrate estimated sensitivity and specificity, relative accuracy to official methods (if appropriate), positive and negative deviation, limit of detection, matrix effect, repeatability, and reproducibility.

Quantitative test methods are validated to demonstrate specificity, sensitivity, relative accuracy, positive and negative deviation, repeatability, reproducibility, and limit of determination.

For new methods where procedures are developing rapidly, especially for emergency situations, it may be necessary to circumvent normal validation procedures. Minimally, this must be a demonstrated recovery in replicate.

New test methods are documented prior to providing test results to clients and contain at least the following information:

- Ø appropriate identification
- Ø scope
- Ø description of the type of item to be tested or calibrated
- Ø parameters or quantities to be determined
- Ø apparatus and equipment, including technical performance requirements
- Ø reference standards and reference materials required
- Ø environmental conditions required and any stabilization period needed
- Ø description of the procedure, including
 - Ø affixing identification marks, handling, transporting, storing and preparing of items
 - Ø ensuring checks are made before the work is started
 - Ø checking that the equipment is working properly and, where required, calibrating and adjusting the equipment before each use
 - Ø listing method of recording the observations and results
 - Ø indicating any safety measures to be observed
- Ø criteria and/or requirements for approval/rejection (quality control plan)
- Ø data to be recorded and method of analysis and presentation
- Ø uncertainty or procedure for estimating uncertainty



5.4.5 Validation of Methods

5.4.5.1 Performance Characteristics

Policy:

Validation of a method establishes, by systematic laboratory studies, that the performance characteristics of the method meet the specifications related to the intended use of the test results.

Details:

The performance characteristics of a validation plan includes, as applicable:

- Ø selectivity and specificity
- Ø range
- Ø linearity
- Ø sensitivity
- Ø limit of detection
- Ø limit of quantitation
- Ø ruggedness
- Ø accuracy
- Ø precision
- Ø reporting limit
- Ø repeatability
- Ø reproducibility
- Ø recovery
- Ø confirmation techniques
- Ø criteria for the number of samples tested to validate method as per defined scope of method
- Ø action levels where defined by regulation
- Ø quality control incorporating statistics as applicable
- Ø interpretation of population results as applicable

Performance characteristics that are selected take into account the intended use of the method, whether for screening, confirmatory analysis, or quantitation.

The design, verification of the method and documentation procedures for validation are planned and conducted by qualified personnel, equipped with adequate resources.

This section lists a few acceptable validation procedures. The choice of the procedure depends on the extent of the deviation from the published method.

Validation of methodology is a value judgment in which the performance parameters of the method are compared with the requirements for the test data. A prerequisite for a valid method is that data produced by the method must attain a state of statistical control. Such a state is obtained



when the mean value of a large number of individual values tends to approach a limiting value called the limiting mean.

Methods may be validated by one or more alternative procedures. Some of these procedures are described below. Apparent differences can be analyzed statistically to confirm their significance. In all cases, the reasons for choosing one or more alternatives must be documented.

- Ø analysis of standard reference materials (SRM) that are identical or almost identical to the test samples
- Ø in the absence of suitable SRMs, analysis of reference materials that are similar in all respect to the test samples; the use and validity of this reference material must be documented
- Ø using an alternative method to measure the same parameter provides a very high level of confidence if results are confirmed
- Ø recovery studies by the addition of a known concentration of the parameter of interest to some of the replicates being measured

The parameters to be determined include:

- Ø the scope of the method and any known interference
- Ø detection limit
- Ø the range of concentration where the method is valid
- Ø precision and bias
- Ø intra-laboratory variations
- Ø inter-laboratory variations

Judgment is required to determine if some or all of the above is required. Requirements will depend largely on the extent of deviation from the original method.

Developments in methodology and techniques require methods to be changed from time to time. The difference in performance between revised and obsolete methods is established so that it is possible to compare old and new data.

Where a change in method involves only minor adjustments, such as sample size, or different reagents, the amended method is validated and the changes brought to the attention of the accreditation body at the next accreditation audit. Where the proposed change involves technology or methodology, the laboratory seeks the approval of the accreditation body.

Records are kept on all validation activities. The records include any of the performance characteristics chosen, reference procedures or guidance documents followed to validate the method or custom validation procedure, and a final confirmation (memo to file) that the method validation results are acceptable for continued use of the method. An example statement would be "This memo serves as record that the validation of the XYZ Test Method has been approved for use by [name and title of approver]".



5.4.5.2 Fit for Use

Policy:

The laboratory validates non-standardized methods, laboratory-designed/developed methods, standardized methods used outside their intended range, and amplifications of standard methods to confirm that the methods are fit for the intended use. The validation is as extensive as is necessary to meet the needs in the given application or field of application (may include procedures for sampling, handling, and transportation). The laboratory records the results obtained, the procedure used for the validation, and a statement as to whether the method is fit for the intended use.

Details and Procedure:

Validation records are kept as in section 5.4.5.1. Included in these records is the validation procedure. The procedure used for the validation is likely to vary between different methods. Therefore, the procedures included in the laboratory records are not as detailed as a typical SOP, but are sufficient enough to re-create how the method was validated.

The techniques used for the determination of the performance of a method, are one of, or a combination of, the following:

- Ø calibration using reference standards or reference materials
- Ø comparison of results achieved with other methods
- Ø inter-laboratory comparisons
- Ø systematic assessment of the factors influencing the result
- Ø assessment of the uncertainty of the results based on scientific understanding of the theoretical principles of the method and practical experience.

When changes are made in the validated non-standard method, the influence of such changes carried out is documented and if appropriate a new validation is performed.

5.4.5.3 Client's Needs

Policy:

The range and accuracy of the values obtainable from validated methods (e.g., the uncertainty of the results, detection limit, selectivity of the method, linearity, limit of repeatability and/or reproducibility, robustness against external influences and/or cross-sensitivity against interference from the matrix of the sample/test object) as assessed for the intended use is relevant to the client's needs.

Details:

Validation includes the specification of the requirements, determination of the characteristics of the methods, the comparison of the requirements with the values of the characteristics of the method, and a statement on the validity.



As method development proceeds, regular review is required to verify that the needs of the client are still being fulfilled. Changing requirements requiring modifications to the development plan are approved and authorized.

Validation is always a balance between costs, risks, and technical possibilities.

5.4.6 Uncertainty of Measurement

5.4.6.1 Calibration

Policy:

Physical, chemical, and biological standards are calibrated or characterized by qualified subcontractors.

Details and Procedures:

Repeatability and reproducibility data are components of measurement uncertainty and are determined as a first step towards producing estimates of this parameter. The uncertainty of measurement is available on the certificate of analysis or calibration certificate from a subcontractor.

Note - in-house calibrations include procedures for uncertainty of measurement estimates where this is common practice.

5.4.6.2 Testing

Policy:

The SOP 5-4-6 is utilized to estimate uncertainties of measurement in testing, except when the test methods preclude such rigorous calculations. In certain cases it is not possible to undertake metrologically and statistically valid estimations of uncertainty of measurement. In these cases the laboratory attempts to identify all the components of uncertainty and make the best possible estimation, and ensure that the form of reporting does not give an exaggerated impression of accuracy. Reasonable estimation is based on knowledge of the performance of the method and on the measurement scope and makes use of previous experience and validation data.

Details:

The degree of rigor needed in an estimation of uncertainty of measurement depends on factors such as:

- Ø requirement of the test method
- Ø requirement by the client
- Ø if there are narrow limits on which decisions on conformance to a specification are based



In cases where a well-recognized test method specifies limits to the values of the major sources of uncertainty of measurement and specifies the form of presentation of calculated results, the laboratory is considered to have satisfied the estimation uncertainty of measurement by following the reporting instructions (see section 5.9).

5.4.6.3 Uncertainty Components

Policy:

When estimating the uncertainty of measurement, all uncertainty components that are of importance in the given situation are taken into account using accepted methods of analysis.

Details:

Sources contributing to the uncertainty include, but are not necessarily limited to, the reference standards and reference materials used, methods and equipment used, the environmental conditions, the item being tested or calibrated and the operator.

The predicted long-term behavior of the tested item is normally not taken into account when estimating the measurement uncertainty.

For further information, see NIST Technical Note 1297: Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results; and AIHA_LAP, LLC Policy Document – Appendix G: Estimation of uncertainty of Measurements.

5.4.7 Control of Data

5.4.7.1 Calculations and Data Transfers

Policy:

Calculations and data transfers are subject to appropriate checks in a systematic manner.

Details:

Test data are validated through the following arrangements by the Senior Analyst:

- Ø checks to determine accuracy of calculations, conversions, and data transfers
- Ø checks for transcription errors, omissions, and mistakes
- Ø checks to determine consistency with normal or expected values

For those analyses where manual data reduction is required, it is performed according to the instructions provided in the test method or SOP.



5.4.7.2 Computers and Automated Equipment

Policy:

When computers or automated equipment are used for the acquisition, processing, manipulation, recording, reporting, storage or retrieval of test or calibration data, the laboratory ensures that:

- Ø computer software developed by the user is documented in sufficient detail and suitably validated or otherwise checked as being adequate for use
- Ø procedures are established and implemented for protecting the integrity of data; such procedures include, but not be limited to, integrity and confidentiality of data entry or collection, data storage, data transmission, and data processing (see section 4.12.1.4)
- Ø computers and automated equipment are maintained to ensure proper functioning and are provided with the environmental and operating conditions necessary to maintain the integrity of test and calibration data
- Ø data is securely maintained by preventing unauthorized access to, and unauthorized amendment of, computer records

Details and Procedures:

Data generated using computer software programs that are interfaced directly to instruments incorporates all dilutions and calculations, thereby eliminating the need for manual data reduction.

Commercially developed software in general use within its designed application range may be considered sufficiently validated. Laboratory software configuration / modifications are validated as outlined in SOP 5-5-1.

Electronic records, electronic signatures, and handwritten signatures executed to electronic records must be equivalent to proper records and handwritten signatures to paper and are validated by procedures in 21 CFR. Part II (Docket No. 92NO251) RIN0910-AA29; Federal Register: March 20, 1997, Volume 62, Number 54), Rules and Regulations, pages 13429-13466. For further details see:

<http://www.fda.gov/cder/esig/index.htm>



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5.5 Equipment

This section tells you to:

1. Identify information needs for accept / reject decisions
2. Install equipment capable of providing that information
3. Use the equipment in the proper environment
4. Periodically check the equipment calibration

Key Words

Required Equipment and Accuracy
Authorized Personnel
Unique Identification
Inventory
Maintenance
Procedures
Out of Service
Calibration Status
Re-verification
Checks
Correction Factors
Safeguards against Adjustment

Cross-references

ISO 17025:2005 Section 5.5
AIHA-LAP, LLC Policy Documents
NVLAP Handbook 150 Section 5.5



5.5.1 Required Equipment

Policy:

The laboratory is furnished with all items for sampling, measurement and test equipment required for the correct performance of the tests (including sampling, preparation of test items, processing and analysis of test data). When equipment is used outside the laboratory's permanent control, it ensures that the requirements of this QA Manual are met.

Details:

Equipment is used in an environment appropriate to its proper performance. All equipment required by a test is described in each method, including the equipment's tolerances.

5.5.2 Required Accuracy

Policy:

Equipment and software used for testing, calibration and sampling are capable of achieving the accuracy required and comply with specifications relevant to the tests concerned. Calibration programs are established for key quantities or values of the instruments where these properties have a significant affect on the results. When received, equipment is checked to establish that it meets the laboratory's specification requirements, complies with the relevant standard specifications, and is checked in accordance with section 5.6 before use.

Details:

The procedures for checking newly received equipment are as determined by manufacturers' specification and/or those determined by the laboratory during procurement.

5.5.3 Authorized Personnel

Policy:

Equipment is operated by authorized personnel. Up-to-date instructions on the use and maintenance of equipment (including any relevant manuals provided by the manufacturer of the equipment), is readily available for use by the appropriate laboratory personnel.

Details:

Access to laboratory equipment is controlled to ensure that only authorized personnel use equipment.



5.5.4 Unique Identification

Policy:

Each item of equipment used for testing and calibration is uniquely identified as appropriate.

Details:

Measuring and testing equipment is uniquely identified through an asset or serial number. Measuring and testing equipment includes any instrument that could affect the quality of test results. Components that can be interchanged between various instruments are tracked in equipment logbooks, but are not assigned individual asset numbers.

5.5.5 Inventory and Maintenance Records

Policy:

Records are maintained of each item of equipment significant to the tests performed. The records include the following:

- Ø identity of the item of equipment (and its software)
- Ø manufacturer's name, type identification, and serial number and/or other unique identification
- Ø checks that equipment complies with the specification (see section 5.5.2)
- Ø current location, where appropriate
- Ø the manufacturer's instructions, if available, or reference to their location
- Ø dates, results and copies of reports and certificates of all calibrations, adjustments, acceptance criteria, and due date of next calibration
- Ø maintenance carried out to date and the maintenance plan (includes calibration)
- Ø damage, malfunction, modification or repair to the equipment

Details:

A database is used to capture the above inventory information. The above information related to service and maintenance is kept in individual equipment files and/or binders. Other information kept in these files and/or binders may include:

- Ø date received and date placed in service
- Ø condition when received (e.g., new, used, refurbished)
- Ø dates and results of calibration and/or verification and date of next calibration and/or verification
- Ø performance history, where appropriate (e.g., response time, drift, noise level)



5.5.6 Equipment Procedures

Policy:

The section 5.5.6 is utilized as an established plan for safe handling, transport, storage, use and maintenance (including calibration) of measuring equipment, and appropriate use of correction factors to ensure proper functioning and in order to prevent contamination or deterioration.

Note: additional procedures may be necessary when measuring equipment is used outside the permanent laboratory for tests, calibrations, or sampling (currently not applicable at our laboratory).

Details and Procedures:

The procedures for each piece of measuring equipment are located in the appropriate room where the equipment is located. These procedures detail any information for safe handling, transport, storage, use, and maintenance of equipment.

5.5.7 Out of Service Equipment

Policy:

Equipment that has either been subjected to overloading or mishandling, or gives suspect results, or has been shown to be defective or outside specified limits, is taken out of service, clearly marked, and appropriately stored until it has been repaired and shown by calibration or test to perform correctly.

Details:

Routine testing work is completely discontinued on equipment that even shows minor non-conformances. Not only do we do this for ethical reasons in support of our client, but minor non-conformances are often indicative of major breakdown of expensive equipment. These breakdowns should be avoided wherever possible.

Out of service equipment is clearly marked as outlined in section 5.5.7.

The laboratory examines the effect of the defect or departure from specified limits on previous test and institutes the "Control of Nonconforming Work" procedure as outlined in section 4.9.



5.5.7 Calibration Status

Policy:

Equipment requiring calibration is labeled to indicate the calibration status and/or operational status and the date when re-calibration is due when appropriate.

Details:

Calibration labels have a write-on surface and a pressure sensitive adhesive. The areas that are filled out include the person who performed the calibration, the date it was performed, the date it is due for re-calibration, and the equipment's identification number.

CALIBRATION	
BY _____	DATE _____
DUE _____	ID# _____

Measuring equipment that has failed calibration or is deemed out of service is labeled with one of the following labels:

CALIBRATION VOID
DO NOT USE

OUT OF SERVICE
DO NOT USE

A piece of equipment that is not calibrated or checked is labeled with the following label:

FOR REFERENCE ONLY

5.5.8 Return to Service

Policy:

When equipment goes outside the direct control of the laboratory for a period, the laboratory ensures that the function and calibration status of the equipment are checked and validated and shown to be satisfactory before the equipment is returned to service.



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Details and Procedures:

The procedures used to check and ensure that the function and calibration status of the equipment are satisfactory before the equipment is returned to service are outlined in the manufacturer's equipment manual. Any additional quality control checks are outlined in the "Quality Control" section of the appropriate test method.

5.5.9 Periodic Checks

Policy:

When intermediate checks are needed to maintain confidence in the calibration status of equipment, these checks are carried out periodically according to defined procedure.

Details and Procedures:

As stated in section 5.5.6, the procedures for each piece of measuring equipment are located in the appropriate room where the equipment is located. SOP 5-5-1 outlines a general maintenance plan for equipment and includes various checks. Internal quality control checks are specified in individual test methods that are located in the appropriate laboratory areas thereby providing procedures for intermediate checks.

5.5.11 Correction Factors

Policy

Calibrations that give rise to a set of correction factors are updated along with all copies of this data (e.g., in computer software).

Details and Procedures:

The updating of correction factors including all copies is assured by following the appropriate test method or SOP. It is the responsibility of the Senior Analyst to ensure that all copies are updated.

5.5.12 Safeguards against Adjustments

Policy:

Test and calibration equipment, including hardware and software, are safeguarded from adjustments that invalidate test and/or calibration results/status.



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Details:

Safeguards against adjustment for laboratory equipment include:

- Ø detailed SOPs and manufacturer's manuals on the operation of the equipment
- Ø policies permitting only fully trained and competent personnel to operate equipment
- Ø access to the laboratory is restricted to authorized personnel

Safeguards against adjustment for software, includes:

- Ø password protection for important files and packages
- Ø access to the laboratory is restricted to authorized personnel



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5.6 Measurement Traceability

This section tells you:

1. Measurements are traceable to SI units (when applicable)
2. Reference Standards and Reference Materials are used

Key Words

System International
Reference Standard
Reference Material
Traceability

Cross-references

ISO 17025:2005 Section 5.6
AIHA-LAP, LLC Policy Documents
NVLAP Handbook 150 Section 5.6



5.6.1 General

Policy:

Test equipment for subsidiary measurements (e.g., for environmental conditions) having a significant effect on the accuracy or validity of the result of the test, calibration, or sampling are calibrated before being put into service. All measurement and test equipment having an effect on the accuracy or validity of tests are calibrated and/or verified before being put into service. As mentioned in section 5.5 outlines an established program for the maintenance of equipment and includes calibration.

Details:

The program includes a system for selecting, using, calibrating, checking, controlling, and maintaining:

- Ø measurement standards
- Ø reference standards used as measurement standards
- Ø measuring and test equipment used to perform tests and calibrations

Procedures are documented where appropriate. All measurements that play a defining role in testing accuracy are based directly or indirectly on reference standards, reference materials, certified reference materials, or other standards or materials having appropriate traceability.

5.6.2 Specific Requirements

5.6.2.1 Calibration

Policy:

The program for calibration equipment is designed and operated to ensure that calibration measurements are traceable to the Système International (SI) units of measurement.

Details:

Traceability of measurement is assured by the use of calibration services from laboratories that can demonstrate competence, measurement capability and traceability. The calibration certificates issued by these laboratories show that there is a link to a primary standard or to a natural constant realizing the SI unit by an unbroken chain of calibrations. The calibration certificates contain the measurement results including the measurement uncertainty and/or a statement of compliance with an identified metrological specification (see also section 5.9.4.2).

Calibration laboratories accredited to ISO 17025 are considered competent to provide the appropriate calibration services.



Traceability to SI units of measurement may be achieved by reference to an appropriate primary standard or by reference to a natural constant the value of which in terms of the relevant SI unit is known.

The term “identified metrological specification” means that it must be clear from the calibration certificate against which specification the measurements have been compared with, by including the specification or by giving an unambiguous reference to the specification.

When the terms “international standard” or “national standard” are used in connection with traceability, it is assumed that these standards fulfil the properties of primary standards for the realization of SI units.

Maintain certificates of all reference standards, measuring equipment, or certified reference material used in ensuring traceability. Where traceability to national standards of measurement is not applicable, the laboratory provides satisfactory evidence of correlation of results, for example by participation in a suitable program of inter-laboratory comparisons or proficiency testing.

Reference standards, such as thermometers and weights are traceable to a national or international standard (e.g., NIST).

5.6.2.2 Testing

5.6.2.2.1

Policy:

The requirements given in section 5.6.2.1 apply to measuring and test equipment with measuring functions used, unless it has been established that the associated calibration uncertainty contributes little to the total uncertainty of the test result. When this situation arises, the laboratory ensures that equipment used can provide the accuracy of measurement needed.

Details:

The extent to which the requirements in section 5.6.2.1 are followed depends on the relative contribution of calibration uncertainty to the total uncertainty. If calibration is the dominant factor, the requirements are strictly followed. If, however, calibration is not one of the major contributors to the total uncertainty, other ways for providing confidence may be used, as given in section 5.6.2.2.2.

5.6.2.2.2

Policy:

Where traceability to SI units of measurement is not possible and/or not relevant, other means for providing confidence in the results are applied, such as:

- Ø the use of suitable reference materials certified to give a reliable characterization of the material



- Ø mutual-consent standards or methods which are clearly specified and agreed upon by all parties concerned
- Ø participation in a suitable program of inter-laboratory comparisons or proficiency testing

Details:

Reliable characterization involves an estimate of recovery.

The laboratory participates in proficiency testing and/or check sample programs. The list of programs is maintained by the Quality Assurance Manager.

5.6.3 Reference Standards and Reference Materials

5.6.3.1 Reference Standards

Policy:

The SOP 5-6-1 outlines the program for the calibration of reference standards. Reference standards are obtained or calibrated by a body that can provide traceability as described in section 5.6.2.1. Such reference standards of measurement held by the laboratory are used for calibration only and for no other purpose, unless it can be shown that their performance as reference standards would not be invalidated.

Details:

Reference standards are obtained from the National Institute of Standards and Technology (NIST) or other established and recognized sources.

5.6.3.2 Reference Materials

Policy:

Where possible, reference materials are traceable to SI units of measurement, or to certified reference materials. Internal reference materials are checked as far as is technically and economically practicable.

Details:

Reference materials, including calibration standards, used in chemical measurement are prepared so that the point of measurement is similar or equivalent to that of the samples. The matrix, prior to the addition of the analyte does not have a detectable concentration of the analyte. Reagents used in the preparation of reference materials, including calibration standards are of certified purity.



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5.6.3.3 Intermediate Checks

Policy:

Checks needed to maintain confidence in the calibration status of reference, primary, transfer or working standards and reference materials are carried out according to defined procedures and schedules.

Details and Procedures:

The control check standards used to verify the accuracy of all the other standards are prepared independently from all the other standards used to establish the original calibration. These control check standards are preferably prepared from a separate lot # or source. It is the responsibility of the Quality Assurance Manager to establish and maintain the individual schedule for each SOP and/or test method.

5.6.3.4 Transport and Storage

Policy:

The SOP 5-6-1 outlines safe handling, transport, storage and use of reference standards and reference materials in order to prevent contamination or deterioration and in order to protect their integrity.

Details:

Additional procedures may be necessary when reference standards and reference materials are used outside the permanent laboratory for tests, calibrations, or sampling.

Proper conditions are established for housing, handling, and care of reference materials and standards. All information needed to properly identify references appears on their housing or containers.



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5.7 Sampling

This section tells you to:

1. Proper methods and procedures for sampling in the laboratory for test material

Key Words

Sample
Air velocity
Cross-contamination
Sample labeling

Cross-references

ISO 17025:2005 Section 5.7
AIHA-LAP, LLC Policy Documents
NVLAP Handbook 150 Section 5.7



5.7.1 Sampling Procedures

***NOTE:** Asbestos TEM Labs does not provide sampling advice to clients or perform sampling in the field, due to liability and conflict of interest issues. The task of sampling for asbestos and lead is relegated to the experts in the field. We provide a government document and contact list to homeowners and non-commercial customers inquiring about sampling and related asbestos remediation issues.*

Policy:

Section 5.7 outlines the procedures for the sampling of customer supplied bulk and soil materials, contamination control, and cross-contamination of samples used to test for hazardous materials.

Details:

Asbestos TEM Laboratories performs only a small amount of sampling in-house. Most of the items tested in the laboratory are sampled in the field by Certified Industrial Hygienist (CIH) consultants, or their reports.

The procedures for appropriate sampling are detailed in SOP-PLM-01, SOP-PLM-02, SOP 5-4-3 AA-030, and draft procedures for TEM air, and TEM Naturally Occurring Asbestos (NOA) bulk sample preparation.

5.7.2 Sampling

Policy:

The PLM CARB soil samples are received in-house as rock or soil, in plastic bags or jars, which are heated/crushed/pulverized/sieved (or combinations of the four soil treatment methods), by the in-house soil technicians. The samples for lead testing arrive at the lab in containers, and a measured amount of the sample is removed for testing.

Details:

The few areas where the in-house analysts or technicians perform sampling on test materials are:

- 1) Soil samples for CARB and lead testing of asbestos (already sampled in the field and placed in a container for treatment, mixing, and sampling)
- 2) Bulk materials for lead/PLM/TEM/PCM analysis and (already sampled as pieces of building materials, and transported to the lab in containers). These bulk materials are sampled in layers by skilled analysts. Each material layer is tweezed and probed for a representative sample. Some materials, like floor tiles, are treated with heat to denature the product, rendering the asbestos mineral visible under the polarized microscope. Reference SOP PLM-02 for a detailed breakdown on building material sample methods.
- 3) Contamination testing of the work areas (air and surface) for
 - A) Analyst safety in the testing laboratory
 - B) Prevention of sample cross-contamination



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Proper mixing of the soil, post treatment, is required to achieve a thoroughly mixed and representative sample. The sampling process for the crushed or sieved soil material requires separation from other samples, and mixing, to obtain a representative sample.

5.7.3 Difficult Samples

Policy:

Asbestos TEM Laboratories recognizes that analytical difficulty on samples is variable. Problem samples at ATEM are identified as asphalt roofing, floor tiles, and linoleum.

Details: Reference SOP PLM-02, sections 9.9, 9.11, and 9.19, for in-depth information on these difficult samples

Roof Tile

Prep considerations: Try to agitate and tease the materials enough to dissolve much, but not all of the material. If all the tar is dissolved completely, this can be difficult and can lead to errors.

Linoleum

Prep considerations: This is the one common material that actually dissolves better in 1.550 than in 1.680. When prepping in 1.550, one must remember that any chrysotile will have low relief and will take some effort to detect.

Analytical notes: This material only rarely contains asbestos, and never more than a few percent.

Floor Tiles

Some of these have extremely short and small pieces. In some cases these tiles contain chrysotile which is almost all below the theoretical limit of optical resolution, which is about 0.25 microns (250 nm) in diameter. These tiles cannot be conclusively called negative by PLM. The state of New York requires that all tiles which are "ND" by PLM be re-analyzed by TEM to confirm that they are asbestos-free

Prep considerations: Thin slices should be made in cross-section, taking care to subsample the entire thickness of the tile; some tiles consist of two inseparable layers bonded together, with the surface layer "ND" (talc may be present) and the bottom layer containing up to 10% chrysotile.

Analytical notes: Fine-grained white tiles are often the more difficult ones. If any tile appears to be asbestos-free at a magnification of 100x, the analyst should continue to search at high power (400x)

5.7.4 Sample Cross-Contamination

Policy:

Most of the soil and rock samples are placed into the drying ovens before additional processing is performed. The disposable materials used in soil processing are single use. Covers are required for the containers, while the material is undergoing treatment, to prevent sample cross-contamination.

Details:



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The equipment for processing soil is located in a HEPA filtered safety hood (pulveriser & crusher). Cleaning (pressurized air, HEPA vacuum, brush) the equipment is required between each use to prevent sample cross-contamination.

Covers (paper towels and binder clips) are placed over the sample drying pans to prevent cross-contamination of samples during the dehydration process.

All samples are transferred and stored in closed containers, and all of the containers are identified with unique numerical sequences, to link the sample to the client.

5.7.5 Analyst and Sample Protection

Policy:

Contamination control for analyst safety and sample cross-contamination is performed quarterly, and the sampling sites are located in close proximity to the analyst work stations. All PLM analyst work stations are equipped with HEPA filtered air particle capture hoods to minimize particulate exposure to the analyst, and prevent cross-contamination of the test samples. The TEM air prep lab has a positive pressure (0.22 μm) HEPA filtered hood to protect the sample from background contamination.

Details:

For contamination control testing, the laboratory air, in close proximity to the test areas, is sampled through 0.45 μm filters for asbestos structures. Samples of intake areas and the surface (100cm²) of lab benches are tested with wipes, for residual lead.

The HEPA filtered safety hoods are certified annually for 0.22 μm particle retention (PAO) and face velocity.

Post testing, the sample containers are closed, labeled, and stored for a minimum of three months, before they are discarded to hazardous or non-hazardous waste, test results dependent. Custom hold times are available for clients on a negotiated basis.



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5.8 Handling of Test and Calibration Items

This section tells you to:

2. Keep samples in good condition.

Key Words

Identification

Receipt

Protection

Cross-references

ISO 17025:2005 Section 5.8

AIHA-LAP, LLC Policy Documents

NVLAP Handbook 150 Section 5.7



5.8.1 Procedures

Policy:

The section 5.7 outlines the procedures for the transportation, receipt, handling, protection, storage, retention and/or disposal of test items, including all provisions necessary to protect the integrity of the test item, and the interests of the laboratory and the client.

Details:

Samples, reagents, and standards are stored so as to ensure their integrity by preventing against deterioration, contamination, and loss of identity. It is recognized that this is a general statement, but details are elaborated upon in SOP 5-7-1.

5.8.2 Identification of Test Items

Policy:

Test items are systematically identified as they arrive at the laboratory. The identification is retained throughout the life of the item in the laboratory. The system is designed and operated so as to ensure that items cannot be confused physically, or when referred to in records or other documents. The system accommodates a sub-division of groups of items and the transfer of items within and from the laboratory when appropriate.

Details:

Sample labelling indicates the unique identification and conforms to applicable legal requirements. Where conformity of possession of a test sample must be maintained for forensic or other purposes, the laboratory establishes and documents a system for appropriate chain-of-custody (forensic samples may be used in a court of law for evidentiary purposes).

5.8.3 Receipt

Policy:

Upon receipt of the test item, any abnormalities or departures from normal or specified conditions, as described in the relevant test method, are recorded. When there is any doubt as to the suitability of an item for test, or when an item does not conform to the description provided, or the required is not specified in sufficient detail, the laboratory consults the client for further instructions before proceeding and keeps a record of the discussion.



Details:

Conform to applicable regulations or contractual arrangements. The condition of sample may include or relate to damage, quantity, preparation, packaging, or temperature. Preparation may include addition of chemical preservative, removal of moisture, and isolation of portion of sample to be tested, homogenization, or sub-sampling.

Arrangements are in place to ensure that elapsed time between sampling and testing does not exceed test method specifications (holding time).

5.8.4 Protection

Policy:

The SOP 5-7-1 outlines the procedures and appropriate facilities for avoiding deterioration, loss or damage to the test item during storage, handling and preparation and testing; instructions provided with the item are followed. When items have to be stored or conditioned under specified environmental conditions, these conditions are maintained, monitored, and recorded. Where a test item is to be held secure (e.g., for reasons of record, safety or value, or to enable complementary test to be performed later), the laboratory has arrangements for storage and security that protect the condition and integrity of the secured item concerned.

Details:

Where test items are to be returned into service after testing (e.g., for non-destructive testing or human beings subject to medical tests), special care is required to ensure that they are not damaged or injured during the handling, testing or storing/waiting processes.

A sampling procedure and information on storage and transport of samples, including all information that may influence the test result, is provided to those responsible for taking and transporting the samples.

The laboratory establishes whether the sample has received all necessary preparation or whether the client requires preparation to be undertaken or arranged by the laboratory. Proper requirements for packaging, environmental conditions, and separation from incompatible materials are observed. Where samples have to be stored or conditioned under specific conditions, these conditions are maintained, monitored, and recorded, where necessary.

Where a sample, or portion of a sample, is to be held secure (e.g., for reasons of record, safety, or value, or to enable check tests to be performed later), the laboratory has storage and security arrangements that protect the condition and integrity of the sample.



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5.9 Assuring the Quality of Test Results

This section tells you:

1. That results are monitored
2. There is a plan for monitoring

Key Words

Internal Quality Control
Statistical Techniques
Inter-laboratory Comparisons
Proficiency Testing
Certified Reference Materials
Secondary Reference Material
Replicates
Re-testing
Correlation

Cross-references

ISO 17025:2005 Section 5.9
AIHA-LAP, LLC Policy Documents
NVLAP Handbook 150 Section 5.9



5.9 Assuring the Quality of Test Results

Policy:

Quality control procedures are utilized to monitor the validity of test and/or calibration results. These procedures are for each test method utilized in the laboratory. The resulting data are recorded so that trends are detectable (and where practicable, statistical techniques are applied to the reviewing of the results. This monitoring is planned and reviewed and may include, but not limited to, the following:

- Ø regular use of certified reference materials and/or internal quality control using secondary reference materials
- Ø participation in inter-laboratory comparisons or proficiency testing programs
- Ø replicate tests or calibrations using the same or different methods
- Ø re-testing or re-calibration of retained items
- Ø correlation of results for different characteristics of an item

The Senior Analyst will prepare all QC summary data and helps Quality Assurance Manager to prepare monthly QC reports. Monthly QC reports shall include:

- Ø Total samples analyzed
- Ø Total number of QC samples analyzed. QC samples can be divided by type.
- Ø Total number of blanks analyzed
- Ø Number of proficiency sample analyzed
- Ø Analysis of statistical data, (control charts and brief summary)
- Ø List of customers complains, corrective and preventive action for the current month
- Ø Other activities

Details:

The methods utilized from the above list will be appropriate for the type and volume of the work undertaken. Records are maintained of assurance activities and any actions taken.

As a guide, for routine analyses the level of internal quality control is typically 10% of the sample throughput. For more complex procedures, 20% is not unusual and on occasions even 50% may be required. For analyses performed infrequently, a full system validation is performed on each occasion. This may typically involve the use of a reference material containing a certified or known concentration of analyte, followed by replicate analyses of the sample and spiked sample. For analyses undertaken more frequently, systematic quality control procedures incorporating the use of control charts and check samples are implemented. These procedures are documented in the "Quality Control" section of each test method.

Internal quality control schemes using statistics include:

- Ø quality control charts
- Ø accuracy, precision and bias evaluation
- Ø uncertainty of measurements evaluation
- Ø trend analysis



Ø The Quality Control data charts for precision of re-analyzed data, re-preparation data, and PAT reference comparison slides will contain the following: UCL, UWL, Mean average. The LCL and LWL will be included in control charts, where appropriate. The control limits will be calculated, as follows:

Ø Mean Average sum of Data Means / total sample #

Ø SD Standard Deviation

Ø UCL (mean average) + 3SD

Ø UWL (mean average) + 2SD

Ø LWL (mean average) - 2SD

Ø LCL (mean average) - 3SD

Ø Adverse Trend Control charts of QC summary data are analyzed for statistically significant trending (systematic deviation from a central line). A trend is considered significant if seven successive sample results are on the same side of the central line, and four out of five successive values exceed 1 SD. If a trend is found to be present, analysis is discontinued, and the problem corrected. Any questionable results require sample reanalysis.

Proficiency testing helps to highlight not only repeatability and reproducibility performance between laboratories, but also systematic errors such as bias. It is important to monitor proficiency testing results as a means of checking quality assurance and take action as necessary.

The Quality Assurance Manager maintains a list of all the current proficiency testing programs the laboratory participates in, monitors the results, and notifies the appropriate personnel of both problematic and successful results.

Technical personnel use certified reference materials and reference materials to evaluate test performance on a daily basis and include daily process control checks. These data are used to evaluate the validity of the test results.

Replicate tests may be used if suitable reference material is available. These materials and proficiency test materials are available for improving repeatability.

Re-testing of test items is performed occasionally at the discretion of the supervisor or when test results seem anomalous.

A lead report with charts shall be generated quarterly, and the Quality Manager shall submit the report to ATEM management, for review.



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5.10 Reporting the Results

This section tells you:

1. What needs to be on a report
2. How to handle amendments to reports

Key Words

Specific Information
Required Information
Interpretation
Opinion
Subcontractor
Electronic Transmission of Results
Format
Amendments

Cross-references

ISO 17025:2005 Section 5.10
AIHA-LAP, LLC Policy Documents
NVLAP Handbook 150 Section 5.10



5.10.1 General

Policy:

The results of each test or series of tests are reported accurately, clearly, unambiguously and objectively, and in accordance with any specific instructions in the test methods.

The results are reported, normally in a test report and include all the information requested by the client and necessary for the interpretation of the test results and all information required by the method used. This information may include what is outlined in section 5.10.2, 5.10.3 and 5.10.4.

In the case of tests performed for internal clients, and in the case of a written agreement with the client, the results may be reported in a simplified way. The information listed in section 5.10.2 to 5.10.4, and not reported, is kept readily available.

Details:

Test reports are issued as either hard copy or by electronic data transfer.

5.10.2 Test Reports

Policy:

Test reports include the following information, as appropriate:

- Ø a title (e.g., "Test Report")
- Ø name and address of laboratory, and location where tests and/or calibrations were carried out if different from the address of the laboratory
- Ø unique identification of the test report [(such as a serial number), and on each page an identification in order to ensure that the page is recognized as a part of the test report, and a clear identification of the end of the test report
- Ø name and address of the client
- Ø identification of the method used
- Ø description, condition, and unambiguous identification of the item(s) tested
- Ø date of receipt of test items (where this is critical to the validity and application of the results) and date(s) of performance of the test
- Ø reference to sampling procedures used by the laboratory or other bodies where these are relevant to the validity or application of the results
- Ø work sheets for PLM and TEM analysis, copy of Metal Data Sheet for AA analysis
- Ø test results with units of measurement
- Ø standards that were used for calibration and verification
- Ø the name(s), function(s) and signature(s) or equivalent of person(s) authorizing the test report
- Ø where relevant, a statement to the effect that the results relate only to the items tested



Details:

Signing authority for test reports is the responsibility of the Laboratory Manager. Records for individuals with signing authority for test reports are approved and maintained by the Laboratory Manager.

Hard copies of test reports include the page number and total number of pages. In cases where a partial report is printed, the verbiage “Printed _ Pages of final Report” shall be stamped on each printed page, near the actual page number. Write the number of printed pages above the “_”.

A statement is included specifying that the test report is not to be reproduced except in full, without written approval of the laboratory. Data reported to the client contains the appropriate significant digits for each test method. Low level data are identified as being below specified limits.

5.9.3 Test Reports Additional Requirements

5.10.3.1

Policy and Details:

In addition to the requirements listed in section 5.9.2, test reports include the following, where necessary for the interpretation of results:

- Ø deviations from, additions to, or exclusions from the test method, and information on specific test conditions, such as environmental conditions
- Ø where relevant, a statement of compliance/non-compliance with requirements and/or specifications
- Ø where applicable, a statement on the estimated uncertainty of measurement of the test result; information on uncertainty is needed in test reports when its is relevant to the validity or application of the test results, when a client’s instruction so requires, or when uncertainty affects compliance to a specification limit
- Ø where appropriate and needed opinions and interpretations (see section 5.9.5)
- Ø additional information required by specific methods, clients, or groups of clients

5.10.3.2

Policy and Details:

In addition to the requirements listed in sections 5.10.2 and 5.10.3.1, test reports containing the results of sampling include the following, where necessary for the interpretation of test results:

- Ø date of sampling
- Ø unambiguous identification of substance, matrix, material or product sampled (including name of manufacturer, model or type of designation and serial numbers as appropriate)
- Ø location of sampling, including any diagrams, sketches or photographs
- Ø reference to sampling plan and procedures used
- Ø details of any environmental condition during sampling that may affect the interpretation of the test results



- Ø any standard or other specification for the sampling method or procedure, and deviations, additions to or exclusions from the specification concerned

5.10.4 Calibration Certificates

Policy:

The testing laboratory does not issue calibration certificates. However, the laboratory often receives calibration services from a calibration laboratory and needs to be familiar with the information on a calibration certificate.

Details:

In addition to the requirements listed in section 5.10.2, the calibration certificate could include the following, where necessary for the interpretation of calibration results:

- Ø the conditions (e.g., environmental) under which the calibrations were made that have an influence on the measurement results
- Ø the uncertainty of measurement and/or a statement of compliance with an identified metrological specification or clauses thereof
- Ø evidence that the measurements are traceable (see section 5.6.2.1.1)

5.10.5 Opinions and Interpretations

Policy:

When opinions and interpretations are included in the test report, the basis upon which the opinions and interpretations have been made is documented. Opinions and interpretations are clearly marked as such in the test report.

Note: opinions and interpretations should not be mixed-up with inspections and product certifications as intended in ISO/IEC 17020 and ISO/IEC Guide 65.

Details:

Opinions and interpretations included in a test report may comprise, but not be limited to the following:

- Ø opinion on conformity of the results with requirements
- Ø fulfilment of contractual requirements
- Ø recommendations on how to use the results
- Ø guidance to be used for improvements

In many cases it is appropriate to communicate the opinions and interpretations by direct dialogue with the client. This dialogue is written down.



5.10.6 Testing Results Obtained from Subcontractors

Policy and Details:

Test reports containing the results of tests performed by subcontractors are clearly identified for the subcontracted results. The subcontractor reports the results either in writing or electronically to our laboratory.

5.10.7 Electronic Transmission of Results

Policy:

In the case of transmission of test results by telephone, telex, facsimile or other electronic or electromagnetic means, the requirements of the policies and procedures of this QA Manual continue to apply (see also section 5.4.7).

Details:

Reports that are “published” electronically contain the statement that signatures are on file.

5.10.8 Format of Reports

Policy:

The format of reports is designed to accommodate each type of test carried out and to minimize the possibility of misunderstanding or misuse.

Details:

The layout of the test report is such that the presentation of the test data facilitates ease of assimilation by the reader.

The headings are standardized as far as possible.

5.10.9 Amendments to Test Reports

Policy:

Material amendment to a test report after issue are made only in the form of a further document, or data transfer, which includes the statement: “Revised Analytical Report”. Such amendments meet all the requirements in this QA Manual.

Details:

When it is necessary to issue a complete new test report, it is uniquely identified and contains a reference to the original report that it replaces. The words “Revised Analytical Report” shall be placed onto each report as a watermark in MS Word or PDF, or an imported picture in MS Excel.



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Revision History and Approval

Revision	Date	Document Revision
0	Jan 26, 2004	Initial Publication
1	Oct 15, 2005	Minor revision of text on distribution restriction
2	Nov 13, 2007	Changed personnel
3	Dec 4, 2007	Changed personnel and change of address
4	Jun 30, 2008	Changed personnel and added section 4.10 Improvement, fixed header and signature block
5	May 12, 2009	Changed personnel; general edit of grammar
6	Nov 2, 2010	Annual Update
7	Jun 15, 2011	Added reference to NVLAP Handbook 150 and AIHA-LAP, LLC Policy Documents, merged editions for AA division and other divisions
8	Dec 12, 2012	8.1 Page1 (bottom) – Delete Copyright and associated verbiage 8.2 Section 4.1 – Delete old org chart, add new org chart 8.3 Section 4.7.2 – add web site customer service form 8.4 Section 4.13.1.1 – Delete references to ten years, add three years 8.5 Section 4.13.1.2 - Delete references to ten years, add three years, and add verbiage for special customer service negotiated time holds 8.6 Delete duplicate section 5.8 (5.7 & 5.8 have duplicate verbiage), add sampling verbiage for new 5.7 section 8.7 Update revision history, document signatures, and effective dates 8.8 Minor grammar changes in document
9	Apr 16, 2013	4.16 Delete current org chart, add updated org chart Page 1 Add ATEM quality policy
10	20 May 2013	All Add current personnel names; delete old names section 5.7 Add difficult samples section 5.9 Add limits for cumulative PLM & TEM accuracy and precision control charts
11	26 Sep 2013	Page 7; Delete: "Proficiency Testing" old def.; Add: New "Proficiency Testing" Def. Step 4.1.5, B, Detail, Page 13, Add: Required laboratory ethics training Step 4.3.3.1; Delete: Biannually Add: Annually Step 4.5.2 Revise Policy to include: subcontract lab, scope, and accrediting body Step 4.11.2 Detail; Added: Root cause analysis methodology and reference to CAR SOP procedure Step 5.2.2 Detail; Added a reference to SOP 5-2-1, training requirements, and duration Step 5.2.2 Detail; Added a requirement for analysts to read and understand the LQAP Step 5.9 Detail, Page 103: The Pb quarterly report shall be submitted to ATEM Management Step 5.10.9 Detail, Add: Instructions for amended report
12	04 Oct 2013	Revise: Org Chart Add: new employees Delete: terminated employee Step 4.5.1; Add: Requirement for Pb to a AIHA accredited lab Step 4.5.3; Add: Reporting subcontractor results to customers

Document Approval

Laboratory Manager

10/04/2013

Date

Quality Assurance Manager

10/04/2013

Date

APPENDIX E

INTERLABORATORY QUALITY CONTROL SUMMARY
INTERSTATE 11 - DESIGN BUILD
BOULDER CITY BYPASS PHASE 2
BOULDER CITY, NEVADA

Kleinfelder Sample Number	Kleinfelder Sample Name	Kleinfelder Sample Depth (feet)	ATEM Sample Number	Lab/Cor Sample Number	QC Analysis Performed	TEM Total Asbestos Structure Count		TEM Total Weight Percent		400 Point Count by PLM Percent Asbestos	
						ATEM Result	Lab/Cor Result	ATEM Result	Lab/Cor Result	ATEM Result	Lab/Cor Result
86	R-66	0-5	1428-00012-003	Q141769 - S1	CARB 435 - TEM	6	8	0.022	0.0327	NP	NP
105	WAPA-3e-4	Surficial	1428-00024-001	Q141769 - S2	CARB 435 - TEM	18	14	0.298	0.116	NP	NP
125	R-83A	21.7-45.0	1428-00040-001	Q141769 - S3	CARB 435 - TEM	ND	ND	ND	ND	NP	NP
227	R-100A	28.5-71.7	1428-00066-035	Q141798 - S1	CARB 435 - PLM	4	NP	1.219	NP	0.75	0.75
254	P-4	126.2-180.0	1428-00066-047	Q141768 - S2	CARB 435 - PLM	40	NP	0.366	NP	0.50	*<0.25
263	R-106	2.5-15.4	1428-00048-004	Q141769 - S4	CARB 435 - TEM	52	25	0.893	1.89	NP	NP
N/A	BC-S2-00084	0-1/2	1428-00078-001	Q141768 - S3	CARB 435 - PLM	NP	NP	NP	NP	ND	ND

Notes: ND = No Asbestos Detected

NP = Not Performed

N/A = Not Applicable

* Asbestos detected in non counted portion of sample.

Extra test shown below; result included for reference but not part of Interlaboratory Quality Control

Kleinfelder Sample Number	Kleinfelder Sample Name	Kleinfelder Sample Depth (feet)	ATEM Sample Number	Lab/Cor Sample Number	QC Analysis Performed	TEM Total Asbestos Structure Count		TEM Total Weight Percent		400 Point Count by PLM Percent Asbestos	
						ATEM Result	Lab/Cor Result	ATEM Result	Lab/Cor Result	ATEM Result	Lab/Cor Result
242	R-101	114.1-143.0	1428-00038-009	Q141768 - S1	CARB 435 - PLM	86	NP	1.181	NP	NP	2.25



Lab/Cor Portland, Inc.

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**Analysis Report Cover
Final Report**

Asbestos and Environmental Analysis

Phone: (503) 224-5055
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<http://www.labcorpdx.net>

Job Number: Q141769 PDX
Client: Asbestos TEM Labs
Address: 630 Bancroft Way
Berkeley, CA 94710-2224
Project Name: InterLab QC 7-23-2014
Project Num:
PO Number:
Sub Project:

Report Number: Q141769R04
Report Date: 8/6/2014

Enclosed please find results for samples submitted to our laboratory. A list of samples and analyses follows:

Lab/Cor Sample #	Client Sample # and Description	Analysis	Analysis Notes	Date Received:
Q141769 - S1	1428-12-3 - R-66, 0-5'	CARB 435 - TEM		7/23/2014
Q141769 - S2	1428-24-1 - Wapa 3a-4	CARB 435 - TEM		7/23/2014
Q141769 - S3	1428-40-1 - R-83a, 21.7-45.'	CARB 435 - TEM		7/23/2014
Q141769 - S4	1428-48-4 - R-106, 2.5-15.4'	CARB 435 - TEM		7/23/2014



Job Number: Q141769 PDX

Client: Asbestos TEM Labs

Project Name: InterLab QC 7-23-2014

Report Number: Q141769R04

Report Date: 8/6/2014

CARB 435 - TEM - Samples were processed and analyzed following the California Air Resources Board (CARB) method 435 using transmission electron microscopy (TEM) as an alternative to polarized light microscopy (PLM). All sample preparation was conducted under a negative air ventilation hood with a HEPA filter. Samples were weighed to the nearest 0.2 g prior to and after the every step of the preparation process. If rocks were observed, these were removed. If large chunks of building materials were observed, these were removed and analyzed by PLM, and the mass and asbestos type and percentage were documented, if present.

To homogenize the sample particle size to an even sizing, samples were ground using a vertical rotating grinder (BICO) which released the ground material into a collection pan once optimal particle sizing had occurred. No overgrinding or overmilling of the sample can occur. Samples that required further reduction to eliminate interferences may have undergone additional ashing and/or hydrolyzation steps to obtain a gravimetric reduction ratio (GRR - less than 1.0). A reported GRR of 1 indicates that these additional steps were not performed. After collection, the ground sample was weighed. A portion of the material (about 0.2 grams) was suspended in particle-free water and sonicated for three minutes, handshaken for another 30 seconds, and allowed to settle for two minutes. A range of aliquots were pipetted into a vacuum filtration system utilizing 25mm MCE filters.

Briefly, the filters were collapsed with a solution of N,N-dimethylformamide and acetic acid, then etched in a low temperature plasma etcher to remove the top surface of the filter and other organics. The samples were carbon coated at high vacuum with a thin layer of carbon, placed on 200 mesh copper grids and allowed to dissolve in N,N-dimethylformamide followed by an acetone bath until cleared of filter debris..

The grid preparations were examined in the TEM at low magnification (about 500-1,000x) to determine the preparation showing optimal particulate loading. Each grid opening was analyzed between 1,000 – 20,000x screen magnification.

Samples were analyzed evenly over 2 grids or until a sensitivity of 0.1% was achieved with a minimum of 4 grid openings analyzed. Initial scanning of each grid was done at the lowest magnification to detect larger fibrous structures that contribute the greatest in weight percent value. A representative number of larger structures to number of available grid openings was determined and used to randomly choose available grid openings for higher magnification analysis.

Structures were identified and classified according to ISO counting rules. In the event that the density of asbestos structures created too many overlapping structures to effectively classify each primary structure individually, a less-dense aliquot was chosen.

TEM analysis was performed using a scanning transmission electron microscope (STEM) under microbeam spot size conditions and equipped with a thin window Noran EDS detector with WinEDS analyzer system capable of quantification using Cliff-Lorimer calculations. An accelerating voltage of 100 KV was applied. Analyzable fibrous structures were greater than or equal to a 3:1 aspect ratio.

Soil Analysis Calculations (str/g) :

$$\text{Analytical Sensitivity (str/g)} = [(\text{EFA}) / \text{GO} * \text{Ago} * \text{w} * \text{DL} * \text{DF}] * \text{GRR}$$

Where:

EFA = Effective filter area (mm2)

GO = Number of grid openings counted

Ago = Area of grid opening (mm2)

w = residual sample weight (amount suspended in water) (g)

DF = Dilution Factor - or - [Filtered Aliquot (mL) / Dispersion Volume (mL)]

DL = Serial Dilution used

GRR = Gravimetric Reduction Weight Ratio (from Acid filter step)

GRR = Final Weight / Sample Weight

$$\text{Concentration (str/g)} = (\# \text{ str}) * \text{Analytical Sensitivity}$$

Weight Percent Calculations:



Job Number: Q141769 PDX

Client: Asbestos TEM Labs

Report Number: Q141769R04

Report Date: 8/6/2014

Project Name: InterLab QC 7-23-2014

$$\text{Analytical Sensitivity} = [(\text{EFA} * \mu) / \text{GO} * \text{Ago} * w * \text{DL} * \text{DF}] * \text{GRR}$$

Where:

- EFA = Effective filter area (mm²)
- GO = Number of grid openings counted
- Ago = Area of grid opening (mm²)
- w = residual sample weight (amount suspended in water) (g)
- DF = Dilution Factor - or - [Filtered Aliquot (mL) / Dispersion Volume (mL)]
- DL = Serial Dilution used
- GRR = Gravimetric Reduction Weight Ratio (from Acid filter step)
- GRR = Final Weight / Sample Weight
- μ = average mass of a Chrysotile bundle 3 μ m in length * 0.1 μ m in width
- $\mu = (\pi/4 * t^2) * l * 2.55 * 0.000000000001$ (g)

where:

- t = particle thickness
- l = particle length

The following formula determines the weight fraction in the residue sample for chrysotile.

$$\text{Wa} = [\text{EFA} / \text{GO} * \text{Ago}] * \Sigma (\pi/4 * t^2 * l * \delta * 0.000000000001)$$

Where:

- Wa = Weight of asbestos on filter (g)
- EFA = Effective filter area (mm²)
- GO = Number of grid openings counted
- Ago = Area of grid opening (mm²)
- t = particle thickness (μ m)
- l = particle length (μ m)
- δ = particle density (g/cm³) – If based off Chrysotile Bundle density = ~ 2.55
- 10-12 = Unit conversion factor (10-12 cm³/ μ m³) – or ((10-4 cm/ μ m)³)

The weight of the soil on the filter is calculated as follows:

$$\text{Ws} = w * \text{DF}$$

Where:

- Ws = Weight of soil on filter (g)
- w = residual sample weight (amount suspended in water)
- DF = Dilution Factor - or - [Filtered Aliquot (mL) / Dispersion Volume (mL)]

Weight percent Calculated as

$$\text{Wt\%} = (\text{Wa} / \text{Ws}) * \text{GRR} * 100$$

Single Structure Mass Calculations

Cylinder (Chrysotile)

$$(\pi/4 * t^2) * l * 2.55 * \text{DE} * 0.000000000001 \text{ (g)}$$

where:

- t = particle thickness
- l = particle length
- DE = Dispersion Estimate. Only applies to CC, CR, MC and MR; they use the number of substructures to estimate the mass of



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Final Report

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http://www.labcorpdx.net

Asbestos and Environmental Analysis

Job Number: Q141769 PDX

Client: Asbestos TEM Labs

Project Name: InterLab QC 7-23-2014

Report Number: Q141769R04

Report Date: 8/6/2014

the whole structure. For F, B and all Substructures this is defaulted to 1.

Rectangle (Amphiboles)

$$t^2 * l * 2.55 * DE * 0.000000000001 \text{ (g)}$$

where:

t = particle thickness

l = particle length

DE = Dispersion Estimate. Only applies to CC, CR, MC and MR; they use the number of substructures to estimate the mass of the whole structure. For F, B and all Substructures this is defaulted to 1.

Analyte Average Density

Analyte	Analyte Shape	Average Density
Actinolite	Rectangular	3.1
Amosite	Rectangular	3.43
Amphibole	Rectangular	3
Anthophyllite	Rectangular	3
Barrosite	Rectangular	0
Chrysotile	Cylinder	2.55
Crocidolite	Rectangular	3.37
Fe-Hornblende	Rectangular	0
Gedrite	Rectangular	3
Glaucophane	Rectangular	0
Hornblende	Rectangular	3
Libby Amphibole	Rectangular	3
Nyboite	Rectangular	0
Richterite	Rectangular	3
Serpentine	Cylinder	2.55
Transitional Fiber	Rectangular	3
Tremolite	Rectangular	3
Winchite	Rectangular	3

Disclaimer The results reported relate only to the samples tested or analyzed; the laboratory is not responsible for data collected by personnel who are not affiliated with the laboratory. Results reported in both structures/cm3 and structures/mm2 are dependent on the sample volume and area. These parameters are measured and recorded by non-laboratory personnel and are not covered by the laboratory's accreditation. Interpretation of these results is the sole responsibility of the client.

If further clarification of these results is needed, please call us. Thank you for allowing the staff at Lab/Cor Portland, Inc. the opportunity to provide you with the analytical services.

Reviewed by:

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Tracy Handrich
Analyst



Asbestos and Environmental Analysis

CARB 435 - TEM

Job Number: Q141769 PDX

Client: Asbestos TEM Labs

Project Name: InterLab QC 7-23-2014

Report Number: Q141769R04

Date Received: 7/23/2014

Lab/Cor Sample No. : S1

Client Sample No. : 1428-12-3 - R-66, 0-5'

GRR : 1

Dilution : 0.001

Dilution Factor : 1

Ws : 0.0000615

w : 0.0615

μ : 6.0083E-14

μ length : μ width :
3 0.1

As Received Weight (g) : 0.06

Lab Filter Area (mm2) : 346

Grid Openings Analyzed : 20

Average Grid Opening Area (mm2) : 0.0094

Area Analyzed (mm2) : 0.188

Analytical Sens. (Weight Percent) : 1.80E-06

Analytical Sens. (struc/g) : 2.99E+07

Detection Limit. (struc/g) : 8.95E+07

Analyst(s)	Analysis Date	Microscope	Magnification
TH	8/1/2014	H-7000	20000
TH	8/4/2014	H-7000	20000
TH	8/5/2014	H-7000	20000
TH	8/6/2014	H-7000	20000

Structure Type	Weight Percent (%)	Concentration (struc/g)	Struct Count ¹		Wa
			Primary	Total	
Primary Asbestos Structures	NA*	1.80E+08	6		1.99E-08
Total Asbestos Structures	3.24E-02	1.80E+08		6	1.99E-08
Total Asb & Libby-OtherAmph Structures	3.24E-02	1.80E+08		6	1.99E-08
Total Chrysotile Structures	NA*	< 29925618.40512		0	0.00E+00
Total Libby-Other Amph Structures	NA*	< 29925618.40512		0	0.00E+00
PCM Equivalent Fibers-ISO	3.11E-02	1.20E+08		4	1.91E-08
PCM Equivalent Fibers-NIOSH	2.81E-02	8.98E+07		3	1.73E-08
PCM Equivalent Structures-ISO	NA*	1.20E+08		4	1.91E-08
PCM Equivalent Structures-NIOSH	NA*	8.98E+07		3	1.73E-08

* NA - weight percent is only calculated using total structures, counting categories that are counted using primary structures are not calculated.



Asbestos and Environmental Analysis

CARB 435 - TEM

Job Number: Q141769 PDX

Client: Asbestos TEM Labs

Project Name: InterLab QC 7-23-2014

Report Number: Q141769R04

Date Received: 7/23/2014

Lab/Cor Sample No. : S2

Client Sample No. : 1428-24-1 - Wapa 3a-4

GRR : 1

Dilution : 0.001

Dilution Factor : 1

Final Dilution: 0.001

Ws : 0.0000623

w : 0.0623

μ : 6.0083E-14

μ length : μ width :
3 0.1

As Received Weight (g) : 0.06

Lab Filter Area (mm2) : 346

Grid Openings Analyzed : 20

Average Grid Opening Area (mm2) : 0.0094

Area Analyzed (mm2) : 0.188

Analytical Sens. (Weight Percent) : 1.77E-06

Analytical Sens. (struc/g) : 2.95E+07

Detection Limit. (struc/g) : 8.83E+07

Analyst(s)	Analysis Date	Microscope	Magnification
TH	8/4/2014	H-7000	20000
TH	8/5/2014	H-7000	20000

Structure Type	Weight Percent (%)	Concentration (struc/g)	Struct Count ¹ Primary/Total		Wa
Primary Asbestos Structures	NA*	4.14E+08	14		2.38E-07
Total Asbestos Structures	1.16E-01	4.14E+08		14	7.26E-08
Total Asb & Libby-OtherAmph Structures	1.16E-01	4.14E+08		14	7.26E-08
Total Chrysotile Structures	NA*	< 29541340.8012		0	0.00E+00
Total Libby-Other Amph Structures	NA*	< 29541340.8012		0	0.00E+00
PCM Equivalent Fibers-ISO	1.07E-01	1.77E+08		6	6.69E-08
PCM Equivalent Fibers-NIOSH	1.00E-01	1.18E+08		4	6.24E-08
PCM Equivalent Structures-ISO	NA*	1.48E+08		5	1.13E-07
PCM Equivalent Structures-NIOSH	NA*	8.86E+07		3	1.09E-07

* NA - weight percent is only calculated using total structures, counting categories that are counted using primary structures are not calculated.



Asbestos and Environmental Analysis

CARB 435 - TEM

Job Number: Q141769 PDX

Client: Asbestos TEM Labs

Project Name: InterLab QC 7-23-2014

Report Number: Q141769R04

Date Received: 7/23/2014

Lab/Cor Sample No. : S3

Client Sample No. : 1428-40-1 - R-83a, 21.7-45.'

GRR : 1

Dilution : 0.001

Dilution Factor : 1

Final Dilution: 0.001

Ws : 0

w : 0.0583

μ : 6.0083E-14

μ length : μ width :
3 0.1

As Received Weight (g) : 0.06

Lab Filter Area (mm2) : 346

Grid Openings Analyzed : 20

Average Grid Opening Area (mm2) : 0.0098

Area Analyzed (mm2) : 0.196

Analytical Sens. (Weight Percent) : 1.82E-06

Analytical Sens. (struc/g) : 3.03E+07

Detection Limit. (struc/g) : 9.05E+07

Analyst(s)	Analysis Date	Microscope	Magnification
TH	8/4/2014	H-7000	20000
TH	8/5/2014	H-7000	20000

Structure Type	Weight Percent (%)	Concentration (struc/g)	Struct Count ¹ Primary/Total		Wa
Primary Asbestos Structures	NA*	< 30279693.35247	0		0.00E+00
Total Asbestos Structures	NA*	< 30279693.35247		0	0.00E+00
Total Asb & Libby-OtherAmph Structures	NA*	< 30279693.35247		0	0.00E+00
Total Chrysotile Structures	NA*	< 30279693.35247		0	0.00E+00
Total Libby-Other Amph Structures	NA*	< 30279693.35247		0	0.00E+00
PCM Equivalent Fibers-ISO	NA*	< 30279693.35247		0	0.00E+00
PCM Equivalent Fibers-NIOSH	NA*	< 30279693.35247		0	0.00E+00
PCM Equivalent Structures-ISO	NA*	< 30279693.35247	0		0.00E+00
PCM Equivalent Structures-NIOSH	NA*	< 30279693.35247	0		0.00E+00

* NA - weight percent is only calculated using total structures, counting categories that are counted using primary structures are not calculated.



Asbestos and Environmental Analysis

CARB 435 - TEM

Job Number: Q141769 PDX
Client: Asbestos TEM Labs
Project Name: InterLab QC 7-23-2014

Report Number: Q141769R04
Date Received: 7/23/2014

Lab/Cor Sample No. : S4	As Received Weight (g) : 0.06
Client Sample No. : 1428-48-4 - R-106, 2.5-15.4'	Lab Filter Area (mm2) : 193
GRR : 1	Grid Openings Analyzed : 20
Dilution : 0.001	Average Grid Opening Area (mm2) : 0.0098
Dilution Factor : 1 Final Dilution: 0.001	Area Analyzed (mm2) : 0.196
Ws : 0.0000594	Analytical Sens. (Weight Percent) : 9.96E-07
w : 0.0594	Analytical Sens. (struc/g) : 1.66E+07
μ : 6.0083E-14 μ length : μ width :	Detection Limit. (struc/g) : 4.96E+07
3 0.1	

Analyst(s)	Analysis Date	Microscope	Magnification
TH	8/4/2014	H-7000	20000
TH	8/5/2014	H-7000	20000

Structure Type	Weight Percent (%)	Concentration (struc/g)	Struct Count ¹ Primary/Total		Wa
Primary Asbestos Structures	NA*	3.65E+08	22		3.59E-05
Total Asbestos Structures	1.89E+00	4.14E+08		25	1.12E-06
Total Asb & Libby-OtherAmph Structures	1.89E+00	4.14E+08		25	1.12E-06
Total Chrysotile Structures	NA*	< 16577338.00591		0	0.00E+00
Total Libby-Other Amph Structures	NA*	< 16577338.00591		0	0.00E+00
PCM Equivalent Fibers-ISO	1.87E+00	2.65E+08		16	1.11E-06
PCM Equivalent Fibers-NIOSH	1.87E+00	4.46E+08		15	1.11E-06
PCM Equivalent Structures-ISO	NA*	1.82E+08	11		3.98E-07
PCM Equivalent Structures-NIOSH	NA*	1.82E+08	11		2.18E-06

* NA - weight percent is only calculated using total structures, counting categories that are counted using primary structures are not calculated.



Lab/Cor Portland, Inc.

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Final Report

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Asbestos and Environmental Analysis

CARB 435 - TEM

Job Number: Q141769 **PDX**
Client: Asbestos TEM Labs
Project Name: InterLab QC 7-23-2014

Report Number: Q141769R04
Date Received: 7/23/2014

Reviewed by:

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X Tracy Handrich
Analyst

* NA - weight percent is only calculated using total structures, counting categories that are counted using primary structures are not calculated.

Asbestos and Environmental Analysis

CARB 435 - TEM Raw Data

Job Number: Q141769 PDX

Client: Asbestos TEM Labs

Project Name: InterLab QC 7-23-2014

Project No.:

Report Number: Q141769R04

Date Received: 7/23/2014

Lab/Cor Sample No: S1

Client Sample No: 1428-12-3

Description: R-66, 0-5'

Gr	No.	Loc.	ID	Prim	Tot	Class	Length	Width	Aspect	Analyte	Elements	Comment	Count Categories
G1	1	41				NSD							
G1	2	42				NSD							
G1	3	43				NSD							
G1	4	44				NSD							
G1	5	45				NSD							
G1	6	51	ADQ	1	1	F	5.706	0.586	9.7	Actinolite	Na, Mg, Al, Si, K, Ca, Mn, Fe		TAOS, PCMEF-NIOSH, PCMES-NIOSH, PCMEF- ISO, PCMES-ISO
						ItemType	ItemNum	Confirmed	Comment				
						Diffraction	H25556DF	TH 8/1/2014	0.53 nm ROW SPACING				
						Spectra	H25556SP	TH 8/1/2014					
						Brightfield	H25556BF						
G1	7	52				NSD							
G1	8	53				NSD							
G1	9	54				NSD							
G1	10	55	ADQ	2	2	F	5.192	0.256	20.3	Actinolite	Mg, Al, Si, K, Ca, Mn, Fe		TAOS, PCMEF-NIOSH, PCMES-NIOSH, PCMEF- ISO, PCMES-ISO
						ItemType	ItemNum	Confirmed	Comment				
						Diffraction	H25557DF	TH 8/1/2014	0.53 nm ROW SPACING				
						Spectra	H25557SP	TH 8/1/2014					
						Brightfield	H25557BF						
G2	11	-32				NSD							
G2	12	-33				NSD							
G2	13	-34	ADQ	3	3	F	6.317	0.34	18.6	Actinolite	Na, Mg, Al, Si, K, Ca, Fe		TAOS, PCMEF-NIOSH, PCMES-NIOSH, PCMEF- ISO, PCMES-ISO
						ItemType	ItemNum	Confirmed	Comment				
						Diffraction	H25558DF	TH 8/1/2014	0.53 nm ROW SPACING				
						Spectra	H25558SP	TH 8/1/2014					
						Brightfield	H25558BF						
G2	14	-24				NSD							
G2	15	-35	AQ	4	4	F	6.967	0.216	32.3	Actinolite	Na, Mg, Al, Si, K, Ca, Fe		TAOS, PCMEF-ISO, PCMES-ISO
						ItemType	ItemNum	Confirmed	Comment				
						Spectra	H25559SP	TH 8/1/2014					
						Brightfield	H25559BF						



Asbestos and Environmental Analysis

CARB 435 - TEM Raw Data

Job Number: Q141769 PDX

Client: Asbestos TEM Labs

Project Name: InterLab QC 7-23-2014

Project No.:

Report Number: Q141769R04

Date Received: 7/23/2014

Lab/Cor Sample No: S1

Client Sample No: 1428-12-3

Description: R-66, 0-5'

Gr	No.	Loc.	ID	Prim	Tot	Class	Length	Width	Aspect	Analyte	Elements	Comment	Count Categories		
G2	16	-36	AQ	5	5	F	2.21	0.241	9.2	Actinolite	Na, Mg, Al, Si, K, Ca, Mn, Fe		TAOS		
							ItemType	ItemNum		Confirmed		Comment			
							Spectra	H25560SP		TH		8/1/2014			
							Brightfield	H25560BF							
G2	16	-36	AQ	6	6	F	0.763	0.11	6.9	Actinolite		Analyzed at high and low mag.	TAOS		
							ItemType	ItemNum		Confirmed		Comment			
							Spectra	H25561SP		TH		8/1/2014			
G2	17	-26				NSD						Analyzed at high and low mag			
G2	18	-27				NSD						Analyzed at high and low mag			
G2	19	-17				NSD						Analyzed at high and low mag			
G2	20	-41				NSD						Analyzed at high and low mag			

Asbestos and Environmental Analysis

CARB 435 - TEM Raw Data

Job Number: Q141769 **PDX**
Client: Asbestos TEM Labs
Project Name: InterLab QC 7-23-2014
Project No.:

Report Number: Q141769R04
Date Received: 7/23/2014

Lab/Cor Sample No: S2
Client Sample No: 1428-24-1
Description: Wapa 3a-4

Gr	No.	Loc.	ID	Prim	Tot	Class	Length	Width	Aspect	Analyte	Elements	Comment	Count	Categories
G1	1	21				NSD						Analyzed at high and low mag		
G1	2	22	ADQ	1	1	F	1.514	0.075	20.2	Actinolite	Mg, Al, Si, K, Ca, Fe	Analyzed at high and low mag		TAOS
						ItemType	ItemNum				Confirmed	Comment		
						Diffraction	H25567DF				TH	8/4/2014	0.53 nm ROW SPACING	
						Spectra	H25567SP				TH	8/4/2014		
						Brightfield	H25567BF							
G1	2	22	ADQ	2	2	F	1.518	0.297	5.1	Actinolite	Na, Mg, Al, Si, K, Ca, Fe	Analyzed at high and low mag		TAOS
						ItemType	ItemNum				Confirmed	Comment		
						Diffraction	H25568DF				TH	8/4/2014	0.53 nm ROW SPACING	
						Spectra	H25568SP				TH	8/4/2014		
						Brightfield	H25568BF							
G1	2	22	AQ	3	3	F	2.79	0.229	12.2	Actinolite		Analyzed at high and low mag		TAOS
						ItemType	ItemNum				Confirmed	Comment		
						Spectra	H25569SP				TH	8/4/2014		
						Brightfield	H25569BF							
G1	2	22	AQ	4		MD 1-0	1.43	0.842	1.7	Actinolite		Analyzed at high and low mag		
G1	2	22	AQ		4	MF	1.43	0.307	4.7	Actinolite		Analyzed at high and low mag		TAOS
						ItemType	ItemNum				Confirmed	Comment		
						Spectra	H25570SP				TH	8/4/2014		
						Brightfield	H25570BF							
G1	2	22	AQ	5	5	F	0.943	0.096	9.8	Actinolite		Analyzed at high and low mag		TAOS
						ItemType	ItemNum				Confirmed	Comment		
						Spectra	H25571SP				TH	8/4/2014		
						Brightfield	H25571BF							
G1	3	23	ADQ	6		MD 1-0	1.941	0.627	3.1	Actinolite		Analyzed at high and low mag		

Asbestos and Environmental Analysis

CARB 435 - TEM Raw Data

Job Number: Q141769 **PDX**
Client: Asbestos TEM Labs
Project Name: InterLab QC 7-23-2014
Project No.:

Report Number: Q141769R04
Date Received: 7/23/2014

Lab/Cor Sample No: S2
Client Sample No: 1428-24-1
Description: Wapa 3a-4

Gr	No.	Loc.	ID	Prim	Tot	Class	Length	Width	Aspect	Analyte	Elements	Comment	Count Categories
G1	3	23	ADQ		6	MF	1.391	0.454	3.1	Actinolite	Na, Mg, Al, Si, K, Ca, Mn, Fe	Analyzed at high and low mag	TAOS
						ItemType	ItemNum		Confirmed		Comment		
						Diffraction	H25572DF		TH 8/4/2014		0.53 nm ROW SPACING		
						Spectra	H25572SP		TH 8/4/2014				
						Brightfield	H25572BF						
G1	4	24				NSD						Analyzed at high and low mag. 15% of grid opening was missing.	
G1	5	25	ADQ	7	7	F	1.725	0.243	7.1	Actinolite	Na, Mg, Al, Si, K, Ca, Fe	Analyzed at high and low mag	TAOS
						ItemType	ItemNum		Confirmed		Comment		
						Diffraction	H25574DF		TH 8/4/2014		0.53 nm ROW SPACING		
						Spectra	H25574SP		TH 8/4/2014				
						Brightfield	H25574BF						
G1	6	31	ADQ	8	8	F	5.732	0.236	24.3	Actinolite			TAOS, PCMEF-ISO, PCMES-ISO
						ItemType	ItemNum		Confirmed		Comment		
						Diffraction	H25575DF		TH 8/4/2014		0.53 nm ROW SPACING		
						Spectra	H25575SP		TH 8/4/2014				
						Brightfield	H25575BF						
G1	6	31	ADQ	9		MD 1-1	5.173	1.348	3.8	Actinolite			PCMES-NIOSH, PCMES-ISO
G1	6	31	ADQ		9	MF	5.173	0.311	16.6	Actinolite	Na, Mg, Al, Si, K, Ca, Fe		TAOS, PCMEF-ISO, PCMEF-NIOSH
						ItemType	ItemNum		Confirmed		Comment		
						Diffraction	H25576DF		TH 8/4/2014		0.53 nm ROW SPACING		
						Spectra	H25576SP		TH 8/4/2014				
						Brightfield	H25576BF						
G1	7	32				NSD							
G1	8	33				NSD							
G1	9	34	ADQ	10	10	F	10.13	0.214	47.3	Actinolite	Na, Mg, Si, K, Ca, Fe		TAOS, PCMEF-ISO, PCMES-ISO
						ItemType	ItemNum		Confirmed		Comment		
						Diffraction	H25577DF		TH 8/4/2014		0.53 nm ROW SPACING		
						Spectra	H25577SP		TH 8/4/2014				
						Brightfield	H25577BF						
G1	9	34	AQ	11		MD 1-1	5.623	1.066	5.3	Actinolite			PCMES-NIOSH, PCMES-ISO

Asbestos and Environmental Analysis

CARB 435 - TEM Raw Data

Job Number: Q141769 **PDX**
Client: Asbestos TEM Labs
Project Name: InterLab QC 7-23-2014
Project No.:

Report Number: Q141769R04
Date Received: 7/23/2014

Lab/Cor Sample No: S2
Client Sample No: 1428-24-1
Description: Wapa 3a-4

Gr	No.	Loc.	ID	Prim	Tot	Class	Length	Width	Aspect	Analyte	Elements	Comment	Count Categories
G1	9	34	AQ		11	MF	5.623	0.327	17.2	Actinolite	Na, Mg, Al, Si, K, Ca, Fe		TAOS, PCMEF-ISO, PCMEF-NIOSH
							ItemType	ItemNum		Confirmed	Comment		
							Brightfield	H25578BF					
							Spectra	H25578SP		TH	8/4/2014		
G1	10	35	AQ	12	12	B	5.2	0.183	28.4	Actinolite	Na, Mg, Al, Si, K, Ca, Fe		TAOS
							ItemType	ItemNum		Confirmed	Comment		
							Spectra	H25579SP		TH	8/4/2014		
							Brightfield	H25579BF					
G2	11	2-1	ADQ	13		MD 1-1	5.151	1.951	2.6	Actinolite			
G2	11	2-1	ADQ		13	MF	5.151	1.131	4.6	Actinolite	Na, Mg, Al, Si, K, Ca, Fe		TAOS, PCMEF-ISO, PCMEF-NIOSH
							ItemType	ItemNum		Confirmed	Comment		
							Diffraction	H25580DF		TH	8/4/2014		
							Spectra	H25580SP		TH	8/4/2014		
							Brightfield	H25580BF					
G2	12	2-2				NSD							
G2	13	2-3				NSD							
G2	14	2-4				NSD							
G2	15	2-5				NSD							
G2	16	3-5				NSD							
G2	17	3-4				NSD							
G2	18	3-3				NSD							
G2	19	3-2				NSD							
G2	20	3-1	ADQ	14	14	F	11.44	0.533	21.5	Actinolite	Na, Mg, Al, Si, K, Ca, Mn, Fe		TAOS, PCMEF-ISO, PCMEF-NIOSH, PCMES- NIOSH, PCMES-ISO
							ItemType	ItemNum		Confirmed	Comment		
							Diffraction	H25581DF		TH	8/4/2014		
							Spectra	H25581SP		TH	8/4/2014		
							Brightfield	H25581BF					



Asbestos and Environmental Analysis

CARB 435 - TEM Raw Data

Job Number: Q141769 PDX

Client: Asbestos TEM Labs

Project Name: InterLab QC 7-23-2014

Project No.:

Report Number: Q141769R04

Date Received: 7/23/2014

Lab/Cor Sample No: S3

Client Sample No: 1428-40-1

Description: R-83a, 21.7-45.'

Gr	No.	Loc.	ID	Prim	Tot	Class	Length	Width	Aspect	Analyte	Elements	Comment	Count Categories
G1	1	23				NSD						Analyzed at high and low mag. 15% of grid opening is missing.	
G1	2	22				NSD						Analyzed at high and low mag. 20% of grid opening is missing.	
G1	3	21				NSD						Analyzed at high and low mag. 20% of grid opening is missing.	
G1	4	2-1				NSD						Analyzed at high and low mag. 10% of grid opening is missing.	
G1	5	2-2				NSD						Analyzed at high and low mag	
G1	6	2-3				NSD						7% of grid opening is missing.	
G1	7	2-4				NSD							
G1	8	3-5				NSD							
G1	9	3-4				NSD							
G1	10	2-5				NSD							
G2	11	21				NSD						30% of the grid opening is missing.	
G2	12	22				NSD						40% of the grid opening is missing.	
G2	13	23				NSD							
G2	14	24				NSD							
G2	15	25				NSD							
G2	16	31				NSD							
G2	17	32				NSD						40% of this grid opening is missing.	
G2	18	33				NSD						25% of this grid opening is missing.	



Lab/Cor Portland, Inc.

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Final Report

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Asbestos and Environmental Analysis

CARB 435 - TEM Raw Data

Job Number: Q141769 **PDX**

Client: Asbestos TEM Labs

Project Name: InterLab QC 7-23-2014

Project No.:

Report Number: Q141769R04

Date Received: 7/23/2014

Lab/Cor Sample No: S3

Client Sample No: 1428-40-1

Description: R-83a, 21.7-45.'

Gr	No.	Loc.	ID	Prim	Tot	Class	Length	Width	Aspect	Analyte	Elements	Comment	Count Categories
G2	19	34				NSD						20% of this grid opening is missing.	
G2	20	35				NSD						45% of this grid opening is missing.	

Asbestos and Environmental Analysis

CARB 435 - TEM Raw Data

Job Number: Q141769 **PDX**
Client: Asbestos TEM Labs
Project Name: InterLab QC 7-23-2014
Project No.:

Report Number: Q141769R04
Date Received: 7/23/2014

Lab/Cor Sample No: S4
Client Sample No: 1428-48-4
Description: R-106, 2.5-15.4'

Gr	No.	Loc.	ID	Prim	Tot	Class	Length	Width	Aspect	Analyte	Elements	Comment	Count	Categories
G1	1	-21	ADQ	1	1	F	4.718	0.158	29.9	Actinolite	Na, Mg, Al, Si, K, Ca, Fe	Analyzed at high and low mag		TAOS
						ItemType	ItemNum		Confirmed		Comment			
						Diffraction	H25582DF		TH 8/4/2014		0.53 nm ROW SPACING			
						Spectra	H25582SP		TH 8/4/2014					
						Brightfield	H25582BF							
G1	1	-21	ADQ	2		MD 2-0	3.065	2.364	1.3	Actinolite		Analyzed at high and low mag		
G1	1	-21	ADQ		2	MF	2.763	0.285	9.7	Actinolite		Analyzed at high and low mag		TAOS
						ItemType	ItemNum		Confirmed		Comment			
						Diffraction	H25583DF		TH 8/4/2014		0.53 nm ROW SPACING			
						Spectra	H25583SP		TH 8/4/2014					
						Brightfield	H25583BF							
G1	1	-21	AM		3	MF	2.027	0.449	4.5	Actinolite		Analyzed at high and low mag		TAOS
G1	1	-21	AM	3	4	F	2.353	0.2	11.8	Actinolite		Analyzed at high and low mag		TAOS
						ItemType	ItemNum		Confirmed		Comment			
						Brightfield	H25584BF							
G1	2	-22	AM	4	5	F	2.059	0.28	7.4	Actinolite		Analyzed at high and low mag		TAOS
						ItemType	ItemNum		Confirmed		Comment			
						Brightfield	H25585BF							
G1	2	-22	AQ	5	6	F	5.367	0.307	17.5	Actinolite	Mg, Al, Si, Ca, Fe	Analyzed at high and low mag		TAOS, PCMEF-ISO, PCMEF-NIOSH, PCMES- NIOSH, PCMES-ISO
						ItemType	ItemNum		Confirmed		Comment			
						Spectra	H25586SP		TH 8/4/2014					
						Brightfield	H25586BF							
G1	2	-22	AM	6	7	F	6.529	0.283	23.1	Actinolite		Analyzed at high and low mag		TAOS, PCMEF-ISO, PCMEF-NIOSH, PCMES- NIOSH, PCMES-ISO
						ItemType	ItemNum		Confirmed		Comment			
						Brightfield	H25587BF							

Asbestos and Environmental Analysis

CARB 435 - TEM Raw Data

Job Number: Q141769 **PDX**
Client: Asbestos TEM Labs
Project Name: InterLab QC 7-23-2014
Project No.:

Report Number: Q141769R04
Date Received: 7/23/2014

Lab/Cor Sample No: S4
Client Sample No: 1428-48-4
Description: R-106, 2.5-15.4'

Gr	No.	Loc.	ID	Prim	Tot	Class	Length	Width	Aspect	Analyte	Elements	Comment	Count Categories
G1	3	-23	ADQ	7	8	F	1.786	0.159	11.2	Actinolite	Na, Mg, Si, K, Ca, Fe	Analyzed at high and low mag	TAOS
						ItemType	ItemNum		Confirmed		Comment		
						Diffraction	H25588DF		TH 8/4/2014		0.53 nm ROW SPACING		
						Spectra	H25588SP		TH 8/4/2014				
						Brightfield	H25588BF						
G1	4	-24	AM	8	9	B	6.852	1.656	4.1	Actinolite			TAOS, PCMEF-ISO, PCMEF-NIOSH, PCMES-NIOSH, PCMES-ISO
						ItemType	ItemNum		Confirmed		Comment		
						Brightfield	H25589BF						
G1	4	-24	AM	9	10	F	6.653	0.168	39.6	Actinolite			TAOS
						ItemType	ItemNum		Confirmed		Comment		
						Brightfield	H25590BF						
G1	5	-25				NSD							
G1	6	-15				NSD							
G1	7	-14				NSD							
G1	8	-13	AQ	10		MD 1-1	8.086	0.676	12	Actinolite			PCMES-NIOSH, PCMES-ISO
G1	8	-13	AQ		11	MF	8.086	0.254	31.8	Actinolite	Na, Mg, Al, Si, K, Ca, Fe		TAOS, PCMEF-ISO, PCMEF-NIOSH
						ItemType	ItemNum		Confirmed		Comment		
						Spectra	H25591SP		TH 8/4/2014				
						Brightfield	H25591BF						
G1	8	-13	AM	11	12	F	8.3	0.178	46.6	Actinolite			TAOS
						ItemType	ItemNum		Confirmed		Comment		
						Brightfield	H25592BF						
G1	8	-13	AM	12	13	F	6.523	0.381	17.1	Actinolite			TAOS, PCMEF-ISO, PCMEF-NIOSH, PCMES-NIOSH, PCMES-ISO
						ItemType	ItemNum		Confirmed		Comment		
						Brightfield	H25593BF						
G1	9	-12				NSD							
G1	10	-11	AQ	13	14	F	10.28	0.634	16.2	Actinolite			TAOS, PCMEF-ISO, PCMEF-NIOSH, PCMES-NIOSH, PCMES-ISO
						ItemType	ItemNum		Confirmed		Comment		
						Spectra	H25594SP		TH 8/4/2014				
						Brightfield	H25594BF						

Asbestos and Environmental Analysis

CARB 435 - TEM Raw Data

Job Number: Q141769 **PDX**
Client: Asbestos TEM Labs
Project Name: InterLab QC 7-23-2014
Project No.:

Report Number: Q141769R04
Date Received: 7/23/2014

Lab/Cor Sample No: S4
Client Sample No: 1428-48-4
Description: R-106, 2.5-15.4'

Gr	No.	Loc.	ID	Prim	Tot	Class	Length	Width	Aspect	Analyte	Elements	Comment	Count Categories
G2	11	-21	ADQ	14		MD 2-2	19.53	12.37	1.6	Actinolite	Na, Mg, Al, Si, K, Ca, Fe		
G2	11	-21	ADQ		15	MB	13.48	1.475	9.1	Actinolite			TAOS, PCMEF-ISO, PCMEF-NIOSH
											Confirmed	Comment	
											TH	8/4/2014	0.53 nm ROW SPACING
											TH	8/4/2014	
G2	11	-21	AM		16	MB	16.29	2.563	6.4	Actinolite			TAOS, PCMEF-ISO, PCMEF-NIOSH
G2	11	-21	AM	15	17	F	5.47	0.311	17.6	Actinolite			TAOS, PCMEF-ISO, PCMEF-NIOSH, PCMES- NIOSH, PCMES-ISO
											Confirmed	Comment	
											Brightfield	H25596BF	
G2	11	-21	AD	16	18	F	6.925	0.151	45.9	Actinolite			TAOS
											Confirmed	Comment	
											TH	8/4/2014	0.53 nm ROW SPACING
											Brightfield	H25597BF	
G2	11	-21	AM		17	MD 2-2	7.464	3.196	2.3	Actinolite			
G2	11	-21	AM		19	MB	6.282	0.688	9.1	Actinolite			TAOS, PCMEF-ISO, PCMEF-NIOSH
											Confirmed	Comment	
											Brightfield	H25598BF	
G2	11	-21	AM		20	MB	5.017	0.812	6.2	Actinolite			TAOS, PCMEF-ISO, PCMEF-NIOSH
G2	12	-22				NSD							
G2	13	-23				NSD							
G2	14	-24				NSD							
G2	15	-25	AD	18	21	F	5.728	0.203	28.2	Actinolite			TAOS, PCMEF-ISO, PCMES-ISO
											Confirmed	Comment	
											TH	8/4/2014	0.53 nm ROW SPACING
											Brightfield	H25599BF	
G2	15	-25	AQ		19	MD 1-1	6.317	1.713	3.7	Actinolite			PCMES-NIOSH, PCMES- ISO
G2	15	-25	AQ		22	MF	5.585	0.918	6.1	Actinolite			TAOS, PCMEF-ISO, PCMEF-NIOSH
											Confirmed	Comment	
											TH	8/4/2014	
											Spectra	H25600SP	
											Brightfield	H25600BF	



Asbestos and Environmental Analysis

CARB 435 - TEM Raw Data

Job Number: Q141769 PDX
Client: Asbestos TEM Labs
Project Name: InterLab QC 7-23-2014
Project No.:

Report Number: Q141769R04
Date Received: 7/23/2014

Lab/Cor Sample No: S4
Client Sample No: 1428-48-4
Description: R-106, 2.5-15.4'

Table with columns: Gr, No., Loc., ID, Prim, Tot, Class, Length, Width, Aspect, Analyte, Elements, Comment, Count Categories. Includes sub-headers for Item Type and Item Num, and a summary table for Count Categories at the bottom.

Reviewed by:

Digital Signature for Lab Use Only... Tracy Handrich Analyst



Asbestos and Environmental Analysis

CARB 435 - TEM Raw Data

Job Number: Q141769 **PDX**

Client: Asbestos TEM Labs

Project Name: InterLab QC 7-23-2014

Report Number: Q141769R04

Date Received: 7/23/2014

Lab/Cor Sample No: S1

Client Sample No: 1428-12-3

Description: R-66, 0-5'

Gr	No.	Loc.	ID	Prim	Tot	Class	Length	Width	Aspect	Analyte	Shape	Analyte Mass	Wa
G1	1	41				NSD						0.00E+00	0.00E+00
G1	2	42				NSD						0.00E+00	0.00E+00
G1	3	43				NSD						0.00E+00	0.00E+00
G1	4	44				NSD						0.00E+00	0.00E+00
G1	5	45				NSD						0.00E+00	0.00E+00
G1	6	51	ADQ	1	1	F	5.706	0.586	9.7	Actinolite	Rectangular	6.07E-12	1.12E-08
G1	7	52				NSD						0.00E+00	0.00E+00
G1	8	53				NSD						0.00E+00	0.00E+00
G1	9	54				NSD						0.00E+00	0.00E+00
G1	10	55	ADQ	2	2	F	5.192	0.256	20.3	Actinolite	Rectangular	1.05E-12	1.94E-09
G2	11	-32				NSD						0.00E+00	0.00E+00
G2	12	-33				NSD						0.00E+00	0.00E+00
G2	13	-34	ADQ	3	3	F	6.317	0.34	18.6	Actinolite	Rectangular	2.26E-12	4.17E-09
G2	14	-24				NSD						0.00E+00	0.00E+00
G2	15	-35	AQ	4	4	F	6.967	0.216	32.3	Actinolite	Rectangular	1.01E-12	1.85E-09
G2	16	-36	AQ	5	5	F	2.21	0.241	9.2	Actinolite	Rectangular	3.98E-13	7.32E-10
G2	16	-36	AQ	6	6	F	0.763	0.11	6.9	Actinolite	Rectangular	2.86E-14	5.27E-11
G2	17	-26				NSD						0.00E+00	0.00E+00
G2	18	-27				NSD						0.00E+00	0.00E+00
G2	19	-17				NSD						0.00E+00	0.00E+00
G2	20	-41				NSD						0.00E+00	0.00E+00



Asbestos and Environmental Analysis

CARB 435 - TEM Raw Data

Job Number: Q141769 **PDX**
Client: Asbestos TEM Labs
Project Name: InterLab QC 7-23-2014

Report Number: Q141769R04
Date Received: 7/23/2014

Lab/Cor Sample No: S2
Client Sample No: 1428-24-1
Description: Wapa 3a-4

Gr	No.	Loc.	ID	Prim	Tot	Class	Length	Width	Aspect	Analyte	Shape	Analyte Mass	Wa
G1	1	21				NSD						0.00E+00	0.00E+00
G1	2	22	ADQ	1	1	F	1.514	0.075	20.2	Actinolite	Rectangular	2.64E-14	4.86E-11
G1	2	22	ADQ	2	2	F	1.518	0.297	5.1	Actinolite	Rectangular	4.15E-13	7.64E-10
G1	2	22	AQ	3	3	F	2.79	0.229	12.2	Actinolite	Rectangular	4.54E-13	8.35E-10
G1	2	22	AQ	4		MD 1-0	1.43	0.842	1.7	Actinolite	Rectangular	3.14E-12	0.00E+00
G1	2	22	AQ		4	MF	1.43	0.307	4.7	Actinolite	Rectangular	4.18E-13	7.69E-10
G1	2	22	AQ	5	5	F	0.943	0.096	9.8	Actinolite	Rectangular	2.69E-14	4.96E-11
G1	3	23	ADQ	6		MD 1-0	1.941	0.627	3.1	Actinolite	Rectangular	2.37E-12	0.00E+00
G1	3	23	ADQ		6	MF	1.391	0.454	3.1	Actinolite	Rectangular	8.89E-13	1.64E-09
G1	4	24				NSD						0.00E+00	0.00E+00
G1	5	25	ADQ	7	7	F	1.725	0.243	7.1	Actinolite	Rectangular	3.16E-13	5.81E-10
G1	6	31	ADQ	8	8	F	5.732	0.236	24.3	Actinolite	Rectangular	9.90E-13	1.82E-09
G1	6	31	ADQ	9		MD 1-1	5.173	1.348	3.8	Actinolite	Rectangular	2.91E-11	0.00E+00
G1	6	31	ADQ		9	MF	5.173	0.311	16.6	Actinolite	Rectangular	1.55E-12	2.85E-09
G1	7	32				NSD						0.00E+00	0.00E+00
G1	8	33				NSD						0.00E+00	0.00E+00
G1	9	34	ADQ	10	10	F	10.13	0.214	47.3	Actinolite	Rectangular	1.44E-12	2.65E-09
G1	9	34	AQ	11		MD 1-1	5.623	1.066	5.3	Actinolite	Rectangular	1.98E-11	0.00E+00
G1	9	34	AQ		11	MF	5.623	0.327	17.2	Actinolite	Rectangular	1.86E-12	3.43E-09
G1	10	35	AQ	12	12	B	5.2	0.183	28.4	Actinolite	Rectangular	5.40E-13	9.94E-10
G2	11	2-1	ADQ	13		MD 1-1	5.151	1.951	2.6	Actinolite	Rectangular	6.08E-11	0.00E+00
G2	11	2-1	ADQ		13	MF	5.151	1.131	4.6	Actinolite	Rectangular	2.04E-11	3.76E-08
G2	12	2-2				NSD						0.00E+00	0.00E+00
G2	13	2-3				NSD						0.00E+00	0.00E+00
G2	14	2-4				NSD						0.00E+00	0.00E+00
G2	15	2-5				NSD						0.00E+00	0.00E+00
G2	16	3-5				NSD						0.00E+00	0.00E+00
G2	17	3-4				NSD						0.00E+00	0.00E+00
G2	18	3-3				NSD						0.00E+00	0.00E+00
G2	19	3-2				NSD						0.00E+00	0.00E+00
G2	20	3-1	ADQ	14	14	F	11.44	0.533	21.5	Actinolite	Rectangular	1.01E-11	1.85E-08



Asbestos and Environmental Analysis

CARB 435 - TEM Raw Data

Job Number: Q141769 **PDX**

Client: Asbestos TEM Labs

Project Name: InterLab QC 7-23-2014

Report Number: Q141769R04

Date Received: 7/23/2014

Lab/Cor Sample No: S3

Client Sample No: 1428-40-1

Description: R-83a, 21.7-45.'

Gr	No.	Loc.	ID	Prim	Tot	Class	Length	Width	Aspect	Analyte	Shape	Analyte Mass	Wa
G1	1	23				NSD						0.00E+00	0.00E+00
G1	2	22				NSD						0.00E+00	0.00E+00
G1	3	21				NSD						0.00E+00	0.00E+00
G1	4	2-1				NSD						0.00E+00	0.00E+00
G1	5	2-2				NSD						0.00E+00	0.00E+00
G1	6	2-3				NSD						0.00E+00	0.00E+00
G1	7	2-4				NSD						0.00E+00	0.00E+00
G1	8	3-5				NSD						0.00E+00	0.00E+00
G1	9	3-4				NSD						0.00E+00	0.00E+00
G1	10	2-5				NSD						0.00E+00	0.00E+00
G2	11	21				NSD						0.00E+00	0.00E+00
G2	12	22				NSD						0.00E+00	0.00E+00
G2	13	23				NSD						0.00E+00	0.00E+00
G2	14	24				NSD						0.00E+00	0.00E+00
G2	15	25				NSD						0.00E+00	0.00E+00
G2	16	31				NSD						0.00E+00	0.00E+00
G2	17	32				NSD						0.00E+00	0.00E+00
G2	18	33				NSD						0.00E+00	0.00E+00
G2	19	34				NSD						0.00E+00	0.00E+00
G2	20	35				NSD						0.00E+00	0.00E+00

Asbestos and Environmental Analysis

CARB 435 - TEM Raw Data

Job Number: Q141769 PDX

Client: Asbestos TEM Labs

Project Name: InterLab QC 7-23-2014

Report Number: Q141769R04

Date Received: 7/23/2014

Lab/Cor Sample No: S4

Client Sample No: 1428-48-4

Description: R-106, 2.5-15.4'

Gr	No.	Loc.	ID	Prim	Tot	Class	Length	Width	Aspect	Analyte	Shape	Analyte Mass	Wa
G1	1	-21	ADQ	1	1	F	4.718	0.158	29.9	Actinolite	Rectangular	3.65E-13	3.60E-10
G1	1	-21	ADQ	2		MD 2-0	3.065	2.364	1.3	Actinolite	Rectangular	1.06E-10	0.00E+00
G1	1	-21	ADQ		2	MF	2.763	0.285	9.7	Actinolite	Rectangular	6.96E-13	6.85E-10
G1	1	-21	AM		3	MF	2.027	0.449	4.5	Actinolite	Rectangular	1.27E-12	1.25E-09
G1	1	-21	AM	3	4	F	2.353	0.2	11.8	Actinolite	Rectangular	2.92E-13	2.87E-10
G1	2	-22	AM	4	5	F	2.059	0.28	7.4	Actinolite	Rectangular	5.00E-13	4.93E-10
G1	2	-22	AQ	5	6	F	5.367	0.307	17.5	Actinolite	Rectangular	1.57E-12	1.54E-09
G1	2	-22	AM	6	7	F	6.529	0.283	23.1	Actinolite	Rectangular	1.62E-12	1.60E-09
G1	3	-23	ADQ	7	8	F	1.786	0.159	11.2	Actinolite	Rectangular	1.40E-13	1.38E-10
G1	4	-24	AM	8	9	B	6.852	1.656	4.1	Actinolite	Rectangular	5.83E-11	5.74E-08
G1	4	-24	AM	9	10	F	6.653	0.168	39.6	Actinolite	Rectangular	5.82E-13	5.73E-10
G1	5	-25				NSD						0.00E+00	0.00E+00
G1	6	-15				NSD						0.00E+00	0.00E+00
G1	7	-14				NSD						0.00E+00	0.00E+00
G1	8	-13	AQ	10		MD 1-1	8.086	0.676	12	Actinolite	Rectangular	1.15E-11	0.00E+00
G1	8	-13	AQ		11	MF	8.086	0.254	31.8	Actinolite	Rectangular	1.62E-12	1.59E-09
G1	8	-13	AM	11	12	F	8.3	0.178	46.6	Actinolite	Rectangular	8.15E-13	8.03E-10
G1	8	-13	AM	12	13	F	6.523	0.381	17.1	Actinolite	Rectangular	2.94E-12	2.89E-09
G1	9	-12				NSD						0.00E+00	0.00E+00
G1	10	-11	AQ	13	14	F	10.28	0.634	16.2	Actinolite	Rectangular	1.28E-11	1.26E-08
G2	11	-21	ADQ	14		MD 2-2	19.53	12.37	1.6	Actinolite	Rectangular	1.85E-08	0.00E+00
G2	11	-21	ADQ		15	MB	13.48	1.475	9.1	Actinolite	Rectangular	9.09E-11	1.60E-07
G2	11	-21	AM		16	MB	16.29	2.563	6.4	Actinolite	Rectangular	3.32E-10	5.86E-07
G2	11	-21	AM	15	17	F	5.47	0.311	17.6	Actinolite	Rectangular	1.64E-12	2.90E-09
G2	11	-21	AD	16	18	F	6.925	0.151	45.9	Actinolite	Rectangular	4.89E-13	8.64E-10
G2	11	-21	AM	17		MD 2-2	7.464	3.196	2.3	Actinolite	Rectangular	4.73E-10	0.00E+00
G2	11	-21	AM		19	MB	6.282	0.688	9.1	Actinolite	Rectangular	9.22E-12	1.63E-08
G2	11	-21	AM		20	MB	5.017	0.812	6.2	Actinolite	Rectangular	1.03E-11	1.81E-08
G2	12	-22				NSD						0.00E+00	0.00E+00
G2	13	-23				NSD						0.00E+00	0.00E+00
G2	14	-24				NSD						0.00E+00	0.00E+00
G2	15	-25	AD	18	21	F	5.728	0.203	28.2	Actinolite	Rectangular	7.32E-13	1.29E-09
G2	15	-25	AQ	19		MD 1-1	6.317	1.713	3.7	Actinolite	Rectangular	5.75E-11	0.00E+00
G2	15	-25	AQ		22	MF	5.585	0.918	6.1	Actinolite	Rectangular	1.46E-11	2.58E-08
G2	16	-14	AM	20	23	F	12.01	1.034	11.6	Actinolite	Rectangular	3.98E-11	7.03E-08
G2	16	-14	AM	21		MD 1-1	20.7	3.973	5.2	Actinolite	Rectangular	1.01E-09	0.00E+00
G2	16	-14	AM		24	MF	19.91	0.497	40.1	Actinolite	Rectangular	1.52E-11	2.69E-08
G2	17	-13	ADQ	22	25	F	12.16	0.995	12.2	Actinolite	Rectangular	3.73E-11	6.59E-08
G2	18	-12				NSD						0.00E+00	0.00E+00
G2	19	-11				NSD						0.00E+00	0.00E+00
G2	20	-1-1				NSD						0.00E+00	0.00E+00



Asbestos and Environmental Analysis

Client: Asbestos TEM Labs
630 Bancroft Way
Berkeley, CA 94710-2224

Report Number: Q141768R03
Report Date: 08/06/2014

Job Number: Q141768

P.O. No: n/a

Project Name: InterLab QC 7-23-2014

Project Number:

Project Notes:

Client Sample ID: R-101, 114.1-143.0'	Sample ID: S1	Date Analyzed: 07/24/2014	
Client Sample Description:		Analyst: Ryan Brown	
Asbestos Mineral Fibers	Layer Percent: Chrysotile Amosite Crocidolite		Percent Asbestos:
Homogeneous fine powder, tan	100% - -	Point Count: 9 Actinolite-2.25 %	Point Count Fields: 400 2.25 %
Other Fibers	Fibrous Glass Cellulose Mineral Wool Synthetic - 0.25% - -	Other Wollastonite Trace	Matrix 97.5 %

Client Sample ID: P-4, 126.2-180.0'	Sample ID: S2	Date Analyzed: 07/24/2014	
Client Sample Description:		Analyst: Ryan Brown	
Asbestos Mineral Fibers	Layer Percent: Chrysotile Amosite Crocidolite		Percent Asbestos:
Homogeneous fine powder, dark brown	100% - -	Point Count: 0 Actinolite-Trace	Point Count Fields: 400 < 0.25 %
Other Fibers	Fibrous Glass Cellulose Mineral Wool Synthetic - 0.25% - -	Other -	Matrix 99.75 %

Client Sample ID: BC-52-00084	Sample ID: S3	Date Analyzed: 07/24/2014	
Client Sample Description:		Analyst: Ryan Brown	
Asbestos Mineral Fibers	Layer Percent: Chrysotile Amosite Crocidolite		Percent Asbestos:
Homogeneous fine powder, tan	100% - -	Point Count: 0	Point Count Fields: 0 NAD
Other Fibers	Fibrous Glass Cellulose Mineral Wool Synthetic - - - -	Other -	Matrix 100 %





Lab/Cor Portland, Inc.

4321 SW Corbett Ave., Ste A
Portland, OR 97239

BULK SAMPLE ASBESTOS ANALYSIS

Phone: (503) 224-5055
Fax: (503) 228-8282
<http://www.labcorpdx.net>

Asbestos and Environmental Analysis

Job Number: Q141768

Report Number: Q141768R03

Report Date: 08/06/2014

This laboratory participates in the National Voluntary Laboratory Accreditation Program (NVLAP).
Testing method is per 40 CFR 763 Subpart F, Appendix A, PLM.

Layered samples are considered non-homogeneous. "Misc" is miscellaneous. "NAD" is No Asbestos Detected.
Asbestos consists of the following minerals: chrysotile, amosite, crocidolite, tremolite, actinolite, anthophyllite.
Small diameter fibers such as those found in vinyl floor tiles, may not be detected by PLM.
Asbestos detection interferences may result from material binders.

Qualitative and quantitative TEM analysis may be recommended for difficult samples.


Quantitative analysis by PLM point count or TEM is recommended for samples testing at < or = to 1% asbestos.

The following estimate of error for this method by visual estimation of asbestos percent are as follows:

1% asbestos: 0-3% error, 5% asbestos: 1-9% error, 10% asbestos: 5-15% error, 20% asbestos: 10-30% error.

This report pertains only to the samples listed on the report. Report considered valid only when signed by analyst.

Reviewed by:


Digital Signature for Lab Use Only
X

Stephanie Golden
Technical Manager



Client: Asbestos TEM Labs
630 Bancroft Way
Berkeley, CA 94710-2224

Report Number: Q141798R02

Report Date: 08/07/2014

Job Number: Q141798

P.O. No: n/a

Project Name: Asbestos Project - 07/25/2014

Project Number:

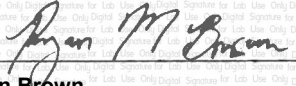
Project Notes:

Client Sample ID: 1428-66-35	Sample ID: S1	Date Analyzed: 08/07/2014
Client Sample Description: R-100A, 28.5-71.7'		Analyst: Ryan Brown
Asbestos Mineral Fibers	Layer	Percent Asbestos:
	Percent: Chrysotile Amosite Crocidolite	
Homogeneous		Point Count: 3 Point Count Fields: 400
fine powder, brown	100 % - - -	Actinolite- 0.75 % 0.75 %
Other Fibers	Fibrous Mineral	
	Glass Cellulose Wool Synthetic Other	Matrix
	- - - - -	99.25 %

This laboratory participates in the National Voluntary Laboratory Accreditation Program (NVLAP).
Testing method is per 40 CFR 763 Subpart F, Appendix A, PLM.

Layered samples are considered non-homogeneous."Misc" is miscellaneous. "NAD" is No Asbestos Detected.
Asbestos consists of the following minerals: chrysotile, amosite, crocidolite, tremolite, actinolite, anthophyllite.
Small diameter fibers such as those found in vinyl floor tiles, may not be detected by PLM.
Asbestos detection interferences may result from material binders.
Qualitative and quantitative TEM analysis may be recommended for difficult samples.
Quantitative analysis by PLM point count or TEM is recommended for samples testing at < or = to 1% asbestos.
The following estimate of error for this method by visual estimation of asbestos percent are as follows:
1% asbestos: 0-3% error, 5% asbestos: 1-9% error, 10% asbestos: 5-15% error, 20% asbestos: 10-30% error.
This report pertains only to the samples listed on the report. Report considered valid only when signed by analyst.

Reviewed by:

Digital Signature for Lab Use Only

Ryan Brown
Analyst



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **325099**
Date: May-09-2014
Date Received: Apr-01-2014
Total Samples Analyzed: 5

SAMPLE DESCRIPTION

Client Sample # **TI-1, 0-5'**
Laboratory Sample # **1428-00031-001**

Composite, sample sieved (200 mesh)

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 3963.1 Mass Suspended (mg) 59.6 Filter Type & Pore Size: MCE 0.22um
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 242.13 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0020%	<0.0020%	<0.0020%*
Struc/gr	<3.1E+07	<3.1E+07	<3.1E+07	<3.1E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0077%	<0.0124%	<0.0124%	<0.0124%*
Struc/gr	<3.1E+7	<3.1E+7	<3.1E+7	<3.1E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094	0.188
<5µm Strucs.	5	18,000X	0.0094	0.047

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.09E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	325099
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Apr-01-2014
		Total Samples Analyzed:	<u>5</u>

SAMPLE DESCRIPTION	
Client Sample #	TI-2, 0-5'
Laboratory Sample #	1428-00031-002
Composite, sample sieved (200 mesh)	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>3900.2</u>	Mass Suspended (mg)	<u>60.3</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>205.8</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22um</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0020%	<0.0020%	<0.0020%*
Struc/gr	<3.1E+07	<3.1E+07	<3.1E+07	<3.1E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0076%	<0.0122%	<0.0122%	<0.0122%*
Struc/gr	<3.1E+7	<3.1E+7	<3.1E+7	<3.1E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (pg)				
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0094	0.188	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0094	0.047	Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.05E+07**

NOTATION KEY

- NSD - No Structures Detected
- Struc Cnt = Structure Count
- * - Analytical Sensitivity used
- Wt.% = Weight percent
- E = to the power of 10
- Struc/gr = Structure per gram

Analyst Signature *He Meisheng*

QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **325097**
Date: May-09-2014
Date Received: Apr-01-2014
Total Samples Analyzed: 6

SAMPLE DESCRIPTION

Client Sample # **Qoa1-1, 0-5'**
Laboratory Sample # **1428-00029-003**

Composite, sample sieved (200 mesh)

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 3978.5 Mass Suspended (mg) 57.4 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 239.39 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.014%	<0.0002%	0.014%
Struc/gr	<1.3E+08	1.3E+08	<1.3E+08	1.3E+08

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.014%	<0.0002%	0.014%
Struc/gr	NA	1.3E+08	NA	1.3E+08

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0021%	<0.0021%	<0.0021%*
Struc/gr	<3.2E+07	<3.2E+07	<3.2E+07	<3.2E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0080%	<0.0128%	<0.0128%	<0.0128%*
Struc/gr	<3.2E+7	<3.2E+7	<3.2E+7	<3.2E+7*

COMMENTS

Small Winchite Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094
<5µm Strucs.	5	18,000X	0.0094

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.21E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*

QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	325097
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Apr-01-2014
		Total Samples Analyzed:	<u>6</u>

SAMPLE DESCRIPTION

Client Sample #	Qoa1-2, 0-5'	Composite, sample sieved (200 mesh)
Laboratory Sample #	1428-00029-004	

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g)	<u>4024.4</u>	Mass Suspended (mg)	<u>57.3</u>	Filter Type & Pore Size:	<u>MCE 0.22µm</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>	Filter Area (mm ²):	<u>385</u>
Sieved Mass (g)	<u>255.65</u>	Volume Filtered (ml)	<u>0.5</u>	Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.3E+08	<1.3E+08	<1.3E+08	<1.3E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0021%	<0.0021%	<0.0021%*
Struc/gr	<3.2E+07	<3.2E+07	<3.2E+07	<3.2E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0080%	<0.0128%	<0.0128%	<0.0128%*
Struc/gr	<3.2E+7	<3.2E+7	<3.2E+7	<3.2E+7*

COMMENTS

No Asbestos Detected	Final Sieve Type: -200 (75µm) Tyler Mesh
	Filter Loading: Moderate
	SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

ANALYTICAL SENSITIVITY - MASS (pg)

Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)	<5µm	>=5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0094	0.188	Chrys. 0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0094	0.047	Amph. 0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.21E+07**

NOTATION KEY

NSD - No Structures Detected	Struc Cnt = Structure Count
* - Analytical Sensitivity used	Wt.% = Weight percent
E = to the power of 10	Struc/gr = Structure per gram

Analyst Signature *He Meisheng*

QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	325097
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Apr-01-2014
		Total Samples Analyzed:	<u>6</u>

SAMPLE DESCRIPTION	
Client Sample #	Qoa1-3, 0-5'
Laboratory Sample #	1428-00029-005
Composite, sample sieved (200 mesh)	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>3886.0</u>	Mass Suspended (mg)	<u>58.6</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>417.17</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22µm</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL				
<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.3E+08	<1.3E+08	<1.3E+08	<1.3E+08*
TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA
≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0020%	<0.0020%	<0.0020%*
Struc/gr	<3.1E+07	<3.1E+07	<3.1E+07	<3.1E+07*
TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0079%	<0.0126%	<0.0126%	<0.0126%*
Struc/gr	<3.1E+7	<3.1E+7	<3.1E+7	<3.1E+7*
COMMENTS				
No Asbestos Detected		Final Sieve Type:	-200 (75µm) Tyler Mesh	
		Filter Loading:	Moderate	
		SAED Photo Nos.		

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (µg)				
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
≥5µm Strucs.	20	10,000X	0.0094	0.188	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0094	0.047	Amph.	0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 3.14E+07								

NOTATION KEY

NSD - No Structures Detected	Struc Cnt = Structure Count
* - Analytical Sensitivity used	Wt.% = Weight percent
E = to the power of 10	Struc/gr = Structure per gram

Analyst Signature: *He Meisheng*

QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman	REPORT NO. 325097
Address: Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date: <u>May-09-2014</u> Date Received: <u>Apr-01-2014</u>
Job Site/ No. Boulder City Bypass 137120.12	Total Samples Analyzed: <u>6</u>

SAMPLE DESCRIPTION

Client Sample #	Qoa1-4, 0-5'	Composite, sample sieved (200 mesh)
Laboratory Sample #	1428-00029-006	

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g)	<u>3490.0</u>	Mass Suspended (mg)	<u>58.8</u>	Filter Type & Pore Size:	<u>MCE 0.22µm</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>	Filter Area (mm ²):	<u>385</u>
Sieved Mass (g)	<u>181.65</u>	Volume Filtered (ml)	<u>0.5</u>	Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<u><5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.3E+08	<1.3E+08	<1.3E+08	<1.3E+08*

<u>TOTAL STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

<u>>=5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0020%	<0.0020%	<0.0020%*
Struc/gr	<3.1E+07	<3.1E+07	<3.1E+07	<3.1E+07*

<u>TOTAL PCME</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0078%	<0.0125%	<0.0125%	<0.0125%*
Struc/gr	<3.1E+7	<3.1E+7	<3.1E+7	<3.1E+7*

COMMENTS

No Asbestos Detected	Final Sieve Type: -200 (75µm) Tyler Mesh Filter Loading: Moderate SAED Photo Nos.
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TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094	0.188
<5µm Strucs.	5	18,000X	0.0094	0.047

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.13E+07**

NOTATION KEY

NSD - No Structures Detected	Struc Cnt = Structure Count
* - Analytical Sensitivity used	Wt.% = Weight percent
E = to the power of 10	Struc/gr = Structure per gram

Analyst Signature

 QC Reviewer Signature

www.asbestostemplabs.com

California Headquarters	630 Bancroft Way Berkeley, CA 94710	P: (510) 704-8930 F: (510) 704-8429
Nevada Branch Lab	1350 Freeport Blvd., Unit 104 Sparks, NV 89431	P: (775) 359-3377 F: (775) 359-2798



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	325099
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Apr-01-2014
		Total Samples Analyzed:	<u>5</u>

SAMPLE DESCRIPTION	
Client Sample #	TSMY-1, 0-3'
Laboratory Sample #	1428-00031-003
Composite, sample sieved (200 mesh)	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>3798.0</u>	Mass Suspended (mg)	<u>60.2</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>394.78</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22um</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0020%	<0.0020%	<0.0020%*
Struc/gr	<3.1E+07	<3.1E+07	<3.1E+07	<3.1E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0077%	<0.0122%	<0.0122%	<0.0122%*
Struc/gr	<3.1E+7	<3.1E+7	<3.1E+7	<3.1E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (pg)				
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0094	0.188	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0094	0.047	Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.06E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature: *He Meisheng*
QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	325099
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Apr-01-2014
		Total Samples Analyzed:	<u>5</u>

SAMPLE DESCRIPTION	
Client Sample #	TSMY-2, 0-4'
Laboratory Sample #	1428-00031-004
Composite, sample sieved (200 mesh)	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>3994.3</u>	Mass Suspended (mg)	<u>58.7</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>449.96</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22um</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	2	NSD	2
Wt.%	<0.0001%	0.143%	<0.0002%	0.143%
Struc/gr	<1.3E+08	2.5E+08	<1.3E+08	2.5E+08

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	3	NSD	3
Wt.%	<0.0001%	0.244%	<0.0002%	0.244%
Struc/gr	NA	2.8E+08	NA	2.8E+08

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.100%	<0.0020%	0.100%
Struc/gr	<3.1E+07	3.1E+07	<3.1E+07	3.1E+07

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0078%	0.100%	<0.0125%	0.100%
Struc/gr	<3.1E+7	1.3E+08	<3.1E+7	1.3E+08

COMMENTS

Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (pg)			
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)	<5µm	≥5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0094	0.188	Chrys. 0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0094	0.047	Amph. 0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 3.14E+07							

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature: *He Meisheng*
QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **325099**
Date: May-09-2014
Date Received: Apr-01-2014
Total Samples Analyzed: 5

SAMPLE DESCRIPTION

Client Sample # **TSMY-3, 0-2.5'**
Laboratory Sample # **1428-00031-005**

Composite, sample sieved (200 mesh)

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 3623.6 Mass Suspended (mg) 58.6 Filter Type & Pore Size: MCE 0.22um
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 270.51 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<u><5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	2	NSD	2
Wt.%	<0.0001%	0.053%	<0.0002%	0.053%
Struc/gr	<1.3E+08	2.5E+08	<1.3E+08	2.5E+08

<u>TOTAL STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	3	NSD	3
Wt.%	<0.0001%	0.066%	<0.0002%	0.066%
Struc/gr	NA	2.8E+08	NA	2.8E+08

<u>>=5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.013%	<0.0020%	0.013%
Struc/gr	<3.1E+07	3.1E+07	<3.1E+07	3.1E+07

<u>TOTAL PCME</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0079%	0.013%	<0.0126%	0.013%
Struc/gr	<3.1E+7	1.3E+08	<3.1E+7	1.3E+08

COMMENTS

Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094	0.188
<5µm Strucs.	5	18,000X	0.0094	0.047

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.14E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **325053**
Date: May-09-2014
Date Received: Mar-28-2014
Total Samples Analyzed: 3

SAMPLE DESCRIPTION

Client Sample # **Qoa2-1, 0-6"**
Laboratory Sample # **1428-00026-001**

Surficial, sample sieved (200 mesh)

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 2687.5 Mass Suspended (mg) 61.7 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 382.09 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<3.0E+07	<3.0E+07	<3.0E+07	<3.0E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0075%	<0.0119%	<0.0119%	<0.0119%*
Struc/gr	<3.0E+7	<3.0E+7	<3.0E+7	<3.0E+7*

COMMENTS

No Asbests Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094
<5µm Strucs.	5	18,000X	0.0094

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **2.98E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **325053**
Date: May-09-2014
Date Received: Mar-28-2014
Total Samples Analyzed: 3

SAMPLE DESCRIPTION

Client Sample # **Qoa2-2, 0-6"**
Laboratory Sample # **1428-00026-002**

Surficial, sample sieved (200 mesh)

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 2143.4 Mass Suspended (mg) 60.5 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 320.98 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<3.0E+07	<3.0E+07	<3.0E+07	<3.0E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0076%	<0.0122%	<0.0122%	<0.0122%*
Struc/gr	<3.0E+7	<3.0E+7	<3.0E+7	<3.0E+7*

COMMENTS

No Asbests Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094	0.188
<5µm Strucs.	5	18,000X	0.0094	0.047

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.04E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	325053
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Mar-28-2014
		Total Samples Analyzed:	<u>3</u>

SAMPLE DESCRIPTION

Client Sample #	Qoa2-3, 0-6"	Surficial, sample sieved (200 mesh)
Laboratory Sample #	1428-00026-003	

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g)	<u>2462.1</u>	Mass Suspended (mg)	<u>60.5</u>	Filter Type & Pore Size:	<u>MCE 0.22µm</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>	Filter Area (mm ²):	<u>385</u>
Sieved Mass (g)	<u>105.05</u>	Volume Filtered (ml)	<u>0.5</u>	Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<3.0E+07	<3.0E+07	<3.0E+07	<3.0E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0076%	<0.0122%	<0.0122%	<0.0122%*
Struc/gr	<3.0E+7	<3.0E+7	<3.0E+7	<3.0E+7*

COMMENTS

No Asbests Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094	0.188
<5µm Strucs.	5	18,000X	0.0094	0.047

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.04E+07**

NOTATION KEY

NSD - No Structures Detected	Struc Cnt = Structure Count
* - Analytical Sensitivity used	Wt.% = Weight percent
E = to the power of 10	Struc/gr = Structure per gram

Analyst Signature: *He Meisheng*
QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	325080
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Mar-31-2014
		Total Samples Analyzed:	<u>5</u>

SAMPLE DESCRIPTION	
Client Sample #	Qoa2-4, 0-6"
Laboratory Sample #	1428-00028-001
Surficial, sample sieved (200 mesh)	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>2936.1</u>	Mass Suspended (mg)	<u>61</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>69.02</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22µm</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<3.0E+07	<3.0E+07	<3.0E+07	<3.0E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0076%	<0.0121%	<0.0121%	<0.0121%*
Struc/gr	<3.0E+7	<3.0E+7	<3.0E+7	<3.0E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (pg)				
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0094	0.188	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0094	0.047	Amph.	0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 3.02E+07								

NOTATION KEY

- NSD - No Structures Detected
- * - Analytical Sensitivity used
- E = to the power of 10
- Struc Cnt = Structure Count
- Wt.% = Weight percent
- Struc/gr = Structure per gram

Analyst Signature: *He Meisheng*
QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **324292**
Date: May-09-2014
Date Received: Feb-24-2014
Total Samples Analyzed: 3

SAMPLE DESCRIPTION

Client Sample # **95B-1, 0-5'**
Laboratory Sample # 1428-00010-001

Auger cuttings, sample sieved (200 mesh)

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 2684.1 Mass Suspended (mg) 58.2 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 377.59 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.3E+08	<1.3E+08	<1.3E+08	<1.3E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0020%	<0.0020%	<0.0020%*
Struc/gr	<3.2E+07	<3.2E+07	<3.2E+07	<3.2E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0079%	<0.0126%	<0.0126%	<0.0126%*
Struc/gr	<3.2E+7	<3.2E+7	<3.2E+7	<3.2E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094
<5µm Strucs.	5	18,000X	0.0094

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.16E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *Jonathan Lehman*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	324138
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Feb-18-2014
		Total Samples Analyzed:	<u>7</u>

SAMPLE DESCRIPTION

Client Sample #	R-1, 0-5'	Auger cuttings, sample sieved (200 mesh)
Laboratory Sample #	1428-00003-001	

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g)	<u>2748.6</u>	Mass Suspended (mg)	<u>57.3</u>	Filter Type & Pore Size:	<u>MCE 0.22µm</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>	Filter Area (mm ²):	<u>385</u>
Sieved Mass (g)	<u>243.52</u>	Volume Filtered (ml)	<u>0.5</u>	Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.3E+08	<1.3E+08	<1.3E+08	<1.3E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0021%	<0.0021%	<0.0021%*
Struc/gr	<3.2E+07	<3.2E+07	<3.2E+07	<3.2E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0080%	<0.0128%	<0.0128%	<0.0128%*
Struc/gr	<3.2E+7	<3.2E+7	<3.2E+7	<3.2E+7*

COMMENTS

No Asbestos Detected	Final Sieve Type: -200 (75µm) Tyler Mesh
	Filter Loading: Moderate
	SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094
<5µm Strucs.	5	18,000X	0.0094

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.21E+07**

NOTATION KEY

NSD - No Structures Detected	Struc Cnt = Structure Count
* - Analytical Sensitivity used	Wt.% = Weight percent
E = to the power of 10	Struc/gr = Structure per gram

Michael Conlon
Analyst Signature

Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	324292
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Feb-24-2014
		Total Samples Analyzed:	<u>3</u>

SAMPLE DESCRIPTION

Client Sample #	95B-2, 0-5'	Auger cuttings, sample sieved (200 mesh)
Laboratory Sample #	1428-00010-002	

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g)	<u>2538.6</u>	Mass Suspended (mg)	<u>58.7</u>	Filter Type & Pore Size:	<u>MCE 0.22µm</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>	Filter Area (mm ²):	<u>385</u>
Sieved Mass (g)	<u>399.11</u>	Volume Filtered (ml)	<u>0.5</u>	Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.002%	<0.0002%	0.002%
Struc/gr	<1.3E+08	1.3E+08	<1.3E+08	1.3E+08

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.002%	<0.0002%	0.002%
Struc/gr	NA	1.3E+08	NA	1.3E+08

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0020%	<0.0020%	<0.0020%*
Struc/gr	<3.1E+07	<3.1E+07	<3.1E+07	<3.1E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0078%	<0.0125%	<0.0125%	<0.0125%*
Struc/gr	<3.1E+7	<3.1E+7	<3.1E+7	<3.1E+7*

COMMENTS

Actinolite Asbestos Detected	Final Sieve Type: -200 (75µm) Tyler Mesh
	Filter Loading: Moderate
	SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094	0.188
<5µm Strucs.	5	18,000X	0.0094	0.047

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.14E+07**

NOTATION KEY

NSD - No Structures Detected	Struc Cnt = Structure Count
* - Analytical Sensitivity used	Wt.% = Weight percent
E = to the power of 10	Struc/gr = Structure per gram

Analyst Signature *Jonathan Lehman*

QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **324292**
Date: May-09-2014
Date Received: Feb-24-2014
Total Samples Analyzed: 3

SAMPLE DESCRIPTION

Client Sample # **R-5, 0-5'**
Laboratory Sample # 1428-00010-003

Auger cuttings, sample sieved (200 mesh)

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 2492.5 Mass Suspended (mg) 58.3 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 390.6 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.3E+08	<1.3E+08	<1.3E+08	<1.3E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0020%	<0.0020%	<0.0020%*
Struc/gr	<3.2E+07	<3.2E+07	<3.2E+07	<3.2E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0079%	<0.0126%	<0.0126%	<0.0126%*
Struc/gr	<3.2E+7	<3.2E+7	<3.2E+7	<3.2E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094
<5µm Strucs.	5	18,000X	0.0094

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.16E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *Jonathan Lehman*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **324138**
Date: May-09-2014
Date Received: Feb-18-2014
Total Samples Analyzed: 7

SAMPLE DESCRIPTION

Client Sample # **R-2, 0-5'**
Laboratory Sample # **1428-00003-002**

Auger cuttings, sample sieved (200 mesh)

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 2654.3 Mass Suspended (mg) 60.5 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 159.66 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.012%	<0.0002%	0.012%
Struc/gr	<1.2E+08	1.2E+08	<1.2E+08	1.2E+08

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.012%	<0.0002%	0.012%
Struc/gr	NA	1.2E+08	NA	1.2E+08

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<3.0E+07	<3.0E+07	<3.0E+07	<3.0E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0076%	<0.0122%	<0.0122%	<0.0122%*
Struc/gr	<3.0E+7	<3.0E+7	<3.0E+7	<3.0E+7*

COMMENTS

Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094	0.188
<5µm Strucs.	5	18,000X	0.0094	0.047

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.04E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Michael Conlon
Analyst Signature
Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	324212
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Feb-20-2014
		Total Samples Analyzed:	10

SAMPLE DESCRIPTION

Client Sample #	R-6, 0-5'	Auger cuttings, sample sieved (200 mesh)
Laboratory Sample #	1428-00004-010	

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g)	2582.1	Mass Suspended (mg)	58.2	Filter Type & Pore Size:	MCE 0.22µm
Split Mass (g)	0	Suspension Volume (ml)	500	Filter Area (mm ²):	385
Sieved Mass (g)	114.29	Volume Filtered (ml)	0.5	Effective Filter Area (mm ²):	346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.3E+08	<1.3E+08	<1.3E+08	<1.3E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0020%	<0.0020%	<0.0020%*
Struc/gr	<3.2E+07	<3.2E+07	<3.2E+07	<3.2E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0079%	<0.0126%	<0.0126%	<0.0126%*
Struc/gr	<3.2E+7	<3.2E+7	<3.2E+7	<3.2E+7*

COMMENTS

No Asbestos Detected	Final Sieve Type: -200 (75µm) Tyler Mesh
	Filter Loading: Moderate
	SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

ANALYTICAL SENSITIVITY - MASS (pg)

Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)	<5µm	>=5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0094	0.188	Chrys. 0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0094	0.047	Amph. 0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.16E+07**

NOTATION KEY

NSD - No Structures Detected	Struc Cnt = Structure Count
* - Analytical Sensitivity used	Wt.% = Weight percent
E = to the power of 10	Struc/gr = Structure per gram

Analyst Signature: *He Meisheng*

QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	323095
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	<u>Jun-17-2014</u>
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	<u>Jan-03-2014</u>
		Total Samples Analyzed:	<u>10</u>

SAMPLE DESCRIPTION	
Client Sample #	R-7, 0-5'
Laboratory Sample #	1428-00001-001
Auger Cuttings, sample sieved (200 mesh)	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>2700.0</u>	Mass Suspended (mg)	<u>62.3</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>72</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22µm</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL									
<u><10µm STRUCTURES</u>					<u>TOTAL STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total		Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD	Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*	Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.3E+08	<1.3E+08	<1.3E+08	<1.3E+08*	Struc/gr	NA	NA	NA	NA
<u>>=10µm STRUCTURES</u>					<u>TOTAL PCME</u>				
	Chrysotile	Actinolite	Hornblende	Total		Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD	Struc Cnt	NA	NA	NA	NA
Wt.%	<0.0001%	<0.0020%	<0.0020%	<0.0020%*	Wt.%	NA	NA	NA	NA
Struc/gr	<3.2E+07	<3.2E+07	<3.2E+07	<3.2E+07*	Struc/gr	NA	NA	NA	NA
COMMENTS									
No Asbestos Detected					Final Sieve Type: -200 (710µm) Tyler Mesh Filter Loading: Moderate SAED Photo Nos.				

TEM ANALYTICAL PARAMETERS					ANALYTICAL SENSITIVITY - MASS (pg)			
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<10µm	>=10µm	PCME	
>=10µm Strucs.	20	10,000X	0.0088	0.176	Chrys.	0.0004	0.004	NA
<10µm Strucs.	5	18,000X	0.0088	0.044	Amph.	0.0160	0.160	NA
PCME ANALYTICAL SENSITIVITY - STRUC/GR = NA								

NOTATION KEY

NSD - No Structures Detected	Struc Cnt = Structure Count
* - Analytical Sensitivity used	Wt.% = Weight percent
E = to the power of 10	Struc/gr = Structure per gram

Analyst Signature: *Hu Meisheng*

QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **324138**
Date: May-09-2014
Date Received: Feb-18-2014
Total Samples Analyzed: 7

SAMPLE DESCRIPTION

Client Sample # **R-4, 0-5'**
Laboratory Sample # 1428-00003-003

Auger cuttings, sample sieved (200 mesh)

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 3499.9 Mass Suspended (mg) 58.5 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 80.56 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.3E+08	<1.3E+08	<1.3E+08	<1.3E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0020%	<0.0020%	<0.0020%*
Struc/gr	<3.1E+07	<3.1E+07	<3.1E+07	<3.1E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0079%	<0.0126%	<0.0126%	<0.0126%*
Struc/gr	<3.1E+7	<3.1E+7	<3.1E+7	<3.1E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094
<5µm Strucs.	5	18,000X	0.0094

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.15E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Michael Conlon
Analyst Signature
Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	324137
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Feb-18-2014
		Total Samples Analyzed:	<u>2</u>

SAMPLE DESCRIPTION	
Client Sample #	STA 235+15, 55'L, 0-6"
Laboratory Sample #	1428-00002-001
Surficial, sample sieved (200 mesh)	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>7860.0</u>	Mass Suspended (mg)	<u>60.5</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>311.53</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22µm</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	4	NSD	4
Wt.%	<0.0001%	0.204%	<0.0002%	0.204%
Struc/gr	<1.2E+08	4.9E+08	<1.2E+08	4.9E+08

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	4	NSD	4
Wt.%	<0.0001%	0.204%	<0.0002%	0.204%
Struc/gr	NA	4.9E+08	NA	4.9E+08

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<3.0E+07	<3.0E+07	<3.0E+07	<3.0E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0076%	<0.0122%	<0.0122%	<0.0122%*
Struc/gr	<3.0E+7	<3.0E+7	<3.0E+7	<3.0E+7*

COMMENTS

Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (pg)			
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)	<5µm	≥5µm	PCME	
>5µm Strucs.	20	10,000X	0.0094	0.188	Chrys. 0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0094	0.047	Amph. 0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 3.04E+07							

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature: *He Meisheng*
QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **324138**
Date: May-09-2014
Date Received: Feb-18-2014
Total Samples Analyzed: 7

SAMPLE DESCRIPTION

Client Sample # **R-9, 0-5'**
Laboratory Sample # 1428-00003-004

Auger cuttings, sample sieved (200 mesh)

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 2710.0 Mass Suspended (mg) 62.1 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 143.04 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<3.0E+07	<3.0E+07	<3.0E+07	<3.0E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0074%	<0.0119%	<0.0119%	<0.0119%*
Struc/gr	<3.0E+7	<3.0E+7	<3.0E+7	<3.0E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094
<5µm Strucs.	5	18,000X	0.0094

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **2.96E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Michael Conlon
Analyst Signature
Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **324138**
Date: May-09-2014
Date Received: Feb-18-2014
Total Samples Analyzed: 7

SAMPLE DESCRIPTION

Client Sample # **R-9a, 0-5'**
Laboratory Sample # **1428-00003-005**

Auger cuttings, sample sieved (200 mesh)

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 2719.0 Mass Suspended (mg) 57.5 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 228.93 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.3E+08	<1.3E+08	<1.3E+08	<1.3E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0020%	<0.0020%	<0.0020%*
Struc/gr	<3.2E+07	<3.2E+07	<3.2E+07	<3.2E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0080%	<0.0128%	<0.0128%	<0.0128%*
Struc/gr	<3.2E+7	<3.2E+7	<3.2E+7	<3.2E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094
<5µm Strucs.	5	18,000X	0.0094

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.20E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Ana Bozhanovic
Analyst Signature
Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **324138**
Date: May-09-2014
Date Received: Feb-18-2014
Total Samples Analyzed: 7

SAMPLE DESCRIPTION

Client Sample # **R-10, 0-5'**
Laboratory Sample # 1428-00003-006

Auger cuttings, sample sieved (200 mesh)

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 2821.9 Mass Suspended (mg) 62.5 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 166.06 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<2.9E+07	<2.9E+07	<2.9E+07	<2.9E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0074%	<0.0118%	<0.0118%	<0.0118%*
Struc/gr	<2.9E+7	<2.9E+7	<2.9E+7	<2.9E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094
<5µm Strucs.	5	18,000X	0.0094

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **2.94E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Ana Bozhanovic
Analyst Signature
Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	324137
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Feb-18-2014
		Total Samples Analyzed:	<u>2</u>

SAMPLE DESCRIPTION	
Client Sample #	STA 253+10, 0-6"
Laboratory Sample #	1428-00002-002
Surficial, sample sieved (200 mesh)	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>6602.7</u>	Mass Suspended (mg)	<u>61.4</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>107.49</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22µm</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.005%	<0.0002%	0.005%
Struc/gr	NA	3.0E+07	NA	3.0E+07

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.005%	<0.0019%	0.005%
Struc/gr	<3.0E+07	3.0E+07	<3.0E+07	3.0E+07

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0075%	0.005%	<0.0120%	0.005%
Struc/gr	<3.0E+7	1.2E+08	<3.0E+7	1.2E+08

COMMENTS

Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (pg)			
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)	<5µm	≥5µm	PCME	
>5µm Strucs.	20	10,000X	0.0094	0.188	Chrys. 0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0094	0.047	Amph. 0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 3.00E+07							

NOTATION KEY

- NSD - No Structures Detected
- Struc Cnt = Structure Count
- * - Analytical Sensitivity used
- Wt.% = Weight percent
- E = to the power of 10
- Struc/gr = Structure per gram

Analyst Signature: *He Meisheng*

QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	324138
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Feb-18-2014
		Total Samples Analyzed:	<u>7</u>

SAMPLE DESCRIPTION

Client Sample #	R-11, 0-5'	Auger cuttings, sample sieved (200 mesh)
Laboratory Sample #	1428-00003-007	

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g)	<u>2142.1</u>	Mass Suspended (mg)	<u>58.6</u>	Filter Type & Pore Size:	<u>MCE 0.22µm</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>	Filter Area (mm ²):	<u>385</u>
Sieved Mass (g)	<u>58.99</u>	Volume Filtered (ml)	<u>0.5</u>	Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.3E+08	<1.3E+08	<1.3E+08	<1.3E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0020%	<0.0020%	<0.0020%*
Struc/gr	<3.1E+07	<3.1E+07	<3.1E+07	<3.1E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0079%	<0.0126%	<0.0126%	<0.0126%*
Struc/gr	<3.1E+7	<3.1E+7	<3.1E+7	<3.1E+7*

COMMENTS

No Asbestos Detected	Final Sieve Type: -200 (75µm) Tyler Mesh
	Filter Loading: Moderate
	SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094	0.188
<5µm Strucs.	5	18,000X	0.0094	0.047

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.14E+07**

NOTATION KEY

NSD - No Structures Detected	Struc Cnt = Structure Count
* - Analytical Sensitivity used	Wt.% = Weight percent
E = to the power of 10	Struc/gr = Structure per gram

Ana Bozhovic
Analyst Signature

Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **325080**
Date: May-09-2014
Date Received: Mar-31-2014
Total Samples Analyzed: 5

SAMPLE DESCRIPTION

Client Sample # **R-12, 0-5'**
Laboratory Sample # 1428-00028-002

Auger cuttings, sample sieved (200 mesh)

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 3519.4 Mass Suspended (mg) 57.5 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 126.49 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.3E+08	<1.3E+08	<1.3E+08	<1.3E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0020%	<0.0020%	<0.0020%*
Struc/gr	<3.2E+07	<3.2E+07	<3.2E+07	<3.2E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0080%	<0.0128%	<0.0128%	<0.0128%*
Struc/gr	<3.2E+7	<3.2E+7	<3.2E+7	<3.2E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094	0.188
<5µm Strucs.	5	18,000X	0.0094	0.047

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.20E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **324212**
Date: May-09-2014
Date Received: Feb-20-2014
Total Samples Analyzed: 10

SAMPLE DESCRIPTION

Client Sample # **R-14, 0-5'**
Laboratory Sample # 1428-00004-001

Auger cuttings, sample sieved (200 mesh)

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 2568.1 Mass Suspended (mg) 61 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 107.49 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<3.0E+07	<3.0E+07	<3.0E+07	<3.0E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0076%	<0.0121%	<0.0121%	<0.0121%*
Struc/gr	<3.0E+7	<3.0E+7	<3.0E+7	<3.0E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094
<5µm Strucs.	5	18,000X	0.0094

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.02E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **324212**
Date: May-09-2014
Date Received: Feb-20-2014
Total Samples Analyzed: 10

SAMPLE DESCRIPTION

Client Sample # **R-16, 0-5'**
Laboratory Sample # 1428-00004-002

Auger cuttings, sample sieved (200 mesh)

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 2430.4 Mass Suspended (mg) 63.8 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 88.31 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0018%	<0.0018%	<0.0018%*
Struc/gr	<2.9E+07	<2.9E+07	<2.9E+07	<2.9E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0072%	<0.0115%	<0.0115%	<0.0115%*
Struc/gr	<2.9E+7	<2.9E+7	<2.9E+7	<2.9E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094
<5µm Strucs.	5	18,000X	0.0094

ANALYTICAL SENSITIVITY - MASS (µg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **2.88E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **324212**
Date: May-09-2014
Date Received: Feb-20-2014
Total Samples Analyzed: 10

SAMPLE DESCRIPTION

Client Sample # **R-18, 0-5'**
Laboratory Sample # 1428-00004-003

Auger cuttings, sample sieved (200 mesh)

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 2158.5 Mass Suspended (mg) 58.9 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 92.63 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0020%	<0.0020%	<0.0020%*
Struc/gr	<3.1E+07	<3.1E+07	<3.1E+07	<3.1E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0078%	<0.0125%	<0.0125%	<0.0125%*
Struc/gr	<3.1E+7	<3.1E+7	<3.1E+7	<3.1E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094
<5µm Strucs.	5	18,000X	0.0094

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.12E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	323095
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	<u>Jun-17-2014</u>
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	<u>Jan-03-2014</u>
		Total Samples Analyzed:	<u>10</u>

SAMPLE DESCRIPTION	
Client Sample #	R-19, 0-5'
Laboratory Sample #	1428-00001-002
Auger Cuttings, sample sieved (200 mesh)	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>2208.0</u>	Mass Suspended (mg)	<u>58.3</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>75.6</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22µm</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL									
<u><10µm STRUCTURES</u>					<u>TOTAL STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total		Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD	Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*	Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.3E+08	<1.3E+08	<1.3E+08	<1.3E+08*	Struc/gr	NA	NA	NA	NA
<u>>=10µm STRUCTURES</u>					<u>TOTAL PCME</u>				
	Chrysotile	Actinolite	Hornblende	Total		Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD	Struc Cnt	NA	NA	NA	NA
Wt.%	<0.0001%	<0.0022%	<0.0022%	<0.0022%*	Wt.%	NA	NA	NA	NA
Struc/gr	<3.4E+07	<3.4E+07	<3.4E+07	<3.4E+07*	Struc/gr	NA	NA	NA	NA

COMMENTS	
No Asbestos Detected	Final Sieve Type: -200 (710µm) Tyler Mesh Filter Loading: Moderate SAED Photo Nos.

TEM ANALYTICAL PARAMETERS					ANALYTICAL SENSITIVITY - MASS (pg)			
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<10µm	>=10µm	PCME	
>=10µm Strucs.	20	10,000X	0.0088	0.176	Chrys.	0.0004	0.004	NA
<10µm Strucs.	5	18,000X	0.0088	0.044	Amph.	0.0160	0.160	NA
PCME ANALYTICAL SENSITIVITY - STRUC/GR = NA								

NOTATION KEY

NSD - No Structures Detected	Struc Cnt = Structure Count
* - Analytical Sensitivity used	Wt.% = Weight percent
E = to the power of 10	Struc/gr = Structure per gram

Analyst Signature: *Hu Meisheng*

QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **324212**
Date: May-09-2014
Date Received: Feb-20-2014
Total Samples Analyzed: 10

SAMPLE DESCRIPTION

Client Sample # **R-20, 0-5'**
Laboratory Sample # 1428-00004-004

Auger cuttings, sample sieved (200 mesh)

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 2130.1 Mass Suspended (mg) 59.3 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 96.17 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0020%	<0.0020%	<0.0020%*
Struc/gr	<3.1E+07	<3.1E+07	<3.1E+07	<3.1E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0078%	<0.0124%	<0.0124%	<0.0124%*
Struc/gr	<3.1E+7	<3.1E+7	<3.1E+7	<3.1E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094
<5µm Strucs.	5	18,000X	0.0094

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.10E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **324212**
Date: May-09-2014
Date Received: Feb-20-2014
Total Samples Analyzed: 10

SAMPLE DESCRIPTION

Client Sample # **R-22, 0-5'**
Laboratory Sample # 1428-00004-005

Auger cuttings, sample sieved (200 mesh)

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 2058.0 Mass Suspended (mg) 61.6 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 77.52 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<3.0E+07	<3.0E+07	<3.0E+07	<3.0E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0075%	<0.0120%	<0.0120%	<0.0120%*
Struc/gr	<3.0E+7	<3.0E+7	<3.0E+7	<3.0E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094
<5µm Strucs.	5	18,000X	0.0094

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **2.99E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ No. Boulder City Bypass
137120.12

REPORT NO. **324212**
Date: May-09-2014
Date Received: Feb-20-2014
Total Samples Analyzed: 10

SAMPLE DESCRIPTION

Client Sample # **R-23, 0-5'**
Laboratory Sample # 1428-00004-006

Auger cuttings, sample sieved (200 mesh)

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 2109.0 Mass Suspended (mg) 63 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 101.53 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<2.9E+07	<2.9E+07	<2.9E+07	<2.9E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0073%	<0.0117%	<0.0117%	<0.0117%*
Struc/gr	<2.9E+7	<2.9E+7	<2.9E+7	<2.9E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094
<5µm Strucs.	5	18,000X	0.0094

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **2.92E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman	REPORT NO. 324212
Address: Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date: <u>May-09-2014</u> Date Received: <u>Feb-20-2014</u>
Job Site/ No. Boulder City Bypass 137120.12	Total Samples Analyzed: <u>10</u>

SAMPLE DESCRIPTION	
Client Sample #	R-25, 0-5'
Laboratory Sample #	1428-00004-007
Auger cuttings, sample sieved (200 mesh)	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>2093.6</u>	Mass Suspended (mg)	<u>63.6</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>77.14</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22µm</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<2.9E+07	<2.9E+07	<2.9E+07	<2.9E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0072%	<0.0116%	<0.0116%	<0.0116%*
Struc/gr	<2.9E+7	<2.9E+7	<2.9E+7	<2.9E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
 Filter Loading: Moderate
 SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (µg)			
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)	<5µm	≥5µm	PCME	
≥5µm Strucs.	20	10,000X	0.0094	0.188	Chrys. 0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0094	0.047	Amph. 0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = 2.89E+07

NOTATION KEY

- NSD - No Structures Detected
- * - Analytical Sensitivity used
- E = to the power of 10
- Struc Cnt = Structure Count
- Wt.% = Weight percent
- Struc/gr = Structure per gram

Analyst Signature

 QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **324212**
Date: May-09-2014
Date Received: Feb-20-2014
Total Samples Analyzed: 10

SAMPLE DESCRIPTION

Client Sample # **R-27, 0-5'**
Laboratory Sample # 1428-00004-008

Auger cuttings, sample sieved (200 mesh)

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 2165.4 Mass Suspended (mg) 58.2 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 95.59 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.3E+08	<1.3E+08	<1.3E+08	<1.3E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0020%	<0.0020%	<0.0020%*
Struc/gr	<3.2E+07	<3.2E+07	<3.2E+07	<3.2E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0079%	<0.0126%	<0.0126%	<0.0126%*
Struc/gr	<3.2E+7	<3.2E+7	<3.2E+7	<3.2E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094
<5µm Strucs.	5	18,000X	0.0094

ANALYTICAL SENSITIVITY - MASS (µg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.16E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	323095
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	<u>Jun-17-2014</u>
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	<u>Jan-03-2014</u>
		Total Samples Analyzed:	<u>10</u>

SAMPLE DESCRIPTION	
Client Sample #	R-29, 0-5'
Laboratory Sample #	1428-00001-003
Auger Cuttings, sample sieved (200 mesh)	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>2290.0</u>	Mass Suspended (mg)	<u>59.5</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>66.1</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22µm</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL									
<u><10µm STRUCTURES</u>					<u>TOTAL STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total		Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	1	1	Struc Cnt	NSD	NSD	1	1
Wt.%	<0.0001%	<0.0002%	0.010%	0.010%	Wt.%	<0.0001%	<0.0002%	0.010%	0.010%
Struc/gr	<1.3E+08	<1.3E+08	1.3E+08	1.3E+08	Struc/gr	NA	NA	1.3E+08	1.3E+08
<u>>=10µm STRUCTURES</u>					<u>TOTAL PCME</u>				
	Chrysotile	Actinolite	Hornblende	Total		Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD	Struc Cnt	NA	NA	NA	NA
Wt.%	<0.0001%	<0.0021%	<0.0021%	<0.0021%*	Wt.%	NA	NA	NA	NA
Struc/gr	<3.3E+07	<3.3E+07	<3.3E+07	<3.3E+07*	Struc/gr	NA	NA	NA	NA

COMMENTS	
Small Hornblende (<10µm) Asbestos Detected	Final Sieve Type: -200 (710µm) Tyler Mesh Filter Loading: Moderate SAED Photo Nos.

TEM ANALYTICAL PARAMETERS					ANALYTICAL SENSITIVITY - MASS (pg)			
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<10µm	>=10µm	PCME	
>=10µm Strucs.	20	10,000X	0.0088	0.176	Chrys.	0.0004	0.004	NA
<10µm Strucs.	5	18,000X	0.0088	0.044	Amph.	0.0160	0.160	NA
PCME ANALYTICAL SENSITIVITY - STRUC/GR = NA								

NOTATION KEY

NSD - No Structures Detected	Struc Cnt = Structure Count
* - Analytical Sensitivity used	Wt.% = Weight percent
E = to the power of 10	Struc/gr = Structure per gram

Analyst Signature: *Hu Meisheng*

QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **324212**
Date: May-09-2014
Date Received: Feb-20-2014
Total Samples Analyzed: 10

SAMPLE DESCRIPTION

Client Sample # **R-30, 0-5'**
Laboratory Sample # 1428-00004-009

Auger cuttings, sample sieved (200 mesh)

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 2066.4 Mass Suspended (mg) 60.8 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 113.31 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<3.0E+07	<3.0E+07	<3.0E+07	<3.0E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0076%	<0.0121%	<0.0121%	<0.0121%*
Struc/gr	<3.0E+7	<3.0E+7	<3.0E+7	<3.0E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094
<5µm Strucs.	5	18,000X	0.0094

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.03E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **324245**
Date: May-09-2014
Date Received: Feb-21-2014
Total Samples Analyzed: 10

SAMPLE DESCRIPTION

Client Sample # **R-32, 0-5'**
Laboratory Sample # 1428-00006-001

Auger cuttings, sample sieved (200 mesh)

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 2643.3 Mass Suspended (mg) 57.8 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 43.62 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	4	NSD	4
Wt.%	<0.0001%	0.017%	<0.0002%	0.017%
Struc/gr	<1.3E+08	5.1E+08	<1.3E+08	5.1E+08

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	5	NSD	5
Wt.%	<0.0001%	0.035%	<0.0002%	0.035%
Struc/gr	NA	5.4E+08	NA	5.4E+08

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.018%	<0.0020%	0.018%
Struc/gr	<3.2E+07	3.2E+07	<3.2E+07	3.2E+07

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0080%	0.018%	<0.0127%	0.018%
Struc/gr	<3.2E+7	1.3E+08	<3.2E+7	1.3E+08

COMMENTS

Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094
<5µm Strucs.	5	18,000X	0.0094

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.18E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	324245
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Feb-21-2014
		Total Samples Analyzed:	10

SAMPLE DESCRIPTION	
Client Sample #	R-33, 0-5'
Laboratory Sample #	1428-00006-002
Auger cuttings, sample sieved (200 mesh)	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>2685.3</u>	Mass Suspended (mg)	<u>61.6</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>58.28</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22µm</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	2	NSD	2
Wt.%	<0.0001%	0.008%	<0.0002%	0.008%
Struc/gr	<1.2E+08	2.4E+08	<1.2E+08	2.4E+08

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	2	NSD	2
Wt.%	<0.0001%	0.008%	<0.0002%	0.008%
Struc/gr	NA	2.4E+08	NA	2.4E+08

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<3.0E+07	<3.0E+07	<3.0E+07	<3.0E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0075%	<0.0120%	<0.0120%	<0.0120%*
Struc/gr	<3.0E+7	<3.0E+7	<3.0E+7	<3.0E+7*

COMMENTS

Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (pg)				
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0094	0.188	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0094	0.047	Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = 2.99E+07

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature: *He Meisheng*
QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **324245**
Date: May-09-2014
Date Received: Feb-21-2014
Total Samples Analyzed: 10

SAMPLE DESCRIPTION

Client Sample # **R-34, 0-5'**
Laboratory Sample # 1428-00006-003

Auger cuttings, sample sieved (200 mesh)

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 2408.6 Mass Suspended (mg) 59.9 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 139.9 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.004%	<0.0002%	0.004%
Struc/gr	<1.2E+08	1.2E+08	<1.2E+08	1.2E+08

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.004%	<0.0002%	0.004%
Struc/gr	NA	1.2E+08	NA	1.2E+08

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0020%	<0.0020%	<0.0020%*
Struc/gr	<3.1E+07	<3.1E+07	<3.1E+07	<3.1E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0077%	<0.0123%	<0.0123%	<0.0123%*
Struc/gr	<3.1E+7	<3.1E+7	<3.1E+7	<3.1E+7*

COMMENTS

Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094
<5µm Strucs.	5	18,000X	0.0094

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.07E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **324245**
Date: May-09-2014
Date Received: Feb-21-2014
Total Samples Analyzed: 10

SAMPLE DESCRIPTION

Client Sample # **R-35, 0-5'**
Laboratory Sample # 1428-00006-004

Auger cuttings, sample sieved (200 mesh)

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 3794.8 Mass Suspended (mg) 59.8 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 33.37 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.004%	<0.0002%	0.004%
Struc/gr	<1.2E+08	1.2E+08	<1.2E+08	1.2E+08

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.004%	<0.0002%	0.004%
Struc/gr	NA	1.2E+08	NA	1.2E+08

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0020%	<0.0020%	<0.0020%*
Struc/gr	<3.1E+07	<3.1E+07	<3.1E+07	<3.1E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0077%	<0.0123%	<0.0123%	<0.0123%*
Struc/gr	<3.1E+7	<3.1E+7	<3.1E+7	<3.1E+7*

COMMENTS

Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094
<5µm Strucs.	5	18,000X	0.0094

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.08E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **324245**
Date: May-09-2014
Date Received: Feb-21-2014
Total Samples Analyzed: 10

SAMPLE DESCRIPTION

Client Sample # **R-36, 0-5'**
Laboratory Sample # 1428-00006-005

Auger cuttings, sample sieved (200 mesh)

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 3584.0 Mass Suspended (mg) 57.7 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 100.83 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.3E+08	<1.3E+08	<1.3E+08	<1.3E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0020%	<0.0020%	<0.0020%*
Struc/gr	<3.2E+07	<3.2E+07	<3.2E+07	<3.2E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0080%	<0.0128%	<0.0128%	<0.0128%*
Struc/gr	<3.2E+7	<3.2E+7	<3.2E+7	<3.2E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094	0.188
<5µm Strucs.	5	18,000X	0.0094	0.047

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.19E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	323095
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	<u>Jun-17-2014</u>
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	<u>Jan-03-2014</u>
		Total Samples Analyzed:	<u>10</u>

SAMPLE DESCRIPTION	
Client Sample #	WPB-2, 0-5'
Laboratory Sample #	1428-00001-006
Auger Cuttings, sample sieved (200 mesh)	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>2370.5</u>	Mass Suspended (mg)	<u>61.2</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>71.9</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22µm</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL									
<u><10µm STRUCTURES</u>					<u>TOTAL STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total		Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD	Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*	Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.3E+08	<1.3E+08	<1.3E+08	<1.3E+08*	Struc/gr	NA	NA	NA	NA
<u>>=10µm STRUCTURES</u>					<u>TOTAL PCME</u>				
	Chrysotile	Actinolite	Hornblende	Total		Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD	Struc Cnt	NA	NA	NA	NA
Wt.%	<0.0001%	<0.0021%	<0.0021%	<0.0021%*	Wt.%	NA	NA	NA	NA
Struc/gr	<3.2E+07	<3.2E+07	<3.2E+07	<3.2E+07*	Struc/gr	NA	NA	NA	NA

COMMENTS	
No Asbestos Detected	Final Sieve Type: -200 (710µm) Tyler Mesh Filter Loading: Moderate SAED Photo Nos.

TEM ANALYTICAL PARAMETERS					ANALYTICAL SENSITIVITY - MASS (pg)			
<u>Grid Openings Scanned</u>	<u>Mag</u>	<u>Grid Op Area (mm²)</u>	<u>Scan Area(mm²)</u>		<u><10µm</u>	<u>>=10µm</u>	<u>PCME</u>	
>=10µm Strucs.	20	10,000X	0.0088	0.176	Chrys.	0.0004	0.004	NA
<10µm Strucs.	5	18,000X	0.0088	0.044	Amph.	0.0160	0.160	NA
PCME ANALYTICAL SENSITIVITY - STRUC/GR = NA								

NOTATION KEY

NSD - No Structures Detected	Struc Cnt = Structure Count
* - Analytical Sensitivity used	Wt.% = Weight percent
E = to the power of 10	Struc/gr = Structure per gram

Analyst Signature: *Hu Meisheng*

QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	324245
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Feb-21-2014
		Total Samples Analyzed:	10

SAMPLE DESCRIPTION

Client Sample #	WPB-4, 0-5'	Auger cuttings, sample sieved (200 mesh)
Laboratory Sample #	1428-00006-010	

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g)	2355.8	Mass Suspended (mg)	63	Filter Type & Pore Size:	MCE 0.22µm
Split Mass (g)	0	Suspension Volume (ml)	500	Filter Area (mm ²):	385
Sieved Mass (g)	201.19	Volume Filtered (ml)	0.5	Effective Filter Area (mm ²):	346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<2.9E+07	<2.9E+07	<2.9E+07	<2.9E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0073%	<0.0117%	<0.0117%	<0.0117%*
Struc/gr	<2.9E+7	<2.9E+7	<2.9E+7	<2.9E+7*

COMMENTS

No Asbestos Detected	Final Sieve Type: -200 (75µm) Tyler Mesh
	Filter Loading: Moderate
	SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094
<5µm Strucs.	5	18,000X	0.0094

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = 2.92E+07

NOTATION KEY

NSD - No Structures Detected	Struc Cnt = Structure Count
* - Analytical Sensitivity used	Wt.% = Weight percent
E = to the power of 10	Struc/gr = Structure per gram

Analyst Signature: *He Meisheng*

QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	324245
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Feb-21-2014
		Total Samples Analyzed:	10

SAMPLE DESCRIPTION	
Client Sample #	R-37, 0-5'
Laboratory Sample #	1428-00006-006
Auger cuttings, sample sieved (200 mesh)	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	2274.4	Mass Suspended (mg)	56.9
Split Mass (g)	0	Suspension Volume (ml)	500
Sieved Mass (g)	174.23	Volume Filtered (ml)	0.5
		Filter Type & Pore Size:	MCE 0.22µm
		Filter Area (mm ²):	385
		Effective Filter Area (mm ²):	346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.005%	<0.0002%	0.005%
Struc/gr	<1.3E+08	1.3E+08	<1.3E+08	1.3E+08

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.005%	<0.0002%	0.005%
Struc/gr	NA	1.3E+08	NA	1.3E+08

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0021%	<0.0021%	<0.0021%*
Struc/gr	<3.2E+07	<3.2E+07	<3.2E+07	<3.2E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0081%	<0.0129%	<0.0129%	<0.0129%*
Struc/gr	<3.2E+7	<3.2E+7	<3.2E+7	<3.2E+7*

COMMENTS

Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (pg)			
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)	<5µm	≥5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0094	0.188	Chrys. 0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0094	0.047	Amph. 0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 3.23E+07							

NOTATION KEY

- NSD - No Structures Detected
- * - Analytical Sensitivity used
- E = to the power of 10
- Struc Cnt = Structure Count
- Wt.% = Weight percent
- Struc/gr = Structure per gram

Analyst Signature: *He Meisheng*

QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **324245**
Date: May-09-2014
Date Received: Feb-21-2014
Total Samples Analyzed: 10

SAMPLE DESCRIPTION

Client Sample # **R-38, 0-5'**
Laboratory Sample # 1428-00006-007

Auger cuttings, sample sieved (200 mesh)

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 2358.4 Mass Suspended (mg) 59.9 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 189.5 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.005%	<0.0002%	0.005%
Struc/gr	NA	3.1E+07	NA	3.1E+07

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.005%	<0.0020%	0.005%
Struc/gr	<3.1E+07	3.1E+07	<3.1E+07	3.1E+07

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0077%	0.005%	<0.0123%	0.005%
Struc/gr	<3.1E+7	1.2E+08	<3.1E+7	1.2E+08

COMMENTS

Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094	0.188
<5µm Strucs.	5	18,000X	0.0094	0.047

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.07E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **324245**
Date: May-09-2014
Date Received: Feb-21-2014
Total Samples Analyzed: 10

SAMPLE DESCRIPTION

Client Sample # **R-39, 0-5'**
Laboratory Sample # 1428-00006-008

Auger cuttings, sample sieved (200 mesh)

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 2435.0 Mass Suspended (mg) 60.8 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 199.59 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<3.0E+07	<3.0E+07	<3.0E+07	<3.0E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0076%	<0.0121%	<0.0121%	<0.0121%*
Struc/gr	<3.0E+7	<3.0E+7	<3.0E+7	<3.0E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094
<5µm Strucs.	5	18,000X	0.0094

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.03E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **324245**
Date: May-09-2014
Date Received: Feb-21-2014
Total Samples Analyzed: 10

SAMPLE DESCRIPTION

Client Sample # R-40, 0-5'
Laboratory Sample # 1428-00006-009

Auger cuttings, sample sieved (200 mesh)

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 926.9 Mass Suspended (mg) 57.2 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 73.75 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.3E+08	<1.3E+08	<1.3E+08	<1.3E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0021%	<0.0021%	<0.0021%*
Struc/gr	<3.2E+07	<3.2E+07	<3.2E+07	<3.2E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0081%	<0.0129%	<0.0129%	<0.0129%*
Struc/gr	<3.2E+7	<3.2E+7	<3.2E+7	<3.2E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094	0.188
<5µm Strucs.	5	18,000X	0.0094	0.047

ANALYTICAL SENSITIVITY - MASS (µg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.22E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **324250**
Date: May-09-2014
Date Received: Feb-21-2014
Total Samples Analyzed: 7

SAMPLE DESCRIPTION

Client Sample # **R-41, 0-5'**
Laboratory Sample # 1428-00009-001

Auger cuttings, sample sieved (200 mesh)

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 2528.1 Mass Suspended (mg) 63 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 119.27 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<2.9E+07	<2.9E+07	<2.9E+07	<2.9E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0073%	<0.0117%	<0.0117%	<0.0117%*
Struc/gr	<2.9E+7	<2.9E+7	<2.9E+7	<2.9E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094
<5µm Strucs.	5	18,000X	0.0094

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **2.92E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **324250**
Date: May-09-2014
Date Received: Feb-21-2014
Total Samples Analyzed: 7

SAMPLE DESCRIPTION

Client Sample # **R-42, 0-5'**
Laboratory Sample # 1428-00009-002

Auger cuttings, sample sieved (200 mesh)

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 2388.4 Mass Suspended (mg) 59.9 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 757.64 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 69.28 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0020%	<0.0020%	<0.0020%*
Struc/gr	<3.1E+07	<3.1E+07	<3.1E+07	<3.1E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0077%	<0.0123%	<0.0123%	<0.0123%*
Struc/gr	<3.1E+7	<3.1E+7	<3.1E+7	<3.1E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094
<5µm Strucs.	5	18,000X	0.0094

ANALYTICAL SENSITIVITY - MASS (µg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.07E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **324250**
Date: May-09-2014
Date Received: Feb-21-2014
Total Samples Analyzed: 7

SAMPLE DESCRIPTION

Client Sample # **R-43, 0-5'**
Laboratory Sample # 1428-00009-003

Auger cuttings, sample sieved (200 mesh)

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 2742.2 Mass Suspended (mg) 59.7 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 1334.9 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 63.1 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.005%	<0.0002%	0.005%
Struc/gr	NA	3.1E+07	NA	3.1E+07

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.005%	<0.0020%	0.005%
Struc/gr	<3.1E+07	3.1E+07	<3.1E+07	3.1E+07

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0077%	0.005%	<0.0123%	0.005%
Struc/gr	<3.1E+7	1.2E+08	<3.1E+7	1.2E+08

COMMENTS

Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094	0.188
<5µm Strucs.	5	18,000X	0.0094	0.047

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.08E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **324250**
Date: May-09-2014
Date Received: Feb-21-2014
Total Samples Analyzed: 7

SAMPLE DESCRIPTION

Client Sample # R-44, 0-5'
Laboratory Sample # 1428-00009-004

Auger cuttings, sample sieved (200 mesh)

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 2453.1 Mass Suspended (mg) 58.7 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 1164.1 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 137.81 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.002%	<0.0002%	0.002%
Struc/gr	<1.3E+08	1.3E+08	<1.3E+08	1.3E+08

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.002%	<0.0002%	0.002%
Struc/gr	NA	1.3E+08	NA	1.3E+08

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0020%	<0.0020%	<0.0020%*
Struc/gr	<3.1E+07	<3.1E+07	<3.1E+07	<3.1E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0078%	<0.0125%	<0.0125%	<0.0125%*
Struc/gr	<3.1E+7	<3.1E+7	<3.1E+7	<3.1E+7*

COMMENTS

Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094
<5µm Strucs.	5	18,000X	0.0094

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.14E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	323095
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	<u>Jun-17-2014</u>
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	<u>Jan-03-2014</u>
		Total Samples Analyzed:	<u>10</u>

SAMPLE DESCRIPTION	
Client Sample #	R-45, 0-5'
Laboratory Sample #	1428-00001-004
Auger Cuttings, sample sieved (200 mesh)	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>2008.0</u>	Mass Suspended (mg)	<u>57.4</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>108.61</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22µm</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL									
<u><10µm STRUCTURES</u>					<u>TOTAL STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total		Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD	Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*	Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.4E+08	<1.4E+08	<1.4E+08	<1.4E+08*	Struc/gr	NA	NA	NA	NA
<u>>=10µm STRUCTURES</u>					<u>TOTAL PCME</u>				
	Chrysotile	Actinolite	Hornblende	Total		Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD	Struc Cnt	NA	NA	NA	NA
Wt.%	<0.0001%	<0.0022%	<0.0022%	<0.0022%*	Wt.%	NA	NA	NA	NA
Struc/gr	<3.4E+07	<3.4E+07	<3.4E+07	<3.4E+07*	Struc/gr	NA	NA	NA	NA
COMMENTS									
No Asbestos Detected					Final Sieve Type: -200 (710µm) Tyler Mesh				
					Filter Loading: Moderate				
					SAED Photo Nos.				

TEM ANALYTICAL PARAMETERS					ANALYTICAL SENSITIVITY - MASS (pg)			
<u>Grid Openings Scanned</u>	<u>Mag</u>	<u>Grid Op Area (mm²)</u>	<u>Scan Area(mm²)</u>		<u><10µm</u>	<u>>=10µm</u>	<u>PCME</u>	
>=10µm Strucs.	20	10,000X	0.0088	0.176	Chrys.	0.0004	0.004	NA
<10µm Strucs.	5	18,000X	0.0088	0.044	Amph.	0.0160	0.160	NA
PCME ANALYTICAL SENSITIVITY - STRUC/GR = NA								

NOTATION KEY

NSD - No Structures Detected	Struc Cnt = Structure Count
* - Analytical Sensitivity used	Wt.% = Weight percent
E = to the power of 10	Struc/gr = Structure per gram

Analyst Signature: *Hu Meisheng*

QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **325080**
Date: May-09-2014
Date Received: Mar-31-2014
Total Samples Analyzed: 5

SAMPLE DESCRIPTION

Client Sample # **R-46, 0-5'**
Laboratory Sample # 1428-00028-003

Auger cuttings, sample sieved (200 mesh)

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 5275.7 Mass Suspended (mg) 60.7 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 204.74 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.006%	<0.0002%	0.006%
Struc/gr	<1.2E+08	1.2E+08	<1.2E+08	1.2E+08

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.006%	<0.0002%	0.006%
Struc/gr	NA	1.2E+08	NA	1.2E+08

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<3.0E+07	<3.0E+07	<3.0E+07	<3.0E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0076%	<0.0121%	<0.0121%	<0.0121%*
Struc/gr	<3.0E+7	<3.0E+7	<3.0E+7	<3.0E+7*

COMMENTS

Small Actinolite Asbestos Fiber Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094	0.188
<5µm Strucs.	5	18,000X	0.0094	0.047

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.03E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	324250
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Feb-21-2014
		Total Samples Analyzed:	<u>7</u>

SAMPLE DESCRIPTION

Client Sample #	R-47, 0-5'	Auger cuttings, sample sieved (200 mesh)
Laboratory Sample #	1428-00009-005	

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g)	<u>2558.2</u>	Mass Suspended (mg)	<u>61.1</u>	Filter Type & Pore Size:	<u>MCE 0.22µm</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>	Filter Area (mm ²):	<u>385</u>
Sieved Mass (g)	<u>187.68</u>	Volume Filtered (ml)	<u>0.5</u>	Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<3.0E+07	<3.0E+07	<3.0E+07	<3.0E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0075%	<0.0120%	<0.0120%	<0.0120%*
Struc/gr	<3.0E+7	<3.0E+7	<3.0E+7	<3.0E+7*

COMMENTS

No Asbestos Detected	Final Sieve Type: -200 (75µm) Tyler Mesh
	Filter Loading: Moderate
	SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094	0.188
<5µm Strucs.	5	18,000X	0.0094	0.047

ANALYTICAL SENSITIVITY - MASS (µg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.01E+07**

NOTATION KEY

NSD - No Structures Detected	Struc Cnt = Structure Count
* - Analytical Sensitivity used	Wt.% = Weight percent
E = to the power of 10	Struc/gr = Structure per gram

Analyst Signature *He Meisheng*

QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	324250
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Feb-21-2014
		Total Samples Analyzed:	<u>7</u>

SAMPLE DESCRIPTION

Client Sample #	R-48, 0-5'	Auger cuttings, sample sieved (200 mesh)
Laboratory Sample #	1428-00009-006	

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g)	<u>2483.6</u>	Mass Suspended (mg)	<u>60.5</u>	Filter Type & Pore Size:	<u>MCE 0.22µm</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>	Filter Area (mm ²):	<u>385</u>
Sieved Mass (g)	<u>215.57</u>	Volume Filtered (ml)	<u>0.5</u>	Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<3.0E+07	<3.0E+07	<3.0E+07	<3.0E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0076%	<0.0122%	<0.0122%	<0.0122%*
Struc/gr	<3.0E+7	<3.0E+7	<3.0E+7	<3.0E+7*

COMMENTS

No Asbestos Detected	Final Sieve Type: -200 (75µm) Tyler Mesh
	Filter Loading: Moderate
	SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094
<5µm Strucs.	5	18,000X	0.0094

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.04E+07**

NOTATION KEY

NSD - No Structures Detected	Struc Cnt = Structure Count
* - Analytical Sensitivity used	Wt.% = Weight percent
E = to the power of 10	Struc/gr = Structure per gram

Analyst Signature *He Meisheng*

QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	324249
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Feb-21-2014
		Total Samples Analyzed:	<u>1</u>

SAMPLE DESCRIPTION	
Client Sample #	STA 480 + 90, 0-6"
Laboratory Sample #	1428-00008-001
Surficial, sample sieved (200 mesh)	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>8197.0</u>	Mass Suspended (mg)	<u>58.6</u>
Split Mass (g)	<u>1158.7</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>7.55</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22µm</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.3E+08	<1.3E+08	<1.3E+08	<1.3E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0020%	<0.0020%	<0.0020%*
Struc/gr	<3.1E+07	<3.1E+07	<3.1E+07	<3.1E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0079%	<0.0126%	<0.0126%	<0.0126%*
Struc/gr	<3.1E+7	<3.1E+7	<3.1E+7	<3.1E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (µg)				
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0094	0.188	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0094	0.047	Amph.	0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 3.14E+07								

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature: *He Meisheng*
QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **324250**
Date: May-09-2014
Date Received: Feb-21-2014
Total Samples Analyzed: 7

SAMPLE DESCRIPTION

Client Sample # **R-49, 0-5'**
Laboratory Sample # 1428-00009-007

Auger cuttings, sample sieved (200 mesh)

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 2686.3 Mass Suspended (mg) 58.8 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 112.19 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.3E+08	<1.3E+08	<1.3E+08	<1.3E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0020%	<0.0020%	<0.0020%*
Struc/gr	<3.1E+07	<3.1E+07	<3.1E+07	<3.1E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0078%	<0.0125%	<0.0125%	<0.0125%*
Struc/gr	<3.1E+7	<3.1E+7	<3.1E+7	<3.1E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094
<5µm Strucs.	5	18,000X	0.0094

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.13E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	324397
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Feb-26-2014
		Total Samples Analyzed:	10

SAMPLE DESCRIPTION	
Client Sample #	RW-1, 0-5'
Laboratory Sample #	1428-00011-001
Auger cuttings, sample sieved (200 mesh)	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	2539.0	Mass Suspended (mg)	58.5
Split Mass (g)	665.48	Suspension Volume (ml)	500
Sieved Mass (g)	72.04	Volume Filtered (ml)	0.5
		Filter Type & Pore Size:	MCE 0.22µm
		Filter Area (mm ²):	385
		Effective Filter Area (mm ²):	346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.3E+08	<1.3E+08	<1.3E+08	<1.3E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0020%	<0.0020%	<0.0020%*
Struc/gr	<3.1E+07	<3.1E+07	<3.1E+07	<3.1E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0079%	<0.0126%	<0.0126%	<0.0126%*
Struc/gr	<3.1E+7	<3.1E+7	<3.1E+7	<3.1E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (pg)				
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0094	0.188	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0094	0.047	Amph.	0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 3.15E+07								

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	324243
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Feb-21-2014
		Total Samples Analyzed:	<u>3</u>

SAMPLE DESCRIPTION

Client Sample #	497+80, 45'L, 0-6"	Surficial, sample sieved (200 mesh)
Laboratory Sample #	1428-00005-001	

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g)	<u>7785.2</u>	Mass Suspended (mg)	<u>60.2</u>	Filter Type & Pore Size:	<u>MCE 0.22µm</u>
Split Mass (g)	<u>1088.6</u>	Suspension Volume (ml)	<u>500</u>	Filter Area (mm ²):	<u>385</u>
Sieved Mass (g)	<u>81.47</u>	Volume Filtered (ml)	<u>0.5</u>	Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0020%	<0.0020%	<0.0020%*
Struc/gr	<3.1E+07	<3.1E+07	<3.1E+07	<3.1E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0077%	<0.0122%	<0.0122%	<0.0122%*
Struc/gr	<3.1E+7	<3.1E+7	<3.1E+7	<3.1E+7*

COMMENTS

No Asbestos Detected. Very common fibrous clay minerals (e.g., palygorskite).	Final Sieve Type: -200 (75µm) Tyler Mesh
	Filter Loading: Moderate
	SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094	0.188
<5µm Strucs.	5	18,000X	0.0094	0.047

ANALYTICAL SENSITIVITY - MASS (µg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.06E+07**

NOTATION KEY

NSD - No Structures Detected	Struc Cnt = Structure Count
* - Analytical Sensitivity used	Wt.% = Weight percent
E = to the power of 10	Struc/gr = Structure per gram

Michael Conlon
Analyst Signature

Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	324397
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Feb-26-2014
		Total Samples Analyzed:	10

SAMPLE DESCRIPTION

Client Sample #	STA 497+80, 45'L, 0-6"	Surficial, sample sieved (200 mesh)
Laboratory Sample #	1428-00011-002	

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g)	5825.0	Mass Suspended (mg)	62.4	Filter Type & Pore Size:	MCE 0.22µm
Split Mass (g)	809.3	Suspension Volume (ml)	500	Filter Area (mm ²):	385
Sieved Mass (g)	63.13	Volume Filtered (ml)	0.5	Effective Filter Area (mm ²):	346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<2.9E+07	<2.9E+07	<2.9E+07	<2.9E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0074%	<0.0118%	<0.0118%	<0.0118%*
Struc/gr	<2.9E+7	<2.9E+7	<2.9E+7	<2.9E+7*

COMMENTS

No Asbestos Detected	Final Sieve Type: -200 (75µm) Tyler Mesh
	Filter Loading: Moderate
	SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094
<5µm Strucs.	5	18,000X	0.0094

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = 2.95E+07

NOTATION KEY

NSD - No Structures Detected	Struc Cnt = Structure Count
* - Analytical Sensitivity used	Wt.% = Weight percent
E = to the power of 10	Struc/gr = Structure per gram

Analyst Signature *He Meisheng*

QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **324247**
Date: May-09-2014
Date Received: Feb-21-2014
Total Samples Analyzed: 5

SAMPLE DESCRIPTION

Client Sample # **R-50, 0-5'**
Laboratory Sample # 1428-00007-001

Auger cuttings, sample sieved (200 Mesh)

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 3207.1 Mass Suspended (mg) 61.2 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 400.51 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<3.0E+07	<3.0E+07	<3.0E+07	<3.0E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0075%	<0.0120%	<0.0120%	<0.0120%*
Struc/gr	<3.0E+7	<3.0E+7	<3.0E+7	<3.0E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094
<5µm Strucs.	5	18,000X	0.0094

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.01E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **324247**
Date: May-09-2014
Date Received: Feb-21-2014
Total Samples Analyzed: 5

SAMPLE DESCRIPTION

Client Sample # R-51, 0-5'
Laboratory Sample # 1428-00007-002

Auger cuttings, sample sieved (200 Mesh)

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 2430.5 Mass Suspended (mg) 59.4 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 344.89 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0020%	<0.0020%	<0.0020%*
Struc/gr	<3.1E+07	<3.1E+07	<3.1E+07	<3.1E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0078%	<0.0124%	<0.0124%	<0.0124%*
Struc/gr	<3.1E+7	<3.1E+7	<3.1E+7	<3.1E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094	0.188
<5µm Strucs.	5	18,000X	0.0094	0.047

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.10E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman	REPORT NO. 324247
Address: Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date: <u>May-09-2014</u> Date Received: <u>Feb-21-2014</u>
Job Site/ No. Boulder City Bypass 137120.12	Total Samples Analyzed: <u>5</u>

SAMPLE DESCRIPTION	
Client Sample #	R-52, 0-5'
Laboratory Sample #	1428-00007-003
Auger cuttings, sample sieved (200 Mesh)	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>3649.5</u>	Mass Suspended (mg)	<u>59.2</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>176.24</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22µm</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0020%	<0.0020%	<0.0020%*
Struc/gr	<3.1E+07	<3.1E+07	<3.1E+07	<3.1E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0078%	<0.0124%	<0.0124%	<0.0124%*
Struc/gr	<3.1E+7	<3.1E+7	<3.1E+7	<3.1E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
 Filter Loading: Moderate
 SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (pg)				
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0094	0.188	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0094	0.047	Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.11E+07**

NOTATION KEY

- | | |
|---------------------------------|-------------------------------|
| NSD - No Structures Detected | Struc Cnt = Structure Count |
| * - Analytical Sensitivity used | Wt.% = Weight percent |
| E = to the power of 10 | Struc/gr = Structure per gram |

Analyst Signature

 QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **324243**
Date: May-09-2014
Date Received: Feb-21-2014
Total Samples Analyzed: 3

SAMPLE DESCRIPTION

Client Sample # **519+90, 75'L, 0-6"**
Laboratory Sample # 1428-00005-003

Surficial, sample sieved (200 mesh)

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 7850.0 Mass Suspended (mg) 58.9 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 5131 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 12.96 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0020%	<0.0020%	<0.0020%*
Struc/gr	<3.1E+07	<3.1E+07	<3.1E+07	<3.1E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0078%	<0.0125%	<0.0125%	<0.0125%*
Struc/gr	<3.1E+7	<3.1E+7	<3.1E+7	<3.1E+7*

COMMENTS

No Asbestos Detected. Very common fibrous clay minerals (e.g., palygorskite).

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094	0.188
<5µm Strucs.	5	18,000X	0.0094	0.047

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.12E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Michael Conlon
Analyst Signature
Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **324247**
Date: May-09-2014
Date Received: Feb-21-2014
Total Samples Analyzed: 5

SAMPLE DESCRIPTION

Client Sample # **R-53, 0-5'**
Laboratory Sample # 1428-00007-004

Auger cuttings, sample sieved (200 Mesh)

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 2537.4 Mass Suspended (mg) 60.5 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 289.37 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<3.0E+07	<3.0E+07	<3.0E+07	<3.0E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0076%	<0.0122%	<0.0122%	<0.0122%*
Struc/gr	<3.0E+7	<3.0E+7	<3.0E+7	<3.0E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094
<5µm Strucs.	5	18,000X	0.0094

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.04E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	323095
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	<u>Jun-17-2014</u>
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	<u>Jan-03-2014</u>
		Total Samples Analyzed:	<u>10</u>

SAMPLE DESCRIPTION	
Client Sample #	R-54, 0-5'
Laboratory Sample #	1428-00001-005
Auger Cuttings, sample sieved (200 mesh)	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>2211.0</u>	Mass Suspended (mg)	<u>62</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>165.7</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22µm</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL									
<u><10µm STRUCTURES</u>					<u>TOTAL STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total		Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD	Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*	Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.3E+08	<1.3E+08	<1.3E+08	<1.3E+08*	Struc/gr	NA	NA	NA	NA
<u>>=10µm STRUCTURES</u>					<u>TOTAL PCME</u>				
	Chrysotile	Actinolite	Hornblende	Total		Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD	Struc Cnt	NA	NA	NA	NA
Wt.%	<0.0001%	<0.0020%	<0.0020%	<0.0020%*	Wt.%	NA	NA	NA	NA
Struc/gr	<3.2E+07	<3.2E+07	<3.2E+07	<3.2E+07*	Struc/gr	NA	NA	NA	NA
COMMENTS									
No Asbestos Detected					Final Sieve Type: -200 (710µm) Tyler Mesh				
					Filter Loading: Moderate				
					SAED Photo Nos.				

TEM ANALYTICAL PARAMETERS					ANALYTICAL SENSITIVITY - MASS (pg)			
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<10µm	>=10µm	PCME	
>=10µm Strucs.	20	10,000X	0.0088	0.176	Chrys.	0.0004	0.004	NA
<10µm Strucs.	5	18,000X	0.0088	0.044	Amph.	0.0160	0.160	NA
PCME ANALYTICAL SENSITIVITY - STRUC/GR = NA								

NOTATION KEY

NSD - No Structures Detected	Struc Cnt = Structure Count
* - Analytical Sensitivity used	Wt.% = Weight percent
E = to the power of 10	Struc/gr = Structure per gram

Analyst Signature: *Hu Meisheng*

QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **324247**
Date: May-09-2014
Date Received: Feb-21-2014
Total Samples Analyzed: 5

SAMPLE DESCRIPTION

Client Sample # **R-55, 0-5'**
Laboratory Sample # 1428-00007-005

Auger cuttings, sample sieved (200 Mesh)

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 2466.2 Mass Suspended (mg) 62.9 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 332.8 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<2.9E+07	<2.9E+07	<2.9E+07	<2.9E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0073%	<0.0117%	<0.0117%	<0.0117%*
Struc/gr	<2.9E+7	<2.9E+7	<2.9E+7	<2.9E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094
<5µm Strucs.	5	18,000X	0.0094

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **2.93E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	324243
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Feb-21-2014
		Total Samples Analyzed:	<u>3</u>

SAMPLE DESCRIPTION

Client Sample #	537+90, 10"L, 0-6"	Surficial, sample sieved (200 mesh)
Laboratory Sample #	1428-00005-002	

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g)	<u>7900.2</u>	Mass Suspended (mg)	<u>60.9</u>	Filter Type & Pore Size:	<u>MCE 0.22µm</u>
Split Mass (g)	<u>5207.6</u>	Suspension Volume (ml)	<u>500</u>	Filter Area (mm ²):	<u>385</u>
Sieved Mass (g)	<u>128.91</u>	Volume Filtered (ml)	<u>0.5</u>	Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<u><5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

<u>TOTAL STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

<u>>=5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<3.0E+07	<3.0E+07	<3.0E+07	<3.0E+07*

<u>TOTAL PCME</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0076%	<0.0121%	<0.0121%	<0.0121%*
Struc/gr	<3.0E+7	<3.0E+7	<3.0E+7	<3.0E+7*

COMMENTS

No Asbestos Detected. Very common fibrous clay minerals (e.g., palygorskite).	Final Sieve Type: -200 (75µm) Tyler Mesh
	Filter Loading: Moderate
	SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094
<5µm Strucs.	5	18,000X	0.0094

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.02E+07**

NOTATION KEY

NSD - No Structures Detected	Struc Cnt = Structure Count
* - Analytical Sensitivity used	Wt.% = Weight percent
E = to the power of 10	Struc/gr = Structure per gram

Michael Conlon
Analyst Signature

Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	324397
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Feb-26-2014
		Total Samples Analyzed:	10

SAMPLE DESCRIPTION

Client Sample #	R-56, 0-5'	Auger cuttings, sample sieved (200 mesh)
Laboratory Sample #	1428-00011-003	

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g)	2426.3	Mass Suspended (mg)	61.4	Filter Type & Pore Size:	MCE 0.22µm
Split Mass (g)	0	Suspension Volume (ml)	500	Filter Area (mm ²):	385
Sieved Mass (g)	322.98	Volume Filtered (ml)	0.5	Effective Filter Area (mm ²):	346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<3.0E+07	<3.0E+07	<3.0E+07	<3.0E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0075%	<0.0120%	<0.0120%	<0.0120%*
Struc/gr	<3.0E+7	<3.0E+7	<3.0E+7	<3.0E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094
<5µm Strucs.	5	18,000X	0.0094

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = 3.00E+07

NOTATION KEY

NSD - No Structures Detected	Struc Cnt = Structure Count
* - Analytical Sensitivity used	Wt.% = Weight percent
E = to the power of 10	Struc/gr = Structure per gram

Analyst Signature: *He Meisheng*
QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **324397**
Date: May-09-2014
Date Received: Feb-26-2014
Total Samples Analyzed: 10

SAMPLE DESCRIPTION

Client Sample # **R-57, 0-5'**
Laboratory Sample # 1428-00011-004

Auger cuttings, sample sieved (200 mesh)

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 2502.8 Mass Suspended (mg) 62.5 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 264.6 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<2.9E+07	<2.9E+07	<2.9E+07	<2.9E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0074%	<0.0118%	<0.0118%	<0.0118%*
Struc/gr	<2.9E+7	<2.9E+7	<2.9E+7	<2.9E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094
<5µm Strucs.	5	18,000X	0.0094

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **2.94E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	324397
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Feb-26-2014
		Total Samples Analyzed:	10

SAMPLE DESCRIPTION

Client Sample #	BSCB-1a, 0-5'	Auger cuttings, sample sieved (200 mesh)
Laboratory Sample #	1428-00011-008	

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g)	2265.2	Mass Suspended (mg)	59.4	Filter Type & Pore Size:	MCE 0.22µm
Split Mass (g)	652.9	Suspension Volume (ml)	500	Filter Area (mm ²):	385
Sieved Mass (g)	66.9	Volume Filtered (ml)	0.5	Effective Filter Area (mm ²):	346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.020%	<0.0002%	0.020%
Struc/gr	<1.2E+08	1.2E+08	<1.2E+08	1.2E+08

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.020%	<0.0002%	0.020%
Struc/gr	NA	1.2E+08	NA	1.2E+08

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0020%	<0.0020%	<0.0020%*
Struc/gr	<3.1E+07	<3.1E+07	<3.1E+07	<3.1E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0078%	<0.0124%	<0.0124%	<0.0124%*
Struc/gr	<3.1E+7	<3.1E+7	<3.1E+7	<3.1E+7*

COMMENTS

Actinolite Asbestos Detected	Final Sieve Type: -200 (75µm) Tyler Mesh
	Filter Loading: Moderate
	SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094	0.188
<5µm Strucs.	5	18,000X	0.0094	0.047

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = 3.10E+07

NOTATION KEY

NSD - No Structures Detected	Struc Cnt = Structure Count
* - Analytical Sensitivity used	Wt.% = Weight percent
E = to the power of 10	Struc/gr = Structure per gram

Analyst Signature: *He Meisheng*

QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	324397
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Feb-26-2014
		Total Samples Analyzed:	10

SAMPLE DESCRIPTION	
Client Sample #	BSCB-1, 0-5'
Laboratory Sample #	1428-00011-007
Auger cuttings, sample sieved (200 mesh)	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	2190.2	Mass Suspended (mg)	61.5
Split Mass (g)	0	Suspension Volume (ml)	500
Sieved Mass (g)	400.85	Volume Filtered (ml)	0.5
		Filter Type & Pore Size:	MCE 0.22µm
		Filter Area (mm ²):	385
		Effective Filter Area (mm ²):	346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<3.0E+07	<3.0E+07	<3.0E+07	<3.0E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0075%	<0.0120%	<0.0120%	<0.0120%*
Struc/gr	<3.0E+7	<3.0E+7	<3.0E+7	<3.0E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (pg)				
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
≥5µm Strucs.	20	10,000X	0.0094	0.188	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0094	0.047	Amph.	0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 2.99E+07								

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature: *He Meisheng*
QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	324397
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Feb-26-2014
		Total Samples Analyzed:	10

SAMPLE DESCRIPTION

Client Sample #	BSCB-2, 0-5'	Auger cuttings, sample sieved (200 mesh)
Laboratory Sample #	1428-00011-009	

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g)	2248.7	Mass Suspended (mg)	59.7	Filter Type & Pore Size:	MCE 0.22µm
Split Mass (g)	0	Suspension Volume (ml)	500	Filter Area (mm ²):	385
Sieved Mass (g)	343.87	Volume Filtered (ml)	0.5	Effective Filter Area (mm ²):	346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0020%	<0.0020%	<0.0020%*
Struc/gr	<3.1E+07	<3.1E+07	<3.1E+07	<3.1E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0077%	<0.0123%	<0.0123%	<0.0123%*
Struc/gr	<3.1E+7	<3.1E+7	<3.1E+7	<3.1E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094	0.188
<5µm Strucs.	5	18,000X	0.0094	0.047

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = 3.08E+07

NOTATION KEY

NSD - No Structures Detected	Struc Cnt = Structure Count
* - Analytical Sensitivity used	Wt.% = Weight percent
E = to the power of 10	Struc/gr = Structure per gram

Analyst Signature: *He Meisheng*
QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **324397**
Date: May-09-2014
Date Received: Feb-26-2014
Total Samples Analyzed: 10

SAMPLE DESCRIPTION

Client Sample # **BSCB-2a, 0-5'**
Laboratory Sample # 1428-00011-010

Auger cuttings, sample sieved (200 mesh)

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 2041.1 Mass Suspended (mg) 60.3 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 534.2 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 131.84 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.006%	<0.0002%	0.006%
Struc/gr	<1.2E+08	1.2E+08	<1.2E+08	1.2E+08

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	2	NSD	2
Wt.%	<0.0001%	0.008%	<0.0002%	0.008%
Struc/gr	NA	1.5E+08	NA	1.5E+08

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.002%	<0.0020%	0.002%
Struc/gr	<3.1E+07	3.1E+07	<3.1E+07	3.1E+07

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0076%	<0.0122%	<0.0122%	<0.0122%*
Struc/gr	<3.1E+7	<3.1E+7	<3.1E+7	<3.1E+7*

COMMENTS

Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094
<5µm Strucs.	5	18,000X	0.0094

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.05E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	324397
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Feb-26-2014
		Total Samples Analyzed:	10

SAMPLE DESCRIPTION

Client Sample #	R-58, 0-5'	Auger cuttings, sample sieved (200 mesh)
Laboratory Sample #	1428-00011-005	

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g)	2018.2	Mass Suspended (mg)	58.4	Filter Type & Pore Size:	MCE 0.22µm
Split Mass (g)	0	Suspension Volume (ml)	500	Filter Area (mm ²):	385
Sieved Mass (g)	360.66	Volume Filtered (ml)	0.5	Effective Filter Area (mm ²):	346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.3E+08	<1.3E+08	<1.3E+08	<1.3E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0020%	<0.0020%	<0.0020%*
Struc/gr	<3.2E+07	<3.2E+07	<3.2E+07	<3.2E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0079%	<0.0126%	<0.0126%	<0.0126%*
Struc/gr	<3.2E+7	<3.2E+7	<3.2E+7	<3.2E+7*

COMMENTS

No Asbestos Detected	Final Sieve Type: -200 (75µm) Tyler Mesh
	Filter Loading: Moderate
	SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

ANALYTICAL SENSITIVITY - MASS (pg)

Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)	<5µm	>=5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0094	0.188	Chrys. 0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0094	0.047	Amph. 0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = 3.15E+07

NOTATION KEY

NSD - No Structures Detected	Struc Cnt = Structure Count
* - Analytical Sensitivity used	Wt.% = Weight percent
E = to the power of 10	Struc/gr = Structure per gram

Analyst Signature: *He Meisheng*

QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	325080
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Mar-31-2014
		Total Samples Analyzed:	<u>5</u>

SAMPLE DESCRIPTION	
Client Sample #	566+25, 0-6"
Laboratory Sample #	1428-00028-004
Surficial, sample sieved (200 mesh)	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>3451.4</u>	Mass Suspended (mg)	<u>58.5</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>0.97</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22µm</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.3E+08	<1.3E+08	<1.3E+08	<1.3E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.002%	<0.0002%	0.002%
Struc/gr	NA	3.1E+07	NA	3.1E+07

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.002%	<0.0020%	0.002%
Struc/gr	<3.1E+07	3.1E+07	<3.1E+07	3.1E+07

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0079%	<0.0126%	<0.0126%	<0.0126%*
Struc/gr	<3.1E+7	<3.1E+7	<3.1E+7	<3.1E+7*

COMMENTS

Large Actinolite Asbestos Fiber Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (pg)			
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)	<5µm	≥5µm	PCME	
≥5µm Strucs.	20	10,000X	0.0094	0.188	Chrys. 0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0094	0.047	Amph. 0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 3.15E+07							

NOTATION KEY

- NSD - No Structures Detected
- Struc Cnt = Structure Count
- * - Analytical Sensitivity used
- Wt.% = Weight percent
- E = to the power of 10
- Struc/gr = Structure per gram

Analyst Signature: *He Meisheng*
QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	325080
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Mar-31-2014
		Total Samples Analyzed:	<u>5</u>

SAMPLE DESCRIPTION	
Client Sample #	570+00, 0-6"
Laboratory Sample #	1428-00028-005
Surficial, sample sieved (200 mesh)	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>2810.9</u>	Mass Suspended (mg)	<u>57.4</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>99.62</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22µm</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.3E+08	<1.3E+08	<1.3E+08	<1.3E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0021%	<0.0021%	<0.0021%*
Struc/gr	<3.2E+07	<3.2E+07	<3.2E+07	<3.2E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0080%	<0.0128%	<0.0128%	<0.0128%*
Struc/gr	<3.2E+7	<3.2E+7	<3.2E+7	<3.2E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (pg)				
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
≥5µm Strucs.	20	10,000X	0.0094	0.188	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0094	0.047	Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.21E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*

QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman	REPORT NO. 324397
Address: Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date: <u>May-09-2014</u> Date Received: <u>Feb-26-2014</u>
Job Site/ No. Boulder City Bypass 137120.12	Total Samples Analyzed: <u>10</u>

SAMPLE DESCRIPTION	
Client Sample #	R-59, 0-5'
Laboratory Sample #	1428-00011-006
Auger cuttings, sample sieved (200 mesh)	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>2466.0</u>	Mass Suspended (mg)	<u>57</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>161.75</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22µm</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.3E+08	<1.3E+08	<1.3E+08	<1.3E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0021%	<0.0021%	<0.0021%*
Struc/gr	<3.2E+07	<3.2E+07	<3.2E+07	<3.2E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0081%	<0.0129%	<0.0129%	<0.0129%*
Struc/gr	<3.2E+7	<3.2E+7	<3.2E+7	<3.2E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
 Filter Loading: Moderate
 SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (pg)				
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
≥5µm Strucs.	20	10,000X	0.0094	0.188	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0094	0.047	Amph.	0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 3.23E+07								

NOTATION KEY

- NSD - No Structures Detected
- * - Analytical Sensitivity used
- E = to the power of 10
- Struc Cnt = Structure Count
- Wt.% = Weight percent
- Struc/gr = Structure per gram

Analyst Signature

 QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	323095
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	<u>Jun-17-2014</u>
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	<u>Jan-03-2014</u>
		Total Samples Analyzed:	<u>10</u>

SAMPLE DESCRIPTION	
Client Sample #	R-60, 0-5'
Laboratory Sample #	1428-00001-007
Auger Cuttings, sample sieved (200 mesh)	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>1939.6</u>	Mass Suspended (mg)	<u>61.5</u>
Split Mass (g)	<u>1110.6</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>48.8</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22µm</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL									
<u><10µm STRUCTURES</u>					<u>TOTAL STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total		Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD	Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*	Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.3E+08	<1.3E+08	<1.3E+08	<1.3E+08*	Struc/gr	NA	NA	NA	NA
<u>>=10µm STRUCTURES</u>					<u>TOTAL PCME</u>				
	Chrysotile	Actinolite	Hornblende	Total		Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD	Struc Cnt	NA	NA	NA	NA
Wt.%	<0.0001%	<0.0020%	<0.0020%	<0.0020%*	Wt.%	NA	NA	NA	NA
Struc/gr	<3.2E+07	<3.2E+07	<3.2E+07	<3.2E+07*	Struc/gr	NA	NA	NA	NA
COMMENTS									
No Asbestos Detected					Final Sieve Type: -200 (710µm) Tyler Mesh				
					Filter Loading: Moderate				
					SAED Photo Nos.				

TEM ANALYTICAL PARAMETERS					ANALYTICAL SENSITIVITY - MASS (pg)			
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<10µm	>=10µm	PCME	
>=10µm Strucs.	20	10,000X	0.0088	0.176	Chrys.	0.0004	0.004	NA
<10µm Strucs.	5	18,000X	0.0088	0.044	Amph.	0.0160	0.160	NA
PCME ANALYTICAL SENSITIVITY - STRUC/GR = NA								

NOTATION KEY

NSD - No Structures Detected	Struc Cnt = Structure Count
* - Analytical Sensitivity used	Wt.% = Weight percent
E = to the power of 10	Struc/gr = Structure per gram

Analyst Signature: *Hu Meisheng*

QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	324818
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-19-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Mar-17-2014
		Total Samples Analyzed:	7

SAMPLE DESCRIPTION	
Client Sample #	R-62, 0-5'
Laboratory Sample #	1428-00018-001
Auger Cuttings, sample sieved (200 mesh)	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	4708.0	Mass Suspended (mg)	60
Split Mass (g)	0	Suspension Volume (ml)	500
Sieved Mass (g)	73.21	Volume Filtered (ml)	0.5
		Filter Type & Pore Size:	MCE 0.22µm
		Filter Area (mm ²):	385
		Effective Filter Area (mm ²):	346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.023%	<0.0002%	0.023%
Struc/gr	<1.2E+08	1.2E+08	<1.2E+08	1.2E+08

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.023%	<0.0002%	0.023%
Struc/gr	NA	1.2E+08	NA	1.2E+08

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0020%	<0.0020%	<0.0020%*
Struc/gr	<3.1E+07	<3.1E+07	<3.1E+07	<3.1E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0077%	<0.0123%	<0.0123%	<0.0123%*
Struc/gr	<3.1E+7	<3.1E+7	<3.1E+7	<3.1E+7*

COMMENTS

Small Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (pg)			
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)	<5µm	≥5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0094	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0094	Amph.	0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 3.07E+07							

NOTATION KEY

- NSD - No Structures Detected
- * - Analytical Sensitivity used
- E = to the power of 10
- Struc Cnt = Structure Count
- Wt.% = Weight percent
- Struc/gr = Structure per gram

[Signature]
Analyst Signature

[Signature]
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **324423**
Date: May-09-2014
Date Received: Feb-27-2014
Total Samples Analyzed: 6

SAMPLE DESCRIPTION

Client Sample # **R-63, 0-5'**
Laboratory Sample # 1428-00012-001

Auger cuttings, sample sieved (200 mesh)

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 2529.4 Mass Suspended (mg) 62 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 679.7 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 78.77 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.004%	<0.0002%	0.004%
Struc/gr	<1.2E+08	1.2E+08	<1.2E+08	1.2E+08

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.004%	<0.0002%	0.004%
Struc/gr	NA	1.2E+08	NA	1.2E+08

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<3.0E+07	<3.0E+07	<3.0E+07	<3.0E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0074%	<0.0119%	<0.0119%	<0.0119%*
Struc/gr	<3.0E+7	<3.0E+7	<3.0E+7	<3.0E+7*

COMMENTS

Small Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094
<5µm Strucs.	5	18,000X	0.0094

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **2.97E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **324699**
Date: May-09-2014
Date Received: Mar-11-2014
Total Samples Analyzed: 3

SAMPLE DESCRIPTION

Client Sample # **TSB-13**
Laboratory Sample # 1428-00017-002

Surficial sample of rock outcrop, sample crushed

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 0.0 Mass Suspended (mg) 58.6 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 0 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	1	1
Wt.%	<0.0001%	<0.0002%	0.001%	0.001%
Struc/gr	<1.3E+08	<1.3E+08	1.3E+08	1.3E+08

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	1	1
Wt.%	<0.0001%	<0.0002%	0.001%	0.001%
Struc/gr	NA	NA	1.3E+08	1.3E+08

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0020%	<0.0020%	<0.0020%*
Struc/gr	<3.1E+07	<3.1E+07	<3.1E+07	<3.1E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0079%	<0.0126%	<0.0126%	<0.0126%*
Struc/gr	<3.1E+7	<3.1E+7	<3.1E+7	<3.1E+7*

COMMENTS

Small Hornblende Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094	0.188
<5µm Strucs.	5	18,000X	0.0094	0.047

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.14E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Michael Conlon
Analyst Signature
Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **324423**
Date: May-09-2014
Date Received: Feb-27-2014
Total Samples Analyzed: 6

SAMPLE DESCRIPTION

Client Sample # **R-65, 0-5'**
Laboratory Sample # 1428-00012-002

Auger cuttings, sample sieved (200 mesh)

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 2515.8 Mass Suspended (mg) 60.7 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 743.5 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 24.68 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<3.0E+07	<3.0E+07	<3.0E+07	<3.0E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0076%	<0.0121%	<0.0121%	<0.0121%*
Struc/gr	<3.0E+7	<3.0E+7	<3.0E+7	<3.0E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094
<5µm Strucs.	5	18,000X	0.0094

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.03E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **324423**
Date: May-09-2014
Date Received: Feb-27-2014
Total Samples Analyzed: 6

SAMPLE DESCRIPTION

Client Sample # **R-66, 0-5'**
Laboratory Sample # 1428-00012-003

Auger cuttings, sample sieved (200 mesh)

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 2642.5 Mass Suspended (mg) 61.5 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 709.6 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 34.18 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<u><5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	6	NSD	6
Wt.%	<0.0001%	0.022%	<0.0002%	0.022%
Struc/gr	<1.2E+08	7.2E+08	<1.2E+08	7.2E+08

<u>TOTAL STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	6	NSD	6
Wt.%	<0.0001%	0.022%	<0.0002%	0.022%
Struc/gr	NA	7.2E+08	NA	7.2E+08

<u>>=5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<3.0E+07	<3.0E+07	<3.0E+07	<3.0E+07*

<u>TOTAL PCME</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0075%	<0.0120%	<0.0120%	<0.0120%*
Struc/gr	<3.0E+7	<3.0E+7	<3.0E+7	<3.0E+7*

COMMENTS

Small Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094	0.188
<5µm Strucs.	5	18,000X	0.0094	0.047

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **2.99E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **324423**
Date: May-09-2014
Date Received: Feb-27-2014
Total Samples Analyzed: 6

SAMPLE DESCRIPTION

Client Sample # **R-67, 0-5'**
Laboratory Sample # 1428-00012-004

Auger cuttings, sample sieved (200 mesh)

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 2992.2 Mass Suspended (mg) 58.8 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 626.9 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 80.87 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.005%	<0.0002%	0.005%
Struc/gr	<1.3E+08	1.3E+08	<1.3E+08	1.3E+08

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.005%	<0.0002%	0.005%
Struc/gr	NA	1.3E+08	NA	1.3E+08

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0020%	<0.0020%	<0.0020%*
Struc/gr	<3.1E+07	<3.1E+07	<3.1E+07	<3.1E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0078%	<0.0125%	<0.0125%	<0.0125%*
Struc/gr	<3.1E+7	<3.1E+7	<3.1E+7	<3.1E+7*

COMMENTS

Small Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094
<5µm Strucs.	5	18,000X	0.0094

ANALYTICAL SENSITIVITY - MASS (µg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.13E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **324423**
Date: May-09-2014
Date Received: Feb-27-2014
Total Samples Analyzed: 6

SAMPLE DESCRIPTION

Client Sample # **R-69, 0-5'**
Laboratory Sample # 1428-00012-005

Auger cuttings, sample sieved (200 mesh)

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 2395.9 Mass Suspended (mg) 61.2 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 709.3 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 68.71 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.001%	<0.0002%	0.001%
Struc/gr	<1.2E+08	1.2E+08	<1.2E+08	1.2E+08

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.001%	<0.0002%	0.001%
Struc/gr	NA	1.2E+08	NA	1.2E+08

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<3.0E+07	<3.0E+07	<3.0E+07	<3.0E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0075%	<0.0120%	<0.0120%	<0.0120%*
Struc/gr	<3.0E+7	<3.0E+7	<3.0E+7	<3.0E+7*

COMMENTS

Small Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094
<5µm Strucs.	5	18,000X	0.0094

ANALYTICAL SENSITIVITY - MASS (µg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.01E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **324699**
Date: May-09-2014
Date Received: Mar-11-2014
Total Samples Analyzed: 3

SAMPLE DESCRIPTION

Client Sample # TSB-14
Laboratory Sample # 1428-00017-003

Surficial sample of rock outcrop, sample crushed

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 0.0 Mass Suspended (mg) 58.1 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 0 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<u><5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.009%	<0.0002%	0.009%
Struc/gr	<1.3E+08	1.3E+08	<1.3E+08	1.3E+08

<u>TOTAL STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.009%	<0.0002%	0.009%
Struc/gr	NA	1.3E+08	NA	1.3E+08

<u>>=5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0020%	<0.0020%	<0.0020%*
Struc/gr	<3.2E+07	<3.2E+07	<3.2E+07	<3.2E+07*

<u>TOTAL PCME</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0079%	<0.0127%	<0.0127%	<0.0127%*
Struc/gr	<3.2E+7	<3.2E+7	<3.2E+7	<3.2E+7*

COMMENTS

Small Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094	0.188
<5µm Strucs.	5	18,000X	0.0094	0.047

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.17E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Michael Conlon
Analyst Signature
Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **324699**

Date: May-09-2014
Date Received: Mar-11-2014

Total Samples Analyzed: 3

SAMPLE DESCRIPTION

Client Sample # **TSB-9**
Laboratory Sample # 1428-00017-001

Surficial sample of rock outcrop, sample crushed

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 0.0 Mass Suspended (mg) 59.2 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 0 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<u><5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	11	NSD	11
Wt.%	<0.0001%	0.047%	<0.0002%	0.047%
Struc/gr	<1.2E+08	1.4E+09	<1.2E+08	1.4E+09

<u>TOTAL STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	13	NSD	13
Wt.%	<0.0001%	0.092%	<0.0002%	0.092%
Struc/gr	NA	1.4E+09	NA	1.4E+09

<u>>=5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	2	NSD	2
Wt.%	<0.0001%	0.046%	<0.0020%	0.046%
Struc/gr	<3.1E+07	6.2E+07	<3.1E+07	6.2E+07

<u>TOTAL PCME</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	2	NSD	2
Wt.%	<0.0078%	0.046%	<0.0124%	0.046%
Struc/gr	<3.1E+7	2.5E+08	<3.1E+7	2.5E+08

COMMENTS

Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094	0.188
<5µm Strucs.	5	18,000X	0.0094	0.047

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.11E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *Jonathan Lehman*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.:	324423
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-21-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Feb-27-2014
		Total Samples Analyzed:	6

SAMPLE DESCRIPTION	
Client Sample #	R-70, 0-10'
Laboratory Sample #	1428-00012-006
Auger cuttings, sample sieved (200 mesh)	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	2828.2	Mass Suspended (mg)	63.8
Split Mass (g)	829.5	Suspension Volume (ml)	500
Sieved Mass (g)	79.32	Volume Filtered (ml)	0.5
		Filter Type & Pore Size:	MCE 0.22µm
		Filter Area (mm ²):	385
		Effective Filter Area (mm ²):	346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt. %	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt. %	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt. %	<0.0001%	<0.0018%	<0.0018%	<0.0018%*
Struc/gr	<2.9E+07	<2.9E+07	<2.9E+07	<2.9E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt. %	<0.0072%	<0.0115%	<0.0115%	<0.0115%*
Struc/gr	<2.9E+7	<2.9E+7	<2.9E+7	<2.9E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (pg)		
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area (mm ²)	<5µm	≥5µm	PCME
>=5µm Strucs.	20	10,000X	0.0094	Chrys.	0.0004	0.004
<5µm Strucs.	5	18,000X	0.0094	Amph.	0.0160	0.160

PCME ANALYTICAL SENSITIVITY - STRUC/GR = 2.88E+07

NOTATION KEY

- NSD - No Structures Detected
- Struc Cnt = Structure Count
- * - Analytical Sensitivity used
- Wt. % = Weight percent
- E = to the power of 10
- Struc/gr = Structure per gram

Analyst Signature: *He Meisheng*

QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	323095
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	<u>Jun-17-2014</u>
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	<u>Jan-03-2014</u>
		Total Samples Analyzed:	<u>10</u>

SAMPLE DESCRIPTION

Client Sample #	R-71, 0-5'	Auger Cuttings, sample sieved (200 mesh)
Laboratory Sample #	1428-00001-008	

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g)	<u>2468.2</u>	Mass Suspended (mg)	<u>56.8</u>	Filter Type & Pore Size:	<u>MCE 0.22µm</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>	Filter Area (mm ²):	<u>385</u>
Sieved Mass (g)	<u>76.1</u>	Volume Filtered (ml)	<u>0.5</u>	Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<u><10µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	7	1	8
Wt.%	<0.0001%	0.233%	0.125%	0.358%
Struc/gr	<69.2E+06	4.8E+08	6.9E+07	5.5E+08

<u>TOTAL STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	7	1	8
Wt.%	<0.0001%	0.233%	0.125%	0.358%
Struc/gr	NA	4.8E+08	6.9E+07	5.5E+08

<u>>=10µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0011%	<0.0011%	<0.0011%*
Struc/gr	<3.5E+07	<3.5E+07	<3.5E+07	<3.5E+07*

<u>TOTAL PCME</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NA	NA	NA	NA
Wt.%	NA	NA	NA	NA
Struc/gr	NA	NA	NA	NA

COMMENTS

Small Actinolite & Hornblende (<10µm) Asbestos Detected	Final Sieve Type: -200 (710µm) Tyler Mesh
	Filter Loading: Moderate
	SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=10µm Strucs.	20	10,000X	0.0088	0.176
<10µm Strucs.	10	18,000X	0.0088	0.088

ANALYTICAL SENSITIVITY - MASS (pg)

	<10µm	>=10µm	PCME
Chrys.	0.0004	0.004	NA
Amph.	0.0160	0.160	NA

PCME ANALYTICAL SENSITIVITY - STRUC/GR = NA

NOTATION KEY

NSD - No Structures Detected	Struc Cnt = Structure Count
* - Analytical Sensitivity used	Wt.% = Weight percent
E = to the power of 10	Struc/gr = Structure per gram

Analyst Signature *Hu Meisheng*

QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **324460**
Date: May-09-2014
Date Received: Feb-28-2014
Total Samples Analyzed: 11

SAMPLE DESCRIPTION

Client Sample # **R-72, 0-5'**
Laboratory Sample # 1428-00013-001

Auger cuttings, sample sieved (200 mesh)

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 2564.4 Mass Suspended (mg) 60.9 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 473.93 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	1	1
Wt.%	<0.0001%	<0.0002%	0.001%	0.001%
Struc/gr	<1.2E+08	<1.2E+08	1.2E+08	1.2E+08

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	2	2
Wt.%	<0.0001%	<0.0002%	0.004%	0.004%
Struc/gr	NA	NA	1.5E+08	1.5E+08

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	1	1
Wt.%	<0.0001%	<0.0019%	0.003%	0.003%
Struc/gr	<3.0E+07	<3.0E+07	3.0E+07	3.0E+07

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	1	1
Wt.%	<0.0076%	<0.0121%	0.003%	0.003%
Struc/gr	<3.0E+7	<3.0E+7	1.2E+08	1.2E+08

COMMENTS

Hornblende Fibers Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094
<5µm Strucs.	5	18,000X	0.0094

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.02E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Michael Conlon
Analyst Signature
Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **324697**
Date: May-09-2014
Date Received: Mar-11-2014
Total Samples Analyzed: 11

SAMPLE DESCRIPTION

Client Sample # **R-72, 16.5-16.9'**
Laboratory Sample # 1428-00016-001

Rock core, sample crushed

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 0.0 Mass Suspended (mg) 61.9 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 0 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<u><5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	16	NSD	16
Wt.%	<0.0001%	0.123%	<0.0002%	0.123%
Struc/gr	<1.2E+08	1.9E+09	<1.2E+08	1.9E+09

<u>TOTAL STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	20	NSD	20
Wt.%	<0.0001%	0.461%	<0.0002%	0.461%
Struc/gr	NA	2.0E+09	NA	2.0E+09

<u>>=5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	4	NSD	4
Wt.%	<0.0001%	0.339%	<0.0019%	0.339%
Struc/gr	<3.0E+07	1.2E+08	<3.0E+07	1.2E+08

<u>TOTAL PCME</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	4	NSD	4
Wt.%	<0.0074%	0.339%	<0.0119%	0.339%
Struc/gr	<3.0E+7	4.8E+08	<3.0E+7	4.8E+08

COMMENTS

Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Light
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094	0.188
<5µm Strucs.	5	18,000X	0.0094	0.047

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **2.97E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Ana Bozhanovic
Analyst Signature
Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman	REPORT NO. 324460
Address: Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date: <u>May-09-2014</u> Date Received: <u>Feb-28-2014</u>
Job Site/ No. Boulder City Bypass 137120.12	Total Samples Analyzed: <u>11</u>

SAMPLE DESCRIPTION	
Client Sample #	R-74, 0-5'
Laboratory Sample #	1428-00013-002
Auger cuttings, sample sieved (200 mesh)	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>2106.5</u>	Mass Suspended (mg)	<u>61.2</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>147.96</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22µm</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	1	1
Wt.%	<0.0001%	<0.0002%	0.001%	0.001%
Struc/gr	<1.2E+08	<1.2E+08	1.2E+08	1.2E+08

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	1	1
Wt.%	<0.0001%	<0.0002%	0.001%	0.001%
Struc/gr	NA	NA	1.2E+08	1.2E+08

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<3.0E+07	<3.0E+07	<3.0E+07	<3.0E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0075%	<0.0120%	<0.0120%	<0.0120%*
Struc/gr	<3.0E+7	<3.0E+7	<3.0E+7	<3.0E+7*

COMMENTS

Hornblende Fiber Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
 Filter Loading: Moderate
 SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (pg)				
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0094	0.188	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0094	0.047	Amph.	0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 3.01E+07								

NOTATION KEY

- NSD - No Structures Detected
- * - Analytical Sensitivity used
- E = to the power of 10
- Struc Cnt = Structure Count
- Wt.% = Weight percent
- Struc/gr = Structure per gram

Analyst Signature

 QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **324697**
Date: May-09-2014
Date Received: Mar-11-2014
Total Samples Analyzed: 11

SAMPLE DESCRIPTION

Client Sample # **R-74, 15.9-16.4'**
Laboratory Sample # 1428-00016-002

Rock core, sample crushed

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 0.0 Mass Suspended (mg) 61.7 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 0 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	15	NSD	15
Wt.%	<0.0001%	0.093%	<0.0002%	0.093%
Struc/gr	<1.2E+08	1.8E+09	<1.2E+08	1.8E+09

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	18	NSD	18
Wt.%	<0.0001%	0.117%	<0.0002%	0.117%
Struc/gr	NA	1.9E+09	NA	1.9E+09

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	3	NSD	3
Wt.%	<0.0001%	0.025%	<0.0019%	0.025%
Struc/gr	<3.0E+07	8.9E+07	<3.0E+07	8.9E+07

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	2	NSD	2
Wt.%	<0.0075%	0.025%	<0.0119%	0.025%
Struc/gr	<3.0E+7	2.4E+08	<3.0E+7	2.4E+08

COMMENTS

Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094	0.188
<5µm Strucs.	5	18,000X	0.0094	0.047

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **2.98E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Ana Bocharovic
Analyst Signature
Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **325051**
Date: May-09-2014
Date Received: Mar-28-2014
Total Samples Analyzed: 4

SAMPLE DESCRIPTION

Client Sample # **WAPA-4e-1**
Laboratory Sample # 1428-00024-002

Surficial composite of rock outcrop, sample crushed

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 0.0 Mass Suspended (mg) 62.7 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 0 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	8	1	9
Wt.%	<0.0001%	0.068%	0.012%	0.080%
Struc/gr	<1.2E+08	9.4E+08	1.2E+08	1.1E+09

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	18	1	19
Wt.%	<0.0001%	1.859%	0.012%	1.871%
Struc/gr	NA	1.2E+09	1.2E+08	1.4E+09

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	10	NSD	10
Wt.%	<0.0001%	1.790%	<0.0019%	1.790%
Struc/gr	<2.9E+07	2.9E+08	<2.9E+07	2.9E+08

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	5	NSD	5
Wt.%	<0.0073%	1.780%	<0.0117%	1.780%
Struc/gr	<2.9E+7	5.9E+08	<2.9E+7	5.9E+08

COMMENTS

Actinolite & Hornblende Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094	0.188
<5µm Strucs.	5	18,000X	0.0094	0.047

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **2.94E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **324460**
Date: May-09-2014
Date Received: Feb-28-2014
Total Samples Analyzed: 11

SAMPLE DESCRIPTION

Client Sample # **R-75, 0-5'**
Laboratory Sample # 1428-00013-003

Auger cuttings, sample sieved (200 mesh)

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 2288.1 Mass Suspended (mg) 59.8 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 215.7 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	6	12	18
Wt.%	<0.0001%	0.022%	0.059%	0.082%
Struc/gr	<1.2E+08	7.4E+08	1.5E+09	2.2E+09

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	8	13	21
Wt.%	<0.0001%	0.119%	0.159%	0.278%
Struc/gr	NA	8.0E+08	1.5E+09	2.3E+09

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	2	1	3
Wt.%	<0.0001%	0.097%	0.100%	0.196%
Struc/gr	<3.1E+07	6.2E+07	3.1E+07	9.2E+07

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0077%	<0.0123%	<0.0123%	<0.0123%*
Struc/gr	<3.1E+7	<3.1E+7	<3.1E+7	<3.1E+7*

COMMENTS

Actinolite and Hornblende Fibers Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094	0.188
<5µm Strucs.	5	18,000X	0.0094	0.047

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.08E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Michael Conlon
Analyst Signature
Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	324697
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Mar-11-2014
		Total Samples Analyzed:	11

SAMPLE DESCRIPTION	
Client Sample #	R-75, 42.8-43.1'
Laboratory Sample #	1428-00016-003
Rock core, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	0.0	Mass Suspended (mg)	58.6
Split Mass (g)	0	Suspension Volume (ml)	500
Sieved Mass (g)	0	Volume Filtered (ml)	0.5
		Filter Type & Pore Size:	MCE 0.22µm
		Filter Area (mm ²):	385
		Effective Filter Area (mm ²):	346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	38	NSD	38
Wt.%	<0.0001%	0.571%	<0.0002%	0.571%
Struc/gr	<1.3E+08	4.8E+09	<1.3E+08	4.8E+09

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	50	1	51
Wt.%	<0.0001%	0.999%	0.030%	1.029%
Struc/gr	NA	5.2E+09	3.1E+07	5.2E+09

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	12	1	13
Wt.%	<0.0001%	0.428%	0.030%	0.458%
Struc/gr	<3.1E+07	3.8E+08	3.1E+07	4.1E+08

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	9	1	10
Wt.%	<0.0079%	0.420%	0.030%	0.450%
Struc/gr	<3.1E+7	1.1E+09	1.3E+08	1.3E+09

COMMENTS

Actinolite and Hornblende Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS					ANALYTICAL SENSITIVITY - MASS (pg)			
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	>=5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0094	0.188	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0094	0.047	Amph.	0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 3.14E+07								

NOTATION KEY

- NSD - No Structures Detected
- * - Analytical Sensitivity used
- E = to the power of 10
- Struc Cnt = Structure Count
- Wt.% = Weight percent
- Struc/gr = Structure per gram

Ana Bozhovic
Analyst Signature

Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **324697**
Date: May-09-2014
Date Received: Mar-11-2014
Total Samples Analyzed: 11

SAMPLE DESCRIPTION

Client Sample #

TSB-6

Laboratory Sample #

1428-00016-011

Surficial sample of rock outcrop, sample crushed

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 0.0 Mass Suspended (mg) 62.7 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 0 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES

	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	5	NSD	5
Wt.%	<0.0001%	0.087%	<0.0002%	0.087%
Struc/gr	<1.2E+08	5.9E+08	<1.2E+08	5.9E+08

TOTAL STRUCTURES

	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	8	NSD	8
Wt.%	<0.0001%	0.302%	<0.0002%	0.302%
Struc/gr	NA	6.8E+08	NA	6.8E+08

>=5µm STRUCTURES

	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	3	NSD	3
Wt.%	<0.0001%	0.214%	<0.0019%	0.214%
Struc/gr	<2.9E+07	8.8E+07	<2.9E+07	8.8E+07

TOTAL PCME

	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	3	NSD	3
Wt.%	<0.0073%	0.214%	<0.0117%	0.214%
Struc/gr	<2.9E+7	3.5E+08	<2.9E+7	3.5E+08

COMMENTS

Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094
<5µm Strucs.	5	18,000X	0.0094

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **2.94E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*

QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **324460**
Date: May-09-2014
Date Received: Feb-28-2014
Total Samples Analyzed: 11

SAMPLE DESCRIPTION

Client Sample # **R-76A, 0-5'**
Laboratory Sample # 1428-00013-004

Auger cuttings, sample sieved (200 mesh)

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 2400.7 Mass Suspended (mg) 62.5 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 296.24 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	2	2	4
Wt.%	<0.0001%	0.038%	0.059%	0.097%
Struc/gr	<1.2E+08	2.4E+08	2.4E+08	4.7E+08

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	3	5	8
Wt.%	<0.0001%	0.051%	0.381%	0.432%
Struc/gr	NA	2.7E+08	3.2E+08	5.9E+08

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	3	4
Wt.%	<0.0001%	0.013%	0.322%	0.335%
Struc/gr	<2.9E+07	2.9E+07	8.8E+07	1.2E+08

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	3	4
Wt.%	<0.0074%	0.013%	0.322%	0.335%
Struc/gr	<2.9E+7	1.2E+08	3.5E+08	4.7E+08

COMMENTS

Actinolite and Hornblende Fibers Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094	0.188
<5µm Strucs.	5	18,000X	0.0094	0.047

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **2.94E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Michael Conlon
Analyst Signature
Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **324697**
Date: May-09-2014
Date Received: Mar-11-2014
Total Samples Analyzed: 11

SAMPLE DESCRIPTION

Client Sample # **R-76a, 6.2-6.6'**
Laboratory Sample # 1428-00016-004

Rock core, sample crushed

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 0.0 Mass Suspended (mg) 61.6 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 0 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.007%	<0.0002%	0.007%
Struc/gr	<1.2E+08	1.2E+08	<1.2E+08	1.2E+08

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	10	NSD	10
Wt.%	<0.0001%	0.153%	<0.0002%	0.153%
Struc/gr	NA	3.9E+08	NA	3.9E+08

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	9	NSD	9
Wt.%	<0.0001%	0.146%	<0.0019%	0.146%
Struc/gr	<3.0E+07	2.7E+08	<3.0E+07	2.7E+08

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	7	NSD	7
Wt.%	<0.0075%	0.143%	<0.0120%	0.143%
Struc/gr	<3.0E+7	8.4E+08	<3.0E+7	8.4E+08

COMMENTS

Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094	0.188
<5µm Strucs.	5	18,000X	0.0094	0.047

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **2.99E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **324460**
Date: May-09-2014
Date Received: Feb-28-2014
Total Samples Analyzed: 11

SAMPLE DESCRIPTION

Client Sample # R-77, 0-5'
Laboratory Sample # 1428-00013-005

Auger cuttings, sample sieved (200 mesh)

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 2632.1 Mass Suspended (mg) 61.3 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 295.19 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	11	5	16
Wt.%	<0.0001%	0.016%	0.038%	0.054%
Struc/gr	<1.2E+08	1.3E+09	6.0E+08	1.9E+09

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	15	7	22
Wt.%	<0.0001%	0.160%	0.067%	0.227%
Struc/gr	NA	1.4E+09	6.6E+08	2.1E+09

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	4	2	6
Wt.%	<0.0001%	0.144%	0.029%	0.173%
Struc/gr	<3.0E+07	1.2E+08	6.0E+07	1.8E+08

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	2	1	3
Wt.%	<0.0075%	0.065%	0.028%	0.093%
Struc/gr	<3.0E+7	2.4E+08	1.2E+08	3.6E+08

COMMENTS

Actinolite and Hornblende Fibers Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094	0.188
<5µm Strucs.	5	18,000X	0.0094	0.047

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.00E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Michael Conlon
Analyst Signature
Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman	REPORT NO. 324697
Address: Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date: <u>May-09-2014</u> Date Received: <u>Mar-11-2014</u>
Job Site/ No. Boulder City Bypass 137120.12	Total Samples Analyzed: <u>11</u>

SAMPLE DESCRIPTION	
Client Sample # R-77, 19.8-20.3'	Rock core, sample crushed
Laboratory Sample # <u>1428-00016-005</u>	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g) <u>0.0</u>	Mass Suspended (mg) <u>60.8</u>	Filter Type & Pore Size: <u>MCE 0.22µm</u>	
Split Mass (g) <u>0</u>	Suspension Volume (ml) <u>500</u>	Filter Area (mm ²): <u>385</u>	
Sieved Mass (g) <u>0</u>	Volume Filtered (ml) <u>0.5</u>	Effective Filter Area (mm ²): <u>346</u>	

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	29	NSD	29
Wt.%	<0.0001%	0.117%	<0.0002%	0.117%
Struc/gr	<1.2E+08	3.5E+09	<1.2E+08	3.5E+09

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	45	NSD	45
Wt.%	<0.0001%	0.514%	<0.0002%	0.514%
Struc/gr	NA	4.0E+09	NA	4.0E+09

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	16	NSD	16
Wt.%	<0.0001%	0.396%	<0.0019%	0.396%
Struc/gr	<3.0E+07	4.8E+08	<3.0E+07	4.8E+08

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	9	NSD	9
Wt.%	<0.0076%	0.389%	<0.0121%	0.389%
Struc/gr	<3.0E+7	1.1E+09	<3.0E+7	1.1E+09

COMMENTS

Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
 Filter Loading: Moderate
 SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (pg)				
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
≥5µm Strucs.	20	10,000X	0.0094	0.188	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0094	0.047	Amph.	0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 3.03E+07								

NOTATION KEY

- NSD - No Structures Detected Struc Cnt = Structure Count
- * - Analytical Sensitivity used Wt.% = Weight percent
- E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature

 QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **325051**
Date: May-09-2014
Date Received: Mar-28-2014
Total Samples Analyzed: 4

SAMPLE DESCRIPTION

Client Sample # **WAPA-3e-4**
Laboratory Sample # 1428-00024-001

Surficial composite of rock outcrop, sample crushed

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 0.0 Mass Suspended (mg) 62.3 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 0 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<u><5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	9	1	10
Wt.%	<0.0001%	0.177%	0.018%	0.195%
Struc/gr	<1.2E+08	1.1E+09	1.2E+08	1.2E+09

<u>TOTAL STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	17	1	18
Wt.%	<0.0001%	0.280%	0.018%	0.298%
Struc/gr	NA	1.3E+09	1.2E+08	1.4E+09

<u>>=5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	8	NSD	8
Wt.%	<0.0001%	0.103%	<0.0019%	0.103%
Struc/gr	<3.0E+07	2.4E+08	<3.0E+07	2.4E+08

<u>TOTAL PCME</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	6	NSD	6
Wt.%	<0.0074%	0.098%	<0.0118%	0.098%
Struc/gr	<3.0E+7	7.1E+08	<3.0E+7	7.1E+08

COMMENTS

Actinolite & Hornblende Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094	0.188
<5µm Strucs.	5	18,000X	0.0094	0.047

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **2.95E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **325051**

Date: May-09-2014
Date Received: Mar-28-2014

Total Samples Analyzed: 4

SAMPLE DESCRIPTION

Client Sample # **WAPA-4/3a**
Laboratory Sample # 1428-00024-004

Surficial composite of rock outcrop, sample crushed

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 0.0 Mass Suspended (mg) 59.9 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 0 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	5	4	9
Wt.%	<0.0001%	0.016%	0.073%	0.088%
Struc/gr	<1.2E+08	6.1E+08	4.9E+08	1.1E+09

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	12	5	17
Wt.%	<0.0001%	0.149%	0.076%	0.225%
Struc/gr	NA	8.3E+08	5.2E+08	1.4E+09

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	7	1	8
Wt.%	<0.0001%	0.133%	0.003%	0.137%
Struc/gr	<3.1E+07	2.2E+08	3.1E+07	2.5E+08

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	6	NSD	6
Wt.%	<0.0077%	0.128%	<0.0123%	0.128%
Struc/gr	<3.1E+7	7.4E+08	<3.1E+7	7.4E+08

COMMENTS

Actinolite & Hornblende Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094
<5µm Strucs.	5	18,000X	0.0094

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.07E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **325051**
Date: May-09-2014
Date Received: Mar-28-2014
Total Samples Analyzed: 4

SAMPLE DESCRIPTION

Client Sample # **WAPA-4/4**
Laboratory Sample # **1428-00024-003**

Surficial composite of rock outcrop, sample crushed

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 0.0 Mass Suspended (mg) 61.8 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 0 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	8	NSD	8
Wt.%	<0.0001%	0.053%	<0.0002%	0.053%
Struc/gr	<1.2E+08	9.5E+08	<1.2E+08	9.5E+08

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	8	1	9
Wt.%	<0.0001%	0.053%	0.031%	0.084%
Struc/gr	NA	9.5E+08	3.0E+07	9.8E+08

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	1	1
Wt.%	<0.0001%	<0.0019%	0.031%	0.031%
Struc/gr	<3.0E+07	<3.0E+07	3.0E+07	3.0E+07

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	1	1
Wt.%	<0.0075%	<0.0119%	0.031%	0.031%
Struc/gr	<3.0E+7	<3.0E+7	1.2E+08	1.2E+08

COMMENTS

Actinolite & Hornblende Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094
<5µm Strucs.	5	18,000X	0.0094

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **2.98E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman	REPORT NO. 324460
Address: Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date: <u>May-09-2014</u> Date Received: <u>Feb-28-2014</u>
Job Site/ No. Boulder City Bypass 137120.12	Total Samples Analyzed: <u>11</u>

SAMPLE DESCRIPTION

Client Sample #	R-78, 0-5'	Auger cuttings, sample sieved (200 mesh)
Laboratory Sample #	1428-00013-006	

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g)	<u>2436.7</u>	Mass Suspended (mg)	<u>58.7</u>	Filter Type & Pore Size:	<u>MCE 0.22µm</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>	Filter Area (mm ²):	<u>385</u>
Sieved Mass (g)	<u>260.74</u>	Volume Filtered (ml)	<u>0.5</u>	Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<u><5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	10	NSD	10
Wt.%	<0.0001%	0.071%	<0.0002%	0.071%
Struc/gr	<1.3E+08	1.3E+09	<1.3E+08	1.3E+09

<u>TOTAL STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	16	NSD	16
Wt.%	<0.0001%	0.164%	<0.0002%	0.164%
Struc/gr	NA	1.4E+09	NA	1.4E+09

<u>>=5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	6	NSD	6
Wt.%	<0.0001%	0.093%	<0.0020%	0.093%
Struc/gr	<3.1E+07	1.9E+08	<3.1E+07	1.9E+08

<u>TOTAL PCME</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	4	NSD	4
Wt.%	<0.0078%	0.086%	<0.0125%	0.086%
Struc/gr	<3.1E+7	5.0E+08	<3.1E+7	5.0E+08

COMMENTS

Actinolite Fibers Detected	Final Sieve Type: -200 (75µm) Tyler Mesh Filter Loading: Moderate SAED Photo Nos.
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TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094	0.188
<5µm Strucs.	5	18,000X	0.0094	0.047

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.14E+07**

NOTATION KEY

NSD - No Structures Detected	Struc Cnt = Structure Count
* - Analytical Sensitivity used	Wt.% = Weight percent
E = to the power of 10	Struc/gr = Structure per gram

Analyst Signature

QC Reviewer Signature

www.asbestostemplabs.com

California Headquarters	630 Bancroft Way Berkeley, CA 94710	P: (510) 704-8930 F: (510) 704-8429
Nevada Branch Lab	1350 Freeport Blvd., Unit 104 Sparks, NV 89431	P: (775) 359-3377 F: (775) 359-2798



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	324460
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Feb-28-2014
		Total Samples Analyzed:	11

SAMPLE DESCRIPTION	
Client Sample #	ITB-1, 0-5'
Laboratory Sample #	1428-00013-007
Auger cuttings, sample sieved (200 mesh)	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	2428.3	Mass Suspended (mg)	57.6
Split Mass (g)	0	Suspension Volume (ml)	500
Sieved Mass (g)	257.31	Volume Filtered (ml)	0.5
		Filter Type & Pore Size:	MCE 0.22µm
		Filter Area (mm ²):	385
		Effective Filter Area (mm ²):	346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	14	NSD	14
Wt.%	<0.0001%	0.249%	<0.0002%	0.249%
Struc/gr	<1.3E+08	1.8E+09	<1.3E+08	1.8E+09

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	21	NSD	21
Wt.%	<0.0001%	0.557%	<0.0002%	0.557%
Struc/gr	NA	2.0E+09	NA	2.0E+09

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	7	NSD	7
Wt.%	<0.0001%	0.308%	<0.0020%	0.308%
Struc/gr	<3.2E+07	2.2E+08	<3.2E+07	2.2E+08

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	4	NSD	4
Wt.%	<0.0080%	0.055%	<0.0128%	0.055%
Struc/gr	<3.2E+7	5.1E+08	<3.2E+7	5.1E+08

COMMENTS	
Actinolite Fibers Detected	Final Sieve Type: -200 (75µm) Tyler Mesh Filter Loading: Moderate SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (pg)				
<u>Grid Openings Scanned</u>	<u>Mag</u>	<u>Grid Op Area (mm²)</u>	<u>Scan Area(mm²)</u>		<u><5µm</u>	<u>>=5µm</u>	<u>PCME</u>	
>=5µm Strucs.	20	10,000X	0.0094	0.188	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0094	0.047	Amph.	0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 3.20E+07								

NOTATION KEY

NSD - No Structures Detected	Struc Cnt = Structure Count
* - Analytical Sensitivity used	Wt.% = Weight percent
E = to the power of 10	Struc/gr = Structure per gram

Analyst Signature: *He Meisheng*

QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	323095
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	<u>Jun-17-2014</u>
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	<u>Jan-03-2014</u>
		Total Samples Analyzed:	<u>10</u>

SAMPLE DESCRIPTION

Client Sample #	R-79, 0-5'	Auger Cuttings, sample sieved (200 mesh)
Laboratory Sample #	1428-00001-009	

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g)	<u>2616.1</u>	Mass Suspended (mg)	<u>58.8</u>	Filter Type & Pore Size:	<u>MCE 0.22µm</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>	Filter Area (mm ²):	<u>385</u>
Sieved Mass (g)	<u>123.6</u>	Volume Filtered (ml)	<u>0.5</u>	Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<u><10µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	8	NSD	8
Wt.%	<0.0001%	0.190%	<0.0002%	0.190%
Struc/gr	<1.3E+08	1.1E+09	<1.3E+08	1.1E+09

<u>TOTAL STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	9	NSD	9
Wt.%	<0.0001%	0.615%	<0.0002%	0.615%
Struc/gr	NA	1.1E+09	NA	1.1E+09

<u>>=10µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.425%	<0.0021%	0.425%
Struc/gr	<3.3E+07	3.3E+07	<3.3E+07	3.3E+07

<u>TOTAL PCME</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NA	NA	NA	NA
Wt.%	NA	NA	NA	NA
Struc/gr	NA	NA	NA	NA

COMMENTS

Small Actinolite (<10µm) & Large Actinolite (>=10µm) Asbestos Detected	Final Sieve Type: -200 (710µm) Tyler Mesh
	Filter Loading: Moderate
	SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=10µm Strucs.	20	10,000X	0.0088
<10µm Strucs.	5	18,000X	0.0088

ANALYTICAL SENSITIVITY - MASS (pg)

	<10µm	>=10µm	PCME
Chrys.	0.0004	0.004	NA
Amph.	0.0160	0.160	NA

PCME ANALYTICAL SENSITIVITY - STRUC/GR = NA

NOTATION KEY

NSD - No Structures Detected	Struc Cnt = Structure Count
* - Analytical Sensitivity used	Wt.% = Weight percent
E = to the power of 10	Struc/gr = Structure per gram

Analyst Signature: *Hu Meisheng*

QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **324697**
Date: May-09-2014
Date Received: Mar-11-2014
Total Samples Analyzed: 11

SAMPLE DESCRIPTION

Client Sample # **R-79, 8.6-9.0'**
Laboratory Sample # 1428-00016-006

Rock core, sample crushed

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 0.0 Mass Suspended (mg) 58.1 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 0 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<u><5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	39	NSD	39
Wt.%	<0.0001%	0.483%	<0.0002%	0.483%
Struc/gr	<1.3E+08	4.9E+09	<1.3E+08	4.9E+09

<u>TOTAL STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	48	NSD	48
Wt.%	<0.0001%	2.295%	<0.0002%	2.295%
Struc/gr	NA	5.2E+09	NA	5.2E+09

<u>>=5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	9	NSD	9
Wt.%	<0.0001%	1.813%	<0.0020%	1.813%
Struc/gr	<3.2E+07	2.9E+08	<3.2E+07	2.9E+08

<u>TOTAL PCME</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	5	NSD	5
Wt.%	<0.0079%	1.805%	<0.0127%	1.805%
Struc/gr	<3.2E+7	6.3E+08	<3.2E+7	6.3E+08

COMMENTS

Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094	0.188
<5µm Strucs.	5	18,000X	0.0094	0.047

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.17E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	324460
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Feb-28-2014
		Total Samples Analyzed:	11

SAMPLE DESCRIPTION

Client Sample #	ITB-4, 0-5'	Auger cuttings, sample sieved (200 mesh)
Laboratory Sample #	1428-00013-008	

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g)	2503.3	Mass Suspended (mg)	58.7	Filter Type & Pore Size:	MCE 0.22µm
Split Mass (g)	0	Suspension Volume (ml)	500	Filter Area (mm ²):	385
Sieved Mass (g)	115.97	Volume Filtered (ml)	0.5	Effective Filter Area (mm ²):	346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	6	NSD	6
Wt.%	<0.0001%	0.042%	<0.0002%	0.042%
Struc/gr	<1.3E+08	7.5E+08	<1.3E+08	7.5E+08

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	8	NSD	8
Wt.%	<0.0001%	0.049%	<0.0002%	0.049%
Struc/gr	NA	8.2E+08	NA	8.2E+08

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	2	NSD	2
Wt.%	<0.0001%	0.007%	<0.0020%	0.007%
Struc/gr	<3.1E+07	6.3E+07	<3.1E+07	6.3E+07

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0078%	<0.0125%	<0.0125%	<0.0125%*
Struc/gr	<3.1E+7	<3.1E+7	<3.1E+7	<3.1E+7*

COMMENTS

Actinolite Fibers Detected	Final Sieve Type: -200 (75µm) Tyler Mesh
	Filter Loading: Moderate
	SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094	0.188
<5µm Strucs.	5	18,000X	0.0094	0.047

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = 3.14E+07

NOTATION KEY

NSD - No Structures Detected	Struc Cnt = Structure Count
* - Analytical Sensitivity used	Wt.% = Weight percent
E = to the power of 10	Struc/gr = Structure per gram

Analyst Signature: *He Meisheng*

QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **324460**
Date: May-09-2014
Date Received: Feb-28-2014
Total Samples Analyzed: 11

SAMPLE DESCRIPTION

Client Sample # **R-80, 0-5'**
Laboratory Sample # 1428-00013-009

Auger cuttings, sample sieved (200 mesh)

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 2662.5 Mass Suspended (mg) 58.6 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 300.55 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	7	NSD	7
Wt.%	<0.0001%	0.160%	<0.0002%	0.160%
Struc/gr	<1.3E+08	8.8E+08	<1.3E+08	8.8E+08

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	11	NSD	11
Wt.%	<0.0001%	0.243%	<0.0002%	0.243%
Struc/gr	NA	1.0E+09	NA	1.0E+09

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	4	NSD	4
Wt.%	<0.0001%	0.084%	<0.0020%	0.084%
Struc/gr	<3.1E+07	1.3E+08	<3.1E+07	1.3E+08

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	3	NSD	3
Wt.%	<0.0079%	0.082%	<0.0126%	0.082%
Struc/gr	<3.1E+7	3.8E+08	<3.1E+7	3.8E+08

COMMENTS

Actinolite Fibers Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094	0.188
<5µm Strucs.	5	18,000X	0.0094	0.047

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.14E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	324697
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Mar-11-2014
		Total Samples Analyzed:	11

SAMPLE DESCRIPTION	
Client Sample #	R-80, 36.1-36.5'
Laboratory Sample #	1428-00016-007
	Rock core, sample crushed

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	0.0	Mass Suspended (mg)	59.2
Split Mass (g)	0	Suspension Volume (ml)	500
Sieved Mass (g)	0	Volume Filtered (ml)	0.5
		Filter Type & Pore Size:	MCE 0.22µm
		Filter Area (mm ²):	385
		Effective Filter Area (mm ²):	346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	11	NSD	11
Wt.%	<0.0001%	0.196%	<0.0002%	0.196%
Struc/gr	<1.2E+08	1.4E+09	<1.2E+08	1.4E+09

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	19	NSD	19
Wt.%	<0.0001%	1.873%	<0.0002%	1.873%
Struc/gr	NA	1.6E+09	NA	1.6E+09

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	8	NSD	8
Wt.%	<0.0001%	1.676%	<0.0020%	1.676%
Struc/gr	<3.1E+07	2.5E+08	<3.1E+07	2.5E+08

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	5	NSD	5
Wt.%	<0.0078%	1.670%	<0.0124%	1.670%
Struc/gr	<3.1E+7	6.2E+08	<3.1E+7	6.2E+08

COMMENTS

Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (µg)				
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
≥5µm Strucs.	20	10,000X	0.0094	0.188	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0094	0.047	Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = 3.11E+07

NOTATION KEY

- NSD - No Structures Detected
- * - Analytical Sensitivity used
- E = to the power of 10
- Struc Cnt = Structure Count
- Wt.% = Weight percent
- Struc/gr = Structure per gram

Analyst Signature *He Meisheng*

QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **324697**
Date: May-09-2014
Date Received: Mar-11-2014
Total Samples Analyzed: 11

SAMPLE DESCRIPTION

Client Sample # **TSB-5**
Laboratory Sample # 1428-00016-010

Surficial sample of rock outcrop, sample crushed

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 0.0 Mass Suspended (mg) 58.3 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 0 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<u><5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	31	NSD	31
Wt.%	<0.0001%	0.143%	<0.0002%	0.143%
Struc/gr	<1.3E+08	3.9E+09	<1.3E+08	3.9E+09

<u>TOTAL STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	33	NSD	33
Wt.%	<0.0001%	0.147%	<0.0002%	0.147%
Struc/gr	NA	4.0E+09	NA	4.0E+09

<u>>=5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	2	NSD	2
Wt.%	<0.0001%	0.004%	<0.0020%	0.004%
Struc/gr	<3.2E+07	6.3E+07	<3.2E+07	6.3E+07

<u>TOTAL PCME</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0079%	<0.0126%	<0.0126%	<0.0126%*
Struc/gr	<3.2E+7	<3.2E+7	<3.2E+7	<3.2E+7*

COMMENTS

Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094	0.188
<5µm Strucs.	5	18,000X	0.0094	0.047

ANALYTICAL SENSITIVITY - MASS (µg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.16E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	324460
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Feb-28-2014
		Total Samples Analyzed:	11

SAMPLE DESCRIPTION

Client Sample #	R-81, 0-5'	Auger cuttings, sample sieved (200 mesh)
Laboratory Sample #	1428-00013-010	

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g)	2086.1	Mass Suspended (mg)	60.1	Filter Type & Pore Size:	MCE 0.22µm
Split Mass (g)	0	Suspension Volume (ml)	500	Filter Area (mm ²):	385
Sieved Mass (g)	237.01	Volume Filtered (ml)	0.5	Effective Filter Area (mm ²):	346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	12	NSD	12
Wt.%	<0.0001%	0.087%	<0.0002%	0.087%
Struc/gr	<1.2E+08	1.5E+09	<1.2E+08	1.5E+09

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	15	NSD	15
Wt.%	<0.0001%	0.238%	<0.0002%	0.238%
Struc/gr	NA	1.6E+09	NA	1.6E+09

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	3	NSD	3
Wt.%	<0.0001%	0.150%	<0.0020%	0.150%
Struc/gr	<3.1E+07	9.2E+07	<3.1E+07	9.2E+07

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	3	NSD	3
Wt.%	<0.0077%	0.150%	<0.0122%	0.150%
Struc/gr	<3.1E+7	3.7E+08	<3.1E+7	3.7E+08

COMMENTS

Actinolite Fibers Detected	Final Sieve Type: -200 (75µm) Tyler Mesh
	Filter Loading: Moderate
	SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094	0.188
<5µm Strucs.	5	18,000X	0.0094	0.047

ANALYTICAL SENSITIVITY - MASS (µg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = 3.06E+07

NOTATION KEY

NSD - No Structures Detected	Struc Cnt = Structure Count
* - Analytical Sensitivity used	Wt.% = Weight percent
E = to the power of 10	Struc/gr = Structure per gram

Analyst Signature: *He Meisheng*

QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **325164**
Date: May-08-2014
Date Received: Apr-04-2014
Total Samples Analyzed: 7

SAMPLE DESCRIPTION

Client Sample # **R-81, 10.0-31.0'**
Laboratory Sample # **1428-00037-006**

Rock core composite, sample crushed

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 0.0 Mass Suspended (mg) 61.5 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 0 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	16	3	19
Wt.%	<0.0001%	0.281%	0.025%	0.305%
Struc/gr	<1.1E+08	1.8E+09	3.4E+08	2.2E+09

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	23	3	26
Wt.%	<0.0001%	0.828%	0.025%	0.853%
Struc/gr	NA	2.0E+09	3.4E+08	2.4E+09

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	7	NSD	7
Wt.%	<0.0001%	0.547%	<0.0018%	0.547%
Struc/gr	<2.9E+07	2.0E+08	<2.9E+07	2.0E+08

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	7	NSD	7
Wt.%	<0.007%	0.547%	<0.011%	0.547%
Struc/gr	<2.9E+7	8.0E+08	<2.9E+7	8.0E+08

COMMENTS

Actinolite & Hornblende Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Light
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0098	0.196
<5µm Strucs.	5	18,000X	0.0098	0.049

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **2.87E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *Jonathan Lehman*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	324697
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Mar-11-2014
		Total Samples Analyzed:	11

SAMPLE DESCRIPTION	
Client Sample #	R-81, 16.8-17.4'
Laboratory Sample #	1428-00016-008
Rock core, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	0.0	Mass Suspended (mg)	60.9
Split Mass (g)	0	Suspension Volume (ml)	500
Sieved Mass (g)	0	Volume Filtered (ml)	0.5
		Filter Type & Pore Size:	MCE 0.22µm
		Filter Area (mm ²):	385
		Effective Filter Area (mm ²):	346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.003%	<0.0002%	0.003%
Struc/gr	<1.2E+08	1.2E+08	<1.2E+08	1.2E+08

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	9	NSD	9
Wt.%	<0.0001%	0.082%	<0.0002%	0.082%
Struc/gr	NA	3.6E+08	NA	3.6E+08

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	8	NSD	8
Wt.%	<0.0001%	0.079%	<0.0019%	0.079%
Struc/gr	<3.0E+07	2.4E+08	<3.0E+07	2.4E+08

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	4	NSD	4
Wt.%	<0.0076%	0.070%	<0.0121%	0.070%
Struc/gr	<3.0E+7	4.8E+08	<3.0E+7	4.8E+08

COMMENTS	
Actinolite Asbestos Detected	Final Sieve Type: -200 (75µm) Tyler Mesh Filter Loading: Moderate SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (pg)			
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)	<5µm	≥5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0094	0.188	Chrys. 0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0094	0.047	Amph. 0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 3.02E+07							

NOTATION KEY

NSD - No Structures Detected	Struc Cnt = Structure Count
* - Analytical Sensitivity used	Wt.% = Weight percent
E = to the power of 10	Struc/gr = Structure per gram

Analyst Signature: *He Meisheng*

QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	324460
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Feb-28-2014
		Total Samples Analyzed:	11

SAMPLE DESCRIPTION	
Client Sample #	R-82, 0-5'
Laboratory Sample #	1428-00013-011
Auger cuttings, sample sieved (200 mesh)	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	2401.5	Mass Suspended (mg)	62.1
Split Mass (g)	0	Suspension Volume (ml)	500
Sieved Mass (g)	157.66	Volume Filtered (ml)	0.5
		Filter Type & Pore Size:	MCE 0.22µm
		Filter Area (mm ²):	385
		Effective Filter Area (mm ²):	346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	6	NSD	6
Wt.%	<0.0001%	0.106%	<0.0002%	0.106%
Struc/gr	<1.2E+08	7.1E+08	<1.2E+08	7.1E+08

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	9	NSD	9
Wt.%	<0.0001%	0.391%	<0.0002%	0.391%
Struc/gr	NA	8.0E+08	NA	8.0E+08

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	3	NSD	3
Wt.%	<0.0001%	0.285%	<0.0019%	0.285%
Struc/gr	<3.0E+07	8.9E+07	<3.0E+07	8.9E+07

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	3	NSD	3
Wt.%	<0.0074%	0.285%	<0.0119%	0.285%
Struc/gr	<3.0E+7	3.6E+08	<3.0E+7	3.6E+08

COMMENTS

Actinolite Fibers Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (pg)				
<u>Grid Openings Scanned</u>	<u>Mag</u>	<u>Grid Op Area (mm²)</u>	<u>Scan Area(mm²)</u>		<u><5µm</u>	<u>≥5µm</u>	<u>PCME</u>	
≥5µm Strucs.	20	10,000X	0.0094	0.188	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0094	0.047	Amph.	0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 2.96E+07								

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature: *He Meisheng*
QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	325098
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Apr-01-2014
		Total Samples Analyzed:	<u>6</u>

SAMPLE DESCRIPTION	
Client Sample #	R-82, 5.5-44'
Laboratory Sample #	1428-00030-001
Rock core composite, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>0.0</u>	Mass Suspended (mg)	<u>58.9</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>0</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22µm</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	11	NSD	11
Wt.%	<0.0001%	0.087%	<0.0002%	0.087%
Struc/gr	<1.2E+08	1.4E+09	<1.2E+08	1.4E+09

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	19	NSD	19
Wt.%	<0.0001%	0.300%	<0.0002%	0.300%
Struc/gr	NA	1.6E+09	NA	1.6E+09

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	8	NSD	8
Wt.%	<0.0001%	0.214%	<0.0020%	0.214%
Struc/gr	<3.1E+07	2.5E+08	<3.1E+07	2.5E+08

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	5	NSD	5
Wt.%	<0.0078%	0.201%	<0.0125%	0.201%
Struc/gr	<3.1E+7	6.2E+08	<3.1E+7	6.2E+08

COMMENTS

Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (pg)			
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)	<5µm	≥5µm	PCME	
≥5µm Strucs.	20	10,000X	0.0094	0.188	Chrys. 0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0094	0.047	Amph. 0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 3.12E+07							

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature: *He Meisheng*
QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **324697**

Date: May-09-2014
Date Received: Mar-11-2014

Total Samples Analyzed: 11

SAMPLE DESCRIPTION

Client Sample # **R-82, 42.3-42.8'**
Laboratory Sample # 1428-00016-009

Rock core, sample crushed

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 0.0 Mass Suspended (mg) 61.3 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 0 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	9	NSD	9
Wt.%	<0.0001%	0.105%	<0.0002%	0.105%
Struc/gr	<1.2E+08	1.1E+09	<1.2E+08	1.1E+09

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	9	NSD	9
Wt.%	<0.0001%	0.105%	<0.0002%	0.105%
Struc/gr	NA	1.1E+09	NA	1.1E+09

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<3.0E+07	<3.0E+07	<3.0E+07	<3.0E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0075%	<0.0120%	<0.0120%	<0.0120%*
Struc/gr	<3.0E+7	<3.0E+7	<3.0E+7	<3.0E+7*

COMMENTS

Small Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094	0.188
<5µm Strucs.	5	18,000X	0.0094	0.047

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.00E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	324656
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Mar-10-2014
		Total Samples Analyzed:	12

SAMPLE DESCRIPTION

Client Sample #	TSB-4	Surficial sample of rock outcrop, sample crushed
Laboratory Sample #	1428-00014-012	

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g)	0.0	Mass Suspended (mg)	61.2	Filter Type & Pore Size:	MCE 0.22µm
Split Mass (g)	0	Suspension Volume (ml)	500	Filter Area (mm ²):	385
Sieved Mass (g)	0	Volume Filtered (ml)	0.5	Effective Filter Area (mm ²):	346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<3.0E+07	<3.0E+07	<3.0E+07	<3.0E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0075%	<0.0120%	<0.0120%	<0.0120%*
Struc/gr	<3.0E+7	<3.0E+7	<3.0E+7	<3.0E+7*

COMMENTS

No Asbestos Detected	Final Sieve Type: -200 (75µm) Tyler Mesh
	Filter Loading: Moderate
	SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094	0.188
<5µm Strucs.	5	18,000X	0.0094	0.047

ANALYTICAL SENSITIVITY - MASS (µg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.01E+07**

NOTATION KEY

NSD - No Structures Detected	Struc Cnt = Structure Count
* - Analytical Sensitivity used	Wt.% = Weight percent
E = to the power of 10	Struc/gr = Structure per gram

Analyst Signature: *He Meisheng*

QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	325164
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-08-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Apr-04-2014
		Total Samples Analyzed:	<u>7</u>

SAMPLE DESCRIPTION	
Client Sample #	R-83A, 0-10.6'
Laboratory Sample #	1428-00037-007
Rock core composite, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>0.0</u>	Mass Suspended (mg)	<u>59.4</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>0</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22µm</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.000%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.000%	<0.0002%	<0.000%*
Struc/gr	NA	NA	NA	NA

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.002%*
Struc/gr	<3.0E+07	<3.0E+07	<3.0E+07	<3.0E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.007%	<0.012%	<0.012%	<0.012%*
Struc/gr	<3.0E+7	<3.0E+7	<3.0E+7	<3.0E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Light
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (pg)				
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0098	0.196	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0098	0.049	Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **2.97E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *Jonathan Lehman*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman	REPORT NO. 325153
Address: Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date: <u>May-09-2014</u> Date Received: <u>Apr-03-2014</u>
Job Site/ No. Boulder City Bypass 137120.12	Total Samples Analyzed: <u>7</u>

SAMPLE DESCRIPTION	
Client Sample # R-83A, 10.6-21.7'	Rock core composite, sample crushed
Laboratory Sample # <u>1428-00035-007</u>	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g) <u>0.0</u>	Mass Suspended (mg) <u>59.1</u>	Filter Type & Pore Size: <u>MCE 0.22µm</u>	
Split Mass (g) <u>0</u>	Suspension Volume (ml) <u>500</u>	Filter Area (mm ²): <u>385</u>	
Sieved Mass (g) <u>0</u>	Volume Filtered (ml) <u>0.5</u>	Effective Filter Area (mm ²): <u>346</u>	

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<3.0E+07	<3.0E+07	<3.0E+07	<3.0E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0075%	<0.0119%	<0.0119%	<0.0119%*
Struc/gr	<3.0E+7	<3.0E+7	<3.0E+7	<3.0E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
 Filter Loading: Moderate
 SAED Photo Nos.

TEM ANALYTICAL PARAMETERS					ANALYTICAL SENSITIVITY - MASS (pg)			
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0098	0.196	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0098	0.049	Amph.	0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 2.99E+07								

NOTATION KEY

- NSD - No Structures Detected
- * - Analytical Sensitivity used
- E = to the power of 10
- Struc Cnt = Structure Count
- Wt.% = Weight percent
- Struc/gr = Structure per gram

Analyst Signature

 QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	325200
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Apr-07-2014
		Total Samples Analyzed:	<u>9</u>

SAMPLE DESCRIPTION

Client Sample #	R-83A, 21.7-45.0'	Rock core composite, sample crushed
Laboratory Sample #	1428-00040-001	

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g)	<u>0.0</u>	Mass Suspended (mg)	<u>58.5</u>	Filter Type & Pore Size:	<u>MCE 0.22µm</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>	Filter Area (mm ²):	<u>385</u>
Sieved Mass (g)	<u>0</u>	Volume Filtered (ml)	<u>0.5</u>	Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<3.0E+07	<3.0E+07	<3.0E+07	<3.0E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0076%	<0.0121%	<0.0121%	<0.0121%*
Struc/gr	<3.0E+7	<3.0E+7	<3.0E+7	<3.0E+7*

COMMENTS

No Asbestos Detected	Final Sieve Type: -200 (75µm) Tyler Mesh
	Filter Loading: Moderate
	SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0098	0.196
<5µm Strucs.	5	18,000X	0.0098	0.049

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.02E+07**

NOTATION KEY

NSD - No Structures Detected	Struc Cnt = Structure Count
* - Analytical Sensitivity used	Wt.% = Weight percent
E = to the power of 10	Struc/gr = Structure per gram

Analyst Signature *He Meisheng*

QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman	REPORT NO. 325098
Address: Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date: <u>May-09-2014</u> Date Received: <u>Apr-01-2014</u>
Job Site/ No. Boulder City Bypass 137120.12	Total Samples Analyzed: <u>6</u>

SAMPLE DESCRIPTION	
Client Sample # R-83a, 45-59'	Rock core composite, sample crushed
Laboratory Sample # <u>1428-00030-002</u>	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>0.0</u>	Mass Suspended (mg)	<u>59.1</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>0</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22µm</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0020%	<0.0020%	<0.0020%*
Struc/gr	<3.1E+07	<3.1E+07	<3.1E+07	<3.1E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0078%	<0.0125%	<0.0125%	<0.0125%*
Struc/gr	<3.1E+7	<3.1E+7	<3.1E+7	<3.1E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
 Filter Loading: Moderate
 SAED Photo Nos.

TEM ANALYTICAL PARAMETERS					ANALYTICAL SENSITIVITY - MASS (µg)			
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0094	0.188	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0094	0.047	Amph.	0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 3.11E+07								

NOTATION KEY

- NSD - No Structures Detected
- * - Analytical Sensitivity used
- E = to the power of 10
- Struc Cnt = Structure Count
- Wt.% = Weight percent
- Struc/gr = Structure per gram

Analyst Signature

 QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	324656
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Mar-10-2014
		Total Samples Analyzed:	12

SAMPLE DESCRIPTION	
Client Sample #	R-83a, 54.5-55.0'
Laboratory Sample #	1428-00014-001
Rock core, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	0.0	Mass Suspended (mg)	58.1
Split Mass (g)	0	Suspension Volume (ml)	500
Sieved Mass (g)	0	Volume Filtered (ml)	0.5
		Filter Type & Pore Size:	MCE 0.22µm
		Filter Area (mm ²):	385
		Effective Filter Area (mm ²):	346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.3E+08	<1.3E+08	<1.3E+08	<1.3E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0020%	<0.0020%	<0.0020%*
Struc/gr	<3.2E+07	<3.2E+07	<3.2E+07	<3.2E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0079%	<0.0127%	<0.0127%	<0.0127%*
Struc/gr	<3.2E+7	<3.2E+7	<3.2E+7	<3.2E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS					ANALYTICAL SENSITIVITY - MASS (µg)			
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	>=5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0094	0.188	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0094	0.047	Amph.	0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 3.17E+07								

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature: *He Meisheng*
QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	325405
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Apr-17-2014
		Total Samples Analyzed:	<u>5</u>

SAMPLE DESCRIPTION	
Client Sample #	P-1, 0.0-36.6'
Laboratory Sample #	1428-00057-001
Rock core composite, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>0.0</u>	Mass Suspended (mg)	<u>61.1</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>0</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22um</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL									
<5µm STRUCTURES					TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total		Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1	Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.004%	<0.0002%	0.004%	Wt.%	<0.0001%	0.004%	<0.0002%	0.004%
Struc/gr	<1.2E+08	1.2E+08	<1.2E+08	1.2E+08	Struc/gr	NA	1.2E+08	NA	1.2E+08
≥5µm STRUCTURES					TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total		Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD	Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0018%	<0.0018%	<0.0018%*	Wt.%	<0.0072%	<0.0116%	<0.0116%	<0.0116%*
Struc/gr	<2.9E+07	<2.9E+07	<2.9E+07	<2.9E+07*	Struc/gr	<2.9E+7	<2.9E+7	<2.9E+7	<2.9E+7*

COMMENTS	
Small Actinolite Asbestos Detected	Final Sieve Type: -200 (75µm) Tyler Mesh Filter Loading: Light SAED Photo Nos.

TEM ANALYTICAL PARAMETERS					ANALYTICAL SENSITIVITY - MASS (pg)			
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0098	0.196	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0098	0.049	Amph.	0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 2.89E+07								

NOTATION KEY

NSD - No Structures Detected	Struc Cnt = Structure Count
* - Analytical Sensitivity used	Wt.% = Weight percent
E = to the power of 10	Struc/gr = Structure per gram

Ana Bozhanovic
Analyst Signature

Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	325405
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Apr-17-2014
		Total Samples Analyzed:	<u>5</u>

SAMPLE DESCRIPTION	
Client Sample #	P-1, 36.6-65.5'
Laboratory Sample #	1428-00057-002
Rock core composite, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>0.0</u>	Mass Suspended (mg)	<u>62.8</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>0</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22um</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.1E+08	<1.1E+08	<1.1E+08	<1.1E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0018%	<0.0018%	<0.0018%*
Struc/gr	<2.8E+07	<2.8E+07	<2.8E+07	<2.8E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0070%	<0.0112%	<0.0112%	<0.0112%*
Struc/gr	<2.8E+7	<2.8E+7	<2.8E+7	<2.8E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Light
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS					ANALYTICAL SENSITIVITY - MASS (pg)			
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0098	0.196	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0098	0.049	Amph.	0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 2.81E+07								

NOTATION KEY

- NSD - No Structures Detected
- * - Analytical Sensitivity used
- E = to the power of 10
- Struc Cnt = Structure Count
- Wt.% = Weight percent
- Struc/gr = Structure per gram

Ana Bozhanovic
Analyst Signature

Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	325200
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Apr-07-2014
		Total Samples Analyzed:	<u>9</u>

SAMPLE DESCRIPTION	
Client Sample #	R-84, 0.0-12.8'
Laboratory Sample #	1428-00040-002
Rock core composite, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>0.0</u>	Mass Suspended (mg)	<u>58.3</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>0</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22µm</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<3.0E+07	<3.0E+07	<3.0E+07	<3.0E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0076%	<0.0121%	<0.0121%	<0.0121%*
Struc/gr	<3.0E+7	<3.0E+7	<3.0E+7	<3.0E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS					ANALYTICAL SENSITIVITY - MASS (pg)			
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
≥5µm Strucs.	20	10,000X	0.0098	0.196	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0098	0.049	Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.03E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature: *He Meisheng*
QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	324656
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Mar-10-2014
		Total Samples Analyzed:	12

SAMPLE DESCRIPTION	
Client Sample #	R-84, 9.4-10.0'
Laboratory Sample #	1428-00014-002
Rock core, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	0.0	Mass Suspended (mg)	58.7
Split Mass (g)	0	Suspension Volume (ml)	500
Sieved Mass (g)	0	Volume Filtered (ml)	0.5
		Filter Type & Pore Size:	MCE 0.22µm
		Filter Area (mm ²):	385
		Effective Filter Area (mm ²):	346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.3E+08	<1.3E+08	<1.3E+08	<1.3E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0020%	<0.0020%	<0.0020%*
Struc/gr	<3.1E+07	<3.1E+07	<3.1E+07	<3.1E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0078%	<0.0125%	<0.0125%	<0.0125%*
Struc/gr	<3.1E+7	<3.1E+7	<3.1E+7	<3.1E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (pg)				
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0094	0.188	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0094	0.047	Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = 3.14E+07

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature: *He Meisheng*
QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman	REPORT NO. 325098
Address: Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date: <u>May-09-2014</u> Date Received: <u>Apr-01-2014</u>
Job Site/ No. Boulder City Bypass 137120.12	Total Samples Analyzed: <u>6</u>

SAMPLE DESCRIPTION	
Client Sample #	R-84, 12.8-55.5'
Laboratory Sample #	1428-00030-003
Rock core composite, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>0.0</u>	Mass Suspended (mg)	<u>58.2</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>0</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22µm</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.3E+08	<1.3E+08	<1.3E+08	<1.3E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0020%	<0.0020%	<0.0020%*
Struc/gr	<3.2E+07	<3.2E+07	<3.2E+07	<3.2E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0079%	<0.0126%	<0.0126%	<0.0126%*
Struc/gr	<3.2E+7	<3.2E+7	<3.2E+7	<3.2E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
 Filter Loading: Moderate
 SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (pg)				
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
≥5µm Strucs.	20	10,000X	0.0094	0.188	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0094	0.047	Amph.	0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 3.16E+07								

NOTATION KEY

- NSD - No Structures Detected
- * - Analytical Sensitivity used
- E = to the power of 10
- Struc Cnt = Structure Count
- Wt.% = Weight percent
- Struc/gr = Structure per gram

Analyst Signature

 QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **325200**
Date: May-09-2014
Date Received: Apr-07-2014
Total Samples Analyzed: 9

SAMPLE DESCRIPTION

Client Sample # **R-84, 55.0-92.1'**
Laboratory Sample # 1428-00040-003

Rock core composite, sample crushed

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 0.0 Mass Suspended (mg) 59.6 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 0 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	3	NSD	3
Wt.%	<0.0001%	0.053%	<0.0002%	0.053%
Struc/gr	<1.2E+08	3.6E+08	<1.2E+08	3.6E+08

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	5	NSD	5
Wt.%	<0.0001%	0.077%	<0.0002%	0.077%
Struc/gr	NA	4.1E+08	NA	4.1E+08

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	2	NSD	2
Wt.%	<0.0001%	0.024%	<0.0019%	0.024%
Struc/gr	<3.0E+07	5.9E+07	<3.0E+07	5.9E+07

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	2	NSD	2
Wt.%	<0.0074%	0.024%	<0.0118%	0.024%
Struc/gr	<3.0E+7	2.4E+08	<3.0E+7	2.4E+08

COMMENTS

Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0098
<5µm Strucs.	5	18,000X	0.0098

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **2.96E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*

QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	324656
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Mar-10-2014
		Total Samples Analyzed:	12

SAMPLE DESCRIPTION	
Client Sample #	R-84, 76.4-77.0'
Laboratory Sample #	1428-00014-003
Rock core, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	0.0	Mass Suspended (mg)	60.7
Split Mass (g)	0	Suspension Volume (ml)	500
Sieved Mass (g)	0	Volume Filtered (ml)	0.5
		Filter Type & Pore Size:	MCE 0.22µm
		Filter Area (mm ²):	385
		Effective Filter Area (mm ²):	346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<3.0E+07	<3.0E+07	<3.0E+07	<3.0E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0076%	<0.0121%	<0.0121%	<0.0121%*
Struc/gr	<3.0E+7	<3.0E+7	<3.0E+7	<3.0E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (pg)			
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)	<5µm	≥5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0094	0.188	Chrys. 0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0094	0.047	Amph. 0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 3.03E+07							

NOTATION KEY

- NSD - No Structures Detected
- Struc Cnt = Structure Count
- * - Analytical Sensitivity used
- Wt.% = Weight percent
- E = to the power of 10
- Struc/gr = Structure per gram

Analyst Signature: *He Meisheng*
QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **324656**

Date: May-09-2014
Date Received: Mar-10-2014

Total Samples Analyzed: 12

SAMPLE DESCRIPTION

Client Sample # **R-84, 85.0-85.5'**
Laboratory Sample # 1428-00014-004

Rock core, sample crushed

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 0.0 Mass Suspended (mg) 59.4 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 0 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<u><5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	54	NSD	54
Wt.%	<0.0001%	0.236%	<0.0002%	0.236%
Struc/gr	<1.2E+08	6.7E+09	<1.2E+08	6.7E+09

<u>TOTAL STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	79	NSD	79
Wt.%	<0.0001%	0.795%	<0.0002%	0.795%
Struc/gr	NA	7.5E+09	NA	7.5E+09

<u>>=5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	25	NSD	25
Wt.%	<0.0001%	0.558%	<0.0020%	0.558%
Struc/gr	<3.1E+07	7.7E+08	<3.1E+07	7.7E+08

<u>TOTAL PCME</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	14	NSD	14
Wt.%	<0.0078%	0.526%	<0.0124%	0.526%
Struc/gr	<3.1E+7	1.7E+09	<3.1E+7	1.7E+09

COMMENTS

Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094	0.188
<5µm Strucs.	5	18,000X	0.0094	0.047

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.10E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	324656
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Mar-10-2014
		Total Samples Analyzed:	12

SAMPLE DESCRIPTION	
Client Sample #	R-84, 91.3-91.8'
Laboratory Sample #	1428-00014-005
Rock core, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	0.0	Mass Suspended (mg)	58.5
Split Mass (g)	0	Suspension Volume (ml)	500
Sieved Mass (g)	0	Volume Filtered (ml)	0.5
		Filter Type & Pore Size:	MCE 0.22µm
		Filter Area (mm ²):	385
		Effective Filter Area (mm ²):	346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	57	NSD	57
Wt.%	<0.0001%	0.192%	<0.0002%	0.192%
Struc/gr	<1.3E+08	7.2E+09	<1.3E+08	7.2E+09

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	78	NSD	78
Wt.%	<0.0001%	0.468%	<0.0002%	0.468%
Struc/gr	NA	7.8E+09	NA	7.8E+09

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	21	NSD	21
Wt.%	<0.0001%	0.276%	<0.0020%	0.276%
Struc/gr	<3.1E+07	6.6E+08	<3.1E+07	6.6E+08

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	9	NSD	9
Wt.%	<0.0079%	0.257%	<0.0126%	0.257%
Struc/gr	<3.1E+7	1.1E+09	<3.1E+7	1.1E+09

COMMENTS

Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (pg)			
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)	<5µm	≥5µm	PCME	
≥5µm Strucs.	20	10,000X	0.0094	0.188	Chrys. 0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0094	0.047	Amph. 0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = 3.15E+07

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*

QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **325200**
Date: May-09-2014
Date Received: Apr-07-2014
Total Samples Analyzed: 9

SAMPLE DESCRIPTION

Client Sample # **R-85A, 0.0-51.0'**
Laboratory Sample # 1428-00040-004

Rock core composite, sample crushed

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 0.0 Mass Suspended (mg) 58.6 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 0 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<u><5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	3	NSD	3
Wt.%	<0.0001%	0.016%	<0.0002%	0.016%
Struc/gr	<1.2E+08	3.6E+08	<1.2E+08	3.6E+08

<u>TOTAL STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	6	NSD	6
Wt.%	<0.0001%	0.057%	<0.0002%	0.057%
Struc/gr	NA	4.5E+08	NA	4.5E+08

<u>>=5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	3	NSD	3
Wt.%	<0.0001%	0.042%	<0.0019%	0.042%
Struc/gr	<3.0E+07	9.0E+07	<3.0E+07	9.0E+07

<u>TOTAL PCME</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	3	NSD	3
Wt.%	<0.0075%	0.042%	<0.0120%	0.042%
Struc/gr	<3.0E+7	3.6E+08	<3.0E+7	3.6E+08

COMMENTS

Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0098	0.196
<5µm Strucs.	5	18,000X	0.0098	0.049

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.01E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	324656
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Mar-10-2014
		Total Samples Analyzed:	12

SAMPLE DESCRIPTION	
Client Sample #	R-85a, 23.0-23.5'
Laboratory Sample #	1428-00014-006
Rock core, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	0.0	Mass Suspended (mg)	62.4
Split Mass (g)	0	Suspension Volume (ml)	500
Sieved Mass (g)	0	Volume Filtered (ml)	0.5
		Filter Type & Pore Size:	MCE 0.22µm
		Filter Area (mm ²):	385
		Effective Filter Area (mm ²):	346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<2.9E+07	<2.9E+07	<2.9E+07	<2.9E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0074%	<0.0118%	<0.0118%	<0.0118%*
Struc/gr	<2.9E+7	<2.9E+7	<2.9E+7	<2.9E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (µg)				
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	>=5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0094	0.188	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0094	0.047	Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = 2.95E+07

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*

QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	324656
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Mar-10-2014
		Total Samples Analyzed:	12

SAMPLE DESCRIPTION	
Client Sample #	TSB-2
Laboratory Sample #	1428-00014-011
Surficial sample of rock outcrop, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	0.0	Mass Suspended (mg)	61.9
Split Mass (g)	0	Suspension Volume (ml)	500
Sieved Mass (g)	0	Volume Filtered (ml)	0.5
		Filter Type & Pore Size:	MCE 0.22µm
		Filter Area (mm ²):	385
		Effective Filter Area (mm ²):	346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<3.0E+07	<3.0E+07	<3.0E+07	<3.0E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0074%	<0.0119%	<0.0119%	<0.0119%*
Struc/gr	<3.0E+7	<3.0E+7	<3.0E+7	<3.0E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type:	-200 (75µm) Tyler Mesh
Filter Loading:	Moderate
SAED Photo Nos.	

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (µg)				
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
≥5µm Strucs.	20	10,000X	0.0094	0.188	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0094	0.047	Amph.	0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 2.97E+07								

NOTATION KEY

NSD - No Structures Detected	Struc Cnt = Structure Count
* - Analytical Sensitivity used	Wt.% = Weight percent
E = to the power of 10	Struc/gr = Structure per gram

Analyst Signature

QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **325200**
Date: May-09-2014
Date Received: Apr-07-2014
Total Samples Analyzed: 9

SAMPLE DESCRIPTION

Client Sample # **R-86, 0.0-45.0'**
Laboratory Sample # 1428-00040-005

Rock core composite, sample crushed

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 0.0 Mass Suspended (mg) 59.9 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 0 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	3	1	4
Wt.%	<0.0001%	0.136%	0.018%	0.154%
Struc/gr	<1.2E+08	3.5E+08	1.2E+08	4.7E+08

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	7	1	8
Wt.%	<0.0001%	0.250%	0.018%	0.268%
Struc/gr	NA	4.7E+08	1.2E+08	5.9E+08

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	4	NSD	4
Wt.%	<0.0001%	0.114%	<0.0019%	0.114%
Struc/gr	<2.9E+07	1.2E+08	<2.9E+07	1.2E+08

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	2	NSD	2
Wt.%	<0.0074%	0.110%	<0.0118%	0.110%
Struc/gr	<2.9E+7	2.4E+08	<2.9E+7	2.4E+08

COMMENTS

Actinolite & Hornblende Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0098	0.196
<5µm Strucs.	5	18,000X	0.0098	0.049

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **2.95E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	324656
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Mar-10-2014
		Total Samples Analyzed:	12

SAMPLE DESCRIPTION	
Client Sample #	R-86, 34.5-35.0'
Laboratory Sample #	1428-00014-007
Rock core, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	0.0	Mass Suspended (mg)	61.3
Split Mass (g)	0	Suspension Volume (ml)	500
Sieved Mass (g)	0	Volume Filtered (ml)	0.5
		Filter Type & Pore Size:	MCE 0.22µm
		Filter Area (mm ²):	385
		Effective Filter Area (mm ²):	346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<3.0E+07	<3.0E+07	<3.0E+07	<3.0E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0075%	<0.0120%	<0.0120%	<0.0120%*
Struc/gr	<3.0E+7	<3.0E+7	<3.0E+7	<3.0E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (pg)			
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)	<5µm	≥5µm	PCME	
≥5µm Strucs.	20	10,000X	0.0094	0.188	Chrys. 0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0094	0.047	Amph. 0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 3.00E+07							

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature: *He Meisheng*
QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **324837**
Date: May-09-2014
Date Received: Mar-18-2014
Total Samples Analyzed: 6

SAMPLE DESCRIPTION

Client Sample # **AS-2, 0-6"**
Laboratory Sample # 1428-00019-002

Surficial, sample sieved (200 mesh)

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 818.2 Mass Suspended (mg) 57.1 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 61.2 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.3E+08	<1.3E+08	<1.3E+08	<1.3E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0021%	<0.0021%	<0.0021%*
Struc/gr	<3.2E+07	<3.2E+07	<3.2E+07	<3.2E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0081%	<0.0129%	<0.0129%	<0.0129%*
Struc/gr	<3.2E+7	<3.2E+7	<3.2E+7	<3.2E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094
<5µm Strucs.	5	18,000X	0.0094

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.22E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Ana Bozhanovic
Analyst Signature
Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman	REPORT NO. 325052
Address: Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date: <u>May-09-2014</u> Date Received: <u>Mar-28-2014</u>
Job Site/ No. Boulder City Bypass 137120.12	Total Samples Analyzed: <u>2</u>

SAMPLE DESCRIPTION

Client Sample #	R-87-1, 0-6"	Surficial, sample sieved (200 mesh)
Laboratory Sample #	1428-00025-001	

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g)	<u>2503.0</u>	Mass Suspended (mg)	<u>61</u>	Filter Type & Pore Size:	<u>MCE 0.22µm</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>	Filter Area (mm ²):	<u>385</u>
Sieved Mass (g)	<u>279.63</u>	Volume Filtered (ml)	<u>0.5</u>	Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<u><5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

<u>TOTAL STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

<u>>=5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<3.0E+07	<3.0E+07	<3.0E+07	<3.0E+07*

<u>TOTAL PCME</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0076%	<0.0121%	<0.0121%	<0.0121%*
Struc/gr	<3.0E+7	<3.0E+7	<3.0E+7	<3.0E+7*

COMMENTS

No Asbests Detected	Final Sieve Type: -200 (75µm) Tyler Mesh Filter Loading: Moderate SAED Photo Nos.
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TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094	0.188
<5µm Strucs.	5	18,000X	0.0094	0.047

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.02E+07**

NOTATION KEY

NSD - No Structures Detected	Struc Cnt = Structure Count
* - Analytical Sensitivity used	Wt.% = Weight percent
E = to the power of 10	Struc/gr = Structure per gram

Analyst Signature

QC Reviewer Signature

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EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **325200**
Date: May-09-2014
Date Received: Apr-07-2014
Total Samples Analyzed: 9

SAMPLE DESCRIPTION

Client Sample # **R-87, 2.5-52.0'**
Laboratory Sample # 1428-00040-006

Rock core composite, sample crushed

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 0.0 Mass Suspended (mg) 61.5 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 0 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	10	1	11
Wt.%	<0.0001%	0.145%	0.001%	0.147%
Struc/gr	<1.1E+08	1.1E+09	1.1E+08	1.3E+09

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	15	1	16
Wt.%	<0.0001%	0.267%	0.001%	0.268%
Struc/gr	NA	1.3E+09	1.1E+08	1.4E+09

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	5	NSD	5
Wt.%	<0.0001%	0.121%	<0.0018%	0.121%
Struc/gr	<2.9E+07	1.4E+08	<2.9E+07	1.4E+08

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	4	NSD	4
Wt.%	<0.0072%	0.120%	<0.0115%	0.120%
Struc/gr	<2.9E+7	4.6E+08	<2.9E+7	4.6E+08

COMMENTS

Actinolite & Hornblende Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0098	0.196
<5µm Strucs.	5	18,000X	0.0098	0.049

ANALYTICAL SENSITIVITY - MASS (µg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **2.87E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	324656
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Mar-10-2014
		Total Samples Analyzed:	12

SAMPLE DESCRIPTION	
Client Sample #	R-87, 46.8-47.4'
Laboratory Sample #	1428-00014-008
Rock core, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	0.0	Mass Suspended (mg)	58
Split Mass (g)	0	Suspension Volume (ml)	500
Sieved Mass (g)	0	Volume Filtered (ml)	0.5
		Filter Type & Pore Size:	MCE 0.22µm
		Filter Area (mm ²):	385
		Effective Filter Area (mm ²):	346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	16	NSD	16
Wt.%	<0.0001%	0.090%	<0.0002%	0.090%
Struc/gr	<1.3E+08	2.0E+09	<1.3E+08	2.0E+09

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	35	NSD	35
Wt.%	<0.0001%	0.254%	<0.0002%	0.254%
Struc/gr	NA	2.6E+09	NA	2.6E+09

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	19	NSD	19
Wt.%	<0.0001%	0.164%	<0.0020%	0.164%
Struc/gr	<3.2E+07	6.0E+08	<3.2E+07	6.0E+08

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	8	NSD	8
Wt.%	<0.0079%	0.126%	<0.0127%	0.126%
Struc/gr	<3.2E+7	1.0E+09	<3.2E+7	1.0E+09

COMMENTS

Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (µg)				
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0094	0.188	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0094	0.047	Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = 3.17E+07

NOTATION KEY

- NSD - No Structures Detected
- * - Analytical Sensitivity used
- E = to the power of 10
- Struc Cnt = Structure Count
- Wt.% = Weight percent
- Struc/gr = Structure per gram

Analyst Signature: *He Meisheng*
QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **324837**
Date: May-09-2014
Date Received: Mar-18-2014
Total Samples Analyzed: 6

SAMPLE DESCRIPTION

Client Sample # **AS-1, 0-6"**
Laboratory Sample # **1428-00019-001**

Surficial, sample sieved (200 mesh)

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 1018.1 Mass Suspended (mg) 60.8 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 10.46 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<3.0E+07	<3.0E+07	<3.0E+07	<3.0E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0076%	<0.0121%	<0.0121%	<0.0121%*
Struc/gr	<3.0E+7	<3.0E+7	<3.0E+7	<3.0E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094
<5µm Strucs.	5	18,000X	0.0094

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.03E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Ana Bozhanovic
Analyst Signature
Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **325200**
Date: May-09-2014
Date Received: Apr-07-2014
Total Samples Analyzed: 9

SAMPLE DESCRIPTION

Client Sample # **R-88, 9.5-50.0'**
Laboratory Sample # 1428-00040-007

Rock core composite, sample crushed

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 0.0 Mass Suspended (mg) 59.8 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 0 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<u><5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.002%	<0.0002%	0.002%
Struc/gr	<1.2E+08	1.2E+08	<1.2E+08	1.2E+08

<u>TOTAL STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	2	NSD	2
Wt.%	<0.0001%	0.018%	<0.0002%	0.018%
Struc/gr	NA	1.5E+08	NA	1.5E+08

<u>>=5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.016%	<0.0019%	0.016%
Struc/gr	<3.0E+07	3.0E+07	<3.0E+07	3.0E+07

<u>TOTAL PCME</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0074%	0.016%	<0.0118%	0.016%
Struc/gr	<3.0E+7	1.2E+08	<3.0E+7	1.2E+08

COMMENTS

Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0098	0.196
<5µm Strucs.	5	18,000X	0.0098	0.049

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **2.95E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **324656**

Date: May-09-2014
Date Received: Mar-10-2014

Total Samples Analyzed: 12

SAMPLE DESCRIPTION

Client Sample # **R-88, 19.2-19.7'**
Laboratory Sample # 1428-00014-009

Rock core, sample crushed

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 0.0 Mass Suspended (mg) 61 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 0 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<u><5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	3	NSD	3
Wt.%	<0.0001%	0.016%	<0.0002%	0.016%
Struc/gr	<1.2E+08	3.6E+08	<1.2E+08	3.6E+08

<u>TOTAL STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	8	NSD	8
Wt.%	<0.0001%	0.087%	<0.0002%	0.087%
Struc/gr	NA	5.1E+08	NA	5.1E+08

<u>>=5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	5	NSD	5
Wt.%	<0.0001%	0.071%	<0.0019%	0.071%
Struc/gr	<3.0E+07	1.5E+08	<3.0E+07	1.5E+08

<u>TOTAL PCME</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	2	NSD	2
Wt.%	<0.0076%	0.061%	<0.0121%	0.061%
Struc/gr	<3.0E+7	2.4E+08	<3.0E+7	2.4E+08

COMMENTS

Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094	0.188
<5µm Strucs.	5	18,000X	0.0094	0.047

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.02E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman	REPORT NO. 325200
Address: Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date: <u>May-09-2014</u> Date Received: <u>Apr-07-2014</u>
Job Site/ No. Boulder City Bypass 137120.12	Total Samples Analyzed: <u>9</u>

SAMPLE DESCRIPTION	
Client Sample #	R-88, 50.0-85.0'
Laboratory Sample #	1428-00040-008
Rock core composite, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>0.0</u>	Mass Suspended (mg)	<u>58.8</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>0</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22µm</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<3.0E+07	<3.0E+07	<3.0E+07	<3.0E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0075%	<0.0120%	<0.0120%	<0.0120%*
Struc/gr	<3.0E+7	<3.0E+7	<3.0E+7	<3.0E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
 Filter Loading: Moderate
 SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (µg)				
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0098	0.196	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0098	0.049	Amph.	0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 3.00E+07								

NOTATION KEY

- NSD - No Structures Detected
- * - Analytical Sensitivity used
- E = to the power of 10
- Struc Cnt = Structure Count
- Wt.% = Weight percent
- Struc/gr = Structure per gram

Analyst Signature

 QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	324656
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Mar-10-2014
		Total Samples Analyzed:	12

SAMPLE DESCRIPTION	
Client Sample #	R-88, 71.1-71.6'
Laboratory Sample #	1428-00014-010
Rock core, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	0.0	Mass Suspended (mg)	59.4
Split Mass (g)	0	Suspension Volume (ml)	500
Sieved Mass (g)	0	Volume Filtered (ml)	0.5
		Filter Type & Pore Size:	MCE 0.22µm
		Filter Area (mm ²):	385
		Effective Filter Area (mm ²):	346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	7	NSD	7
Wt.%	<0.0001%	0.013%	<0.0002%	0.013%
Struc/gr	<1.2E+08	8.7E+08	<1.2E+08	8.7E+08

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	7	NSD	7
Wt.%	<0.0001%	0.013%	<0.0002%	0.013%
Struc/gr	NA	8.7E+08	NA	8.7E+08

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0020%	<0.0020%	<0.0020%*
Struc/gr	<3.1E+07	<3.1E+07	<3.1E+07	<3.1E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0078%	<0.0124%	<0.0124%	<0.0124%*
Struc/gr	<3.1E+7	<3.1E+7	<3.1E+7	<3.1E+7*

COMMENTS

Small Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS					ANALYTICAL SENSITIVITY - MASS (µg)			
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0094	0.188	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0094	0.047	Amph.	0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 3.10E+07								

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature: *He Meisheng*
QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	325200
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Apr-07-2014
		Total Samples Analyzed:	<u>9</u>

SAMPLE DESCRIPTION	
Client Sample #	R-89A, 0.0-36.0'
Laboratory Sample #	1428-00040-009
Rock core composite, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>0.0</u>	Mass Suspended (mg)	<u>58.8</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>0</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22µm</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	2	NSD	2
Wt.%	<0.0001%	0.032%	<0.0002%	0.032%
Struc/gr	<1.2E+08	2.4E+08	<1.2E+08	2.4E+08

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	3	NSD	3
Wt.%	<0.0001%	0.059%	<0.0002%	0.059%
Struc/gr	NA	2.7E+08	NA	2.7E+08

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.028%	<0.0019%	0.028%
Struc/gr	<3.0E+07	3.0E+07	<3.0E+07	3.0E+07

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0075%	0.028%	<0.0120%	0.028%
Struc/gr	<3.0E+7	1.2E+08	<3.0E+7	1.2E+08

COMMENTS

Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS					ANALYTICAL SENSITIVITY - MASS (µg)			
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
≥5µm Strucs.	20	10,000X	0.0098	0.196	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0098	0.049	Amph.	0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 3.00E+07								

NOTATION KEY

- NSD - No Structures Detected
- * - Analytical Sensitivity used
- E = to the power of 10
- Struc Cnt = Structure Count
- Wt.% = Weight percent
- Struc/gr = Structure per gram

Analyst Signature: *He Meisheng*
QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	325244
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Apr-09-2014
		Total Samples Analyzed:	9

SAMPLE DESCRIPTION	
Client Sample #	R-89A, 36.0-96.0'
Laboratory Sample #	1428-00042-001
Rock core composite, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	0.0	Mass Suspended (mg)	60.2
Split Mass (g)	0	Suspension Volume (ml)	500
Sieved Mass (g)	0	Volume Filtered (ml)	0.5
		Filter Type & Pore Size:	MCE 0.22µm
		Filter Area (mm ²):	385
		Effective Filter Area (mm ²):	346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	2	2
Wt.%	<0.0001%	<0.0002%	0.136%	0.136%
Struc/gr	NA	NA	5.9E+07	5.9E+07

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	2	2
Wt.%	<0.0001%	<0.0019%	0.136%	0.136%
Struc/gr	<2.9E+07	<2.9E+07	5.9E+07	5.9E+07

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	2	2
Wt.%	<0.0073%	<0.0117%	0.136%	0.136%
Struc/gr	<2.9E+7	<2.9E+7	2.3E+08	2.3E+08

COMMENTS

Hornblende Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (pg)				
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
≥5µm Strucs.	20	10,000X	0.0098	0.196	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0098	0.049	Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = 2.93E+07

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*

QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **325052**
Date: May-09-2014
Date Received: Mar-28-2014
Total Samples Analyzed: 2

SAMPLE DESCRIPTION

Client Sample # **R-90-1, 0-6"**
Laboratory Sample # 1428-00025-002

Surficial, sample sieved (200 mesh)

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 2092.5 Mass Suspended (mg) 59.9 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 252.89 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0020%	<0.0020%	<0.0020%*
Struc/gr	<3.1E+07	<3.1E+07	<3.1E+07	<3.1E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0077%	<0.0123%	<0.0123%	<0.0123%*
Struc/gr	<3.1E+7	<3.1E+7	<3.1E+7	<3.1E+7*

COMMENTS

No Asbests Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094	0.188
<5µm Strucs.	5	18,000X	0.0094	0.047

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.07E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	325244
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Apr-09-2014
		Total Samples Analyzed:	9

SAMPLE DESCRIPTION	
Client Sample #	R-90, 10.0-35.0'
Laboratory Sample #	1428-00042-002
Rock core composite, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	0.0	Mass Suspended (mg)	59.4
Split Mass (g)	0	Suspension Volume (ml)	500
Sieved Mass (g)	0	Volume Filtered (ml)	0.5
		Filter Type & Pore Size:	MCE 0.22µm
		Filter Area (mm ²):	385
		Effective Filter Area (mm ²):	346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<3.0E+07	<3.0E+07	<3.0E+07	<3.0E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0074%	<0.0119%	<0.0119%	<0.0119%*
Struc/gr	<3.0E+7	<3.0E+7	<3.0E+7	<3.0E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS					ANALYTICAL SENSITIVITY - MASS (pg)			
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
≥5µm Strucs.	20	10,000X	0.0098	0.196	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0098	0.049	Amph.	0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 2.97E+07								

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature: *He Meisheng*
QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.:	324818
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-19-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Mar-17-2014
		Total Samples Analyzed:	7

SAMPLE DESCRIPTION	
Client Sample #	R-90, 17.4-18'
Laboratory Sample #	1428-00018-002
Rock core, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	0.0	Mass Suspended (mg)	60
Split Mass (g)	0	Suspension Volume (ml)	500
Sieved Mass (g)	0	Volume Filtered (ml)	0.5
		Filter Type & Pore Size:	MCE 0.22µm
		Filter Area (mm ²):	385
		Effective Filter Area (mm ²):	346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL									
<5µm STRUCTURES					TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total		Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD	Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*	Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*	Struc/gr	NA	NA	NA	NA
>=5µm STRUCTURES					TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total		Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD	Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0020%	<0.0020%	<0.0020%*	Wt.%	<0.0077%	<0.0123%	<0.0123%	<0.0123%*
Struc/gr	<3.1E+07	<3.1E+07	<3.1E+07	<3.1E+07*	Struc/gr	<3.1E+7	<3.1E+7	<3.1E+7	<3.1E+7*

COMMENTS	
No Asbestos Detected	Final Sieve Type: -200 (75µm) Tyler Mesh Filter Loading: Moderate SAED Photo Nos.

TEM ANALYTICAL PARAMETERS					ANALYTICAL SENSITIVITY - MASS (pg)			
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	>=5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0094	0.188	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0094	0.047	Amph.	0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 3.07E+07								

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
 * - Analytical Sensitivity used Wt.% = Weight percent
 E = to the power of 10 Struc/gr = Structure per gram

[Signature]
 Analyst Signature

[Signature]
 QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	325098
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Apr-01-2014
		Total Samples Analyzed:	<u>6</u>

SAMPLE DESCRIPTION	
Client Sample #	R-90, 35-66'
Laboratory Sample #	1428-00030-004
Rock core composite, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>0.0</u>	Mass Suspended (mg)	<u>60.5</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>0</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22µm</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	2	NSD	2
Wt.%	<0.0001%	0.620%	<0.0002%	0.620%
Struc/gr	NA	6.1E+07	NA	6.1E+07

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	2	NSD	2
Wt.%	<0.0001%	0.620%	<0.0019%	0.620%
Struc/gr	<3.0E+07	6.1E+07	<3.0E+07	6.1E+07

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	2	NSD	2
Wt.%	<0.0076%	0.620%	<0.0122%	0.620%
Struc/gr	<3.0E+7	2.4E+08	<3.0E+7	2.4E+08

COMMENTS

Large Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (pg)			
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)	<5µm	≥5µm	PCME	
≥5µm Strucs.	20	10,000X	0.0094	0.188	Chrys. 0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0094	0.047	Amph. 0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.04E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature: *He Meisheng*
QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **324818**

Date: May-09-2014
Date Received: Mar-17-2014

Total Samples Analyzed: 7

SAMPLE DESCRIPTION

Client Sample # **R-90, 50-50.5'**
Laboratory Sample # 1428-00018-003

Rock core, sample crushed

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 0.0 Mass Suspended (mg) 58.8 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 0 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<u><5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	3	NSD	3
Wt.%	<0.0001%	0.046%	<0.0002%	0.046%
Struc/gr	<1.3E+08	3.8E+08	<1.3E+08	3.8E+08

<u>TOTAL STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	4	NSD	4
Wt.%	<0.0001%	0.055%	<0.0002%	0.055%
Struc/gr	NA	4.1E+08	NA	4.1E+08

<u>>=5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.009%	<0.0020%	0.009%
Struc/gr	<3.1E+07	3.1E+07	<3.1E+07	3.1E+07

<u>TOTAL PCME</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0078%	0.009%	<0.0125%	0.009%
Struc/gr	<3.1E+7	1.3E+08	<3.1E+7	1.3E+08

COMMENTS

Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094	0.188
<5µm Strucs.	5	18,000X	0.0094	0.047

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.13E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Michael Conlon
Analyst Signature

Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **325244**
Date: May-09-2014
Date Received: Apr-09-2014
Total Samples Analyzed: 9

SAMPLE DESCRIPTION

Client Sample # **R-90, 66.0-106.0'**
Laboratory Sample # 1428-00042-003

Rock core composite, sample crushed

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 0.0 Mass Suspended (mg) 60.3 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 0 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<u><5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.018%	<0.0002%	0.018%
Struc/gr	<1.2E+08	1.2E+08	<1.2E+08	1.2E+08

<u>TOTAL STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	3	NSD	3
Wt.%	<0.0001%	0.217%	<0.0002%	0.217%
Struc/gr	NA	1.8E+08	NA	1.8E+08

<u>>=5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	2	NSD	2
Wt.%	<0.0001%	0.199%	<0.0019%	0.199%
Struc/gr	<2.9E+07	5.9E+07	<2.9E+07	5.9E+07

<u>TOTAL PCME</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	2	NSD	2
Wt.%	<0.0073%	0.199%	<0.0117%	0.199%
Struc/gr	<2.9E+7	2.3E+08	<2.9E+7	2.3E+08

COMMENTS

Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0098	0.196
<5µm Strucs.	5	18,000X	0.0098	0.049

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **2.93E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	324818
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Mar-17-2014
		Total Samples Analyzed:	<u>7</u>

SAMPLE DESCRIPTION	
Client Sample #	R-90, 87.9-88.4'
Laboratory Sample #	1428-00018-004
Rock core, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>0.0</u>	Mass Suspended (mg)	<u>60</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>0</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22µm</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0020%	<0.0020%	<0.0020%*
Struc/gr	<3.1E+07	<3.1E+07	<3.1E+07	<3.1E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0077%	<0.0123%	<0.0123%	<0.0123%*
Struc/gr	<3.1E+7	<3.1E+7	<3.1E+7	<3.1E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (µg)				
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0094	0.188	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0094	0.047	Amph.	0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 3.07E+07								

NOTATION KEY

- NSD - No Structures Detected
- * - Analytical Sensitivity used
- E = to the power of 10
- Struc Cnt = Structure Count
- Wt.% = Weight percent
- Struc/gr = Structure per gram

Michael Conlon
Analyst Signature

Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	325244
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Apr-09-2014
		Total Samples Analyzed:	9

SAMPLE DESCRIPTION	
Client Sample #	R-90, 106.0-146.0'
Laboratory Sample #	1428-00042-004
Rock core composite, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	0.0	Mass Suspended (mg)	58.9
Split Mass (g)	0	Suspension Volume (ml)	500
Sieved Mass (g)	0	Volume Filtered (ml)	0.5
		Filter Type & Pore Size:	MCE 0.22µm
		Filter Area (mm ²):	385
		Effective Filter Area (mm ²):	346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<3.0E+07	<3.0E+07	<3.0E+07	<3.0E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0075%	<0.0120%	<0.0120%	<0.0120%*
Struc/gr	<3.0E+7	<3.0E+7	<3.0E+7	<3.0E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS					ANALYTICAL SENSITIVITY - MASS (pg)			
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
≥5µm Strucs.	20	10,000X	0.0098	0.196	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0098	0.049	Amph.	0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 3.00E+07								

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature: *He Meisheng*
QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **324818**

Date: May-09-2014
Date Received: Mar-17-2014

Total Samples Analyzed: 7

SAMPLE DESCRIPTION

Client Sample # **R-90, 123.5-124.2'**
Laboratory Sample # 1428-00018-005

Rock core, sample crushed

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 0.0 Mass Suspended (mg) 60.1 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 0 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	2	NSD	2
Wt.%	<0.0001%	0.069%	<0.0002%	0.069%
Struc/gr	<1.2E+08	2.4E+08	<1.2E+08	2.4E+08

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	3	NSD	3
Wt.%	<0.0001%	0.082%	<0.0002%	0.082%
Struc/gr	NA	2.8E+08	NA	2.8E+08

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.013%	<0.0020%	0.013%
Struc/gr	<3.1E+07	3.1E+07	<3.1E+07	3.1E+07

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0077%	<0.0122%	<0.0122%	<0.0122%*
Struc/gr	<3.1E+7	<3.1E+7	<3.1E+7	<3.1E+7*

COMMENTS

Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094	0.188
<5µm Strucs.	5	18,000X	0.0094	0.047

ANALYTICAL SENSITIVITY - MASS (µg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.06E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	325244
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Apr-09-2014
		Total Samples Analyzed:	<u>9</u>

SAMPLE DESCRIPTION	
Client Sample #	R-91, 12.0-36.5'
Laboratory Sample #	1428-00042-005
Rock core composite, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>0.0</u>	Mass Suspended (mg)	<u>62.5</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>0</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22µm</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.1E+08	<1.1E+08	<1.1E+08	<1.1E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0018%	<0.0018%	<0.0018%*
Struc/gr	<2.8E+07	<2.8E+07	<2.8E+07	<2.8E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0071%	<0.0113%	<0.0113%	<0.0113%*
Struc/gr	<2.8E+7	<2.8E+7	<2.8E+7	<2.8E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Light
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (µg)				
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0098	0.196	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0098	0.049	Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **2.82E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*

QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **324837**

Date: May-09-2014
Date Received: Mar-18-2014

Total Samples Analyzed: 6

SAMPLE DESCRIPTION

Client Sample # **R-91, 22.3-22.8'**
Laboratory Sample # 1428-00019-003

Rock core, sample crushed

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 0.0 Mass Suspended (mg) 59.1 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 0 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	2	1	3
Wt.%	<0.0001%	0.014%	0.002%	0.016%
Struc/gr	<1.2E+08	2.5E+08	1.2E+08	3.7E+08

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	3	1	4
Wt.%	<0.0001%	0.017%	0.002%	0.019%
Struc/gr	NA	2.8E+08	1.2E+08	4.0E+08

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.003%	<0.0020%	0.003%
Struc/gr	<3.1E+07	3.1E+07	<3.1E+07	3.1E+07

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0078%	<0.0125%	<0.0125%	<0.0125%*
Struc/gr	<3.1E+7	<3.1E+7	<3.1E+7	<3.1E+7*

COMMENTS

Actinolite & Hornblende Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094	0.188
<5µm Strucs.	5	18,000X	0.0094	0.047

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.11E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Ana Bocharovic
Analyst Signature
Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	325098
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Apr-01-2014
		Total Samples Analyzed:	<u>6</u>

SAMPLE DESCRIPTION	
Client Sample #	R-91, 36.5-81.5'
Laboratory Sample #	1428-00030-005
Rock core composite, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>0.0</u>	Mass Suspended (mg)	<u>59.1</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>0</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22µm</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0020%	<0.0020%	<0.0020%*
Struc/gr	<3.1E+07	<3.1E+07	<3.1E+07	<3.1E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0078%	<0.0125%	<0.0125%	<0.0125%*
Struc/gr	<3.1E+7	<3.1E+7	<3.1E+7	<3.1E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (µg)				
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0094	0.188	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0094	0.047	Amph.	0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 3.11E+07								

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature: *He Meisheng*
QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **324837**

Date: May-09-2014
Date Received: Mar-18-2014

Total Samples Analyzed: 6

SAMPLE DESCRIPTION

Client Sample # **R-91, 67.7-68.3'**
Laboratory Sample # 1428-00019-004

Rock core, sample crushed

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 0.0 Mass Suspended (mg) 58.2 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 0 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.3E+08	<1.3E+08	<1.3E+08	<1.3E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0020%	<0.0020%	<0.0020%*
Struc/gr	<3.2E+07	<3.2E+07	<3.2E+07	<3.2E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0079%	<0.0126%	<0.0126%	<0.0126%*
Struc/gr	<3.2E+7	<3.2E+7	<3.2E+7	<3.2E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Light
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094	0.188
<5µm Strucs.	5	18,000X	0.0094	0.047

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.16E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Ana Bozhanovic
Analyst Signature
Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **325244**
Date: May-09-2014
Date Received: Apr-09-2014
Total Samples Analyzed: 9

SAMPLE DESCRIPTION

Client Sample # **R-91, 81.5-116.5'**
Laboratory Sample # 1428-00042-006

Rock core composite, sample crushed

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 0.0 Mass Suspended (mg) 61.4 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 0 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0018%	<0.0018%	<0.0018%*
Struc/gr	<2.9E+07	<2.9E+07	<2.9E+07	<2.9E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0072%	<0.0115%	<0.0115%	<0.0115%*
Struc/gr	<2.9E+7	<2.9E+7	<2.9E+7	<2.9E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0098
<5µm Strucs.	5	18,000X	0.0098

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **2.88E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman	REPORT NO. 324837
Address: Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date: <u>May-09-2014</u> Date Received: <u>Mar-18-2014</u>
Job Site/ No. Boulder City Bypass 137120.12	Total Samples Analyzed: <u>6</u>

SAMPLE DESCRIPTION	
Client Sample # R-91, 98.3-98.8'	Rock core, sample crushed
Laboratory Sample # <u>1428-00019-005</u>	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>0.0</u>	Mass Suspended (mg)	<u>61</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>0</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22µm</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<3.0E+07	<3.0E+07	<3.0E+07	<3.0E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0076%	<0.0121%	<0.0121%	<0.0121%*
Struc/gr	<3.0E+7	<3.0E+7	<3.0E+7	<3.0E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
 Filter Loading: Moderate
 SAED Photo Nos.

TEM ANALYTICAL PARAMETERS					ANALYTICAL SENSITIVITY - MASS (pg)			
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0094	0.188	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0094	0.047	Amph.	0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 3.02E+07								

NOTATION KEY

- NSD - No Structures Detected
- * - Analytical Sensitivity used
- E = to the power of 10
- Struc Cnt = Structure Count
- Wt.% = Weight percent
- Struc/gr = Structure per gram

Analyst Signature

 QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.:	325244
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-19-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Apr-09-2014
		Total Samples Analyzed:	9

SAMPLE DESCRIPTION	
Client Sample #	R-92, 15.0-66.0'
Laboratory Sample #	1428-00042-008
Rock core composite, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	0.0	Mass Suspended (mg)	61.4
Split Mass (g)	0	Suspension Volume (ml)	500
Sieved Mass (g)	0	Volume Filtered (ml)	0.5
		Filter Type & Pore Size:	MCE 0.22µm
		Filter Area (mm ²):	385
		Effective Filter Area (mm ²):	346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt. %	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt. %	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt. %	<0.0001%	<0.0018%	<0.0018%	<0.0018%*
Struc/gr	<2.9E+07	<2.9E+07	<2.9E+07	<2.9E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt. %	<0.0072%	<0.0115%	<0.0115%	<0.0115%*
Struc/gr	<2.9E+7	<2.9E+7	<2.9E+7	<2.9E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS					ANALYTICAL SENSITIVITY - MASS (pg)			
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area (mm ²)		<5µm	≥5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0098	0.196	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0098	0.049	Amph.	0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 2.88E+07								

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt. % = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature: *He Meisheng*
QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	324818
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Mar-17-2014
		Total Samples Analyzed:	<u>7</u>

SAMPLE DESCRIPTION	
Client Sample #	R-92, 31.9-32.4'
Laboratory Sample #	1428-00018-006
Rock core, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>0.0</u>	Mass Suspended (mg)	<u>57.5</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>0</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22µm</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.3E+08	<1.3E+08	<1.3E+08	<1.3E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	5	1	6
Wt.%	<0.0001%	0.137%	0.055%	0.192%
Struc/gr	NA	1.6E+08	3.2E+07	1.9E+08

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	5	1	6
Wt.%	<0.0001%	0.137%	0.055%	0.192%
Struc/gr	<3.2E+07	1.6E+08	3.2E+07	1.9E+08

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	3	1	4
Wt.%	<0.0080%	0.133%	0.055%	0.188%
Struc/gr	<3.2E+7	3.8E+08	1.3E+08	5.1E+08

COMMENTS


Large Actinolite & Hornblende Asbestos Detected


Final Sieve Type: -200 (75µm) Tyler Mesh
 Filter Loading: Moderate
 SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (pg)				
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0094	0.188	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0094	0.047	Amph.	0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 3.20E+07								

NOTATION KEY

- NSD - No Structures Detected Struc Cnt = Structure Count
- * - Analytical Sensitivity used Wt.% = Weight percent
- E = to the power of 10 Struc/gr = Structure per gram


 Analyst Signature


 QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.:	325873
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-19-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	May-14-2014
		Total Samples Analyzed:	2

SAMPLE DESCRIPTION	
Client Sample #	R-92, 66.0-126.0'
Laboratory Sample #	1428-00067-001
Rock core composite, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	0.0	Mass Suspended (mg)	61.3
Split Mass (g)	0	Suspension Volume (ml)	500
Sieved Mass (g)	0	Volume Filtered (ml)	0.5
		Filter Type & Pore Size:	MCE 0.22µm
		Filter Area (mm ²):	385
		Effective Filter Area (mm ²):	346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL									
<5µm STRUCTURES					TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total		Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD	Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*	Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*	Struc/gr	NA	NA	NA	NA
>=5µm STRUCTURES					TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total		Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD	Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0018%	<0.0018%	<0.0018%*	Wt.%	<0.0072%	<0.0115%	<0.0115%	<0.0115%*
Struc/gr	<2.9E+07	<2.9E+07	<2.9E+07	<2.9E+07*	Struc/gr	<2.9E+7	<2.9E+7	<2.9E+7	<2.9E+7*
COMMENTS									
No Asbestos Detected					Final Sieve Type: -200 (75µm) Tyler Mesh				
					Filter Loading: Moderate				
					SAED Photo Nos.				

TEM ANALYTICAL PARAMETERS					ANALYTICAL SENSITIVITY - MASS (pg)			
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area (mm ²)		<5µm	>=5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0098	0.196	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0098	0.049	Amph.	0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 2.88E+07								

NOTATION KEY

NSD - No Structures Detected	Struc Cnt = Structure Count
* - Analytical Sensitivity used	Wt.% = Weight percent
E = to the power of 10	Struc/gr = Structure per gram

Mona Prochovnic

Analyst Signature

Stephanie Dunn

QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **324837**

Date: May-09-2014
Date Received: Mar-18-2014

Total Samples Analyzed: 6

SAMPLE DESCRIPTION

Client Sample # **R-92, 68.5-69.0'**
Laboratory Sample # 1428-00019-006

Rock core, sample crushed

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 0.0 Mass Suspended (mg) 59.2 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 0 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	4	NSD	4
Wt.%	<0.0001%	0.017%	<0.0002%	0.017%
Struc/gr	<1.2E+08	5.0E+08	<1.2E+08	5.0E+08

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	8	NSD	8
Wt.%	<0.0001%	0.877%	<0.0002%	0.877%
Struc/gr	NA	6.2E+08	NA	6.2E+08

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	4	NSD	4
Wt.%	<0.0001%	0.860%	<0.0020%	0.860%
Struc/gr	<3.1E+07	1.2E+08	<3.1E+07	1.2E+08

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	4	NSD	4
Wt.%	<0.0078%	0.860%	<0.0124%	0.860%
Struc/gr	<3.1E+7	5.0E+08	<3.1E+7	5.0E+08

COMMENTS

Large Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094	0.188
<5µm Strucs.	5	18,000X	0.0094	0.047

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.11E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Ana Bozhanovic
Analyst Signature
Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	324818
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Mar-17-2014
		Total Samples Analyzed:	<u>7</u>

SAMPLE DESCRIPTION	
Client Sample #	R-92, 102.8-103.3'
Laboratory Sample #	1428-00018-007
Rock core, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>0.0</u>	Mass Suspended (mg)	<u>59.6</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>0</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22µm</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0020%	<0.0020%	<0.0020%*
Struc/gr	<3.1E+07	<3.1E+07	<3.1E+07	<3.1E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0077%	<0.0124%	<0.0124%	<0.0124%*
Struc/gr	<3.1E+7	<3.1E+7	<3.1E+7	<3.1E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (µg)				
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0094	0.188	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0094	0.047	Amph.	0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 3.09E+07								

NOTATION KEY

- NSD - No Structures Detected
- * - Analytical Sensitivity used
- E = to the power of 10
- Struc Cnt = Structure Count
- Wt.% = Weight percent
- Struc/gr = Structure per gram

Analyst Signature: *He Meisheng*

QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **325098**
Date: May-09-2014
Date Received: Apr-01-2014
Total Samples Analyzed: 6

SAMPLE DESCRIPTION

Client Sample # **R-92, 126-139.5'**
Laboratory Sample # 1428-00030-006

Rock core composite, sample crushed

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 0.0 Mass Suspended (mg) 61.5 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 0 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.004%	<0.0002%	0.004%
Struc/gr	<1.2E+08	1.2E+08	<1.2E+08	1.2E+08

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	2	NSD	2
Wt.%	<0.0001%	0.464%	<0.0002%	0.464%
Struc/gr	NA	1.5E+08	NA	1.5E+08

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.460%	<0.0019%	0.460%
Struc/gr	<3.0E+07	3.0E+07	<3.0E+07	3.0E+07

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0075%	0.460%	<0.0120%	0.460%
Struc/gr	<3.0E+7	1.2E+08	<3.0E+7	1.2E+08

COMMENTS

Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094	0.188
<5µm Strucs.	5	18,000X	0.0094	0.047

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **2.99E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **325164**
Date: May-08-2014
Date Received: Apr-04-2014
Total Samples Analyzed: 7

SAMPLE DESCRIPTION

Client Sample # **P-2, 0-26.8'**
Laboratory Sample # 1428-00037-001

Rock core composite, sample crushed

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 0.0 Mass Suspended (mg) 59.6 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 0 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<u><5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.014%	<0.0002%	0.014%
Struc/gr	<1.2E+08	1.2E+08	<1.2E+08	1.2E+08

<u>TOTAL STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	3	NSD	3
Wt.%	<0.0001%	0.309%	<0.0002%	0.309%
Struc/gr	NA	1.8E+08	NA	1.8E+08

<u>>=5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	2	NSD	2
Wt.%	<0.0001%	0.295%	<0.0019%	0.295%
Struc/gr	<3.0E+07	5.9E+07	<3.0E+07	5.9E+07

<u>TOTAL PCME</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	2	NSD	2
Wt.%	<0.007%	0.295%	<0.012%	0.295%
Struc/gr	<3.0E+7	2.4E+08	<3.0E+7	2.4E+08

COMMENTS

Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Light
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0098	0.196
<5µm Strucs.	5	18,000X	0.0098	0.049

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **2.96E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Michael Conlon
Analyst Signature
Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **325164**
Date: May-08-2014
Date Received: Apr-04-2014
Total Samples Analyzed: 7

SAMPLE DESCRIPTION

Client Sample # **P-2, 26.8-81.0'**
Laboratory Sample # 1428-00037-002

Rock core composite, sample crushed

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 0.0 Mass Suspended (mg) 58.3 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 0 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.000%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.318%	<0.0002%	0.318%
Struc/gr	NA	3.0E+07	NA	3.0E+07

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.318%	<0.0019%	0.318%
Struc/gr	<3.0E+07	3.0E+07	<3.0E+07	3.0E+07

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.008%	0.318%	<0.012%	0.318%
Struc/gr	<3.0E+7	1.2E+08	<3.0E+7	1.2E+08

COMMENTS

Large Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Light
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0098	0.196
<5µm Strucs.	5	18,000X	0.0098	0.049

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.03E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Michael Conlon
Analyst Signature

Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	325164
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-08-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Apr-04-2014
		Total Samples Analyzed:	<u>7</u>

SAMPLE DESCRIPTION	
Client Sample #	P-2, 81.0-135.1'
Laboratory Sample #	1428-00037-003
Rock core composite, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>0.0</u>	Mass Suspended (mg)	<u>58.4</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>0</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22µm</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.003%	<0.0002%	0.003%
Struc/gr	<1.2E+08	1.2E+08	<1.2E+08	1.2E+08

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.003%	<0.0002%	0.003%
Struc/gr	NA	1.2E+08	NA	1.2E+08

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.002%*
Struc/gr	<3.0E+07	<3.0E+07	<3.0E+07	<3.0E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.008%	<0.012%	<0.012%	<0.012%*
Struc/gr	<3.0E+7	<3.0E+7	<3.0E+7	<3.0E+7*

COMMENTS

Small Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Light
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS					ANALYTICAL SENSITIVITY - MASS (pg)			
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
≥5µm Strucs.	20	10,000X	0.0098	0.196	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0098	0.049	Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.02E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Michael Conlon
Analyst Signature

Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman	REPORT NO. 325164
Address: Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date: <u>May-08-2014</u> Date Received: <u>Apr-04-2014</u>
Job Site/ No. Boulder City Bypass 137120.12	Total Samples Analyzed: <u>7</u>

SAMPLE DESCRIPTION	
Client Sample # P-2, 135.1-170.2'	Rock core composite, sample crushed
Laboratory Sample # <u>1428-00037-004</u>	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>0.0</u>	Mass Suspended (mg)	<u>62.5</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>0</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22µm</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.000%*
Struc/gr	<1.1E+08	<1.1E+08	<1.1E+08	<1.1E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.000%	<0.0002%	<0.000%*
Struc/gr	NA	NA	NA	NA

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0018%	<0.0018%	<0.002%*
Struc/gr	<2.8E+07	<2.8E+07	<2.8E+07	<2.8E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.007%	<0.011%	<0.011%	<0.011%*
Struc/gr	<2.8E+7	<2.8E+7	<2.8E+7	<2.8E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
 Filter Loading: Light
 SAED Photo Nos.

TEM ANALYTICAL PARAMETERS					ANALYTICAL SENSITIVITY - MASS (pg)			
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0098	0.196	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0098	0.049	Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **2.82E+07**

NOTATION KEY

- NSD - No Structures Detected
- * - Analytical Sensitivity used
- E = to the power of 10
- Struc Cnt = Structure Count
- Wt.% = Weight percent
- Struc/gr = Structure per gram

Analyst Signature

 QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	325164
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-08-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Apr-04-2014
		Total Samples Analyzed:	<u>7</u>

SAMPLE DESCRIPTION	
Client Sample #	P-2, 170.2-205.3'
Laboratory Sample #	1428-00037-005
Rock core composite, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>0.0</u>	Mass Suspended (mg)	<u>58.1</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>0</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22µm</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.031%	<0.0002%	0.031%
Struc/gr	<1.2E+08	1.2E+08	<1.2E+08	1.2E+08

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.031%	<0.0002%	0.031%
Struc/gr	NA	1.2E+08	NA	1.2E+08

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.002%*
Struc/gr	<3.0E+07	<3.0E+07	<3.0E+07	<3.0E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.008%	<0.012%	<0.012%	<0.012%*
Struc/gr	<3.0E+7	<3.0E+7	<3.0E+7	<3.0E+7*

COMMENTS

Small Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Light
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS					ANALYTICAL SENSITIVITY - MASS (pg)			
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0098	0.196	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0098	0.049	Amph.	0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 3.04E+07								

NOTATION KEY

- NSD - No Structures Detected
- * - Analytical Sensitivity used
- E = to the power of 10
- Struc Cnt = Structure Count
- Wt.% = Weight percent
- Struc/gr = Structure per gram

Michael Conlon
Analyst Signature

Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **325097**
Date: May-09-2014
Date Received: Apr-01-2014
Total Samples Analyzed: 6

SAMPLE DESCRIPTION

Client Sample # **R-93, 7-56'**
Laboratory Sample # 1428-00029-001

Rock core composite, sample crushed

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 0.0 Mass Suspended (mg) 59.4 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 0 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0020%	<0.0020%	<0.0020%*
Struc/gr	<3.1E+07	<3.1E+07	<3.1E+07	<3.1E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0078%	<0.0124%	<0.0124%	<0.0124%*
Struc/gr	<3.1E+7	<3.1E+7	<3.1E+7	<3.1E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Light
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094	0.188
<5µm Strucs.	5	18,000X	0.0094	0.047

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.10E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *Jonathan Lehman*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	325152
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Apr-03-2014
		Total Samples Analyzed:	<u>8</u>

SAMPLE DESCRIPTION	
Client Sample #	R-93, 56.0-169.5'
Laboratory Sample #	1428-00034-001
Rock core composite, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>0.0</u>	Mass Suspended (mg)	<u>61.4</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>0</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22µm</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<3.0E+07	<3.0E+07	<3.0E+07	<3.0E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0075%	<0.0120%	<0.0120%	<0.0120%*
Struc/gr	<3.0E+7	<3.0E+7	<3.0E+7	<3.0E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Light
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (pg)				
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
≥5µm Strucs.	20	10,000X	0.0094	0.188	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0094	0.047	Amph.	0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 3.00E+07								

NOTATION KEY

- NSD - No Structures Detected
- * - Analytical Sensitivity used
- E = to the power of 10
- Struc Cnt = Structure Count
- Wt.% = Weight percent
- Struc/gr = Structure per gram

Michael Conlon
Analyst Signature

Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **324877**

Date: May-09-2014
Date Received: Mar-20-2014

Total Samples Analyzed: 4

SAMPLE DESCRIPTION

Client Sample # **R-93, 75.0-75.7'**
Laboratory Sample # 1428-00020-001

Rock core, sample crushed

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 0.0 Mass Suspended (mg) 57.3 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 0 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<u><5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	4	1	5
Wt.%	<0.0001%	0.172%	0.006%	0.179%
Struc/gr	<1.3E+08	5.1E+08	1.3E+08	6.4E+08

<u>TOTAL STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	7	2	9
Wt.%	<0.0001%	1.885%	0.027%	1.912%
Struc/gr	NA	6.1E+08	1.6E+08	7.7E+08

<u>>=5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	3	1	4
Wt.%	<0.0001%	1.713%	0.021%	1.734%
Struc/gr	<3.2E+07	9.6E+07	3.2E+07	1.3E+08

<u>TOTAL PCME</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	3	1	4
Wt.%	<0.0080%	1.713%	0.021%	1.734%
Struc/gr	<3.2E+7	3.9E+08	1.3E+08	5.1E+08

COMMENTS

Actinolite & Hornblende Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094	0.188
<5µm Strucs.	5	18,000X	0.0094	0.047

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.21E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*

QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	324877
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Mar-20-2014
		Total Samples Analyzed:	<u>4</u>

SAMPLE DESCRIPTION	
Client Sample #	R-93, 134.6-135.0'
Laboratory Sample #	1428-00020-002
Rock core, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>0.0</u>	Mass Suspended (mg)	<u>60.6</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>0</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22µm</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0010%	<0.0010%	<0.0010%*
Struc/gr	<6.1E+08	<6.1E+08	<6.1E+08	<6.1E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0010%	<0.0010%	<0.0010%*
Struc/gr	NA	NA	NA	NA

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0097%	<0.0097%	<0.0097%*
Struc/gr	<3.0E+07	<3.0E+07	<3.0E+07	<3.0E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0380%	<0.0607%	<0.0607%	<0.0607%*
Struc/gr	<3.0E+7	<3.0E+7	<3.0E+7	<3.0E+7*

COMMENTS

Sample Voided

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS					ANALYTICAL SENSITIVITY - MASS (µg)			
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0094	0.188	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	1	18,000X	0.0094	0.0094	Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.04E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*

QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	325201
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Apr-07-2014
		Total Samples Analyzed:	<u>2</u>

SAMPLE DESCRIPTION	
Client Sample #	R-93, 135.0-136.0'
Laboratory Sample #	1428-00041-001
Rock core, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>0.0</u>	Mass Suspended (mg)	<u>61</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>0</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22µm</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<2.9E+07	<2.9E+07	<2.9E+07	<2.9E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0072%	<0.0116%	<0.0116%	<0.0116%*
Struc/gr	<2.9E+7	<2.9E+7	<2.9E+7	<2.9E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Light
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS					ANALYTICAL SENSITIVITY - MASS (µg)			
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0098	0.196	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0098	0.049	Amph.	0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 2.89E+07								

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature: *He Meisheng*
QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	325244
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Apr-09-2014
		Total Samples Analyzed:	9

SAMPLE DESCRIPTION	
Client Sample #	R-93, 169.5-190.0'
Laboratory Sample #	1428-00042-007
Rock core composite, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	0.0	Mass Suspended (mg)	63
Split Mass (g)	0	Suspension Volume (ml)	500
Sieved Mass (g)	0	Volume Filtered (ml)	0.5
		Filter Type & Pore Size:	MCE 0.22µm
		Filter Area (mm ²):	385
		Effective Filter Area (mm ²):	346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.1E+08	<1.1E+08	<1.1E+08	<1.1E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0018%	<0.0018%	<0.0018%*
Struc/gr	<2.8E+07	<2.8E+07	<2.8E+07	<2.8E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0070%	<0.0112%	<0.0112%	<0.0112%*
Struc/gr	<2.8E+7	<2.8E+7	<2.8E+7	<2.8E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (µg)				
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0098	0.196	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0098	0.049	Amph.	0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 2.80E+07								

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature: *He Meisheng*
QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	325097
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Apr-01-2014
		Total Samples Analyzed:	<u>6</u>

SAMPLE DESCRIPTION

Client Sample #	R-94, 7-28'	Rock core composite, sample crushed
Laboratory Sample #	1428-00029-002	

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g)	<u>0.0</u>	Mass Suspended (mg)	<u>62.2</u>	Filter Type & Pore Size:	<u>MCE 0.22µm</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>	Filter Area (mm ²):	<u>385</u>
Sieved Mass (g)	<u>0</u>	Volume Filtered (ml)	<u>0.5</u>	Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	2	NSD	2
Wt.%	<0.0001%	0.013%	<0.0002%	0.013%
Struc/gr	<1.2E+08	2.4E+08	<1.2E+08	2.4E+08

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	3	NSD	3
Wt.%	<0.0001%	0.722%	<0.0002%	0.722%
Struc/gr	NA	2.7E+08	NA	2.7E+08

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.709%	<0.0019%	0.709%
Struc/gr	<3.0E+07	3.0E+07	<3.0E+07	3.0E+07

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0074%	0.709%	<0.0118%	0.709%
Struc/gr	<3.0E+7	1.2E+08	<3.0E+7	1.2E+08

COMMENTS

Actinolite Asbestos Detected	Final Sieve Type: -200 (75µm) Tyler Mesh
	Filter Loading: Light
	SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094	0.188
<5µm Strucs.	5	18,000X	0.0094	0.047

ANALYTICAL SENSITIVITY - MASS (µg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **2.96E+07**

NOTATION KEY

NSD - No Structures Detected	Struc Cnt = Structure Count
* - Analytical Sensitivity used	Wt.% = Weight percent
E = to the power of 10	Struc/gr = Structure per gram

Analyst Signature *Jonathan Lehman*

QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	325152
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Apr-03-2014
		Total Samples Analyzed:	<u>8</u>

SAMPLE DESCRIPTION	
Client Sample #	R-94, 28.0-128.0'
Laboratory Sample #	1428-00034-002
Rock core composite, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>0.0</u>	Mass Suspended (mg)	<u>60.2</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>0</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22µm</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0020%	<0.0020%	<0.0020%*
Struc/gr	<3.1E+07	<3.1E+07	<3.1E+07	<3.1E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0077%	<0.0122%	<0.0122%	<0.0122%*
Struc/gr	<3.1E+7	<3.1E+7	<3.1E+7	<3.1E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Light
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (pg)				
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0094	0.188	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0094	0.047	Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.06E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Michael Conlon
Analyst Signature

Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	324877
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Mar-20-2014
		Total Samples Analyzed:	<u>4</u>

SAMPLE DESCRIPTION	
Client Sample #	R-94, 39.3-39.9'
Laboratory Sample #	1428-00020-003
Rock core, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>0.0</u>	Mass Suspended (mg)	<u>62.5</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>0</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22µm</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<2.9E+07	<2.9E+07	<2.9E+07	<2.9E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0074%	<0.0118%	<0.0118%	<0.0118%*
Struc/gr	<2.9E+7	<2.9E+7	<2.9E+7	<2.9E+7*

COMMENTS

Sample Voided

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (µg)				
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
≥5µm Strucs.	20	10,000X	0.0094	0.188	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0094	0.047	Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **2.94E+07**

NOTATION KEY

- NSD - No Structures Detected
- Struc Cnt = Structure Count
- * - Analytical Sensitivity used
- Wt.% = Weight percent
- E = to the power of 10
- Struc/gr = Structure per gram

Analyst Signature *He Meisheng*

QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	325201
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Apr-07-2014
		Total Samples Analyzed:	<u>2</u>

SAMPLE DESCRIPTION	
Client Sample #	R-94, 40-40.5'
Laboratory Sample #	1428-00041-002
Rock core, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>0.0</u>	Mass Suspended (mg)	<u>59.8</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>0</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22µm</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL				
<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	49	NSD	NSD	49
Wt.%	0.11333%	<0.0002%	<0.0002%	0.113%
Struc/gr	5.8E+09	<1.2E+08	<1.2E+08	5.8E+09
TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	53	2	NSD	55
Wt.%	0.1234%	0.273%	<0.0002%	0.397%
Struc/gr	5.9E+09	5.9E+07	NA	6.0E+09
>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	4	2	NSD	6
Wt.%	0.01%	0.273%	<0.0019%	0.283%
Struc/gr	1.2E+08	5.9E+07	<3.0E+07	1.8E+08
TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	2	1	NSD	3
Wt.%	9.339E-05	0.271%	<0.0118%	0.281%
Struc/gr	2.4E+08	1.2E+08	<3.0E+7	3.5E+08
COMMENTS				
Actinolite & Chrysotile Asbestos Detected		Final Sieve Type: -200 (75µm) Tyler Mesh		
		Filter Loading: Light		
		SAED Photo Nos.		

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (pg)		
Grid Openings Scanned	Mag	Grid Op Area (mm²)	Scan Area(mm²)		<5µm	>=5µm
>=5µm Strucs.	20	10,000X	0.0098	0.196	Chrys.	0.0004
<5µm Strucs.	5	18,000X	0.0098	0.049	Amph.	0.160
						0.004
						0.160
						1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 2.95E+07						

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
 * - Analytical Sensitivity used Wt.% = Weight percent
 E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature: *He Meisheng*

QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	325152
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Apr-03-2014
		Total Samples Analyzed:	<u>8</u>

SAMPLE DESCRIPTION	
Client Sample #	R-94, 128.0-144.0'
Laboratory Sample #	1428-00034-003
Rock core composite, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>0.0</u>	Mass Suspended (mg)	<u>60.8</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>0</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22µm</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	2	NSD	2
Wt.%	<0.0001%	0.022%	<0.0002%	0.022%
Struc/gr	<1.2E+08	2.4E+08	<1.2E+08	2.4E+08

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	2	NSD	2
Wt.%	<0.0001%	0.022%	<0.0002%	0.022%
Struc/gr	NA	2.4E+08	NA	2.4E+08

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<3.0E+07	<3.0E+07	<3.0E+07	<3.0E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0076%	<0.0121%	<0.0121%	<0.0121%*
Struc/gr	<3.0E+7	<3.0E+7	<3.0E+7	<3.0E+7*

COMMENTS

Small Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Light
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (pg)				
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
≥5µm Strucs.	20	10,000X	0.0094	0.188	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0094	0.047	Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.03E+07**

NOTATION KEY

- NSD - No Structures Detected
- * - Analytical Sensitivity used
- E = to the power of 10
- Struc Cnt = Structure Count
- Wt.% = Weight percent
- Struc/gr = Structure per gram

Michael Conlon
Analyst Signature

Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman	REPORT NO. 324877
Address: Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date: <u>May-09-2014</u> Date Received: <u>Mar-20-2014</u>
Job Site/ No. Boulder City Bypass 137120.12	Total Samples Analyzed: <u>4</u>

SAMPLE DESCRIPTION	
Client Sample # R-94, 140.4-140.9'	Rock core, sample crushed
Laboratory Sample # <u>1428-00020-004</u>	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g) <u>0.0</u>	Mass Suspended (mg) <u>60.5</u>	Filter Type & Pore Size: <u>MCE 0.22µm</u>	
Split Mass (g) <u>0</u>	Suspension Volume (ml) <u>500</u>	Filter Area (mm ²): <u>385</u>	
Sieved Mass (g) <u>0</u>	Volume Filtered (ml) <u>0.5</u>	Effective Filter Area (mm ²): <u>346</u>	

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL									
<5µm STRUCTURES					TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total		Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1	Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.053%	<0.0002%	0.053%	Wt.%	<0.0001%	0.053%	<0.0002%	0.053%
Struc/gr	<1.2E+08	1.2E+08	<1.2E+08	1.2E+08	Struc/gr	NA	1.2E+08	NA	1.2E+08
≥5µm STRUCTURES					TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total		Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD	Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*	Wt.%	<0.0076%	<0.0122%	<0.0122%	<0.0122%*
Struc/gr	<3.0E+07	<3.0E+07	<3.0E+07	<3.0E+07*	Struc/gr	<3.0E+7	<3.0E+7	<3.0E+7	<3.0E+7*

COMMENTS	
Small Actinolite Asbestos Detected	Final Sieve Type: -200 (75µm) Tyler Mesh Filter Loading: Moderate SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (pg)				
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0094	0.188	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0094	0.047	Amph.	0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 3.04E+07								

NOTATION KEY	
NSD - No Structures Detected	Struc Cnt = Structure Count
* - Analytical Sensitivity used	Wt.% = Weight percent
E = to the power of 10	Struc/gr = Structure per gram

Analyst Signature

QC Reviewer Signature

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California Headquarters	630 Bancroft Way Berkeley, CA 94710	P: (510) 704-8930 F: (510) 704-8429
Nevada Branch Lab	1350 Freeport Blvd., Unit 104 Sparks, NV 89431	P: (775) 359-3377 F: (775) 359-2798



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman	REPORT NO. 325244
Address: Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date: <u>May-09-2014</u> Date Received: <u>Apr-09-2014</u>
Job Site/ No. Boulder City Bypass 137120.12	Total Samples Analyzed: <u>9</u>

SAMPLE DESCRIPTION	
Client Sample # R-94, 144.0-204.0'	Rock core composite, sample crushed
Laboratory Sample # <u>1428-00042-009</u>	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g) <u>0.0</u>	Mass Suspended (mg) <u>61.6</u>	Filter Type & Pore Size: <u>MCE 0.22µm</u>	
Split Mass (g) <u>0</u>	Suspension Volume (ml) <u>500</u>	Filter Area (mm ²): <u>385</u>	
Sieved Mass (g) <u>0</u>	Volume Filtered (ml) <u>0.5</u>	Effective Filter Area (mm ²): <u>346</u>	

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.033%	<0.0002%	0.033%
Struc/gr	<1.1E+08	1.1E+08	<1.1E+08	1.1E+08

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.033%	<0.0002%	0.033%
Struc/gr	NA	1.1E+08	NA	1.1E+08

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0018%	<0.0018%	<0.0018%*
Struc/gr	<2.9E+07	<2.9E+07	<2.9E+07	<2.9E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0072%	<0.0115%	<0.0115%	<0.0115%*
Struc/gr	<2.9E+7	<2.9E+7	<2.9E+7	<2.9E+7*

COMMENTS

Small Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
 Filter Loading: Moderate
 SAED Photo Nos.

TEM ANALYTICAL PARAMETERS					ANALYTICAL SENSITIVITY - MASS (µg)			
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0098	0.196	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0098	0.049	Amph.	0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 2.87E+07								

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
 * - Analytical Sensitivity used Wt.% = Weight percent
 E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature

 QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	325277
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Apr-10-2014
		Total Samples Analyzed:	<u>8</u>

SAMPLE DESCRIPTION	
Client Sample #	R-94, 204.0-265.0'
Laboratory Sample #	1428-00044-002
Rock core composite, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>0.0</u>	Mass Suspended (mg)	<u>60.7</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>0</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22µm</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	2	NSD	2
Wt.%	<0.0001%	0.041%	<0.0002%	0.041%
Struc/gr	NA	5.8E+07	NA	5.8E+07

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	2	NSD	2
Wt.%	<0.0001%	0.041%	<0.0019%	0.041%
Struc/gr	<2.9E+07	5.8E+07	<2.9E+07	5.8E+07

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0073%	0.039%	<0.0116%	0.039%
Struc/gr	<2.9E+7	1.2E+08	<2.9E+7	1.2E+08

COMMENTS

Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Light
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (µg)				
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0098	0.196	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0098	0.049	Amph.	0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 2.91E+07								

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Ana Bozhanovic
Analyst Signature

Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	324918
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Mar-21-2014
		Total Samples Analyzed:	<u>7</u>

SAMPLE DESCRIPTION	
Client Sample #	R-94, 240.7-241.2'
Laboratory Sample #	1428-00021-001
Rock core, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>0.0</u>	Mass Suspended (mg)	<u>61.2</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>0</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22µm</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<3.0E+07	<3.0E+07	<3.0E+07	<3.0E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0075%	<0.0120%	<0.0120%	<0.0120%*
Struc/gr	<3.0E+7	<3.0E+7	<3.0E+7	<3.0E+7*

COMMENTS



No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
 Filter Loading: Moderate
 SAED Photo Nos.

TEM ANALYTICAL PARAMETERS					ANALYTICAL SENSITIVITY - MASS (µg)			
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0094	0.188	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0094	0.047	Amph.	0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 3.01E+07								

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
 * - Analytical Sensitivity used Wt.% = Weight percent
 E = to the power of 10 Struc/gr = Structure per gram


 Analyst Signature

 QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	324918
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Mar-21-2014
		Total Samples Analyzed:	<u>7</u>

SAMPLE DESCRIPTION	
Client Sample #	R-94, 250.4-251.0'
Laboratory Sample #	1428-00021-002
Rock core, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>0.0</u>	Mass Suspended (mg)	<u>61.1</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>0</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22µm</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL									
<5µm STRUCTURES					TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total		Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1	Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.050%	<0.0002%	0.050%	Wt.%	<0.0001%	0.050%	<0.0002%	0.050%
Struc/gr	<1.2E+08	1.2E+08	<1.2E+08	1.2E+08	Struc/gr	NA	1.2E+08	NA	1.2E+08
>=5µm STRUCTURES					TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total		Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD	Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*	Wt.%	<0.0075%	<0.0120%	<0.0120%	<0.0120%*
Struc/gr	<3.0E+07	<3.0E+07	<3.0E+07	<3.0E+07*	Struc/gr	<3.0E+7	<3.0E+7	<3.0E+7	<3.0E+7*
COMMENTS									
Small Actinolite Asbestos Detected					Final Sieve Type: -200 (75µm) Tyler Mesh Filter Loading: Moderate SAED Photo Nos.				

TEM ANALYTICAL PARAMETERS					ANALYTICAL SENSITIVITY - MASS (pg)		
<u>Grid Openings Scanned</u>	<u>Mag</u>	<u>Grid Op Area (mm²)</u>	<u>Scan Area(mm²)</u>		<u><5µm</u>	<u>>=5µm</u>	<u>PCME</u>
>=5µm Strucs.	20	10,000X	0.0094	0.188	Chrys.	0.0004	0.004
<5µm Strucs.	5	18,000X	0.0094	0.047	Amph.	0.0160	0.160
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 3.01E+07							

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
 * - Analytical Sensitivity used Wt.% = Weight percent
 E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*

QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	325152
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Apr-03-2014
		Total Samples Analyzed:	<u>8</u>

SAMPLE DESCRIPTION	
Client Sample #	R-95, 2.5-29.0'
Laboratory Sample #	1428-00034-004
Rock core composite, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>0.0</u>	Mass Suspended (mg)	<u>58.8</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>0</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22µm</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.3E+08	<1.3E+08	<1.3E+08	<1.3E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0020%	<0.0020%	<0.0020%*
Struc/gr	<3.1E+07	<3.1E+07	<3.1E+07	<3.1E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0078%	<0.0125%	<0.0125%	<0.0125%*
Struc/gr	<3.1E+7	<3.1E+7	<3.1E+7	<3.1E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Light
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (pg)				
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0094	0.188	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0094	0.047	Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.13E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Michael Conlon
Analyst Signature

Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **325152**
Date: May-09-2014
Date Received: Apr-03-2014
Total Samples Analyzed: 8

SAMPLE DESCRIPTION

Client Sample # **R-95, 29.0-103.0'**
Laboratory Sample # 1428-00034-005

Rock core composite, sample crushed

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 0.0 Mass Suspended (mg) 59 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 0 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.002%	<0.0002%	0.002%
Struc/gr	<1.2E+08	1.2E+08	<1.2E+08	1.2E+08

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.002%	<0.0002%	0.002%
Struc/gr	NA	1.2E+08	NA	1.2E+08

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0020%	<0.0020%	<0.0020%*
Struc/gr	<3.1E+07	<3.1E+07	<3.1E+07	<3.1E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0078%	<0.0125%	<0.0125%	<0.0125%*
Struc/gr	<3.1E+7	<3.1E+7	<3.1E+7	<3.1E+7*

COMMENTS

Small Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094	0.188
<5µm Strucs.	5	18,000X	0.0094	0.047

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.12E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Michael Conlon
Analyst Signature
Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **324918**

Date: May-09-2014
Date Received: Mar-21-2014

Total Samples Analyzed: 7

SAMPLE DESCRIPTION

Client Sample # **R-95, 53.4-54.1'**
Laboratory Sample # 1428-00021-003

Rock core, sample crushed

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 0.0 Mass Suspended (mg) 61.2 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 0 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	2	NSD	2
Wt.%	<0.0001%	0.112%	<0.0002%	0.112%
Struc/gr	NA	6.0E+07	NA	6.0E+07

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	2	NSD	2
Wt.%	<0.0001%	0.112%	<0.0019%	0.112%
Struc/gr	<3.0E+07	6.0E+07	<3.0E+07	6.0E+07

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	2	NSD	2
Wt.%	<0.0075%	0.112%	<0.0120%	0.112%
Struc/gr	<3.0E+7	2.4E+08	<3.0E+7	2.4E+08

COMMENTS

Large Asbestos Fibers Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094	0.188
<5µm Strucs.	5	18,000X	0.0094	0.047

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.01E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	325276
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-20-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Apr-10-2014
		Total Samples Analyzed:	<u>6</u>

SAMPLE DESCRIPTION	
Client Sample #	R-95, 103.0-207.0'
Laboratory Sample #	1428-00043-001
Rock core composite, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>0.0</u>	Mass Suspended (mg)	<u>61.3</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>0</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22µm</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.478%	<0.0002%	0.478%
Struc/gr	NA	2.9E+07	NA	2.9E+07

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.478%	<0.0018%	0.478%
Struc/gr	<2.9E+07	2.9E+07	<2.9E+07	2.9E+07

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0072%	<0.0115%	<0.0115%	<0.0115%*
Struc/gr	<2.9E+7	<2.9E+7	<2.9E+7	<2.9E+7*

COMMENTS

Large Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Light
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (pg)			
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)	<5µm	≥5µm	PCME	
≥5µm Strucs.	20	10,000X	0.0098	0.196	Chrys. 0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0098	0.049	Amph. 0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 2.88E+07							

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Ana Bozhanovic
Analyst Signature

Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	324918
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Mar-21-2014
		Total Samples Analyzed:	<u>7</u>

SAMPLE DESCRIPTION	
Client Sample #	R-95, 112.5-113.0'
Laboratory Sample #	1428-00021-004
Rock core, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>0.0</u>	Mass Suspended (mg)	<u>61.7</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>0</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22µm</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.055%	<0.0002%	0.055%
Struc/gr	<1.2E+08	1.2E+08	<1.2E+08	1.2E+08

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.055%	<0.0002%	0.055%
Struc/gr	NA	1.2E+08	NA	1.2E+08

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<3.0E+07	<3.0E+07	<3.0E+07	<3.0E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0075%	<0.0119%	<0.0119%	<0.0119%*
Struc/gr	<3.0E+7	<3.0E+7	<3.0E+7	<3.0E+7*

COMMENTS

Small Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (µg)			
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)	<5µm	≥5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0094	0.188	Chrys. 0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0094	0.047	Amph. 0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 2.98E+07							

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature: *He Meisheng*
QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	325152
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Apr-03-2014
		Total Samples Analyzed:	<u>8</u>

SAMPLE DESCRIPTION	
Client Sample #	R-95, 184.5-227.0'
Laboratory Sample #	1428-00034-006
Rock core composite, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>0.0</u>	Mass Suspended (mg)	<u>58.8</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>0</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22µm</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.3E+08	<1.3E+08	<1.3E+08	<1.3E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0020%	<0.0020%	<0.0020%*
Struc/gr	<3.1E+07	<3.1E+07	<3.1E+07	<3.1E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0078%	<0.0125%	<0.0125%	<0.0125%*
Struc/gr	<3.1E+7	<3.1E+7	<3.1E+7	<3.1E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (µg)				
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
≥5µm Strucs.	20	10,000X	0.0094	0.188	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0094	0.047	Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.13E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Michael Conlon
Analyst Signature

Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	324918
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Mar-21-2014
		Total Samples Analyzed:	<u>7</u>

SAMPLE DESCRIPTION	
Client Sample #	R-95, 209.4-209.9'
Laboratory Sample #	1428-00021-005
Rock core, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>0.0</u>	Mass Suspended (mg)	<u>61.7</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>0</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22µm</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL									
<5µm STRUCTURES					TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total		Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD	Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*	Wt.%	<0.0001%	0.024%	<0.0002%	0.024%
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*	Struc/gr	NA	3.0E+07	NA	3.0E+07
≥5µm STRUCTURES					TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total		Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1	Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.024%	<0.0019%	0.024%	Wt.%	<0.0075%	0.024%	<0.0119%	0.024%
Struc/gr	<3.0E+07	3.0E+07	<3.0E+07	3.0E+07	Struc/gr	<3.0E+7	1.2E+08	<3.0E+7	1.2E+08

COMMENTS	
Large Asbestos Fibers Detected	Final Sieve Type: -200 (75µm) Tyler Mesh Filter Loading: Light SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (pg)		
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)	<5µm	≥5µm	PCME
≥5µm Strucs.	20	10,000X	0.0094	Chrys.	0.0004	0.004
<5µm Strucs.	5	18,000X	0.0094	Amph.	0.0160	0.160
						1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 2.98E+07						

NOTATION KEY

NSD - No Structures Detected	Struc Cnt = Structure Count
* - Analytical Sensitivity used	Wt.% = Weight percent
E = to the power of 10	Struc/gr = Structure per gram

Michael Conlon
Analyst Signature

Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **325277**
Date: May-09-2014
Date Received: Apr-10-2014
Total Samples Analyzed: 8

SAMPLE DESCRIPTION

Client Sample # **R-95, 227.0-249.0'**
Laboratory Sample # 1428-00044-001

Rock core composite, sample crushed

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 0.0 Mass Suspended (mg) 59 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 0 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<u><5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.001%	<0.0002%	0.001%
Struc/gr	<1.2E+08	1.2E+08	<1.2E+08	1.2E+08

<u>TOTAL STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	2	NSD	2
Wt.%	<0.0001%	0.006%	<0.0002%	0.006%
Struc/gr	NA	1.5E+08	NA	1.5E+08

<u>>=5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.005%	<0.0019%	0.005%
Struc/gr	<3.0E+07	3.0E+07	<3.0E+07	3.0E+07

<u>TOTAL PCME</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0075%	0.005%	<0.0120%	0.005%
Struc/gr	<3.0E+7	1.2E+08	<3.0E+7	1.2E+08

COMMENTS

Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Light
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0098	0.196
<5µm Strucs.	5	18,000X	0.0098	0.049

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **2.99E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Ana Bozhanovic
Analyst Signature
Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	325152
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Apr-03-2014
		Total Samples Analyzed:	<u>8</u>

SAMPLE DESCRIPTION	
Client Sample #	R-96A, 0.0-17.0'
Laboratory Sample #	1428-00034-007
Rock core composite, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>0.0</u>	Mass Suspended (mg)	<u>59.4</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>0</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22µm</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0020%	<0.0020%	<0.0020%*
Struc/gr	<3.1E+07	<3.1E+07	<3.1E+07	<3.1E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0078%	<0.0124%	<0.0124%	<0.0124%*
Struc/gr	<3.1E+7	<3.1E+7	<3.1E+7	<3.1E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Light
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (µg)				
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0094	0.188	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0094	0.047	Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.10E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Michael Conlon
Analyst Signature

Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **325152**
Date: May-09-2014
Date Received: Apr-03-2014
Total Samples Analyzed: 8

SAMPLE DESCRIPTION

Client Sample # **R-96B, 0.0-64.3'**
Laboratory Sample # 1428-00034-008

Rock core composite, sample crushed

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 0.0 Mass Suspended (mg) 59.1 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 0 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<u><5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

<u>TOTAL STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

<u>>=5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0020%	<0.0020%	<0.0020%*
Struc/gr	<3.1E+07	<3.1E+07	<3.1E+07	<3.1E+07*

<u>TOTAL PCME</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0078%	<0.0125%	<0.0125%	<0.0125%*
Struc/gr	<3.1E+7	<3.1E+7	<3.1E+7	<3.1E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Light
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094	0.188
<5µm Strucs.	5	18,000X	0.0094	0.047

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.11E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Michael Conlon
Analyst Signature
Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **324918**

Date: May-09-2014
Date Received: Mar-21-2014

Total Samples Analyzed: 7

SAMPLE DESCRIPTION

Client Sample # **R-96B, 56.5-57.2'**
Laboratory Sample # 1428-00021-006

Rock core, sample crushed

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 0.0 Mass Suspended (mg) 63 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 0 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	4	NSD	4
Wt.%	<0.0001%	0.076%	<0.0002%	0.076%
Struc/gr	<1.2E+08	4.7E+08	<1.2E+08	4.7E+08

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	8	NSD	8
Wt.%	<0.0001%	0.352%	<0.0002%	0.352%
Struc/gr	NA	5.8E+08	NA	5.8E+08

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	4	NSD	4
Wt.%	<0.0001%	0.276%	<0.0019%	0.276%
Struc/gr	<2.9E+07	1.2E+08	<2.9E+07	1.2E+08

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	4	NSD	4
Wt.%	<0.0073%	0.276%	<0.0117%	0.276%
Struc/gr	<2.9E+7	4.7E+08	<2.9E+7	4.7E+08

COMMENTS

Asbestos Fibers Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Light
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094	0.188
<5µm Strucs.	5	18,000X	0.0094	0.047

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **2.92E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Michael Conlon
Analyst Signature

Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **325276**
Date: May-09-2014
Date Received: Apr-10-2014
Total Samples Analyzed: 6

SAMPLE DESCRIPTION

Client Sample # **R-96B, 64.3-115.0'**
Laboratory Sample # 1428-00043-002

Rock core composite, sample crushed

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 0.0 Mass Suspended (mg) 62.6 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 0 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<u><5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.014%	<0.0002%	0.014%
Struc/gr	<1.1E+08	1.1E+08	<1.1E+08	1.1E+08

<u>TOTAL STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	2	NSD	2
Wt.%	<0.0001%	0.247%	<0.0002%	0.247%
Struc/gr	NA	1.4E+08	NA	1.4E+08

<u>>=5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.233%	<0.0018%	0.233%
Struc/gr	<2.8E+07	2.8E+07	<2.8E+07	2.8E+07

<u>TOTAL PCME</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0071%	0.233%	<0.0113%	0.233%
Struc/gr	<2.8E+7	1.1E+08	<2.8E+7	1.1E+08

COMMENTS

Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Light
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0098	0.196
<5µm Strucs.	5	18,000X	0.0098	0.049

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **2.82E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Ana Bozhanovic
Analyst Signature
Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **325276**
Date: May-09-2014
Date Received: Apr-10-2014
Total Samples Analyzed: 6

SAMPLE DESCRIPTION

Client Sample # **R-96B, 115.0-165.0'**
Laboratory Sample # 1428-00043-003

Rock core composite, sample crushed

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 0.0 Mass Suspended (mg) 62.5 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 0 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	2	NSD	2
Wt.%	<0.0001%	0.265%	<0.0002%	0.265%
Struc/gr	<1.1E+08	2.3E+08	<1.1E+08	2.3E+08

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	2	NSD	2
Wt.%	<0.0001%	0.265%	<0.0002%	0.265%
Struc/gr	NA	2.3E+08	NA	2.3E+08

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0018%	<0.0018%	<0.0018%*
Struc/gr	<2.8E+07	<2.8E+07	<2.8E+07	<2.8E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0071%	<0.0113%	<0.0113%	<0.0113%*
Struc/gr	<2.8E+7	<2.8E+7	<2.8E+7	<2.8E+7*

COMMENTS

Small Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Light
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0098
<5µm Strucs.	5	18,000X	0.0098

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **2.82E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Ana Bozhanovic
Analyst Signature
Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **324918**

Date: May-09-2014
Date Received: Mar-21-2014

Total Samples Analyzed: 7

SAMPLE DESCRIPTION

Client Sample # **R-96B, 147.2-147.8'**
Laboratory Sample # 1428-00021-007

Rock core, sample crushed

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 0.0 Mass Suspended (mg) 62 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 0 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<u><5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

<u>TOTAL STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.030%	<0.0002%	0.030%
Struc/gr	NA	3.0E+07	NA	3.0E+07

<u>>=5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.030%	<0.0019%	0.030%
Struc/gr	<3.0E+07	3.0E+07	<3.0E+07	3.0E+07

<u>TOTAL PCME</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0074%	0.030%	<0.0119%	0.030%
Struc/gr	<3.0E+7	1.2E+08	<3.0E+7	1.2E+08

COMMENTS

Large Asbestos Fibers Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Light
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094	0.188
<5µm Strucs.	5	18,000X	0.0094	0.047

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **2.97E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Michael Conlon
Analyst Signature
Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	325387
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Apr-16-2014
		Total Samples Analyzed:	<u>7</u>

SAMPLE DESCRIPTION	
Client Sample #	P-3, 0-50.2'
Laboratory Sample #	1428-00056-001
Rock core composite, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>0.0</u>	Mass Suspended (mg)	<u>60.1</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>0</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22µm</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<2.9E+07	<2.9E+07	<2.9E+07	<2.9E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0074%	<0.0117%	<0.0117%	<0.0117%*
Struc/gr	<2.9E+7	<2.9E+7	<2.9E+7	<2.9E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (µg)				
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0098	0.196	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0098	0.049	Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **2.94E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature: *He Meisheng*
QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **325405**
Date: May-09-2014
Date Received: Apr-17-2014
Total Samples Analyzed: 5

SAMPLE DESCRIPTION

Client Sample # **P-3, 50.2-93.2'**
Laboratory Sample # 1428-00057-003

Rock core composite, sample crushed

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 0.0 Mass Suspended (mg) 61.6 Filter Type & Pore Size: MCE 0.22um
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 0 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.1E+08	<1.1E+08	<1.1E+08	<1.1E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0018%	<0.0018%	<0.0018%*
Struc/gr	<2.9E+07	<2.9E+07	<2.9E+07	<2.9E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0072%	<0.0115%	<0.0115%	<0.0115%*
Struc/gr	<2.9E+7	<2.9E+7	<2.9E+7	<2.9E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0098
<5µm Strucs.	5	18,000X	0.0098

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **2.87E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *Jonathan Lehman*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **325405**
Date: May-09-2014
Date Received: Apr-17-2014
Total Samples Analyzed: 5

SAMPLE DESCRIPTION

Client Sample # **P-3, 93.2-138.3'**
Laboratory Sample # 1428-00057-004

Rock core composite, sample crushed

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 0.0 Mass Suspended (mg) 59.9 Filter Type & Pore Size: MCE 0.22um
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 0 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<u><5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

<u>TOTAL STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.008%	<0.0002%	0.008%
Struc/gr	NA	2.9E+07	NA	2.9E+07

<u>>=5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.008%	<0.0019%	0.008%
Struc/gr	<2.9E+07	2.9E+07	<2.9E+07	2.9E+07

<u>TOTAL PCME</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0074%	0.008%	<0.0118%	0.008%
Struc/gr	<2.9E+7	1.2E+08	<2.9E+7	1.2E+08

COMMENTS

Large Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0098	0.196
<5µm Strucs.	5	18,000X	0.0098	0.049

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **2.95E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *Jonathan Lehman*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **325405**
Date: May-09-2014
Date Received: Apr-17-2014
Total Samples Analyzed: 5

SAMPLE DESCRIPTION

Client Sample # **P-3, 138.3-201.0'**
Laboratory Sample # 1428-00057-005

Rock core composite, sample crushed

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 0.0 Mass Suspended (mg) 60.6 Filter Type & Pore Size: MCE 0.22um
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 0 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<2.9E+07	<2.9E+07	<2.9E+07	<2.9E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0073%	<0.0117%	<0.0117%	<0.0117%*
Struc/gr	<2.9E+7	<2.9E+7	<2.9E+7	<2.9E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Light
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0098	0.196
<5µm Strucs.	5	18,000X	0.0098	0.049

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **2.91E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *Jonathan Lehman*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **325277**
Date: May-09-2014
Date Received: Apr-10-2014
Total Samples Analyzed: 8

SAMPLE DESCRIPTION

Client Sample # **R-97, 7.0-46.0'**
Laboratory Sample # **1428-00044-007**

Rock core composite, sample crushed

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 0.0 Mass Suspended (mg) 62.4 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 0 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<u><5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.1E+08	<1.1E+08	<1.1E+08	<1.1E+08*

<u>TOTAL STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.088%	<0.0002%	0.088%
Struc/gr	NA	2.8E+07	NA	2.8E+07

<u>>=5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.088%	<0.0018%	0.088%
Struc/gr	<2.8E+07	2.8E+07	<2.8E+07	2.8E+07

<u>TOTAL PCME</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0071%	0.088%	<0.0113%	0.088%
Struc/gr	<2.8E+7	1.1E+08	<2.8E+7	1.1E+08

COMMENTS

Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Light
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0098	0.196
<5µm Strucs.	5	18,000X	0.0098	0.049

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **2.83E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Ana Bozhanovic
Analyst Signature
Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **325277**
Date: May-09-2014
Date Received: Apr-10-2014
Total Samples Analyzed: 8

SAMPLE DESCRIPTION

Client Sample # **R-97, 46.0-85.0'**
Laboratory Sample # 1428-00044-004

Rock core composite, sample crushed

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 0.0 Mass Suspended (mg) 61.4 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 0 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.003%	<0.0002%	0.003%
Struc/gr	<1.2E+08	1.2E+08	<1.2E+08	1.2E+08

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.003%	<0.0002%	0.003%
Struc/gr	NA	1.2E+08	NA	1.2E+08

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0018%	<0.0018%	<0.0018%*
Struc/gr	<2.9E+07	<2.9E+07	<2.9E+07	<2.9E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0072%	<0.0115%	<0.0115%	<0.0115%*
Struc/gr	<2.9E+7	<2.9E+7	<2.9E+7	<2.9E+7*

COMMENTS

Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Light
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0098	0.196
<5µm Strucs.	5	18,000X	0.0098	0.049

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **2.88E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Ana Bozhanovic
Analyst Signature
Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **325367**
Date: May-09-2014
Date Received: Apr-15-2014
Total Samples Analyzed: 9

SAMPLE DESCRIPTION

Client Sample # **BHB1-1, 4.4-40.9'**
Laboratory Sample # 1428-00053-007

Rock core composite, sample crushed

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 0.0 Mass Suspended (mg) 60.1 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 0 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<u><5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

<u>TOTAL STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

<u>>=5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<2.9E+07	<2.9E+07	<2.9E+07	<2.9E+07*

<u>TOTAL PCME</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0074%	<0.0117%	<0.0117%	<0.0117%*
Struc/gr	<2.9E+7	<2.9E+7	<2.9E+7	<2.9E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Light
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0098	0.196
<5µm Strucs.	5	18,000X	0.0098	0.049

ANALYTICAL SENSITIVITY - MASS (µg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **2.94E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Ana Bozhanovic
Analyst Signature
Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **325367**
Date: May-09-2014
Date Received: Apr-15-2014
Total Samples Analyzed: 9

SAMPLE DESCRIPTION

Client Sample # **BHB1-2, 8.0-42.2'**
Laboratory Sample # 1428-00053-008

Rock core composite, sample crushed

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 0.0 Mass Suspended (mg) 59.4 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 0 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<u><5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

<u>TOTAL STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

<u>>=5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<3.0E+07	<3.0E+07	<3.0E+07	<3.0E+07*

<u>TOTAL PCME</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0074%	<0.0119%	<0.0119%	<0.0119%*
Struc/gr	<3.0E+7	<3.0E+7	<3.0E+7	<3.0E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Light
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0098	0.196
<5µm Strucs.	5	18,000X	0.0098	0.049

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **2.97E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Ana Bozhanovic
Analyst Signature
Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **325367**
Date: May-09-2014
Date Received: Apr-15-2014
Total Samples Analyzed: 9

SAMPLE DESCRIPTION

Client Sample # **BHB1-3, 1.6-41.3'**
Laboratory Sample # 1428-00053-009

Rock core composite, sample crushed

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 0.0 Mass Suspended (mg) 59.8 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 0 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<u><5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

<u>TOTAL STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

<u>>=5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<3.0E+07	<3.0E+07	<3.0E+07	<3.0E+07*

<u>TOTAL PCME</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0074%	<0.0118%	<0.0118%	<0.0118%*
Struc/gr	<3.0E+7	<3.0E+7	<3.0E+7	<3.0E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Light
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0098
<5µm Strucs.	5	18,000X	0.0098

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **2.95E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Ana Bozhanovic
Analyst Signature
Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	325368
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Apr-15-2014
		Total Samples Analyzed:	9

SAMPLE DESCRIPTION	
Client Sample #	BHB1-4, 5.0-40.0'
Laboratory Sample #	1428-00054-001
Rock core composite, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	0.0	Mass Suspended (mg)	59.4
Split Mass (g)	0	Suspension Volume (ml)	500
Sieved Mass (g)	0	Volume Filtered (ml)	0.5
		Filter Type & Pore Size:	MCE 0.22µm
		Filter Area (mm ²):	385
		Effective Filter Area (mm ²):	346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<3.0E+07	<3.0E+07	<3.0E+07	<3.0E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0074%	<0.0119%	<0.0119%	<0.0119%*
Struc/gr	<3.0E+7	<3.0E+7	<3.0E+7	<3.0E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (pg)				
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0098	0.196	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0098	0.049	Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = 2.97E+07

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *Jonathan Lehman*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **325277**
Date: May-09-2014
Date Received: Apr-10-2014
Total Samples Analyzed: 8

SAMPLE DESCRIPTION

Client Sample # **R-98, 0.0-50.0'**
Laboratory Sample # **1428-00044-008**

Rock core composite, sample crushed

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 0.0 Mass Suspended (mg) 61 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 0 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<2.9E+07	<2.9E+07	<2.9E+07	<2.9E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0072%	<0.0116%	<0.0116%	<0.0116%*
Struc/gr	<2.9E+7	<2.9E+7	<2.9E+7	<2.9E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Light
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0098	0.196
<5µm Strucs.	5	18,000X	0.0098	0.049

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **2.89E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Ana Bozhanovic
Analyst Signature
Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	325276
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Apr-10-2014
		Total Samples Analyzed:	<u>6</u>

SAMPLE DESCRIPTION	
Client Sample #	R-98, 50.0-100.0'
Laboratory Sample #	1428-00043-004
Rock core composite, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>0.0</u>	Mass Suspended (mg)	<u>61.8</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>0</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22µm</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.1E+08	<1.1E+08	<1.1E+08	<1.1E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0018%	<0.0018%	<0.0018%*
Struc/gr	<2.9E+07	<2.9E+07	<2.9E+07	<2.9E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0072%	<0.0114%	<0.0114%	<0.0114%*
Struc/gr	<2.9E+7	<2.9E+7	<2.9E+7	<2.9E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Light
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS					ANALYTICAL SENSITIVITY - MASS (µg)			
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0098	0.196	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0098	0.049	Amph.	0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 2.86E+07								

NOTATION KEY

- NSD - No Structures Detected
- * - Analytical Sensitivity used
- E = to the power of 10
- Struc Cnt = Structure Count
- Wt.% = Weight percent
- Struc/gr = Structure per gram

Ana Bozhanovic
Analyst Signature

Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	325277
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Apr-10-2014
		Total Samples Analyzed:	<u>8</u>

SAMPLE DESCRIPTION	
Client Sample #	R-98, 100.0-147.0'
Laboratory Sample #	1428-00044-005
Rock core composite, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>0.0</u>	Mass Suspended (mg)	<u>62</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>0</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22µm</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.1E+08	<1.1E+08	<1.1E+08	<1.1E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0018%	<0.0018%	<0.0018%*
Struc/gr	<2.8E+07	<2.8E+07	<2.8E+07	<2.8E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0071%	<0.0114%	<0.0114%	<0.0114%*
Struc/gr	<2.8E+7	<2.8E+7	<2.8E+7	<2.8E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Light
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS					ANALYTICAL SENSITIVITY - MASS (µg)			
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0098	0.196	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0098	0.049	Amph.	0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 2.85E+07								

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Ana Bozhanovic
Analyst Signature

Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	325277
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Apr-10-2014
		Total Samples Analyzed:	<u>8</u>

SAMPLE DESCRIPTION	
Client Sample #	R-99, 3.4-51.0'
Laboratory Sample #	1428-00044-006
Rock core composite, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>0.0</u>	Mass Suspended (mg)	<u>61</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>0</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22µm</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.006%	<0.0002%	0.006%
Struc/gr	<1.2E+08	1.2E+08	<1.2E+08	1.2E+08

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	2	NSD	2
Wt.%	<0.0001%	0.022%	<0.0002%	0.022%
Struc/gr	NA	1.4E+08	NA	1.4E+08

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.016%	<0.0019%	0.016%
Struc/gr	<2.9E+07	2.9E+07	<2.9E+07	2.9E+07

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0072%	0.016%	<0.0116%	0.016%
Struc/gr	<2.9E+7	1.2E+08	<2.9E+7	1.2E+08

COMMENTS

Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Light
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS					ANALYTICAL SENSITIVITY - MASS (pg)			
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
≥5µm Strucs.	20	10,000X	0.0098	0.196	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0098	0.049	Amph.	0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 2.89E+07								

NOTATION KEY

- NSD - No Structures Detected
- * - Analytical Sensitivity used
- E = to the power of 10
- Struc Cnt = Structure Count
- Wt.% = Weight percent
- Struc/gr = Structure per gram

Ana Bozhanovic
Analyst Signature

Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.:	325165
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	Aug-01-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Apr-04-2014
		Total Samples Analyzed:	9

SAMPLE DESCRIPTION

Client Sample #	R-99, 51.0-91.0'	Rock core composite, sample crushed
Laboratory Sample #	1428-00038-001	

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g)	0.0	Mass Suspended (mg)	58.3	Filter Type & Pore Size:	MCE 0.22µm
Split Mass (g)	0	Suspension Volume (ml)	500	Filter Area (mm ²):	385
Sieved Mass (g)	0	Volume Filtered (ml)	0.5	Effective Filter Area (mm ²):	346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<3.0E+07	<3.0E+07	<3.0E+07	<3.0E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0076%	<0.0121%	<0.0121%	<0.0121%*
Struc/gr	<3.0E+7	<3.0E+7	<3.0E+7	<3.0E+7*

COMMENTS

No Asbestos Detected	Final Sieve Type: -200 (75µm) Tyler Mesh
	Filter Loading: Moderate
	SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0098	0.196
<5µm Strucs.	5	18,000X	0.0098	0.049

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	≥5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = 3.03E+07

NOTATION KEY

NSD - No Structures Detected	Struc Cnt = Structure Count
* - Analytical Sensitivity used	Wt.% = Weight percent
E = to the power of 10	Struc/gr = Structure per gram

Analyst Signature: *He Meisheng*

QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.:	325165
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	Aug-01-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Apr-04-2014
		Total Samples Analyzed:	9

SAMPLE DESCRIPTION	
Client Sample #	R-99, 91.0-134.7'
Laboratory Sample #	1428-00038-002
Rock core composite, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	0.0	Mass Suspended (mg)	59.8
Split Mass (g)	0	Suspension Volume (ml)	500
Sieved Mass (g)	0	Volume Filtered (ml)	0.5
		Filter Type & Pore Size:	MCE 0.22µm
		Filter Area (mm ²):	385
		Effective Filter Area (mm ²):	346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt. %	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt. %	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt. %	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<3.0E+07	<3.0E+07	<3.0E+07	<3.0E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt. %	<0.0074%	<0.0118%	<0.0118%	<0.0118%*
Struc/gr	<3.0E+7	<3.0E+7	<3.0E+7	<3.0E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS					ANALYTICAL SENSITIVITY - MASS (pg)			
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area (mm ²)		<5µm	≥5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0098	0.196	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0098	0.049	Amph.	0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 2.95E+07								

NOTATION KEY

- NSD - No Structures Detected
- * - Analytical Sensitivity used
- E = to the power of 10
- Struc Cnt = Structure Count
- Wt. % = Weight percent
- Struc/gr = Structure per gram

Analyst Signature: *He Meisheng*
QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	325277
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Apr-10-2014
		Total Samples Analyzed:	<u>8</u>

SAMPLE DESCRIPTION	
Client Sample #	R-99, 134.7-141.0'
Laboratory Sample #	1428-00044-003
Rock core composite, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>0.0</u>	Mass Suspended (mg)	<u>61</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>0</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22µm</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<2.9E+07	<2.9E+07	<2.9E+07	<2.9E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0072%	<0.0116%	<0.0116%	<0.0116%*
Struc/gr	<2.9E+7	<2.9E+7	<2.9E+7	<2.9E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Light
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (µg)				
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0098	0.196	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0098	0.049	Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **2.89E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Ana Bozhanovic
Analyst Signature

Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	325153
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Apr-03-2014
		Total Samples Analyzed:	<u>7</u>

SAMPLE DESCRIPTION	
Client Sample #	R-100A, 0.0-28.5'
Laboratory Sample #	1428-00035-002
Rock core composite, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>0.0</u>	Mass Suspended (mg)	<u>62.1</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>0</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22µm</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.1E+08	<1.1E+08	<1.1E+08	<1.1E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0018%	<0.0018%	<0.0018%*
Struc/gr	<2.8E+07	<2.8E+07	<2.8E+07	<2.8E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0071%	<0.0114%	<0.0114%	<0.0114%*
Struc/gr	<2.8E+7	<2.8E+7	<2.8E+7	<2.8E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Light
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS					ANALYTICAL SENSITIVITY - MASS (µg)			
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0098	0.196	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0098	0.049	Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **2.84E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Ana Bozhanovic
Analyst Signature

Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **325276**
Date: May-09-2014
Date Received: Apr-10-2014
Total Samples Analyzed: 6

SAMPLE DESCRIPTION

Client Sample # **R-100A, 28.5-71.7'**
Laboratory Sample # 1428-00043-005

Rock core composite, sample crushed

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 0.0 Mass Suspended (mg) 63 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 0 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<u><5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.002%	<0.0002%	0.002%
Struc/gr	<1.1E+08	1.1E+08	<1.1E+08	1.1E+08

<u>TOTAL STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	4	NSD	4
Wt.%	<0.0001%	1.219%	<0.0002%	1.219%
Struc/gr	NA	2.0E+08	NA	2.0E+08

<u>>=5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	3	NSD	3
Wt.%	<0.0001%	1.217%	<0.0018%	1.217%
Struc/gr	<2.8E+07	8.4E+07	<2.8E+07	8.4E+07

<u>TOTAL PCME</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	3	NSD	3
Wt.%	<0.0070%	1.217%	<0.0112%	1.217%
Struc/gr	<2.8E+7	3.4E+08	<2.8E+7	3.4E+08

COMMENTS

Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Light
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0098	0.196
<5µm Strucs.	5	18,000X	0.0098	0.049

ANALYTICAL SENSITIVITY - MASS (µg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **2.80E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Ana Bozhanovic
Analyst Signature
Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **325153**
Date: May-09-2014
Date Received: Apr-03-2014
Total Samples Analyzed: 7

SAMPLE DESCRIPTION

Client Sample # **R-100A, 71.7-99.5'**
Laboratory Sample # 1428-00035-003

Rock core composite, sample crushed

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 0.0 Mass Suspended (mg) 58.8 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 0 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<u><5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.133%	<0.0002%	0.133%
Struc/gr	<1.2E+08	1.2E+08	<1.2E+08	1.2E+08

<u>TOTAL STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	4	NSD	4
Wt.%	<0.0001%	0.204%	<0.0002%	0.204%
Struc/gr	NA	2.1E+08	NA	2.1E+08

<u>>=5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	3	NSD	3
Wt.%	<0.0001%	0.071%	<0.0019%	0.071%
Struc/gr	<3.0E+07	9.0E+07	<3.0E+07	9.0E+07

<u>TOTAL PCME</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	2	NSD	2
Wt.%	<0.0075%	0.070%	<0.0120%	0.070%
Struc/gr	<3.0E+7	2.4E+08	<3.0E+7	2.4E+08

COMMENTS

Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Light
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0098	0.196
<5µm Strucs.	5	18,000X	0.0098	0.049

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.00E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Ana Bozhanovic
Analyst Signature
Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **325276**
Date: May-09-2014
Date Received: Apr-10-2014
Total Samples Analyzed: 6

SAMPLE DESCRIPTION

Client Sample # **R-100A, 99.5-144.1'**
Laboratory Sample # 1428-00043-006

Rock core composite, sample crushed

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 0.0 Mass Suspended (mg) 62.4 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 0 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.1E+08	<1.1E+08	<1.1E+08	<1.1E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0018%	<0.0018%	<0.0018%*
Struc/gr	<2.8E+07	<2.8E+07	<2.8E+07	<2.8E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0071%	<0.0113%	<0.0113%	<0.0113%*
Struc/gr	<2.8E+7	<2.8E+7	<2.8E+7	<2.8E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Light
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0098	0.196
<5µm Strucs.	5	18,000X	0.0098	0.049

ANALYTICAL SENSITIVITY - MASS (µg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **2.83E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Ana Bozhanovic
Analyst Signature
Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	325368
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Apr-15-2014
		Total Samples Analyzed:	<u>9</u>

SAMPLE DESCRIPTION

Client Sample #	BHB2-1, 0.6-44.0'	Rock core composite, sample crushed
Laboratory Sample #	1428-00054-002	

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g)	<u>0.0</u>	Mass Suspended (mg)	<u>58.4</u>	Filter Type & Pore Size:	<u>MCE 0.22µm</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>	Filter Area (mm ²):	<u>385</u>
Sieved Mass (g)	<u>0</u>	Volume Filtered (ml)	<u>0.5</u>	Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<3.0E+07	<3.0E+07	<3.0E+07	<3.0E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0076%	<0.0121%	<0.0121%	<0.0121%*
Struc/gr	<3.0E+7	<3.0E+7	<3.0E+7	<3.0E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0098	0.196
<5µm Strucs.	5	18,000X	0.0098	0.049

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.02E+07**

NOTATION KEY

NSD - No Structures Detected	Struc Cnt = Structure Count
* - Analytical Sensitivity used	Wt.% = Weight percent
E = to the power of 10	Struc/gr = Structure per gram

Analyst Signature *Jonathan Lehman*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	325368
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Apr-15-2014
		Total Samples Analyzed:	9

SAMPLE DESCRIPTION	
Client Sample #	BHB2-2, 1.7-40.5'
Laboratory Sample #	1428-00054-003
Rock core composite, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	0.0	Mass Suspended (mg)	61.6
Split Mass (g)	0	Suspension Volume (ml)	500
Sieved Mass (g)	0	Volume Filtered (ml)	0.5
		Filter Type & Pore Size:	MCE 0.22µm
		Filter Area (mm ²):	385
		Effective Filter Area (mm ²):	346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.1E+08	<1.1E+08	<1.1E+08	<1.1E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0018%	<0.0018%	<0.0018%*
Struc/gr	<2.9E+07	<2.9E+07	<2.9E+07	<2.9E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0072%	<0.0115%	<0.0115%	<0.0115%*
Struc/gr	<2.9E+7	<2.9E+7	<2.9E+7	<2.9E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (pg)				
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0098	0.196	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0098	0.049	Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = 2.87E+07

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature: *Jonathan Lehman*
QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	325368
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Apr-15-2014
		Total Samples Analyzed:	9

SAMPLE DESCRIPTION	
Client Sample #	BHB2-3, 5.9-40.5'
Laboratory Sample #	1428-00054-004
Rock core composite, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>0.0</u>	Mass Suspended (mg)	<u>58.1</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>0</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22µm</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<3.0E+07	<3.0E+07	<3.0E+07	<3.0E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0076%	<0.0122%	<0.0122%	<0.0122%*
Struc/gr	<3.0E+7	<3.0E+7	<3.0E+7	<3.0E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (pg)				
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0098	0.196	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0098	0.049	Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.04E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *Jonathan Lehman*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	325368
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Apr-15-2014
		Total Samples Analyzed:	9

SAMPLE DESCRIPTION

Client Sample #	BHB2-4, 0.0-40.2'	Rock core composite, sample crushed
Laboratory Sample #	1428-00054-005	

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g)	0.0	Mass Suspended (mg)	59.1	Filter Type & Pore Size:	MCE 0.22µm
Split Mass (g)	0	Suspension Volume (ml)	500	Filter Area (mm ²):	385
Sieved Mass (g)	0	Volume Filtered (ml)	0.5	Effective Filter Area (mm ²):	346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<3.0E+07	<3.0E+07	<3.0E+07	<3.0E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0075%	<0.0119%	<0.0119%	<0.0119%*
Struc/gr	<3.0E+7	<3.0E+7	<3.0E+7	<3.0E+7*

COMMENTS

No Asbestos Detected	Final Sieve Type: -200 (75µm) Tyler Mesh
	Filter Loading: Moderate
	SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0098
<5µm Strucs.	5	18,000X	0.0098

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = 2.99E+07

NOTATION KEY

NSD - No Structures Detected	Struc Cnt = Structure Count
* - Analytical Sensitivity used	Wt.% = Weight percent
E = to the power of 10	Struc/gr = Structure per gram

Analyst Signature *Jonathan Lehman*

QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **325368**
Date: May-09-2014
Date Received: Apr-15-2014
Total Samples Analyzed: 9

SAMPLE DESCRIPTION

Client Sample # **BHB2-5, 1.0-40.0'**
Laboratory Sample # 1428-00054-006

Rock core composite, sample crushed

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 0.0 Mass Suspended (mg) 58.9 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 0 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<u><5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	4	NSD	4
Wt.%	<0.0001%	0.019%	<0.0002%	0.019%
Struc/gr	<1.2E+08	4.8E+08	<1.2E+08	4.8E+08

<u>TOTAL STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	5	NSD	5
Wt.%	<0.0001%	0.058%	<0.0002%	0.058%
Struc/gr	NA	5.1E+08	NA	5.1E+08

<u>>=5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.040%	<0.0019%	0.040%
Struc/gr	<3.0E+07	3.0E+07	<3.0E+07	3.0E+07

<u>TOTAL PCME</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0075%	0.040%	<0.0120%	0.040%
Struc/gr	<3.0E+7	1.2E+08	<3.0E+7	1.2E+08

COMMENTS

Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0098	0.196
<5µm Strucs.	5	18,000X	0.0098	0.049

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.00E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *Jonathan Lehman*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **325368**
Date: May-09-2014
Date Received: Apr-15-2014
Total Samples Analyzed: 9

SAMPLE DESCRIPTION

Client Sample # **BHB2-6, 0.3-40.0'**
Laboratory Sample # 1428-00054-007

Rock core composite, sample crushed

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 0.0 Mass Suspended (mg) 62.4 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 0 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<u><5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.1E+08	<1.1E+08	<1.1E+08	<1.1E+08*

<u>TOTAL STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

<u>>=5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0018%	<0.0018%	<0.0018%*
Struc/gr	<2.8E+07	<2.8E+07	<2.8E+07	<2.8E+07*

<u>TOTAL PCME</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0071%	<0.0113%	<0.0113%	<0.0113%*
Struc/gr	<2.8E+7	<2.8E+7	<2.8E+7	<2.8E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0098
<5µm Strucs.	5	18,000X	0.0098

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **2.83E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	325368
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Apr-15-2014
		Total Samples Analyzed:	9

SAMPLE DESCRIPTION	
Client Sample #	BHB2-7, 0.0-42.5'
Laboratory Sample #	1428-00054-008
Rock core composite, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	0.0	Mass Suspended (mg)	60.3
Split Mass (g)	0	Suspension Volume (ml)	500
Sieved Mass (g)	0	Volume Filtered (ml)	0.5
		Filter Type & Pore Size:	MCE 0.22µm
		Filter Area (mm ²):	385
		Effective Filter Area (mm ²):	346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<2.9E+07	<2.9E+07	<2.9E+07	<2.9E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0073%	<0.0117%	<0.0117%	<0.0117%*
Struc/gr	<2.9E+7	<2.9E+7	<2.9E+7	<2.9E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (pg)				
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0098	0.196	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0098	0.049	Amph.	0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 2.93E+07								

NOTATION KEY

- NSD - No Structures Detected
- * - Analytical Sensitivity used
- E = to the power of 10
- Struc Cnt = Structure Count
- Wt.% = Weight percent
- Struc/gr = Structure per gram

Analyst Signature: *He Meisheng*
QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **325324**
Date: May-09-2014
Date Received: Apr-14-2014
Total Samples Analyzed: 9

SAMPLE DESCRIPTION

Client Sample # **BHB2-8, 0-40.0'**
Laboratory Sample # 1428-00050-001

Rock core composite, sample crushed

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 0.0 Mass Suspended (mg) 59.6 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 0 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.027%	<0.0002%	0.027%
Struc/gr	<1.2E+08	1.2E+08	<1.2E+08	1.2E+08

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	2	NSD	2
Wt.%	<0.0001%	0.030%	<0.0002%	0.030%
Struc/gr	NA	1.5E+08	NA	1.5E+08

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.003%	<0.0019%	0.003%
Struc/gr	<3.0E+07	3.0E+07	<3.0E+07	3.0E+07

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0074%	<0.0118%	<0.0118%	<0.0118%*
Struc/gr	<3.0E+7	<3.0E+7	<3.0E+7	<3.0E+7*

COMMENTS

Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0098
<5µm Strucs.	5	18,000X	0.0098

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **2.96E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	325368
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Apr-15-2014
		Total Samples Analyzed:	9

SAMPLE DESCRIPTION	
Client Sample #	BHB2-9, 0.5-40.0'
Laboratory Sample #	1428-00054-009
Rock core composite, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	0.0	Mass Suspended (mg)	62.5
Split Mass (g)	0	Suspension Volume (ml)	500
Sieved Mass (g)	0	Volume Filtered (ml)	0.5
		Filter Type & Pore Size:	MCE 0.22µm
		Filter Area (mm ²):	385
		Effective Filter Area (mm ²):	346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.1E+08	<1.1E+08	<1.1E+08	<1.1E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0018%	<0.0018%	<0.0018%*
Struc/gr	<2.8E+07	<2.8E+07	<2.8E+07	<2.8E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0071%	<0.0113%	<0.0113%	<0.0113%*
Struc/gr	<2.8E+7	<2.8E+7	<2.8E+7	<2.8E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS					ANALYTICAL SENSITIVITY - MASS (pg)			
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
≥5µm Strucs.	20	10,000X	0.0098	0.196	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0098	0.049	Amph.	0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 2.82E+07								

NOTATION KEY

NSD - No Structures Detected	Struc Cnt = Structure Count
* - Analytical Sensitivity used	Wt.% = Weight percent
E = to the power of 10	Struc/gr = Structure per gram

Analyst Signature: *He Meisheng*
QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.:	325165
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	Aug-01-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Apr-04-2014
		Total Samples Analyzed:	9

SAMPLE DESCRIPTION	
Client Sample #	R-101, 0-58.9'
Laboratory Sample #	1428-00038-003
Rock core composite, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	0.0	Mass Suspended (mg)	57.9
Split Mass (g)	0	Suspension Volume (ml)	500
Sieved Mass (g)	0	Volume Filtered (ml)	0.5
		Filter Type & Pore Size:	MCE 0.22µm
		Filter Area (mm ²):	385
		Effective Filter Area (mm ²):	346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	17	NSD	17
Wt.%	<0.0001%	0.371%	<0.0002%	0.371%
Struc/gr	<1.2E+08	2.1E+09	<1.2E+08	2.1E+09

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	41	NSD	41
Wt.%	<0.0001%	1.360%	<0.0002%	1.360%
Struc/gr	NA	2.8E+09	NA	2.8E+09

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	24	NSD	24
Wt.%	<0.0001%	0.988%	<0.0020%	0.988%
Struc/gr	<3.0E+07	7.3E+08	<3.0E+07	7.3E+08

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	13	NSD	13
Wt.%	<0.0076%	0.970%	<0.0122%	0.970%
Struc/gr	<3.0E+7	1.6E+09	<3.0E+7	1.6E+09

COMMENTS

Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS					ANALYTICAL SENSITIVITY - MASS (pg)			
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area (mm ²)		<5µm	≥5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0098	0.196	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0098	0.049	Amph.	0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 3.05E+07								

NOTATION KEY

- NSD - No Structures Detected
- * - Analytical Sensitivity used
- E = to the power of 10
- Struc Cnt = Structure Count
- Wt.% = Weight percent
- Struc/gr = Structure per gram

Analyst Signature: *He Meisheng*
QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.:	325165
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	Aug-01-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Apr-04-2014
		Total Samples Analyzed:	9

SAMPLE DESCRIPTION	
Client Sample #	R-101, 58.9-100.0'
Laboratory Sample #	1428-00038-007
Rock core composite, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	0.0	Mass Suspended (mg)	59.4
Split Mass (g)	0	Suspension Volume (ml)	500
Sieved Mass (g)	0	Volume Filtered (ml)	0.5
		Filter Type & Pore Size:	MCE 0.22µm
		Filter Area (mm ²):	385
		Effective Filter Area (mm ²):	346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	19	NSD	19
Wt.%	<0.0001%	0.189%	<0.0003%	0.189%
Struc/gr	<2.0E+08	3.8E+09	<2.0E+08	3.8E+09

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	40	NSD	40
Wt.%	<0.0001%	1.402%	<0.0003%	1.402%
Struc/gr	NA	4.4E+09	NA	4.4E+09

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	21	NSD	21
Wt.%	<0.0001%	1.213%	<0.0032%	1.213%
Struc/gr	<3.0E+07	6.2E+08	<3.0E+07	6.2E+08

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	15	NSD	15
Wt.%	<0.0124%	1.197%	<0.0198%	1.197%
Struc/gr	<3.0E+7	3.0E+09	<3.0E+7	3.0E+09

COMMENTS

Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (pg)		
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)	<5µm	≥5µm	PCME
≥5µm Strucs.	20	10,000X	0.0098	Chrys.	0.0004	0.004
<5µm Strucs.	3	18,000X	0.0098	Amph.	0.0160	0.160
						0.63
						1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 2.97E+07						

NOTATION KEY

- NSD - No Structures Detected
- * - Analytical Sensitivity used
- E = to the power of 10
- Struc Cnt = Structure Count
- Wt.% = Weight percent
- Struc/gr = Structure per gram

Analyst Signature: *He Meisheng*

QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.:	325165
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	Aug-01-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Apr-04-2014
		Total Samples Analyzed:	9

SAMPLE DESCRIPTION	
Client Sample #	R-101, 100.0-114.1'
Laboratory Sample #	1428-00038-008
Rock core composite, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	0.0	Mass Suspended (mg)	58.4
Split Mass (g)	0	Suspension Volume (ml)	500
Sieved Mass (g)	0	Volume Filtered (ml)	0.5
		Filter Type & Pore Size:	MCE 0.22µm
		Filter Area (mm ²):	385
		Effective Filter Area (mm ²):	346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	19	NSD	19
Wt.%	<0.0001%	0.115%	<0.0003%	0.115%
Struc/gr	<2.0E+08	3.8E+09	<2.0E+08	3.8E+09

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	46	NSD	46
Wt.%	<0.0001%	0.680%	<0.0003%	0.680%
Struc/gr	NA	4.6E+09	NA	4.6E+09

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	27	NSD	27
Wt.%	<0.0001%	0.565%	<0.0032%	0.565%
Struc/gr	<3.0E+07	8.2E+08	<3.0E+07	8.2E+08

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	15	NSD	15
Wt.%	<0.0126%	0.525%	<0.0202%	0.525%
Struc/gr	<3.0E+7	3.0E+09	<3.0E+7	3.0E+09

COMMENTS

Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS					ANALYTICAL SENSITIVITY - MASS (pg)			
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
≥5µm Strucs.	20	10,000X	0.0098	0.196	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	3	18,000X	0.0098	0.0294	Amph.	0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 3.02E+07								

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature: *He Meisheng*
QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	325165
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	Aug-01-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Apr-04-2014
		Total Samples Analyzed:	9

SAMPLE DESCRIPTION	
Client Sample #	R-101, 114.1-143.0'
Laboratory Sample #	1428-00038-009
Rock core composite, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	0.0	Mass Suspended (mg)	61.4
Split Mass (g)	0	Suspension Volume (ml)	500
Sieved Mass (g)	0	Volume Filtered (ml)	0.5
		Filter Type & Pore Size:	MCE 0.22µm
		Filter Area (mm ²):	385
		Effective Filter Area (mm ²):	346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	38	NSD	38
Wt.%	<0.0001%	0.321%	<0.0003%	0.321%
Struc/gr	<1.9E+08	7.3E+09	<1.9E+08	7.3E+09

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	86	NSD	86
Wt.%	<0.0001%	1.181%	<0.0003%	1.181%
Struc/gr	NA	8.7E+09	NA	8.7E+09

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	48	NSD	48
Wt.%	<0.0001%	0.860%	<0.0031%	0.860%
Struc/gr	<2.9E+07	1.4E+09	<2.9E+07	1.4E+09

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	22	NSD	22
Wt.%	<0.0120%	0.806%	<0.0192%	0.806%
Struc/gr	<2.9E+7	4.2E+09	<2.9E+7	4.2E+09

COMMENTS

Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (pg)		
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)	<5µm	≥5µm	PCME
≥5µm Strucs.	20	10,000X	0.0098	Chrys.	0.0004	0.004
<5µm Strucs.	3	18,000X	0.0098	Amph.	0.0160	0.160
						0.63
						1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 2.88E+07						

NOTATION KEY

- NSD - No Structures Detected
- * - Analytical Sensitivity used
- E = to the power of 10
- Struc Cnt = Structure Count
- Wt.% = Weight percent
- Struc/gr = Structure per gram

Analyst Signature: *He Meisheng*
QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **325303**
Date: May-09-2014
Date Received: Apr-11-2014
Total Samples Analyzed: 4

SAMPLE DESCRIPTION

Client Sample # **R-102, 0.5-53.0'**
Laboratory Sample # 1428-00048-001

Rock core composite, sample crushed

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 0.0 Mass Suspended (mg) 62.2 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 0 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<u><5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	36	NSD	36
Wt.%	<0.0001%	0.497%	<0.0009%	0.497%
Struc/gr	<5.7E+08	2.0E+10	<5.7E+08	2.0E+10

<u>TOTAL STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	76	NSD	76
Wt.%	<0.0001%	0.808%	<0.0009%	0.808%
Struc/gr	NA	2.2E+10	NA	2.2E+10

<u>>=5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	40	NSD	40
Wt.%	<0.0001%	0.311%	<0.0091%	0.311%
Struc/gr	<2.8E+07	1.1E+09	<2.8E+07	1.1E+09

<u>TOTAL PCME</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	15	NSD	15
Wt.%	<0.0355%	0.266%	<0.0568%	0.266%
Struc/gr	<2.8E+7	8.5E+09	<2.8E+7	8.5E+09

COMMENTS

Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0098	0.196
<5µm Strucs.	1	18,000X	0.0098	0.0098

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **2.84E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **325153**
Date: May-09-2014
Date Received: Apr-03-2014
Total Samples Analyzed: 7

SAMPLE DESCRIPTION

Client Sample # **R-102, 53.0-103.4'**
Laboratory Sample # 1428-00035-001

Rock core composite, sample crushed

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 0.0 Mass Suspended (mg) 61.9 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 0 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.1E+08	<1.1E+08	<1.1E+08	<1.1E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0018%	<0.0018%	<0.0018%*
Struc/gr	<2.9E+07	<2.9E+07	<2.9E+07	<2.9E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0071%	<0.0114%	<0.0114%	<0.0114%*
Struc/gr	<2.9E+7	<2.9E+7	<2.9E+7	<2.9E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Light
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0098	0.196
<5µm Strucs.	5	18,000X	0.0098	0.049

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **2.85E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Ana Bozhanovic
Analyst Signature
Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	325303
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Apr-11-2014
		Total Samples Analyzed:	<u>4</u>

SAMPLE DESCRIPTION	
Client Sample #	R-102, 103.4-115.0'
Laboratory Sample #	1428-00048-002
Rock core composite, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>0.0</u>	Mass Suspended (mg)	<u>58</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>0</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22µm</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<3.0E+07	<3.0E+07	<3.0E+07	<3.0E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0076%	<0.0122%	<0.0122%	<0.0122%*
Struc/gr	<3.0E+7	<3.0E+7	<3.0E+7	<3.0E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (pg)				
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0098	0.196	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0098	0.049	Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.04E+07**

NOTATION KEY

NSD - No Structures Detected	Struc Cnt = Structure Count
* - Analytical Sensitivity used	Wt.% = Weight percent
E = to the power of 10	Struc/gr = Structure per gram

Analyst Signature *He Meisheng*

QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **325305**
Date: May-09-2014
Date Received: Apr-11-2014
Total Samples Analyzed: 7

SAMPLE DESCRIPTION

Client Sample # **R-103, 1.7-49.0'**
Laboratory Sample # 1428-00049-001

Rock core composite, sample crushed

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 0.0 Mass Suspended (mg) 58.8 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 0 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<3.0E+07	<3.0E+07	<3.0E+07	<3.0E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0075%	<0.0120%	<0.0120%	<0.0120%*
Struc/gr	<3.0E+7	<3.0E+7	<3.0E+7	<3.0E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Light
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0098
<5µm Strucs.	5	18,000X	0.0098

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.00E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Michael Conlon
Analyst Signature
Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **325305**
Date: May-09-2014
Date Received: Apr-11-2014
Total Samples Analyzed: 7

SAMPLE DESCRIPTION

Client Sample # **R-103, 49.0-97.0'**
Laboratory Sample # 1428-00049-002

Rock core composite, sample crushed

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 0.0 Mass Suspended (mg) 62.8 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 0 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.1E+08	<1.1E+08	<1.1E+08	<1.1E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0018%	<0.0018%	<0.0018%*
Struc/gr	<2.8E+07	<2.8E+07	<2.8E+07	<2.8E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0070%	<0.0112%	<0.0112%	<0.0112%*
Struc/gr	<2.8E+7	<2.8E+7	<2.8E+7	<2.8E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Light
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0098
<5µm Strucs.	5	18,000X	0.0098

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **2.81E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Michael Conlon
Analyst Signature
Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	325324
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Apr-14-2014
		Total Samples Analyzed:	9

SAMPLE DESCRIPTION	
Client Sample #	BHB3-1, 0.6-40.5'
Laboratory Sample #	1428-00050-002
Rock core composite, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	0.0	Mass Suspended (mg)	62.3
Split Mass (g)	0	Suspension Volume (ml)	500
Sieved Mass (g)	0	Volume Filtered (ml)	0.5
		Filter Type & Pore Size:	MCE 0.22µm
		Filter Area (mm ²):	385
		Effective Filter Area (mm ²):	346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.1E+08	<1.1E+08	<1.1E+08	<1.1E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0018%	<0.0018%	<0.0018%*
Struc/gr	<2.8E+07	<2.8E+07	<2.8E+07	<2.8E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0071%	<0.0113%	<0.0113%	<0.0113%*
Struc/gr	<2.8E+7	<2.8E+7	<2.8E+7	<2.8E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS					ANALYTICAL SENSITIVITY - MASS (pg)			
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
≥5µm Strucs.	20	10,000X	0.0098	0.196	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0098	0.049	Amph.	0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 2.83E+07								

NOTATION KEY

- NSD - No Structures Detected
- * - Analytical Sensitivity used
- E = to the power of 10
- Struc Cnt = Structure Count
- Wt.% = Weight percent
- Struc/gr = Structure per gram

Analyst Signature: *He Meisheng*

QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **325324**
Date: May-09-2014
Date Received: Apr-14-2014
Total Samples Analyzed: 9

SAMPLE DESCRIPTION

Client Sample # **BHB3-2, 0-40.0'**
Laboratory Sample # 1428-00050-003

Rock core composite, sample crushed

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 0.0 Mass Suspended (mg) 60.4 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 0 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<2.9E+07	<2.9E+07	<2.9E+07	<2.9E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0073%	<0.0117%	<0.0117%	<0.0117%*
Struc/gr	<2.9E+7	<2.9E+7	<2.9E+7	<2.9E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0098
<5µm Strucs.	5	18,000X	0.0098

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **2.92E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **325324**
Date: May-09-2014
Date Received: Apr-14-2014
Total Samples Analyzed: 9

SAMPLE DESCRIPTION

Client Sample # **BHB3-3, 0.4-40.0'**
Laboratory Sample # 1428-00050-004

Rock core composite, sample crushed

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 0.0 Mass Suspended (mg) 60.3 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 0 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<u><5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	11	NSD	11
Wt.%	<0.0001%	0.035%	<0.0002%	0.035%
Struc/gr	<1.2E+08	1.3E+09	<1.2E+08	1.3E+09

<u>TOTAL STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	22	NSD	22
Wt.%	<0.0001%	0.286%	<0.0002%	0.286%
Struc/gr	NA	1.6E+09	NA	1.6E+09

<u>>=5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	11	NSD	11
Wt.%	<0.0001%	0.252%	<0.0019%	0.252%
Struc/gr	<2.9E+07	3.2E+08	<2.9E+07	3.2E+08

<u>TOTAL PCME</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	4	NSD	4
Wt.%	<0.0073%	0.226%	<0.0117%	0.226%
Struc/gr	<2.9E+7	4.7E+08	<2.9E+7	4.7E+08

COMMENTS

Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0098	0.196
<5µm Strucs.	5	18,000X	0.0098	0.049

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **2.93E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **325324**
Date: May-09-2014
Date Received: Apr-14-2014
Total Samples Analyzed: 9

SAMPLE DESCRIPTION

Client Sample # **BHB3-4, 0-40.0'**
Laboratory Sample # 1428-00050-005

Rock core composite, sample crushed

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 0.0 Mass Suspended (mg) 62.5 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 0 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.1E+08	<1.1E+08	<1.1E+08	<1.1E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0018%	<0.0018%	<0.0018%*
Struc/gr	<2.8E+07	<2.8E+07	<2.8E+07	<2.8E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0071%	<0.0113%	<0.0113%	<0.0113%*
Struc/gr	<2.8E+7	<2.8E+7	<2.8E+7	<2.8E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0098
<5µm Strucs.	5	18,000X	0.0098

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **2.82E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	325387
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Apr-16-2014
		Total Samples Analyzed:	<u>7</u>

SAMPLE DESCRIPTION	
Client Sample #	P-4, 0-55.9'
Laboratory Sample #	1428-00056-002
Rock core composite, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>0.0</u>	Mass Suspended (mg)	<u>59.7</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>0</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22µm</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	2	NSD	2
Wt.%	<0.0001%	0.023%	<0.0002%	0.023%
Struc/gr	<1.2E+08	2.4E+08	<1.2E+08	2.4E+08

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	2	NSD	2
Wt.%	<0.0001%	0.023%	<0.0002%	0.023%
Struc/gr	NA	2.4E+08	NA	2.4E+08

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<3.0E+07	<3.0E+07	<3.0E+07	<3.0E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0074%	<0.0118%	<0.0118%	<0.0118%*
Struc/gr	<3.0E+7	<3.0E+7	<3.0E+7	<3.0E+7*

COMMENTS

Small Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (pg)			
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)	<5µm	≥5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0098	0.196	Chrys. 0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0098	0.049	Amph. 0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 2.96E+07							

NOTATION KEY

- NSD - No Structures Detected
- * - Analytical Sensitivity used
- E = to the power of 10
- Struc Cnt = Structure Count
- Wt.% = Weight percent
- Struc/gr = Structure per gram

Analyst Signature: *He Meisheng*
QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	325387
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Apr-16-2014
		Total Samples Analyzed:	<u>7</u>

SAMPLE DESCRIPTION

Client Sample #	P-4, 55.9-126.2'	Rock core composite, sample crushed
Laboratory Sample #	1428-00056-003	

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g)	<u>0.0</u>	Mass Suspended (mg)	<u>59.9</u>	Filter Type & Pore Size:	<u>MCE 0.22µm</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>	Filter Area (mm ²):	<u>385</u>
Sieved Mass (g)	<u>0</u>	Volume Filtered (ml)	<u>0.5</u>	Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	22	NSD	22
Wt.%	<0.0001%	0.157%	<0.0002%	0.157%
Struc/gr	<1.2E+08	2.6E+09	<1.2E+08	2.6E+09

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	40	NSD	40
Wt.%	<0.0001%	0.627%	<0.0002%	0.627%
Struc/gr	NA	3.1E+09	NA	3.1E+09

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	18	NSD	18
Wt.%	<0.0001%	0.470%	<0.0019%	0.470%
Struc/gr	<2.9E+07	5.3E+08	<2.9E+07	5.3E+08

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	11	NSD	11
Wt.%	<0.0074%	0.461%	<0.0118%	0.461%
Struc/gr	<2.9E+7	1.3E+09	<2.9E+7	1.3E+09

COMMENTS

Actinolite Asbestos Detected	Final Sieve Type: -200 (75µm) Tyler Mesh
	Filter Loading: Moderate
	SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0098	0.196
<5µm Strucs.	5	18,000X	0.0098	0.049

ANALYTICAL SENSITIVITY - MASS (µg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **2.95E+07**

NOTATION KEY

NSD - No Structures Detected	Struc Cnt = Structure Count
* - Analytical Sensitivity used	Wt.% = Weight percent
E = to the power of 10	Struc/gr = Structure per gram

Analyst Signature *He Meisheng*

QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **325387**
Date: May-09-2014
Date Received: Apr-16-2014
Total Samples Analyzed: 7

SAMPLE DESCRIPTION

Client Sample # **P-4, 126.2-180.0'**
Laboratory Sample # 1428-00056-004

Rock core composite, sample crushed

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 0.0 Mass Suspended (mg) 59.6 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 0 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	22	NSD	22
Wt.%	<0.0001%	0.083%	<0.0002%	0.083%
Struc/gr	<1.2E+08	2.6E+09	<1.2E+08	2.6E+09

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	40	NSD	40
Wt.%	<0.0001%	0.366%	<0.0002%	0.366%
Struc/gr	NA	3.1E+09	NA	3.1E+09

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	18	NSD	18
Wt.%	<0.0001%	0.283%	<0.0019%	0.283%
Struc/gr	<3.0E+07	5.3E+08	<3.0E+07	5.3E+08

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	8	NSD	8
Wt.%	<0.0074%	0.268%	<0.0118%	0.268%
Struc/gr	<3.0E+7	9.5E+08	<3.0E+7	9.5E+08

COMMENTS

1 Winchite & Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0098
<5µm Strucs.	5	18,000X	0.0098

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **2.96E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	325305
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Apr-11-2014
		Total Samples Analyzed:	<u>7</u>

SAMPLE DESCRIPTION	
Client Sample #	R-104, 2.5-50.0'
Laboratory Sample #	1428-00049-003
Rock core composite, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>0.0</u>	Mass Suspended (mg)	<u>61.9</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>0</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22µm</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.1E+08	<1.1E+08	<1.1E+08	<1.1E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0018%	<0.0018%	<0.0018%*
Struc/gr	<2.9E+07	<2.9E+07	<2.9E+07	<2.9E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0071%	<0.0114%	<0.0114%	<0.0114%*
Struc/gr	<2.9E+7	<2.9E+7	<2.9E+7	<2.9E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (µg)				
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
≥5µm Strucs.	20	10,000X	0.0098	0.196	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0098	0.049	Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **2.85E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Michael Conlon
Analyst Signature

Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **325305**
Date: May-09-2014
Date Received: Apr-11-2014
Total Samples Analyzed: 7

SAMPLE DESCRIPTION

Client Sample # **R-104, 50.0-98.0'**
Laboratory Sample # 1428-00049-004

Rock core composite, sample crushed

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 0.0 Mass Suspended (mg) 61.9 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 0 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	2	NSD	2
Wt.%	<0.0001%	0.003%	<0.0002%	0.003%
Struc/gr	<1.1E+08	2.3E+08	<1.1E+08	2.3E+08

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	4	NSD	4
Wt.%	<0.0001%	0.023%	<0.0002%	0.023%
Struc/gr	NA	2.9E+08	NA	2.9E+08

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	2	NSD	2
Wt.%	<0.0001%	0.021%	<0.0018%	0.021%
Struc/gr	<2.9E+07	5.7E+07	<2.9E+07	5.7E+07

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	2	NSD	2
Wt.%	<0.0071%	0.021%	<0.0114%	0.021%
Struc/gr	<2.9E+7	2.3E+08	<2.9E+7	2.3E+08

COMMENTS

Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0098
<5µm Strucs.	5	18,000X	0.0098

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **2.85E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Michael Conlon
Analyst Signature

Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **325305**
Date: May-09-2014
Date Received: Apr-11-2014
Total Samples Analyzed: 7

SAMPLE DESCRIPTION

Client Sample # **R-104, 98.0-145.0'**
Laboratory Sample # 1428-00049-005

Rock core composite, sample crushed

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 0.0 Mass Suspended (mg) 61.7 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 0 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.1E+08	<1.1E+08	<1.1E+08	<1.1E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0018%	<0.0018%	<0.0018%*
Struc/gr	<2.9E+07	<2.9E+07	<2.9E+07	<2.9E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0072%	<0.0114%	<0.0114%	<0.0114%*
Struc/gr	<2.9E+7	<2.9E+7	<2.9E+7	<2.9E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0098
<5µm Strucs.	5	18,000X	0.0098

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **2.86E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Michael Conlon
Analyst Signature
Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	325305
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Apr-11-2014
		Total Samples Analyzed:	<u>7</u>

SAMPLE DESCRIPTION	
Client Sample #	R-105, 7.0-51.0'
Laboratory Sample #	1428-00049-006
Rock core composite, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>0.0</u>	Mass Suspended (mg)	<u>60.7</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>0</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22µm</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<2.9E+07	<2.9E+07	<2.9E+07	<2.9E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0073%	<0.0116%	<0.0116%	<0.0116%*
Struc/gr	<2.9E+7	<2.9E+7	<2.9E+7	<2.9E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Light
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS					ANALYTICAL SENSITIVITY - MASS (pg)			
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0098	0.196	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0098	0.049	Amph.	0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 2.91E+07								

NOTATION KEY

- NSD - No Structures Detected
- * - Analytical Sensitivity used
- E = to the power of 10
- Struc Cnt = Structure Count
- Wt.% = Weight percent
- Struc/gr = Structure per gram

Michael Conlon
Analyst Signature

Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	325305
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Apr-11-2014
		Total Samples Analyzed:	<u>7</u>

SAMPLE DESCRIPTION	
Client Sample #	R-105, 51.0-95.0'
Laboratory Sample #	1428-00049-007
Rock core composite, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>0.0</u>	Mass Suspended (mg)	<u>60.2</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>0</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22µm</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<2.9E+07	<2.9E+07	<2.9E+07	<2.9E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0073%	<0.0117%	<0.0117%	<0.0117%*
Struc/gr	<2.9E+7	<2.9E+7	<2.9E+7	<2.9E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Light
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS					ANALYTICAL SENSITIVITY - MASS (µg)			
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
≥5µm Strucs.	20	10,000X	0.0098	0.196	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0098	0.049	Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **2.93E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Michael Conlon
Analyst Signature

Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **325153**
Date: May-09-2014
Date Received: Apr-03-2014
Total Samples Analyzed: 7

SAMPLE DESCRIPTION

Client Sample # **R-105, 95.0-155.0'**
Laboratory Sample # 1428-00035-004

Rock core composite, sample crushed

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 0.0 Mass Suspended (mg) 60.2 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 0 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<u><5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

<u>TOTAL STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

<u>>=5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<2.9E+07	<2.9E+07	<2.9E+07	<2.9E+07*

<u>TOTAL PCME</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0073%	<0.0117%	<0.0117%	<0.0117%*
Struc/gr	<2.9E+7	<2.9E+7	<2.9E+7	<2.9E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Light
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0098	0.196
<5µm Strucs.	5	18,000X	0.0098	0.049

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **2.93E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Ana Bozhanovic
Analyst Signature
Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **325303**
Date: May-09-2014
Date Received: Apr-11-2014
Total Samples Analyzed: 4

SAMPLE DESCRIPTION

Client Sample # **R-105, 155.0-180.0'**
Laboratory Sample # 1428-00048-003

Rock core composite, sample crushed

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 0.0 Mass Suspended (mg) 58.8 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 0 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<3.0E+07	<3.0E+07	<3.0E+07	<3.0E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0075%	<0.0120%	<0.0120%	<0.0120%*
Struc/gr	<3.0E+7	<3.0E+7	<3.0E+7	<3.0E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0098	0.196
<5µm Strucs.	5	18,000X	0.0098	0.049

ANALYTICAL SENSITIVITY - MASS (µg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.00E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	325303
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Apr-11-2014
		Total Samples Analyzed:	<u>4</u>

SAMPLE DESCRIPTION	
Client Sample #	R-106, 2.5-15.4'
Laboratory Sample #	1428-00048-004
Rock core composite, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>0.0</u>	Mass Suspended (mg)	<u>59.4</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>0</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22µm</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	29	NSD	29
Wt.%	<0.0001%	0.167%	<0.0003%	0.167%
Struc/gr	<2.0E+08	5.7E+09	<2.0E+08	5.7E+09

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	52	NSD	52
Wt.%	<0.0001%	0.893%	<0.0003%	0.893%
Struc/gr	NA	6.4E+09	NA	6.4E+09

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	23	NSD	23
Wt.%	<0.0001%	0.726%	<0.0032%	0.726%
Struc/gr	<3.0E+07	6.8E+08	<3.0E+07	6.8E+08

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	14	NSD	14
Wt.%	<0.0124%	0.698%	<0.0198%	0.698%
Struc/gr	<3.0E+7	2.8E+09	<3.0E+7	2.8E+09

COMMENTS

Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS					ANALYTICAL SENSITIVITY - MASS (µg)			
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
≥5µm Strucs.	20	10,000X	0.0098	0.196	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	3	18,000X	0.0098	0.0294	Amph.	0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 2.97E+07								

NOTATION KEY

- NSD - No Structures Detected
- * - Analytical Sensitivity used
- E = to the power of 10
- Struc Cnt = Structure Count
- Wt.% = Weight percent
- Struc/gr = Structure per gram

Analyst Signature: *He Meisheng*
QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.:	325165
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	Aug-01-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Apr-04-2014
		Total Samples Analyzed:	9

SAMPLE DESCRIPTION	
Client Sample #	R-106, 15.4-49.0'
Laboratory Sample #	1428-00038-004
Rock core composite, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	0.0	Mass Suspended (mg)	60.1
Split Mass (g)	0	Suspension Volume (ml)	500
Sieved Mass (g)	0	Volume Filtered (ml)	0.5
		Filter Type & Pore Size:	MCE 0.22µm
		Filter Area (mm ²):	385
		Effective Filter Area (mm ²):	346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	26	NSD	26
Wt. %	<0.0001%	0.574%	<0.0009%	0.574%
Struc/gr	<5.9E+08	1.5E+10	<5.9E+08	1.5E+10

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	82	NSD	82
Wt. %	<0.0001%	2.042%	<0.0009%	2.042%
Struc/gr	NA	1.7E+10	NA	1.7E+10

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	56	NSD	56
Wt. %	<0.0001%	1.468%	<0.0094%	1.468%
Struc/gr	<2.9E+07	1.6E+09	<2.9E+07	1.6E+09

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	35	NSD	35
Wt. %	<0.0368%	1.422%	<0.0587%	1.422%
Struc/gr	<2.9E+7	2.1E+10	<2.9E+7	2.1E+10

COMMENTS

Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (pg)			
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area (mm ²)	<5µm	≥5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0098	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	1	18,000X	0.0098	Amph.	0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 2.94E+07							

NOTATION KEY

- NSD - No Structures Detected
- * - Analytical Sensitivity used
- E = to the power of 10
- Struc Cnt = Structure Count
- Wt. % = Weight percent
- Struc/gr = Structure per gram

Analyst Signature: *He Meisheng*

QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	325369
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Apr-15-2014
		Total Samples Analyzed:	9

SAMPLE DESCRIPTION	
Client Sample #	R-106, 49.0-90.8'
Laboratory Sample #	1428-00055-001
Rock core composite, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	0.0	Mass Suspended (mg)	62.2
Split Mass (g)	0	Suspension Volume (ml)	500
Sieved Mass (g)	0	Volume Filtered (ml)	0.5
		Filter Type & Pore Size:	MCE 0.22µm
		Filter Area (mm ²):	385
		Effective Filter Area (mm ²):	346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	29	NSD	29
Wt.%	<0.0001%	0.772%	<0.0009%	0.772%
Struc/gr	<5.7E+08	1.6E+10	<5.7E+08	1.6E+10

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	60	NSD	60
Wt.%	<0.0001%	6.380%	<0.0009%	6.380%
Struc/gr	NA	2.0E+10	NA	2.0E+10

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	31	NSD	31
Wt.%	<0.0001%	5.608%	<0.0091%	5.608%
Struc/gr	<1.1E+08	3.5E+09	<1.1E+08	3.5E+09

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	22	NSD	22
Wt.%	<0.0355%	5.548%	<0.0568%	5.548%
Struc/gr	<1.1E+8	1.2E+10	<1.1E+8	1.2E+10

COMMENTS

Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS					ANALYTICAL SENSITIVITY - MASS (pg)			
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
≥5µm Strucs.	5	10,000X	0.0098	0.049	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	1	18,000X	0.0098	0.0098	Amph.	0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 1.14E+08								

NOTATION KEY

- NSD - No Structures Detected
- * - Analytical Sensitivity used
- E = to the power of 10
- Struc Cnt = Structure Count
- Wt.% = Weight percent
- Struc/gr = Structure per gram

Michael Conlon
Analyst Signature

Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	325324
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Apr-14-2014
		Total Samples Analyzed:	9

SAMPLE DESCRIPTION	
Client Sample #	P-6, 0-46.5'
Laboratory Sample #	1428-00050-006
Rock core composite, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	0.0	Mass Suspended (mg)	60
Split Mass (g)	0	Suspension Volume (ml)	500
Sieved Mass (g)	0	Volume Filtered (ml)	0.5
		Filter Type & Pore Size:	MCE 0.22µm
		Filter Area (mm ²):	385
		Effective Filter Area (mm ²):	346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<2.9E+07	<2.9E+07	<2.9E+07	<2.9E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0074%	<0.0118%	<0.0118%	<0.0118%*
Struc/gr	<2.9E+7	<2.9E+7	<2.9E+7	<2.9E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS					ANALYTICAL SENSITIVITY - MASS (pg)			
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0098	0.196	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0098	0.049	Amph.	0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 2.94E+07								

NOTATION KEY

NSD - No Structures Detected	Struc Cnt = Structure Count
* - Analytical Sensitivity used	Wt.% = Weight percent
E = to the power of 10	Struc/gr = Structure per gram

Analyst Signature: *He Meisheng*
QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	325324
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Apr-14-2014
		Total Samples Analyzed:	9

SAMPLE DESCRIPTION	
Client Sample #	P-6, 46.5-101.0'
Laboratory Sample #	1428-00050-007
Rock core composite, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	0.0	Mass Suspended (mg)	59.6
Split Mass (g)	0	Suspension Volume (ml)	500
Sieved Mass (g)	0	Volume Filtered (ml)	0.5
		Filter Type & Pore Size:	MCE 0.22µm
		Filter Area (mm ²):	385
		Effective Filter Area (mm ²):	346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	15	NSD	15
Wt.%	<0.0001%	0.036%	<0.0002%	0.036%
Struc/gr	<1.2E+08	1.8E+09	<1.2E+08	1.8E+09

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	22	NSD	22
Wt.%	<0.0001%	0.133%	<0.0002%	0.133%
Struc/gr	NA	2.0E+09	NA	2.0E+09

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	7	NSD	7
Wt.%	<0.0001%	0.097%	<0.0019%	0.097%
Struc/gr	<3.0E+07	2.1E+08	<3.0E+07	2.1E+08

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	3	NSD	3
Wt.%	<0.0074%	0.094%	<0.0118%	0.094%
Struc/gr	<3.0E+7	3.6E+08	<3.0E+7	3.6E+08

COMMENTS

Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (pg)				
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
≥5µm Strucs.	20	10,000X	0.0098	0.196	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0098	0.049	Amph.	0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 2.96E+07								

NOTATION KEY

- NSD - No Structures Detected
- * - Analytical Sensitivity used
- E = to the power of 10
- Struc Cnt = Structure Count
- Wt.% = Weight percent
- Struc/gr = Structure per gram

Analyst Signature: *He Meisheng*
QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **325324**
Date: May-09-2014
Date Received: Apr-14-2014
Total Samples Analyzed: 9

SAMPLE DESCRIPTION

Client Sample # **P-6, 101.0-156.4'**
Laboratory Sample # 1428-00050-008

Rock core composite, sample crushed

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 0.0 Mass Suspended (mg) 60.7 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 0 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<2.9E+07	<2.9E+07	<2.9E+07	<2.9E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0073%	<0.0116%	<0.0116%	<0.0116%*
Struc/gr	<2.9E+7	<2.9E+7	<2.9E+7	<2.9E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0098
<5µm Strucs.	5	18,000X	0.0098

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **2.91E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	325324
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Apr-14-2014
		Total Samples Analyzed:	9

SAMPLE DESCRIPTION	
Client Sample #	P-6, 156.4-181.0'
Laboratory Sample #	1428-00050-009
Rock core composite, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	0.0	Mass Suspended (mg)	61.3
Split Mass (g)	0	Suspension Volume (ml)	500
Sieved Mass (g)	0	Volume Filtered (ml)	0.5
		Filter Type & Pore Size:	MCE 0.22µm
		Filter Area (mm ²):	385
		Effective Filter Area (mm ²):	346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0018%	<0.0018%	<0.0018%*
Struc/gr	<2.9E+07	<2.9E+07	<2.9E+07	<2.9E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0072%	<0.0115%	<0.0115%	<0.0115%*
Struc/gr	<2.9E+7	<2.9E+7	<2.9E+7	<2.9E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (pg)				
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0098	0.196	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0098	0.049	Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = 2.88E+07

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*

QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **325369**
Date: May-09-2014
Date Received: Apr-15-2014
Total Samples Analyzed: 9

SAMPLE DESCRIPTION

Client Sample # **R-107, 0.5-63.6'**
Laboratory Sample # 1428-00055-002

Rock core composite, sample crushed

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 0.0 Mass Suspended (mg) 59.4 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 0 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<3.0E+07	<3.0E+07	<3.0E+07	<3.0E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0074%	<0.0119%	<0.0119%	<0.0119%*
Struc/gr	<3.0E+7	<3.0E+7	<3.0E+7	<3.0E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Light
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0098	0.196
<5µm Strucs.	5	18,000X	0.0098	0.049

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **2.97E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Michael Conlon
Analyst Signature
Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman	REPORT NO. 325369
Address: Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date: <u>May-09-2014</u> Date Received: <u>Apr-15-2014</u>
Job Site/ No. Boulder City Bypass 137120.12	Total Samples Analyzed: <u>9</u>

SAMPLE DESCRIPTION	
Client Sample # R-107, 63.6-103.6'	Rock core composite, sample crushed
Laboratory Sample # <u>1428-00055-003</u>	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>0.0</u>	Mass Suspended (mg)	<u>61.3</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>0</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22µm</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0018%	<0.0018%	<0.0018%*
Struc/gr	<2.9E+07	<2.9E+07	<2.9E+07	<2.9E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0072%	<0.0115%	<0.0115%	<0.0115%*
Struc/gr	<2.9E+7	<2.9E+7	<2.9E+7	<2.9E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
 Filter Loading: Light
 SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (µg)				
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0098	0.196	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0098	0.049	Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **2.88E+07**

NOTATION KEY

- NSD - No Structures Detected
- * - Analytical Sensitivity used
- E = to the power of 10
- Struc Cnt = Structure Count
- Wt.% = Weight percent
- Struc/gr = Structure per gram

Analyst Signature

 QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	325153
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Apr-03-2014
		Total Samples Analyzed:	<u>7</u>

SAMPLE DESCRIPTION	
Client Sample #	R-108A, 2.5-35.0'
Laboratory Sample #	1428-00035-005
Rock core composite, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>0.0</u>	Mass Suspended (mg)	<u>61.8</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>0</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22µm</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.1E+08	<1.1E+08	<1.1E+08	<1.1E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0018%	<0.0018%	<0.0018%*
Struc/gr	<2.9E+07	<2.9E+07	<2.9E+07	<2.9E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0072%	<0.0114%	<0.0114%	<0.0114%*
Struc/gr	<2.9E+7	<2.9E+7	<2.9E+7	<2.9E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Light
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (µg)				
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
≥5µm Strucs.	20	10,000X	0.0098	0.196	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0098	0.049	Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **2.86E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Ana Bozhanovic
Analyst Signature
Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	325153
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Apr-03-2014
		Total Samples Analyzed:	<u>7</u>

SAMPLE DESCRIPTION	
Client Sample #	R-108A, 35.0-75.0'
Laboratory Sample #	1428-00035-006
Rock core composite, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>0.0</u>	Mass Suspended (mg)	<u>59.9</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>0</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22µm</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<2.9E+07	<2.9E+07	<2.9E+07	<2.9E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0074%	<0.0118%	<0.0118%	<0.0118%*
Struc/gr	<2.9E+7	<2.9E+7	<2.9E+7	<2.9E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Light
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS					ANALYTICAL SENSITIVITY - MASS (pg)			
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
≥5µm Strucs.	20	10,000X	0.0098	0.196	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0098	0.049	Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **2.95E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Ana Bozhanovic
Analyst Signature

Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	325369
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Apr-15-2014
		Total Samples Analyzed:	<u>9</u>

SAMPLE DESCRIPTION	
Client Sample #	R-108A, 75.0-86.0'
Laboratory Sample #	1428-00055-006
Rock core composite, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>0.0</u>	Mass Suspended (mg)	<u>59.6</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>0</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22µm</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<u><5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

<u>TOTAL STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

<u>>=5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<3.0E+07	<3.0E+07	<3.0E+07	<3.0E+07*

<u>TOTAL PCME</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0074%	<0.0118%	<0.0118%	<0.0118%*
Struc/gr	<3.0E+7	<3.0E+7	<3.0E+7	<3.0E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Light
SAED Photo Nos.

<u>TEM ANALYTICAL PARAMETERS</u>					<u>ANALYTICAL SENSITIVITY - MASS (pg)</u>			
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	>=5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0098	0.196	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0098	0.049	Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **2.96E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Michael Conlon
Analyst Signature

Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.:	325165
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	Aug-01-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Apr-04-2014
		Total Samples Analyzed:	9

SAMPLE DESCRIPTION	
Client Sample #	R-108A, 86.0-142.5'
Laboratory Sample #	1428-00038-005
Rock core composite, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	0.0	Mass Suspended (mg)	58.5
Split Mass (g)	0	Suspension Volume (ml)	500
Sieved Mass (g)	0	Volume Filtered (ml)	0.5
		Filter Type & Pore Size:	MCE 0.22µm
		Filter Area (mm ²):	385
		Effective Filter Area (mm ²):	346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<3.0E+07	<3.0E+07	<3.0E+07	<3.0E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0076%	<0.0121%	<0.0121%	<0.0121%*
Struc/gr	<3.0E+7	<3.0E+7	<3.0E+7	<3.0E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Light
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS					ANALYTICAL SENSITIVITY - MASS (pg)			
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area (mm ²)		<5µm	≥5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0098	0.196	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0098	0.049	Amph.	0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 3.02E+07								

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature: *He Meisheng*
QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.:	325873
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-19-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	May-14-2014
		Total Samples Analyzed:	2

SAMPLE DESCRIPTION	
Client Sample #	R-108A, 142.5-208.5'
Laboratory Sample #	1428-00067-002
Rock core composite, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	0.0	Mass Suspended (mg)	61.6
Split Mass (g)	0	Suspension Volume (ml)	500
Sieved Mass (g)	0	Volume Filtered (ml)	0.5
		Filter Type & Pore Size:	MCE 0.22µm
		Filter Area (mm ²):	385
		Effective Filter Area (mm ²):	346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL									
<5µm STRUCTURES					TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total		Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD	Struc Cnt	NSD	NSD	NSD	NSD
Wt. %	<0.0001%	<0.0002%	<0.0002%	<0.0002%*	Wt. %	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.1E+08	<1.1E+08	<1.1E+08	<1.1E+08*	Struc/gr	NA	NA	NA	NA
>=5µm STRUCTURES					TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total		Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD	Struc Cnt	NSD	NSD	NSD	NSD
Wt. %	<0.0001%	<0.0018%	<0.0018%	<0.0018%*	Wt. %	<0.0072%	<0.0115%	<0.0115%	<0.0115%*
Struc/gr	<2.9E+07	<2.9E+07	<2.9E+07	<2.9E+07*	Struc/gr	<2.9E+7	<2.9E+7	<2.9E+7	<2.9E+7*
COMMENTS									
No Asbestos Detected					Final Sieve Type: -200 (75µm) Tyler Mesh Filter Loading: Light SAED Photo Nos.				

TEM ANALYTICAL PARAMETERS					ANALYTICAL SENSITIVITY - MASS (pg)			
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area (mm ²)		<5µm	>=5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0098	0.196	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0098	0.049	Amph.	0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 2.87E+07								

NOTATION KEY

NSD - No Structures Detected	Struc Cnt = Structure Count
* - Analytical Sensitivity used	Wt. % = Weight percent
E = to the power of 10	Struc/gr = Structure per gram

Mona Prochovnic
Analyst Signature

Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **325369**
Date: May-09-2014
Date Received: Apr-15-2014
Total Samples Analyzed: 9

SAMPLE DESCRIPTION

Client Sample # **R-109, 7.0-59.1'**
Laboratory Sample # 1428-00055-004

Rock core composite, sample crushed

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 0.0 Mass Suspended (mg) 59.8 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 0 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<3.0E+07	<3.0E+07	<3.0E+07	<3.0E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0074%	<0.0118%	<0.0118%	<0.0118%*
Struc/gr	<3.0E+7	<3.0E+7	<3.0E+7	<3.0E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Light
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0098	0.196
<5µm Strucs.	5	18,000X	0.0098	0.049

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **2.95E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Michael Conlon
Analyst Signature
Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **325369**
Date: May-09-2014
Date Received: Apr-15-2014
Total Samples Analyzed: 9

SAMPLE DESCRIPTION

Client Sample # **R-109, 59.1-100.0'**
Laboratory Sample # 1428-00055-005

Rock core composite, sample crushed

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 0.0 Mass Suspended (mg) 61.3 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 0 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0018%	<0.0018%	<0.0018%*
Struc/gr	<2.9E+07	<2.9E+07	<2.9E+07	<2.9E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0072%	<0.0115%	<0.0115%	<0.0115%*
Struc/gr	<2.9E+7	<2.9E+7	<2.9E+7	<2.9E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Light
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0098	0.196
<5µm Strucs.	5	18,000X	0.0098	0.049

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **2.88E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Michael Conlon
Analyst Signature
Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman	REPORT NO. 325369
Address: Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date: <u>May-09-2014</u> Date Received: <u>Apr-15-2014</u>
Job Site/ No. Boulder City Bypass 137120.12	Total Samples Analyzed: <u>9</u>

SAMPLE DESCRIPTION	
Client Sample #	R-110, 5.0-59.5'
Laboratory Sample #	1428-00055-007
Rock core composite, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>0.0</u>	Mass Suspended (mg)	<u>59.2</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>0</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22µm</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<3.0E+07	<3.0E+07	<3.0E+07	<3.0E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0075%	<0.0119%	<0.0119%	<0.0119%*
Struc/gr	<3.0E+7	<3.0E+7	<3.0E+7	<3.0E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type:	-200 (75µm) Tyler Mesh
Filter Loading:	Light
SAED Photo Nos.	

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (µg)				
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0098	0.196	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0098	0.049	Amph.	0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 2.98E+07								

NOTATION KEY

NSD - No Structures Detected	Struc Cnt = Structure Count
* - Analytical Sensitivity used	Wt.% = Weight percent
E = to the power of 10	Struc/gr = Structure per gram

Michael Conlon

Analyst Signature

Stephanie Dunn

QC Reviewer Signature

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P: (510) 704-8930 F: (510) 704-8429
 P: (775) 359-3377 F: (775) 359-2798



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **325367**
Date: May-09-2014
Date Received: Apr-15-2014
Total Samples Analyzed: 9

SAMPLE DESCRIPTION

Client Sample # **R-110, 59.5-115.4'**
Laboratory Sample # 1428-00053-001

Rock core composite, sample crushed

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 0.0 Mass Suspended (mg) 58.9 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 0 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<u><5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.002%	<0.0002%	0.002%
Struc/gr	<1.2E+08	1.2E+08	<1.2E+08	1.2E+08

<u>TOTAL STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.002%	<0.0002%	0.002%
Struc/gr	NA	1.2E+08	NA	1.2E+08

<u>>=5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<3.0E+07	<3.0E+07	<3.0E+07	<3.0E+07*

<u>TOTAL PCME</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0075%	<0.0120%	<0.0120%	<0.0120%*
Struc/gr	<3.0E+7	<3.0E+7	<3.0E+7	<3.0E+7*

COMMENTS

Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Light
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0098	0.196
<5µm Strucs.	5	18,000X	0.0098	0.049

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.00E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Ana Bozhanovic
Analyst Signature
Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **325367**
Date: May-09-2014
Date Received: Apr-15-2014
Total Samples Analyzed: 9

SAMPLE DESCRIPTION

Client Sample # **R-110, 115.4-166.5'**
Laboratory Sample # 1428-00053-002

Rock core composite, sample crushed

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 0.0 Mass Suspended (mg) 60.6 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 0 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<u><5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

<u>TOTAL STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

<u>>=5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<2.9E+07	<2.9E+07	<2.9E+07	<2.9E+07*

<u>TOTAL PCME</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0073%	<0.0117%	<0.0117%	<0.0117%*
Struc/gr	<2.9E+7	<2.9E+7	<2.9E+7	<2.9E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Light
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0098	0.196
<5µm Strucs.	5	18,000X	0.0098	0.049

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **2.91E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Ana Bozhanovic
Analyst Signature
Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	325367
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Apr-15-2014
		Total Samples Analyzed:	9

SAMPLE DESCRIPTION	
Client Sample #	R-110, 166.5-217.0'
Laboratory Sample #	1428-00053-003
Rock core composite, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>0.0</u>	Mass Suspended (mg)	<u>61.9</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>0</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22µm</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL									
<5µm STRUCTURES					TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total		Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD	Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*	Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.1E+08	<1.1E+08	<1.1E+08	<1.1E+08*	Struc/gr	NA	NA	NA	NA
≥5µm STRUCTURES					TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total		Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD	Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0018%	<0.0018%	<0.0018%*	Wt.%	<0.0071%	<0.0114%	<0.0114%	<0.0114%*
Struc/gr	<2.9E+07	<2.9E+07	<2.9E+07	<2.9E+07*	Struc/gr	<2.9E+7	<2.9E+7	<2.9E+7	<2.9E+7*
COMMENTS									
No Asbestos Detected					Final Sieve Type: -200 (75µm) Tyler Mesh Filter Loading: Light SAED Photo Nos.				

TEM ANALYTICAL PARAMETERS					ANALYTICAL SENSITIVITY - MASS (pg)			
	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME
>=5µm Strucs.	20	10,000X	0.0098	0.196	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0098	0.049	Amph.	0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 2.85E+07								

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
 * - Analytical Sensitivity used Wt.% = Weight percent
 E = to the power of 10 Struc/gr = Structure per gram

Ana Bozhanovic
 Analyst Signature

Stephanie Dunn
 QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	325369
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Apr-15-2014
		Total Samples Analyzed:	<u>9</u>

SAMPLE DESCRIPTION	
Client Sample #	R-111, 0.8-53.0'
Laboratory Sample #	1428-00055-008
Rock core composite, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>0.0</u>	Mass Suspended (mg)	<u>59.5</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>0</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22µm</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	21	NSD	21
Wt.%	<0.0001%	0.099%	<0.0002%	0.099%
Struc/gr	<1.2E+08	2.5E+09	<1.2E+08	2.5E+09

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	41	NSD	41
Wt.%	<0.0001%	0.248%	<0.0002%	0.248%
Struc/gr	NA	3.1E+09	NA	3.1E+09

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	20	NSD	20
Wt.%	<0.0001%	0.149%	<0.0019%	0.149%
Struc/gr	<3.0E+07	5.9E+08	<3.0E+07	5.9E+08

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	10	NSD	10
Wt.%	<0.0074%	0.137%	<0.0119%	0.137%
Struc/gr	<3.0E+7	1.2E+09	<3.0E+7	1.2E+09

COMMENTS

Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Light
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (pg)				
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
≥5µm Strucs.	20	10,000X	0.0098	0.196	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0098	0.049	Amph.	0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 2.97E+07								

NOTATION KEY

- NSD - No Structures Detected
- * - Analytical Sensitivity used
- E = to the power of 10
- Struc Cnt = Structure Count
- Wt.% = Weight percent
- Struc/gr = Structure per gram

Michael Conlon
Analyst Signature

Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **325369**
Date: May-09-2014
Date Received: Apr-15-2014
Total Samples Analyzed: 9

SAMPLE DESCRIPTION

Client Sample # **R-111, 53.0-83.2'**
Laboratory Sample # 1428-00055-009

Rock core composite, sample crushed

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 0.0 Mass Suspended (mg) 60.2 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 0 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	14	3	17
Wt.%	<0.0001%	0.155%	0.003%	0.159%
Struc/gr	<1.2E+08	1.6E+09	3.5E+08	2.0E+09

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	25	5	30
Wt.%	<0.0001%	1.721%	0.004%	1.726%
Struc/gr	NA	2.0E+09	4.1E+08	2.4E+09

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	11	2	13
Wt.%	<0.0001%	1.566%	0.001%	1.567%
Struc/gr	<2.9E+07	3.2E+08	5.9E+07	3.8E+08

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	6	NSD	6
Wt.%	<0.0073%	1.563%	<0.0117%	1.563%
Struc/gr	<2.9E+7	7.0E+08	<2.9E+7	7.0E+08

COMMENTS

Actinolite & Hornblende Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Light
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0098	0.196
<5µm Strucs.	5	18,000X	0.0098	0.049

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **2.93E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Michael Conlon
Analyst Signature
Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	325367
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Apr-15-2014
		Total Samples Analyzed:	9

SAMPLE DESCRIPTION	
Client Sample #	R-112, 0-60.0'
Laboratory Sample #	1428-00053-004
Rock core composite, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	0.0	Mass Suspended (mg)	60
Split Mass (g)	0	Suspension Volume (ml)	500
Sieved Mass (g)	0	Volume Filtered (ml)	0.5
		Filter Type & Pore Size:	MCE 0.22µm
		Filter Area (mm ²):	385
		Effective Filter Area (mm ²):	346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<2.9E+07	<2.9E+07	<2.9E+07	<2.9E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0074%	<0.0118%	<0.0118%	<0.0118%*
Struc/gr	<2.9E+7	<2.9E+7	<2.9E+7	<2.9E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Light
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS					ANALYTICAL SENSITIVITY - MASS (µg)			
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0098	0.196	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0098	0.049	Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = 2.94E+07

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Ana Bozhanovic
Analyst Signature

Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	325367
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Apr-15-2014
		Total Samples Analyzed:	9

SAMPLE DESCRIPTION	
Client Sample #	R-112, 60.0-90.0'
Laboratory Sample #	1428-00053-005
Rock core composite, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	0.0	Mass Suspended (mg)	60.1
Split Mass (g)	0	Suspension Volume (ml)	500
Sieved Mass (g)	0	Volume Filtered (ml)	0.5
		Filter Type & Pore Size:	MCE 0.22µm
		Filter Area (mm ²):	385
		Effective Filter Area (mm ²):	346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	35	NSD	35
Wt.%	<0.0001%	0.302%	<0.0003%	0.302%
Struc/gr	<2.0E+08	6.9E+09	<2.0E+08	6.9E+09

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	47	NSD	47
Wt.%	<0.0001%	0.466%	<0.0003%	0.466%
Struc/gr	NA	7.2E+09	NA	7.2E+09

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	12	NSD	12
Wt.%	<0.0001%	0.165%	<0.0031%	0.165%
Struc/gr	<2.9E+07	3.5E+08	<2.9E+07	3.5E+08

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	10	NSD	10
Wt.%	<0.0123%	0.159%	<0.0196%	0.159%
Struc/gr	<2.9E+7	2.0E+09	<2.9E+7	2.0E+09

COMMENTS

Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Light
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS					ANALYTICAL SENSITIVITY - MASS (pg)			
	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME
>=5µm Strucs.	20	10,000X	0.0098	0.196	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	3	18,000X	0.0098	0.0294	Amph.	0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 2.94E+07								

NOTATION KEY

- NSD - No Structures Detected
- * - Analytical Sensitivity used
- E = to the power of 10
- Struc Cnt = Structure Count
- Wt.% = Weight percent
- Struc/gr = Structure per gram

Ana Bozhanovic
Analyst Signature

Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.:	325165
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	Aug-01-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Apr-04-2014
		Total Samples Analyzed:	9

SAMPLE DESCRIPTION	
Client Sample #	R-112, 90.0-149.0'
Laboratory Sample #	1428-00038-006
Rock core composite, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	0.0	Mass Suspended (mg)	57.3
Split Mass (g)	0	Suspension Volume (ml)	500
Sieved Mass (g)	0	Volume Filtered (ml)	0.5
		Filter Type & Pore Size:	MCE 0.22µm
		Filter Area (mm ²):	385
		Effective Filter Area (mm ²):	346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	30	NSD	30
Wt.%	<0.0001%	0.056%	<0.0002%	0.056%
Struc/gr	<1.2E+08	3.7E+09	<1.2E+08	3.7E+09

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	34	NSD	34
Wt.%	<0.0001%	0.065%	<0.0002%	0.065%
Struc/gr	NA	3.8E+09	NA	3.8E+09

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	4	NSD	4
Wt.%	<0.0001%	0.009%	<0.0020%	0.009%
Struc/gr	<3.1E+07	1.2E+08	<3.1E+07	1.2E+08

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0077%	<0.0123%	<0.0123%	<0.0123%*
Struc/gr	<3.1E+7	<3.1E+7	<3.1E+7	<3.1E+7*

COMMENTS

Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (pg)			
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)	<5µm	≥5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0098	0.196	Chrys. 0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0098	0.049	Amph. 0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 3.08E+07							

NOTATION KEY

- NSD - No Structures Detected
- * - Analytical Sensitivity used
- E = to the power of 10
- Struc Cnt = Structure Count
- Wt.% = Weight percent
- Struc/gr = Structure per gram

Analyst Signature: *He Meisheng*

QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	325367
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Apr-15-2014
		Total Samples Analyzed:	9

SAMPLE DESCRIPTION	
Client Sample #	R-112, 149.0-185.0'
Laboratory Sample #	1428-00053-006
Rock core composite, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	0.0	Mass Suspended (mg)	59
Split Mass (g)	0	Suspension Volume (ml)	500
Sieved Mass (g)	0	Volume Filtered (ml)	0.5
		Filter Type & Pore Size:	MCE 0.22µm
		Filter Area (mm ²):	385
		Effective Filter Area (mm ²):	346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	33	NSD	33
Wt.%	<0.0001%	0.511%	<0.0010%	0.511%
Struc/gr	<6.0E+08	2.0E+10	<6.0E+08	2.0E+10

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	87	NSD	87
Wt.%	<0.0001%	2.380%	<0.0010%	2.380%
Struc/gr	NA	2.1E+10	NA	2.1E+10

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	54	NSD	54
Wt.%	<0.0001%	1.869%	<0.0096%	1.869%
Struc/gr	<3.0E+07	1.6E+09	<3.0E+07	1.6E+09

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	33	NSD	33
Wt.%	<0.0375%	1.819%	<0.0598%	1.819%
Struc/gr	<3.0E+7	2.0E+10	<3.0E+7	2.0E+10

COMMENTS

Winchite & Actinolite Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Light
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS					ANALYTICAL SENSITIVITY - MASS (µg)			
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0098	0.196	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	1	18,000X	0.0098	0.0098	Amph.	0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 2.99E+07								

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Ana Bozhanovic
Analyst Signature

Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	325387
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Apr-16-2014
		Total Samples Analyzed:	<u>7</u>

SAMPLE DESCRIPTION	
Client Sample #	P-5, 0-46.1'
Laboratory Sample #	1428-00056-005
Rock core composite, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>0.0</u>	Mass Suspended (mg)	<u>61.4</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>0</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22µm</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0018%	<0.0018%	<0.0018%*
Struc/gr	<2.9E+07	<2.9E+07	<2.9E+07	<2.9E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0072%	<0.0115%	<0.0115%	<0.0115%*
Struc/gr	<2.9E+7	<2.9E+7	<2.9E+7	<2.9E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (µg)				
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
≥5µm Strucs.	20	10,000X	0.0098	0.196	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0098	0.049	Amph.	0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 2.88E+07								

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature *He Meisheng*
QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	325387
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	May-09-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Apr-16-2014
		Total Samples Analyzed:	<u>7</u>

SAMPLE DESCRIPTION

Client Sample #	P-5, 46.1-100.5'	Rock core composite, sample crushed
Laboratory Sample #	1428-00056-006	

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g)	<u>0.0</u>	Mass Suspended (mg)	<u>59.3</u>	Filter Type & Pore Size:	<u>MCE 0.22µm</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>	Filter Area (mm ²):	<u>385</u>
Sieved Mass (g)	<u>0</u>	Volume Filtered (ml)	<u>0.5</u>	Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*
Struc/gr	<3.0E+07	<3.0E+07	<3.0E+07	<3.0E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0075%	<0.0119%	<0.0119%	<0.0119%*
Struc/gr	<3.0E+7	<3.0E+7	<3.0E+7	<3.0E+7*

COMMENTS

No Asbestos Detected	Final Sieve Type: -200 (75µm) Tyler Mesh
	Filter Loading: Moderate
	SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0098	0.196
<5µm Strucs.	5	18,000X	0.0098	0.049

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **2.98E+07**

NOTATION KEY

NSD - No Structures Detected	Struc Cnt = Structure Count
* - Analytical Sensitivity used	Wt.% = Weight percent
E = to the power of 10	Struc/gr = Structure per gram

Analyst Signature *He Meisheng*

QC Reviewer Signature *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman	REPORT NO. 325387
Address: Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date: <u>May-09-2014</u> Date Received: <u>Apr-16-2014</u>
Job Site/ No. Boulder City Bypass 137120.12	Total Samples Analyzed: <u>7</u>

SAMPLE DESCRIPTION	
Client Sample #	P-5, 100.5-150.5'
Laboratory Sample #	1428-00056-007
Rock core composite, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>0.0</u>	Mass Suspended (mg)	<u>61.2</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>0</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22µm</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

≥5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0018%	<0.0018%	<0.0018%*
Struc/gr	<2.9E+07	<2.9E+07	<2.9E+07	<2.9E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0072%	<0.0115%	<0.0115%	<0.0115%*
Struc/gr	<2.9E+7	<2.9E+7	<2.9E+7	<2.9E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type:	-200 (75µm) Tyler Mesh
Filter Loading:	Moderate
SAED Photo Nos.	

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (pg)				
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	≥5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0098	0.196	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0098	0.049	Amph.	0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 2.88E+07								

NOTATION KEY

NSD - No Structures Detected	Struc Cnt = Structure Count
* - Analytical Sensitivity used	Wt.% = Weight percent
E = to the power of 10	Struc/gr = Structure per gram

Analyst Signature

QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **324694**
Date: May-09-2014
Date Received: Mar-11-2014
Total Samples Analyzed: 3

SAMPLE DESCRIPTION

Client Sample # **R-114, 0-5'**
Laboratory Sample # 1428-00015-001

Auger cuttings, sample sieved (200 mesh)

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 2706.2 Mass Suspended (mg) 58.7 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 141.41 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.3E+08	<1.3E+08	<1.3E+08	<1.3E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0020%	<0.0020%	<0.0020%*
Struc/gr	<3.1E+07	<3.1E+07	<3.1E+07	<3.1E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0078%	<0.0125%	<0.0125%	<0.0125%*
Struc/gr	<3.1E+7	<3.1E+7	<3.1E+7	<3.1E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Light
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

	Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094	0.188
<5µm Strucs.	5	18,000X	0.0094	0.047

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.14E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Michael Conlon
Analyst Signature
Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **324694**
Date: May-09-2014
Date Received: Mar-11-2014
Total Samples Analyzed: 3

SAMPLE DESCRIPTION

Client Sample # **R-115, 0-5'**
Laboratory Sample # 1428-00015-002

Auger cuttings, sample sieved (200 mesh)

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 2101.2 Mass Suspended (mg) 59.5 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 200.14 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<u><5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.018%	<0.0002%	0.018%
Struc/gr	<1.2E+08	1.2E+08	<1.2E+08	1.2E+08

<u>TOTAL STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	2	1	3
Wt.%	<0.0001%	0.409%	0.001%	0.410%
Struc/gr	NA	1.5E+08	3.1E+07	1.9E+08

<u>>=5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	1	2
Wt.%	<0.0001%	0.391%	0.001%	0.392%
Struc/gr	<3.1E+07	3.1E+07	3.1E+07	6.2E+07

<u>TOTAL PCME</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0077%	0.391%	<0.0124%	0.391%
Struc/gr	<3.1E+7	1.2E+08	<3.1E+7	1.2E+08

COMMENTS

2 Actinolite, 1 Mg-Hornblende Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Light
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094
<5µm Strucs.	5	18,000X	0.0094

ANALYTICAL SENSITIVITY - MASS (pg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.09E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Michael Conlon
Analyst Signature

Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman
Address: Kleinfelder
6380 S Polaris Avenue
Las Vegas, NV 89118
Job Site/ Boulder City Bypass
No. 137120.12

REPORT NO. **324694**
Date: May-09-2014
Date Received: Mar-11-2014
Total Samples Analyzed: 3

SAMPLE DESCRIPTION

Client Sample # **R-116, 0-5'**
Laboratory Sample # 1428-00015-003

Auger cuttings, sample sieved (200 mesh)

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g) 2528.2 Mass Suspended (mg) 58.2 Filter Type & Pore Size: MCE 0.22µm
Split Mass (g) 0 Suspension Volume (ml) 500 Filter Area (mm²): 385
Sieved Mass (g) 316.42 Volume Filtered (ml) 0.5 Effective Filter Area (mm²): 346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.3E+08	<1.3E+08	<1.3E+08	<1.3E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0020%	<0.0020%	<0.0020%*
Struc/gr	<3.2E+07	<3.2E+07	<3.2E+07	<3.2E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0079%	<0.0126%	<0.0126%	<0.0126%*
Struc/gr	<3.2E+7	<3.2E+7	<3.2E+7	<3.2E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS

Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)
>=5µm Strucs.	20	10,000X	0.0094
<5µm Strucs.	5	18,000X	0.0094

ANALYTICAL SENSITIVITY - MASS (µg)

	<5µm	>=5µm	PCME
Chrys.	0.0004	0.004	0.63
Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **3.16E+07**

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Michael Conlon
Analyst Signature
Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	323095
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	<u>Jun-17-2014</u>
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	<u>Jan-03-2014</u>
		Total Samples Analyzed:	<u>10</u>

SAMPLE DESCRIPTION	
Client Sample #	R-117, 0-5'
Laboratory Sample #	1428-00001-010
Auger Cuttings, sample sieved (200 mesh)	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>2610.7</u>	Mass Suspended (mg)	<u>65.1</u>
Split Mass (g)	<u>1321</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>51.15</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22µm</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL									
<u><10µm STRUCTURES</u>					<u>TOTAL STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total		Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD	Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*	Wt.%	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*	Struc/gr	NA	NA	NA	NA
<u>>=10µm STRUCTURES</u>					<u>TOTAL PCME</u>				
	Chrysotile	Actinolite	Hornblende	Total		Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD	Struc Cnt	NA	NA	NA	NA
Wt.%	<0.0001%	<0.0019%	<0.0019%	<0.0019%*	Wt.%	NA	NA	NA	NA
Struc/gr	<3.0E+07	<3.0E+07	<3.0E+07	<3.0E+07*	Struc/gr	NA	NA	NA	NA

COMMENTS	
No Asbestos Detected	Final Sieve Type: -200 (710µm) Tyler Mesh Filter Loading: Moderate SAED Photo Nos.

TEM ANALYTICAL PARAMETERS					ANALYTICAL SENSITIVITY - MASS (pg)			
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<10µm	>=10µm	PCME	
>=10µm Strucs.	20	10,000X	0.0088	0.176	Chrys.	0.0004	0.004	NA
<10µm Strucs.	5	18,000X	0.0088	0.044	Amph.	0.0160	0.160	NA
PCME ANALYTICAL SENSITIVITY - STRUC/GR = NA								

NOTATION KEY

NSD - No Structures Detected	Struc Cnt = Structure Count
* - Analytical Sensitivity used	Wt.% = Weight percent
E = to the power of 10	Struc/gr = Structure per gram

Analyst Signature: *Hu Meisheng*

QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.:	326057
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	Jun-02-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	May-27-2014
		Total Samples Analyzed:	8

SAMPLE DESCRIPTION	
Client Sample #	TS-3
Laboratory Sample #	1428-00068-001
Surficial sample of rock outcrop, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	0.0	Mass Suspended (mg)	60.5
Split Mass (g)	0	Suspension Volume (ml)	500
Sieved Mass (g)	0	Volume Filtered (ml)	0.5
		Filter Type & Pore Size:	MCE 0.22µm
		Filter Area (mm ²):	385
		Effective Filter Area (mm ²):	346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt. %	<0.0001%	<0.0003%	<0.0003%	<0.0003%*
Struc/gr	<1.9E+08	<1.9E+08	<1.9E+08	<1.9E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt. %	<0.0001%	<0.0003%	<0.0003%	<0.0003%*
Struc/gr	NA	NA	NA	NA

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt. %	<0.0001%	<0.0031%	<0.0031%	<0.0031%*
Struc/gr	<2.9E+07	<2.9E+07	<2.9E+07	<2.9E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt. %	<0.0122%	<0.0195%	<0.0195%	<0.0195%*
Struc/gr	<2.9E+7	<2.9E+7	<2.9E+7	<2.9E+7*

COMMENTS	
No Asbestos Detected	Final Sieve Type: -200 (75µm) Tyler Mesh Filter Loading: Moderate SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (pg)			
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area (mm ²)	<5µm	>=5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0098	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	3	18,000X	0.0098	Amph.	0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 2.92E+07							

NOTATION KEY

NSD - No Structures Detected	Struc Cnt = Structure Count
* - Analytical Sensitivity used	Wt. % = Weight percent
E = to the power of 10	Struc/gr = Structure per gram

Analyst Signature: *Hu Meishong*

QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.:	326057
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	Jun-02-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	May-27-2014
		Total Samples Analyzed:	8

SAMPLE DESCRIPTION	
Client Sample #	TS-4
Laboratory Sample #	1428-00068-002
Surficial sample of rock outcrop, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	0.0	Mass Suspended (mg)	59.5
Split Mass (g)	0	Suspension Volume (ml)	500
Sieved Mass (g)	0	Volume Filtered (ml)	0.5
		Filter Type & Pore Size:	MCE 0.22µm
		Filter Area (mm ²):	385
		Effective Filter Area (mm ²):	346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.007%	<0.0003%	0.007%
Struc/gr	<2.0E+08	2.0E+08	<2.0E+08	2.0E+08

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	2	NSD	2
Wt.%	<0.0001%	0.273%	<0.0003%	0.273%
Struc/gr	NA	2.2E+08	NA	2.2E+08

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0001%	0.266%	<0.0032%	0.266%
Struc/gr	<2.0E+07	2.0E+07	<2.0E+07	2.0E+07

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt.%	<0.0124%	0.266%	<0.0198%	0.266%
Struc/gr	<2.0E+7	2.0E+08	<2.0E+7	2.0E+08

COMMENTS	
Actinolite Fibers Detected	Final Sieve Type: -200 (75µm) Tyler Mesh Filter Loading: Moderate SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (pg)		
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area (mm ²)	<5µm	>=5µm	PCME
>=5µm Strucs.	30	10,000X	0.0098	Chrys.	0.0004	0.63
<5µm Strucs.	3	18,000X	0.0098	Amph.	0.0160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 1.98E+07						

NOTATION KEY

NSD - No Structures Detected	Struc Cnt = Structure Count
* - Analytical Sensitivity used	Wt.% = Weight percent
E = to the power of 10	Struc/gr = Structure per gram

Analyst Signature: *Hu Meishong*

QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman	REPORT NO. 326057
Address: Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date: Jun-02-2014 Date Received: May-27-2014
Job Site/ No. Boulder City Bypass 137120.12	Total Samples Analyzed: 8

SAMPLE DESCRIPTION	
Client Sample # TS-5	Surficial sample of rock outcrop, sample crushed
Laboratory Sample # 1428-00068-003	


SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g) <u>0.0</u>	Mass Suspended (mg) <u>59.8</u>	Filter Type & Pore Size: <u>MCE 0.22µm</u>	
Split Mass (g) <u>0</u>	Suspension Volume (ml) <u>500</u>	Filter Area (mm ²): <u>385</u>	
Sieved Mass (g) <u>0</u>	Volume Filtered (ml) <u>0.5</u>	Effective Filter Area (mm ²): <u>346</u>	


TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL									
<5µm STRUCTURES					TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total		Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD	Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0003%	<0.0003%	<0.0003%*	Wt.%	<0.0001%	<0.0003%	<0.0003%	<0.0003%*
Struc/gr	<2.0E+08	<2.0E+08	<2.0E+08	<2.0E+08*	Struc/gr	NA	NA	NA	NA
>=5µm STRUCTURES					TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total		Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD	Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0031%	<0.0031%	<0.0031%*	Wt.%	<0.0123%	<0.0197%	<0.0197%	<0.0197%*
Struc/gr	<3.0E+07	<3.0E+07	<3.0E+07	<3.0E+07*	Struc/gr	<3.0E+7	<3.0E+7	<3.0E+7	<3.0E+7*
COMMENTS									
No Asbestos Detected					Final Sieve Type: -200 (75µm) Tyler Mesh Filter Loading: Moderate SAED Photo Nos.				

TEM ANALYTICAL PARAMETERS					ANALYTICAL SENSITIVITY - MASS (pg)			
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)		<5µm	>=5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0098	0.196	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	3	18,000X	0.0098	0.0294	Amph.	0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 2.95E+07								

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
 * - Analytical Sensitivity used Wt.% = Weight percent
 E = to the power of 10 Struc/gr = Structure per gram


 Analyst Signature


 QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.:	326057
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	Jun-02-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	May-27-2014
		Total Samples Analyzed:	8

SAMPLE DESCRIPTION	
Client Sample #	TS-10
Laboratory Sample #	1428-00068-008
Surficial sample of rock outcrop, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	0.0	Mass Suspended (mg)	59.6
Split Mass (g)	0	Suspension Volume (ml)	500
Sieved Mass (g)	0	Volume Filtered (ml)	0.5
		Filter Type & Pore Size:	MCE 0.22µm
		Filter Area (mm ²):	385
		Effective Filter Area (mm ²):	346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt. %	<0.0001%	<0.0003%	<0.0003%	<0.0003%*
Struc/gr	<2.0E+08	<2.0E+08	<2.0E+08	<2.0E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt. %	<0.0001%	<0.0003%	<0.0003%	<0.0003%*
Struc/gr	NA	NA	NA	NA

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt. %	<0.0001%	<0.0032%	<0.0032%	<0.0032%*
Struc/gr	<3.0E+07	<3.0E+07	<3.0E+07	<3.0E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt. %	<0.0124%	<0.0197%	<0.0197%	<0.0197%*
Struc/gr	<3.0E+7	<3.0E+7	<3.0E+7	<3.0E+7*

COMMENTS	
No Asbestos Detected	Final Sieve Type: -200 (75µm) Tyler Mesh Filter Loading: Moderate SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (pg)			
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area (mm ²)	<5µm	>=5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0098	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	3	18,000X	0.0098	Amph.	0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 2.96E+07							

NOTATION KEY

NSD - No Structures Detected	Struc Cnt = Structure Count
* - Analytical Sensitivity used	Wt. % = Weight percent
E = to the power of 10	Struc/gr = Structure per gram

Analyst Signature: *Hu Meishong*

QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.:	326057
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	Jun-02-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	May-27-2014
		Total Samples Analyzed:	8

SAMPLE DESCRIPTION	
Client Sample #	TS-9
Laboratory Sample #	1428-00068-007
Surficial sample of rock outcrop, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	0.0	Mass Suspended (mg)	59.9
Split Mass (g)	0	Suspension Volume (ml)	500
Sieved Mass (g)	0	Volume Filtered (ml)	0.5
		Filter Type & Pore Size:	MCE 0.22µm
		Filter Area (mm ²):	385
		Effective Filter Area (mm ²):	346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL									
<5µm STRUCTURES					TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total		Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD	Struc Cnt	NSD	NSD	NSD	NSD
Wt. %	<0.0001%	<0.0003%	<0.0003%	<0.0003%*	Wt. %	<0.0001%	<0.0003%	<0.0003%	<0.0003%*
Struc/gr	<2.0E+08	<2.0E+08	<2.0E+08	<2.0E+08*	Struc/gr	NA	NA	NA	NA
>=5µm STRUCTURES					TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total		Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD	Struc Cnt	NSD	NSD	NSD	NSD
Wt. %	<0.0001%	<0.0031%	<0.0031%	<0.0031%*	Wt. %	<0.0123%	<0.0196%	<0.0196%	<0.0196%*
Struc/gr	<2.9E+07	<2.9E+07	<2.9E+07	<2.9E+07*	Struc/gr	<2.9E+7	<2.9E+7	<2.9E+7	<2.9E+7*
COMMENTS									
No Asbestos Detected					Final Sieve Type: -200 (75µm) Tyler Mesh				
					Filter Loading: Moderate				
					SAED Photo Nos.				

TEM ANALYTICAL PARAMETERS					ANALYTICAL SENSITIVITY - MASS (pg)			
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area (mm ²)		<5µm	>=5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0098	0.196	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	3	18,000X	0.0098	0.0294	Amph.	0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 2.95E+07								

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
 * - Analytical Sensitivity used Wt. % = Weight percent
 E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature: *Hu Meishong*
 QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.:	326057
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	Jun-02-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	May-27-2014
		Total Samples Analyzed:	8

SAMPLE DESCRIPTION	
Client Sample #	TS-8
Laboratory Sample #	1428-00068-006
Surficial sample of rock outcrop, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	0.0	Mass Suspended (mg)	61.6
Split Mass (g)	0	Suspension Volume (ml)	500
Sieved Mass (g)	0	Volume Filtered (ml)	0.5
		Filter Type & Pore Size:	MCE 0.22µm
		Filter Area (mm ²):	385
		Effective Filter Area (mm ²):	346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt. %	<0.0001%	<0.0003%	<0.0003%	<0.0003%*
Struc/gr	<1.9E+08	<1.9E+08	<1.9E+08	<1.9E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt. %	<0.0001%	<0.0003%	<0.0003%	<0.0003%*
Struc/gr	NA	NA	NA	NA

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt. %	<0.0001%	<0.0031%	<0.0031%	<0.0031%*
Struc/gr	<2.9E+07	<2.9E+07	<2.9E+07	<2.9E+07*

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt. %	<0.0120%	<0.0191%	<0.0191%	<0.0191%*
Struc/gr	<2.9E+7	<2.9E+7	<2.9E+7	<2.9E+7*

COMMENTS	
No Asbestos Detected	Final Sieve Type: -200 (75µm) Tyler Mesh Filter Loading: Moderate SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (pg)			
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area (mm ²)	<5µm	>=5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0098	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	3	18,000X	0.0098	Amph.	0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 2.87E+07							

NOTATION KEY

NSD - No Structures Detected	Struc Cnt = Structure Count
* - Analytical Sensitivity used	Wt. % = Weight percent
E = to the power of 10	Struc/gr = Structure per gram

Analyst Signature: *Hu Meishong*

QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.:	326057
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	Jun-02-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	May-27-2014
		Total Samples Analyzed:	8

SAMPLE DESCRIPTION	
Client Sample #	TS-7
Laboratory Sample #	1428-00068-005
Surficial sample of rock outcrop, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	0.0	Mass Suspended (mg)	61.4
Split Mass (g)	0	Suspension Volume (ml)	500
Sieved Mass (g)	0	Volume Filtered (ml)	0.5
		Filter Type & Pore Size:	MCE 0.22µm
		Filter Area (mm ²):	385
		Effective Filter Area (mm ²):	346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL									
<5µm STRUCTURES					TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total		Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD	Struc Cnt	NSD	NSD	NSD	NSD
Wt. %	<0.0001%	<0.0003%	<0.0003%	<0.0003%*	Wt. %	<0.0001%	<0.0003%	<0.0003%	<0.0003%*
Struc/gr	<1.9E+08	<1.9E+08	<1.9E+08	<1.9E+08*	Struc/gr	NA	NA	NA	NA
>=5µm STRUCTURES					TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total		Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD	Struc Cnt	NSD	NSD	NSD	NSD
Wt. %	<0.0001%	<0.0031%	<0.0031%	<0.0031%*	Wt. %	<0.0120%	<0.0192%	<0.0192%	<0.0192%*
Struc/gr	<2.9E+07	<2.9E+07	<2.9E+07	<2.9E+07*	Struc/gr	<2.9E+7	<2.9E+7	<2.9E+7	<2.9E+7*
COMMENTS									
No Asbestos Detected					Final Sieve Type: -200 (75µm) Tyler Mesh				
					Filter Loading: Moderate				
					SAED Photo Nos.				

TEM ANALYTICAL PARAMETERS					ANALYTICAL SENSITIVITY - MASS (pg)			
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area (mm ²)		<5µm	>=5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0098	0.196	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	3	18,000X	0.0098	0.0294	Amph.	0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 2.88E+07								

NOTATION KEY

NSD - No Structures Detected	Struc Cnt = Structure Count
* - Analytical Sensitivity used	Wt. % = Weight percent
E = to the power of 10	Struc/gr = Structure per gram

Analyst Signature: *Hu Meishong*

QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.:	326057
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	Jun-02-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	May-27-2014
		Total Samples Analyzed:	8

SAMPLE DESCRIPTION	
Client Sample #	TS-6
Laboratory Sample #	1428-00068-004
Surficial sample of rock outcrop, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	0.0	Mass Suspended (mg)	60.8
Split Mass (g)	0	Suspension Volume (ml)	500
Sieved Mass (g)	0	Volume Filtered (ml)	0.5
		Filter Type & Pore Size:	MCE 0.22µm
		Filter Area (mm ²):	385
		Effective Filter Area (mm ²):	346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL									
<5µm STRUCTURES					TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total		Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD	Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0003%	<0.0003%	<0.0003%*	Wt.%	<0.0001%	<0.0003%	<0.0003%	<0.0003%*
Struc/gr	<1.9E+08	<1.9E+08	<1.9E+08	<1.9E+08*	Struc/gr	NA	NA	NA	NA
>=5µm STRUCTURES					TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total		Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD	Struc Cnt	NSD	NSD	NSD	NSD
Wt.%	<0.0001%	<0.0031%	<0.0031%	<0.0031%*	Wt.%	<0.0121%	<0.0194%	<0.0194%	<0.0194%*
Struc/gr	<2.9E+07	<2.9E+07	<2.9E+07	<2.9E+07*	Struc/gr	<2.9E+7	<2.9E+7	<2.9E+7	<2.9E+7*
COMMENTS									
No Asbestos Detected					Final Sieve Type: -200 (75µm) Tyler Mesh				
					Filter Loading: Moderate				
					SAED Photo Nos.				

TEM ANALYTICAL PARAMETERS					ANALYTICAL SENSITIVITY - MASS (pg)			
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area (mm ²)		<5µm	>=5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0098	0.196	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	3	18,000X	0.0098	0.0294	Amph.	0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 2.90E+07								

NOTATION KEY

NSD - No Structures Detected	Struc Cnt = Structure Count
* - Analytical Sensitivity used	Wt.% = Weight percent
E = to the power of 10	Struc/gr = Structure per gram

Analyst Signature: *Hu Meishong*

QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.:	326460
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	Jul-30-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Jan-12-2014
		Total Samples Analyzed:	5

SAMPLE DESCRIPTION	
Client Sample #	TS-11A
Laboratory Sample #	1428-00072-002
Surficial sample of rock outcrop, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	2700.0	Mass Suspended (mg)	59.3
Split Mass (g)	0	Suspension Volume (ml)	500
Sieved Mass (g)	72	Volume Filtered (ml)	0.5
		Filter Type & Pore Size:	MCE 0.22µm
		Filter Area (mm ²):	385
		Effective Filter Area (mm ²):	346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	22	NSD	22
Wt. %	<0.0001%	0.134%	<0.0002%	0.134%
Struc/gr	<1.2E+08	2.6E+09	<1.2E+08	2.6E+09

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	122	NSD	122
Wt. %	<0.0001%	1.512%	<0.0002%	1.512%
Struc/gr	NA	5.6E+09	NA	5.6E+09

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	100	NSD	100
Wt. %	<0.0001%	1.378%	<0.0019%	1.378%
Struc/gr	<3.0E+07	3.0E+09	<3.0E+07	3.0E+09

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	48	NSD	48
Wt. %	<0.0075%	1.240%	<0.0119%	1.240%
Struc/gr	<3.0E+7	5.7E+09	<3.0E+7	5.7E+09

COMMENTS	
Actinolite Asbestos Detected	Final Sieve Type: -200 (75µm) Tyler Mesh Filter Loading: Moderate SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (pg)			
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area (mm ²)	<5µm	>=5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0098	0.196	Chrys. 0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0098	0.049	Amph. 0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 2.98E+07							

NOTATION KEY

NSD - No Structures Detected	Struc Cnt = Structure Count
* - Analytical Sensitivity used	Wt. % = Weight percent
E = to the power of 10	Struc/gr = Structure per gram

Analyst Signature: *Hu Meishong*

QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.:	326460
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	Jul-30-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Jan-12-2014
		Total Samples Analyzed:	5

SAMPLE DESCRIPTION	
Client Sample #	TS-11B
Laboratory Sample #	1428-00072-003
Surficial sample of rock outcrop, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	2700.0	Mass Suspended (mg)	61.8
Split Mass (g)	0	Suspension Volume (ml)	500
Sieved Mass (g)	72	Volume Filtered (ml)	0.5
		Filter Type & Pore Size:	MCE 0.22µm
		Filter Area (mm ²):	385
		Effective Filter Area (mm ²):	346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt. %	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.1E+08	<1.1E+08	<1.1E+08	<1.1E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt. %	<0.0001%	0.155%	<0.0002%	0.155%
Struc/gr	NA	2.9E+07	NA	2.9E+07

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt. %	<0.0001%	0.155%	<0.0018%	0.155%
Struc/gr	<2.9E+07	2.9E+07	<2.9E+07	2.9E+07

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt. %	<0.0072%	0.155%	<0.0114%	0.155%
Struc/gr	<2.9E+7	1.1E+08	<2.9E+7	1.1E+08

COMMENTS	
Large Asbestos Detected	Final Sieve Type: -200 (75µm) Tyler Mesh Filter Loading: Moderate SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (pg)		
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area (mm ²)	<5µm	>=5µm	PCME
>=5µm Strucs.	20	10,000X	0.0098	Chrys.	0.0004	0.63
<5µm Strucs.	5	18,000X	0.0098	Amph.	0.0160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 2.86E+07						

NOTATION KEY

NSD - No Structures Detected	Struc Cnt = Structure Count
* - Analytical Sensitivity used	Wt. % = Weight percent
E = to the power of 10	Struc/gr = Structure per gram

Analyst Signature: *Hu Meishong*

QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	<u>326466</u>
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	<u>Jul-17-2014</u>
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	<u>Jan-13-2014</u>
		Total Samples Analyzed:	<u>3</u>

SAMPLE DESCRIPTION	
Client Sample #	<u>788+60, 0-6"</u>
Laboratory Sample #	<u>1428-00073-002</u>
Surficial, sample sieved (200 mesh)	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>11259.6</u>	Mass Suspended (mg)	<u>61.6</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>345.6</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	<u>MCE 0.22µm</u>
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<u><5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt. %	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.3E+08	<1.3E+08	<1.3E+08	<1.3E+08*

<u>TOTAL STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt. %	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	NA	NA	NA	NA

<u>>=5µm STRUCTURES</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt. %	<0.0001%	<0.0020%	<0.0020%	<0.0020%*
Struc/gr	<3.2E+07	<3.2E+07	<3.2E+07	<3.2E+07*

<u>TOTAL PCME</u>				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt. %	<0.0080%	<0.0128%	<0.0128%	<0.0128%*
Struc/gr	<3.2E+7	<3.2E+7	<3.2E+7	<3.2E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

<u>TEM ANALYTICAL PARAMETERS</u>					<u>ANALYTICAL SENSITIVITY - MASS (pg)</u>			
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area (mm ²)		<5µm	>=5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0088	0.176	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0088	0.044	Amph.	0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 3.19E+07								

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt. % = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Hu Meishang

Analyst Signature

Stephanie Dunn

QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.:	326460
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	Jul-30-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Jan-12-2014
		Total Samples Analyzed:	5

SAMPLE DESCRIPTION	
Client Sample #	TS-12A
Laboratory Sample #	1428-00072-004
Surficial sample of rock outcrop, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	2700.0	Mass Suspended (mg)	60
Split Mass (g)	0	Suspension Volume (ml)	500
Sieved Mass (g)	72	Volume Filtered (ml)	0.5
		Filter Type & Pore Size:	MCE 0.22µm
		Filter Area (mm ²):	385
		Effective Filter Area (mm ²):	346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt. %	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	4	NSD	4
Wt. %	<0.0001%	0.018%	<0.0002%	0.018%
Struc/gr	NA	1.2E+08	NA	1.2E+08

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	4	NSD	4
Wt. %	<0.0001%	0.018%	<0.0019%	0.018%
Struc/gr	<2.9E+07	1.2E+08	<2.9E+07	1.2E+08

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt. %	<0.0074%	0.008%	<0.0118%	0.008%
Struc/gr	<2.9E+7	1.2E+08	<2.9E+7	1.2E+08

COMMENTS	
Large Asbestos Detected	Final Sieve Type: -200 (75µm) Tyler Mesh Filter Loading: Moderate SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (pg)		
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area (mm ²)	<5µm	>=5µm	PCME
>=5µm Strucs.	20	10,000X	0.0098	Chrys.	0.0004	0.63
<5µm Strucs.	5	18,000X	0.0098	Amph.	0.0160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 2.94E+07						

NOTATION KEY

NSD - No Structures Detected	Struc Cnt = Structure Count
* - Analytical Sensitivity used	Wt. % = Weight percent
E = to the power of 10	Struc/gr = Structure per gram

Analyst Signature: *Hu Meishong*

QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman	REPORT NO. 326460
Address: Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date: Jul-30-2014 Date Received: Jan-12-2014
Job Site/ No. Boulder City Bypass 137120.12	Total Samples Analyzed: 5

SAMPLE DESCRIPTION	
Client Sample # TS-12B	Surficial sample of rock outcrop, sample crushed
Laboratory Sample # 1428-00072-005	


SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g) <u>2700.0</u>	Mass Suspended (mg) <u>59.7</u>	Filter Type & Pore Size: <u>MCE 0.22µm</u>	
Split Mass (g) <u>0</u>	Suspension Volume (ml) <u>500</u>	Filter Area (mm ²): <u>385</u>	
Sieved Mass (g) <u>72</u>	Volume Filtered (ml) <u>0.5</u>	Effective Filter Area (mm ²): <u>346</u>	


TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL									
<5µm STRUCTURES					TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total		Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD	Struc Cnt	NSD	NSD	NSD	NSD
Wt. %	<0.0001%	<0.0002%	<0.0002%	<0.0002%*	Wt. %	<0.0001%	<0.0002%	<0.0002%	<0.0002%*
Struc/gr	<1.2E+08	<1.2E+08	<1.2E+08	<1.2E+08*	Struc/gr	NA	NA	NA	NA
>=5µm STRUCTURES					TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total		Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD	Struc Cnt	NSD	NSD	NSD	NSD
Wt. %	<0.0001%	<0.0019%	<0.0019%	<0.0019%*	Wt. %	<0.0074%	<0.0118%	<0.0118%	<0.0118%*
Struc/gr	<3.0E+07	<3.0E+07	<3.0E+07	<3.0E+07*	Struc/gr	<3.0E+7	<3.0E+7	<3.0E+7	<3.0E+7*
COMMENTS									
No Asbestos Detected					Final Sieve Type: -200 (75µm) Tyler Mesh Filter Loading: Moderate SAED Photo Nos.				

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (pg)				
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area (mm ²)		<5µm	>=5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0098	0.196	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0098	0.049	Amph.	0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 2.96E+07								

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
 * - Analytical Sensitivity used Wt. % = Weight percent
 E = to the power of 10 Struc/gr = Structure per gram


 Analyst Signature


 QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	326466
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	Jul-17-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Jan-13-2014
		Total Samples Analyzed:	<u>3</u>

SAMPLE DESCRIPTION	
Client Sample #	796+40, 0-6"
Laboratory Sample #	1428-00073-003
Surficial, sample sieved (200 mesh)	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	<u>8942.5</u>	Mass Suspended (mg)	<u>61.6</u>
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>
Sieved Mass (g)	<u>586.1</u>	Volume Filtered (ml)	<u>0.5</u>
		Filter Type & Pore Size:	MCE 0.22µm
		Filter Area (mm ²):	<u>385</u>
		Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt. %	<0.0001%	0.006%	<0.0002%	0.006%
Struc/gr	<1.3E+08	1.3E+08	<1.3E+08	1.3E+08

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	2	NSD	2
Wt. %	<0.0001%	0.058%	<0.0002%	0.058%
Struc/gr	NA	1.6E+08	NA	1.6E+08

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt. %	<0.0001%	0.052%	<0.0020%	0.052%
Struc/gr	<3.2E+07	3.2E+07	<3.2E+07	3.2E+07

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt. %	<0.0080%	0.052%	<0.0128%	0.052%
Struc/gr	<3.2E+7	1.3E+08	<3.2E+7	1.3E+08

COMMENTS	
Actinolite Asbestos Detected	Final Sieve Type: -200 (75µm) Tyler Mesh Filter Loading: Moderate SAED Photo Nos.

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (µg)			
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area (mm ²)	<5µm	>=5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0088	0.176	Chrys. 0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0088	0.044	Amph. 0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 3.19E+07							

NOTATION KEY

NSD - No Structures Detected	Struc Cnt = Structure Count
* - Analytical Sensitivity used	Wt. % = Weight percent
E = to the power of 10	Struc/gr = Structure per gram

Analyst Signature: *Hu Meishang*

QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman	REPORT NO. 326460
Address: Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date: Jul-17-2014 Date Received: Jan-12-2014
Job Site/ No. Boulder City Bypass 137120.12	Total Samples Analyzed: <u>5</u>

SAMPLE DESCRIPTION	
Client Sample # SS-1, 0-6"	Surficial, sample sieved (200 mesh)
Laboratory Sample # 1428-00072-001	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g) <u>2700.0</u>	Mass Suspended (mg) <u>60.9</u>	Filter Type & Pore Size: <u>MCE 0.22µm</u>	
Split Mass (g) <u>0</u>	Suspension Volume (ml) <u>500</u>	Filter Area (mm ²): <u>385</u>	
Sieved Mass (g) <u>72</u>	Volume Filtered (ml) <u>0.5</u>	Effective Filter Area (mm ²): <u>346</u>	

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	2	NSD	2
Wt.%	<0.0001%	0.014%	<0.0002%	0.014%
Struc/gr	<1.2E+08	2.3E+08	<1.2E+08	2.3E+08

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	5	NSD	5
Wt.%	<0.0001%	0.209%	<0.0002%	0.209%
Struc/gr	NA	3.2E+08	NA	3.2E+08

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	3	NSD	3
Wt.%	<0.0001%	0.195%	<0.0019%	0.195%
Struc/gr	<2.9E+07	8.7E+07	<2.9E+07	8.7E+07

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	3	NSD	3
Wt.%	<0.0073%	0.195%	<0.0116%	0.195%
Struc/gr	<2.9E+7	3.5E+08	<2.9E+7	3.5E+08

COMMENTS

Actinolite Asbestos Detected	Final Sieve Type: -200 (75µm) Tyler Mesh Filter Loading: Moderate SAED Photo Nos.
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TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (pg)		
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area(mm ²)	<5µm	>=5µm	PCME
>=5µm Strucs.	20	10,000X	0.196	Chrys. 0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.049	Amph. 0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 2.90E+07						

NOTATION KEY

NSD - No Structures Detected Struc Cnt = Structure Count
* - Analytical Sensitivity used Wt.% = Weight percent
E = to the power of 10 Struc/gr = Structure per gram

Hu Meisheng
Analyst Signature

Stephanie Dunn
QC Reviewer Signature



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact:	Jonathan Lehman	REPORT NO.	326459
Address:	Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date:	Jul-17-2014
Job Site/ No.	Boulder City Bypass 137120.12	Date Received:	Jan-12-2014
		Total Samples Analyzed:	<u>1</u>

Client Sample #	SS-2, 0-6"	SAMPLE DESCRIPTION
Laboratory Sample #	1428-00071-001	Surficial, sample sieved (200 mesh)

SAMPLE PREPARATION PARAMETERS

Submitted Mass (g)	<u>11368.4</u>	Mass Suspended (mg)	<u>61.3</u>	Filter Type & Pore Size:	MCE 0.22µm
Split Mass (g)	<u>0</u>	Suspension Volume (ml)	<u>500</u>	Filter Area (mm ²):	<u>385</u>
Sieved Mass (g)	<u>773.5</u>	Volume Filtered (ml)	<u>0.5</u>	Effective Filter Area (mm ²):	<u>346</u>

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES

	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt. %	<0.0001%	<0.0003%	<0.0003%	<0.0003%*
Struc/gr	<1.9E+08	<1.9E+08	<1.9E+08	<1.9E+08*

TOTAL STRUCTURES

	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt. %	<0.0001%	<0.0003%	<0.0003%	<0.0003%*
Struc/gr	NA	NA	NA	NA

>=5µm STRUCTURES

	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt. %	<0.0001%	<0.0031%	<0.0031%	<0.0031%*
Struc/gr	<2.9E+07	<2.9E+07	<2.9E+07	<2.9E+07*

TOTAL PCME

	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	NSD	NSD	NSD
Wt. %	<0.0120%	<0.0192%	<0.0192%	<0.0192%*
Struc/gr	<2.9E+7	<2.9E+7	<2.9E+7	<2.9E+7*

COMMENTS

No Asbestos Detected

Final Sieve Type: -200 (75µm) Tyler Mesh
Filter Loading: Moderate
SAED Photo Nos.

TEM ANALYTICAL PARAMETERS					ANALYTICAL SENSITIVITY - MASS (µg)			
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area (mm ²)		<5µm	>=5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0098	0.196	Chrys.	0.0004	0.004	0.63
<5µm Strucs.	3	18,000X	0.0098	0.0294	Amph.	0.0160	0.160	1.00

PCME ANALYTICAL SENSITIVITY - STRUC/GR = **2.88E+07**

NOTATION KEY

- NSD - No Structures Detected
- * - Analytical Sensitivity used
- E = to the power of 10
- Struc Cnt = Structure Count
- Wt. % = Weight percent
- Struc/gr = Structure per gram

Analyst Signature: *He Meisheng*
QC Reviewer Signature: *Stephanie Dunn*



EPA NOA QUANTITATIVE TEM ANALYTICAL REPORT

Contact: Jonathan Lehman	REPORT NO. 326466
Address: Kleinfelder 6380 S Polaris Avenue Las Vegas, NV 89118	Date: Aug-01-2014 Date Received: Jan-13-2014
Job Site/ No. Boulder City Bypass 137120.12	Total Samples Analyzed: 3

SAMPLE DESCRIPTION	
Client Sample #	TS-13
Laboratory Sample #	1428-00073-001
Surficial of rock outcrop, sample crushed	

SAMPLE PREPARATION PARAMETERS			
Submitted Mass (g)	0.0	Mass Suspended (mg)	61
Split Mass (g)	0	Suspension Volume (ml)	500
Sieved Mass (g)	0	Volume Filtered (ml)	0.5
		Filter Type & Pore Size:	MCE 0.22µm
		Filter Area (mm ²):	385
		Effective Filter Area (mm ²):	346

TEM ANALYSIS RESULTS ON SIEVED SOIL MATERIAL

<5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt. %	<0.0001%	0.014%	<0.0002%	0.014%
Struc/gr	<1.3E+08	1.3E+08	<1.3E+08	1.3E+08

TOTAL STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	2	NSD	2
Wt. %	<0.0001%	0.048%	<0.0002%	0.048%
Struc/gr	NA	1.6E+08	NA	1.6E+08

>=5µm STRUCTURES				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt. %	<0.0001%	0.034%	<0.0021%	0.034%
Struc/gr	<3.2E+07	3.2E+07	<3.2E+07	3.2E+07

TOTAL PCME				
	Chrysotile	Actinolite	Hornblende	Total
Struc Cnt	NSD	1	NSD	1
Wt. %	<0.0081%	0.034%	<0.0129%	0.034%
Struc/gr	<3.2E+7	1.3E+08	<3.2E+7	1.3E+08

COMMENTS	
<p>Small Winchite and Large Actinolite Asbestos Detected</p>	<p>Final Sieve Type: -200 (75µm) Tyler Mesh Filter Loading: Moderate SAED Photo Nos.</p>

TEM ANALYTICAL PARAMETERS				ANALYTICAL SENSITIVITY - MASS (pg)			
Grid Openings Scanned	Mag	Grid Op Area (mm ²)	Scan Area (mm ²)	<5µm	>=5µm	PCME	
>=5µm Strucs.	20	10,000X	0.0088	0.176	Chrys. 0.0004	0.004	0.63
<5µm Strucs.	5	18,000X	0.0088	0.044	Amph. 0.0160	0.160	1.00
PCME ANALYTICAL SENSITIVITY - STRUC/GR = 3.22E+07							

NOTATION KEY

- NSD - No Structures Detected Struc Cnt = Structure Count
- * - Analytical Sensitivity used Wt. % = Weight percent
- E = to the power of 10 Struc/gr = Structure per gram

Analyst Signature

 QC Reviewer Signature

APPENDIX F

**ROCK AND SOIL SAMPLES
MINUS NO. 10 SIEVE, THEN CRUSHED**

POLARIZED LIGHT MICROSCOPY CARB 435 ANALYTICAL REPORT

Contact: Jonathan Lehman	Samples Submitted: 10	Report No. 325777
Address: Kleinfelder 12750 Calaveras Road, Suite A Fremont, CA 94539	Samples Analyzed: 10	Date Submitted: May-08-14
	Job Site / No. Boulder City Bypass 137120.12	Date Reported: May-12-14

SAMPLE ID	ASBESTOS		LOCATION / DESCRIPTION
	POINTS COUNTED	% TYPE	
R-11, 0-5' Lab ID # 1428-00065-001	<0.25% 400 - Total Points	None Detected	Auger cuttings, sample sieved (10 mesh), then crushed
R-32, 0-5' Lab ID # 1428-00065-002	<0.25% 400 - Total Points	None Detected	Auger cuttings, sample sieved (10 mesh), then crushed
BSCB-1, 0-5' Lab ID # 1428-00065-003	<0.25% 400 - Total Points	None Detected	Auger cuttings, sample sieved (10 mesh), then crushed
R-66, 0-5' Lab ID # 1428-00065-004	<0.25% 400 - Total Points	None Detected	Auger cuttings, sample sieved (10 mesh), then crushed
ITB-1, 0-5' Lab ID # 1428-00065-005	<0.25% 400 - Total Points	Actinolite	Auger cuttings, sample sieved (10 mesh), then crushed Asbestos detected in non counted portion of sample.
R-75, 0-5' Lab ID # 1428-00065-006	<0.25% 400 - Total Points	None Detected	Auger cuttings, sample sieved (10 mesh), then crushed
R-82, 0-5' Lab ID # 1428-00065-007	<0.25% 400 - Total Points	Actinolite	Auger cuttings, sample sieved (10 mesh), then crushed Asbestos detected in non counted portion of sample.
TI-1, 0-5' Lab ID # 1428-00065-008	<0.25% 400 - Total Points	None Detected	Composite, sample sieved (10 mesh), then crushed
TSMY-2, 0-4' Lab ID # 1428-00065-009	<0.25% 400 - Total Points	Actinolite	Composite, sample sieved (10 mesh), then crushed Asbestos detected in non counted portion of sample.
R-45, 0-5' Lab ID # 1428-00065-010	<0.25% 400 - Total Points	None Detected	Auger cuttings, sample sieved (10 mesh), then crushed

QC Reviewer 

Analyst 

POLARIZED LIGHT MICROSCOPY CARB 435 ANALYTICAL REPORT

Contact: Jonathan Lehman	Samples Submitted: 50	Report No. 325778
Address: Kleinfelder 12750 Calaveras Road, Suite A Fremont, CA 94539	Samples Analyzed: 50	Date Submitted: May-08-14
	Job Site / No. Boulder City Bypass 137120.12	Date Reported: May-27-14

SAMPLE ID	POINTS COUNTED	ASBESTOS %	TYPE	LOCATION / DESCRIPTION
R-2, 0-5'		<0.25%	None Detected	
Lab ID # 1428-00066-001	400 - Total Points			
519+90, 75'L, 0-6"		<0.25%	None Detected	
Lab ID # 1428-00066-002	400 - Total Points			
WPB-4, 0-5'		<0.25%	None Detected	
Lab ID # 1428-00066-003	400 - Total Points			
R-43, 0-5'		<0.25%	None Detected	
Lab ID # 1428-00066-004	400 - Total Points			
R-65, 0-5'		<0.25%	None Detected	
Lab ID # 1428-00066-005	400 - Total Points			
R-70, 0-5'		<0.25%	None Detected	
Lab ID # 1428-00066-006	400 - Total Points			
R-74, 0-5'		<0.25%	None Detected	
Lab ID # 1428-00066-007	400 - Total Points			
R-77, 0-5'		<0.25%	Actinolite	Asbestos observed in non counted portion of sample.
Lab ID # 1428-00066-008	400 - Total Points			
R-80, 0-5'		<0.25%	Actinolite	Asbestos observed in non counted portion of sample.
Lab ID # 1428-00066-009	400 - Total Points			
TSB-2		<0.25%	None Detected	
Lab ID # 1428-00066-010	400 - Total Points			

QC Reviewer 

Analyst 

POLARIZED LIGHT MICROSCOPY CARB 435 ANALYTICAL REPORT

Contact: Jonathan Lehman	Samples Submitted: 50	Report No. 325778
Address: Kleinfelder 12750 Calaveras Road, Suite A Fremont, CA 94539	Samples Analyzed: 50	Date Submitted: May-08-14
	Job Site / No. Boulder City Bypass 137120.12	Date Reported: May-27-14

SAMPLE ID	POINTS COUNTED	ASBESTOS %	TYPE	LOCATION / DESCRIPTION
R-114, 0-5'		<0.25%	None Detected	
Lab ID # 1428-00066-011	400 - Total Points			
R-74, 15.9-16.4'		<0.25%	Actinolite	
Lab ID # 1428-00066-012	400 - Total Points			Asbestos observed in non counted portion of sample.
TSB-14		<0.25%	None Detected	
Lab ID # 1428-00066-013	400 - Total Points			
R-94, 140.4-140.9'		<0.25%	None Detected	
Lab ID # 1428-00066-014	400 - Total Points			
R-94, 240.7-241.2'		<0.25%	None Detected	
Lab ID # 1428-00066-015	400 - Total Points			
R-95, 209.4-209.9'		<0.25%	None Detected	
Lab ID # 1428-00066-016	400 - Total Points			
WAPA-4/3a		<0.25%	Actinolite	
Lab ID # 1428-00066-017	400 - Total Points			Asbestos observed in non counted portion of sample.
R-87-1, 0-6"		<0.25%	None Detected	
Lab ID # 1428-00066-018	400 - Total Points			
570+00, 0-6"		<0.25%	None Detected	
Lab ID # 1428-00066-019	400 - Total Points			
R-46, 0-5'		<0.25%	None Detected	
Lab ID # 1428-00066-020	400 - Total Points			

QC Reviewer 

Analyst 

POLARIZED LIGHT MICROSCOPY CARB 435 ANALYTICAL REPORT

Contact: Jonathan Lehman	Samples Submitted: 50	Report No. 325778
Address: Kleinfelder 12750 Calaveras Road, Suite A Fremont, CA 94539	Samples Analyzed: 50	Date Submitted: May-08-14
	Job Site / No. Boulder City Bypass 137120.12	Date Reported: May-27-14

SAMPLE ID	ASBESTOS		LOCATION / DESCRIPTION
	POINTS COUNTED	%	
R-83a, 45-59'		<0.25%	None Detected
Lab ID # 1428-00066-021	400 - Total Points		
R-90, 35-66'		0.25%	Actinolite
Lab ID # 1428-00066-022	1 - Total Points		
TSMY-1, 0-3'		<0.25%	None Detected
Lab ID # 1428-00066-023	400 - Total Points		
R-93, 56.0-169.5'		<0.25%	None Detected
Lab ID # 1428-00066-024	400 - Total Points		
R-94, 128.0-144.0'		<0.25%	None Detected
Lab ID # 1428-00066-025	400 - Total Points		
R-94, 28.0-128.0'		<0.25%	None Detected
Lab ID # 1428-00066-026	400 - Total Points		
R-95, 184.5-227.0'		<0.25%	None Detected
Lab ID # 1428-00066-027	400 - Total Points		
R-96B, 0.0-64.3'		<0.25%	None Detected
Lab ID # 1428-00066-028	400 - Total Points		
R-102, 53.0-103.4'		<0.25%	None Detected
Lab ID # 1428-00066-029	400 - Total Points		
R-108A, 35.0-75.0'		<0.25%	None Detected
Lab ID # 1428-00066-030	400 - Total Points		

QC Reviewer 

Analyst 

POLARIZED LIGHT MICROSCOPY CARB 435 ANALYTICAL REPORT

Contact: Jonathan Lehman	Samples Submitted: 50	Report No. 325778
Address: Kleinfelder 12750 Calaveras Road, Suite A Fremont, CA 94539	Samples Analyzed: 50	Date Submitted: May-08-14
	Job Site / No. Boulder City Bypass 137120.12	Date Reported: May-27-14

SAMPLE ID	ASBESTOS		LOCATION / DESCRIPTION
	POINTS COUNTED	%	
P-2, 170.2-205.3' Lab ID # 1428-00066-031		<0.25%	None Detected
	400 - Total Points		
R-101, 100.0-114.1' Lab ID # 1428-00066-032	2	0.50%	Actinolite
	400 - Total Points		
R-84, 55.0-92.1' Lab ID # 1428-00066-033		<0.25%	None Detected
	400 - Total Points		
R-91, 12.0-36.5' Lab ID # 1428-00066-034		<0.25%	None Detected
	400 - Total Points		
R-100A, 28.5-71.7' Lab ID # 1428-00066-035	3	0.75%	Actinolite
	400 - Total Points		
R-100A, 99.5-144.1' Lab ID # 1428-00066-036		<0.25%	None Detected
	400 - Total Points		
R-98, 50.0-100.0' Lab ID # 1428-00066-037		<0.25%	None Detected
	400 - Total Points		
R-104, 50.0-98.0' Lab ID # 1428-00066-038		<0.25%	None Detected
	400 - Total Points		
R-105, 51.0-95.0' Lab ID # 1428-00066-039		<0.25%	None Detected
	400 - Total Points		
P-6, 101.0-156.4' Lab ID # 1428-00066-040		<0.25%	None Detected
	400 - Total Points		

QC Reviewer 

Analyst 

POLARIZED LIGHT MICROSCOPY CARB 435 ANALYTICAL REPORT

Contact: Jonathan Lehman	Samples Submitted: 50	Report No. 325778
Address: Kleinfelder 12750 Calaveras Road, Suite A Fremont, CA 94539	Samples Analyzed: 50	Date Submitted: May-08-14
	Job Site / No. Boulder City Bypass 137120.12	Date Reported: May-27-14

SAMPLE ID	POINTS COUNTED	ASBESTOS %	TYPE	LOCATION / DESCRIPTION
BHB2-5, 1.0-40.0'		<0.25%	None Detected	
Lab ID # 1428-00066-041	400 - Total Points			
BHB2-7, 0.0-42.5'		<0.25%	None Detected	
Lab ID # 1428-00066-042	400 - Total Points			
R-106, 49.0-90.8'	8	2.00%	Actinolite	
Lab ID # 1428-00066-043	400 - Total Points			
R-110, 5.0-59.5'		<0.25%	None Detected	
Lab ID # 1428-00066-044	400 - Total Points			
R-111, 0.8-53.0'	2	0.50%	Actinolite	
Lab ID # 1428-00066-045	400 - Total Points			
P-4, 0-55.9'		<0.25%	None Detected	
Lab ID # 1428-00066-046	400 - Total Points			
P-4, 126.2-180.0'	2	0.50%	Actinolite	
Lab ID # 1428-00066-047	400 - Total Points			
P-5, 0-46.1'		<0.25%	None Detected	
Lab ID # 1428-00066-048	400 - Total Points			
P-3, 50.2-93.2'		<0.25%	None Detected	
Lab ID # 1428-00066-049	400 - Total Points			
R-96B-115-165		<0.25%	None Detected	
Lab ID # 1428-00066-050	400 - Total Points			

QC Reviewer 

Analyst 

**SOIL SAMPLES
MINUS NO. 60 SIEVE**

POLARIZED LIGHT MICROSCOPY CARB 435 ANALYTICAL REPORT

Contact: Jonathan Lehman	Samples Submitted: 10	Report No. 325776
Address: Kleinfelder 12750 Calaveras Road, Suite A Fremont, CA 94539	Samples Analyzed: 10	Date Submitted: May-08-14
	Job Site / No. Boulder City Bypass 137120.12	Date Reported: May-12-14

SAMPLE ID	ASBESTOS		LOCATION / DESCRIPTION
	POINTS COUNTED	% TYPE	
R-11, 0-5' Lab ID # 1428-00064-001	400 - Total Points	<0.25% None Detected	Auger cuttings, sample sieved (60 mesh)
R-32, 0-5' Lab ID # 1428-00064-002	400 - Total Points	<0.25% None Detected	Auger cuttings, sample sieved (60 mesh)
BSCB-1, 0-5' Lab ID # 1428-00064-003	400 - Total Points	<0.25% None Detected	Auger cuttings, sample sieved (60 mesh)
R-66, 0-5' Lab ID # 1428-00064-004	400 - Total Points	<0.25% None Detected	Auger cuttings, sample sieved (60 mesh)
ITB-1, 0-5' Lab ID # 1428-00064-005	400 - Total Points	<0.25% Actinolite	Auger cuttings, sample sieved (60 mesh) Asbestos detected in non counted portion of sample.
R-75, 0-5' Lab ID # 1428-00064-006	400 - Total Points	<0.25% Actinolite	Auger cuttings, sample sieved (60 mesh) Asbestos detected in non counted portion of sample.
R-82, 0-5' Lab ID # 1428-00064-007	400 - Total Points	<0.25% Actinolite	Auger cuttings, sample sieved (60 mesh) Asbestos detected in non counted portion of sample.
TI-1, 0-5' Lab ID # 1428-00064-008	400 - Total Points	<0.25% None Detected	Composite, sample sieved (60 mesh)
TSMY-2, 0-4' Lab ID # 1428-00064-009	400 - Total Points	<0.25% Actinolite	Composite, sample sieved (60 mesh) Asbestos detected in non counted portion of sample.
R-45, 0-5' Lab ID # 1428-00064-010	400 - Total Points	<0.25% None Detected	Auger cuttings, sample sieved (60 mesh)

QC Reviewer 

Analyst 

**SOIL SAMPLES
MINUS NO. 200 SIEVE**

POLARIZED LIGHT MICROSCOPY CARB 435 ANALYTICAL REPORT

Contact: Jonathan Lehman	Samples Submitted: 10	Report No. 325772
Address: Kleinfelder 12750 Calaveras Road, Suite A Fremont, CA 94539	Samples Analyzed: 10	Date Submitted: May-08-14
	Job Site / No. Boulder City Bypass 137120.12	Date Reported: May-09-14

SAMPLE ID	POINTS COUNTED	ASBESTOS %	TYPE	LOCATION / DESCRIPTION
R-11, 0-5'		<0.25%	None Detected	Auger cuttings, sample sieved (200 mesh)
Lab ID # 1428-00063-001	400 - Total Points			
R-32, 0-5'		<0.25%	None Detected	Auger cuttings, sample sieved (200 mesh)
Lab ID # 1428-00063-002	400 - Total Points			
BSCB-1,0-5'		<0.25%	None Detected	Auger cuttings, sample sieved (200 mesh)
Lab ID # 1428-00063-003	400 - Total Points			
R-66, 0-5'		<0.25%	None Detected	Auger cuttings, sample sieved (200 mesh)
Lab ID # 1428-00063-004	400 - Total Points			
ITB-1, 0-5'	2	0.50%	Actinolite	Auger cuttings, sample sieved (200 mesh)
Lab ID # 1428-00063-005	400 - Total Points			
R-75, 0-5'		<0.25%	Actinolite	Auger cuttings, sample sieved (200 mesh) Asbestos detected in non counted portion of sample.
Lab ID # 1428-00063-006	400 - Total Points			
R-82, 0-5'	1	0.25%	Actinolite	Auger cuttings, sample sieved (200 mesh)
Lab ID # 1428-00063-007	400 - Total Points			
TI-1, 0-5'		<0.25%	None Detected	Composite, sample sieved (200 mesh)
Lab ID # 1428-00063-008	400 - Total Points			
TSMY-2, 0-4'		<0.25%	Actinolite	Composite, sample sieved (200 mesh) Asbestos detected in non counted portion of sample.
Lab ID # 1428-00063-009	400 - Total Points			
R-45, 0-5'		<0.25%	None Detected	Auger cuttings, sample sieved (200 mesh)
Lab ID # 1428-00063-010	400 - Total Points			

QC Reviewer 

Analyst 

APPENDIX G

Sample calculation of weighted average for total NOA concentration of Tib based on rock core recovery

GIVEN:

- Tabulated NOA concentrations as determined by TEM analyses performed by Asbestos TEM
- Boring logs with rock core recovery data from the Boulder Phase 2 Geotechnical Data Report dated April 9, 2014.
- A summary of the data is below:

Sample No.	Station	Offset	Sample Name	Depth (feet)	Drill Length (feet)	Length of Rock Core Recovered (feet)	Geologic Unit	NOA Concentration (Percent Weight)
154	P1716+75	46' LT	R- 90	10.0-35.0	25.0	22.7	Tib	0.000
156	P1716+75	46' LT	R- 90	35.0-66.0	31.0	28.7	Tib	0.620
158	P1716+75	46' LT	R- 90	66.0-106.0	40.0	39.8	Tib	0.217
160	P1716+75	46' LT	R- 90	106.0-146.0	19.0	19.0	Tib	0.000
164	P1716+93	218' RT	R- 91	36.5-81.5	45.0	45.0	Tib	0.000
166	P1716+93	218' RT	R- 91	81.5-116.5	35.0	33.4	Tib	0.000
168	P1716+93	213' LT	R- 92	15.0-66.0	51.0	42.6	Tib	0.000
170	P1716+93	213' LT	R- 92	66.0-126.0	36.7	36.6	Tib	0.000
174	P1720+59	39' LT	P- 2	0-26.8	26.8	14.6	Tib	0.309
175	P1720+59	39' LT	P- 2	26.8-81.0	54.2	20.4	Tib	0.318
176	P1720+59	39' LT	P- 2	81.0-135.1	54.1	39.2	Tib	0.003
177	P1720+59	39' LT	P- 2	135.1-170.2	35.1	33.2	Tib	0.000
178	P1720+59	39' LT	P- 2	170.2-205.3	9.8	9.4	Tib	0.031
179	P1720+74	303' RT	R- 93	7.0-56.0	49.0	24.1	Tib	0.000
180	P1720+74	303' RT	R- 93	56.0-169.5	110.5	57.8	Tib	0.000
185	P1720+91	310' LT	R- 94	7.0-28.0	21.0	12.9	Tib	0.722
186	P1720+91	310' LT	R- 94	28.0-128.0	100.0	49.3	Tib	0.000
189	P1720+91	310' LT	R- 94	128.0-144.0	16.0	11.0	Tib	0.022
191	P1720+91	310' LT	R- 94	144.0-204.0	60.0	59.0	Tib	0.033
192	P1720+91	310' LT	R- 94	204.0-265.0	33.2	29.5	Tib	0.041
195	P1723+22	354' RT	R- 95	2.5-29.0	26.5	15.8	Tib	0.000
196	P1723+22	354' RT	R- 95	29.0-103.0	74.0	50.0	Tib	0.002
198	P1723+22	354' RT	R- 95	103.0-207.0	80.0	40.0	Tib	0.478
203	P1723+28	225' LT	R- 96A	0.0-17.0	16.9	9.1	Tib	0.000
204	P1723+23	161' LT	R- 96B	0.0-64.3	57.3	26.0	Tib	0.000
206	P1723+23	161' LT	R- 96B	64.3-115.0	17.2	4.2	Tib	0.247
209	P1723+86	167' RT	P- 3	0-50.2	50.2	37.6	Tib	0.000
210	P1723+86	167' RT	P- 3	50.2-93.2	43.0	31.3	Tib	0.000
211	P1723+86	167' RT	P- 3	93.2-138.3	45.1	45	Tib	0.008
212	P1723+86	167' RT	P- 3	138.3-201.0	62.7	60.6	Tib	0.000
213	P1729+03	39' LT	R- 97	7.0-46.0	3.0	3.0	Tib	0.088

ASSUMPTIONS:

- 8 NOA rock core composite samples of Tib also contained portions of Tibu. It is assumed that the NOA concentrations for these samples are equally representative for both units.
- NOA concentration of 0.0 is applicable to non detect test results

FIND: Average NOA Concentration for Tib weighted based on rock core recovery.

SOLUTION:

Weighted Average = $\frac{\text{sum}(\text{Length Recovered} \times \text{NOA Total Weight (percent)})}{\text{sum}(\text{Length Recovered})}$

Length recovered x NOA total weight $_1$ =

$$(49.3 \cdot 0 + 11.025 \cdot .02 + 59.0 \cdot .03 + 29.5 \cdot .04 + 15.83 \cdot 0 + 50.0 \cdot 0 + 40.0 \cdot .48 + 9.1167 \cdot 0 + 26.0 \cdot 0 + 4.2 \cdot .25 + 37.6 \cdot 0) = 23.421$$

Length recovered x NOA total weight $_2$ =

$$(31.3 \cdot 0 + 45.0 \cdot .01 + 60.6 \cdot 0 + 3.0 \cdot .09 + 22.7 \cdot 0 + 28.7 \cdot 0.62 + 39.8 \cdot 0.22 + 19.0 \cdot 0 + 45.0 \cdot 0 + 33.4 \cdot 0) = 27.27$$

Length recovered x NOA total weight $_3$ =

$$(42.6 \cdot 0 + 36.6 \cdot 0 + 14.6 \cdot 0.31 + 20.4 \cdot 0.32 + 39.2 \cdot 0 + 33.2 \cdot 0 + 9.4 \cdot .03 + 24.1 \cdot 0 + 57.8 \cdot 0 + 12.9 \cdot .72) = 20.624$$

Sum_Length_recovered $_1$ =

$$(22.7 + 28.7 + 39.8 + 19.0 + 45.0 + 33.4 + 42.6 + 36.6 + 14.6 + 20.4 + 39.2 + 33.2 + 9.4 + 24.1 + 57.8 + 12.9 + 49.3) = 528.7$$

Sum_Length_recovered $_2$ =

$$(11.025 + 59.0 + 29.5 + 15.8333 + 50.0 + 40.0 + 9.1167 + 26.0 + 4.2 + 37.6 + 31.3 + 45.0 + 60.6 + 3.0) = 422.175$$

$$\text{Weighted_ave} := \frac{(23.421 + 27.27 + 20.624)}{(528.7 + 422.175)} = 0.075$$

**COMPOSITED ROCK CORE NOA
WEIGHTED AVERAGE PER BORING
INTERSTATE 11 - DESIGN BUILD
BOULDER CITY BYPASS PHASE 2
BOULDER CITY, NEVADA**

Sample No.	Station	Offset	Sample Name	Depth (ft.)	Drill Length (ft)	Length Recovered (ft)	Geologic Unit	Sample Type	Total Wt (%)	% NOA by Wt
117	P1 678+24	74' LT	R- 81	10.0-31.0	21.0	20.8	Tsmo	Rock Core Composite	0.853	0.853
*120	P1 681+75	0	R- 82	5.5-44	38.7	33.8	Tsmo	Rock Core Composite	0.300	0.300
*123	P1 686+05	67' RT	R- 83A	0-10.6	9.5	9.5	Tdmm	Rock Core Composite	--	--
124	P1 686+05	67' RT	R- 83A	10.6-21.7	11.1	10.6	Tdmm	Rock Core Composite	--	
125	P1 686+05	67' RT	R- 83A	21.7-45.0	23.3	23.1	Tdmm	Rock Core Composite	--	
126	P1 686+05	67' RT	R- 83A	45.0-59.0	14.0	12.8	Tdmm	Rock Core Composite	--	
128	P1 687+18	117' RT	P- 1	0.0-36.6	36.6	35.6	Tdmm	Rock Core Composite	0.004	0.002
129	P1 687+18	117' RT	P- 1	36.6-65.5	28.9	28.9	Tdmm	Rock Core Composite	--	
*130	P1 689+00	110' LT	R- 84	0.0-12.8	11.8	11.7	Tdmm	Rock Core Composite	--	0.032
132	P1 689+00	110' LT	R- 84	12.8-55.0	42.2	40.6	Tdmm	Rock Core Composite	--	
133	P1 689+00	110' LT	R- 84	55.0-92.1	37.1	37.1	Tdmm/Tsmo	Rock Core Composite	0.077	
137	P1 695+82	99' LT	R- 85A	0.0-51.0	51.0	48.3	Tdmm/Tsmo	Rock Core Composite	0.057	0.057
*140	P1 704+70	20' LT	R- 86	0.0-45.0	44.0	42.8	Tsmo	Rock Core Composite	0.268	0.268
144	P1 709+75	6' LT	R- 87	2.5-52.0	49.5	49.0	Tsmo	Rock Core Composite	0.268	0.268
147	P1 712+24	145' LT	R- 88	9.5-50.0	40.5	39.7	Tsmo	Rock Core Composite	0.018	0.010
149	P1 712+24	145' LT	R- 88	50.0-85.0	35.0	35.0	Tsmo	Rock Core Composite	--	
*151	P1 713+26	171' RT	R- 89A	0.0-36.0	35.1	23.8	Tsmo	Rock Core Composite	0.059	0.114
152	P1 713+26	171' RT	R- 89A	36.0-96.0	60.0	59.6	Tsmo	Rock Core Composite	0.136	
154	P1 716+75	46' LT	R- 90	10.0-35.0	25.0	22.7	Tib	Rock Core Composite	--	0.209
156	P1 716+75	46' LT	R- 90	35.0-66.0	31.0	28.7	Tib	Rock Core Composite	0.620	
158	P1 716+75	46' LT	R- 90	66.0-106.0	40.0	39.8	Tib	Rock Core Composite	0.217	
160	P1 716+75	46' LT	R- 90	106.0-146.0	40.0	35.3	Tib/Tibu	Rock Core Composite	--	
162	P1 716+93	218' RT	R- 91	12.0-36.5	24.5	24.5	Tsmo	Rock Core Composite	--	--
164	P1 716+93	218' RT	R- 91	36.5-81.5	45.0	45.0	Tib	Rock Core Composite	--	
166	P1 716+93	218' RT	R- 91	81.5-116.5	35.0	33.4	Tib	Rock Core Composite	--	
168	P1 716+93	213' LT	R- 92	15.0-66.0	51.0	42.6	Tib	Rock Core Composite	--	0.051
170	P1 716+93	213' LT	R- 92	66.0-126.0	60.0	59.8	Tib/Tibu	Rock Core Composite	--	
173	P1 716+93	213' LT	R- 92	126-139.5	13.5	12.6	Tibu	Rock Core Composite	0.464	
174	P1 720+59	39' LT	P- 2	0-26.8	26.8	14.6	Tib	Rock Core Composite	0.309	0.086
175	P1 720+59	39' LT	P- 2	26.8-81.0	54.2	20.4	Tib	Rock Core Composite	0.318	
176	P1 720+59	39' LT	P- 2	81.0-135.1	54.1	39.2	Tib	Rock Core Composite	0.003	
177	P1 720+59	39' LT	P- 2	135.1-170.2	35.1	33.2	Tib	Rock Core Composite	--	
178	P1 720+59	39' LT	P- 2	170.2-205.3	35.1	34.9	Tib/Tibu	Rock Core Composite	0.031	
179	P1 720+74	303' RT	R- 93	7.0-56.0	49.0	24.1	Tib	Rock Core Composite	--	--
180	P1 720+74	303' RT	R- 93	56.0-169.5	113.5	60.7	Tib/Tibu	Rock Core Composite	--	
184	P1 720+74	303' RT	R- 93	169.5-190.0	20.5	12.4	Tibu	Rock Core Composite	--	
185	P1 720+91	310' LT	R- 94	7.0-28.0	21.0	12.9	Tib	Rock Core Composite	0.722	0.073
186	P1 720+91	310' LT	R- 94	28.0-128.0	100.0	49.3	Tib	Rock Core Composite	0.000	
189	P1 720+91	310' LT	R- 94	128.0-144.0	16.0	11.0	Tib	Rock Core Composite	0.022	
191	P1 720+91	310' LT	R- 94	144.0-204.0	60.0	59.0	Tib	Rock Core Composite	0.033	
192	P1 720+91	310' LT	R- 94	204.0-265.0	61.0	56.6	Tib/Tibu	Rock Core Composite	0.041	
195	P1 723+22	354' RT	R- 95	2.5-29.0	26.5	15.8	Tib	Rock Core Composite	--	0.156
196	P1 723+22	354' RT	R- 95	29.0-103.0	74.0	50.0	Tib	Rock Core Composite	0.002	
198	P1 723+22	354' RT	R- 95	103.0-207.0	104.0	56.0	Tib/Tibu	Rock Core Composite	0.478	
200	P1 723+22	354' RT	R- 95	184.5-227.0	42.5	33.3	Tibu	Rock Core Composite	--	
202	P1 723+22	354' RT	R- 95	227.0-249.0	22.0	18.4	Tibu	Rock Core Composite	0.006	
*203	P1 723+28	225' LT	R- 96A	0.0-17.0	16.9	9.1	Tib	Rock Core Composite	--	--
**204	P1 723+23	161' LT	R- 96B	0.0-64.3	57.3	26.0	Tib	Rock Core Composite	--	0.191
206	P1 723+23	161' LT	R- 96B	64.3-115.0	50.7	28.5	Tib/Tibu	Rock Core Composite	0.247	
207	P1 723+23	161' LT	R- 96B	115.0-165.0	50.0	44.8	Tibu	Rock Core Composite	0.265	
209	P1 723+86	167' RT	P- 3	0-50.2	50.2	37.6	Tib	Rock Core Composite	--	0.002
210	P1 723+86	167' RT	P- 3	50.2-93.2	43.0	31.3	Tib	Rock Core Composite	--	
211	P1 723+86	167' RT	P- 3	93.2-138.3	45.1	45	Tib	Rock Core Composite	0.008	
212	P1 723+86	167' RT	P- 3	138.3-201.0	62.7	60.6	Tib	Rock Core Composite	--	
213	P1 729+03	39' LT	R- 97	7.0-46.0	39.0	38.9	Tib/Tibu	Rock Core Composite	0.088	0.046
214	P1 729+03	39' LT	R- 97	46.0-85.0	39.0	39.0	Tibu	Rock Core Composite	0.003	
*215	P1 733+60	100' RT	BHB1-1	4.4-40.9	38.4	29.1	Tibu	Rock Core Composite	--	--
216	P1 734+00	55' LT	BHB1-2	8.0-42.2	34.2	17.3	Tibu	Rock Core Composite	--	--
217	P1 735+60	85' RT	BHB1-3	1.6-41.3	39.7	24.0	Tibu	Rock Core Composite	--	--
218	P1 735+75	36' LT	BHB1-4	5.0-40.0	35.0	31.9	Tibu	Rock Core Composite	--	--
*219	P1 739+00	240' RT	R- 98	0.0-50.0	48.3	38.7	Tibu	Rock Core Composite	--	--
220	P1 739+00	240' RT	R- 98	50.0-100.0	50.0	44.2	Tibu	Rock Core Composite	--	
221	P1 739+00	240' RT	R- 98	100.0-147.0	47.0	37.8	Tibu	Rock Core Composite	--	
222	P1 739+45	81' RT	R- 99	3.4-51.0	47.6	44.0	Tibu	Rock Core Composite	0.022	0.007
223	P1 739+45	81' RT	R- 99	51.0-91.0	40.0	39.5	Tibu	Rock Core Composite	--	
224	P1 739+45	81' RT	R- 99	91.0-134.7	43.7	41.3	Tibu	Rock Core Composite	--	
225	P1 739+45	81' RT	R- 99	134.7-141.0	6.3	6.3	Tibu	Rock Core Composite	--	

* The difference of the sample depth interval does not directly correspond to the tabulated drill length due to compositing procedures; the difference is less than 2 feet.

** Actual Sample begins at 7 feet.

"--" Asbestos not detected to level of analytical sensitivity

**COMPOSITED ROCK CORE NOA
WEIGHTED AVERAGE PER BORING
INTERSTATE 11 - DESIGN BUILD
BOULDER CITY BYPASS PHASE 2
BOULDER CITY, NEVADA**

Sample No.	Station	Offset	Sample Name	Depth (ft.)	Drill Length (ft)	Length Recovered (ft)	Geologic Unit	Sample Type	Total Wt (%)	% NOA by Wt
*226	P1 741+58	204' RT	R- 100A	0.0-28.5	27.9	27.8	Tibu	Rock Core Composite	--	0.397
227	P1 741+58	204' RT	R- 100A	28.5-71.7	43.2	38.1	Tibu	Rock Core Composite	1.219	
228	P1 741+58	204' RT	R- 100A	71.7-99.5	27.8	27.0	Tibu	Rock Core Composite	0.204	
229	P1 741+58	204' RT	R- 100A	99.5-144.1	44.6	37.9	Tibu	Rock Core Composite	--	
230	P1 743+20	30' LT	BHB2-1	0.6-44.0	43.4	24.4	Tibu	Rock Core Composite	--	--
231	P1 744+25	55' LT	BHB2-2	1.7-40.5	38.8	27.7	Tibu	Rock Core Composite	--	--
*232	P1 744+25	60' RT	BHB2-3	5.9-40.5	35.5	22.4	Tibu	Rock Core Composite	--	--
233	P1 745+26	65' LT	BHB2-4	0.0-40.2	40.2	37.1	Tibu	Rock Core Composite	--	--
234	P1 745+31	49' RT	BHB2-5	1.0-40.0	39.0	36.5	Tibu	Rock Core Composite	0.058	0.058
235	P1 746+35	55' LT	BHB2-6	0.3-40.0	39.7	30.9	Tibu	Rock Core Composite	--	--
*236	P1 746+35	60' RT	BHB2-7	0.0-42.5	41.9	39.9	Tibu	Rock Core Composite	--	--
237	P1 747+81	20' LT	BHB2-8	0-40.0	40.0	35.7	Tibu	Rock Core Composite	0.030	0.030
238	P1 746+99	57' RT	BHB2-9	0.5-40.0	39.5	38.3	Tibu	Rock Core Composite	--	--
*239	P1 750+25	200' RT	R- 101	0-58.9	57.9	55.4	Tibu	Rock Core Composite	1.360	1.267
240	P1 750+25	200' RT	R- 101	58.9-100.0	41.1	40.9	Tibu	Rock Core Composite	1.402	
241	P1 750+25	200' RT	R- 101	100.0-114.1	14.1	13.9	Tibu	Rock Core Composite	0.680	
242	P1 750+25	200' RT	R- 101	114.1-143.0	28.9	28.9	Tibu	Rock Core Composite	1.181	
243	P1 752+71	14' LT	R- 102	0.5-53.0	52.5	45.3	Tibu	Rock Core Composite	0.808	0.342
244	P1 752+71	14' LT	R- 102	53.0-103.4	50.4	50.1	Tibu	Rock Core Composite	--	
245	P1 752+71	14' LT	R- 102	103.4-115.0	11.6	11.6	Tibu	Rock Core Composite	--	
*246	P1 752+87	165' LT	R- 103	1.7-49.0	45.3	45.1	Tibu	Rock Core Composite	--	--
247	P1 752+87	165' LT	R- 103	49.0-97.0	48.0	46.9	Tibu	Rock Core Composite	--	--
248	P1 754+80	55' LT	BHB3-1	0.6-40.5	39.9	36.6	Tibu	Rock Core Composite	--	--
**249	P1 754+80	49' RT	BHB3-2	0-40.0	32.0	30.1	Tibu	Rock Core Composite	--	--
250	P1 756+65	55' LT	BHB3-3	0.4-40.0	39.6	39.0	Tibu	Rock Core Composite	0.286	0.286
*251	P1 756+65	49' RT	BHB3-4	0-40.0	38.5	37.2	Tibu	Rock Core Composite	--	--
252	P1 759+89	39' RT	P- 4	0-55.9	55.9	55	Tibu	Rock Core Composite	0.023	0.363
*253	P1 759+89	39' RT	P- 4	55.9-126.2	70	70	Tibu	Rock Core Composite	0.627	
254	P1 759+89	39' RT	P- 4	126.2-180.0	53.8	55	Tibu	Rock Core Composite	0.366	
255	P1 760+63	180' LT	R- 104	2.5-50.0	47.5	40.0	Tibu	Rock Core Composite	0.000	0.008
256	P1 760+63	180' LT	R- 104	50.0-98.0	48.0	46.8	Tibu	Rock Core Composite	0.023	
257	P1 760+63	180' LT	R- 104	98.0-145.0	47.0	46.1	Tibu	Rock Core Composite	0.000	
258	P1 761+06	207' RT	R- 105	7.0-51.0	44.0	37.1	Tibu	Rock Core Composite	--	--
259	P1 761+06	207' RT	R- 105	51.0-95.0	44.0	43.9	Tibu	Rock Core Composite	--	
260	P1 761+06	207' RT	R- 105	95.0-155.0	60.0	60.0	Tibu	Rock Core Composite	--	
261	P1 761+06	207' RT	R- 105	155.0-180.0	25.0	24.9	Tibu	Rock Core Composite	--	
262	P1 763+41	0	R- 106	2.5-15.4	12.9	11.3	Tibu	Rock Core Composite	0.893	3.986
263	P1 763+41	0	R- 106	15.4-49.0	33.6	28.1	Tibu	Rock Core Composite	2.042	
264	P1 763+41	0	R- 106	49.0-90.8	41.8	37.4	Tibu	Rock Core Composite	6.380	
*265	P1 766+00	144' RT	P- 6	0-46.5	46	46	Tibu	Rock Core Composite	--	0.041
266	P1 766+00	144' RT	P- 6	46.5-101.0	54.5	52.8	Tibu	Rock Core Composite	0.133	
267	P1 766+00	144' RT	P- 6	101.0-156.4	55.4	47.8	Tibu	Rock Core Composite	--	
268	P1 766+00	144' RT	P- 6	156.4-181.0	24.6	24.6	Tibu	Rock Core Composite	--	
269	P1 766+97	0	R- 107	0.5-63.6	63.1	38.5	Tibu	Rock Core Composite	--	--
270	P1 766+97	0	R- 107	63.6-103.6	40.0	28.4	Tibu	Rock Core Composite	--	--
271	P1 769+04	266' RT	R- 108A	2.5-35.0	32.5	30.0	Tibu	Rock Core Composite	--	--
272	P1 769+04	266' RT	R- 108A	35.0-75.0	40.0	38.9	Tibu	Rock Core Composite	--	
273	P1 769+04	266' RT	R- 108A	75.0-86.0	11.0	9.8	Tibu	Rock Core Composite	--	
274	P1 769+04	266' RT	R- 108A	86.0-142.5	56.5	56.1	Tibu	Rock Core Composite	--	
275	P1 769+04	266' RT	R- 108A	142.5-208.5	66.0	57.7	Tibu	Rock Core Composite	--	
276	P 772+32	0	R- 109	7.0-59.1	52.1	23.1	Tibu	Rock Core Composite	--	--
277	P 772+32	0	R- 109	59.1-100.0	40.9	39.2	Tibu	Rock Core Composite	--	--
278	P1 772+82	265' RT	R- 110	5.0-59.5	54.5	51.2	Tibu	Rock Core Composite	--	0.001
279	P1 772+82	265' RT	R- 110	59.5-115.4	55.9	55.1	Tibu	Rock Core Composite	0.002	
280	P1 772+82	265' RT	R- 110	115.4-166.5	51.1	49.3	Tibu	Rock Core Composite	--	
281	P1 772+82	265' RT	R- 110	166.5-217.0	50.5	35.9	Tibu	Rock Core Composite	--	
*282	P1 774+95	137' LT	R- 111	0.8-53.0	51.7	37.9	Tibu	Rock Core Composite	0.248	0.875
283	P1 774+95	137' LT	R- 111	53.0-83.2	30.2	27.9	Tibu	Rock Core Composite	1.726	
284	P1 775+40	11' RT	R- 112	0-60.0	60.0	20.9	Tibu	Rock Core Composite	--	0.757
285	P1 775+40	11' RT	R- 112	60.0-90.0	30.0	28.9	Tibu	Rock Core Composite	0.466	
286	P1 775+40	11' RT	R- 112	90.0-149.0	59.0	44.0	Tibu	Rock Core Composite	0.065	
287	P1 775+40	11' RT	R- 112	149.0-185.0	36.0	33.7	Tibu	Rock Core Composite	2.380	
288	P1 779+10	270' LT	P- 5	0-46.1	46.1	44.5	Tibu	Rock Core Composite	--	--
289	P1 779+10	270' LT	P- 5	46.1-100.5	54.4	54.4	Tibu	Rock Core Composite	--	
290	P1 779+10	270' LT	P- 5	100.5-150.5	50	48.8	Tibu	Rock Core Composite	--	

* The difference of the sample depth interval does not directly correspond to the tabulated drill length due to compositing procedures; the difference is less than 2 feet.

** Actual sample begins at 8 feet.

"--" Asbestos not detected to level of analytical sensitivity

APPENDIX H

**SOIL BORING DRILLING ORDER SUMMARY
INTERSTATE 11 - DESIGN BUILD
BOULDER CITY BYPASS PHASE 2
BOULDER CITY, NEVADA**

Boring Designation	Depth Drilled (feet)	Date Started	Station	*Offset (feet)	**Total Weight % Asbestos (TEM Analyses)
R- 5	11.5	10/17/2013	P 216+47	420 Rt.	--
R- 6	16.5	10/17/2013	P 222+41	218 Rt.	--
R- 7	27.8	10/17/2013	P 227+00	--	--
R- 4	26.5	10/17/2013	P 232+11	57 Lt.	--
R-3	24.0	10/17/2013	P 226+14	109 Lt.	Not Tested
R- 2	11.5	10/17/2013	P 221+30	234 Lt.	0.012
R-10	26.3	10/18/2013	P 249+20	--	--
R-11	31.5	10/18/2013	P 255+80	--	--
R-12	24.0	10/18/2013	P 262+00	--	--
R- 9A	21.5	10/18/2013	P 243+61	--	--
R- 9	26.5	10/18/2013	P 237+60	--	--
R-13	26.5	10/21/2013	P 267+40	--	Not Tested
R-14	26.5	10/21/2013	P 274+00	--	--
R-15	26.5	10/21/2013	P 280+00	--	Not Tested
R-16	36.5	10/21/2013	P 285+00	--	--
R-17	26.5	10/22/2013	P 293+00	--	--
R-18	14.0	10/22/2013	P 297+00	--	--
R-19	16.5	10/22/2013	P 307+00	--	--
R-20	26.5	10/22/2013	P 313+50	--	--
R-21	21.5	10/22/2013	P 321+60	--	Not Tested
R-22	15.5	10/22/2013	P 325+80	--	--
R-23	16.5	10/23/2013	P 335+70	--	--
R-24	21.5	10/23/2013	P 342+25	--	Not Tested
R-25	24.0	10/23/2013	P 345+75	--	--
R-26	16.5	10/23/2013	P 352+09	1 Rt.	Not Tested
R-29	16.5	10/23/2013	P 367+00	--	0.010
R-30	16.5	10/23/2013	P 372+00	--	--
R-31	16.5	10/23/2013	P 375+65	--	Not Tested
R-27	31.5	10/24/2013	P 358+95	--	--
R-28	31.5	10/24/2013	P 362+50	8 Lt.	Not Tested
R-32	21.5	10/24/2013	P 382+50	--	0.035
R-33	15.1	10/24/2013	P 389+40	--	0.008
R-34	16.5	10/24/2013	P 395+00	--	0.004
WPB-1	50.4	10/28/2013	P 409+40	60 Lt.	Not Tested
WPB-2	50.4	10/28/2013	P 409+40	60 Rt.	--
R-35	31.5	10/29/2013	P 400+20	--	0.004
R-36	36.5	10/29/2013	P 404+50	--	--
WPB-3	50.3	10/29/2013	P 411+10	60 Lt.	Not Tested
WPB-4	50.3	10/30/2013	P 411+10	60 Rt.	--

* "--" Boring drilled approximately on centerline.

**"--" Asbestos not detected to level of analytical sensitivity .

**SOIL BORING DRILLING ORDER SUMMARY
INTERSTATE 11 - DESIGN BUILD
BOULDER CITY BYPASS PHASE 2
BOULDER CITY, NEVADA**

Boring Designation	Depth Drilled (feet)	Date Started	Station	*Offset (feet)	**Total Weight % Asbestos (TEM Analyses)
R-37	35.2	10/31/2013	P 417+50	--	0.005
R-38	25.2	10/31/2013	P 422+80	--	0.005
R-39	25.2	10/31/2013	P 427+50	--	--
R-40	20.4	10/31/2013	P 433+10	--	--
R-41	16.5	11/1/2013	P 440+25	--	--
R-42	11.3	11/1/2013	P 445+00	--	--
R-43	21.5	11/1/2013	P 452+00	--	0.005
R-44	20.3	11/1/2013	P 457+60	--	0.002
R-45	16.5	11/1/2013	P 463+60	--	--
R-46	20.3	11/1/2013	P 467+00	--	0.006
R-47	16.5	11/4/2013	P 474+70	--	--
R-48	20.3	11/4/2013	P 480+08	7 Lt.	--
R-49	25.3	11/4/2013	P 485+20	--	--
RW-1	25.8	11/4/2013	P 488+51	27 Rt.	--
R-50	11.5	11/4/2013	P 501+00	--	--
R-51	21.5	11/4/2013	P 505+40	18 Lt.	--
R-52	15.3	11/5/2013	P 511+00	--	--
R-53	15.8	11/5/2013	P 522+00	--	--
R-54	16.5	11/5/2013	P 528+40	--	--
R-55	11.5	11/5/2013	P 534+00	--	--
R-56	15.8	11/5/2013	P 544+10	--	--
R-57	14.0	11/5/2013	P 555+00	--	--
R-58	30.2	11/6/2013	P 563+50	--	--
BSCB-1	30.1	11/6/2013	P 560+70	60 Lt.	--
BSCB-2	32.2	11/7/2013	P 560+91	61 Rt.	--
R-59	15.3	11/8/2013	P 575+26	7 Lt.	--
R-60	20.2	11/8/2013	P 581+10	--	--
R-61	16.4	11/8/2013	P 585+10	--	Not Tested
R-62	15.7	11/8/2013	P 588+60	--	0.023
R-66	25.3	11/11/2013	P 608+22	--	0.022
R-65	21.2	11/11/2013	P 604+75	--	--
BSCB-2A	30.1	11/13/2013	P 561+74	71 Lt.	0.008
BSCB-1A	30.3	11/13/2013	P 559+90	60 Rt.	0.020
95B-1	40.1	11/15/2013	P 214+65	69 Rt.	--
95B-2	40.2	11/15/2013	P 216+65	65 Lt.	0.002
R- 1	11.5	11/15/2013	P 216+43	315 Lt.	--

R-114	15.2	11/22/2013	P1 801+00	--	--
R-115	16.3	11/22/2013	P1 805+18	4 Rt.	0.410

* "--" Boring drilled approximately on centerline.

**"--" Asbestos not detected to level of analytical sensitivity .

**SOIL BORING DRILLING ORDER SUMMARY
INTERSTATE 11 - DESIGN BUILD
BOULDER CITY BYPASS PHASE 2
BOULDER CITY, NEVADA**

Boring Designation	Depth Drilled (feet)	Date Started	Station	*Offset (feet)	**Total Weight % Asbestos (TEM Analyses)
R-116	8.2	11/23/2013	P1 812+74	132 Lt.	--
R-117	10.5	11/23/2013	P1 815+43	3 Lt.	--
R-81	31.0	11/23/2013	P1 678+24	74 Lt.	0.238
					0.853
					0.082
R-82	44.0	11/24/2013	P1 681+75	0	0.391
					0.300
					0.105
R-75	50.5	11/25/2013	P 650+92	148 Lt.	0.278
					1.029
R-76A	10.3	11/26/2013	P 657+70	80 Lt.	0.432
					0.153
R-76B	50.8	11/26/2013	P 657+68	82 Lt.	Not Tested
ITB-3	39.6	12/3/2013	P1 673+45	60 Lt.	Not Tested
ITB-4	29.6	12/3/2013	P1 673+72	36 Rt.	0.049
ITB-2	20.0	12/8/2013	P 672+70	57 Rt.	Not Tested
ITB-1	29.8	12/8/2013	P 672+00	50 Lt.	0.557
R-78	44.8	12/8/2013	P 668+10	24 Lt.	0.164
R-77	27.3	12/9/2013	P 662+09	35 Lt.	0.227
					0.514
R-74	16.9	12/9/2013	P 645+39	17 Lt.	0.001
					0.117
R-72	24.8	12/9/2013	P 637+00	60 Lt.	0.004
					0.461
R-71	20.2	12/10/2013	P 631+54	17 Lt.	0.358
R-73	52.0	12/10/2013	P 641+27	118 Lt.	Not Tested
R-70	50.3	12/11/2013	P 625+68	50 Lt.	--
R-69	26.1	12/11/2013	P 618+25	60 Lt.	0.001
R-68	15.3	12/12/2013	P 616+00	--	Not Tested
R-67	22.5	12/12/2013	P 612+70	30 Lt.	0.005
R-63	30.6	12/12/2013	P 596+70	60 Lt.	0.004
R-79	34.6	12/13/2013	P 672+61	204 Lt.	0.615
					2.295
R-80	40.7	12/13/2013	P1 673+79	182 Rt.	0.243
					1.873

* "--" Boring drilled approximately on centerline.

**"--" Asbestos not detected to level of analytical sensitivity .