Hanson Aggregates Pennsylvania LLC
7660 Imperial Way
Allentown, PA 18195-1040
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Sent via e-mail

October 3, 2019

Michael P. Kutney, P.G.
Pottsville District Mining Office
Pennsylvania Department of Environmental Protection
5 West Laurel Boulevard
Pottsville, PA 17901

Re: Response to PADEP September 20, 2019 Letter
Rock Hill Quarry
Hanson Aggregates Pennsylvania LLC
SMP # 7974SM1
East Rockhill Twp., Bucks Co., PA

Mr. Kutney:

Hanson Aggregates Pennsylvania LLC (Hanson) is in receipt of the following data and correspondence:

- September 20, 2019 letter from Pennsylvania Department of Environmental Protection (PADEP);
- September 11, 2019 letter from East Rockhill Township Board of Supervisors as prepared by Steven Baluh, P.E.
- EMSL Analytical, Inc. lab report (PDF) as transmitted by Michael Kutney on August 28, 2019

The Department's September 20, 2019 letter requests, among other items, additional TEM analysis of the samples collected at the Rock Hill Quarry site. Hanson is providing the Department with the attached information from RJ Lee Group that clarifies the laboratory methods and procedures utilized for characterization of the potential presence of asbestiform minerals at the Rock Hill Quarry site. RJ Lee Group also addresses the recent EMSL Analytical, Inc. lab report (referenced above).

Also contained within RJ Lee's response are two (2) maps and a table showing the boulder, core and aggregate sampling locations as requested in your letter of September 20, 2019.

As we have discussed, our consultants are currently preparing a Qualitative Geologic Survey Report detailing the results of the sampling completed at the site per the approved work plan, and we are further preparing responses to the Department's, East Rockhill Township's and REPA's comment letters.

Furthermore, several prominent mineralogists are reviewing the recent EMSL Analytical, Inc. report and the following items are being requested to aid in that review:

- PLM and TEM photos of the samples;
- EDS and SAED of each particle from the EMSL count sheets;
- Powder x-ray diffraction of each sample;
- Explanation of how EMSL differentiates asbestiform / non-asbestiform for TEM & PLM;
- Explanation of how EMSL distinguished between pyroxenes and amphiboles

Please feel free to contact me at (610) 366-4819 should you wish to discuss this submission or have any questions regarding the enclosed information.

Regards,

Andrew J. Gutshall, P.G.
Area Environmental Manager

encl: RJ Lee Group letter to Andrew J. Gutshall, P.G. dated October 3, 2019

cc: John Stefanko, PADEP
Daniel Sammarco, PADEP
Gary A. Latsha, PADEP
Amiee Bollinger, PADEP
James Rebarchak, PADEP
Sachin Shankar, PADEP
Robert Vogel, PADEP
Virginia Cain, PADEP,
Craig Lambeth, PADEP
East Rockhill Township
David Raphael, K&L Gates
Kelly Bailey, KBC LLC
Drew Van Orden, RJ Lee Group
Louis F. Vittorio, P.G., EarthRes
Robert Gundlach, Fox Rothschild
Curt Mitchell, R.E. Pierson
Mark Kendrick, Hanson
Matthew Burns, Hanson
Environmental File

RJ LEE GROUP
DELIVERING SCIENTIFIC RESOLUTION

October 3, 2019

Mr. Andrew J. Gutshall
Hanson Aggregates Pennsylvania LLC
7660 Imperial Way
Allentown, PA 18195-1040

RE: Response to Comments by East Rockhill Township
RJ Lee Group Project Number: LLH901997

Mr. Gutshall,

I am providing the following information in response to a letter from East Rockhill Township's engineer to the Pennsylvania Department of Environmental Protection (PA DEP) dated September 11, 2019.[1] The referenced letter requests, in part, that the PA DEP require Hanson to complete additional sampling and analysis to further delineate the presence and extent of asbestos at the Rock Hill Quarry site. The Township's request is based on faulty data generated by PA DEP's contract laboratory. Performing additional analyses of the rock to be mined and sold as aggregate will only provide similar data to existing reports and will not offer any new insights into the issues at hand.

RJ Lee Group is in receipt of the data developed by PA DEP's laboratory contractor, EMSL. While some initial evaluations of this data can be made, there are unresolved issues that prevent a complete evaluation. Among these are questions regarding how EMSL differentiated the reported amphibole minerals into asbestos and non-asbestos minerals. There are no images, elemental compositions, or diffraction data contained in the EMSL reports that would assist with that evaluation.

Samples from the Rock Hill Quarry have been collected per the approved work plan and include produced aggregate (stockpiles), drill cores, hand samples, and mineral veins from boulders identified in the deposit. The sampling, conducted by professional geologists in cooperation with PA DEP, has focused on the rock that has been and will be quarried from the site. The data developed to date indicates that the amphibole mineral actinolite can be found in distinct veins occurring infrequently throughout the rock to be quarried, and that actinolite asbestos is present at low concentrations (below 0.25 % by weight). Trace levels of actinolite asbestos were also observed in the water samples, but at concentration below US EPA safe drinking water levels (even when analyzing for fibers 5 µm and longer).

Based on the drill core data, the amphibole veins in the deposit represent approximately 0.4% of the possible rock to be quarried, with only a fraction of that amphibole occurring in the asbestiform habit (approximately 0.02%). The Township letter makes specific reference to some samples that are hand samples of boulders and veins which do not represent the diabase to be mined at the site. These samples were chosen to purposefully isolate potential veins of minerals that could contain asbestos. Such results must be considered in the context of the sampling – they represent a tiny fraction of the overall diabase deposit.

[1] S. Baluh (2019). "Rockhill Quarry (Pierson Materials/Hanson Aggregates); East Rockhill Township Comments on Qualitative Geologic Survey", September 11, 2019.

RJ Lee Group's analyses on these collected samples were conducted using accepted analytical procedures. For example, the water samples were analyzed using two approved EPA methods: EPA 100.2, transmission electron microscopy (TEM) and EPA 100.1 (for fibers 5 µm and longer). Of seven water samples, only one sample was observed to contain any asbestos (NPDES Outfall, 0.2 MFL). Bulk material (57 samples of aggregate, veins, etc.) were examined using an approved EPA method (EPA 600/R-93/116, polarized light microscopy). Of these, six samples of the aggregate were examined using TEM, with asbestos concentrations (≤ 0.05%) reported in half of the samples; the other samples reported no asbestos detected. These analyses indicate that there are sporadic, irregularly spaced locations where low levels of actinolite asbestos can be found.

Engineering controls, such as those planned for this site, are appropriate for this type of material. The controls are described in Modules 16 and 17 currently under review by PA DEP and are also listed in the attached Table 1. Engineering controls are routinely recognized by regulatory agencies and utilized throughout the mining industry to prevent fugitive dust emissions and meet applicable standards.

Sampling at Rock Hill Quarry

The sampling at the Rock Hill Quarry was conducted by a professional geologist in conjunction with representatives of the PA DEP. The samples were collected from four (4) drill cores from the proposed mining areas, from exposed mineral veins on quarry highwall faces in the area to be mined, from existing quarry stockpiles, and selected boulders on the property. The samples were collected in accordance with the PA DEP approved workplan. Maps showing the locations of the samples is attached as Figure 1 (stockpile samples) and Figure 2 (boulder, drill core, and hand samples); the locations are tabulated in Table 2.

This sampling does indicate that the only type of asbestos present is from the tremolite/actinolite solid solution series of amphibole minerals. When these minerals occur in the asbestiform habit, they are regulated as asbestos by all agencies of the Federal government as well as by the Commonwealth of Pennsylvania. Hornblende (a non-asbestiform amphibole mineral) has also been observed, but to date, no other amphibole mineral (or any other mineral) has been observed in an asbestiform habit. The mineralogy of the diabase is very consistent, suggesting that additional analyses are not expected to provide a different characterization of the deposit.

Reported Asbestos Concentrations

The analyses of the aggregate piles indicate that there is a small amount of actinolite asbestos present in some, but not all, samples. This asbestos was observed at concentrations below 0.25% when examined using either polarized light microscopy (PLM) or transmission electron microscopy (TEM). There is no significant difference in concentration when comparing the PLM and TEM results. The TEM reports of the bulk samples are attached in Appendix 1. These TEM analyses were performed using accepted definitions of asbestos and non-asbestos. The results indicate that asbestos was observed in half of the samples, but at concentrations ≤ 0.054%.

The analytical procedures used on these samples are appropriate. Asbestos fibers are difficult to grind due to their high tensile strength; the majority of the asbestos fibers will retain dimensions that are visible in the polarized light microscope. In addition, the PLM method analyzes a much larger aliquot of sample (approximately 10,000 times larger) than does the TEM method. These are some of the reasons that

states such as California[2] and Nevada[3] require the use of PLM to analyze aggregate samples for asbestos content. In addition, PLM is the method used by EPA and OSHA for documenting whether a material is regulated as asbestos-containing.

There are obvious differences in the morphology of asbestos and non-asbestos minerals. Figure 3 and Figure 4 show pictures of asbestos and non-asbestos actinolite. The asbestos minerals have a cotton ball-like appearance while the non-asbestos actinolite appears as chunks of rock with a blocky shape. These differences are further illustrated with the PLM photographs shown in Figure 5, where the differences in morphology between asbestos and non-asbestos minerals are obvious.

Some of the results cited by the Township letter are from evaluations where the differences between the growth habits of the amphibole minerals appear to have been ignored. This is a critical error. Only the asbestiform habit of the actinolite mineral (the amphibole mineral at Rock Hill) is regulated by Federal and Commonwealth agencies. Furthermore, the analytical procedures used in these analyses require the laboratory to make this morphological distinction ("All fibrous materials in amounts greater than trace should be identified as asbestos or non-asbestos…". EPA 600/R-93/116). When laboratories fail to properly differentiate between the asbestos and non-asbestos growth habits (as required by the methods), results are overestimated, inflating the amount of asbestos present.

The asbestiform habit is defined in the EPA methodology (EPA 600/R-93/116) which states:

> "**Asbestiform (morphology)** - Said of a mineral that is like asbestos, i.e., crystallized with the habit of asbestos. Some asbestiform minerals may lack the properties which make asbestos commercially valuable, such as long fiber length and high tensile strength. With the light microscope, the asbestiform habit is generally recognized by the following characteristics:
>
> - Mean aspect ratios ranging from 20: 1 to 100: 1 or higher for fibers longer than 5µm. Aspect ratios should be determined for fibers, not bundles.
> - Very thin fibrils, usually less than 0.5 micrometers in width, and
> - Two or more of the following:
>   - Parallel fibers occurring in bundles,
>   - Fiber bundles displaying splayed ends,
>   - Matted masses of individual fibers, and/or
>   - Fibers showing curvature
>
> These characteristics refer to the population of fibers as observed in a bulk sample. It is not unusual to observe occasional particles having aspect ratios of 10:1 or less, but it is unlikely that the asbestos component should be dominated by particles (individual fibers) having aspect ratios of <20:1 for fibers longer than 5µm. If a sample contains a fibrous component of which most of the fibers have aspect ratios of <20:1 and that do not display the additional asbestiform characteristics, by definition the component should not be considered asbestos."

[2] ARB Monitoring and Laboratory Division (2017). *Implementation Guidance Document: Field Sampling and Laboratory Practices*, California Environmental Protection Agency, Air Resources Board, April 2017.
[3] Nevada DOT (2019). *Documenting Naturally Occurring Asbestos and Erionite in Import Material from Non-Nevada Department of Transportation Sources for Project*, Department of Transportation, Version 2.0, February 11, 2019.

Failure to adhere to this EPA definition and its required characteristics leads to errors that can be illustrated by examining data produced by EMSL. This is true for both naturally occurring asbestos as well as commercially sold asbestos. If the dimensional criteria from EPA 600/R-93/116 are applied to all of the EMSL reported amphibole particles, then the reported asbestos concentrations in the samples are reduced (on average) to about 3% of the reported values, Table 3 for fibers 5 µm and longer. If shorter fibers (< 5 µm) are included, then the average asbestos concentrations are reduced to about 7% of the reported values. These differences are highlighted by the Vein 7 sample that goes from 19.1% to 1.4% (1.8% possible asbestos if <5 µm fibers are included). Additional information described above would validate this characterization, though even with this additional information this represents a very small fraction of the aggregate to be mined. These simple calculations illustrate the problem that occurs when laboratories do not properly differentiate between asbestos and non-asbestos growth habits. As noted earlier, it is not clear how EMSL differentiated between these habits and no photographs were produced that could aid in this interpretation.

Other errors noted in the EMSL data include using incorrect optical properties for the asbestiform minerals, principally the extinction angle of the amphibole minerals. EMSL reported this value as "oblique" (inclined) when reporting asbestos fibers. Research on asbestos indicates that monoclinic amphibole minerals (such as actinolite) have anomalous extinction properties because you are observing the extinction of a bundle of fibers and therefore witness an "average" extinction.[4,5,6] Inclusion of these particles with "oblique" (inclined) extinction as "asbestos" fibers results in an overestimation of the actual asbestos content.

The produced aggregate is not regulated as an "asbestos-containing material" (ACM). Both EPA and OSHA define ACM as containing more than 1% asbestos. The Nevada Department of Transportation and the California Air Resources Board (an agency referenced by the Township's retained expert, Bradley Erskine) regulate aggregate as acceptable for use on unpaved roads when the aggregate is less than 0.25% asbestos. As noted, the values reported for the aggregate samples is <0.1%. Certainly, restricting the use of aggregate at such low levels of asbestos may have major impacts on any activity in Pennsylvania that involves the movement/disturbance of rock or soil.

If you have any questions about these comments, please feel free to call me.

Sincerely,

Drew R Van Orden

Drew R. Van Orden, PE
Senior Consulting Scientist

[4] J. R. Verkouteren and A. G. Wylie (2002). "Anomalous optical properties of fibrous tremolite, actinolite, and ferro-actinolite", *American Mineralogist*, 87, p. 1090-1095.
[5] T. Schneider, et al. (1998). "Development of a method for the determination of low contents of asbestos fibres in bulk material", *The Analyst*, 123, p. 1391–1400.
[6] M. Sanchez, et al. (2008). "Extinction Characteristics of Six Tremolites with Differing Morphologies", *The Microscope*, 56, p. 13-27.

Figure 1. Map showing the locations of the stockpile samples collected at the Rock Hill Quarry. The latitude and longitude for each sample location is shown in Table 2.

Figure 2. Map showing the locations of the boulder, dill core, and hand samples collected at the Rock Hill Quarry. The latitude and longitude for each sample location is shown in Table 2.

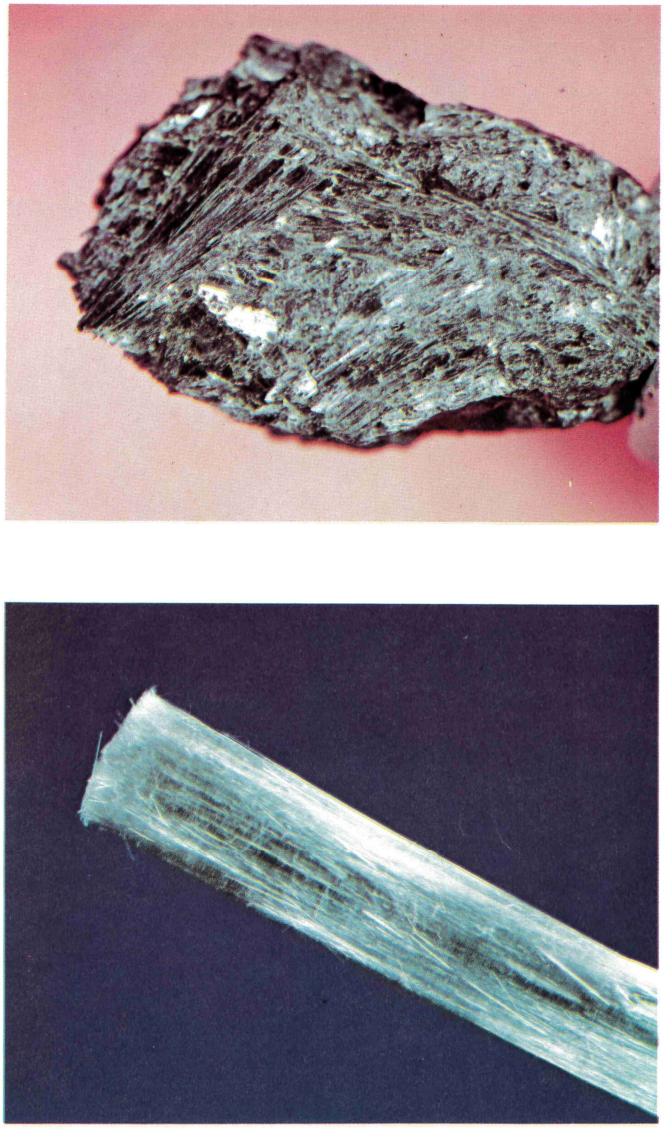

Figure 3. Photographs of actinolite showing non-asbestos actinolite (top) and actinolite asbestos (bottom). Photographs were taken from W. J. Campbell, et al (1977), *Selected Silicate minerals and Their Asbestiform Varieties*, Bureau of Mines Information Circular IC 8751, page 9.

Figure 4. Photographs of non-asbestos actinolite (top, San Bernardino CA) and actinolite asbestos (bottom, HSE reference material). The asbestos appears cotton-like while the non-asbestos has a blocky appearance.

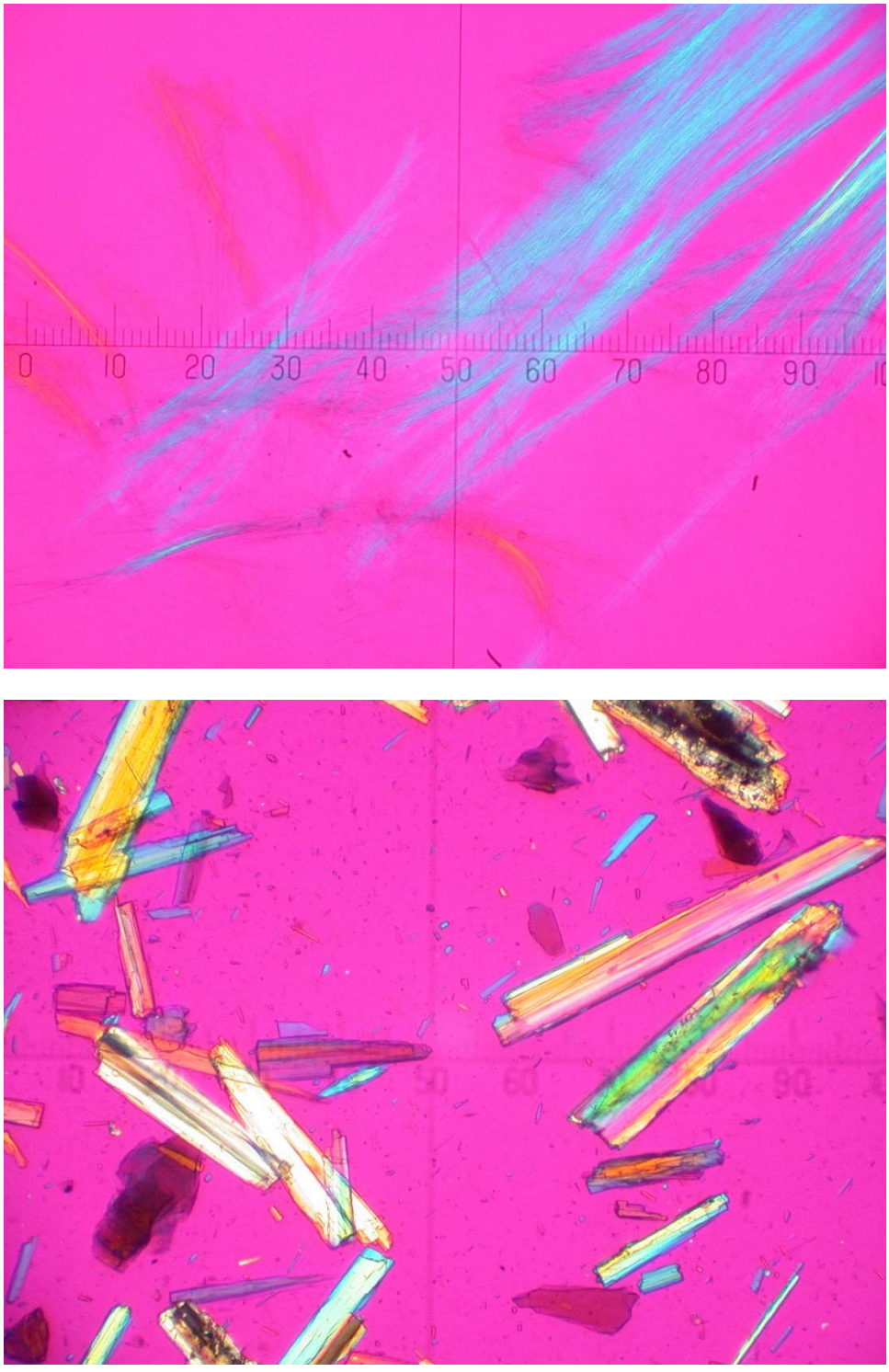

Figure 5. Polarized light microscopy photographs of asbestos (top) and non-asbestos (bottom) amphibole particles. The asbestos appears as bundles of thin fibers showing some curvature while the non-asbestos is larger and irregularly shaped.

Table 1. Engineering controls to be utilized at the Rock Hill Quarry

Parameter	Control
Blasting	• Stemming material should not contain fine material such as drill cuttings or 'fines'; • Any 'fines' or drill cuttings produced shall be removed from the blast area prior to initiating blast; and • Prior to loading, shot area (both blast holes and laydown area) must be watered down to limit dust from blast.
Air Pollution	• If necessary, portable water misters will be utilized to control fugitive dust from specific areas/activities (i.e. blasting) at the facility
Roads	• Internal paved roadways are to be cleaned (as needed) using a water truck and/or street sweeper to control the generation of fugitive dust or to collect accumulated dust and mud, unless weather conditions (e.g. rain/snow) prohibit the use of these control measures; • As needed, water will be applied to unpaved roads at the facility each operating day through the use of a water truck assigned to the facility unless weather conditions (e.g. rain/snow) prohibit the use of this control measure; • A facility-wide speed limit of 15 miles per hour (mph) will be posted and enforced to reduce associated fugitive dust emissions. Stone or asphalt paving will be applied to the roadway near the entrance/exit to the facility to reduce fugitive dust emissions; • Any spillage of stone onto public roads will be removed and the roadway cleaned as soon as practical. All materials will be wetted prior to removal. A street sweeper will be utilized as needed for public roads; • In addition to water, other dust suppressants approved by the Department may be used to control fugitive dust. Currently, the Department has approved calcium chloride; Ultra Bond 2000 (manufactured by JMG Enterprises - www.jmgemulsions.com); Pennzsuppress D (manufactured by PennzSuppress - www.pennzsuppress.com); Coherex and Dustbond (manufactured by Weavertown Oil (distributed by D&D Emulsions). Operator reserves the right to use any additional dust suppressants approved by the Department in the future
Trucks	• All trucks carrying products from the site are required to tarp their loads prior to exiting the site. A sign will be posted at the entrance/exit gate to the facility reminding drivers of the tarping requirements
Drilling	• To control dust, drill rigs will either add water during the drilling process or vent the exhaust through the drill rig's baghouse to minimize fugitive dust emissions
Mining	• Overburden will be removed using heavy construction equipment and be placed in stockpiles. Upon placement, the material will be stabilized with vegetation to prevent erosion by wind or water; and • As needed, water will be applied to mineral extraction area (e.g. area where loading haul trucks with shot rock occurs) using the water truck assigned to the facility unless weather conditions (e.g. rain/snow) prohibit the use of this control

Parameter	Control
Stockpiles	• Overburden materials will be stockpiled and stabilized with vegetation to prevent erosion by wind or water; • In accordance with the Pennsylvania Department of Environmental Protection Air Quality Permits, wet suppression (water sprays, etc.) methods will be used to control dust associated with the production of aggregate products. Sufficient moisture should be applied to the aggregate product during production to control fugitive dust emissions during stockpiling; • The height of each stockpile will be maintained so that the top of the pile is accessible to the water sprays from the water truck; and • In order to prevent fugitive dust, aggregate that has accumulated near or under process equipment will be cleaned up on a regular basis.
Loading and unloading	• Sufficient moisture should exist in the stockpiled aggregate products to control dust emissions during loadout. As needed, water should also be applied to the unpaved surfaces in the loading and unloading areas; stockpiles; and any other area where stone is being handled to prevent fugitive dust
Processing equipment	• The processing equipment approved under the GP-3 Air Quality Permit and Plan Approval 09-0241 utilizes wet suppression to reduce fugitive emissions during material processing. The wet suppression systems detailed in Plan Approval 09-0241 consist of high-pressure water pumps supplying nozzles and multiple manifold spray bars positioned at transfer points, outlets of crushers and the primary dump hopper; and • Loaders and hoppers will not be overfilled in order to prevent the spillage of aggregate
Conveyors	• Conveyors associated with the processing equipment will use wet suppression to control fugitive emissions; and • The drop heights of stone onto stockpiles or during stone handling operations will be kept to a minimum to prevent fugitive dust

Additionally, site processing activities of bedrock material are addressed under separate Air Quality General Permit GP3-03-0157 (issued 03/14/2018) and Plan Approval 09-0241 (issued 12/05/2018).

Table 2. Locations for each sample collected at the Rock Hill Quarry, East Rockhill Township

Type	ID	Latitude, N	Longitude, W	Date Collected	ID On COC*
2B Pile	1	40°24'22.94"	75°18'17.05"	4/18/2019	1
2B Pile	2	40°24'22.39"	75°18'16.82"	4/18/2019	2
2B Pile	3	40°24'22.01"	75°18'16.77"	4/18/2019	3
2B Pile	4	40°24'21.80"	75°18'16.85"	4/18/2019	4
2B Pile	5	40°24'21.64"	75°18'17.15"	4/18/2019	5
2B Pile	6	40°24'21.79"	75°18'17.75"	4/18/2019	6
2B Pile	7	40°24'22.02"	75°18'18.08"	4/18/2019	7
2B Pile	8	40°24'22.55"	75°18'18.22"	4/18/2019	8
2B Pile	9	40°24'22.86"	75°18'17.97"	4/18/2019	9
2B Pile	10	40°24'23.03"	75°18'17.47"	4/18/2019	10
1B Pile	11	40°24'23.03"	75°18'16.23"	4/18/2019	11
1B Pile	12	40°24'23.24"	75°18'15.56"	4/18/2019	12
2A Pile	13	40°24'22.41"	75°18'14.88"	4/18/2019	13
2A Pile	14	40°24'22.69"	75°18'14.61"	4/18/2019	14
Screenings	15	40°24'20.59"	75°18'16.51"	4/18/2019	15
Screenings	16	40°24'20.92"	75°18'16.78"	4/18/2019	16
Boulder	RH#1	40°24'7.76"	75°17'49.46"	5/8/2019	RH#1
Boulder	RH#2	40°24'7.18"	75°17'50.43"	5/8/2019	RH#2
Boulder	RH#3	40°24'7.18"	75°17'50.43"	5/8/2019	RH#3
Boulder	RH#4	40°24'6.63"	75°17'51.06"	5/8/2019	RH#4
Boulder	RH#5	40°24'6.70"	75°17'51.60"	5/8/2019	RH#5
Boulder	RH#6	40°24'6.74"	75°17'52.45"	5/8/2019	RH#6
Boulder	RH#7	40°24'7.19"	75°17'52.55"	5/8/2019	RH#7
Boulder	RH#8	40°24'8.22"	75°17'49.40"	5/8/2019	RH#8
Boulder	RH#9	40°24'8.77"	75°17'50.46"	NS	
Boulder	RH#10	40°24'9.45"	75°17'49.91"	5/8/2019	RH#10
Boulder	RH#11	40°24'9.64"	75°17'48.85"	5/8/2019	RH#11
Boulder	RH#12	40°24'12.13"	75°17'46.65"	5/8/2019	RH#12
Boulder	RH#13	40°24'12.13"	75°17'46.65"	NS	
Boulder	RH#14	40°24'11.87"	75°17'46.30"	5/8/2019	RH#14
Boulder	RH#15	40°24'11.29"	75°17'46.36"	NS	
Boulder	RH#16	40°24'10.39"	75°17'46.12"	NS	
Boulder	RH#17	40°24'11.88"	75°17'45.76"	NS	
Boulder	RH#18	40°24'12.09"	75°17'46.05"	5/7/2019	RH#18
Boulder	RH#19	40°24'12.84"	75°17'45.70"	NS	
Boulder	RH#20	40°24'12.82"	75°17'45.70"	NS	
Boulder	RH#21	40°24'12.82"	75°17'45.70"	NS	
Boulder	RH#22	40°24'15.09"	75°17'44.40"	5/7/2019	RH#22

Type	ID	Latitude, N	Longitude, W	Date Collected	ID On COC*
Boulder	RH#23	40°24'15.60"	75°17'44.50"	5/7/2019	RH#23
Boulder	RH#24	40°24'14.25"	75°17'46.61"	5/7/2019	RH#24
Boulder	RH#25	40°24'14.27"	75°17'46.83"	5/7/2019	RH#25
Boulder	RH#26	40°24'14.25"	75°17'47.57"	5/7/2019	RH#26
Boulder	RH#27	40°24'14.54"	75°17'47.58"	5/7/2019	RH#27
Boulder	RH#28	40°24'10.86"	75°17'49.42"	5/8/2019	RH#28
Boulder	RH#29	40°24'9.47"	75°17'51.30"	5/8/2019	RH#29
Boulder	RH#30	40°24'8.47"	75°17'51.60"	5/8/2019	RH#30
Boulder	RH#31	40°24'14.40"	75°18'9.67"	5/7/2019	RH#31
Boulder	RH#32	40°24'15.88"	75°18'1.51"	5/7/2019	RH#32
Boulder	RH#33	40°24'15.88"	75°18'1.51"	5/13/2019	RH#33
Core	CB-1 #1	40°24'12.37"	75°17'49.51"	5/23/2019	CB-1 #1
Core	CB-1 #3	40°24'12.37"	75°17'49.51"	5/23/2019	CB-1 #3
Core	DB-1	40°24'12.37"	75°17'49.51"	5/23/2019	DB-1
Core	CB-2 #4	40°24'13.31"	75°17'49.24"	5/23/2019	CB-2 #4
Core	CB-2 #5	40°24'13.31"	75°17'49.24"	5/23/2019	CB-2 #5
Core	CB-2 #6	40°24'13.31"	75°17'49.24"	5/23/2019	CB-2 #6
Core	DB-2	40°24'13.31"	75°17'49.24"	5/23/2019	DB-2
Core	CB-3 #7	40°24'13.92"	75°17'47.50"	5/23/2019	CB-3 #7
Core	CB-3 #8	40°24'13.92"	75°17'47.50"	5/23/2019	CB-3 #8
Core	CB-3 #9	40°24'13.92"	75°17'47.50"	5/23/2019	CB-3 #9
Core	DB-3	40°24'13.92"	75°17'47.50"	5/23/2019	DB-3
Core	CB-4 #10	40°24'14.71"	75°17'47.00"	5/23/2019	CB-4 #10
Core	DB-4	40°24'14.71"	75°17'47.00"	5/23/2019	DB-4
Hand Sample	Hand Samp 1	40°24'8.52"	75°17'50.82"	5/23/2019	Hand Samp 1
Hand Sample	Hand Samp 2	40°24'11.55"	75°17'52.31"	5/23/2019	Hand Samp 2
Hand Sample	Vein 7 (HS#3)	40°24'12.01"	75°17'50.79"	5/23/2019	Vein 7
Surf. H2O	NPDES Outfall	40°24'23.08"	75°18'20.07"	4/18/2019	NPDES Outfall
Surf. H2O	Sed. Trap 2	40°24'22.52"	75°18'19.00"	4/18/2019	Sed. Trap 2
Surf. H2O	Sed. Basin 2	40°24'17.91"	75°18'15.22"	4/18/2019	Sed. Basin 2
Surf. H2O	Sed Basin 1	40°24'14.10"	75°18'13.14"	4/18/2019	Sed Basin 1
Surf. H2O	Quarry Pit	40°24'14.79"	75°18'0.53"	4/18/2019	Quarry Pit
Surf. H2O	Sed Trap 1	40°24'2.97"	75°18'0.33"	4/18/2019	Sed Trap 1
Surf. H2O	Sed Trap 3	40°24'5.56"	75°18'1.15"	4/18/2019	Sed Trap 3

* - Identification on Chain-of-Custody

Table 3. Asbestos content of several samples recalculated from the produced EMSL data.

Sample	Reported Asbestos %	Asbestos %, Length > 5 µm, Aspect Ratio > 20:1	Asbestos %, [Length > 5 µm, Aspect Ratio > 20:1] plus [Length < 5 µm, Aspect Ratio > 10:1]
RH #33	< 0.1	None Detected	0.003
DB #4	< 0.1	None Detected	None Detected
HS #2	0.6	0.028	0.068
CB-3 #8	0.2	0.005	0.017
CB-1 #1	3.3	0.391	0.44
CB-2 #5	0.6	0.013	0.02
CB-4 #10	< 0.1	0.0002	0.002
CB-2 #4	0.5	0.006	0.028
RH HS-1	0.7	0.004	0.004
RH Vein #7	19.1	1.48	1.79

Appendix 1

Transmission Electron Microscopy Reports for Aggregate Samples

RJ Lee Group, Inc
350 Hochberg Road
Monroeville, PA 15146
Tel: (724) 325-1776 | Fax (724) 733-1799

Final Laboratory Report

TEM Bulk Protocol

Attention: David Raphael
K & L Gates
17 North Second Street
Harrisburg, PA 17101
US

Report Date: 09/26/2019
Sample Receipt Date: 09/03/2019
RJ Lee Group Job No.: LLH901997-14
Authorization/P.O. No.:
Samples Received: 6
Client Job No.:

Method: ASTM D-5756 Standard Test Method, Modified

TABLE 1 -- Weight Percent of Asbestos, Cleavage Fragment Amphibole and Non-Asbestos

		Total Structures				----------Weight Percent---------- Total Structures Analytical Sensitivity			
Client Sample Number	RJLG Sample Number	Chry	Amph	Cleavage	Non Asbestos	Chry	Amph Asb	Amph Cleavage Fragment	Non Asbestos
11	3158157	0	10	9	1	**< 1.9E-6** 1.9E-6	**6.2E-3** 2.4E-6	**2.2E-2** 1.5E-6	**2.7E-3** 1.4E-6
13	3158159	0	48	39	19	**< 1.4E-6** 1.4E-6	**5.4E-2** 1.7E-6	**2.7E-1** 1.1E-6	**5.3E-2** 1.0E-6

NOTES
1. "<" indicates results less than analytical sensitivity. "---" indicates that sample was not analyzed.
2. Sample(s) for this project were analyzed at our: Monroeville, PA (AIHA #100364, NVLAP #101208-0, NY ELAP #10884) facility.
3. If RJ Lee Group, Inc. did not collect the samples analyzed, the verifiability of the laboratory's results are limited to the reported values.
4. Density of amphibole: 3.2 * 10^{-3} ng/ µm³, density of chrysotile: 2.55 * 10^{-3} ng/ µm³, density of non-asbestos: 3.00 * 10^{-3} ng/ µm³.
5. Abbreviations: N/A-Not Applicable, Chry-Chrysotile Asbestos, Amph-Amphibole Asbestos, Asb-Asbestos Amphibole, Cleavage-Cleavage Amphibole.
6. Samples will be held for 90 days and then disposed of per Federal regulations.
7. These results are submitted pursuant to RJ Lee Group's current terms and conditions of sale, including the company's standard warranty and limitation of liability provisions. No responsibility or liability is assumed for the manner in which these results are used or interpreted.

TABLE 1 -- Weight Percent of Asbestos, Cleavage Fragment Amphibole and Non-Asbestos

Client Sample Number	RJLG Sample Number	Total Structures Chry	Total Structures Amph	Total Structures Cleavage	Total Structures Non Asbestos	Weight Percent (Total Structures Analytical Sensitivity) Chry	Amph Asb	Amph Cleavage Fragment	Non Asbestos
15	3158161	0	7	6	0	**< 4.8E-6** 4.8E-6	**2.5E-2** 6.0E-6	**4.2E-2** 3.8E-6	**< 3.6E-6** 3.6E-6
3	3158165	0	0	1	2	**< 2.4E-6** 2.4E-6	**< 3.0E-6** 3.0E-6	**8.8E-4** 1.9E-6	**7.7E-4** 1.8E-6
5	3158167	0	0	3	1	**< 3.2E-6** 3.2E-6	**< 4.0E-6** 4.0E-6	**1.6E-3** 2.6E-6	**3.9E-3** 2.4E-6
8	3158170	0	0	1	1	**< 4.8E-6** 4.8E-6	**< 6.0E-6** 6.0E-6	**2.0E-3** 3.8E-6	**3.0E-2** 3.6E-6

NOTES

1. "<" indicates results less than analytical sensitivity. "---" indicates that sample was not analyzed.
2. Sample(s) for this project were analyzed at our: Monroeville, PA (AIHA #100364, NVLAP #101208-0, NY ELAP #10884) facility.
3. If RJ Lee Group, Inc. did not collect the samples analyzed, the verifiability of the laboratory's results are limited to the reported values.
4. Density of amphibole: $3.2 * 10^{-3}$ ng/μm^3, density of chrysotile: $2.55 * 10^{-3}$ ng/μm^3, density of non-asbestos: $3.00 * 10^{-3}$ ng/μm^3.
5. Abbreviations: N/A-Not Applicable, Chry-Chrysotile Asbestos, Amph-Amphibole Asbestos, Asb-Asbestos Amphibole, Cleavage-Cleavage Amphibole.
6. Samples will be held for 90 days and then disposed of per Federal regulations.
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TABLE 2 -- Weight Percent of Asbestos, Cleavage Fragment Amphibole and Non-Asbestos ≥5 µm

		--------Structures ≥5 µm--------				----------Weight Percent---------- Structures ≥5 µm Analytical Sensitivity			
						Amphibole			
Client Sample Number	RJLG Sample Number	Chry	Amph	Cleavage	Non-Asbestos	Chry	Asb	Cleavage Fragment	Non-Asbestos
11	3158157	0	1	1	0	**< 1.9E-5** 1.9E-5	**4.8E-3** 2.4E-5	**1.5E-2** 1.5E-5	**< 1.4E-5** 1.4E-5
13	3158159	0	27	2	4	**< 1.4E-5** 1.4E-5	**5.0E-2** 1.7E-5	**2.5E-1** 1.1E-5	**3.6E-2** 1.0E-5
15	3158161	0	4	1	0	**< 4.8E-5** 4.8E-5	**1.6E-2** 6.0E-5	**3.0E-2** 3.8E-5	**< 3.6E-5** 3.6E-5
3	3158165	0	0	0	0	**< 2.4E-5** 2.4E-5	**< 3.0E-5** 3.0E-5	**< 1.9E-5** 1.9E-5	**< 1.8E-5** 1.8E-5
5	3158167	0	0	0	0	**< 3.2E-5** 3.2E-5	**< 4.0E-5** 4.0E-5	**< 2.6E-5** 2.6E-5	**< 2.4E-5** 2.4E-5
8	3158170	0	0	0	1	**< 4.8E-5** 4.8E-5	**< 6.0E-5** 6.0E-5	**< 3.8E-5** 3.8E-5	**3.0E-2** 3.6E-5

NOTES
1. "<" indicates results less than analytical sensitivity. "---" indicates that sample was not analyzed.
2. Sample(s) for this project were analyzed at our: Monroeville, PA (AIHA #100364, NVLAP #101208-0, NY ELAP #10884) facility.
3. If RJ Lee Group, Inc. did not collect the samples analyzed, the verifiability of the laboratory's results are limited to the reported values.
4. Density of amphibole: 3.2 * 10^{-3} ng/µm³, density of chrysotile: 2.55 * 10^{-3} ng/µm³, density of non-asbestos: 3.00 * 10^{-3} ng/µm³.
5. Abbreviations: N/A-Not Applicable, Chry-Chrysotile Asbestos, Amph-Amphibole Asbestos, Asb-Asbestos Amphibole, Cleavage-Cleavage Amphibole.
6. Samples will be held for 90 days and then disposed of per Federal regulations.
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Client Sample Number	RJLG Sample Number	Material Used (gm)	Area Analyzed Total (mm^2)	Area Analyzed $\geq 5 \mu m$ (mm^2)	Effective Filter Area (mm^2)	Dilution Factor
11	3158157	0.0005	0.31704	0.31704	1220	1.0
13	3158159	0.0007	0.31704	0.31704	1220	1.0
15	3158161	0.0002	0.31704	0.31704	1220	1.0
3	3158165	0.0004	0.31704	0.31704	1220	1.0
5	3158167	0.0003	0.31704	0.31704	1220	1.0
8	3158170	0.0002	0.31704	0.31704	1220	1.0

Authorized Signature: 

Monica McGrath-Koerner, Scientist

NOTES

1. "<" indicates results less than analytical sensitivity. "---" indicates that sample was not analyzed.
2. Sample(s) for this project were analyzed at our: Monroeville, PA (AIHA #100364, NVLAP #101208-0, NY ELAP #10884) facility.
3. If RJ Lee Group, Inc. did not collect the samples analyzed, the verifiability of the laboratory's results are limited to the reported values.
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5. Abbreviations: N/A-Not Applicable, Chry-Chrysotile Asbestos, Amph-Amphibole Asbestos, Asb-Asbestos Amphibole, Cleavage-Cleavage Amphibole.
6. Samples will be held for 90 days and then disposed of per Federal regulations.
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ASTM 5756-95 Hi Mag

RJ Lee Group, Inc.

TEM Count Sheet

Date Analyzed: 9/8/2019

RJL: LLH901997-14	3158157.HTA2	Microscope tem2000fx1	Grid Openings	10
11	K & L Gates	Magnification 21 KX	Asbestos	9.0
Wt: 0.0005 gm	Grid: 0.0091 mm²	Acc. Voltage 120 KV	Asbestos >= 5µm	0.0
Dil: 1.	Filter Size: 47 mm	Operator: Jon Swope	Nonasbestos	10.0
HQ44614		Cv = 0.89	Nonasbestos >= 5µm	1.0
			% Wt of largest asbestos structure	%

Field	Fiber	Length	Width	FiberType	Morph	EDX	File #	Photo	SAED	AmpID	C/A
1	1	1.95	0.05	Amphibole	F	MgSiCaFe	15649C	Image1 Image2	X	Acti	Asb
1	2	1.95	0.05	Amphibole	B	MgSiCaFe	15650C	Image3 Image4	Diff1	Acti	Asb
1	3	2.3	0.25	Amphibole		MgSiCaFe	15651C	Image5	Diff2	Acti	Cle
1	4	1.85	0.2	Amphibole		MgSiCaFe		Image6	X	Acti	Cle
1	5	2.3	0.18	Amphibole		MgSiCaFe		Image7	X	Acti	Cle
1	6	2.5	0.22	Amphibole	B	MgSiCaFe	15652C	Image8 Image9	Diff3	Acti	Asb
2	1	3.45	0.05	Amphibole	F	MgSiCaFe		Image10	X	Acti	Asb
3	1	2.8	0.06	Amphibole	F	MgSiCaFe		Image11	X	Acti	Asb
4	1	3.22	0.46	Amphibole		MgSiCaFe		Image12 Image13	X	Acti	Cle
4	2	3.3	0.06	Amphibole	F	MgSiCaFe		Image14	X	Acti	Asb
5	1	1.15	0.08	Amphibole		MgSiCaFe		Image15	X	Acti	Cle
5	2	2.45	0.1	Amphibole	F	MgSiCaFe	15653C	Image16	Diff4	Acti	Asb
6	1	2.9	0.3	Amphibole		MgSiCaFe		Image17	X	Acti	Cle
7	1	3.2	0.46	Non-Asbestos		AlSiCaFeNa	15654C	Image18	X		
7	2	7.1	0.7	Amphibole		MgSiCaFe		Image19	X	Acti	Cle
8	1	0.95	0.1	Amphibole		MgSiCaFe		Image20	X	Acti	Cle
9				NSD							
10	1	3.75	0.4	Amphibole		MgSiCaFeAl	15655C	Image21	X	Acti	Cle
10	2	1.5	0.05	Amphibole	F	MgSiCaFe		Image22	X	Acti	Asb
10	3	2.5	0.1	Amphibole	F	MgSiCaFe		Image23	X	Acti	Asb

10% Particulate

Analyst's Comments: N/A

Abbreviations: F - Fiber, C - Cluster, B - Bundle, M - Matrix, Cle - Cleavage, Asb - Asbestiform, Bys - Byssolite

Initial Review: 9/8/2019 1:18:07 PM approve by Jon Swope
Final Review: 9/10/19 9:40 AM approve by Monica Mcgrath

ASTM 5756-95 Lo Mag

RJ Lee Group, Inc.

TEM Count Sheet

Date Analyzed: 9/8/2019

RJL: LLH901997-14	3158157.HTA2	Microscope tem2000fx1	Grid Openings 25
11	K & L Gates	Magnification 10 KX	Asbestos 1.0
Wt: 0.0005 gm	Grid: 0.0091 mm²	Acc. Voltage 120 KV	Nonasbestos 0.0
Dil: 1.	Filter Size: 47 mm	Operator: Jon Swope	% Wt of largest asbestos %
HQ44614		Cv = 0.038	structure

Field	Fiber	Length	Width	FiberType	Morph	EDX	File #	Photo	SAED	AmpID	C/A
1				NSD							
2				NSD							
3				NSD							
4				NSD							
5				NSD							
6				NSD							
7				NSD							
8				NSD							
9				NSD							
10				NSD							
11	1	9.1	0.45	Amphibole	B	MgSiCaFe	15656C	Image1	Diff1	Acti	Asb
12				NSD							
13				NSD							
14				NSD							
15				NSD							
16				NSD							
17				NSD							
18				NSD							
19				NSD							
20				NSD							
21				NSD							
22				NSD							
23				NSD							
24				NSD							
25				NSD							

10% Particulate

Analyst's Comments: N/A

Abbreviations: F - Fiber, C - Cluster, B - Bundle, M - Matrix, Cle - Cleavage, Asb - Asbestiform, Bys - Byssolite

Initial Review: 9/8/2019 2:41:51 PM approve by Jon Swope
Final Review: 9/10/19 9:40 AM approve by Monica Mcgrath

ASTM 5756-95 Hi Mag

RJ Lee Group, Inc.

TEM Count Sheet

Date Analyzed: 9/6/2019

RJL: LLH901997-14	3158159.HTA1	Microscope tem1200_2	Grid Openings	10
13	K & L Gates	Magnification 21 KX	Asbestos	36.0
Wt: 0.0007 gm	Grid: 0.0091 mm²	Acc. Voltage 120 KV	Asbestos >= 5µm	15.0
Dil: 1.0	Filter Size: 47 mm	Operator: Ashleigh Sload	Nonasbestos	54.0
HQ44614		Cv = 3.44	Nonasbestos >= 5µm	2.0
			% Wt of largest asbestos structure	%

Field	Fiber	Length	Width	FiberType	Morph	EDX	File #	Photo	SAED	AmpID	C/A
1	1	15.9	0.4	Amphibole	B	MgSiCaFe	15642C	Image1 Image2 Image3	Diff1	Acti	Asb
1	2	2.8	0.5	Non-Asbestos		MgAlSiFe	15643C	Image4	X		
1	3	1.38	0.2	Amphibole		MgSiCaFe		Image5	X	Acti	Cle
1	4	0.9	0.12	Non-Asbestos		MgAlSiFe			X		
1	5	1.12	0.12	Non-Asbestos		MgAlSiFe			X		
1	6	3.68	0.1	Amphibole	F	MgSiCaFe		Image6	X	Acti	Asb
1	7	3.22	0.6	Amphibole		MgSiCaFe		Image7	X	Acti	Cle
1	8	2.9	0.05	Amphibole	M	MgSiCaFe		Image8	X	Acti	Asb
1	9	1.84	0.15	Amphibole		MgSiCaFe		Image9	X	Acti	Cle
1	10	2.3	0.7	Non-Asbestos		MgAlSiFe			X		
2	1	2.45	0.25	Non-Asbestos		MgAlSiFe			X		
2	2	3.22	0.05	Amphibole	F	MgSiCaFe		Image10	X	Acti	Asb
2	3	9.89	0.05	Amphibole	F	MgSiCaFe		Image11	X	Acti	Asb
2	4	1.84	0.05	Amphibole	F	MgSiCaFe		Image12	X	Acti	Asb
2	5	2.99	0.25	Amphibole	B	MgSiCaFe			X	Acti	Asb
2	6	10.1	0.12	Amphibole	B	MgSiCaFeAl	15644C	Image13	Diff2	Acti	Asb
2	7	3.45	0.66	Non-Asbestos		MgAlSiFe			X		
2	8	3.91	0.45	Amphibole		MgSiCaFe		Image14	X	Acti	Cle
2	9	5.98	0.18	Amphibole	B	MgSiCaFe			X	Acti	Asb
2	10	2.64	0.25	Amphibole		MgSiCaFe		Image15	X	Acti	Cle
2	11	1.15	0.12	Amphibole		MgSiCaFe			X	Acti	Cle
3	1	3.33	0.25	Non-Asbestos		AlSiFe	15645C	Image16	X		
3	2	4.37	0.15	Amphibole	B	MgSiCaFe			X	Acti	Asb
3	3	12.2	0.12	Amphibole	F	MgSiCaFe			X	Acti	Asb
3	4	2.4	0.15	Amphibole		MgSiCaFe			X	Acti	Cle
3	5	1.5	0.15	Amphibole		MgSiCaFe			X	Acti	Cle
3	6	13.6	0.1	Amphibole	M	MgSiCaFe			X	Acti	Asb
3	7	2.3	0.05	Amphibole	F	MgSiCaFe			X	Acti	Asb
3	8	15.2	0.05	Amphibole	F	MgSiCaFe			X	Acti	Asb
3	9	2.3	0.18	Amphibole		MgSiCaFe			X	Acti	Cle
3	10	8.51	0.15	Amphibole	F	MgSiCaFe			X	Acti	Asb
4	1	2.5	0.05	Amphibole	F	MgSiCaFe			X	Acti	Asb
4	2	2.05	0.35	Amphibole		MgSiCaFe	15646C	Image17	Diff3	Acti	Cle
4	3	2.1	0.25	Amphibole		MgSiCaFe			X	Acti	Cle
4	4	2.99	0.25	Amphibole		MgSiCaFe			X	Acti	Cle
4	5	2.7	0.12	Amphibole	B	MgSiCaFe			X	Acti	Asb
4	6	3.91	0.05	Amphibole	F	MgSiCaFe			X	Acti	Asb
4	7	1.84	0.2	Amphibole		MgSiCaFe			X	Acti	Cle
4	8	7.45	0.2	Amphibole	F	MgSiCaFe			X	Acti	Asb
4	9	2.76	0.3	Non-Asbestos		MgAlSiCaFe	15647C	Image18	X		
4	10	8.05	0.05	Amphibole	F	MgSiCaFe			X	Acti	Asb
4	11	1.61	0.2	Amphibole		MgSiCaFe			X	Acti	Cle

RJ Lee Group, Inc.

TEM Count Sheet

RJL: LLH901997-14	3158159.HTA1	Microscope tem1200_2	Grid Openings	10
13	K & L Gates	Magnification 21 KX	Asbestos	36.0
Wt: 0.0007 gm	Grid: 0.0091 mm²	Acc. Voltage 120 KV	Asbestos >= 5µm	15.0
Dil: 1.0	Filter Size: 47 mm	Operator: Ashleigh Sload	Nonasbestos	54.0
HQ44614		Cv = 3.44	Nonasbestos >= 5µm	2.0
			% Wt of largest asbestos structure	%

Field	Fiber	Length	Width	FiberType	Morph	EDX	File #	Photo	SAED	AmpID	C/A
5	1	3.22	0.2	Amphibole		MgSiCaFe			X	Acti	Cle
5	2	1.9	0.15	Amphibole		MgSiCaFe			X	Acti	Cle
5	3	1.15	0.1	Amphibole		MgSiCaFe			X	Acti	Cle
5	4	12.88	2.3	Amphibole		MgAlSiCaFe	15648C	Image19	Diff5	Horn	Cle
5	5	1.84	0.2	Amphibole		MgAlSiCaFe			X	Horn	Cle
5	6	0.8	0.15	Amphibole		MgSiCaFe			X	Acti	Cle
5	7	1.15	0.1	Amphibole		MgSiCaFe			X	Acti	Cle
6	1	1.84	0.15	Non-Asbestos		AlSiFe			X		
6	2	1.61	0.2	Amphibole		MgSiCaFe		Image20	X	Acti	Cle
6	3	2.88	0.5	Non-Asbestos		AlSiFe			X		
6	4	3.22	0.08	Amphibole	F	MgSiCaFe		Image21	X	Acti	Asb
6	5	6.65	0.12	Amphibole	F	MgSiCaFeAlNa	15661C	Image22	Diff6	Acti	Asb
6	6	1.7	0.15	Non-Asbestos		AlSiFe			X		
6	7	2.1	0.3	Amphibole		MgSiCaFe			X	Acti	Cle
6	8	2.3	0.1	Amphibole	F	MgSiCaFe			X	Acti	Asb
6	9	5.1	0.05	Amphibole	F	MgSiCaFe			X	Acti	Asb
6	10	3.45	0.12	Amphibole	B	MgSiCaFe			X	Acti	Asb
6	11	1.45	0.25	Amphibole		MgSiCaFe			X	Acti	Cle
6	12	4.83	0.6	Amphibole		MgAlSiCaFe			X	Horn	Cle
7	1	1.15	0.1	Non-Asbestos		AlSiFe			X		
7	2	1.61	0.3	Amphibole		MgSiCaFe			X	Acti	Cle
7	3	2.64	0.35	Non-Asbestos		AlSiFeMg			X		
7	4	5.98	0.4	Amphibole	B	MgSiCaFe			X	Acti	Asb
7	5	7.82	0.2	Amphibole	F	MgSiCaFe			X	Acti	Asb
8	1	2.64	0.15	Amphibole	F	MgSiCaFe	15662C	Image23	Diff7	Acti	Asb
8	2	2.53	0.05	Amphibole	F	MgSiCaFe				Acti	Asb
8	3	2.99	0.35	Non-Asbestos		AlSiFe			X		
8	4	2.99	0.5	Amphibole		MgAlSiCaFe			X	Horn	Cle
8	5	1.4	0.15	Amphibole		MgSiCaFe			X	Acti	Cle
8	6	0.9	0.1	Amphibole		MgSiCaFe			X	Acti	Cle
8	7	2.3	0.1	Amphibole	F	MgSiCaFe			X	Acti	Asb
8	8	3.45	0.6	Amphibole		MgSiCaFeAl	15663C	Image24	Diff8	Acti	Cle
8	9	3.22	0.05	Amphibole	F	MgSiCaFeAl			X	Acti	Asb
8	10	1.5	0.2	Amphibole		MgSiCaFe			X	Acti	Cle
9	1	0.9	0.15	Amphibole		MgSiCaFe			X	Acti	Cle
9	2	8.7	0.35	Amphibole	B	MgSiCaFe			X	Acti	Asb
9	3	2.76	0.2	Amphibole		MgSiCaFe			X	Acti	Cle
9	4	2.02	0.1	Amphibole		MgSiCaFe			X	Acti	Cle
9	5	1.84	0.05	Amphibole	F	MgSiCaFe			X	Acti	Asb
9	6	1.35	0.2	Amphibole		MgSiCaFe			X	Acti	Cle
10	1	3.91	0.2	Amphibole	F	MgSiCaFe			X	Acti	Asb
10	2	1.84	0.05	Amphibole	F	MgSiCaFe			X	Acti	Asb
10	3	2.5	0.35	Non-Asbestos		AlSiFe			X		
10	4	4.7	0.08	Amphibole	F	MgSiCaFe			X	Acti	Asb

ASTM 5756-95 Hi Mag

RJ Lee Group, Inc.

TEM Count Sheet

Date Analyzed: 9/6/2019

RJL: LLH901997-14	3158159.HTA1	Microscope tem1200_2	Grid Openings	10
13	K & L Gates	Magnification 21 KX	Asbestos	36.0
Wt: 0.0007 gm	Grid: 0.0091 mm²	Acc. Voltage 120 KV	Asbestos >= 5µm	15.0
Dil: 1.0	Filter Size: 47 mm	Operator: Ashleigh Sload	Nonasbestos	54.0
HQ44614		Cv = 3.44	Nonasbestos >= 5µm	2.0
			% Wt of largest asbestos structure	%

Field	Fiber	Length	Width	FiberType	Morph	EDX	File #	Photo	SAED	AmpID	C/A
10	5	1.2	0.15	Amphibole		MgSiCaFe			X	Acti	Cle
10	6	1.85	0.15	Amphibole		MgSiCaFe			X	Acti	Cle
10	7	9.66	1.4	Amphibole		MgAlSiCaFe			X	Horn	Cle
10	8	0.9	0.15	Amphibole		MgSiCaFe			X	Acti	Cle

12% Particulate

Analyst's Comments: Sample Analayzed on TEM-2000i

Abbreviations: F - Fiber, C - Cluster, B - Bundle, M - Matrix, Cle - Cleavage, Asb - Asbestiform, Bys - Byssolite

Initial Review: 9/6/2019 2:40:26 PM approve by Ashleigh Sload
Final Review: 9/10/19 9:40 AM approve by Monica Mcgrath

ASTM 5756-95 Lo Mag

RJ Lee Group, Inc.

TEM Count Sheet

Date Analyzed: 9/6/2019

RJL: LLH901997-14	3158159.HTA1	Microscope tem2000fx1	Grid Openings	25
13	K & L Gates	Magnification 10 KX	Asbestos	12.0
Wt: 0.0007 gm	Grid: 0.0091 mm²	Acc. Voltage 120 KV	Nonasbestos	4.0
Dil: 1.0	Filter Size: 47 mm	Operator: Ashleigh Sload	% Wt of largest asbestos	%
HQ44614		Cv = 0.41	structure	

Field	Fiber	Length	Width	FiberType	Morph	EDX	File #	Photo	SAED	AmpID	C/A
1	1	8.2	1.6	Non-Asbestos		MgAlSiFe	15637C	Image1	Diff1		
2				NSD							
3				NSD							
4				NSD							
5				NSD							
6				NSD							
7	1	8.9	0.1	Amphibole	F	MgSiCaFe	15639C	Image2	Diff3 Diff4	Acti	Asb
8	1	12.6	0.1	Amphibole	B	MgSiCaFe		Image3 Image4 Image5	X	Acti	Asb
8	2	7.4	0.22	Amphibole	F	MgSiCaFe	15640C	Image6	Diff5	Acti	Asb
9				NSD							
10	1	6.3	0.36	Amphibole	B	MgSiCaFe		Image7	X	Acti	Asb
10	2	7.7	0.1	Amphibole	F	MgSiCaFe		Image8	X	Acti	Asb
11				NSD							
12	1	8.8	0.15	Amphibole	F	MgSiCaFe		Image9	X	Acti	Asb
12	2	5.4	0.54	Non-Asbestos		MgAlSiFe			X		
13	1	7.2	0.2	Amphibole	F	MgSiCaFe		Image10	X	Acti	Asb
14	1	7.7	0.27	Amphibole	F	MgSiCaFe	15641C	Image11	Diff6 Diff7	Acti	Asb
15	1	9.9	0.9	Non-Asbestos		MgAlSiFe			X		
16	1	10.8	0.1	Amphibole	F	MgSiCaFe		Image12	X	Acti	Asb
17				NSD							
18				NSD							
19				NSD							
20	1	8.1	0.4	Non-Asbestos		MgAlSiFe			X		
21	1	18.2	0.45	Amphibole	B	MgSiCaFe		Image14 Image15	X	Acti	Asb
22	1	7.7	0.4	Amphibole	B	MgSiCaFe		Image16	X	Acti	Asb
23				NSD							
24				NSD							
25	1	17.3	0.45	Amphibole	F	MgSiCaFe		Image17	X	Acti	Asb

12% Particulate

Analyst's Comments: N/A

Abbreviations: F - Fiber, C - Cluster, B - Bundle, M - Matrix, Cle - Cleavage, Asb - Asbestiform, Bys - Byssolite

Initial Review: 9/6/2019 10:37:59 AM approve by Ashleigh Sload
Final Review: 9/10/19 9:40 AM approve by Monica Mcgrath

ASTM 5756-95 Hi Mag

RJ Lee Group, Inc.

TEM Count Sheet

Date Analyzed: 9/8/2019

RJL: LLH901997-14	3158161.HTA2	Microscope tem1200_2	Grid Openings	10
15	K & L Gates	Magnification 20 KX	Asbestos	5.0
Wt: 0.0002 gm	Grid: 0.0091 mm²	Acc. Voltage 120 KV	Asbestos >= 5µm	2.0
Dil: 1.	Filter Size: 47 mm	Operator: Jon Swope	Nonasbestos	6.0
HQ44614		Cv = 0.45	Nonasbestos >= 5µm	1.0
			% Wt of largest asbestos structure	%

Field	Fiber	Length	Width	FiberType	Morph	EDX	File #	Photo	SAED	AmpID	C/A
1	1	2.1	0.06	Amphibole	F	MgSiCaFe	19424B	Image1	Diff1	Acti	Asb
2	1	1.12	0.18	Amphibole		MgSiCaFe		Image2	X	Acti	Cle
3	1	6.5	0.66	Amphibole		MgSiCaFe	19425B	Image3	Diff2	Acti	Cle
4	1	1.35	0.12	Amphibole		MgSiCaFe		Image4	X	Acti	Cle
5				NSD							
6				NSD							
7	1	5.1	0.4	Amphibole	B	MgSiCaFe	19426B	Image5 Image6 Image7	Diff3	Acti	Asb
7	2	1.8	0.18	Amphibole	B	MgSiCaFe		Image8	X	Acti	Asb
8	1	4.7	0.4	Amphibole		MgSiCaFe		Image9	X	Acti	Cle
9	1	3.95	0.35	Amphibole	B	MgSiCaFe		Image10	X	Acti	Asb
9	2	2.5	0.33	Amphibole		MgSiCaFe		Image11	X	Acti	Cle
10	1	2.8	0.18	Amphibole		MgSiCaFe		Image12	X	Acti	Cle
10	2	11.1	0.08	Amphibole	F	MgSiCaFe	19427B	Image13	Diff4	Acti	Asb

10% Particulate

Analyst's Comments: N/A

Abbreviations: F - Fiber, C - Cluster, B - Bundle, M - Matrix, Cle - Cleavage, Asb - Asbestiform, Bys - Byssolite

Initial Review: 9/8/2019 12:54:52 PM approve by Jon Swope
Final Review: 9/10/19 9:41 AM approve by Monica Mcgrath

ASTM 5756-95 Lo Mag

RJ Lee Group, Inc.

TEM Count Sheet

Date Analyzed: 9/8/2019

RJL: LLH901997-14	3158161.HTA2	Microscope tem1200_2	Grid Openings 25
15	K & L Gates	Magnification 10 KX	Asbestos 2.0
Wt: 0.0002 gm	Grid: 0.0091 mm²	Acc. Voltage 120 KV	Nonasbestos 0.0
Dil: 1.	Filter Size: 47 mm	Operator: Jon Swope	% Wt of largest asbestos %
HQ44614		Cv = 0.074	structure

Field	Fiber	Length	Width	FiberType	Morph	EDX	File #	Photo	SAED	AmpID	C/A
1				NSD							
2				NSD							
3				NSD							
4				NSD							
5				NSD							
6				NSD							
7				NSD							
8				NSD							
9				NSD							
10	1	5.2	0.12	Amphibole	F	MgSiCaFe	19428B	Image1	Diff1	Acti	Asb
11	1	7.4	0.08	Amphibole	F	MgSiCaFe		Image2	X	Acti	Asb
12				NSD							
13				NSD							
14				NSD							
15				NSD							
16				NSD							
17				NSD							
18				NSD							
19				NSD							
20				NSD							
21				NSD							
22				NSD							
23				NSD							
24				NSD							
25				NSD							

10% Particulate

Analyst's Comments: N/A

Abbreviations: F - Fiber, C - Cluster, B - Bundle, M - Matrix, Cle - Cleavage, Asb - Asbestiform, Bys - Byssolite

Initial Review: 9/8/2019 2:27:48 PM approve by Jon Swope
Final Review: 9/10/19 9:41 AM approve by Monica Mcgrath

ASTM 5756-95 Hi Mag

RJ Lee Group, Inc.

TEM Count Sheet

Date Analyzed: 9/8/2019

RJL: LLH901997-14	3158165.HTA1	Microscope tem2000fx1	Grid Openings	10
3	K & L Gates	Magnification 21 KX	Asbestos	0.0
Wt: 0.0004 gm	Grid: 0.0091 mm²	Acc. Voltage 120 KV	Asbestos >= 5µm	0.0
Dil: 1.0	Filter Size: 47 mm	Operator: Jon Swope	Nonasbestos	3.0
HQ44614		Cv = 0	Nonasbestos >= 5µm	0.0
			% Wt of largest asbestos structure	%

Field	Fiber	Length	Width	FiberType	Morph	EDX	File #	Photo	SAED	AmpID	C/A
1				NSD							
2				NSD							
3	1	1.15	0.1	Non-Asbestos		MgSiCaFe	15657C	Image1	Diff1	CPX	
4				NSD							
5	1	3.45	0.22	Amphibole		MgSiCaFeAl	15658C	Image2	Diff2	Acti	Cle
6				NSD							
7				NSD							
8				NSD							
9	1	3.5	0.2	Non-Asbestos		MgSiCaFe	15659C	Image3	Diff3 Diff4	CPX	
10				NSD							

10% Particulate

Analyst's Comments: N/A

Abbreviations: F - Fiber, C - Cluster, B - Bundle, M - Matrix, Cle - Cleavage, Asb - Asbestiform, Bys - Byssolite

Initial Review: 9/8/2019 4:16:22 PM approve by Jon Swope
Final Review: 9/10/19 9:41 AM approve by Monica Mcgrath

ASTM 5756-95 Lo Mag

RJ Lee Group, Inc.

TEM Count Sheet

Date Analyzed: 9/8/2019

RJL: LLH901997-14	3158165.HTA1	Microscope tem2000fx1	Grid Openings	25
3	K & L Gates	Magnification 10 KX	Asbestos	0.0
Wt: 0.0004 gm	Grid: 0.0091 mm²	Acc. Voltage 120 KV	Nonasbestos	0.0
Dil: 1.0	Filter Size: 47 mm	Operator: Jon Swope	% Wt of largest asbestos	%
HQ44614		Cv = 0	structure	

Field	Fiber	Length	Width	FiberType	Morph	EDX	File #	Photo	SAED	AmpID	C/A
1				NSD							
2				NSD							
3				NSD							
4				NSD							
5				NSD							
6				NSD							
7				NSD							
8				NSD							
9				NSD							
10				NSD							
11				NSD							
12				NSD							
13				NSD							
14				NSD							
15				NSD							
16				NSD							
17				NSD							
18				NSD							
19				NSD							
20				NSD							
21				NSD							
22				NSD							
23				NSD							
24				NSD							
25				NSD							

10% Particulate

Analyst's Comments: N/A

Abbreviations: F - Fiber, C - Cluster, B - Bundle, M - Matrix, Cle - Cleavage, Asb - Asbestiform, Bys - Byssolite

Initial Review: 9/8/2019 4:18:43 PM approve by Jon Swope
Final Review: 9/10/19 9:41 AM approve by Monica Mcgrath

ASTM 5756-95 Hi Mag

RJ Lee Group, Inc.

TEM Count Sheet

Date Analyzed: 9/8/2019

RJL: LLH901997-14	3158167.HTA1	Microscope tem2000fx1	Grid Openings	10
5	K & L Gates	Magnification 21 KX	Asbestos	0.0
Wt: 0.0003 gm	Grid: 0.0091 mm²	Acc. Voltage 120 KV	Asbestos >= 5µm	0.0
Dil: 1.0	Filter Size: 47 mm	Operator: Jon Swope	Nonasbestos	4.0
HQ44614		Cv = 0	Nonasbestos >= 5µm	0.0
			% Wt of largest asbestos structure	%

Field	Fiber	Length	Width	FiberType	Morph	EDX	File #	Photo	SAED	AmpID	C/A
1	1	1.8	0.2	Amphibole		MgSiCaFeAl	15660C	Image1	Diff1	Acti	Cle
2				NSD							
3	1	1.65	0.1	Amphibole		MgAlSiCaFe	15667C	Image2	Diff2	Horn	Cle
4	1	2.85	0.45	Non-Asbestos		MgAlSiCaFe	15668C	Image3	Diff3	CPX	
4	2	2.4	0.25	Amphibole		MgSiCaFe		Image4	X	Acti	Cle
5				NSD							
6				NSD							
7				NSD							
8				NSD							
9				NSD							
10				NSD							

10% Particulate

Analyst's Comments: N/A

Abbreviations: F - Fiber, C - Cluster, B - Bundle, M - Matrix, Cle - Cleavage, Asb - Asbestiform, Bys - Byssolite

Initial Review: 9/8/2019 4:37:43 PM approve by Jon Swope
Final Review: 9/10/19 9:41 AM approve by Monica Mcgrath

ASTM 5756-95 Lo Mag

RJ Lee Group, Inc.

TEM Count Sheet

Date Analyzed: 9/9/2019

RJL: LLH901997-14	3158167.HTA1	Microscope tem2000fx1	Grid Openings	25
5	K & L Gates	Magnification 10 KX	Asbestos	0.0
Wt: 0.0003 gm	Grid: 0.0091 mm²	Acc. Voltage 120 KV	Nonasbestos	0.0
Dil: 1.0	Filter Size: 47 mm	Operator: Jon Swope	% Wt of largest asbestos	%
HQ44614		Cv = 0	structure	

Field	Fiber	Length	Width	FiberType	Morph	EDX	File #	Photo	SAED	AmpID	C/A
1				NSD							
2				NSD							
3				NSD							
4				NSD							
5				NSD							
6				NSD							
7				NSD							
8				NSD							
9				NSD							
10				NSD							
11				NSD							
12				NSD							
13				NSD							
14				NSD							
15				NSD							
16				NSD							
17				NSD							
18				NSD							
19				NSD							
20				NSD							
21				NSD							
22				NSD							
23				NSD							
24				NSD							
25				NSD							

10% Particulate

Analyst's Comments: N/A

Abbreviations: F - Fiber, C - Cluster, B - Bundle, M - Matrix, Cle - Cleavage, Asb - Asbestiform, Bys - Byssolite

Initial Review: 9/9/2019 12:07:41 PM approve by Jon Swope
Final Review: 9/10/19 9:41 AM approve by Monica Mcgrath

ASTM 5756-95 Hi Mag

RJ Lee Group, Inc.

TEM Count Sheet

Date Analyzed: 9/9/2019

RJL: LLH901997-14	3158170.HTA2	Microscope tem2000fx1	Grid Openings	10
8	K & L Gates	Magnification 21 KX	Asbestos	0.0
Wt: 0.0002 gm	Grid: 0.0091 mm²	Acc. Voltage 120 KV	Asbestos >= 5µm	0.0
Dil: 1.	Filter Size: 47 mm	Operator: Ashleigh Sload	Nonasbestos	2.0
HQ44614		Cv = 0	Nonasbestos >= 5µm	1.0
			% Wt of largest asbestos structure	%

Field	Fiber	Length	Width	FiberType	Morph	EDX	File #	Photo	SAED	AmpID	C/A
1				NSD							
2				NSD							
3				NSD							
4				NSD							
5				NSD							
6	1	2.99	0.25	Amphibole		MgSiCaFeAl	15664C	Image1	Diff1	Acti	Cle
7				NSD							
8	1	5.98	0.7	Non-Asbestos		NaAlSiCa	15665C	Image2	Diff2		
9				NSD							
10				NSD							

7% Particulate

Analyst's Comments: N/A

Abbreviations: F - Fiber, C - Cluster, B - Bundle, M - Matrix, Cle - Cleavage, Asb - Asbestiform, Bys - Byssolite

Initial Review: 9/9/2019 10:25:46 AM approve by Ashleigh Sload
Final Review: 9/10/19 9:41 AM approve by Monica Mcgrath

ASTM 5756-95 Lo Mag

RJ Lee Group, Inc.

TEM Count Sheet

Date Analyzed: 9/9/2019

RJL: LLH901997-14	3158170.HTA2	Microscope tem2000fx1	Grid Openings	25
8	K & L Gates	Magnification 10 KX	Asbestos	0.0
Wt: 0.0002 gm	Grid: 0.0091 mm²	Acc. Voltage 120 KV	Nonasbestos	0.0
Dil: 1.	Filter Size: 47 mm	Operator: Ashleigh Sload	% Wt of largest asbestos	%
HQ44614		Cv = 0	structure	

Field	Fiber	Length	Width	FiberType	Morph	EDX	File #	Photo	SAED	AmpID	C/A
1				NSD							
2				NSD							
3				NSD							
4				NSD							
5				NSD							
6				NSD							
7				NSD							
8				NSD							
9				NSD							
10				NSD							
11				NSD							
12				NSD							
13				NSD							
14				NSD							
15				NSD							
16				NSD							
17				NSD							
18				NSD							
19				NSD							
20				NSD							
21				NSD							
22				NSD							
23				NSD							
24				NSD							
25				NSD							

7% Particulate

Analyst's Comments: N/A

Abbreviations: F - Fiber, C - Cluster, B - Bundle, M - Matrix, Cle - Cleavage, Asb - Asbestiform, Bys - Byssolite

Initial Review: 9/9/2019 10:00:43 AM approve by Ashleigh Sload
Final Review: 9/10/19 9:41 AM approve by Monica Mcgrath