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**Industrial Hygiene Data Evaluation Team Report on
Asbestos Samples Associated with Demolition
Activities and Follow-up Sampling**



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Date

Executive Summary

This report communicates worker health and safety information regarding Hanford Site asbestos work activities, in response to recent Hanford worker questions and concerns. Hanford employees from multiple contractors expressed concerns related to asbestos and requested that certain Deactivation and Decommissioning (D&D) sites, as well as legacy facilities/steam lines in the Central Plateau, be inspected for Asbestos-Containing Material (ACM), that any identified asbestos be contained/removed, and that potential adverse health effects be evaluated. These concerns were communicated through a Hanford Site inclusive "Stop Work," issued January 12, 2012. This report is not intended to provide asbestos regulatory release, clearance, or site closure information.

A team of industrial hygienists from multiple Hanford contractors and DOE reviewed 278 personal breathing zone (lapel) and 2,878 perimeter samples collected during and prior to demolition activities. All lapel samples were below the Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit (PEL) of 0.1 fibers/cc for an eight-hour time-weighted average. All perimeter samples indicated they were equal to or less than an administrative control level of 0.01 fibers/cc, 10% of the OSHA PEL.

Additionally, post D&D asbestos air, wipe, and bulk samples were collected in and around building 2266E and from equipment and vehicles that were in close proximity to the 272E and 284E demolition sites. These samples were collected to evaluate the potential for deposition and re-suspension of asbestos fibers in adjacent work areas. In those areas where wipe and/or bulk sampling indicated the presence of any asbestos fibers, air samples were collected to evaluate potential worker exposure to asbestos fibers. All air sample results from these activities (68 total) were also below the administrative control level of 0.01 fibers/cc, 10% of the OSHA PEL.

The data reviewed for this evaluation, in which lapel samples, area/perimeter samples, and additional post demolition ACM removal samples were evaluated, showed no exposures above the OSHA permissible exposure limit to the workers on Site due to the activities associated with demolition of facilities and legacy debris clean up. Further, over 90% of collected air sample data indicate asbestos concentrations were maintained below our administrative control levels of 0.01 fibers/cc, both during and after D&D activities.

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1 Introduction and Background

1.1 Introduction

Workers recently expressed concerns about the exposure potential from re-suspended asbestos fibers surrounding the 272E D&D site. Concerns stem from asbestos control methods used during prior demolition of Asbestos-Containing Material (ACM) containing structures, and the existence of ACM debris (e.g., transite panel pieces) either left in place or migrating through the gravel/soil backfill over time. Some ACM debris originated from legacy Hanford activities, soil erosion, or vehicle use in and around building footprints.

A “Stop Work” was issued on January 12, 2012, to stop asbestos work activities on previous demolition sites until the effectiveness of asbestos control methods could be validated and an action plan to address concerns implemented. In response to the stop work, meetings were held with concerned employees; management; bargaining unit representatives; U.S. Department of Energy, Richland Operations Office (RL); and representatives from site contractors to develop an action plan.

The Asbestos Action Plan identified steps to address concerns raised by workers and evaluate whether or not proper procedures are in place. Two key components of the plan were:

1. Evaluate the asbestos data collected before, during, and after demolition activities.
2. Conduct field walk-downs to identify locations where some ACM was not removed by conventional hand abatement methods during demolition of structures containing ACM, and to remove any residual ACM debris visible at the demolition sites.

1.2 Background

Exposure to hazardous substances, including asbestos, can occur in both the environment and workplace. The Agency for Toxic Substances and Disease Registry (ATSDR) provides useful information regarding asbestos exposure in their Division of Toxicology ToxFAQs™ sheet and Public Health Statement for Asbestos, CAS 1332-21-4, dated September 2001. Risk from asbestos exposure is dependent on many factors. Similar to radiation and other carcinogens, the risk depends on the dose (how much), the duration (how long), and the exposure route, (inhalation or ingestion). For asbestos, the fiber type (mineral form and size distribution) is also a factor. Other chemical exposures, as well as your age, sex, diet, family traits, lifestyle (including whether you smoke tobacco), and state of health also contribute to the risk from asbestos exposure.

The Occupational Safety and Health Administration (OSHA), the National Institute for Occupational Safety and Health (NIOSH), and the American Conference of Governmental Industrial Hygienists (ACGIH), with regard to asbestos, are responsible for establishing workplace exposure limits. These groups have these two things in common:

1. All recommend that exposure to a known carcinogen, such as asbestos, should be minimized.
2. All have established occupational exposure limits to asbestos.

Relative to occupational asbestos exposure, the establishment of occupational exposure limits is intended to minimize the health effects of exposure to these substances in the workplace. The OSHA Permissible Exposure Limits (PELs) are regulatory limits on the amount/concentration of a substance in the air that shall not be exceeded. In general, exposure to any hazardous substance at the corresponding PEL, when averaged over an eight-hour work day for a 40-hour work week, is intended to ensure that, for most workers, no adverse health effects will occur over their occupational career. OSHA recognizes that there is risk from exposure to carcinogens at any level. For this reason, the OSHA asbestos PEL is accompanied by mandated work controls to minimize the release of asbestos fibers. Additional

provisions, such as training and personal protective equipment, are also intended to further reduce risk to workers.

With respect to monitoring worker exposure levels, lapel air sampling is the nationally recognized sampling method for evaluating the amount of asbestos fibers in the breathing zone. Contractors use NIOSH sampling and analytical methods to assess worker exposure to asbestos fibers. The NIOSH methods are the recognized standard for evaluation of worker exposure to airborne hazards.

With respect to the analysis of asbestos fibers collected on lapel samples, two different analytical methods are used:

1. Phase Contrast Microscopy (PCM) analysis, according to NIOSH Method 7400, is a technique used for determination of airborne particulate aerosols. The PCM method is used for many applications, including dust characterizations, enumeration of airborne asbestos fibers or fungal spores, and airborne mold fragments. Particulates collected on the lapel sample are evaluated under a microscope against specific counting criteria established for asbestos. The PCM analysis is fast and relatively inexpensive. However, the inability to distinguish between asbestos and non-asbestos fibers is the main disadvantage of PCM. As such, all fibers that meet the counting criteria are “counted” as asbestos fibers. This provides a conservative estimate of the potential asbestos concentration in the workplace, but can significantly overestimate actual asbestos content due to the nature of the analysis. Where precise determination of airborne asbestos fibers is needed, transmission electron microscopy is used.
2. Transmission Electron Microscopy (TEM) analysis, according to NIOSH Method 7402, is a technique that specifically identifies asbestos fibers on air sampling media. This method is typically used to confirm the presence and concentration of asbestos fibers where PCM analysis indicates asbestos may be present. The TEM analysis is more expensive and takes longer to complete. As such, it is typically used as a supplement to PCM analysis, providing more accurate evaluation of asbestos concentrations by eliminating the interference of other fibrous material present on the sample.

2 Purpose

The U. S. Department of Energy (DOE) field offices (ORP and RL), in conjunction with their prime contractors, convened a joint team of site industrial hygienists to review the asbestos sampling data associated with prior D&D activities involving ACM containing facilities/structures. The data was reviewed to determine if there was sufficient evidence to determine whether the OSHA PEL for asbestos was, or was not, exceeded. The Industrial Hygiene Data Evaluation Team (IH Team) consisted of DOE and Site contractor industrial hygienists with knowledge in the evaluation and control of asbestos exposure, and a Hanford Atomic Metal Trades Council (HAMTC) Safety Representative.

A field walk down team was also established which generated a list of previous demolition locations where structures had contained ACM. That list was provided to the contractors to establish a plan for visually inspecting identified locations and subsequent removal of any noted ACM debris.

3 Scope

The IH Team was tasked with reviewing lapel and area asbestos sampling data associated with prior demolition activities involving ACM control methods, from October 2008 to January 2012. The IH Team also reviewed personal and area sampling data collected during asbestos debris removal at locations identified by the field walk-down team. Additional evaluation of air, bulk, and surface sampling, performed as specified in the Asbestos Action Plan, and other industrial hygiene-related concerns

associated with the “Stop Work” resolution, were also performed in response to worker concerns. The IH Team compared asbestos sampling data to current regulatory occupational exposure limits and an internal administrative control limit of 10% of the OSHA PEL.

3.1 Review of Air Monitoring Results

Three companies provided air monitoring results which were evaluated by the IH Team: CH2M HILL Plateau Remediation Company (CHPRC), Washington Closure Hanford, LLC (WCH), and Mission Support Alliance, LLC (MSA). Appendix B provides a tabular summary of the sampling results provided by each contractor that used control methods, as well as the current status of the facilities where sampling took place.

The IH Team reviewed all air monitoring data associated with the demolition of facilities where ACM was present during the demolition process. This was a comprehensive review of historical data which was previously subject to quality and compliance audits and assessments involving each phase of survey preparation, sample collection, sample custody, and sample analysis. Contractor procedures require that asbestos samples be collected and analyzed in accordance with applicable methods as specified by OSHA and NIOSH.

The personal samples collected from workers inside the controlled work area were compared to the OSHA PEL of 0.1 fiber/cc for an eight-hour time weighted average. To evaluate the potential migration of asbestos fibers outside the asbestos regulated area, perimeter area samples were collected and compared with an administrative control limit of 0.01 fibers/cc, 10% of the OSHA PEL.

3.2 Air Monitoring Results for Demolition Activities

CHPRC Data

The IH Team evaluated sampling data associated with structures demolished over a three-year period (October 2008-January 2012). A summary of the air sampling data collected during demolition activities is provided in Appendix B.

Personal

The IH Team reviewed 278 personal asbestos air samples collected by CHPRC during D&D activities. The samples were collected on representative employees and those workers expected to have the highest potential exposure to airborne asbestos fibers during work activities. Personal asbestos samples were collected on crane operators, heavy equipment operators, D&D workers, insulators, and radiation control technicians. Due to the task performed and the proximity to the ACM, crane operators and D&D workers were expected to have the greatest exposure to asbestos fibers. All workers entering the controlled work area were required to wear respiratory protection regardless of asbestos fiber levels monitored at the site.

None of the personal samples collected indicated occupational exposures exceeding the OSHA PEL. Personal samples were collected during demolition until enough data could be collected to establish the asbestos control methods were effective, as evidenced by asbestos concentrations being maintained below the OSHA PEL. During demolition work where thermal insulation system materials remained, personal samples were taken for the duration of the project.

Area

The IH Team reviewed 1,776 area/perimeter samples collected by CHPRC during demolition activities. Perimeter sampling was conducted at each demolition site, typically at the four points of the compass. Additional locations were selected by the industrial hygienist to assess the potential of fiber migration outside of the controlled work area.

At two demolition sites (284W & 209E), sampling was also conducted at elevations above the work area. Samples were collected at approximately 25 feet above ground level while heavy equipment was used to raze the structures. These samples were collected to assess potential asbestos fiber release at elevations that would have the potential to migrate outside the work area boundary and not be captured by ground level area/perimeter sampling.

Perimeter samples with reported fiber counts by PCM above an administrative control level of 0.01 fibers/cc were further analyzed specifically for asbestos fiber count using TEM analysis. No asbestos fibers were identified on any of the samples subject to TEM, indicating PCM results reported substances other than asbestos. Three of the perimeter samples were disposed of by the laboratory prior to the request for re-analysis by TEM. One sample was collected in a trailer with no ACM present and, therefore, not confirmed by TEM.

WCH Data

WCH demolished the 384 Building with ACM in place. Samples were processed daily and the results returned to the workers and supervisors to provide immediate feedback on the demolition methods. The IH Team reviewed 706 area/perimeter samples collected for this project to assess the potential of fiber migration outside of the controlled work area. All samples were at or below 0.01 fibers/cc.

MSA Data

MSA was not involved in the demolition of structures containing ACM. However, they conducted sampling both pre-demolition and during demolition of CHPRC structures due to the proximity of MSA facilities and concerns by MSA employees. A total of 10 pre-demolition area air samples were collected as part of this effort around 2266E and 2101M. All results were below 0.01 fibers/cc. Perimeter air sampling parallel to the sampling conducted by CHPRC during demolition activities was performed at many sites. The parallel perimeter samples collected by MSA accounted for 384 total samples during demolition activities. MSA parallel sampling results were also below 0.01 fibers/cc and are summarized in Appendix B.

3.3 Sampling During ACM Debris Removal

Personal and perimeter air samples were collected during asbestos debris removal activities to evaluate occupational exposures to asbestos fibers. Personal samples were collected on those workers involved in the ACM debris removal to assess worker exposures during those activities. Area/perimeter samples were also collected at the boundary of the asbestos debris removal locations to evaluate potential migration of asbestos fibers outside the work area.

Where ACM debris was removed at previous demolition locations identified by the field walk down team, all personal samples collected (17) were below the OSHA PEL. All perimeter samples (48) collected to assess exposure potential outside the work area were below 0.01 fibers/cc. Appendix C is a tabular summary of the data reviewed by the IH Team.

3.4 Additional Sampling Following Demolition

The Asbestos Action Plan tasked MSA with developing a sampling plan to assess the potential for asbestos fiber migration outside the demolition work control boundary. The sampling plan included collecting air, wipe, and bulk samples in and around building 2266E. The 2266E building is close to the demolition activities that took place at 272E and 284E. CHPRC collected parallel samples during this sampling campaign.

The sampling plan developed by MSA included the collection of area air samples in selected rooms inside the 2266E building. Area air samples were also collected outside of 2266E, downwind of the 272E demolition site on a windy day, to assess potential re-suspension of asbestos fibers from the demolition site. All 20 area samples collected as part of this plan were below 0.01 fibers/cc.

Wipe samples were collected for asbestos on surfaces inside 2266E, inside the building HVAC system, and inside vehicles that were located downwind of the 272E demolition, to evaluate the potential deposition of asbestos fibers from prior demolition activities. Bulk samples were collected inside the HVAC supply system (upstream of the filtration system) and at locations in and around the facility. Bulk material was also collected from four representative vehicles that were identified as being downwind of the prior demolition activities. Additionally, bulk soil samples were collected at the 272E demolition site to determine if the remaining soil at the site, or at adjacent locations, contained asbestos fibers. For comparative purposes, samples of loose material were collected off site in Richland.

Air sampling was conducted at those locations where bulk or wipe sampling indicated the presence of asbestos, as well as inside 48 additional vehicles that were contiguous to the prior 284E and 272E demolition (craft parking area). The air sampling inside vehicles was conducted with the vehicle windows closed, the engine running, and the vehicle ventilation system operating. All air samples collected in conjunction with the wipe, bulk, and vehicle sampling efforts were below 0.01 fibers/cc.

Heavy Equipment Filter Sampling

The cab intake air filter from a John Deere®¹ 850 excavator used on various D&D sites was analyzed in response to employee concerns. An air sample was collected by placing the filter in a sealed bag, agitating the filter to remove loose fibers, and sampling the air inside the bag for asbestos fibers. The sample was analyzed by TEM, and no asbestos fibers were detected. Bulk material was collected from the bag and an asbestos bulk analysis was conducted; laboratory results indicated the sample contained a homogeneous mixture of gray dirt with no asbestos present.

Water System Evaluation

Demolition of the 284W Steam Plant prompted concerns about potential asbestos contamination of the water supply system at the adjacent 283W water treatment plant. The 283W water filter plant supplies potable water throughout the 200 Area. Due to the design of the filtration system, asbestos particulates/fibers would be entrained within the water treatment plant's sand filter, precluding infiltration of asbestos into the water supply system. As such, asbestos sampling was not conducted of the treated water.

¹ John Deere is a registered trademark of Deere & Company, Molina, IL.

4 Discussion

This report was developed and reviewed by the members of the Hanford Site joint Industrial Hygiene Data Evaluation Team. The report was also reviewed by site contractor safety and industrial hygiene managers and representatives, HAMTC Safety Representatives, RL representatives, and physicians from the CSC Hanford Occupational Health Services (CSC).

5 Conclusions

The data reviewed for this evaluation, consisting of personal samples, area/perimeter samples, and additional post-demolition ACM debris removal samples, document that workers were not exposed above the OSHA PEL, without regard for prescribed respiratory protection. The area samples collected at the perimeter of demolition controlled areas were below our administrative control level of 0.01 fibers/cc. The results of air samples collected at locations where trace amounts of asbestos were detected in the wipe and bulk samples were also an order of magnitude below the OSHA PEL.

6 Definitions

Permissible Exposure Limit (PEL) - OSHA sets enforceable permissible exposure limits to protect workers against the health effects of exposure to hazardous substances. OSHA PELs are based on an 8-hour time weighted average (TWA) exposure. For asbestos, the PEL is 0.1 fibers/cc.

Phase Contrast Microscopy (PCM) - The most common analytical techniques used to assess exposure to asbestos fibers in air samples. The results are reported in total fibers, irrespective of the fiber mineralogy or composition.

Polarized Light Microscopy (PLM) - The traditional method used for the identification of asbestos in bulk materials.

Transmission Electron Microscopy (TEM) - The current definitive analytical method for identification of asbestos fibers on air sampling media. This method is typically used to confirm asbestos fibers reported by PCM.

7 References

29 CFR 1926.1101, "Safety and Health Regulations for Construction," "Asbestos," *Code of Federal Regulations*.

NIOSH Pocket Guide to Chemical Hazards, June 1997, U.S. Department of Health and Human Services, National Institute for Occupational Safety and Health.

TLVs[®] and BEIs[®] Based on the Documentation of the Threshold Limit Values for Chemical Substances and Physical Agents & Biological Exposure Indices, 2011, ACGIH.

ToxFAQs[™] Asbestos, CAS # 1332-21-4, September 2001, Agency for Toxic Substances and Disease Registry (ATSDR), Division of Toxicology.

Appendix A

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Appendix B

Previous Demolition Sample Data Summary

**CHPRC Air Sampling Summary
 (During Active Demolition)**

Location	Personal		Area	
	Number of Samples	Results (fibers/cc)*	Number of Samples	Results (fibers/cc)
Industrial Seven Project -272W				
Industrial Seven Project -2707W				
Industrial Seven Project -272-BA				
Industrial Seven Project -2704W				
Industrial Seven Project -277W	25	0.034 – <0.002	183	< 0.01 – <0.0004
Industrial Seven Project -274W				
Industrial Seven Project –Old Laundry				
Industrial Seven Project -2902W				
Industrial Seven Project -2902B				
Industrial Seven Project -2091W				
211U	4	0.006 – 0.003	2	0.005 – 0.007
211UA				
203UX				
224U	38	0.0059 – <0.0005	214	≤ 0.01 – <0.001
224UA				

Location	Personal		Area	
	Number of Samples	Results (fibers/cc)*	Number of Samples	Results (fibers/cc)
ALE-6652G				
ALE-6652H				
ALE-6652I				
ALE-6652J				
ALE-6652M				
ALE-6652R				
ALE-6652S	10	0.0691 – <0.0005	22	0.01 – <0.0004
ALE-6631				
ALE-6652C				
ALE-6652CSHED				
ALE-6652T				
ALE-6652U				
ALE-646				
MO840	0	N/A	4	3 samples ≤0.01; One sample ≥0.01
MO104	0	N/A	4	<0.01 – <0.005
2701M	1	<0.005	4	≤ 0.01
2722W	0	N/A	4	≤ 0.01
272E	45	0.009 – <0.002	177	< 0.01 – <0.005
275E	10	<0.008 – <0.003	29	0.01 – <0.005

Location	Personal		Area	
	Number of Samples	Results (fibers/cc)*	Number of Samples	Results (fibers/cc)
284E	69	0.022 – <0.002	389	0.01 – <0.005
X8	0	N/A	2	≤ 0.01
284WB	0	N/A	27	≤ 0.01
2701EC	0	N/A	4	≤ 0.01
2718E	0	N/A	8	0.004 – 0.002
209E	24	0.032 – 0.0004	161	0.01 – <0.0008
284W	12	0.018 – 0.004	135	< 0.01 – <0.0001
2701W	0	N/A	12	≤ 0.01
MO107	0	N/A	20	< 0.01 – <0.0004
1717K	0	N/A	12	≤ 0.01
190KE	3	<0.01 to 0.004	89	0.01 – <0.002
190KW	14	0.014 – 0.002	40	0.008 – <0.001
1706KE	11	0.028 – <0.002	11	< 0.01
1720K	0	N/A	2	≤ 0.01
1908KE	0	N/A	153	0.01 – 0.002
105KE	9	0.008 – 0.001	5	≤ 0.01
110KW	0	N/A	8	≤ 0.01
182KE	0	N/A	19	≤ 0.01
183KE	2	≤ 0.008	36	≤ 0.01
183KW	1	0.016		≤ 0.01

*OSHA Permissible Exposure Limit - 0.1 fibers/cc

**WCH Air Sampling Summary
 (During Active Demolition)**

Location	Personal		Area	
	Number of Samples	Results (fibers/cc)*	Number of Samples	Results (fibers/cc)
384	None Reported	N/A	706	≤0.01 – <0.0007

*OSHA Permissible Exposure Limit - 0.1 fibers/cc

**MSA Parallel and Pre-Demolition Air Sampling Summary
 (During Active Demolition)**

Date	Location	Area	
		Number of Samples	Results(fibers/cc)
4/19, 5/4, 5/13/2010 pre demo ambient background	Exterior 2266E, 2101M	10	≤0.01
4/27-28/2010	Exterior of MO-840 demo	4	<0.01
5/10	Exterior MO-104 demo	5	<0.01
5/19-20, 5/25, 6/8/2010	Exterior of MO-405 demo	7	<0.01 – <0.005
6/11/2010	Exterior of 2701 guard shack demo	2	<0.01
6/25 – 9/28 66 days	Exterior of 272E and 275 demo. Around 2266E and related buildings	368	<0.01 – <0.005

Appendix C

Residual ACM Debris Removal Sample Data Summary

CHPRC Air Sampling Summary During Post Demolition ACM Debris Removal Activities

Date	Location	Personal		Area	
		Number of Samples	Results(fibers/cc)*	Number of Samples	Results(fibers/cc)
2/6-7/2012	284E	4	0.02 – <0.01	8	≤0.01
2/8/2012	272E	3	<0.01	4	<0.01
2/9/2012	284W	2	0.02 – 0.01	0**	No Data
2/14-16/2012	Industrial 7	6	<0.01	12	≤0.01
3/14/2012	182K	2	<0.01	4	<0.01

*OSHA Permissible Exposure Limit - 0.1 fibers/cc
 **This work activity was of such a short duration that the perimeter samples had insufficient sampling time to generate meaningful data and were not analyzed.

WCH Air Sampling Summary During Post Demolition ACM Debris Removal Activities

Date	Location	Area	
		Number of Samples	Results(fibers/cc)
5/14-17/2012	4702	20	0.01 – < 0.002

Appendix D

Additional Sampling Data Summary

Additional Sampling Summary

(CHPRC)

Date	Location	Number of Samples	Sample Type	Results(fibers/cc)
02/22/2012	2266E -Inside	1	Air	0.01
02/22/2012	2266E-outside	1	Air	0.01
03/07/2012	2266E -Inside	4	Air	<0.0003
03/07/2012	2266E-Outside	2	Air	≤0.0003
03/13/2012	2266E-Vehicle	1	Wipe	ND (TEM)
03/13/2012	2266E-Inside	2	Wipe	ND (TEM)
03/13/2012	2266E-Outside	2	Wipe	ND (TEM)
2/27/2012	2266E -Inside	3	Bulk (MV)	ND (PLM)
03/01/2012	2266E-Vehicle	3	Bulk (MV)	ND (PLM)
3/13/2012	2266E-Inside	3	Bulk (MV)	ND (PLM)
3/13/2012	2266E-outside	3	Bulk (MV)	ND (PLM)
3/13/2012	2266E-outside	3	Bulk (MV)	ND (TEM)
02/29/2012	RCHN General	3	Bulk	ND (PLM)
03/01/2012	2266E-Vehicle	3	Bulk	ND (PLM)
3/13/2012	2266E-Outside	4	Bulk	ND (PLM)
2/14/2012	272E	6	Soil	ND (PLM)

- MV Micro-vacuum method for bulk material, analyzed by PLM.
- MV-TEM Micro-vacuum method for surface dusts, analyzed by TEM per ASTM D5755.
- Wipe Clean room wipe method for surface dusts, analyzed by TEM per ASTM D6480.
- ND Non detect - the sample was reported as below the analytical detection limit of the analysis by PLM of 1%.
- Trace For bulk scoop samples this indicates that some asbestos fibers were seen in the sample, but less than the 0.1% analytical limit used to identify bulk asbestos by TEM.
- Detected For the MV-TEM sample this means asbestos fibers were detected on the filter.
- Detected For the bulk (TEM) sample this means an asbestos fiber was detected on the filter, but the mass of fine dust collected could not be determined and results reflect only the qualitative presence.
- Detected For the wipe sample this means asbestos fibers were detected on the wipe.

Additional Sampling Summary

(MSA)

Date	Location	Number of Samples	Sample Type	Results
02/14/2012	272E	8 2 of 8 sent for TEM	Soil	8 ND (PLM) 2 ND (TEM)
02/22/2012	2266E - Inside	2	Air	<0.0007 fibers/cc
02/22/2012	2266E - Outside	4	Air	0.01 – <0.0006 fibers/cc
03/07/2012	2266E - Inside	4	Air	0.005 – <0.0003 fibers/cc
03/07/2012	2266E- Outside	2	Air	≤0.01 fibers/cc
02/27/2012	2266E - Inside	3	Bulk (MV)	ND (PLM)
02/27/2012	2266E - Outside	1	Bulk (SCOOP)	ND (PLM) ND (TEM)
02/29/2012	RCHN General	2	Bulk (MV)	ND (PLM)
02/29/2012	RCHN General	1	Bulk (SCOOP)	ND (PLM) ND (TEM)
03/01/2012	2266E - Vehicle	3 1 of 3 sent for TEM	Bulk (SCOOP)	3 ND (PLM) 1 TEM: < detection limit, trace
03/01/2012	2266E - Vehicle	3	Bulk (MV-TEM)	2 ND 1 detected
03/13/2012	2266E - Inside	3	Bulk (MV)	ND (PLM)
03/13/2012	2266E-Outside (in HVAC)	2	Bulk (MV)	ND (PLM)
03/13/2012	2266E-Outside (in HVAC)	2	Bulk (SCOOP)	ND (PLM)
03/13/2012	2266E-Outside (in HVAC)	2	Bulk (MV-TEM)	2 ND
03/13/2012	2266E-Outside (in HVAC)	1	Bulk (TEM)	1 detected
03/13/2012	2266E-Outside (in HVAC)	2	Wipe	1 ND (TEM) 1 detected
03/13/2012	2266E-Vehicle	1	Wipe	ND (TEM)
03/13/2012	2266E-Inside	2	Wipe	ND (TEM)
5/1/2012	Vehicle-G41-1428K	1	Air	≤0.01 fibers/cc
4/23/2012	Vehicle-G41-3867H	1	Air	≤0.01 fibers/cc

Date	Location	Number of Samples	Sample Type	Results
5/1/2012	Vehicle-G42-3603A	1	Air	0.0009 fibers/cc
4/23/2012	Vehicle-G43-1064K	1	Air	≤0.01 fibers/cc
4/23/2012	Vehicle-G43-1066K	1	Air	≤0.01 fibers/cc
4/23/2012	Vehicle-G43-1070K	1	Air	≤0.01 fibers/cc
4/23/2012	Vehicle-G43-1071K	1	Air	≤0.01 fibers/cc
4/25/2012	Vehicle-G43-1958	1	Air	≤0.01 fibers/cc
4/23/2012	Vehicle-G43-1967L	1	Air	≤0.01 fibers/cc
4/25/2012	Vehicle-G43-1977L	1	Air	≤0.01 fibers/cc
4/23/2012	Vehicle-G43-4514A	1	Air	≤0.01 fibers/cc
4/23/2012	Vehicle-G62-0703G	1	Air	≤0.01 fibers/cc
4/25/2012	Vehicle-G63-0570H	1	Air	≤0.01 fibers/cc
5/1/2012	Vehicle-G63-0660D	1	Air	≤0.01 fibers/cc
4/25/2012	Vehicle-G63-0848K	1	Air	≤0.0005 fibers/cc
4/25/2012	Vehicle-G63-1255L	1	Air	≤0.0005 fibers/cc
5/1/2012	Vehicle-G63-1263L	1	Air	≤0.01 fibers/cc
4/10/2012	Vehicle-xx-25230	1	Air	≤0.01 fibers/cc
4/10/2012	Vehicle-xx-3862A	1	Air	≤0.01 fibers/cc
4/19/2012	Vehicle-G43-1057K	1	Air	≤0.01 fibers/cc
4/23/2012	Vehicle-G43-1058K	1	Air	≤0.01 fibers/cc
4/19/2012	Vehicle-G43-1059K	1	Air	≤0.01 fibers/cc
4/19/2012	Vehicle-G43-1062K	1	Air	≤0.01 fibers/cc
4/19/2012	Vehicle-G43-1978	1	Air	≤0.01 fibers/cc
4/19/2012	Vehicle-G43-25217	1	Air	≤0.01 fibers/cc
4/19/2012	Vehicle-G43-3035B	1	Air	≤0.01 fibers/cc
4/19/2012	Vehicle-G43-3261H	1	Air	≤0.01 fibers/cc
4/19/2012	Vehicle-G63-1252L	1	Air	≤0.01 fibers/cc
4/23/2012	Vehicle-G63-0568H	1	Air	≤0.01 fibers/cc
4/19/2012	Vehicle-G63-2225A	1	Air	≤0.01 fibers/cc
4/19/2012	Vehicle-G63-2234A	1	Air	≤0.01 fibers/cc
4/25/2012	Vehicle-G41-1069B	1	Air	≤0.01 fibers/cc
4/25/2012	Vehicle-G43-1014H	1	Air	≤0.01 fibers/cc

Date	Location	Number of Samples	Sample Type	Results
4/25/2012	Vehicle-G43-1061K	1	Air	≤0.01 fibers/cc
4/25/2012	Vehicle-G43-1069K	1	Air	≤0.01 fibers/cc
4/25/2012	Vehicle-G43-1084K	1	Air	≤0.01 fibers/cc
4/24/2012	Vehicle-G42-3602A	1	Air	≤0.01 fibers/cc
4/24/2012	Vehicle-G43-1015H	1	Air	≤0.01 fibers/cc
5/2/2012	Vehicle-G43-1055K	1	Air	≤0.0005 fibers/cc
4/24/2012	Vehicle-G43-1060K	1	Air	≤0.01 fibers/cc
4/24/2012	Vehicle-G43-1065K	1	Air	≤0.01 fibers/cc
4/24/2012	Vehicle-G43-1075K	1	Air	≤0.01 fibers/cc
4/24/2012	Vehicle-G43-1076K	1	Air	≤0.01 fibers/cc
4/24/2012	Vehicle-G43-1077K	1	Air	≤0.01 fibers/cc
4/24/2012	Vehicle-G43-25217	1	Air	≤0.01 fibers/cc
4/24/2012	Vehicle-G43-3032B	1	Air	≤0.01 fibers/cc
5/2/2012	Vehicle-G63-2097G	1	Air	≤0.01 fibers/cc
5/1/2012	Vehicle-G42-0941H	1	Air	≤0.01 fibers/cc

MV Micro-vacuum method for bulk material, analyzed by PLM.
 MV-TEM Micro-vacuum method for surface dusts, analyzed by TEM per ASTM D5755.
 Wipe Clean room wipe method for surface dusts, analyzed by TEM per ASTM D6480.
 ND Non detect - the sample was reported as below the analytical detection limit of the analysis by PLM of 1%.
 Trace For bulk scoop samples this indicates that some asbestos fibers were seen in the sample, but less than the 0.1% analytical limit used to identify bulk asbestos by TEM.
 Detected For the MV-TEM sample this means asbestos fibers were detected on the filter.
 Detected For the bulk (TEM) sample this means an asbestos fiber was detected on the filter, but the mass of fine dust collected could not be determined and results reflect only the qualitative presence.
 Detected For the wipe sample this means asbestos fibers were detected on the wipe.