

DRAFT

Table 1
Summary Statistics for Air Sample Data - Asbestos
New York City Department of Health

CONSTITUENT	Number of Samples	Number of Detects	Frequency of Detection	Minimum Detected Concentration (fibers/mL)	Maximum Detected Concentration (fibers/mL)	Minimum Non-Detected Concentration (fibers/mL)	Maximum Non-Detected Concentration (fibers/mL)	Mean Detected Concentration (fibers/mL)	95% UCL Concentration (fibers/mL)
Asbestos	236	12	5.1%	0.0005	0.2317	0.003	0.01	0.048	0.0036

FDNY World Trade Center Vehicles - SAMPLING REPORT

2001 / 2002

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Date Sampling	Vendor	Eng./Ladder Co. #	Sample Type	COMMENTS	Results
11/21/2001	ATC	Ladder 21	Asbestos Dust / Debris	9 samples	<1%
11/21/2001	ATC	Squad 41	Asbestos Dust / Debris	9 samples	<1%
				All samples tested Negative for Asbestos	
11/23/2001	ATC	Eng.Co.226	Asbestos / Bulk Sample	12 samples	<1% nd
11/28/2001	ATC	na	Asbestos Dust / Debris	13 samples - All samples tested Negative for	nd
				asbestos content	
12/4/2001	ATC	Eng.Co.217	Asbestos Dust / Debris	Sample # 5 - contained asbestos	2.10%
12/7/2001	ATC	Ladder 131	Asbestos Dust	*Positive - for asbestos content-cabinet/floor	1.8%,1.3%,1.8%
12/13/2001	KAM Consultants	Eng.Co.47	Wipe / Bulk Sample	Interior/Exterior (6samples) Asbestos=0%	0%
12/20/2001	KAM Consultants	Eng.Co.214	Wipe / Bulk Sample	Interior/Exterior (6samples) Asbestos=0%	0%
1/2/2002	KAM Consultants	#54 Paidge Ave	Bulk Sample	6 samples - 2 indicated asbestos less than 1%	<1%
1/25/2002	KAM Consultants	Eng.Co.235	Wipe	Interior/Exterior (6samples) Asbestos=0%	0%
1/31/2002	KAM Consultants	Eng.Co.217	Air Monitoring	Inside Crew Cabin	<0.01 f/cc
1/31/2002	KAM Consultants	Eng.Co.163	Air Monitoring	Inside Crew Cabin	<0.01 f/cc
1/31/2002	KAM Consultants	MP8904D	Air Monitoring	Inside Crew Cabin	<0.01 f/cc
1/31/2002	KAM Consultants	Field Bank	Air Monitoring	Inside Crew Cabin	<0.055 f/field
2/6/2002	KAM Consultants	QHC -H Bldg	Bulk Sample	Vehicle #776 - hood,intake box, interior f/b	Asbestos 0%
2/8/2002	KAM Consultants	Eng.Co.279	Asbestos Air Monitoring	Drivers Cabin/Inside/Outside/Frt/Bck/Sides	<0.01f/cc
				Asbestos =0% Field Bank	<0.055 f/field
2/12/2002	KAM Consultants	Eng.Co.211	Air Monitoring/Bulk Samp	Cabin Front/Back	Asb.0%,<0.01 f/cc
2/12/2002	KAM Consultants	Eng.Co.9	Air Monitoring/Bulk Samp	Cabin Front/Back	Asb.0%,<0.01 f/cc
2/12/2002	KAM Consultants	Eng.Co.16	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0056
2/12/2002	KAM Consultants	Fleet Gar. EC279	Asbestos/Fiberglass/Silica	Inside Crew Cabin EC 279	<0.0044
2/12/2002	KAM Consultants	Ladder Co. 7	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0067
2/13/2002	KAM Consultants	Eng.Co.23	Asbestos/Fiberglass/Silica	Truck Cabin	<0.0040
2/13/2002	KAM Consultants	Ladder Co. 15	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0063
2/13/2002	KAM Consultants	Eng.Co.24	Asbestos/Fiberglass/Silica	Truck's Cabin	<0.0040

2/13/2002	KAM Consultants	Eng.Co.226	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0045
2/13/2002	KAM Consultants	Eng.Co.5	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0052

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2/13/2002	KAM Consultants	Eng.Co.7	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<i>Asb.0.0345 CHR/ FG <0.0049 / Sil.<0.0049</i>
2/14/2002	KAM Consultants	Eng.Co.205	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0050
2/14/2002	KAM Consultants	Eng.Co. 211	Asbestos/Fiberglass/Silica	Cabin	<0.0050
		Ladder Co. 119	Asbestos/Fiberglass/Silica	Cabin	<0.0050
2/14/2002	KAM Consultants	Eng.Co.201	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0048
2/14/2002	KAM Consultants	Ladder Co.131	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
2/14/2002	KAM Consultants	Ladder Co.114	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0050
2/14/2002	KAM Consultants	Eng.Co.207	Asbestos/Fiberglass/Silica	Cabin	<0.0050
2/14/2002	KAM Consultants	Eng.Co.239	Asbestos/Fiberglass/Silica	EC239	<0.0050
2/14/2002	KAM Consultants	Eng.Co.228	Asbestos/Fiberglass/Silica	EC228	<0.0050
2/15/2002	KAM Consultants	EMS Gar. 58th St	Asbestos/Fiberglass/Silica	Inside Car 778, Inside Car 716, Inside Trk 825	<0.0049
2/15/2002	KAM Consultants	Eng.Co.220	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
2/15/2002	KAM Consultants	Eng.Co.240	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
2/15/2002	KAM Consultants	Eng.Co.219	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
2/15/2002	KAM Consultants	Ladder Co.122	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
2/15/2002	KAM Consultants	Eng.Co.224	Asbestos/Fiberglass/Silica	Inside Crew Cabin - Spare Apparatus tested	<0.0049
2/15/2002	KAM Consultants	Eng.Co.209	Asbestos/Fiberglass/Silica	Inside Truck's Cabin	<0.0049
2/15/2002	KAM Consultants	Ladd.1/ EC 7	Asbestos/Fiberglass/Silica	Battalion Chief Suburban, LC 1 Truck	<0.0049
2/15/2002	KAM Consultants	Eng.Co.280	Asbestos/Fiberglass/Silica	Inside Truck's Cabin	<0.0049
2/15/2002	KAM Consultants	Ladder Co. 104	Asbestos/Fiberglass/Silica	Inside Cabin	<0.0049
2/15/2002	KAM Consultants	Eng.Co.221	Asbestos/Fiberglass/Silica	Inside Cabin	<0.0049
2/15/2002	KAM Consultants	Ladder Co.102	Asbestos/Fiberglass/Silica	Inside Truck's Cabin	<0.0049
2/16/2002	KAM Consultants	Eng.Co.9	Asbestos/Fiberglass/Silica	<i>Asbestos 0.2317 CHR, FG 0.0267, Silica <0.0089</i>	
2/16/2002	KAM Consultants	Ladder Co.6	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
2/16/2002	KAM Consultants	Satellite 1	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
2/16/2002	KAM Consultants	Ladder Co. 20	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
2/16/2002	KAM Consultants	Eng.Co.55	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
2/16/2002	KAM Consultants	Eng.Co.505	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
2/16/2002	KAM Consultants	Eng.Co.500	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049

2/16/2002	KAM Consultants	Ladder Co.5	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0048
2/16/2002	KAM Consultants	Ladder Co.8	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
2/16/2002	KAM Consultants	Eng.Co.4	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0042
2/16/2002	KAM Consultants	Eng.Co. 10	Asbestos/Fiberglass/Silica	Inside Crew Cabin - Test was conducted in quarters of Eng.Co. 4 and Ladder 14	<0.0049

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2/16/2002	KAM Consultants	Eng.Co. 6	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
2/16/2002	KAM Consultants	Eng.Co. 7	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
				Apparatus #8923 was tested at 59 Paidge Ave	
2/17/2002	KAM Consultants	Eng.Co. 14	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
2/17/2002	KAM Consultants	Ladder Co.3	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
2/17/2002	KAM Consultants	Ladder Co.12	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0048
2/17/2002	KAM Consultants	Eng.Co. 3	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
2/17/2002	KAM Consultants	Eng.Co.18	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0048
2/17/2002	KAM Consultants	Ladder Co.1	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
2/17/2002	KAM Consultants	Ladder Co.18	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0048
2/17/2002	KAM Consultants	Eng.Co.15	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0048
2/17/2002	KAM Consultants	Eng.Co. 28	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
2/17/2002	KAM Consultants	Eng.Co. 26	Asbestos/Fiberglass/Silica	<i>Asbestos 0.1632CHR, FG 0.0178, Silica <0.0089</i>	
2/17/2002	KAM Consultants	Ladder Co. 9	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0048
2/17/2002	KAM Consultants	Eng.Co. 33	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0050
2/17/2002	KAM Consultants	Ladder Co. 11	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
2/18/2002	KAM Consultants	Ladder Co. 21	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0050
2/18/2002	KAM Consultants	Ladder Co. 24	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
2/18/2002	KAM Consultants	Ladder Co. 2	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0050
2/18/2002	KAM Consultants	Eng.Co. 65	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
2/18/2002	KAM Consultants	Eng.Co. 8	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
2/18/2002	KAM Consultants	Eng.Co. 34	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
2/18/2002	KAM Consultants	Eng.Co. 1	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
2/18/2002	KAM Consultants	Eng.Co. 54	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
2/18/2002	KAM Consultants	Ladder Co. 4	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
2/18/2002	KAM Consultants	Ladder Co. 21	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0050
2/19/2002	KAM Consultants	Ladder Co. 25	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
2/19/2002	KAM Consultants	Eng.Co. 58	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
2/19/2002	KAM Consultants	Ladder Co. 16	Asbestos/Fiberglass/Silica	Inside Truck #SL9414	<0.0049
2/19/2002	KAM Consultants	Eng.Co. 39	Asbestos/Fiberglass/Silica	Inside Truck #MP8815	<0.0049
2/19/2002	KAM Consultants	Eng.Co. 37	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049

2/19/2002	KAM Consultants	Eng.Co. 74	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
2/19/2002	KAM Consultants	Eng.Co. 76	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
2/19/2002	KAM Consultants	Ladder Co. 22	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
2/20/2002	KAM Consultants	Eng.Co. 259	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
2/20/2002	KAM Consultants	Ladder Co. 128	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049

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2/20/2002	KAM Consultants	Ladder Co. 138	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0048
2/20/2002	KAM Consultants	Ladder Co. 116	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
2/20/2002	KAM Consultants	Eng.Co. 261	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
2/20/2002	KAM Consultants	Eng.Co.258	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
2/20/2002	KAM Consultants	Ladder Co. 115	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
2/20/2002	KAM Consultants	Eng.Co. 264	Asbestos/Fiberglass/Silica	Inside Truck #SP98033	<0.0049
2/20/2002	KAM Consultants	Eng.Co. 328	Asbestos/Fiberglass/Silica	Inside Truck #SP98038	<0.0049
2/20/2002	KAM Consultants	Eng.Co. 260	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
2/20/2002	KAM Consultants	Ladder Co. 136	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
2/21/2002	KAM Consultants	Ladder Co.47	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
2/21/2002	KAM Consultants	Squad Co. 41	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
2/21/2002	KAM Consultants	Eng.Co. 64	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0050
2/21/2002	KAM Consultants	Rescue Co. # 3	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
2/21/2002	KAM Consultants	Eng. Co. 241	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
2/21/2002	KAM Consultants	Ladder Co.161	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
2/21/2002	KAM Consultants	Eng. Co. 35	Asbestos/Fiberglass/Silica	Inside Truck #35 SP99913	<0.0049
2/21/2002	KAM Consultants	Eng.Co. 94	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
2/21/2002	KAM Consultants	Eng. Co. 50	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
2/21/2002	KAM Consultants	Eng.Co. 83	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0050
2/21/2002	KAM Consultants	Ladder Co. 48	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
2/21/2002	KAM Consultants	Eng.Co. 68	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
2/21/2002	KAM Consultants	Reserve Pumper	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
2/22/2002	KAM Consultants	Ladder #133	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
2/22/2002	KAM Consultants	Squad #288	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
2/22/2002	KAM Consultants	Eng.Co. 277	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0050
2/22/2002	KAM Consultants	Eng.Co. 231	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0050
2/22/2002	KAM Consultants	Eng.Co. 310	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
2/22/2002	KAM Consultants	Eng.Co. 233	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
2/22/2002	KAM Consultants	Rescue Co. # 1	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0047
2/22/2002	KAM Consultants	Eng.Co. 262	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
2/22/2002	KAM Consultants	Eng.Co. 311	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049

2/23/2002	KAM Consultants	Eng.Co. 22	Asbestos/Fiberglass/Silica	Positive for Asbestos 0.0433	Fiberglass <0.0048	Silica <0.0048
2/23/2002	KAM Consultants	Eng.Co. 53	Asbestos/Fiberglass/Silica	Inside Crew Cabin		<0.0049
2/23/2002	KAM Consultants	Eng.Co. 43	Asbestos/Fiberglass/Silica	Inside Crew Cabin		<0.0049
2/23/2002	KAM Consultants	Eng.Co. 44	Asbestos/Fiberglass/Silica	Inside Crew Cabin		<0.0049
2/23/2002	KAM Consultants	Ladder Co. 35	Asbestos/Fiberglass/Silica	Inside Crew Cabin		<0.0048

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2/23/2002	KAM Consultants	Ladder Co. 13	Asbestos/Fiberglass/Silica	Inside Crew Cabin		<0.0049
2/23/2002	KAM Consultants	Eng.Co. 40	Asbestos/Fiberglass/Silica	Inside Crew Cabin		<0.0050
2/23/2002	KAM Consultants	Eng.Co. 21	Asbestos/Fiberglass/Silica	Inside Crew Cabin		<0.0049
2/23/2002	KAM Consultants	Eng.Co. 72	Asbestos/Fiberglass/Silica	Inside Crew Cabin		<0.0049
2/23/2002	KAM Consultants	Eng.Co. 9	Asbestos/Fiberglass/Silica	Inside Crew Cabin		<0.0049
2/23/2002	KAM Consultants	Eng.Co. 26	Asbestos/Fiberglass/Silica	Inside Crew Cabin		<0.0049
2/24/2002	KAM Consultants	Eng.Co. 212	Asbestos/Fiberglass/Silica	Eng.212.Spare-Foam Truck 212 only tested		<0.0049
2/24/2002	KAM Consultants	Eng.Co. 281	Asbestos/Fiberglass/Silica	Inside Crew Cabin		<0.0049
2/24/2002	KAM Consultants	Eng.Co. 284	Asbestos/Fiberglass/Silica	Inside Crew Cabin		<0.0050
2/24/2002	KAM Consultants	Eng.Co. 229	Asbestos/Fiberglass/Silica	Inside Crew Cabin		<0.0049
2/24/2002	KAM Consultants	Eng.Co. 278	Asbestos/Fiberglass/Silica	Inside Crew Cabin		<0.0050
2/24/2002	KAM Consultants	Squad 252	Asbestos/Fiberglass/Silica	Inside Crew Cabin		<0.0049
2/24/2002	KAM Consultants	Eng.Co. 230	Asbestos/Fiberglass/Silica	Inside Crew Cabin		<0.0049
2/24/2002	KAM Consultants	Ladder Co. 149	Asbestos/Fiberglass/Silica	Inside Crew Cabin		<0.0048
2/24/2002	KAM Consultants	Eng.Co. 216	Asbestos/Fiberglass/Silica	Inside Crew Cabin		<0.0049
2/24/2002	KAM Consultants	Eng.Co. 249	Asbestos/Fiberglass/Silica	Inside Crew Cabin		<0.0049
2/24/2002	KAM Consultants	Squad 18	Asbestos/Fiberglass/Silica	Inside Crew Cabin		<0.0049
2/25/2002	KAM Consultants	Ladder 17	Asbestos/Fiberglass/Silica	Inside Crew Cabin		<0.0049
2/25/2002	KAM Consultants	Eng.Co. 60	Asbestos/Fiberglass/Silica	Inside Crew Cabin		<0.0049
2/25/2002	KAM Consultants	Ladder 54	Asbestos/Fiberglass/Silica	Inside Crew Cabin		<0.0049
2/25/2002	KAM Consultants	Field Comm.Unit	Asbestos/Fiberglass/Silica	In Operation Area Reg.# 8509		<0.0049
2/25/2002	KAM Consultants	Ladder Co. 14	Asbestos/Fiberglass/Silica	Inside Crew Cabin		<0.0049
2/25/2002	KAM Consultants	Ladder Co. 26	Asbestos/Fiberglass/Silica	Inside Crew Cabin		<0.0050
2/25/2002	KAM Consultants	Field Comm.Unit	Asbestos/Fiberglass/Silica	In Operation Area Reg.#FM01028		<0.0050
2/26/2002	KAM Consultants	Eng.Co. 276	Asbestos/Fiberglass/Silica	Inside Crew Cabin		<0.0049
2/26/2002	KAM Consultants	Eng.Co. 246	Asbestos/Fiberglass/Silica	Inside Crew Cabin		<0.0049
2/26/2002	KAM Consultants	Eng.Co. 318	Asbestos/Fiberglass/Silica	Inside Crew Cabin		<0.0049
2/26/2002	KAM Consultants	Ladder Co. 166	Asbestos/Fiberglass/Silica	Inside Crew Cabin		<0.0049
2/26/2002	KAM Consultants	Eng.Co. 210	Asbestos/Fiberglass/Silica	Inside Crew Cabin		<0.0049
2/26/2002	KAM Consultants	Eng.Co. 36	Asbestos/Fiberglass/Silica	Inside Truck #36 SP9309		<0.0049
2/26/2002	KAM Consultants	Eng.Co. 47	Asbestos/Fiberglass/Silica	Inside Truck #47 SP9413		<0.0049

2/26/2002	KAM Consultants	Ladder Co. 78	Asbestos/Fiberglass/Silica	Inside Crew Cabin - test done on spare apparat.	<0.0049
2/26/2002	KAM Consultants	Ladder Co. 148	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
2/26/2002	KAM Consultants	Eng.Co. 282	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
2/26/2002	KAM Consultants	Eng.Co. 160	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
2/27/2002	KAM Consultants	Eng.Co. 247	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049

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2/27/2002	KAM Consultants	Eng.Co. 71	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
2/27/2002	KAM Consultants	Ladder Co.55	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
2/27/2002	KAM Consultants	Eng.Co.91	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
2/27/2002	KAM Consultants	Batt. #3	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
2/27/2002	KAM Consultants	Batt.#11	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
2/28/2002	KAM Consultants	Eng.Co. 217	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
2/28/2002	KAM Consultants	Eng.Co.227	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
2/28/2002	KAM Consultants	Batt.#10	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
2/28/2002	KAM Consultants	Batt.#8	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
3/1/2002	KAM Consultants	Eng.Co.235	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
3/1/2002	KAM Consultants	Ladder Co.124	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
3/1/2002	KAM Consultants	Eng.Co.218	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0050
3/1/2002	KAM Consultants	Eng.Co. 271	Asbestos/Fiberglass/Silica	Inside Crew Cabin (Spare appartus Mp8917)	<0.0049
3/1/2002	KAM Consultants	Mobile Comm.Ctr	Asbestos/Fiberglass/Silica	Driver Cabin	<0.0049
3/1/2002	KAM Consultants	Mobile Comm.Ctr	Asbestos/Fiberglass/Silica	Operations Area-Center Reg.# FT9502	<0.0049
3/2/2002	KAM Consultants	Batt.#38	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
3/2/2002	KAM Consultants	Eng.Co.238	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
3/2/2002	KAM Consultants	Batt.#41	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
3/2/2002	KAM Consultants	Batt.#39	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
3/2/2002	KAM Consultants	Batt.#42	Asbestos/Fiberglass/Silica	Inside Truck Cabin	<0.0048
3/2/2002	KAM Consultants	Batt.#31	Asbestos/Fiberglass/Silica	Inside Cabin	<0.0049
3/2/2002	KAM Consultants	Batt.#40	Asbestos/Fiberglass/Silica	Inside Truck Cabin	<0.0049
3/2/2002	KAM Consultants	Batt.#32	Asbestos/Fiberglass/Silica	Inside Truck Cabin	<0.0048
3/3/2002	KAM Consultants	Eng.Co. 312	Asbestos/Fiberglass/Silica	Sattelite 4	<0.0049
3/3/2002	KAM Consultants	Eng.Co. 325	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
3/3/2002	KAM Consultants	Eng.Co.156	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
3/3/2002	KAM Consultants	Eng.Co. 152	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
3/3/2002	KAM Consultants	Rescue Co.5	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
3/3/2002	KAM Consultants	Ladder Co.163	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
3/3/2002	KAM Consultants	Ladder Co.84	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
3/3/2002	KAM Consultants	Eng.Co.164	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049

3/3/2002	KAM Consultants	Eng.Co.307	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
3/3/2002	KAM Consultants	Eng.Co.324	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
3/3/2002	KAM Consultants	Eng.Co.159	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
3/3/2002	KAM Consultants	Sattelite 5	Asbestos/Fiberglass/Silica	Inside Crew Cabin	<0.0049
3/4/2002	KAM Consultants	Batt.#46	Asbestos/Fiberglass/Silica	Inside Truck Cabin	<0.0049

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[illegible]

AIR MONITORING RESULTS PERFORMED INSIDE THE ESS VEHICLES

VEHICLES #	ESS #	Date of Sampling	Lab Results (f/cc)
5589	1	12/10/2001	<0.01
5553	1	12/10/2001	<0.01
Truck 1	1	12/10/2001	<0.01
5280	1	12/10/2001	<0.01
5518	2	12/11/2001	<0.005
6712	2	12/11/2001	<0.005
4044	2	12/11/2001	<0.006
5549	2	12/11/2001	<0.003
5694	2	12/11/2001	<0.009
5592	3	12/11/2001	0.008
4039	3	12/11/2001	0.01
5508	8	12/12/2001	<0.0070
5584	8	12/12/2001	<0.0064
3104	8	12/12/2001	<0.0070
5527	8	12/12/2001	<0.0071
4063	7	12/12/2001	<0.006
5538	10	12/12/2001	<0.0061
5550	7	12/12/2001	<0.0061
6711	7	12/12/2001	<0.0062
3503	6	12/13/2001	0.0329
5598	6	12/13/2001	<0.0042
5522	6	12/13/2001	<0.0064
5534	6	12/13/2001	<0.0063
4042	6	12/13/2001	<0.0062
5693	6	12/13/2001	0.0102
5504	4	12/14/2001	<0.0055
5531	4	12/14/2001	<0.0055
5533	4	12/14/2001	<0.0055
3502	4	12/14/2001	0.0429
5537	9	12/14/2001	<0.0062
5590	9	12/14/2001	<0.0061
5594	9	12/14/2001	<0.0061
9511	5	12/17/2001	0.001
4052	5	12/17/2001	0.0005
Truck-55	5	12/17/2001	0.0005
5698 (Van)	1	12/17/2001	<0.01

NOTE:

The Permissible Exposure Limit (PEL) for Asbestos is 0.1 fiber per cubic centimeter (f/cc). All air samples listed above, laboratory results indicates the exposures are much below than the OSHA PEL.

DRAFT REPORT

**HUMAN HEATH RISK ASSESSMENT
ASBESTOS IN RECOVERED
VEHICLES**

Prepared for

New York City Department of Health
New York, New York

Prepared by

TRC Environmental Corporation
Windsor, Connecticut

April 2002

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Introduction

TRC Environmental Corporation (TRC) performed a human health risk assessment evaluating the potential for adverse health effects associated with exposure to airborne asbestos fibers at levels measured in the emergency response vehicles recovered from the World Trade Center (WTC) site. This human health risk assessment was performed in accordance with the general methods and procedures outlined in applicable guidance documents developed by the U.S. Environmental Protection Agency (EPA) (1989a,b). This assessment is based on the results provided by New York Department of Health, the details of which can be found in the memorandum titled “*Environmental Health Considerations of WTC Vehicles*”

Conceptual Model

Vehicles that have been recovered from the WTC site have had their interior spaces contaminated with the dust and debris generated during the WTC collapse. The degree to which any individual vehicle was impacted in this manner varies with a number of factors, including, whether or not the windows of the vehicle were broken and whether or not the vehicle was running with ventilation systems on during the collapse. The data set used to estimate risk for normal use of recovered vehicles was collected from emergency and rescue vehicles that were generally situated closer to the WTC during collapse. It was assumed that these vehicles were most damaged and were considered to represent a ‘worst case’ in terms of being impacted by dust and debris.

The risk assessment estimates cancer risk for the population of individuals who are slated to retake possession of recovered vehicles and return these vehicles to normal use. Under normal use the receptor population is assumed to be exposed to airborne asbestos fibers while driving and while periodically cleaning the interior of the vehicle. It is assumed for the purposes of this risk assessment that the vehicles carpet and upholstery serve as a continuous source of asbestos fibers that become airborne during driving and interior cleaning. It is also assumed that the vehicles would be cleaned using methods similar to those employed for the emergency vehicles described above.

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The Risk Assessment Process

Based on EPA (1989a) guidance, a four-part process was used to estimate the chance that exposure to airborne asbestos resulting from the return of recovered vehicles to normal use will result in adverse health effects. This process involves hazard identification, exposure assessment, toxicity assessment, and risk characterization.

Hazard Identification

During the hazard identification step, data is collected and evaluated to determine what chemicals are present and at what levels. The memorandum referenced above lists asbestos, silica, fiberglass, cement dust, gypsum, calcite, and mica as the main constituents in the WTC dust and debris. With the exception of asbestos, these dust constituents were not present at levels associated with adverse health effects.

A total of 236 air samples were collected from FDNY and NYPD vehicles recovered from the WTC site. These vehicles were repaired, subjected to a “ cursory ” cleaning, and returned to service. The sampling protocol specified that the vehicles be driven with windows closed and ventilation systems on full during sampling. **Table 1** provides a summary of the air sampling data. Asbestos was reported in 12 of 236 samples at detectable concentrations. Detected concentrations ranged from 0.0005 fibers/mL to 0.23 fibers/mL. The average detected asbestos concentration was 0.048 fibers/mL (note: fibers/mL and fibers/cc are interchangeable). These data represented a reasonable worst case and were used as a surrogate to estimate risk associated with other vehicles recovered from the WTC site.

Exposure Assessment

The second part of the risk assessment process is the exposure assessment. In this step, the data that was collected during the hazard identification is used to determine the extent to which people might be exposed. The amount of risk depends on the amount of exposure. The exposure assessment component of the risk assessment (i) defines the human receptors of concern, (ii) identifies the exposure pathways, (iii) estimates exposure point concentrations, and (iv) estimates the average daily exposure. The average

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daily exposure estimates combine the exposure point concentrations with assumptions about the magnitude (how much), frequency (how often), and duration of exposure (how long). The point at which exposure occurs (i.e., exposure point) and the pathways through which a receptor comes in contact with the exposure point(s) (i.e., exposure pathways) are discussed below for the receptors quantitatively evaluated in the risk assessment:

- **New York City Personal Vehicle Commuter:** The potential exposure point for the Commuter is air space inside the vehicle where asbestos fibers are resuspended as a result of the vehicles ventilation system and during an occasional interior cleaning. The exposure pathway for the Commuter is inhalation of airborne asbestos fibers. The Commuter was assumed to be exposed for two hours, one hour, and one-half hour per day (representative of different lengths of commute), 6 days per week, for 10 years (length of service for recovered vehicle).

Estimation of Exposure Point Concentrations

The exposure point concentration (EPC) is the measured or estimated amount of a chemical in the environmental medium of concern at the point of human contact. The environmental media of concern is the interior airspace of the vehicle.

For the purpose of this risk assessment, the exposure point concentration is calculated as specified in Chapter 6 of the Risk Assessment Guidance for Superfund (EPA, 1989) and the Supplemental Guidance to RAGS: Calculating the Concentration Term (EPA, 1992). This statistical method uses a confidence interval to calculate a theoretical concentration. The calculated concentration is the 95% upper confidence limit (UCL) on the arithmetic average. This means that the chance that the actual average concentration of airborne asbestos exceeds the 95% UCL is estimated to be less than 5%. Data from all 236 samples collected were considered in calculating the 95% UCL. Non-detected results were entered into the data set as one-half of the non-detected value. This is done to address uncertainty in the true asbestos concentration stemming from limitations in the laboratory's ability to detect very small concentrations. It is assumed, for purposes of the risk assessment, that the true asbestos concentration is somewhere between zero and the laboratory's limit of detection. The 95% UCL was calculated using the following formula:

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$$95\% \text{ UCL} = \exp \left[Y_{\text{bar}} + 0.5 \times Sy^2 + \frac{Sy \times H_{95}}{n-1} \right]$$

Where:

- 95% UCL = the 95% UCL on the arithmetic mean for a log normally distributed dataset
- Y_{bar} = the average of the natural logarithms of all concentrations
- Sy = the standard deviation of the logarithms of the concentrations
- n = the number of samples
- H_{95} = a statistical parameter which depends on n and Sy , obtained as a table value (Gilbert, 1987).

Estimation of Average Daily Exposure

Since the Commuter's daily exposure is for only short durations and the service life of the recovered vehicles is expected to be less than the receptor's lifetime, the asbestos concentration in air, as represented by the EPC, was adjusted to represent a continuous lifetime average daily exposure using the following standard equation:

$$\text{LADE} = \frac{\text{EPC} \times \text{EF} \times \text{ED} \times \text{EP} \times \text{UC}}{\text{AT}}$$

Where:

- LADE = Lifetime average daily exposure via inhalation (fibers/mL)
- EPC = Exposure point concentration (fibers/mL)
- EF = Exposure Frequency (events/day)
- ED = Exposure Duration (hours/event)
- EP = Exposure Period (years)
- UC = Unit Conversion (days/hour)
- AT = Averaging Time (years)

Toxicity Assessment

The Environmental Protection Agency's Integrated Risk Information System (IRIS) lists asbestos as a Class-A human carcinogen based on "increased mortality and incidence of lung cancer, mesotheliomas and gastrointestinal cancer in occupationally exposed workers that are consistent across investigators and study populations". A unit risk factor of $0.23 \text{ (fibers/mL)}^{-1}$ is provided in IRIS and is based on data from a number of occupational studies. This unit risk value was adjusted to continuous exposure by

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applying a factor of $140 \text{ m}^3/50 \text{ m}^3$, accounting for the difference between weekly ventilation rates associated with continuous exposure and occupational exposure.

Risk Characterization

The risk characterization combines the previously described components of the Risk Assessment (i.e., hazard identification, exposure assessment, and toxicity assessment) to provide numerical estimates of human health risk. In general, these risk estimates are expressed in terms of excess lifetime cancer risk for cancer endpoints expressed as a probability. The EPA has established a range of acceptable risk from one in ten thousand to a one in one million. A result below one in one million is generally accepted to represent no significant risk of adverse health effects. A result above one in ten thousand generally warrants aggressive risk management actions. A result between one in one million and one in ten thousand represents a 'gray area' where the costs of risk reduction need to be carefully weighed with the projected benefits.

Table 2 presents the estimated total cancer risks for the Commuter receptor scenario for exposure to asbestos in air. The Two-hour Commuter is shown to have a cancer risk of eight in one million (0.000008). The one-hour and one-half hour Commuter are shown to have cancer risks of four in one million (0.000004) and two in one million (0.000002), respectively.

Risk-based Concentrations

Risk-based concentrations have been developed for asbestos in air by running the exposure assessment equations presented above in reverse. These risk-based concentrations are based on the inhalation of airborne asbestos fibers and are specific to the Commuter scenario developed in the exposure assessment. **Table 3** presents risk-based concentrations at target risk levels of one in ten thousand ($1\text{E-}4$), one in one hundred thousand ($1\text{E-}5$), and one in one million ($1\text{E-}6$). The following equations was used to calculate risk-based concentrations:

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$$RBC = TR * (EPC / Risk)$$

Where:

RBC = Risk-based Concentration (fibers/mL)

TR = Target Risk (unitless)

EPC = Exposure Point Concentration (fibers/mL)

Risk = Risk resulting from input of EPC into exposure assessment models (unitless)

Uncertainty

The main source of uncertainty stems from the analytical techniques used to determine asbestos concentration in air. In the studies referenced in IRIS, Phase Contrast Microscopy (PCM) was used to provide asbestos in air concentrations for determination of the unit risk factor. The criteria used to identify fibers, using PCM methodology, do not distinguish between asbestos fibers and other fibers. While it is most appropriate to use PCM data in risk assessments that employ the unit risk factor listed in IRIS, it is possible that airborne asbestos concentrations provided by PCM would cause an overestimation of risk if other fiber types were present.

Transmission Electron Microscopy (TEM) is selective for asbestos; however, the asbestos IRIS file states that the correlation between PCM and TEM results is difficult to pin down. The effect of applying the unit risk factor listed in IRIS to TEM results can result in either an overestimation or underestimation of risk. The IRIS file also cautions against using the listed unit risk factor with airborne asbestos greater than 0.04 fibers/mL citing uncertainty in the dose-response curve.

Four of the data points from the FDNY data set are TEM results reported in structures per square centimeter (s/cc). In some studies, the structure of the asbestos fiber is considered a factor in its ability to cause cancer. Asbestos analysis by TEM reporting results in s/cc does not provide a distinction between fibers and particles. As a result, in some cases, the use of TEM data reported in s/cc would tend to overestimate the cancer risk. Further, the IRIS file for asbestos does not provide quantitative data for assessing other health endpoints, such as asbestosis. The lack of such data prohibits this risk assessment from quantitatively evaluating asbestosis as a health endpoint resulting in an underestimation of risk.

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