Appendix E: Ambient Levels of Asbestos

Ambient Levels of Asbestos

This section provides information about background levels of asbestos in the ambient environment. The measurement techniques and the quality of the data may vary from study to study. This data is provided for general information only.

Levels of Asbestos in Air

Table E-1: Background Levels of Asbestos in Environmental Air Samples in USA (fibers/ml, >5 um)[1]

	Median	**Mean***	**Range***
Urban Outdoor Air[2]	0.0003a		ND-0.008
Urban Outdoor Air[3]		0.00005a	
Outdoor Air[4]		0.00039b	
Residences with ACM[5]		0.0001	ND-0.002
Buildings with ACM[6,7,8]		0.00005	ND-0.00056
Buildings without ACM		ND	ND
Schools[9]		0.00024	ND-0.0023
Schools with ACM[10]		0.0002	ND-0.0016
Public Buildings (no ACM)		0.00099	
Public Buildings (with ACM in good condition)		0.00059	
Public Buildings (with damaged ACM)		0.00073	

*ND = non-detect

a PCOM analysis

b Not specified

[1] Adapted from Tables 14-16, Environmental Health Criteria 203, World Health Organization, Geneva, 1998 pp. 48-49

[2] Chesson J, Margeson DP, Ogden J, Bauer K, Constant PC, Bergman FJ, & Rose DP (1985) Evaluation of asbestos abatement techniques. Phase 1: Removal. Washington, DC, US Environmental Protection Agency (EPA-560/5-85-109).

[3] Tuckfield RC, Tsay Y, Margeson DP, Ogden J, Chesson J, Buer K, Constant PC, Bergman FJ, & Rose DP (1988) Final report for tasks 1-6: Evaluation of asbestos abatement techniques - Phase 3: Removals. Washington, DC, US Environmental Protection Agency (EPA-68-02-4294).

[4] Mossman BT, Bignon J, Corn M, Seaton A, & Gee JBL (1990) Asbestos: Scientific developments and implications for public policy. Science, 247: 294-301.

[5] CPSC (1987) Report on the first round of air sampling of asbestos in home study. Washington, DC, US Consumer Product Safety Commission

[6] Hatfield J, Ogden J, Srockrahm J, Leczynski B, Price B, Chesson J, Russel J, Ford P, Thomas J, Fitzgerald J, Roat R, Lee R, Van Orden D, Dunmyre G, Constant P, & McHugh J (1988) Assessing asbestos exposure in public buildings. Washington, DC, US Environmental Protection Agency (EPA-560/5-88-002).

[7] Crump KS & Farrar DB (1989) Statistical analysis of data on airborne asbestos levels collected in an EPA survey of public buildings. Regul Toxicol Pharmacol, 10: 51-62

[8] Chesson J, Hatfield J, Schultz B, Dutrow E, & Blake J (1990) Airborne asbestos in public buildings. Environ Res, 51: 100-107

[9] Corn M, Crump K, Farrar DB, Lee RJ, & McFee DR (1991) Airborne concentrations of asbestos in 71 school buildings. Regul Toxicol Pharmacol, 13: 99-114.

[10] McCrone (1991) Data provided to the literature review panel, HEI-AR. Norcross, Georgia, McCrone Environmental Services Inc

Water

Analyses made with TEM microscopy from July, 1974-December, 1975, in raw water collected at water treatment plants from Waukegan, IL – Burns Harbor, IN, indicated concentrations were 420,000-4,200,000 fibers/liter, 2.0-8.0 μm in length. (Approximately 50% of fibers ranged from 2.0 to 5.0 μm in length). 80% of the total appeared to be chrysotile. Treated water concentrations ranged from 80,000-550,000 fibers/liter, indicating that the filtration process in place at the time eliminated 70-90% of the fibers. There appeared to be seasonal variations in concentration, with higher concentrations in winter months.[11] A similar finding about seasonality of asbestos concentrations in a water supply was mentioned in a study of amphibole minerals found in Lake Superior water at average concentrations ranging from $10^6 – 10^{12}$ fibers/liter from an apparent iron ore mining source of contamination.[12]

More recent water analyses at IBSP indicated asbestos concentration of water was less than the limit of detection of 800,000 fibers/liter.[13]

Average asbestos concentrations in water ranged from 0.3 to 1.5 μg/liter (approximately 0.6 - 3 million fibers/liter) in eastern U.S. river samples. National water surveys of drinking water in the U.S., Canada, the United Kingdom, Germany, and other countries found 10^5 to 10^6 fibers/liter in water supplies. Some 10% of water supplies in the U.S. and about 5% in Canada had concentrations ranging from 10^8 to 10^9 fibers/liter due to naturally occurring asbestos from bedrock and /or mining activities.[14, 15] The review articles that describe these studies do not provide detailed descriptions of fiber length and diameter counted.

Street Dust and Soil

A study was performed in 1979-1980 in an unincorporated community named Castro Valley (Year 2000 population 57,300),[16] located in Alameda County, California, about 40 kilometers (24 miles) east of San Francisco, in the San Francisco Bay watershed. No known asbestos-containing serpentine outcrops of bedrock were present in the area, although some highly diluted serpentine erosion products were mixed with other erosion materials in the down slope areas of the watershed. Approximately 22 samples were analyzed by TEM/SAED after a screening protocol that found asbestos in 69% of samples screened. All of the analyzed samples contained significant asbestos fiber concentrations. Five samples were collected in runoff creek water, one each in sediment from a rural and urban creek, and 17 from paved and unpaved areas. Paved area samples were collected with a vacuum procedure and unpaved area samples were collected with a brush. Sediment samples were collected with a coring tool**.**

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[11] McMillan, Lilia M., Roy G. Stout, and Benjamin Willey, Asbestos in Raw and Treated Water: An Electron Microscopy Study, Environmental Science and Technology, Volume 11, Number 4, April, 1977 pp 390-394

[12] Cook, Philip M., Gary E. Glass, James H. Tucker, Asbestiform Amphibole Minerals: Detection and Measurement of High Concentrations in Municipal Water Supplies, Science, Vol. 185, September, 1974, pp 853-855.

[13] Hanson Engineers, Inc., Sampling for Asbestos Material, Oversight of Asbestos Removal Activities at Illinois Beach State Park, Volume I, May, 1998**.**

[14] California Office of Environmental Health Hazard Assessment, Public Health Goals for Chemicals in Drinking Water: Asbestos, September 2003, pp 14-15.

[15] Belanger, Scott, et al, "Effects of Asbestos on Coho Salmon and Green Sunfish: Evidence of Behavioral and Pathological Stress", Environmental Research 39, 74-85, 1986. p 75.

[16] http://www.city-data.com/city/Castro-Valley-California.html, accessed 3/18/05

The sample results for total fibers of all lengths, expressed as concentration of fibers per gram of material (street dust or soil) were significant, ranging from 55 x 10^6 to 1,900 x 10^6 fibers per gram. Two creek sediment samples had concentrations of 39 x 10^6 to 230 x 10^6 fibers per gram. Median fiber lengths were 0.7 to 1.7 μm in length, and zero to 30% of the fibers found were greater than 2.49 μm in length. Less than ten percent of all samples were amphibole fibers, and about 3% of street surface samples were amphibole.[17]

This study above differs from the IBSP study in that the IBSP study only considered fibers greater than 5 μm in length and the concentrations were expressed as structures per gram of PM_{10} instead of fibers per gram of total street dust and soil.

[17] Pitt, Robert. Asbestos as an urban area pollutant, Water Pollut. Control Fed., 60, 1988, pages 1993-2001.