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ASSESSING RISKS FROM THE PRESENCE OF ASBESTOS IN SOILS AND OTHER BULK MATERIALS

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Coworkers and I have spent the last 15 years developing an improved set of methods for measuring asbestos in various environmental media, which are unique because they can be used to support asbestos risk assessment. These methods have been published as U.S. Environmental Protection Agency (EPA) interim methods and include:

- Chatfield EJ and Berman DW (1990a). *Interim Superfund Method for the Determination of Asbestos in Air. Part 1: Method.* EPA 540/2-90/005a

- Berman DW and Chatfield EJ (1990b). *Interim Superfund Method for the Determination of Asbestos in Air. Part 2: Technical Background Document.* EPA 540/2-90/005b.

- Berman, DW and Kolk AJ (1997). *Interim Superfund Method for the Determination of Releasable Asbestos in Soils and Bulk Materials.* EPA 540-R-97-028.

- Berman, D.W. and Kolk, A.J. *(2000). Draft: Modified Elutriator Method for the Determination of Asbestos in Soils and Bulk Materials, Revision 1.* Submitted to the U.S. Environmental Protection Agency, Region 8, May 23.

We have also developed a companion protocol for conducting asbestos-related risks (based on appropriate measurements) that is supported by a comprehensive review and reconciliation of the literature and supplemented with additional studies:

- Berman, D.W. and Crump, K.S. *(2001). Technical Support Document for a Protocol to Assess Asbestos-Related Risk.* Prepared for: Mark Raney, Volpe Center, U.S. Department of Transportation, 55 Broadway, Kendall Square, Cambridge, Massachusetts 02142 and Chris Weis and Paul Peronard, U.S. Environmental Protection Agency, Region 8, Denver, Colorado. Under EPA Review.

The protocol defines a new exposure index (size range of structures to be included in the determination of exposure) that appears to better represent biologically active structures (and, therefore, better predicts risk) than the set of structures included in traditional analyses of asbestos. To assess risk using the protocol, asbestos exposure must be determined in terms of the defined exposure index and exposure estimates are combined with a properly matched set of dose-response factors using procedures that are unambiguous and quantitative. In contrast, the traditional approach for assessing asbestos risks in current use lacks such specificity, which leads to unavoidable ambiguity and thus limits its utility.

Although the protocol represents neither EPA policy nor current practice, it has recently been subjected to an EPA peer review consultation. During the consultation, the expert panel generally endorsed the overall approach and suggested some additional research to further refine the protocol. A study is now in progress to complete the additional, recommended research.

To assess exposure, airborne asbestos concentrations can be measured directly using the air method (or the newer ISO Method 10312, which represents a refinement of the Superfund air method) or can be estimated by combining bulk measurements with properly matched emission and dispersion models. Typically, a combination of these tools integrated in a carefully designed study proves to be the most cost-effective.

The Superfund soil/bulk method[1] is designed to provide results that can be combined with properly adapted emission and dispersion models to predict airborne asbestos concentrations that may be produced by the release of asbestos. Such procedures can be applied to any of a broad range of activities that might disturb asbestos-containing soils or other bulk materials. In a previously published study (Berman, D.W. “Asbestos Measurement in Soils and Bulk Materials: Sensitivity, Precision, and Interpretation -- You *Can* Have It All.” in *Advances in Environmental Measurement Methods for Asbestos, ASTM STP 1342,* M.E. Beard, H.L. Rook, Eds., American Society for Testing and Materials. Pp. 70-89, 2000), this approach was applied to serpentine-surfaced roads and the resulting predictions were compared against airborne asbestos concentrations that were actually measured downwind of the road.

Results from this study demonstrate that the indicated procedures yield predictions of airborne asbestos concentrations that are remarkably accurate. More importantly, the models used to develop the predictions contain no adjustable parameters (i.e. no fudge factors). The paper also shows, in contrast, that there is no reasonable way to link airborne asbestos concentrations observed downwind of a site to asbestos measurements in soils that are derived using traditional methods (based on polarized light microscopy) for making such measurements. It is therefore not surprising that

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[1] Note that the draft modified elutriator method is simply a refinement of the superfund soil/bulk method that yields improved performance at reduced cost.

quantitative emission and dispersion modeling for asbestos could not reasonably be used to support risk assessment in the past.

Models are available to estimate exposures associated with construction-related activities, mining-related activities, wind entrainment, outdoor residential activities, and certain indoor track-in/resuspension activities that may be useful for evaluating specific sites.

With these new procedures, it is now possible to perform quantitative risk assessment at asbestos sites. This means that it is now possible to distinguish asbestos-containing sites that pose a real threat to human health (so that they need to be managed) from those that do not. It is also possible to distinguish potentially problematic activities that may release asbestos from soils and rocks at unacceptable rates (so that they need to be managed) from activities that are inherently safe. Thus, use of these new procedures will allow effective focusing of asbestos-management requirements for any kind of site where asbestos is present and where activities are conducted that might promote its release. The methods and protocol are being applied at a variety of government and private sites with good success and several of the resulting risk assessments are now publicly available.