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United States Government Accountability Office
Washington, DC 20548

March 10, 2009

The Honorable Darrell Issa
Ranking Member
Committee on Oversight and Government Reform
House of Representatives

The Honorable Christopher H. Smith
House of Representatives

Subject: *Hazardous Materials: Status of EPA's Efforts to Assess Sites That May Have Received Asbestos-Contaminated Ore from Libby, Montana*

In October 2007, we reported on how the Environmental Protection Agency (EPA) and other federal agencies had assessed and addressed risks at sites that were thought to have received asbestos-contaminated ore from a mine located in Libby, Montana, and the overall results of these efforts.¹ As we noted at that time, EPA has identified hundreds of sites nationwide that are thought to have received millions of tons of the contaminated ore between 1923 and the early 1990s.² Figure 1 shows the distribution of the 266 sites across the states, the District of Columbia, and Puerto Rico. In this context, you asked that we provide a database with detailed descriptions of EPA's efforts to assess and address risk at each of the 266 sites that have been identified.

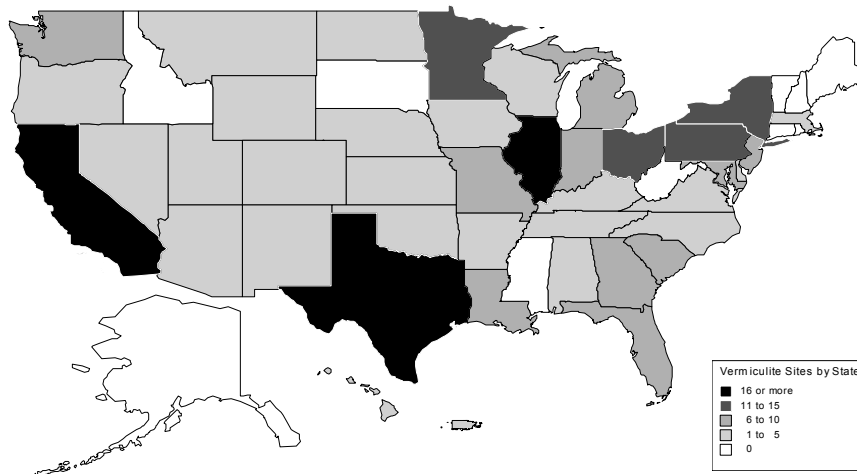
This report provides information that will be helpful in understanding the site descriptions in the database, which is provided in a separate report, entitled *Hazardous Materials: EPA's Assessment of Sites That May Have Received Asbestos-Contaminated Ore from Libby, Montana (GAO-09-7SP)*. For each of the sites that EPA had identified, the database provides available information on the site's location, how much ore was shipped to the site, and the type of facility that operated at the site, as well as whether EPA visited the site and conducted sampling and what EPA's evaluation showed. The data on the amount of ore received are based on an EPA database of W.R. Grace invoices for shipments of vermiculite ore from the Libby mine between 1964 and 1990. EPA does not believe it has an invoice for every shipment of

¹GAO, *Hazardous Materials: EPA May Need to Reassess Sites Receiving Asbestos-Contaminated Ore from Libby, Montana, and Should Improve Its Public Notification Process*, [GAO-08-71](#) (Washington, D.C.: Oct. 12, 2007).

²GAO's October 2007 report provided information on 271 sites that EPA had identified for assessment. When asked to provide detailed information about each of the sites, EPA determined that 5 of the sites were duplicates. Therefore, this report refers to EPA's assessment of 266 sites.

ore that was made during this time; the database represents only the invoices EPA was able to collect. For about 28 percent of the sites that are in the database, the amount of ore received is unknown. For these reasons, the information on the number of sites receiving the contaminated ore and the amount of ore received is likely to be understated.

Figure 1: Nationwide Distribution of 266 Sites Investigated by EPA for Potential Contamination from Asbestos-Contaminated Vermiculite Ore



Sources: EPA (information); Map Resources (map).
Note: Alaska, Hawaii, and Puerto Rico are not to scale.

The vermiculite ore mined in Libby contained high concentrations of naturally occurring asbestos. At some of the facilities that received Libby ore, manufacturing processes—to produce such products as building insulation, fireproofing material, and some gardening products—released the asbestos into the air. Some workers and others who inhaled the asbestos fibers developed serious, in some cases fatal, asbestos-related respiratory illnesses. As we reported in October 2007, EPA began to clean up asbestos contamination in the Libby area in 2000 and to identify and evaluate those sites that received the ore to determine if they were contaminated.³ Enclosure I provides an overview of EPA’s process for identifying and assessing sites thought to have received the asbestos-contaminated ore.

As of January 2009, with the assistance of other federal and state agencies, EPA had evaluated 266 sites thought to have received the asbestos-contaminated ore from the Libby mine, conducted sampling at 82 sites, and determined that 21 needed to be

³The cleanups conducted by EPA in Libby, Montana, and the evaluations of the sites that received the contaminated ore were conducted under the authority of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 as amended (CERCLA), 42 U.S.C. § 9601 *et seq.*

cleaned up (removal actions).⁴ However, as we reported in October 2007, EPA used cleanup standards for the sites that were not health-based, and it had not completed an assessment for determining the toxicity of the asbestos in the Libby ore.⁵ We also found that the sampling and analysis techniques that EPA used at some of the sites were limited, and advances in technology have since led to the development of more accurate methods.⁶ EPA has initiated plans to complete an assessment of the toxicity and associated risks of Libby asbestos by the end of fiscal year 2010.

EPA has also initiated steps to reassess its procedures for collecting data on the nature and extent of asbestos contamination at sites, including methods for analyzing samples collected. As a part of this effort, in September 2008, EPA issued a framework for investigating and characterizing the potential for human exposure from asbestos contamination in outdoor soil and indoor dust at CERCLA sites.⁷ Among other things, the framework discusses strategies for performing assessments at asbestos sites that are based on the best available science and recommends methods for characterizing exposure and risk from asbestos. If and when all of its planned actions are completed, EPA should be better able to determine if any of the sites that received Libby ore may still pose a risk to public health and need to be reevaluated.

Because of a pending federal criminal case against W.R. Grace (the company that owned the Libby vermiculite mine and some of the facilities that processed ore from the mine),⁸ we designed our methodology to minimize direct contact with EPA staff. To obtain information on the status of efforts to assess and address potential risks at

⁴ There are two basic types of cleanup actions: (1) removal actions—generally short-term or emergency cleanups to mitigate threats—and (2) remedial actions—generally long-term cleanup activities.

⁵ In general, EPA performed a cleanup if sampling results indicated asbestos was present in amounts greater than 1 percent (based on the percentage area in a microscopic field) in soils or debris or greater than 0.1 asbestos fibers per cubic centimeter of air. According to EPA, the “1 percent threshold” for asbestos in soils or debris is not a health-based standard, but is rather related to the limit of detection for the analytical methods available during the early years of EPA’s asbestos program (early 1970s) and to EPA’s desire to concentrate resources on materials containing higher percentages of asbestos. EPA has never determined that materials containing less than 1 percent asbestos necessarily present an acceptable exposure level, and indeed, scientists have not been able to develop a safe level for exposure to airborne asbestos.

⁶ EPA used polarized light microscopy (PLM) at most of the sites to visually estimate the percentage of asbestos in bulk samples. This type of analysis can distinguish between asbestos and nonasbestos fibers and different types of asbestos fibers but cannot reliably detect asbestos in low concentrations. Since EPA began its efforts to assess the sites potentially receiving ore from the Libby mine, it has worked with laboratories to refine the PLM analytical procedure to achieve detection levels of 0.2 percent. Transmission electron microscopy (TEM), a more sensitive analytical method than PLM, was also used at some sites. TEM can distinguish between asbestos and nonasbestos fibers and asbestos types. It can be used at higher magnifications, enabling identification of smaller asbestos fibers than can be seen by other techniques. However, it is difficult to use this technique to determine asbestos concentrations in soil and other bulk material. Also, the TEM analytical procedure typically is more than 10 times costlier than PLM, a fact that can be a limiting factor in its use. Phase contrast microscopy (PCM), which is generally used to measure asbestos fibers in air samples, was used at a few sites. This is the analytical method used in many federal programs to evaluate asbestos exposures (e.g., asbestos exposure in mining). PCM has limited use because it cannot differentiate between asbestos and nonasbestos fibers. For this reason, it was used at some of the sites in combination with TEM.

⁷ U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response (OSWER), *Framework for Investigating Asbestos-Contaminated Superfund Sites*, OSWER Directive #9200.0-68, (Washington, D.C., September 2008).

⁸ *United States v. W.R. Grace*, Crim. No. 05-07, D. Mont., filed Feb. 7, 2005.

each of the sites identified as potentially receiving the Libby ore, we asked EPA to review for accuracy and completeness a list of vermiculite sites that we originally obtained from the Agency for Toxic Substances and Disease Registry (ATSDR). This list was largely based on site data that ATSDR had obtained from EPA. For each site, the data included the location, type of facility, amount of ore received, and limited information on the results of EPA's evaluation. EPA officials reviewed the list and provided comments and clarifications. We also submitted questions in writing to EPA to clarify some of the information provided by the agency and EPA provided its responses in writing.

We conducted this engagement from December 2007 to March 2009 in accordance with all sections of GAO's Quality Assurance Framework that are relevant to our objectives. The framework requires that we plan and perform the engagement to obtain sufficient and appropriate evidence to meet our stated objective and to discuss any limitations in our work. We believe that the information and data obtained, and the analysis conducted, provide a reasonable basis for any findings and conclusions. A more detailed description of our scope and methodology is presented in enclosure II.

Agency Comments and Our Evaluation

We provided a draft of this report and the related information on the assessment of each of the sites to EPA for comment. EPA generally agreed with the information presented and provided only technical comments which we incorporated, as appropriate.

As agreed with your offices, unless you publicly announce the contents of this report earlier, we plan no further distribution until 30 days from the report date. At that time, we will send copies of this report to interested congressional committees and the EPA Administrator, and other interested parties. The report also will be available at no charge on the GAO Web site at <http://www.gao.gov>.

If you or your staffs have questions about this report, please contact me at (202) 512-3841 or stephensonj@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made major contributions to this report are included in enclosure III.



John B. Stephenson
Director, Natural Resources
and Environment

Enclosures

Enclosure I
EPA's Actions to Identify and Evaluate Sites Believed to Have Received
Asbestos-Contaminated Ore from Libby, Montana

The Environmental Protection Agency (EPA) has taken a number of actions to identify and evaluate sites that may have received asbestos-contaminated vermiculite ore from a mine in Libby, Montana, and has carried out removal actions at some of the sites. In early 2000, EPA began compiling a list of facilities that might have received asbestos-contaminated vermiculite ore from the Libby mine. To compile the list, it used shipping records and other information obtained from W.R. Grace, as well as historical information about vermiculite-processing facilities from the Bureau of Mines and the U.S. Geological Survey.

After coordinating with the U.S. Geological Survey to update and revise the list of facilities and eliminate duplicate entries, EPA identified 266 sites that may have received the contaminated ore. These sites were located in 40 states, the District of Columbia, and Puerto Rico. The most sites were in California (27) and Texas (26). EPA has continued to identify sites and, according to EPA, will investigate them as it deems necessary. For example, as recently as July 2006, EPA identified 4 additional sites (included in the 266) that it needed to assess for asbestos contamination.

The site data that EPA collected showed that most (95 percent) of the vermiculite ore known to have been shipped from Libby between 1964 and 1990 went to facilities that converted it into commercial vermiculite through a process called exfoliation (expansion). Exfoliation plants heated the vermiculite ore to approximately 2,000 degrees Fahrenheit, causing the ore to expand, or “pop.” This expanded vermiculite was then used in a variety of products, including loose-fill insulation in homes. Because significant quantities of asbestos fibers were likely released during the exfoliation process, EPA deemed exfoliation plants to be the most likely of the facilities that received Libby ore to have caused environmental contamination and exposure.

Because exfoliation facilities were likely to pose the most risk, while conducting site investigations, EPA paid particular attention to whether a site had the characteristics of an exfoliation plant. For example, vermiculite ore was often delivered to these facilities in bulk by railcar. Workers generally used shovels or mechanical equipment to unload ore from the railcars and transport it to open stockpiles or enclosed silos for storage or to a furnace for exfoliation. After the exfoliation process was completed, stoner rock—waste material—remained and might have been placed in a dump on the site, offered to workers or the public for gardening and landscaping, or disposed of in a landfill off-site. While the vermiculite ore was being handled or processed, it could be scattered on the ground in areas where it was unloaded, stored, or exfoliated and was recognizable as a shiny, sparkly, mica-like material on the ground. Therefore, the presence of railroad spurs, silos, furnaces, waste rock, or shiny, sparkly material in the soil was an indication that a site could have been used to exfoliate vermiculite ore.

In their investigation of sites, EPA regions generally tried to determine the facilities' locations using a variety of methods, including title searches; reviews of town

records; and interviews with people who might provide useful information, such as company representatives or people who formerly worked at the sites. Once they identified an accurate address for a site, regional officials performed a preliminary assessment to determine current site conditions and gather additional information on past operations at the site. These assessments generally included viewing the suspected location and its surrounding area and, in some instances, interviewing business owners and residents in the immediate vicinity.

If these initial assessments indicated the need for further examination, the regions typically conducted a detailed investigation. This investigation usually consisted of a site visit, which included a more thorough inspection of the property and surrounding area; additional interviews with people who might be knowledgeable about past operations, such as facility representatives; reviews of any relevant and available documentation from state and federal agencies; and, if deemed necessary, collection of soil and air samples.

For the sites where the regions decided sampling was warranted, EPA collected samples of “bulk” materials (such as raw vermiculite ore, suspected vermiculite waste piles, and soils). EPA collected air samples if it was concerned that disturbing contaminated materials (in the soil or elsewhere) could send asbestos fibers migrating into the air, where it could be inhaled. According to the information EPA provided, EPA collected samples of bulk materials and, in some cases air samples, for at least 82 (or 31 percent) of the sites.⁹

One of the most important factors that EPA regional offices considered in determining whether a site needed to be cleaned up was the amount of asbestos at the site. In general, a cleanup would be performed if sampling results indicated that asbestos was present in amounts greater than 1 percent (based on the percentage of the area of a microscopic field) in soils or debris, or greater than 0.1 asbestos fibers per cubic centimeter of air. According to EPA, the “1 percent threshold” for asbestos in soils or debris is not a health-based standard, but rather is related to the limit of detection for the analytical methods available during the early years of EPA’s asbestos program (early 1970s) and to EPA’s desire to concentrate resources on materials containing higher percentages of asbestos. EPA has never determined that materials containing less than 1 percent asbestos necessarily present an acceptable exposure level, and indeed, scientists have not been able to develop a safe level for exposure to airborne asbestos.¹⁰ Of the sites where EPA confirmed sampling had taken place, 25 had levels of asbestos that exceeded the thresholds, 28 had detectable

⁹For 20 sites in Region 4, EPA’s files did not contain sufficient documentation to determine definitively if sampling had taken place.

¹⁰After reviewing a draft of this report, EPA suggested that GAO use the term “acceptable risk” when describing exposure levels to asbestos. Regulations implementing the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 as amended (CERCLA), 42 U.S.C. § 9601 *et seq.* use the term “acceptable exposure level” in describing cleanup goals for addressing risks posed by systemic toxicants or known or suspected carcinogens. 40 C.F.R. § 300.430(e) (2). Therefore, where this report describes EPA’s actions related to assessments under CERCLA of risks posed by asbestos, we have used the term “acceptable exposure level.”

levels of asbestos that were below the thresholds (trace amounts, or less than 1 percent), and 27 had no detectable levels of asbestos.¹¹

After reviewing the sampling results and other pertinent information collected about the sites, EPA—and in some instances states—identified 21 sites where contamination from the asbestos in Libby ore needed to be cleaned up. With the exception of 1 site, all of the sites that were cleaned up had levels of asbestos in soils that exceeded the 1 percent threshold.¹² For the one exception, a site located in Salt Lake City, all of the soil samples contained trace amounts of asbestos (less than 1 percent). However, after raking the ground and using a leaf blower, EPA collected air samples that showed elevated levels of asbestos fibers exceeding the threshold of 0.1 asbestos fibers per cubic centimeter of air. As a result, EPA determined this site needed to be cleaned up as well.

¹¹For one site in Region 5, sampling results were unavailable because the site file was lost. For one site in Region 6, sampling occurred in November 2008 but the results were not available before our work was completed.

¹²Five sites had asbestos contamination in excess of the 1 percent threshold but were not cleaned up under CERCLA. For one of those sites, located near Center, North Dakota, residual contamination was limited to a hopper used to process vermiculite ore. According to company officials, Libby ore was used for a 28-day trial period in the early 1980s and has not been used since. The company agreed to have trained asbestos workers remove the residual vermiculite from the hopper, and Region 8 officials decided no further action was needed. For a site in Brutus, New York, after a review by a regional risk assessor and the EPA official in charge of the project, EPA decided that the site was not eligible for cleanup under CERCLA. For a site located in Dallas, Texas, although one sample in the furnace room contained 2 percent asbestos, because there were no vermiculite waste piles on the site, EPA decided not to perform a cleanup. EPA may reassess this site. For another site located in Billerica, Massachusetts, the asbestos found was predominately chrysotile asbestos, a type of asbestos not found in Libby ore. EPA decided a cleanup was not needed but may reassess this site again. Lastly, for a site located in Edgewater, New Jersey, EPA also found high levels of chrysotile asbestos. Since the New Jersey Department of Environmental Protection was taking lead responsibility for cleaning up this site, EPA took no further action.

Enclosure II **Scope and Methodology**

Because of a pending federal criminal case against W.R. Grace (the company that owned the Libby vermiculite mine and some of the facilities that processed ore from the mine),¹³ we designed our methodology to minimize direct contact with EPA staff. Accordingly, we obtained most of the information we needed about EPA's assessments of the sites that were believed to have received asbestos-contaminated Libby ore by submitting questions to EPA in writing; the agency provided written responses. We did not further pursue access to this information because we had sufficient data to respond to our objective.

To describe the process EPA generally followed to identify and evaluate sites, we used information from our October 2007 report on contaminated vermiculite.¹⁴ To describe the status of EPA's efforts to assess and address potential risks at each of the facilities thought to have received asbestos-contaminated vermiculite ore from the Libby mine, we obtained a table of sites that had potentially received contaminated ore from the U.S. Department of Health and Human Services' Agency for Toxic Substances and Disease Registry (ATSDR). This table was largely based on data that ATSDR had received from EPA about each of the sites. The table included, for each site, the location, type of facility, and limited information on the status of EPA's assessments of the sites as of April 2003. The table also included information on the amount of ore received as of April 2001. For our previous report on contaminated vermiculite, we asked EPA to verify, update, and complete the information in the table. The information was last updated in May 2007. To develop the database of sites, we asked EPA to review the table of sites and update it as needed. We also submitted written questions to clarify the data in the table. Through correspondence, we obtained EPA's comments and clarifications about the site data and responses to our written questions.¹⁵

We also collected and analyzed relevant documentation about the sites from EPA's Superfund record centers, which are public repositories, and analyzed health consultation reports that ATSDR prepared for 28 of the sites. To the extent possible, we used the information from the record centers and the health consultations to verify and supplement the site information EPA provided. However, we did not attempt to independently verify the site information provided by EPA.

We conducted this engagement from December 2007 to March 2009 in accordance with all sections of GAO's Quality Assurance Framework that are relevant to our objectives. The framework requires that we plan and perform the engagement to obtain sufficient and appropriate evidence to meet our stated objective and to discuss

¹³*United States v. W.R. Grace*, Crim. No. 05-07, D. Mont., filed Feb. 7, 2005.

¹⁴[GAO-08-71](#).

¹⁵During our previous work on contaminated vermiculite, we submitted a set of questions to EPA to assess the reliability of the site information, focusing mainly on the data about the amount of ore received by each site. On the basis of EPA's responses regarding the accuracy and completeness of the information in the table of sites, we determined the data are adequate to provide conservative estimates of the amount of ore received by each site.

any limitations in our work. We believe that the information and data obtained, and the analysis conducted, provide a reasonable basis for any findings and conclusions.

Enclosure III
GAO Contact and Staff Acknowledgments

GAO Contact

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Staff Acknowledgments

In addition to the individual named above, Steve Elstein (Assistant Director), Alice Feldesman, Richard Johnson, Carol Herrnstadt Shulman, and Lisa Turner made key contributions to this report.

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