

## **Health Consultation**

### **Former W.R. Grace & Company Site**

603 Fenton Lane  
West Chicago, DuPage County, Illinois

September 9, 2003



**Prepared by**

**Illinois Department of Public Health  
Under a Cooperative Agreement with the  
U.S. Department of Health and Human Services  
Agency for Toxic Substances and Disease Registry**

## **Foreword: ATSDR's National Asbestos Exposure Review**

Vermiculite was mined and processed in Libby, Montana, from the early 1920s until 1990. We now know that this vermiculite, which was shipped to many locations around the U.S. for processing, contained asbestos.

The National Asbestos Exposure Review (NAER) is a project of the Agency for Toxic Substances and Disease Registry (ATSDR). ATSDR is working with other federal, state, and local environmental and public health agencies to evaluate public health impacts at sites that processed Libby vermiculite.

The evaluations focus on the processing sites and on human health effects that might be associated with possible past or current exposures. They do not consider commercial or consumer use of the products of these facilities.

The sites that processed Libby vermiculite will be evaluated by (1) identifying ways people could have been exposed to asbestos in the past and ways that people could be exposed now and (2) determining whether the exposures represent a public health hazard. ATSDR will use the information gained from the site-specific investigations to recommend further public health actions as needed. Site evaluations are progressing in two phases:

Phase 1: ATSDR has selected 28 sites for the first phase of reviews on the basis of the following criteria:

- The U.S. Environmental Protection Agency (EPA) mandated further action at the site based upon contamination in place

- or -

- The site was an exfoliation facility that processed more than 100,000 tons of vermiculite ore from Libby mine. Exfoliation, a processing method in which ore is heated and “popped,” is expected to have released more asbestos than other processing methods.

The following document is one of the site-specific health consultations ATSDR and its state health partners are developing for each of the 28 Phase 1 sites. A future report will summarize findings at the Phase 1 sites and include recommendations for evaluating the more than 200 remaining sites nationwide that received Libby vermiculite.

Phase 2: ATSDR will continue to evaluate former Libby vermiculite processing sites in accordance with the findings and recommendations contained in the summary report. ATSDR will also identify further actions as necessary to protect public health.

## BACKGROUND

### Site History

From February 1974 to 1996, W. R. Grace (Grace) operated a vermiculite exfoliation plant on Fenton Lane in West Chicago, Illinois (Figure 1). During the 1974 to 1988 timeframe, at least 273,600 tons of vermiculite from the Libby mine were processed at the site (unpublished information from USEPA's database of W.R. Grace invoices). Processing involved heating the vermiculite, which then popped or exfoliated to form a lightweight material that was used to produce several kinds of building insulation (including Zonolite<sup>®</sup>) as well as spray-applied fireproofing products such as Monokote<sup>®</sup> (Marriam 2003). The West Chicago site is about 6.4 acres in size, has one large industrial building, and is in a commercial and industrial area (Tetra Tech EM 2001).

Company records indicate the West Chicago facility was closed in 1996 (Marriam 2003). After Grace closed the facility, a clean-up contractor and Grace staff removed contaminated soil and other surface materials (Ahern 1997, Illinois Chamber of Commerce 1998, Tin 1990). In 1998, Royal Corinthian, the present owner, bought the property from Grace to manufacture marble columns and railings for homes and other buildings. Royal Corinthian made improvements and renovations to the interior of the building (Tetra Tech EM 2001).

There is very little information regarding the historical disposal of wastes from this facility. Field notes from sampling efforts conducted by Grace in 1976 indicated that some waste was disposed at a local landfill and some waste may have been disposed on the site (unpublished documents from USEPA's database of W.R. Grace documents). Other company records cite a waste transporter and landfill facility (Waste Management, Midway Landfill, Batavia, IL) reportedly used from 1978 to 1988 (Marriam 2003). Illinois Department of Public Health (IDPH) does not have detailed information (i.e., transport manifests, landfill receipts) to confirm the quantities of waste reportedly disposed at the landfill.

### Environmental Sampling

On November 20 and December 12, 1975, Grace sampled air inside the West Chicago facility and found high asbestos concentrations, ranging from 0.76 to 63.18 fibers per cubic centimeter (f/cc) (Wright WR 1976). The current Occupational Safety and Health Administration (OSHA) permissible exposure limit (PEL) for asbestos is 0.1 f/cc, a limit based on an 8-hour time-weighted average (TWA). There is little information regarding how the November and December 1975 samples were collected and analyzed. However, it is likely that the 0.1 f/cc current exposure limit was exceeded regardless of the sampling strategy used.

An industrial hygiene evaluation was conducted by Grace after they closed the West Chicago facility in 1996. Grace personnel collected four air samples inside the facility and one air sample outside the facility. Samples were analyzed by an independent laboratory using NIOSH Method 7402 (a "TEM" method, as discussed in Attachment 1). Results indicated asbestos concentrations at or below 0.001 f/cc for all five samples. These results are well below the OSHA PEL of 0.1 f/cc for daily (8-hour) worker exposures. Although the results indicate worker exposure to

residual Libby asbestos is not a health concern, two data quality limitations impact this interpretation. The first limitation is a lack of documentation for sample collection methods and procedures; without such documentation, the representativeness of the samples cannot be evaluated. The second limitation is a quality assurance issue associated with the laboratory (R.J. Lee Group, Inc.) used to analyze the samples.

More recently, on August 30, 2001, results from five soil samples collected at the site indicated trace levels of tremolite-actinolite in each of the samples (Figure 2) (Tetra Tech EM 2001). Sample results are reported as tremolite-actinolite to indicate the presence of Libby asbestos. In this case, the laboratory clarified that the “trace” terminology indicated there were too few fibers to quantify, at a level much less than 1% (personal communication with Reservoirs Environmental Services, Inc.). Sample results are included in Table 1. Sample locations were reportedly chosen according to the greatest likelihood that asbestos would be present because of the nature of former vermiculite activities. Composite samples for each location were submitted to a laboratory for analysis by polarized light microscopy and dispersion staining following USEPA Test Method 600/R-93/116 (Tetra Tech EM 2001). The depth at which the samples were collected was not reported.

### **Site Visit**

On July 24, 2002, ATSDR and IDPH staff conducted a site visit of the West Chicago facility. A chain-link fence with barbed wire surrounded the site. ATSDR staff found what appeared to be vermiculite along an unused railroad spur on the western part of the site and what appeared to be stoner rock in the former storage area on the northeastern part of the site (Figure 2). Tetra Tech EM, Inc. did not take soil samples in either of those areas. Royal Corinthian was not using the areas that appeared to have vermiculite and stoner rock. Tall grass and weeds grow in those areas, and the absence of tall brush or trees suggests that the property has been mowed periodically during the previous 14 years. No waste piles of vermiculite or stoner rock were observed. Grayish-white powder was observed on the concrete pavement immediately north of the site building, perhaps originating from the marble processing of Royal Corinthian. The nearest homes are about 0.5 miles east of the site. These homes were likely built in the 1950s and 1960s, and they would have been present during the operation of the Grace facility.

### **Climate**

Northern Illinois experiences several days of winter snowfall and below-freezing temperatures. For at least three months each year, weather conditions would limit exposure to outdoor contamination. Prevailing winds in the area are from the west and south.

### **Demographics**

The 1990 Census data shows a population of 3,065 people within 1 mile of the site (Figure 3). The City of West Chicago, while a predominantly white population in 1990, has become mostly Hispanic in recent years. The influx of Hispanics started in the 1980's, and Hispanics became the dominant population in the mid-1990's. The population has not remained stable in past decades, therefore the past potentially exposed population has likely moved away from the area.

## **ASBESTOS OVERVIEW**

Asbestos is a general name applied to a group of silicate minerals consisting of thin, separable fibers in a parallel arrangement. Asbestos minerals fall into two classes, serpentine and amphibole. Serpentine asbestos has relatively long and flexible crystalline fibers; this class includes chrysotile, the predominant type of asbestos used commercially. Amphibole asbestos minerals are brittle, with a rod- or needle-like shape. Amphibole minerals regulated as asbestos by OSHA include five classes: fibrous tremolite, actinolite, anthophyllite, crocidolite, and amosite. However, other amphibole minerals, including winchite, richterite, and others, can exhibit fibrous asbestiform properties (ATSDR 2001).

Asbestos fibers do not have any detectable odor or taste. They do not dissolve in water or evaporate, and they are resistant to heat, fire, and chemical and biological degradation.

The vermiculite mined at Libby contains amphibole asbestos, with a characteristic composition including tremolite, actinolite, richterite, and winchite; this characteristic material will be referred to as Libby asbestos. The raw ore was estimated to contain up to 26% Libby asbestos as it was mined (MRI 1982). For most of the mine's operation, Libby asbestos was considered a byproduct of little value and was not used commercially. The mined vermiculite ore was processed to remove unwanted materials and then sorted into various grades or sizes of vermiculite that were then shipped to sites across the nation for expansion (exfoliation) or use as a raw material in manufactured products. Samples of the various grades of unexpanded vermiculite shipped from the Libby mine contained 0.3-7% fibrous tremolite-actinolite (by mass) (MRI 1982).

Attachment 1 provides an overview of several concepts relevant to the evaluation of asbestos exposure, including analytical techniques, toxicity and health effects, and the current regulations concerning asbestos in the environment. A more detailed discussion of these topics will also be provided in ATSDR's upcoming Summary Report for the national review of vermiculite sites.

## **DISCUSSION**

The vermiculite processed at this site originated from the mine in Libby, MT known to be contaminated with asbestos. Studies conducted in the Libby community indicate health impacts that are associated with asbestos exposure (ATSDR 2002b, Peipins et al. 2003). The findings at Libby provided the impetus for investigating this site, as well as other sites across the nation that received asbestos-contaminated vermiculite from the Libby mine. It is important to recognize, however, that the asbestos exposures documented in the Libby community are in many ways unique and will not collectively be present at other sites that processed or handled Libby vermiculite. The site investigation at the West Chicago site is part of a national effort to identify and evaluate potential asbestos exposures that may be expected at these other sites. The West Chicago site was selected for evaluation as part of the Phase 1 national effort because it was an exfoliation facility that processed a relatively high tonnage (greater than 100,000 tons) of Libby vermiculite.

## Exposure Assessment and Toxicological Evaluation

Evaluating the health effects of exposure to Libby asbestos requires extensive knowledge of both exposure pathways and toxicity data. The toxicological information currently available is limited and therefore the exact level of health concern for different sizes and types of asbestos remains controversial. Site-specific exposure pathway information is also limited or unavailable.

- There is limited information on past concentrations of Libby asbestos in air in and around the plant. Also, as described in Attachment 1, significant uncertainties and conflicts in the methods used to analyze asbestos exist. This makes it hard to estimate the levels of Libby asbestos people may have been exposed to.
- There is not enough information known about how and how often people came in contact with the Libby asbestos from the plant, because most exposures happened so long ago. This information is necessary to estimate quantitative exposure doses.
- There is not enough information available about how some vermiculite materials, such as waste rock, were handled or disposed. This makes it difficult to identify and assess both past and present exposures.

Given these difficulties, the public health implications of past operations at this site are evaluated qualitatively. Current health implications are likewise evaluated qualitatively. The following sections describe the various types of evidence we used to evaluate exposure pathways and reach conclusions about the site.

### Exposure Pathway Analysis

An exposure pathway is how a person comes in contact with chemicals originating from a source of contamination. Every exposure pathway consists of the following five elements: 1) a *source* of contamination; 2) a *media* such as air or soil through which the contaminant is transported; 3) a *point of exposure* where people can contact the contaminant; 4) a *route of exposure* by which the contaminant enters or contacts the body; and 5) a *receptor population*. A pathway is considered complete if all five elements are present and connected. A pathway is considered potential if the pathway elements are (or were) likely present, but insufficient information is available to confirm or characterize the pathway elements. A pathway may also be considered potential if it is currently missing one or more of the pathway elements, but the element(s) could easily be present at some point in time. An incomplete pathway is missing one or more of the pathway elements and it is likely that the elements were never present and not likely to be present at a later point in time. An eliminated pathway was a potential or completed pathway in the past, but has had one or more of the pathway elements removed to prevent present and future exposures.

After reviewing information from Libby, Montana and from facilities that processed vermiculite ore from Libby, a list of possible exposure pathways for vermiculite processing facilities was developed. All pathways have a common source—vermiculite from Libby contaminated with Libby asbestos—and a common route of exposure—*inhalation*. Although asbestos ingestion and dermal exposure pathways could exist, health risks from these pathways are minor in comparison to those resulting from *inhalation* exposure to asbestos and will not be evaluated.

The exposure pathways considered for each site are listed in the following table. More detail on the pathways is included in Table 2. Not every pathway identified will be a significant source of exposure for a particular site. An evaluation of the pathways for this site is presented in the following paragraphs. Definitions for the hazard category terminology used to characterize the pathways is presented in Attachment 3.

### Summary of Inhalation Pathways Considered for the West Chicago Site

Pathway Name	Exposure Scenario(s)	Past Pathway Status	Present Pathway Status	Future Pathway Status
Occupational	Former workers exposed to airborne Libby asbestos during handling and processing of contaminated vermiculite	Complete	Not applicable	Not applicable
	Current workers exposed to airborne Libby asbestos from residual contamination inside former processing buildings	Not applicable	Potential	Potential
Household Contact	Household contacts exposed to airborne Libby asbestos brought home on workers' clothing	Potential	Eliminated	Eliminated
Waste Piles	Community members (particularly children) playing in or otherwise disturbing on-site piles of contaminated vermiculite or waste rock	Potential	Eliminated	Eliminated
On-site Soils	Current on-site workers, contractors, or community members disturbing contaminated on-site soils (residual contamination, buried waste)	Not applicable	Potential	Potential
Ambient Air	Community members or nearby workers exposed to airborne fibers from plant emissions during handling and processing of contaminated vermiculite	Potential	Eliminated	Eliminated
Residential Outdoor	Community members using contaminated vermiculite or waste material at home (for gardening, paving driveways, fill material)	Potential	Potential	Potential
Residential Indoor	Community members disturbing household dust containing Libby asbestos from plant emissions or waste rock brought home for personal use	Potential	Potential	Potential
Consumer Products	Community members, contractors, and repairmen disturbing consumer products containing contaminated vermiculite	Potential	Potential	Potential

#### *Occupational*

The occupational exposure pathway for former workers exposed to airborne Libby asbestos during handling and processing of contaminated vermiculite is considered complete. Limited air sampling data from the Grace facility during operations in 1975 indicated airborne asbestos fiber levels ranging from 0.76 to 63.18 f/cc (Wright WR 1976). Airborne fiber levels of 63.18 f/cc are 600 times higher than the current occupational standard for asbestos exposure. Although relevant details (i.e., short-term vs. long-term sampling efforts, personal or area samples, sample analysis methodologies, percent asbestos vs. non-asbestos fibers) concerning the sample data are not available, it is likely that former Grace workers were exposed to airborne asbestos at levels above the current OSHA occupational standard. Inhalation of airborne asbestos above the OSHA PEL would increase the risk for asbestos-related disease and therefore would have posed a public health hazard to former employees.

The pathway concerning current or future worker exposure to airborne Libby asbestos from residual contamination inside former processing buildings is considered potentially complete.

The Grace facility was reportedly cleaned prior to its sale to Royal Corinthian. Indoor and outdoor air samples collected by Grace personnel after they closed the facility in 1996 indicated levels of airborne asbestos well below the current OSHA standard for worker exposure during an 8-hour day. These data suggest no apparent public health hazard exists for current or future workers at the facility. Due to possible laboratory quality assurance issues, the sample results need further evaluation to confirm that no apparent public health hazard exists. Air and dust samples collected inside the facility at the present time would also serve to confirm this conclusion.

### ***Household Contact***

Exposure of household contacts to airborne Libby asbestos brought home on the clothing of former workers is considered a potential exposure pathway. Grace workers probably exposed household members to asbestos fibers if they did not shower or change clothes before leaving work. Family or other household contacts could have come in contact with Libby asbestos by direct contact with the worker, by laundering clothing, or by the re-suspension of dusts during cleaning activities. Exposures to household contacts cannot be estimated without information concerning Libby asbestos levels on worker clothing and behavior-specific factors (e.g., worker practices, household laundering practices). Still, exposure to asbestos resulting in asbestos-related disease in family members of asbestos industry workers has been well-documented (Anderson et al 1976, Kilburn et al 1985). In Libby, Montana, an elevated prevalence of pleural abnormalities was also observed in the household contacts of workers employed at the mine and at associated vermiculite processing facilities (ATSDR 2000). Inhalation of Libby asbestos fibers by household contacts as a result of worker take-home contamination is therefore considered a past public health hazard.

Exposure of household contacts to airborne Libby asbestos brought home on the clothing of current or future workers is considered eliminated. Based on historical air samples collected by Grace after they closed the facility, current and future workers at this site are probably not being exposed to residual Libby asbestos fibers inside the building. Workers may occasionally be exposed to Libby asbestos still present in onsite soils, however this contact is expected to be infrequent, of short duration, and at very low levels. This type of exposure would not be a hazard for household members who have contact with workers or their clothing. No apparent public health hazard exists for the household contacts of current or future employees at the site.

### ***Waste Piles***

Community members (particularly children) playing in or otherwise disturbing on-site piles of contaminated vermiculite or waste rock at the facility is considered a past potential exposure pathway. Waste rock from the West Chicago facility may have been temporarily stockpiled on site and accessible to children and other community members. The commercial/industrial nature of the area immediately surrounding the site does indicate that children were less likely to be playing at or around the site. However, more information is needed to confirm past waste handling practices and the potential for community exposures to waste. This historical information may be difficult or impossible to obtain. On-site waste piles pose an indeterminate past public health hazard.



During the site visit in July 2002, no waste piles were observed at the site. The present and future exposure pathway to onsite waste piles is considered eliminated and therefore poses no public health hazard to community members.

### ***On-site Soils***

The exposure pathway concerning current on-site workers, contractors, or community members disturbing contaminated onsite soils – including residual contamination or buried waste – is considered a potential pathway for the present and future.

During the July 2002 site visit, ATSDR staff saw what appeared to be vermiculite along an unused railroad spur on the western part of the site and what appeared to be stoner rock in the former storage area on the northeastern part of the site.

There is very little information regarding the disposal of wastes from this facility. Company records indicate that some waste was disposed at a local landfill and some waste may have been disposed on the site (Marriam 2003, unpublished documents from USEPA's database of W.R. Grace documents).

Currently, the thick vegetation cover on areas of the former Grace facility that appeared to contain vermiculite and stoner rock would reduce the airborne dispersal of any asbestos from this soil, making exposure negligible. In addition, site access is restricted by a chain-link fence, and trespassers are unlikely. On-site workers do have access to several areas on the east side of the building where vermiculite was observed in soils; however, these areas appear to be limited in size and are not utilized for any work-related activities. It does not appear that this area is landscaped or maintained regularly. Maintenance activities (i.e., mowing, trimming) would result in infrequent exposures of short duration. For at least three months each year, weather conditions (e.g., rainfall, snow cover) would limit exposure to outdoor contamination. Under current conditions, and assuming occasional contact with these areas that may contain Libby asbestos, on-site exposure to Libby asbestos-contaminated soils poses no apparent public health hazard.

We do not know if a change in the condition or future use of the property would result in increased exposures.

### ***Ambient Air***

Past exposures to airborne fibers from plant emissions is considered a potential pathway for the community surrounding the site as well as for nearby workers. Community members and area workers could have been exposed to Libby asbestos fibers released into the ambient air from fugitive dusts or the furnace stack while the plant was running. Specific information concerning historical emissions from the plant is not available; therefore, an estimate of risk from this exposure cannot be made. Even with emission data, it would be difficult to construct past exposures, given limited information on population in the area. However, exposure of the public to airborne emissions downwind of the site would have been at much lower concentrations than that experienced by the Grace workers. Some contamination of nearby businesses may have

occurred from the airborne dispersal of asbestos fibers. Community exposures to Libby asbestos from facility air emissions is an indeterminate past public health hazard.

Present and future exposures to Libby asbestos from air emissions have been eliminated because the facility is no longer in operation.

### ***Residential Outdoor***

Past, present, or future community members using contaminated vermiculite or waste material at home is considered a potential exposure pathway. At a Grace vermiculite exfoliation facility in Minneapolis, Minnesota, the waste rock was given to community members for use as fill, as a soil additive for gardening, and as a surfacing material for driveways (Johnson 2002). We do not know whether this happened in West Chicago. If so, residents handling waste rock may have been exposed to airborne Libby asbestos, and they may have contaminated the soil in their yards.

Although company records indicate that waste from the West Chicago facility was transported to a landfill, it is possible that some waste rock from the West Chicago facility was taken home with workers or distributed for use in the community. Further information is needed to confirm the actual fate of the majority of the waste. Insufficient information is available concerning community use of waste rock; therefore, residential outdoor exposure to Libby asbestos fibers from waste rock brought off-site for personal use is an indeterminate public health hazard for past, present, and future scenarios.

### ***Residential Indoor***

Community members disturbing household dust containing Libby asbestos fibers from plant emissions or from waste rock brought home for personal use is considered a potential exposure pathway. Insufficient information is available concerning past air emissions and community use of waste rock, therefore residential indoor exposure to Libby asbestos fibers that infiltrated homes is an indeterminate past public health hazard.

Facility emissions have ceased and are no longer a source of potential contamination in nearby homes. Residual Libby asbestos from potential past sources is possible, though housekeeping (particularly wet cleaning methods) over the past 13 years would probably have removed any residual Libby asbestos in area homes. The only likely current source of Libby asbestos fibers in the home would be from waste rock brought home for residential use. Insufficient information is available to determine if waste rock was used in the community. However exposures to Libby asbestos from waste rock in the community would primarily be an outdoor exposure concern; the waste rock alone would not be expected to significantly contribute to residential indoor exposures. As such, the current and future residential indoor exposure pathway is considered no apparent public health hazard for community members.

### ***Consumer Products***

People who purchased and used company products that contain Libby vermiculite may be exposed to asbestos fibers from using those products in and around their homes. At this time,

determining the public health implication of commercial or consumer use of company products (such as home insulation or vermiculite gardening products) that contain Libby vermiculite is beyond the scope of this evaluation. It has been shown that disturbing soil containing even trace amounts of Libby asbestos can result in airborne levels of Libby asbestos fibers that are of concern (Weis 2001). Additional information for consumers of vermiculite products has been developed by USEPA, ATSDR, and NIOSH and provided to the public (see [www.epa.gov/asbestos/insulation.html](http://www.epa.gov/asbestos/insulation.html)).

Contaminated vermiculite insulation in homes and in soil could pose an inhalation hazard if it were disturbed. Exposure to asbestos in vermiculite insulation in an uninhabited attic or behind walls should be negligible. Exposure to asbestos in soil is less likely if the soil is covered by asphalt, concrete, or vegetation. Asbestos fibers do not break down in the environment, and asbestos in soil may remain for decades (ATSDR 2001).

### **HEALTH OUTCOME DATA**

In cooperation with ATSDR's Division of Health Studies, the IDPH Division of Epidemiologic Studies participated with several other states in reviewing health statistics for communities that received vermiculite from Libby, Montana. In April 2001, IDPH sent cancer incidence and mortality data for six Illinois communities including West Chicago to ATSDR. The incidence data were pooled together because of small numbers of residents within individual zip code areas and the lack of city identifiers for cancer incidence data (as opposed to mortality data for which city identifiers are usually available). Unless information is available to indicate large differences in exposures across the six sites, pooled data analysis should be more powerful and meaningful than site-specific analyses where one would encounter not only more random variations but also more multiple comparison problems. On the other hand, aggregating the data in this manner can dilute site-specific findings and therefore should not be used for conclusions at an individual site. The mortality data were provided individually for each community.

The exposure pathway investigation for this site indicated a substantial change in demographics occurred in West Chicago from the 1980's to mid-1990's. In accordance with ATSDR protocols, the study period for the mortality data review was 1979-1998 and the study period for the cancer incidence data review was 1986-1995 (ATSDR 2001b). Because the population of West Chicago was changing during this period (existing residents moving out and different residents moving in), the mortality and cancer incidence data reported may not correspond to the actual exposed population.

A description of the health statistics review effort and preliminary site-specific results for the West Chicago site are included in Attachment 2. ATSDR's Division of Health Studies will release annual reports summarizing health statistics review findings for all sites for which data have been received. The first annual report is slated to be released in late summer 2003.

### **CHILD HEALTH CONSIDERATIONS**

ATSDR recognizes that infants and children might be more vulnerable to exposures than adults in communities faced with environmental contamination. Because children depend completely

on adults for risk identification and management decisions, ATSDR is committed to evaluating their special interests at the site as part of the ATSDR Child Health Initiative.

The effects of asbestos on children are thought to be similar to the effects on adults. However, children could be especially vulnerable to asbestos exposures because they are more likely to disturb fiber-laden soils or indoor dust while playing. Children also breathe air that is closer to the ground and may thus be more likely to inhale airborne fibers from contaminated soils or dust.

Furthermore, children who are exposed could be more at risk of actually developing asbestos-related disease than people exposed later in life because of the long latency period between exposure and onset of asbestos-related respiratory disease.

The most at-risk children are those who were household contacts of former workers while the plant was operating. Because the (1) plant is no longer operating, (2) there are no waste piles present on site, and (3) the site is fenced and access is limited, it is unlikely that current neighborhood children would be exposed to on-site Libby asbestos-contaminated vermiculite. Potential current exposures to Libby vermiculite or to waste that may have been distributed throughout the community is an indeterminate public health hazard.

## CONCLUSIONS

Based on the data reviewed for the W.R. Grace and Company West Chicago facility, IDPH concludes the following for workers and their household contacts:

- Former workers at the Grace facility likely were exposed to airborne asbestos at levels above current occupational standards. In addition, Grace workers may have exposed household members to asbestos fibers if they did not shower or change clothes before leaving work. Inhalation of airborne asbestos at elevated levels would increase the risk for asbestos-related disease and therefore posed a public health hazard to former employees and household contacts.
- No apparent public health hazard exists for current or future workers at the facility; however, further evaluation of the historical Grace air sampling results is necessary to confirm the absence of significant residual Libby asbestos fibers inside the facility. Air and dust samples collected inside the facility at the present time would also serve to confirm that no public health hazard exists.
- Under current conditions, and assuming only occasional contact with areas that may contain Libby asbestos, on-site exposure of workers and contractors to Libby asbestos-contaminated soils poses no apparent public health hazard. Future changes in the condition or use of the property may affect on-site exposures and should be evaluated.

IDPH concludes the following for the community surrounding the West Chicago site:

- The community around the site during the time the facility processed Libby vermiculite (estimated 1974-1988) could have been exposed to Libby asbestos fibers by disturbing or playing in onsite waste piles, from plant emissions, from waste rock brought home for personal use, or from indoor household dust that contained Libby asbestos from one or

more outside sources. Insufficient information is available to determine if these exposures occurred, how often they may have occurred, or what concentrations of airborne Libby asbestos may have been present during potential exposures. This information may never be available. Because critical information is lacking, these past community exposures are an indeterminate public health hazard.

- The West Chicago facility no longer processes vermiculite at the site and no evidence of onsite waste piles were observed during a recent site visit. The pathways for current or future community exposure to airborne Libby asbestos from facility emissions and to onsite waste piles have been eliminated and pose no public health hazard.
- Residential indoor exposure to household dust containing Libby asbestos fibers from past plant emissions or waste rock brought home for personal use is considered no apparent public health hazard for present and future community members.
- Individuals within the community could be exposed to airborne Libby asbestos from waste rock used as fill material, for gardening, or for paving driveways. This current and future exposure pathway is an indeterminate public health hazard because insufficient information is available to determine if waste material was used within the community.

### **RECOMMENDATIONS**

- Identify former workers and their household contacts for follow-up activities.
- Confirm that no apparent public health hazard exists for current workers inside the West Chicago facility.
- Review site-specific information as it becomes available and utilize any new information to evaluate indeterminate exposure pathways.

### **PUBLIC HEALTH ACTION PLAN**

The purpose of the public health action plan is to ensure that public health hazards are not only identified, but also addressed. The public health action plan for this site describes actions that ATSDR and/or other government agencies plan to take at the site to mitigate and prevent adverse human health effects resulting from exposure to hazardous substances in the environment. ATSDR will also follow up on the plan to ensure implementation of the following public health actions:

#### **Actions completed**

- EPA conducted site visits and collected environmental samples at the site in 2001.
- ATSDR and IDPH staff conducted a site visit in July 2002.
- Vermiculite attic insulation fact sheets have been developed by ATSDR, NIOSH, and EPA and are available at [www.epa.gov/asbestos/insulation.html](http://www.epa.gov/asbestos/insulation.html). EPA has begun implementing a consumer awareness campaign for vermiculite attic insulation.

#### **Actions ongoing**

- ATSDR will combine the findings from this health consultation with findings from other

Libby vermiculite processing sites to create a national summary report outlining overall conclusions and a strategy for addressing public health implications.

- ATSDR's Division of Health Studies will release annual reports summarizing health statistics review finding for all sites for which data have been received. The first annual report is slated to be released in late summer 2003.
- ATSDR staff is researching unpublished information within the USEPA database of W.R. Grace documents. Site-specific data concerning exposure pathways will be evaluated as it becomes available.

### **Actions planned**

- ATSDR, in cooperation with state partners, is researching and determining the feasibility of conducting worker and household contact follow-up activities.
- ATSDR and IDPH will continue efforts to confirm that no apparent public health hazard exists for current or future workers at the facility.

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### **Certification**

This W. R. Grace and Company (West Chicago, Illinois) Health Consultation was prepared by the Illinois Department of Public Health under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedures existing at the time the health consultation was begun.

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Technical Project Officer  
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Division of Health Assessment and Consultation (DHAC)  
ATSDR

The Division of Health Assessment and Consultation, ATSDR, has reviewed this health consultation and concurs with its findings.

---

Susan Moore  
Chief, Consultations Section  
Exposure Investigation and Consultation Branch (EICB), DHAC, ATSDR

---

Roberta Erlwein  
Chief, State Programs Section  
SSAB, DHAC, ATSDR

**Table 1.**

**RESERVOIRS ENVIRONMENTAL SERVICES, INC.**

NVLAP Accredited Laboratory # 101896  
 IDH Licensed Laboratory # 30-0136

**TABLE 1. PLM BULK ANALYSIS, PERCENTAGE COMPOSITION BY VOLUME**

RES Job Number: RES 79628-1  
 Client: Tetra Tech EM, Inc  
 Client Project Number / P.O.: 505-0108-027  
 Client Project Description: Former WR Grace & Company  
 Date Samples Received: September 5, 2001  
 Analysis Type: PLM Short Report, Bulk  
 Turnaround: 3-5 Day

Analyst: PDL

Client Sample Number	Lab ID Number	L A Y E R	Physical Description	Sub Part (%)	Asbestos Content		Non-Asbestos Fibrous Components (%)	Non-Fibrous Components (%)
					Mineral	Visual Estimate (%)		
1	EM 561614	A	Brown micaceous soil	100	Trem-Act.	TR	10	90
1D	EM 561615	A	Brown micaceous soil	100	Trem-Act.	TR	10	90
2	EM 561616	A	Brown micaceous soil	100	Trem-Act.	TR	10	90
3	EM 561617	A	Brown micaceous soil	100	Trem-Act.	TR	10	90
4	EM 561618	A	Brown micaceous soil	100	Trem-Act.	TR	10	90
5	EM 561619	A	Brown micaceous soil	100	Trem-Act.	TR	15	85

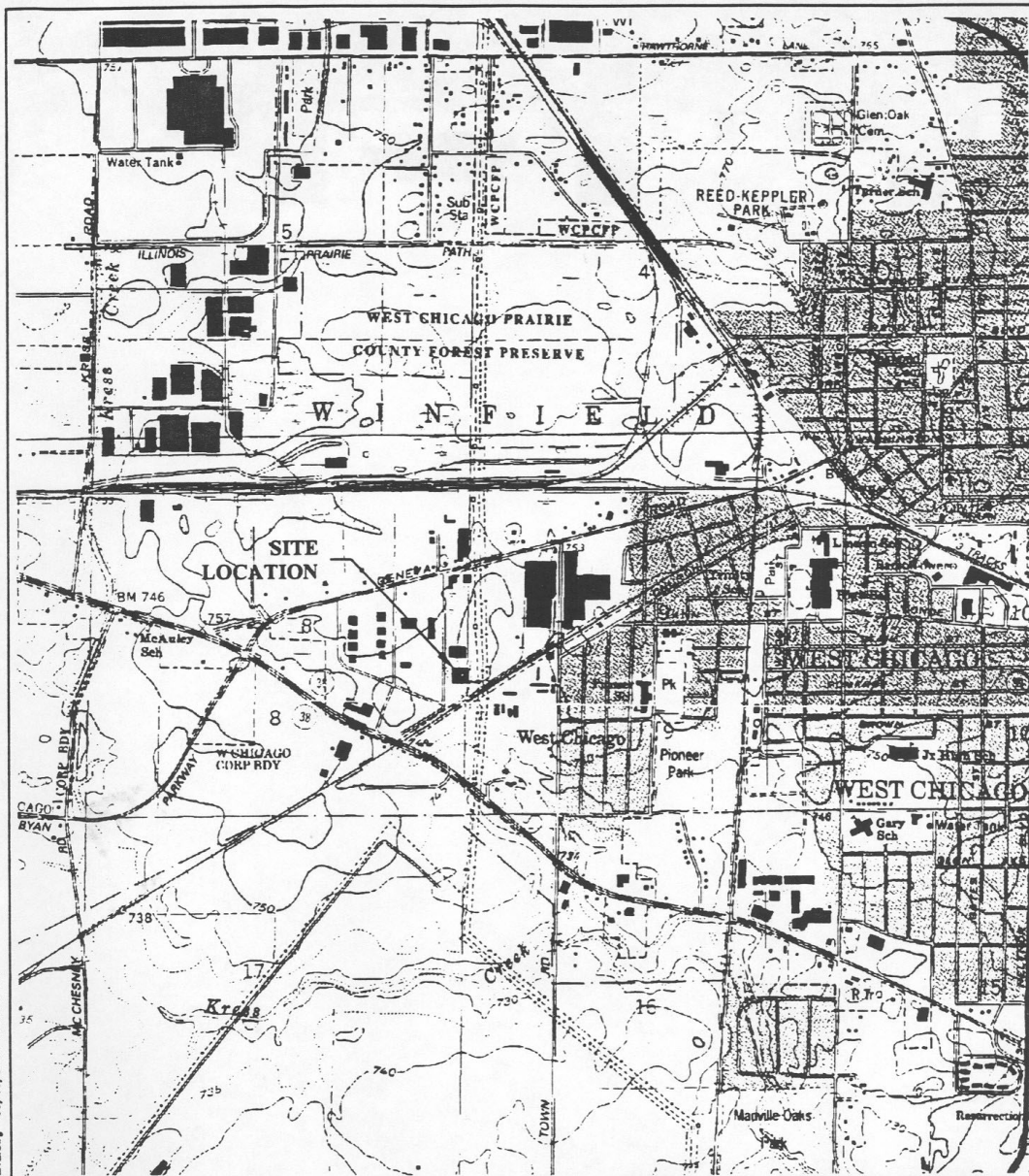
ND = None Detected  
 TR = Trace, < 1% Visual Estimate

Trem-Act = Tremolite-Actinolite

**Table 2. Potential Exposure Pathways for Sites that Received Libby Vermiculite  
Source for all Pathways: Libby Asbestos-contaminated Vermiculite from Libby, Montana**

<b>PATHWAY NAME</b>	<b>ENVIRONMENTAL MEDIA &amp; TRANSPORT MECHANISMS</b>	<b>POINT OF EXPOSURE</b>	<b>ROUTE OF EXPOSURE</b>	<b>EXPOSURE POPULATION</b>	<b>TIME</b>
Occupational	Suspension of Libby asbestos fibers or contaminated dust into air during materials transport and handling operations or during processing operations	Onsite	Inhalation	Former workers	Past
	Suspension of Libby asbestos fibers into air from residual contamination inside former processing buildings	Inside former processing buildings	Inhalation	Current workers	Present, Future
Household Contact	Suspension of Libby asbestos fibers into air from dirty clothing of workers after work	Workers' homes	Inhalation	Former and/or current workers' families and other household contacts	Past, present, future
Waste Piles	Suspension of Libby asbestos fibers into air by playing in or otherwise disturbing piles of vermiculite or waste rock	Onsite, at waste piles	Inhalation	Community members, particularly children	Past, present, future
Onsite Soils	Suspension of Libby asbestos fibers into air from disturbing contaminated material remaining in onsite soils (residual soil contamination, buried waste)	At areas of remaining contamination at or around the site	Inhalation	Current onsite workers, contractors, community members	Present, future
Ambient Air	Stack emissions and fugitive dust from plant operations into neighborhood air	Neighborhood around site	Inhalation	Community members, nearby workers	Past
Residential Outdoor	Suspension of Libby asbestos fibers into air by disturbing contaminated vermiculite brought offsite for personal uses (gardening, paving driveways, traction, fill)	Residential yards or driveways	Inhalation	Community members	Past, present, future
Residential Indoor	Suspension of household dust containing Libby asbestos from plant emissions or waste rock brought home for personal use	Residences	Inhalation	Community members	Past, present, future
Consumer Products	Suspension of Libby asbestos fibers into air from using or disturbing insulation or other consumer products containing Libby vermiculite.	At homes where Libby asbestos-contaminated products were/are present	Inhalation	Community members, contractors, and repairmen	Past, present, future

FIGURES



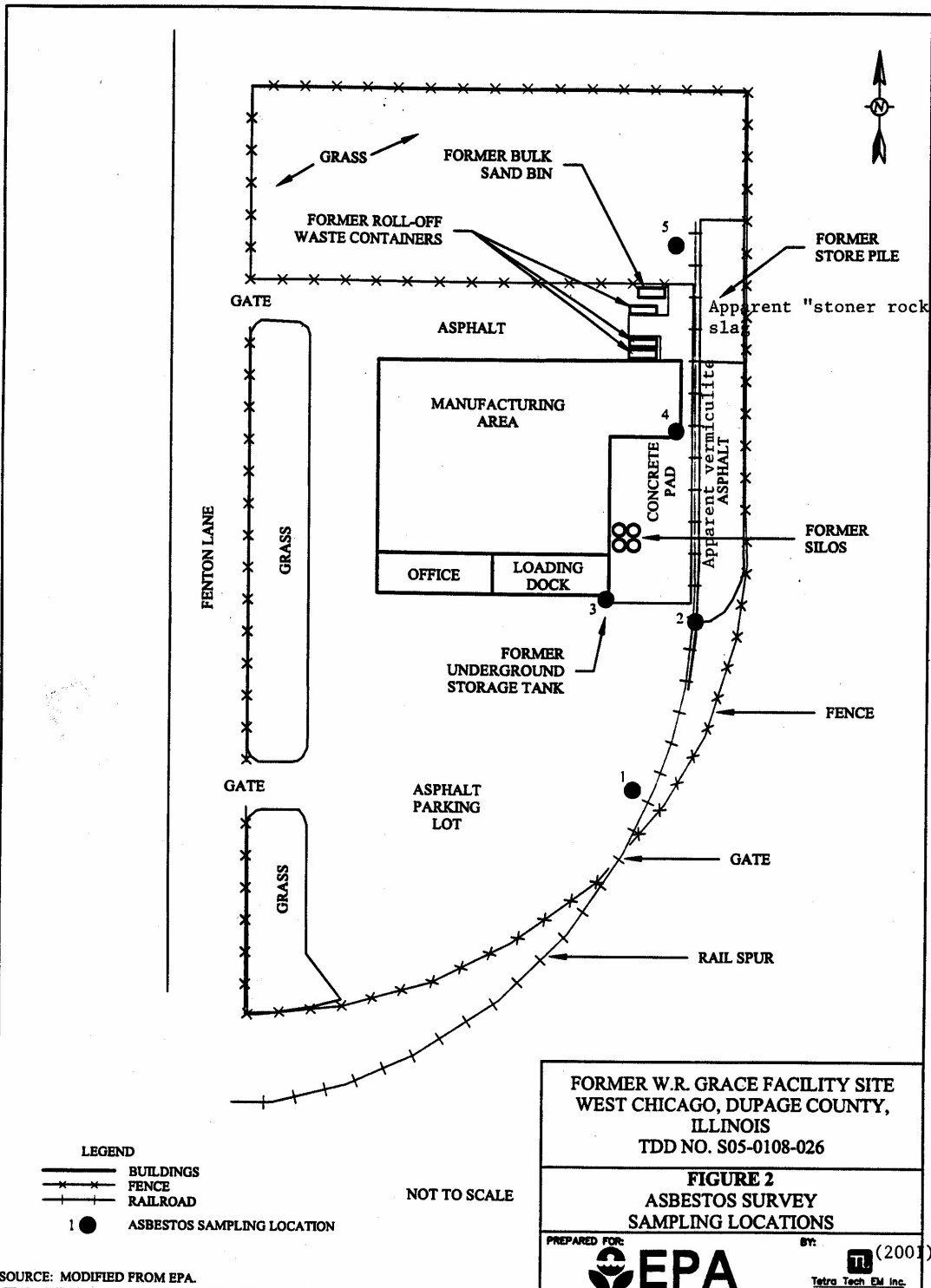
G:\9009\LD106028-VERMICULITE\VERMICULITE.dwg 09/19/2001 PETERSJ CH

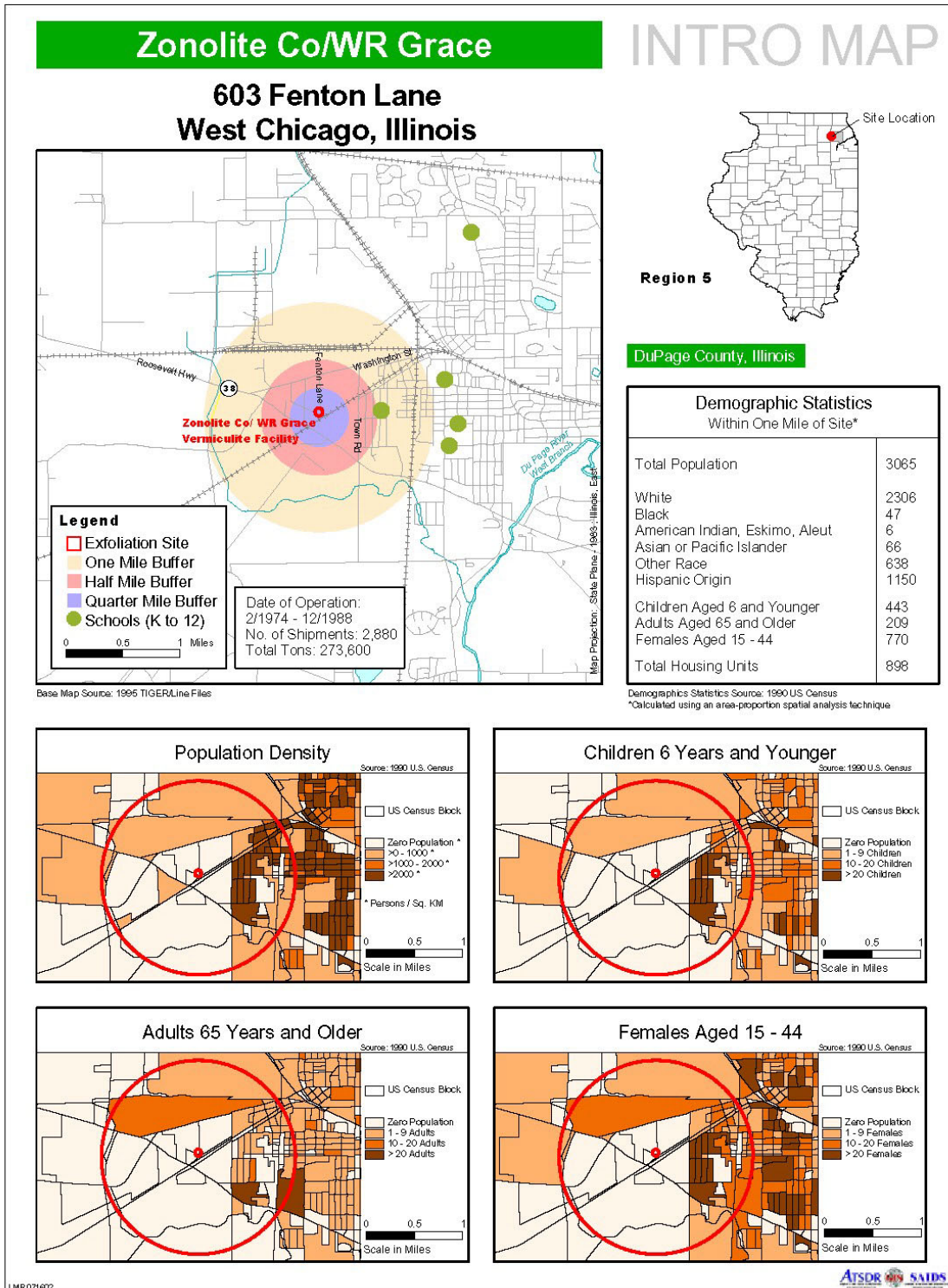
SOURCE: MODIFIED FROM USGS, WEST CHICAGO AND NAPERVILLE, ILLINOIS QUADRANGLES, 1993.

FORMER W.R. GRACE FACILITY SITE  
 WEST CHICAGO, DUPAGE COUNTY,  
 ILLINOIS  
 TDD NO. S05-0108-026

**FIGURE 1**  
 SITE LOCATION MAP

PREPARED FOR:  EPA BY:  (2001)  
 Tetra Tech EM Inc.





## Attachment 1

### Methods for Measuring Asbestos Content

There are a number of different analytical methods used to evaluate asbestos content in air, soil, and other bulk materials. Each method varies in its ability to measure fiber characteristics such as length, width, and mineral type. For air samples, fiber quantification is traditionally done through phase contrast microscopy (PCM) by counting fibers longer than 5  $\mu\text{m}$  and with an aspect ratio (length:width) greater than 3:1. This is the standard method by which regulatory limits were developed. Disadvantages of this method include the inability to detect fibers thinner than 0.25  $\mu\text{m}$  in diameter and the inability to distinguish between asbestos and nonasbestos fibers [1].

Asbestos content in soil and bulk material samples is commonly determined using polarized light microscopy (PLM), a method which uses polarized light to compare refractive indices of minerals and can distinguish between asbestos and nonasbestos fibers and between different types of asbestos. The PLM method can detect fibers with lengths greater than  $\sim 1 \mu\text{m}$ , widths greater than  $\sim 0.25 \mu\text{m}$ , and aspect ratios (length to width ratios) of greater than 3. Detection limits for PLM methods are typically 0.25-1% asbestos.

Scanning electron microscopy (SEM) and, more commonly, transmission electron microscopy (TEM) are more sensitive methods and can detect smaller fibers than light microscopic techniques. TEM allows the use of electron diffraction and energy-dispersive x-ray methods, which give information on crystal structure and elemental composition, respectively. This information can be used to determine the elemental composition of the visualized fibers. SEM does not allow measurement of electron diffraction patterns. One disadvantage of electron microscopic methods is that it is difficult to determine asbestos concentration in soils and other bulk materials [1].

For risk assessment purposes, TEM measurements are sometimes multiplied by conversion factors to give PCM equivalent fiber concentrations. The correlation between PCM fiber counts and TEM mass measurements is very poor. A conversion between TEM mass and PCM fiber count of 30 micrograms per cubic meter per fiber per cubic centimeter ( $\mu\text{g}/\text{m}^3$ )/(f/cc) was adopted as a conversion factor, but this value is highly uncertain since it represents an average of conversions ranging from 5 to 150 ( $\mu\text{g}/\text{m}^3$ )/(f/cc) [2]. The correlation between PCM fiber counts and TEM fiber counts is also very uncertain, and no generally applicable conversion factor exists for these two measurements [2]. Generally, a combination of PCM and TEM is used to describe the fiber population in a particular air sample.

EPA is currently working with several contract laboratories and other organizations to develop, refine, and test a number of methods for screening bulk soil samples. The methods under investigation include PLM, infrared (IR), and SEM (personal communication, Jim Christiansen, U.S. Environmental Protection Agency, November 2002).

### Asbestos Health Effects and Toxicity

Breathing any type of asbestos increases the risk of the following health effects.



*Malignant mesothelioma* – Cancer of the lining of the lung (pleura) and other internal organs. This cancer can spread to tissues surrounding the lungs or other organs. The great majority of mesothelioma cases are attributable to asbestos exposure [1].

*Lung cancer* – Cancer of the lung tissue, also known as bronchogenic carcinoma. The exact mechanism relating asbestos exposure with lung cancer is not completely understood. The combination of tobacco smoking and asbestos exposure greatly increases the risk of developing lung cancer [1].

*Noncancer effects* – these include asbestosis, scarring and reduced lung function caused by asbestos fibers lodged in the lung; pleural plaques, localized or diffuse areas of thickening of the pleura (lining of the lung); pleural thickening, extensive thickening of the pleura which may restrict breathing; pleural calcification, calcium deposition on pleural areas thickened from chronic inflammation and scarring; and pleural effusions, fluid buildup in the pleural space between the lungs and the chest cavity [1].

There is not enough evidence to conclude whether inhalation of asbestos increases the risk of cancers at sites other than the lungs, pleura, and abdominal cavity [1].

Ingestion of asbestos causes little or no risk of noncancer effects. However, there is some evidence that acute oral exposure might induce precursor lesions of colon cancer and that chronic oral exposure might lead to an increased risk of gastrointestinal tumors [1].

ATSDR considers the inhalation route of exposure to be the most significant in the current evaluation of sites that received Libby vermiculite. Exposure scenarios that are protective of the inhalation route of exposure should be protective of dermal and oral exposures.

There is general acceptance in the scientific community of correlations of asbestos toxicity with fiber length as well as fiber mineralogy. Fiber length may play an important role in clearance and mineralogy may affect both biopersistence and surface chemistry.

ATSDR, responding to concerns about asbestos fiber toxicity from the World Trade Center disaster, held an expert panel meeting to review fiber size and its role in fiber toxicity in December, 2002 [3]. The panel concluded that fiber length plays an important role in toxicity. Fibers with lengths less than 5  $\mu\text{m}$  are essentially non-toxic when considering a role in mesothelioma or lung cancer promotion. However, fibers less than 5  $\mu\text{m}$  in length may play a role in asbestosis when exposure duration is long and fiber concentrations are high. More information is needed to definitively make this conclusion.

In accordance with these concepts, it has been suggested that amphibole asbestos is more toxic than chrysotile asbestos, mainly due to physical characteristics which allow chrysotile to be broken down and cleared from the lung, whereas amphibole is not removed and builds up to high levels in lung tissue [4]. Some researchers believe the resulting increased duration of exposure to amphibole asbestos significantly increases the risk of mesothelioma and, to a lesser extent, asbestosis and lung cancer [4]. However, OSHA continues to regulate chrysotile and amphibole

asbestos as one substance, as both types increase the risk of disease [5]. EPA's Integrated Risk Information System (IRIS) assessment of asbestos also treats mineralogy (and fiber length) as equipotent.

Evidence suggesting that the different types of asbestos fibers vary in carcinogenic potency and site specificity is limited by the lack of information on fiber exposure by mineral type. Other data indicate that differences in fiber size distribution and other process differences can contribute at least as much to the observed variation in risk as does the fiber type itself [6].

Counting fibers using the regulatory definitions (see below) does not adequately describe risk of health effects, as fiber size, shape, and composition contribute collectively to risks in ways that are still being elucidated. For example, shorter fibers appear to preferentially deposit in the deep lung, but longer fibers might disproportionately increase the risk of mesothelioma [1,6]. Some of the unregulated amphibole minerals, such as the winchite present in Libby asbestos, can exhibit asbestiform characteristics and contribute to risk. Fiber diameters greater than 2-5  $\mu\text{m}$  are considered above the upper limit of respirability (that is, too large to inhale) and do not contribute significantly to risk. Methods are being developed to assess the risks posed by varying types of asbestos and are currently awaiting peer review [6].

### **Current Standards, Regulations, and Recommendations for Asbestos**

In industrial applications, asbestos-containing materials are defined as any material with greater than 1% bulk concentration of asbestos, [7]. It is important to note that 1% is not a health-based level, but instead represents the practical detection limit in the 1970s when OSHA regulations were created. Studies have shown that disturbing soils containing less than 1% amphibole asbestos can suspend fibers at levels of health concern [8].

Friable asbestos (asbestos which is crumbly and can be broken down to suspendable fibers) is listed as a Hazardous Air Pollutant on EPA's Toxic Release Inventory [9]. This requires companies that release friable asbestos at concentrations greater than 0.1% to report the release under Section 313 of the Emergency Planning and Community Right-to Know Act.

OSHA has set a permissible exposure limit (PEL) of 0.1 f/cc for asbestos fibers longer than 5  $\mu\text{m}$  and with an aspect ratio (length:width) greater than 3:1, as determined by PCM [10]. This value represents a time-weighted average (TWA) exposure level based on 8 hours a day for a 40-hour work week. In addition, OSHA has defined an excursion limit in which no worker should be exposed in excess of 1 f/cc as averaged over a sampling period of 30 minutes [10]. Historically, the OSHA PEL has steadily decreased from an initial standard of 12 f/cc established in 1971. The PEL levels prior to 1983 were determined based upon empirical worker health observations, while the levels set from 1983 forward employed some form of quantitative risk assessment. ATSDR has used the current OSHA PEL of 0.1 f/cc as a reference point for evaluating asbestos inhalation exposure for past workers. ATSDR does not, however, support using the PEL for evaluating community member exposure, as the PEL is based on an unacceptable risk level.

In response to the World Trade Center disaster in 2001 and an immediate concern about asbestos levels in homes in the area, the Department of Health and Human Services, EPA and the

Department of Labor formed the Environmental Assessment Working Group. This work group was made up of ATSDR, US Environmental Protection Agency, National Institute of Occupational Safety and Health, CDC National Center for Environmental Health, Occupational Safety and Health Administration, New York City Department of Health and Mental Hygiene, the New York State Department of Health, and other state, local, and private entities. The work group set a re-occupation level of 0.01 f/cc after cleanup. Continued monitoring was also recommended to limit long-term exposure to this level [11].

The National Institute of Occupational Safety and Health (NIOSH) set a recommended exposure limit of 0.1 f/cc for asbestos fibers longer than 5  $\mu\text{m}$ . This limit is a TWA for up to a 10-hour workday in a 40-hour work week [10]. The American Conference of Government Industrial Hygienists (ACGIH) has also adopted a TWA of 0.1 f/cc as its threshold limit value [12].

EPA has set a maximum contaminant level (MCL) for asbestos fibers in water of 7,000,000 fibers longer than 10  $\mu\text{m}$  per liter, based on an increased risk of developing benign intestinal polyps [13]. Many states use the same value as a human health water quality standard for surface water and groundwater.

Asbestos is a known human carcinogen. Historically, EPA has calculated an inhalation unit risk for cancer (cancer slope factor) of 0.23 per f/cc of asbestos [2]. This value estimates additive risk of lung cancer and mesothelioma using a relative risk model for lung cancer and an absolute risk model for mesothelioma. This quantitative risk model has significant limitations. First, the unit risks were based on measurements with phase contrast microscopy and therefore cannot be applied directly to measurements made with other analytical techniques. Second, the unit risk should not be used if the air concentration exceeds 0.04 f/cc, since above this concentration the slope factor might differ from that stated [2]. Perhaps the most significant limitation is that the model does not consider mineralogy, fiber size distribution, or other physical aspects of asbestos toxicity. EPA is in the process of updating their asbestos quantitative risk methodology given the limitations of the current assessment and the knowledge gained since it was implemented in 1986.

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## Attachment 2

### Health Statistics Review for Populations in Close Proximity to the Zonolite Co/W. R. Grace (WRG) facility in West Chicago, IL

#### **Background:**

Through an analysis of mortality records, ATSDR and the Montana Department of Public Health and Human Services detected a statistically significant excess of asbestos-related disease (asbestosis) among residents of Libby, MT (1). Rates of asbestosis were 60 times higher than the national rates and this difference was highly unlikely due to natural fluctuations in the occurrence of this disease. This discovery led to several follow-up activities in Libby to address the health impacts on the community (2, 3). Another follow-up activity is a nation-wide effort to screen for a similar impact on the health of communities near facilities that processed or received vermiculite ore from the mine in Libby. As part of this activity, ATSDR has awarded nine state health departments funding to conduct health statistics reviews (HSR) on sites that may have received the asbestos-contaminated Libby ore. Seven additional states have conducted health statistics reviews without ATSDR funding, including the Illinois Department of Health (IDH). HSRs are statistical analyses of existing health outcome data (e.g., cancer registry data and/or death certificate data) that help provide information on whether people living in a particular community have gotten selected diseases more often than a comparison population (i.e., people living in the rest of the country). Finding an excess of asbestos-related diseases in a community through an HSR analysis would inform ATSDR and IDH to the possibility that workers and/or community members might have been exposed to Libby asbestos from the vermiculite ore. Participating state health departments are conducting HSRs for all of the communities in their state near vermiculite facilities, regardless of whether it is known if the community was exposed to Libby asbestos through the processing or handling of vermiculite ore. The methodology of the HSR used for West Chicago and other vermiculite sites across the US was developed by ATSDR (4).

#### **Methods:**

The target area consisted of people who died and/or were diagnosed with potential asbestos-related diseases while residing within zip code 60185 (population 14,796 according to 1990 Census data). Zip code 60185 is in West Chicago and contains the Zonolite Co/WRG facility. Analysis at the zip code level was chosen because it is the smallest area that is electronically coded on both the IL death certificates and cancer registry records. For this particular analysis, both cancer registry data and death certificate data were used. However, because the cancer registry data for the West Chicago site was pooled by IDH with data from five other IL sites around the state that received Libby ore, ATSDR chose not to use the data. This decision was based on the fact that pooled data analyses tend not to yield meaningful results for individual sites. The death certificate data however, was analyzed on a site-specific basis and therefore was of greater interest to ATSDR. There were 12 disease groupings used for this mortality analysis (Table A). Of the 12 groupings, the three of greatest interest to ATSDR were the ones that have a known association with asbestos exposure. These three included asbestosis [ICD9 501], malignant neoplasm of peritoneum, retroperitoneum, and pleura [ICD9 158, 163, which includes

mesothelioma], and malignant neoplasm of lung and bronchus [ICD9 162.2 - 162.9]. The other 9 disease groupings analyzed were reported in the literature as having weaker associations with asbestos exposure or were included to evaluate reporting/coding anomalies in the analysis areas. The analysis period for the mortality data was from 1979-1998. This period was chosen because a) it covered the most recent 20 years of mortality data available at the time the analysis began, b) it corresponded to an approximate latency period in which initial exposure occurred and death would be expected, and c) no overlapping of ICD revisions occurred.

Gender specific age-standardized mortality ratios (SMRs) were calculated for selected diseases (including asbestos-related diseases). An SMR is a measure of whether the number of people who developed selected diseases in this West Chicago community is the same as, lower, or higher than the number of people we would expect to find if the occurrence of selected diseases in the West Chicago community was the same as the occurrence of selected diseases in a comparison population. The comparison population used in this analysis was for the rest of the country. This comparison population was national death certificate data received from the National Center of Health Statistics (5). If the number of people developing selected diseases in this West Chicago community is the same as the number we would expect to find, the SMR will equal 1. If the number of West Chicago community members developing selected diseases is less than one would expect, the SMR will be between 0 and 1. If the number of West Chicago members developing selected diseases is more than one would expect, the SMR will be greater than 1.

The number of people who develop asbestos-related diseases in the United States changes from year to year. As a result, the value of the SMR for a community will also change, depending on which years are being studied: one year, the SMR may be higher than 1 (e.g., 1.2), and the next year it may be less than 1 (e.g., 0.9). Some degree of fluctuation in the SMR values from year to year is considered normal.

An important question is: when is a SMR higher or lower than what would be expected? In other words, when are more or fewer people developing asbestos-related diseases than we would expect, taking into account that there is a normal fluctuation in the number of people developing asbestos-related diseases? In order to answer this question, a measure called a 95% confidence interval (CI) is calculated for the SMR using Byar's approximation (6). The 95% CI consists of two numbers which define a range (a lower and an upper) of expected, or normal, values for the SMR for a community. If both numbers are less than 1, then we conclude that the selected diseases are occurring less frequently in the community than they are in the rest of the country (this is called a statistically significant decrease). If both of the numbers in the confidence interval are higher than 1, then we conclude that the selected diseases are occurring more frequently in the community than they are in the rest of the country (this is called a statistically significant excess). Lastly, if one of the numbers in confidence interval is less than 1 and the second number is higher than 1, then we conclude that the selected diseases are occurring in the community at the same frequency as they are occurring in the rest of the country (this is called a non-statistically significant difference).

## **Results:**

Table A shows, for each disease group studied: 1) whether past studies have shown a link between asbestos exposure and that specific disease; 2) the number of people in the West Chicago community who got each type of selected disease; 3) the number of people we would expect to get the selected disease if the community had the same occurrence of the disease as the rest of the country; 4) the SMR; and 5) the 95% confidence interval for the SMR.

For the time period 1979-1998, the occurrence of disease in 11 of the 12 groupings for the West Chicago area was the same as the occurrence in the rest of the country. The only disease grouping for West Chicago that had a statistically significant excess was for Chronic Obstructive Pulmonary Disease (COPD [ICD9 490 - 496]) for the total zip code population (observed deaths, n=83; expected deaths, n=62.4; SMR=1.3; 95% confidence interval 1.06 - 1.65).

### **Discussion and Limitations:**

The main goal of conducting these HSRs is to help determine if communities near facilities that received Libby vermiculite have higher than expected occurrences of asbestos-related diseases. This SMR analysis suggests that the occurrence of asbestos-related diseases in this West Chicago population is not higher than expected compared to the rest of the country. While not considered an asbestos-related disease, an excess of COPD was detected within zip code 60185. COPD is a group of diseases characterized by airflow obstruction that can be associated with breathing-related symptoms (e.g., chronic cough, exertional dyspnea, expectoration, and wheeze) (7). COPD can be present with or without substantial physical impairment or symptoms, and it is the fourth leading cause of death in the United States (8). Tobacco use is the key risk factor in COPD development and progression, and trends in COPD mortality among women reported reflect the recent increase in smoking by women, relative to men, in the United States (9). Although tobacco smoking is the most critical risk factor for both development and progression of COPD, asthma (10), exposure to ambient pollutants in the home and workplace (11), and respiratory infections (12, 13) are also key factors.

There are many limitations to using existing data sources to examine the relationship between environmental exposures and chronic diseases (a chronic disease is one that develops over a long period of time). Some of the major limitations in this analysis include, but are not limited to: exposure misclassification, population migration, lack of control for confounding factors (i.e., smoking status data), overstated numerators/under-estimated denominators, large study areas, small numbers of cases, and under-reporting of cancer cases to the state registry. Most of these limitations would make it less likely (as opposed to more likely) that this type of analysis would identify an higher than expected occurrence of asbestos-related cancers among people who lived near the Zonolite Co/W. R. Grace (WRG) facility in West Chicago, IL facility during its years of operation.



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**Table A: Mortality data findings for residents who died from selected diseases in close proximity to the Zonolite Co/W. R. Grace (WRG) facility in West Chicago, IL (Zip code 60185)**

Selected Disease	Past studies have shown a link to asbestos exposure?	Number of people who got disease	Expected number of deaths*	SMR†	95% Confidence Interval‡	
					Upper	Lower
Malignant neoplasm of digestive organs	Weak link	70	62.73	1.12	0.87	1.41
Malignant neoplasm of respiratory system and intrathoracic organs	Weak link	100	102.22	0.98	0.80	1.19
Malignant neoplasm of lung and bronchus §	Yes	95	98.63	0.96	0.78	1.18
Malignant neoplasm of peritoneum, retroperitoneum, and pleura (includes mesothelioma) §	Yes	1	0.78	1.28	0.02	7.12
Malignant neoplasm without specification of site	No	30	24.13	1.24	0.84	1.77
Diseases of pulmonary circulation	No	7	9.86	0.71	0.28	1.46
Chronic obstructive pulmonary disease	No	83	62.40	1.33	1.06	1.65
Asbestosis §	Yes	0	0.17	0.00	0.00	0.00
Other diseases of respiratory system	No	7	12.61	0.56	0.22	1.14
All malignant neoplasms	No	397	377.18	1.05	0.95	1.16
Malignant neoplasm of female breast	No	44	33.50	1.31	0.95	1.76
Malignant neoplasm of prostate	No	24	18.14	1.32	0.85	1.97

\* Calculated using mortality data received from the National Center of Health Statistics (unpublished data) (5).

† The Standardized Mortality Ratio (SMR) equals the number of people who died divided by the expected number of deaths.

‡ The 95% CIs were calculated to assess statistical significance using Byar's approximation (6).

§ Have known associations with asbestos exposure. The other disease groupings analyzed were either reported in the literature as having weaker associations with asbestos exposure or were included to evaluate reporting/coding anomalies in the target area.

### **Attachment 3 Hazard Category Definitions**

Public health hazard categories are statements about whether people could be harmed by conditions present at the site in the past, present, or future. One or more hazard categories might be appropriate for each site. The five public health hazard categories are no public health hazard, no apparent public health hazard, indeterminate public health hazard, public health hazard, and urgent public health hazard.

#### **No public health hazard**

A category used in ATSDR's public health assessment documents for sites where people have never and will never come into contact with harmful amounts of site-related substances.

#### **No apparent public health hazard**

A category used in ATSDR's public health assessments for sites where human exposure to contaminated media might be occurring, might have occurred in the past, or might occur in the future, but where the exposure is not expected to cause any harmful health effects.

#### **Indeterminate public health hazard**

The category used in ATSDR's public health assessment documents when a professional judgment about the level of health hazard cannot be made because information critical to such a decision is lacking.

#### **Public health hazard**

A category used in ATSDR's public health assessments for sites that pose a public health hazard because of long-term exposures (greater than 1 year) to sufficiently high levels of hazardous substances or radionuclides that could result in harmful health effects.

#### **Urgent public health hazard**

A category used in ATSDR's public health assessments for sites where short-term exposures (less than 1 year) to hazardous substances or conditions could result in harmful health effects that require rapid intervention.