Health Consultation

Review of Activity Based Sampling

Former W. R. Grace Facility
(a/k/a North Little Rock Auto Salvage)
600 Dixie Lane
North Little Rock, Pulaski County, AR 72114

EPA Identification Number: ARN000607042
AFIN Number: 60-02502

Prepared by the
Arkansas Department of Health

JANUARY 23, 2014

Prepared under a Cooperative Agreement with the
U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Agency for Toxic Substances and Disease Registry
Division of Community Health Investigations
Atlanta, Georgia 30333

Health Consultation: A Note of Explanation

A health consultation is a verbal or written response from ATSDR or ATSDR's Cooperative Agreement Partners to a specific request for information about health risks related to a specific site, a chemical release, or the presence of hazardous material. In order to prevent or mitigate exposures, a consultation may lead to specific actions, such as restricting use of or replacing water supplies; intensifying environmental sampling; restricting site access; or removing the contaminated material.

In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members. This concludes the health consultation process for this site, unless additional information is obtained by ATSDR or ATSDR's Cooperative Agreement Partner which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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Environmental Epidemiology
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SUMMARY

INTRODUCTION

In the residential area surrounding the Former W.R. Grace Facility in North Little Rock, ADH/ATSDR's top priority is to ensure that the community has the best information possible to safeguard its health and prevent people from coming in contact with harmful toxic substances.

CONCLUSION

ADH/ATSDR calculated a lifetime cancer risk (LCR) value for children and adults under a "worst case" scenario using the activity-based sampling (ABS) results from the Environmental Protection Agency (EPA). The total excess LCR (1.5×10^{-5}) fell within EPA's target risk value and indicates that airborne asbestos exposures within the community are below levels of health concern.

BASIS FOR DECISION

Every time asbestos-containing vermiculite or waste rock is stirred up, asbestos fibers may be released into the air. However, being exposed to asbestos does not necessarily mean that a person will develop health problems. Based on the calculated values and the remedial work already done by EPA, no special precautions are currently needed during any residential or recreational activities near this site.

NEXT STEPS

ADH/ATSDR is working with EPA during the remediation process and is actively involved in community education to promote awareness for those still concerned with possible asbestos exposure and subsequent health related issues.

FOR MORE INFORMATION

If you have concerns about your health, you should contact your health care provider. You can also call ATSDR at 1 – 800 – CDC – INFO, or the Arkansas Department of Health at 501-661-2936 and ask for information on the Former W.R. Grace Facility in North Little Rock, AR.

Statement of Issues

In response to a request from the U.S. Environmental Protection Agency (EPA) Region 6, the Arkansas Department of Health (ADH) has been working with state and federal partners involved in an on-going asbestos investigation at the Former W.R. Grace site in North Little Rock, AR. Preliminary soil samples collected from the Former W.R. Grace Facility and the surrounding Dixie Community indicated trace levels of asbestos were present. Outdoor activities that disturb soil containing trace levels of asbestos can sometimes result in airborne asbestos concentrations of health concern. Typically, activity-based sampling (ABS) is recommended to characterize actual exposures for representative activities taking place in locations where trace levels of asbestos in soil exist. Therefore, further work related to this public health investigation involved ABS for asbestos in the community. Under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR), ADH has prepared this health consultation to determine, through ABS data analysis, if a potential exposure to asbestos-contaminated soil further exists from the Former W.R. Grace site.

History

In Libby, MT, from the 1920s through the early 1990s, W.R. Grace and other entities mined, processed, and shipped millions of tons of vermiculite ore to approximately 244 sites across the United States. This included the Former W.R. Grace Facility site in North Little Rock, AR. While in operation, the Libby mine may have produced 80% of the world's supply of vermiculite [1]. Libby vermiculite has been known to be contaminated with asbestos. Vermiculite is generally used for insulation, as a lightweight aggregate in construction materials, and as a soil additive for gardening [2].

Flakes of raw vermiculite are mica-like in appearance and contain water molecules within their internal structure. During processing when the flakes are heated rapidly at a temperature of 900 degrees Celsius (900^{o} C) or higher, the water flashes into steam, and the flakes expand into accordion-like particles. The color, which can range from black and various shades of brown to yellow for the raw flakes, changes upon expansion to gold or bronze. This expansion process is called exfoliation, and the resulting lightweight material is chemically inert, fire resistant, and odorless. Expanded and unexpanded vermiculite from Libby had many commercial applications. Expanded (exfoliated by high temperatures) vermiculite included loose fill insulation, fertilizer carrier, and concrete aggregate. Unexpanded Libby vermiculite concentrate has been found in gypsum wallboard, joint compound, cinder blocks, and many other building products.

Background

The Former W.R. Grace Facility, also more recently known as the North Little Rock Auto Salvage site, is located at 600 Dixie Lane, North Little Rock, Pulaski County, AR (refer to map in Appendix A). The site, located in a mixed commercial/industrial and residential area of town, is an abandoned vermiculite ore processing (*i.e.*, exfoliating) facility [3]. Possibly a former brick processing plant initially, the W.R. Grace Zonolite Company (originating from Libby, MT) bought the North Little Rock plant in the 1950's. Historical aerial photos from 1943 depict the four large silos on the property, indicating industrial use (it is unknown whether it was used for brick processing or vermiculite processing at this time because no documents have been found, and silos were used at other exfoliation sites to store raw vermiculite) [3, 4]. During the time that this property was used by the W. R. Grace Zonolite Company, there was a warehouse, shed, loading dock, and the four silos on the property [4]. From 1953 to 1989, approximately 85,050 tons (a historical estimate that could possibly be low due to incomplete facility records) of raw vermiculite were documented to be shipped to the North Little Rock plant from Libby, MT [3]. This site is not currently being used for any industrial purpose.

The site is adjacent to an industrial business still in operation, as well as Union Pacific Railroad property, farmland, and residential properties. The site is not secured by fencing; however, a gate blocks the front entrance. The site is also located close to a switching area for the railroad. Evidence of trespassers has been noted on the property. In the summer of 2011, a fire burned down a structure near the east end of the facility, but left the three-story warehouse intact [4].

Contaminant of Concern: Asbestos Overview

Asbestos is a general name applied to a group of silicate minerals consisting of thin, separable fibers in a parallel arrangement. 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 [5]. Asbestos minerals fall into two classes: serpentine and amphibole.

The vermiculite that was mined at Libby, MT contains amphibole asbestos, with a characteristic composition including tremolite, actinolite, richterite, and winchite. This material is referred to as "Libby asbestos" in this health consultation. Samples of the various grades of unexpanded vermiculite (after being concentrated and milled) shipped from the Libby mine contained 0.3% - 7.0% fibrous tremolite-actinolite (by mass), and this was the type shipped to the North Little Rock facility [2]. 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 used as a raw material in manufactured products [5].

Discussion

Evaluating the health effects of exposure to Libby asbestos requires both extensive knowledge of exposure pathways and access to toxicity data. The toxicological information currently available is limited, so the exact level of health concern for different sizes and types of asbestos remains uncertain. However, Libby asbestos is now known to cause asbestos-related disease, and all vermiculite from Libby is presumed to be contaminated with Libby asbestos. Data have shown that any disturbance of waste rock or vermiculite containing trace levels of Libby asbestos may result in air concentrations of concern. While Libby asbestos-containing vermiculite waste rock has been found on and around the Former W.R. Grace site, exposure pathway information for past exposures in and around the North Little Rock facility is limited or unavailable. Specific data limitations include:

- Limited information on past concentrations of Libby asbestos in ambient air on-site and around the North Little Rock facility.
- Unclear data on how (exposure pathway) and how often (exposure duration) people came in contact with Libby asbestos from the processing facility, since most exposures happened long ago. This information is necessary to estimate accurate exposure doses.
- Insufficient information about how some vermiculite materials, such as waste rock, were handled, distributed, or disposed. As a result, identifying and assessing potential exposures is difficult.

Exposure to asbestos is determined by examining human exposure pathways. An exposure pathway has five parts:

1. A source of contamination (e.g., hazardous compound(s) from a processing plant),
2. An environmental medium such as air, soil, or water that can hold or move the contamination,
3. A point at which people come in contact with a contaminated medium such as a residential yard or public park,
4. An exposure route, such as inhalation (breathing) of airborne asbestos fibers, and
5. A population who could come in contact with the contaminants.

An exposure pathway is eliminated if at least one of the five parts is missing and will not occur in the future. For a completed pathway, all five parts must exist and exposure to a contaminant must have occurred, is occurring, or will occur. Past, present, and/or future exposures to asbestos in the soil of on-site and off-site areas is possible for commercial, residential and/or public recreational areas surrounding the Former W.R. Grace Facility that contain Libby asbestos in the soil. The likelihood of these exposures is increased when the soils are disturbed and asbestos is released into the air.

The raw vermiculite ore processed in North Little Rock contained Libby asbestos, which has the potential to become airborne and inhaled. After reviewing information from the vermiculite mine in Libby, MT, and from facilities that processed vermiculite from Libby, ADH/ATSDR has identified *potential* exposure pathways that apply, in general, to all of the vermiculite processing facilities, including the Former W.R. Grace Facility in North Little Rock, AR. All of these pathways have a common source (vermiculite from Libby) and a common route of exposure (inhalation).

Although asbestos ingestion and dermal (skin) exposure pathways could exist, health risks from these pathways are minor in comparison to those resulting from inhalation exposure to asbestos. Therefore, this health consultation does not evaluate the ingestion or absorption (dermal contact) pathways. [NOTE: For information addressing any *past* exposures, see the previously written health consultation entitled, "Former W.R. Grace Facility (a.k.a. North Little Rock Auto Salvage) Review of Vermiculite Findings and Community Investigation" (June 2012).] This health consultation will address present and/or future inhalation exposure based on ABS data provided by EPA.

The scenarios used to represent activities that would disturb Libby asbestos in soil and result in potential exposure to airborne fibers included (1) an adult raking (represents adult inhalation exposure) and (2) a child playing outside (represents child inhalation exposure). The ABS data for these two scenarios were collected by EPA in phases. Phase I ABS samples were collected from January 12 – 15, 2012. Phase II ABS samples were collected from June 19 – 21, 2012. Three different types of samples were collected:

- personal samples, representing exposure to airborne fibers released from disturbing Libby asbestos in soil during the raking or playing activities,
- perimeter samples, representing bystander exposure to airborne fibers from the selected activity, and
- ambient samples, representing the natural levels or background concentration of asbestos fibers in the air for the area.

Personal air samples were the samples collected from the individual (i.e., EPA environmental contractor) who conducted the ABS scenario for one hour per sample. Personal air monitors collect a volume of air through a filter, and asbestos structures can be trapped by the filter for counting later in a laboratory setting. For each personal air sample, there were two readings: a high flow sample (3 – 10 liters per minute) and a low flow sample (1 – 3 liters per minute). Each personal air sample cassette was situated in the particular breathing zone of the person conducting the ABS scenarios to closely represent actual exposures.

Perimeter air samples were collected from stationary air sampling monitors located on the edge of the grid in which the ABS activities were being conducted. Perimeter monitors were moved to the different sampling locations as the ABS sampling continued throughout the day. Two perimeter samples were collected per ABS scenario at 3 – 10 liters per minute for one hour each. Eighty lots were identified (from the previous soil sampling phase) and sampling location grids were established within each lot that was currently sampled; 18 lots were selected for the adult ABS scenario and 18 lots were selected for the child ABS scenario. (See Appendix B for an *example* figure of the ABS sampling grid locations. Although, please note that some residential areas have been redacted or blocked from the map in order to maintain property owners' privacy.)

During the collection process, ambient air samples were collected in Conley Park (near the site) from a stationary air sample station established at the beginning of the sampling day and not moved during the day's sampling activities. The ambient air samplers were set at a high flow rate (10 liters per minute) for an 8 – 12 hour period. The ambient air samples represent "background" or "bystander" air samples (i.e., locations not in the influence of the ABS activities). Also collected were perimeter air samples and personal air samples.

Table 1, below, presents the background and maximum concentration results for phase contrast microscopy equivalent (PCMe) asbestos structures per cubic centimeter of air (s/cc) found during Phase I and Phase II ABS. PCMe is a light microscopy analytical method; at this site, EPA utilized the direct-transfer Transmission Electron Microscopy (TEM) (International Standard ISO 10312, ambient air) test method for determination of asbestos fibers and reported PCMe in s/cc. This is a typical method for the exposure analysis that asbestos health assessment is based on. The total reported ABS data from EPA include: 18 adult raking scenario samples (8 collected from Phase I and 10 collected from Phase II), 18 child playing scenario samples (8 collected from Phase I and 10 collected from Phase II), and 5 background (ambient) air samples. All background samples showed consistent results of fewer than 0.0005 s/cc.

Table 1. Activity-Based Sampling (ABS) and Air Monitoring Results from EPA Asbestos Sampling in the Community Surrounding the Former W.R. Grace Site, North Little Rock, AR; January (Phase I) and June (Phase II) 2012

Sample	Location	Scenario	Maximum Concentration (s/cc)
#462, Phase I, Personal - High Flow	Area N, Lot 54, Grid 001	Adult Raking	0.005
#593, Phase II, Personal - High Flow	Area M, Lot 42, Grid 001	Child Playing	0.004
#615, Phase II, Ambient - Stationary	Conley Park	Background	<0.0005

EPA = Environmental Protection Agency; s/cc = asbestos structures per cubic centimeter of air

Evaluation of Potential Risk

To estimate potential risk from residential activities in the neighborhoods surrounding this site, ADH/ATSDR assumed that the "worst case" would apply to a long-time (or permanent) resident working or playing outside their house. Based on the general scenarios of raking and playing, it was conservatively assumed that a person would have the potential of one hour of exposure every day to each of the two activities represented by ABS, for six months out of the year.

Although health screening values for ABS data do not exist, a cumulative Lifetime Cancer Risk (LCR) for worst-case scenarios is evaluated to determine potential public health risks to asbestos exposure. To estimate potential risk posed by this exposure, ADH/ATSDR followed the EPA guidelines, "Framework for Investigating Asbestos-contaminated Superfund Sites" [6]. This document specifies unit risk values for given ages at onset and exposure durations to asbestos. The increased theoretical cancer risk is given by this unit risk times the asbestos concentration for a given activity (given in PCMe s/cc) times a time-weighting factor that describes the fraction of time over the exposure duration that the particular activity is performed.

For ADH/ATSDR's analysis, the specific activity's maximum asbestos concentration and time-weighting factor terms were combined to calculate a "worst-case asbestos exposure concentration", which is then multiplied by the inhalation unit risk (IUR) to determine the increased risk of cancer. The calculations are detailed below for the two general scenarios considered:

Ages 18 through 65 (Adult Raking Scenario):

Age at onset: 18 Exposure Duration: 30 years Inhalation Unit Risk: 0.081 $(s/cc)^{-1}$

Worst-Case Exposure Concentration:

$$\left(0.005\frac{s}{cc}\times\frac{1\ hr}{24\ hr}\times\frac{6\ months}{12\ months}\right)$$

$$=0.000104\ s/cc$$

Ages 6 through 17 (Child Playing Scenario):

Age at onset: 6 Exposure Duration: 12 years Inhalation Unit Risk: 0.077 $(s/cc)^{-1}$

Worst-Case Exposure Concentration:

$$\left(0.004\frac{s}{cc}\times\frac{1\ hr}{24\ hr}\times\frac{6\ month}{12\ months}\right)$$

$$=0.000083\ s/cc$$

The worst-case total excess lifetime cancer risk associated with this exposure is given by the total sum of the unit risk for each time period multiplied by the worst-case exposure concentration for the time period.

$$Total\ Risk = (0.081(s/cc)^{-1} \times 0.000104\ s/cc) + (0.077(s/cc)^{-1} \times 0.000083\ s/cc)$$

$$= 0.000015 = 1.5\times10^{-5}, \text{ or } 1.5 \text{ in } 100{,}000.$$

In other words, a person who was raised in this community as a child and has lived in the same location for over 40 consecutive years has at most only a 1.5 in 100,000 chance of developing asbestos-related disease if they have been exposed to and inhaled airborne asbestos at the highest concentrations measured for each activity. [NOTE: Exposure from birth to 5 years old is possible, but would be expected to be a minor contributor to exposure and thus overall risk. Therefore, data were not collected for this age scenario.] People living in the community for a lesser time period would have even lower potential risks. This risk is within EPA's acceptable risk range for Superfund (environmental clean-up sites) of 1 in a million to 1 in 10,000 (1×10^{-6} to 1×10^{-4}). These calculations indicate that activities in the surrounding neighborhoods do not contribute an appreciable lifetime risk of cancer (or LCR) from asbestos exposure to children or adults at the former W.R. Grace site. Also supporting this conclusion are perimeter sample results indicating that no asbestos was detected away from activities. These results suggest that background or bystander exposures are not a significant contribution to potential risk at this site.

Previous on-site and off-site soil samples collected by EPA indicated asbestos was detected in the soil at trace amounts (greater than 0%, but less than 1.0%) in a few specific locations [7]. EPA has stated that their agency will oversee removal action at this site and the surrounding community for any soils containing asbestos at a level of 0.25% or higher [3]. Asbestos was also detected at levels up to 2% in one of the grids sampled at the Conley Park baseball field. Soil at this grid has now been completely removed and filled with clean soil. Conley Park, which is within a half-mile radius of the Former W.R. Grace Facility, is now fully remediated and open to the community for use [8]. These findings and removal actions suggest that there is not a major health concern relating to asbestos in the community.

Community Health Concerns

The community surrounding the Former W. R. Grace site has taken an active role in allowing the EPA access to residential yards for asbestos testing. Several public meetings have been held by EPA or the community, and ADH/ATSDR has actively participated in these meetings. Dates of meetings held within the community include December 8, 2011, June 19, 2012, October 23, 2012, and February 5, 2013. ADH personnel have attended all meetings held to date, along with personnel from the Arkansas Department of Environmental Quality (ADEQ) and the North Little

Rock Mayor's Office. ADH/ATSDR personnel have spoken to the community collectively, as well as on an individual basis, concerning the potential health effects from asbestos exposure. Since initial environmental testing by the EPA, the community has been made aware of the potential hazards of airborne asbestos through health education and public meeting forums with federal and state agencies involved in this investigation.

Child Health Considerations

In communities faced with soil contamination, the many physical differences between children and adults may require special emphasis. Children could be at greater risk than adults from certain kinds of exposure to hazardous substances. Children play outdoors and sometimes engage in hand-to-mouth behaviors that increase their exposure potential. Children are shorter than are adults; this means they breathe dust, soil, and vapors closer to the ground. A child's lower body weight and higher intake rate results in a greater dose of hazardous substance per unit of body weight. If toxic exposure levels are high enough during critical growth stages, the developing body systems of children can sustain permanent damage. Additionally, children are dependent on adults for access to housing, for access to medical care, and for risk identification. Therefore, adults need as much information as possible to make informed decisions regarding their children's health.

This health consultation evaluates children's exposure (ages 6 years to 18 years calculated; birth to 5 years considered minimal risk) to airborne asbestos from the Former W.R. Grace Facility and surrounding community based on the factors listed above. Potential on-going asbestos exposure could occur in locations where vermiculite wastes were used as fill. However, the EPA has identified and removed all hazardous asbestos levels found in public recreational and/or residential areas. ABS results indicate that asbestos exposures in the community are below levels of health concern for children who play in this area on a regular basis.

Conclusions

Every time vermiculite or waste rock is stirred up, asbestos fibers may be released into the air. However, being exposed to asbestos does not necessarily mean that a person will develop health problems. Exposure to asbestos, depending on the duration (*i.e.*, how long), intensity or concentration (*i.e.*, how much), and frequency (*i.e.*, how often), may increase these residents' risk of asbestos related diseases. There are other factors as well, including size and type (mineralogy) of fibers to which a person is exposed, and personal risk factors such as smoking history, history of lung disease, and genetic susceptibility.

In view of these factors, ADH/ATSDR calculated a LCR value for a combined adult and child exposure under a "worst case" scenario using the ABS results from the EPA. At this site, the

"worst-case" scenario was calculated for a person who was raised in this community as a child and has lived in the same location for over 40 consecutive years. The total excess LCR (1.5×10^{-5}) fell within EPA's target risk value and indicates that airborne asbestos exposures within the community are below levels of health concern. Based on the calculated values and the remedial work already completed, no special precautions are currently needed during any residential or recreational activities near this site.

Recommendations

ADH/ATSDR recommends the following for the Former W.R. Grace Facility in North Little Rock, AR:

- Any future construction or re-development plans in the community should recognize the potential of past asbestos soil contamination from waste rock and/or fill material and plan accordingly.
- Continue to provide public information to educate and increase community awareness about potential residual asbestos remaining near or at the site.

Public Health Action Plan

The purpose of the Public Health Action Plan (PHAP) is to ensure that this health consultation not only identifies any public health hazards, but also provides a plan of action designed to mitigate and prevent adverse human health effects resulting from exposure to hazardous substances in the environment. The PHAP implemented by ADH/ATSDR with regards to the Former W.R. Grace Facility is as follows:

Completed Actions

- ADH responded to a request from EPA Region 6 to evaluate data for public health implications.
- ADH conducted a site visit (November 16, 2011) along with an EPA On-Scene Coordinator and the EPA Contractor.
- ADH attended the public meeting held by EPA (December 8, 2011) and answered questions regarding potential adverse health effects of asbestos-contaminated soils.
- ADH/ATSDR assessed surface and subsurface soil data.
- ADH hosted a free flu shot clinic for area residents (December 20, 2011). This was part of the community health education outreach efforts, as requested by residents (who voiced respiratory concerns) at the public meeting.

- ADH attended public meetings held by EPA (June 19, 2012 and February 5, 2013), and answered questions regarding potential adverse health effects of asbestos-contaminated soils and both meetings.

Future Activities

- ADH/ATSDR will provide public health evaluation of future environmental data and assistance to federal and state agencies, as needed or requested.
- ADH/ATSDR will continue to educate the public and address community member's requests in regards to this site, as needed or requested.
- ADH will review any additional sampling data provided by EPA for public health evaluation.

REPORT PREPARATION

This Health Consultation for the Former W.R. Grace Facility (a.k.a. North Little Rock Auto Salvage) was prepared by the Arkansas Department of Health (ADH) under a cooperative agreement with the federal Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with the approved agency methods, policies, procedures existing at the date of publication. Editorial review was completed by the cooperative agreement partner. ATSDR has reviewed this document and concurs with its findings based on the information presented.

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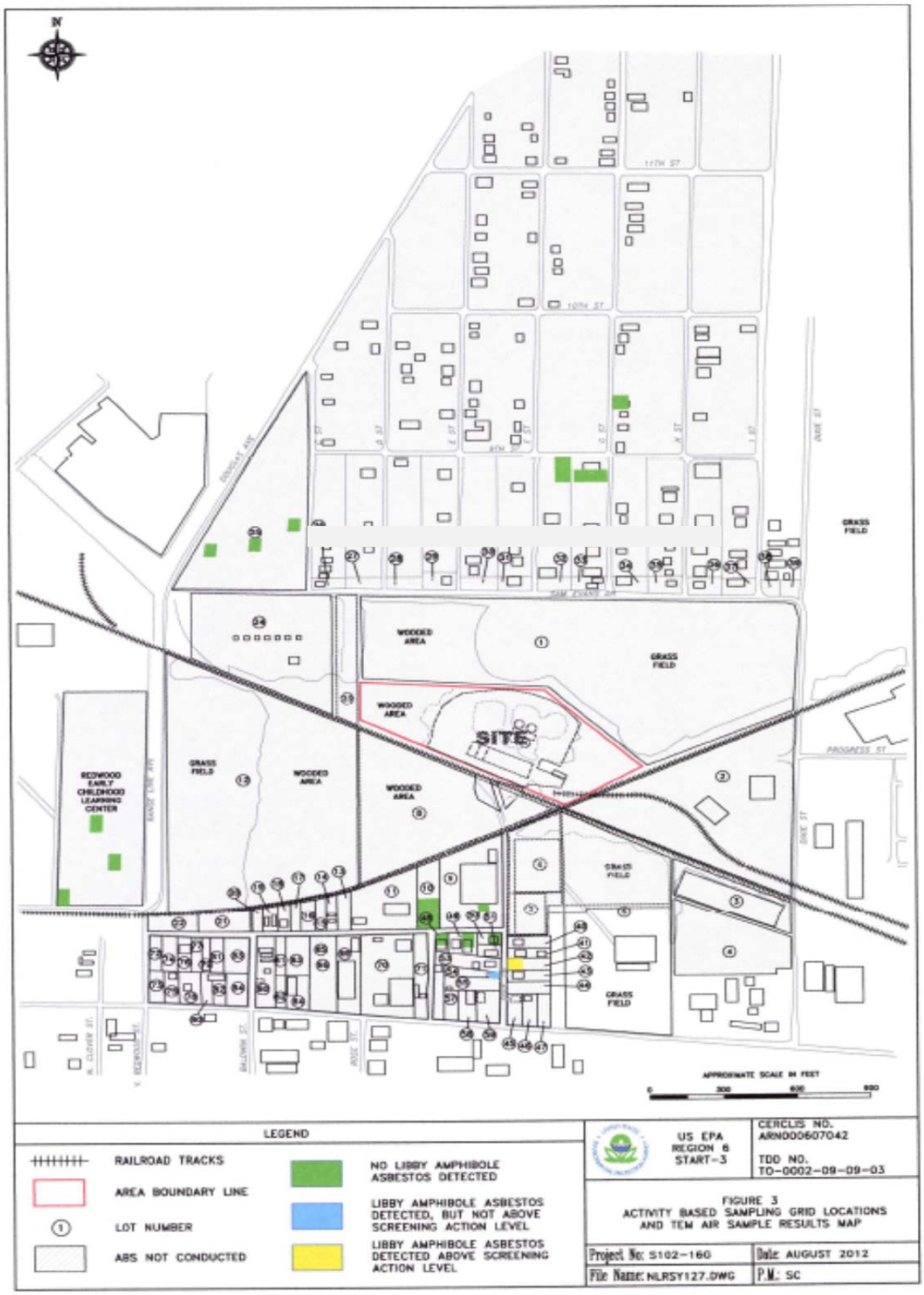
7. U.S. Environmental Protection Agency Region 6, "Soil data for North Little Rock Salvage Yard (formerly known as W.R. Grace/Zonolite)", CERCLIS No. ARN000607042. October 2011.
8. U.S. Environmental Protection Agency, "Removal Assessment Update North Little Rock Auto Salvage (Zonolite Little Rock) Site", Region 6, Dallas, TX. October 2012.

Appendix A: Site Map

Figure 1. Map of Former W.R. Grace Facility: 600 Dixie Lane, North Little Rock 72114

Appendix B: Example Sampling Grid Figure



To protect privacy, residential areas have been blocked off.