DEPARTMENT OF HEALTH & HUMAN SERVICES · USA

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

Public Health Assessment for

AMERICAN BRASS, INCORPORATED
HEADLAND, HENRY COUNTY, ALABAMA
EPA FACILITY ID: ALD981868466
SEPTEMBER 8, 2003

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
PUBLIC HEALTH SERVICE
Agency for Toxic Substances and Disease Registry

THE ATSDR PUBLIC HEALTH ASSESSMENT: A NOTE OF EXPLANATION

This Public Health Assessment was prepared by ATSDR pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund) section 104 (i)(6) (42 U.S.C. 9604 (i)(6)), and in accordance with our implementing regulations (42 C.F.R. Part 90). In preparing this document, ATSDR has collected relevant health data, environmental data, and community health concerns from the Environmental Protection Agency (EPA), state and local health and environmental agencies, the community, and potentially responsible parties, where appropriate.

In addition, this document has previously been provided to EPA and the affected states in an initial release, as required by CERCLA section 104 (i)(6)(H) for their information and review. The revised document was released for a 30-day public comment period. Subsequent to the public comment period, ATSDR addressed all public comments and revised or appended the document as appropriate. The public health assessment has now been reissued. This concludes the public health assessment process for this site, unless additional information is obtained by ATSDR which, in the agency's opinion, indicates a need to revise or append the conclusions previously issued.

Agency for Toxic Substances & Disease Registry.. Julie L. Gerberding, M.D., M.P.H., Administrator
Howard Frumkin, M.D., Dr.P.H., Director

Division of Health Assessment and Consultation…. .... William Cibulas, Jr., Ph.D., Director
Sharon Williams-Fleetwood, Ph.D., Deputy Director

Health Promotion and Community Involvement Branch ....Susan J. Robinson, M.S., Chief

Exposure Investigations and Consultation Branch...Susan M. Moore, Ph.D., Chief

Federal Facilities Assessment Branch .... Sandra G. Isaacs, B.S., Chief

Superfund and Program Assessment Branch ....Richard E. Gillig, M.C.P., Chief

Use of trade names is for identification only and does not constitute endorsement by the Public Health Service or the U.S. Department of Health and Human Services.

Additional copies of this report are available from:
National Technical Information Service, Springfield, Virginia
(703) 605-6000

You May Contact ATSDR TOLL FREE at
1-888-42ATSDR
or
Visit our Home Page at: http://www.atsdr.cdc.gov

PUBLIC HEALTH ASSESSMENT

AMERICAN BRASS, INCORPORATED

HEADLAND, HENRY COUNTY, ALABAMA

EPA FACILITY ID: ALD981868466

Prepared by:

Alabama Department of Public Health
Under a Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry

Foreword

The Agency for Toxic Substances and Disease Registry (ATSDR) was established by Congress in 1980 under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), also called the *Superfund* law. That law set up a fund to pay for identifying and cleaning up our country's hazardous waste sites. The United States Environmental Protection Agency (EPA) and state environmental agencies oversee the site investigation and clean up actions. Historically, public health assessments are conducted by environmental and health scientists from ATSDR. In 1993, the Alabama Department of Public Health (ADPH) entered into a cooperative agreement with ATSDR, the goal of which was that ADPH would develop the capacity to perform this function for ATSDR.

In 1986, the Superfund Amendments and Re-authorization Act (SARA, Title III) required ATSDR to conduct a public health assessment at each site on the EPA National Priorities List (NPL). Public health assessments seek to discover whether people are being exposed to hazardous substances. If people are exposed or have the potential to be exposed, ATSDR decides whether the exposure is harmful and at what level health effects might occur; from these data, a decision can be made whether the exposure should be stopped or reduced.

Exposure: ADPH health assessors review environmental data to see how much contamination is at a site, where it is, and how people might come into contact with it. ADPH does not collect and analyze environmental samples**,** but, instead, reviews sampling data provided by EPA, other government agencies, businesses, or the public. When there is not enough environmental information available, the assessment will indicate that further sampling data are needed.

Health Effects: If the review of the environmental data shows that people have or could come into contact with hazardous substances, ADPH scientists evaluate whether that exposure may result in harmful effects. ADPH, as well as ATSDR, recognizes that children, because of their play activities and their smaller body size, may be most susceptible to these effects. As a policy, unless data are available to suggest otherwise, ADPH health professionals responsible for assessing effects in populations consider children to be more sensitive and vulnerable to hazardous substances. Thus, the health impact to children is considered first when evaluating the health threat to a community. The health impact to other high risk groups within the community (i.e., elderly, those with compromised immune systems, chronically ill, women of child-bearing age, and people engaging in high risk practices) also receive special attention during the evaluation.

ADPH uses existing scientific information that can include the results of medical, toxicological, and epidemiologic studies and disease registry data to determine the health effects that may result from exposure. The science of environmental health is still developing, and sometimes scientific information on the health effects of certain substances may not be available. In such cases, the report will document the need for further data collection activities.

Conclusions: The report assigns a public health hazard category and describes any hazards at the site. It contains a public health action plan that recommends ways to stop or reduce exposure. Because ATSDR is an advisory agency, the report identifies actions that are appropriate for EPA, other responsible parties, or the research or education divisions of ATSDR to conduct. However, if there is an urgent public health hazard, ATSDR can issue a public health advisory to warn people of the danger. When appropriate, ATSDR also authorizes health education or pilot studies of health effects, full-scale epidemiology studies, diseases registries, surveillance studies, or research on specific hazardous substances.

Interactive Process: The development of a health assessment is an interactive process. The approach requires accumulation of information from many sources, including, but not limited to: ATSDR; many city, state, and federal agencies; the companies responsible for cleaning up the site, the principal responsible party (PRP), and the community. Once an assessment has been completed, the conclusions are shared with all interested parties. They are asked to comment on an early draft of the report to make sure the data they provided are presented correctly and responsibly. Sometimes agencies will begin to carry out recommendations when they read the draft conclusions and recommendations.

Community: ADPH needs to determine what people in the area know about the site and what health concerns they may have about the site. Therefore, ADPH gathers information and comments from the public. The public is broadly defined to include people who live or work nearby, property owners, business owners, civic leaders, health professionals, community groups, and anyone else who is interested or concerned. The public is asked to comment on a draft of the report to ensure that the report addresses their health concerns. The final report contains a written response to public comments.

Comments: If you have questions or comments after reading this report, please send them to the Agency for Toxic Substances and Disease Registry, Program Evaluation, Records, and Information Services (PERIS) Branch.

Letters should be addressed as follows:

Chief of PERIS
ATSDR
1600 Clifton Road (E-60)
Atlanta, GA 30333

Table of Contents

List of Tables

List of Figures

List of Acronyms and Abbreviations

ABI	American Brass, Inc.
ADEM	Alabama Department of Environmental Management
ADPH	Alabama Department of Public Health
ATSDR	Agency for Toxic Substances and Disease Registry
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
EMEG	Environmental Media Evaluation Guides
EPA	U.S. Environmental Protection Agency
GIS	Geographic Information System
HRS	Hazard Ranking System
LTHA	Lifetime Health Advisory for Drinking Water
NPL	National Priorities List
MCLG	Maximum Contaminant Level Goal
RCRA	Resource Conservation and Recovery Act
RMEG	Reference Dose Media Evaluation Guide

Summary

The American Brass Incorporated (ABI) is in a rural, agricultural area approximately 4 miles southwest of Headland, Henry County, Alabama, on Alabama Highway 134. The entire property covers approximately 148 acres. The ABI site is an abandoned secondary smelter/foundry facility covering approximately 30 acres. Several structures currently exist on the developed portion of the site. The office building, nearest Highway 134, has been broken into and vandalized. The furnace building is open to trespassers and contains open sumps approximately 10 feet deep that hold at least one foot of water. These structures are only partially fenced. Warning signs have been posted and public access to the site from Highway 134 is restricted by concrete barriers (Figure4,5). Access from Arnold Faulkner Road is restricted from motor vehicle traffic by an earthen mound and a chain (Figure 6). There are no restrictions to access of the former Ball Mill Residue pile.

The Alabama Department of Environmental Management (ADEM) referred ABI to EPA Region IV for immediate action in February 1996 (1). This was done based on findings in the preliminary assessment of the site. In October 1996, EPA conducted its first round of emergency removal actions.

In 1998, ADEM prepared a Hazard Ranking System (HRS) package. A HRS package describes the environmental problem and assigns a hazard score. Based on the HRS score, EPA proposed ABI to the National Priorities List (NPL). This NPL registers uncontrolled hazardous waste sites that have released or pose a threat of release of hazardous substances into the environment. ABI was included in the NPL listing in May 1999.

NPL sites are eligible for Superfund-financed remedial actions. These sites are addressed through a combination of removal and remedial authority. Clean-up activities under removal authority are handled promptly through emergency, time-critical and non time-critical actions. Clean-up activities under remedial authority are called remedial actions. EPA completed a second round of removal activities at this site in March 1999. EPA has assigned personnel and funds to investigate any residual contamination and finish cleaning up the site. As EPA provides data on any remaining contamination, ADPH will evaluate it to assess any potential public health impact.

The conclusions reached in this report are:

1. The ABI site poses a public health hazard for trespassers due to the potential for physical injury.

2. The ABI site currently poses no apparent public health hazard for nearby residents.

3. The ABI site may have posed a public health hazard for workers in the past due to the metal, pesticide, and PCB contamination present in onsite soils.

The recommendations given in this report are:

1. Access to the property should be restricted and warning signs posted until the property is fully remediated.

2. The structures on the ABI property need to be stabilized or demolished before the property can be used again.

3. Evaluate the areas of contaminated soil to select the appropriate remediation mechanism to eliminate present and future exposure to contaminants.

4. New environmental data or information concerning the future use of this property may require future health consultations.

Purpose and Health Issues

The Agency for Toxic Substances and Disease Registry (ATSDR) is required by the Superfund law to become involved with all sites that are on or proposed for the NPL. The Alabama Department of Public Health (ADPH) has a cooperative agreement with ATSDR to assess the public health impact of hazardous waste sites in Alabama. ADPH conducted this public health assessment on American Brass, Incorporated to evaluate site conditions and environmental data collected from both on-site and off-site environmental water, soil, and sediment samples. The purpose of this public health assessment is to determine whether site conditions or environmental exposure to site-related contaminants poses or posed a public health hazard.

During this public health assessment, ADPH reviewed environmental data and community health concerns. Limited health outcome data was available for review. The data collected show specific contaminants that have been measured in the environment and the levels of concentration. When ADPH establishes that people are being or have been exposed to contaminants, we determine whether people may have sufficient exposure to cause harm. An investigation of the community health concerns can reveal specific health problems or site-related events the people near the site have experienced. ADPH determines whether those health problems or events could be related to exposure to contaminants present at the site. Health outcome data show how much sickness and/or death has occurred in the area because of certain health problems. ADPH can use some health outcome data, if they are available, to determine if illness has occurred as a result of exposure.

This public health assessment describes the public health impact of physical hazards or of past, present, and future environmental exposure to site-related contaminants. ADPH uses this evaluation to assign an appropriate public health hazard category. In some cases, ADPH has enough data to determine whether people were exposed in the past. However, a lack of data may make it impossible to measure some past exposures. The public health action plan lists actions ADPH has recommended to protect public health.

Background

Site Description and Operational History

The ABI site is in a rural, agricultural area approximately 4 miles southwest of Headland, Henry County, Alabama, on Alabama Highway 134. The site is approximately 5 miles north of Dothan, Alabama, and approximately 5 miles east of Midland City, Alabama (Figure 1).

The entire property covers approximately 148 acres. Twenty-four acres at the northern end of the property were developed for industrial use. The developed portion of the site is bordered on the north by Highway 134, on the west by farmland and trees, on the south by the Seaboard Coast Line

Railroad, and on the east by an unpaved road (Arnold Faulkner Road/County Road 1), swamp, and trees. The undeveloped portion of the property south of the railroad extends to the Houston County line. That portion was previously covered with trees and swamp, except for a (5- acre) clearing where ABI piled ball mill residue. In this report, “the site” refers to approximately 30 acres that includes the developed portion and the clearing south of the railroad (Figure 2) (2, 3).

The developed portion of the site has a relatively level ground surface. Changes in elevation include low areas and ditches that allow drainage to swamps. Surface water runoff from the developed portion drains to a swamp in the northeast corner of the property. This swamp drains north toward an unnamed tributary of Dunham Creek. Surface water runoff from the clearing (south of the railroad) drains south toward an unnamed tributary of Cedar Creek. Surface water runoff beside the railroad appears to flow both east and west along the track (3, 4).

The area receives approximately 55 inches of rainfall per year. Some rainfall runs off as surface water and the rest soaks in to become groundwater. Groundwater is water that fills pores below the ground surface. The ground below the site (the residuum) is a deep, well drained, heterogeneous combination of sand, clay, gravel, boulders, altered limestone, and sandstone. Groundwater from the residuum recharges the Lisbon Aquifer immediately below it. The Lisbon Aquifer is approximately 100 feet deep and consists of sand, clay, and small gravel. Groundwater in the saturated portion of the residuum moves generally to the east. Groundwater in the Lisbon Aquifer moves to the west (1, 2, and 5) the Lisbon Aquifer may serve as a source of potable water for private wells in the areas immediately surrounding the ABI site.

The Headland Industrial Development Board holds the title to the ABI site which is an abandoned secondary smelter/foundry facility where scrap metals were melted down to recover brass. Several structures currently exist on the developed portion of the site. The main office building, which has been vandalized, also contained a laboratory and a machine shop on the east end. The furnace building (the largest building), the ball mill building, and the ball mill residue building are also not secured. Two baghouses remain on-site. An open furnace cooling water basin continues to contain water and is fenced. Previously used structures that have been removed include a railroad spur, an impoundment lagoon, a wooden slag storage building, and structural elements of the furnace building (i.e., chimneys, ventilation ducts, and the ingot conveyer belt) (2). The developed portion of the site is only partially fenced (Figure 2) (3).

Aerial photographs taken of the property in 1961 show the ABI site as farmland, with a farmstead on the east side next to Arnold Faulkner Road (2). The site was converted from farmland to industrial use in the 1960s. ADPH has little knowledge about initial industrial development; however, United Chemical Corporation installed a well on the site in 1965 (5 USGS WA 1994). In the early to mid-1970’s, the Mississippi Chemical Company (MCC) operated a fertilizer packing facility on the site. MCC received bulk quantities of ammonium nitrate and agricultural materials by rail, blended them, and packaged the products for resale as fertilizer. [(2)]

In 1976, Lewis Sitkin converted the site to a brass smelting facility called Sitkin Smelting and Refining (SS&R). Mr. Sitkin also operated an SS&R plant in Pennsylvania. SS&R had a contract with Dow to conduct silver extraction from silver nitrate, silver oxide, and oil alumina. It also had contracts with Polaroid and Kodak to extract metals from film. In 1978, Mr. Sitkin filed for bankruptcy on the Alabama facility. Commercial Technology of Dallas, Texas, acquired the facility and reorganized it as American Brass, Inc. (ABI) [(2)].

ABI conducted brass smelting operations from 1978 until 1992. Scrap metal was smelted in furnaces to retrieve brass that was poured into molds, cooled, packaged, and shipped to customers. Furnace chimneys were lined with fire bricks that were replaced every 6 to 8 weeks. One baghouse collected furnace gases from the top of the furnace. A second baghouse collected flue gases from the back of the furnace, thus reclaiming zinc oxide dust that was sold to customers. Furnace slag was cooled outside the furnace building, then it was crushed and put into ball mills. The ball mills crushed the slag further, then the slag was shaken and screened, and residual brass was recovered. The remaining ball mill residue was kept in the ball mill residue building until it was sold or piled on site [(2)]. Local residents reported that ABI furnaces operated around the clock throughout the week (9).

ABI operations created four types of waste: 1) Baghouse dusts contained zinc, boron, lead, and cadmium. 2) Brass furnace slag contained lead, cadmium, zinc, iron, copper, boron, manganese, molybdenum, and brass. 3) Ball mill residue contained smaller amounts of the same substances found in the brass furnace slag. 4) Used fire bricks from the furnace chimneys contained brass, lead, and cadmium. At times, these wastes failed Toxicity Characteristic Leaching Procedure tests for the named substances. ABI had a history of violations and enforcement actions brought by ADEM and EPA (1). Inspectors noted several types of violations, including waste material spilled where it was generated, and a 1-4 inch layer of waste material spilled on Arnold Faulkner Road during transport to the ball mill residue pile south of the railroad (4, 5).

Regulatory and Remedial History

The Resource Conservation and Recovery Act (RCRA) applies to industries while they are operating. Congress passed RCRA to require companies to dispose of waste materials in a manner that conserves land, energy, and useful materials. ADEM and EPA were responsible for regulating ABI under the RCRA law. Both agencies inspected and took environmental samples between 1986 and 1992. During those years, ABI received several Notices of Violation (NOVs) on the four types of waste they created. The NOVs were issued for improper handling of wastes and for wastes that contained unacceptable levels of contaminants (1, 2).

After ABI closed in 1992, ADEM and EPA continued investigation and clean up activities under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Congress passed CERCLA to investigate and clean up hazardous waste sites. This law can be applied to facilities that are either closed or still operating. ADEM prepared a Preliminary Assessment of ABI in July 1995. Based on that report, ADEM referred the site to EPA for immediate action (1, 2).

EPA investigated the site and conducted removal actions in 1996 and 1997. During that period, EPA removed structural elements of the furnace building (i.e., chimneys, ventilation ducts, and the ingot conveyer belt); cleaned buildings and machinery; removed some soil; excavated an impoundment lagoon; moved waste material and debris to the ball mill residue pile; and covered the ball mill residue pile with a protective liner. EPA continued its removal activities in 1998 and 1999. During this second period, EPA removed the ball mill residue pile, soil under the pile, and diesel fuel from storage tanks (2). These actions were intended to remove any immediate hazards.

ADEM prepared a Hazard Ranking System (HRS) package in 1998. An HRS package describes the environmental problem and assigns a hazard score. Based on the HRS score, EPA proposed ABI to the National Priorities List (NPL). The NPL listing was finalized in May 1999 (1, 2). EPA has assigned personnel and funds to investigate any remaining contamination and finish cleaning up the site. As EPA provides data on remaining contamination, ADPH will evaluate it to assess any potential public health impact.

Additional documents have been prepared by ADEM and EPA. All public documents are available for review at the Blanche R. Solomon Memorial Library, 17 Park Street, Headland, Alabama.

Demographics, Land Use, and Natural Resources Use

The ABI site is in a rural, sparsely populated area in the southwest corner of Henry County, Alabama. The U.S. Census Bureau listed Henry County's population in 1990 as 15,374. They listed the population of the Headland zip code (36345) as 4,701 (7). 2000 census data list the population of Henry County as 16,310. The city of Headland is listed with a population of 3,523. Demographic data for the State of Alabama and for Henry County show similar percentages for age, sex, and race (8).

ATSDR prepared an introductory Geographic Information Systems (GIS) map for ABI (Figure 3). Based on 1990 census data, the GIS map estimates a population of 148 people living within a 1-mile radius of the site. A 1-mile radius is a circular shape drawn around the site to mark the area nearest the site (within 1 mile of the site border). Health professionals identify the people nearest sites because those people are more likely to be exposed to site-related contaminants.

ADPH conducted a community survey of homes nearest the ABI site. Fifty homes were found within a 1-mile radius of the ABI site. Based on survey interviews conducted in 1999, ADPH estimated the population within 1 mile of the site as 100 to 130 people. Many of those people are native to the area or have lived there most of their lives. There are no institutions such as schools, nursing homes, or day care facilities within 1 mile of the site. A smaller percentage of African Americans live within 1 mile of the site than the percentages of the state, the county, and the zip code. However, African Americans and children have historically lived very near the facility (9). ADPH personnel have seen evidence of trespassing on the site, and environmental personnel noticed children riding bicycles onsite in waste-disposal areas prior to clean up activities (3, 4).

Aerial photographs taken in 1961 and 1968 show homes within 100 yards of the west and north borders of the site. An aerial photograph taken in 1977 shows two additional homes near the east border of the site; those homes still exist. The homes north and west of the site in the 1961 and 1968 photograph no longer existed in a 1981 aerial photograph (2).

Municipal water is available to most residents within 1 mile of the site. Some of those residents use municipal water and others continue to use private wells. A few of the nearest residents still use private wells (9).

Land near the site is used to raise peanuts, cotton, soybeans, and corn. Cattle are also raised within one mile of the site. Residents near the site have historically harvested pecans and fruit from trees on their property. Residents also reported that local people fish in the unnamed tributaries to Dunham Creek and Cedar Creek and in beaver ponds on those tributaries (9).

ADPH assumes that the people who are most susceptible to environmental exposure are trespassers who may have been on site before EPA removal actions and people who live nearest the site on Arnold Faulkner Road.

ADPH and ATSDR Involvement

In 1996, ADPH and ATSDR were requested to review environmental sampling data to determine if contamination at the site posed a public health hazard, and to comment on proposed clean up levels. Both agencies responded with recommendations based on possible exposure scenarios and future land use. The Henry County Health Department conducted the recommended blood lead testing. In 1998 ADPH responded to a request from ADEM to supply information on lead levels and health effects, and actions to reduce potential exposure. The data ADPH and ATSDR evaluated in those actions were also evaluated for this report.

When the site was proposed to the NPL in 1999, ADPH and ATSDR began the required public health assessment activities. ADPH provided input during a site visit to EPA for their Community Relations Plan and recommended that the site be fenced to restrict public access due to physical hazards. ADPH and ATSDR participated in the public availability session hosted by EPA. ADPH also collected community health concerns, activities of local residents, and educational needs through a community survey.

Quality Assurance and Quality Control

The quality of this public health assessment is dependent upon the quantity and quality of the sampling data and information evaluated. ADPH reviewed available information on the chain of custody, laboratory, and data reporting procedures provided in documents referenced in this report, and found no deviations from approved adequate quality assurance and quality control methods. Field notes, maps, diagrams, photographs, and site descriptions were reviewed for assistance in interpreting sampling data.

Discussion

Environmental Contamination and Exposure

ADEM and EPA conducted several investigations and sampling events at ABI while the facility was operating. Sampling data are reported in documents referenced in this report. Most of the substances found in waste material at the ABI site occur naturally in the earth without harming the public, and some are essential nutrients for humans. Therefore, ADPH screened the substances reported in sampling data to select those that require public health study. Each substance was screened by comparing its concentration level in the environment with ATSDR's health-based comparison values.

Comparison values are set below the levels that would be expected to harm public health to assure a margin of safety to the public. ADPH emphasizes that comparison values are screening tools for health assessments, and are not to be confused with clean up levels, health effect levels, or toxicity levels. Comparison values used in this public health assessment include ATSDR's health-based environmental media evaluation guides (EMEGs), reference dose media evaluation guides (RMEGs), EPA's maximum contaminant levels (MCLs), maximum contaminant level goals (MCLGs), and lifetime health advisories for drinking water (LTHAs), human health risk assessments (HHRAs), the cancer risk evaluation guides (CREGs), the National Toxicology Program cancer class (NTP), the secondary maximum contaminant level (SMCL) for water, and the safe drinking water standards (SDWS).

Substances at the ABI site that were found at levels above comparison values and substances for which there are no comparison values are considered contaminants of concern and receive further evaluation.

When a substance is released into the environment, it enters the air, soil, water, or food chain. That release does not always cause human exposure. People are exposed only if they come into contact with the substance. Exposure may occur through breathing, eating or drinking, or skin contact. Many things determine whether exposed people will experience adverse health effects:

- exposure dose (how much),
- exposure duration (how long),
- exposure frequency (how often),
- how contact occurred,
- exposure to other substances,
- age, sex, and family traits,
- health habits, and
- health status.

To best serve the community, public health assessments attempt to make exposure estimates that reflect actual human activity and select appropriate comparison values. ADPH used information from the community, health and environmental data, and site observations to evaluate human exposures.

Soil Pathway

Baghouse dust and furnace slag dust samples were taken in or next to operational (process) buildings. The public was not likely to have extensive contact with those contaminants before ABI closed in 1992. However, the public had access to those areas between 1992 and the clean-up activities in 1996-1997. Workers or trespassers who came into contact with the waste material and soil could be exposed to boron, cadmium, cobalt, copper, lead and mercury through inhalation (breathing) or incidental ingestion. Incidental ingestion is swallowing small amounts of material through normal hand-to-mouth activity.

Soil near the baghouse and other operational buildings was not easily accessible. The public was not likely to have extensive contact to those contaminants before ABI closed in 1992. However, the public had access to those areas between 1992 and the clean-up activities in 1996-1997. Employees or trespassers who came in contact with that soil could have been exposed to aluminum, arsenic, boron, cadmium, copper, lead, mercury, vanadium, zinc, pesticides and PCBs, benzene, and toluene through inhalation or incidental ingestion. ADPH assumes chronic inhalation and incidental ingestion for employees or trespassers.

The furnace slag pile was near the operational buildings. Employees of ABI would have had unrestricted access to the slag pile. The public was not likely to have extensive contact with those contaminants before ABI closed in 1992. The slag pile was cleaned up in 1992, preventing public access to contaminants. Employees who came into contact with the slag pile could have been exposed to aluminum, cadmium, chromium, and lead through incidental ingestion. Therefore, ADPH assumed chronic inhalation and incidental ingestion for former employees of ABI.

A ball mill residue pile was created south of the railroad and was easily accessible to the public until it was covered with a liner in 1997. Trespassers who came into contact with the waste pile could have been exposed to beryllium, boron, copper, lead, manganese, and zinc through incidental ingestion. ADPH assumes chronic inhalation and incidental ingestion for trespassers on the site.

Remedial actions were undertaken between 1996 and 1999. During the first removal action in 1996, soil and waste material was removed from the main site facility and placed in the ball mill residue pile. During the second removal action in 1999, the ball mill residue pile was excavated to a maximum depth of seven feet. The hazardous waste was sent to a hazardous waste landfill in Michigan. After clearance testing, the excavated areas were then backfilled with onsite soil (1).Sampling performed over the entire site after the removal activities revealed the presence of metals, PCBs and pesticide contamination in both the surface soil (Table 1) and subsurface samples (Table 2). Aroclor 1260 (PCB) was detected south/southwest of the process building in an open storage area. This area was not accessible to the public while the facility was in operation. Since the facility has been closed, trespassers who come into contact with the soil in this area may be exposed through inhalation and incidental ingestion. ADPH assumes chronic inhalation and incidental ingestion for trespassers, and former workers at the site.

Surface Water Pathway

ABI is located on a sub-regional drainage divide. Surface waters are diverted primarily eastward/northeastward toward Dunham Creek or southward/southwestward toward Cedar Creek.

On the northern portion of the site, runoff from the foundry facility drains through two or three drainage ditches to a swampy area located to the northeast of the facility along Highway 134. This seems to be the source of the unnamed tributary of Dunham Creek which flows north/ northwest to Blackwood Creek (4).

Although sampling indicates that some contamination has reached the tributary to Dunham Creek, there are no drinking water intakes within the 15-mile downstream distance. Dunham Creek (from its source to Blackwood Creek) is classified as fish and wildlife usage although Dunham Creek seems too small to support fish large enough for human consumption.

On the southern portion of the site, there is an approximate 5-acre area located near the intersection of the railroad and the unpaved county road (Arnold Faulkner Road) where the foundry accumulated ball mill residue. Stressed vegetation is noted in this area. Drainage from the former ball mill residue pile drains southward toward an intermittent creek which feeds Cedar Creek. Cedar Creek flows into Omusee Creek, which flows to the Chattahoochee River.

It is known that fish have been caught and eaten from Cedar Creek. At the point where fishing has occurred, the levels of contaminants found in the surface water were below ATSDR screening values (5).

Sampling conducted after the removal activities were accomplished showed the presence of metals and boron in the surface water on the site (Table 3). Trespassers in the area could be incidentally exposed to contaminants in the water through ingestion or dermal contact. The potential for people to be exposed to the contaminated surface water is low.

Groundwater Pathway

The groundwater gradient in the ABI site area is generally to the east. The Lisbon Aquifer, which underlies this site, is highly susceptible to contamination from surface sources. This aquifer may be the source of water for primary private wells in the immediate area. A confining layer exists below the Lisbon Aquifer that should prevent downward leakage to deeper aquifers that are used for the public drinking water supply.

Four monitoring wells were established on the ABI site. Contaminants in groundwater from sampling done in 1987, 1989, and 1991 at the site include lead, chromium, and 1,2,3-Trichlorobenzene. Additional samples were taken from the private wells immediately surrounding the site. The presence of copper and lead were noted at levels that exceed comparison values in these samples. ADPH assumes chronic ingestion and dermal contact with contaminants in the groundwater for nearby residents (including children) that utilize private wells for household water use.

During the remedial investigation (EPA 2000) groundwater was sampled in two phases. In Phase I, 38 temporary wells were established in the Lisbon Formation. A total of 37 samples was collected and analyzed for volatile organic compounds (VOCs), extractable organics, pesticides, PCBs, and metals.[1]

Of the samples collected, VOCs were detected primarily in the well near the underground storage tanks. Also found in the samples were pesticides, PCBs, and metals. During Phase II, a network of 37 monitoring wells was established, including: 11 shallow wells at 30 to 40 feet below ground surface (bgs), 13 intermediate wells at 45 to 60 ft. bgs, and 13 deeper wells at 90 to 100 ft. bgs. Analysis from this sampling round revealed the presence of ammonia, boron, metals, nitrate, and PCBs (Table 5).

Phase II sampling included monitoring of the two residential wells east of the site. Sample results revealed no current exposure for the residents. ADPH assumes past exposure to residents of the homes near the site through ingestion and dermal contact.

Sediment Pathway

A pond that is located outside the foundry borders (east across Arnold Faulkner Road) has been contaminated with what has been presumed to be fly-ash blown down from the furnaces. Debris falling from trucks during the transport of waste material from the main facility to the ball mill residue pile also contaminated the pond. This process settling pond (Bato pond) has an area of approximately 2500 square feet. Sediment from the bank of this pond is contaminated with cadmium, lead, and zinc at levels above their comparison values.

Though no barriers exist to prevent access to the Bato pond, frequent visitations are unlikely due to the surrounding overgrowth and the condition of the water. While there is a potential for exposure of humans to any contaminants which may be contained in the sediment from the Bato pond, it is very unlikely.

Sediment samples collected from Dunham and Cedar Creeks and from tributaries to Dunham and Cedar Creeks revealed the presence of metals and boron at levels above health-based comparison values. DDD, DDE, DDT, and PCBs were also detected in the sediment samples. In addition to the metals found in the surface water, pesticides and PCBs were also detected in the sediment samples from the south process ditch and Cedar Creek (Table 6).

Children playing in the creek could be exposed to contaminants in the sediment via ingestion or dermal contact; however, there is no evidence of frequent visitation to the creeks.

Air Pathway

According to community surveys, smoke and odor were problems during ABI's operation. Uncontrolled night burning was a regular occurrence and made it difficult to breathe. Numerous correspondences from ADEM to ABI mentioned problems with fugitive emissions and the opacity of the emissions. The accumulation of a blue residue on house tops was also noted (5).
ABI was not operating during this assessment period, and as such, no air monitoring was accomplished. While operational, ABI produced dust from air pollution control equipment on air vented from the furnace building. This dust was collected in the baghouse, but spillage was a constant occurrence. Dust was also generated from air pollution control equipment on the rotary kiln arc furnaces. This dust was bagged and sold as fertilizer. Again spillage was a constant problem (4).

By nature of being dust, particles were easily airborne. This is evident by the accumulation of contaminants (assumed to be fly-ash) in the Bato pond located outside the site boundary. The substances of concern were cadmium, copper, lead, zinc, mercury, and chromium. However, ADPH has no air data to evaluate (4).

Pathway Analysis

Local residents who responded to the 1999 community survey said they had not seen children on the site. ADPH estimates that no more than 20 children lived (or visited) close enough to ride bicycles or explore on the ABI site. The evidence of trespassing on site consists of few but regularly-appearing food containers and graffiti. Therefore, ADPH estimates that trespassing was by transients or by no more than 10 to 15 adolescents from the local area.

A site visit in 2002 revealed the presence of additional graffiti. Evidence of eating and drinking and the presence of flyers from a 2002 event were found in one of the process buildings. Therefore, ADPH assumes that the area is continuing to be trespassed by adolescents from the area.

Approximately 12 people used the private wells east of the site that contained lead, copper, and zinc. One well is no longer in use. Residents using the other wells were contacted by ADEM, ADPH, and EPA and have received information about health effects, blood testing, and how to limit exposure. Phase II sampling included monitoring of the two residential wells near the site. Sample results revealed no current exposure for the residents. ADPH assumes past exposure to residents of the homes near the site through ingestion and dermal contact.

Children who live near the site have had blood lead samples taken on two occasions. The Centers for Disease Control and Prevention has established that adverse health effects may be seen at blood lead levels of 10 micrograms per deciliter (µg/dL) or above. The highest childhood lead level was below 10 µg/dL. Since no child had a blood lead level above 10 µg/dL , ADPH is confident that any exposure to site-related contaminants has been minimal at best (14).

Public Health Implications

As discussed in the Pathways Analysis section, the surface soil and surface water exposure pathways are considered completed (i.e., human exposure has occurred or is occurring). The contaminants of concern are aluminum, arsenic, benzene, beryllium, boron, cadmium, copper, lead, manganese, thallium, toluene, vanadium, zinc and aroclor 1260 (PCB) for surface soil and water pathways. A groundwater pathway also exists for private wells in the area. Additional contaminants found in the groundwater collected from the Lisbon Formation include nitrates.

The Toxicological Evaluation portion of this section discusses the possible health hazards from exposure to the contaminants of concern in groundwater, surface water, surface soil, and ambient air. Community health concerns are addressed in the Community Health Concerns Evaluation section. Health outcome data are not available at this time.

A. Toxicological Evaluation

1. Introduction

When a substance is released from a large area, such as in industrial plant, or from a container, such as a drum or bottle, it enters the environment. This release does not always lead to exposure. Exposure to a substance occurs only when someone comes in contact with the substance by breathing, eating, drinking, or touching it.

Typically, the toxicological evaluation in a public health assessment is a comparison of the estimated exposure dose (i.e., the amount of a substance individuals in an exposure pathway are exposed to daily) with an appropriate health guideline. The guideline is usually either the Agency for Toxic Substances and Disease Registry's (ATSDR's) Minimal Risk Level (MRL) or the Environmental Protection Agency's (EPA's) Reference Dose (RfD). The MRLs and RfDs are estimates of daily human exposure to a contaminant below which noncarcinogenic adverse health effects are unlikely to occur.

Therefore, a review of the toxicological literature is conducted to determine whether the specific exposure situation represents a hazard to public health.

One of the contaminants of concern, lead, is considered a probable human carcinogen when exposed through ingestion and inhalation. Cadmium is considered carcinogenic only through inhalation (11). PCBs have been shown to cause cancer in animals and the U.S. Department of Health and Human Services has concluded that PCBs may reasonably be anticipated to be carcinogenic. In the only relevant study, zinc has not been shown to cause cancer in one laboratory animal. EPA has not made a determination as to whether zinc could potentially cause cancer in humans (20). There are currently no scientific data on how strong lead is as a cancer causing chemical (i.e., cancer potency factor) (14). Neither beryllium, manganese, thallium, nor vanadium has been proven carcinogenic (10, 15, 18, and 19).

a. Cadmium

Based on human data, there is some possibility of noncarcinogenic health effects for children exposed to cadmium in residential soil. For small children who ingest large amounts of soil (i.e., pica children), the lowest effects level is exceeded when the cadmium level exceeds 15 milligrams of cadmium per kilogram of soil (mg/Kg) (12). Children trespassing on the ABI site would have been exposed to soil cadmium levels exceeding 15mg/Kg.

The lowest observed effect for ingestion of cadmium in humans is proteinuria, which is the discharge of proteins from the kidney into the urine. Epidemiologic studies of individuals living a lifetime in cadmium-contaminated areas in Japan, Belgium, and China identified rates of proteinuria that were statistically greater than rates identified in uncontaminated areas. Proteinuria is considered a mild adverse effect on the kidney. Human studies do not identify a dose where more serious kidney problems begin. Animal studies indicate this level may be about 5 times greater than the exposure dose for small children with the habit of pica and 130 times greater than for small children who do not ingest large amounts of dirt.

Other animal studies reveal that serious developmental and immunological effects begin to be observed at 3 and 70 times greater than the exposure doses for pica children and small children respectively (12). Because of animals' and humans' differences in responses to toxins, it is possible that these more serious effects could occur. However, a child of the age subject to pica behavior is not likely to be on the property for long periods without supervision.

Based on a study of workers exposed to cadmium for 30 years (not related to the ABI facility), it is possible to conclude that air cadmium levels of 0.2 micrograms of cadmium per cubic meter of air ($\mu g/m^3$) or greater could cause mild damage to the kidney as evidenced by an increase in proteinuria (12). There is no ambient air monitoring data available for the ABI site. No health outcome data for residents of this area or former employees of ABI is available.

Since exposure is on an infrequent basis via the trespasser scenario, adverse health effects are unlikely.

Combined Exposures

It is likely that residents of the area around the smelter are exposed to cadmium both through ingestion and inhalation and that those residents' risk of health effects would therefore be greater. Because there are differences in the way the body metabolizes inhaled versus ingested cadmium, it is not possible to calculate what this greater risk might be.

Risk of Cancer

Evidence (i.e., the high surface concentrations of cadmium) indicates that people living near the smelter could have been exposed to high levels of cadmium in the ambient air. This exposure could represent a moderate increase in the risk of cancer for residents around the smelter. The cancer slope factor on which this conclusion is based comes from a study of cadmium smelter workers (not related to ABI) exposed for 6 months to 29 years to dust and fumes from cadmium and other metals (12). The study identified a two-fold increase in the rate of lung cancer. Other causes of lung cancer, such as smoking or arsenic, were properly taken into account.

b. Chromium

Chromium in the environment occurs primarily in the trivalent state (III), which is the most stable form, or in the hexavalent state (VI), which is a strong oxidizing agent. Trivalent chromium is thought to be an essential nutrient required for sugar and fat metabolism. Normal dietary intake of chromium for humans is believed to be suboptimal. The estimated safe and adequate daily dietary intake for trivalent chromium is 50 to 200 µg. However, trivalent chromium has a very large safety range and there have been no documented signs of chromium toxicity in any of the nutritional studies at levels up to 1 milligram (1000 µg) per day. Most diets are thought to contain less than 60% of the minimum suggested daily intake of 50 µg. As a nutrient, chromium will be of benefit only to those who are marginally or overtly chromium deficient (13).

Hexavalent chromium is recognized by the International Agency for Research on Cancer and by the U.S. Department of Health and Human Services as a carcinogen. The increased risk of cancer occurs through inhalation and affects primarily the lung. Although individual studies suggest the possibility of an excess incidence of cancer at sites outside the lung, the results from these studies are inconsistent. Further, studies have shown that the available evidence strongly indicates that hexavalent chromium is changed (reduced) in body fluids and tissues to the trivalent form which greatly attenuates its potential toxicity and genotoxicity. Animal studies have not shown trivalent chromium to be carcinogenic by ingestion. Therefore, even in the respiratory tract which is the only consistent target of hexavalent chromium carcinogenicity in humans, there are barriers hampering its carcinogenicity. These hurdles could be only overwhelmed under conditions of massive exposure by inhalation (13).

Hexavalent chromium compounds also produce an allergic contact dermatitis characterized by eczema. Sensitivity to trivalent compounds is much less frequent; however, industrially, some workers may react to high concentrations of these compounds. Chromium as a pure metal has no adverse effect (13).

c. PCBs

Polychlorinated biphenyls (PCBs) are complex mixtures of up to 209 synthetic organic chemicals with no known natural source. Because PCBs don’t burn easily and are good insulation materials, they were widely used as coolants and lubricants in transformers, capacitors, and other electrical equipment. PCBs are no longer produced in the United States, but are still found in the environment and may cause harmful effects. Many commercial mixtures found in the U.S. are known by the trade name Aroclor (20).

PCBs do not readily break down in the environment and thus remain there for extended periods of time. They can travel long distances in the air and be deposited far away from where they were released. In water, small amounts of PCBs may remain dissolved, but most stick to organic particles and sediments. PCBs also bind strongly to soil. PCBs are taken up into the bodies of small aquatic organisms and fish, especially those fish that are bottom feeders, and can accumulate through the food chain. They accumulate in the body fat and can enter breast milk. The most likely source of human exposure is through the eating of contaminated fish, although PCBs can be absorbed through the skin and via inhalation (20).

Women who were exposed to relatively high levels of PCBs in the workplace or consumed large amounts of PCB-contaminated fish had babies that weighed slightly less than babies from women who were not exposed. Babies born to women who ate contaminated fish also showed abnormal responses in tests of infant behavior. Some of the behaviors lasted for several years. Other studies suggest that the immune systems were affected in children born to and nursed by mothers exposed to increased levels of PCBs. There are no reports of structural birth defects caused by exposure to PCBs or of health effects of PCBs in older children. The most likely way infants will be exposed to PCBs is from breast milk. Transplacental transfers of PCBs were also reported. In most cases, the benefits of breast-feeding outweigh any risks from exposure to PCBs in mother's milk (20).

The Department of Health and Human Services has concluded that PCBs may reasonably be anticipated to be carcinogens. The EPA and the International Agency for Research on Cancer have determined that PCBs are probably carcinogenic to humans. The most commonly observed health effects in humans exposed to large amounts of PCBs are skin conditions such as acne and rashes. Studies of exposed workers (not at this site) have shown changes in blood and urine that may indicate liver damage. General population exposures are not likely to result in skin and liver effects (20).

d. Zinc

Based on human data, there is some possibility of noncarcinogenic health effects for children exposed to zinc in soil (23). Soil zinc concentrations of 50,000 mg/kg and greater result in exposure doses for small children (10 Kg/22 lbs) that exceed the lowest observed effect level in humans of 1.0 mg/kg/day. For small children who ingest large amounts of soil (i.e., pica children), the lowest effects level is exceeded when the zinc level exceeds 2,000 mg/kg. Trespassers at the ABI site could be exposed to soil zinc levels up to 150,000 mg/kg.

The lowest observed effect for ingestion of zinc in humans is a 47% decrease in the level of the enzyme erythrocyte superoxide dismutase, which regulates the copper levels in the body (23). A long-term decrease in erythrocyte superoxide dismutase would result in a copper deficiency. Small children likely experience this effect at a higher dose than adults because children metabolize zinc more slowly than adults. Therefore, children would need more zinc per unit body weight than adults for this effect to occur. Zinc is an essential nutrient, and the recommended daily allowance for children, 10 milligrams of zinc per day (mg/day), is actually the same dose, 1 mg/kg/day, for a 10 Kg child as the lowest observed effect level seen in studies of adults (23). Studies of adults indicate that it is unlikely that small children who do not have the habit of pica (ingesting 5 or more grams of soil a day) would experience other health effects (23). Pica children ingesting soil contaminated with levels of zinc greater than 4,000 mg/kg could possibly experience a decline in high-density lipoprotein levels, or impairment of immune response. Because of the zinc metabolism differences between adults and children, it is uncertain that these health effects would occur in children. A child of the age subject to pica behavior is not likely to be on the property for long periods without supervision. Infrequent exposure to zinc contaminants at the site would make the development of adverse health effects unlikely.

e. Interactions Between Cadmium, Lead, and Zinc

Zinc is an essential element from the diet (23). However, there are no known benefits of cadmium or lead (12,15). Many different metals (e.g., calcium) and nutrients interact with the absorption, distribution, and excretion of cadmium, lead, and zinc. There is some evidence that these interactions may reduce the amount of cadmium, lead, and zinc absorbed into the body. In addition, cadmium, lead, and zinc compete for some similar target sites inside the body. This competition may result in decreased accumulation of cadmium in cells. If this occurs, the toxic effects of exposure to cadmium would be reduced. There are some studies which indicate that simultaneous exposure to cadmium and zinc decreases the toxic effect of cadmium. In addition, zinc may have a protective effect against lead toxicity. However, some toxicological studies indicate that simultaneous exposure to lead and cadmium increases the toxic effects. As indicated by this discussion, there are many factors which influence these interactions (e.g., the dose of each metal, the nutritional status of the person exposed, etc.) and at this time it is not possible to precisely predict how cadmium, lead, and zinc may interact when people are exposed simultaneously to all three metals.

f. Copper

Copper occurs naturally at levels of approximately 50 ppm in the earth's crust. Levels at the ABI site vary up to 10,000 ppm in subsurface soil. Potential for high exposure of the general population to copper may exist where people consume large amounts of tap water that has picked up copper from the distribution system. People living near copper smelters and refineries and workers in these and other industries may be exposed to high levels of copper in dust by inhalation and ingestion.

Copper levels were elevated in the soil at the ABI site, but no health guideline has been developed for copper. Estimates for exposure to copper in food range from 1-5 mg/day. Daily contact with copper in soil would result in exposures much less than those from copper commonly found in food, so adverse health effects are unlikely (14). Infrequent exposure to the soil on the site would make development of adverse health effects unlikely.

g. Lead

Exposure to lead can cause adverse health effects, especially for young children and pregnant women, since lead is a neurotoxin that permanently interrupts normal brain development. Lead has no beneficial biological function and is known to accumulate in the body. ATSDR has not developed a health guideline for lead because no safe threshold has been identified. The U.S. Food and Drug Administration (U.S.FDA) published a provisional tolerable daily lead intake value of 6 micrograms for a 10-kg child based on an acceptable blood lead level of 10 micrograms per deciliter. A survey of a variety of foods determined the average adult lead intake to be 54 micrograms per day (µg/day)(15).

The Centers for Disease Control and Prevention (CDC) considers lead poisoning the number one preventable pediatric health problem facing children today. Several signs of lead toxicity have been described at low levels of exposure that are comparable to those found near these sites. They include decreased attention span, hyperactivity, and lower IQ scores. Lead levels as low as 10 µg/dL have been shown to affect child development. Several studies provide sufficient evidence that children's cognition is adversely affected by lead (15).

Any child might incidentally ingest more lead in a day, body weight for body weight, from the soil on the property than did volunteers who exhibited changes in their blood chemistry consistent with inhibited blood synthesis after consuming a single capsule of lead acetate. Lead is a cumulative poison, in that many small doses have the same effect as a single large dose. Lead primarily attacks the nervous system. Lead also interferes with growth and development of the nervous system. Some laboratory animals that were fed a diet containing lead developed cancers of the liver or kidneys. The

U.S. EPA has classified lead as a probable human carcinogen (U.S. EPA Class B2). There is not enough information available to evaluate the risk of contracting cancer from exposure to lead (15).

Although current estimated ingestion doses of these metals do not appear to consistently exceed health guidelines for most of the population, it is likely that past inhalation exposures to former workers may have been problematic since lung tissues tend to absorb metals more completely than tissues in the gastrointestinal tract. No historical exposure data (blood lead levels) are known to exist from any bio-monitoring of workers at the smelter. No past or present air sampling data are available.

Older children and adults who trespass on the site may regularly be exposed to material high in lead and other metals that are more concentrated near the old smelting operations. Since the frequency of trespass is unknown, estimating potential exposure is very difficult. Still, it is possible that a frequent trespasser may be exposed to metals at levels that would exceed health guidelines.

There are no health guidelines for exposure to lead in soil, so the exposure doses for lead in this medium cannot be evaluated directly. However, blood lead concentrations do relate well to possible health effects (15).

h. Boron

Boron is a naturally occurring substance usually found combined with other substances to form compounds called borates. Common borate compounds are boric acid, salts of borates, and boron oxide. Borates are primarily used in glass production. They are also used in fire retardants, leather tanning industries, cosmetics, photographic materials, soaps and cleaners, and high-energy fuels. Some pesticides used for cockroach control and some wood preservatives also contain borates.

The Department of Health and Human Services, the International Agency for Research on Cancer, and the Environmental Protection Agency (EPA) have not classified boron as to its human carcinogenicity.

One animal study found no evidence of cancer after lifetime exposure to boric acid in food. No human studies are available.

If humans eat large amounts of boron over a short period of time, it can affect the stomach, intestines, liver, kidney, and brain and can eventually lead to death. Irritation of the nose, throat, and eyes can occur if small amounts of boron are breathed in.

Children trespassing on the site or playing in the creeks near the site would be exposed to boron in the soil and surface water at levels that exceed ATSDR's screening values. Infrequent exposure to the soil on the site would make development of adverse health effects unlikely.

i. Nitrates

Nitrates and nitrites are nitrogen-oxygen chemical units commonly found in drinking water at low levels, around three parts per million (3ppm) (18). EPA has determined the Maximum Contaminant Level (MCL) for nitrates in drinking water to be 10 ppm (19).

Elevated levels of nitrates in drinking water wells usually come from fertilizer or manure leaching into the groundwater (18). The primary inorganic nitrates which may contaminate drinking water are potassium nitrate and ammonium nitrate both of which are widely used as fertilizers (19).

Short term exposures to excessive levels of nitrate in drinking water have caused serious illness and sometimes death. Specific research has shown a link between elevated nitrate levels and methemoglobinemia or Ablue baby" disease. This is a disease in which nitrates prevent oxygen from being carried in a baby=s blood. Low oxygen in the blood will cause babies to have shortness of breath and blue-colored skin, which is why the disease is commonly called Ablue-baby syndrome@ (18).

Long term exposure to nitrate levels that exceed the MCL has the potential to causediuresis, increased starchy deposits, and hemorrhaging of the spleen (19).

Nitrates were detected in the groundwater at the ABI site. Residents using private wells may have been exposed to nitrates in the past; however samples from these wells have not shown the presence of nitrates.

j. Manganese

The manganese concentration in the shallow groundwater monitoring wells was higher than that in the drinking water in towns in Greece where elderly (average age 67 years), long-term residents (residing 50 years or longer) displayed differences in various neurological signs from similarly-aged residents of a nearby town where the water contained much less manganese. A child subject to pica behavior might ingest more manganese each day, weight for weight, from the soil on the property than did the villagers described above. There is no evidence to connect manganese ingestion with cancer. Pica behavior typically does not last as long as the people drank manganese-contaminated water and a child of the age subject to pica behavior is not likely to be on the property for long periods without supervision. Manganese is also less readily absorbed from food or other solid material than from water. It is not likely that anyone will be exposed to the metal at levels of health concern (16).

k. Beryllium

A child subject to pica behavior is not likely to be exposed to beryllium at this site at levels of health concerns since the child is not likely to be on the property for long periods without supervision. Beryllium has not been shown to cause cancer in humans. High levels of inhalation exposure in an industrial setting have been shown to cause acute beryllium disease, which adversely affects the lungs and respiratory system. Since the ABI facility is now closed, it is not likely that anyone will be exposed to beryllium at levels of health concern (10).

l. Thallium

Exposure to thallium occurs mainly from eating food grown in thallium-contaminated soil. Exposure to higher levels of thallium may occur in the workplace. Living near hazardous waste sites containing thallium may also result in higher than normal exposure.

The Department of Health and Human Services, the International Agency for Research on Cancer, and the Environmental Protection Agency have not classified thallium as to its human carcinogenicity. Exposure to high levels of thallium can result in harmful health effects. A study on workers exposed on the job (not the ABI site) over several years reported nervous system effects, such as numbness of fingers and toes, from breathing thallium. (21). Infrequent exposure to the soil on the site would make development of adverse health effects unlikely.

m. Vanadium

A child subject to pica behavior is not likely to be exposed to vanadium at this site at levels of health concerns since the child is not likely to be on the property for long periods without supervision. Vanadium has not been shown to cause cancer in humans. High levels of exposure in an industrial setting have been shown to cause lung irritation, coughing, wheezing, chest pain, runny nose, and a sore throat. These effects stopped soon after they stopped breathing the contaminated air. No other significant health effects of vanadium exposure have been found in people. Since the ABI facility is now closed, it is not likely that anyone will be exposed to vanadium at levels of health concern (22).

B. Other Physical Hazards

In addition to the chemical concerns at this site, there are physical hazards. Trespassers to the site could be injured on the broken glass scattered throughout the office building or by the jagged glass in the windows and doors left after the building was broken into and vandalized. The furnace building also poses a hazard to trespassers. It contains open sumps approximately 10 feet deep that hold at least one foot of water, thus presenting a drowning hazard. Other structural buildings on the site are deteriorating. The potential for trespassers to be struck by falling debris is great. Pieces of metal from building roofs and sides are loose and some have fallen.

The site is only partially fenced. A fence extends along the western border from the railroad northward to a point even with the office building, then eastward to the entry drive next to the office building. The front of the office building is not fenced. Another fence extends eastward from the east side of the office building for approximately 12 feet, then southward to a point approximately even with the north end of the furnace building. A single piece of chain prevents vehicle traffic through one drive from Arnold Faulkner Road. The single piece of chain that had been erected across the drive south of the railroad was on the ground in November 1999. Warning signs have been posted and public access to the site is restricted by concrete barriers

Community Health Concerns

Community health concerns are a vital part of public health assessments. Area residents provide valuable information about the health problems that people near the ABI site have experienced. They may have questions or beliefs about the causes of those health problems. Nearby residents can describe their activities that may bring them into contact with contaminated media. Local people can also describe events in the past that affect the people, the land, and the site. ADPH evaluates this information in relation to the environmental sampling data to determine whether the site has affected public health.

ADPH collected information from people who live near the ABI site in scheduled appointments, at a public availability session, and in door-to-door interviews (Appendix C). The health concerns are summarized below with responses. Responses in this report are based on an evaluation of currently available data. Answers to some of the concerns will be revised in the future when new data are evaluated.

Summary of Health Concerns and Responses

- *Some children have learning problems at school. Could those problems have been caused by exposure to lead from ABI?*

  The Centers for Disease Control and Prevention (CDC) has established that adverse health effects may be seen at blood lead levels of 10 micrograms per deciliter (µg/dl). Testing of children under age six around this site did not reveal lead levels greater than 7µg/dl; therefore, lead exposure from this site is not believed to be related to learning problems at a nearby school.

- *Many people in the area use private wells. Should we test our wells? If so, for what substances?*

  Well testing of private well in the vicinity of ABI has been accomplished. During the remedial action, sampling of the two private residential wells immediately adjacent to and down gradient of the site revealed no current exposure for the residents. These wells will be included in future monitoring provided EPA is granted access.

- *Homes in the area were often inundated with smoke when ABI was operating. The smoke was blue/white; had a pungent, metallic odor; and made breathing difficult. Could the smoke have caused lung disease and deaths in this area?*

  ADPH does not have morbidity or mortality data relating to substances at ABI. Because ABI operated as a smelter, smoke would have been released during its operations. This smoke would have contained many of the contaminants found at this site. Although the baghouses were to collect smoke and debris from the stacks, spills and fugitive emissions have been noted. Stack monitoring data from ADEM showed observations of the opacity of the emissions. Opacity of up to 60% was noted from as far away as 1000 ft. ADPH does not have data on air releases from this site.

- *The streams in the area have looked stagnant for the past 10-12 years and have fewer fish than before. Could it be contamination from ABI, and are the fish safe to eat?*

  Both Dunham and Cedar Creeks have tributaries that run through the ABI site. Contaminants from the site have entered the tributaries. Some of the contaminants are available to fish and will accumulate in small aquatic organisms. If fish caught

in either creek are not consumed in large quantities or on a daily basis, the effects of contaminants on humans should be minimal.

· *Could substances at ABI affect the water and cause Parkinson's Disease?*
The levels of contaminants found in the surface water and in the groundwater would not affect the public drinking water. The public water supply is drawn from a deeper aquifer. Only those residences with private wells near the site could be affected. Samples from one of the private wells revealed the presence of manganese at 3.5 ug/L, this level is well below ATSDR's lowest comparison value of 500 ug/L. EPA plans to sample these wells in their ongoing investigation.

Manganism, a Parkinson-like syndrome is caused from too much manganese. The body usually controls the amount of absorbed manganese. Excess manganese in the diet is excreted. Those persons who are iron-deficient may absorb more manganese than normal, and people with liver problems may be unable to eliminate it effectively. (16)

· *There seems to be a lot of cancer in the area. Is the cancer related to ABI?*

No health outcome data are available to link occurrence of cancer to any contaminants found at the ABI site.

ATSDR Child Health Considerations

ATSDR recognizes that infants and children may be more sensitive to environmental exposure than adults. Because of this sensitivity, routes and means of exposure must be examined. Children potentially incur increased exposure to lead as a result of the following factors:

- Children are more likely to be exposed to outdoor media (air, soil, water) because they spend more time outdoors, and because they play and eat outdoors.
- Children are more likely to put unwashed hands in their mouth, or eat with unwashed hands.
- Some children deliberately eat non-food items, such as soil. This is called pica behavior.
- Children are shorter than adults, so they breathe more of the dust, soil, and vapors that are close to the ground.
- Children are smaller, so their exposure results in higher doses of contaminants in relation to their body weight.

Children may sustain permanent damage if they are exposed to toxic chemicals during critical growth stages.

ADPH identified several exposure pathways whereby children trespassing on the ABI site may have been exposed to metals and PCBs at levels that could result in adverse health effects. The Environmental Contamination and Exposure, and Public Health Implications sections above describe exposure scenarios and the potential for adverse health effects.

Conclusions

The ABI site currently poses a public health hazard for trespassers due to the potential for physical injury. Trespassers who enter the office building could be injured on broken glass. Trespassers who enter the furnace building could fall into open sumps and sustain physical injury.

If sufficiently injured in the fall, one could drown in the standing water. Trespassers could be injured inside or outside the buildings if loose pieces of roofing or siding should fall.

The on-site chemical contamination currently poses no apparent public health hazard for nearby residents. Although high levels of contaminants (especially copper, lead, zinc, and, aroclor 1260) are present on the ABI site, the site is heavily vegetated. Though off-site migration may occur, sample results from nearby residences have not shown levels of contaminants to exceed screening values. For Dunham and Cedar Creeks, contaminated areas near the site are not easily accessible.

The ABI site may have posed a public health hazard for workers in the past due to the metal contamination present in onsite soils. However, more data are needed to evaluate this pathway more fully.

Recommendations

The structures on the ABI property need to be stabilized or demolished, and any hazards remediated before the property can be used again.

Access to the property should be restricted and warning signs posted until the property is fully cleaned up.

Although no current apparent health hazard exists, future exposure could occur unless clean-up is accomplished. An evaluation of the areas of contaminated soil to select the appropriate remediation to eliminate long-term exposure to the contaminants is needed. Soil, sediment, groundwater, surface water, and air data need to be collected during the ongoing remedial investigation.

New environmental data or information concerning the future use of this property will require future health consultations.

Public Health Action Plan

A draft of this document has been sent to the Alabama Department of Environmental Management (ADEM) and the United States Environmental Protection Agency (U.S.EPA) for review.

ADPH will be available to consult on the appropriateness and efficacy of future remedial actions.

ADPH will consult with the local county health department on the need for and appropriate method of health education regarding the property.

Preparers of Report

Phyllis Mardis
Public Health Senior Environmentalist
Alabama Department of Public Health

and

Cheryl Browder
Public Health Educator
Alabama Department of Public Health

References

1. U.S. Environmental Protection Agency. Final Remedial Investigation Report for the American Brass, Incorporated Superfund Site, Headland, Alabama. Atlanta: EPA Region IV; 2001 Sept.

2. U.S. Environmental Protection Agency. Remedial Investigation Work Plan for the American Brass, Incorporated Superfund Site, Headland, Alabama. Atlanta: EPA Region IV; 1999.

3 Site Visits. Alabama Department of Public Health, Risk Assessment & Toxicology Branch. 1999.

4. Alabama Department of Environmental Management, Preliminary Assessment on American Brass. Inc. Montgomery, AL; ADEM Special Projects; 1995

5. Alabama Department of Environmental Management. Site Investigation, American Brass, Inc. Montgomery, AL: ADEM Field Operations Division; 1978, 1996.

6. U.S. Geological Survey. Water Availability, Henry County, Alabama: Basic Data. Table 2. Records of Wells and Springs.

7. U.S. Census Bureau.1990 census data available on the Internet; URL: http://www.census.gov.

8. U.S. Census Bureau. Profile of General Demographic Characteristics: 2000; URL: http://factfinder.census.gov

9. Community Survey. Alabama Department of Public Health, Risk Assessment & Toxicology Branch. 1999.

10. Agency for Toxic Substances and Disease Registry. Toxicological profile for beryllium. Atlanta: US Department of Health and Human Services; 1993. Apr. Report No.:TP-92/04.

11. Agency for Toxic Substances and Disease Registry. Toxicological profile for boron (update). Atlanta: US Department of Health and Human Services; 2001, June.

12. Agency for Toxic Substances and Disease Registry. Toxicological profile for cadmium (update). Atlanta: US Department of Health and Human Services; 1999, Jul.

13. Agency for Toxic Substances and Disease Registry. Toxicological profile for chromium (public comment update). Atlanta: US Department of Health and Human Services; 1998, Aug.

14. Agency for Toxic Substances and Disease Registry. Toxicological profile for copper. Atlanta: US Department of Health and Human Services; 1990 Dec. Report No.:TP- 90/08

15. Agency for Toxic Substances and Disease Registry. Toxicological profile for lead (update). Atlanta: US Department of Health and Human Services; 1999, Jul.

16. Agency for Toxic Substances and Disease Registry. Toxicological profile for manganese (public comment update). Atlanta: US Department of Health and Human Services; 1997, Sept

17. Healthy Environments and Consumer Safety Branch of Health Canada; It's Your Health: Manganese and Your Health; September 2001: URL: http://www .hc-sc.gc.ca/ehp/ehd/catalogue/general/iyh/manganese.htm.

18. The Florida Department of Health; Drinking Water Programs, Nitrates and Blue Baby Disease; 2002-2003:URL: http://www.doh.state.fl.us/environment/water/watertox/nitrate.htm

19. U. S. Environmental Protection Agency; Ground Water & Drinking Water: Consumer Factsheet on: Nitrates/Nitrites; November 2002: URL: http://www.epa.gov/OGWDW/dwh/c-ioc/nitrates.html

20 Agency for Toxic Substances and Disease Registry. 2000.Toxicological profile for polychlorinated biphenyls (PCBs). Atlanta, GA: U.S. Department of Health and Human Services.

21. Agency for Toxic Substances and Disease Registry. 1992. Toxicological profile for thallium. Atlanta, GA: U.S. Department of Health and Human Services; Public Health Service. 2001, June

22. Agency for Toxic Substances and Disease Registry. 1992. Toxicological profile for vanadium Atlanta, GA: US Department of Health and Human Services, Public Health Service. 2001, June

23. Agency for Toxic Substances and Disease Registry. Toxicological profile for zinc (public comment update). Atlanta: US Department of Health and Human Services; 1997 Sept.

Certification

This American Brass, Inc., Public Health Assessment was prepared by the Alabama 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 public health assessment was begun.

Technical Project Officer
Superfund Site Assessment Branch (SAAB)
Division of Health Assessment and Consultation (DHAC)
ATSDR

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

Chief, SPS, SAAB, DHAC, ATSDR