ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

Public Health Assessment for

MOHONK ROAD INDUSTRIAL PLANT
MARBLETOWN, ULSTER COUNTY, NEW YORK
EPA FACILITY ID: NYD986950012
MARCH 14, 2005

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.

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PUBLIC HEALTH ASSESSMENT

MOHONK ROAD INDUSTRIAL PLANT

MARBLETOWN, ULSTER COUNTY, NEW YORK

EPA FACILITY ID: NYD986950012

Prepared by:

New York Department of Health
Center for Environmental Health
Under a Cooperative Agreement with
The U.S. Department of Health and Human Services
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
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SUMMARY

The Mohonk Road Industrial Plant site is outside the Hamlet of High Falls in a rural area of Ulster County. Improper disposal of industrial solvents and chemicals used by multiple owners at the site since the 1960s has contaminated the groundwater at the site and downgradient of the site. Groundwater is the only drinking water source for the community.

In the early 1990s, the volatile organic compounds (VOCs) trichloroethene, 1,1,1-trichloroethane and other chemicals were detected in soil and groundwater at the site and in groundwater off-site. One or more site-related contaminants at levels exceeding the New York State Department of Health (NYS DOH) drinking water standards were found in 70 private or commercial drinking water wells since the beginning of sampling in 1994.

At the request of the New York State Department of Health (NYS DOH), the New York State Department of Environmental Conservation (NYS DEC) installed granular activated carbon (GAC) filters in homes and businesses with contaminated well water which exceeded the NYS DOH drinking water standards. Residents had been exposed to several VOCs in groundwater before the GAC filters were installed in 1995. One recently identified contaminant, 1,4-dioxane, is not effectively removed by the GAC filters, and exposures to this chemical continue. The extent of groundwater contamination may increase and affect more private water supplies; however, contaminant movement is being closely monitored.

For an undetermined period of time, possibly for up to 30 years, residents were exposed to chlorinated volatile organic chemicals, specifically bromomethane, chloroethane, 1,1-dichloroethane, 1,2-dichloroethane, 1,1-dichloroethene, 1,1,1-trichloroethane, 1,4-dioxane and trichloroethene, via contaminated private water supply wells, at levels exceeding NYS public drinking water standards and/or public health assessment comparison values. This public health assessment generally confirms the previous conclusions and recommendations drawn by the 1997 health consultation (ATSDR 1997a). Based on ATSDR's public health hazard category classification, the Mohonk Road Plant site was a public health hazard in the past because of exposure to VOCs in private drinking water supply wells. Although exposures were reduced by installation of GAC filters, some exposures to 1,4-dioxane remain. Therefore, this site is currently an indeterminate public health hazard. The public health implications of the remaining exposures to 1,4-dioxane will be evaluated in a separate health consultation. In addition, soil vapor intrusion into indoor air is a potential pathway that needs to be evaluated. For this potential exposure pathway, this site is also classified as an indeterminate public health hazard.

There have been several public meetings and a public availability session held for the Mohonk Road site. Community health concerns at the site focus on the potential for exposures to contaminants in drinking water to cause health problems, particularly cancer. There are also concerns that VOCs from the site will migrate further in the groundwater and affect additional private wells.

Persons known to have been exposed to site-related contaminants in drinking water at this site have been offered enrollment in the NYS VOC Exposure Registry established by the NYS DOH.

The exposure registry allows long-term follow-up on the health status of persons with documented exposures to VOCs from this site as well as other selected sites in New York State. People who are enrolled in the Registry will be kept informed of any research results that come from the Registry data.

Recommendations for the Mohonk Road Industrial Plant Site include: affected private drinking water supply wells should continue to be monitored and treated; groundwater should continue to be monitored, as contamination may affect both existing and potential newly drilled wells and private wells that have thus far not been contaminated; and, actions should be taken to provide a permanent, alternate supply of drinking water to dissociate people from the contaminated water on a long-term basis. All owners of properties with underlying groundwater contamination should be notified of the contamination and encouraged to notify future owners of the property should they sell or otherwise transfer ownership. In addition, soil gas contaminated with VOCs may be present and could intrude into the indoor air of residences in the area. No data have been collected to evaluate this potential exposure pathway. This PHA recommends that EPA evaluate the possibility that soil gas contaminated with VOCs may intrude into the indoor air at residences.

The NYSDOH and ATSDR also will perform a separate Health Consultation on the public health implications of exposure to 1,4-dioxane.

PURPOSE AND HEALTH ISSUES

The purpose of this public health assessment is to evaluate past exposures and potential current and future exposures to site-related contaminants. It fulfills the congressional mandate for a public health activity for each site on the National Priorities List (NPL). For the Mohonk Road site, the only completed exposure pathway is for volatile organic compound (VOC) contamination in private drinking water wells. Water from those wells was contaminated for a period of up to 30 years, until carbon filters were installed to reduce exposures. The primary health concerns are for past exposures to VOCs in private drinking water wells and long-term use of contaminated groundwater (with treatment) for drinking water.

BACKGROUND

Under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR), the New York State Department of Health (NYS DOH) evaluated the public health significance of the Mohonk Road Industrial Plant site. More specifically, the ATSDR and NYS DOH determined whether health effects related to this site are possible, and recommended actions, listed at the end of this document, to reduce or prevent possible health effects. The ATSDR is a federal agency within the U.S. Department of Health and Human Services and is authorized by the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, to conduct public health assessments at hazardous waste sites proposed for the National Priorities List (NPL). The Mohonk Road Industrial Plant site was proposed to the NPL in September 1998 and was placed on the NPL in 1999.

A. Site Description and History

The Mohonk Road Industrial Plant site is at 186 Mohonk Road, outside the Hamlet of High Falls, in a rural area of Ulster County. The site is approximately 14.5 acres, most of which is undeveloped property. The site is bounded on the southeast by Mohonk Road and to the northeast, northwest, and southwest by residential properties on large wooded lots.

The property was used for manufacturing, by multiple owners, since the 1960s. The plant began operation in the mid-1960s as Varifab. Varifab reportedly used trichloroethene in assembling and finishing metal parts for cash registers. In 1972, R.C. Ballard Corporation conducted a wet spray painting process at the site and operated a vapor degreasing machine in its manufacturing process. Degreasing typically requires large quantities of solvents, including 1,1,1-trichloroethane, to clean the metal surfaces. 1,4-Dioxane was mainly used as a stabilizer for 1,1,1-trichloroethane, and was likely introduced to this site when 1,1,1-trichloroethane came into use. The site was purchased in 1976 by Daniel E. Gelles, who began manufacturing plastic and metal store display fixtures at the site. Gelles' coating process generated "waste lacquer" until 1991, when the company began using electrostatic powder coating. Solvents were reportedly mishandled at the plant and various chemicals were disposed on the ground on the north side of the approximately 43,000 sq. ft. building.

In the early 1990s, VOCs, including benzene, toluene, 1,1,1-trichloroethane and trichloroethene, were detected in soil and groundwater on and off the site, from solvent disposal at the site. Other VOCs identified at the site include 1,1-dichloroethane, 1,1-dichloroethene, cis- and trans-1,2-dichloroethene and chloroform. All data presented here are for the total of cis- and trans-isomers of 1,2-dichloroethene.

In January 1993, two composite samples from the drums left on the site were collected and analyzed. The highest detected value for these samples analyzed for VOCs are as follows: 1,1-dichloroethene - 938 milligrams per kilogram (mg/kg) waste; toluene - 10,400 mg/kg; 1,1,1-trichloroethane - 31,100 mg/kg; ethylbenzene - 4800 mg/kg; and total xylene 10,100 mg/kg.

Groundwater is the primary source for drinking water in the area. There is no public water supply system for this rocky, mountainside hamlet. In April 1994, responding to a private resident's concern that her drinking water was contaminated, the NYS DOH tested the water and found volatile organic contaminants above the state drinking water standards for public water supplies.

Since April 1994, 136 private/commercial wells have been tested, with 70 wells containing one or more site-related contaminants at levels exceeding the NYS DOH drinking water standards. Granular activated carbon (GAC) filters were installed in all 70 wells, and bottled water was provided when requested. Residential wells are affected up to 0.85 miles away from the source.

In the fall of 1996, a NYS DEC contractor performed an Immediate Investigation Work Assignment (IIWA). The IIWA included sludge and water sampling from an abandoned 1000-gallon underground storage tank found on-site. Sludge from the tank contained 1,1,1-trichloroethane at 260,000 mg/kg (26%) and 18,000 mg/kg of 1,1,-dichloroethene. The tank was assessed to be a major source of the 1,1,1-trichloroethane and other VOCs in the groundwater. The tank was removed as an Interim Remedial Measure (IRM) in September 1997. The bottom of the tank was corroded and had numerous holes through which contaminants leaked. Soil that appeared to be contaminated beneath the tank was excavated and disposed off-site.

NYS DOH and ATSDR issued a Health Consultation (HC) for this site on December 9, 1997 (ATSDR 1997a). The HC concluded that the Mohonk Road Industrial Plant Site is a public health hazard because of past exposures and possible current and future exposures to VOCs in private drinking water supply wells. It also concluded that human exposures to contaminants occurred via ingestion, inhalation and dermal contact for some undetermined period of time, possibly up to 30 years. The HC recommended continuing monitoring of private water supplies and providing treatment where contaminants were found above drinking water standards. It also recommended a remedial investigation to determine the extent of contamination, and action be taken to provide a permanent, alternate water supply to residences with contaminated wells.

On May 5, 1999, US EPA contractors dug test pits on-site. One of the test pits, approximately 50 feet behind the building, contained what appeared to be paint wastes. Prior to backfilling the pit, soil and waste samples were collected and subsequently analyzed. The highest

concentrations were found in a mixture of fill and paint sludge which contained over 1800 mg/kg of toluene and up to several hundred mg/kg of other petroleum related compounds. Other compounds present included 4-methyl-2-pentanone (41 mg/kg), 2-hexanone (5 mg/kg), acetone (0.6 mg/kg), tetrachloroethene (0.6 mg/kg) and methylene chloride (0.1 mg/kg).

In July of 2003, the US EPA sampled 20 private wells for 1,4-dioxane at a point before the GAC filter treated the water. Private drinking water samples were tested for 1,4-dioxane because of an association with 1,1,1-trichloroethane, a major contaminant at the site. 1,4-Dioxane was identified in 18 of the wells tested. They were all below the NYS DOH drinking water standard of 50 mcg/L for unspecified organic compounds (UOC). In December of 2003, US EPA collected five before- and 80 after-GAC filter samples from private wells. 1,4-Dioxane was detected in all five before- GAC filter samples, one above the unspecified organic compound (UOC) standard and four below. 1,4-Dioxane was detected in 62 of the 80 samples post GAC filter. Two of the sample results were above the NYS standard for UOCs in drinking water of 50 mcg/L. The US EPA immediate action level for drinking water for 1,4-dioxane is 600 mcg/L.

B. Site Visit and Physical Hazards

NYS DOH staff visited the site in 1995 and 1999. Site characteristics were observed and the potential for human exposures was noted. In 1995, there was no observed surficial contamination. In 1999, test pitting occurred and DOH staff examined the excavation area where paint wastes were discovered. No paint wastes were observed on the surface of the excavation area and the area was cordoned off with safety tape.

Scarlett Messier of the NYS DOH visited the site on July 21, 2004. She was accompanied by the US EPA Project Manager of the Mohonk Road Site. The primary objective of this visit was to observe site characteristics and evaluate potential human exposures. A building is being used on site for art and craft purposes. The building is locked after hours. The site perimeter is not fenced and there is the potential for trespassers to enter the site although no evidence of trespassing was observed on this visit. The area with an old waste pond was capped and fenced. Ms. Messier entered the water treatment area currently in service that consisted of air strippers, a sand filter (not currently in use), aqueous phase GAC filters, and vapor phase GAC filters. Treated water is discharged in the Coxing Kill. The water treatment building is locked when not occupied by EPA or consultant staff who collect routine samples at the facility.

C. Demographics

The NYSDOH estimated, from the 1990 Census (US Bureau of the Census 1990), that 600 people live within one mile of the Mohonk Rd. Industrial Plant Site. The age distribution of the area is similar to that of Ulster County as well as New York State excluding New York City. There were 141 females of reproductive age (ages 15-44) within one mile of the site. The area within one mile of the site has a smaller proportion of minorities compared to the county and state. Based on the 1990 Census (US Bureau of the Census 1992), a lower percentage of the population is living below the poverty level while the median household income is lower than

the rest of the county and state. These comparisons are provided in the following table. In addition, there are no schools or nursing homes within a mile of the site.

1990 Census Demographics	New York State excluding NYC	Ulster County	Area within 1 mile of the Mohonk Rd. Industrial Plant Site
Age Distribution			
<6	8%	8%	8%
6-19	19%	18%	18%
20-64	59%	61%	60%
>64	13%	13%	14%
Race Distribution			
White	90%	93%	97%
Black	7%	5%	3%
Native American	<1%	<1%	<1%
Asian	2%	1%	<1%
Other	1%	1%	<1%
Ethnicity Distribution			
Percent Hispanic	4%	4%	1%
1999 Median Income	$35,711	$34,033	$29,934
% Below Poverty Level	9%	9%	1%

DISCUSSION

A. Environmental Contamination and Exposure Pathways

As part of the 1997 Remedial Investigation, NYS DEC's consultant installed 12 on-site and 11 off-site groundwater monitoring wells. In the on-site monitoring wells, 1,1,1-trichloroethane was detected at levels up to 130,000 micrograms per liter (mcg/L), trichlorothene up to 3,300 mcg/L, 1,1-dichloroethene up to 6,000 mcg/L, 1,1-dichlorethane up to 6,700 mcg/L, and 1,2-dichloroethene up to 100 mcg/L (see Table 1 in Appendix B). In the off-site monitoring wells, 1,1,1-trichloroethane was detected up to 540 mcg/L, trichloroethene up to 31 mcg/L, 1,1-dichloroethene up to 110 mcg/L, and 1,1-dichloroethane up to 46 mcg/L (see Table 2 in Appendix B).

The UCHD and NYS DOH collected samples from 136 private or commercial water supply wells and analyzed them for volatile organic compounds (VOCs). All VOCs detected in these samples are shown in Table 3 in Appendix B. The sampling found that 70 wells contained at least one or more site-related contaminants at levels exceeding NYS DOH drinking water standards. The four most prevalent contaminants (1,1,1-trichloroethane, trichloroethene, 1,1-dichloroethane and 1,1-dichloroethene) were found at elevated levels in 29 wells.

1,1,1-Trichloroethane was detected in concentrations up to 480 mcg/L. Trichloroethene was detected in concentrations up to 61 mcg/L. 1,1-Dichloroethane was detected up to 47 mcg/L. 1,1-Dichloroethene was found up to 180 mcg/L (see Table 3 in Appendix B). Carbon filters were supplied to residents with contaminants in drinking water exceeding NYS DOH drinking water standards; however, residents were exposed before treatment was provided. Residents with contaminated water supplies may have been exposed to site related contaminants via ingestion, inhalation, and dermal contact for up to 30 years.

In July and December 2003, the US EPA collected samples from 86 private or commercial water supply wells, and found that 65 wells contained 1,4-dioxane. Two of these wells contained 1,4-dioxane above the current NYS DOH standard of 50 mcg/L for UOCs. 1,4-Dioxane was detected in these wells in concentrations between 1 mcg/L and 96 mcg/L after GAC filtration. Wells were also tested pre-GAC filtration. At NYS DOH's request, the NYS DEC provided bottled water to the two locations where the 1,4 dioxane levels were above the NYS drinking water standard. The US EPA concluded that the carbon filters installed, while removing the majority of VOC contamination, did not effectively remove the 1,4-dioxane from the drinking water. Residents with contaminated water supplies may have been exposed to 1,4-dioxane via ingestion, inhalation, and dermal contact for up to 30 years. The concentrations and extent of VOC groundwater contamination in relation to the High Falls Water District (HFWD) is shown in the Figure presented in Appendix A.

The US EPA, UCHD, NYS DOH, and NYS DEC continue to analyze data from private wells and off-site monitoring wells to determine if more private wells, including any potential newly drilled wells, are threatened by the contaminant plume. The US EPA collects samples from wells that appear to be threatened; therefore, there is reduced potential for significant current or future exposures to contaminated groundwater.

Subsurface soils (1 to 6 feet below the ground surface) at the site were contaminated with VOCs, but 1,4-dioxane is highly soluble, and may not stay in soil. Exposures to the various VOCs in subsurface soil was unlikely because the contaminants were found in on-site subsurface soil, not in surface soil. The US EPA excavated and removed on-site soil in December of 2000. Subsequent sampling has confirmed that contaminants in remaining on-site soil are within acceptable ranges. Influent samples at the groundwater treatment plant show low levels of 1,4-dioxane, consistent with the contaminant’s solubility and tendency to move quickly in groundwater.

In addition, soil gas contaminated with VOCs may be present and could intrude into the indoor air of residences in the area. No data have been collected to evaluate this potential exposure pathway.

B. Public Health Implications - Toxicological and Epidemiological Evaluation

An analysis of the toxicological implications of the human exposure pathways of concern is presented below. To evaluate the potential health risks from contaminants of concern associated with the Mohonk Road Industrial Plant Site, the NYS DOH assessed the risks for cancer and non-cancer health effects. The risks of health effects depend primarily on contaminant

concentration, exposure route, exposure frequency and duration. Additional information on how the NYS DOH determined and qualified health risks for this site is presented in Appendix C. Exposures to contaminants in drinking water supplies can occur via ingestion, dermal contact and inhalation from water uses such as showering, bathing or other household uses. Although exposure varies depending on an individual's lifestyle, each of these exposure routes contributes to the overall daily intake of contaminants and, thus, can increase the risk for chronic health effects.

For an undetermined period of time, possibly for up to 30 years (from the time manufacturing operations began on-site in the mid-1960s to 1994/1995), private water supply wells have been contaminated with chlorinated volatile organic chemicals. The highest levels of bromomethane (13 mcg/L), chloroethane (24 mcg/L), 1,1-dichloroethane (47 mcg/L), 1,2-dichloroethene (6 mcg/L), 1,1-dichloroethene (180 mcg/L), 1,1,1-trichloroethane (480 meg/L) and trichloroethene (61 mcg/L), measured in private wells, exceed NYS public drinking water standards and/or public health assessment comparison values (see Table 5). Therefore, these chemicals were selected for further evaluation.

Studies of workers exposed to trichloroethene and other chemicals show an association between exposure to high levels of trichloroethene and increased risks of certain forms of cancer, including kidney, liver and non-Hodgkin's lymphoma. It is unlikely that chance is responsible for these associations; however, the role of other factors in causing these cancers, including exposures to other potential cancer-causing chemicals, is not fully known. Thus, these data suggest, but do not prove, that trichloroethene causes cancer in humans.

Other studies show that people living in communities with drinking water supplies contaminated by mixtures of chemicals, including trichloroethene, have higher risks of certain types of cancer (e.g., non-Hodgkin's lymphoma) than do people living in communities with uncontaminated drinking water. These studies are weaker than those of workers largely because we do not know for certain whether the people who got cancer actually drank the contaminated water for long periods of time before they got cancer.

Trichloroethene causes cancer in laboratory animals given large oral doses or exposed to high levels in air over their lifetimes. The animal cancers caused by trichloroethene include liver, kidney, testes, lymphoma, and lung cancer (ATSDR, 1997b). Chloroethane and 1,1-dichloroethene also causes cancer in laboratory animals exposed to high levels over their lifetimes (ATSDR, 1994, 1998). Chemicals that may cause cancer in workers or cause cancer in laboratory animals may cause cancer in humans who are exposed to lower levels over long periods of time. Whether chloroethane and 1,1-dichloroethene cause cancer in humans is not known.

Based on the results of animal studies and limited sampling of private residential water supply wells, people drinking water containing 1,1-dichloroethene, over a period of up to 30 years, at levels between 70 to 180 mcg/L (the highest level detected) are estimated to have a high increased risk of getting cancer. People drinking water containing 1,1-dichloroethene at levels from 7 to 70 mcg/L for 30 years are estimated to have a moderate increased risk for cancer and people drinking water containing 0.07 to 7 mcg/L are estimated to have a low increased cancer

risk. People exposed to the highest reported levels of chloroethane (24 mcg/L) and trichloroethene (61 mcg/L) could have a low increased risk of developing cancer. The actual cancer risk for these chemicals in drinking water cannot be estimated because of the lack of information on past exposures. There are no sampling data prior to 1994 and the amount of time the contaminants have been present is also unknown.

There is limited evidence that 1,1-dichloroethane causes cancer in laboratory animals exposed to high levels over their lifetimes (ATSDR 1990). However, a quantitative estimate of cancer potency is not available, and therefore the cancer risk for exposure to this chemical in drinking water can not be estimated. Toxicological data are inadequate to assess the carcinogenic potential of bromomethane, 1,2-dichloroethene and 1,1,1-trichloroethane (ATSDR 1992, 1995, 1996)

The chlorinated contaminants detected in private drinking water supplies near the Mohonk Road Industrial Plant site also produce a variety of noncarcinogenic effects, primarily to the liver, kidneys and nervous system. TCE also causes developmental toxicity in laboratory animals (see ATSDR Child Health Considerations). Although the risks of noncarcinogenic effects from past exposures to the highest measured levels of these chlorinated VOCs in private drinking water supply wells are not completely understood, the existing data suggest that they could be moderate for trichloroethene at 61 mcg/L, low for 1,1-dichloroethene at 180 mcg/L and minimal for the highest detected levels of bromomethane, chloroethane, 1,1-dichloroethane, 1,2-dichloroethene, and 1,1,1-trichloroethane. Some studies suggest that exposure to trichloroethene in drinking water during pregnancy may increase the risk of birth defects (e.g., neural tube defects, oral cleft defects and congenital heart defects) and childhood leukemia (ATSDR 1997). The noncancer risk for exposures to 1,1-dichloroethene below 158 mcg/L would be minimal. The US EPA prepared a fact sheet on 1,4-dioxane related to this site in January of 2004. A toxicological and epidemiological review of this chemical will be evaluated separately in a Health Consultation.

C. Community Health Concerns

There have been several public meetings held for this site and one public availability session. The purpose of these meetings was to inform members of the community and interested parties about the site contamination and how it might affect residents, to provide advice and to listen to community concerns. An availability session held on June 17, 1999. US EPA, ATSDR, NYS DOH and UCHD staff persons were available to discuss residents' concerns on an individual basis. As has been expressed at all of the public meetings held for this site, the community's primary concern is the presence of VOCs in private drinking water wells and that many of the residents may have consumed this contaminated water for some time. They are concerned about the potential for these exposures to cause health problems, particularly cancer. The potential for health effects to occur as a result of exposure is discussed in the Public Health Implications Section. There are also concerns from others in the community with private wells that VOCs from the site may migrate further in the groundwater and affect additional private wells. The extent of groundwater contamination may increase in the future and affect more private water supplies. However, movement of the contamination is being closely monitored and additional actions will be taken if necessary to minimize the potential for people to be exposed. Staff from

the NYS DOH and NYS DEC met with the public on December 2, 1999 to present the proposed Remedial Action Plan for the site. In addition, on October 12, 2000, the US EPA and UCHD staff met with the community regarding formation of a new water district. The plans for the new water treatment system are being finalized.

The public was invited to review the draft during the public comment period that ran from June 7th, 2002 to July 8th, 2002. We received three written comments from residents. A summary of these comments and responses are shown in Appendix E.

D. ATSDR Child Health Considerations

The ATSDR Child Health Initiative emphasizes the ongoing examination of relevant child health issues in all of the agency's activities, including evaluating child-focused concerns through its mandated public health assessment activities. The ATSDR and NYS DOH consider children when we evaluate exposure pathways and potential health effects from environmental contaminants. We recognize that children are of special concern because of their greater potential for exposure from play and other behavior patterns. Children sometimes differ from adults in their susceptibility to hazardous chemicals, but whether there is a difference depends on the chemical. Children may be more or less susceptible than adults to health effects, and the relationship may change with developmental age.

The possibility that children or the developing fetus may have increased sensitivity to trichloroethene or 1,1-dichloroethene (the primary contaminants associated with the Mohonk Road site) was taken into account when evaluating the potential health risks associated with the site. Human studies on 1,1-dichloroethene are not available, but some studies suggest that exposure to trichloroethene in drinking water during pregnancy may increase the risk of birth defects (e.g., neural tube defects, oral cleft defects and congenital heart defects) and childhood leukemia (ATSDR 1997). In each of these studies, however, there are uncertainties about how much contaminated water the women drank during pregnancy, about how much trichloroethene was in the water the women drank during pregnancy, and about the presence of other chemicals in the water the women drank. In addition, the role of other factors, not related to chemicals in drinking water, in causing these effects is not fully known. Thus, these studies suggest, but cannot prove, that the developing fetus may have increased sensitivity to the effects of trichloroethene. In animal studies, when pregnant animals are exposed by ingestion and/or inhalation of 1,1-dichloroethene or trichloroethene, adverse effects on the normal development of the offspring are observed (ATSDR 1994, 1997b). In most, but not all of these studies, the high amounts of the chemical also caused adverse health effects on the parent animal. The estimated exposures to 1,1-dichloroethene and trichloroethene in drinking water in the private wells near the site (based on the highest detected levels) are about 3000 times and 50 times lower, respectively, than the lowest exposure levels that cause adverse effects on development in animals.

E. Health Outcome Data

The NYS DOH has not previously evaluated health outcome data specifically for the Mohonk Road Industrial Site. The NYS DOH maintains several health outcome databases, which could

be used to generate health outcome data for a specific area, if appropriate. These databases include the Cancer Registry, the Congenital Malformations Registry, Vital Records (birth and death certificates) and hospital discharge information. NYS DOH has not conducted an evaluation using these health outcome databases for this specific site because the number of people with potential exposures is relatively small. However, NYS DOH has included this site in the New York State Volatile Organic Compounds (VOC) Exposure Registry. By enrolling individuals from multiple sites across New York State, the VOC Exposure Registry provides the opportunity to evaluate health outcomes for larger groups of people with similar exposures. The VOC Exposure Registry enrolls individuals who are willing to participate and provide health outcome information, as described below. Health outcome data from available NYS DOH databases, including the Cancer Registry and Congenital Malformations Registry, are also being generated for potentially exposed populations included in the VOC Exposure Registry. These data will be evaluated for groups of sites with similar exposures.

In 1999, the NYS DOH established the New York State Volatile Organic Compounds (VOC) Exposure Registry as a tool for health status assessment and long-term follow-up for communities and individuals with documented exposures to VOCs. The Registry is currently evaluating exposures and health status of New York State residents at locations where drinking water or indoor air was contaminated with chemicals such as industrial solvents or petroleum products from landfills, industrial sites, spills, or other sources. Individuals and communities are selected for inclusion in the Registry if potential exposures from the contamination of private wells, public water supplies, or indoor air have been verified by sampling results.

Because levels of VOCs exceeding state drinking water guidelines were found in 70 wells, this community was selected as one of the initial sites for inclusion in the NYS VOC Exposure Registry. Residents of households who were exposed in the past to VOCs from private well drinking water supplies are being asked by the NYS DOH to participate.

Following contact by mail and brief telephone interview to determine eligibility, potential registrants will be asked to complete a mailed questionnaire seeking information about exposures during the time period before the contamination was detected and before intervention occurred to prevent exposure. Information about other risk factors such as tobacco and alcohol use, detailed information about registrant health status before and after the potential exposure, and basic demographic information such as age, education and occupation, will be collected. Health status questions seek information about cancer as well as respiratory, neurological, cardiovascular, gastrointestinal, musculo-skeletal, endocrine, and reproductive symptoms and diseases. Initial enrollment of exposed households in the community was started in 1999. A follow-up questionnaire was mailed to individuals of these households in March 2003.

An exposure registry such as this one is designed as a resource to help us learn whether exposures to VOCs are related to health effects. The registry was not designed to be an epidemiologic study. It was designed to enroll persons potentially exposed to VOCs at various levels in their drinking water in order to undertake long-term, ongoing surveillance. Registry data may be useful at a future date for epidemiologic studies. People who are enrolled in the Registry will be kept informed of any research results that come from the Registry data.

CONCLUSIONS

Based on sampling data and the ATSDR's public health hazard category classification (Appendix D), the Mohonk Road Industrial Plant site was a public health hazard in the past. This classification is used because people were exposed to VOCs in private drinking water supply wells exceeding public health comparison values and/or drinking water standards, and there is evidence from studies in animals and humans that exposure to elevated levels of VOCs can increase the risk of adverse health effects. Human exposure to contaminants occurred via ingestion, inhalation and dermal contact for some undetermined period of time, possibly up to 30 years.

Future exposures could occur if contaminants migrate to additional private water supply wells, if new wells are installed within the contaminant plume, or if the treatment systems are not maintained. The US EPA has begun to remediate the site and private wells are monitored biannually and treated if necessary. Therefore, potential exposures to most VOC contaminants will be minimized. However, recent sampling has indicated that 1,4-dioxane was present in several wells and the GAC filtration systems on wells do not remove the 1,4-dioxane. For this contaminant, this site is classified as an indeterminate health hazard. In addition, soil vapor intrusion into indoor air is a potential pathway that needs to be evaluated. For this potential exposure pathway, this site is also classified as an indeterminate public health hazard.

Based on the results of animal studies and limited sampling of private residential water supply wells, people drinking water over a period of up to 30 years containing 1,1-dichloroethene at the highest measured level (180 mcg/L) are estimated to have a high increased risk of developing cancer. People exposed to the highest reported levels of chloroethane (24 mcg/L), and trichloroethene (61 mcg/L) are estimated to have a low increased risk of developing cancer. The actual cancer risk for these chemicals in drinking water cannot be estimated because of the lack of information on past exposures.

Although the risks of noncarcinogenic effects from past exposures to the highest measured levels of these chlorinated VOCs in private drinking water supply wells are not completely understood, the existing data suggest that they could be moderate for trichloroethene, low for 1,1-dichloroethene and 1,1,1-trichloroethane, and minimal for bromomethane, chloroethane, 1,1-dichloroethane, and 1,2-dichloroethene. Public health implications of exposures to 1,4-dioxane are not evaluated in the public health assessment, and will be evaluated in a separate health consultation.

The NYS DOH has not previously evaluated health outcome data specifically for the Mohonk Road Industrial Site. The NYS DOH maintains several health outcome databases, which could be used to generate health outcome data for a specific area, if appropriate. These databases include the Cancer Registry, the Congenital Malformations Registry, Vital Records (birth and death certificates) and hospital discharge information. NYS DOH has not conducted an evaluation using these health outcome databases for this specific site because the number of people with potential exposures is relatively small. However, NYS DOH has included this site in the New York State Volatile Organic Compounds (VOC) Exposure Registry. By enrolling

individuals from multiple sites across New York State, the VOC Exposure Registry provides the opportunity to evaluate health outcomes for larger groups of people with similar exposures.

RECOMMENDATIONS

1. The affected private drinking water supply wells, potentially affected existing wells, new wells and GAC treatment systems should continue to be monitored at frequent intervals to ensure that a continuous supply of potable water is provided. The treatment systems should remain in use until the raw groundwater quality in the affected wells consistently meets the state drinking water standards, or until such time that an acceptable permanent alternate drinking water supply is provided.

2. Groundwater should continue to be monitored to determine the nature and extent of contamination, particularly as the contamination may affect private wells that have thus far not been affected by site contaminants.

3. Action should be taken to provide a permanent, alternate supply to dissociate people from the contaminated water on a long-term basis.

4. All owners of properties with underlying groundwater contamination should be notified of the contamination and encouraged to notify future owners of the property should they sell or otherwise transmit ownership.

5. The possibility that soil gas contaminated with VOCs may intrude into the indoor air at residences needs to be evaluated.

PUBLIC HEALTH ACTION PLAN

The Public Health Action Plan (PHAP) for the Mohonk Road site describes the actions to be taken by the ATSDR and/or NYS DOH following completion of this health consultation. Those actions already taken at the site are included in the Background and Statement of Issue sections of this public health assessment. The purpose of the PHAP is to ensure that this health consultation not only identifies public health hazards, but provides a plan of action designed to mitigate and prevent adverse human health effects resulting from present and/or future exposures to hazardous substances at or near the site. The ATSDR and/or the NYS DOH will ensure that this plan is implemented. The public health actions for the Mohonk Road site are as follows:

1. The US EPA will continue to monitor private water supply treatment systems to ensure that a continuous supply of water meeting drinking water standards is available until a permanent drinking water supply is provided. The NYS DOH and the Ulster County Health Department will continue to review sampling results.

2. The US EPA will monitor groundwater to determine if the contaminant plume has advanced and to help identify private drinking water wells, both existing and potential newly drilled wells, that may become affected.

3. The US EPA did release a Record of Decision, which selected the permanent, alternate water supply based on the information in the Feasibility Study, community input and input from NYS DEC and NYS DOH.

4. For properties with underlying groundwater contamination, the NYS DOH will work with the Ulster County Health Department, the US EPA and the NYS DEC to notify existing property owners of the presence of groundwater contamination and encourage the owners to notify future owners of the property should they sell or otherwise transmit ownership.

5. The NYS DOH has a registry of persons exposed to VOCs in drinking water. People who were exposed to VOCs through ingestion of contaminated drinking water at the Mohonk Road Plant Site are eligible and encouraged to enroll in the registry. The NYS DOH will continue to enroll eligible residents near the Mohonk Road Industrial Plant site, follow-up on their health status, and keep people informed of any research results that come from Registry data.

6. The NYS DOH will continue to conduct community health education as appropriate

7. The NYS DOH and ATSDR will prepare a Health Consultation outlining the public health implications of exposure to 1,4-dioxane from the Mohonk Road Site.

8. The NYSDOH and ATSDR will work with the US EPA to evaluate the potential that soil gas contaminated with VOCs may intrude into the indoor air of residences.

The ATSDR will reevaluate and expand the PHAP as needed. New environmental, toxicological, or health outcome data, or the results of implementing the above proposed actions may determine the need for additional actions at the site.

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CERTIFICATION

The Public Health Assessment for the Jackson Steel site was prepared by the New York State Department of 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 initiated.

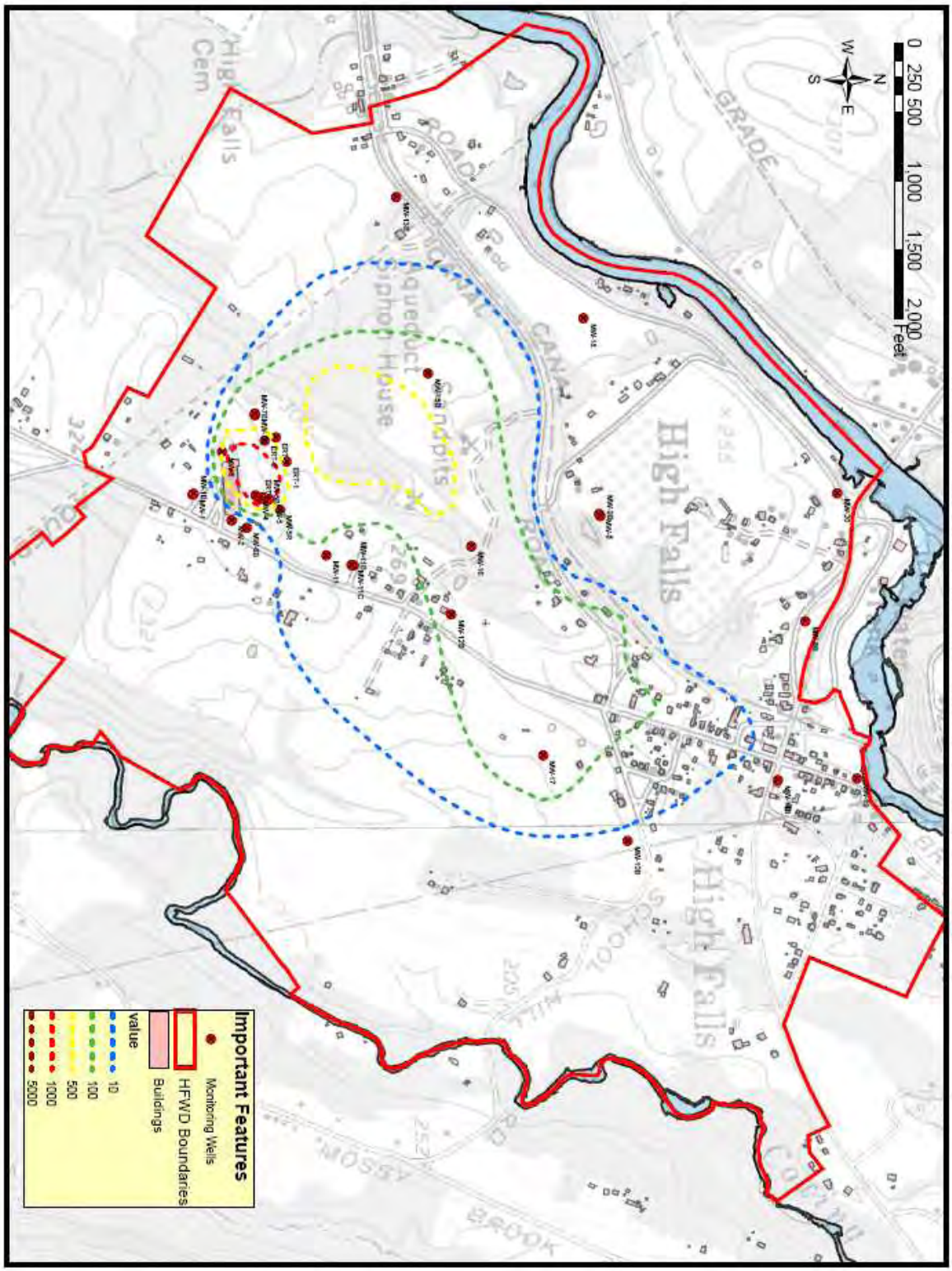
Technical Project Officer, CAT, SPAB, DHAC

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

Team Leader, CAT, SPAB, DHAC, ATSDR

APPENDIX A

Figure


Total Volatile Organic Compound Concentrations (July 2003)
0 250 500 1,000 1,500 2,000
Feet
N
W
E
S
High Falls
Important Features
Monitoring Wells
HFWD Boundaries
Buildings
value
10
100
500
1000
5000

APPENDIX B

Tables

TABLE 1
SUMMARY OF ON-SITE GROUNDWATER SAMPLE RESULTS

Compound	Range Micrograms per liter (mcg/L)
1,1,1-trichloroethane	18 - 130,000
trichloroethene	15 - 3,300
1,1-dichloroethane	2 - 6,700
1,1-dichloroethene	4 - 10,000
1,2-dichloroethene	16 - 100
Acetone	96 - 240
Methylene chloride	1 - 500
Total VOCs	21-150,000

NOTE: Data are compiled of the basis of wells sampled through March 2000 by NYS DEC and US EPA.

TABLE 2
SUMMARY OF OFF-SITE GROUNDWATER SAMPLE RESULTS

Compound	Range Observed Micrograms per liter (mcg/L)
1,1,1-trichloroethane	5-540
trichloroethene	16-31
1,1-dichloroethane	2-46
1,1-dichloroethene	17-110
Acetone	3-6
Benzene	3-5
Methylene chloride	1-9
Total VOCs	3-720

NOTE: Data are compiled on the basis of wells sampled through March 2000 by NYS DEC and US EPA.

TABLE 3
SUMMARY OF RESIDENTIAL/BUSINESS DRINKING WELL SAMPLE RESULTS
CONTAMINANTS OF CONCERN IN UNTREATED WATER (all results in micrograms per liter (mcg/L**)**

Compound	Range Observed	No. Of Samples	No. Of Wells Detected
1,1,1-trichloroethane	0.5-480	136	61
trichloroethene	0.5-61	136	33
1,1-dichloroethane	0.5-47	136	64
1,1-dichloroethene	0.5-180	136	66
choroethane	0.5-24	136	5
chloroform	0.5-15	136	6
methyl-tert-butylether	0.5-48	136	1
1,2-dichloroethene	0.5-6.0	136	2
bromomethane	0.5-13	136	2

Note: Data are compiled on the basis of 136 wells initially sampled in 1994.

TABLE 4
ON-SITE SUBSURFACE SOIL DATA SUMMARY

Parameter	Range of Detected Concentrations (mg/kg)	Frequency of Detection
methylene chloride	0.0030-0.087	14/20
chloroethane	0.0020	2/11
chloromethane	0.0020	2/11
bromomethane	0.0040	1/9
acetone	0.006-0.75	21/30
chloroform	0.003	1/6
1,1-dichloroethene	0.002-0.044	13/34
1,1-dichloroethane	0.001-1.3	16/41
1,2-dichloroethene (total)	0.001-0.75	8/19
1,1,1-trichloroethane	0.0017-1.1	29/41
trichloroethene	0.0011-0.1629	16/41
tetrachloroethene	0.0016-14	7/24
toluene	0.17	1/10
ethylbenzene	0.002-41	7/24
xylene (total)	0.002-210	9/21

At a depth of 0-4 feet
Sampling data summary of on-site subsurface soil prior to December 2000 remediation

Table 5
Water Quality Standards/Guidelines and/or Public Health Assessment Comparison Values Exceeded by Contaminants Found in Drinking Water Wells at or Near the Mohonk Road Industrial Plant Site
[All values in micrograms per liter (mcg/L)]

Contaminant	Water Quality Standards/Guidelines			Comparison Values*			
	New York State		US EPA				
	Ground-Water	Drinking Water	Drinking Water	Cancer	Basis**	Noncancer	Basis**
Bromomethane	5	5	50	--	--	10	US EPA LTHA
Chloroethane	5	5	--	12	US EPA PV	2800	US EPA PV
1,1-dichloroethane	5	5	--	--	--	700	US EPA HEAST
1,1-dichloroethene	5	5	7	0.06	US EPA CPF	7	US EPA LTHA
1,2 – dichloroethene	5	5	70***	--	--	70***	US EPA LTHA
1,1,1-trichloroethane	5	5	200	--	--	200	US EPA LTHA
Trichloroethene	5	5	5	3.2	US EPA PV	42	US EPA PV

* Comparison values determined for a 70 kg adult who drinks 2 liters of water per day.
** EPA CPF = US EPA Cancer Potency Factor
EPA HEAST = US EPA Health Effects Assessment Summary Tables
EPA LTHA = US EPA Lifetime Health Advisory
EPA PV = Provisional value from US EPA Superfund Technical Support Center; National Center for Environmental Assessment
*** Value for *cis* - 1,2-dichloroethene.

APPENDIX C

New York State Department of Health Procedure
for Evaluating Potential Health Risks
for Contaminants of Concern

NYS DOH PROCEDURE FOR EVALUATING POTENTIAL HEALTH RISKS FOR CONTAMINANTS OF CONCERN

To evaluate the potential health risks from contaminants of concern associated with the Mohonk Road Industrial Plant Site, the New York State Department of Health assessed the risks for cancer and noncancer health effects.

Increased cancer risks were estimated by using site-specific information on exposure levels for the contaminant of concern and interpreting them using cancer potency estimates derived for that contaminant by the US EPA or, in some cases, by the NYS DOH. The following qualitative ranking of cancer risk estimates, developed by the NYS DOH, was then used to rank the risk from very low to very high. For example, if the qualitative descriptor was "low", then the excess lifetime cancer risk from that exposure is in the range of greater than one per million to less than one per ten thousand. Other qualitative descriptors are listed below:

Excess Lifetime Cancer Risk

Risk Ratio	Qualitative Descriptor
equal to or less than one per million	very low
greater than one per million to less than one per ten thousand	low
one per ten thousand to less than one per thousand	moderate
one per thousand to less than one per ten	high
equal to or greater than one per ten	very high

An estimated increased excess lifetime cancer risk is not a specific estimate of expected cancers. Rather, it is a plausible upper bound estimate of the probability that a person may develop cancer sometime in his or her lifetime following exposure to that contaminant.

There is insufficient knowledge of cancer mechanisms to decide if there exists a level of exposure to a cancer-causing agent below which there is no risk of getting cancer, namely, a threshold level. Therefore, every exposure, no matter how low, to a cancer-causing compound is assumed to be associated with some increased risk. As the dose of a carcinogen decreases, the chance of developing cancer decreases, but each exposure is accompanied by some increased risk.

There is general consensus among the scientific and regulatory communities on what level of estimated excess cancer risk is acceptable. An increased lifetime cancer risk of one in one million or less is generally not considered a significant public health concern.

For noncarcinogenic health risks, the contaminant intake was estimated using exposure assumptions for the site conditions. This dose was then compared to a risk reference dose (estimated daily intake of a chemical that is likely to be without an appreciable risk of health effects) developed by the US EPA, ATSDR and/or NYS DOH. The resulting ratio was then compared to the following qualitative scale of health risk:

Qualitative Descriptions for
Noncarcinogenic Health Risks

Ratio of Estimated Contaminant Intake to Risk Reference Dose	Qualitative Descriptor
equal to or less than the risk reference dose	minimal
greater than one to five times the risk reference dose	low
greater than five to ten times the risk reference dose	moderate
greater than ten times the risk reference dose	high

Noncarcinogenic effects unlike carcinogenic effects are believed to have a threshold, that is, a dose below which adverse effects will not occur. As a result, the current practice is to identify, usually from animal toxicology experiments, a no-observed-effect-level (NOEL). This is the experimental exposure level in animals at which no adverse toxic effect is observed. The NOEL is then divided by an uncertainty factor to yield the risk reference dose. The uncertainty factor is a number which reflects the degree of uncertainty that exists when experimental animal data are extrapolated to the general human population. The magnitude of the uncertainty factor takes into consideration various factors such as sensitive subpopulations (for example, children or the elderly), extrapolation from animals to humans, and the incompleteness of available data. Thus, the risk reference dose is not expected to cause health effects because it is selected to be much lower than dosages that do not cause adverse health effects in laboratory animals.

The measure used to describe the potential for noncancer health effects to occur in an individual is expressed as a ratio of estimated contaminant intake to the risk reference dose. A ratio equal to or less than one is generally not considered a significant public health concern. If exposure to the contaminant exceeds the risk reference dose, there may be concern for potential noncancer health effects because the margin of protection is less than that afforded by the reference dose. As a rule, the greater the ratio of the estimated contaminant intake to the risk reference dose, the greater the level of concern. This level of concern depends upon an evaluation of a number of factors such as the actual potential for exposure, background exposure, and the strength of the toxicologic data.

APPENDIX D

Agency For Toxic Substances and Disease
Registry Public Health Hazard Categories

INTERIM PUBLIC HEALTH HAZARD CATEGORIES

CATEGORY / DEFINITION	DATA SUFFICIENCY	CRITERIA
A. Urgent Public Health Hazard This category is used for sites where short-term exposures (< 1 yr) to hazardous substances or conditions could result in adverse health effects that require rapid intervention.	This determination represents a professional judgement based on critical data which ATSDR has judged sufficient to support a decision. This does not necessarily imply that the available data are complete; in some cases additional data may be required to confirm or further support the decision made.	Evaluation of available relevant information* indicates that site-specific conditions or likely exposures have had, are having, or are likely to have in the future, an adverse impact on human health that requires immediate action or intervention. Such site-specific conditions or exposures may include the presence of serious physical or safety hazards.
B. Public Health Hazard This category is used for sites that pose a public health hazard due to the existence of long-term exposures (> 1 yr) to hazardous substance or conditions that could result in adverse health effects.	This determination represents a professional judgement based on critical data which ATSDR has judged sufficient to support a decision. This does not necessarily imply that the available data are complete; in some cases additional data may be required to confirm or further support the decision made.	Evaluation of available relevant information* suggests that, under site-specific conditions of exposure, long-term exposures to site-specific contaminants (including radionuclides) have had, are having, or are likely to have in the future, an adverse impact on human health that requires one or more public health interventions. Such site-specific exposures may include the presence of serious physical or safety hazards.
C. Indeterminate Public Health Hazard This category is used for sites in which "*critical*" data are *insufficient* with regard to extent of exposure and/or toxicologic properties at estimated exposure levels.	This determination represents a professional judgement that critical data are missing and ATSDR has judged the data are insufficient to support a decision. This does not necessarily imply all data are incomplete; but that some additional data are required to support a decision.	The health assessor must determine, using professional judgement, the "criticality" of such data and the likelihood that the data can be obtained and will be obtained in a timely manner. Where some data are available, even limited data, the health assessor is encouraged to the extent possible to select other hazard categories and to support their decision with clear narrative that explains the limits of the data and the rationale for the decision.
D. No Apparent Public Health Hazard This category is used for sites where human exposure to contaminated media may be occurring, may have occurred in the past, and/or may occur in the future, but the exposure is not expected to cause any adverse health effects.	This determination represents a professional judgement based on critical data which ATSDR considers sufficient to support a decision. This does not necessarily imply that the available data are complete; in some cases additional data may be required to confirm or further support the decision made.	Evaluation of available relevant information* indicates that, under site-specific conditions of exposure, exposures to site-specific contaminants in the past, present, or future are not likely to result in any adverse impact on human health.
E: No Public Health Hazard This category is used for sites that, because of the absence of exposure, do NOT pose a public health hazard.	Sufficient evidence indicates that no human exposures to contaminated media have occurred, none are now occurring, and none are likely to occur in the future	

**Such as environmental and demographic data; health outcome data; exposure data; community health concerns information; toxicologic, medical, and epidemiologic data; monitoring and management plans.*

APPENDIX E

Response to Public Comments

Summary of Public Comments and Responses
Mohonk Road Industrial Plant Site Public Health Assessment

This summary was prepared to address comments and questions on the public comment draft of the Mohonk Road Industrial Plant site Public Health Assessment. The public was invited to review the draft during the public comment period that ran from June 7th, 2002 to July 8th, 2002. We received three written comments from residents. Similar comments may be consolidated or grouped together and some statements reworded to clarify the comment. If you have any questions about this summary, you may contact Mr. Michael Rivara of the New York State Department of Health (NYS DOH) at the toll-free number: 1-800-458-1158, extension 27850.

Comment 1: While it is important to allow all groups and individuals an opportunity to make their voices heard, the measures you will be considering must ensure the protection of our natural resources and the well-being and safety of residents.

Response 1: The selected remedy for the site, documented in the March 2000 Record of Decision, is protective of the environment and human health. The remedy includes the continued operation of the groundwater extraction and treatment system to address on-site contamination. Modifications to this pump and treat system will also be made to address less contaminated groundwater found off-site. The US EPA will evaluate the groundwater data and determine when treatment is complete. These actions are protective of natural resources.

The remedy also includes the establishment of an alternative water supply. An agreement has been made to obtain potable water from the Catskill Aqueduct, which is part of the New York City Watershed. The US EPA is designing a public water supply system to construct for the High Falls area. The US EPA will continue to maintain the granular activated carbon filters on contaminated private wells and monitor contaminated and threatened water supply wells until the public water supply is constructed. These actions are protective of human health.

Comment 2: Possible exposures deserve immediate attention to appropriately assess health risks around the site.

Response 2: In April of 1994, the NYS DOH found contamination in a private drinking water well. From April 1994 to December 1994 the NYSDOH and UCDOH sampled 153 private drinking wells at homes and businesses. In June 1994, DEC issued a work order to install granular activated carbon (GAC) filters on wells contaminated with volatile organic compounds. The NYS DEC installed and maintained 73 GAC filters. The NYS DEC also supplied bottled water when requested. The US EPA currently maintains the GAC filters and regularly monitors contaminated and threatened wells. The US EPA is developing plans for an alternative public water supply system.

Comment 3: A critical concern is that groundwater contamination may become more intense in the future and have an increasing effect on water supplies.

Response 3: NYS DEC removed the source area of the contamination. This reduces the potential sources of contamination to the aquifer. The selected remedy for the site includes extraction and treatment of on and off-site groundwater contamination. The source removal and groundwater treatment, in combination with natural processes such as dilution and natural attenuation, will decrease the amount of contamination found in the aquifer.

APPENDIX F

ATSDR Glossary of Environmental Health Terms

ATSDR Glossary of Terms

The Agency for Toxic Substances and Disease Registry (ATSDR) is a federal public health agency with headquarters in Atlanta, Georgia, and 10 regional offices in the United States. ATSDR's mission is to serve the public by using the best science, taking responsive public health actions, and providing trusted health information to prevent harmful exposures and diseases related to toxic substances. ATSDR is not a regulatory agency, unlike the U.S. Environmental Protection Agency (EPA), which is the federal agency that develops and enforces environmental laws to protect the environment and human health. This glossary defines words used by ATSDR in communications with the public. It is not a complete dictionary of environmental health terms. If you have questions or comments, call ATSDR's toll-free telephone number, 1-888-42-ATSDR (1-888-422-8737).

General Terms

Absorption
The process of taking in. For a person or an animal, absorption is the process of a substance getting into the body through the eyes, skin, stomach, intestines, or lungs.
Acute
Occurring over a short time [compare with chronic].
Acute exposure
Contact with a substance that occurs once or for only a short time (up to 14 days) [compare with intermediate duration exposure and chronic exposure].
Additive effect
A biologic response to exposure to multiple substances that equals the sum of responses of all the individual substances added together [compare with antagonistic effect and synergistic effect].
Adverse health effect
A change in body function or cell structure that might lead to disease or health problems
Aerobic
Requiring oxygen [compare with anaerobic].
Ambient
Surrounding (for example, ambient air).
Anaerobic
Requiring the absence of oxygen [compare with aerobic].
Analyte
A substance measured in the laboratory. A chemical for which a sample (such as water, air, or blood) is tested in a laboratory. For example, if the analyte is mercury, the laboratory test will determine the amount of mercury in the sample.
Analytic epidemiologic study
A study that evaluates the association between exposure to hazardous substances and disease by testing scientific hypotheses.
Antagonistic effect
A biologic response to exposure to multiple substances that is less than would be expected if the known effects of the individual substances were added together [compare with additive effect and synergistic effect].
Background level
An average or expected amount of a substance or radioactive material in a specific environment, or typical amounts of substances that occur naturally in an environment.
Biodegradation
Decomposition or breakdown of a substance through the action of microorganisms (such as bacteria or fungi) or other natural physical processes (such as sunlight).
Biologic indicators of exposure study
A study that uses (a) biomedical testing or (b) the measurement of a substance [an analyte], its metabolite, or another marker of exposure in human body fluids or tissues to confirm human exposure to a hazardous substance [also see exposure investigation].

Biologic monitoring
Measuring hazardous substances in biologic materials (such as blood, hair, urine, or breath) to determine whether exposure has occurred. A blood test for lead is an example of biologic monitoring.
Biologic uptake
The transfer of substances from the environment to plants, animals, and humans.
Biomedical testing
Testing of persons to find out whether a change in a body function might have occurred because of exposure to a hazardous substance.
Biota
Plants and animals in an environment. Some of these plants and animals might be sources of food, clothing, or medicines for people.
Body burden
The total amount of a substance in the body. Some substances build up in the body because they are stored in fat or bone or because they leave the body very slowly.
CAP [see Community Assistance Panel.]
Cancer
Any one of a group of diseases that occur when cells in the body become abnormal and grow or multiply out of control.
Cancer risk
A theoretical risk for getting cancer if exposed to a substance every day for 70 years (a lifetime exposure). The true risk might be lower.
Carcinogen
A substance that causes cancer.
Case study
A medical or epidemiologic evaluation of one person or a small group of people to gather information about specific health conditions and past exposures.
Case-control study
A study that compares exposures of people who have a disease or condition (cases) with people who do not have the disease or condition (controls). Exposures that are more common among the cases may be considered as possible risk factors for the disease.
CAS registry number
A unique number assigned to a substance or mixture by the American Chemical Society Abstracts Service.
Central nervous system
The part of the nervous system that consists of the brain and the spinal cord.
CERCLA [see Comprehensive Environmental Response, Compensation, and Liability Act of 1980]
Chronic
Occurring over a long time [compare with acute].
Chronic exposure
Contact with a substance that occurs over a long time (more than 1 year) [compare with acute exposure and intermediate duration exposure]
Cluster investigation
A review of an unusual number, real or perceived, of health events (for example, reports of cancer) grouped together in time and location. Cluster investigations are designed to confirm case reports; determine whether they represent an unusual disease occurrence; and, if possible, explore possible causes and contributing environmental factors.
Community Assistance Panel (CAP)
A group of people from a community and from health and environmental agencies who work with ATSDR to resolve issues and problems related to hazardous substances in the community. CAP members work with ATSDR to gather and review community health concerns, provide information on how people might have been or might now be exposed to hazardous substances, and inform ATSDR on ways to involve the community in its activities.
Comparison value (CV)
Calculated concentration of a substance in air, water, food, or soil that is unlikely to cause harmful (adverse) health effects in exposed people. The CV is used as a screening level during the public health assessment process. Substances found in amounts greater than their CVs might be selected for further evaluation in the public health assessment process.
Completed exposure pathway [see exposure pathway].

Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA)
CERCLA, also known as Superfund, is the federal law that concerns the removal or cleanup of hazardous substances in the environment and at hazardous waste sites. ATSDR, which was created by CERCLA, is responsible for assessing health issues and supporting public health activities related to hazardous waste sites or other environmental releases of hazardous substances. This law was later amended by the Superfund Amendments and Reauthorization Act (SARA).

Concentration
The amount of a substance present in a certain amount of soil, water, air, food, blood, hair, urine, breath, or any other media.

Contaminant
A substance that is either present in an environment where it does not belong or is present at levels that might cause harmful (adverse) health effects.

Delayed health effect
A disease or an injury that happens as a result of exposures that might have occurred in the past.

Dermal
Referring to the skin. For example, dermal absorption means passing through the skin.

Dermal contact
Contact with (touching) the skin [see route of exposure].

Descriptive epidemiology
The study of the amount and distribution of a disease in a specified population by person, place, and time.

Detection limit
The lowest concentration of a chemical that can reliably be distinguished from a zero concentration.

Disease prevention
Measures used to prevent a disease or reduce its severity.

Disease registry
A system of ongoing registration of all cases of a particular disease or health condition in a defined population.

DOD
United States Department of Defense.

DOE
United States Department of Energy.

Dose (for chemicals that are not radioactive)
The amount of a substance to which a person is exposed over some time period. Dose is a measurement of exposure. Dose is often expressed as milligram (amount) per kilogram (a measure of body weight) per day (a measure of time) when people eat or drink contaminated water, food, or soil. In general, the greater the dose, the greater the likelihood of an effect. An "exposure dose" is how much of a substance is encountered in the environment. An "absorbed dose" is the amount of a substance that actually got into the body through the eyes, skin, stomach, intestines, or lungs.

Dose (for radioactive chemicals)
The radiation dose is the amount of energy from radiation that is actually absorbed by the body. This is not the same as measurements of the amount of radiation in the environment.

Dose-response relationship
The relationship between the amount of exposure [dose] to a substance and the resulting changes in body function or health (response).

Environmental media
Soil, water, air, biota (plants and animals), or any other parts of the environment that can contain contaminants.

Environmental media and transport mechanism
Environmental media include water, air, soil, and biota (plants and animals). Transport mechanisms move contaminants from the source to points where human exposure can occur. The environmental media and transport mechanism is the second part of an exposure pathway.

EPA
United States Environmental Protection Agency.

Epidemiologic surveillance [see Public health surveillance].

Epidemiology
The study of the distribution and determinants of disease or health status in a population; the study of the occurrence and causes of health effects in humans.

Exposure
Contact with a substance by swallowing, breathing, or touching the skin or eyes. Exposure may be short-term [acute exposure], of intermediate duration, or long-term [chronic exposure].
Exposure assessment
The process of finding out how people come into contact with a hazardous substance, how often and for how long they are in contact with the substance, and how much of the substance they are in contact with.
Exposure-dose reconstruction
A method of estimating the amount of people's past exposure to hazardous substances. Computer and approximation methods are used when past information is limited, not available, or missing.
Exposure investigation
The collection and analysis of site-specific information and biologic tests (when appropriate) to determine whether people have been exposed to hazardous substances.
Exposure pathway
The route a substance takes from its source (where it began) to its end point (where it ends), and how people can come into contact with (or get exposed to) it. An exposure pathway has five parts: a source of contamination (such as an abandoned business); an environmental media and transport mechanism (such as movement through groundwater); a point of exposure (such as a private well); a route of exposure (eating, drinking, breathing, or touching), and a receptor population (people potentially or actually exposed). When all five parts are present, the exposure pathway is termed a completed exposure pathway.
Exposure registry
A system of ongoing followup of people who have had documented environmental exposures.
Feasibility study
A study by EPA to determine the best way to clean up environmental contamination. A number of factors are considered, including health risk, costs, and what methods will work well.
Geographic information system (GIS)
A mapping system that uses computers to collect, store, manipulate, analyze, and display data. For example, GIS can show the concentration of a contaminant within a community in relation to points of reference such as streets and homes.
Grand rounds
Training sessions for physicians and other health care providers about health topics.
Groundwater
Water beneath the earth's surface in the spaces between soil particles and between rock surfaces [compare with surface water].
Half-life (t½)
The time it takes for half the original amount of a substance to disappear. In the environment, the half-life is the time it takes for half the original amount of a substance to disappear when it is changed to another chemical by bacteria, fungi, sunlight, or other chemical processes. In the human body, the half-life is the time it takes for half the original amount of the substance to disappear, either by being changed to another substance or by leaving the body. In the case of radioactive material, the half life is the amount of time necessary for one half the initial number of radioactive atoms to change or transform into another atom (that is normally not radioactive). After two half lives, 25% of the original number of radioactive atoms remain.
Hazard
A source of potential harm from past, current, or future exposures.
Hazardous Substance Release and Health Effects Database (HazDat)
The scientific and administrative database system developed by ATSDR to manage data collection, retrieval, and analysis of site-specific information on hazardous substances, community health concerns, and public health activities.
Hazardous waste
Potentially harmful substances that have been released or discarded into the environment.
Health consultation
A review of available information or collection of new data to respond to a specific health question or request for information about a potential environmental hazard. Health consultations are focused on a specific exposure issue. Health consultations are therefore more limited than a public health assessment, which reviews the exposure potential of each pathway and chemical [compare with public health assessment].

Health education
Programs designed with a community to help it know about health risks and how to reduce these risks.
Health investigation
The collection and evaluation of information about the health of community residents. This information is used to describe or count the occurrence of a disease, symptom, or clinical measure and to evaluate the possible association between the occurrence and exposure to hazardous substances.
Health promotion
The process of enabling people to increase control over, and to improve, their health.
Health statistics review
The analysis of existing health information (i.e., from death certificates, birth defects registries, and cancer registries) to determine if there is excess disease in a specific population, geographic area, and time period. A health statistics review is a descriptive epidemiologic study.
Indeterminate public health hazard
The category used in ATSDR's public health assessment documents when a professional judgment about the level of health hazard cannot be made because information critical to such a decision is lacking.
Incidence
The number of new cases of disease in a defined population over a specific time period [contrast with prevalence].
Ingestion
The act of swallowing something through eating, drinking, or mouthing objects. A hazardous substance can enter the body this way [see route of exposure].
Inhalation
The act of breathing. A hazardous substance can enter the body this way [see route of exposure].
Intermediate duration exposure
Contact with a substance that occurs for more than 14 days and less than a year [compare with acute exposure and chronic exposure].
In vitro
In an artificial environment outside a living organism or body. For example, some toxicity testing is done on cell cultures or slices of tissue grown in the laboratory, rather than on a living animal [compare with in vivo].
In vivo
Within a living organism or body. For example, some toxicity testing is done on whole animals, such as rats or mice [compare with in vitro].
Lowest-observed-adverse-effect level (LOAEL)
The lowest tested dose of a substance that has been reported to cause harmful (adverse) health effects in people or animals.
Medical monitoring
A set of medical tests and physical exams specifically designed to evaluate whether an individual's exposure could negatively affect that person's health.
Metabolism
The conversion or breakdown of a substance from one form to another by a living organism.
Metabolite
Any product of metabolism.
mg/kg
Milligram per kilogram.
mg/cm2
Milligram per square centimeter (of a surface).
mg/m3
Milligram per cubic meter; a measure of the concentration of a chemical in a known volume (a cubic meter) of air, soil, or water.
Migration
Moving from one location to another.
Minimal risk level (MRL)
An ATSDR estimate of daily human exposure to a hazardous substance at or below which that substance is unlikely to pose a measurable risk of harmful (adverse), noncancerous effects. MRLs are calculated for a route of exposure (inhalation or oral) over a specified time period (acute, intermediate, or chronic). MRLs should not be used as predictors of harmful (adverse) health effects [see reference dose].

Morbidity
State of being ill or diseased. Morbidity is the occurrence of a disease or condition that alters health and quality of life.
Mortality
Death. Usually the cause (a specific disease, a condition, or an injury) is stated.
Mutagen
A substance that causes mutations (genetic damage).
Mutation
A change (damage) to the DNA, genes, or chromosomes of living organisms.
National Priorities List for Uncontrolled Hazardous Waste Sites (National Priorities List or NPL)
EPA's list of the most serious uncontrolled or abandoned hazardous waste sites in the United States. The NPL is updated on a regular basis.
National Toxicology Program (NTP)
Part of the Department of Health and Human Services. NTP develops and carries out tests to predict whether a chemical will cause harm to humans.
No apparent public health hazard
A category used in ATSDR's public health assessments for sites where human exposure to contaminated media might be occurring, might have occurred in the past, or might occur in the future, but where the exposure is not expected to cause any harmful health effects.
No-observed-adverse-effect level (NOAEL)
The highest tested dose of a substance that has been reported to have no harmful (adverse) health effects on people or animals.
No public health hazard
A category used in ATSDR's public health assessment documents for sites where people have never and will never come into contact with harmful amounts of site-related substances.
NPL [see National Priorities List for Uncontrolled Hazardous Waste Sites]
Physiologically based pharmacokinetic model (PBPK model)
A computer model that describes what happens to a chemical in the body. This model describes how the chemical gets into the body, where it goes in the body, how it is changed by the body, and how it leaves the body.
Pica
A craving to eat nonfood items, such as dirt, paint chips, and clay. Some children exhibit pica-related behavior.
Plume
A volume of a substance that moves from its source to places farther away from the source. Plumes can be described by the volume of air or water they occupy and the direction they move. For example, a plume can be a column of smoke from a chimney or a substance moving with groundwater.
Point of exposure
The place where someone can come into contact with a substance present in the environment [see exposure pathway].
Population
A group or number of people living within a specified area or sharing similar characteristics (such as occupation or age).
Potentially responsible party (PRP)
A company, government, or person legally responsible for cleaning up the pollution at a hazardous waste site under Superfund. There may be more than one PRP for a particular site.
ppb
Parts per billion.
ppm
Parts per million.
Prevalence
The number of existing disease cases in a defined population during a specific time period [contrast with incidence].
Prevalence survey
The measure of the current level of disease(s) or symptoms and exposures through a questionnaire that collects self-reported information from a defined population.
Prevention
Actions that reduce exposure or other risks, keep people from getting sick, or keep disease from getting worse.

Public availability session
An informal, drop-by meeting at which community members can meet one-on-one with ATSDR staff members to discuss health and site-related concerns.
Public comment period
An opportunity for the public to comment on agency findings or proposed activities contained in draft reports or documents. The public comment period is a limited time period during which comments will be accepted.
Public health action
A list of steps to protect public health.
Public health advisory
A statement made by ATSDR to EPA or a state regulatory agency that a release of hazardous substances poses an immediate threat to human health. The advisory includes recommended measures to reduce exposure and reduce the threat to human health.
Public health assessment (PHA)
An ATSDR document that examines hazardous substances, health outcomes, and community concerns at a hazardous waste site to determine whether people could be harmed from coming into contact with those substances. The PHA also lists actions that need to be taken to protect public health [compare with health consultation].
Public health hazard
A category used in ATSDR's public health assessments for sites that pose a public health hazard because of long-term exposures (greater than 1 year) to sufficiently high levels of hazardous substances or radionuclides that could result in harmful health effects.
Public health hazard categories
Public health hazard categories are statements about whether people could be harmed by conditions present at the site in the past, present, or future. One or more hazard categories might be appropriate for each site. The five public health hazard categories are no public health hazard, no apparent public health hazard, indeterminate public health hazard, public health hazard, and urgent public health hazard.
Public health statement
The first chapter of an ATSDR toxicological profile. The public health statement is a summary written in words that are easy to understand. The public health statement explains how people might be exposed to a specific substance and describes the known health effects of that substance.
Public health surveillance
The ongoing, systematic collection, analysis, and interpretation of health data. This activity also involves timely dissemination of the data and use for public health programs.
Public meeting
A public forum with community members for communication about a site.
Radioisotope
An unstable or radioactive isotope (form) of an element that can change into another element by giving off radiation.
Radionuclide
Any radioactive isotope (form) of any element.
RCRA [see Resource Conservation and Recovery Act (1976, 1984)]
Receptor population
People who could come into contact with hazardous substances [see exposure pathway].
Reference dose (RfD)
An EPA estimate, with uncertainty or safety factors built in, of the daily lifetime dose of a substance that is unlikely to cause harm in humans.
Registry
A systematic collection of information on persons exposed to a specific substance or having specific diseases [see exposure registry and disease registry].
Remedial investigation
The CERCLA process of determining the type and extent of hazardous material contamination at a site.
Resource Conservation and Recovery Act (1976, 1984) (RCRA)
This Act regulates management and disposal of hazardous wastes currently generated, treated, stored, disposed of, or distributed.
RFA
RCRA Facility Assessment. An assessment required by RCRA to identify potential and actual releases of hazardous chemicals.

RfD [see reference dose]

Risk

The probability that something will cause injury or harm.

Risk reduction

Actions that can decrease the likelihood that individuals, groups, or communities will experience disease or other health conditions.

Risk communication

The exchange of information to increase understanding of health risks.

Route of exposure

The way people come into contact with a hazardous substance. Three routes of exposure are breathing [inhalation], eating or drinking [ingestion], or contact with the skin [dermal contact].

Safety factor [see uncertainty factor]

SARA [see Superfund Amendments and Reauthorization Act]

Sample

A portion or piece of a whole. A selected subset of a population or subset of whatever is being studied. For example, in a study of people the sample is a number of people chosen from a larger population [see population]. An environmental sample (for example, a small amount of soil or water) might be collected to measure contamination in the environment at a specific location.

Sample size

The number of units chosen from a population or an environment.

Solvent

A liquid capable of dissolving or dispersing another substance (for example, acetone or mineral spirits).

Source of contamination

The place where a hazardous substance comes from, such as a landfill, waste pond, incinerator, storage tank, or drum. A source of contamination is the first part of an exposure pathway.

Special populations

People who might be more sensitive or susceptible to exposure to hazardous substances because of factors such as age, occupation, sex, or behaviors (for example, cigarette smoking). Children, pregnant women, and older people are often considered special populations.

Stakeholder

A person, group, or community who has an interest in activities at a hazardous waste site.

Statistics

A branch of mathematics that deals with collecting, reviewing, summarizing, and interpreting data or information. Statistics are used to determine whether differences between study groups are meaningful.

Substance

A chemical.

Substance-specific applied research

A program of research designed to fill important data needs for specific hazardous substances identified in ATSDR's toxicological profiles. Filling these data needs would allow more accurate assessment of human risks from specific substances contaminating the environment. This research might include human studies or laboratory experiments to determine health effects resulting from exposure to a given hazardous substance.

Superfund [see Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and Superfund Amendments and Reauthorization Act (SARA)

Superfund Amendments and Reauthorization Act (SARA)

In 1986, SARA amended the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and expanded the health-related responsibilities of ATSDR. CERCLA and SARA direct ATSDR to look into the health effects from substance exposures at hazardous waste sites and to perform activities including health education, health studies, surveillance, health consultations, and toxicological profiles.

Surface water

Water on the surface of the earth, such as in lakes, rivers, streams, ponds, and springs [compare with groundwater].

Surveillance [see public health surveillance]

Survey

A systematic collection of information or data. A survey can be conducted to collect information from a group of people or from the environment. Surveys of a group of people can be conducted by telephone, by mail, or in person. Some surveys are done by interviewing a group of people [see prevalence survey].

Synergistic effect
A biologic response to multiple substances where one substance worsens the effect of another substance. The combined effect of the substances acting together is greater than the sum of the effects of the substances acting by themselves [see additive effect and antagonistic effect].
Teratogen
A substance that causes defects in development between conception and birth. A teratogen is a substance that causes a structural or functional birth defect.
Toxic agent
Chemical or physical (for example, radiation, heat, cold, microwaves) agents that, under certain circumstances of exposure, can cause harmful effects to living organisms.
Toxicological profile
An ATSDR document that examines, summarizes, and interprets information about a hazardous substance to determine harmful levels of exposure and associated health effects. A toxicological profile also identifies significant gaps in knowledge on the substance and describes areas where further research is needed.
Toxicology
The study of the harmful effects of substances on humans or animals.
Tumor
An abnormal mass of tissue that results from excessive cell division that is uncontrolled and progressive. Tumors perform no useful body function. Tumors can be either benign (not cancer) or malignant (cancer).
Uncertainty factor
Mathematical adjustments for reasons of safety when knowledge is incomplete. For example, factors used in the calculation of doses that are not harmful (adverse) to people. These factors are applied to the lowest-observed-adverse-effect-level (LOAEL) or the no-observed-adverse-effect-level (NOAEL) to derive a minimal risk level (MRL). Uncertainty factors are used to account for variations in people's sensitivity, for differences between animals and humans, and for differences between a LOAEL and a NOAEL. Scientists use uncertainty factors when they have some, but not all, the information from animal or human studies to decide whether an exposure will cause harm to people [also sometimes called a safety factor].
Urgent public health hazard
A category used in ATSDR's public health assessments for sites where short-term exposures (less than 1 year) to hazardous substances or conditions could result in harmful health effects that require rapid intervention.
Volatile organic compounds (VOCs)
Organic compounds that evaporate readily into the air. VOCs include substances such as benzene, toluene, methylene chloride, and methyl chloroform.

Other glossaries and dictionaries:

Environmental Protection Agency (http://www.epa.gov/OCEPAterms/)

National Center for Environmental Health (CDC) (http://www.cdc.gov/nceh/dls/report/glossary.htm)

National Library of Medicine (NIH) (http://www.nlm.nih.gov/medlineplus/mplusdictionary.html)

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