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Public Health Assessment

SMITHTOWN GROUNDWATER CONTAMINATION SITE

Town of Smithtown, Suffolk County, New York

August 28, 2002    CERCLIS No. NYD002318889

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SUMMARY

The Smithtown Groundwater Contamination site is in the Town of Smithtown, encompassed by the Villages of Nissequogue and Head of the Harbor and the Hamlet of St. James in Suffolk County, New York. Groundwater in the area is contaminated with volatile organic compounds (VOCs), primarily tetrachloroethene (also known as perchloroethylene, perc, or PCE). Many residents in the area use private wells for their potable water supply. Residents with contaminated private wells were exposed to VOCs in their water for an undetermined amount of time, possibly up to thirty years.

Samples collected from private wells between 1996 and 1998 showed that 38 wells were contaminated with PCE above the United States Environmental Protection Agency (US EPA) maximum contaminant level (MCL) and the New York State Department of Health (NYS DOH) drinking water standard of 5 micrograms per liter (μg/L), which is about the same as parts per billion or ppb for water. Six of the 38 wells had concentrations of PCE that also exceeded the US EPA’s Removal Action Level of 70 μg/L. One additional well sampled in 1996 was contaminated with 1,2-dichloropropane in excess of the US EPA MCL and NYS DOH drinking water standard of 5 μg/L.

For some compounds, the US EPA MCL and the NYS DOH drinking water standards differ. In 1998, nine wells were contaminated with 1,1,1-trichloroethane and one well was contaminated with cis-1,2-dichloroethene at levels which exceeded the NYS drinking water standard of 5 μg/L; these wells did not exceed the US EPA’s MCL for these compounds of 200 μg/L for 1,1,1-trichloroethane and 70 μg/L for cis-1,2-dichloroethene.

Beginning in April 1998, the US EPA initiated a removal action to reduce exposures to water contaminated with VOCs above the US EPA MCLs. As of April 1999, all 38 homes that had PCE concentrations in excess of the US EPA and the NYS DOH drinking water standard had been provided with a treatment system or an alternative water supply. Those 38 homes included the well with cis-1,2-dichloroethene and two with 1,1,1-trichloroethane. Seven wells with 1,1,1-trichloroethane and the well with 1,2-dichloropropane remain without treatment systems.

Because people were exposed to VOCs in drinking water at levels above New York State drinking water standards at the Smithtown Groundwater Contamination site, public health actions were needed to interrupt or minimize exposures (primarily to PCE). These exposures may have increased or continued had these measures not been taken. Human exposures to these contaminants occurred via ingestion, inhalation, and dermal contact. Exposures to VOCs in drinking water may have occurred for as long as 30 years. Studies of workers exposed to PCE and other chemicals suggest, but do not prove, that PCE causes cancer in humans. Somewhat weaker evidence that comes from
other studies show that people living in communities with drinking water supplies contaminated with mixtures of chemicals including PCE have higher risks of certain types of cancer than do people living in communities with uncontaminated drinking water. Because there is evidence from studies in animals and humans that exposure to elevated levels of PCE can increase the risk of adverse cancer and noncancer health effects in humans, we evaluated the potential health risk for exposure to these chemicals at the Smithtown Groundwater site.

Available data indicate that people drinking water from the six wells contaminated with PCE at the highest contaminant levels detected (82 μg/L to 200 μg/L) are estimated to have a moderate increased risk of developing cancer. Those exposed to 1,2 dichloropropane at the highest contaminant levels detected (14 μg/L) are estimated to have a low increased risk of developing cancer. The risks of non-carcinogenic effects - primarily to the liver, kidneys and nervous system - from exposure to site-related contaminants are estimated to be low to minimal. Some studies suggest, but do not prove, that the developing fetus may have increased sensitivity to the effects of PCE. The possibility that children may have increased sensitivity to PCE was taken into account when evaluating the potential health risks associated with the site.

Since 1996 and before treatment systems were installed, the Suffolk County Department of Health Services (SCDHS) issued health advisories to residents exposed to contaminants in their private drinking water supplies. In addition, the US EPA and Village officials held several community meetings to respond to residents' concerns. Residents expressed concerns about the possible sources of contamination and remediation of the problem. The NYS DOH continues to work with federal, county, and other state officials to address the remaining contamination and to ensure that the selected remedies are protective of public health.

The site currently presents no apparent public health hazard at the 38 residences which have been connected to public water supplies or where treatment systems have been installed to reduce levels of PCE contamination to below drinking water standards. In eight homes, residents may currently be exposed to levels of other site-related VOCs in excess of NYS DOH drinking water standards; however, the levels detected and the duration of exposure to date are not expected to result in adverse health effects. Future exposures could occur if groundwater is not remediated and contaminants migrate to additional wells, if new wells are installed in the contaminated plume(s), or if treatment systems are not maintained. Recommendations to reduce the threat of future or existing exposures include: maintaining the installed treatment systems and monitoring the quality of the treated water, installing additional treatment systems when VOC levels exceed the NYS DOH drinking water standards, providing public water where feasible, and pursuing a more permanent, long-term groundwater remedy.

This site is being considered for inclusion in the NYS VOC Exposure Registry. If this site is selected in the future, residents of households who were exposed in the past to VOCs from private well drinking water supplies will be asked by the NYS DOH to participate. The exposure registry allows long-term follow-up on the health status of persons with documented exposures to VOCs.
An exposure registry such as this one is a resource for research that may help us learn whether exposures to VOCs are related to health effects. Future analysis, based on VOC Exposure Registry information, may increase understanding of potential health effects from exposures similar to those experienced by residents in the area affected by the Smithtown Groundwater Contamination site. People who are enrolled in the Registry will be kept informed of any research results that come from the Registry data.

The NYS DOH and ATSDR will continue to coordinate with the US EPA, SCDHS, and the NYS DEC to implement the recommendations in this public health assessment and explore options for providing uncontaminated water supplies for those residents who continue to use wells that have contaminated water. Residents who were exposed in the past to VOCs in drinking water will be considered for inclusion in the NYS DOH VOC Exposure Registry.
PURPOSE AND HEALTH ISSUES

The purpose of this public health assessment (PHA) is to evaluate the public health implication of the human exposure pathways from contaminants at the site. Moreover, this PHA fulfills the congressional mandate for a public health assessment for each site being proposed to the National Priorities List (NPL). This public health assessment will focus primarily on exposure to VOCs in private drinking water supplies, the only documented exposure pathway at the site. Exposures to VOCs from contamination at potential source areas, such as those associated with contaminated soils or vapors, can not be evaluated at the present time because appropriate information is not available. The actions taken to date to identify those potentially exposed and to provide an alternate source of drinking water for the homeowners with wells contaminated above the NYS DOH drinking water standard will be discussed in this document.

BACKGROUND

A. Site Description and History

The Smithtown Groundwater Contamination study area (site) is an area of contaminated groundwater in the Town of Smithtown, Suffolk County, New York and includes the Villages of Nissoquogue and Head of the Harbor, and the Hamlet of St. James. The area is approximately 2.5 square miles and is south of Stony Brook Harbor and east of the Nissequogue River (Figure 1). The study area is primarily residential with some light commercial industry to the east of the Village of St. James and to the south of Smithtown. Approximately 1,500 people live within the study area. Many residents in the study area rely on private wells as their sole source of potable water. Residential wells in the area are contaminated with volatile organic compounds (VOCs), primarily tetrachloroethene (also known as perchloroethylene, perc, or PCE).

Between 1996 and 1998, the Suffolk County Department of Health Services (SCDHS) collected approximately 150 water samples from homes with private wells throughout the area. The results indicated widespread VOC contamination. PCE was the predominant contaminant of concern and was the basis for the additional investigations conducted by the SCDHS and the United States Environmental Protection Agency (US EPA). The initial investigation found twenty-three wells contaminated with PCE at concentrations exceeding the US EPA Maximum Contaminant Levels (MCL) and the New York State Department of Health (NYS DOH) drinking water standard of 5 micrograms per liter (μg/L). The MCL is the maximum permissible level of a contaminant in water delivered to the free-flowing outlet of the ultimate user of a public water system (ATSDR, 1993). Four of the 23 homes had PCE concentrations exceeding the US EPA’s Removal Action Level (RAL) of 70 μg/L.

As a follow up to the sampling conducted by the SCDHS, the US EPA collected approximately 350 well water samples from 300 homes to determine the extent of VOC contamination. The sampling
was part of an Integrated Assessment to evaluate the site for both Superfund Removal Action and National Priorities List (NPL) eligibility. Analytical results indicated a total of 38 residential wells contaminated with PCE at concentrations above the US EPA MCL and the NYS DOH drinking water standard of 5 μg/L. Six of these wells were found to have levels of PCE exceeding the US EPA’s RAL of 70 μg/L.

In addition to the PCE contamination, eleven of the residential wells sampled by the SCDHS and the US EPA were contaminated with other VOCs in excess of NYS DOH drinking water standards. While the US EPA MCL and NYS DOH drinking water standard are the same for PCE (5 μg/L), for some other VOCs, the NYS DOH drinking water standard is lower than the US EPA MCL. Nine wells had concentrations of 1,1,1-trichloroethane (1,1,1-TCA) at concentrations above the NYS DOH drinking water standard of 5 μg/L but below the US EPA MCL of 200 μg/L. Another well contained cis-1,2-dichloroethene above the NYS DOH drinking water standard of 5 μg/L but below the US EPA MCL of 70 μg/L. In one other well that was sampled only in 1996, the concentration of 1,2-dichloropropane exceeded the NYS DOH drinking water standard and the US EPA MCL of 5 μg/L.

The New York State Department of Environmental Conservation (NYS DEC) submitted a request to the US EPA in October 1997 for assistance in funding alternative water supplies for affected residents. The NYS DEC was not able to undertake actions because a source had not been identified. The site was proposed for the NPL on September 29, 1998. The site was listed on the NPL on January 19, 1999. The site was listed by the NYS DEC on its Registry of Inactive Hazardous Waste Disposal Sites in January, 2000.

To address the immediate health concern from exposure to PCE in drinking water, the US EPA initiated a removal action in April 1998. The US EPA supplied bottled water to four of the six residences with wells contaminated with PCE above the federal RAL. The other two residences with PCE concentrations above the RAL had granulated activated carbon (GAC) treatment systems installed at their own expense. In June 1998, the US EPA expanded the delivery of bottled water to homes where the State and federal drinking water standard for PCE was exceeded. These actions were undertaken until a more permanent solution could be implemented.

In July 1998, the US EPA initiated a removal action to provide a permanent water supply for residents. At residences where the US EPA MCL was exceeded and where water mains were available, the US EPA provided service connections to the public water supply. At residences where US EPA MCL was exceeded and water mains were not available, the US EPA installed GAC treatment systems or upgraded existing treatment systems. The US EPA continued bottled water delivery to homes where US EPA MCL was exceeded until final connections to water supply mains were made or alternative treatment systems were installed or upgraded.

Thirty-eight private residential wells had concentrations of PCE in excess of the US EPA’s MCL and the NYS DOH drinking water standard. As a result of the US EPA’s removal actions, all of these homes have alternative water supplies. A total of 29 homes were provided with connections
to public water supplies. Household GAC water treatment systems were installed at seven homes; existing treatment systems were upgraded in two homes.

Three of the eleven wells that were contaminated with VOCs other than PCE at concentrations above NYS DOH drinking water standards were among the 38 wells where PCE concentrations exceeded the US EPA MCL. One of these was the well contaminated with cis-1,2-DCE above the NYS DOH drinking water standard. The other two had 1,1,1-TCA concentrations above the NYS DOH drinking water standard. These three residences were among those connected to the public water supply by the US EPA's removal action.

The US EPA's removal action addressed homes where VOC concentrations in private water supplies exceeded US EPA MCLs. However, for some VOCs, including 1,1,1-TCA, the NYS DOH drinking water standard is lower than the US EPA MCL. The US EPA cannot provide connections or treatment for wells where contaminant concentrations do not exceed Federal MCLs. Thus, seven wells where concentrations of 1,1,1-TCA exceeded the NYS DOH drinking water standard were not addressed by the US EPA's removal action. The removal action also did not address the residential well that exceeded the NYS DOH drinking water standard and US EPA MCL for 1,2-dichloropropane in 1996 because this isolated occurrence did not appear to be related to the other contamination in the area.

The US EPA is conducting a remedial investigation to determine the extent of the groundwater contamination and to identify potential source areas. The SCDHS has also investigated several former and current commercial/industrial facilities south and east of the site to identify potential sources of the contaminated groundwater plume or plumes. Potential responsible parties investigated thus far include seven dry cleaning facilities, five auto repair shops, a cesspool facility, a gas station and a bus maintenance facility. Waste disposal systems were contaminated with VOCs including PCE at twelve of the fifteen potential sources investigated by the SCDHS. At the direction of the SCDHS, these facilities removed the contaminated materials from their waste disposal systems and disposed of them properly. The SCDHS collected samples that confirmed the satisfactory remediation of these potential source areas.

B. Actions Implemented During the Public Health Assessment Process

Public water mains continue to be extended into affected areas. Additional homes are connected to the public water system as the water mains are extended. The SCDHS continued its water sampling program in the affected area and continued to investigate potential sources of the contamination.

C. Site Visit and Physical Hazards

NYS DOH staff met with SCDHS staff on May 12, 1999 and visited the affected area. The purpose of the site visit was to observe area characteristics and to inspect the locations of suspected sources. The site visit included a walking inspection of an area at the southern end of Stony Brook Harbor where spring water from an artesian well, Dunton Spring, is allegedly collected and a drive through
the town and residential areas. Staff observed public water supply lines being installed at several locations within the site area. In the area of the spring, staff observed spring water flowing from a hose, which could be used for dispensing/collecting spring water. No physical hazards were identified at the site.

D. Demographics

The affected area was defined as the approximate 2.5 square mile region where well water is being tested for contamination. The NYS DOH estimated from the 1990 Census (US Bureau of the Census, 1991) that 1,500 people live within the area. This population is 98.4% white. The percent of persons of Hispanic origin is 2.9%. Based on the 1990 census, 4.8% of the population is under 6 years of age, 19.4% is 6-19 years of age, 69.3% is 20-64 years of age, and 6.5% is 65 years or older. In 1990 there were 321 females of reproductive age (ages 15-44) in the area. The area lies mostly within block groups 1349.04/9, 1350.04/1, and 1350.04/2. The median household income for this area is $90,500 in 1989, with 1.3% of the population living below the poverty level. There are no schools or nursing homes in the area. The following chart compares these demographics with statewide averages.

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<th>New York State</th>
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<td><strong>% Below Poverty Level</strong></td>
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COMMUNITY HEALTH CONCERNS

The US EPA and Village officials held a public meeting in Smithtown on July 22, 1998 to discuss the groundwater contamination investigation and the selected remedial action. Residents expressed concerns about the possible source(s) of the contamination, remediation of the problem and responsibility for costs associated with the supply of an uncontaminated drinking water source. The removal action initially selected by the US EPA included installation of household GAC treatment systems at most affected residences. However, the majority of residents preferred connection to the public water supply over installation of treatment systems. The US EPA was informed that privately-funded water mains were planned or proposed for much of the affected area. Based on this finding, the US EPA revised the removal action to include providing public water main connections to affected residents where available. The US EPA did not provide water main connections or treatment systems to eight homes where VOC contamination exceeded NYS drinking water standards. These included the seven with 1,1,1-TCA concentrations between the NYS DOH and US EPA MCLs and the one with 1,2-dichloropropane in excess of the NYS DOH and US EPA MCLs.

Before treatments systems were installed, or before connections to public water supplies were provided, Suffolk County health officials provided written statements to affected residents advising them of potential health effects from exposure to VOCs and recommended ways to reduce their exposures to VOCs in household water.

ENVIRONMENTAL CONTAMINATION

This section includes a discussion of sampling data for environmental media. The environmental data presented in this section were gathered during investigations by the SCDHS and the US EPA. The following sections summarize the results of the investigations of groundwater contamination in and around the study area.

Groundwater

Groundwater in the area is known to be contaminated. The contamination includes an area of two to three square miles. Private wells in the area which use groundwater as a source of potable water are between 70 and 200 feet deep. In some cases, individual water supplies showed no contamination in areas where neighbors had high levels of contamination. Such differences may be due to differences in depth and construction of individual wells.

Between 1996 and 1998, approximately 500 private well samples were collected by the SCDHS and the US EPA (multiple samples were collected from some residences). The volatile organic compounds PCE, 1,1,1-trichloroethane (TCA), cis-1,2-dichloroethene and 1,2-dichloropropane were detected at concentrations greater than the NYS DOH drinking water standards (Table 1 in Appendix B). Two of these contaminants, PCE and 1,2-dichloropropane, exceeded applicable US EPA MCL. Lesser concentrations of other VOC compounds, including breakdown products of
PCE, were detected at levels which did not exceed applicable drinking water standards (Table 2 in Appendix B). Two samples contained tetrachloroterephthalic acid (TCPA), a breakdown product of the pesticide dacthal, though not at levels which exceeded the NYS DOH drinking water standard.

TCA was detected more frequently than PCE, but at lower concentrations. TCA was present in approximately two-thirds (264/405) of the samples collected; PCE was detected in approximately one-third (161/481) of the samples collected. Samples containing cis-1,2-dichloroethene (up to 6 μg/L) and 1,2-dichloropropane (up to 14 μg/L) were less frequent.

One household well was contaminated with PCE at 200 μg/L, the highest level detected. This level is approximately 40 times the US EPA and NYS DOH drinking water standard. In all, six wells were contaminated with PCE above the US EPA’s RAL of 70 μg/L; another 32 were contaminated at levels ranging between 5 and 70 μg/L. Approximately 68 private wells were contaminated with PCE at levels below the current US EPA MCL and NYS DOH drinking water standard of 5 μg/L.

The highest level of TCA detected was 38 μg/L. Nine wells were contaminated with TCA at levels above the NYS DOH drinking water standard; however, the majority (approximately 85) of wells contaminated with TCA are at levels below the NYS DOH drinking water standard of 5 μg/L. One well was contaminated with cis-1,2-dichloroethene (6 μg/L) at levels slightly above the NYS DOH drinking water standard of 5 μg/L. These private wells did not exceed the US EPA’s MCL of 200 μg/L for TCA and 70 μg/L for cis-1,2-dichloroethene. 1,2-Dichloropropane was detected at one residence at a level of 14 μg/L, which exceeds federal and state drinking water standards of 5 μg/L for the compound.

Analytical data from existing groundwater monitoring wells near suspected source areas did not indicate significant VOC contamination. The US EPA is planning to install additional groundwater monitoring wells in the study area to define the extent of the groundwater contamination.

Samples collected from the artesian well, Dunton Spring, contained up to 2 μg/L of PCE. The US EPA is planning to resample Dunton Spring and other “seep” areas where groundwater is discharged to the surface.

Surface Water

Groundwater in the area is thought to flow in a north-northwest direction, with strong influences in flow direction towards the Nissoquoque River and Stony Brook Harbor (C.D.M. 2000). This will be confirmed during the remedial investigation of the site. The contamination appears to be moving in a northwest direction toward Stony Brook Harbor and the Nissoquoque River. Several residential wells directly adjacent to Stony Brook Harbor have been contaminated with PCE and 1,1,1-TCA; two of these wells have been contaminated above the RAL. There are no analytical data for surface water from Stony Brook Harbor or the Nissoquoque River.
Sediment, Sludge and Liquids at Potential Source Areas

The SCDHS has been investigating potential sources of the contamination by sampling the septic tanks, cesspools/leaching pools and/or other on-site waste disposal systems of several businesses south and east of the site. The SCDHS investigated fifteen facilities that could be responsible for the groundwater contamination. Samples collected from the waste disposal systems of twelve of these fifteen facilities contained high concentrations of VOCs, including PCE. The other three potential sources either did not use VOCs or their disposal systems did not contain chlorinated solvents. Samples from the twelve potential sources contained concentrations of PCE and its breakdown products up to 67,900,000 µg/L (6.6% by weight) in liquid and up to 160,000 µg/kg in sludge. To date, all of the identified waste disposal systems have been satisfactorily remediated through excavation or pumping and require no further action. The US EPA and SCDHS will continue the search for potential sources of the area’s groundwater contamination.

Air/Soil Vapor

No outdoor or indoor air samples have been collected. The VOC contamination associated with the site is believed to be related to subsurface sources not directly vented to the atmosphere. No soil vapor samples have been collected. Soil vapor migration is not likely in the study area because the VOC contamination appears to be limited to the groundwater and levels of contamination are low, the groundwater is deep, and the depth of the contaminants in the groundwater are still deeper. As more detailed investigations of potential source areas are conducted, soil vapor or air samples may be collected at these locations.

PATHWAYS ANALYSIS

This section of the public health assessment (PHA) identifies completed exposure pathways associated with the site in the past, during the present and potentially in the future. An exposure pathway is the process by which an individual may be exposed to contaminants originating from a site. An exposure pathway is comprised of five elements including: (1) a contaminant source, (2) environmental media and transport mechanisms, (3) a point of exposure, (4) a route of exposure, and (5) a receptor population.

The source of contamination is the origin of the release of the contaminant to the environment (any waste disposal area or point of discharge); if the original source is unknown, it is the environmental media (soil, air, biota, water) which are contaminated at the point of exposure. Environmental media and transport mechanisms “carry” contaminants from the source to points where human exposure may occur. The exposure point is a location where actual or potential human contact with a contaminated medium may occur. The route of exposure is the manner in which a contaminant actually enters or contacts the body (i.e., ingestion, inhalation, dermal adsorption). The receptors are people who are exposed or may be exposed to contaminants at a point of exposure.

For the Smithtown Groundwater Contamination site, there is one completed exposure pathway -
exposure to VOCs in private drinking water. Exposure to contaminants in drinking water supplies can occur via ingestion, dermal contact and absorption during showering, bathing or other household uses, and via inhalation of aerosols and vapors from water used in the household. For an undetermined period of time, well owners have been exposed to VOCs in their drinking water supply. Prior to 1996, we do not know how long or at what concentrations people were exposed to these contaminants. If a worst case exposure scenario is assumed, the maximum exposure duration could be as long as 30 years, the approximate time since the affected homes were constructed and the potential source facilities were operational. Exposures have been eliminated or significantly reduced at residences where PCE contamination exceeded the US EPA MCL through the implementation of water treatment systems or provision of alternate water supplies (see Table 2 in Appendix B). However, if treatment systems fail or if wells are used in the future (e.g., household or irrigation purposes), then exposures could recur. Exposure to VOCs at levels below current US EPA MCL may still be occurring at some households. Homes with private wells that contain site-related contamination above the NYS drinking water standard, but below the US EPA’s MCL and thus not addressed by the US EPA’s previous removal action, are being considered as candidates for an alternate water supply under a separate action contemplated by the NYS DEC.

Exposure to VOCs through ingestion of contaminated spring water (Dunton Spring) remains a potential pathway if the spring water is collected for drinking. The SCDHS maintains a database of the historic monitoring results from the spring. The US EPA sampled the spring as recently as 1998. A review of the data indicates that VOC contaminants have not been detected at concentrations exceeding US EPA or NYS drinking water standards. While there are no current or were no known past exposures to VOCs from the spring above the drinking water standard, migration of the contaminant plume(s) into the area of the spring could result in exposures at higher levels. The US EPA is planning to resample Dunton Spring and sample several potential seep points along the shores of Stony Brook Harbor to characterize the nature and extent of groundwater contamination in these areas.

Past potential pathways of exposure may have existed around potential source area facilities. Subsurface sediments and soils in and around the septic systems of some of these areas were heavily contaminated with VOCs. To date, all of the identified waste disposal systems have been satisfactorily remediated. Employees of the suspected facilities and other individuals could have been exposed in the past to residual VOC vapors in indoor air. The vapors could have originated in heavily contaminated subsurface soils and sediments and migrated into overlying buildings and structures via soil vapor migration. This exposure pathway may have been completed in the past but does not exist in the present due to the corrective remedial measures undertaken at the suspected facilities. There are no analytical data on indoor air quality from any of the identified potential source areas; therefore, we do not know the public health implications of the past potential exposures.

Soil vapor migration is unlikely in the study area because the VOC contamination appears to be limited to the groundwater. The levels of contamination are relatively low and the groundwater is deep.
PUBLIC HEALTH IMPLICATIONS: ADULT AND CHILDREN’S HEALTH ISSUES

An analysis of the toxicological and epidemiological implications of the human exposure pathways of concern is presented below. To evaluate the potential health risks from contaminants of concern associated with the Smithtown Groundwater site, the NYS DOH assessed the risks for cancer and noncancer health effects. The risks of health effects depend primarily on contaminant concentration, exposure route, exposure frequency and duration. Additional information on the NYS DOH assessment for this site is presented in Appendix C.

A. Toxicological and Epidemiological Evaluation

Exposure 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 approximately 30 years, some private water supply wells in the Smithtown community have been contaminated with chlorinated volatile organic compounds (VOCs). The highest levels of cis-1,2-dichloroethene (6 µg/L), 1,2-dichloropropane (14 µg/L), PCE (200 µg/L) and TCA (38 µg/L) measured in private wells exceed NYS public drinking water standards and/or public health assessment comparison values (see Table 3 in Appendix B). Therefore, these chemicals have been selected for further evaluation.

Studies of workers exposed to PCE and other chemicals show an association between exposure to high levels of these chemicals and increased risks of certain forms of cancer, including cervical, esophageal and non-Hodgkin's lymphoma (ATSDR, 1997). These associations are unlikely to be due to chance; 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 PCE causes cancer in humans. Other studies show that people living in communities with drinking water supplies contaminated by mixtures of chemicals including PCE 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. PCE and 1,2-dichloropropane cause cancer in laboratory animals exposed to high levels over their lifetimes (ATSDR, 1989, 1997). Chemicals that cause cancer in laboratory animals may cause cancer in humans who are exposed to lower levels over long periods of time. Whether 1,2-dichloropropane causes cancer in humans is not known. The highest detected level of PCE in well water people drank was 200 µg/L, and six samples from untreated wells had levels between 82 and 200 µg/L. Based on the results of animal studies, studies in humans and limited sampling of private residential water supply wells, people drinking water over a period of up to 30 years containing PCE at levels from 82 µg/L up to
200 µg/L are estimated to have a moderate increased risk of developing cancer. People drinking water with PCE levels from 5 µg/L to 82 µg/L for 30 years have a low risk of developing cancer. For people drinking treated water with an occasional breakthrough concentration of PCE in excess of the drinking water standard (such as the 11 µg/L concentration observed in one home), the risk is estimated to be very low. People exposed to 14 µg/L 1,2-dichloropropane are also estimated to have a low increased cancer risk. Toxicological data are inadequate to assess the carcinogenic potential of cis-1,2-dichloroethene and 1,1,1-trichloroethane (ATSDR, 1995, 1996).

The chlorinated contaminants detected in some of the private drinking water supplies in the Smithtown community also produce a variety of noncarcinogenic effects, primarily to the liver, kidneys and nervous system. Although the risks of noncarcinogenic effects from past exposures to the highest levels of these chlorinated VOCs in private drinking water supplies are not completely understood, the existing data suggest that they would be low for PCE levels from 175 µg/L to 200 µg/L, minimal for PCE concentrations up to 175 µg/L and minimal for cis-1,2-dichloroethene (6 µg/L), 1,2-dichloropropane (14 µg/L) and TCA (38 µg/L). Following treatment, the risk for PCE would be minimal.

B. ATSDR Child Health Initiative

The ATSDR Child Health Initiative emphasizes examining child health issues in all of the Agency activities, including evaluating child-focused concerns through its mandated public health assessment activities. The ATSDR and NYS DOH consider children when evaluating 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 from a chemical and the relationship may change with developmental age.

The possibility that children or the developing fetus may have increased sensitivity to PCE (the primary contaminant at the Smithtown Groundwater Contamination site) was taken into account when evaluating the potential health risks associated with the site. Human studies suggest that exposure to mixtures of chlorinated solvents (including PCE) 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/or childhood leukemia (ATSDR, 1997). In each of these studies, however, there are uncertainties about how much contaminated water the women drank during pregnancy and about how much PCE was in the water the women drank during pregnancy. Moreover, the role of other factors in causing these effects is not fully known. The most important of the factors was the potential exposure during pregnancy to other chemicals in drinking water. These studies suggest, but do not prove, that the developing fetus may have increased sensitivity to the effects of PCE.

When pregnant animals are exposed by ingestion or inhalation to large amounts of PCE (i.e., amounts that caused adverse health effects in the adult animal), adverse effects on the normal
development of the offspring are observed. In addition, a study in young mice suggests effects on
the central nervous system after transient exposure to PCE by ingestion 10 to 16 days after birth
(Fredriksson et al., 1993). The estimated levels of exposure to PCE at the Smithtown Groundwater
Contamination site were more than 400 times lower than the levels of exposure in the animal
studies in which adverse health effects were observed. Thus, the possibility that children may have
increased sensitivity to PCE was taken into account when evaluating the potential health risks
associated with the site.

HEALTH OUTCOME DATA

This site is being considered for inclusion in the NYS VOC Exposure Registry. If this site is
selected in the future, residents of households who were exposed in the past to VOCs from private
well drinking water supplies will be asked by the NYS DOH to participate. The exposure registry
allows long-term follow-up on the health status of persons with documented exposures to VOCs.
An exposure registry such as this one is a resource for research that may help us learn whether
exposures to VOCs are related to health effects. Future analysis, based on VOC Exposure Registry
information, may increase understanding of potential health effects from exposures similar to those
experienced by residents in the area affected by the Smithtown Groundwater Contamination site.
People who are enrolled in the Registry will be kept informed of any research results that come
from the Registry data.

CONCLUSIONS

Because people were exposed to VOCs in drinking water at levels above New York State drinking
water standards at the Smithtown Groundwater Contamination site, public health actions were
needed to interrupt or minimize exposures (primarily to PCE). These exposures may have increased
or continued had these measures not been taken. Human exposures to these contaminants occurred
via ingestion, inhalation, and dermal contact. Exposures to VOCs in drinking water may have
occurred for as long as 30 years. Studies of workers exposed to PCE and other chemicals suggest,
but do not prove, that PCE causes cancer in humans. Somewhat weaker evidence that comes from
other studies show that people living in communities with drinking water supplies contaminated
with mixtures of chemicals including PCE have higher risks of certain types of cancer than do
people living in communities with uncontaminated drinking water. Because there is evidence
from studies in animals and humans that exposure to elevated levels of PCE can increase the risk of
adverse cancer and noncancer health effects in humans, we evaluated the potential health risk for
exposure to these chemicals at the Smithtown Groundwater site.

Available data indicate that people drinking water from the six wells contaminated with PCE at the
highest contaminant levels detected (82 µg/L to 200 µg/L) are estimated to have a moderate (See
Appendix C) increased risk of developing cancer. Those exposed to 1,2 dichloropropane at the
highest contaminant levels detected (14 µg/L) are estimated to have a low increased risk of
developing cancer. Toxicological data are inadequate to assess the carcinogenic potential of
cis-1,2-dichloroethene and 1,1,1-trichloroethane. The risks of non-carcinogenic effects - primarily

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to the liver, kidneys and nervous system - from exposure to all site-related contaminants are estimated to be low to minimal. Residents who were exposed are being considered for inclusion in the NYS VOC Exposure Registry.

Exposures to PCE in drinking water at concentrations above its drinking water standard have been eliminated or significantly reduced in thirty-eight homes. Therefore, the site currently poses no apparent public health hazard for individual households supplied with a treatment system or public drinking water. However, future exposures could occur for residents not connected to public water supplies if groundwater is not remediated and the contaminants migrate to additional wells, if new wells are installed in the contaminated plume, or if treatment systems are not maintained. Occasional failures in the treatment system could result in temporary exposure to contaminants at concentrations above the drinking water standard. The increased cancer risk associated with the occasional breakthrough is estimated to be very low. Proper maintenance of these systems is encouraged.

Residents using seven wells may currently be exposed to 1,1,1-TCA and residents using one well to 1,2-dichloropropane at levels which exceed current NYS DOH drinking water standards. Although people exposed to these contaminants at the highest levels detected are estimated to have a low to minimal increased risk of developing cancer and noncancer effects, respectively, the NYS DOH, in accordance with prudent public health practice, recommends that measures be taken to minimize the potential for human consumption of drinking water containing elevated concentrations of VOCs.

Exposure pathways other than via drinking water are not considered to be significant. A single source of the contamination has not been found, and there may be or may have been multiple sources. Historic groundwater flow data indicate that the contamination is moving in a northwest direction. Investigations currently underway for the Smithtown Groundwater site will provide the details necessary to track the movement of groundwater contamination more thoroughly.

RECOMMENDATIONS

1. Actions should continue to be taken to reduce exposures to people from drinking water that exceeds drinking water standards.
2. Installed treatment systems must be maintained and the quality of the treated water should be monitored until contamination stops or an alternative water supply is provided.
3. Monitoring of potentially affected private wells in the area should continue, with alternative water supplies provided to additional homes identified as having contaminant levels which exceed the NYS drinking water standard.
4. Potential sources of contamination, if any, should continue to be identified and remediated as necessary. Potential exposures from these areas should also be evaluated.
5. The natural spring in the study area should be sampled and appropriate control measures should be implemented, if necessary.
6. A permanent, long-term remedy for groundwater users should be sought.
PUBLIC HEALTH ACTION PLAN

The Public Health Action Plan (PHAP) for the Smithtown Groundwater Contamination site contains a description of actions to be taken by ATSDR and/or the NYS DOH following completion of this health assessment. For those actions already taken at the site, please refer to the Background section of this public health assessment. The purpose of the PHAP is to ensure that this public health assessment identifies public health hazards and provides a plan of action designed to mitigate and prevent adverse human health effects resulting from the past, present and/or future exposures to hazardous substances at or near the site. Included is a commitment on the part of ATSDR and/or the NYS DOH to follow up on this plan to ensure that it is implemented. The public health actions to be implemented by ATSDR and/or the NYS DOH are as follows:

1. The NYS DOH and SCDHS will work with the NYS DEC and US EPA to explore options for providing alternative water sources to residents who continue to use wells that are contaminated with 1,1,1-TCA and 1,2-dichloropropane above NYS drinking water standards.
2. The NYS DOH will coordinate with the appropriate environmental agencies to develop a plan to implement the recommendations contained in this public health assessment.
3. ATSDR will provide follow-up to this PHAP, as needed, outlining the actions completed and those in progress. This report will be placed in repositories that contain copies of this public health assessment and will be provided to people who request it.
4. Residents who were exposed in the past to VOCs in drinking water will be considered for inclusion in the NYS DOH registry of VOC exposures in drinking water.
5. The NYS DOH, in conjunction with the SCDHS, will continue community health education activities to people whose drinking water supplies are contaminated with PCE in the Smithtown Groundwater Contamination study area. These activities will include meeting with the public and providing information on ways to reduce exposures to VOCs in drinking water.

ATSDR will reevaluate and expand the PHAP when 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 this site.
REFERENCES


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Agency for Toxic Substances and Disease Registry

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Regional Operations
Office of the Assistant Administrator

Technical Project Officer
Greg Ulirsch
Technical Project Officer
Division of Health Assessment and Consultation
Superfund Site Assessment Branch
CERTIFICATION

This Public Health Assessment 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.

[Signature]
Technical Project Officer, SPS, SSAB, DHAC

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

[Signature]
Chief, SPS, SSAB, DHAC, ATSDR
APPENDIX A

FIGURE
APPENDIX B

TABLES
Table 1
Contaminants of Concern for Smithtown Groundwater Contamination Site

All values in micrograms per liter (μg/L)

<table>
<thead>
<tr>
<th>Analyte</th>
<th>NYS Drinking Water Standard</th>
<th>US EPA MCL</th>
<th>UNTREATED WATER (includes pre-filter samples)</th>
<th>TREATED WATER (post-filter samples)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MoD</td>
<td>Range</td>
<td>FoD</td>
<td>Range</td>
</tr>
<tr>
<td>tetrachloroethene (PCE)</td>
<td>5</td>
<td>5</td>
<td>160/481</td>
<td>&lt;0.5 - 200</td>
</tr>
<tr>
<td>1,1,1-trichloroethane (TCA)</td>
<td>5</td>
<td>200</td>
<td>261/408</td>
<td>&lt;0.5 - 38</td>
</tr>
<tr>
<td>cis-1,2 dichloroethene</td>
<td>5</td>
<td>70</td>
<td>13/35</td>
<td>&lt;0.5 - 6</td>
</tr>
<tr>
<td>1,2-dichloropropane</td>
<td>5</td>
<td>5</td>
<td>4/20</td>
<td>&lt;0.5 - 14</td>
</tr>
</tbody>
</table>

Data taken from private drinking water supply well sampling results
FoD = Frequency of Detection
* All untreated water results represent concentrations at actual exposure points (historical) or eliminated but potential exposure points (wells currently filtered)

NA = Not Analyzed or Not Available
<table>
<thead>
<tr>
<th>Analyte</th>
<th>Analyte Code</th>
<th>Range</th>
<th>FoD</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>tetrachloroethene (PCE)</td>
<td>160/481</td>
<td>&lt;0.5 - 200</td>
<td>4/23</td>
<td>&lt;0.5 - 11</td>
</tr>
<tr>
<td>1,1,1-trichloroethane (TCA)</td>
<td>261/408</td>
<td>&lt;0.5 - 38</td>
<td>3/23</td>
<td>&lt;0.5 - 2.1</td>
</tr>
<tr>
<td>trichloroethene (TCE)</td>
<td>16/55</td>
<td>&lt;0.5 - 4</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>1,1-dichloroethene</td>
<td>11/55</td>
<td>&lt;0.5 - 1</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>1,1-dichloroethane</td>
<td>26/55</td>
<td>&lt;0.5 - 3</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>cis-1,2-dichloroethylene</td>
<td>13/35</td>
<td>&lt;0.5 - 6</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>dichlorodifluoromethane</td>
<td>9/35</td>
<td>&lt;0.5 - 3</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>1,2-dichloropropane</td>
<td>4/20</td>
<td>&lt;0.5 - 14</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>chloroform</td>
<td>3/35</td>
<td>&lt;0.5 - 3</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>chlorofluoromethane</td>
<td>4/55</td>
<td>&lt;0.5 - 2</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>methyl tert butyl ether (MTBE)</td>
<td>3/55</td>
<td>&lt;0.5 - 1</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>TCPA</td>
<td>2/20</td>
<td>&lt;10.0 - 42</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>1,2,3-trichloropropane</td>
<td>1/20</td>
<td>&lt;0.5 - 2</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Data taken from private drinking water supply well sampling results
FoD = Frequency of Detection
N/A = Not Analyzed or Not Available
TCPA is a breakdown product of the pesticide dacthal.

<table>
<thead>
<tr>
<th>Contaminant</th>
<th>Range of Detection</th>
<th>Ground-Water</th>
<th>Drinking-Water</th>
<th>US EPA Drinking Water</th>
<th>Cancer Basis**</th>
<th>Noncancer Basis**</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Untreated Water</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>cis-1,2-dichloroethene</td>
<td>0.5 - 6</td>
<td>5</td>
<td>5</td>
<td>70</td>
<td>--</td>
<td>70</td>
</tr>
<tr>
<td>1,2-dichloropropane</td>
<td>0.5 - 14</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>0.51</td>
<td>630</td>
</tr>
<tr>
<td>tetrachloroethene</td>
<td>0.5 - 200</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>0.7</td>
<td>70</td>
</tr>
<tr>
<td>1,1,1-trichloroethane</td>
<td>0.5 - 38</td>
<td>5</td>
<td>5</td>
<td>200</td>
<td>--</td>
<td>140</td>
</tr>
<tr>
<td><strong>Treated Water</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>tetrachloroethene</td>
<td>0.5 - 11</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>0.7</td>
<td>70</td>
</tr>
</tbody>
</table>

* Comparison values determined for a 70 kg adult who drinks 2 liters of water per day.

** ATSDR MRL = ATSDR Minimal Risk Level
EPA CPF = US EPA Cancer Potency Factor
EPA HEAST = US EPA Health Effects Assessment Summary Tables
EPA LTHA = US EPA Lifetime Health Advisory
EPA RFD = US EPA Reference Dose
EPA PV = Provisional value from US EPA Superfund Technical Support Center; National Center for Environmental Assessment
APPENDIX C

NEW YORK STATE DEPARTMENT OF HEALTH
PROCEDURES 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 Smithtown Groundwater Contamination 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:

<table>
<thead>
<tr>
<th>Risk Ratio</th>
<th>Qualitative Descriptor</th>
</tr>
</thead>
<tbody>
<tr>
<td>equal to or less than one per million</td>
<td>very low</td>
</tr>
<tr>
<td>greater than one per million to less than one per ten thousand</td>
<td>low</td>
</tr>
<tr>
<td>one per ten thousand to less than one per thousand</td>
<td>moderate</td>
</tr>
<tr>
<td>one per thousand to less than one per ten</td>
<td>high</td>
</tr>
<tr>
<td>equal to or greater than one per ten</td>
<td>very high</td>
</tr>
</tbody>
</table>

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.

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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:

<table>
<thead>
<tr>
<th>Qualitative Descriptions for Noncarcinogenic Health Risks</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ratio of Estimated Contaminant Intake to Risk Reference Dose</strong></td>
</tr>
<tr>
<td>equal to or less than the risk reference dose</td>
</tr>
<tr>
<td>greater than one to five times the risk reference dose</td>
</tr>
<tr>
<td>greater than five to ten times the risk reference dose</td>
</tr>
<tr>
<td>greater than ten times the risk reference dose</td>
</tr>
</tbody>
</table>

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

PUBLIC HEALTH HAZARD CATEGORIES
### INTERIM PUBLIC HEALTH HAZARD CATEGORIES

<table>
<thead>
<tr>
<th>CATEGORY / DEFINITION</th>
<th>DATA SUFFICIENCY</th>
<th>CRITERIA</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A. Urgent Public Health Hazard</strong></td>
<td>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.</td>
<td>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.</td>
</tr>
<tr>
<td><strong>B. Public Health Hazard</strong></td>
<td>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.</td>
<td>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.</td>
</tr>
<tr>
<td><strong>C. Indeterminate Public Health Hazard</strong></td>
<td>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.</td>
<td>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.</td>
</tr>
<tr>
<td><strong>D. No Apparent Public Health Hazard</strong></td>
<td>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.</td>
<td>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.</td>
</tr>
<tr>
<td><strong>E: No Public Health Hazard</strong></td>
<td>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.</td>
<td></td>
</tr>
</tbody>
</table>

*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

ATSDR GLOSSARY OF ENVIRONMENTAL HEALTH TERMS
Absorption: How a chemical enters a person’s blood after the chemical has been swallowed, has come into contact with the skin, or has been breathed in.

Acute Exposure: Contact with a chemical that happens once or only for a limited period of time. ATSDR defines acute exposures as those that might last up to 14 days.

Additive Effect: A response to a chemical mixture, or combination of substances, that might be expected if the known effects of individual chemicals, seen at specific doses, were added together.

Adverse Health Effect: A change in body function or the structures of cells that can lead to disease or health problems.

Antagonistic Effect: A response to a mixture of chemicals or combination of substances that is less than might be expected if the known effects of individual chemicals, seen at specific doses, were added together.

ATSDR: The Agency for Toxic Substances and Disease Registry. ATSDR is a federal health agency in Atlanta, Georgia that deals with hazardous substance and waste site issues. ATSDR gives people information about harmful chemicals in their environment and tells people how to protect themselves from coming into contact with chemicals.

Background Level: An average or expected amount of a chemical in a specific environment. Or, amounts of chemicals that occur naturally in a specific environment.

Biota: Used in public health, things that humans would eat – including animals, fish and plants.

CAP: See Community Assistance Panel.

Cancer: A group of diseases which occur when cells in the body become abnormal and grow, or multiply, out of control.

Carcinogen: Any substance shown to cause tumors or cancer in experimental studies.


Chronic Exposure: A contact with a substance or chemical that happens over a long period of time. ATSDR considers exposures of more than one year to be chronic.

Completed Exposure Pathway: See Exposure Pathway.
Community Assistance
Panel (CAP): A group of people from the community and health and environmental agencies who work together on issues and problems at hazardous waste sites.

Comparison Value:
(CVs) Concentrations or the amount of substances in air, water, food, and soil that are unlikely, upon exposure, to cause adverse health effects. Comparison values are used by health assessors to select which substances and environmental media (air, water, food and soil) need additional evaluation while health concerns or effects are investigated.

Comprehensive Environmental Response, Compensation, and Liability
Act (CERCLA): CERCLA was put into place in 1980. It is also known as Superfund. This act concerns releases of hazardous substances into the environment, and the cleanup of these substances and hazardous waste sites. ATSDR was created by this act and is responsible for looking into the health issues related to hazardous waste sites.

Concern: A belief or worry that chemicals in the environment might cause harm to people.

Concentration: How much or the amount of a substance present in a certain amount of soil, water, air, or food.

Contaminant: See Environmental Contaminant.

Delayed Health Effect: A disease or injury that happens as a result of exposures that may have occurred far in the past.

Dermal Contact: A chemical getting onto your skin. (see Route of Exposure).

Dose: The amount of a substance to which a person may be exposed, usually on a daily basis. Dose is often explained as “amount of substance(s) per body weight per day”.

Dose / Response: The relationship between the amount of exposure (dose) and the change in body function or health that result.

Duration: The amount of time (days, months, years) that a person is exposed to a chemical.

Environmental Contaminant: A substance (chemical) that gets into a system (person, animal, or the environment) in amounts higher than that found in Background Level, or what would be expected.

Environmental Media: Usually refers to the air, water, and soil in which chemicals of interest are found. Sometimes refers to the plants and animals that are eaten by humans. Environmental Media is the second part of an Exposure Pathway.
U.S. Environmental Protection Agency (EPA): The federal agency that develops and enforces environmental laws to protect the environment and the public’s health.

Epidemiology: The study of the different factors that determine how often, in how many people, and in which people will disease occur.

Exposure: Coming into contact with a chemical substance. (For the three ways people can come in contact with substances, see Route of Exposure.)

Exposure Assessment: The process of finding the ways people come in contact with chemicals, how often and how long they come in contact with chemicals, and the amounts of chemicals with which they come in contact.

Exposure Pathway: A description of the way that a chemical moves from its source (where it began) to where and how people can come into contact with (or get exposed to) the chemical.

ATSDR defines an exposure pathway as having 5 parts:
1. Source of Contamination,
2. Environmental Media and Transport Mechanism,
3. Point of Exposure,
4. Route of Exposure, and
5. Receptor Population.

When all 5 parts of an exposure pathway are present, it is called a Completed Exposure Pathway. Each of these 5 terms is defined in this Glossary.

Frequency: How often a person is exposed to a chemical over time; for example, every day, once a week, twice a month.

Hazardous Waste: Substances that have been released or thrown away into the environment and, under certain conditions, could be harmful to people who come into contact with them.

Health Effect: ATSDR deals only with Adverse Health Effects (see definition in this Glossary).

Indeterminate Public Health Hazard: The category is used in Public Health Assessment documents for sites where important information is lacking (missing or has not yet been gathered) about site-related chemical exposures.

Ingestion: Swallowing something, as in eating or drinking. It is a way a chemical can enter your body (See Route of Exposure).

Inhalation: Breathing. It is a way a chemical can enter your body (See Route of Exposure).
LOAEL: **Lowest Observed Adverse Effect Level.** The lowest dose of a chemical in a study, or group of studies, that has caused harmful health effects in people or animals.

Malignancy: See **Cancer.**

MRL: **Minimal Risk Level.** An estimate of daily human exposure -- by a specified route and length of time -- to a dose of chemical that is likely to be without a measurable risk of adverse, noncancerous effects. An MRL should not be used as a predictor of adverse health effects.

NPL: **The National Priorities List. (Which is part of Superfund.)** A list kept by the U.S. Environmental Protection Agency (EPA) of the most serious, uncontrolled or abandoned hazardous waste sites in the country. An NPL site needs to be cleaned up or is being looked at to see if people can be exposed to chemicals from the site.

NOAEL: **No Observed Adverse Effect Level.** The highest dose of a chemical in a study, or group of studies, that did not cause harmful health effects in people or animals.

No Apparent Public Health Hazard: The category is used in ATSDR’s Public Health Assessment documents for sites where exposure to site-related chemicals may have occurred in the past or is still occurring but the exposures are not at levels expected to cause adverse health effects.

No Public Health Hazard: The category is used in ATSDR’s Public Health Assessment documents for sites where there is evidence of an absence of exposure to site-related chemicals.

PHA: **Public Health Assessment.** A report or document that looks at chemicals at a hazardous waste site and tells if people could be harmed from coming into contact with those chemicals. The PHA also tells if possible further public health actions are needed.

Plume: A line or column of air or water containing chemicals moving from the source to areas further away. A plume can be a column or clouds of smoke from a chimney or contaminated underground water sources or contaminated surface water (such as lakes, ponds and streams).

Point of Exposure: The place where someone can come into contact with a contaminated environmental medium (air, water, food or soil). For examples: the area of a playground that has contaminated dirt, a contaminated spring used for drinking water, the location where fruits or vegetables are grown in contaminated soil, or the backyard area where someone might breathe contaminated air.

Population: A group of people living in a certain area; or the number of people in a certain area.
PRP: Potentially Responsible Party. A company, government or person that is responsible for causing the pollution at a hazardous waste site. PRP’s are expected to help pay for the clean up of a site.

Public Health Assessment(s): See PHA.

Public Health Hazard: The category is used in PHAs for sites that have certain physical features or evidence of chronic, site-related chemical exposure that could result in adverse health effects.

Public Health Hazard Criteria: PHA categories given to a site which tell whether people could be harmed by conditions present at the site. Each are defined in the Glossary. The categories are:
- Urgent Public Health Hazard
- Public Health Hazard
- Indeterminate Public Health Hazard
- No Apparent Public Health Hazard
- No Public Health Hazard

Receptor Population: People who live or work in the path of one or more chemicals, and who could come into contact with them (See Exposure Pathway).

Reference Dose (RfD): An estimate, with safety factors (see safety factor) built in, of the daily, lifetime exposure of human populations to a possible hazard that is not likely to cause harm to the person.

Route of Exposure: The way a chemical can get into a person’s body. There are three exposure routes: - breathing (also called inhalation), - eating or drinking (also called ingestion), and - or getting something on the skin (also called dermal contact).

Safety Factor: Also called Uncertainty Factor. When scientists don’t have enough information to decide if an exposure will cause harm to people, they use “safety factors” and formulas in place of the information that is not known. These factors and formulas can help determine the amount of a chemical that is not likely to cause harm to people.

SARA: The Superfund Amendments and Reauthorization Act in 1986 amended CERCLA and expanded the health-related responsibilities of ATSDR. CERCLA and SARA direct ATSDR to look into the health effects from chemical exposures at hazardous waste sites.

Sample Size: The number of people that are needed for a health study.

Sample: A small number of people chosen from a larger population (See Population).
Source (of Contamination): The place where a chemical comes from, such as a landfill, pond, creek, incinerator, tank, or drum. Contaminant source is the first part of an Exposure Pathway.

Special Populations: People who may be more sensitive to chemical exposures because of certain factors such as age, a disease they already have, occupation, sex, or certain behaviors (like cigarette smoking). Children, pregnant women, and older people are often considered special populations.

Statistics: A branch of the math process of collecting, looking at, and summarizing data or information.

Superfund Site: See NPL.

Survey: A way to collect information or data from a group of people (population). Surveys can be done by phone, mail, or in person. ATSDR cannot do surveys of more than nine people without approval from the U.S. Department of Health and Human Services.

Synergistic effect: A health effect from an exposure to more than one chemical, where one of the chemicals worsens the effect of another chemical. The combined effect of the chemicals acting together are greater than the effects of the chemicals acting by themselves.

Toxic: Harmful. Any substance or chemical can be toxic at a certain dose (amount). The dose is what determines the potential harm of a chemical and whether it would cause someone to get sick.

Toxicology: The study of the harmful effects of chemicals on humans or animals.

Tumor: Abnormal growth of tissue or cells that have formed a lump or mass.

Uncertainty Factor: See Safety Factor.

Urgent Public Health Hazard: This category is used in ATSDR’s Public Health Assessment documents for sites that have certain physical features or evidence of short-term (less than 1 year), site-related chemical exposure that could result in adverse health effects and require quick intervention to stop people from being exposed.
Appendix F - Summary of Public Comments and Responses

This summary was prepared to address comments and questions on the public comment draft of the Smithtown Groundwater Contamination Site Public Health Assessment. The public was invited to review the draft during the public comment period, which ran from December 18, 2001 through January 17, 2002. We received four responses, two of which were from public agencies. Some comments were addressed by minor changes in the text of this public health assessment. These comments are not reproduced in this summary. Some statements were reworded for clarity. If you have any questions about this summary, you can contact the New York State Department of Health’s (NYS DOH) Outreach Unit at the toll-free number: 1-800-458-1158, extension 27530.

Comment #1 - Is the contamination in general getting worse, less, or is it the same as when the investigation started?

Response #1 - The degree of groundwater contamination in the area seems to be about the same as it was when the investigation started. The United States Environmental Protection Agency (US EPA) is conducting a Remedial Investigation to look for sources for the groundwater contamination. The results so far suggest that the contamination is not a single defined plume but rather a number of small “slugs” of contaminated groundwater. When the investigation is complete, a Remedial Investigation Report will be published. The report will be available to the public at the document repository for the site, which is the Smithtown Library, 1 North Country Road, Smithtown, NY 11787.

Comment #2 - Have any individuals been indicted or convicted of causing the contamination?

Response #2 - No. Investigations to date have not determined the source of the contamination detected in private wells in Smithtown. As the Remedial Investigation continues, potential source areas will be investigated. Those found to be contributing to groundwater contamination will be addressed under an appropriate remedial program by the US EPA or the New York State Department of Environmental Conservation (NYS DEC).

Comment #3 - Will the monitoring effort continue? If so, for how long?

Response #3 - The monitoring of private water supplies will continue until a remedy for the contamination is in place. The US EPA has been monitoring private water supplies about once a year for the past several years as part of the Remedial Investigation, and they will continue to do so. Residents who continue to use private wells and wish to have their water tested more frequently may contact the Suffolk County Department of Health Services (SCDHS) Laboratory, which provides this service for a fee. As of this writing, the cost of the analysis is $65 per sample. A number of private laboratories can also test water samples, but the cost will likely be higher. For more information about having a private water supply tested, please contact the NYS DOH at the number listed above or the SCDHS at (631) 853-2250.

Comment #4 - Each homeowner should be connected by state and federal means to the Suffolk County Water Authority water supply immediately.
Response #4 - The US EPA is able to provide public water supply connections (where available) or private water supply treatment for homes where contamination in private water supplies exceeds Federal drinking water standards, also called Maximum Contaminant Levels or MCLs. To date, the US EPA has connected 29 homes and provided water treatment systems for 9 homes where public water supply was not available. The supply wells for all of these homes were contaminated with tetrachloroethene (PCE) at concentrations greater than the MCL of five micrograms per liter (5 µg/L).

There are some private water supplies in the area in which contaminant concentrations (primarily 1,1,1-trichloroethane [1,1,1-TCA]) exceed New York State drinking water standards but do not exceed Federal drinking water standards. The US EPA cannot provide connections or treatment for wells where concentrations do not exceed Federal standards. The New York State Superfund Program is set up to remediate contamination that originates from a known source. Because no source has yet been found for the Smithtown Groundwater Contamination, the NYS DEC cannot use Superfund monies to provide public water supply connections or treatment for private wells impacted by the contamination.

Residents whose private water supplies are contaminated at levels below Federal standards and who wish to reduce their exposure to those contaminants may take actions on their own. These actions may include connecting to the public water supply system where it is available or installing and maintaining a water treatment system where public water is not available. The NYS DOH and the SCDHS can provide guidance on the selection, installation and maintenance of a treatment system for a private water supply.

Comment #5 - I am very concerned about the slow reaction to the problem. Little has been done in the 6-7 years since the contamination has been recognized.

Response #5 - This investigation and others like it take a considerable amount of time. However, much has been accomplished.

The existence of relatively widespread groundwater contamination in the area was recognized during the SCDHS’s private well sampling effort, which took place between 1996 and 1998. The initial responses to the discovery were focused on reducing exposures to the contamination. By July 1998, US EPA had begun to provide public water supply connections or treatment systems to residences where private water supplies exceeded the US EPA MCL for one or more volatile organic compounds. This effort continues. If ongoing monitoring at the site shows that a private well has exceeded the US EPA MCL for one or more volatile organic compounds, the US EPA will provide a water supply connection, if possible, or a treatment system if public water is unavailable.

The SCDHS investigated a number of potential sources of contamination - primarily existing or former dry cleaners - in 1997 and 1998. The SCDHS found contamination in onsite wastewater disposal systems (such as septic tanks and leaching pools) at several of these establishments. The contaminated systems were cleaned with oversight from the SCDHS. Whether any of these systems were sources of the contamination detected in private wells in Smithtown is not known.

In 1999, the US EPA developed a work plan for a Remedial Investigation to fully characterize the extent of
groundwater contamination in the area. The plan called for two phases of investigation: Phase 1 would determine the extent of contamination in the impacted residential area, and Phase 2 would focus on the apparent sources of the contamination suggested by Phase 1.

The US EPA had difficulty negotiating access to conduct the field work for Phase 1 of the investigation, which delayed the investigation for nearly a year. The Phase 1 work began in 2001 and was completed by the spring of 2002. As of this writing, the US EPA is evaluating the results of Phase 1 and planning the scope of work for Phase 2. The results of the investigations will be documented in Remedial Investigation Reports, which will be placed in the document repositories for the site. The Phase 1 Report should be available during the calendar year 2002.

The Remedial Investigation will be followed by a Feasibility Study in which options for remediating the contamination will be evaluated. Based on this evaluation, the US EPA will present its proposed remedy to the public in a Proposed Remedial Action Plan. The public will have the opportunity to comment on the proposed remedy, and the US EPA will consider those comments in selecting the final remedy for the contamination.

Comment # 6 - Page 14, Last Paragraph: The text focuses on exposure via ingestion. The text should also address potential exposure through inhalation of aerosols and vapors from drinking water. This evaluation can be either quantitative or qualitative.

Response # 6 - Although the term “drinking water” is used in the text, it is not meant to suggest that ingestion is the only route of exposure to contaminants in a drinking water supply. As stated on page 11, exposure 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.