ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

Public Health Assessment for

LAWRENCE AVIATION INDUSTRIES
PORT JEFFERSON, SUFFOLK COUNTY, NEW YORK
EPA FACILITY ID: NYD002041531
NOVEMBER 29, 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

LAWRENCE AVIATION INDUSTRIES

PORT JEFFERSON, SUFFOLK COUNTY, NEW YORK

EPA FACILITY ID: NYD002041531

Prepared by:

New York Department of Health
Center for Environmental Health
Under cooperative agreement with
The U.S. Department of Health and Human Services
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SUMMARY

Lawrence Aviation Industries is in the Hamlet of Port Jefferson Station, Town of Brookhaven, Suffolk County, off Sheep Pasture Road. Lawrence Aviation manufactured titanium sheet metal for the aviation industry. In October 1999, Lawrence Aviation was proposed for addition to the National Priorities List (NPL) due to their potential responsibility for contaminating groundwater and private drinking water supply wells. The site was added to the NPL on February 4, 2000.

Lawrence Aviation began operations as Ledkote Products in Port Jefferson Station in 1951 when the facility moved from New York City. The name was changed to Lawrence Aviation Industries in 1959. In May 1980, a site visit was conducted by the Suffolk County Department of Health Services. During this visit many areas of concern were identified. There was an accumulation of drums, many improperly stored and in disrepair, in seven areas of the site. Unpermitted discharges of liquid waste were also noted. Unlined cesspools and lagoons were utilized to store liquid waste.

The Town of Brookhaven Department of Environmental Protection tested water from private wells near Lawrence Aviation for volatile organic compounds in 1979. Elevated levels of trichloroethene and cis-1,2-dichloroethene were found. The source of contamination was unknown at the time. In 1987, four private wells downgradient of Lawrence Aviation were sampled. High levels of trichloroethene contamination were detected, as well as lower levels of tetrachloroethene and cis-1,2-dichloroethene. Contaminant levels exceeded the New York State Department of Health (NYS DOH) public drinking water standards. The United States Environmental Protection Agency (US EPA) supplied bottled water until the homes were connected to the public water supply. Since then, additional contaminated private wells have been discovered and connected to the public water supply. Groundwater investigations detected volatile organic compound (VOC) contamination downgradient of the site. Also, trichloroethene was detected in a downgradient stream and pond.

Residents may have been exposed to drinking water containing trichloroethene and other VOCs over a period from the 1950s or later through the 1980s or 1990s, depending on when they were connected to public water. Using an estimate of 30 years, past exposure at the highest measured level (910 micrograms per liter (mcg/L)) of trichloroethene in private wells could result in a moderate increased risk of developing cancer. For past exposure to levels of trichloroethene (TCE) exceeding the drinking water standard in private wells, other than that where the highest level was found, the estimated increased risk for developing cancer would be low. The risk for noncancer health effects from past exposure to the 910 mcg/L and 300 mcg/L (the highest levels of TCE detected) is estimated to be high. The actual health risks for exposure to trichloroethene in drinking water cannot be estimated because of the lack of information on past exposures. Exposure levels in private drinking water wells near Lawrence Aviation were lower than exposure levels that caused adverse health effects in animal studies. Health outcome data have not been evaluated specifically for this site since exposure was limited to a small number of residents.

Community health concerns identified for this site include: possible health effects from exposure to contaminated drinking water; the possible adverse health effects caused by eating vegetables from a home garden; and, the number of cancer cases in residential areas surrounding the site. Using exposure estimates, there is a low to moderate increased risk of developing cancer due to exposure from private wells contaminated with trichloroethene. Adverse health effects are not expected via consumption of garden vegetables. NYS DOH discussed issues regarding cancer in the area with residents during public meetings in 1997 and 2002. This public health assessment was released for a public comment period which ran from August 17th, 2005 to September 17th, 2005. NYS DOH received no comments from the public. Comments received from NYS DEC and SCDHS are addressed within the document.

Based on the ATSDR current guidance for assigning a public health hazard category (refer to Appendix C), the Lawrence Aviation site posed a public health hazard in the past because of known exposures to trichloroethene in private drinking water wells. Currently, the site poses an indeterminate public hazard, because, although exposure to contaminated drinking water was eliminated by connecting homes to the public drinking water supply, there are limited environmental data to fully evaluate exposure pathways for the site.

Recommendations for the site include: further investigation to define the extent of the contaminated groundwater plume; on-site surface and subsurface soil sampling to evaluate the potential for exposures to soil contamination; maintenance of signs posted along Old Mill Creek and Old Mill Pond (also called Brook Road Pond) to discourage prolonged contact with contaminated surface waters, assess the potential for vapor intrusion related to contaminated soil or groundwater at and near the site and evaluation of remedial strategies to address any contamination found. NYS DOH and ATSDR will reevaluate the health risks posed by the Lawrence Aviation site as additional data become available.

PURPOSE AND HEALTH ISSUES

The purpose of this public health assessment is to evaluate potential human exposure pathways from contaminants at the Lawrence Aviation Industries site. The Lawrence Aviation site was proposed to the NPL on October 22, 1999 and was listed on February 4, 2000.

Much is still unknown about the ways in which people might have been exposed to contamination from the Lawrence Aviation site. The United States Environmental Protection Agency (US EPA) is conducting a remedial investigation at the site, which may help to answer questions about potential exposure pathways. To date, the only confirmed exposures that are likely related to the site have involved contaminated private water supplies and a small stream and pond near the site. The predominant contaminant was trichloroethene, a chlorinated solvent used by many industries in the past.

This public health assessment focuses primarily on exposure to volatile organic contaminants (VOCs) in private drinking water supplies and possible exposure to contaminated surface water. The document describes actions taken to date to identify those potentially exposed and to provide an alternative source of drinking water for the homeowners with contaminated private wells.

BACKGROUND AND STATEMENT OF ISSUE

Under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR), the New York State Department of Health (NYS DOH) will evaluate the public health implications of the Lawrence Aviation Industries site. More specifically, ATSDR and NYS DOH will determine whether adverse health effects are likely from exposure to site-related contaminants and will recommend actions to reduce or prevent potential exposures to contaminants. 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).

A. Site Description and History

The Lawrence Aviation Industries, Inc. (Lawrence Aviation) site is off Sheep Pasture Road in Port Jefferson Station, Town of Brookhaven, Suffolk County, New York. The site is surrounded by urban and residential land (Figure 1). To the north, Lawrence Aviation is bounded by the Long Island Rail Road tracks and Sheep Pasture Road. A Long Island Power Authority easement runs along the southern edge of the property, separating the site from a residential area. To the east and west are residential homes. A New York State Department of Transportation (NYS DOT) right-of-way crosses the southern part of the site. There are ten major buildings occupying 34 acres of the 126-acre site. A fence surrounds the industrial portion of the site. Groundwater is about 175 feet

below the ground surface and flows north toward the Long Island Sound. Port Jefferson Harbor, an outlet to the Long Island Sound, is one mile north of the site (CDM 2000).

The Lawrence Aviation site was once a turkey farm owned by Ledkote Products, a New York City company that was Lawrence Aviation's corporate predecessor. Ledkote Products moved its operations, which included production of lead gutters and spouts for roof drains, to the site in 1951. In 1959, Ledkote Products changed their name to Lawrence Aviation Industries, Inc. (CDM 2000). About this time, the facility began producing titanium sheet metal for the aviation industry, a process that continued until approximately 2003. At one time, Lawrence Aviation employed over 200 people. As of March 2004, production at the facility halted, and fewer than six employees remained at the site (US EPA 2004).

Registration records from the Suffolk County Department of Health Services (SCDHS) show that Lawrence Aviation has had ten above ground and 21 below ground process tanks in service containing various acids, caustic compounds and rinse waters. There are also records of three above ground and one under ground storage tanks containing No. 2 fuel oil. Tanks containing industrial waste, waste oil, gasoline, and diesel fuel were removed from the Lawrence Aviation site between 1992 and 1995 (CDM 2004).

In the past, the areas of concern included storage drum areas, unlined lagoons and cesspools. A pile of old transformers was also identified on-site. An oily liquid was leaking out of some transformers. More than 10,000 drums on-site were in disrepair, improperly stored and leaking onto the ground surface. Acid sump sludges, salt waste, tetrachloroethene, hydraulic oil, zyglo penetrant, solvents, hydrofluoric acid and trichloroethene were reportedly contained in the drums. In 1980, SCDHS ordered Lawrence Aviation to remove the drums. A SCDHS employee witnessed the disposal of the drums. The drums were collected and the liquid wastes were discharged to the ground surface. Some chemical mixtures caused violent reactions. The drums and remaining sludges in them were disposed at an out of state landfill (CDM 2000). Another major drum removal action occurred in 1991 (CDM 2000). This action was overseen by the New York State Department of Environmental Conservation (NYS DEC) Region 1 Resource Conservation and Recovery Act (RCRA) Hazardous Substance Group. RCRA regulates active facilities that generate wastes as part of their operations. A third major removal action occurred in 2004. In March and April 2004, US EPA covered 14 open vats of chemicals and repacked, segregated, and properly staged approximately 1,600 drums and containers, some of which were labeled as 70% hydrofluoric acid (US EPA 2004).

SCDHS and NYS DEC have been investigating Lawrence Aviation as a possible source of environmental contamination since the 1970s. In 1979, the Town of Brookhaven Department of Environmental Protection sampled private water supply wells at four homes near Lawrence Aviation (CDM 2004). Elevated levels of trichloroethene and other VOCs were detected, but the source was not identified at the time. Subsequent sampling in 1985, 1986 1987, 1997, 1998 and 2004 found additional private wells that were contaminated with VOCs and were downgradient of Lawrence Aviation.

NYS DEC conducted a preliminary remedial investigation for the Lawrence Aviation site between November 1999 and April 2000. Because Lawrence Aviation denied NYS DEC access to the site, the investigation was conducted along the perimeter of the site and the NYS DOT easement along the southern edge of the site (CDM 2000).

US EPA has recently been allowed access to the site to conduct a remedial investigation, which began in 2003. US EPA expects to complete field work for the on-site and off-site portions of the investigation in 2005.

NYS DOT plans to construct a paved bicycle path along the NYS DOT right-of-way that crosses the Lawrence Aviation property (NYS DOT 2004). NYS DOT is working with US EPA, NYS DEC, NYS DOH, and SCDHS to ensure that construction and use of the bicycle path will not cause people to be exposed to contamination from the Lawrence Aviation site. Construction of the path, which will run from Setauket to Port Jefferson Station, is expected to begin in 2005.

B. Site Visit

Ms. Stephanie Haskins and Mr. John Olm of NYS DOH visited the site on August 29, 2000. Site access is restricted by a fence around the perimeter of the industrial portion of the site, which is patrolled periodically. There is also a guard booth at the main entrance off Sheep Pasture Road. No evidence of trespassing was observed. The site is currently occupied by Lawrence Aviation Industries.

C. Demographics

NYS DOH estimated from the 1990 Census that 14,113 people live within one mile of the site. In 1990 there were 3,469 females of reproductive age (ages 15-44) in the area. The following chart compares these demographics with statewide averages. There are five schools and two nursing homes in the area.

	New York State	Area within 1 mile of Site
Age Distribution		
<6	8.3%	7%
6-19	18.4%	17.2%
20-64	60.2%	63.6%
>64	13.1%	12.2%
Race Distribution		
White	74.4%	94%
Black	15.9%	2%
Native American	.3%	0.2%
Asian	3.9%	2.7%
Other	5.5%	1.1%
Ethnicity Distribution		
Percent Hispanic	12.3%	5.5%
1989 Median Income	$32,965	$47,950
% Below Poverty Level	13.0%	5%

DISCUSSION

A. Environmental Contamination

There is limited information about environmental contamination on the Lawrence Aviation site, primarily because of difficulties in obtaining access to the property to allow environmental investigations on the site. Some environmental data were collected from the NYS DOT easement that crosses the site.

US EPA plans to complete a remedial investigation in 2005. The investigation is intended to define the nature and extent of site-related contamination in on-site and off-site soil, groundwater, soil vapor, surface water and sediment.

Subsurface Soil

One soil boring was installed in 1997 as part of NYS DEC's remedial investigation (CDM 2000). Two samples were collected from this boring. One sample was collected from a depth of four to six feet below the ground surface and another from 188 - 190 feet below the ground surface. Two more soil samples were collected at different locations at a depth of three to four feet. All samples were collected within the NYS highway easement in the southeastern portion of Lawrence Aviation. The locations of the two samples collected at a depth of three to four feet were in the area where drums were crushed,

allowing liquid wastes to discharge to the ground surface. The samples were analyzed for VOCs, semi-volatile organic compounds (SVOCs), metals and pesticides.

VOCs were not detected in the soil boring samples. SVOCs and heavy metals were detected in some samples at low concentrations and pesticides were not present. VOCs and SVOCs were not detected in the two samples taken at three to four feet. Due to the limited amount of sampling conducted, additional subsurface soil samples are needed to evaluate the amount and extent of contamination in this medium. US EPA plans to collect subsurface soil samples on the site during the remedial investigation.

Surface Soil

No surface soil sampling has been conducted for this site. According to past records, drums and hazardous wastes were allowed to discharge to the ground surface (CDM 2000). Therefore, surface soil sampling is needed to evaluate the impact of these actions. US EPA plans to collect surface soil samples on the site during the remedial investigation.

Surface Water

In 1991 and 1992, SCDHS sampled a stream (Old Mill Creek) and pond (called Old Mill Pond or Brook Road Pond) at six locations downgradient of Lawrence Aviation (CDM 2000). SCDHS also sampled at two locations in the creek in 1998 (NYSDEC 1998). In 2003, CDM (on behalf of US EPA) collected 25 surface water samples from the stream, pond, Port Jefferson Harbor, and some catch basins on the Lawrence Aviation site (CDM 2004).

All samples were analyzed for VOCs, however, the sampling locations varied between sampling events. No VOCs were detected in the catch basins. The two samples from the harbor had low concentrations of several VOCs; the highest detected was trichloroethene at 6.4 mcg/L.

Samples from the stream contained five VOCs at levels approaching or exceeding surface water standards (see Table 2). These were *cis*-1,2-dichloroethene (up to 42 mcg/L), 1,1,1-trichloroethane (up to 39 mcg/L), trichloroethene (up to 1,700 mcg/L), tetrachloroethene (up to 4 mcg/L) and vinyl chloride (up to 3 mcg/L). Trichloroethene was detected at the highest levels, with concentrations up to 1700 mcg/L in 1992 and 340 mcg/L in 2003.

Biota

It is not known whether the stream or pond supports a fish population. If there are fish in these water bodies, samples would be needed to assess whether they have elevated levels of site-related contaminants that people could be exposed to by eating the fish.

Air

There are no analytical air monitoring data available for the Lawrence Aviation site. There are reports (Newsday 1974) that Lawrence Aviation was responsible for a brief release of contamination to the air one day in 1974. This release took the form of a visible cloud, which was thought to contain nitric acid, nitrous oxide and nitrogen dioxide. There is no report of air samples being collected during or following the release.

Soil Vapor

US EPA collected soil vapor in 2004 samples near Old Mill Creek and Pond, where groundwater is believed to be contaminated. The samples did not contain any of the VOCs that are thought to be related to the Lawrence Aviation site. The potential for soil vapor intrusion related to contaminated soil or groundwater has not been investigated on or adjacent to the site.

Groundwater

In 1991 and 1992, SCDHS installed a total of 14 monitoring wells to investigate groundwater contamination in the area of Lawrence Aviation. As of 1995, contamination had been documented in six of these wells adjacent to Lawrence Aviation, but no contamination had been found in the presumed downgradient well to the north (Anson Environmental 1995). Additional groundwater sampling was conducted in 1997 and 2000 as part of NYS DEC's remedial investigation (CDM 2000). Three new monitoring wells were installed; one of which is hydraulically upgradient of the site to evaluate the background groundwater quality. There were no detections of VOCs or SVOCs in the upgradient well.

Elevated levels of VOCs, including trichloroethene (up to 794 mcg/L), tetrachloroethene (up to 132 mcg/L), *cis*-1,2-dichloroethene (13 mcg/L), ethylbenzene (10 mcg/L) and total xylenes (10 mcg/L) were detected above the NYS Drinking Water Standards in an off-site well directly downgradient of the former lagoons and drum storage area. Trichloroethene (200 mcg/L) and tetrachloroethene (10 mcg/L) exceeded NYS Drinking Water Standards in a groundwater sample collected in 1997 from beneath the former drum storage area.

Samples collected from two other existing wells to the north, generally downgradient of the site, did not contain detectable levels of VOCs or SVOCs. Metals including cadmium, chromium, copper, lead, mercury, thallium, zinc and titanium were detected at levels exceeding the public health assessment comparison values. There were no detections of pesticides above the groundwater standards at any monitoring wells. US EPA plans to collect groundwater samples on-site and off-site during the remedial investigation.

Public Water Supply

The contamination from Lawrence Aviation has not been detected in any public water supply wells. Suffolk County Water Authority (SCWA) has a well field in downtown Port Jefferson on West Broadway about one mile downgradient from the site. The two wells there, both about 90 feet deep, are currently inactive (SCDHS 2004). One was removed from service in September 1997 because of high chloride levels (suggestive of salt water intrusion). The other was removed from service in October 2001 when the SCWA elected not to install new disinfection equipment. Neither well was affected by the contamination from Lawrence Aviation.

Private Drinking Water Supply Wells

Samples from seventeen private wells were analyzed for VOCs. Samples from twelve private wells were contaminated with VOCs, mainly trichloroethene (Table 1). Contaminants were first discovered in private drinking water supply wells in 1979 (CDM 2000). One well sampled in 1979 had 300 mcg/L of trichloroethene and 71 mcg/L of cis-1,2-dichloroethene. In 1987, private drinking water supply wells of four homes downgradient from Lawrence Aviation were sampled for VOCs. Trichloroethene was detected as high as 910 mcg/L in one of the wells. In addition to trichloroethene and cis-1,2-dichloroethene, tetrachloroethene was also detected in one well up to 6 mcg/L. The New York State Public Drinking Water Standard for these chemicals is 5 mcg/L. US EPA supplied bottled water to these homes until they were connected to the municipal public water supply in 1988. Ten additional private residential wells were sampled in 1997 (CDM 2000). One of these wells contained 27 mcg/L of trichloroethene. All ten of the homes sampled in 1997 have been connected to the public water supply (CDM 2000).

B. Pathway Analysis

An exposure pathway is the process by which an individual may be exposed to contaminants originating from a site. There are five elements of an exposure pathway: (1) the source of contamination, (2) environmental media and transport mechanisms, (3) a point of exposure, (4) a route of human exposure, and (5) a receptor population. The source of contamination is where the contaminants originated or were released into the environment. Environmental media is the substance in which contaminants are transported, such as water, soil, air and biota. The point of exposure is where a person may come into contact with the contaminant. The route of human exposure is the pathway through which a contaminant enters a person's body. These include ingestion, inhalation, and dermal absorption. The receptor population is the person or people who come into contact with the contaminant. There are two types of exposure pathways; a completed exposure pathway and a potential exposure pathway. The completed exposure pathway exists when all five criteria of an exposure pathway are met. A potential exposure pathway exists when the criterion for any one or more of the five elements comprising an exposure pathway is not met. Potential pathways indicate that exposure to a contaminant could have occurred in the past, could be occurring now, or could occur in the future (ATSDR, 1993).

Completed Exposure Pathways

The only known completed exposure pathway from the Lawrence Aviation inactive hazardous waste disposal site involves past exposures to contamination in private drinking water supplies. There are currently no known exposures.

We do not know how long groundwater downgradient of Lawrence Aviation has been contaminated, or how long private wells have been affected by the contamination. Residents were likely exposed to VOCs in their well water prior to the discovery of the contamination. These exposures would have been through ingestion (drinking) of contaminated water and through inhalation of VOCs that volatilized out of contaminated water during showering or cooking. The contamination would probably have been introduced no earlier than the 1950s, the decade when Ledkote moved its operations to the site (1951) and began doing business as Lawrence Aviation (1959). Exposures ended when public water supply was made available to all homes with affected and potentially affected private wells. Therefore, exposures to VOCs may have occurred for up to 30 years, depending on when each homeowner switched from their private well to public water.

Potential Exposure Pathways

There are potential exposure pathways involving contaminated groundwater, soil, surface water, sediment, biota, and air.

Any known exposures to groundwater contamination have been eliminated through the provision of public water to homes with contaminated private wells. However, there is still a potential for exposure to the groundwater contamination. Suffolk County regulations help reduce the likelihood of exposure by requiring new homes and other construction projects to connect to the public water supply if one is available (SCDHS 2004).

Few soil samples, and no surface soil samples, have been collected, so there are not enough data to assess the potential for exposure to contaminated soil. Any soil contamination that does exist is likely within the boundaries of the site, which would limit current exposures, if there are any, to employees or trespassers on the site. Exposure to surface soils could occur through dermal absorption, inhalation and incidental ingestion of particulates. Exposures to subsurface soils would occur only if contaminated soils were brought to the surface where they would be accessible.

Exposure to surface water is a potential pathway because trichloroethene and other contaminants were detected in the Old Mill Creek and Old Mill (Brook Road) Pond. Exposure to the surface water would likely be infrequent and short in duration. People are not known to swim or wade in these waters; however, access to the surface water bodies is not restricted. In 1993, signs were posted as a precautionary measure warning against any prolonged contact with the water, which could result in dermal contact with VOCs, ingestion of VOCs or inhalation of VOC vapors. In 1997, and again in 2003, new signs were posted as replacements for signs missing and/or in disrepair.

Sediment from the pond and stream has not been sampled. If sediments are contaminated, it is possible that people could be exposed by contact with sediment. Fish and other wildlife in the pond and stream may be contaminated. No samples of fish or other wildlife have been collected, nor are any collections anticipated. Based on field observations, staff from NYS DOH and NYS DEC reported that the stream and pond are quite small, and are not likely places for people to catch fish for eating.

Areas of soil and groundwater contamination must be evaluated to determine whether they are contributing to soil vapor contamination, the process by which volatile chemicals migrate from a subsurface source into the indoor air of buildings. Soil vapor, also referred to as soil gas, is the air found in the pore spaces between soil particles. The possibility of exposures related to vapor intrusion must be evaluated. Off-site soil vapor samples near Old Mill Creek and Pond, where groundwater is likely contaminated, did not contain the contaminants that are thought to be related to Lawrence Aviation. Additional sampling may be needed to assess the potential for groundwater contamination to be a source for soil vapor intrusion, once the groundwater plume has been delineated.

In the past, people could have been exposed to air emissions from Lawrence Aviation's industrial activities. The only documented case of this is the 1974 incident, when 12 people were treated for eye and skin irritation after exposure to a brief release of gases possibly containing nitrogen dioxide, nitrous oxide, and nitric acid (Newsday 1974). As of 2004, the facility was no longer engaging in industrial operations that would cause air emissions (US EPA 2004), so this is currently not a potential exposure pathway.

C. Public Health Implications

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 exposure pathways identified for the Lawrence Aviation Industrial Plant Site, 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 NYS DOH procedures for assessing health risks is presented in Appendix D.

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. Exposure to contaminants in off-site surface water could occur by incidental ingestion and by dermal contact. Accordingly, for the purpose of estimating potential exposure, NYS DOH doubled the concentrations of the VOCs detected in drinking water to account for possible additional exposures via the inhalation and dermal routes. Although exposure varies depending on an individual's lifestyle, each of these exposure routes can contribute to the overall daily intake of contaminants and, thus, may increase the risk for chronic health effects. For this assessment, NYS DOH evaluated exposures to contaminants in private water supply wells and off-site surface water near the Lawrence Aviation Industrial Plant site.

Past ingestion, dermal and inhalation exposure to volatile organic contaminants in private water supply wells

For an undetermined period of time, possibly up to 30 years, private water supplies were contaminated with VOCs. Trichloroethene was found in private wells at levels as high as 910 mcg/L.

The levels of trichloroethene, tetrachloroethene, and cis-1,2-dichloroethene measured in the private wells exceed New York State public drinking water standard and/or public health assessment comparison values. Therefore, these three chemicals have been selected for further evaluation (Table 3).

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 (ATSDR, 1997b). The animal cancers caused by trichloroethene include liver, kidney, testes, lymphoma, and lung cancer. Chemicals that cause cancer in workers and in laboratory animals exposed to high levels over their lifetimes may cause cancer in humans who are exposed to lower levels over long periods of time. Toxicological data are inadequate to assess the carcinogenic potential of cis-1,2-dichloroethene (ATSDR, 1996).

Based on the results of studies in animals and limited sampling of private residential water supply wells, people drinking water containing trichloroethene at levels exceeding the drinking water standard and as high as 300 mcg/L (measured in the second most contaminated well) for 30 years are estimated to have a low increased risk of developing cancer (i.e., the increased risk is between one-in-one million and one-in-ten thousand). For exposure to the highest level of trichloroethene detected (910 mcg/L, found in one private well) the estimated increased risk for developing cancer would be moderate (i.e., the increased risk is between one-in-ten thousand and one-in-one thousand). The actual increase in cancer risk from trichloroethene in drinking water cannot be determined because we have no information on how long or to what levels people may have been exposed prior to the time the contamination was discovered. We also do not know when all of the residents changed from using private well water to bottled water and later to public water supply. Tetrachloroethene, which causes health effects similar to those of trichloroethene (ATSDR, 1997a), was detected twice at low levels in the same private well containing the highest trichloroethene contamination. One sample from this well contained tetrachloroethene at 6 mcg/L (just above the

standard of 5 mcg/L) while the other sample contained 4 mcg/L (below the standard). The increased cancer risk for exposure at this level is low. However, the primary health concern for this well comes from trichloroethene, because the detected levels (910 mcg/L and 770 mcg/L) result in a much higher estimated increased risk for developing cancer compared to tetrachloroethene. The following table summarizes the estimated risks for cancer:

Chemical	Level in Drinking Water	Assumed Duration of Exposure	Qualitative Descriptor for Cancer Risk
Trichloroethene	910 mcg/L	30 years	moderate
Trichloroethene	7 mcg/L to 300 mcg/L	30 years	low
Tetrachloroethene	4 mcg/L to 6 mcg/L	30 years	low

mcg/L = micrograms per liter

Trichloroethene also produces noncarcinogenic effects, primarily to the liver and kidneys. Although the risks of noncarcinogenic effects from past exposures in drinking water are not completely understood, the existing data suggest that they could be low for people exposed to levels of trichloroethene exceeding the drinking water standard and up to about 130 mcg/L, and moderate for people exposed to levels from 130 mcg/L to 180 mcg/L (detected in the well with the third and fourth highest levels of contamination). Two private wells had higher trichloroethene levels, at 300 mcg/L and 910 mcg/L (the highest level detected). Exposure to these levels is estimated to pose a high risk for noncancer health effects. Again, the actual noncancer risk for trichloroethene in drinking water cannot be estimated because of the lack of information on past exposures. The risks for noncancer effects would be minimal for tetrachloroethene and cis-1,2-dichloroethene.

Potential incidental ingestion and dermal contact exposure to volatile organic contaminants in surface water

Old Mill Creek and Old Mill (Brook Road) Pond have been contaminated with VOCs (trichloroethene, cis-1,2-dichloroethene, vinyl chloride, tetrachloroethene and 1,1,1-trichloroethane) for an undetermined period of time. The highest level of tetrachloroethene (4 mcg/L) measured in off-site surface water does not exceed standards for surface water. The highest levels of trichloroethene (1,700 mcg/L), cis-1,2-dichloroethene (42 mcg/L), vinyl chloride (3 mcg/L) and 1,1,1-trichloroethene (39 mcg/L) exceed New York State surface water standards, however, only the levels of trichloroethene exceed public health assessment comparison values based on incidental ingestion and dermal exposure to surface water (Table 2). The health effects for exposure to trichloroethene have already been discussed. Based on the results of animal studies and limited sampling results, people exposed by incidental ingestion and by dermal contact for up to 30 years to the highest reported levels of trichloroethene (1,700 mcg/L) in surface water are estimated to have a low increased risk of developing cancer. The risks for noncarcinogenic effects would also be low. The increased cancer risk for ingestion and dermal exposure to tetrachloroethene and vinyl chloride in surface water would be very low. The noncancer risks for tetrachloroethene, vinyl chloride, 1,1,1-trichloroethane and cis-1,2-dichloroethene would be minimal.

D. Health Outcome Data Evaluation

Site-Specific Evaluation

Exposure was limited to a small number of homes, and exposure has been eliminated since the homes were connected to the public water supply. For this reason NYS DOH has not evaluated health outcome data specifically for this site, and there are no community health studies planned at this time. NYS DOH maintains several health outcome databases, which could be used to generate site-specific data, if warranted. These databases include the cancer registry, the congenital malformations registry, the heavy metals registry, vital records (birth and death certificates) and hospital discharge information.

VOC Exposure Registry

NYS DOH has also developed a registry of individuals in New York State who have been exposed to VOCs through ingestion of contaminated drinking water or inhalation of contaminated indoor air. Residents with documented exposure to VOCs will be considered for inclusion in the registry. The exposure registry allows long-term follow-up on the health status of persons with exposures to VOCs at selected sites in New York State. 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.

Regional Cancer Studies

As part of the NYS DOH Cancer Surveillance Improvement Initiative, age-adjusted incidence rates for specific sites of cancer were tabulated and mapped at the ZIP code for the entire state for the years 1993-1997. Areas of the state having higher than expected rates of cancer are highlighted on the maps using statistical methods to evaluate the disease pattern. NYS DOH has evaluated four sites of cancer at the ZIP code level; breast, prostate, lung and colorectal. Additional information on this project can be found at the NYS DOH Cancer Surveillance Improvement Initiative web site at http://www.health.state.ny.us/nysdoh/cancer/csii/nyscsii.htm or by calling 1-800-458-1158.

The Lawrence Aviation site and its surroundings lie within an area identified by the Cancer Surveillance Improvement Initiative project as an area with higher than expected breast cancer incidence. NYS DOH has selected this area for a more in depth investigation (the Coram-Mt. Sinai-Port Jefferson Follow-up Investigation). Results of this investigation can be found on the NYS DOH website. Known risk factors for breast cancer include age, a family history of the disease, a personal history of benign breast disease, never having children or age over 30 at first childbirth, early age at first period, and late age at menopause.

E. ATSDR Child Health Considerations

The ATSDR Child Health Considerations emphasizes examining child health issues in all of the agency activities, including evaluating child-focused concerns through its mandated public health assessment activities. 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 the effects of 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 potential for trichloroethene (the primary contaminant associated with the Lawrence Aviation site) to cause adverse effects in the offspring of humans and/or laboratory animals has been assessed in several studies. Studies of children born to women who were exposed to trichloroethene in drinking water during pregnancy provide limited evidence that an association may exist between oral trichloroethene exposure and adverse developmental effects (e.g., neural tube and oral cleft defects, low birth weight and congenital heart defects) as well as childhood leukemia (ATSDR, 1997b). In each of these studies, the mothers were exposed to chemicals other than trichloroethene, and the overall data are not strong enough to conclude that the effects are caused by trichloroethene and not by some other factor or factors. When pregnant animals are exposed by ingestion and/or inhalation to large amounts of trichloroethene, adverse effects on the normal development of the offspring are observed (ATSDR, 1997b). In most, but not all of these studies, the high amounts of trichloroethene also caused adverse health effects on the parent animal. The estimated levels of exposure to trichloroethene in environmental media near the Lawrence Aviation site are at least 2000 times lower than the exposure levels in the animal studies in which adverse developmental health effects were observed. Thus, the possibility that children may have increased sensitivity to trichloroethene was taken into account when evaluating the potential health risks associated with the site.

COMMUNITY HEALTH CONCERNS

Community health concerns were identified at a public meeting held by NYS DEC and NYS DOH in August of 1997, and responses were provided at that time. The following is a summary of the concerns raised and the responses provided. This public health assessment was released for a public comment period which ran from August 17th, 2005 to September 17th, 2005. NYS DOH received no comments from the public. Comments received from NYS DEC and SCDHS are addressed within the document.

Concern: One resident living close to the site was concerned about the effect that contamination from the site may have on his vegetable garden and in turn the health effects that could be caused by eating those vegetables.

Response: Because of the distance of the backyard from the site, soil contamination is unlikely to have migrated off-site to this location. The only known major air release from the site occurred in 1974 and consisted of non-persistent chemicals (see Discussion section). If the resident is watering their garden with water from a private well that had not been tested for contamination, the resident should contact SCDHS or NYS DOH at 1-800-458-1158.

Concern: Concern was also expressed about the number of cancer cases diagnosed among residents in a neighborhood near Lawrence Aviation.

Response: As part of the NYS DOH Cancer Surveillance Improvement Initiative, age-adjusted incidence rates for breast cancer, lung cancer, colorectal cancer, and prostate cancer have been tabulated and mapped by ZIP code for the entire state (NYS DOH Website, 2004). NYS DOH's maps show that the Lawrence Aviation site is in an area where breast cancer incidence rates are significantly greater than expected. Known risk factors for breast cancer include age, a family history of the disease, and history of benign breast disease. Because of the elevated breast cancer incidence, the area was selected for a more in depth investigation. This investigation, as well as the Cancer Surveillance Improvement Initiative, are described in more detail in the discussion of Health Outcome Data Evaluation on page 15 of this Public Health Assessment.

Concern: NYS DEC reports that residents were concerned about the following:

- Piles of "white rocks" on the site that would ignite when thrown on the ground. In the 1970's, a child reportedly was burned by one of these rocks while playing on the site.
- Occasionally, the lagoons on the site would overflow with yellow liquids and come into the neighborhoods to the south.
- Clouds of yellow dust from the facility would come over nearby homes and cause residents' eyes to water.
- Noise from the Lawrence facility was a source of stress for nearby residents.

Response: NYS DOH has no further information about these issues. US EPA reports that production at the facility had ceased as of March 2004; thus, the noise concerns and other issues related to active manufacturing at the facility have likely been abated. These concerns were forwarded to US EPA for their consideration as they conduct further investigations at the site.

In 2002, several community members responded to NYS DOH's Environmental Concerns Reporting Sheet (part of the Coram-Mount Sinai-Port Jefferson Follow-Up Investigation) with concerns about the Lawrence Aviation site. Some of these concerns (about historical disposal of waste and chemicals on the site, and about the contamination of surface water and groundwater off-site, which has affected private water supply wells) have been addressed earlier in this section or elsewhere in this document. Other concerns were as follows:

Concern: Six to ten children were treated for a chemical gas release in the late 1960s or early 1970s.

Response: This concern probably relates to an incident that occurred in April 1974. According to a newspaper article (Newsday 1974), a "cloud" of gas was emitted from three or four smokestacks and spread for about 20 minutes over a ten-block area south of the site. Newsday reported that the gas was generated "when workmen on a lunch break left a sheet of titanium in a vat of nitric acid and water too long." The newspaper reported that the cloud contained nitrogen dioxide, nitrous oxide, and possibly nitric acid, but the article does not indicate that any air samples were actually collected or analyzed during the brief period of the release. According to the news article, seven firemen and five children were treated for minor skin and eye irritation as a result of exposure to the gas. The article repeated the local fire chief's advice that "residents who might have had clothes hanging on lines (should) wash them again."

Concern: An unknown runoff was piped to a "dead swamp" along the LILCO high power wires area. This area was developed into a residential street.

Response: NYS DOH has no further information about this. There is documentation of many unpermitted discharges to the ground surface on the Lawrence Aviation property, but these involved overflowing drainage structures or the emptying of barrels, and they reportedly took place within the boundaries of the Lawrence Aviation site. This concern was forwarded to US EPA for their consideration as they conduct further investigations at the site.

Concern: A farm on Sheep Pasture Road, downgradient of Lawrence Aviation's storage lagoons, grew produce. In addition, watermelon and other crops were farmed below the Lawrence Aviation leaching ponds.

Response: We are not aware of any off-site soil contamination that could affect farm produce off-site. If contaminated groundwater was used for irrigation, the site-related VOCs are unlikely to have remained on or in the produce at the time of consumption. Nevertheless, this concern was forwarded to US EPA for their consideration as they conduct further investigations at the site.

CONCLUSIONS

Based upon the available data, NYS DOH concludes that a public health hazard existed in the past because of contamination of private drinking water supply wells. Residents drinking contaminated groundwater were exposed for an unknown length of time, beginning as early as the 1950s and continuing until 1988 (for the higher levels of contamination found) or 1997 (for lower levels). Using an estimate of 30 years, past exposure at the highest measured level (910 mcg/L) of trichloroethene in private wells could result in a moderate increased risk of developing cancer. For past exposure to levels exceeding the drinking water standard in private wells, other than that where the highest level was found, the estimated increased risk for developing cancer would be low. For

trichloroethene at the highest level detected (910 mcg/L and 300 mcg/L), the risk for noncancer health effects is estimated to be high. The actual health risks for exposure to trichloroethene in drinking water cannot be determined because of the lack of information on past exposures. Also, we do not know when all of the residents changed from using private well water to bottled water and later to public water supply. This exposure has been eliminated through the connection of these homes to the municipal public water supply. Contamination from Lawrence Aviation has not been detected in public water supplies.

Due to elevated levels of VOCs detected in surface waters, exposures may occur if people come in contact with the contaminated surface water at Old Mill Creek and Old Mill (Brook Road) Pond. Signs have been posted in the area warning against prolonged contact with the surface water.

Documented exposures to contaminated groundwater via private water supply wells have been eliminated by connection to the public drinking water supply. However, the site currently poses an indeterminate public health hazard because additional investigation is needed to further evaluate potential exposures to contaminants from the site. The nature and extent of soil contamination on the site must be established to evaluate whether it may contribute to groundwater contamination and to evaluate the potential for exposure of current and future users of the site. Areas of soil and groundwater contamination must be evaluated to determine whether they are contributing to soil vapor contamination. If they are, the possibility of exposures related to vapor intrusion into buildings must be evaluated.

RECOMMENDATIONS

- Residents should avoid prolonged contact with the surface waters of Old Mill (Brook Road) Pond and Old Mill Creek.
- Surface water quality should continue to be monitored in Old Mill (Brook Road) Pond and Old Mill Creek.
- Sediment samples should be collected from Old Mill (Brook Road) Pond and Old Mill Creek. Samples should be analyzed for VOC's, SVOC's, and metals.
- Groundwater samples should be collected to fully define the contaminant plume in the area of Lawrence Aviation. Samples should be analyzed for VOCs, SVOCs and metals.
- Use of private wells should be determined and clearly documented when downgradient of the site and potentially affected by the contaminant plume.
- On-site surface and subsurface soil should be sampled to evaluate the potential for exposures to site-related contaminants. Samples should be analyzed for VOCs, SVOCs, metals and PCBs.

- Remedial strategies should be considered to address site-related contamination to minimize the potential for future exposures.

- The potential for soil vapor contamination related to contaminated soil or groundwater at and near the site should be addressed. If soil vapor is contaminated, the possibility of exposures related to vapor intrusion into buildings must then be evaluated and, if necessary, actions should be taken to mitigate exposures.

PUBLIC HEALTH ACTION PLAN

The Public Health Action Plan (PHAP) for the Lawrence Aviation site contains a description of actions to be taken by ATSDR and/or NYS DOH at and near the site, following completion of this public health assessment. For those actions already taken at the site, please see the Background section of this public health assessment. The purpose of the PHAP is to ensure that this health assessment not only identifies public health hazards, but provides a plan of action designed to mitigate exposures and minimize adverse human health effects resulting from 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 NYS DOH to follow up on this plan to ensure that it is implemented. The public health actions taken or to be implemented are as follows:

Public Health Actions Taken

1. When VOC contamination was found in private drinking water wells, US EPA supplied bottled water until the homes were connected to the municipal public water supply.

2. As a precaution, NYS DOH posted signs in 1993 along Old Mill Creek and Old Mill (Brook Road) Pond, warning against prolonged contact with surface waters. Missing signs were replaced in 1997 and again in 2003.

3. A public meeting was held in August 1997 to discuss the remedial investigation and feasibility study planned for the site and answer questions from the public, including questions about health concerns. A fact sheet was distributed to announce the meeting and provide information to residents regarding the site.

4. Responses were provided to residents who inquired about high numbers of cancer cases in the neighborhood including educational materials regarding cancer.

Public Health Actions Proposed

1. NYS DOH will coordinate with the Village of Port Jefferson to be sure signs were re-posted along Old Mill Creek and Old Mill (Brook Road) Pond and that the signs will be maintained in good condition.

2. US EPA, NYS DEC, NYS DOH and SCDHS will oversee the investigation and remediation of this site as indicated in the Recommendations section of this public health assessment.

3. ATSDR and NYS DOH will reevaluate the level of public health hazard category posed by this site as new data become available.

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.

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CERTIFICATION

The Public Health Assessment for the Lawrence Aviation Industries 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. Editorial review was completed by the cooperative agreement partner.

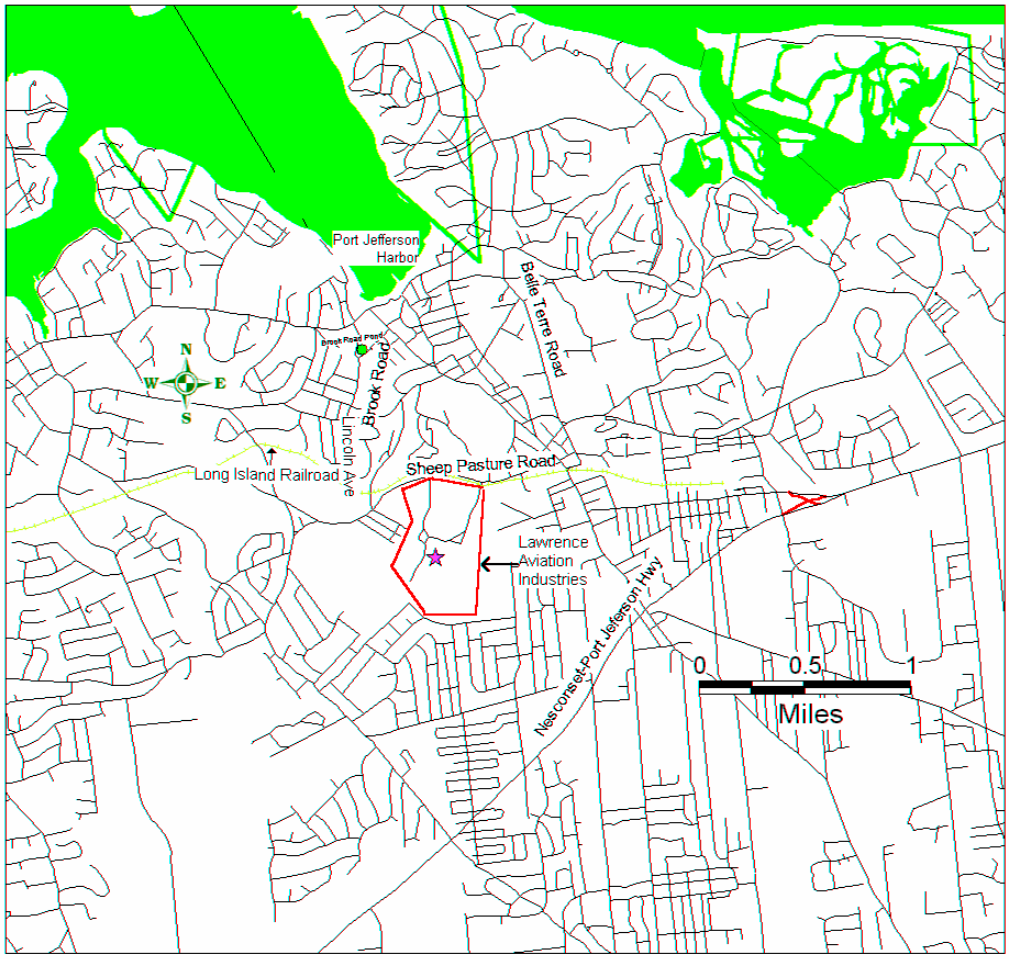
Technical Project Officer, CAT, SPAB, DHAC

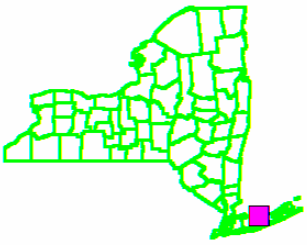
The Division of Health Assessment and Consultation (DHAC), ATSDR, has reviewed this health consultation, and concurs with its findings.

Team Leader, CAT, SPAB, DHAC, ATSDR

APPENDIX A

SITE LOCATION MAP





Site Location Map
Lawrence Aviation Industries

Site No: 152016
Location: Port Jefferson Sta.
Suffolk County

STATE OF NEW YORK
DEPARTMENT OF HEALTH

APPENDIX B

TABLES

Table 1

Volatile Organic Compounds Detected in Private Residential Drinking Water Wells Near the Lawrence Aviation Site

[All values in micrograms per liter (mcg/L)]

Residence number	SAMPLE DATE	trichloroethene	tetrachloroethene	*cis*-1,2-dichloroethene	1,1-dichloroethene	1,1,1 - trichloroethane
Residence # 1	8/10/79	300	2	71	1	1
Residence # 2	9/4/85	43				
	10/16/85	83				
	4/10/86	62				
Residence # 3	1/7/87	130		2		
	2/20/87	180				
Residence # 4	9/12/79	5				
	1/7/87	10		<1		
	2/20/87	11				
Residence # 5	1/21/87	770	6	15		
	2/20/87	910	4			
Residence # 6	7/25/79	1			1	
	1/21/87	35				
	2/20/87	38				
Residence # 7	9/15/97					
Residence # 8	9/15/97	2	0.8	2	1	1
Residence # 9	9/15/97	0.9	0.5	0.9	2	3
Residence # 10	9/15/97				1	0.8
Residence # 11	9/15/97					
	2004					
Residence # 12	7/20/79	177		1	1	
	9/15/97	27	0.6			0.7
Residence # 13	9/15/97					
Residence # 14	9/16/97	0.8			2	2
Residence # 15	9/22/97					
Residence # 16	2/2/98					
Residence # 17	7/1/98	1				

Table 2
Water Quality Standards/Guidelines and /or Public Health Assessment Comparison
Values Exceeded by Contaminants Found in Surface Water Near the Lawrence Aviation Site
[All values in micrograms per liter (mcg/L)]

		Water Quality Standards/Guidelines							
		New York State			US EPA	Comparison Values*			
Contaminant	**Maximum Detection**	**Ground Water**	**Surface Water**	**Drinking Water**	**Drinking Water**	**Cancer**	**Basis****	**Noncancer**	**Basis****
Cis-1.2-dichloroethene	42	5	5	5	70	--	--	95,000	US EPA OSRTI
tetrachloroethene	4	5	0.7[a]	5	5	37	CA EPA	29,000	US EPA IRIS
1,1,1-trichloroethane	39	5	5	5	200	--	--	1,300,000	US EPA RBC
trichloroethene	1,700	5	5	5	5[b]	795	NYS CPF	1460	Health Canada
vinyl chloride	3	2	2	2	2	24	US EPA IRIS	100	ATSDR

* Cancer comparison values for organic chemicals are determined for a 70 kilogram adult whose arms and hands are exposed to leachate or surface water for 1 hour per day, 2 days per week for3 months per year and who swallows 0.05 liters of surface water per day, 2 days a week, 3 months per year for 30 years. The contact surface area for an adult (arms and hands) is 1,980 cm^2. Noncancer comparison values for organic chemicals are determined for a 21 kilogram child whose arms and hands are exposed to leachate or shallow surface water for 1 hour per day, 2 days per week for 3 months per year and who swallows 0.05 liters of surface water per day, 2 days a week, 3 months per year. The contact surface area for a child (arms and hands) is 1,050 cm^2.

** ATSDR : Agency for Toxic Substances and Disease Registry
CA EPA: California Environmental Protection Agency
Health Canada Reference Dose
NYS CPF: New York State Cancer Potency Factor
US EPA IRIS: United States Environmental Protection Agency Integrated Risk Information System
US EPA OSRTI : Office of Superfund Remediation and Technology Innovation
US EPA RBC: United States Environmental Protection Agency Risk-Based Concentration Table.

[a]Guidance Value
[b]Under Review

Table 3
Water Quality Standards/Guidelines and /or Public Health Assessment Comparison Values Exceeded by Contaminants Found in Private Wells Near the Lawrence Aviation Industrial Site
[All values in micrograms per liter (mcg/L)]

	Water Quality Standards/Guidelines							
	New York State			US EPA	Comparison Values*			
Contaminant	**Ground Water**	**Surface Water**	**Drinking Water**	**Drinking Water**	**Cancer**	**Basis****	**Noncancer**	**Basis****
Cis-1,2-dichloroethene	5	5	5	70	---	---	70	EPA LTHA
tetrachloroethene	5	0.7[a]	5	5	0.08	CA EPA	10	EPA LTHA
trichloroethene	5	5	5	5[b]	6.1	NYS CPF	10	Health Canada

* Comparison values determined for a 70 kilogram adult who drinks 2 liters of water per day. The cancer comparison value is the water concentration that provides an intake corresponding to an increased lifetime cancer risk of one-in-one million. The noncancer comparison value assumes a relative source contribution of 20%.

** CA EPA: California Environmental Protection Agency
EPA LTHA: U.S. Environmental Protection Agency Lifetime Health Advisory
Health Canada Reference Dose
NYS CPF: New York State Cancer Potency Factor

[a]Guidance value

APPENDIX C

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 D

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 Lawrence Aviation 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 E

ATSDR Glossary of 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 ($t_{1/2}$)
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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