Health Consultation

Soil Vapor Intrusion Evaluation

LAWRENCE AVIATION INDUSTRIES

PORT JEFFERSON STATION, SUFFOLK COUNTY, NEW YORK

EPA FACILITY ID: NYD002041531

Prepared by the
New York Department of Health

FEBRUARY 17, 2010

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

Health Consultation: A Note of Explanation

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

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

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Superfund and Program Assessment Branch
Atlanta, Georgia

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SUMMARY

INTRODUCTION

NYSDOH (New York State Department of Health) and ATSDR's (Agency for Toxic Substances and Disease Registry) top priority is to ensure that the community has the best information possible about how contaminants in soil vapor from the Lawrence Aviation Industries site in Port Jefferson Station might affect their health.

This Health Consultation is a follow-up to the 2005 Public Health Assessment in which soil vapor intrusion (movement of chemical gases through underground soil) from the Lawrence Aviation Industries site was identified as a possible health concern for people living, working or attending school near the site.

In February 2005, the United States Environmental Protection Agency (USEPA) began a soil vapor intrusion investigation at the Lawrence Aviation Industries site. During the course of this investigation, the USEPA collected sub-slab (below building) samples from 56 nearby buildings and indoor air (inside building) samples from Port Jefferson High School, a daycare and six residences. The result of these samples forms the basis for the conclusions and recommendations in this document by ATSDR and NYSDOH.

CONCLUSION

NYSDOH and ATSDR conclude that breathing volatile organic chemicals at levels measured inside buildings that were identified as potentially affected by soil vapor intrusion from the nearby Lawrence Aviation Industries site is not expected to harm people's health. This includes residents and occupants of the school, daycare and commercial buildings tested.

BASIS FOR DECISION

- Overall, the results of the USEPA soil vapor intrusion investigation indicate that contaminants associated with the Lawrence Aviation site are not significantly affecting the indoor air quality of buildings downgradient from the site.
- The USEPA installed sub-slab depressurization systems beneath four residential buildings and the wrestling room of Port Jefferson High School where sub-slab soil vapor contained trichloroethene (TCE) or tetrachloroethene (PCE) at levels of concern for future impacts to indoor air.
- The levels of TCE and PCE in the indoor of these five buildings were, on average, within the range typically found in residential buildings and below public health comparison values for cancer and non-cancer health effects.

- The elevated levels of PCE and dichlorobenzene (DCB) found in single samples of indoor air from two buildings can be attributed to indoor sources rather than to soil vapor intrusion.
- NYSDOH and ATSDR also evaluated the increased risk of health effects associated with breathing the measured indoor level of chemicals over a person's lifetime and found that it would result in a minimal increase of risk for non-cancer health effects and a very low or low increase of risk for cancer.

NEXT STEPS

1. The USEPA will continue monitoring soil vapor to determine if the contaminant plume has advanced and to help identify buildings that may become affected because of changes in the plume or because new structures are built over the plume.

2. The USEPA will periodically verify that installed soil vapor intrusion mitigation systems are operational**.**

FOR MORE INFORMATION

If you have questions about the investigation at the Lawrence Aviation Industries site, please contact the USEPA at (212) 637-3967. If you have questions about this Health Consultation or other health concerns about this site, please contact the NYSDOH at 1-800-458-1158, extension 2-7880.

BACKGROUND AND STATEMENT OF ISSUE

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. Under a cooperative agreement with the ATSDR, the NYSDOH evaluated the public health implications of the Lawrence Aviation Industries site in a public health assessment (ATSDR, 2005). In the 2005 public health assessment, NYSDOH and ATSDR recommended that the potential for soil vapor contamination be addressed, and if necessary, actions be taken to mitigate exposures. Subsequently, the USEPA conducted a soil vapor intrusion investigation. This public health consultation summarizes the results of USEPA's soil vapor intrusion investigation and evaluates the public health implications of exposure to site-related contaminants in the indoor air of nearby buildings.

A. Site Description and History

The Lawrence Aviation Industries, Inc. (Lawrence Aviation) site is off Sheep Pasture Road in the hamlet of Port Jefferson Station, Town of Brookhaven, Suffolk County, New York. One mile to the north of the site lies the Port Jefferson Harbor. Lawrence Aviation is bounded by the Long Island Railroad tracks and Sheep Pasture Road to the north. 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 homes (Appendix A, Figure 1).

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, the Suffolk County Department of Health Services (SCDHS) conducted a site visit to Lawrence Aviation Industries. 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 used 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 (DCE) were found. The source of contamination was unknown at the time. In 1987, four private wells downgradient of Lawrence Aviation were sampled by the SCDHS. High levels of trichloroethene contamination were detected, as well as lower levels of tetrachloroethene and cis-1,2-dichloroethene. Contaminant levels exceeded the NYSDOH public drinking water guidelines. In 1987, Suffolk County and New York State requested that USEPA provide an alternative water supply the residence with safe drinking water. The USEPA supplied bottled water until the homes were connected to the public water supply. Since then, additional contaminated private wells were discovered and connected to the public water supply. In 1991, the SCDHS installed 14 test wells down gradient of the

site. Groundwater investigations detected volatile organic compound (VOC) contamination downgradient of the site. Also, trichloroethene was detected in a downgradient stream and pond.

The 2005 Public Health Assessment for the Lawrence Aviation site contained several recommendations, including further investigation to define the extent of the contaminated groundwater plume; assessment of the potential for soil vapor intrusion related to contaminated soil or groundwater at and near the site; and, evaluation of remedial strategies to address any contamination found.

B. Site Visit

Scarlett Messier and Kathleen McLaughlin of NYSDOH met with USEPA and New York State Department of Environmental Conservation (NYSDEC) staff at the site on November 28, 2007. A Port Jefferson Village representative was also present. Site access is restricted by a fence around the perimeter of the industrial portion of the site, which is patrolled. There is also a guard booth at the main entrance off Sheep Pasture Road. The site visit consisted of a tour of the grounds and two main on-site buildings, as well as a visit to the off-site soil vapor intrusion investigation area. During the site visit it was noted that the signs posted at the Old Mill Pond warning residents of contaminated water had been removed. The Suffolk County Department of Health Services has made additional visits to the site since 2007 and updates the NYSDOH on changes in site conditions and on plans for new housing developments.

DISCUSSION

A. Environmental Contamination and Exposure Pathways - Soil Vapor Intrusion

The 2005 Public Health Assessment identified TCE, PCE, TCA and DCE as primary contaminants of concern in groundwater downgradient of the Lawrence Aviation site. These and other VOCs can evaporate from groundwater, enter soil vapor (air spaces between soil particles) and migrate up through building foundations into indoor air, a process called soil vapor intrusion, which is the focus of this health consultation.

In February of 2006, the USEPA began a soil vapor intrusion investigation on the Lawrence Aviation site and at nearby structures. Since then, the USEPA collected sub-slab soil vapor samples from beneath 56 nearby buildings, indoor air samples were collected in the Port Jefferson High school, a daycare facility and six residential buildings. The results of this sampling are summarized in Appendix B, Tables 1 and 2.

Sub-slab soil vapor from beneath four residences (Table 1, Buildings number (#) 4, #5, #7 and #8) and the wrestling room at the high school (Table 1, Building #2) contained either TCE or PCE at levels of concern for impacts to indoor air. With two exceptions, indoor air levels of TCE and PCE in these five buildings were within the range typically found in residential buildings and below public health comparison values (Table 3). In 2008, TCE was detected in the indoor air of building #4 at levels of 0.31 mcg/m^3 (first

floor) and 0.32 mcg/m³ (basement); 2007 sampling results were <0.17 mcg/m³ (i.e. not detected) and 0.19 mcg/m³ respectively. Vinyl chloride (VC), a degradation product of TCE, was also detected in basement air samples from Building #4 at levels of 0.14 mcg/m³ (2008) and 0.044 mcg/m³ (2007); VC was not detected in first floor air or sub-slab vapor samples. In Building #5, PCE was detected at a level of 5.4 mcg/m³ in a 2006 first floor air sample; 1.2 mcg/m³ was detected in basement air and 7.3 mcg/m³ was detected in sub-slab vapor. Elevated levels of PCE were not detected in followup sampling of indoor air in 2007, indicating that the elevated level of PCE detected in 2006 was likely due to an indoor source rather than soil vapor intrusion. Similarly, an indoor source was likely responsible for the elevated level (3.8 mcg/m³) of 1,4 dichlorobenzene (DCB) detected in a 2006 sample of indoor air from the wrestling room at the high school. DCB was not detected in samples from eight other areas in the school or in sub-slab vapor from beneath the school; results of followup sampling (2007) in the wrestling room were 0.48 mcg/m³ in indoor air and ND for sub-slab vapor.

Overall, the results of the USEPA soil vapor intrusion investigation indicate that contaminants in sub-slab soil vapor are not significantly affecting the indoor air quality of buildings downgradient of the Lawrence Aviation site. To mitigate the potential for future exposures to TCE, PCE and/or VC via soil vapor intrusion to indoor air, the USEPA installed sub-slab depressurization systems (SSDS) under the high school wrestling room and three residential structures (Buildings #4, #5 and #7). Installation of SSDS was completed on April 16, 2008. The other residence (Building #8), with PCE levels of concern in sub-slab soil vapor, declined USEPA's offer to install an SSDS.

Sub-slab soil vapor samples from beneath two residential buildings (Table 2, Buildings #9 and #30) contained TCA at levels of 420 mcg/m³ and 340 mcg/m³, respectively, that, while not exceeding the USEPA action level for follow-up sampling of indoor air, they do exceed the action level (100 mcg/m³) above which the October 2006 Guidance for Evaluating Soil Vapor Intrusion in the State of New York (NYS DOH, 2006a) recommends either monitoring of sub-slab vapor and indoor air or mitigation, depending on indoor air sampling results. In the absence of indoor air sampling results, we do not know whether or not elevated exposures to are occurring via soil vapor intrusion.

B. Public Health Implications – Toxicological and Epidemiological Evaluation of Children's and Adult's Health Issues

Low levels of TCE , PCE, VC, TCA and DCB were detected in some of the indoor air samples collected in 2006, 2007 and 2008. Indoor air and/or sub-slab soil vapor data are not available to assess potential exposures prior to 2006. Some people could have been exposed to site-related contamination via soil vapor intrusion for up to about 56 years since Lawrence Aviation began operations; however, this appears unlikely since movement of contamination from the facility to groundwater and soil vapor to indoor air would have taken some period of time, resulting in a shorter exposure duration.

The potential health effects associated with exposure to TCE, PCE, VC and DCB were discussed in the 2005 Public Health Assessment. The indoor air sampling results can

be compared to levels we typically expect to find in indoor air, established indoor air guidelines and public health assessment comparison values for cancer and non-cancer health effects (Table 3). A comparison value is the concentration of an environmental contaminant in air that is unlikely to cause adverse health effects in exposed individuals. A cancer comparison value is the air concentration corresponding to an increased cancer risk of one in one million. A non-cancer comparison value is the air concentration that is unlikely to result in any appreciable risk of adverse non-cancer effects. The NYSDOH has also established guidelines for TCE in air (5 mcg/m^3) to help guide decisions about when and how to reduce exposures. These guidelines were developed taking into account non-cancer and cancer health risks, as well as levels typically found in air and analytical detection limits (NYSDOH, 2003; 2006). Exposure to air concentrations less than comparison values and air guidelines is generally considered to pose very low or minimal risks of adverse health effects. The possibility that children or the developing fetus may have increased sensitivity to the contaminants detected in indoor air, as well as potential interactions (such as antagonism or synergy) that could take place among chemicals in a mixture, was considered when evaluating the public health implications of the results of USEPA's soil vapor intrusion investigation for the Lawrence Aviation site. Please refer to Appendix D for more information on how potential health risks are evaluated and characterized.

In 2008, TCE and VC were detected in Building #4 (Table 1) at levels as high as 0.32 mcg/m^3 (first floor air) and 0.14 mcg/m^3 (basement air), respectively, both of which slightly exceed comparison values (0.3 and 0.11 mcg/m^3, respectively) for cancer effects over a lifetime (70 years) of continuous exposure (Table 3). In 2007, TCE was not detected in first floor air and was 0.19 mcg/m^3 in the basement sample. The average of the 2008/2007 results for TCE (<0.24 mcg/m^3 for the first floor and 0.26 mcg/m^3 for the basement) are below the comparison value. VC was not detected in first floor air (both years) but was detected at a level of 0.04 mcg/m^3 in a 2007 sample of basement air. Based on these results, the increased cancer risk for residents of Building #4 is estimated to be very low (less than one in one million). Sub-slab soil vapor beneath Building #4 contained TCE at levels of concern (69 mcg/m^3 to 190 mcg/m^3) for potential future impacts to indoor air which the USEPA addressed by installing a SSDS.

In 2006, PCE was detected in the indoor air of Building #5 (Table 1) at levels of 5.4 mcg/.m^3 (first floor) and 1.2 mcg/m^3 (basement), both of which slightly exceed the cancer comparison value of 1 mcg/m^3 (Table 3). Followup sampling in 2007 and 2008 did not detect elevated levels of PCE in indoor air, indicating that the 2006 sample result was likely due to an indoor source rather than soil vapor intrusion. PCE is a dry-cleaning fluid that can evaporate from recently dry-cleaned clothes or from a bottle of cleaning fluid and impact indoor air for short periods of time. Based on these results, the increased cancer risk from past exposure to PCE in Building #5 is estimated to be very low (less than one in one million) and not likely associated with soil vapor intrusion from the Lawrence site. Although TCE was not detected at levels above comparison values in the indoor air of Building #5, sub-slab vapor under the building contained TCE

at levels of concern (47 mcg/m³ to 54 mcg/m³) for potential future impacts to indoor air. The USEPA installed an SSDS to mitigate this concern.

PCE was also detected at levels of concern (420 mcg/m³ to 560 mcg/m³) in sub-slab vapor from beneath the wrestling room at Port Jefferson High School; indoor air sampling did not detect any impact on indoor air quality. The USEPA installed an SSDS under the wrestling room to mitigate the potential for future exposure to PCE via soil vapor intrusion. DCB was detected at a level of 3.8 mcg/m³ in a 2006 sample of indoor air from the wrestling room, which slightly exceeds the cancer comparison value (3.6 mcg/m³) for a school employee exposed 180 days a year for 25 years. Followup sampling (2007) found 0.38 mcg/m³ in wrestling room air. DCB was not detected in eight other areas of the school or in sub-slab vapor samples indicating that the elevated 2006 result was associated with an indoor source rather than soil vapor intrusion. DCB is found in some space deodorants, toilet deodorizers and products used to control mold, mildew and moths and will evaporate from these products into indoor air. Based on these results, the increased cancer risk from exposure to DCB in the school is estimated to be very low (less than one in one million) and not associated with soil vapor intrusion from the Lawrence Aviation site. See Appendix E for more information on volatile organic chemicals in commonly used household products.

For the two buildings (Table 2, Buildings #9 and #30) with 420 mcg/m³ and 340 mcg/m³, respectively of TCA in sub-slab vapor but no indoor air data, we do not know whether residents are being exposed via soil vapor intrusion or whether sub-slab levels of TCA will increase in the future. Based on these results, the risk of non-cancer effects would be minimal even at indoor air levels equal to the highest level found in sub-slab vapor.

COMMUNITY HEALTH CONCERNS

Press reports on the subject of soil vapor intrusion mentioned several sites in Long Island where the potential for soil vapor intrusion was being investigated, including the Lawrence Aviation site. Several calls from the community were received by the NYSDOH inquiring about the status of the investigation, and requesting that their homes be included in the study. The NYSDOH answered questions from residents and facilitated inclusion of their homes in the USEPA's vapor intrusion investigation. USEPA is working closely with the State and Port Jefferson Village representatives to ensure that the investigation progress meets or exceeds the community's expectations. Subsequent to the initial response to press reports, the NYSDOH and Suffolk County Department of Health Services have not received inquiries about the site.

This health consultation was distributed for public comment on September 29, 2009. The public comment period ended on November 20, 2009 and NYS DOH and ATSDR received no comments from the public or elected officials.

CONCLUSION

NYSDOH and ATSDR conclude that breathing volatile organic chemicals at levels measured inside buildings that where identified as potentially affected by soil vapor intrusion from the nearby Lawrence Aviation Industries site is not expected to harm people's health (see Appendix C for more information on this conclusion category). This includes residents and occupants of the school and commercial buildings tested.

- Overall, the results of the USEPA soil vapor intrusion investigation indicate that contaminants associated with the Lawrence Aviation site is not significantly affecting the indoor air quality of buildings downgradient from the site.
- The USEPA installed SSDS beneath four residential buildings and the wrestling room of Port Jefferson High School where sub-slab soil vapor contained TCE or PCE at levels of concern for future impacts to indoor air.
- The levels of TCE and PCE in the indoor of these five buildings were, on average, within the range typically found in residential buildings and below public health comparison values for cancer and non-cancer health effects.
- The elevated levels of PCE and DCB found in single samples of indoor air from two buildings can be attributed to indoor sources rather than to soil vapor intrusion.
-

RECOMMENDATIONS

NYSDOH and ATSDR recommend that:

- USEPA continue to monitor the potential for soil vapor intrusion to occur in downgradient buildings, should environmental or building use or conditions change. As necessary, additional samples should be collected to further delineate the off-site soil vapor plume and evaluate the potential for soil vapor intrusion to occur;
- Sub-slab depressurization systems be maintained in good working order;
- Concurrent sub-slab soil vapor and indoor air samples be collected for Buildings #9 and #30, as the sub-slab soil vapor data indicate the potential for soil vapor intrusion to result in long-term, chronic exposure to levels of TCA above those typically found in indoor air; and
- Proposals for newly constructed buildings and housing developments near the Lawrence Aviation Industries site should be evaluated for the potential for soil vapor intrusion and preventive actions should be taken as needed.

PUBLIC HEALTH ACTION PLAN

The Public Health Action Plan for the Lawrence Aviation Industries site describes the actions taken or to be taken by the ATSDR, NYSDOH, USEPA or NYSDEC following completion of this health consultation. The purpose of the Public Health Action Plan is to ensure that this health consultation not only identifies public health hazards, but

provides a plan of action designed to mitigate and prevent adverse human health effects resulting from present and/or future exposures to site contaminants via soil vapor intrusion at and near the site. ATSDR and/or NYSDOH will ensure that this plan is implemented. The public health actions for the Lawrence Aviation site are as follows:

1. The NYSDOH will continue using the Guidance for Evaluation Soil Vapor Intrusion in the State of New York to evaluate sub-slab soil vapor and indoor air sampling data and recommend appropriate corrective actions, as necessary.

2. USEPA will monitor soil vapor to determine whether the contaminant plume has advanced and to help identify buildings that may become affected because of changes in the plume or because new structures are built over the plume. NYSDOH will work with USEPA and NYSDEC to notify property owners of the presence of soil vapor contamination and encourage the owners to allow USEPA to sample as necessary.

3. USEPA will periodically verify that installed SSDS are operational.

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

REFERENCES

ATSDR (Agency for Toxic Substances and Disease Registry), 2005. Public Health Assessment Lawrence Aviation Industries. U.S. Department of Health and Human Services. Atlanta, Georgia: U.S. Public Health Service.

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NYSDOH, 2006a. Guidance for Evaluating Soil Vapor Intrusion in New York State. New York State Department of Health, Center for Environmental Health, Troy, New York

NYSDOH, 2006b. Trichloroethene (TCE) in Indoor and Outdoor Air. Bureau of Toxic Substance Assessment, Center for Environmental Health, Troy, New York. Available on line at http://www.health.state.ny.us/environmental/investigations/soil_gas/svi_guidance/fs_tce.htm

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CERTIFICATION

The health consultation 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 health consultation was initiated. Editorial reviews were completed by the Cooperative Agreement Partner.

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

for Richard Gillig
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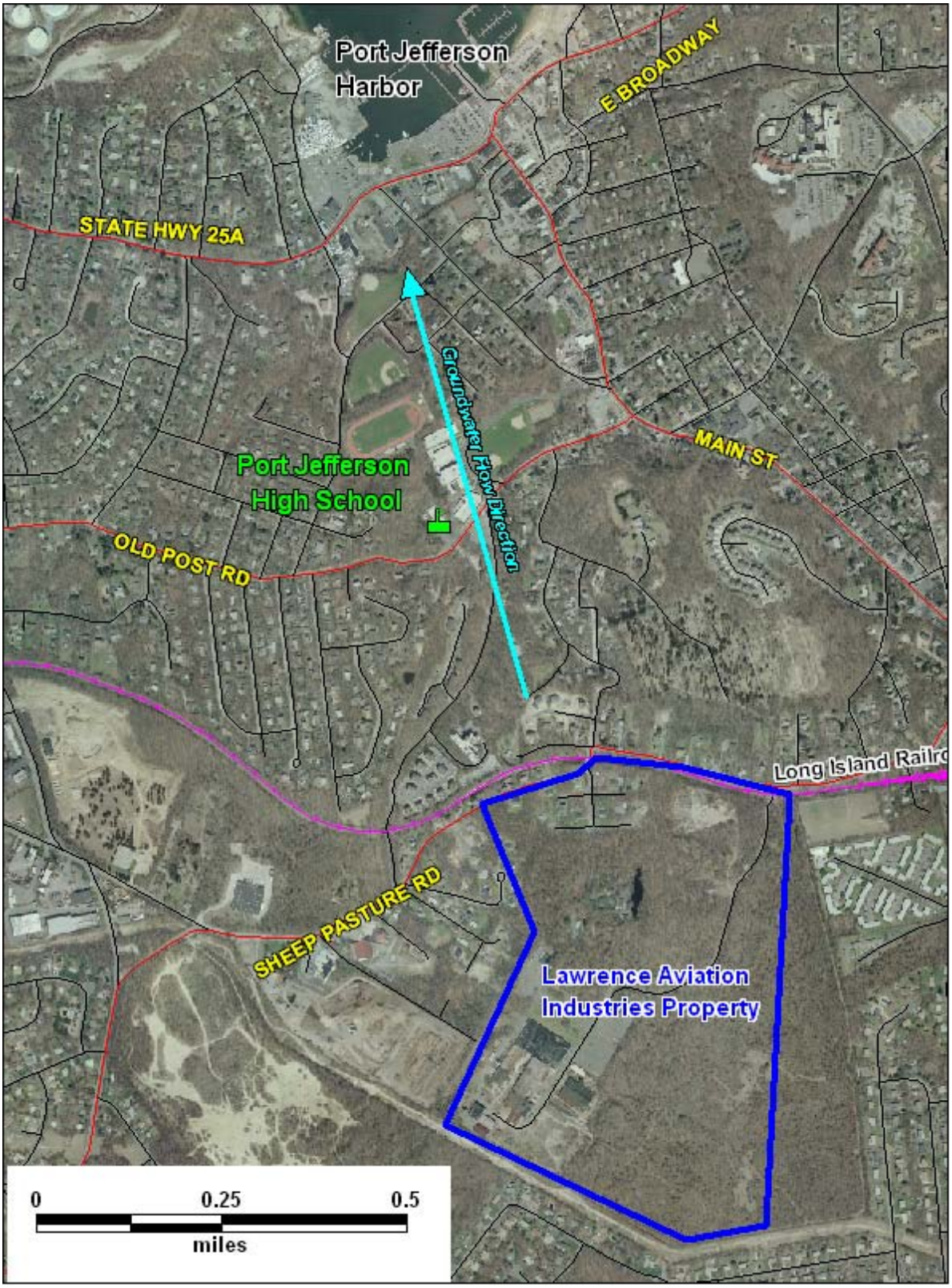
APPENDIX A
Figure 1
Site Location Map

Figure 1. Site Location Map



APPENDIX B
Tables

Table 1: Summary of USEPA Soil Vapor Intrusion Investigation Results for Buildings near the Lawrence Aviation Industries Site with Indoor Air Sampling Results

All Values in Micrograms per Cubic Meter (mcg/m^3)

	Daycare		**School**		**Residences**												
Analyte	**Building 1**		**Building 2**		**Building 3**		**Building 4**		**Building 5**		**Building 6**		**Building 7**		**Building 8**		**Ambient Air**
	Subslab	**Indoor Air**	**Subslab**	**Indoor Air**	**Subslab**	**Indoor Air**	**Subslab**	**Indoor Air**	**Subslab**	**Indoor Air**	**Subslab**	**Indoor Air**	**Subslab**	**Indoor Air**	**Subslab**	**Indoor Air**	
TCE*	NA**	ND***	ND - 8.3	ND	ND - 2.6	ND	**69 - 190**	ND - **0.32**	**47 - 54**	ND - 0.21	6.4, 7.8	ND	ND	ND	ND	ND	ND - 4.3
TCA	NA	ND	ND - 9.2	ND - 0.34	0.84 - 1.2	ND	ND	1.4 - 4.0	4.6 - 8.6	ND - 0.32	22, 22	ND	0.28 - 0.29	ND	0.27, 0.32	ND	ND
PCE	NA	ND - 0.38	ND - **560**	ND - 0.58	1.7 - 2.3	0.27, 0.28	ND	ND - 0.36	7.2 - 11	ND - **5.4**	2.0, 2.4	0.28, 0.28	**110 - 120**	0.39 - 0.46	**79, 110**	ND , 0.3	ND - 0.39
DCB	NA	ND	ND	ND - **3.8**	ND - 0.87	NA	ND - 0.33	ND	0.29 - 0.67	ND	<0.99	NA	0.59 - 2.1	ND	ND - 0.21	ND	ND
VC	NA	ND	ND	ND	ND	NA	ND	**ND - 0.14**	ND	ND	<0.42	NA	ND	ND	ND	ND	ND

* TCE- trichloroethene, TCA - 1,1,1-trichloroethane,
PCE - tetrachloroethene, DCB -1,4 -dichlorobenzene,
VC - vinyl chloride.
**NA - not analyzed
***ND - not detected

Table 2: Sub-slab Soil Vapor Sampling Results for Buildings Where Indoor Air Samples Were Not Collected

All Values in Micrograms per Cubic Meter (mcg/m^3)

Location	TCE *	TCA	PCE	DCB	VC
Building 9	ND**	**420**	8.3	ND	ND
Building 10	3.9	0.25	16	ND	ND
Building 11	ND	1	1	ND	ND
Building 12	ND	3	3.3	ND	ND
Building 13	ND	ND	ND	ND	ND
Building 14	ND	ND	1.3	ND	ND
Building 15	ND	0.45 - 0.46	1.6	0.54 - 0.55	ND
Building 16	ND	ND	ND	ND	ND
Building 17	ND	18	3.2	0.46	ND
Building 18	ND	0.52	1.8	ND	ND
Building 19	ND	1.7	ND	ND	ND
Building 20	ND	2.8	ND	ND	ND
Building 21	ND	25	34	ND	ND
Building 22	ND	ND	ND	ND	ND
Building 23	ND	2	3.3	0.5	ND
Building 24	1.90	1.2	18	ND	ND
Building 25	ND	7	1.3	0.23	ND
Building 26	ND	2	2.6	ND	ND
Building 27	ND	5.2	5.2	ND	ND
Building 28	ND	2.2	1.7	ND	ND
Building 29	ND	ND	ND	ND	ND
Building 30	ND	**340**	ND	ND	ND
Building 31	ND	5.2	3.5	ND	ND
Building 32	ND	<0.16 - 4.1	0.46 - 0.7	ND	ND
Building 33	ND	ND	ND	ND	ND
Building 34	ND	ND	2.1	ND	ND
Building 35	ND	ND	ND	ND	ND
Building 36	ND	2.4	11	ND	ND
Building 37	ND	ND	2.1	ND	ND
Building 38	ND	ND	ND	ND	ND
Building 39	ND	0.87	2.5	ND	ND
Building 40	ND	0.74	2.3	1.2	ND
Building 41	ND	2.8	2.1	ND	ND
Building 42	ND	1.3	0.68	ND	ND
Building 43	ND	0.48	0.99	ND	ND
Building 44	ND	3.6	3.9	0.21	ND
Building 45	ND	0.3	19	ND	ND
Building 46	ND	ND	1.6	2.2	ND
Building 47	ND	ND	8.4	7.4	ND
Building 48	ND	ND	2.3	0.77	ND
Building 49	ND	0.33 - 0.49	8.6 - 9.8	0.33 - 1.3	0.24 - 0.49
Building 50	ND	0.55	3.7	3	ND
Building 51	ND	ND	14	0.55	ND
Building 52	ND	ND	5.8 - 14	0.48 - 1.1	ND
Building 53	ND	0.49	2.2	0.66	ND
Building 54	ND	5.8	4.1	0.97	ND
Building 55	ND	ND	ND	ND	ND
Building 56	ND	ND	ND	ND	ND

* TCE- trichloroethene, TCA - 1,1,1-trichloroethane, PCE - tetrachloroethene, DCB -1,4 -dichlorobenzene, VC - vinyl chloride.
**ND - not detected

Table 3: Typical Indoor Air Levels, Air Guidelines and Public Health Assessment Comparison Values For Chemicals Detected in Indoor Air in Buildings Near the Lawrence Aviation Site

All values in micrograms per cubic meter (mcg/m^3)

Contaminant	Typical Indoor Air Levels* Percentile 25^{th} – 75^{th}	Typical Indoor Air Levels* Percentile 90^{th}	New York State Air Guidelines**	Public Health Assessment Comparison Values: Cancer***	Basis****	Non-cancer	Basis****
1,4-dichlorobenzene (DCB)	<0.25 – 0.5	1.3	--	3.6	US EPA CPF	800	US EPA RfC
tetrachloroethene (PCE)	<0.25 – 1.1	2.9	100	1	NYS DOH UR	100	NYS DOH CV
1,1,1-trichloroethane (TCA)	<0.25 – 1.1	3.1	--	--	--	2200	US EPA RfC
trichloroethene (TCE)	<0.25 – <0.25	0.5	5	0.3 to 7.8	NYS DOH UR	10	NYS DOH CV
vinyl chloride (VC)	<0.25 – <0.25	<0.25	--	0.11	US EPA UR	100	US EPA RfC

*25^{th} to 75^{th} percentiles and 90th percentiles air levels obtained from *Summary of Indoor and Outdoor Levels of Volatile Organic Compounds from Fuel Oil Heated Homes in New York State 1997-2003* (available at *http://www.health.state.ny.us/nysdoh/indoor/fuel_oil.htm*).

**Public health assessment comparison values for air are based solely on toxicological data and scientific evaluations of the relationship between contaminant air concentrations and human health risks. In contrast, an air guideline is a ceiling air concentration used to help guide risk management decisions, taking into consideration other factors (e.g., analytical capabilities, background concentrations, technological feasibility) that are typically evaluated when establishing contaminant air concentrations that trigger remedial action to reduce exposures.

***The cancer comparison value for PCE, TCE and VC is the air concentration corresponding to an increased cancer risk of one-in-one million after a lifetime (70 years) of continuous exposure (20 cubic meters of contaminated air inhaled per day). For DCB, the cancer comparison value corresponds to an increased cancer risk of one-in-one million for a high school employee who inhales 10 m^3 of contaminated air/day, 180 days/year for 25 years.

****US EPA CPF: U.S. Environmental Protection Agency Cancer Potency Factor
US EPA RfC: U.S. Environmental Protection Agency Reference Concentration
NYS DOH UR: New York State Department of Health Unit Risk
NYS DOH CV: New York State Noncancer Criteria Value for noncancer endpoints
US EPA UR: U.S. Environmental Protection Agency Unit Risk

APPENDIX C

Conclusion Categories and Hazard Statements

Conclusion Categories and Hazard Statements

ATSDR has five distinct descriptive conclusion categories that convey the overall public health conclusion about a site or release, or some specific pathway by which the public may encounter site-related contamination. These defined categories help ensure a consistent approach in drawing conclusions across sites and assist the public health agencies in determining the type of follow-up actions that might be warranted. The conclusions are based on the information available to the author(s) at the time they are written.

1. Short-term Exposure, Acute Hazard "ATSDR concludes that...could harm people's health."

This category is used for sites where short-term exposures (e.g. < 1 yr) to hazardous substances or conditions could result in adverse health effects that require rapid public health intervention.

2. Long-term Exposure, Chronic Hazard "ATSDR concludes that...could harm people's health."

This category is used for sites that pose a public health hazard due to the existence of long-term exposures (e.g. > 1 yr) to hazardous substance or conditions that could result in adverse health effects.

3. Lack of Data or Information "ATSDR cannot currently conclude whether...could harm people's health."

This category is used for sites in which data are insufficient with regard to extent of exposure and/or toxicologic properties at estimated exposure levels to support a public health decision.

4. Exposure, No Harm Expected "ATSDR concludes that ... is not expected to harm people's health."

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.

5. No Exposure, No Harm Expected "ATSDR concludes that ...will not harm people's health."

This category is used for sites that, because of the absence of exposure, are not expected to cause any adverse health effects.

APPENDIX D

NYSDOH PROCEDURE FOR EVALUATING POTENTIAL HEALTH RISKS
FOR CONTAMINANTS OF CONCERN

Appendix D

NYSDOH 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 Industries, the NYSDOH assessed the risks for cancer and non-cancer 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 USEPA or, in some cases, by the NYSDOH. The following qualitative ranking of cancer risk estimates, developed by the NYSDOH, 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:

Qualitative Descriptors for 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 non-carcinogenic 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 USEPA, ATSDR and/or NYSDOH. The resulting ratio was then compared to the following qualitative scale of health risk:

Qualitative Descriptors for Non-carcinogenic 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

Non-carcinogenic 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 that 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 sub-populations (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 non-cancer 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 non-cancer 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

Volatile Organic Compounds (VOCs) in Commonly Used Products

Volatile Organic Compounds (VOCs) in Commonly Used Products

People spend most of their time indoors – at home, school and work. This makes the quality of the indoor air you breathe important. This fact sheet focuses on certain kinds of chemicals called *volatile organic compounds* or *VOCs* that are found in many products that we commonly use. It is designed to help you think about what VOCs may be present in your indoor air and steps you can take to reduce them.

What are VOCs?

VOCs are chemicals that easily enter the air as gases from some solids or liquids. They are ingredients in many commonly used products and are in the air of just about every indoor setting. The table to the right shows some examples of products that contain VOCs.

How do VOCs get into indoor air?

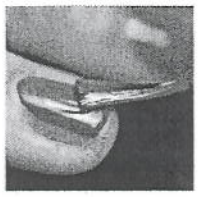
Products containing VOCs can release these chemicals when they are used and when they are stored. Many times you'll notice an odor when using these products. Product labels often list VOC ingredients and recommend that they should be used in well ventilated areas. *Ventilation* means bringing in fresh, outdoor air to mix with indoor air.

When you use a product containing VOCs indoors, the levels of these chemicals in the air increase, then decrease over time after you stop using them. The amount of time the chemical stays in the air depends on how quickly fresh air enters the room and the amount of the chemical used. Levels of VOCs will decrease faster if you open windows or doors, or use exhaust fans.

Building materials and furnishings, such as new carpets or furniture, slowly release VOCs over time. It may be necessary to ventilate areas with new carpeting or furniture for longer time periods because VOC levels can build up again after the windows are closed. If possible, unroll new carpets or store furniture outside your home (in a shed or detached garage) to minimize odors before bringing them in the home. If that's not possible, open windows, close doors and try to stay out of rooms until odors are reduced.

If VOC containing products are used outdoors near your home, you may want to close windows and nearby vents to prevent chemicals from coming inside.

Products used at home or work can release VOCs into the air when used and stored.



Examples of Household Products	Possible VOC Ingredients
Fuel containers or devices using gasoline, kerosene, fuel oil and products with petroleum distillates: paint thinner, oil-based stains and paint, aerosol or liquid insect pest products, mineral spirits, furniture polishes	BTEX (benzene, toluene, ethylbenzene, xylene), hexane, cyclohexane, 1,2,4-trimethylbenzene
Personal care products: nail polish, nail polish remover, colognes, perfumes, rubbing alcohol, hair spray	Acetone, ethyl alcohol, isopropyl alcohol, methacrylates (methyl or ethyl), ethyl acetate
Dry cleaned clothes, spot removers, fabric/ leather cleaners	Tetrachloroethene (perchloroethene (PERC), trichloroethene (TCE))
Citrus (orange) oil or pine oil cleaners, solvents and some odor masking products	d-limonene (citrus odor), a-pinene (pine odor), isoprene
PVC cement and primer, various adhesives, contact cement, model cement	Tetrahydrofuran, cyclohexane, methyl ethyl ketone (MEK), toluene, acetone, hexane, 1,1,1-trichloroethane, methyl-iso-butyl ketone (MIBK)
Paint stripper, adhesive (glue) removers	Methylene chloride, toluene, older products may contain carbon tetrachloride
Degreasers, aerosol penetrating oils, brake cleaner, carburetor cleaner, commercial solvents, electronics cleaners, spray lubricants	Methylene chloride, PERC, TCE, toluene, xylenes, methyl ethyl ketone, 1,1,1-trichloroethane
Moth balls, moth flakes, deodorizers, air fresheners	1,4-dichlorobenzene, naphthalene
Refrigerant from air conditioners, freezers, refrigerators, dehumidifiers	Freons (trichlorofluoromethane, dichlorodifluoromethane)
Aerosol spray products for some paints, cosmetics, automotive products, leather treatments, pesticides	Heptane, butane, pentane
Upholstered furniture, carpets, plywood, pressed wood products	Formaldehyde

VOCs can also get into indoor air from contaminated soils and groundwater under buildings. The chemicals enter buildings through cracks and openings in basements or slabs. When nearby soil or groundwater is contaminated, you might be asked for permission to investigate indoor air at your property. More information can be found at *www.nyhealth.gov/environmental/indoors/vapor_intrusion/.*

Should I be surprised if VOCs are in the air I breathe?

No. Because they are commonly used, some VOCs are almost always found in indoor air. The New York State Department of Health (DOH) and other agencies have studied typical levels of VOCs that may be present in indoor and outdoor air. Sometimes these levels are called *"background levels".*

The term "background levels" can be confusing because they can vary depending on where an air sample was collected and whether VOCs were used or stored. For example, a study of VOCs in urban areas might find higher levels than another study in rural areas. Some studies look at office environments, others examine residences. Please keep in mind study findings may or may not make sense for your setting.

More information about levels of VOCs collected by DOH is available in Appendix C of the guidance for evaluating vapor intrusion at *www.nyhealth.gov/environmental/investigations/soil_gas/svi_guidance.*

How can VOCs affect human health?

Chemicals can enter the body through three major pathways (breathing, touching or swallowing). This is referred to as *exposure*. No matter how dangerous a substance or activity is, it cannot harm you without exposure.

Whether or not a person will have health effects after breathing in VOCs depends on:

1. The *toxicity* of the chemical (the amount of harm that can be caused by contact with the chemical).
2. How much of the chemical is in the air.
3. How long and how often the air is breathed.

Differences in age, health condition, gender and exposure to other chemicals also can affect whether or not a person will have health effects.

Short-term exposure to high levels of some VOCs can cause headaches, dizziness, light-headedness, drowsiness, nausea, and eye and respiratory irritation. These effects usually go away after the exposure stops. In laboratory animals, long-term exposure to high levels of some VOCs has caused cancer and affected the liver, kidney and nervous system. In general, we recommend minimizing exposure to chemicals, if possible.

How can I reduce the levels of VOCs indoors?

- Find out if products used or stored in your home contain VOCs. Information about the chemicals in many household products are listed on the front of this fact sheet and a larger list is on the National Institute of Health's website at *hpd.nlm.nih.gov/products.htm*.
- If you must store products containing VOCs, do so in tightly sealed, original containers in a secure and well-ventilated area. If possible store products in places where people do not spend much time, such as a garage or outdoor shed. Better yet, buy these products in amounts that are used quickly.
- Dispose of unneeded products containing VOCs. Many of these products are considered *household hazardous wastes* and should be disposed of at special facilities or during special household hazardous waste collection programs in your area. Contact your town or visit the New York State Department of Environmental Conservation's website at *www.dec.ny.gov/chemical/8485.html* for more information about disposing of these products.
- Use products containing VOCs in well-ventilated areas or outdoors. Open windows and doors or use an exhaust fan to increase ventilation. Repeated or prolonged ventilation may be necessary for reducing levels from building materials (new carpeting or furniture) that release VOCs slowly over time.
- Carefully read labels and follow directions for use.

Where can I find out more?

- **New York State Department of Health**
  (800) 458-1158
  www.nyhealth.gov/environmental/
- **Indoor Air Quality and Your Home** from the New York State Energy Research and Development Authority *www.nyserda.org/publications/iaq.pdf*
- **The Inside Story: A Guide to Indoor Air Quality**
  www.epa.gov/iaq/pubs/insidest.html
- **New York State Department of Environmental Conservation** website for information about household hazardous waste disposal
  www.dec.ny.gov/chemical/8485.html
- **National Institute of Health's** website for information about chemicals found in many household products.
  hpd.nlm.nih.gov/products.htm

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