

# Health Consultation

## Stuart Olver Holtz Site

City of Rochester, Monroe County, New York

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## **Summary and Statement of Issues**

Groundwater and soil at the Stuart Olver Holtz site is contaminated with volatile organic compounds. Soil and groundwater remedial actions have been implemented. The New York State Departments of Environmental Conservation (DEC) and Health (DOH) identified the need for a soil vapor intrusion investigation. This health consultation reviews and makes conclusions based on the soil vapor intrusion investigation data collected at the site.

## **Background, Site Description and History**

The Stuart Olver Holtz Site is located at 39 Commerce Drive, in the Town of Henrietta, Monroe County, New York. The site occupies about 3.8 acres in a mixed commercial-industrial area. The DEC demolished the building on the site in December 2005. The site currently consists of a building foundation and paved/concrete/grassed areas surrounded by a locked chain-link fence. The site is bounded on the east by several small businesses, on the west by Pullman Manufacturing, on the south by Ruby Gordon, Inc., and on the north side by Commerce Drive and several commercial properties.

Electro Chemical Products, Inc. developed the site from farmland in 1962, and evolved into Stuart Olver Holtz, Inc. The company operated a specialty finishing business on a contractual basis and conducted painting, conversion coating and metal plating of parts. In 1974, a fire destroyed a portion of the facility and resulted in the uncontrolled release of plating and coating solutions into the environment. In 1980, the company applied for (but did not obtain) a permit to operate a solvent recovery unit at the facility and began accumulating drums of waste solvents for processing. The DEC issued an enforcement order requiring the company to remove the waste solvent drums, some of which were leaking. Subsequently, the company removed all of the drums. The primary contaminants of concern at the site are the volatile organic compounds 1,1-dichloroethane (1,1-DCA), tetrachloroethene (PCE), 1,1,1-trichloroethane (1,1,1-TCA) and trichloroethene (TCE). Investigations indicate that the area where the soil is a source of contamination extends southeast from the loading dock area under the southern half of the building slab. The compounds detected in the soil do not exceed the applicable New York State soil cleanup objectives for commercial use. A majority of the groundwater plume containing these volatile organic compounds is located within the Site.

A March 1997 Record of Decision specified that a shallow groundwater collection trench and groundwater treatment be implemented to remediate the site. The Record of Decision required periodic sampling of bedrock groundwater, and also called for excavation and off-site disposal of the remaining contaminated soil, followed by capping of the excavated area. DEC later modified the Record of Decision to include in-situ chemical oxidation and bio-remediation instead of groundwater collection and treatment.

DEC began groundwater treatment (injections) in the summer of 2011. Additional injections are expected to be implemented at the site beginning in early 2014.

The DEC has a policy that requires evaluation of soil vapor intrusion at all contaminated sites in New York. DEC and DOH completed a soil vapor intrusion investigation for the site and at the adjacent property in January 2013. Based on the results of that investigation, DEC and DOH determined that actions are necessary to address the potential for soil vapor intrusion at both the site and at the adjacent property.

## **Discussion**

### Soil Vapor Intrusion Investigation

Volatile organic compounds in groundwater or soil may move into the air spaces within the soil (called soil vapor). This vapor may migrate into overlying buildings and affect indoor air quality (DOH 2006a). This process, which is similar to the movement of radon gas from the subsurface into the indoor air of buildings, is referred to as soil vapor intrusion. Due to the presence of volatile organic compounds in on-site groundwater and soil, DOH identified soil vapor intrusion and subsequent inhalation as a potential human exposure pathway at the Stuart Olver Holtz site.

Since the site is vacant, soil vapor intrusion is not a current concern on site. However, a vapor mitigation system would be required for any buildings developed at the site in the future.

The URS Corporation (under contract with the DEC) conducted the off-site soil vapor intrusion study in January 2013 at the Furniture Store located south of the site. DEC did not identify any other buildings as being potentially affected by site related volatile organic compounds. Because of high groundwater at the property (groundwater is up to the bottom of the building slab, leaving no air spaces beneath the slab), sub-slab vapor samples could not be collected. URS Corporation sampled indoor air at four locations within the furniture store, with one duplicate sample also collected. Complete sample results are shown in the Indoor Air Sampling Report (URS 2013). Exhibit 1 of Appendix A shows all chemicals detected in the indoor air samples. As expected for a commercial building, the sampling detected several non-site related volatile organic compounds in the indoor air of the furniture store. Table 1 shows sampling results for the indoor air at the furniture store only for Stuart Olver Holtz Site related volatile organic compounds. The site related volatile organic compounds detected in indoor air include 1,1-DCA, PCE, 1,1,1-TCA and TCE.

**Table 1. Stuart Olver Holtz Site: Indoor Air Sampling Results for the Ruby Gordon Furniture Store**  
(All values in micrograms per cubic meter).

Location	1,1-Dichloroethane	Tetrachloroethene	1,1,1-Trichloroethane	Trichloroethene
1	3.6 J	7.6 J	7.0 J	4.0 J
1A*	4.0	7.4	6.7	3.9
2	2.9	29.0	13.0	3.4
3	3.0	9.3	7.0	3.8
4	4.5	2.5	6.8	3.7
<b>Average**</b>	<b>3.55</b>	<b>12.0</b>	<b>8.4</b>	<b>3.71</b>

\*Duplicate sample

\*\*1 and 1A (duplicate) were averaged, then averaged with samples 2, 3 and 4.

1,1-DCA = 1; PCE =; 1,1,1-TCE =; TCE =; J = estimated value

### Public Health Implications

DOH screened the indoor air levels (i.e., concentrations) of 1,1-DCA, PCE, 1,1,1-TCA and TCE by comparing the highest detected level to indoor air background levels (DOH 2005), available New York State air guidelines (DOH 2006b; 2013), and ATSDR air comparison values (ATSDR 2013a), as shown in Table 2. Both the comparison values and air guidelines are air concentrations at which DOH does not expect adverse health effects to occur. The comparison values are based solely on health-based criteria, while the air guideline considers other factors, including the ability to reliably detect the chemicals, background levels, and gaps in the toxicological database.

**Table 2. Stuart Olver Holtz Site: Air Background Levels, Guidelines and Comparison Values for Contaminants Detected in Indoor Air of the Ruby Gordon Furniture Store**  
(All values in micrograms per cubic meter).

Chemical	Highest Level Detected in Indoor Air	Indoor Air Background Level <sup>a</sup>		New York State Air Guidelines	ATSDR Comparison Values
		25 <sup>th</sup> – 75 <sup>th</sup> Percentile <sup>b</sup>	Upper Fence <sup>c</sup>		
1,1-dichloroethane	4.5	<0.25 - <0.25	0.38	---	---
tetrachloroethene	29	<0.25 - 1.1	2.5	30	3.8 <sup>d</sup>
1,1,1-trichloroethane	13	<0.25 - 1.1	2.5	---	3800 <sup>e</sup>
trichloroethene	4.0	<0.25 - <0.25	0.46	5	0.24 <sup>d</sup>

<sup>a</sup>Indoor air background levels from DOH Study of Volatile Organic Chemicals in Air of Fuel Oil Heated Homes (DOH 2005).

<sup>b</sup>One quarter of the values are above and one quarter of the values are below the 25<sup>th</sup> to 75<sup>th</sup> percentile range.

<sup>c</sup>The upper fence is a boundary used for identifying outliers in the data and is calculated as 1.5 times the interquartile range (difference between the 25<sup>th</sup> and 75<sup>th</sup> percentile values) above the 75<sup>th</sup> percentile value.

<sup>d</sup>Air concentration corresponding to an increased lifetime cancer risk of one-in-one million assuming continuous lifetime exposure, based on the EPA unit risk for PCE (EPA 2012a) and TCE (EPA 2011a).

<sup>e</sup>ATSDR minimal risk level for intermediate exposure (ATSDR 2006)

ATSDR = Agency for Toxic Substances and Disease Registry.

The sampling detected all four chemicals at levels above those DOH would typically expect to find in indoor air (i.e., background). In a letter to the furniture store owner, DOH recommended that actions be taken to improve the indoor air quality at the furniture store. DOH suggested that appropriate actions may include covering the groundwater sumps which are present in the building or increasing the fresh air exchange rate. In addition, DEC is responsible for making sure that periodic monitoring of the indoor air will be conducted to assess whether additional actions to improve the indoor air quality are needed.

DOH further evaluated and characterized the risks for 1,1-DCA, PCE, 1,1,1-TCA and TCE because the indoor air levels exceeded indoor air background levels and these are site related volatile organic compounds. The highest levels of PCE and TCE (29 and 4 micrograms per cubic meter [ $\text{mcg}/\text{m}^3$ ]) are also nearly equal to the respective New York State air guidelines (30 and 5  $\text{mcg}/\text{m}^3$ ), and exceed the ATSDR comparison values based on an increased lifetime cancer risk of one-in-one-million.

The health effects of 1,1-DCA, PCE, 1,1,1-TCA and TCE have been reviewed (ATSDR 2006; ATSDR 2013b; DOH 2006b; EPA 2007a, 2011b, 2012b). Briefly, the EPA classifies TCE as carcinogenic to humans by all routes of exposure (EPA 2011a), and PCE as likely to carcinogenic to humans by all routes of exposure (EPA 2012a). EPA considers 1,1-DCA as possibly carcinogenic to humans (EPA 1996), and there is inadequate information to assess the carcinogenic potential of 1,1,1-trichloroethane (EPA 2007b).

Exposure to high levels of 1,1-DCA, PCE, 1,1,1-TCA and TCE can also cause noncancer health effects, primarily on the nervous system, kidneys and liver (ATSDR 2006, 2013b; DOH, 2006b; EPA 2011b, 2012b). Exposure to high levels of 1,1,1-trichloroethane also causes cardiovascular system damage in laboratory animals (ATSDR 2006). High levels of TCE exposure affect the immune system of laboratory animals and their ability to have healthy offspring (EPA 2011b). Some studies report an increased risk for adverse effects on human fetal development in the offspring of women who lived in areas with elevated levels of TCE in air or drinking water (Goldberg et al., 1990; Forand et al., 2012), but it is not known if the effects are due to TCE or some other factor. Some studies show a slightly increased risk for some types of reproductive effects among workers (including dry-cleaning workers) exposed to PCE and other chemicals (DOH 2013). The reproductive effects associated with exposure included increased risks for spontaneous abortion, menstrual and sperm disorders, and reduced fertility. The data suggest, but do not prove, that the effects were caused by PCE and not by some other factor or factors.

DOH calculated the estimated increased risk of developing cancer for people who may work in the furniture store for long periods of time using the exposure based on the measured indoor air levels for 1,1-DCA, PCE and TCE and the inhalation unit risk value for each chemical (CA EPA 2011; EPA 2001a, 2012a). DOH evaluated the workers since their exposure frequency and duration is expected to be greater than people shopping in the furniture store. The inhalation unit risk value is a numerical estimate of

the carcinogenic strength (potency) of a chemical. People are assumed to be exposed to the average levels of 1,1-DCA, PCE and TCE for eight hours per day, five days per week for 25 years based on recommendations by the EPA for evaluating occupational exposures (EPA 2009) and occupational mobility (EPA 2011c). The estimated increased cancer risk for long-term occupational exposure (25 years) to the average levels of TCE detected in the furniture store is just over one-in-one million.<sup>1</sup> DOH considers this increase in lifetime cancer risk to be low. The estimated increased cancer risk for exposure to 1,1-DCA and PCE is less than one-in-one million, which DOH considers to be very low. Examples of calculations used in the evaluation of cancer risk are presented in Appendix B.

DOH evaluated the noncancer risks<sup>2</sup> for exposure to PCE, 1,1,1-TCA and TCE by comparing the measured levels in the furniture store to the chemical's reference concentration, assuming someone works eight hours per day and five days per week. The reference concentration is a chemical-specific exposure (expressed as an air concentration) with uncertainty spanning perhaps an order of magnitude, that is without appreciable risk of noncancer health effects, assuming the exposure lasts up to a lifetime. Reference concentrations are set by state, national and international health agencies (e.g., the EPA, the ATSDR and others). Using the highest air levels measured in the furniture store, the time-weighted air concentrations of PCE, 1,1,1-TCA and TCE are all below their corresponding reference concentrations (Table 3). Therefore the risk for noncancer health effects from these exposures is minimal.

**Table 3. Stuart Olver Holtz Site: Measured Indoor Air Concentrations, Time-weighted Air Concentrations and Reference Concentrations for tetrachloroethene, 1,1,1-trichloroethane, and trichloroethene.**  
(All values in micrograms per cubic meter).

Chemical	Highest Concentration Detected in Indoor Air	Time-Weighted Air Concentration <sup>a</sup>	Reference Concentration	Reference
tetrachloroethene	29	6.9	40	EPA (2012a)
1,1,1-trichloroethane	13	3.1	5000	EPA (2007b)
trichloroethene	4	0.95	2	EPA (2011a)

<sup>a</sup>Time-weighted air concentration = (indoor air concentration)(8 hours/24 hours)(5 days/7 days).  
EPA = United States Environmental Protection Agency.

<sup>1</sup> Since the exposure is to adults in an occupational setting, age dependent adjustment factors, which account for the increased vulnerability of children to the carcinogenic effects of TCE (EPA 2011a,b) are not used.  
<sup>2</sup>There is inadequate toxicological information to quantitatively evaluate the noncancer health risk for exposure to 1,1-DCA.

## **Conclusions**

DOH and ATSDR conclude that the Stuart Olver Holtz Site is not expected to harm people's health (Appendix C). This conclusion is based on the fact that, although people in the furniture store were likely to have been exposed to site-related volatile organic compounds, the concentrations were low enough that the exposure is unlikely to result in any adverse health effects.

## **Recommendations**

DOH and ATSDR recommend an SVI evaluation, or the installation of a vapor intrusion mitigation system (as required by DEC), prior to any future construction on the site property.

DOH and ATSDR recommend that the owners of the furniture company take actions to reduce the levels of site related volatile organic compounds in the indoor air of the furniture store. These actions could include installing covers for the basement sumps to improve the quality of the indoor air.

DOH and ATSDR recommend that the DEC require a Site Management Plan for the site and that it includes appropriate monitoring of the indoor air of the furniture store, inspection of the measure implemented to reduce indoor air levels and considers the contamination in any future construction, renovation or repairs.

## REFERENCES

- ATSDR (Agency for Toxic Substances and Disease Registry). 2006. Toxicological Profile for 1,1,1-Trichloroethane. Accessed (January 23, 2014) on-line at <http://www.atsdr.cdc.gov/ToxProfiles/tp70.pdf>.
- ATSDR (Agency for Toxic Substances and Disease Registry). 2013a. Air Comparison Values from ATSDR's Sequoia Database. March, 2013.
- ATSDR (Agency for Toxic Substances and Disease Registry). 2013b. Toxicological Profile for 1,1-Dichloroethane. Draft for Public Comment. Accessed (January 23, 2014) on-line at: <http://www.atsdr.cdc.gov/toxprofiles/tp.asp?id=718&tid=129>.
- CA EPA (California Environmental Protection Agency). 2011. Air Toxics Hot Spots Risk Assessment Guidelines: Cancer Potency Factors. Office of Environmental Health Hazard Assessment). Accessed (February 3, 2013) on-line at [http://www.oehha.ca.gov/air/hot\\_spots/tsd052909.html](http://www.oehha.ca.gov/air/hot_spots/tsd052909.html).
- DOH (New York State Department of Health). 2005. Study of Volatile Organic Chemicals in Air of Fuel Oil Heated Homes. Accessed (January 23, 2014) on-line at [http://www.health.ny.gov/environmental/indoors/air/fuel\\_oil.htm](http://www.health.ny.gov/environmental/indoors/air/fuel_oil.htm).
- DOH (New York State Department of Health). 2006a. Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York. Accessed (February 3, 2013) on-line at: [http://www.health.ny.gov/environmental/investigations/soil\\_gas/svi\\_guidance/](http://www.health.ny.gov/environmental/investigations/soil_gas/svi_guidance/).
- DOH (New York State Department of Health). 2006b. Trichloroethene Air Criteria Document. Final Report. Bureau of Toxic Substance Assessment. Accessed (February 3, 2013) on-line at: [http://www.health.ny.gov/environmental/chemicals/trichloroethene/docs/cd\\_tce.pdf](http://www.health.ny.gov/environmental/chemicals/trichloroethene/docs/cd_tce.pdf).
- DOH (New York State Department of Health). 2013. Tetrachloroethene (Perc) in Indoor and Outdoor Air. September 2013 Fact Sheet. Bureau of Toxic Substance Assessment. Accessed (February 3, 2013) on-line at: <http://www.health.ny.gov/environmental/chemicals/tetrachloroethene/docs/perc.pdf>.
- EPA (United States Environmental Protection Agency). 1996. Integrated Risk Information System. 1,1-Dichloroethane (CASRN 75-34-3). National Center for Environmental Assessment, Office of Research and Development. Washington, DC. Accessed (February 3, 2014) on-line at <http://www.epa.gov/iris/subst/0409.htm>.
- EPA (United States Environmental Protection Agency). 2007a. Toxicological Review of 1,1,1-Trichloroethane. EPA/635/R-03/013. Accessed (February 3, 2013) on-line at <http://www.epa.gov/iris/toxreviews/0197tr.pdf>.

EPA (United States Environmental Protection Agency). 2007b. Integrated Risk Information System. 1,1,1-Trichloroethane (CASRN 71-55-6). National Center for Environmental Assessment, Office of Research and Development. Washington, DC. Accessed (February 3, 2014) on-line at <http://www.epa.gov/iris/subst/0197.htm>.

EPA (United States Environmental Protection Agency). 2009. Risk Assessment Guidance for Superfund. Volume I: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment). EPA-540-R-070-002. Accessed (February 3, 2013) on-line at [http://www.epa.gov/oswer/riskassessment/ragsf/pdf/partf\\_200901\\_final.pdf](http://www.epa.gov/oswer/riskassessment/ragsf/pdf/partf_200901_final.pdf).

EPA (United States Environmental Protection Agency). 2011a. Integrated Risk Information System. Trichloroethylene (CASRN 79-01-6). National Center for Environmental Assessment, Office of Research and Development. Washington, DC. Accessed (January 31, 2014) on-line at <http://www.epa.gov/iris/subst/0199.htm>.

EPA (United States Environmental Protection Agency). 2011b. Toxicological Review of Trichloroethylene. EPA/635/R-09/011F. Accessed (February 3, 2013) on-line at <http://www.epa.gov/iris/toxreviews/0199tr/0199tr.pdf>.

EPA (United States Environmental Protection Agency). 2011c. Exposure Factors Handbook. National Center for Environmental Assessment. Office of Research and Development EPA/600/R-09/052F Accessed (February 3, 2013) on-line at <http://www.epa.gov/ncea/efh/report.html>.

EPA (United States Environmental Protection Agency). 2012a. Integrated Risk Information System. Tetrachloroethylene (CASRN 127-18-4). National Center for Environmental Assessment, Office of Research and Development. Washington, DC. Accessed (January 31, 2014) on-line at <http://www.epa.gov/iris/subst/0106.htm>.

EPA (United States Environmental Protection Agency). 2012b. Toxicological Review of Tetrachloroethylene (Perchloroethylene). EPA/635/R-08/011F. Accessed (February 3, 2013) on-line at <http://www.epa.gov/iris/toxreviews/0106tr.pdf>.

Forand SP, Lewis-Michl EL, Gomez MI. 2012. Maternal exposure to tetrachloroethylene and trichloroethylene through soil vapor intrusion and adverse birth outcomes in New York State. *Environ Health Perspect* 120: 616-621.

Goldberg SJ, Lebowitz MD, Graver EJ, Hicks S. 1990. An association of human congenital cardiac malformations and drinking water contaminants. *J Am Coll Cardiol* 16: 155-164.

URS (URS Corporation). 2013. Ruby Gordon Furniture Store Indoor Air Sampling Report. March 27.

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**Appendix A.**  
**Exhibit 1. Results of Indoor Air Investigation of Ruby Gordon Furniture Store\***  
**(adapted from URS 2013).**

Chemical	Sample 01 Duplicate	Sample 01	Sample 02	Sample 03	Sample 04
	Concentration (mcg/m <sup>3</sup> )				
1,1,1-trichloroethane	7.0	6.7J	13	7.0	6.8
1,1,2-trichloro-1,2,2-trifluoroethane	1.8	1.7J	1.5	2.0	1.6
1,1-dichloroethane	4.0	3.6J	2.9	3.0	4.5
1,1-dichloroethene	0.94	0.88J	1.0	0.85	0.97
1,2,4-trimethylbenzene	2.4	0.45J	1.8	2.3	ND
1,2-dichloroethane	1.6	1.4J	1.8	1.6	1.2
<i>cis</i> -1,2,-dichloroethene	1.5	1.4J	1.2	1.3	1.7
1,3,5-trimethylbenzene	0.42	ND	ND	0.39	ND
1,4-dichlorobenzene	1.8	ND	1.3	1.9	ND
4-methyl-2-pentanone	1.1	0.92J	ND	ND	ND
benzene	0.64	0.61J	0.59	0.63	0.39
carbon tetrachloride	0.41	0.41J	0.39	0.43	0.33
chloroethane	0.21	ND	ND	ND	ND
chloromethane	1.2	0.97J	1.1	1.1	1.1
dichlorodifluoromethane	2.1	1.9J	2.0	2.1	1.8
ethanol	17	14J	15	12	15
ethylbenzene	4.4	2.9J	2.8	3.3	0.41
hexane	ND	ND	ND	0.92	ND
methyl ethyl ketone	3.4	4.5J	2.4	3.1	2.7
methylene chloride	2.5	2.1J	2.3	2.0	2.0
styrene	8.2	1.7J	4.3	5.9	0.38
tetrachloroethene	7.6	7.4J	29	9.3	2.5
toluene	14	11J	10	14	2.3
trichloroethene	4.0	3.9J	3.4	3.8	3.7
trichlorofluoromethane	2.4	2.2J	2.1	2.4	2.0
xylene (total)	9.2	4.7J	6.3	7.5	0.69

\*Table shows only chemicals detected in at least one sample.  
mcg/m<sup>3</sup> = micrograms per cubic meter; J = estimated value; ND = not detected

## **Appendix B**

### **Sample Cancer Risk Calculation**

DOH calculated the cancer risk estimates using the EPA inhalation unit risk for the chemical and applying it to the time-weighted air concentration measured in the furniture store. Using TCE as an example, DOH used the average air concentration (3.71 mcg/m<sup>3</sup>), assuming a person is exposed on an occupational basis for eight hours per day, five days per week for 25 years (EPA 2009, 2011c), and applied the EPA unit risk of 4.1E-6 per mcg/m<sup>3</sup> (EPA 2011a):

#### Calculation of Time-weighted Air Concentration

$$3.71 \text{ mcg/m}^3 \times [8 \text{ hours}/24 \text{ hours}] \times [5 \text{ days}/7 \text{ days}] \times [25 \text{ years}/70 \text{ years}] = 0.32 \text{ mcg/m}^3$$

#### Calculation of Cancer Risk

$$0.32 \text{ mcg/m}^3 \times 4.1\text{E-}6 \text{ per mcg/m}^3 = 1.3\text{E-}6 \text{ (or one-in-one million)}$$

## **Appendix C**

### **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.